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INDEX TO VOLUME LXXXIII

July 1 to December 31, 1919

PAGES

July	3	1 to	48
July	10	49 to	103
July	17	105 to	152
July	24	153 to	200
July	31	201 to	248
Aug.	7	249 to	296
Aug.	14	297 to	344
Aug.	21	345 to	396
Aug.	28	397 to	446
Sept.	4	447 to	490
Sept.	11	491 to	538
Sept.	18	539 to	588
Sept.	25	589 to	636
Oct.	2	637 to	684
Oct.	9	685 to	716
Oct.	16	717 to	748
Oct.	23	749 to	780
Oct.	30-Nov. 6	781 to	844
Nov.	13-Nov. 20	845 to	908
Nov.	27-Dec. 4	909 to	972
Dec.	11-Dec. 18	973 to	1036
Dec.	25	1037 to	1084

A

Page

Abbot, Col. F. V., acting chief of engineers, U. S. A. n715
Abbott, H., on small river terminal for widely varying water stages *999
Abrams, D. A., on does rich concrete in roads crack more than lean?..e491, 518
Receives Wason medal n42
Accident-prevention highway spurs at railroad grade crossings (A. L. Wyman) letter 94, (H. G. Butler) ..... letter 286

ACCIDENTS, see also SAFETY

Fall of dirigible balloon in Chicago e153
Grade crossings, prevention by highway spurs suggested (A. L. Wyman) letter 94, (H. G. Butler) ..... letter 286
Grain-elevator at Port Colborne, board of engineers appointed to investigate, by Canadian Government n442
Lower Otay dam failure called by court "Act of God" n340
Adams, E. E., on protecting viaduct from snowslides by concrete walls *470
Adler, A. A., on design of riveted butt joints after Schweuler assumptions *765
Administrative areas and watersheds should coincide (C. G. Lyman) ..... letter 239

AERONAUTICS

Air patrols detect forest fires 120
Airship (dirigible balloon) completes round trip across Atlantic n148
Balloon, dirigible, completes round trip across Atlantic n148
Balloon, dirigible, falls in Chicago e153
Municipally owned landing fields 413
Service progress e638
Sheds, French, built of framed concrete. *702
Travel e397
War, and gas warfare e591
Aëroplanes, see Aëronautics
Air, dust in, standard methods of ascertaining 936
Air-compressor, gas-driven, portable n*684
Airplanes and Airships, see Aëronautics
Air pockets prevented in concreting scroll case, by use of curved pipe (R. C. Hardman) h*963
Akron, Ohio to appoint manager n968
Garbage collection and disposal (F. C. (Tolles) 1013
Water-works improvements 608
Alaska coast line measured by sextant and stadia-rod method (B. A. Baird) 647
Fairbanks district gold yield 854
Alaska Railroad, more money asked n196
Alaska Railroad Commission, Colonel Mears made chairman and chief engineer. n340
Albany, N. Y., brick water conduit gives long service 768
Savings made by motorizing street-cleaning equipment *762
Water-works e591, 604, 605; one hundred years ago e591, 605
Allen, C. F., on "Case system for study of law" 183
Allen, J. R., resigned as dean of college of engineering, University of Minnesota n246
Allen, R., on sewage and dissolved oxygen in New York harbor *228
Allen, M. E., on fabricated-ship plant planned for later general use *79
Alloys, bearing value 420
America in European eyes e750

AMERICAN ASSOCIATION OF ENGINEERS

And founder societies n966
Attitude on trade unionism n903
Baltimore Chapter urges increase of pay of city engineers n714
Chicago Chapter to start business courses for members 579
Cincinnati Chapter urges increase of rapid-transit engineers' pay n714
Committee chairmen n839
Committee on engineers' pay n101
Committee proposes salary schedule for highway engineers 677
Employment work ..... e974; (E. B. Miller) letter 1025
Established Federal department in Washington n714
Headquarters, new n487

Page

Navy Technical Association joins n44
New York Chapter indorses General Langfitt and discusses freight pier design n777
New York Chapter joins New York Union of Technical Men in pay demand n486
Not technical organization, it states n1029
Or new engineering council? (K. B. Knudsen) ..... letter 237
Proposes salaries of highway engineers in state employ n714
Publicity contest *959
Rapid-Transit section, New York City, organized n969
Supports Jones-Reavis bill for Public Works Department n532
To admit architects n679
Wood, Gen. Leonard, joins n1029
American Association of State Highway Officials, address of A. R. Hirst e845, 856
American Association of State Highway Officials, annual meeting n1029
American Automobile Association issues booklet, "National Highway System" n152
American Chemical Society to meet n341
American Concrete Institute, Convention n41
American Federation of Labor, farmers will not affiliate with e717
Bill of rights e1037, 1038
On trial e539
American Institute of Architects, model registration law e846
American Institute of Consulting Engineers, committee on ethics renders decisions on ownership of plans and state engineer's right to practice 365
Council protests to President against Plumb plan *405
American Public Health Association convention n714
Abstracts, reports and discussions at meeting 882
Meeting of sanitary engineering section. n488
American Railway Bridge and Building Association to meet n679
American Road Builders' Association meeting n744

AMERICAN SOCIETY FOR TESTING MATERIALS

Adopts new standards for materials n583
Convention e1, 9
In new headquarters n679
Refuses to grant money for National Service Committee e1, 9
Warwick, C. L., new secretary-treasurer. 9

AMERICAN SOCIETY OF CIVIL ENGINEERS

Connecticut Association formed n634
Davis, A. P., selected by nominating committee for president n714
Development Committee report commended (W. H. Woodbury) ..... letter 141
Development Committee report (R. E. Spear) ..... letter 433
Development Committee signs final report n679; is discharged n714
Development Committee report ..... e846; discussed n902
Development Committee report, Philadelphia Association begins campaign for n1077
Discusses compensation of engineers n745
Discusses Public Works Department bill. n630
Discusses railroad nationalization n775
District of Columbia Association indorses comprehensive engineering organization n1081
Illinois Association cooperates with Western Society of Engineers n634
Philadelphia Association of Members, energy and accomplishment 1069
Philadelphia Association begins campaign for Development Committee report. n1077
American Society of Mechanical Engineers, proposed activities, report on 22
Alliance with employers e750
Recommends new by-laws for student branches 991
Secretary Rice reports on work of Joint Employment Bureau ..... e974; (E. B. Miller) letter 1025
American Society of Municipal Improvements meeting n775
Americanization, leaders in e685
American Water Works Association to have New York home 533
New York Section meeting 969
Nominating committee elected n969
Andrews, Lieut. S. H., on bridging Rhine by American Army engineers *119
Anthony, C. W., on hexagonal chart for finding velocity of water in pipes e153, *169
Anthony, G. C., on changes at Tuft's College engineering school 185

APPLIANCES

Arch supports, light for canvas sun shields h*1074
Backfiller, improvised, cuts costs on Panama sewer job (R. C. Hardman) h*834
Belt, bow-frame, for finishing concrete roads h*40
Boardwalk for motor truck h*337
Boring machines improvised from electric drill h963
Casters increase utility of pinch bar. .h*1028
Chain tilts and dumps truck body h*773

Page

Dishpans used for light reflectors (A. S. Fry) h195
Drag, special, finishes channel slopes dug by dragline excavator (B. L. Zull) h*96
Endless-track arrangement for carrying away at steam shovels (D. J. McFadden) h*484
Flanging machine, for thin steel plates, built on job h*628
Gage glass on barrel measures water for concrete h*773
Knuckle guard for wheelbarrow handles (J. H. Sawkins) h*1074
Mixer for mastic pavement filler h*338
Pinch bar, utility increased by casters. h*1028
Rig used for sounding under piers (R. W. Beuttenmuller) h*1075
Road digger for breaking old macadam before resurfacing h*195
Special rig for jacking up spans to renew baseplates (C. Baker) h*832
Steel ribs on wide concrete-finishing belt prevent warping h*712
Sun shields, canvas, light arch supports for h*1074
Templet with saw teeth cuts off and finishes concrete road surface h*833
Tightener and clamper for wire pipe-bands n*48
Toggle relieves load on bridge posts during reinforcement work h*743
Trailer, device for lifting and coupling n*972
Turnbuckle adjustment for hammer clutch (E. E. Glass) h899
Valve, home-made, quick-opening for small tanks (D. J. McFadden) h*713
Wedge, spreading, for striking arch centers h*713
Aqueduct canal, bridge over, combined with headgates *610
Arabian port benefited by light railway 503
Arch built with primitive centers h*900
Arches, groined or flat roof for concrete reservoirs, 566, (T. C. Atwood) letter 673

ARCHITECTS

American Institute of Architects' model registration law e846
Buffalo, forwarding Board of Education's building program e910
Licensing law, Illinois n243
Michigan registration board n967
New York State Association formed e448, n488
Profession organized e448, n488
To be admitted to American Association of Engineers n679
To design and supervise Pittsburgh bridges e686, n714
Arcs, elliptic, computation of lengths (G. Paaswell) 221
Armstrong, J., on backfilling tunnel through holes poured from surface *174

ARMY, UNITED STATES

Chief of Engineers, delay in naming n902
Construction Division, Conference on Public Works would make it part of Department of Public Works n968
Fate undecided n1031
Corps of Engineers and Auxiliary Engineer Corps (M. O. Leighton) ..letter 237
Ability vs. seniority e719
Contest for chief n744
Not behind Auxiliary Engineer Corps (Maj. Gen. W. M. Black) letter 141, (M. O. Leighton) letter 237
Versus national Department of Public Works (I. Randolph) 561
Engineers:
Bridge Rhine in record time (Capt. J. M. Farrin and Lieut. S. H. Andrews) *118
Casualties third highest 576
Chief of, delay in naming n902
Credit for e447
Payment of mileage n100
General Staff bill a menace to technical services, e346, 358, (G. D. Snyder) letter 435, ("Ex.") ..... letter 481
Influenza and pneumonia in camps (Maj. G. A. Soper) *72
Light-railway practice in France (P. McGeehan) *635
Materials, surplus, for sale n442
Motor trucks for highways n714, 746
Military policy discussed by Am. Soc. C. E. n714
New Orleans supply base building *122
Pneumonia and influenza in camps (Maj. G. A. Soper) *72
Road-building plant may go to states n533, n583
School at Camp A. A. Humphreys (Maj. C. C. More and Capt. W. E. Duckering) 183
Training school for engineers at Camp A. A. Humphreys n196
Work among most notable achievements of A. E. F., says General Pershing n1030
Arneson, E. P., on pile foundations for unequal load distribution *698
Art national bureau proposed by J. Pennell 194
Ashpit, double-track water-type, Pennsylvania R.R. *408
Ashpits, railway, of new design *1007

*, illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page

ASPHALT

Asphalt Association establishes office in Washington n908
Asphalt Association service department. n101
Device indicates proper grade to use.... *200
Lectures on at colleges..... n836
Pavement, device for scooping up and loading (R. H. Moulton) h*289
Trinidad Lake, maximum sounding.... 132
Asphalt Association, aims, etc..... e398
Investigates college highway courses.... n487
Service department n103
Asphalt-block handling at Army base.... h*439
Assessments, paving, computation of (R. D. Gladding) ..... letter 672

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

And General Contractors' Association to consolidate publications n680
Joined by Cincinnati contractors..... n1077
Organize subsidiary, Contractors' Service Corporation n485
Plan highway conference..... n715
Set dues n837
St. Louis contractors join..... n970
To be represented by C. A. Crane..... n394
Association of Ohio Technical Societies on status of engineer 671
To meet n634
Associations, promotional aims of, etc.... 398
Astronomy for surveyors (book review by H. J. Hughes) 891
Athens, Greece, American engineers to install water-works n392
Atlanta council favors municipal ownership. 216
"Atlantus," first Government concrete ship, commissioned n441
Atmosphere, dust in, standard methods of ascertaining 936
Augusta, Ga., protecting banks of Savannah River *410
Austin, Tex., new sewage works *1066
Australia has large irrigation projects.... 215
Highway activities n340
Auxiliary Engineer Corps and Corps of Engineers (M. O. Leighton)..... letter 237
Not supported by Corps of Engineers (Maj. Gen. W. M. Black) letter 141, (M. O. Leighton) letter 237
Avery, F. H., on new type of wood and asphalt flooring for Chicago bridges.... *866

B

Backfiller, improvised, cuts costs on Panama sewer job (R. C. Hardman)..... h*834
Backfilling tunnel through holes bored from surface (J. Armstrong)..... *174
Bailey, F. S., on diagrams for excess loss of head in pipe lines..... *162
Baird, B. A., on sextant and stadia-rod method for measuring distance..... 647
Baird, S. P., on universal form for skew culvert ends h*901
Baker, C., on special rig for jacking up bridge spans h*832
Baker, C. W., on freight transportation by motor truck or railway....e2, e50, 52, (W. Jackson) letter 434; (J. Wilkes) letter 829
On "The Railway Problem"..announced 719, 752, e783, 789, e749; (F. Lavis) letter 1070
Transportation monographs e781
Baldwin, R. L., on unit costs for use in public utility appraisals..... *514
Balloons, see Aëronautics.
Baltimore urged by A. A. E. chapter to increase city engineers' pay..... n714
Paving recorded by map and file system (R. K. Compton)..... *865
Water-supply; sanitary effect of water storage in open reservoirs (A. Wolman and S. T. Powell)..... *804
Water-works, enlargement recommended (W. E. Lee)..... n630
Band spacing for wood-stave pipe diagram for computing (W. T. Batcheller)..... *472
Barge canal terminal opened in New York City (F. M. Williams)..... *1047
Bartholomew, H., on amendments to St. Louis zoning ordinance..... 403
Bartlett, T., on tidal storm at Corpus Christi and effect on engineering structures..... *848
Batcheller, W. T., on diagram for computing band spacing for wood-stave pipe.. *472
Bathing places, public, state control in Florida 312
Bayles, G. H., on constructing 98-km. water conduit in Chile, *593; correction 1063

BEAMS

Concrete, diagram for locating stirrups in (M. J. Lorente)..... *310
Continuous, and rigid frames, deflection of (F. E. Richart)..... *564
Loads, safe, easily memorized method for finding (M. E. Hibbs)....115, (G. S. Burrell and W. H. Cullers) letters 388
Reactions and bending moments, diagrams for (R. Burnham)..... *956
Steel and wood, safe loads on (H. F. Blood) ..... letter 526
Yellow-pine tested for shear with concentrated loads (L. R. Mancille and C. R. Hill)....*69, (H. D. Dewell) letter 336
Beckworth, A. J., on oil drum makes portable concrete mixer h*531
Belgium, low wages in..... e685
Belt, bow-frame, for finishing concrete roads h*40
Benchmarks, depressed permanent set in concrete floors (L. C. Scott)..... *365
Berkeley, Calif., lets entire water front at private lease n101
Berlin buys street railway system..... 175
Beuttenmuller, R. W., on material under piers removed by jetting with hydraulic dredge h*775
On rig used to sound under piers.... h*1075
Bibbin, J. R., on effect of deferred earnings on capital value..... *947
Birmingham, Ala., port of, work commenced n1034
Black, Gen. W. M., discusses military policy n714
Retires n715
Blair, W. P., on is beam strength the important item in brick roads?..... 699
Blasting tests show TNT stronger than 40% dynamite h145
Blenderman, H., on construction labor's instability 939
Block yard cheaply improvised from old equipment *356
Boards, reinforced-concrete, straightened. h*901
Boiler-house structure and fittings, concrete used in (G. S. Nobles)..... *262
Boiler plates, old, for coffer plates (G. W. McAlpin)..... h900
Boiler water, treatment..... a323

BOLTS

Construction, tight nuts on..... h484
Experience with....e298, (R. Fleming) *316, (W. E. Belcher) letter 529, (H. B. Tabor and E. D. Coddington), letter 896
In field connections of steel-frame buildings (R. Fleming) ..... e298, *316, (W. E. Belcher) letter 529, (J. E. Bernhardt and W. L. Kelly) letters 771
Bonds, corporate contract, function of (E. W. Bush) ..... letter 142
Criticism of business answered (H. V. Swart) 669
Book prices barred by Postoffice Department from reviews....e345, 379, 382, (C. J. Tilden) letter 482, (W. A. E. Doying) letter 580

BOOKS

"American Air Service" (Sweetser)..... 138
"American Labor Policy, An" (Cohen).. 742
"America's Munitions, 1917-1918"..... 138
"Analysis of Statically Indeterminate Structures by the Slope-Deflection Method (Wilson, Richart and Weiss). 138
"Boiler Chemistry and Feed-Water Supplies (Paul), (reviewed by G. C. Whipple) 380
"Book of the National Parks." (Yard)..1022
"Condensed Chemical Dictionary"..... 1022
"Construction of Graphical Charts" (Peddle) 139
"Delaware River Bridge and Tunnel Commission Report"..... 380
"Democracy in Reconstruction (F. A. Cleveland) 578
"Design of Walls, Bins and Grain Elevators" (Ketchum) 139
"Draftsman, The" (Shelmire)..... 380
"Elastic Stresses in Structures" (Castigliano; translated by Andrews)..... 381
"Electric Power Transmission" (Still).. 381
"Elements of Astronomy for Surveyors" (Chapman), (reviewed by H. J. Hughes)..... 891
"Employment Management" (D. Bloomfield) 577
"Engineering Education; Essays for English" (Baker) 891
"Field Engineering" (Searles and Ives).. 139
"Forest Products, Their Manufacture and Use" (Brown) 1021
"Gasoline Automobile" (Hobbs and Elliott) 892
"Government of the United States" (Munro) 139
"Health Officer, The" (Overton)..... 1023
"History of Indian Railways"..... 381
"Houses, Site Planning Utilities (report of U. S. Housing Corporation)..... 578
"How France Is Governed" (Poincaré).. 139
"Hydraulics" (Daugherty) 892
"Hydrology" (Mead) reviewed by F. H. Newell 1021
"Incidents in the Life of a Mining Engineer" (McCarthy) 1021
"Industrial Good-Will" (Commons)..... 380
"Labor Turnover, Loyalty and Output" (Colvin) 381
"Law of Government Contracts" (Shealey) 380
"Machine-made Cement Pipe for Irrigation Systems and Other Purposes" (Smith) 139
"Municipal Ownership, 100 Reasons Why 100 Cities Have Changed to"..... 742
"New Towns After the War"..... 892
"One Hundred Reasons Why 100 Cities Have Changed from Private to Municipal Ownership" 742
"Orifice as a Means of Measuring Flow of Water Through a Pipe" (Davis).. 1022
"Record of War Activities" (Turner Construction Co.) 139
"Shell Loading at Amatol, N. J." (Atlantic Loading Co.) 139
"Shore Processes and Shoreline Development" (Johnson) 138
"Socialism and American Ideals" (Myers) 891
"Southern Yellow Pine"..... 891
"Statistics of Government Railways in China" 892
"Tables of Mechanical Properties of Materials" 379
"Tests of Metals and Other Materials" (at Watertown Arsenal)..... 138
"Timbee" (H. S. Betts) reviewed by F. W. Dean..... 577
"Town Improvement" (Evans)..... 742
"Trautwine's Civil Engineer's Pocket-Book" 137
"United States Reclamation Service".... 1021
Booth & Flinn get Pittsburgh tunnel contract. n903
Boring machine improvised from electric drill h*963
Bosard, R., on determination of Kutter's roughness in drainage ditch..... *921
Boston, Army supply base wharf, semi-portal dock cranes *516
Boston, supply bureau to be reorganized. n842
Bow-frame belt for finishing concrete roads h*40
Box-car shortage due..... e153
Breed, H. E., on what has New York received for $100,000,000 road expenditures? e447, 450
Brewer, B., on control of new streets in relation to extension of water mains.. 705
Brick, fugless standard for paving brick.. e845
Brick Manufacturers' Association (common brick) to advertise..... n343
Brick water conduit gives long service.... 768
Bridgeport District Salvage Board issues weekly bulletin..... n151

BRIDGES

Arch bridge pier, test of sandy foundations (A. Richards) *208, (H. Abbott) letter 772
Arch bridges, historic, strengthened....*431
Arches, flat on high piers, South Side bridge, Fairmont, W. Va..... *270
Bascule, Chicago, span increased to allow swing bridge to operate 309
Largest single-leaf, Chicago River...*1056
Michigan Ave., Chicago, substructure (H. E. Young and W. A. Mulcahy) *210
Single-leaf, in double-leaf bridge.... 189
Bethlehem, Penn., to be contracted for by Public Service Commission n1081
Cast-iron, historic, jacketed with concrete 134
Chicago River, largest single-leaf bascule *1056
Coal Valley, Penn.; unusual design and joint details..... e639, *656
Concrete:
Arch bridge with ribs anchored by concrete keys (C. B. McCullough)....*924
Lightning pushes sidewalk off..... *68
Spreading wedge for striking arch centers h*713
Through concrete arch, to give large waterway (F. W. Epps)..... *994
Wide bridge built as two bridges without interval..... *928
Cumberland River suspension (W. G. Grove) *4
Delaware River, appropriation asked...n1033
Design and joint details, unusual, of 430-foot bridge, Coal Valley, Penn. e639, *656
Design, Rondout Creek, condemned for excessive load on batter piles...*329, (W. E. Belcher) ..... letter 479
Detroit, bridge across American channel, bill passed by United States Senate; plans for..... n904
Project studied..... n969
Drawbridge, extraordinary repairs to 1900-ton bridge..... *366, e398
Drip floor, steel-plate, for Niagara railway arch *620
Fairmont, W. Va..... *270
Floors, replaced after corrosion, e541, *562
New type, wood and asphalt, for Chicago bridges (F. H. Avery)..... *866
Foundations, cofferdam experience, Chicago River (H. E. Young and W. A. Mulcahy) e249, *268
Arch bridge pier, test of sandy foundations (A. Richards) *208, (H. Abbott) letter 772
Girder expansion bearing fails to slide.. 652
Highway and culvert surveys, Iowa..... 140

Highway Bridges:
Corrosion of steel e541, *562
Covered wooden economical in Oregon 215
Wheel guards *282
Wheel loads on floors (H. F. Blood) letter 190
Home-made, two, in Catskill village (R. Fleming) *568
Inspection contract proposed in Portland, Ore. n776
Iowa highway and culvert surveys..... 140
Lift spans, timber, spiral drums for operation of *803
Michigan Ave., Chicago, bascule, substructure (H. E. Young and W. A. Mulcahy) *210
Military e448
Military, in active warfare (L. E. Moore and M. W. McDonald)..e687, *688, *734, (J. W. Pearl) ..... letter 1073
Nashville, design features and erection methods (W. G. Grove)....*4, (D. Ording and W. G. Grove) letters 527
New York, traffic separated..... n487
Niagara railway arch, steel-plate drip floor for *620
Reinforced for heaviest traffic..... *877
Niagara, toggle relieves load on posts during reinforcement work..... h*743
Pier drops span n680
Pittsburgh, architects employed to design and oversee construction....e686, n714
New plan for n715
Pottstown, Penn., floor replaced after corrosion e541, *562
Railway:
Floors e639
Painting, paint service and paint technology 827, (A. H. Rhett)..letter 1072

*, illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page

Specifications....e2, 33, e51, (E. Godfrey) .....letter 437
Replacement problem in Chicago..... 309
Rhine bridged by American Army engineers in record time (Capt. J. M. Farrin and Lieut. S. H. Andrews)....*118
Rondout Creek, design condemned for excessive load on batter piles....*329 (W. E. Belcher) letter 479
Roumanian, wrecked during war.....*182
Special rig for jacking up spans to renew baseplates (C. Baker).....h*832
Spiral drums for operation of timber lift spans *803
Steel-plate drip floor for Niagara railway arch *620
Stress reversal e51
Substructure of Michigan Ave. bascule bridge, Chicago (H. E. Young and W. A. Mulcahy) *210
Surveys, Iowa 140
Suspension, 540-foot, design features and erection methods (W. G. Grove) *4, (D. Ording and W. G. Grove) letters 527; (D. Ording) letter 711
Largest in New Zealand (O. Johnson) *263
331-foot, erected with unskilled labor (A. M. Truesdell) .....letter *241
Susquehanna River memorial, at Harrisburg, Penn., contract for is let....n714
Through concrete arch, to give large waterway (F. W. Epps).....*994
Timber, on Alaska railway.....*420
Toggle relieves load on posts during reinforcement work h*743
Toll, to be purchased by New York and Pennsylvania. 860
Train-ferry, English Channel (P. J. Risdon) *660
Triangular, and H. E. Horton (J. W. Pearl) .....letter 1073
Unusual design and joint details of 430-ft. bridge *656
Wide, built as two bridges without interval *928
Wilmington, Del., memorial arch bridge, bids to be asked n779
Engineer chosen by competition.....*806

Bristol, Conn., paying for water-main extension at 772
British city engineer, problems of 1006
British Columbia Technical Union now B. C. T. Association.....n837
Activity 1069
Brooklyn Army supply base, freight handling e540, *555
Paving of streets and aisles....*400, h*439
Brush, W. W., on insulation resistance in motors reduced by moisture.....a818
Budget, national, indorsed by Engineering Council committee.....n714
Promotion, *The National Budget*..... 892
Buffalo, N. Y., architects forwarding Board of Education's building program.....e910
Buffalo sells garbage on Chicago hog-price basis n197
"Building for Victory," by Col. W. A. Starrett 139
Building, 3000-ton, moved 450 feet by electric hoists *706
Building-association stock provides plant-replacement fund (O. H. Yeager) h1027
Building materials, prices, 1914-1919....*799
British and American (A. G. Duke) letter 142
Building trade wage increase since 1913..*788
Building trades, "team spirit" plan, British 1000
Building trades employers and employees sign two-year wage agreement.....n905

BUILDINGS

Concrete, addition made at reasonable cost *75
Concrete and steel framing combined for economy *178
Concrete, large, at stockyards, Denver..*413
Handling materials in construction of New York hotels.....*222
Steel and concrete framing combined for economy *178
Steelwork for, common errors in detailing (E. Godfrey), 1730; (L. C. Jordan), letter, 961; (G. Paaswell), letter 962

Bulletin of the Associated General Contractors of America, to be issued.....n680
Bureau of Housing and Living Conditions, bill drafted n393
Bureau of Mines to dedicate new Pittsburgh laboratories n583
Bureau of Public Roads, enlargement asked by Mississippi Valley Association.....n1077
Bureau of Standards' current budget.....n969
Annual report 1060
Burkholder, J. E., on dragline excavator helps itself to fuel and lays track over soft ground h*582, h*1047
On drainage works of Rio Grande irrigation project *543
Burlington, Vt., water-supply filtered and chlorinated 655
Burnham, R., on diagrams for reactions and bending moments of beams.....*956
Burpee, R. W., on heavy double trestle for shipbuilding cranes (R. W. Burpee), e717, e718, *723
Bus depot, union, at Los Angeles n1080
Business for breakfast.....e782
Butcher, W. L., on what will engineers pay to improve their status?..... 722
Butts, W. M., on what will engineers pay to improve their status?..... 722
Bypass filter valve, faulty, cause of Moline, Ill., typhoid outbreak e106

Cable incline handles dump cars in building wet fill.....h*96

C

Page

Caissons, suspended pneumatic place dam foundation *108
Telescopic foundation, sunk in bank basement (F. H. Eastman).....*369
Calculating machines in Geological Survey work. 422

CALIFORNIA

C. H. Lee appointed water commissioner. n714
County engineers replace county surveyors. n197
Highway bond issue carried.....n99
State council of engineers in process of formation. 284
Cameron Co. settles claims for septic tank royalties. n714
Camouflage powder magazines look like trees (Maj. G. C. Muñoz) *280
Camp, A. A. Humphreys, Army Engineer School (Maj. C. C. More and W. E. Duckering). 183
Camps, Construction (see Construction Camps).

CANADA

Commission on Industrial Relations, report. 223
Electric generating plants.....207
Government railway operation shows loss. n148
Health Department, new.....36
Housing aid, Federal and provincial.... 649
Impressions here and there—from Niagara to Ottawa. 797
Opposition to purchase of Grand Trunk Railway. n715, n745
Railway War Board abolished, Railway Association of Canada formed.....n837
Waterways convention.....n967
Canadian Pacific Railway plans extension of Kipawa branch n839

CANALS

American, at Sault Ste. Marie, fourth lock opened. n678
Cape Cod, $16,000,000 for n779
Grand, China, improvement to be designed by T. H. Wiggin.....n441
Gulf to Atlantic proposed.....n98
Lock closed by dam supported by bascule bridge. *116
New Jersey ship canal agitated.....n836
New York Barge, largest terminal opened in New York City (F. M. Williams)..*1047
New York Barge; state wants full control of rates.....n243
Rates, bill to give Interstate Commerce Commission control. n243
Sand removed by sluicing 998
Sault Ste. Marie, fourth lock opened....n678
St. Lawrence system, proposed enlargement. n679
Trolhattan, Sweden, dam supported by bascule bridge closes lock.....*116
Welland Canal work shut down.....n680
Canning-plant wastes, in Wisconsin, treatment (E. J. Tully) *1017
Canvas chute prevents cement dusting....h*440
Canvas pipe gives flexible distribution of sluicing water. h*390
Cape Cod Canal, $16,000,000 for.....n779
"Cape Fear," Government concrete ship, launched. n*291
Capital value, effect of deferred earnings on (J. R. Bibbin).....*947
Carnegie, A., obituary.....e297, n339
United Engineering Society's tribute to..n394
Carver, T. H., and J. H. Quense, on tests of concrete in tension *1005
"Case system," changes in engineering curricula, and business training for engineers....e153, 183, (J. K. Finch) letter 285
Casters increase utility of pinch bar....h*1028
Caterpillar steam shovel makes construction railway fill h*1028
Caterpillar tractor hauls gravel in Minnesota. *227
Castings, X-ray examinations for blowholes..234

CEMENT

American exports not excessive in 1919..1061
Bin; measuring box reduces clearance in. h*532
Companies, Federal action against..e347, n392
Dusting prevented by use of canvas chute. h*440
Export company elects officers.....n844
Exports lower than in any year since war began e1037
Fineness requirement, Government, postponed. n744
Flat-car stock pile for paving mixer..h*1076
Kansas companies sued for restraint of trade. n196
Nevada may have State mill.....n197
Production fell off in 1918.....129
Testing by Government.....e782, 825

Cement gun, lining reservoir with (E. C. Eaton). *167
Cement joints for cast-iron water mains at shipbuilding plant (A. J. Newman).....609
Census, fourteenth. 831
Irrigation in (R. P. Teele).....926
Manufactures to be carefully enumerated 929
Chain Belt Co., new plant.....n684
Chain tilts and dumps truck body.....h*773
Chamber of Commerce of United States admits Engineering Council.....n714

Page

Committee on Department of Public Works n1031
Referendum vote on return of railways to owners. n292
International trade conference postponed..n680
Chandler, E. M., on reconstruction of Naches-Selah irrigation canal.....*276
Chaney, R. C., on soil exploration by pipe sounding h*439
On special targets facilitate survey of flood works *766
On unusual concrete retaining wall section has raised heel.....*621
Changed dollar and the engineer....*182, e201
Changes in value of dollar.....*937
Channel, concrete, for stream over fractured mine outcrop (H. A. Coy).....*327

CHARTS

Concrete road specifications, summary (A. N. Johnson).....*160
Curve, for railway resurvey (J. G. Wetherell). *506
Hexagonal, for finding velocity of water in pipes (C. W. Anthony).....e153, *169
Chemical industries, fifth national exposition. n490
Chester Shipbuilding Co. and Merchant Shipbuilding Corporation consolidated.....n341
Cheyenne, Wyo., corner gutters depressed...424

CHICAGO

City engineer, examination for is urged..n1077
City engineers get increase.....n292
Increase in motor vehicles.....280
Lake-front $140,000,000 improvement, n196, *216, correction *360
Smoke problem civic more than engineering. n101
Technical employees hear union labor leaders n1081
Theater and office building, combined steel and concrete framing.....*178
To vote on $28,000,000 bonds for improvements n147
Votes improvement bonds.....n836
Chicago Drainage Canal, lake water diversion and sewage treatment.....231
Chicago River, closing to navigation suggested. 321
Chicago Sanitary District will build 60 miles of road.....n100
Chicago to Liverpool by steamer.....n43
Chicopee, Mass., steel standpipe subject of suit e1039, 1053
Chief of Engineers, U. S. A., delay in naming. n902
Chile, constructing 98-km. water conduit in (G. H. Bayles), *593; correction 1063
Topographical surveying on Atacama desert (B. L. G. Rees).....*224
Chimney, highest, built for Anaconda, Mont., smelter.....*764
China, Grand Canal improvement to be designed by T. H. Wiggin.....n441
Chloramine, permanent plants for, installed at Denver. *606
Churches and labor.....e910
Chute, canvas, prevents cement dusting..h*440
Cincinnati completing meter program..... 876
Cincinnati Rapid Transit Commission urged by A. E. chapter to increase engineers' pay. n714

CITIES

Atlanta council favors municipal ownership 216
Berkeley, Calif., lets entire water front at private lease n101
Berlin buys street railway system..... 175
British municipal engineer, problems of..1006
Centralization of city traffic.....e154, *170
City planning, progress in..... 249
Consulting engineers, board of, for Columbus, Ohio 1073
Effect of size of lots on industrial housing (M. Knowles)..... 955
Garden suburb and housing plan, Ottawa, Ont. *412
Home rule cities, Colorado, may regulate utility rates 214
Kansas City Engineers' Club to get growth data on which to base civic opinion 93
Landing fields for airplanes, municipally owned 413
Markets, municipal, in United States.... 496
Minneapolis will have right to buy street railways n633
Monroe, La., engages city consulting engineer and works director..... 82
Municipal ownership favored by Atlanta council 216
Municipal savings bank, St. Paul..... 407
Newark, N. J., zoning ordinance.....n1033
Paving (Baltimore) recorded by map and file system (R. K. Compton).....*865
Philadelphia, city planning n1034
Proposes new loan bill.....n1034
Zoning proposed for..... 918
Public improvement programs hampered by local authorities e250
Seattle advances wages..... n46
Should they take risks in water filtration and sewage treatment?.....e909
Special legislation for, how ban is avoided in Kansas..... 573
St. Louis zoning ordinance, amendments (H. Bartholomew) 403
St. Paul increases tax limit..... a99
St. Paul municipal savings bank..... 407
Tallahassee, Fla., to have manager....n836
Three planning commissions in Pittsburgh 763
Transit developments e105

*, illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page

Washington, D. C., bill to limit height of buildings, etc., and zoning, passed by House n584
Wheeling, W. Va., begins civic development n486
Zoning authorized in Oregon 498
Zoning for Washington n339
Zoning ordinance, Newark, N. J. .n1033, 1045
Zoning ordinance, St. Louis, amendments (H. Bartholomew) 403
Zoning proposed for Philadelphia 918
City Managers' Association, date of meeting advanced n680
Civil engineering and public health (R. J. Harding 920
Civil Service examinations 46, 101, 149, 199, 246, 293, 341, 394, 444, 488, 536, 586, 634, 681, 842, 905, 970, 1035, 1082
Clamshell bucket digs 30 cu.yd. per dip ... *279
Operated by gears completely inclosed . .n*636
Clay, soft, resistance to penetration by pyramids and piles 946
Cleveland orders bond issue vote on subway n836
Public-works engineering in—impressions here and there 996
Sliding hillside at *164
Street-car loop subways e105, e154, *170
Clinton, Mass., washing sewage-filter gravel at 763
Closet, dry, folding portable h*146
Sanitary, with septic tank h*97

COAL, COAL MINES, COAL STRIKE

Builders press priority claims n902
Coal and construction materials e781
Constructors continue plea n966
Mines taken over by Kansas n745
Restrictions protested by builders' committee n835
Strike e685, n745, e781, n835
And water power e973
Kansas Highway Commission aids in emergency n1031
Tractor engine operates plant during crisis n*1036
Coast and Geodetic Survey, mapmaking work n341
Cock box, curb, and water meter, combined. 1084
Cofferdam experience at bridge in Chicago River (H. E. Young and W. A. Mulcahy) e249, *268
Thin-wall, new type *817
Coffer plates made from old boiler plates (G. W. McAlpin) h900
Colombia, S. A., American contractors invited to bid on tunnel n969
Colorado slow in putting license law into action n779
Colorado Engineering Council working 284
Colorado Society of Engineers keeps members in employment 579
Columbia Basin Survey Commission completing irrigation surveys n714, 800

COLUMBUS, OHIO

Columbus, Ohio, board of consulting engineers for 1073
Engineers' Club asks information on organization to increase pay (D. T. Wadsworth) ..... letter 286
Flood protection work, concrete wall construction is continuous process *454
Garbage-reduction results 1067
Proposed water-works enlargements 885
Widened channel reduces hazard *512
Columns, steel, further tests e202
Comfort station law in Wisconsin 121
Common professional program . .e782, 808, n835
Compressed air used to clean road surface before oiling (Maj. W. A. Welch) *933
Compressed-air line anchored to concrete posts h963
Compressed Gas Manufacturers' Association to meet n972
"Compression" wood and failure of factory roof-beam (G. E. Heck) *508
Compton, R. K., on Baltimore paving recorded by map and file system *865
Computing cross-section paper for earthwork computations (J. H. Dorroh) letter 39, (L. C. Craig) letter 240
Comyn, W. L., receives medal for building first concrete ship n42, n*100

CONCRETE

Aggregates:
Burnt clay and wood 703
Clean, insured by carpet of screenings h676
Gravel deposits for, explored by suction pumps h532
Slag, in England 315
American Concrete Institute convention . . n41
Backfilling tunnel through holes bored from surface (J. Armstrong) *174
Beams, diagram for locating stirrups in (M. J. Lorente) *310
Bonding new to old 209
Building, addition made at reasonable cost *75
Concreting procedure on Miami flood-control dams *640
Excess water in cement glue ....e105, (C. T. Wiskosil) *130
Fireproofing columns with plates a92
Forms:
Bottom carries ginpole to erect top form h242
Floor, designed for easy stripping . h*195
Universal, for skew culvert ends (S. P. Baird) h*901
Gravel, does not make concrete fire-resistant e49, a76
Jigging, vibration and pressure, effect on concrete a16

Page

Lightning pushes sidewalk off concrete bridge *68
Lining reservoir with concrete with cement gun (E. C. Eaton) *167
Materials chuted into sidewalk vault mixing plants h40
Mixers and Mixing
Gage glass on barrel measures water h*773
Materials chuted into sidewalk-vault plants h40
Labor saved by resource of contractor (W. F. Reichardt) h*712
Large mixer puts in 180-yd pavement slab every hour *658
Portable made from oil drum (A. J. Beckwith) h*531
Traveling plant concretes wall h*145
Mortar test for, more against (J. O. Jones) ..... letter 581
Pressure, vibration and jigging, effect on concrete a16
Proportioning, see also Concrete, Tests:
Defends aggregate grading theories (L. N. Edwards) letter 191, (G. M. Williams and W. Davis) letter 334
Excess water in cement glue ....e105, (C. T. Wiskosil) *130
Ratio of fine to coarse aggregate a92
Water ratio as affected by rodding (D. A. Abrams) ..... letter 895
Quick-hardening with special cements ... a16
Rapid concreting a feature of big Portsmouth dry dock *494
Reinforced:
Columns reinforced with cast-iron tubes 521
Tests on properties (W. A. Slater) *217
Rich, in roads; does it crack more than lean? (J. C. Pearson, W. D. Uhler, E. N. Hines, P. S. Wilson, A. N. Johnson, C. Older, D. A. Abrams, A. H. Hinkle, e491, 518, (B. H. Tong), letter 771
Rodding concrete, further researches in (F. E. Giesecke) ..... letter *528
Rough field tests for concrete sands ... 424
Ship, French tests 821
Ships see Ships, Concrete
Slag, in England 315
Stress, repeated e449
Striking off, on superelevated curves . h*289
Tests see also Concrete, Proportioning:
Columns reinforced with cast-iron tubes 521
Escaping water important (G. A. Parkinson, D. A. Abrams and J. C. Pearson) ..... letters 192
French for ships 821
In tension (T. H. Carver and J. H. Quense) *1005
Making gravel concrete fire-resistant, e49, a76
Mortar, for concrete, more against (J. O. Jones) ..... letter 581
Paper cylinders used for molds (W. Davis) *473
Properties of reinforced concrete (W. A. Slater) *217
Quick-hardening concrete with special cements a16
Ratio of fine to coarse aggregate a92
Vibration, pressure and jigging a16
Used in boiler-house structure and fittings (G. S. Nobles) *262
Used to jacket historic cast-iron bridges. 134
Vibration, pressure and jigging, effect on concrete a16
Concrete beams, standard sizes wanted . e910
Concrete blocks, yard for casting cheaply improvised from old equipment *356
Concrete buildings, large, at stockyards, Denver *413
Concrete channel for steam over fractured mine outcrop (H. A. Coy) *327
Concrete conduit for railway track wires *1055
Concrete flagpole poured in place (R. C. Hardman) *173
Concrete floors, depressed permanent bench marks (L. C. Scott) *365
Concrete I-beams used to make crib retaining wall *651
Concrete mast 164 feet high built in place. 952
Concrete pipe and culverts, joint committee organized n98
Concrete pipe fails from unusual expansion of shell (Prof. G. E. P. Smith) *113
Concrete posts hollow packed with sand . *269
Concrete railway track support ....165, (A. C. Irwin) letter 333
Concrete tanks for oil storage a16
Concrete tower, 140 foot, for concreting raised in one piece (S. S. Hammel) h*242
Concrete wall construction is continuous process *454
Concreting procedure on Miami flood control dams *640
Concreting scroll case curved pipe prevents air pockets (R. C. Hardman) h*963
Conduit brick water gives long service . 758
Conduit, concrete for railway track wires *1055
Congressional persecution of contractors and manufacturers (W. B. King) 1044
Connecticut Association of Members of Am. Soc. C. E. formed n634

CONSTRUCTION

Labor ..... e397, instability 759, 813 876
New methods in subway work under Philadelphia City Hall e297, *300
Power costs cut by electricity *311
Work, largest use of electric power on *417

CONSTRUCTION CAMPS

Camp beds and bedding reduce labor turnover (W. C. Hanson) e202, 213
Folding portable h*146
Sanitary closet with septic tank h*97

Page

Constructors' vs designers' pay e539
Constructors continue coal plea n966
Consulting Engineers' council protests to President against Plumb plan *405
Continuous girders, mechanical method for determining reactions in (R. Fleming) *428

CONTRACTORS AND CONTRACTING; see also CONTRACTS

American, invited to bid on Colombian tunnel n969
And engineers, coöperation e249
Appropriation asked for relief of n681
Associated General Contractors of America organize subsidiary, Contractors' Service Corporation n485
Plan highway conference n715
Set dues n837
To be represented by C. A. Crane . n394
Canadian gets Turkey Creek sewer, Kansas City, Mo., contract n535
Cincinnati, join national body n1077
Congressional persecution of (W. B. King) 1044
Equipment, charging off, depreciation on h582
Government, relief sought n392
Large, shun road work (Practical Engineer) letter 38, e49, (W. J. Hoskyn) letter 284, (L. B. Smith) letter 480 e637
Pay for estimates, say contractors .. 619
Refuse to bid save on cost plus basis ... n534
Service Corporation formed n485
Specifications, responsibility for (W. P. Bullock) ..... letter 388
Texas Association n99
Tool records kept on two form sheets . h*675

CONTRACTS; see also CONTRACTING and CONTRACTORS

Bonds, corporate contract, function of (E. W. Bush) ..... letter 142
Bonds, criticism of business answered (H. V. Swart) 669
"Contract Forms and Specifications," Miami Conservancy District (book review) 380
Cost of bonds on War Department construction contracts in dispute n99
Government specifications should not misplace responsibility (E. D. Buel) letter, 144; (S. W. Barakat), letter ... 285
Highway, long, in Arkansas 87
"Law of Government Contracts" (book review) 380
Overhead exceeds cost plus 10 per cent e50, (A. P. Roscoe) 89
Convict labor on Arizona highways 88
Coolidge, Governor of Massachusetts, re-elected e685
Copper, effect in reducing corrosion of steel a14
Corps of Engineers, see Army, U. S. A. Corps of Engineers
Corpus Christi, Tex., tidal storm and effect on engineering structure (T. Bartlett) . .*848
Cost of living, effect of production shown graphically n443
Costello J. W., on Newark, N. J., garbage feeding contract 456

COSTS

Cost engineering as a science ...e250, *252
Keeping costs of building government houses (J. C. Prior and H. P. Green) e250, *252
Overhead exceeds cost plus 10 per cent e50, (A. P. Roscoe) 89
Coy, H. A., on concrete channel for stream over fractured mine outcrop *327
Crandell, J. S., on corrugated spacer for wood-block pavements *463
Crane, C. A., to represent Associated General Contractors n394

CRANES

Heavy double trestle for shipbuilding (R. W. Burpee) e717, e718, *723
Semi-portal dock, at Boston Army base wharf *516
Track-laying tractor crane of ordnance department n*396
Traveling, safety in operation 471
Creosote oil specifications declared "closed" by Chicago court n1080
Creosoted piles sound after 29 years *378
Creosoted timber tanks and poles damaged by woodpeckers (L. W. Duffee) ..... letter 962
Crib retaining wall, concrete I-beams used to make *651
Cribbing protects banks of Yakima River. 624
Cribs, wood, hold toe of riprap on slopes . h*899
Critical hour, the e685
Cross-section paper, computing, for earth work computation (J. H. Dorroh) letter *39 (L. C. Craig) letter 240
Cross-sections, exaggerated measured by planimeter (C. P. Mowry) ..... letter *456
Crown V. M., on leakage test of wood-stave pipe line *264
Culvert for drainage, built through high railway fill *645
Surveys, Iowa 140
Universal form for skew culvert ends (S. P. Baird) h901
Curb cock box and water meter, combined. 1084
Curb protects stock pile in street h628
Curtis, G. A., on screeding easements of banked highway curves *274
Curve chart for railway resurvey (J. G. Wetherell) *506
Curved drive for automobiles in six-story garage *188
Curves, short-radius, convenient table for locating (C. M. Pritchett) h1076

*, illustrated; e, editorials; h, hints; n, news notes; a, abstracts

Page

Curves and tables, mechanical device for reading .....•644
Cutting granite with oxyacetylene flame..h•390
Cylindrical structures, wind pressures on (R. W. Fleming)..e491, 409, connection 659

D

Dabney, A. L., on what will engineers pay to improve their status?..... 720

DAMS

American Falls project, Idaho, demanded ....e718; (B. Dibble) letter 1070
Closing construction openings 377
Closure risks e845
Concreting procedure on Miami flood-control dams .....•640
Earth, constructed by means of large use of machinery (F. E. Winsor)..... 612
Foundation placed by suspended pneumatic caissons .....•108
Hay used to line slopes..... 378
Headgates combined with bridge over aqueduct canal .....•610
Hetchy Hetchy, new, to be one of world's highest n244, bid accepted n292
High Falls, Ont., foundation placed by suspended pneumatic caissons .....•108
Hydraulic dam cores, study of pressure in.....e1037, •1040, e1038
Hydraulic-fill, consistency of cores tested by three methods 708
Hydraulic-fill construction.....e345, •371
Hydraulicking embankment .....e345, •371
Jackson Lake the savior of Snake River valley .....•992
Lower Otay failure called by court "act of God".....n340
Multiple-arch fundamentals in design (R. P. McIntosh).....e447, •464
Rensselaer Lake, without spillway..... 713
Supported by bascule bridge closes canal lock .....•116
Daniels, Secretary, dedicates Pearl Harbor dry dock n486
Dappert family, of Taylorville, Ill., war record n148
Davis, A. P., selected by nominating committee as president Am. Soc. C.E.....n714
Davis, W., on paper cylinders used for molds for concrete test pieces .....•473
Daylight saving continued n148, repeal again up, n290; passed over veto.....n394
Dean, F. W., review of "Timber"..... 577
Deepest mine is Michigan Tamarack shaft. 403
Deflection of continuous beams and rigid frames (F. E. Richart) .....•564
Delaware, annual highway meeting and exhibit n841
Delaware, Lackawanna & Western R.R. trainshed raised without traffic interruption .....•460
Denison, E. E., on analysis of Esch railway bill..... 885
Denver, large concrete building at stockyards .....•413
Water-works, permanent plants for chloramine installed .....•606
Department of health, state, essential functions of 1002

DEPARTMENT OF PUBLIC WORKS

Bills introduced n41
Chamber of Commerce committee on ..n1031
Construction Division, U. S. A., should be made part of proposed department..n968
Discussed by Am. Soc. C. E.....n630
In other countries n245
Indorsed by Engineers' Club of Minneapolis n836
Jones-Reavis bill n149; supported by A. A. E., n585; certain points of, n585; engineers urge commercial bodies to indorse •967
National Public Works Department Association n1030
Need for, seen in work of Coast and Geodetic Survey n341
Need for seen in treatment of rivers by Government n198
Versus Corps of Engineers (I. Randolph) 561, (I. Randolph) letter 770, correction 771
Derrick, improvised hoisting, tilts steel stack onto base.....h•337
Erection, straddles site of narrow building .....h•900
Operates light piledriver without extra engine (F. W. Epps).....h•963
Design records for operating force.....e539
Des Moines, manager for water-works to be selected n679
Detroit bridge across American channel authorized by United States Senate; plans for, n904; project studied, n969
Downtown street-car subways proposed..n678
Milk hauled into city by motor trucks.. 758
Street-car terminal subways approved..n714
Development committees' conferees meet..e345
Device, mechanical, for reading curves and tables .....•644

DIAGRAMS

Adaptation of rational method of storm-water drain design (H. G. McGee)...•868
Computing band spacing for wood-stave pipe (W. T. Batcheller).....•472
Drought, method of constructing (P. V. Tchikoff) .....•554
Excess loss of head in pipe lines (F. S. Bailey) .....•162
Reactions and bending moments of beams (R. Burnham).....•956
Stirrups in concrete beams, locating (M. J. Lorente) .....•310
Diaphragms damp water-gage fluctuations. 613

Page

Dikes, steel spur, for shore protection....•410
Dishpans used for light reflectors (A. S. Fry) h195
Distance barriers broken down.....e638
Ditches, railway, cost of..... 700
Dock caisson gate, 400-ton, lowering with sand jacks (G. W. Plaisted).....•886
Dollar, changes in value.....•937
Doman, R. S., on engineering and construction prospects in Roumania 925
Douglas fir, long-used and freshly cut, strength compared 281
Drafting and draftsmen, rules for drafting practice 121
Union, Federal Employees' Union and strike methods (H. F. Robinson) .letter 143
Drag, special, finishes channel slopes dug by dragline excavator (B. L. Zull).....h•96
Dragline crosses Rio Grande on cable pontoon bridge .....h•1074
Dragline excavator helps itself to fuel and lays track over soft ground (J. E. Burkholder) .....h•582, h•1074
Lowers water main .....h•146
Draglines, oil-driven; radiators outside secure cooler air and save space.....h•440
Steam and electric compared..... 722

DRAINAGE

And Federal aid.....e1038
And flood protection at East St. Louis, Ill. .....•814
Culvert built through high railway fill..•645
Doing hardest work by force account keeps prices down (A. S. Fry).....h•40
English act of 1918..... 462
Irrigated land in Yakima County, Washington 984
Kutter's roughness in ditch, determination of (R. Bosard).....•921
Land values raised by..... 881
Maintenance of systems.....e718
National Drainage Congress.....n839
New York State swamp drainage amendment vote n1081
Nondrainage of irrigated lands causes malaria 207
Sinking long board mattress in narrow channel .....•230
State and Federal control needed (A. M. Shaw) 523
Wisconsin's new laws 1066
Works of Rio Grande irrigation project (J. L. Burkholder) .....•543

Drawbridges, see Bridges, Drawbridges.

DREDGES AND DREDGING

Clamshell bucket digs 20 cu.yd. per dip.•279
Hydraulic removes material under piers by jetting (R. W. Beuttenmuller)...h•774
Orange-peel buckets repaired without costly delays .....h•391
Scows to be emptied let down Niagara River on lines .....h•1075
Drill, land, on barge, drills test hole in tidewater (A. J. Newman).....h•899
Driller-crusher-tractor needed (S. H. Lea) .....letter 962
Drive, curved, for automobiles in six-story garage .....•188
Droughts, probable, method of constructing diagram to show (V. V. Tchikoff)..•554
Drums, spiral, for operation of timber lift spans .....•803
Dry closet, folding portable .....h•146
Dry dock, Pearl Harbor, Hawaii, dedicated n486
Pearl Harbor, pump well large precast unit (R. W. Gaylord).....•861
Portsmouth, Va., rapid concreting a feature of construction .....•494
Duckering, Capt. W. E., on problem method at Army Engineer School..... 183
Duluth Engineers' Club, assignment to committees 1069
Questions members concerning legislation 93
Dumping fixed-box motor trucks, improvised method .....h•676
Duplex strainer for water or oil.....n344
Dust in atmospheric standard method of determining 936
Dutch East Indies, construction opportunities in (J. W. Evans)..... 497
Dynamite, 40%, not as strong as TNT....h145

E

Earnshaw, H. P. J., on traction steam shovel crosses railroad bridge..... h•773
Earth slips prove disastrous to open-cut sewers .....•989
Earth problems studied.....e1037, •1040
Earthwork, computing cross-section paper for (J. H. Dorroh) letter •39, (L. C. Craig) .....letter 240
Computing with planimeter (L. C. Craig) .....letter 240
East St. Louis, Ill., flood protection and drainage at .....•814
Eastern Ontario Hydro-Electric Municipal Union formed.....n970
Eastman, F. H., on telescopic foundation caissons sunk in bank basement.....•369
Eaton, E. C., on construction details of Lindsay-Strathmore Irrigation District, California •348; operating methods and results 474
On lining reservoir with concrete by cement gun .....•167

ECONOMICS

Changed dollar and the engineer..•182, e201
Changes in value of dollar.....•937
Deferred earnings, effect on capital value (J. R. Bibbin).....•947
Effect of production on living cost graphically shown n443

Page

Personal element, the (P. B. McDonald). 809
Production and patience.....e298
Edgewood Arsenal, Maryland, narrow-gage railway operation (Lieut. J. A. Silsbee). 127

EDUCATION

Aims of engineering schools.....e397
American Society of Mechanical Engineers recommends new by-laws for student branches 991
Asphalt, lectures on, at colleges.....n836
Business training for engineer (A. Marston) 187
Capitalizing engineering urge.....e911
"Case system," changes in engineering curricula and business training for engineers (C. F. Allen, Maj. C. C. More and Capt. W. E. Duckering, G. C. Anthony, J. C. Tracy, A. A. Potter, A. Marston) e153, 183; (J. K. Finch).. letter 285
Conference in Washington n44
Economic and business training for engineers n44
Engineer Training Camps should be continued e153
Engineering fundamentals for four-year course (W. G. Raymond).....letter 959
Harvard Engineering School, aims expressed by President Lowell.....e397
Highway engineering courses investigated by Asphalt Association n487
Highway engineering fellowships offered by University of Michigan.....n679
Highway engineering, suggested course in (R. T. Brown) .....letter 580
Kansas State Agricultural College, modifications in engineering at, (A. A. Potter) 186
Lowell, A. L., views on aims of engineering schools e397
Massachusetts Institute of Technology contracts with industries.....n966
Minnesota University to correlate schools of chemistry and engineering n246
Plight of the colleges.....e590
Progress in e3, n43
Reaction in engineering education (J. K. Finch) .....letter 285
Salaries for technical instructors (C. H. Fuller) ..... letter 435
Training School at Camp A. A. Humphreys n196
Tufts College engineering school, changes at (G. C. Anthony) 185
University of Illinois, salaries of instructors criticized (C. H. Fuller) letter 435
Yale, reorganization at (J. C. Tracy).. 186
Edwards, H. H., on tests of thin-base monolithic-brick road ..... •134
Electric generating plants in Canada 207
Electric hoists pull 3000-ton building 450 feet .....•706
Electric mucking machine used on Hetch Hetchy tunnels 996
Electric power, high-tension transmission lines for Spain 352
On construction work, largest use .....•417
Output 549
Electric railway as freight carrier (W. Jackson) ..... letter 434
Electricity cuts construction-plant power costs .....•311
Electrolysis, American Committee on, resumes work..... n970
In underground structures..... 798
Elevator, stacking, simplifies freight handling .....•855
Emergency Fleet Corporation equipment and supplies selling plan n100
Emigration exaggerated e685
Employment Bureau, Joint, report on.... e974, (E. B. Miller) letter 1025
Employment bureaus, 98, 147, 196, 243, 290, 339, 392, 441, 485, 533, 583, 630, 678
Employment bureaus, society and private (S. S. Newbury) .....letter 831
Endless-track arrangement for carrying away at steam shovels (D. J. McFadden) .....h•484
Engineer casualties third highest in war.. 576
Engineer Training Camps should be continued e153
"Engineering aristocracy" blamed for present status of technical men (J. L. Harrison) .....letter 1071
Engineering, civil and public health (R. J. Harding) 920
Engineering records, important; data on repairs e639
Engineering, safety, reduces cost of construction 864

ENGINEERING COUNCIL

Classification of state, county and municipal salaries and positions .....•352
Committee drafts model registration law n746
Committee indorses plan for national budget n714
Difficulty in raising funds for Washington office e492
Elected to membership in Chamber of Commerce of United States n714
Makes direct appeal for funds.....n967
Suggests conference on coördination of Government map-making n714
Urges appointment of engineer to Interstate Commerce Commission.....n442

Engineering Institute of Canada, fifth professional meeting n631
New life in 823

ENGINEERING NEWS-RECORD

Combined issues e781
History and staff 1
Printers' strike ended e749
Resumes publication e637

•, illustrated; e, editorials; h, hints; n, news notes; a, abstracts.

Page

Engineering Standards Committee, proposed reorganization e106
Proposes new constitution 579
Engineering urge, capitalizing e911

ENGINEERS

American kindness appreciated by visitor from New Zealand (W. E. Bush) letter 239
And contractors, coöperation 249
And investment securities e1038
As others see them e345
(M. O. Leighton) ..... letter 387
(R. Hering) ..... letter 525
British municipal engineer, problems of. 1006
Business training for (A. Marston) 187
Constructors' vs. designers' pay e539
(W. E. Brown) ..... letter 674
Consulting, board of, for Columbus, Ohio 1073
Consulting, getting retainers e447
Coöperation or competition among? (C. E. Drayer) ..... letter 479
Cost of living *182, e201
County engineers replace county surveyors in California n197
Designing, prepare atlases and operating plans e539
(W. E. Brown) ..... letter 674
Dropped from San Francisco payroll ... n585
Education and compensation (A. Hinrichs) ..... letter 386
"Engineering aristocracy" blamed for present status of technical men (J. L. Harrison) ..... letter 1071
Examining, see Engineers, Licensing
For Interstate Commerce Commission urged by Engineering Council n442
French consulting (E. McCullough) letter 142
French visit America n98
Government, forced out of service by small salaries n903
Eastern engineers proficient e1037
Highway, salary schedule proposed by A. A. E. committee 677
Highway, work in France (C. M. Buck) letter, with editorial comment, 39
Hints on applying for a job by letter (R. T. Brown) ..... letter 770
India to unite in single society n*840; dues e909
Influence on public affairs, lack of n149
Interstate Commerce Commission, to be released n339
Joint Conference Committee's report on unification n835
Licensing:
Colorado slow in putting law into action n779
Engineering Council committee drafts model law n746
Idaho law n293
Illinois architects' license law n243
Illinois surveyors' license law n441
Institution of Civil Engineers favors registration n836
Institution of Civil Engineers may regulate British practice n442
Iowa board appointed n631
Iowa, dates set for registration n1082
Iowa engineers must register n1033
Michigan board n967
Michigan law 697
Model laws e846
New Jersey county engineers demand greater recognition n681
Oregon board organized n533
Oregon registration begins n631
Regulate profession by law (F. E. Chesley) ..... letter 238
Surveyors licensed in Texas 315
More authority for (F. A. Churchill ..... letter 37
(Practical Engineer) ..... letter 38, 649
Office arrangement (H. P. Farrow) ... *502
Oregon, oppose union label on plans .. n779
Organization of profession e448
Pay, see also Engineers, Unionization:
Actual case shows something wrong (W. S. Harvey) ..... letter 143
American Association of Engineers' committee n101
And education (A. Hinrichs) 386
Baltimore and Cincinnati urged to increase pay by local chapters A. A. E. n714
Canadian ratings criticized n486
Chicago city engineers get increase.. n292
Classification of state, county and municipal salaries and positions, by Engineering Council *352
"Common surveying" and engineers' unrest (C. T. Johnson) ..... letter 94
Discussed by American Society of Civil Engineers n745
Economic side of profession (E. R. Taylor) ..... letter 388
Engineers' Club, Columbus, Ohio, asks information on organization to increase pay (D. T. Wadsworth) letter 286
Engineers have long been underpaid (P. M. Fogg) ..... letter 193
Federal salaries, reclassification.. e590, 622
Government engineers forced out of service by small salaries n903
Highway engineers schedule proposed by A. A. E. committee 677, n714
New York City increases municipal engineers' pay n837
New York Union of Technical Men demand increase, supported by New York chapter, A. A. E. n486
Railroad engineers get increase n992
Railroad engineers', considered by Board of Wages n585
Salary diagrams in college catalogs (G. H. Ellis) ..... letter 38
Salaries for technical instructors (W. N. Fuller) ..... letter 145

Page

Seattle engineers protest against municipal [illegible] pay n631
St. Louis municipal engineers get increase n1033
State and municipal engineers, pay and classification n340
Status of engineers, Association of Ohio Technical Societies on 671
Stop college supply of engineers (F. N. Harris) ..... letter 141
(F. E. Chesley) ..... letter 238
(M. E. Cooley) ..... letter 433
(T. J. Brennan, M. E. Cooley, J. C. Parker, H. E. Riggs, H. C. Anderson, A. H. White, E. M. Bragg ..... letters 625
Plans, ownership of 365
Professional obligations (Simultaneous) ..... letter 828
Public and the engineer (C. Hansel) 646
Public-works status should be changed (F. A. Churchill) ..... letter 37, 649
Registration, see Engineers, Licensing
Responsibility for specifications (W. P. Bullock) ..... letter 388
Retainers, getting e447
Sanitary, as health officers (E. G. Shebley) ..... letter 526
with editorial comment
Should study legislative bills e105
State and municipal classification and pay n340
State, right to practice 365
Status of engineers, Association of Ohio Technical Societies on 671
Status, present, blamed on "engineering aristocracy" (J. L. Harrison) letter 1071
Stop college supply (F. N. Harris) letter 141
(F. E. Chesley) ..... letter 238
(M. E. Cooley) ..... letter 433
(T. J. Brennan, M. E. Cooley, J. C. Parker, H. E. Riggs, H. C. Anderson, A. H. White, E. M. Bragg) ..... letters 625
Teach doctrine of designed roads in Iowa 953
Technical writing, how may young engineers receive training in? (J. W. Moulton) letter with editorial comment 433, (A. Writer), letter 526
Three openings to one graduate, (F. N. Harris) ..... letter 141
(F. E. Chesley) ..... letter 238
(M. E. Cooley) ..... letter 433
(T. J. Brennan, M. E. Cooley, J. C. Parker, H. E. Riggs, H. G. Anderson, A. H. White, E. M. Bragg) ..... letters 625
Union—not confederacy—future strength of profession (H. B. Smith) ..... letter 1024
Unionization see also Engineers, Pay
Activities of "Engineers' Union, Local No. 1" visualized by correspondent (H. Berlin) 386
Chicago technical employees hear union labor leaders n1081
Federal Employees' union and strike methods (B. F. Robinson) ..... letter 143
Movement to unionize all New York City municipal employees n631
Rapid Transit Engineers' Association, New York votes for n147
Stop college supply of engineers (see under Engineers, Pay)
What will engineers pay to improve their status? e492; (F. Lavis and others) 729, (K. P. Armstrong) letter 984, (H. V. Knouse and J. Ross) letters 960; (E. T. Cranch) letter 1050
Why engineers are not appreciated 125
(R. E. Spear) ..... letter 433
Wilmington, Del. chooses engineer for memorial bridge by competition *806

Engineers, Architects and Engineers' Conference on National Public Works, committee (chairman, etc. n149
Contributions from n149, n198, n215, n341, n585
New National Public Works Department Association n1030
Engineers' Club, New York, damaged by fire n1031
Epps, F. W., on light pile-driver operated by derrick without extra engine .. h*963
On through concrete arch bridge to give large waterway *994
Errors, common in detailing steelwork for buildings (E. Godfrey) *730
Estimates should be paid for, say contractors 619
Evans, J. W., on construction opportunities in Dutch East Indies 497
Excavation channel stages finished by special drag (B. L. Zull) h*96
Dragline excavator helps itself to fuel and lays track over soft ground (J. E. Burkholder) h*582
Excavator, Dragline lowers water main h*146
Explosives, blasting tests show TNT stronger than 40% dynamite h145
Exports, see Trade, Foreign
Extensometer, mirror, for testing wires.. a*32

F

Factories [illegible] to be sold by War Department n197
Factory wastes [illegible] ers in Wisconsin. 159
Fairbanks district, Alaska, gold yield .. 854
Farmers where they stand on affiliation with [illegible] e717
Farms, [illegible] on bridge, Rhine by *118
[illegible] of engineers *502
[illegible] and strike ..... letter 143
[illegible]nson) .....

Page

Federal Highway Council, New York Council organized n244
Federal Highway Council takes up Highway Transport Committee's work n680
Field Engineering, "Searles", error in field tables (A. Llano) ..... letter 962
Field tables, error in "Searles' "Field Engineering" (A. Llano) ..... letter 962
File for prints made from rack (C. P. Rumpf h*531
Fill, construction railway, made by caterpillar steam shovel h*1028
Filling concrete ties hold together walls of bridge-approach fill *522
Filters, drifting sand, results at Toronto (N. J. Howard) a*822
Fireproofing concrete columns with plates 492
Fire-resisting metal lath to be tested n636

FIRES

Forest, detected by air patrols 120
Gasoline, damages Pennsylvania R. R. tunnel 110
Hazards in storage of fuel oil (J. W. Lord) a415
Losses in United States 456
Oil tank, menaces Brooklyn n583

Flag pole, concrete, poured in place (R. C. Hardman) *173
Flanging machine, for thin steel plates, built on job h*628
Flat-car cement stock pile for paving mixer h*1076
Flat roof or groined arches for concrete reservoirs 566
Fleming, R., on bolts in field connections of steel-frame buildings e298, *316
On mechanical method for determining reactions in continuous girders *428
On two home-made bridges in Catskill village *568
On wind pressures and wind stresses in tower design *660
On wind pressures on cylindrical structures ..... e491, 499, correction 659
Floats show course of river currents .. *119
Floodgates proposed for control of Savannah River (E. C. Garvin) *873

FLOODS AND FLOOD PREVENTION

Carried past broken ground by concrete channel (H. A. Coy) *327
Columbus, Ohio, widened channel reduces hazard *512
First valley closure of Miami protection system completed e845, 853
Flood works, special targets facilitate survey of (R. C. Chaney) *768
Galveston Sept. 14 ..... n585, n630
Lower Rio Grande in New Mexico and Texas (A. J. Henry) 1001
Palo Verde District levee work ..... n 44
Protection and drainage at East St. Louis, Ill. *814

Floor, tile and concrete flat-slab being tested 933
Food products, better distribution wanted.. e49
Force account doing hardest work by, keeps prices down (A. S. Fry) h*10
Foreign Trade, see Trade, Foreign
Forest fire service standard lookout house *432
Forest fires, air patrols to detect 120
Forest protection and timber supply e492
Forest Service highway work handicapped n393
Forests, national roads in n291
Forest Products Laboratory gets Chicago support n46
Formula, Johnson's, broader use of, for repeated stresses (Prof. J. B. Kommers) *942

FOUNDATIONS

Cofferdam experience, Chicago River bridge (H. E. Young and W. A. Mulcahy) e249, *268
In quicksand and watery gravel *414
Pile foundations for unequal load distribution (E. P. Arneson) *698
Sandy, at arch bridge pier tested (A. Richards *208
Telescopic foundation caissons sunk in bank basement (F. H. Eastman *369
Work, care in e249, *268

Founder societies and American Association of Engineers n966
Frames, rigid, and continuous beams, deflection of (F. E. Richart) *564

FRANCE

High prices of engineering materials... 275
House rebuilding let to G. Vanmer, Canadian architect n149
Housing contract for MacArthur Bros. Co. n393
Low wages in e685
Lumber order for house construction being placed n485
Railways light, Army's practice (P. McGeehan) *653
Reconstruction, a new view of e685

FREIGHT

Electric railway as freight carrier (W. Jackson) ..... letter 434
Elevator, stacking simplifies handling.. *855
Handling at Brooklyn Army base e540, *555
New pier handling methods at New York, consideration asked n680
Pier design discussed by New York Chapter, A. A. S. n777
Terminal design a traffic problem e540, *555
Terminal, small river for widely varying water stages (H. Abbott) *999

* Illustrated [illegible] news notes; a abstracts

Page

Tra... (illegible) ... letter 144
Trenches ... 904
Trench ... n88
Trench L. C. on Congress and railways ... 17
Tri A. S. on cofferdams used for light to ... h1076
On ... concrete work, by laser ... n944
... h*44
On keeping scrap covered ... saves money ... h260
On ... for handling crews ... h444
For ... for handling in storage (J. W. ... h444
Tube ... concrete design and construction ... h*1076
Tucker, L. D. on cofferdams ... letter to ... h*1076
Tunnel, draw-bridge ... h*966 e398

G

Gage ... on barrel measures water for ... h*773
Gates ... gal ... n*1076
Gates ... September 1919 ... n85, n940
Geology ... J. B. L. ... h*617
Sewage ... city from steam ... n*719

GARBAGE

Burning ... garbage on Chicago hog ... n197
Collection and disposal at Akron, Ohio ... 1013
F. C. ... 1067
Collection ... Utica, N. Y. ... *810
Collection ... results ... 1067
Feeding to hogs and sheep at Utica, N. Y. ... *810
Newark, N. J., ... contract ... 456
Reduction ... Columbus, Ohio ... 1067
St. Louis ... disposal ... n243
Removed from tenants by net and pole ... 454

Gates, E. C. on protecting banks of Savannah River through Augusta ... *410
On ... proposed for control of Savannah River ... *873
Gear ... in ball ... e591
Gas ... at steam water works station 492
Gas ... to prevent water ... (E. J. ...) ... *917
Gasoline tax for road ... 916
General, R. W. on Pearl Harbor dry dock ... and ... plant ... *861
General, W. R. on water works operating ... in Quincy, Ill. ... 1019
General Contractors Association and Associated General Contractors of America ... n680
Geological Survey creates West Indian div. ... n148
Losses ... through small salaries ... n904
Work ... machines in ... *422
Work ... 984
Geology, increasing production ... e940
Methods used in overcoming fire short ... (H. M. Kelley) ... *701
Trade ... with ... n151
Gere, Col. E. A. on safety in steel erection ... 801
Gill, E. J. nominated for secretary New England Waterworks Association ... n744
Gilmore, ... bearing ... 662
Gilmore, ... mechanical methods for ... packers in (R. Fleming) ... *428
Gilmore, J. ... some problems in design of ... e774
Gilson, E. E. on ... loss ... h964
On ... adjustment for hammer ... h899
Gilson, E. on ... rings in defining ... work for ... *730; (L. C. ... letter 964; G. Pauwels) letter 962
Gilson ... between water supply and ... *416
Gold, ... 854
Gonzales, S. ... 1082
... n486
... *648
Good, ... (M. ...) ... n1082
... letter 144
... n42
... n149
... n42
... 447
... 446
... 446
... 446

Page

Iowa, bridge and culvert surveys 140
County, tile drainage (J. A. King) •760
Iowa, engineers teach doctrine of designed roads 953
Good roads without great debt in bond issues 704
Made impassable by rains e718
Paved, built in installments from dirt roads 1008
Large construction firms shun road work (Practical Engineer) ...letter 48 49
(L. B. Smith) letter 480
Large state projects n841
Letting next year's contracts this year c758
Long contracts in Arkansas 87
Macadam light, high cost of maintenance (F. S. Greene) 353
Machinery and paving companies accused of bribery n715
Machinery companies cited for unfair competition n1084
Main route construction in New Jersey •407
Maricopa County, Arizona, asks bids on entire system n1080
Maryland, apportionment of costs n1078
Massachusetts retention of highway commission members urged n841
Materials:
Early transport urged n745
Illinois will pay on delivery n840
In Texas n700
Scarce e647
Wisconsin supply not depleted n746
Missouri Valley Road Builders' Association organized n535
Motor-truck impact on roads five times dead load •773
National forests, roads in n291
"National Highway System" booklet issued by American Automobile Association n150
New Jersey, high traffic record on New Jersey road 226
Main-route construction •407
New York cost maintenance and life 3
State officials and others discuss financing n1078
What has state received for $100,000,000? (H. E. Breed) e447 450
Officials change frequently e1037
Ohio counties vote levies for n903
Oregon, county commissioners to meet n487
Patrol, bonus paid in Wisconsin 162
Patrol established in Wyoming 524
Paved, Iowa, built in installments from dirt roads 1008
Pavements:
Asphalt, light portable plant for patching •1068
Asphalt-block handling at Army base h•439
Baltimore, recorded by map and file system (R. K. Compton) •867
Bituminous paving of railway crossings 396
Corner gutters depressed in Cheyenne, Wyo. 494
Creosote oil specifications declared "closed" by Chicago court n1080
Engineer should select types (F. A. Churchill) letter 37 149
Filler, device for mixing h•338
Granite block, splitting and relaying 1069
Need for design (D. Moonray) letter 480
Streets and aisles, Brooklyn Army supply base •400, h•439
Wood block, corrugated spacer for (J. S. Crandell) •463
Wood-block, creosote oil specifications declared "closed" by Chicago court n1080
Paving assessments, computation of (R. D. Gladding) letter 672
Pennsylvania adopts system of rewards for road work n292
Pennsylvania 1919 contracts total 649 miles n968
Program dangers building e845
Real cost of e447 450
Rewards for roadwork, Pennsylvania adopts system n292
Rhode Island, bituminous macadam (I. W. Patterson) e974 e974 •976
Rural road design, proportion and reasonable economy (W. G. Harger) •304
Salt Lake County, bond-issue program •1015
Screening, easements of, banked highway curves (G. A. Curtis) •874
Shade trees on e492
State department standards e738
Stone sizes standardized n967
Streets:
Asphalt pavement device for sweeping up and loading (R. H. Moulton) h•480
Light portable plant for patching •1068
Laying concrete in cramped alleys (W. W. Horner) h•488
Subgrade and air temperatures, comparison of (C. C. Wiley) •128
Terminals needed (C. H. Norwood) letter 38 e49
e200
Texas, materials in
Texas, state highway engineer to be highest paid state official
Tile drainage for Iowa county highways (J. A. King) •760
Timber roads in France with split poles and sleepers used by British Army •169
Townsend bill, see Highways, Federal
Traffic record, high, on New Jersey road
Utah, bond-issue program in Salt Lake County
Contracts for largest amount of concrete road per capita
Virginia, new laws signed
War Department, equipment bills, see transfer
Washington State, county commissioners to meet

Page

[illegible] •99
W. [illegible] 1
W. [illegible] n1008
[illegible]
Roads and Pavements, Association for, see next
[illegible] e448
Highways, Federal Committee, position [illegible] e49
Hill, C. R., with E. V. [illegible] e46
United States Department of Agriculture, see Office of Public Roads
Hillman, C. C., and Co. •104
Hirons, A. N., on [illegible] concrete in Essex County, Mass. e45 e48
Hirons, A. H., [illegible] concrete in Essex County, Mass. e491 e48
Hunt, A. R., [illegible] Association, Ames, Iowa, meeting of highway officials e845 846
Hotel, electric [illegible] for heating, 400-bed •700
Hoover, H. C., [illegible] by American Institute of Mining and Metallurgical Engineers n1044 n1080 •1000
Horton, R. W., [illegible] for [illegible] storm water, Cleveland •847 col [illegible] 110
Horton, W. W., on heavy type destroyers and railways at St. [illegible] •968
On [illegible] concrete in [illegible] Ohio h• 88
Horses, cost of maintaining, per day 64
Decrease in use of 733
Horton, R. E., and [illegible] bridges (J. W. Post) letter 1074
Horton, R. E., on water-[illegible] legislation to gravity water supplies e870
Horton, T. [illegible] of [illegible] water supplies by State of New York e814

HOUSING

Federal and provincial aid in Canada 649
Industrial effect of use of [illegible] (M. Kennedy) 960
Keeping costs of housing down, methods for •e959
Permanent houses proposed in Hoover bill n944
Housing Corporation, United States, bill to aid n894 (C. E. Hetherington) letter 480
Report 578
To be abolished n1037
Howard, Tex., harbor development •134 •136
Howard, N. J., on Toronto drill, [illegible] letter to •e807
Howe, H. M., made honorary member American Society for Testing Materials 14
Hudson River, channel New York City, [illegible] to [illegible] e681
Long-term valuations in Sen. E. H. Scott's [illegible] •960
Tunnel, see Tunnels, Hudson River
Hughes, H. J., review of "Elements of Astronomy for Surveyors" 891
Hughman, E. M., secretary of New [illegible] society of engineers •840
Hunt, C. W., on membership and functions of local engineering societies and [illegible] (K. B. Keeler) 917
Hunt, R. W., made honorary member American Society for Testing Materials 14
Hurley, E. N., retires as chairman of Shipping Board n148
Hydraulic fill, [illegible] tube, see Pressure, distribution of, during water h•390

HYDRAULICS

Diagrams for [illegible] loss of head in [illegible] (F. S. [illegible] •167
Deflections of [illegible] stream flow to [illegible] (F. H. Scott) •167
Duty of water, [illegible] to F. R. Law •347
Formulas
Kutter, [illegible] to [illegible] (R. [illegible] •951
Manning, [illegible] (R. D. [illegible] •648
Manning, [illegible] tion (M. J. Shamray) letter •194
Hydrants, [illegible] (W. [illegible] water in [illegible] •179
Low, [illegible] Ridge (F. H. Scott) •360
Name-[illegible] [illegible] (Mc[illegible] ping Company, M. J. S[illegible] •194
Sprinkler, [illegible] Western [illegible] States (J. T. Wh[illegible] •58
Venturi, [illegible] (W. S. [illegible] •606
Water, [illegible] (C. [illegible] A. H. [illegible] 137
Water, [illegible] (N. [illegible] •58
Hydrographic [illegible] •951
Hydrometer, [illegible] Pressure

I

[illegible] 93
[illegible] e840
[illegible] 46
[illegible] e744
[illegible] e1 16
[illegible] 700
[illegible] e681

Page

Interests, see Trans- Forests
Improvements, [illegible]
Cost per [illegible] connections on [illegible] •807
From Niagara to Ottawa 56
In the Pacific Northwest 884
Pittsburgh 469
Indian contracts [illegible] to be made and [illegible] •845
Water-power sites in 64
Industrial [illegible] [illegible] Islands, [illegible] and [illegible] 819
Insurance, [illegible] [illegible] [illegible] 66
Trade [illegible] •955
United States [illegible] without interest for [illegible] •84
Interstate conference called by President Wilson e491
New board named e756 e781 formulates plan of procedure e781
Committee [illegible] report e1080
Appointments [illegible] New [illegible] published 807
Personnel and [illegible] in Army called May 15, A. Supply
Invert [illegible] for [illegible] steam [illegible] e731 •1.66
Institute of Civil Engineers, Essex [illegible] relation n836
May [illegible] British [illegible] Dec. [illegible] 441
Instruction [illegible] [illegible] [illegible] [illegible] (W. W. Bride) 818
International Railway Congress, discussion [illegible] by International Railway Association e847
International Trade Conference to be held e444
Interprofessional Conference held in Detroit [illegible] 808 845
Interstate Commerce Commission, [illegible] for repeal by Democratic Congress e447
Elections to be [illegible] e490
Investment [illegible] [illegible] 1078
Iowa, Board of Examiners appointed n731
Engineers [illegible] n1044
Engineers' [illegible] and fee [illegible] 1082
Gone eight [illegible] without great debt in bond issues 704
Motor-vehicle [illegible] fees and [illegible] 78
Iowa, University of, engineering [illegible] meetings for four years course (W. G. Raymond) letter 969

IRON

Cast synthetic [illegible] production •809
Malleable cast iron, properties of •149
Ore output decreases 64

IRRIGATION

Australia has large [illegible] 715
Bond issue voted in Imperial Valley n681
Coachella [illegible] [illegible] report nearly [illegible] 800
Coachella [illegible] [illegible] (Lindsay Strathmore) [illegible] Co., [illegible] •148
Engineer [illegible] [illegible] [illegible] Land, Yakima 984
County, Wash. [illegible]
Development [illegible] of Rio Grande project (J. L. [illegible] •444
Ditch, [illegible] for (H. E. Robinson) •860
In [illegible] [illegible] (R. P. [illegible] 966
Laguna Seca [illegible] Imperial Co., [illegible] [illegible] •148
Office [illegible] [illegible] [illegible] •988
Operating [illegible] [illegible] [illegible] 44
Nueces South [illegible] [illegible] [illegible] (M. [illegible] •956
Nueces [illegible] of [illegible] [illegible] [illegible] 907
Pumping [illegible] [illegible] by [illegible] [illegible] [illegible] •941
Reclamation Service projects need $20,000,000 [illegible] e480
Report [illegible] of Nueces South [illegible] (M. M. Chandler) •956
Rio Grande [illegible] [illegible] [illegible] (J. L. [illegible] •544
Salt [illegible] [illegible] [illegible] [illegible] 908
Storage [illegible] [illegible] [illegible] by [illegible] [illegible] e748
Tunnel [illegible] [illegible] [illegible] [illegible] [illegible] 800
Tunnel [illegible] [illegible] [illegible] [illegible] [illegible] •956
Tunnel, [illegible] to be built by Water [illegible] 100
Washington State Commission [illegible] Supply Commissioners, [illegible] •744

J

Jacks, sand used [illegible] [illegible] •886
[illegible] [illegible] [illegible] •845
[illegible] [illegible] [illegible] [illegible] 841
[illegible] [illegible] [illegible] [illegible] [

K

Jones Reavis bill for Department of Public Works [illegible] opposed by American Association of Engineers model certain [illegible] n1031
Kansas Highway Commission acts in coal [illegible] n745
Kansas [illegible] coal mines [illegible] 93
Kansas City Engineers Club to get city [illegible] data on which to base civic [illegible] •410
Kaw River Kansas, bank protection [illegible] n969
Keefer, Lieut. Col. C. [illegible] to control [illegible] •632
Kellogg, M. S., new head of civil engineering college, University of Pennsylvania [illegible] •760
Kellogg, W. H., on Congressional persecution of [illegible] manufacturers 1044
Kennedy, W. J., engineer in consulting engineering practice for water works, Memphis, Tenn. 82
Kiefer, E. M., on methods used by Germans in [illegible] •701
Kilbourne, Perry, refused permission to [illegible] n583
Kinnicutt, M., on effect of sale of lots on [illegible] 955
Kirby, Joseph, [illegible] 599
Knives, steel for wheelbarrow handles, [illegible] h•1074
Koenigs, Prof. J. B., on broader use of Jeffersons formula for repeated stresses •942

L

LABOR

Accident prevention instructions n99
American Federation, Farmers will not [illegible] with e717
On trial e539
Barring trade employers and employees [illegible] war agreement n905
Bonding trade wage increase since 1913 •788
Canal locks and bridges reduce labor [illegible] (W. C. Ransome) e202 213
[illegible] •937
[illegible] e910
Coal Strike see Coal
Carpenters' then and now" (J. E. L. Mansfield) letter with editorial comment 828
Construction, [illegible] e397
Construction Labor's mortality 750 814 876 939 1051
Contract on Arizona highways 88
Democracy, or partnership in labor management 177
Efficiency, largest element in cost and [illegible] e297
Engineers [illegible] e685
Fatal [illegible] e1047
Gasoline, short [illegible] day in e40
Governors heard by Senate committee e717
Increase [illegible] cost of 40 per cent 621
Industrial [illegible] called by President Wilson [illegible] n776, e781, [illegible] n968
Industrial [illegible] new publication 892
Locomotives [illegible] by shifting crews (A. S. Lee) h145
Locomotives in France and Belgium e685
Motor [illegible] carry Border Bros. [illegible] •446
Navy [illegible] by [illegible] e447
Pensions, [illegible] (C. B. McDonald) 809
[illegible] conditions n838
Rolling [illegible] 697
Railway [illegible] board permanent board n33
Report [illegible] Commission on [illegible] 993
Scaffolds, [illegible] (W. F. [illegible]) h•712
Shortage [illegible] employees 146
[illegible] and [illegible] 1049
Shipping [illegible] 539
[illegible] [illegible] [illegible] of motor [illegible] 946
[illegible] [illegible] [illegible] e89
[illegible] [illegible] [illegible] e49
[illegible] [illegible] [illegible] e59
[illegible] [illegible] [illegible] e447
[illegible] [illegible] [illegible] [

Page

McAlpin, G. W., on old boiler flues for coffer plates h*900
McDaniel, A. B. receives Wason medal . . . n42
McDonald, M. W., and L. E. Moore on military bridges (e687, *688, *734, cJ W Pearl) . . . . . letter 1073
McDonald, P. B., on personal element in labor 809
McFadden, D. J., on endless track arrangement for carrying away at steam shovels h*484
On home-made quick-opening valve for small tanks h*713
McGee, H. G. on diagram adaptation of rational method of storm-water drain design *868
McGeehan, P. on Army's light railway practice in France *653
McIntosh, R. P. on fundamentals in design of multiple-arch dam e447, *464
Mears, Col F., chairman of Alaska R. R. Commission n440
Mechanical device for reading curves and tables *644
Medal, American Concrete Institute awarded to W. L. Comyn for building first concrete ship n42, n*100
Medal, Wason, awarded to A. B. McDaniel, C. W. Gow and D. A. Abrams n42
Merchant Shipbuilding Corporation and Chester Co. consolidate n341
Merriman, M. made honorary member American Society for Testing Materials . . . 14
Metal lath fire resisting, to be tested . . . n636

METERS

Cincinnati completing program 876
Prevent water famine at Pocatello, Idaho . . . 611
Render additional water-supply unnecessary at Middletown, Conn. 613
St. Paul meters 91.8% of water service . . . 74
Water and curb cock box, combined 1084

MIAMI FLOOD-CONTROL WORKS

Block yard cheaply improvised from old equipment *356
Canvas pipe gives flexible distribution of sluicing water h*390
Concreting procedure on dams *640
"Contract Forms and Specifications, with Atlas" (book review) 380
First valley closure completed . . . e845, 853
Hydraulicking dam embankment . . . e845, *871
Largest use of electric power on construction work *417
Railway changes, radical, involved in work *313
Study of pressure in hydraulic dam cores e1037, *1040
Michigan engineers' registration law 697
Registration board for engineers and architects n967
Water-treatment plants, supervision 1067
Michigan University offers highway engineering fellowships n679
Middletown, Conn., additional water-supply rendered unnecessary by metering . . . 613
Milk hauled by motor truck into trucks . . . 738
Milwaukee water siphon under river a difficult job 818
Milwaukee Engineers' Society active civic affairs committee 93
Milwaukee Sewerage Commission remains unchanged h99
Mine, deepest, is Michigan Tamarack shaft . . . 404
Mine timbers concrete hollow posts packed with sand *269
Mineral products output in 1918 947
Minneapolis will have right to buy street railways n633
Minnesota University to correlate schools of chemistry and engineering n746
Mirror extensometer for testing wire *532
Mississippi proposes road bonds n967
Missouri Valley Road Builders' Association organized n434
Moisture content of Dry lumber 491
Reduces insulation resistance in motors (W. W. Brush) h818
Moline, Ill., typhoid outbreak caused by faulty bypass valve e106
Mondell, F. W. on postal zone law as menace to union 670
Soldier settlement bill reported in House . . . n791
Monroe, La., consults W. G. Kirkpatrick as consulting engineer and works director . . . 82
Montauk Point terminal scheme . . . 291, n343, n797
Montreal aqueduct arbitration favorable to city n534
Montreal aqueduct headgates combined with bridge over canal *610
Moore, L. E. and M. W. McDonald, on military bridges (e687, *688, *734, cJ. W. Pearl) . . . . . letter 1073
More, Maj. C. C. with Capt. W. E. Dreyfering, on problem method at Army Engineer School 183
Morrissey, W. J., on construction labor's instability 759
Mortar, test, for concrete, more against (J. O. Jones) . . . . . letter 581
Mosquitoes troublesome on non-irrigated land, California 797
Motor Transport Corps to make coast to ocean trip 143

MOTOR TRUCKS AND OTHER MOTOR VEHICLES

Allotment to states by War Department . . .
And railways for freight transportation . . .
e2, e50, (C. W. Baker) 52; W. . . . son) letter 434; (J. Wils . . .
Boardwalk for . . . . . .
Bus for city traffic . . .

Page

Carry . . . of Dodge Bros. during . . . in Detroit . . . *446
Ch . . . 280
Defense . . . handling piled material . . . h*248
Demo . . . caused by faulty h*774
Detroit . . . method h*676
Express . . . for Paris, New York . . . n486
Express . . . adopted . . . 424
Fleet . . . New York to Buffalo . . . n199
Frame . . . for hauling mess to cut from woods . . . h*964
Hard . . . for pavement . . . 458
Hard . . . gravel for . . . h*966
Highway . . . Conference, program for . . . 2004
Highways . . . number now used in Wisconsin . . . 27
Inland . . . Iowa, Ohio and Penn. . . . h*74
Iowa . . . crew, and speeds . . . 58
Law to . . . Ohio, Pennsylvania . . . n198
License . . . Massachusetts and Iowa . . . 58
License . . . Massachusetts . . . 441
Motor . . . Corps to make ocean cruises . . . n44
Pneumatic . . . 314
Service . . . railway stops . . . 946
Skid . . . h*1077
Speed . . . Ohio . . . h*194
Texas, earn large pay in oil fields . . . n292
Transport . . . by National Highways . . . Association, North Atlantic . . . n776
Transport . . . on timber roads . . . h*844
Wrecker . . . Fire Department . . . h*966

Motors, insulation resistance in reduced by moisture (W. W. Brush) . . . 818
Moulton, R. H. on causes for scooping up old worn asphalt pavement . . . h*889
Mycalex machine electric used on Hetch Hetchy turbines . . . 996
Mulcahy, W. V. and H. E. Young on caisson disease experience at bridge in Chicago River . . . e49, *268
On substructure of Michigan Ave. Chicago bascule bridge . . . *240
Multiple-arch dam, Fundamentals in design (R. P. McIntosh) . . . e447, *464
Multiple-outlet pressure for varying sewage flow (S. I. Sperling) . . . *728
Municipal Government Improvements Ownership Lighting Cities
Munroe, Maj. G. C. on powder magazines made to last long time . . . *980
Muscle Shoals, Ala., filtrate plant may be enlarged . . . n835

N

Naches-Selah irrigation canal reconstruction, F. M. Chapman . . . *276
National Association of Railway and Utility Commissioners to meet . . . n634
National . . . new . . . 892
National . . . Congress of American . . . Association of Engineers (K. B. Keniston) . . . e167, 237
Scheme of organization (L. E. Smith) . . . e246, 190
National Federation of Construction . . . tures passes and . . . e966, n966
National . . . 291
National . . . to advocate with American . . . of Labor . . . e747
National . . . System opposed by American . . . Association . . . n152
National . . . American . . . North American . . . post . . . n776
National Industrial Conference Board . . . opposed by Associated Society of Mechanical Engineers . . . e751
National Public Works Department Association . . . n1030
National Safety Council organized . . . n714
Conference . . . at Detroit . . . e782
National Sewage Pumping Engineers . . . n714
National Slag Cement Co. formed for . . . Associated Society for Testing Materials . . . 419
Observations . . . n1067
National . . . n718
National . . . n966
National . . . e154, *156
Navy . . . American . . . n44
National . . . n197
Newark, N. J. . . . contract . . . 456
. . . e1084
Z . . . 1044, 1045
Newark, N. J. . . . pay . . . 759
Report . . . 1071
New . . . n747
N . . . 744
N . . . 1030
N . . . e681
N . . . e838
N . . . e718, 609
On . . . h*899
. . . *1
. . . e718, *723

NEW YORK CITY

Engineers
Rapid Transit . . . of Association of Engineers . . . 969
Harbor
City to build piers on Staten Island . . . n197
Commission makes preliminary report . . . 196
Development . . . 44
Increases . . . 284
Municipal employees movement to . . . Air . . . 641
Rapid transit
East River tunnel bored through . . . n440
Treaty to encroach on Hudson River channel . . . 1084
New York Council Federal Highway Council organized . . . n744

NEW YORK STATE

Recommends use of shorter bucket on concrete shovel . . . *740
State engineer should be appointed not elected . . . 1
Swamps . . . and cannot vote . . . 1084
Water supplies supervision by state of Health . . . n842
New York State Association of Architects formed . . . e448, n488
New York State Council of Federal Highway Control . . . n484
New Zealand latest . . . bridge in O. Johnson . . . *763
Newark railway arch steel plate drop floor for . . . *640
Reinforced for heaviest traffic . . . *877
Niles, W. Va., Government receiving bids for . . . n444
Nitrate plant, Muscle Shoals, Ala., may be enlarged . . . n835
Nolen, C. S. on concrete used in bullet . . . *262
Nolen, C. S. on concrete used in bullet . . . *262
North Dakota . . . excavators . . . n46
North River and Hudson River . . .
Northwest Pacific improvements here and there . . . 884
Nuts, tight on construction bolts . . . h484

O

OBITUARY

Barrett, N. F. 280, Brown, S. P. 972, Butler, H. 1084
Carrier, H. V. 700, Church, C. T. 190, Coe, T. 446, Cole, P. H. 644, Cooper, T. *444, Cunningham, W. P. 446
Farrand, A. 294, Ford, W. G. 47, Frey, J. C. 48
Gantt, H. L. 844
Harris, W. D. 780, Hazelhurst, Mrs. J. N. 48, Hyde, J. V. 780, Jones, R. 646, Hunter, A. J. 780, Hyde, Col. H. W. *1070, Hooper, T. N. 1084
Jackson, Sir John, 1036, Jacobs, C. M. *884, Jeffrey, J. W. 1084
Kennedy, C. 1036; Kilbourne, Col. J. 780, Kirk, T. 446, Kreisser, F. H. 48, Kunkler, W. M. 190
Lawrence, G. F. 488, Livingston, Col. W. R. 46, Long, C. E. 1036
McKenzie, A. C. 488, Mann, T. 190, Martin, T. J. 607, Mead, A. 1084
Nash, L. W. 994
Ogden, G. W. 700
Pierson, F. 48
Rice, E. J. 344, Rice, T. 684, Rider, J. C. 48, Ridgway, Gen. W. T. 48, Robinson, O. A. 488
Sayre, E. O. 646, Sawyer, F. 446, Shields, T. P. 646, Shreve, E. P. 907, Shreve, M. R. 908, Snow, Maj. G. 446
Thomas, E. L. 488
Van Buren, R. 1084
Wagner, W. D. 248, Ward, R. 646, Wilson, H. M. 646, Wilson, W. T. 848
Odors from sewage at Madison, Wis., prevented . . . 469
Office . . . appointment (H. P. Eddy) . . . 1081 . . . *307
Ogden . . . lever gate hoist support . . . *988
Ohio . . . bridge . . . 1097
Ohio River . . . proposed states . . . *903
Ohio . . . bridge . . . to meet . . . 1041

OIL

Fuel . . . concrete tank design and construction . . . e477
Fire . . . at Bayonne . . . (J. W. Lieb) . . . 411
Shale . . . of United States, how to . . . 307
Storage . . . tanks for . . . n46
Vegetable . . . at Panama-Pacific . . . 1078
. . . e991, *1004
Ohio . . . 518
. . . 890
. . . n678
. . . h*391
. . . 429
. . . 498
. . . n779
. . . 941
. . . *412
. . . *778
. . . h*993
. . . *978
In . . . 940

P

Page

Pascal, G. on computation of lengths of cubic arcs 1
Pa[illegible] 894
Pa[illegible] Northwest ... letter and ... 884
Pa[illegible] (A H Rhett) . . . . . letter 1074
Pa[illegible] C. E. on meters ... city water ... •906
Pa[illegible] (A H Rhett) . . . . . letter 1074
Pa[illegible] Ver[illegible] 844
Pa[illegible] Engineering Conference ... Tests on n1077
Pa[illegible] ... shipping pier has moved ... G. W. Tra[illegible] . . . . . •913
Parker, W. S. on ... [illegible] of ... of discharge of ... meters . . . . . •906
Parker, A. F. ... to prevent ... [illegible] water storage n935
Pa[illegible] ... tests 1017
Patent wood ... dedicated to n1082
Patent Office n447 n841
Patterson, I. W. on ... museum ... Rhode Island . . . . . c974 c974 •976
Pavements ... Pavements
Pay of ... compilation of R. D. ... letter 672
Peace ... dock destroyed n486
Pe[illegible] ... well large precast unit ... R. W. Gra[illegible] . . . . . •861
Pearson, J. C. ... dam rich concrete in ... dam at ... [illegible] c491 518
Pe[illegible] ... plant, Michigan county ... $10,000,000 944
Pe[illegible] ... proposes national art bureau 194
Petroleum ... water heating in ... economy of ... (E. Crewdson and A. H. Reeve ... letters 437
Pe[illegible] ... claims the (P. B. McDonald) 809
Pe[illegible] ... domestic deliveries 315
Ph[illegible] ... city planning n1034
... Government to be bettered under terms of ... bequest 136
Ph[illegible] ... new boat bill n1034
Subway ... new construction methods . . . . . c297 •300
Zone ... permitted for 918
Pi[illegible] ... Association of Members Am. Soc. C. E. ... and accomplishments 1069
Pl[illegible] ... N. J. sewage works ... tentatively authorized n584
Po[illegible] ... concrete at Panama has novel de[illegible] ... by W. [illegible] . . . . . •917
Pot hooking ... methods at New York City ... contemplated n680
Pr[illegible] ... under rig used for (R. W. ... h•1075
Pr[illegible] ... light operated by derrick ... ashmont extra engine (F. W. Epps) . . . . . h•963
Pr[illegible] ... invented rig developed by Army . . . . . •232

PILES

Bidder ... load on Roudout Creek ... design condemned for ... (W. E. Belcher) . . . . . letter 179
... sound after 20 years . . . . . •378
... in potential space 171
Foundations for unequal load distribution ... (E. P. Armstrong) . . . . . •898
Penetrations of soft clay by test made 946
Punch bar ... utility increased by ... h•1028

PIPE

... to St. Louis 918
... gives flexible distribution of ... water . . . . . h•390
... and culverts joint committee ... organized n98
... fails from thermal expansion of ... Prof. G. E. P. Smith) . . . . . •113
... tests ... at special unit ... h•183
... joint to prevent ... in pockets in ... small size (R. C. Hird ... h•964
... Salt Lake 109
... h•964
... made by centrifugal ... •707
... •176
... h•698
... •844
... •710
... •964
... •169

PITTSBURGH

... •880

Page

Plane-table or transit for topography: letters on (H. W. ... 95, C. F. Vernon, K. A. ... F. ... Howes) 333, 344, (E. L. ... Brown) 673
Plan ... methods exaggerated cross-sections (C. P. Mowry) . . . . . letter •436
... to compute earthwork (L. C. ... Craig) . . . . . letter 240
Plates ... of 365
Plate ... modern in concrete ... (H. D. Hammond) . . . . . •784
Platt ... fund provided by build ... association stock (O. H. Yeager) h1027
Plumb ... railway control see Railways, Control
Pneumonia and influenza in Army camps (Maj. G. A. Soper) . . . . . •72
Portable ... meters prevent water famine 611 (G. Rae) letter, with editorial comment 1073
Pollution by ... industrial wastes enjoined 711
Pontoons move 200 ton transfer bridge . . . . . •478
Portland Ore. labor conditions n838
Proposed bridge-inspection contract n776

PORTS AND HARBORS

Birmingham, Ala., work commenced on n1034
Chicago River closing to navigation suggested 321
Handling vegetable oils at Pacific coast ports . . . . . c201 •204
Houston, Tex., harbor development . . . . . e154, •156
Inland navigation for ocean steamers . . . . . e154 •156
Lake port planning e398
Montreux Point terminal scheme . . . . . c201 •204
. . . . . n243 c297
New York commission preliminary report n196
New York harbor development hindered e153
New York to build piers on Staten Island n197
Pacific coast, handling vegetable oils . . . . . c201 •204
Wilmington, Del., authorizes improvements n533
Portsmouth, Va., dry dock, rapid concreting a feature of construction . . . . . •494
Postal zone law is menace to nation (F. W. Mondell) 629
Potter, A. A. on modifications in engineering at Kansas State Agricultural College 186
Powder magazines made to look like trees (Maj. G. C. Muñoz) . . . . . •280
Powell, S. T. and A. Wolman on sanitary effect of water storage in open reservoirs . . . . . •804
Power output electric 549
Power, solving hydro-electric problems of small town . . . . . •650
Precast concrete pump well set in 12 feet of water . . . . . •954

PRICES

Building materials, British and American (A. G. Duke) . . . . . letter 142
Changes in value of dollar . . . . . •937
High, for engineering material in France 275
Lumber high and advancing (A. W. Welch) n296
War in bulletin 232
Printers' strike ended e749
Printing telegraph valuable during war 227
Prints filed in rack (C. P. Rumpf) . . . . . h•531
Prior, J. C. and H. P. Green on keeping costs of building Government houses . . . . . c250 •252
Pritchett, C. M. on convenient table for locating short-radius curves h1076
Problem method at Army Engineer School (Maj. C. C. More and Capt. W. E. Duck ... 183
Production and patience e298
Effect of ... on living cost graphically shown n443
Professional men and women, movement for e782, 808, n835
Professional prestige e751
Professionalism, common basis of e782, 808, n835
Providence Engineering Society increases membership 62% by drive 958
Public and the engineer (C. Hansel) 646
Public comfort station law in Wisconsin 121
Public health see Sanitation
Public Health Service engineers, etc., disconnection ended e153
Public Service Corps proposed in Congress n392
Public utilities commissioners to meet n633
Public utility, effect of deferred earnings on capital value (J. R. Bibbins) . . . . . •947
Public utility valuation principles under fire 425

PUBLIC WORKS DEPARTMENT, see DEPARTMENT OF PUBLIC WORKS

Public works ... for 1921, $284 ... outgoing n902
Publicity ... manufacturers, Pittsburgh ... bureau ... months n151
... recommended by ... and ... . •941
... of Port Harbor dry dock ... ... (R. W. Gaylord) . . . . . •861
... set in 12 feet ... . •954

PUMPS AND PUMPING

... by test at Grenoch 518
... of c299
... deposits b539
Training partition in canal inlet increases ... . •993

Page

Puyallup River, Washington, additional money for control recommended n680
Pyramids, penetration of soft clay by, tests made 946

Q

Quartermaster's Office, civilian construction employees get bonus n394
Queenston-Chippawa power development, construction progress . . . . . e973, •1010
Construction railway fill made by caterpillar steam shovel . . . . . h•1028
Dredge screws to be emptied, let down Niagara River on lines . . . . . h•1075
Power canal danger sign on high-tension wires . . . . . h•832
Power canal makes wells dry up n839
Quense, J. H. and T. H. Carver, on tests of concrete in tension . . . . . •1005
Quicksand and watery gravel, foundations in . . . . . •414

R

Rack, simple, files many prints (C. P. Rumpf) . . . . . h•531
Radiators outside on oil-driven draglines secure cooler air and save space . . . . . h•440
Radicalism, Massachusetts against e685
Railroad Executive on Federal railroad operation and betterments policy 615
On upkeep of railways under Federal control 457
Rails, see Railways, Rails.

RAILWAYS

Alaska, Colonel Mears chairman of commission n340
Timber bridge problems . . . . . •420
And motor trucks, for freight transportation e2, e50 (C. W. Baker) 52, (W. Jackson) letter 134, (J. Wilkes) . . letter 829
Ashpit double-track water-type, Pennsylvania R.R. . . . . •408
Ashpits of new design . . . . . •1007
Box car shortage due e153
Canadian Pacific plans extension of Kipawa branch n839
Canadian Railway Association formed . . . n837
Canadian Railway War Board abolished n837
Construction fill made by caterpillar steam shovel . . . . . h•1028
Control
Analysis of Esch bill (E. E. Denison) . 885
Brotherhoods plan . . . e249, n290, n340
Canadian operation shows loss n148
Commission to fix wages proposed . . . n533
Comparison of various bills 874
Cummins bill n485
Cummins bill to be passed n1029
Cummins bill passed by Senate h1077
Esch bill analysis of (E. E. Denison) 885
Esch bill passed by House n745
Essentials of problem e493
Executives ask emergency law n836
Federal operation and betterments policy (Railroad Executive) 615
Federal purchase at fair value 820
Grand Trunk opposition to purchase by Canadian Government . . . n715, n745
How will Congress determine railways' future? (L. C. Fritch) 17
Nationalization discussed at Am. Soc. C. E. meeting n775
Operation by brotherhoods e290
Orderly progress e297
Plan for private operation of Federalized railways (W. J. Wilgus) 496, e592, 820
Plan to finance Federal purchase (G. Lindenthal) 504, e592
Plumb plan . . . e249, n290, n340, •405
Plumb plan protest against n393
Plumb plan, Council of American Institute of Consulting Engineers protests against . . . . . •405
Plumb plan supported (T. Flynn) letter 479
Private vs. Government ownership . . . e592
"Railway Problem, The" (C. W. Baker) article announced . . . e719, e749, 752, e783, 789
Railways may not be returned at beginning of year n967
Referendum vote of Chamber of Commerce of United States n292
Return by Jan. 1 seems certain n715
Security owners ask guaranteed return n186
Self-operating roads advocated before House committee n442
Undermentioned see under Federal control e448 457
Values versus capitalization e789
Crossings, bituminous paving 696
Sectional removable concrete slab . . . •173
Delaware, Lackawanna & Western trainshed, Hoboken, N. J., raised without traffic interruption . . . . . •480
Dutchess coal at 700
Embankments, recent old fill reveals reasons for track trouble (R. Rettmann) . . . . . •126
Engine terminal improvements, Pennsylvania, Long Island . . . . . •24 163
Fill opening closed, reasons for track trouble (R. Rettmann) . . . . . •126
Freight ... recommended for 221
Transitory protective measures asked by 890
Grade ... light prevention high way grade (A. Vaneau) letter 94 (H. C. Fish) . . . . . letter 286
Grade ... Indianapolis 286
International R. ... ross dissolved; ... ... National Railway Association n837

• Illustrated. ... letter. ... n ... notes. a abstracts

Page

Light, Army's practice in France (P. McGeehan) ... •
Light benefits Arabian port ... 1
Maintenance and track labor, economies of ... 69
Mexican, suffer heavily by storms ... 1
Maintenance under Federal control ... e148 157
Narrow gage; operation at munition plant (Lieut J A Silsbee) ... 107
New Haven stockholders seek limited receivership ... e1030
New York Central concrete conduit for track wires ... •1055 1017
Passenger train resistance tests ... 1017
Pennsylvania Lines West engine terminal at Logansport and Richmond Ind ... •734 163
Rails
Cracks in steel e2 a15. (C W Gennet Jr) ... letter 192
Failures in 1918 ... 1052
Joint simulates continuous rail (W M Pegram) ... letter •829
Old and new compound of same type e298. (S D Williams Jr) ... letter •336
Practice in gaging e2 (C W Gennet Jr) ... letter 193
Thermit-welding and hardening in place Leeds England ... •83
Railway Association of Canada formed ... n837
Resurvey, curve chart for (J G. Wetherell) ... •506
Salt Lake and Denver project revived ... n143
San Diego and Arizona open ... n1033
South American and the United States ... 105
Street, gages and wagon gages ... 328
Latest British track construction ... •83
Pittsburgh elements of value in ... 807
Valuation elements in Pittsburgh case ... 807
Survey, another chart of railway resurvey (H P Boardman) ... letter •898
Swiss to extend electrification ... 959
Ties preservation ... e1001
Soaking in Salt Lake increases life ... 944
Track
Creepage stopped on heavy grades of logging railroads ... 940
Elevation on Indianapolis Union R R ... •205
Labor and railway maintenance ... 697
Ladder, renewal of ... 1012
Material, heavy, machines for handling ... a1081
Support, concrete 165. (A. C. Irwin) ... letter 333
Trouble revealed by opening old fill (R Reimann) ... •126
Track wires, New York Central RR. concrete conduit for ... •1055
Trainshed Hoboken, N. J., raised without traffic interruption ... •460
Turntable, 110 foot with adjustable center ... 370
Turntable reinforced by trussing to carry heavy engines ... 1014
Undermaintenance ("Railroad Executive") ... e448 457
Union station rebuilt, Indianapolis, without interrupting traffic ... •84
Upkeep under Federal control (Railroad Executive) ... 457
Valuation:
Cost of work to August 1919 ... n340
Developing prices for Federal valuation (H J Saunders) ... 930
Interstate Commerce Commission report ... n1079
Plumb plan arouses new interest in ... n340
Report to be ready January, 1922 ... n837
Value versus capitalization ... e589
Wage board permanent urged ... n533
Wages, commission proposed ... n533
Water supply to ruling against discriminatory rates to railway ... 115

RAINFALL AND RUN-OFF

Excessive, at Manila ... 677
Graphical method for estimating storm-water run-off (R. W Horne) •282 corrections ... 410
Heavy rain destroys sewer and railway at St. Louis (W W Horner) ... •958
More accuracy needed in collecting data (J. B Lippincott and R. E Horton) ... letters •830
Gages, method of Weather Bureau's use criticized (J B Lippincott and R E Horton) ... letters •830
Records at Muscatine, Iowa ... 471
Randolph, I., on national Public Works Department vs. Corps of Engineers ... 561

RAPID TRANSIT

Centralization of city traffic ... e154 •170
Cleveland, Ohio street-car loop subways ... e105 e154 •170
Pittsburgh underground street-car loop ... e105
Rapid Transit Engineers' Association New York meets n18; votes for unionization ... n147
Reactions in continuous girders mechanical method for determining (R Fleming) ... •128
Reclamation Service needs $262,000,000 ... e980
Year's work in ... e685
Reconstruction French, a new view on ... 1017
Red Cross Division of Sanitation headed by Prof. G. C Whipple and Col F F Longley ... n777
Rees B L G on topographical surveying on Chilean desert ... •204
Reichardt, W F on resources of city ... h•512
tractor saves labor ... 1
Reimann, R., on opening old railroad fill reveals reasons for track trouble ... •126
Rensselaer Lake dam and reservoir with ... 513
spillway ... e73
Repairs, data on ... 1
Report form for water-treatment plants, Wisconsin ... •66

Page

RESERVOIRS

Concrete ... or flat roof ... letter 654
... reinforced concrete arches ... •1067
... to be removed ... 985
... concrete by ... •167
Open ... water ... •804
... 713
... flat roof ... C ... letter 673
Spillways ... for ... Western United States (J T Wentzel) ... •28
Responsibility for water drain ... 944
Retaining wall ... concrete I beams used to make ... •631
Retaining wall ... reinforced concrete ... •621
Rhine bridged by American Army engineers to record low ... (Capt J M Farrin and Lieut S H Anderson) ... •118
Ribs, steel or ... concrete finishing ... prevent warping ... h•712
Richards, A ... test of ... foundations at arch bridge ... •308
Richart, F E ... on design of continuous beams ... •504
Richmond, Ind ... terminal ... •734 163
Rig used to sound under piers (R W Beatty) ... h•1075
Rio Grande River, lower, floods on in New Mexico and Texas (A J Henry) ... 1001
Riprap, toe of, held on slopes by wood crib ... h•809
Risdon, P J on English Channel tram ferry bridge of 1,071 span ... •668
River and harbor estimates for next year ... 919
River control, additional money recommended ... n980
of Puyallup, Stuck and White Rivers Washington)

RIVERS

Bank protection, Kaw River, Kansas, and Savannah River, Georgia ... •410
Erosion of bank of Yakima River prevented by cribbing ... 624
Floodgates proposed for control of Savannah River (E C Garvin) ... •873
Floats show course of currents ... •119
Ohio present status of improvement ... •902
St Lawrence, improved (viewed by Canadian Waterways convention ... n967 n1031
Report to appear soon ... n1031
Stream flow in France, seasonal utilization of (E H Sargent) ... •402
Terminal, small, for widely varying water stages (H Abbott) ... •999 n148
Under many jurisdictions ... n148
Riveted butt joints, design of, after Schwedler specifications ... •705
Rivets, as compared with bolts in steel frame buildings (R Fleming) •316 e298 letter 529 (W E Belcher) ... n•908
Rivets, electric heater
Experience with bolted steel structures (H B Tabor and E D Coddington) ... letters 806
Roadmasters' and Maintenance of Way Association meeting ... n631

ROADS, see HIGHWAYS

Robinson, H F on duty of water in irrigation ... •355
Rogers, M A on road construction in West Virginia mountains ... •90
Rolls, wood under excavator replaced by pipe ... h•337
Roundout Creek, bridge design condemned for excessive load on batter piles •300 (W E Belcher) ... letter 470
Roof, flat or ground, arches for concrete reservoirs a66. (T C Atwood) ... letter 673
Roof beam, factory failure of and "Compression" wood (G F Rech) ... •508
Rope, new, ruined by improper winding on engine drum ... h•92
Wire, empirical formula for strength of, as overbend and time test ... 560
Roscoe, A F ... on overbend and time test of rod and trough examination ... 50 89
Roumania, engineering and construction in, (R S Dean) ... 995
Roumanian bridges wrecked during war ... •182
Rumpton bridge wrecked, with locomotive, new, with locomotive smoke ... 758
Rungeltz, W C on open beds and log dog reduce labor turnover ... 213
Russell, C P on simple rack lets many prents ... h•531

RUN-OFF, see RAINFALL AND RUN-OFF

Russia, ... to Low ... •764
probably ... 655
Rutland, Vt ... water ...

S

Sabin, L. C. ... Ste. Marie ... n628
named for
Sacramento, Cal., ... for water filter ... n644
... by ... h•643
To ... plant

SAFETY

... for ... 599
... 15 ... •430
... (A. L. ... (H. G. Butler)
... 4 ... (C. ... a801 78
... Co., ... Co., ... at ... e782

Page

Safety engineering reduces cost of ... •
Sign ... Quebec ...
Chautauqua ...
Suggestions ...
Training ...
Safeties, Federal, ...
Salt Lake and Denver project revived ... 143
Sand and gravel ... in 1918 ... 1
Sand for ... 1
Removed from ... by ... 105
San Francisco, ... from city's ... n485
Water sent to ... n447
Sanitary engineers, section, American Public Health Association, meeting ... e488
Sanitary engineers recently in service, new positions ... e444

SANITATION

Canada, new health department ... 46
Civil engineering and public health (R J. Harding) ... h•391
Closet, camps with septic tank ... e1001
Disinfection against Public Health Service engineers, etc ... e1001
Division, Red Cross, headed by Prof. G. C Whipple and Col F F Longley ... n777
Fabrics, portable city ... n•146
Health, district of Penn ... 100
Hearthstone, New York State ... 49
Heavy, ... in typical ... 1900 ...
Influenza and typhoid in Army camps (Maj G A Soper) ... •
(Maj G A Soper) ... 74
New York State, health mobile ... 1007
Open, health district of ...
Pneumonia and influenza in Army camps (Maj G A Soper) ... •74
Press, bulletin service on public health established by University of Illinois ... 89 171
Public comfort stations, 58 in Wisconsin ...
Survey engineer, as health officer. E G Sanderson ... letter •36 with editorial comment
Sanitary engineer for Newark, N J on ... advised ... 1082
State department of health, essential functions of ... 1002
Typhoid and suicide deaths ... e42 807
In New York City decline in ... 807
Various current phases of sanitary engineering ... 887
Vermont organized into health districts ... 644
Wisconsin Health board wider powers for ... 341
Sargent, E H on long-term variation in flow of Hudson River ... •460
On stream ... in seasonal stream flow in France ... •402
Saunders, H J on developing prices for Federal valuation of railroads ... 930
Savannah River, Georgia, ... protection ... •410
Savannah River, Georgia, flood protection proposed (E C Garvin) ... •873
Saville, T. ... C. I. West on Lawton, Okla., sewage treatment works ... •474 correction 102
Sawyers, J. H. on knuckle guard for wheelbarrow handles ... h•1074
Sawhorse, J. H. on traversing by a 36° ... method ... •734 (K. F. Jaeger) letter 780 (C. B. Schmeltzer) letter 778 (G. E. Schlesinger) letter 858
Scarsdale, N. Y., sewer construction records used at (P. Thompson) ... n111
Schmitz, W. P. on construction labor ... in Seattle ... 813
Schuylkill development, New York water supply, ... dam and 18-mile tunnel (J. W. Smith) ... •804
Schuylkill, ... dam, design of riveted ... •705
Scott, L. C. on depressed permanent bench ... set in concrete floors ... •305
Screw, ... chained long horizontal ... •30
... to prevent ...
Screw, ... R chained up ... saves money (A. S. ...) ... h•490
Sea wall, Galveston, extending (J. B. ...) ... •617
Searles, "Field Engineering," error in Table A, Line ... letter ...
Seattle, ... pay of city employees ... 146
Engineers protest against city's pay ... 1041
Gypsy Lake, ... by stocking ... water ... •805
Vegetable oils, ... at Port of Seattle ... •204
Seelye, I. F. on what will engineers pay to ... their status ... 1
Seepage, ... stop ... by ... 489
Sewer, ... by ... claims settled by ... and others ... n714
Service charge for water defined ... 809

SEWAGE

Acid dissolved oxygen in New York harbor (K. Arata) ... •
Grease, ... from ... e918 948
Oxygen, ... in New York harbor (K. Arata) ... •938
Recovery of ... products from ... e910 948
Sludge, ... of grease from ... e910 948

SEWAGE-DISPOSAL

Madison, Wis., difficulties at ... •510

SEWAGE TREATMENT

... in Texas ... •1066
... Wisconsin treatment ... (R. J. Faulk) ... •1017
... and sewage ... 241

Page

Concrete pipe westerly works contract let . . . 144
Pipe . . . (E. E. Allen) letter . . . 1003
Eastern Pipe . . . tests of lime-cement-sylvite . . . 541 . . . (K. E. Allen) letter . . . 1003
Engineering work not accomplished . . . e541, . . . (K. E. Allen) letter . . . 1003
Engineering . . . system completed . . . in Wisconsin 159
Hercules Tex . . . concrete-water tests . . . e973 1003
Inspection of . . . and preservative letters for Wisconsin Mass . . . n246 796
Jacksonville . . . electric plant . . . system . . . 541 . . . (K. E. Allen) letter . . . 1003
Lawrence Land Virginia works (T. Sy . . . and C. L. Wirt) . . . 374, correction . . . 1003
Lime-cement-sylvite process at . . . e541 . . . (K. E. Allen) letter . . . 1003
Materials testing station experimental . . . 1063
Oxygen process cutout at Easton . . . 541 . . . (K. E. Allen) letter . . . 1003
Pennsylvania filters and Imhoff tanks for Wisconsin Mass . . . n246
Report . . . tests and testing apparatus (E. J. Lo . . . and J. H. Mc . . .) . . . 825
Standard testing test at Houston Tex . . . e973, 1003
Testing . . . and report forms (E. J. Lo . . . and J. H. Mc . . .) . . . 825
Water-supply claims settled . . . n714
Wisconsin . . . 655
Working sewage later gravel at Clinton, Mass . . . 763
Water power for Wisconsin Health . . . 231
Wisconsin Mass Imhoff tanks and per . . . filters . . . n246

SEWAGE WORKS

Perth Amboy N. J. works conditionally authorized . . . n584

SEWERS

Brooklyn improvement cuts costs on Pan . . . (R. C. Hargrave) . . . h*834
Construction records used at Scarsdale N. Y. (P. Thompson) . . . *111
Inspection laws made compulsory in Wis . . . 267
Kansas City, Mo., Turkey Creek sewer . . . contract for Canadian contractor . . . n535
Letting of portion of 4th per cent . . . 621
Louisville, Ky., new sewerage board to . . . n837
Massachusetts commission remains un . . . n99
Metering outlet openings for variable . . . (S. T. Smith) . . . *728
Overloaded trunk sewers prove disastrous to . . . *989
Pressure Valley outfall tunnel section . . . n147
Sewage sheet over trench in narrow space (G. C. D. Leith) . . . *1064
Storm sewage adaptation of rational method of design (H. G. McGee) . . . *868
Sturgis, A. M., on state and Federal control of . . . 593
Supervising the laying of trench . . . h*142
Surveying by proposed regulating dis . . . n678
Symposium, R. E., Jr., on what will engineers . . . 720
Systems of combined sewers and following . . . by commission . . . 103

SHIPBUILDING, SEE SHIPS AND SHIPBUILDING

Shipping Board reconstituted . . . n340

SHIPS AND SHIPBUILDING

Ammonia . . . by burner . . . n43
Concrete . . . n441
. . . *91
. . . *361
. . . *291
. . . *100
. . . *309
. . . *995
. . . 489
. . . 6
. . . 441
. . . *1
. . . 3
. . . *1
. . . *1
. . . 3
. . . *1
. . . *1
. . . *1

Plane-table or transit for topography letters on (H. Wood) 95; (F. Vernon K. Allen and F. J. Howes) 333, 344, (E. Low) 434; (W. Brown) 673
Railways, resurvey, curve chart for (J. G. Wetherell) *506
Railway; another chart for railway resurvey (H. P. Boardman) letter *898
Sextant and stadia-rod method for measuring distance (B. A. Baird) 647
Targets, special, facilitate survey of flood works (R. C. Chaney) *768
Texas license law 315
Topographical, on Chilean desert (B. L. G. Rees) *224
Transit or plane-table for topography? letters on (H. Wood) 95 (F. Vernon K. Allen and F. J. Howes) 333, 344, (E. Low) 434; (W. Brown) 673
Traversing by a 35′ angle method (J. H. Sawkins) *373; (K. F. Jaeger) letter 580, (C. B. Schmeltzer) letter 772, (G. F. Schlesinger) letter 828
Swart, H. V., on criticism of contract-bond business 669
Sweden large exports of timber from 347
Water power development 471
Swimming tank on third floor of concrete building (L. R. Viterbo) *135, (J. S.) letter 287, (M. D.) letter 437, with editorial comment
Switches, split-switch turnout, method of laying out (L. C. Scott) letter 711
Switzerland, railways to extend electrification 220
Symonds, H. A., on selection of pumps for small water-works a429

T

Tables and curves, mechanical device for reading *641
Tallahassee, Fla., to have manager n836
Tanks, concrete for fuel-oil, design and construction a322
Three large steel, moved 150 miles by water (A. J. Taylor) *226
Tape, steel, readings corrected for sag and stretch (W. S. Weiks) *401
Taylor, A. J., on moving three large steel tanks 150 miles by water *226
Tchikoff, V. V., on method of constructing diagram to show probable droughts *554
Teele, R. P., on irrigation in fourteenth census 926
Telegraph and telephone systems returned to owners n290
Telegraph printing, valuable during war 227
Telephone and telegraph systems returned to owners n790
Templet used in clearing sand from irrigation canal 800
Terminal, small river, for widely varying water stages (H. Abbott) *999
Test hole in tidewater drilled by land drill on barge (A. J. Newman) h899

TESTS, see also CONCRETE, TESTS; STEEL, TESTS, Etc.

Blasting, show TNT stronger than 40% dynamite h145
Cast iron, malleable properties of *142
Castings, X-ray examinations for blow-holes 231
Exposure, on steel sheeting 521
Floor, tile and concrete flat-slab 943
Gypsum, structural 802
Materials e1
Motor truck impact on roads five times dead load a*573
Resistance of soft clay to penetration by pyramids and piles 946
Road, thin base mat with brick road tested (H. H. Edwards) *134
Rope, wire 560
Ship stresses *550
Recording strain-gage 489
Soil for foundation of arch bridge per (A. Richards) *208
Steel, see Steel Tests
Stresses, ship *550
Wheel loads on highway bridge floors (H. F. Blood) letter 190
Wires, mirror extensometer for testing a*32
Wood strength of longleaf and freshly cut Douglas fir compared 281
Wood-stave pipe line, seepage test (V. M. Crown) *264
Yellow pine beams tested for shear with concentrated load (L. R. Metcalfe and C. R. Hill) *69 (H. D. Dewell) letter 388
Texas, activated sludge tests in 622
Road building materials in n290
State highway engineer to be highest paid state official n1084
Texas Association of Contractors n790
Thompson, P., on sewer construction records at Scarsdale, N. Y. *111
Timber, see Lumber
Timber bridge problems on Alaska railway *429
Time lost reduced by shifting crews (A. S. Fry) h11
Tires, methods used by Germany in overcoming shortage (E. M. Kistler) *761
TNT stronger than 40% dynamite h145
Toggle relieves load on bridge posts during reinforcement work *543
Tolles, F. C., on garbage collection and disposal at Akron, O. 1042
Tomlin, Capt. R. K., Jr., returns to editorial duties n290
Tower concreting 140 foot, raised in one piece (S. S. Hammel) h*242
Towers, wind pressures and wind stresses in design (R. Fleming) *
Tracing, Janney process for reproducing, improved *

Tractor [illegible] *, 646
Traffic [illegible] *, 27
[illegible] Conference
[illegible] n*396
Train [illegible] at Yale [illegible] 180

TRADE, FOREIGN

Chamber of Commerce of United States [illegible] n680
Dutch East [illegible] Association, opposed [illegible] 397
Export [illegible] n548
Import [illegible] n843
International Trade Conference to be held [illegible] 613
Removed with [illegible] and some other countries n151
Tractor [illegible] h*39
Trade [illegible] by [illegible] J. P. Jones *660
Traction [illegible] without tires *460
Tractor [illegible] on pontoons *148
Transit [illegible] *818
Transit or [illegible] letters on (H. Wood) 95, (F. Vernon K. Allen and F. J. [illegible] 333, 344, (E. Low) 434, (W. [illegible] 673
Transportation, [illegible] by C. W. Baker e781
Traversing by a 35′ angle method (J. H. Sawkins) *373, (C. B. Schmeltzer) letter [illegible]72, (K. J. Jaeger) [illegible] letter 580, (G. F. Schlesinger) letter 828
Trinitrotoluene [illegible] than 40% dynamite h145

TRUCKS, see MOTOR TRUCKS

Truss, G. W. [illegible] concrete coping pier at Panama has novel [illegible] *912
Trusses, wood, [illegible] not affected by shrinkage *934
Tufts College [illegible] school changes at, C. C. Anthony 185
Tully, E. J., and J. C. Marx, on sewage-treatment report [illegible] and testing apparatus *825
Tully, E. J., on treatment of canning-plant wastes in Wisconsin *1017
On treatment of gas waste to prevent water pollution *917

TUNNELS

Bank [illegible] through holes bored from surface (J. Armstrong) *174
Colombia, S. A., American contractors invited to bid n960
East River, hole through n339
Hudson River
Congress [illegible] state agreement n98
Interstate agreement on n678
Proposed types *122
Irrigation [illegible] may be built in Washington n196
Pennsylvania R. R. damaged by gasoline fire 110
Turbine [illegible] 355
Turntable, [illegible] for hammer clutch (E. E. [illegible]) h899
Turntable, 110-[illegible] 350
Turntable [illegible] by trussing to carry heavy [illegible] *1014
Twenty-third Engineers, returned units n45

TYPHOID

Army [illegible] deaths e40
Heavy [illegible] 1909 39
In New York City [illegible] in 827
Moline, Ill., outbreak e106

U

Uhler, W. D., [illegible] concrete in reservoir e491 518
[illegible] 708
Underground [illegible] of Water pipe n533
[illegible] Mfrs. New York Local, meeting e186
Underwriters' Association of Eastern [illegible] e903
Uniform [illegible] for highway [illegible] *514
Union [illegible] (R. [illegible]) tribute to [illegible] e494
Public Service Corporation of New Jersey [illegible] 111
[illegible] 378
[illegible]
[illegible] 892
[illegible] (C. H. [illegible]) 435
[illegible]
[illegible] 959
[illegible] e629
[illegible] e835
[illegible] *810
[illegible] *514

V

VALUATION [illegible] 807
[illegible] letter 332
[illegible] City
[illegible] Supreme
[illegible] n1040

Principles underlying determination of fair value 1
Public attitude and costs [illegible] to R. L. Baldwin) *511
Railways
Increasing prices for Federal valuation
Report to be ready January 1921
Washington, D. C., street railways completed n1045
Valve, bypass, faulty cause of typhoid outbreak, Moline, Ill. e106
Home-made, [illegible] opening for small [illegible] (D. F. McLaren) * 14
Vanuxem, G. C., [illegible] contract for French house building n149
Veeder, [illegible] J. C., on [illegible] seals pay for themselves twice every year *211
Venturi meters, [illegible] of coefficient of [illegible] W. S. Pardee *
Vermont, [illegible] of health district, Water and sewage treatment 655
Vicksburg, [illegible] at battlefields, Penn. [illegible] appropriated among eight parks n970
Victoria, protected from snowslides by concrete work, F. F. Adams *470
Victoria, [illegible] R., [illegible] test on third floor of concrete building *145, (J. S.) letter 287, (M. D.) letter 437 with editorial comment
Volk, K. G., [illegible] land-survey indexing plan for county surveyors *283

W

Wages, gages and street railway gages 328
Wall, concrete construction is continuous [illegible] *454
Walla Walla, Wash., reservoir construction [illegible] contractors refuse to bid save on cost plus basis n534

WAR

Airplanes and gas warfare e591
Bridges [illegible] e448
Bridges in active warfare (L. J. Mensch and M. W. M. Donald) e887, *888 *534
Engineer [illegible] Third highest 776
Engineering [illegible] peace work e448
Factories to be sold by War Department 1197
Gas and aircraft warfare e591
War Department [illegible] building equipment bills for transfer e978
War Labor Board ends n490
Warwick, C. L., new secretary [illegible] American Society for Testing Materials 9
Washington, D. C., bill to limit height of buildings etc. and for zoning passed by House n584
Street railway valuation completed n934
Zoning for n490
Waste stockyards in Chicago, cost of treatment n487
Wasting, factory control over, in Wisconsin 129
Water, [illegible] 1
Water-bearing [illegible] 614
Water-bearing flat-terraces dumped by dredges
Water hammer in pipe lines and economy of [illegible] (E. Crewson and A. H. Reeves) 147
What [illegible] (R. Gibson) letter 430, (N. F. Sanford) letter 710; (W. P. Bullock) letter 828

WATER-POWER

And the coal strike e973
Bill passed by House of Representatives n11
Development in Sweden 471
Electric [illegible] Electric Munici[illegible]
[illegible] n9
[illegible] 1
Large [illegible] turbines 1
Legislation [illegible] n1041
Operating [illegible] 880
Pumping [illegible] town, solution of *
Sewage [illegible] n784
Sewage [illegible] 1
Utilizing [illegible] 973
Wisconsin River [illegible] n744
Water-power [illegible] tributary areas should [illegible] C. C. Hayes letter 230
Water supply, Utah counties unite in n545

WATER SUPPLY

Appropriations [illegible] unnecessary by modification of [illegible] 615
Auburn, N. Y., [illegible] and reservoir, with [illegible] 744
Aqueduct [illegible] 746
Bacteria [illegible] of water after [illegible] (A. Wilson) [illegible] *804
Bristol, Conn., [illegible] for water-works [illegible] 77
Brooklyn, N. Y., [illegible] 1
Chicago, [illegible] pumping [illegible] of [illegible] plant 1
Colorado [illegible] water [illegible] 876
Colorado [illegible] Valley [illegible] 744
Colorado [illegible] [illegible] 884
Contract of [illegible] to [illegible] extensions of water mains (B. Brownell) [illegible]
Des Moines, manager for water-works to be [illegible] e970
Engineer to [illegible] Omaha 8
Filtration [illegible] results at Toronto, N. J. [illegible] a*855
Fort [illegible] 1
From [illegible] [illegible] of *768
Gage [illegible] between meter and water [illegible] 516

n, news notes; a, abstracts

Page

Grand Rapids, Mich., reduced line feed saves motors and lessens deposits *923
Gravity water-shed leakage in relation to R. E. Horton a826
Grinnell, Iowa, cost of pumping reduced 30% by test a18
Jersey City, N. J., large concrete-lined steel pipe laid in one piece *176
Kansas, rates and meters 459
Kansas City, Kan., refused permission to install duplicate plant n583
Leakage, watershed in relation to gravity water supplies (R. E. Horton) a826
Los Angeles, assessment for extensions of mains 644
Boiler construction of Owens George power plants n904
Main breaks, responsibility for 944
Mains, extensions of, at Bristol, Conn., paving for 772
Massachusetts to be studied n743
Meters, Cincinnati completing program 876
Meters cut city consumption in irrigated district (C. E. Painter) *956
Prevent famine at Pocatello, Idaho (H. G. Rae) letter, with editorial comment 1073
Middletown, Conn., additional supply rendered unnecessary by metering 613
Mixing, experiments 23
Moving, pipe siphon under river a difficult job 818
Montreal aqueduct arbitration favorable to city n534
Municipal, lack of foresight in 599
New York City, Schoharie development involves dam and 18-mile tunnel (J. W. Smith) a*824
New York State, supervision by state (T. Horton) a812
Omaha, economy in operation 8
Pittsburgh, Herron Hill reservoir to be relined 668
Pocatello, Idaho, meters prevent famine 611; (G. Rae) letter, with editorial comment 1073
Pollution by industrial wastes enjoined 711
Pump valve springs found in standpipe (Hydraulic) letter 38
Pumping cost reduced 30% by test at Grinnell, Iowa a18
Rahway, N. J., pollution by industrial wastes enjoined 711
Rates and meters in Kansas 459
Rates, discriminatory, to railway, ruling against 115
Rutland, Vt., treated 655
Sacramento, Calif., bonds for filtration plant about to be issued n244
New staff plans treatment works n1080
Bid accepted n292
To have municipal filter plant n535
Votes $1,800,000 for filtered water n42
San Francisco, new Hetch Hetchy dam to be one of world's highest n244
City wins suit to protect rights n442
Electric mucking machine used for Hetch Hetchy tunnels 996
Service charge defined 809
Siphon under river a difficult job 818
Snowfields, determination of water supply from *766
St. Louis, report of water commissioner e973
Upkeep problems at filtration plant a935
St. Paul, meters 91.8% of service 74
Storage in open reservoirs, sanitary effect of (A. Wolman and S. T. Powell) *804
Supervision by State of New York (T. Horton) a812
Toronto, drifting-sand filter results (N. J. Howard) a*822
Filtration experiment e909
Treatment of gas waste to prevent water pollution (E. J. Tully) *917
Twin Falls, Idaho, consumption cut by meters (C. E. Painter) *956
Vermont, treatment 655
Walla Walla, Wash., contractors refuse to bid on reservoir save on cost plus basis n534
Wisconsin, wider powers for state Health Board 231

WATER TREATMENT

Boiler water treatment a323
Mixing, experiments 23
Mechanical plants, supervision 1067
Reduced line feed saves money and lessens deposits *923
Report form for plants, Wisconsin *189
Vermont 655
Waterways, Canadian convention n967
Waterways, Illinois deep waterway from Chicago Drainage Canal to Illinois River e105, n147

WATER-WORKS

Akron, Ohio, improvements 608
Albany, N. Y. e591, 604, 605
A hundred years ago n591, 605
Brick conduit gives long service 768
Athens, Greece, American engineers to install n392
Baltimore, enlargement recommended (W. E. Lee) n630
Cement joints for cast-iron water mains at shipbuilding plant (A. J. Newman) 609
Chile, constructing 98-km. water conduit (G. H. Bayles) *593
Conduit, brick, gives long service 768
Denver, permanent plants for chlorine mine installed *606
Diaphragms, damp water-gage fluctuations 613
Duplicate, Kittanning, Penn., may not build n583
Gas producers at small station 462
Moline, Ill., typhoid outbreak e106
Operating data, St. Paul 8
Operating problems, Quincy, Ill. (W. R. Gelston) 1019
Pipe laying by force account, Salt Lake 469
Profit and loss account 576
Pumps for small water-works, selection of a429
Purification plant methods and results at Albany, N. Y. e591, 604
Quincy, Ill., operating problems (W. R. Gelston) 1019
St. Paul operating data 8
Weather Bureau, method of using rain gages criticized (J. B. Lippincott and R. E. Horton) letters *829
Wedge, spreading, for striking arch centers h*713
Weeks, W. S., on correcting steel tape readings for sag and stretch *404
Weights and measures laws being compiled n680
Weir, C. L., and T. Saville, on Langley Field sewage-treatment works *374
Correction 402
Welch, A. W., on lumber prices high and advancing n296
Welch, Maj. W. A., on cleaning road surface with compressed air before oiling *933
Wells, R., on economic values in sewage and sewage sludge e910 a948
Wells, deepest in world in West Virginia 520
West Virginia has world's deepest wells 520
Western Society of Engineers celebrates 50th anniversary n45
Coöperates with Illinois Association of Members of Am. Soc. C.E. n634
Drive for members n678
Gains 2000 members n714
Western Wood Pipe Publicity Bureau formed n844
Weston, E. M., on reinforced-concrete pipe made by centrifugal process *707
Wetherell, J. G., on curve chart for railway survey *506
What will engineers pay to improve their status? (F. Lavis and eight others) 720
Wheel guards on highway bridges *282
Wheel loads on highway bridge floors (H. F. Blood) letter 190
Wheelbarrow handles, knuckle guard for (J. H. Sawkins) h*1074
Wheeling, W. Va., begins civic development n486
Whinery, S., on highways for motor trucks 77
Whipple, G. C., Prof., director Division of Sanitation, Red Cross n777
Review of "Boiler Chemistry and Feed-Water Supplies" 380
Whistler, J. T., on spillway capacities for reservoirs in Western United States *28
White River, Washington, additional money for control recommended n680
Wiggin, T. H., to design Grand Canal China improvement n441
Wiley, C. C., on depressed crosswalk connections *281
On road subgrade and air temperatures *128
Wilgus, Col. W. J., made Officer of Legion of Honor n187
On Federal purchase of railroads at fair value 820
On plan for private operation of Federalized railways 496, e592
Williams, F. M., on largest barge canal terminal (Canal) in New York City *1047
Wilmington, Del., authorizes port improvement n533
Memorial bridge, bids to be asked n778
Engineer chosen by competition *806
Wilson, J. S., does rich concrete in roads cost more than lean? e491, 518
Wilson, President, calls industrial conference e491
Second conference e781
Views on high cost of living and low production e397
Wind pressure and wind stresses in tower design (Fleming) *660
At great height (R. Fleming) e491, 499
Correction 659
On cylindrical structures in practice (R. Fleming) e491, 499
Correction 659
Winnipeg River, hydro-electric project begun n714
Winsor, F. E., on plans for earth-dam construction involve large use of machinery 612
Wire, mirror extensometer for testing a*32
Wire pipe-bands, device for tightening and clamping n*48
Wireless stations, Government 264
Wisconsin drainage laws, new 1066
Health Board, wider powers for 231
Road materials not depleted n746
Wiskocil, Prof. C. T., on excess water in cement glue e105, *130
Wolman, A. and S. T. Powell, on sanitary effect of water storage in open reservoirs *804
Wood, Gen. Leonard, joins American Association of Engineers n1029

WOOD

"Compression" and failure of factory roof beam (G. E. Heck) *508
Strength of long-used and freshly cut Douglas fir compared 281
Tests on heartwood and sapwood 657

WOOD PRESERVATION

Creosote oil specifications declared "closed" by Chicago court n1080
Creosoted piles sound after 29 years *378
Perforating patent dedicated to public by O. P. M. Goss n1082
Soaking in Salt Lake increases life of ties 944
Ties, railway e106
Woodpeckers damage creosoted tanks and poles (L. W. Duffee) letter 962
Zinc chloride steeping process h676
Woodpeckers damage creosoted timber; aid in swatting them asked (L. W. Duffee) letter 962
Wood-stave pipe line, leakage test (V. M. Crown) *264
Worcester, Mass., Imhoff tanks for 796
Wrecker, motor truck, Boston Fire Department n*395
Wright, G. E., on steam pipe replaces wood rolls under excavator h*337

X

X-ray examinations for blow-holes in castings 234

Y

Yakima River, banks protected by cribbing 624
Yeager, O. H., on building association stock provides plant-replacement fund h1027
Yellow pine beams tested for shear with concentrated loads (L. R. Manville and C. R. Hill) *69, (H. D. Dewell) letter 388
Young, H. E. and W. A. Mulcahy, on cofferdam experience at bridge in Chicago River e249, *268
And W. A. Mulcahy, on substructure of Michigan Ave., Chicago, bascule bridge *210

Z

Zinc chloride timber steeped in h676
Zoning, city, see Cities, Zoning
Zull, R. L., on special drag finishes channel slopes dug by dragline excavator h*96

*, illustrated; e, editorials; h, hints; n, news notes; a, abstracts

A Consolidation of Engineering News and Engineering [illegible]

McGraw-Hill Company, Inc.—JAMES H. McGRAW, President

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. MEHREN, *Editor*

CHARLES WHITING BAKER, *Consulting Editor*

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"Engineering News-Record" is a consolidation of "Engineering News" and "Engineering Record."

"Engineering News" was founded in 1874 by George H. Frost, as the "Engineer and Surveyor," which title subsequently became the "Engineer, Architect and Surveyor," then "Engineering News and American Railway Journal" and, finally, "Engineering News," under the successive editorships of D. McN. Stauffer, Arthur M. Wellington and Charles Whiting Baker.

"Engineering Record" was established in 1877 by Henry C. Meyer as the "Plumber and Sanitary Engineer." The name was subsequently changed to the "Sanitary Engineer," "Engineering and Building Record" and, finally, to "Engineering Record." During his ownership of the paper, Mr. Meyer was directly responsible for the editorial policy. John M. Goodell became editor in 1902, and was succeeded by E. J. Mehren.

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Technical Revival

IN THE refreshing spirit which animated last week's meeting of investigators and engineers at Atlantic City, under the auspices of the American Society for Testing Materials, new vigor of technical thought found unmistakable expression. The strong program of technical papers which distinguished the meeting showed, too, that the society's vitality needs other outlet than merely through the laborious routine of committee work. Scientific study of test methods and instruments, and exploration of the properties of materials and their modification by different treatments, offer a field in which more brilliant performance may yet be achieved than ever recorded in the past.

Materials and "Recommended Practice"

MUCH of the development of the engineering art rests on the view that a construction material is something definite, something that can be specified and tested without regard to what use the engineer or constructor may subsequently make of it. Faithful adherence to this idea has created that large branch of the profession which deals with materials and their testing, has brought engineering construction to an efficiency and economy otherwise unattainable, and incidentally has made the American Society for Testing Materials flourish and grow. Now, however, in that very society more than one technical committee appointed for the purpose of defining and prescribing tests for a particular material, insists on preparing a code of practice for the use of that material. The tendency in this direction has recently increased in very marked degree. Is this a desirable condition? It seems to us that it presents a problem meriting the early consideration of the society's governing authorities, and possibly the exercise of some wise restraint. Singleness of purpose is necessary to give aim and sound guidance to the work of an organization as of an individual; and this would be endangered if the separation between the field of materials and the fields of engineering and construction were not scrupulously respected. The battles fought within a committee before a specification can be agreed upon must often range far enough to encroach on the field of construction. But such encroachment should be limited to the committee room. When a group of men appointed to draw specifications for sewer pipe, or for gypsum plaster, claim that they cannot proceed unless they are first allowed to write codes of engineering practice in sewer construction or hard plastering, the committee-room atmosphere extends beyond due limits.

Income and Expenditure

THERE is something sobering in the refusal of the American Society for Testing Materials to grant the money requested for support of the National Service Committee. But it will be clear that the society merely obeyed the dictates of prudence when it took this action. Its financial condition does not permit the extra expenditure. Living on a narrow margin of income, the society faces a greatly enlarged budget because of necessary changes in its business methods, already inaugurated. Obviously this is the sole motive for the unfavorable action which the society's executive committee took on the request for its share of a $25,000 budget; the society has expressed no views unfavorable to the National Service Committee or to the Engineering Council's action in establishing that committee. Under the circumstances it will be the more interesting to learn what the other member societies of the Council will do as to their share of the needed sum. It is known that some of them are almost as limited in financial ability as is the American Society for Testing Materials. An uncomfortable question will be raised if it turns out that the societies have, in effect, adopted a scale of living exceeding their income. Shall the new-born views of far-reaching society activity prevail? Or, shall the dictates of sound management be observed, in keeping expenditure within income? These questions deserve serious consideration.

Railway or Highway?

WHAT is the proper field of the railway and of the highway in the country's transportation system? To what extent has the coming of the motor truck rendered the branch line railway obsolete? How does the heavy cost of building and maintaining roads that will stand up under motor truck traffic affect the total cost of truck transportation? *Engineering News-Record* has just completed an investigation of these and related questions. The results of this investigation will be given at length next week.

How to Make Stucco

STUCCO, that is, the plastering of exterior wall surfaces, is as old as civilization, but it is one of those things which practice has not made perfect. Engineers and architects particularly are ignorant of its fine points, and the practical man—upon whom in most cases the application of stucco rests—has not benefited by the experience of his trade ancestors. Consequently, there is more poor stucco today than any other form of wall surface and the use of it is only in mild favor. In spite of this, good lasting stucco can be made if proper attention is paid to details. Its application is an engineering operation and deserves the consideration of the technical man. To such of these as are still of the opinion that the plasterer is the real judge of stucco application, the report of the Committee on Concrete Surfaces of the American Concrete Institute, presented last week, should be a revelation. Seldom has there been a more complete study of a single subject nor one which, if properly assimilated, will do more to improve a detail of engineering construction.

Regulating Design by Standard Rules

AMONG the five bridge specifications summarized on another page, one is a specification which was drafted for country-wide use. It was meant to be adopted by all railway bridge engineers and to regulate the construction of railway bridges throughout the country. In this purpose it has not succeeded, though it has had wide currency—more largely as a code of bridge-design principles than as a purchase specification. Every railway of importance has its own specification, such as those of the Pennsylvania, of the Southern Pacific, and of the New York Central, summarized in our table.

Present tendencies would indicate that this condition will continue. If, however, bridge practice all over the country is to come under the sway of a single design specification, it is worth while giving heed to authoritative opinion on the subject.

A railway engineer of unusually long experience says of standardized design codes: "Standard specifications are a curse. They divest the individual engineer of responsibility and make him work to rule rather than to conscience." This remark strikes at the root of the case; it is the more weighty because the complexity of the subject has given rise to not a few misconceptions about standards, and particularly standards that tend to control engineering practice.

It is imperative that the methods of engineering practice should be so shaped and so maintained as to stimulate original thought, initiative, and individual study of the specific problems presented. Efficiency cannot otherwise be assured. Routinization of engineering is bound to sap the foundations of the art. It is in this sense that rules to control engineering design are harmful: they tend to discourage and to check original thought.

The considerations here suggested are of serious import to the future development of bridge construction. They cannot be met by mere insistence on the abstract desirability of standardization. Unquestionably a record of the conclusions and judgments developed by experience in bridge construction and maintenance, those conclusions which represent the sum of bridge knowledge, should be briefed in a document available for the general guidance of bridge engineers. But shall such a document take the form of a rigidly drawn set of rules, or shall it be modeled on another pattern? This is the essential problem presented.

Cracks in Rail Steel

STUDY of rail quality has progressed since the publication of the first results obtained by the new deep-etching method three months ago. The method is now acknowledged to be a powerful instrument of investigation, one which, by furnishing an additional method of observation, brings out new truths through correlation now with one set of phenomena, now with another. It is rapidly linking up a chain of evidence that promises to tie together rail failures and steel quality.

Evidence already collected tends to establish the view that fine cracks in steel are responsible for the gashes produced by the hot acid used in the deep-etching method; at any rate it makes this a good working hypothesis. These gashes, again, have been shown to be intimately related to both fissures and the "gray spots" which always accompany fissures. Thus a condition in which the steel is broken by numerous internal cracks, a "shattered" condition of the metal, as some of the experts call it, is concluded to be associated with rail breakages, and is assumed to be the cause of these breakages. Various other explanations of transverse fissures have failed to satisfy the facts. It has been claimed, for instance, that gagging is responsible for the origin of the fissures; but the internal cracks revealed by etching are sometimes located near the end of the rail, and fissures are also often found in this neighborhood, while gagging affects only the middle part of the rail's length. Moreover, gashes have been developed in specimens taken from tires and wheels, metal that is not gagged.

If the etching gashes are cracks, they are analogous to "snowflakes" in gun forgings, which in a very careful and sharply reasoned study by H. S. Rawdon some months ago were shown to be most probably cracks in the metal. It has been claimed by others that non-metallic inclusions or the like are responsible for snowflakes; and the same explanation has been given for the nuclei of transverse fissures in rails and for the gashes in rails. But there are very great difficulties in the way of believing in the existence of large films of such inclusions, so distributed and so numerous as are the gashes in rail steel, and equal difficulties in the way of understanding the mechanism by which the hot acid could convert the inclusions into such gashes as develop in rail metal. It happens also that some of the

gashes appear precisely in those locations where the deformation of the steel during the rolling process might be expected to produce tension cracks.

From the facts now accumulating, the most likely direction of progress in rail study leads through research in the production and the prevention of cracks in rolled material. The metal composition, ingot conditions, the heat treatment of the steel, and the rolling and cooling are all involved here. Such research would show whether the weakness of the metal *per se* or shrinkage or tearing actions are mainly at fault, and it should then be easy to decide whether improvement must be made in the steel chemistry or in the manufacturing procedure, or, possibly, in both.

Both the American Railway Engineering Association and the American Society for Testing Materials have now concerned themselves with the new rail study, and the subject thus creates a new bond between these, the most active technical societies of the country. Partly because of this fact there is extensive coöperation between metallurgical investigators, railway engineers, manufacturers and laboratory scientists, a condition warranting high expectations for early solution of the mysteries surrounding rail quality.

Progress in Engineering Education

THOSE who have criticised the society for the Promotion of Engineering Education in the past for failure to attack its problems by the scientific method, and for its tendency to deal with opinions rather than facts, will find cause for encouragement in the report of the 27th annual meeting printed in our news pages this week. Definite evidence that the society is rising to meet the greatest opportunity in the history of engineering education—the combination of the war experience with the epoch-making report by Dr. Mann—are seen in several resolutions of the utmost significance for the future. Local sections of the society are to be established. Committees were created to coöperate with national engineering societies and to develop classifications and specifications as to the preparation and qualifications for egineers. Recommendations were made for the immediate adoption of intelligence tests. A distinct new tendency to seek first-hand information, such as results from experience or direct investigation, is seen. Enthusiastic interest was aroused by the description of the "case system" used in law and medical schools and its application to engineering as carried out in the Army Engineer School at Camp Humphrey, at Tufts College and elsewhere. One of Dr. Mann's major recommendations—that greater emphasis should be placed upon values and costs—received, however, wholly inadequate discussion, despite the two-day session in Washington on the subject of business training for engineers which preceded the Baltimore meeting.

The intelligence tests, recommended both at admission and to be applied throughout the course, if applied with "gumption" and commen sense as supplementing the usual examinations, have shown valuable results. The correlation coefficient, as determined at the Carnegie Institute, and the graphical charts there developed, have indicated clearly whether bright students are working to their maximum possibilities, serving also as a test of the teacher's success in arousing the class. These tests can be developed to determine the aptitudes of the students and most effectively, and the teachers' judgment in deciding questions of discipline or dismissal for low scholarship records.

Most pregnant in its possibilities for the future of education and of the profession is the development in the application of the concrete-problem method, somewhat similar to that described by Professor Morrow, of Yale University, in our issue of April 24, 1918, p. 827. This method requires teachers with initiative, wide practical experience, and special qualities of mind and soul. Students and teachers both are described as being "on their toes" all of the time. As often mentioned at the convention, sufficient salaries to attract the proper type of teacher must be provided. In this connection, it should be remembered that the salaries now offered of say $1800, $3000, $4000 per annum, at present really correspond respectively to only about $1200, $2000, and $2700 at pre-war prices. The most effective education, that of master and disciple, urged in the address by President Hollis, of the Worcester Polytechnic Institute, cannot be developed by men paid for half time who give full time to outside practice, as he so aptly expressed it. The teachers should be relieved of administrative duties and given leisure to develop their courses and their students, as well as pursue research in practical lines. The recent announcement that Cornell University has increased teachers' salaries about 20 to 33%—at the same time increasing tuition fees—and that Harvard plans a $10,000,000 endowment to allow an increase of 25% in teachers' salaries, is an encouraging sign.

The claim made for the project or "case" system of teaching that it will help to develop the "engineering mind" appears to be in process of fulfillment, if the enthusiasm expressed by those who have had intimate contact with the work done in this line is any criterion. To satisfy the double demand of the profession for engineering leaders and for the rank and file, employers and employees—the new methods seem to have great inherent possibilities. The students are aroused to their best efforts; in fact, these new methods are carrying back the true research idea into direct contact with the problems of the engineering world.

One of the live issues of the day which was not given sufficient place in the convention is that of raising the profession to a higher status in the social structure. The general trend toward closer relations between the engineering educator and the profession should prove to be a fruitful element of progress in this direction. In fact, if followed to logical conclusions this awakening points to the responsibility of the profession to enter the business world and furnish places for the greater number of trained leaders which engineering education should develop. As an aid to the true attitude toward engineering on the part of the students, outside specialists should be called to address the student organizations. These organizations should be given every support by the teachers, and used to develop that character, self-confidence, and leadership which the profession needs, giving college credit for such activities.

The inflow of new life from our engineering schools would in a few years raise the profession to that higher position it desires. May the promises of these new developments have rich fulfillment!

Special Design Features and Erection Methods For 540-Foot Suspension Bridge

Cumberland River Foot-Bridge for du Pont Engineering Company, Near Nashville, Was Designed With Varying Cable Inclinations at Towers

By William G. Grove

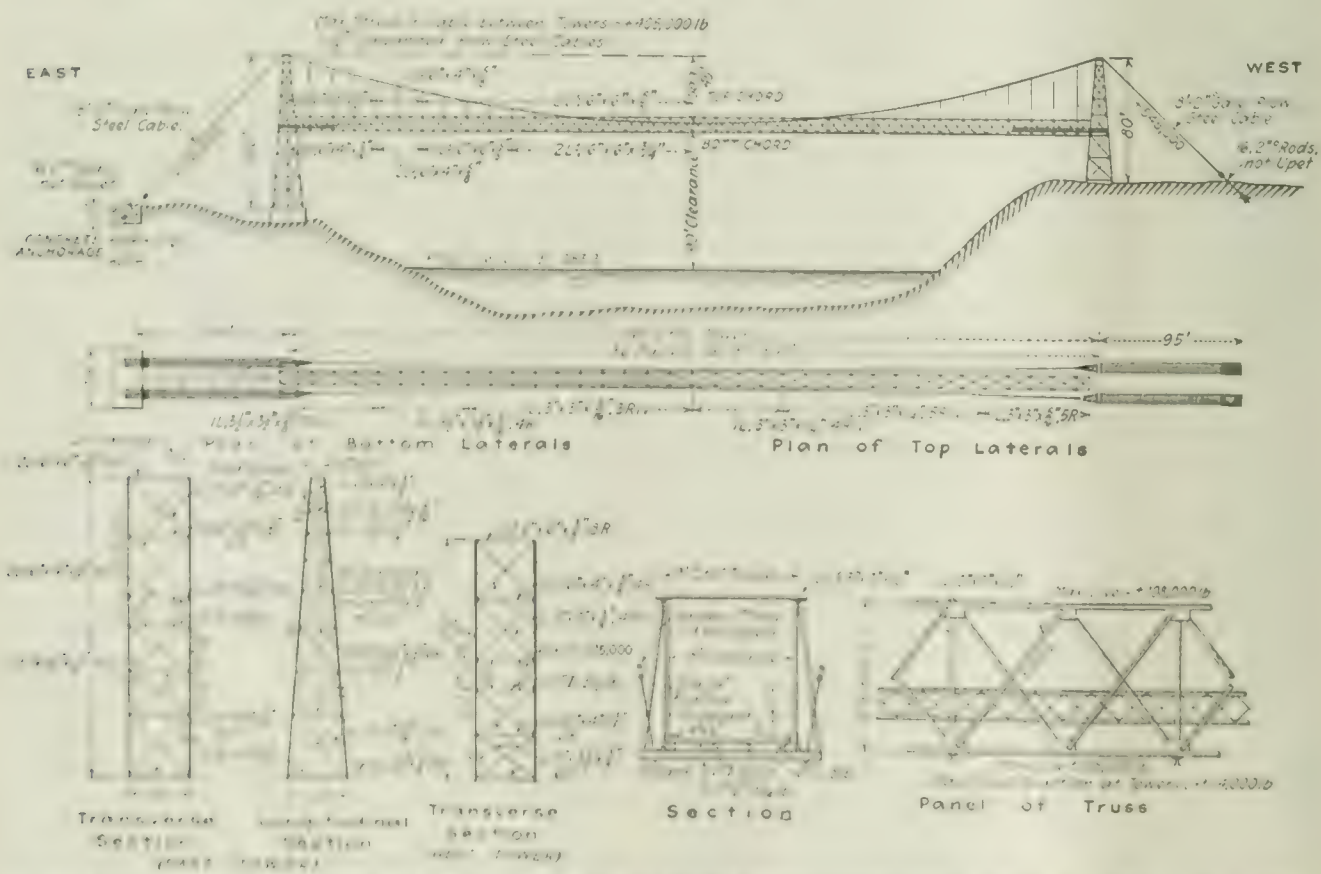
Assistant Engineer, American Bridge Company, New York City

THE design of the 540-ft. highway suspension bridge, over the Cumberland River near Nashville, Tenn., for the du Pont Enginering Co., contains somewhat unusual features. Owing to the height of towers, and also to the location of a railroad and some telegraph wires on one bank, the angles of inclination of the anchorage cable and main cable at the towers were made different. As the cable stress has a constant horizontal component from anchorage to anchorage, the different angles of inclination required heavier cables for the anchorage than for the main span and, in order to save expense, the cables, instead of being continuous as is normally the case, were made in three separate units. The lengths of the anchorage cables necessitated special consideration for the placing of the shoes and rollers on top of the towers, so as to allow for free movements due to deformation both during erection and under traffic.

Description of Site—The du Pont plant is situated about eight miles from Nashville by electric line, but on the opposite side of the Cumberland River from the trolley. Until 1918 there was only a ferry crossing at the site, and in order to provide a more easy and convenient access to the plant the du Pont company decided to build a foot-bridge across the river. The normal traffic would be from the electric line over the bridge into the plant in the morning and from the plant over to the electric line in the evening, so that the bulk of the traffic would be in only one direction at any one time. It was therefore decided to make this bridge with a clear width of 8 ft., which would be ample for one-way automobile passage in the middle of the day when there would not be any congestion due to pedestrian traffic.

The river at ordinary stages is about 25 ft. deep, and the east bank is 40 ft. and the west bank 60 ft. above normal pool level. During high-water stages the river overflows the east bank regularly, and it was decided to make the underclearance of the span 90 ft. above normal pool level. This condition, indicated by Fig. 1, brought the floor of the bridge 50 ft. above ground on the east bank and 30 ft. above the west bank, and to provide access to the bridge, therefore, the du Pont company built a wooden trestle approach at each end of the structure.

Design of Bridge—For light highway suspension bridges the sag of the cable is usually made from one-tenth to one-twelfth of the span length, and in this case, to keep the height of towers as small as possible, the ratio of one-twelfth was adopted, thus giving the cables a normal sag of 45 ft., based on a span length of 540 ft. With this value of sag the height of the towers became 100 ft. for the east tower and 80 ft. for the west tower.



GENERAL DIMENSIONS AND SECTIONS OF 540-FOOT SUSPENSION BRIDGE OVER CUMBERLAND RIVER

In a light suspension bridge, as ordinarily designed, the horizontal component of the cable stress is constant from anchorage to anchorage and the cable stress is maximum at the towers. In order to use a continuous cable between anchorages, the angle of inclination of the anchorage cable to the tower is made the same as the angle of inclination to the main cable of the tower. In the present bridge, to keep the inclination of the cable to the tower the same on either side of the tower would mean that the cast anchorage would be 300 ft. and west anchorage 240 ft. from the base of the towers, respectively. The anchorage portion of each cable would thus become extremely long, amounting to 320 ft. for the east and 250 ft. for the west cable. Not only would these lengths be excessive, but, on account of the conditions at the west bank, the anchorage cables would foul the line of the Louisville & Nashville R.R. and also some telegraph wires paralleling the road.

On account of these difficulties, it was decided to locate the west anchorage in such position as to be clear of both railroad and telegraph wires, and a location was determined upon giving an angle of inclination of west anchorage cable to tower of 45°. In order to preserve symmetry of appearance, the angle of inclination of the east anchorage cable to the tower was also made 45 degrees.

The floor was designed for a live load of 80 lb. per square foot or a three-ton automobile in addition to its own dead load. The trusses were designed for a continuous live load of 400 lb. per linear foot of bridge of such length and in such position as to cause maximum stress for the individual truss members, based on the assumption that the stiffening truss serves to distribute the live load in any position on the bridge equally to all the hangers and so give a uniform load on the cable. On this assumption, the ends of the trusses are subject to positive and negative reactions, depending on the position of the live load. The cables and towers were designed for a continuous live load of 400 lb. per linear foot of bridge in addition to their own dead weight.

The maximum stress in the main cable between the towers is 405,000 lb., the maximum horizontal component of which is 385,000 lb. This horizontal component being constant from anchorage to anchorage, the maximum stress in each anchorage cable is 545,000 lb. The two anchorage cables are approximately 140 ft. and 110 ft. long, respectively, while the main span cable is about 550 ft. in length. To use a continuous cable from anchorage to anchorage of sufficient strength for 545,000 lb. of stress would mean that the main-span portion would have a greater margin of safety than the anchorage portion, and as the main-span portion is twice as long as the sum of the two end portions there would be a considerable waste of cable and consequently of money.

The cables were therefore made in three separate lengths, the two anchorage cables of sufficient strength for 545,000 lb., and the main-span cable good for 405,000 lb. Using galvanized plow-steel wire rope with a factor of safety of 5, based on the approximate breaking stress determined from results of tests, it was necessary to adopt seven ropes of 1¼-in. diameter for the main-span cable and eight ropes of 2-in. diameter for each anchorage cable. Seven ropes were used in the main-span cable, as that number more easily lends itself to clamping into one cable at each hanger connection, so that the general appearance of the seven cables when clamped every 15 ft. is of one large cable, as in Fig. 2. From the end hanger to the top of the tower, the seven individual ropes are splayed out so as more easily to make a connection there.



FIG. 2. TRESTLE APPROACH, TOWER AND ANCHORAGE CABLES IN FOREGROUND

Eight ropes were used for each anchorage cable, as this number not only permitted the use of smaller individual ropes, but also provided for a more symmetrical connection at the top of the tower than could have been made by the use of seven ropes in the anchorage cable. The eight anchorage cables and the seven main-span cables were connected to a pin in a cast-steel shoe shown in Fig. 3. This shoe rests on 2½-in. rollers on top of the tower, the rollers providing for free movement of the span during and after erection due to stress



FIG. 3. CAST STEEL SHOE AT TOP OF TOWER

and temperature changes. Details are indicated in Fig. 4.

Floor System—The floor is of the ordinary type of construction for light highway bridges, consisting of plank floor resting on steel joists. The floor-beams on

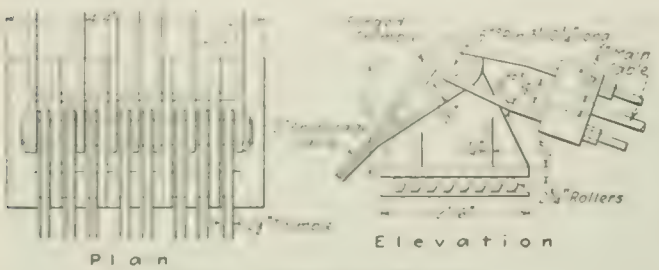


FIG. 4. DETAILS OF SHOE

which the joists rest consist of two channels, each spaced back to back with a gap of sufficient width to allow the hanger rods to pass between the channels. The lower ends of these hanger rods are threaded, and the rods are held against the bottom of the floor-beams by beveled washers and nuts. The trusses were made 10 ft. deep back to back of flange angles, this depth permitting the use of overhead lateral bracing. The top of each truss was further stiffened by a kneebrace at each panel point extending from the top flange to the end of the extended floor-beam.

The towers were made 20 ft. wide so as to give sufficient stability against wind pressure, which was assumed at 25 lb. per square foot on the unloaded and 10 lb. per square foot on the loaded structure. For anchorage, the tower was made safe against wind pressure of 50 lb. per square foot on the unloaded structure. The distance center to center of hangers where they connected to the floor-beams was made 10 ft. 3 in., and as the distance center to center of cables at the top of the towers was 20 ft., each cable with its suspender rods was cradled. This provided additional rigidity against lateral forces.

Anchorage—The total stress in the eight anchorage cables for each truss is 545,000 lb., or 1,090,000 lb. for the entire anchorage, the vertical component of which is 770,000 lb. Ordinarily, in suspension bridge designs, it is customary to provide an anchorage good for 50% in excess of the maximum uplift, which total amount in this case is 1,150,000 lb. The east anchorage, accordingly, consists of a block of reinforced concrete 20 ft. wide by 11 ft. deep by 39 ft. long, this mass of concrete at 135 lb. per cubic foot weighing approximately 1,150,000 lb. The concrete is embedded in the earth in such a manner that the maximum pressure on the soil in front of the anchorage from the maximum horizontal component of the anchorage cable stress is 3600 lb. per square foot. The cables were fastened to 2-in. diameter rods embedded in the concrete, two rods being attached to the cast-steel socket of each of the eight individual cables for each truss. These rods in turn are connected to channels near the bottom of the concrete anchorage.

The ground on the west bank is limestone rock, and here it was the intention merely to embed the anchorage rods into the limestone, provided the rock was solid. It was found on excavation, however, that the rock was very poor, so the du Pont company built a concrete block the same as that at the east end. Fig. 5 shows this anchorage.

The most important feature in connection with the preparation of the detail drawings was the determination of the movements of the cast-steel shoes on top of the towers and the amount that the main-span cable should be shortened in order to provide the proper sag under full live load.

The modulus of elasticity of structural steel is approximately 30,000,000. The modulus of elasticity of steel wire rope is a variable quantity, depending on the lay, the number of wires in a strand and the number of strands in the rope, and an average value for plow-steel wire rope used for suspension bridge cables may be taken as 12,000,000. It is seen, therefore, that a wire rope will elongate 2½ times as much as a steel bar of the same length and subjected to the same unit stress.

The movement of the shoe on top of the tower is due entirely to change in length of the adjacent anchorage cable, except for a slight amount due to the deflection of the tower itself. Any change in length of the main-span cable merely affects the sag of the cable itself.

Movements of Shoes on Towers—Assuming normal temperature, the east anchorage cable will elongate 2¾



FIG. 5. CONCRETE ANCHORAGE WITH EMBEDDED STEEL RODS

in. under dead load and an additional 2 in. under full live load, making an increase in length of 4¾ in. The east tower will shorten ¼ in. under dead load and $\frac{3}{16}$ in. under full live load, making a total shortening of $\frac{7}{16}$ in. The horizontal movement of the shoe due to elongation of the cable and shortening of the tower will be 4¼ in. for dead load and 3 in. for full live load, or a total horizontal movement of 7¼ in. from the no-load position to the dead plus full live load position. It is customary to let the center of the tower bisect the movement of the shoe for live load, so that in this case the position of the shoe at the time of erection under no-load stress in the anchorage cable was 4¼ in. plus 1½ in. = 5¾ in. off the center of the tower back from the river. The no-load length of the east anchorage cable was made 138 feet 5 inches.

In a similar manner, under normal temperature, the shoe on the west tower at the time of erection was placed 4¼ in. off the center of the tower, and the no-load length of the west anchorage cable was 11 feet. 1 inch.

Based on 540-ft. center to center of towers, the horizontal distance center to center of shoes for the no-load or erection position was 540 ft. 10¼ in. This decreased to 540 ft. 2¾ in. for the dead-load position and 539 ft. 9¼ in. for full live-load position. It was desired that the sag of the main-span cable should be 45 ft. under full live load. The length of the parabola having a sag

of 45 ft. and a chord of 539 ft. 9½ in. is given thus:

$$L = C\left[1 + \frac{8}{3}\left(\frac{S}{C}\right)^2 \ldots\right]$$

where L = the length along the curve, S = the sag and C = the chord. L was found to be 549 ft. 7½ in., which is the length of the main cable under full live load. The main cable elongated 10¼ in. under dead load and an additional 7½ in. under full live load, making a total elongation of 1 ft. 5¾ in., and, based on the distances center to center of shoes given above, the no-load cable sag was 38 ft. 6 in. and the dead-load cable sag 42 feet 3 inches.

The above figures are all based on a normal temperature of 55° F.; for a minimum temperature of 0° the east shoe would move back $\frac{7}{16}$ in. and the west shoe [illegible] in., while for a maximum temperature of 110° F. the shoes would move forward these amounts. The sag of the main cable would be decreased by 7 in. at minimum and increased by 7 in. at maximum temperature for any condition of loading.

Erection—The total time of erection was 12 weeks, but the actual time required to place the permanent material was only six weeks. The east and west towers were erected simultaneously by gin poles, Fig. 6, which were lifted to timber supports resting on the bracing struts of the towers for placing the upper members of the towers, shoes, anchorage cables and main cables, the shoes being clamped into position 5 in. and 4½ in. back of the center of tower for the east and west shoes respectively. (See Fig. 3.). The anchorage cables were lifted into place singly, and the 5-in. shoe pin was driven through the thimbles of the anchorage cables and the ribs of the shoe, the U-bolts for connection to the sockets of the main-span cables being placed at this time on the pin.

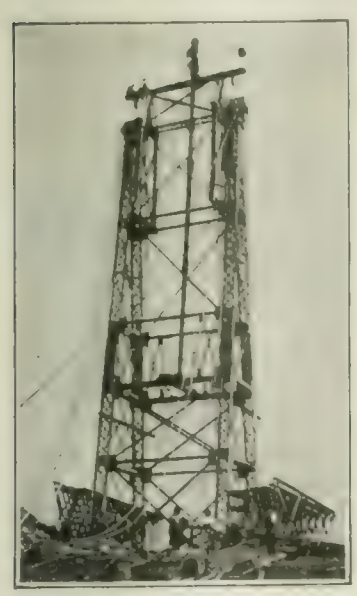


FIG. 6. TOWER ERECTION

The concrete anchorages were built by the du Pont Engineering Co., and in these anchorages were embedded the steel rods for connection to the sockets at the lower end of the anchorage cables. These anchorage cables were then connected to the rods, each cable socket being fastened to two rods by nuts, Fig. 5, by means of which the cables were adjusted until the entire eight anchorage cables were carrying approximately equal stresses.

For erecting the main-span cables a 1-in. wire rope working cable was stretched from tower to tower. Each of the main cables was 542 ft. long and weighed 3500 lb. These were seated on the ground in the rear of one tower and unwound from the reels. One end of the main cable was lifted to the top of the tower, and this end was then hauled across the river to the top of the opposite tower, the cable being supported from the 1-in. working cable by blocks attached at intervals of about 60 ft., thus preventing too much sag. The cable was then



FIG. 7. CABLE CLAMPS AND HANGERS PLACED FROM WORKING PLATFORM

lowered to approximately correct position, and the sockets were pulled over the U-bolts attached to the tower shoes, as shown in Fig. 3.

The remaining six cables of the south main cable were then stretched in a similar manner, after which the seven cables in the north main cable were placed. A straight-edge with a spirit level was laid across all 14 cables, this straight-edge being on the fixed line of sag determined by a transit in the tower at the floor level. The cables were then adjusted by nuts at the end of the U-bolts, until all of them touched by the straight-edge.

After all the cables were stretched the 1-in. wire rope working cable was at the north main cable. Another 1-in. wire rope working cable was stretched from tower to tower over the south main cable and a working platform was supported from these 1-in. cables, the platform being controlled by ropes attached to each end. The cable clamps and hangers were placed by men on the working platform, Fig. 7, beginning in the center and working toward each end. A boatswain chair was used to carry out men and tools.

The floor system was also erected by men on the working platform, in this case beginning at the ends of the bridge and working simultaneously toward the center, the material being carried out to position by the boatswain chair. The platform was removed after the floor system was placed, and for erecting the trusses one of the 1-in. wire rope working cables, placed at the center of the bridge, was used as a trolley cable. The truss sections were brought to position on this working cable and erected by workmen on the floor system, the trusses being erected simultaneously from each end toward the center. Fig. 8 shows the placing of the last truss section at the center of the bridge.



FIG. 8. TOP LATERAL BRACING

After the center sections of trusses were

erected, the top lateral bracing, railing and wood floor were placed, and the bridge was ready for automobile and pedestrian traffic. Fig. 9 shows the top bracing and railing. About 14,000 men a day passed over the bridge about the time of completion.

The total weight of structural steel in the bridge was 205 tons, while the cables weighed 45 tons, making a total of 250 tons of steel. The time from the acceptance of the proposal to the completion of the structure was about seven months.

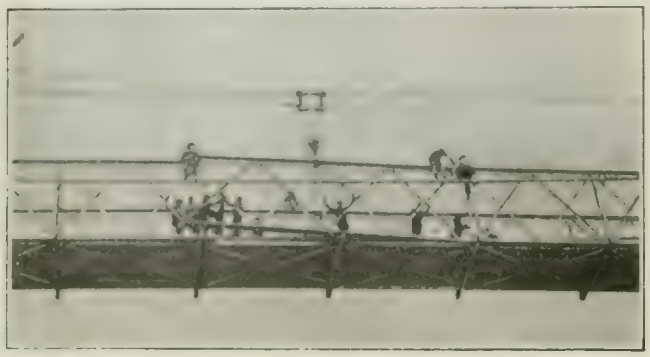


FIG. 8 PLACING LAST TRUSS SECTION AT CENTER

The bridge was designed by the writer, assistant engineer in the New York designing office of the American Bridge Co., under J. E. Wadsworth, division engineer. The detail drawings and the fabrication of structural steel were done at the Ambridge plant, R. G. Manning, engineer, and the bridge was erected by the Western Division erection department, K. L. Strickland, division erection manager. The cables were fabricated by the American Steel & Wire Co. at its Worcester plant.

Cost, Maintenance and Life of Highways

In a discussion of American highways before the American Society of Civil Engineers, Apr. 16, 1919, H. Eltinge Breed, first deputy highway commissioner of New York, made the following classification of highways

AVERAGE COST AND LIFE OF ROADS OF THE 16-26-FOOT SECTION IN NEW YORK STATE

	Name	Thickness In	Average Cost Per Mile: First Cost	Maintenance Cost per Year	Average Life, Years
1		9	$23,000	$970	7[1]
2		9	28,500	412	9[1]
3		6	31,200	112	15[2]
4		10½	[3]	222	12[2]
5		7 to 8	50,600[4]	[5]	[6]
6		7	40,000	245	[6]

[1] Less than 1,000 vehicles per day of traffic.
[2] Estimated.
[3] Constructed since 1917.
[4] Estimated cost, 1919 based on previous figures.
[5] Too few miles constructed to show true cost.
[6] Not enough mileage constructed to show true cost.

as to cost, maintenance and life. These data represent the average experience in New York State, during 1917, on roads having a 16-ft. surfacing and a 26-ft. width between ditches. Mr. Breed called attention to the fact that since 1917 the highway traffic conditions have become much more severe, and that the maintenance cost will probably be increased, while the life will be shortened. As may be seen from the table, the maintenance on other than what may be considered hardsurface types is very heavy.

Economy Kinks in Water-Works Operation in Omaha

H. V. Knouse, Superintendent, Describes How Coal Is Purchased, Alum-Cake Plant Operated and Trucks Utilized

BUYING of coal on its evaporation qualities, coagulant made on the job, folding ditch barricades, truck attachments, and foremen's maps, are items utilized by the Metropolitan Water District of Omaha, Neb., to effect economies in operation. They were described in a paper by H. V. Knouse, assistant superintendent and purchasing agent, at the recent meeting of the Southwestern Water Works Association at Kansas City, Mo.

Every element entering into the operation of the pumping station is measured, and a daily report is laid on the desk of the superintendent each morning, showing in a final analysis a statement as to the foot-pounds developed per pound of steam in each engine, the amount of water evaporated, and the amount of water pumped per pound of coal. Adjustments are made at once. Coal of all kinds has been tried, so that the evaporation record can quickly be balanced against prices quoted by coal salesmen.

The home-made alum-cake plant is now in its third year of satisfactory use, said Mr. Knouse. Bauxite comes from Arkansas and acid from Kansas City, Kan. Coagulant costs 60c. per hundred and represents a yearly saving over a bid of $1.32 per hundred offered in 1916 for a three-year contract of $15,000. The equipment cost $6500. [The plant was described in detail in *Enginering News* of Jan. 11, 1917, p. 54.]

A folding ditch barricade, so arranged that for transportation from yard to job a minimum of space is required, with provision for suspending a red lantern in a secure manner, and being so painted as to be conspicuous under an automobile head light, is a cheap device that has proved of considerable value. With the lantern supported on top of the frame and the bail removed, the lanterns were not nearly so popular with the early morning milkmen.

A tee placed in the exhaust line from the motor of a two-ton truck, to which was connected a flexible hose, often saves the expense of sending for a steamer to thaw out a hydrant. Providing trailer couplings to the trucks for attaching tool wagons, and the mounting on wheels of mixers, large pipe trailers, trench pumps and other tools, save much time.

Foremen are furnished with a map specially made for them, drawn on a scale of 600 ft. to the inch and cut into sections covering one mile by two miles. Printed on cloth and bound with a cover having a snap clasp, the map fills a space 3 x 3 x 11 in. Mains, valves and hydrants only are shown, with numerals alongside to indicate sizes.

St. Paul Water-Works Operating Data

Of 40,721 water service connections in St. Paul, Minn., 91.8% are metered. The percentage of receipts from the sale of water through metered service exceeds the percentage metered by 0.3% only. Of the domestic and industrial consumption 97.7% is metered, while 65.8% of the total consumption, 77 gal. daily per consumer, is metered. Plus interest on bonds and sinking fund, the total cost of supplying water is $69.24 per 1,000,000 gallons.

Meeting of American Society for Testing Materials

New Era Inaugurated — Society Decides on Independent Headquarters and Expands Its Coöperative Work—Strong Technical Program—Development in Steel and Concrete—Marburg Memorial Meeting

A NEW era in the life of the American Society for Testing Materials was inaugurated by the 22nd annual meeting, held last week at Atlantic City, N. J. The significant development of the meeting was great expansion of coöperative work with other societies and with testing and research laboratories. Renewal of vigor in materials study was apparent, not only in the unusually strong program of papers presented, but also in announcements of work in progress or to be undertaken.

New policies were fixed by several decisions of vital importance which the Executive Committee reported to the meeting, though matters of great moment are still in abeyance. A definite organizational policy has been established, with the first independent headquarters in the society's history. C. L. Warwick, long the assistant of the late Professor Edgar Marburg, secretary of the society since its foundation, has been appointed secretary-treasurer to succeed him. The society's office will no longer be at the University of Pennsylvania, but is to be located in the building of the Engineers' Club of Philadelphia, 1315 Spruce St., and is to be manned by a full-time organization. During the past year the society has gone outside the close bounds of its technical activities by joining Engineering Council and by participating in the formation of the American Engineering Standards Committee. Both of these new activities have brought into being very serious problems, not yet solved. Furthermore, many demands for taking up joint committee work in different technical subjects arose after the end of the war, and they led finally to the society's entering upon a much broader program of coöperation than has prevailed at any previous time since its organization. All these matters produced active anteroom discussion at the meeting, but in the sessions of the society attention to the questions at issue was restricted to brief announcements by the chairman, with no discussion.

While these matters were in the foreground of attention, notable technical work constituted the essence of the meeting. In the matter of steel rails, results were reported that give distinct promise of early advance in this difficult subject. A classic group of papers on magnetic study of steel quality was presented. Fatigue and impact testing were brought into new prominence. Several ingenious new testing instruments gave further proof of the activity of laboratory investigators. In cement and concrete, work of exceptional importance was brought to the fore. A paper on paint tests injected new vitality into the lagging thought in this subject.

Council and Standardization

One result of Engineering Council's establishing a National Service Committee with Washington headquarters was a request to its member societies for appropriations totaling $25,000, to pay the expenses of that committee. J. Parke Channing, chairman of the council, guaranteed the sum, but it was desired to take up the guarantee. Of the $25,000 total, $1400 was asked of the American Society for Testing Materials. The society's executive committee, however, found itself financially unable to accede to this request. In reporting its action to the meeting, it did not define further its attitude toward the council or toward the National Service Committee, nor did the meeting enter into discussion of the subject.

A burning question was presented in connection with the American Engineering Standards Committee, whose proposed reorganization was reported in these columns two weeks ago. To review the situation in a word, the society voted a year ago to participate in the formation of such a committee, and in consequence the committee was organized last October. Within three months thereafter, however, it conceived doubt as to the effectiveness of its form of organization, and therefore began studying how to reorganize on a much broader plan than that previously authorized by the societies. It had in the meantime done no work on standards, nor had it taken steps to make its existence known to the technical world, in consequence of which the conferences on reorganization worked themselves out virtually behind closed doors. The result was that on May 17 the committee adopted a new constitution, which thereupon was laid before the boards of the societies for approval. First action in the matter fell to the American Society for Testing Materials, which, it happened, was also the only society in which the original proposal for a Standards Committee was submitted to vote of the membership at large.

It had been expected that the executive committee of the society would, after considering the matter, recommend final action to the meeting. The subject proved so amazingly intricate, however, according to rumors that filtered from the committee room, that no final action could be decided upon. The following resolution was therefore adopted and was reported to the meeting:

> It is the sense of the executive committee that the proposed change in the constitution of the American Engineering Standards Committee is not looked upon with favor at this time, and that a committee be appointed by the chair to confer with the other member bodies to get their views and report at the October meeting of the executive committee.

Inquiry made in the meeting as to the reasons for this action brought out the following explanation: The original scheme of organization as a committee (the reorganization would make this an independent association) has not yet been tried out, and it is thought desirable at this time to await actual experience with the committee plan. "Also," President Clamer stated, "the other societies have as yet not taken action in the matter." The announcement proved a distinct surprise, and despite the intense interest which the subject had aroused the technical program of the meeting was resumed before further discussion developed.

While no official statement was made, it is understood that any further action on the part of the society will not be taken merely by the executive committee but will be submitted to vote of the membership at large.

Intimately related to the problem of the standards committee was the presidential address, delivered by G. H. Clamer, the retiring president. "Standardization" was its subject. Sketching the parallelism of industrial advance with commercial standardization, such as the

harmonizing of candle and candlestick sizes and the adoption of a standard railway gage, the speaker developed the concept standardization in broadly ideal manner, to include the work of the War Industries Board conservation section—the arbitrary curtailment of styles and varieties of products—as well as the establishment of standard cost-keeping systems in manufacturing. Going then into the subject of international standardization, Mr. Clamer asserted that "nothing will promote international trade coöperation and good fellowship so much as would the establishment of wise and mutually satisfactory standards," some of which, he said, are an international language, an international religion, the metric system, the centigrade thermometer scale, an international coinage system, and the like. Finally, he expressed hearty approval of a central standardizing body, whether committee or association.

New Technical Coöperative Work

Several important joint technical committees are in process of formation, the executive committee announced. The decision to enter into such work on a large scale, as was demanded by various calls from the field, appears to have been delayed by the hope that the engineering standards committee would assume direction, according to its fundamental purpose; but the cessation of its work on account of the proposal to expand into an association made it necessary for the society to take the initiative.

Reinforced Concrete—Of widest interest, perhaps, is the case of the projected new joint committee on reinforced concrete. On the request of the society's committee C2 (reinforced concrete), the executive committee invited the American Society of Civil Engineers, the American Railway Engineering Association, the American Concrete Institute and the Portland Cement Association to join with the society in forming such a joint committee. To confer and arrange for organization, a special committee has been appointed.

Rail—Coöperation with the American Railway Engineering Association on track steel has also been inaugurated, an undertaking that may produce results of very great importance. At present the work concerns only splice bars, bolts and tie-plates, but the executive committee has proposed that rails be included in the coöperative study. Revision of the rail specifications has been started by the appropriate committees of both societies, so that joining of the separate undertakings in coöperative work would be natural. There has hitherto been no effective harmonizing of conflicting views on desirable and commercially attainable standards of rail quality, but as the subject is being worked upon actively by the steel committee of this society, the rail committee of the steel manufacturers, and the rail committee of the American Railway Engineering Association, there is opportunity for bringing together all parties in interest.

Concrete Culvert Pipe—On invitation of the American Concrete Pipe Association, the society has joined with it and with the American Concrete Institute, the American Association of State Highway Officials, the American Railway Engineering Association and the American Society of Civil Engineers, in establishing a joint committee to consider specifications for concrete culvert pipe.

Aircraft Steels—Work on specifications for aircraft steels was started recently by the steel committee. To make the results more broadly representative, however, the Society of Automotive Engineers has been asked to coöperative in a joint committee.

Related purposes are involved in the appointment of a delegate by the society, at the Government's request, to take part in a conference of the International Aircraft Standards Commission. J. A. Mathews was appointed delegate.

Pattern Details—A request for the establishment of a committee to consider standardizing pattern colors, core prints, and the like, led to the decision to refer the subject to specialist bodies, such as the American Foundrymen's Association and the Pattern Makers' Association. The society will be prepared to coöperate on questions of materials if these bodies go forward with the subject.

Research Coöperation—Representatives of the society have been appointed, on invitation, to the engineering division of the National Research Council and to the American Welding Society.

Railway Mechanical Standards—Work initiated by the mechanical section of the American Railroad Association (this section comprises the men formerly constituting the Master Car Builders' and the American Railway Master Mechanics' associations) on standard designs and specifications for locomotive and other mechanical parts involves quality of materials. Preliminary consideration has been given to the possibility of the society's coöperating in this work, in order to make fruitful use of the methods its experience has developed in bringing together producer and consumer.

Besides these new joint activities, much coöperative work is already in progress. The coal committee, for example, works jointly with a committee of the American Chemical Society on subjects of sampling and analysis. The new specifications for steel plates for forge welding brought in at the present meeting were prepared in response to a demand from the chairman of the tank car committee of the Master Car Builders' Association, which committee, in its specifications, names the A. S. T. M. requirements for material as standard.

New Work on Specifications for Materials

Less active work in the field of specifications was done by the society's committees during this year than for a long time past, chiefly on account of the pressure of war work. In one of the most difficult subjects, however, in brass and other nonferrous metals, a remarkably large amount was accomplished, no less than six new specifications on bronzes and bearing metals being brought in.

Several new committees have begun work during the past few months, among them one on lime (reorganized), which has already reported a specification, and one on magnetic analysis, whose field was represented by an important series of papers read at the meeting.

It is not possible to review the specification work in detail here, but a list of the new, revised and reconsidered specifications is given below, followed by notes on one or two special phases of the work. The action taken by the meeting (which must be followed by letter ballot in the case of standard specifications) in all but two cases conformed to the recommendations of the technical committees. A proposed specification for adhesive insulating tape was not accepted and

was referred back to the committee. Proposed specifications for gypsum plasters were not accepted by the meeting, but were referred to the executive committee for decision as to the propriety of including working methods in a material specification.

NEW STANDARD SPECIFICATIONS
(Advanced from tentative standards)

Materials
- Malleable Castings
- Cartridge Brass
- Cartridge Brass Disks
- Naval Brass Rods for Structural Purposes

Test Methods
- Methods for Chemical Analysis of Manganese Bronze
- Methods for Chemical Analysis of Gun Metal
- Test for Flash Point of Volatile Paint Thinners
- Tests for Determination of Apparent Specific Gravity of Sand, Stone and Slag Screenings and Other Fine Non-Bituminous Highway Materials
- Method for Determination of Softening Point of Bituminous Materials Other Than Tar Products

Recommended Practice
- Recommended Practice for Laying Sewer Pipe

STANDARD SPECIFICATIONS AFFECTED BY REVISIONS
(Revisions are tentative, the standards remaining unchanged until subsequent action at a later meeting)

Materials
- Open-hearth Steel Girder and High Tee Rails
- Engine-bolt Iron
- 2½-in. Cotton Rubber-lined Fire Hose For Private Department Use
- 2½, 3 and 3½-in Double-Jacketed Cotton Rubber-lined Hose for Public Fire Department Use

Test Methods
- Loss on Heating of Oil and Asphaltic Compounds

NEW TENTATIVE STANDARD SPECIFICATIONS

Materials
- Plates for Forge Welding
- Extra Refined Wrought Iron Bars
- Tinned Soft or Annealed Copper Wire for Rubber Insulation
- Brass Ingot Metal for Sand Castings
- Bronze Bearing Metal in Ingot Form
- Lead
- Solder Metal
- Building Brick
- Gypsum
- Calcined Gypsum
- Materials for Cement Grout Filler for Brick, Stone Block and Wood Block Pavement
- Materials for Cement Mortar Bed for Brick, Stone Block and Wood Block Pavement
- Block for Granite Block Pavement
- Rubber Hose for Use with Pneumatic Tools

Test Methods and Definitions
- Method for Battery Assay of Copper
- Method for Chemical Analysis of Pig Lead
- Methods for Chemical Analysis of Limestone, Lime and Hydrated Lime
- Test for Determination of Softening Point of Fire Clay Brick
- Definitions for Clay Refractories
- Methods of Test for Gypsum and Gypsum Products
- Test for Viscosity of Lubricants
- Methods for Determination of Fusibility of Coal Ash
- Method for Determination of Softening Point of Tar Products (cube-in-water method)

TENTATIVE STANDARDS AFFECTED BY REVISIONS

Materials
- Aluminum Ingots
- Aluminum Sheet
- Light Aluminum Casting Alloys
- Masons' Hydrated Lime
- Rubber Belting for Power Transmission

Test Methods and Definitions
- Test for Slagging Action of Refractory Materials
- Definitions and Rules Governing the Preparation of Micrographs of Metals and Alloys

Sulphur and Phosphorus in Steel

Peculiar interest centered in the action of the Steel committee on the war-emergency increase of the sulphur and phosphorus limits in steel, made last year. As stated by J. A. Capp, chairman of the committee, the effects of the war upon industry have not yet disappeared entirely, and some of the reasons for the higher chemical tolerances remain for the present. It was decided to restore the normal figures at once for those steels in which quality is most essentially affected by the change, and to retain the war clause in the other specifications until next year. This decision received the approval of the meeting.

The clause in question increased the rejection limits for sulphur in all steels and for phosphorus in acid steel by 0.01% above those fixed by the several specifications concerned, the increase to hold during the period of the war and until otherwise ordered by the society. The present action on this clause is summarized as follows:

ACTION ON SULPHUR AND PHOSPHORUS INCREASE IN A. S. T. M. STEEL SPECIFICATIONS

War Clause Removed 1919	War Clause Retained for Present
Forge steel	Forging steel
Structural nickel steel	Shapes steel
Plates for stationary boilers[1]	Carbon steel rails[2]
Forgings and steel for forgings[1]	Tie plates
Splice bars, except low carbon	Splice bars, low carbon
Track bolts, except low carbon	Track bolts, low carbon
Wheels and tires, railway, all	Plates for locomotive and car
Spring steel, all	Tubes for locomotive and stationary boilers
Tool steel	
Automobile steels	Chain
Girder and high tee rails[2]	Bars for concrete reinforcement
Screw stock	Castings

[1] Boiler and firebox steel for locomotives was not put under the war clause.
[2] In applying the war clause to car and tender axles no sulphur increase was allowed, the specification limit being 0.04%.
[3] No sulphur limit in specification, regular for rails affected only as to phosphorus in acid open-hearth, but girder and high tee rails affected as to both.

It is important to note that despite the increased chemical tolerances most steel products have been kept within the strict specification range; the clause, however, avoided rejections for occasional excess in check tests, and thereby proved a distinct convenience in the steel industry. Conditions are not altered in any radical manner by the present action, the tonnage of production being divided between the two classes so as to give ample outlet for steel that does not meet the check limits.

A Ball Test for Rails

Precedents in American rail specifications were broken by the Steel committee in abolishing the drop test for girder rails and high tee rails (for street-railway service), and replacing it by a ball-impression test for hardness. In view of the traditional position of drop testing for brittleness in the rail field, this action is revolutionary. It was taken at the request of electric-railway technical bodies, who desire a hard rail to resist wear and do not consider brittleness a danger where rails are bedded in pavements. Extension of this change in method to regular railway rails is not thought likely.

Further noteworthy features of the change are (1) that no upper limit of hardness is fixed, but merely a lower limit, to reject rail softer than desired, and (2) that the Brinell test is not adopted, a larger ball and a much higher loading being specified. A ¾-in. ball is to be placed on the head of the test rail and a load of 100,000 lb. applied for 15 sec.; the resulting impression should not be deeper than 3.6 mm. for class B or 3.8 mm. for class A rails.

Other Features of Committee Work

In the specification for tinned soft copper wire proposed as tentative standard there is included a new method for determining the integrity of the tin coating. It is based on the view that the tin coating must be entire, but should not be thicker than this object necessitates, as a thick coating will crack when the wire is bent or stranded and in any case reduces the conductivity of the wire. For these reason only two cycles of dipping in the test solutions are specified—the second cycle to make sure that spots which though not bare have too thin a coating are detected. The specified method is to dip a clean sample of the wire into dilute hydrochloric acid (sp.gr. 1.088) for 1 min., wash, wipe dry, and then dip for 30 sec. into sodium polysulphide solution (sp.gr. 1.142), which will blacken bare copper; then to repeat this cycle. If these two cycles

produce any blackening of the wire beyond ½ in. from the cut end, the sample is considered to have failed.

A flashpoint test worked out for paint thinners other than turpentine has, during the past year, been found to be accurate also for turpentine, and the Preservative Coatings committee therefore recommended its extension to cover all thinners. The same committee continued the inspection of test panels erected two years ago as a means of determining the best way of preparing iron and steel surfaces for painting. No conclusions will be reported before another year or two of exposure, but one well-defined result obtained so far is that cleaning a deeply rusted surface with scraper and wire brush is an unsatisfactory preparation for painting; the panels prepared in this way have failed badly. On the other hand, the plates which were painted as received from the mill, with mill scale intact and adherent, are among the best, up to date.

With the presentation of tentative specifications for viscosity tests of lubricants, a long contest in committee came to an end during the past year. The Saybolt instrument was decided on, in spite of the objection by various laboratory investigators that it does not give "absolute viscosity."

The method for determining the fusibility of coal ash presented by the committee on methods of sampling and analysis of coal is one which was formulated by A. C. Fieldner and has been used by the U. S. Bureau of Mines for several years. It was endorsed in joint action with the American Chemical Society.

A very simple colorimetric test for impurities in sand, for use in the field, was reported by the committee on concrete and concrete aggregates. It requires only a prescription bottle and some sodium hydroxide solution. For its application a color chart will be issued later.

Compression tests for cement have been under consideration by the cement committee. While no action has been taken, it was stated to be probable that a compression test will be recommended by next year, as a substitute for the long-standard tension test for cement.

Two important recommendations by the Lime committee involve broad interests. One took the form of a resolution asking that a standing committee on sand be appointed, to work with sand subcommittees of all technical committees whose field touches this important material. The other, expressed as a suggestion only, is that steps be taken by the society to endorse the standard sieves of the Bureau of Standards. In connection with this matter, joint committees on screens and on screen wire are under discussion.

Technical Papers on Tests and Materials

The meeting was noteworthy for the number of strong technical papers presented. As only four or five of those dealt with matters developed through war work, it appears that research in the field of testing and material- has continued in very active condition.

Progress made in rail study by the new method of attacking longitudinal sections of the rail head by hot acid was brought out by F. M. Waring and K. E. Hofammann, in a paper "Deep Etching of Rails and Forgings." Active discussion arose after the paper was read; the information developed in paper and discussion is summarized on another page of this issue.

Magnetic study of steel for uniformity and freedom from internal defects was made a special topic of the program, and five papers were read in which the results of the past half-dozen years' development of the subject were brought together. C. W. Burrows and F. P. Fahy, opening the series of papers, described the methods used and the results of some measurements, emphasizing the "very close relationship between the magnetic and the mechanical characteristics of steel." Other papers dealt with applications of magnetic methods to the discovery of defects in steel rails (P. H. Dudley), to the testing of ball-bearing races (R. L. Sanford and M. F. Fischer), and to the location of flaws in rifle-barrel steel (R. L. Sanford and W. B. Kouwenhoven), which showed that the promise of the method is still largely in the future. C. Nusbaum presented a study of magnetic curves of various steels and developed a method of "limiting values" by which, it is claimed, the mechanical properties can be determined from the magnetic properties.

New Testing Instruments

Five new instruments and machines for testing were described, distinctly extending the range of tests available for study of materials. Of related character was the American Concrete Institute paper of F. R. McMillan, describing the recording extensometer used in the ship-stress studies of the Emergency Fleet Corporation, which paper was read at a joint session of the Institute with the society. The "strainagraph," as this instrument is called, has been applied with remarkable success to both concrete and steel ships, and through its use a greatly increased fund of data for ship design is being accumulated. The vital importance of the subject precludes abstract of the paper here, but a full statement of results is likely to be available soon.

An extensometer of highly successful design, used in the laboratory of the Westinghouse Electric & Manufacturing Co., was described by T. D. Lynch and P. H. Brace, under the title "A Wire Testing Extensometer." It grips the wire by a spring clamp at one end of a pair of distance bars, and at the other end of the bars by two small rollers which carry axial mirrors on their ends. These mirrors reflect a beam of light from a small collimation-tube at one side of the instrument to a curved scale attached on the opposite side. Reading to 2/100,000 in. is possible. S. L. Goodale and R. M. Banks in a paper entitled "Development of Brinell Hardness Tests On Thin Brass Sheet." described a miniature Brinell machine for use in inspection of cartridge cases; the impression is made by a $\frac{1}{16}$-in. ball loaded with 15 kg. F. M. Farmer, in "A Fatigue Testing Machine," reported the design of a very compact repeated-stress machine for testing electrically welded ship plates under the auspices of the now-defunct Welding Committee of the Emergency Fleet Corporation. The testpiece is a rotating simple beam, loaded at the third-points, and the whole machine is only 5 x 19½ in., though the specimen is 0.4 in. in diameter and 13 in. long. W. H. Herschel discussed the testing of light mineral oils in a paper on "A Viscosimeter for Gasoline"; with his new instrument, which has an outflow tube 24 diameters in length instead of 7, as in the Engler and Saybolt instruments, he has found that fluidity and density of gasolines are by no means proportional. An apparatus in which a slab of pitch is bent on a hinged plate while immersed in water whose temperature can be varied was described

by H. E. Lloyd and P. P. Sharples, under the title "Apparatus for Determination of Breaking Point of Pitches."

A new instrument for the paint field, the plastometer, which should be grouped with those just noted, was described in a paper referred to farther on.

Test Methods and Results

Fatigue and impact testing were dealt with in two papers. E. H. Dix, Jr., discussed impact-fracture tests using the Olsen, Izod and Charpy machines, and gave figures for a number of tests made for the Bureau of Aircraft Production ("The Single-Blow Notched-Bar Impact Test as Used in the American Industry"). Prof. H. F. Moore and A. G. Gehrig reported the results of a number of alternating-stress tests on nickel steels, tending to show that heat treatment does not improve their endurance ("Some Fatigue Tests of Nickel-Steel and Chrome-Nickel Steel"). They used logarithmic plotting of the results, thus continuing the application of the exponential formula which Prof. Moore has used as a working hypothesis of fatigue phenomena for some years past, but the results apparently did not add to the evidence supporting this formula.

Extensive corrosion tests of steel to determine the value of copper content were detailed by D. M. Buck ("The Influence of Very Low Percentages of Copper in Retarding the Corrosion of Steel"). His conclusion that as little as 0.03% copper reduces the rate of corrosion, and that 0.12% copper neutralizes the ordinary amount of sulphur in the steel, raised sharp discussion. A. S. Cushman argued pointedly against the author's views. A. F. Robinson said that both abnormal purity and copper content have little value, since they can at best be rust reducers, not preventives, and therefore a protective coating must be used on steel used for structures. When a coating is used, such observations as the author's are inapplicable.

A new concept was introduced into the paint field by a paper "Paint, a Plastic Material and Not a Viscous Liquid; the Measurement of Its Mobility and Yield Value," by E. C. Bingham and Henry Green. An instrument for measuring the consistency of paint, the plastometer, is described in this paper. The fundamental basis of the plasticity theory developed by the authors is that "a definite, appreciable force must be applied to a paint before it commences to flow. This force we have called the yield value." Active and laudatory discussion followed its presentation, in which all the leading paint men present participated. The consensus of opinion was that the new instrument and the authors' methods promise to extend the horizon of paint study considerably, and that the possibilities in this direction will be better known when many laboratories have an opportunity of making plastometer measurements.

Observations and Data on Materials

Research in materials was also represented prominently, various metals being dealt with as well as cement, concrete and refractory brick. The cement and concrete papers are grouped under a separate head, below. On the subject of refractory brick, C. E. Nesbit and M. L. Bell described the evils resulting from lack of uniformity in refractories. Their paper, "Preventable Defects in Refractory Bricks," elicited sharp, not to say acrimonious, criticism from representatives of refractories manufacturers present at the meeting. The author's statements and arguments were well supported, however, by J. S. Unger and by G. C. Stone, representing large users of firebrick. Dealing with "Steam Hose for Car Heating," H. J. Force described a method of manufacture which has been found to reduce hose failures by contraction in length or expansion in diameter. He recommended three-ply calendered tubing for hose subjected to any considerable temperature.

"Modern High Speed Steel" was covered by John A. Mathews, historically and by the presentation of extensive test data for present-day high-speed steel, which he defines as a vanadium-containing tungsten-chrome steel. Discussing the paper, several tool-steel men argued for the value of cobalt additions, which the author had deprecated as lacking any demonstrated good effect. A valuable compendium of data on American malleable iron was given by H. A. Schwartz, under the title "Some Physical Constants of Malleable Cast Iron." Marked improvement in the quality of aluminum casting alloys by heat treatment (quenching) was reported by P. D. Merica and C. P. Karr, in a paper "Some Tests of Light Aluminum Casting Alloys."

A new chapter was added to the history of season-cracking of bronze and brass by a paper of P. D. Merica and R. W. Woodward, "The Behavior of Wrought Manganese Bronze Exposed to Corrosion While Under Tensile Stress." Test pieces of annealed bronze were placed in series with steel test bars in frames by which the bars could be strained in tension, and in this condition were exposed to corrosion by water and moist air for about two years. No specimen which was stressed below its proportional limit broke, and four specimens strained sufficiently to undergo a slight permanent set did not break. Generally specimens whose stress was below 35,000 lb. per sq.in. remained whole, while those stressed to more than 40,000 lb. per sq.in. broke. Specimens protected from corrosion did not break.

Cement and Concrete Papers

Proportioning concrete came in for a major part of the discussion in the concrete session. As a basis there were two papers, on "Proportioning of Pit-Run Gravel for Concrete," by R. W. Crum, and on "Theoretical Studies in Proportioning Concrete by the Method of Surface Areas," by R. B. Young. Mr. Crum's tests were made to determine a working basis for Iowa aggregate as used in highway work in that state. The method consists essentially in controlling the aggregate by the proportion of fine to coarse aggregate. The paper is abstracted on another page. Mr. Young reported the preliminary work of the Hydroelectric Commission of Ontario, which is placing many thousand yards of concrete. The tests are at present very extensive and tend to prove the applicability of the surface-area method for practical work. The author contends, however, that the fineness-modulus method is only another means of determining the physical condition which surface area represents. In the discussion Professor Abrams disagreed to the extent of claiming that the surface-area method does not check the fineness-modulus method except when the material is uniformly graded.

G. M. Williams, of the Bureau of Standards, stated that, so far as their tests go, they were unable to check the fineness-modulus results with those by the surface-area method. He also stated that neither one appears

to insure concrete of known or uniform consistency, and therefore is not usable in laboratory comparison. Prof. A. N. Talbot stated that the laboratory of the University of Illinois had been making a number of tests in an investigation of this matter, both with the surface-area and with the fineness-modulus methods. He said that these tests tended to show that strengths were dependent upon surface areas and that while both methods apparently have possibilities, at present he favored a surface-modulus method which gives a relation to the surface area. In concluding, Professor Talbot said that a number of elements enter into the manufacture of concrete and that we cannot take any single one and say that it represents the distinguishing element in the properties of the material. L. N. Edwards, the propounder of the surface-area theory, also discussed the papers.

Another paper on concrete was a very extensive one on the modulus of elasticity of concrete by Stanton Walker. This gives the results of thousands of tests and establishes the relation between four different measures of the modulus of elasticity of concrete in more or less common use. A paper on methods of curing standard concrete specimens, by Howard W. Green, checks previous conclusions on this subject.

Cement fineness has been made the subject of an extensive series of tests at the Structural Materials Laboratory of Lewis Institute during the past year. The results of the tests, covering many pages, were reported in a paper by Prof. Duff A. Abrams. Briefly, he experimented with seven different degrees of fineness varying from 2% residue on a 200-mesh sieve, to 13%, and broke in compression some 6000 6 x 12-in. cylinders, and in tension some 9,000 mortar specimens. He found that fineness increased strength in a straight-line ratio, the increase being about 2% (seven days' strength) for each 1% additional fineness up to about 91% through a 200-mesh sieve, after which the results are erratic. He found, however, that the additional strength gained by a 1% additional fineness was about the same as that gained by a 1% increase of cement.

Marburg Memorial Meeting

Impressive tribute to the memory of Edgar Marburg, secretary of the society since its foundation, was rendered in addresses delivered at a ceremonial session held on the evening of June 24. President G. H. Clamer, expressing for the officers of the society their feeling of loss, dwelt on Professor Marburg's position of leadership in the executive committee and on the direction given to the society's affairs by virtue of his personal strength. John M. Goodell reviewed Professor Marburg's career as an engineer. Robert W. Lesley, dealing with the early years of the society, and Arthur N. Talbot, on the later years, set forth in fuller detail than had been done by President Clamer the service which the society received from its late secretary. In closure, Robert W. Hunt paid warm personal tribute to the departed.

A notable function, also, was the conferring of honorary membership in the society upon three men of countrywide fame, Henry M. Howe, Robert W. Hunt, and Mansfield Merriman. All three have been active as leaders in testing circles since the earliest days of the society. They are the first to be so distinguished by the Executive Committee.

The following are the newly elected officers of the society: President, J. A. Capp; Vice-President, C. D Young; Members of the Executive Committee, Ernest Ashton, H. F. Moore, C. F. W. Rys, and Admiral D. W. Taylor.

Very favorable conditions of finances and membership were reported. The society has grown to a membership of 2481, a net gain of 220 during the year. Its income was so carefully managed that in spite of increased expenses and undiminished activity in publication a surplus of $2300 resulted. Corresponding to the growth of the society, the present meeting was by far the largest in attendance in its history, with a registration of 762 members, which is 179 more than present at any prior meeting.

Further Data on Effect of Copper in Reducing Corrosion of Steel

BY AN elaborate experimental research into the speed of rusting of steel containing very small amounts of copper, D. M. Buck has determined that the principal protective effect is exerted by proportions of copper so small that most analysts would report them only as traces. The results are made public in a paper read before the American Society for Testing Materials. Increasing the copper content from 0.01% to 0.03% decreases the corrosion by 30 to 40%. With a normal sulphur content of about 0.05%, a copper content of 0.12% gave virtually as complete protection as larger amounts. A copper percentage of 0.15% is considered sufficient to protect steel even with considerable excess of sulphur.

Previous experimentation had indicated that the protective influence of copper is noticeable at much lower copper content than had previously received consideration. To explore this phase of the matter further, new tests were undertaken. Actual atmospheric exposure was used for the purpose of the tests. By making various copper additions to different pourings of an open-hearth heat, copper contents of 0.012 to 0.254% were realized in the resulting ingots. Corrugated sheets, generally of No. 26 gage, were made from these. These sheets, 26 x 96 in., unprotected by paint or other coating, were placed out in the open on inclined racks in the Connellsville coke region, two years ago. A number of 2 x 4-in. test pieces from the same sheet exposed at the same time and place were used for test weighings.

The curve of loss of weight per square foot per month dropped sharply from about 0.50 oz. for low copper steel (about 0.01%) to a value of about 0.15 at a copper content of 0.05%, and then remained almost constant at this value. This is true of a steel of high purity (sulphur content, 0.03%). Higher sulphur changes the result. Not only does it multiply the initial rate of corrosion loss (for low-copper steel) making this value about 1.5 oz. per square foot per month, but also increases the copper percentage at which the full protective effect is attained. With steel containing 0.055% sulphur, the corrosion curve did not reach an approximate horizontal until 0.12% copper was reached.

In addition to the direct conclusions already indicated, concerning the amount of copper needed for protecting steel from rapid corrosion, the author concludes from his work that, since in previous research it has been customary to consider a copper content below 0.05% as a trace, it may be desirable to reinterpret many of the earlier corrosion data.

Further Data and Views on Rail Fissures and Quality

Results of Deep Etching—"Cracks" Found in Rails, Tires and Steel Wheels—Discussion at Testing Materials Meeting

Carrying farther their studies of "cracks" in rails revealed by etching with hot acid, discovery of which they announced to the American Railway Engineering Association three months ago in a memorandum to the report of the Rail committee (see *Engineering News-Record*, March 27, 1919, p. 610), F. M. Waring and K. E. Hofammann of the Pennsylvania R.R. told of new discoveries in a paper "Deep Etching of Rails and Forgings," read before the American Society for Testing Materials last week. Important contributions to the subject were made in the discussion of the paper.

The remarkable gashes developed by deep etching of longitudinal slabs from the rail head have so far been found in all transverse-fissure rails, and in numerous unbroken rails of heats that had produced transverse-fissure rails. Whenever such an unbroken rail showed transverse fissures when broken under the drop, its metal showed characteristic gashes upon etching. So far, no "cracks" have been found in rails that did not exhibit transverse fissures.

Next, it was found that some new rails develop gashes in deep etching. This made it appear that service in the track does not originate the defects of the gashes though it may be the agency that produces transverse fissures in such defective steel. It was therefore suspected that steel used for other products than rail might show similarly defective quality. Slabs from locomotive tires and from rolled steel wheels were etched, and gashes were developed similar to those shown by rails. A tire that broke after running only 25 miles developed numerous transverse "cracks" on both tangential and radial longitudinal sections.

Microscopical and chemical examinations have not yet shown the existence of any inclusions in the "cracks," nor any abnormality of microstructure near these points. The "cracks" extend through the grains of the steel as well as follow the grain boundaries. The authors' concluding passage is important:

> The manner in which the acid attacks these defects and rounds off the edges leads us to speak of them as cracks, but so far the investigation has not developed the cause. We are inclined to believe that the cause must be sought in the mill during some stage in the process of fabrication of the material.

A supplementary observation on the effect of annealing was reported: Companion slabs were cut from steel suspected of defects, and one was etched directly while the other was first thoroughly annealed. The second piece exhibited about the same degree of gash formation upon etching as did the other.

Opening the discussion of the paper, J. A. Capp advanced a theory which the annealing test tended to overthrow. It is that hydrogen liberated in the interior of the metal as the acid penetrates porous spots develops enough pressure to crack the metal where large initial strains exist. According to this theory, formulated on the basis of prior observations on steel springs, annealing should prevent the cracking.

J. E. Howard expressed the view that the evidence at hand tends to show the "cracks" to exist before etching. Certain appearances of the fracture faces suggest to him that these cracks are formed at a fairly high temperature. The orientation of the longitudinal cracks points to transverse strains as responsible.

By turning the discussion on the "snowflakes" found in ordnance steels, Col. W. P. Barba suggested the similarity or identity of these flakes, the "gray spot" defects which according to M. H. Wickhorst are always associated with transverse fissures, and the gashes produced by deep etching. He stated that X-ray investigations by H. S. Rawdon have revealed flakes in unbroken metal. Good ingot practice, Col. Barba claimed, prevents flake defects.

J. S. Unger demanded whether criticisms of manufacturing methods are justified so long as the injuriousness of the gash "defects" remains unproven. The formation of the gashes may be only a manifestation of different solubilities of the steel in different directions; he has found rail steel to be four times as soluble longitudinally as transversely or vertically, and concludes that local sponginess may be greatly exaggerated by acid.

M. H. Wickhorst expressed the view that the cause of the gash defects is not yet known. Remarkable results have been found recently in an elaborate study of a heat of fissure rails. Close correlation of transverse fissures and "gray spots," which may occur either with fissures or separately, was established. The fissure rails revealed a badly shattered condition of the head metal upon etching, while the rails with simple gray spots were in less shattered condition. The cracks appeared to serve as nuclei for the development of transverse fissures. Confirming previous results, no chemical peculiarity could be detected in the defective metal.

A theory as to the cause of fissuring was proposed by H. J. Force, namely that it is due to not holding the steel in the ladle a sufficient length of time. Where the steel is held 9 or 10 mins. better rail is produced, he stated, and he knows of no bad rails produced from ingots teemed after holding the ladle this length of time, while some defective rails were found to have been poured after only 1½ min. in the ladle. That fissuring is chargeable to steel condition is supported by the experience of 12 years' work, in which it has been found that a certain lot of rails from a certain mill will tend to develop transverse fissures while another lot will not, though in the same service.

It is not possible to make good steel from bad ingots, said Guillaem Aertsen, though bad steel can be made from good ingots. The transverse cracks in tires, however, suggest an analogy with the formation of fishtail ends on bars in rolling: if such a bar be thought of as joined into a ring it will be seen that there would be a shortage of metal on the middle line, tending to produce cavities. It is known that rolling can develop cavities in sound steel.

C. B. Bronson reported the conclusion from tests that forging can suppress or remedy cracks in rail steel, while annealing 4½ hr. at 1000° C. does not reduce the extent of crack development. An attempt was made to locate and bring out the cracks in rail steel magnetically, so as not to destroy any of the material by etching. The steel was magnetized and iron filings were dusted over it. Only partial success was attained in locating cracks. The New York Central work on the subject has led to the inference that the "cracks" in rail steel are produced by the rupture of zones of hot-short metal in the rolling process.

Quick-Hardening Concrete With Special Cements

A PAPER entitled "Cement Producing Quick-Hardening Concrete," giving results of certain tests with Sorel cement, a commercial product, and with certain calcium aluminate cements made in the laboratory of the United States Bureau of Standards, was presented by P. H. Bates, of the bureau, before the American Society for Testing Materials. Concretes made from these cements reach a high strength at an early period. For instance, some of the calcium-aluminate specimens in a 1:6 gravel concrete had a strength of 3145 lb. per square inch at the end of 24 hours, 6010 lb. per square inch at the end of seven days, and 8220 lb. per square inch at the end of one year. The Sorel cement is a light calcined magnesite gaged with magnesium chloride. In ordinary commercial mixtures, concrete made with it reached in 24 hours approximately the same strength as the ordinary portland cement concretes do in seven days. In the author's opinion, a further study of these quick-hardening cements should be made because there appear to be a number of places where they could be advantageously used. It appears, for instance, that the Germans used such cements extensively in the construction of field fortifications. On account of their relative lightness compared with portland cement, there has to be care in their proportioning, and concretes made from neither of them would be desirable where they would be subjected to the continued action of water.

Tests of Concrete Tanks for Oil Storage

IN A paper with the above title, read before the American Concrete Institute, J. C. Pearson and G. A. Smith describe the results of a series of tests made by the Bureau of Standards for the concrete-ship section of the Emergency Fleet Corporation to determine the effectiveness of concrete as a retainer of oil. Tests were made with various oils in small containers of concrete of the usual 1:2:4 mix and of the richer 1:½:¾ mix of the concrete ships, the latter being tested also under a 25-ft. head. The results are summarized by the authors as follows:

1. Various mineral oils, covering practically the entire range of fuel oils, have been stored in concrete tanks approximately 13 months, apparently without injuring the concrete in the slightest degree.

2. Concrete test cylinders, 6 x 12 in., have been stored in these oils during the same period and have shown no appreciable diminution in compressive strength.

3. A number of vegetable and animal oils have been stored successfully in concrete tanks for a period of 13 months, and only two, cocoanut oil and lard oil, have appreciably attacked the concrete.

4. Quantitative losses of fuel oils have been determined in 1:½:¾ concrete tanks under pressures of 12 to 15 in. of the oils, and in a smaller number of tanks, under a pressure head of 25 ft. These measurements indicate that even under the latter conditions heavy and medium-weight fuel oils can be stored in concrete of this character without excessive losses. The storage of kerosenes and gasolines under these conditions will probably prove uneconomical, unless some impervious coating can be found which will be durable under long exposure to the lighter oils.

5. In a concrete test of six months' duration, spar varnish has apparently been effective in successfully retaining a 12-in. kerosene oil head with a loss of 0.015 gal. per sq. ft. The loss during this period has been practically negligible.

Effect of Vibration, Pressure and Jigging on Concrete

TESTS to determine the effect of vibration and pressure on fresh concrete were made in the Structural Materials Research Laboratory in Chicago last year and were reported in a paper by D. A. Abrams read befor the American Concrete Institute. The experiments simulated in the laboratory various systems of agitating the concrete during placing which have been tried out in recent years. They included the vibrating of a small form with an electric hammer such as was used in the concrete-ship work, the jigging of fresh concrete on a special table, a process used in the manufacture of certain concrete products, and the application of pressure on small concrete specimens. All the tests were of 28-day 6 x 12-in. concrete cylinders.

Professor Abrams says: "The tests show that after the concrete is properly placed these methods of treatment do no good and may be harmful if too severe or too long continued. However, there can be no doubt of the value of such methods for getting concrete into place in intricate forms and around reinforcing bars. The tests are of value in showing that this is the only desirable function of such treatment. With jigging high strength may be secured with drier mixes than would be feasible otherwise. Concrete of drier consistency (and consequently higher strength) can be placed by means of jigging or vibration than would be possible by usual methods."

General conclusions are as follows: Varying the number of strokes from 12 to 50 on each 4-in layer in hand puddling with a ⅝-in. bar has little influence on the compressive strength of ordinary plastic concrete. In general, tamping methods give lower strength than hand puddling. A tamper of large diameter for a given weight is less effective than one of small diameter, and increasing the thickness of a layer from 4 to 6 in. causes a falling off in strength of about 12% for tamped concrete. The standard method of hand puddling, using 25 strokes and a ⅝-in. steel bar for each 4-in. layer of concrete, and the use of a 6 x 12-in. cylinder, are recommended for laboratory tests.

Vibration of the specimen after molding, by means of an electric hammer running at 1000 r.p.m., has little influence on the strength of puddled concrete up to a period of about 30 sec. If the vibration is continued, there is a steady falling off of strength. Jigging reduces the compressive strength of the concrete regardless of the height of drop, the rate or duration of treatment. Exceptions are found in dry mixtures and those made of aggregate of smaller sizes. In very dry mixtures, strength due to jigging for 20 sec. is increased about 25%, and concrete of finer aggregates showed a material increase in strength with jigging above 1:5 and 1:3 mixtures. The faster the rate of jigging, the lower the strength of 1:5 concrete. Allowing concrete to stand for a period of time before jigging increases the strength to a slight extent, the maximum increase being found at from two to four hours.

Compressive strength of the concrete is increased by pressure applied immediately after molding. With compressions of 200 to 500 lb. per square inch, the increase is 20 to 35%, but the duration of pressure between 15 min. and 16 hours produces no difference in strength. Strength is increased because the water is expelled.

How Will Congress Determine the Future of Our Railways?

Most Important Economic Question Before Country —Quick Action Providing Return of Roads and Guarantees Required

By L. C. Fritch
M. Am. Soc. C. E., Past President, American Railway Engineering Association

WHAT legislation will Congress enact to safeguard our transportation systems?

This is the most important economic question confronting the country and has a greater bearing upon the future prosperity of the country than the peace treaty itself, notwithstanding the fact that the president dismissed the subject with only a single sentence in his message to Congress and referred the responsibility to the legislative branch of the Government.

Government operation has proved an expensive experiment and will cost the country upward of two billions of dollars before the books are closed and accounts settled. It has, however, demonstrated and settled these facts—the inefficiency of the Government operation and the doom of Government ownership of public utilities. It may cost a huge sum to prove the fact, but it is worth the price, and has cost much less than if the Government had actually acquired ownership of the railways and then failed. The public will be satisfied to pay the score, if only Congress will atone for the mistake of the past and enact such legislation as will restore the railrays to their owners and protect them in such a manner that they may not only survive but expand and serve the country in its future growth.

We are on the eve of the greatest boom this country has ever experienced. In a short time the temporary unrest in Europe will give place to rehabilitation and reconstruction of the countries devastated by the war, and the United States will be called upon to supply the necessary raw and manufactured materials to meet the enormous demand. We shall have one of the largest crops this autumn the country has ever enjoyed. All these things need transportation, above all else.

Sufficient Transportation Facilities Lacking

The transportation industry has been at a standstill for the past two years, and in no single item has there been the necessary expansion of facilities to meet even the normal demands. The Railroad Administration is standing absolutely still and making no program whatever to meet the transportation growth which this country will need before the current year is closed.

There will not be sufficient locomotives and equipment and sufficient terminal capacity to handle even the enormous wheat crop which is even now maturing and will begin to move in a few weeks. Congress should wake up and realize the true situation which confronts it, and act promptly and intelligently upon this important matter.

The President has announced that the roads would be returned to their owners on Jan. 1, 1920, but Congress will decree that they shall not be returned to their owners until the necessary legislation has been passed to save them from bankruptcy and provide the necessary means that they may fulfill their public function. It would be suicidal to do less than this, and Congress, as now constituted, is fully aware of this salient fact.

Whatever legislation Congress will enact to meet the situation, there are certain fundamentals which cannot be ignored and which must be squarely met, or this important question will not be settled.

First—There must be, in some form or other, a sufficient revenue derived from transportation operations to meet the necessary expenses, give a return investment, and provide surplus for future growth t meet the country's need. Whether this is in the nature of a scale of rates or a guarantee by the Government, matters not so much as the fact that it must be provided. Unless this is done, it would be as well to dodge the whole question and turn to Government ownership, since a failure to give adequate return means bankruptcy and disaster to the country's progress and welfare.

The Government can well afford to give a substantial guarantee to capital invested in railways, until such time as a level of rates can be established that will provide the necessary revenues, but it will be the same old story over again if Congress merely states that "rates shall be such as to provide a reasonable return on capital invested, etc." This has never yet been demonstrated, and never will, until Congress gives to a commission the necessary authority over rates and their establishment as well as over wages and the expenses of the railways. Then, and not until then, will it be safe to float the ship on a "level of rates." The Government should continue the "standard return" of the "test period" until this "level of rates" has been firmly established.

Legalized Consolidation into Large Systems

Second—There must be legalized consolidation of lines now prohibited, in order that the weaker lines may be absorbed by the stronger lines. No satisfactory rate structure can be established under present conditions, for the reason that rates that would give adequate revenue to the strong lines would not be sufficient for the weaker lines and, conversely, rates sufficient for the weak lines would produce inordinate revenues for the stronger lines. There must, therefore, be a consolidation of the strong and weaker lines to remove this difficulty.

The country should be divided up into about eight traffic regions, and in each region there should be not less than two competing railway systems, composed of the strongest lines in the respective regions as a nucleus, and the weaker lines allocated to these systems. The Warfield plan does not agree that this is possible. The answer is that it is far better for the strong lines to acquire the weaker lines on an equitable basis than for all the lines to go into bankruptcy or into Government ownership. If it had not been for the Sherman law, and if E. H. Harriman had lived, the railways of the country would now be consolidated into a number of strong systems. Harriman saw this necessity twenty-five years ago and was working toward this end in his combinations.

Third—There must be a stronger Governmental regulating body to supervise the operations of the carriers, regulate rates, be responsible for both the revenue and expenses and deal justly between the owners and

the public. The Interstate Commerce Commission—reconstituted, enlarged and given ample powers—is the proper Governmental agency to supervise the railways.

The present interstate commerce law, and not the commission, is responsible for the present condition of the transportation industry. Change the law and give the commission power and jurisdiction, and hold them responsible for the results. The commission should have in its organization, in addition to some of its present able members, real railway men, and not be entirely composed of lawyers and politicians. Place some able operating and traffic men on the commission. Futhermore, there should be in each of the eight regions a subcommission reporting to the central commission in Washington. These regional commissions would be in close touch with the public and the various state commissions.

The commission should also be given jurisdiction over operating matters such as service and the necessary expenditures for proper maintenance of the properties.

The commission, reconstituted and empowered by law to see that the revenues of the carriers are sufficient to meet expenses, fixed charges and a surplus to meet the needs of expansion, will properly fulfill its functions and will go a long way toward solving the railway problem.

The financial need of the railways will amount to one and one-half billions per year for the next five years or about seven or eight billions in that time. No capital will be available to meet this demand unless a proper solution is found that will give a fair return on the capital invested.

VALUATIONS MUST BE QUICHLY CONCLUDED

Fourth—There must be a strong commission appointed at once that will reach a prompt conclusion on the value of the carriers on which a return shall be allowed. As a matter of fact this is one factor of the problem that must be known before there can be established the level of rates, that will determine the reasonableness of the rates.

Sufficient evidence is already available, from the Government valuation work, which, if intelligently applied, will enable a commission to arrive at a value of each carrier's property that will not vary materially from the figures that will be ultimately arrived at by the valuation department of the Government. There must be action now, and the country cannot await the results of the present valuation commission, which will not reach a final conclusion for ten years.

Fifth—There must be founded a strong financial commission that will aid in financing the needs of the railways until such time as the roads can finance themselves or until their credit is restored and capital will seek railway investments instead of railway needs seeking capital. This commission should also pass upon all financing by the carriers on present and future financial plans, and no issue of securities should be permitted without the approval of this finance commission. The moral effect of this plan would at once give the public confidence in railway securities and have a most wholesome effect upon the financial situation and credit.

Congress is fully equipped with information on all phases of the railway problems, and can by its action resolve the situation into one or the other direction. First, pass the suggested remedial legislation and enable the railways to live by their own efforts. Failure to pass such legislation or only partially to relieve the situation will result in a wrecking of the transportation industry, a financial panic of widespread dimensions, and ultimate Government ownership, with all its attendant evils.

Cost of Pumping is Reduced 30 Per Cent. by Test

AN INVESTIGATION of the cost of pumping by air lift from well to cistern, and by power pump for distribution, at Grinnell, Iowa, gave 15.527c. per 1000 gal., as compared with 22 to 24c. based on an earlier test. This case was described at the annual meeting of the Iowa Section of the American Water-Works Association by W. G. Raymond, dean of the College of Engineering at the Iowa State University. The measurements in the test were made by Prof George J. Keller, acting head of the department of mechanical engineering.

When one of the two wells got out of repair early in 1918 the deep-well pump in the other well could not supply the demand, and the former air-lift system was resumed. This proved successful, but the Iowa Light, Heat & Power Co. which had the contract for pumping, claimed that the cost was increased greatly, and the city agreed to pay the actual cost until a new well was put in service. This was billed monthly at 22 to 24c. per 1000 gal., but the city complained that this was too high, and the company appealed to the Iowa State Board of Conciliation. Both sides were inclined to be fair, but the city had little to disprove the company's claims. The board recommended a cost of 22c., but acknowledged that this appeared to be very high, and informally recommended that the city make an investigation. Dean Raymond was then engaged to determine the actual cost.

As the rate was to be temporary, pending the use of the new well, it was considered inadvisable to make a complete valuation. The company's statement of the costs of the plant and equipment was used for estimating interest and depreciation charges, and the books were examined to determine cost of labor, fuel and supplies. Readings of the meter through which water was obtained for steam making were taken as indicating the quantity of steam produced, it being concidered that these readings, extending over a year, would be of more value than the results of a single, costly test. To determine the power used in lifting the water, measurements were made of the steam flow to the compressor and the water delivered to the cistern during the same period. This showed 249 lb. of steam per 1000 gal. of water raised.

The total cost of pumping was found to be 15.227c. per 1000 gal., distributed as follows: Steam for air-pumping, 11.398c.; power for power pumping, 1.369c.; labor, supplies, interest and depreciation, 2.76c.; total, 15.527c. Deducting 0.3c. for depreciated plant leaves 15.227c. Settlement by the city was made on this basis.

Shipbuilding Equipment and Methods at Fore River—I. Hull Construction Plant

Single Type of Berth for Various Kinds of Ships—Concrete Substructure and Bridge Crane Equipment—New Battleship Berth—Two-Bay Fabricating Shop

DURING 1918 the Fore River yard of the Bethlehem Shipbuilding Corporation, Ltd., made a remarkable shipbuilding performance. It delivered to the Government 17 destroyers, 10 submarines, and six merchant ships, the latter totaling 61,000 tons' carrying capacity; more destroyers were turned out by Fore River than by any other yard in the country. A working force of nearly 20,000 was employed, which is double the normal complement and four times the force employed at the beginning of 1917. Early in 1918, in fact, the number of men on the rolls amounted to 26,000. This included the skeleton of a complete organization for the new Squantum destroyer plant, five miles away, a plant designed and built by the Bethlehem company at the request of the Navy Department and operated since April, 1918, by Fore River.

In this intensive production, the physical equipment of the yard made an excellent showing. It proved capable of good service even with the phenomenally increased working force, though, it is true, with noticeable crowding in the shop as well as on the berths and in the storage yard. Expansion and modernization of the Fore River plant had been carried out just before the high-pressure shipbuilding of the war period began, and the enlarged plant, including new shops and additional shipways, and methods of operation which were devised to suit the new conditions as the old proved inadequate, made it possible to maintain efficient production throughout. Particularly interesting, as regards hull construction, is the fact that the high-pressure work evidenced the satisfactory performance of a single type of berth for all the types of ships in the yard.

Expansion of the yard had been started in 1915. New berths for building submarines, a steel fabricating shop of 250 tons' capacity per day, a battleship-building slip, and new turbine and mechanical shops, were items of the program. The new hull-steel fabricating shop, built in 1916, gave a sound basis for the development of efficiency and high capacity in the hull-construction end of the yard. A new galvanizing shop for destroyer frames and plating was also completed in 1916, followed in 1917 by the new steam-turbine shop and the battleship slip. When the urgent war demand came, early in 1917, four temporary building berths for destroyers were added, these requiring only a few months to build and equip.

As now developed, the plant is shown in the ground plan, Fig. 2, which gives the layout of ships and buildings, but does not show an outside area, for storing both raw and fabricated hull material, at present under development. About 10,000 men constitute a normal working shift, and with the present force the plant is working under overload conditions in most of the departments.

All the permanent building berths at Fore River are of the same type, whether intended for submarine and destroyer construction or for building battleships or large merchantmen. The way foundation is of concrete, and overhead bridge cranes spanning the berth are provided for handling the ship material.

Typical of the Fore River berth construction is the newest and largest berth (A in the plan, Fig. 1), designed to take the largest battleships, cruisers and merchant vessels. It is 805 ft. long and 131½ ft. wide between inner columns of the crane runway. Its main portion is a longitudinal keel-block slab 38 ft. wide, with a level top stepped up 9 in. at intervals of 24 ft. (launching slope ¾ in. per foot). Concrete sills 2 ft. wide extend out laterally from this backbone as shown, to a maximum distance of 30 ft.; these sills, spaced 16 ft. apart, are for the support of shores under the ship's bottom. Rock and firm soil were found at the site for the most part, so that little preparation of the ground was required. Outboard of the concrete foundation the launching ways are carried on timber pile bents, as is customary. The backbone slab of the berth is channeled longitudinally on either side of the middle 13-ft. width

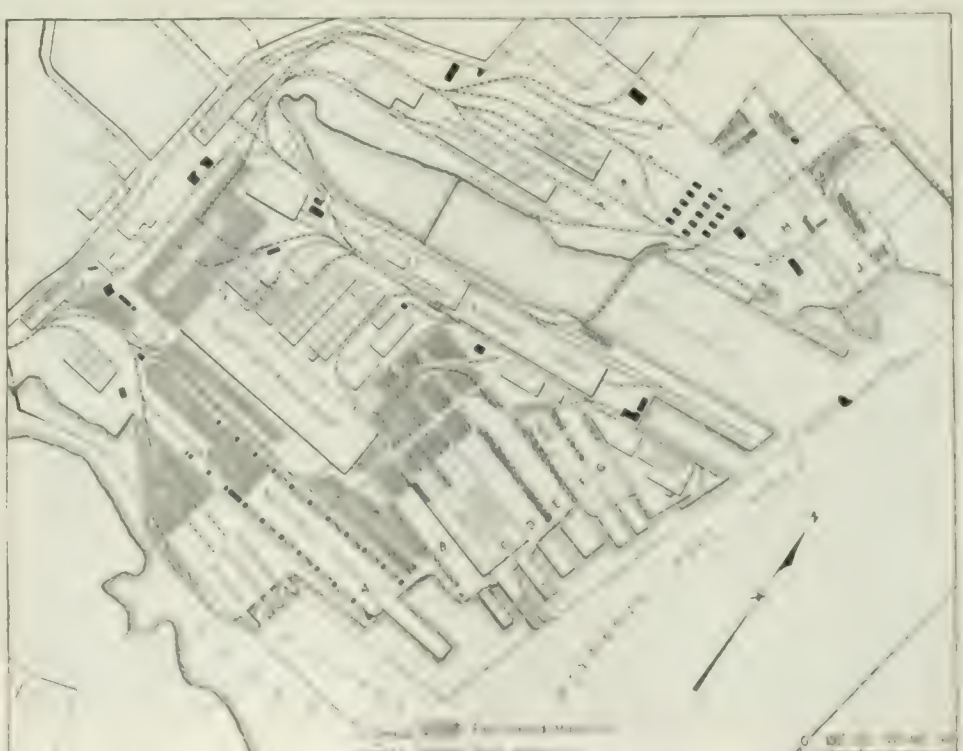


FIG. 1. PLAN OF FORE RIVER YARD, BETHLEHEM SHIPBUILDING CORPORATION

to carry off drainage from the tanks at the time of testing.

Steel towers to either side carry the crane runways. This particular berth has unusually ample crane equipment. There are two superimposed runways, the lower carrying one 50-ton crane, and the upper runway three 7½-ton cranes.

Different varieties from this berth construction appear in the other slips. Usually their substructures are simple, narrow, concrete slabs, and they are covered by a single runway with either one or two cranes of about 10 tons' capacity. They are represented in a general central supports. The crane runway girders are suspended from the roof trusses; there are four runways, each containing one five-ton crane, spanning about 44½ feet.

The two northerly slips of the yard are each a triple berth (three lines of ways under each craneway), but on each line of ways three submarines are built in tandem, so that the two slips accommodate 18 hulls. One of these slips has two cranes, the other only one. This latter proved to be rather short in crane capacity for maximum production, the officials of the yard state, but elsewhere throughout the plant the bridge-crane

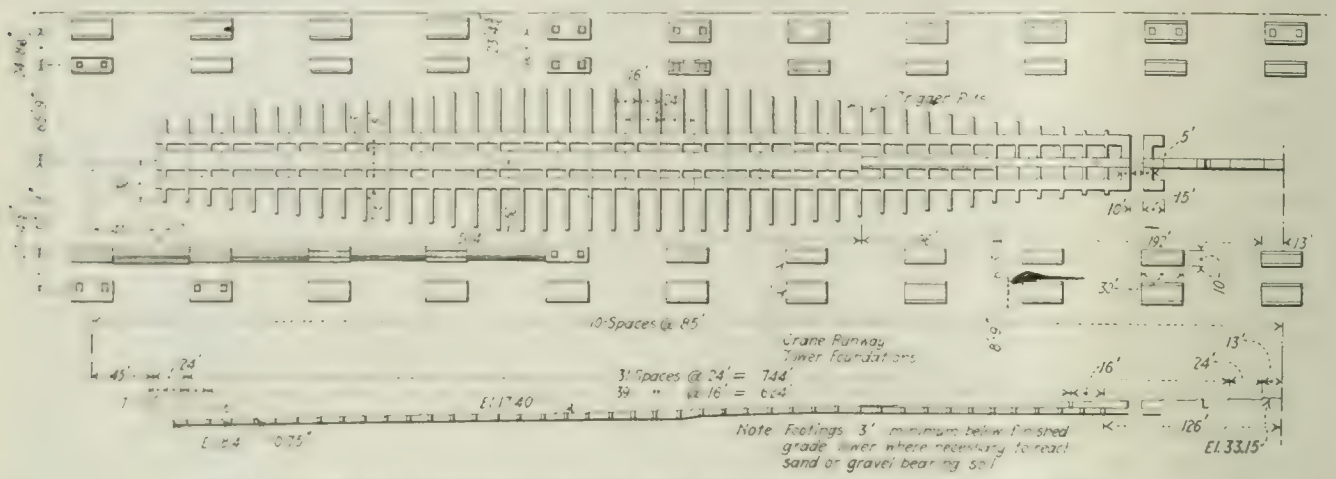


FIG. 2. CONCRETE SUBSTRUCTURE OF NEW BATTLESHIP BERTH AT FORE RIVER

way in the series of cross-sections, Fig. 4. The four groups of berths north of the battleship slip, numbered 9, 8-7, 6 and 5, can be used for building vessels up to battleship size.

In respect to superstructure and crane arrangement, an interesting exception is the double berth 7-8, which was the first bridge-crane berth built at Fore River. It

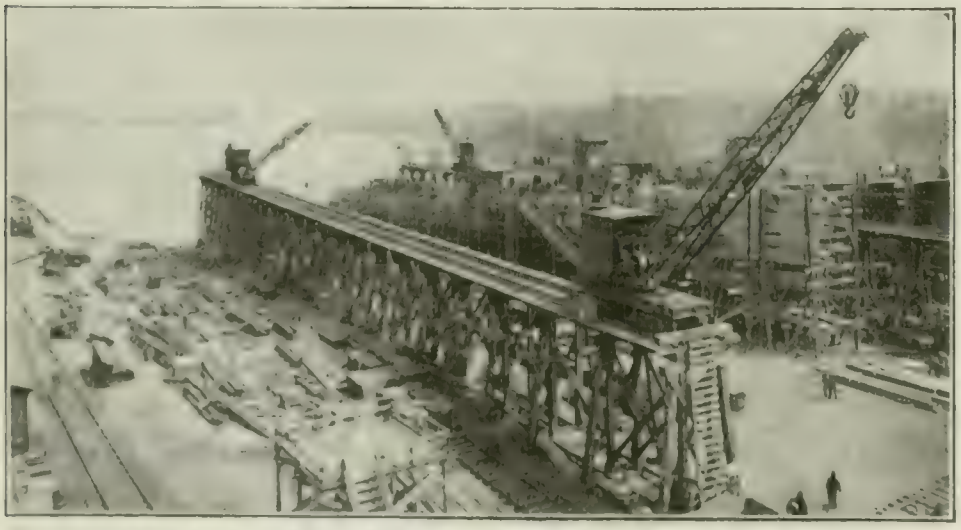


FIG. 3. DOUBLE CRANE RUNWAY OF BATTLESHIP BERTH

was constructed 18 years ago, when contracts were taken to build the battleships Rhode Island and New Jersey. The building berth itself was roofed over in 1915 and has a clear width of 184 ft., sufficient for building two ships of large size under the roof. Inboard of the bow of the ship, however, the roof is discontinued, and the transverse trusses rest on a line of

service has been ample for all needs, even under the greatest pressure for speed.

Four temporary destroyer ways built at the southern end of the yard a year ago lack bridge-crane equipment and are served by locomotive cranes. These travel on two high trestles between the outer and inner berths. Two cranes work on each trestle. None of the berths has tracks or roadways leading down along the ship. The plant is designed and operated solely for supply from the shops to storage spaces at the head of the berths, and for handling longitudinally from this space to the ship under construction, by means of the overhead cranes.

Located as indicated on the plan, Fig. 1, the steel-fabricating shop stands at the head of the central set of ways of the main group. Its length is parallel to the ways, and material passes through longitudinally from a receiving track for raw material at the inshore end to a loading track at the outshore end. By way of the latter track, material is distributed to the fabricated-storage spaces at the various berths. The shop, 188 x 770 ft., is subdivided into two longitudinal bays, used respectively for angle and for plate work (see sketch plan, Fig. 5).

From the receiving track, which is depressed 4 or 5 ft. so as to bring the floor of a car level with the shop

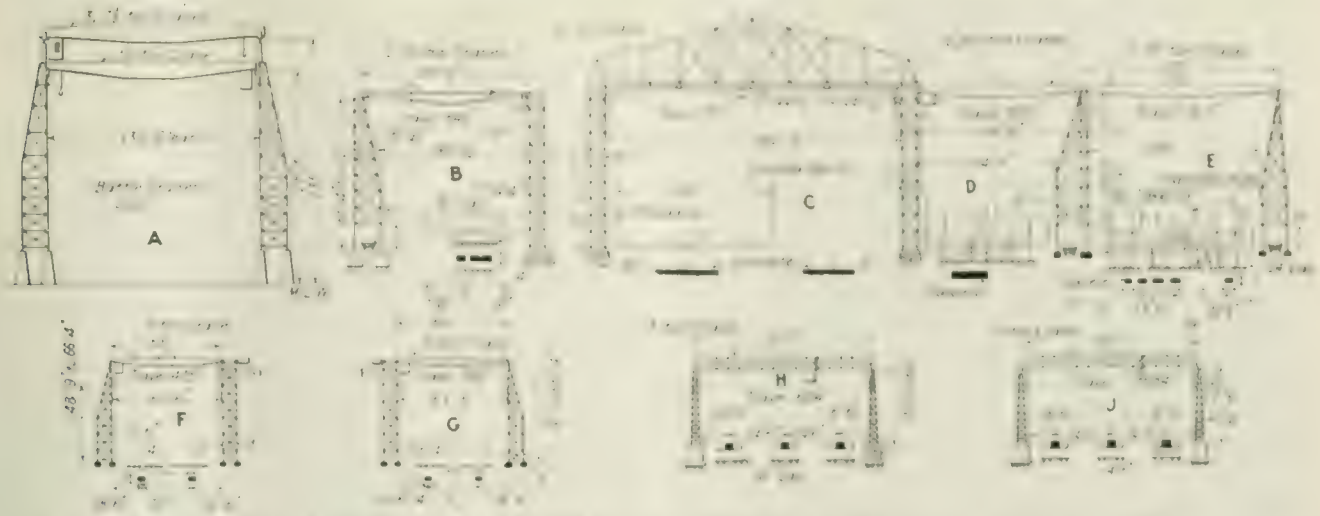


FIG. 4. CROSS-SECTION OF FORE RIVER SHIPBUILDING BERTHS; NEW BATTLESHIP BERTH AT LEFT, SUBMARINE BERTHS AT RIGHT

floor, steel and templets are delivered direct to layout areas at the head of either bay, alongside the bending furnaces. Beyond the slabs, punches, shears, and countersinks are arranged generally in three longitudinal lines in each bay, one line along either side of the bay and one down the midde. The principal equipment of the plate bay comprises six single punches fitted with Lysholm manually operated spacing tables, a middle row of double-end punches without tables, and a series of roller-bed punches. Each bay is served by a bridge crane traveling the full length of the bay. I-beam trolley runways over the outer row of angle punches, and a small number of jib cranes at individual machines, assist in handling material through the shop.

About one-third of the length of the angle bay is devoted to assembly work. Here all floors, stringers, brackets, girders and the like are assembled and riveted up; bulkheads and other large members are assembled at the head of the berth where required. All material going out of the shop passes over weighing scales before being loaded on the outbound track going to the fabricated-storage spaces.

Forging and anglesmith work is done in a shop to the left of the main building, connected by tracks with a longitudinal narrow-gage system in the main shop. Material coming from the forge shop thus reaches the punches in the farther half of the angle bay without passing through the entire length of the bay.

In the main fabricating shop itself a force of about 560 (single shift) is employed at present, and the production is about 110 tons per day. With two shifts working, an output of 250 tons per day can be reached.

Raw plate and shape stock is stored in a yard at the entering end of the shop. The yard is laid out in three 70-ft. strips, about 800 ft. long, each covered by a 10-ton gantry crane. There are no longitudinal tracks, but three spurs from the incoming railway track enter transversely at an angle, an arrangement necessitated by the limitations of the yard railway system. From cars on these spurs, material is distributed along the storage bays by the gantry cranes, and it is similarly reloaded for transfer to the fabricating shop. All plate material is racked.

Only during the past two years was hull work at Fore River put on the basis of working exclusively to and from fabricated storage. To apply this system fully, all available space near the berths had to be pressed into service for fabricated-storage purposes. The various storage areas within the yard are shown hatched on the plan, Fig. 1. Generally, it will be seen, they are reached quite directly by the track leaving the fabricating shop, though the supply to the big battleship berth is less direct, and that to the submarine berths at the north end of the yard must pass over the main track system of the yard.

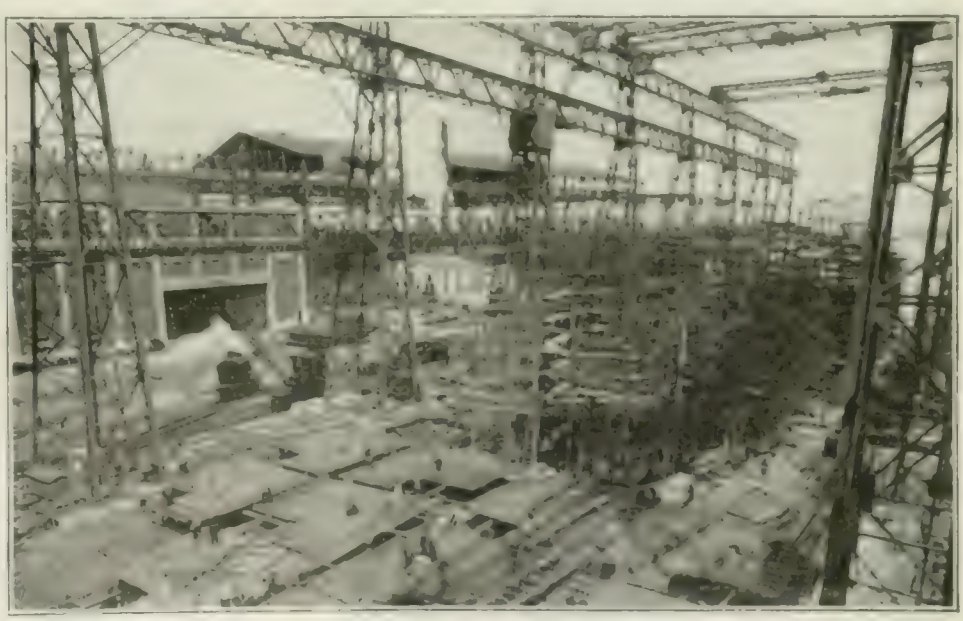


FIG. 5. TEMPORARY SHED OVER WAYS SHOW ONLY DIFFERENCE FROM FORE [illegible] OF BATTLESHIP BERTH SERVICE

Some of the material is stored along the sides of the berths, as shown in Fig. 1, but this is chiefly smaller parts. Plates and other main material are stored in racks and piling spaces at the head of the berth and are handled by way of longitudinal travel of the bridge cranes.

Operating the fabricated storage is the function of a special department of the yard forces, the department of material stowage. This department, comprising about 170 men at present, is among the new operating developments of the yard, but is recognized now as being essential to systematic and well coördinated working of the hull construction. Its working is tied in to the operation of the fabricating shop by a simple but very effective routing and scheduling system, which will be described in the second part of this article.

Report on Proposed Activities of Mechanical Engineers

Committee Makes Recommendation for Greater Technical Activity and Participation in Civic Affairs

PARALLELING the work of the committee on development of the American Society of Civil Engineers, the American Society of Mechanical Engineers has had a committee on aims and organization studying its activities and external relations. The committee's report was presented at the Detroit meeting of the Mechanical Engineers in the week beginning June 15. In general, the report—approved, with some amendment, by the meeting—provides for greater technical activity and looks forward to the assumption by engineers of greater civic responsibility through a federation of engineering societies, starting with the locals and topped by a national agency.

In order that the society may adopt an active, progressive policy in place of the present passive policy, it is recommended that the constitution be amended so that the society may approve and adopt professional reports and standards. This is followed by recommendations looking to the increase of research work. That "better papers of broader scope" may be secured, it is provided that the subcommittees of the committee on meetings and program be appointed for limited terms, but that there be a sufficient number of reappointments to secure continuity of policy.

The work with student branches and technical schools of higher grade is approved and the formation recommended of a committee to deal with industrial education below college grade, the reason for the latter recommendation being "the need of the engineer for trained subordinates and industrial workers."

The constitution already permitting the formation of professional sections, a standing committee on professional sections is recommended. The Civil Engineers' development committee, on the other hand, recommended that professional sections be not established in their society.

In regard to publications, the recommendations look to an enlargement of the *Journal*, now known as *Mechanical Engineering*, and the publication of a handbook of mechanical engineering data. A committee is to be appointed "to study the possibility of a substitute for the present expensive method of publishing the *Transactions*." The recommendation that the *Journal* be made a weekly, instead of a monthly publication, was rejected by the convention.

It is recommended that membership on "any council or committee terminate automatically on account of absence or neglect, either willful or due to force of circumstances." The joint employment work of the national engineering societies is approved and a special committee appointed to study the whole question of code of ethics and its enforcement. The committee's recommendation, not concurred in by the meeting, was that the present code of ethics be abolished "as unnecessary and unenforceable."

On the subject of election of officers the committee recommended to the council of the society that the nominating committee be composed of a member from each local section, providing at the same time that each voting member of the society be assigned to a local section "exclusively for the purpose of electing a nominating committee member." This plan has a parallel in the Civil Engineers' report, wherein it is recommended that "every member of the society be a member of a local association."

The section of the report covering the relations of the mechanical engineer to the community, as amended and adopted, is printed in full below:

(Note.—In order to avoid confusion, the term "technical societies" will be used to refer to the four founder societies and such others as confine their activities to specific professional or technical phases of engineering. The term "general engineering societies" will be used to cover the federation—local, state or national—on such basis as may develop, of the various technical societies, their sections and others concerned with engineering.)

In the opinion of the committee, the relations of the engineer to municipalities can best be cultivated through group activity, proper groups being the local general engineering societies which should include engineers of all classes. In state affairs, these relations may be developed through a coalition of such local groups into state associations, while matters of general and national interest may be handled by a national organization of such local, district and state societies. Such a system of societies is considered below.

The entity of the various local sections of the technical societies should be preserved, but they should form part of the local general engineering societies. In dealing with public affairs, their members should act as members of the general engineering society and *not* of the technical section.

Distinctly technical work such as the formulating and publication of safety codes, the fixing of standards, etc., should be done by those technical societies which, jointly or severally, are concerned with the particular subject; e.g., the boiler code by The American Society of Mechanical Engineers, wiring standards by the American Institute of Electrical Engineers, etc. But the agencies for bringing about their general adoption and legalization should be the general engineering societies; local, district, state and national.

As embodying the above, the committee presents the following resolutions:

"Whereas, The Committee on Local Sections has been engaged in promoting cooperation between local sections of The American Society of Mechanical Engineers and other local engineering organizations; and

"Whereas, It is desirable that this coöperation be encouraged and further vigorously developed not only among local but also among national engineering organizations; and

"Whereas, Engineering solidarity should be established to enable the profession to more effectively serve the community at large; therefore be it

"Resolved, That the policy heretofore pursued by the Committee on Local Sections is heartily endorsed; and be it

"Resolved, That the Council of the Society should actively encourage further development of coöperation both in local organization under the leadership of local engineering societies and in state or territorial groups, which can effectively handle state or territorial problems. This cooperation to take such form as will most readily lend itself to national coöperation; and be it

"Resolved, That there should be created some agency of a national character through which the coöperation of local groups, state groups and national societies can be secured for purposes of national scope. This agency to be composed of representatives of the members of local groups, state groups and national societies. It should be an organization capable of speaking in the name of the profession; and be it

"Resolved, That The American Society of Mechanical Engineers should collect and publish in pamphlet form the various modes of coöperative organizations used in different localities, thus enabling each group of organizations contemplating coöperation to more readily select the method best adapted to their local conditions."

Acting through the organization above suggested, service to the community may best be promulgated along the following lines:

Legislation

Protection of Health, Life and Comfort.—By securing the introduction of safety codes, of which the boiler code is an example, by securing the adoption and enforcement of measures for smoke prevention, the inspection of elevators, and the use of safety methods, and appliances in the industries, etc.

Production, Distribution and Sale of Commodities.—By the establishment of standards of size, strength and quality of manufacture of products, of standards of material and standard methods of testing materials and performances.

Industries, Utilities and National Resources Owned or Controlled by Communities.—By initiating and guiding legislation for their operation, development and conservation, and particularly by developing and securing the adoption of uniform systems of accounts and reports for public utilities, *both* privately and publicly owned.

Legislation for Protecting the Public in Engineering Affairs.—By action to secure uniform State and professional laws for the registration and certification of professional engineers whose work involves the public health, safety and well-being.

Administration

Placing Engineers in Public Positions Requiring Engineering Training.—By efforts to bring about the appointment rather than the election of engineering officials, and to secure the appointment and retention of the best grade of engineers in the public service; and also by coöperation with such civic bodies as the Civil Service Reform League.

Coöperation with Engineers in Public Positions.—By encouraging such engineers to become members of the local general engineering societies, and by giving them the support of such societies when political or other influences seek to interfere with the proper exercise of their functions. The reports of such engineers may be made profitable and mutually helpful subjects of discussion and review by such societies.

Selection of Engineers to Meet Public Emergencies.—The organization of the profession through general engineering societies seems to offer the best means for the prompt direction of the talent and efforts of engineers classified as to their special abilities and experience, and would be helpful in this connection.

Enforcement of the Law.—By action in conjunction with other civic bodies rather than independently.

Public Opinion.—By an active but dignified program of education in the public press. This should be free from objectionable advertising and of a character which would broaden the public knowledge of, and its appreciation for, engineering achievements.

By active participation in the solution of the industrial problems now before us.

In his presidential address before this society in 1882, the second year of its existence, Dr. Thurston said:

Industrial Relations

"In singular and discreditable contrast with all the gain in recent and current practice in engineering, stands one feature of our work which has more importance to us and to the world, and which has a more direct and controlling influence upon the material prosperity and the happiness of the nation than any modern invention or than any discovery in science. I refer to the relations of the employers to the working classes, and to the mutual interests of labor and capital. It is from us, if from any body of men, that the world should expect a complete and satisfactory practical solution of the so-called labor problem. More is expected of us than even of our legislators. And how little has been accomplished!"

Mr. Marburg in the progress report of this committee in December last said:

"Among all the educated classes, the engineers are the one group in closest touch with labor. It is the part of wisdom and our duty to society to try to understand the strivings of the working classes for our own benefit and to interpret them to the rest of the community. If the British Labor Party has been able to frame a reconstruction program and to produce a document commanding the admiration of most thinking men, surely it behooves us, the engineers, the men of whom, on account of training and experience, industrial leadership might reasonably be expected, to discuss the mighty problems now before us."

The engineer was the first to attempt a definite solution of the problems involved; he has contributed most of the constructive work which has been done to date, and on him rests the principal burden of an adequate and constructive solution.

The political autocracies of the world have been overthrown, but industry remains to be democratized. Labor is not going to be contented with its present subservient and limited condition, and its discontent will not be ameliorated by welfare work or other manifestations of benevolent despotism. The engineer stands between opposing interests, frequently between extremists, the self-satisfied obdurate employer who still regards labor as a chattel on the one hand, and on the other the radical laborite who would confiscate all forms of property. With his analytical habit of thought, his experience in estimating and directing physical and industrial forces, he must devise industrial methods which will insure greater and more efficient production and a more equitable distribution of it, and he must take the lead in their adoption.

As outlined above, action in public affairs should be through the general engineering societies, but discussion is distinctly within the province of our own society. The committee therefore presents the following resolution:

"Resolved, That the society should enlighten its membership in regard to all Federal, state and local problems which should interest engineers, and in the solution of which their experience and training may be helpful."

Milwaukee Water-Treatment Experiments

The experimental water-filtration plant at Milwaukee, Wis., having a capacity of 250,000 gal. per 24 hours, has been in operation day and night since Feb. 1, but although it has proved satisfactory, it is too early for definite results to be reported. Four different types of mixing chambers, a settling basin and two filters are provided in the building, and there is also an ozone apparatus arranged for treating both raw and filtered water. The plant was designed by J. W. Ellms, of Cleveland, Ohio, and the experimental work is under his direction.

Engine Terminal Improvements: Pennsylvania Lines West

Heavy Traveling Crane, Circular Crane Runway, Parking Tracks With Transfer Table and Turntable, Mechanical Ashpits, New and Rebuilt Roundhouses and Smoke Exhaust System Are Features

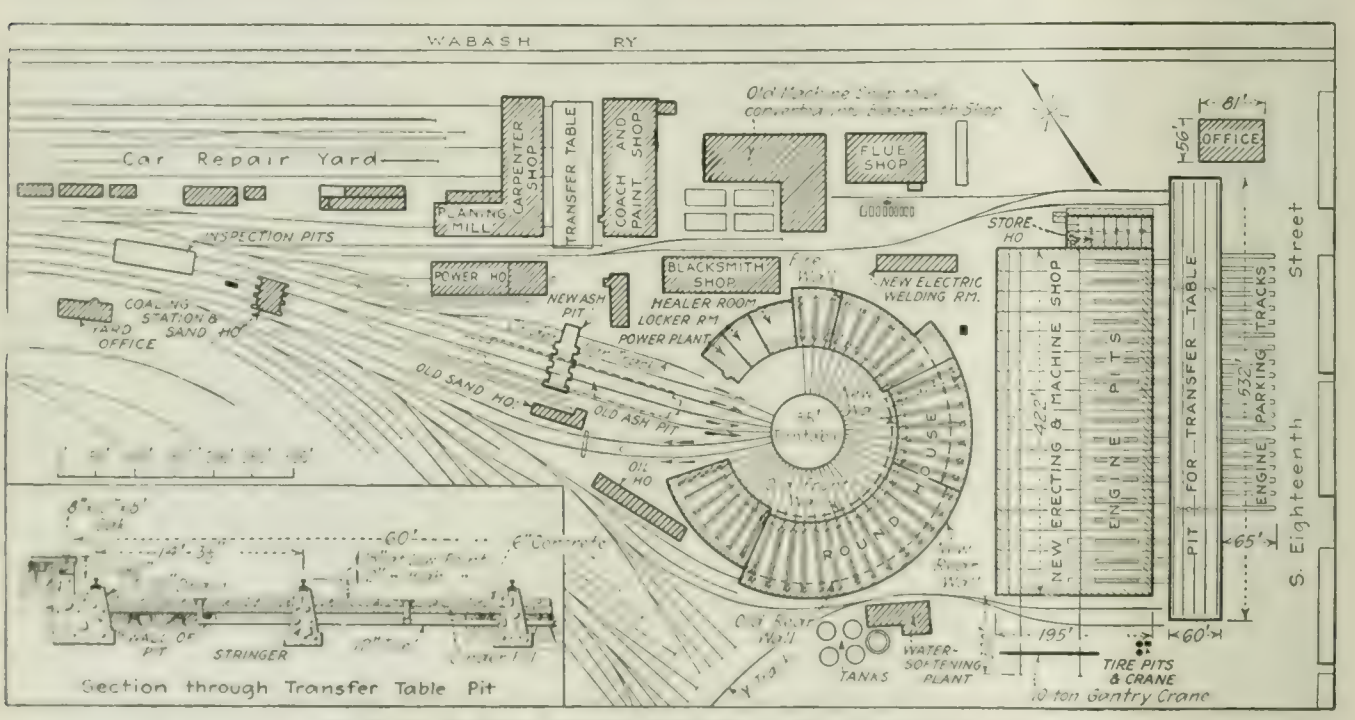
TYPICAL of extensive improvements to engine-terminal facilities on the Pennsylvania Lines West of Pittsburgh are the modernizing of the terminal at Logansport, Ind., and the construction of a new terminal at Richmond, Ind. Both of these are at division points of moderate importance, where provision has to be made for handling and cleaning about 100 locomotives daily. In the former case increased capacity has been provided on the original site, while in the latter it has been necessary to abandon the old terminal and establish a new one outside the city, the conditions being similar to those of the new terminal for the Cleveland, Cincinnati, Chicago & St. Louis Ry. at Galion, Ohio, described in *Engineering News-Record* of Mar. 13, 1919, p. 519.

The work at Logansport included the construction of a large steel-frame locomotive-repair shop having a 250-ton, 90-ft. traveling crane, the installation of a transfer table serving this shop and a group of parking tracks, and the enlargement of a roundhouse to accommodate longer engines, together with a general revision of existing facilities. At Richmond, the prominent features include a reverse-movement entrance, a roundhouse of combined steel and concrete framing, with an overhead crane on a circular track, and an exhaust system for carrying off smoke and gases from the roundhouse. Both terminals include parking tracks and mechanically equipped ashpits, but the arrangements are essentially different, owing to local conditions and requirements. Thus, the tracks are parallel in one case and radial in the other, while the ashpits include both hopper and water-pit types. At both terminals the water for the locomotives is treated in a softening plant.

The decision to carry on heavy repairs and reconstruction of locomotives at Logansport made it necessary to establish entirely new facilities, as hitherto only light or running repairs had been made at that point. As the terminal site is on the outskirts of the city and includes a considerable area of vacant land made by filling along the river front, it was practicable and convenient to place all the additional facilities on this site. The locomotive-repair shop is the most important item of the new works, being a steel-frame building 420 x 195 ft., with exceptionally heavy construction for the 90-ft. erecting shop in order to carry the 250-ton traveling crane noted above. This crane serves the group of 17 parallel stub tracks, which are spaced 24 ft. on centers, its purpose being to transfer engines from place to place as required. The shop and its equipment were described in *Engineering News-Record* of Feb. 2, 1919, page 306.

Engine-parking tracks are arranged opposite the repair shop, and engines ready for service or awaiting general repairs are set on these open tracks, so that the roundhouse need not be used for storage, but can be reserved for engines needing light repairs or overhauling. These parking tracks are parallel stub tracks 65 ft. long and spaced 16 ft. on centers. This layout, as will be seen by the plan, fits in with the use of a transfer table to serve both the repair-shop tracks and the parking tracks.

The transfer table is 60 ft. long, of 250 tons capacity and 33 tons weight. It travels on five lines of 85-lb. rails in a pit 540 ft. long, the pit extending beyond the shop so as to enable the table to connect with yard tracks on which engines are run to and from the table. Concrete stringers carry the three middle rails, while each side rail is carried by a bench in the wall of the pit. The rails are seated on steel channels embedded in the concrete. The walls and stringers are built on solid



LAYOUT OF REVISED ENGINE TERMINAL AT LOGANSPORT, IND.

rock, and the intermediate spaces are paved with concrete sloped to drainage planes. The depth from the top of the track rail to the top of the pit rail is only about 18 in. An unusual feature of the pit is the lowering of the walls at each track to permit placing a tie on the concrete. This not only gives a good support, but admits of renewing the end ties without raising the tracks. A 75-hp. electric motor operates the table, which has a maximum speed of 100 ft. per minute when carrying full load.

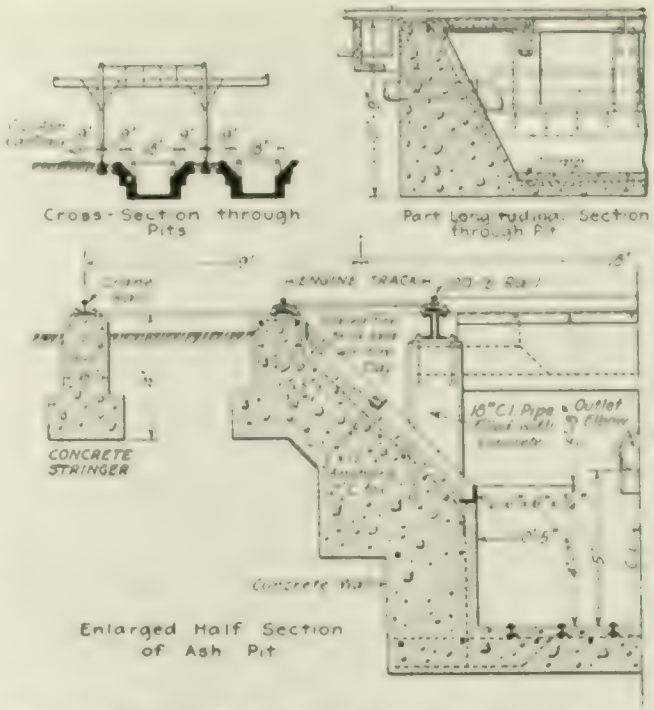
The general improvements to the engine-terminal facilities include the new inspection pits where incoming engines are examined. The use of such pits is standard practice on the Pennsylvania Lines. While it is employed also on some other railways, the more general practice is to have the inspection done in the roundhouse, using the pits where the repair work is done. Advantages of the advance inspection are that it is not hampered by and does not interfere with the roundhouse work, and that the roundhouse foreman can be notified in advance as to the class of repairs needed on each engine.

Two parallel inspection pits are provided at Logansport, about 100 ft. long and spaced 16 ft. on centers. They are of concrete, with convex floors, well drained and lighted and connected by a subway. A timber shed affords protection from the weather and has openings over the ends of each pit, so that an engine headed in either direction will stand with its smoke-stack under a ventilating opening. An office at one side of the shed is connected by compressed-air messenger tubes with the foreman's office in the roundhouse, so that the inspectors' report cards can be transmitted as soon as the inspections are completed. This enables the foreman to assign a stall for the engine and to have a crew ready to make the repairs.

A coaling station which spans two tracks and serves two other tracks by side chutes is located beyond the inspection pit. It is intended to replace the present structure by one of reinforced concrete, with a 750-ton bin, and equipped with a sand dryer and supply spouts. Water columns are so located near the coaling station as to serve both inbound and outbound engines. Water pumped from the Wabash River is treated in a softening plant before delivery to the elevated storage tanks.

New ashpits of the water-pit type, with mechanical equipment, are proposed, in view of labor shortage, the ashes being handled by a gantry or locomotive crane. These will be just beyond the coaling station, where engines have their fires cleaned or dropped. The old pit has two engine tracks carried over a flat floor on which the ash-car track is laid, so that all ashes have to be shoveled up into cars. Two parallel water-filled ashpits will serve four engine tracks located over the sloping sides of the pits, as shown in the drawings. In each track the inner rail is carried on a girder composed of a pair of channels and a top cover plate, these girders being in 13-ft. lengths, supported by pedestals of 18-in. cast-iron pipe filled with concrete and spaced 6½ ft. on centers. At these pedestals the rails are connected by tie rods to maintain the gage.

Electric Cranes Remove Ashes—For removing the ashes by grab bucket there will be an electrically operated gantry crane which straddles one pit and has cantilever girders extending over the adjacent pit on one side and the ash-car track on the other side. The crane travels on a track of 36-ft. gage, the rails of which are anchored to concrete stringers. Ordinarily the middle portion of each pit, between the tracks, is covered with sections of iron grating which are removed and replaced by the crane.



SECTIONS OF WATER ASHPITS—FOUR TRACKS SERVED BY GANTRY CRANE

Alteration or reconstruction of the roundhouse was necessary owing to the increased length of modern locomotives, a trouble which has been experienced at numerous terminals having old buildings. In order to accommodate the largest engines using the Logansport terminal, it was necessary to increase both the width of the building and the turntable. It was decided to alter the present substantial structure, having walls of stone masonry, rather than to build a new one. The alterations include the construction of a new rear wall about 23 to 27 ft. beyond the old wall and a new inner wall about 5 ft. back from the original line, thus giving a net increase of 18 to 22 ft. in width. Steel columns between the tracks, with wooden rolling doors to close the openings, compose the new front wall, an arrangement which eliminates the clearance space required formerly for swinging doors and correspondingly increases the available length of space between the house and the turntable.

As thus altered, the roundhouse is 95 ft. wide instead of about 71 ft., and the largest engines can stand either in the house or between it and the turntable. It has 38 stalls or radial tracks, with pits 80 ft. long. A portion of the house which originally accommodated seven additional tracks has been rebuilt to contain an office for the foreman, a locker and washroom for the roundhouse force and a heater room. This arrangement makes the roundhouse a self-contained unit and facilitates the work in winer.

The reduction thus made in the number of house tracks is more than balanced by the provision of the new parking tracks already mentioned. Heavy concrete walls for the engine pits form supports in jacking the engines; these walls are built on solid rock, which is only a few feet below the surface. A drop pit serving four engine pits provides for handling wheels and axles. Heavy

planks are laid outside of the track rails, and between the pits is a 4-in. plank floor on a 6-in. concrete base, Radial fire walls divide the house into five sections.

Changes in the roof were made necessary by the shifting of the walls. The roof is of timber framing, with radial beams supported by the walls and by three interior rows of posts. New trussed beams had to be placed for the outer bay, owing to the increased span, but at the inner bay the ends of the old beams were cut off after the wall had been set back. Wooden smoke jacks used here have had a life of over 16 years. When installed they received a coat of fire-resisting paint, and soon acquired a coating of soot which protects them from fire and dry rot.

Four inbound tracks and two outbound tracks converging at the 85-ft. electrically-operated turntable provide ample capacity for handling the engines. Changes in the track layout and in the smaller buildings are included in the general improvement of the terminal. Minor new facilities include a steel-frame storehouse 109 x 50 ft. forming an extention of the new machine shop, a brick building 100 x 20 ft. for electric welding, and a two-story brick building 56 x 80 ft. for the offices, drafting room, etc., of the locomotive department.

Richmond Terminal on New Site

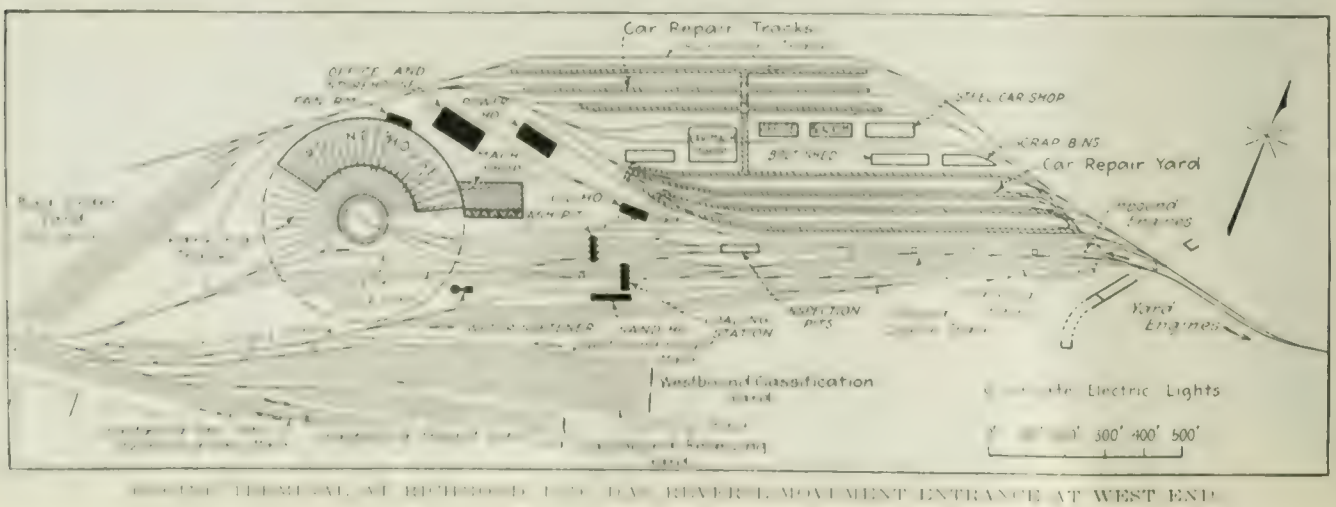
Engine-terminal facilities at Richmond, Ind., were located originally adjacent to the passenger station, in the business part of the city, but the space and facilities are inadequate for present conditions and there is no room for expansion. As it was necessary to find a site for new car-repair shops at this point, the opportunity was taken to obtain ground sufficient for the engine terminal also, and a location was selected in open country about a mile east of the city and adjacent to the freight yards.

Avoidance of reverse movements is considered a fundamental principle in the design of engine terminals, but local conditions prevented its observance in this case. The site lent itself well to the layout desired except for the fact that there was no room for the usual approach lead to the latter from the west, which is the main entrance. The difficulty was met by doubling up this lead to form a V or switchback, so that engines move first from the west to the east end of the terminal and then move back westward to the inspection pits, ashpit, coaling station, roundhouse and other facilities. Outbound engines can move directly to the main line, unless they need coal, in which case they make a similar switchback movement to reach the coaling station. Inbound engines are taken as far as the inspection pit by their road crews, and are then handled by the terminal force. Outbound engines are taken by their crews at the roundhouse or parking tracks. For yard engines and westbound road engines which leave their trains at the switching hump there is a direct entrance at the east end, which is an advantage in keeping these engines clear of the movements of other road engines.

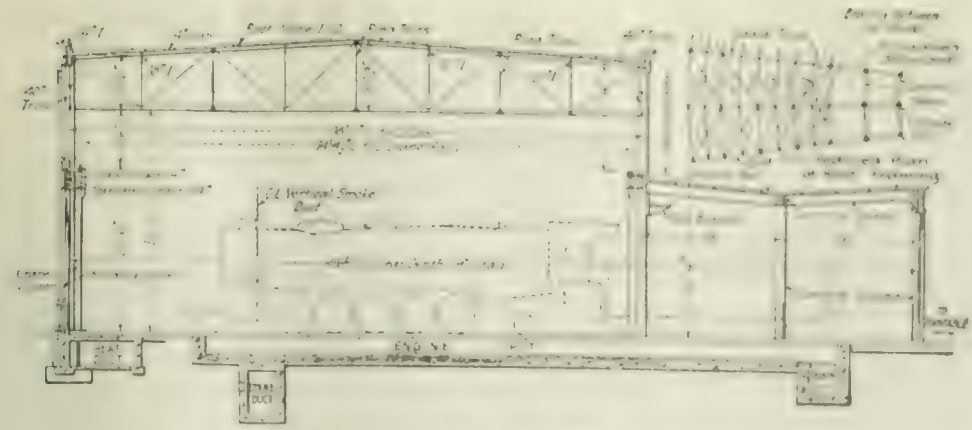
An economical design for a roundhouse which will accommodate the longest locomotives using this terminal was secured by a combination of structural-steel and reinforced-concrete framing. The engines stand in a 78-ft. bay of structural steel, having the roof supported by radial trusses located over the spaces between the tracks and giving a clear height of 30 ft. to permit of using an overhead traveling crane. Less height and space are needed for the tenders, and these are housed in a 38-ft. front bay having a low roof supported by concrete columns and girders. Each bay has a concrete roof slab. At three of the panel points of the radial trusses are lines of ring trusses, as shown on the plan, while at the other four panel points are lines of I-beam purlins supporting the roof slab. Diagonal bracing in the plane of the lower chords makes a rigid framework, and in the two end panels this is supplemented by bracing in the plane of the top chords. Wooden swinging doors fill the openings between the columns of the inner wall.

A 15-ton electric overhead crane of 74½-ft. span, traveling on a circular runway, provides for handling heavy repair parts. Wheels of different diameter are provided at opposite ends of the crane, to insure its circular movement. The runway girders are carried on posts independent of, but tied to, the columns of the structural frame. They are connected with wall or spandrel girders between the columns by means of diagonal latticing over the top and bottom chords in order to provide resistance to crane thrust and wind pressure.

Drop pits for removing wheels and axles are arranged in an unusual manner. There are three of these pits, arranged in echelon or with their ends overlapping, so as to serve four of the pits in the radial engine tracks, each drop pit extending across two tracks. As these drop pits are used only occasionally, they are covered normally by cross planks, and the floors of the radial engine pits are extended across them in the same way. The rails of the engine pits are carried across the lateral drop pits on I-beams which are made to slide or swing aside to clear the drop pit, and are held in place by T-iron braces



RICHMOND TERMINAL AT RICHMOND, IND., HAS REVERSE MOVEMENT ENTRANCE AT WEST END



ROUNDHOUSE COMBINES STEEL AND CONCRETE FRAMING

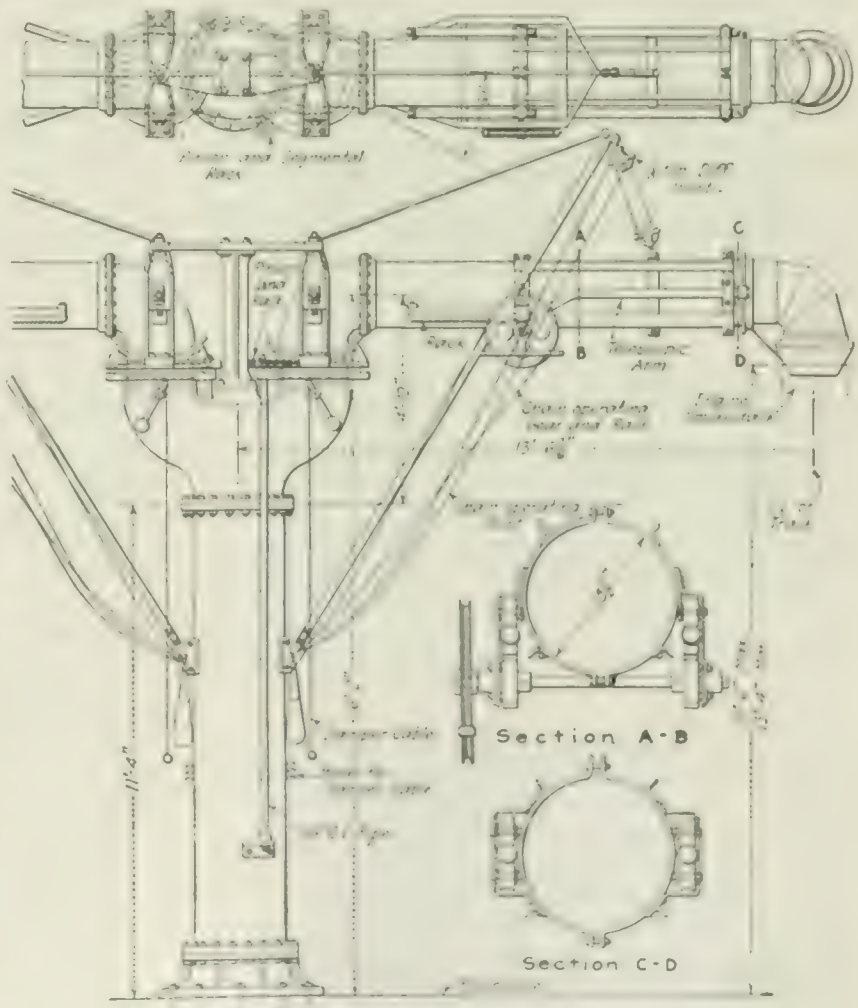
which also are made to swing aside. With an engine jacked up over its pit, the jacking truck in the drop pit is run under the axle of the pair of wheels to be removed, lowers it into the drop pit and then shifts it laterally to the adjacent empty track.

Special Provision for Smoke Removal—Removal of smoke and gas produced by the engines standing in the roundhouse or having their fires lighted is accomplished by the use of an exhaust fan. Ordinarily, the roof of a roundhouse has a ventilating opening or smokejack over each engine pit, and the engines stand with their smokestacks under these openings. To avoid the smoke nuisance at this terminal, however, owing to its proximity to a park and a residential district, all products of combustion are drawn off through floor ducts by a 73-in. exhaust fan and are discharged through an 80-ft. chimney of brick construction.

Special smokejacks are required, therefore, to connect the engine smokestacks with the floor ducts, as shown. In general, they resemble double-arm water cranes, and are placed in alternate spaces between the radial tracks, each smokejack serving two tracks. A fixed vertical 24-in. pipe mounted over the duct carries two horizontal arms having elbows which make the connection with the engine stacks. Each arm has three independent motions to enable it to be adjusted to the engine. It can be swung horizontally by gearing; it can be swung in a vertical plane by hoisting tackle operated by an endless chain; its telescopic end carrying the elbow can be racked in or out by a rack and pinion, also operated by an endless chain, in order to vary the length. A damper in the heel of each swing arm allows for adjusting the draft to meet the requirements for each engine

Water for the terminal is obtained from the city waterworks and treated in a softening plant before being delivered to the two 50,000-gal. elevated supply tanks. A concrete coaling station with a 500-ton bin will serve four engine tracks. The powerhouse plant will supply steam heat for the building, and compressed air for tools and for testing brakes in the yards. Electric current for the shops and for lighting the buildings and yards is purchased from the city's municipal plant. For repair work there is a small machine shop forming an annex to the roundhouse, with one of the radial tracks extending into it. Pneumatic messenger tubes will connect the shop with the foreman's office, as the high price of skilled labor makes it inadvisable to have the men lose time in running about for instructions.

An ashpit of the hopper type extends across four engine tracks and has under each track a steel hopper into which the ashes are dumped from the engines. At convenient times the ashes are discharged into a small steel truck or buggy running on a track along the floor. At the end of the pit is an electric hoist which lifts the buggy and dumps it into an ash car standing on a



ROUNDHOUSE SMOKEJACK CONNECTS LOCOMOTIVE STACKS WITH EXHAUST DUCT

special railway track. This type of ashpit was described in *Engineering News-Record* of Mar. 14, 1918, p. 516.

For parking or storing road engines which are ready for service, there is a group of eight radial stub tracks served by the turntable at the roundhouse, thus allowing such engines to be kept clear of repair work in the house. Engines are parked also on a group of parallel tracks located east of the coaling station and connected to ladders at each end. This location is convenient to the east end yard connection and is of advantage in keeping the movements of parked engines free from each other and from yard and other engines. The turntable is 100 ft. long and its pit has two circular rails, one to carry the end wheels of the turntable and the other for the electric tractor by which the table is moved. This is done to prevent the sand used for the tractor from being carried by the table wheels to their axle bearings.

The design and execution of the work at both terminals are under the supervision of Robert Trimble, chief engineer of construction, Pennsylvania Lines West of Pittsburgh. S. W. Hodgin is division engineer at Richmond, with A. R. Dunn as assistant division engineer and W. C. Wolfe as resident engineer on construction. W. E. Guignon is division engineer at Logansport, with T. L. Doyle as assistant division engeener. The Austin Co., Cleveland, Ohio, has the contract for the new shop at Logansport and the engine terminal at Richmond. Other contractors at the latter point include Latham & Walters, of Indianapolis, Ind., for the car-repair plant, and Iliff Bros., London, Ohio, for the extensions to the freight yards in connection with the other terminal works.

Spillway Capacities Required for Reservoirs in Western United States

Based on a Study of the Flood Discharges of 402 North American and 60 European and Indian Records, with Curves of Probable Flood Discharges for Far Western Streams

By John T. Whistler
Engineer-Adviser, Federal Farm Loan Bureau

In connection with many investigations and reports on irrigation projects made through the Federal Farm Loan Bureau, there has been involved the question of adequacy of spillway capacity for reservoirs. A large majority of the dams for these reservoirs are of earth or earth and rock construction, and will fail immediately on their being overtopped by water from the reservoir. For reservoirs having masonry dams the failure will not follow immediately, and in many cases the dam may withstand overflow for a considerable time. Nevertheless, a masonary dam can only be considered as safer to a limited degree from overflow than an earth dam, unless designed for overflow of the entire structure, in which case the structure itself becomes a secondary or emergency spillway for the reservoir.

Much time has been spent by hydrographers and engineers on the question of floods, the probability of their occurrence, their extent and their frequency. Many efforts have been made to arrive at some expression for probable maximum flood which would be applicable to all streams, and many formulas have been devised. Probably the fullest and best discussion in recent years is that appearing in the *Transactions of the American Society of Civil Engineers*, Vol. LXXVII, pp. 564-694.

None of these formulas has proved of general applicability, because of the many varying, often unknown, and generally undeterminable conditions affecting flood discharges. Among these conditions are rainfall, snowfall, winds as effecting precipitation and as effecting drifting snow, topography or slopes, character of soil—that is, rocky, clayey or sandy—vegetation, character of stream channel, and distribution of precipitation. It has appeared almost if not quite impossible to devise a formula containing factors for these many conditions which can be of even limited value for general application.

Following are tabulations of some of the more important recorded flood discharges for streams west of the Missouri River and south of Salt Lake, streams west of the Missouri River and north of Salt Lake, streams east of the Missouri River, and foreign streams. The more important of the flood discharges given in the table are shown graphically.

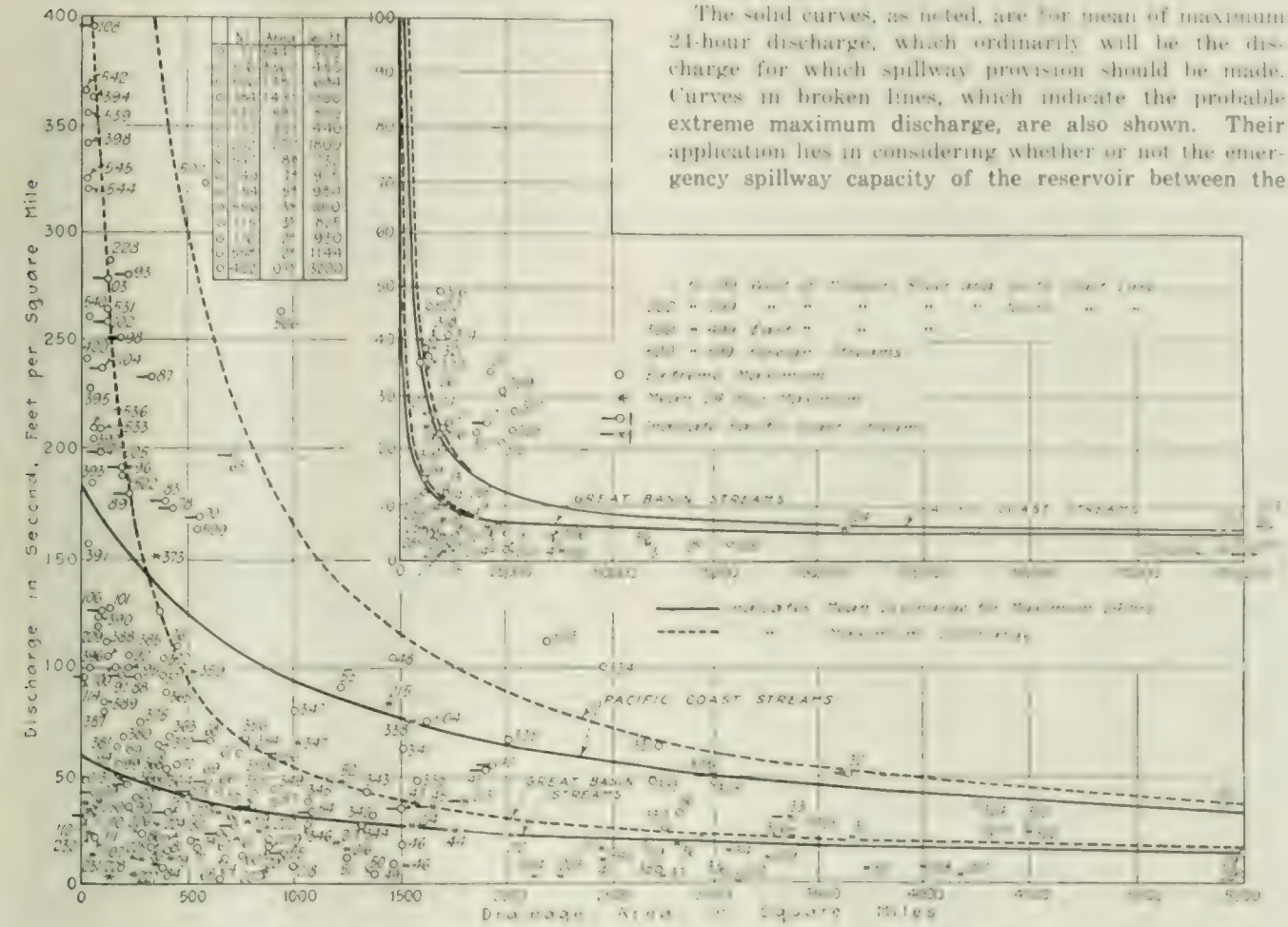
Both on account of the greater number of records for the smaller drainage areas and because by far the largest number of cases to be considered will be for drainage areas of less than 5000 square miles, the scale used for drainage areas up to 5000 square miles is larger than that for drainage areas from 5000 to 200,000 square miles, which latter doubtless exceeds any drainage area which will ever come up for consideration.

After considerable study of these flood data it has appeared impracticable to develop an expression for probable floods in terms of the conditions affecting flood discharges for even this limited region. The best that has appeared possible is to indicate the approximate minimum and maximum probable floods for which spillway capacities should be provided. These have been indicated by solid lines or curves designated "Great Basin streams" and "Pacific Coast streams," respectively. Somewhere between these two curves, it is believed, will be found the flood discharge for which reservoir-spillway capacity should be designed, for any streams west of Missouri river.

The present custom of the Water Resources Branch of the United States Geological Survey is to record for the daily flood discharge the mean of the 24-hour discharge. The difference between this and the actual maximum, which may often be for but an hour or less, is small for streams having more than 5000 square miles drainage area and is practically negligible for the larger streams. Since it is a more general custom now to record the mean of the maximum 24-hour discharge as

the maximum, and since it is not so much the actual maximum rate of discharge for the stream that interests us as that maximum rate which the spillway and emergency storage capacity between the level of the spillway crest and the top of the dam or embankment proper will be called upon to take care of, the solid curves shown are for mean 24-hour discharges. Many of the higher flood discharges for the streams with small drainage areas are far above the higher curve, but these discharges are usually for but a few hours and often for less than an hour.

The solid curves, as noted, are for mean of maximum 24-hour discharge, which ordinarily will be the discharge for which spillway provision should be made. Curves in broken lines, which indicate the probable extreme maximum discharge, are also shown. Their application lies in considering whether or not the emergency spillway capacity of the reservoir between the



FLOODS IN WESTERN UNITED STATES WITH PROBABLE FLOOD CURVES

1. The curves of probable flood occurrences are for the mean of the maximum 24 hours. They were developed by interpolation with reference to the flood-discharge records of streams in the United States west of the Mississippi River. Where there did not seem to be sufficient data from streams of the region, streams east of the Mississippi River were considered to supplement the data. Data from foreign streams were tabulated, and the results generally omitted because of their longer records and as therefore indicating the possibilities for the streams of Western United States with shorter records.

2. After the curves were plotted, expressions were sought for them as follows:

q being the mean rate of discharge in second-feet per square mile for maximum 24 hours and

M being drainage area in square miles contributing to the flood

(1) $q = \dfrac{55{,}000}{M + 1{,}000} + 5$ for the lower curve, and

(2) $q = \dfrac{180{,}000}{M + 1{,}000} + 5$ for the upper curve

3. Expression (1) for the lower curve was almost identical with the original interpolated curve throughout. Expression (2) for the upper curve was close to the original interpolation curve, and since it appeared easy of application was adopted and the curve constructed accordingly.

4. These expressions may be written

(3) $q = C\left(\dfrac{10{,}000}{M + 1{,}000}\right) + 5$

in which C is 55 for the lower curve and 180 for the upper curve.

5. To cover the Willamette River record, No. 215, C was increased to more than 195, or, say, 200. In fixing the lower curve for Great Basin streams, records were available, and it was possible, to plot the mean annual flood discharge which indicated that this curve should be lowered. A value of 55 was taken as 5.

6. Curves of maximum rate of flood discharge [illegible] 40 [illegible]

$$= C\left(\frac{10{,}000}{M + 100}\right) + 5,$$

in which q_{max} is maximum rate of discharge in second-feet per square mile, 5.5 for Great Basin streams and 18.0 for Pacific Coast streams, and M = the contributing drainage area in square miles.

7. The Pacific Coast curve for the expression $q = 18.0$ is exceeded by [illegible] Pacific Coast streams, No. 72 Santa Catalina Mountains and No. 242 Wilson Creek, Oregon, the latter exceeding the curve by 16%. The Lower [illegible]

[illegible] the streams in the Eastern United States No. 440 Otter River at Prospect, Ky., No. 364 Mad River, Ohio, and No. 462 Flowing Creek, New York. [illegible] Pacific Coast streams, except the [illegible] 24 and 44 [illegible] by Kennedy [illegible] Nos. 96, 99 and 107, [illegible] by 20, 32 and 117 [illegible]

[illegible] 14 [illegible] the expression for Western [illegible] Eastern United States. [illegible] curves [illegible] and [illegible] 140 [illegible]

[illegible]

$$= \left(\frac{10{,}000}{M + 100}\right) + 15,$$

[illegible]

$$= \left(\frac{10{,}000}{M + 1{,}000}\right) + 15$$

[illegible] Nos. 72 and 242, [illegible] Nos. 193, 194 and 462, and [illegible] and 444 [illegible] and 107 [illegible]

[illegible] the Willamette River [illegible] 215 [illegible] than 195, [illegible] 200. [illegible] Santa Catalina Mountains [illegible] No. 462. [illegible] Wilson Creek, Oregon, [illegible] No. 242 [illegible] Willamette River [illegible]

[illegible]

spillway crest level and the top of the dam or embankment proper is sufficient to take care of the extreme maximum flood of a few hours before it falls to a discharge not greater than the capacity of the spillway.

In general, the streams of the Colorado River basin may be treated as having flood discharges but little greater, and often no greater, than the streams of the Great Basin. A very marked exception to this, however, is that of Salt River at Roosevelt Dam, Arizona, Nos. 26 and 27. The extreme maximum discharge of record for this stream falls above the upper 24-hour curve. This was in 1893. In 1891 there occurred a similar flood, the record for which is expressed in mean maximum for 24 hours. This is platted as No. 27, and is only just below the upper curve.

No. 7, Sacramento River, 1904, would indicate that the upper curve is not high enough for that drainage area. The discharge for that particular flood was not, however, the discharge at the mouth of the river, but was the sum of the flood discharges for this particular flood, of all the streams coming into the Sacramento Valley. The actual discharge at the mouth of the Sacramento River was probably much less, due to the usual "lag" and to the fact that, although the records of the flood on the many tributaries may have been for the same day, they would not reach the main stream at the same time. The position of this flood record indicates, however, a remote possibility for that stream at least, and does furnish a strong argument for not lowering the curve for Pacific Coast streams.

The record for No. 48, Canadian River, New Mexico, is for a half-hour maximum. No record for the mean 24-hour maximum was obtainable, but from the flashy character of floods in that region it is believed probable it would not be above the upper curve. It stands, however, as a further argument for not lowering the curve.

One record, No. 215, Willamette River, Oregon, plats slightly above the upper curve shown. It is probable that for this stream, which drains some of the regions of heaviest rainfall in the United States, the curve of probable maximum floods should be somewhat higher, though, notwithstanding the heavy mean annual rainfall on the north Pacific Coast as compared with the south Pacific Coast, the extreme floods do not appear to exceed greatly, if at all, those of the south Pacific Coast. See, for example, streams 70, 78, 83, 87, 93, 98, 103, etc.

Of the streams east of the Great Basin and the Colorado River basin those north of Salt Lake have flood discharges generally nearer the curve for Great Basin streams than that for the Pacific Coast streams. South of Salt Lake, however, many of the streams have discharge records as high as those of the Pacific Coast; as, for example, the Canadian River, New Mexico, No. 48, to which reference has already been made. Purgatory River, No. 61, Colorado, is comparable with McCloud River, No. 68, California. For convenience the upper and lower curves shown for streams of the Western United States are designated "Pacific Coast streams" and "Great Basin streams," respectively.

The applicability of these curves of probable flood discharge is further discussed in notes appended to the diagram and modifications of the algebraic expressions (3) and (4), for the curves, developed in expressions (5) and (6), which are adapted to all streams. These latter expressions are almost as simple, and their use is suggested.

In determining spillway capacity necessary for any particular stream, the character of spillway must be considered. Where a spillway requires control by human agency, the possibility or probability of the gate-tender not being present or of the mechanism not being operable when needed should receive weight, as these conditions are known to occur very often. Where there is intended automatic control of spillway gates, the character of such control should be considered, but in general such control should receive little weight, because it almost invariably occurs in a few years that the mechanism is neglected, and when the demand upon it comes suddenly, it fails to operate.

FLOOD DISCHARGES FOR THE UNITED STATES AND FOREIGN COUNTRIES

Streams West of Missouri River and South of Salt Lake

No.	Stream	Place	Year	Drainage Area in Sq. Miles	Discharge, Sec. Ft. per Sq. Mi	Period	Authority
1	Colorado	Yuma, Ariz	1916	225,000	0.9	....	(1)
2	Gila	Yuma, Ariz	1916	71,000	2.7	....	(1)
3	Kansas	Lecompton, Kan	1903	58,550	4.0	....	(2)
					3.8	*	(2)
					2.0	10 da.	(2)
4	Colorado	Austin, Tex	1900	37,000	3.3	....	(3)
5	Republican	Mouth, Kan.	1903	25,840	1.8	....	(2)
6	Arkansas	Holly, Colo	1908	23,000	5.9	....	(4)
7	Sacramento	All	1904	22,500	25.6	....	(5)
8	Pecos	McMillan Res., N. M.	1904	21,500	3.9	....	(5)
9	Gila	Florence, Ariz	1891	17,750	7.5	....	(6)
10	Arkansas	Near Prowers, Colo.	1904	16,000	4.4	....	(4)
					2.5	*	(4)
11	Pecos, above Hondo	Roswell, N. M.	1904	14,840	3.8	....	(5)
12	Salt	? Ariz	1891	12,000	24.7	....	(6)
13	San Juan	Shiprock, N. M	1911	12,000	12.5	....	(4)
14	Canadian	Logan, N. M	1894	11,440	12 3	12 hr.	(5)
					11 0	*	(5)
15	Rio Grande	San Marcial, N. M.	1904	11,250	2.8	....	(5)
					0.5	12 da.	(5)
16	Sacramento	Red Bluff, Calif	1909	10,400	24.4	....	(8)
17	Little Colorado	Holbrook, Ariz	1905	10,000	2 0	*	(3)
18	Blue	Manhattan, Kan	1903	9,490	7.2	*	(2)
19	Sacramento	Iron Canyon, Calif.	1904	9,295	23 5		(5)
20	Grand	Palisades, Colo	1905	8,546	4.8	*	(3)
21	Gunnison	Whitewater, Colo	1905	7,863	3 7		(3)
22	San Juan	Farmington, N. M.	1909	7,000	5.0	...	(4)
23	Pecos	Fort Sumpter, N. M.	1904	6,190	7.3		(5)
24	Verde	McDowell, N. M.	1893	6,000	24.0	*	(7)
25	San Juan	Bloomfield, N. M	1911	6,000	12 0		(4)
					6 0	*	(4)
26	Salt	Roosevelt Dam, Ariz	1893	5,755	36 0		(7)
27	Salt	Roosevelt Dam, Ariz	1891	5,755	26 0	*	(3)
28	San Juan	Bloomfield, N. M	1909	5,500	3.5	....	(4)
29	San Juan	Bloomfield, N. M.	1911	5,500	14 5	....	(4)
30	White	Meeker, Colo	?	3,710	5 9	*	(8)
31	Neosho	Iola, Kan	1894	3,670	20 3	*	(5)
32	Feather	Oroville, Calif	1907	3,640	51.3	....	(8)
33	Feather	Oroville, Calif	1904	3,350	31 5	*	(5)
34	Verdigris	Liberty, Kan	1894	3,065	16 4	*	(5)
35	Salt	Mouth, Roswell, N. M	1904	3,050	4 1		(5)
36	Canadian	Taylor, N. M	1894	2,830	32.1	7 hr.	(5)
					20 0	*	(5)
37	Duchesne	Myton, Utah	?	2,750	3.5	*	(8)
38	Saline	Beverly, Kan	1896	2,730	5 9	...	(2)
39	Pecos	Santa Rosa, N. M	1904	2,650	17.6	....	(5)
40	San Juan	Arboles, N. M	1911	2,500	16.0	....	(4)
41	Logan	Logan, Utah	?	2,450	11.2	*	(8)
42	No. Fork Feather	Big Bend, Calif	1907	1,940	56 3	...	(8)
43	American	Fair Oaks, Calif	1907	1,910	55.0	...	(8)
44	King	State Point, Calif	1901	1,742	25.2	*	(6)
45	San Joaquin	Hamptonville, Calif	1881	1,637	36 5	*	(6)
46	Animas	Aztec, N. M	1911	1,500	18 0	....	(4)
					8.1	*	(4)
47	Tuolumne	Lagrange, Calif	1911	1,500	35 1	....	(8)
48	Canadian	French, N. M	1894	1,480	105.6	½ hr.	(5)
49	Rio Grande	Del Norte, Colo	1911	1,475	8.1	....	(4)
50	Hondo	Roswell, N. M	1904	1,390	4.6	....	(5)
51	Animas	Aztec, N. M	1909	1,250	12.8	....	(4)
52	Yuba	Smartsville, Calif	1904	1,220	49.0	*	(5)
53	Yuba	Smartsville, Calif	1909	1,220	90 9	....	(8)
54	Merced	Nr. Merced Falls, Calif	1911	1,090	34 1	....	(8)
55	Truckee	Nr. State line, Calif	1907	955	16 0	....	(8)
56	Sacramento	Kraklet Ferry, Calif	1907	935	61.2	....	(8)
57	Two Butte	Arkansas Val., Colo	1908	900	39 0	...	(4)
58	Eel	Wilder, Calif	1907	805	37.3	....	(8)
59	Scott	Fruto, Calif	1904	760	29.2	*	(5)
60	Animas	Durango, Colo	1909	750	13.3	....	(4)
61	Purgatory	Trinidad, Colo	1904	742	61.0	....	(4)
					22 0	*	(4)
					7 0	5 da.	(4)

* Mean for 24 hours.

62 Santa Ynez	Lompoc, Calif	1911	725	28 1			
63 San Jacinto	Elsinore, Calif	1916	717	195 0			
64 Rio Grande	Wasson, Colo	1911	685	11 7			
65 Zuni	' N M	1909	650	2 3			
				1 7		•	
66 Mora	Mora, N M	1904	650	43 0			
				11 0	12 da		
67 Mokelumne	Nr Clements, Calif	1911	642	26 0			
68 McCloud	Nr Gregory, Calif	1904	608	68 3			
69 Stony	Nr Fruto, Calif	1909	601	48 8			
70 San Luis Rey	Oceanside, Calif	1916	565	169 0			
71 Dolores	Dolores, Colo	1911	550	18 2			
72 Santa Catarina	Nuevo Leon, Mexico	1909	544	500 0			
73 Cosumnes	Michigan Bar, Calif	1911	524	42 7			
74 No Fork Feather	Belden Prattville, Calif	1907	506	19 5			
75 Cache La Poudre	Livermore, Colo	1904	500	40 0			
76 Troxton Canyon	E of Kingman, Ariz	1894	450	110 0			
77 Cherry (alt)	Denver, Colo	1912	445	56 0			
78 San Diego	San Diego, Calif	1916	434	173 0			
79 Carson, E. Fork	Rockwoods, Nev	'	414	13 4		•	
80 La Plata	Pendleton, N M	1904	400	20 0			
81 La Plata	Pendleton, N M	1909	400	16 0			
82 Mohave	Victorville, Calif	1903	400	33 5			
83 Calaveras	Jenny Land, Calif	1911	395	176 2			
84 Carson, E. Fork	Nr Gardnerville, Nev	1904	381	8 7			
85 Ogden	Ogden, Utah	?	360	9 0		•	
86 Conejos	' Colo	1911	*325	19 0			
87 San Luis Rey	Pala, Calif	1916	322	233 0			
88 Bear	Van Trent, Calif	1907	263	98 1			
89 San Gabriel	Azusa, Calif	1916	222	180 0			
90 Sapello	Los Alamos, N M	1904	221	37 0			
				12 8	12 da		
91 Arroyo Seco	Nr Soledad, Calif	1911	215	61 9			
92 Mora	La Cueva, N M	1904	210	106 0			
				32 0	12 da		
93 San Luis Rey	Mesa Grande, Calif	1916	209	280 0			
94 Santa Ynez	Nr Santa Barbara, Calif	1907	207	45 7			
95 Cherry (Flood area only)	Denver, Colo	1912	200	100 0			
96 San Diego	Cap Cor Dam Site, Calif	1916	189	192 0			
97 Sweetwater	Sweetwater Dam, Calif	1895	186	97 5			
98 Sweetwater	Sweetwater Dam, Calif	1916	181	251 0	1 hr		
99 Cherry	? Colo Prior to	1903	175	57 0			
100 Turquillo	Mora Valley, N M	1904	160	100 0			
				20 0	12 da		
101 Cottonwood	Morena Dam, Calif	1916	120	128 0	2 hr		
102 Santa Ysabel	Ramona, Calif	1916	110	258 0			
103 San Jacinto	San Jacinto, Calif	1916	108	278 0			
104 Otay	Lower Otay Dam, Calif	1916	99	238 0			
105 Putah	Nr Guenoc, Calif	1904	91	198 9			
106 Gallinas	Las Vegas, N M	1904	90	129 0			
107 Carson, W Fork	Woodfords, Calif	1906	70	22 4			
108 Santa Ysabel	Mesa Grande, Calif	1916	53	395 0			
109 Kosk	Nr Henderson, Calif	1911	52	44 3			
110 Pinal (Flood area only)	Globe, Ariz	1894	30	440 0			
				35 0		•	
111 Donner	Truckee, Calif	?	30	32 7		•	
112 Yuba	Bowman Dam, Calif Prior to	1903	19	31 6			
113 Mormon Canyon	Los Angeles, Calif Prior to	1903	15 5	48 5			
114 Goodyear	Goodyear Bar, Calif	1911	12 2	96 7			
115 Estanzuela	Nueva Leon, Mex	1909	3 5	825 0			
116 Cherryvale	Cherryvale, Kan	?	2 0	930 0			

Streams West of Missouri River and North of Salt Lake

200 Columbia	Cascade Locks, Ore	?	247,000	5 9		•	
201 Green	Greenriver, Utah	1897	38,200	1 8		•	
202 Red	Grand Forks, N. D	1897	25,000	1 7			
203 Snake	Minidoka, Ida	?	22,600	2 4		•	
204 Green	Green River, Wyo	?	21,984	2 9		•	
205 Loup	Columbus, Neb	1896	13,540	5 2	7 hr		
206 Missoula (Clarks Fork)	Missoula, Mont	1899	5,960	6 0		•	
207 Malheur	Vale, Oregon	?	4,190	3 5		•	
208 Spokane	Spokane, Wash	?	4,000	8 8		•	
209 Bitterroot	Missoula, Mont	?	3,260	11 5		•	
210 Klamath	Klamath Falls, Ore	1904	3,110	2 9		•	
211 Boise	Boise, Ida	1896	2,450	16 4		•	
212 Rogue	Tolo, Ore	?	2,020	23 9		•	
213 Umpqua	Brockway, Ore	?	1,800	60 3		•	
214 Yakima	Unitarian, Wash	?	1,540	26 6		•	
215 Willamette	Jasper, Ore	1909	1,430	84 1		•	
216 Wenatchee	Cashmere, Wash	?	1,250	15 2		•	
217 Umatilla	Yoakum, Ore	?	1,200	19 9		•	
218 Redwater	Belle Fourche, S. D	1894	1,010	8 0			
219 Weiser	Weiser, Ida	1896	894	20 1			
220 Weiser	Weiser, Ida	1897	894	19 2			
221 Silvies	Burns, Ore	?	865	5 5		•	
222 Snake, No Fork	Moran, Wyo	?	820	25 5		•	
223 Naches	Nile, Wash	?	636	33 4		•	
224 Umatilla	Gibbon, Ore	?	353	28 3		•	
225 Chewaucan	Paisley, Ore	?	272	12 9		•	
226 Miller	Lorella, Ore	1907	270	24 9			
227 Crow	Cheyenne, Wyo	1904	250	40 0			
				5 0		•	
228 Willow	Heppner, Ore	1903	125	288 0			
				4 9		•	
229 Cedar	? Wash	1911	79	120 0			
230 Kachess	Easton, Wash	?	63	36 3		•	
231 Wallowa	Joseph, Ore	?	47	15 5		•	

232 Willow (Flood area only)	Heppner, Ore	1901		20 1500 0			
				25 0		•	

Streams East of Missouri River

300 Mississippi	St Louis, Mo	1883	702,580	1 3			
301 Missouri	St Charles, Mo	1883	330,810	1 1			
302 Missouri	Sioux City, Iowa	1881	323,462	1 6			
303 Ohio	Louisville, Ky	1884	206,300	7 0			
304 Ohio	Louisville, Ky	1913	206,000	6 4	20 da		
305 Mississippi	Clayton, Iowa	1880	79,040	2 7			
306 Mississippi	St Paul, Minn	1881	36,683	3 3			
307 Susquehanna	McCalls Ferry, Penn	1894	27,000	27 6			
308 Susquehanna	McCalls Ferry, Penn	1894	27,000	23 4			
309 Susquehanna	Harrisburg, Penn	1865 1899	24,030	30 6			
310 Ohio	Wheeling, W Va	1884	23,800	20 8			
311 Tennessee	Chattanooga, Tenn	1867	21,480	34 4			
312 Ohio	Pittsburgh, Penn	1907	17,100	23 0			
313 Alabama	Selma, Ala	1892	13,450	9 5			
314 Potomac	Washington, D C	1889	11,000	40 9			
315 Connecticut	Hartford, Conn	1854	10,270	20 0			
316 Potomac	Point of Rocks, Md	1889	9,654	48 9			
317 Allegheny	Kittanning, Penn	1905	9,910	26 6			
318 Savannah	Augusta, Ga	1888	7,500	40 0			
319 Delaware	Trenton, N J	1903	7,000	36 0			
320 Delaware	Lambertville, N J	1841	6,855	37 1			
321 Muskingum	Lock No 4, Penn	1888	5,430	38 1			
322 Hudson	Mechanicsville, N Y	1913	4,500	26 7			
				25 2		•	
323 Kennebec	Waterville, Me	1896	4,410	25 2			
324 Kennebec	Waterville, Me	1901	4,270	35 4			
325 Mohawk	Cohoes, N Y	1913	3,472	28 5			
326 Mohawk	Rexford, N Y	1892	3,384	21 1			
327 Charles River	West Dover, Mass	1901	3,100	26 9			
328 Shenandoah	Millville, W Va	1896	2,973	46 1			
329 Catawba	Rock Hill, S C	1901	2,987	30 5			
330 Hudson	Glens Falls, N Y	1913	2,760	25 4			
331 New River	Radford, Va	1900	2,725	63 8			
332 New River	Radford, Va	1901	2,725	63 4			
333 Kennebec	Messer Waterville, Me	1901	2,700	48 6			
334 Miami	Dayton, Ohio	1913	2,450	100 4			
335 Chemung	Elmira, N Y	1889	2,055	67 1			
336 Kiskiminetas	Avonmore, Penn	1908	1,720	39 1			
337 Allegheny	Redbank, Penn	1910	1,640	25 0			
338 S Fk Shenandoah	Front Royal, Va	1902	1,570	48 9			
339 Scioto	Columbus, Ohio	1913	1,570	75 8		•	
340 Chattahoochee	Oak Isle, Ga	1901	1,560	31 3			
341 Catawba	Catawba, N C	1901	1,535	61 9			
342 Cheat	Morgantown, W Va	1911	1,380	30 3			
343 Greenbrier	Alderson, W Va	1897	1,344	41 6			
344 Youghiogheny	Connellsville, Penn	1910	1,320	27 7			
345 Genesee	Mt Morris, N Y	1894 6	1,070	39 2			
346 Susquehanna	Hallock, N Y	1913	1,060	27 4			
347 Scioto (Upper)	Columbus, Ohio Waterworks Dam	1913	1,032	80 8			
				63 9		•	
348 Clarion	Clarion, Pa	1905	910	43 2			
349 Schoharie	East Hunter, N Y	1913	909	44 6			
350 Schoharie	East Hunter, N Y	1901	900	55 1			
351 Black	Lyons Falls, N Y	1869	897	46 0			
352 Passaic	Dundee Dam, N J	1902	825	30 1			
	Dundee Dam, N J			28 6		•	
353 Passaic	Dundee Dam, N J	1903	825	43 5			
				41 3			
354 Raritan	Bound Brook, N J	1882	806	64			
355 Hudson	North Creek, N Y	1913	804	35 1			
356 Youghiogheny	Confluence, Penn	1888	782	59 0			
357 Hudson	? N Y	1913	695	46 0			
358 Farmington	? Conn	?	684	41 7			
359 Olentangy	Columbus, Ohio	1913	520	98 0		•	
360 Ausable	? N Y	1913	487	45 2			
361 Cattaraugus	? N Y	1913	467	53 6			
362 Conemaugh	Conemaugh, Penn	1907	448	43 9			
363 Susquehanna	Johnsonburg, Penn	?	428	76 0			
364 Hiwassee	Murphy, N C	1911	410	74 7			
365 Pamlico	Pamlico, S C	1903	400	89 0			
366 Middle Oconee	Athens, Ga	1902	393	49 5			
367 Big Black	? Miss	1907	386	81 0			
368 Passaic	Pine Brook, N J	1903	380	44 6			
369 Hudson	Luzerne, N Y	1910	380	31 3			
370 Hoosic	Mount Hoosic, N Y	1910	378	65 3			
371 West Canada	Trenton Falls, N Y	1901	376	96 5			
372 West Canada	Hinckley, N Y	1869	372	104 6			
373 Ohio	Wheeling, W Va	?	350	131 4		•	
374 Croton	Croton Dam, N Y	?	339	74 9			
375 Androscoggin	Lewiston, Me	1869	280	77 6			
376 Susquehanna	? N Y	1913	260	41 6			
377 East Canada	? N Y	1913	256	54 3			
378 Potomac	Brunswick, Md	1901	231	55 2			
379 Oswego	Scriba, N Y	1901	210	100 0			
380 Fall	Gouverneur, N Y	1902	198	69 2			
381 East Branch	? N Y	1913	179	65 1			
382 Susquehanna	Binghamton, N Y	1882	160	65 9			
383 Juniata	Lewistown Junction, Penn	1904	146	64 2			
384 Hoosic	Nr Mechanicville, N Y	1905	143	1300 0			
385 Rappahannock	Remington, Va	1903	118	105 1			
386 Neuse	? Mass	1898	109 0	174 5			
387 East Fork Br	Pine Bush, N Y	1897	94 3	89 5			
388 Susquehanna	Mt Pleasant, Penn	1885	82 4	112 5			
389 Wisconsin	Lyndon, N Y	1910	101 0	83 6			
390 Potomac	Washington, D C	?	77	126 3			
391 Pine Valley	Syracuse, N Y	1898	62	124 9			
392 Conemaugh	Johnstown, Penn	1889	45	295 8			

* Mean for 24 hours.

393 Six Mile	Ithaca, N. Y.	1905	46 0	185 0		(3)
394 Elkhorn	Keystone, W. Va.	1901	44 0	363 0		(25)
395 Sawkill	Kingston, N. Y.	1896	35.0	228 6		(39)
396 Bear Grass	Louisville, Ky.	1908	27 5	100 0		(8)
397 Pequonnock	Bridgeport, Conn.	1905	25.0	157 0		(3)
398 Cane	Bakersville, N. C.	1901	22 0	341.0		(25)
399 Stony	Boston, Mass.	?	12 7	121 0		(5)
400 Mill	Shermans, N. Y.	1905	9 4	241 0		(3)
401 Skinner	Mannsville, N. Y.	1891	6.4	124.2		(22)
402 Beacon	Fishkill, N. Y.	1897	0 25	3200 0		(34)
	Foreign Streams					
500 Loire	France	?		6,945	46 0	(8)
501 Durance	Bompas, France	1886		5,714	37 1	(8)
502 Neckar	Germany	?		4,770	33 0	(8)
503 Loire	France	1846		2,200	113 0	(8)
504 Rhine	Germany	?		1,620	75 0	(8)
505 Ombrone	Italy	?		1,620	43.0	(8)
506 Ardèche	France	1827		938	264 0	(8)
507 Tewbrapoorny	India	?		587	324 0	(8)
508 Kinzig	Germany	?		550	77 0	(8)
509 Tessin	Bellinzona, Italy	?		541	165 0	(8)
510 Lausitzer	Germany	1880		481	60 0	(8)
511 Olsa	Germany	?		435	77 0	(8)
512 Kinzig	Germany	?		386	100 0	(8)
513 Iller	Germany	?		367	74 0	(8)
514 Ubaye	Mouth, France	1843		361	127 1	(8)
515 Bleone	Mouth, France	1843		351	115 7	(8)
516 Irrity	India	?		336	450 0	(8)
517 Ostrawitza	Germany	1894		313	110 0	(8)
518 Olsa	Germany	?		291	72 0	(8)
519 Murg	Germany	?		246	100.0	(8)
520 Serein	France	?		226	78 0	(8)
521 Cure	France	?		208	77 0	(8)
522 Bruna	Italy	?		189	189 0	(8)
523 Ilz	Germany	?		185	86 0	(8)
524 Murg	Germany	?		184	123 0	(8)
525 Queis	Germany	1888	183 5		164.0	(8)
526 Ardeche	Aubenas, France	1890	178 0		694 4	(8)
527 Wiese	Germany	?	163 0		108 0	(8)
528 Bronne	France	1874	145 0		86 0	(8)
529 Mandan	Germany	1890	119 0		135 0	(8)
530 Wittig	Germany	1880	122 0		142 0	(8)
531 Queis	Germany	1888	116 0		264 0	(8)
532 Serein	France	?	108 3		98 0	(8)
533 Stream in	Switzerland	?	87 5		210 0	(8)
534 Tess	Germany	1876	63 0		135 0	(8)
535 Plussnitz	Germany	1890	58 0		820 0	(8)
536 Mandan	Germany	1887	50 2		210 0	(8)
537 Zacken	Germany	?	42 5		490 0	(8)
538 Bargaglino	Genoa, Italy	1892	35 6		485 0	(8)
539 Eyach	Balingen, Wurttemberg	1895	34 7		356.0	(8)
540 Affluente	Italy	?	32 4		260 0	(8)
541 Torside and Rh'd Res.	England	1852	24.1		160 0	(8)
542 Landwassar	Germany	1887	20.1		365.0	(8)
543 Modlock	England	1857	18 8		160 0	(8)
544 Woodhead Reservoir	England	1849	11.0		320.0	(8)
545 Brook near	Dublin, Ireland	1891	10 8		325 0	(8)
546 Furens	St. Etienne, France	1849	9 6		478 0	(8)
547 Bargaglino	Above Genoa, Italy	1892	8 8		732 0	(8)
548 Stream in	Hungary	1875	7 7		400 0	(8)
549 Kemlitz	Germany	1887	7.4		915 0	(8)
550 Eyach	Margarethausen, Wurtemberg	1895	7.3		788 8	(8)
551 Nebenwasser	Germany	1887	7 2		490 0	(8)
552 Spree	Germany	1887	6 7		930.0	(8)
553 Landwasser	Germany	1887	6 1		830 0	(8)
554 Kemlitz	Germany	?	5.4		980 0	(8)
555 Landwasser	Germany	1887	3 8		895 0	(8)
556 Wittgendorfbach	Germany	1887	3 6		1010 0	(8)
557 Schepsbach	Germany	1887	3 3		455 0	(8)
558 Dittersdorfwasser	Germany	1887	2 0		1144 0	(8)
559 Wallgendorfbach	Germany	1887	1 3		1115 0	(8)

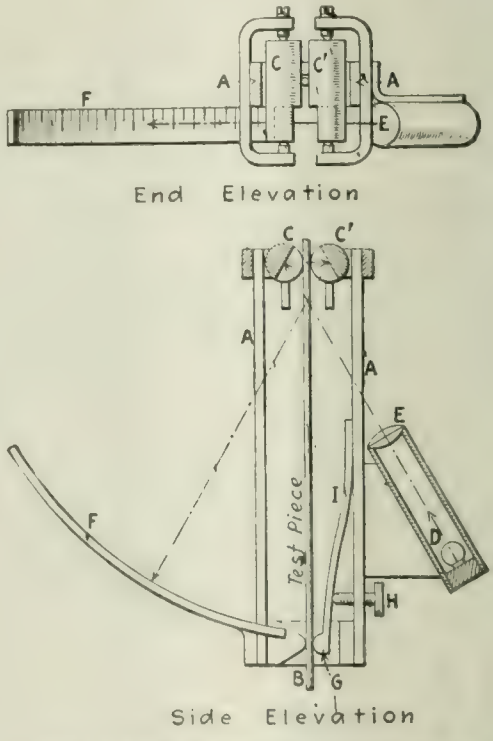
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Mirror Extensometer for Testing Wire

A SIMPLE and yet highly precise extensometer constructed in the past year at the laboratory of the Westinghouse Electric & Manufacturing Co., and described by T. D. Lynch and P. H. Brace before the American Society for Testing Materials, is shown by the drawing below. It is of the mirror type, but utilizes a reflection from two moving mirrors in succession, so that the rotation of the contact rollers which constitute one of the extensometer contacts is multiplied four times.

Two elastic steel strips, *A A*, connect the lower contact block, *B*, with the upper contact rollers, *C*. The block, *B*, is held to the wire (or ribbon, as the extensometer is intended for both classes of material) by the spring jaw, *G*, which may be clamped hard by the thumb-screw, *H*. The rollers *C* and *C'* are held against the specimen by the spring of the pieces, *A*, and are turned as the specimen stretches or shortens. At one side a tube containing a straight filament galvanometer lamp, *D*, is attached, throwing a ray to the mirror on the roller, *C*, whence it is reflected to *C'* and to the curved scale *F*.



DETAILS OF MIRROR EXTENSOMETER

In the instrument as constructed the scale was 500 mm. long, and the value of a scale division, as determined by calibration, was 0.00008233 in. Thus, by estimating to one-fifth division, changes of length as small as 2/100,000 in. may be read

Comparison of Five Railway Bridge Specifications

Proposed Revision of A. R. E. A. Standard Limited to Spans Under 300 Feet — Great Increase in Detail Over Present Standard and Three Other Specifications — Secondaries To Be Computed

WITH the revision of the American Railway Engineering Association's long-established steel bridge specifications, now in progress, the determinative features of bridge design and construction are being discussed more actively than for years past. A tabular comparison of the revision (so far as it has yet proceeded) with four other bridge specifications has therefore been prepared by *Engineering News-Record* as information on present tendencies.

While the association, at its meeting last March, declined to accept the revision as drafted, and referred it back to the committee for reconsideration, yet the redraft which the committee is to prepare by next year is not likely to depart from the general lines of the first draft. The latter, therefore, is included in the table as "Proposed A. R. E. A. Specification." Because of the great influence exerted by the present A. R. E. A. specification and the probably equal influence of the new specification (when adopted), together with the fact that the revision represents a fundamental change, comparison is made with the existing or "Old" A. R. E. A. specification and with three widely-known railway specifications, covering 15 years of practice. The earlier part of this period is represented by the Old A. R. E. A. (drawn up in 1904, adopted in 1906, and slightly revised in 1910), and the Southern Pacific specification (adopted in February, 1904, and revised in September, 1909). More modern views are represented by the Pennsylvania R.R. specification (Oct. 1, 1916) and the New York Central Lines specification (1917).

Two Types of Specifications

Two of these specifications, the Southern Pacific and the Pennsylvania, are of the "min-max" type—that is to say, they increase the live-load stress or decrease the unit stress according to the ratio of minimum to maximum stress in the member. The other three use an impact formula based on load length giving maximum stress.

The proposed A. R. E. A. specifications is limited to spans not exceeding 300 ft. Prior bridge specifications have contained no specific limit of application, but it has been the general view among railway bridge engineers that any bridge of special magnitude constitutes a problem beyond the reach of ordinary specifications.

Great increase of detail characterizes the more recent specifications. The number of clauses in the Southern Pacific is 102, in the Old A. R. E. A. 183 (including 20 on erection), in the Pennsylvania 135, in the New York Central 298, and in the Proposed A. R. E. A 317 (including 24 on erection). The increase is due to covering more fully the minute details of design practice.

Increase of Train Loading

Increase of train loading, one of the most prominent characteristics of bridge development, is represented by the change from E40 in the old to E60 in the Proposed A. R. E. A. specification. The New York Central uses E70. Loadings differing from the Cooper are represented in the other two. None make allowance for light-traffic lines, though it was urged at the A. R. E. A. meeting last March that a general requirement of E60 would make the specification unacceptable for roads outside the heavy-traffic territory. Two separate engine types, as alternates, are specified by the Pennsylvania.

Some striking characteristics of the development represented by the five specifications tabulated may be stated as follows: Requirements as to material and tests have undergone substantially no change (only the Pennsylvania provides a drifting test for ductility). Unit stresses also have not changed perceptibly, although there is a slight tendency toward higher tensile and lower compressive unit stresses today as compared with 15 years ago. The only large change in the matter of stresses is in the column formula. Here the proposed A. R. E. A. specification follows the radical course of abandoning the straight-line and Gordon types and adopting a parabolic formula, which has not been in practical use for a quarter century. At the same time, a very low unit stress is proposed. In the latter regard the influence of the column committee of the American Society of Civil Engineers is evident, though the A. R. E. A. committee obviously disagrees with the A. S. T. M. committee's conclusions, since it uses a higher base stress and reduces more sharply for high length ratios.

Differences Between the Specifications

Marked variations between the several specifications appear in many clauses of incidental rather than fundamental importance. A few of these may be mentioned. Splicing requirements differ materially; two specifications call for full splicing, while the others accept a 50% splice (of compression members) when all four sides of the member are spliced. An unusual feature is the New York Central's requirement of 10% excess in tension splices.

There is somewhat erratic variation on expansion, which ranges from 1 in. in 80 ft. of span length to a temperature change of 150°. Nothing is said as to floor expansion except in the Proposed A. R. E. A., which requires a joint in the floor for lengths over 250 ft. No specific provisions for the transfer of lateral forces at the expansion end are made. Only two specifications require that the rollers should be geared to the shoe plates.

In the matter of camber the range is from the general specification of the old A. R. E. A., that the stringers shall be straight under full load, to the New York Central clause requiring an increase in top-chord length of ½ in. per 10 feet.

Punching and Reaming

Construction clauses, as distinguished from those governing design, center in the requirements as to punching, reaming and drilling, and as to field connections. With respect to punching, there is an evident progression toward higher (and more expensive) workmanship. The older specifications do not require drilling and allow punching even in main material for certain thicknesses, while the recent specifications virtually eliminate full-size punchings and require all material above ¾ in. to be drilled; but more of the specifications fix a maximum for the thickness of material that may be used. Again, the newer specifications require field connec-

Outstanding Features of Five Railroad Bridge Specifications

(Figures in Parentheses Refer to Clause Numbers)

A. R. E. A., PROPOSED	A. R. E. A., 1910	SOU. PAC.-UNION PAC. COMMON ST'D 1909	PENNSYLVANIA, 1916	NEW YORK CENTRAL, 1917
General Features of Design				
(9) Beams, to 35 ft.; plate girders to 125 ft.; riveted trusses 300-300 ft.; pin-connected 150-300 ft.		(37) Beams, to 19 ft., plate girders 19-100 ft., riveted trusses 100-150 ft., pin connected, 150 ft. up (46) Trusses, 6 panels or less, riveted.	. . . . .	(11)–Beams up to 30 ft.; plate girders 30–125 ft.; riveted trusses 125-200ft.; pin-connected, 200 ft. up. Limits varied at discretion of engineer. (86)–Solid floor type preferred (14)–Generally not less than 1/15 span.
(12) Same as (3) A. R. E. A., 1910 (32) Min. depth ratio, trusses 1-10, girders 1-12, beams and [illegible] 1-15 (13) Clearance, 15x22 ft.	(3) Min. spacing 1-20 span or to provide adequate bracing. Max. panel 1½ truss spacing (32) Min. depth ratio, trusses 1-10, girders 1-12 (2) Clearance, 14x22 ft.	(40, 41)–Deck girders and trusses spaced 7 to 14 ft., as specified (38)–Clearance, 15x24 ft.	. . . . .	(15)–Clearance, 15x22 ft.
Live Loads				
(29) Coopers E 60 or 2-75,000-lb. axles, 7 ft. centers	(7) Coopers E40, or 2-50,000-lb. axles, 7 ft. centers	(17)–Cooper's E55 eng. and train 5000 lb. per foot	(8)–2 special engs., 70,000 or 66,000 lb. on main axles, and train 5500 lb. per foot.	(23)–Spans 200 ft. or less, Coopers E70; over 200 ft., Coopers E65, or 2-85,000-lb. axles 7 5 ft. centers. (23)–For 2 tracks, 95%; 3 tracks, 90%; 4 tracks, 85% of live load. (24)–Floors solid bridges, 18,000 lb. per ft. of track. (25)–Uniform over 10 ft. width. (26)–Deck girders, 18,000 lb. per ft. of track for flange rivets
(22) Same as (23) New York Central, 1917				
(3) Floor beams, min. 15,000 lb. per ft. of track. (25) Ballasted floor, live load uniform over 10 ft. width				
Impact				
(23) 100% on ties (28) $I = \frac{300}{300 + L^2 - 100} S$ I = Impact L = Span length in ft., zero for floors with transverse beams S = Computed max. L.L stress.	(5)–100% on ties..... (9) $I = \frac{300}{L + 300} S$ L = Total length of loaded track in ft.	(See unit stresses).....	(See unit stresses).....	(29)– $I = \frac{30{,}000}{30{,}000 + L^2} S$ Min. 20% L = Span length, in ft. (30)–Solid floors with beams. I = 100%. (31)–Where speed 20 m.p.hr. or less, I is ½ above.
Lateral Forces				
(32) Moving 30 lb. per sq. ft. on 1½ vert. proj. train 200 lb. on loaded, 150 on unloaded chords and 600 per ft. at 8 ft. above rail alternate (34) Moving load 50 lb. on 1½ vert. proj. (33) Empty cars 1200 lb. per ft.	(10) Moving, 200 lb. per ft. 10% L. L. one track (11) Viaduct towers, 50 lb. per sq. ft. on 1½ vert. proj. unloaded, or 30 lb. per sq. ft. and 400 lb. per ft. 7 ft. above rail, empty cars 1200 lb. per ft.	(18)–Wind, 30 lb. per sq. ft. on surface and 10-ft. train 2½ ft. above rail, or 50 lb. per sq. ft.; min. 500 lb. per ft., 300 lb. moving for loaded chord and 150 lb. fixed for unloaded chord. Viaducts, 60 lb. per sq. ft. loaded; 100 lb. per sq. ft. unloaded (19) Min. train 800 lb. per ft.	(9)–Wind, 50 lb. per sq. ft. and 10-ft. train 2½ ft. above rail (10)–Empty cars 1,000 lb. per ft.	(37)–Moving, same as (32) new A.R.E.A., except 360 lb. at 8 ft. above rail. (40)–Empty cars, 1,000 lb. per ft.
Centrifugal Force				
(36) Same as (36) New York Central 1917	(13) Computed from speed of 60-2 5 D (D = degree of curve)	(21) 4½% of live load, all tracks, per deg. of curve, 5 5 ft. above rail	(12) Specified uniform loads, varying with span and deg. of curve.	(36)–Percentage of L.L. from 2 5% for 20′ curve to 10% for 2° and over.
Longitudinal Force				
(37) 20% live load on one track only, if unrestrained. If absorbed by friction or continuity, 10%	(12) 20% of live load, at top of rail	(20) 20% of live load	(11)–20% of train load	(34)–20% of live load.
Allowable Unit Stresses				
(39) Tension, 16,000 Comp. 13,000 ½ l/r Web shear 10,000 Shear, rivets and pins 12,000 Bearing, riveted plates 24,000 Bearing, 25% for field rivets and turned pins Bearing, beams 16,000 pin 24,000 (41) Diagonal tension, 16,000	(14-19) Tension, 16,000 Comp. 16,000-70 l/r Max., 14,000 Web shear, 10,000 Shear, rivets and pins, 12,000 Bearing, rivets and pins, 24,000 Field rivets, shear 10,000 bearing 20,000 Bending, beams 16,000 pins 24,000	(23) Tension Bars 8,500 (1+min./max.) Plates or shapes 8,000 (1+min./max.) Floorbeam hangers, 6,000 Comp. If l/r exceeds 40, reduce tension values by 35 l/r, both ends fixed, or by 45 l/r, fixed and round Web shear, 6,000 Pins and rivets—shear 7,500, bearing 15,000, hammer-driven 20% less. Knee braces, 50% greater Beam bending, 7,000 (1+min./max.) Pin bending, 18,000	(13–16)–Tension 16,000 Comp. $\frac{16{,}000}{1 + \frac{l^2}{13{,}500\, r^2}}$ Live load stress mult. by (1+I), I = impact factor depending on min./max. (17) Long hip verticals, 25% excess, short hangers and posts 50% excess. (28) Rivet shear, 12,000 (27) –bearing, 24,000 Pin bearing, 25,000 (30) Field rivets increased 30% in floors, elsewhere 20%; if power riveters, half as much (37)– Bending, beams 16,000 pins 25,000	(41)–Tension, 18,000 Comp. 16,000—70 l/r with max. 15,000 Web shear, 13,500 Shear, rivets and pins, 13,500 Bearing, rivets, 27,000 Pins, 24,000 (If reversal, 12,000) (42)–Reduce 25% for field rivets, etc. Beam bending, 18,000 Pin bending, 24,000 (41)–Diagonal tension, 18,000
Stress Reversal and Provision for Future Live Load				
(44) Same as (22) A. R. E. A., 1910, counting impact	(22) Increase each by 50%, smaller connections for sum of stresses as specified (2) Use ½ (d) for counterset 11	(24) Increase each by 80% smaller. Min. of each taken as zero	(22) Increase as specified by factor: (25)–100% increase 11 add area if stress exceeds twice allowable. Provide counters	(47) Increase each by 80% smaller, connections for sum. (46)–Use 70% (d)
Combined Stresses				
(45) Axial plus bending stress, increase 25% (47) Use ½ (d) for counterset 11 (6) Use ½ (d) for counterset 11 (8) Compression flange bending, ½	(24) Max. combined stress, increase allowable 25%	(31) Axial plus bending stress, increase axial 10% (2) Incl. wind and centrif. stress, increase allowable 10%	(24) Bending and secondary stresses to be provided for (21) In bending w.nd, allow 20,000 (23) Comprn. chords, ¼ simple beam bending	(48) Eccentric and bending stress combinations, within allowable axial (38) Wind stress only if exceeds 25% other combined stresses (48) Contin. chords, ½ simple beam bending.
Secondary Stresses				
(48) Axial and flexural stresses combined, [illegible]				(48) Compute stresses due to rigidity of joints and deflection. Unit stress increased ½ for combination

OUTSTANDING FEATURES OF FIVE RAILROAD [illegible] SPECIFICATIONS

Figures in Parentheses Refer to Clause Numbers

A R E A PROPOSED	A R E A 1910	SOUTHERN PACIFIC COMPANY 1919	PENNSYLVANIA 1916	NEW YORK CENTRAL 1912
Special Design Requirements				
(57) Connections equal to member, but see (44) (27) Only ½ weight ballasted floor considered (59) Only 50% unsymmetrical legs of L in tension flag I not considered to connect) double L members, 90% net area if both legs connected	(37) Connections equal to member, but see (22)	(64) [illegible] (65) [illegible] (66) [illegible] (24) [illegible] with 80 [illegible] (42) [illegible]	(25) [illegible]	(37) [illegible]
Limiting Length Ratio (Compression Members)				
(50) Main members, 100 bracing, 120 (51) Riveted tension members, 200	(20) Main members 100 bracing 120 (21) Riveted tension members 200	(23) Length 45 x least width	(20) General 80 wind bracing 120	(40) Main [illegible] 100 bracing 120
Minimum Thickness				
(146) Gussets, ⅜ in (58) Except fillers, ⅜ in. If corrosive influence, increase thickness, or prevent	(38) Except fillers, ⅜ in	(39) [illegible] (67) Except floor [illegible]	(38) Except fillers ⅜ in [illegible]	(137) [illegible] (42) Except [illegible]
Proportioning Compression Members Etc				
(66) Same as (44) A R E A, 1910 (67) Stringers, min thickness 1-10 outstanding leg in main members, 1-12, bracing, 1-14 (70) Lacing, for shear 2% of axial stress (74) Max length ratio of flange between lacing, 40	(44) Web thickness 1-30 width between rivet lines over 1-40 (45) Flange [illegible] thickness 1-12 outstanding ea (47) Lacing, for shear equivalent to unit stress of 7 000 (50) Flanges between lacing strong as member			(66) Same as (44) A R E A 1910 (74) [illegible] (75) [illegible]
Splice Details				
(75 76)–Same as (51) A R E A, 1910	(51) Faced comp joints spliced four sides 50% gross area all other joints fully spaced	See (64) and (66) under special design requirements	(66) All joints to be faced and fully spliced	(64) [illegible]
Forked Ends				
(83) Same as (53) A R E A, 1910	(53) Jaws two eyes 1 member avoid if possible			(136) Eyes 20 greater area required
Expansion, Etc				
(89)–1 in per 100 ft, spans over 250 ft, joints in floor (90) Same as (60) A R E A 1910 (92) Rollers over 6 in geared to upper and lower plates	(59) ¼ in per 10 ft (60) Spans over 80 ft, end on rollers (62) Segmental rollers over 6 in geared to upper and lower plates	(70) Variation 130 F (43) Spans over 75 ft end on rollers (44) Pin bearings over 75 ft	(44) Variation 100 F (45) Spans over 70 ft end on rollers	(123) [illegible] (124) Spans over 80 ft end on rollers
Truss Camber				
(142) Equal to d l plus l [illegible] tion	(81) Stringers straight under full load	(38) [illegible] (66) [illegible]	(39) Equal to deflection under dead load plus 1 000 lbs	(139) [illegible]
Workmanship				
(212) Bracing up to ¾ in thick, punched full size (213) Other material up to ¾ in sub-punched and reamed (214) Over ¾ in, drilled (230) Field connections, ex bracing, assembled and drilled or reamed or use metal templet	(118) Material over ¾ in thick sub-punched and reamed or drilled (135) Floor connections, sub-punched, reamed to 1 in steel templet	(72) [illegible] 78) Matching [illegible] of girders which must be fully spliced (79) Splices [illegible]	(28)–Soft steel [illegible] punched [illegible] (30)–Matching [illegible]	(200)–Bracing [illegible] punched [illegible] (213) [illegible]
(246) Floor girders faced at ends, min 1-16 in from connection L	(129) Floor girders faced at ends, not 3-32 in from connection L	(95) [illegible]	(96) Same as 1910 [illegible]	(24) [illegible]
Open Hearth Structural Steel				
(162) Max P-acid 0.06 basic 0.04, max S 0.05, tensile 55,000 to 65,000, min yield point 50%, tension; min elongation in 8 in, 1,500,000 tension, in 2 in 22% (170) Bend cold around pins as follows: Thickness t — Diameter Up to ¾ in — flat ¾ to 1¼ in — t Over 1¼ in — 2t	(86) Max P acid 0.06 basic 0.04% max S 0.05 tensile 60 000 to 70,000 elong in 8 in 1,500 000 tension in 2 in 22 Bend cold 180° flat (99) Ends of [illegible] that [illegible] when required by inspector	(11) [illegible]	(13) [illegible]	(164) Max P [illegible] basic 0.04 [illegible]
Open Hearth Rivet Steel				
(162)–Max P, acid or basic 0.04 max S 0.045% tensile 46 to 56 000, min yield point 50% tension min elong in 8 in 1 500 000 tension (173) Bend cold 180° flat	(86) Max P acid 0.04 basic 0.04 max S 0.04 50 000 elong in 8 in 1 500 000 tension Bend cold 180° flat (100) Ends of [illegible]	[illegible]	(13) [illegible]	[illegible]

tions to be assembled before reaming or else reamed to metal templet; this operates to extend the practice of yard assembly of trusses.

Precedent, or tradition, appears to be a factor in the clauses governing proportioning materials for reversed stress. Additional material is required in such members by all of the specifications, apparently as a concession to former ideas on fatigue. The increase specified varies from 50% of the smaller stress to 80%. Three of the specifications require that the end connections of such members must be proportioned for a larger stress than the members themselves, apparently mistrusting the resistance of riveted joints to "fatigue" action.

Tendencies of Change

Important tendencies of recent years are represented in the clauses governing impact, secondary stress and provision for future increase of load.

Impact is not mentioned in the "min-max" specifications. The Schneider impact formula $300/(300 + L)$, devised years ago as a substitute for varying the unit stress or increasing the live load according to the range of stress, found a place in the Old A. R. E. A. specification, while in the New York Central and the Proposed A. R. E. A. the new formula, $30{,}000/(30{,}000 + L^2)$, written by Prof. F. E. Turneaure from the results of his series of impact measurements on bridges, is adopted.

Secondary stresses are not mentioned in the older specifications nor in the Pennsylvania specification. The New York Central and the Proposed A. R. E. A. require secondary stresses to be computed, but call for additional material only when the secondary exceeds 33%. The Proposed A. R. E. A. words its requirement in such a way as virtually to waive the secondary stress computation except when members are wider than one-tenth their length or when trusses are subpaneled.

Load probabilities are taken account of in two of the specifications. The New York Central and the Proposed A. R. E. A. provide that bridges carrying several tracks need not be designed for full live load in the worst position simultaneously on all tracks, but reduce the live load by 5% for each track over the first. The probability of future increase of loading is met in the Proposed A. R. E. A. specification by increasing the material in the web members, where only two-thirds of the dead load and 1⅛ times the live load and impact are to be considered acting. In the Pennsylvania R.R. specification a 100% increase of live load is to be considered, with unit stress increased 100 per cent.

A final load test of the completed bridge is provided for in the Southern Pacific specification, in which the deflection under this load is limited to 1/1500 span. The weight of the test train is not fixed, but it is to be run at 60 miles per hour. This test is rarely carried out.

That bridge specifications are still far from approaching a condition of standardization is indicated not only by the variations above noted, but also by the fact that some clauses are so phrased as to require interpretation. Thus, it is specified that centrifugal force is to be regarded as live load; this cannot mean that it is to be considered as a moving load, since the fact that centrifugal force accompanies the movement of a train is sufficient to show that partial loading must be taken into account. The clause may mean that impact must be added to the static centrifugal effect, but the word impact is not mentioned in the clause. Again, a clause calling for certain increase of opposing stresses requires the end connections to be proportioned for the sum of "the stresses so increased," and leaves a doubt as to whether the stresses before being increased or after being increased are to be added.

New Department of Health for Canada

A DOMINION or Federal department of health for Canada is provided for by a recent act of Parliament. The department will be headed by a crown minister, and there will also be a deputy minister of health, both appointed by the Governor in council. No specific provision is made for an engineering or other technical bureau or service, but the act authorizes the employment of such staff as may be "necessary for the proper conduct of the business of the department." The department is to have charge of "all matters and questions relating to the promotion or preservation of the health of the people of Canada over which Parliament itself has jurisdiction." Without "restricting the generality of the foregoing" authorization, the act mentions particularly the following matters which will be under the jurisdiction of the department:

1. Coöperation with the provincial, territorial, and other health authorities with a view to the coördination of the efforts proposed or made for preserving and improving the public health and the promotion of child welfare.
2. The establishment and maintenance of a national laboratory for public health and research work.
3. The inspection and medical care of immigrants and seamen, and the administration of marine hospitals.
4. The supervision, as regards the public health, of railways, boats, ships and all methods of transportation.
5. The supervision of Federal public buildings and offices with a view to conserving and promoting the health of the civil servants and other Government employees therein.
6. The enforcement of any rules or regulations made by the International Joint Commission, promulgated pursuant to the treaty between the United States of America and His Majesty relating to boundary waters and questions arising between the United States of America and Canada, so far as the same relate to public health.
7. The administration of the statutes mentioned in the schedule to this act, and of acts amending the same, and also of all orders and regulations passed or made under any of the said acts; and all the duties and powers of any minister of the crown under either of the said acts or any of the said orders or regulations, are hereby transferred to and conferred upon the Minister of Health.
8. Subject to the provisions of The Statistics Act, the collection, publication and distribution of information relating to the public health, improved sanitation, and the social and industrial conditions affecting the health and lives of the people.
9. Such other matters as may be referred to the department by the Governor in council.

Power to make such regulations as may be needed to carry out the provisions of the act, and to impose penalties for violations of any such regulations, is vested in the Governor in council.

Provision is made for a Dominion council of health to include the deputy minister of health, who is to be chairman, and also the chief executive officer of each provincial board of health in the Dominion, together with not over five other persons to be appointed by the Governor in council. This Dominion council is to meet at such times as the Minister of Health may direct and is to have such duties and powers as may be prescribed by the Governor in council.

The act specifically excludes the minister or any officer of the Dominion department of health from exercising control over any provincial or municipal board of health operating under the laws of any province.

Among the statutes mentioned under (7) in the schedule to the act are acts relating to quarantine, adulteration and the Public Works Health Act as given in the revised statutes of Canada of 1906.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Status of Public-Works Engineers Should Be Changed

Sir—*Enginering News-Record* could do the public a service, and relieve an important class of engineers from humiliating restrictions, by exerting its influence to bring about a change in the relations of city and county engineers to the matter of the selection of pavements for streets and highways.

Existing conditions make for great wastefulness of money expended for road improvements. Even the poorest types of hard surfacings are high in cost. Mistakes in selection often entail the squandering of huge sums of money. This is inevitable so long as ignorance or prejudice or commercial interests dominate the councils of the selective body. It is obvious that sound public policy demands intelligent judgment in matters involving the expenditure of public funds raised by taxation, or assessed against property. An engineer is best qualified to pass intelligent judgment upon all matters in his department.

A city solicitor is regarded as authority on all legal questions, and a health physician's dictum has all the effect of an authoritative decision in the domain of public health. These officials are consulted as experts, and their opinions are accepted and acted upon *nem con.*

A city or county engineer also is—or at least he ought to be—an expert. His trained judgment and technical knowledge ought to have preponderating weight in all affairs pertaining to the engineering field; yet the engineer is not clothed with authority, and in very many cases his expert opinion is disregarded, or it is not asked at all, when choice of the type of street or highway pavement is to be made. In other words, the engineer is not allowed to exercise his higher functions as an expert, but is confined to surveying, designing and drafting, the mere routine drudgery of office, while others, far less qualified than he, assume to pass expert judgment. This is an injustice to the qualified engineer, and it is prejudicial to public interest.

Law and custom are jointly responsible for a condition which is irksome to self-respecting engineers, and which places important and costly public improvements at the mercy of ignorance, caprice or penuriousness.

Circumstances often compel an engineer to design and supervise the construction of a type of pavement which his judgment disapproves; but no circumstances ought to deter him in such case from filing a protest in behalf of the taxpaying public and for the protection of his own reputation. Professional ethics and official duty require that an engineer guard his employer-public against errors of judgment and the futility of false economy, if possible. Engineers as a class would do that if they could do it; but they are not allowed to do it, and they have fallen into the habit of letting such things go by default.

These matters are in the hands of laymen and property owners who have very limited opportunities for informing themselves concerning the relative merits of types of pavements, and no knowledge of the action of materials under traffic stresses and weather influences. The nature and influence of soils as factors in road improvements have no meaning to the average property owner, nor is it possible for him to analyze a traffic census in terms of effect upon pavements, nor can he calculate with any degree of accuracy the probable growth of traffic in volume, weight and kind that a road may be called upon to sustain, or could sustain.

The engineer is supposed to be, and he ought to be, qualified on all these points. Hundreds of miles of pavements of various kinds have gone to pieces under modern traffic. The engineer knows why, but the average person does not know. The engineer knows what kind of road surfacing will pit, ravel or disintegrate under the combined influence of traffic and the elements. He knows what materials are proof against all these influences. He knows what form of construction is best, and in a professional way he has acquired knowledge of many other important facts which are unknown to the layman. He may advise, if asked so to do, but he cannot decide finally.

Subordination of engineering judgment to the caprice of chance is deplored by all who are familiar with the situation all over the country. A peculiar feature of the situation is that pavements are the only thing, of consequence, subject to this loose method of determination. The choice of grades, width and kind of sidewalks to be laid is not left to property owners. The city authorities decide all these questions autocratically. So also with sewers and other public improvements. Holding a referendum of owners of property abutting a street or road to be improved is folly. All the taxpayers in a city join in paying for the paving of street intersections, and all are called upon to replace the entire pavement when it has worn out.

In the interest of ultimate economy the city engineer ought to be allowed to decide what kind of pavement should be laid. If a reservoir is to be constructed, property owners are not expected to dictate the kind of material that shall be used; but streets and roads, which are the most expensive of all ordinary public improvements, are taken out of the hands of experts, and the selection may be influenced by any consideration except adaptability and durability. As a result, ultimate good is often sacrificed to a false initial economy.

Every step in the selection, the design and the construction of a street or road presents an engineering problem, and nobody not an engineer is competent to solve these problems in advance.

They do things better abroad. Over there engineers decide where a road shall run, what kind of pavement shall be put down, and how wide it shall be. That system produces uniform results and gives the most satisfactory road service. America is still too near the demagogic era of new countries. Public officials too often

try to curry favor with the voters rather than act with public benefit solely in view.

The laws in many states must be revised, and it may be necessary to change the method of choosing city and county engineers, before reform can be accomplished. The engineer must receive some real authority and be held personally responsible for his exercise of authority. The practice of letting anybody or everybody except an engineer exercise either legal or delegated authority in the matter of selecting types of roads to be built ought to be discontinued, and I hope that *Engineering News-Record* will aid in revolutionizing present practices in that regard. F. A. CHURCHILL.

Conneaut, Ohio.

Are Highway Terminals Necessary?

Sir—The lack of proper terminal facilities of our large cities is a subject which too many highway enthusiasts seem to forget. In Chicago we are spending millions to make presentable our front yard, Michigan Ave., but only dilatory steps are being taken to relieve the congestion of the produce markets on S. Water St., or to provide a proper center or centers for the cheap handling of vast amounts of farm produce that comes into the city for its own consumption. The present high cost of food is largely attributable to terminal charges. City officials some time ago turned down the plan of the Santa Fé R.R. for a fruit and produce terminal, after that road had brought it to a point of practicability by acquiring the necessary land. Plans have been proposed for an underground storage and market in Grant Park, and others for taking the commission-house business out of the downtown district. Feeble efforts, from time to time, have been made to establish municipal markets in various parts of the city. A very few are now in operation, but the city officials have given them scant support.

Secretary Lane and those who are advocating the reclamation of a large additional acreage of arid and swamp lands do not tell us how the farmer is to be reimbursed for his efforts, which he surely will not be if the present high terminal costs are not materially reduced. Considering terminal and transportation facilities for certain perishables, we have more land under cultivation than we can take care of. At least one-third of the 1918 Middle West fruit crop was not shipped. And many a fruit farmer has found that freight-terminal and commission charges, on top of the cost of crating and picking, too often leave him with a deficit or a meager return on his labor and investment.

When the development of highways is considered, with the inevitable added congestion of produce easily transported, the terminal problem should not be lost sight of. Perhaps the solution lies in large, centrally located highway terminals or in many small ones strategically scattered over the city near population centers. This would reduce street congestion from the present "back hauling" from market to points of consumption.

Chicago, Ill. C. H. NORWOOD

Springs Found in Standpipe

Sir—The above caption suggests that there must have been a special dispensation of Providence in favor of a small municipality which has been suffering from deficient water supply for some time. The local superintendent feels that if there was any dispensation it came from the other fellow. Unfortunately, and as much as they might have been desired, the springs found in the standpipe, (and they were numerous) were not springs of water but were pump-valve springs.

The water-supply was derived from shallow wells. The pumps, which are old, have been heavily overloaded, and pump valve springs and rubber valves have not infrequently been drawn in through the suction, and as there was no fish-trap or strainer on the delivery from the pumps, they are pumped along with the water into the distribution system.

The trouble is a serious one, as the valves and springs have lodged in valves and hydrants along the course of the distribution mains, excepting such as have been forced clear through the system into the standpipe. Where these valves or springs lodge in valves or hydrants it is often impossible to close the valves in case of breakage in the mains, and if a hydrant is opened it is often impossible to close it. The trouble has become so serious that the question of some practical method of removing these obstructions has arisen.

Of course, remedies will be applied to prevent further occurrences of this kind, but the difficult problem is to get these obstructions out of the distribution system with the least trouble and interference with the water-supply. The present superintendent, whose attention was called to this matter by inability to close off districts in the city for repairs of pipes soon after he took his position, believes that the trouble had been going on for many years and that there may be some hundreds of old pump valves and valve springs scattered through the mains.

Possibly some other water-works engineers may have had similar trouble and can suggest the remedy.

HYDRAULIC.

Large Construction Firms Shun Road Work

Sir—I have read with interest the article in *Engineering News-Record* of June 12, 1919, p. 1150, by C. S. Hill, associate editor, entitled, "Large Construction Companies Shun Road Work." My experience has shown me that Mr. Hill has stated the case fairly—if anything, he has made the case too mild.

Among other reasons for this condition, Mr. Hill states, "too great stress has been laid upon the possibilities of dishonesty." With this I fully agree. My own practice has been in the Middle States and the South, principally, and I have experienced many "ups and downs" in my position as referee between county commissioners and contractors.

Ninety per cent. of the county commissioners are men who know little of business in general, and less of road matters. These men let contracts, hire engineers and their assistants, pass orders directing the work or directing the engineer how to direct the work, pass plans and surveys, pay accounts or prune them as they see fit and act as a rule wholly on their sentiments or their prejudices. I have seen good contractors refused jobs solely because a local man wanted to have a try at road-building. I have seen other instances where a crooked contractor has been awarded a job by holding out sufficient inducement to the commissioners.

My stand has always been that an inexperienced man should not be given a contract, though he makes the low bid. Most of the cases I have observed have proved

that the low bid of an inexperienced contractor is unsatisfactory in the end, resulting in delays, bad work, misunderstandings and bad feeling.

The time has arrived when the character of every contractor bidding on work should be investigated, and, if he has a good clean record, does good work and is properly equipped, he should be treated fairly. If his record will not stand the spotlight, or his experience isn't equal to the anticipated demands, he should not be given the work. By securing men of high character, you secure good work, promote good feeling and all goes harmoniously. The way to keep out of trouble is to block it, before starting forth on any undertaking.

The contractor and the engineer should be equally interested in securing good work, and should have no hesitancy in consulting each other about any phase of it. Honest men and right intentions on both sides will work to the advantage of all concerned.

Another reason is well stated by Mr. Hill: "Too many road departments have attained a reputation for breaking contractors."

My observation has been that state and Federal engineers frequently are to blame for high bids being submitted, as their "red tape" and technical supervision make low bids impossible. The contractor, not knowing what to expect, must anticipate the worst, and bids accordingly. A PRACTICAL ENGINEER.

Highway-Engineer Work in France

Sir—You have had several good articles in your paper relative to the keeping of the engineering forces in France, and I am inclosing herewith a circular issued Mar. 20, 1919, which is a compilation of all road instructions given to the engineering troops printed by the Mobile Topographical Unit, 29th Engineers.

If France is not getting any more service out of our troops than this circular indicates, it is high time they were moved on where they can be furnished with more suitable tools than the mud hoe, shovel and pick. There is a shortage in this country not only of labor but of intelligent oversight in our road work, and it seems too bad that the quality which we have in our engineering troops in France is expended where it is deemed cheaper to break rock by hand than by crusher. You, perhaps, have seen this sheet of instructions before, but if not and you think it advisable, I should like to see the instructions printed in *Engineering News-Record*, in order that the engineers of this country may be advised of the manner in which our engineers are being worked in France. CON M. BUCK.

Topeka, Kan.

[Some of the chief points to which Mr. Buck calls attention are reproduced below.—EDITOR.]

All roads in continued use by the American Expeditionary Forces will be maintained and kept in repair by our forces. Since the enormous mileage involved and the scarcity of road machinery make it impracticable to do extensive resurfacing with machinery, the work will be done by hand, with simple hand tools improvised if they cannot be otherwise obtained.

The economic value of the work to be done is not the business of officers who have received instructions what to do. However, what is being done is the highest economy. Men are in France in abundance. The cheapest way to maintain roads is by using labor to replace, continually, worn-out soft rock. It is cheaper to break rock by hand than by crushers, as men have to be maintained anyway. There is slight chance of any engineer or labor personnel being sent to the United States until roads in use by American troops are in good condition.

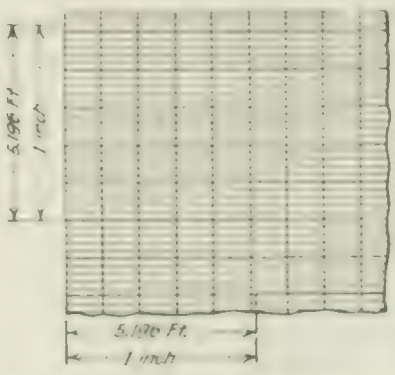
In the maintenance of the first class roads the chief tools necessary are the mud hoe, shovel, pick and roller, and their importance is in the order named.

It is expected that available materials will be used and that soft rock or any other kind of rock will be placed in holes as fast as it goes out, even if a man replaces it after each vehicle passes.

The road detachments and the officers supervising them should consider this work most excellent training and should see that valuable knowledge and training are obtained on this important engineering work.

Computing Cross-Section Paper for Earthwork Computations

Sir—Your attention is called to the inclosed sheet of "Computing Cross-Section Paper," with instructions [small section reproduced, actual size]. The use of this paper saves the time ordinarily spent in reducing square inches to square feet and cubic feet to cubic yards, as required with other cross-section paper.



Perhaps those of your readers who use the planimeter for measuring end areas for earthwork computation will be interested. I designed this size and scale for highway work with 100-ft. stations. The same principle may be employed for other requirements. The computing cross-section paper is ruled to a scale of 1 in. = 5.196 ft. = 27 ft.

If the cross-sections are plotted so that the smallest horizontal and vertical divisions on the paper represent 1 ft. and 0.2 ft., respectively, the scale of the paper is such that 1 sq.in. will represent 27 sq.ft., so that the planimeter reading in square inches will give the cubic yards per linear foot of cut or fill.

The results may be tabulated most conveniently by a method which employs average end areas formula, as described on p. 787 of your issue of Apr. 17.

J. H. DORROH,
Professor of Civil Engineering, University of Mississippi.
University, Miss.

Heavy Decline in Typhoid Since 1900

Typhoid deaths in the registration area of the United States in 1917, according to the Census Bureau's belated summary of mortality statistics for that year, totaled 10,113 in a population estimated at 75,000,000 distributed in 27 states, the District of Columbia and 43 registration cities in nonregistration states. This gives a rate of 13.4 deaths per 100,000 population, compared with 35.9 in 1900. The typhoid deaths in 1917 were 0.9% of all the deaths recorded.

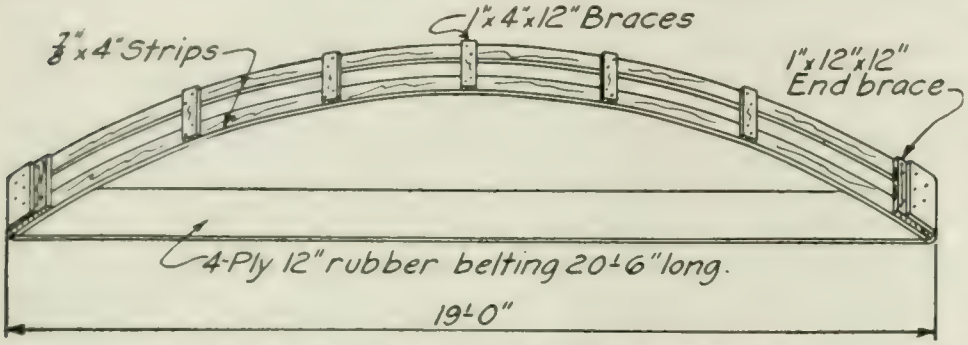
HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Bow-Frame Belt Used in Finishing Concrete Roads

ONE of the more recent adaptations of the belt for finishing concrete roads is shown in the accompanying illustration. This device enables the workmen to push as well as pull when operating the belt, thus attaining greater efficiency.

The bow, which is made of light material, serves to keep the belt taut, and thus, it is claimed, gives a more



BOW FRAME KEEPS CONCRETE FINISHING BELT TAUT.

even surface finish. It was described in a recent issue of the *Highway Magazine*.

Another method of attaining pressure of the belt on the surface, which has been used, is to weight it with short blocks of wood.

Doing Hardest Work by Force Account Keeps Ruling Prices Down

BY ALBERT S. FRY
Morgan Engineering Co., Memphis, Tenn.

RULING prices for land clearing are kept from rising, in the work being done in the Inter-River Drainage District, Missouri, by substituting force-account for contract work, on the most difficult portions. Clearing the right-of-way for the levees in such places



CYPRESS BRAKES COSTLY TO CLEAR FOR LINES

as the cypress brakes and sloughs shown in the illustration is much more difficult than the general run of clearing, and would tend to raise the prevailing prices.

Other Articles in This Issue of Interest to Contractors

Special Design Features and Rapid Erection of 540-Foot Suspension Bridge Page 1
Shipbuilding Equipment and Methods at Fore River—I. Hull Construction Plant Page 19
Large Construction Firms Shun Road Work (Letter) Page 38

To prevent this a policy has been adopted to do all the difficult work with the district's forces and to let contracts for the other work. Thus, the prices for which the ordinary work can be let are kept from rising as a result of the higher cost of doing the work on the brakes and sloughs.

Ordinary land is cleared by contract for $30 an acre. If some of the cypress-brake work was let by contract at double this price, the effect would be to raise the price for ordinary clearing by several dollars.

Concrete Materials Chuted Into Sidewalk-Vault Mixing Plants

GRAVITY delivery of concrete materials by chuting to mixers situated in sidewalk vaults, whence it is distributed by cars to the cylinder piers, is the method employed in concreting the foundations for the headhouse of the new union station in Chicago. The site, covering an entire city block, was excavated to the basement level, which served as a working floor in sinking the open pier wells. Two concrete mixers were installed on opposite sides of the site, and about midway between the street and basement levels. This makes it possible to handle materials with little or no obstruction of street traffic, as in cases where it is necessary to carry in the materials at the sidewalk level.

Stone and sand are dumped in piles along the curb line, and cement in sacks is stored in a shed in the street, the sidewalks and main parts of the roadways being kept clear. The materials are wheeled to openings in the roadway, near the gutter, and chuted to the mixer below. Concrete is discharged directly into steel dump cars which are moved on portable narrow-gage tracks to the wells and there dumped. Tracks are laid in both directions across the site, with turntables at their intersections, allowing the cars to be run to any pier desired.

Wood lagging and steel ring braces for the wells are also lowered to the site through similar openings in the street. The John Griffith & Son Co. has the contract.

NEWS OF THE WEEK

New York, July 3, 1919

Bills for Department of Public Works

Government Engineering To Be Centered in Department To Take Place of Interior

Identical bills have been introduced in the Senate by Mr. Jones of Washington and in the House of Representatives by Mr. Reavis of Nebraska, providing for a Federal Department of Public Works to take the place of the present Department of the Interior and to have charge of all of the engineering activities of the United States Government. Such bureaus of the Interior Department as are not engineering in character are to be placed under the jurisdiction of appropriate departments, while engineering bureaus from other departments are to be included in the new Department of Public Works.

The new department would include the Supervising Architect's office of the Treasury, the Construction Division, River and Harbor Improvements, the Mississippi River Commission, and California Debris Commission of the War Department, the Bureau of Standards and the Coast and Geodetic Survey of the Department of Commerce, the Bureau of Public Roads, and the Forest Service of the Department of Agriculture. At the same time the Patent Office is removed from the Interior Department and placed under the Department of Commerce. The Bureau of Pensions is assigned to the Treasury Department and the Bureau of Education to the Labor Department. The Bureau of Indian Affairs is transferred to the Department of Labor, with the proviso that the engineering and construction work and the land and mineral surveys now performed under the direction of the Bureau of Indian Affairs are to be prosecuted under the Department of Public Works. Other minor branches of the Interior Department go under different cabinet offices.

The bill provides that the new Secretary of Public Works "shall by training and experience be qualified to administer the affairs of the department and to evaluate the technical principles and operations involved in the work thereof." Four assistant secretaries, each to be paid $7500 per annum, are provided. One of these is to have jurisdiction over matters of engineering, design and construction; another over architectural design and construction; a third over all scientific work and surveys, while the fourth is to be in charge of land and naval matters.

The bill provides that engineer

(*Concluded on p. 43*)

Properties and Design of Concrete Discussed

Annual Convention of American Concrete Institute Develops Some Important New Facts Regarding the Material

War activities during the past year prevented many of the committees of the American Concrete Institute from continuing their work in the preparation of specifications for concrete and its products, so the major part of the annual convention held at Atlantic City on June 27 and 28 was devoted to papers which, it happened, emphasized the properties and the design of the material. Several of these marked notable steps forward in the knowledge of the material, and all together with the concrete papers presented to the American Society for Testing Materials in the joint session of the two societies on June 27—were valuable.

Committee Reports

In spite of the other interests of the past year some of the committees presented reports. Three of them submitted standards for the letter ballot of the Institute. These were the Standard Specifications for the Manufacture of Concrete Roofing Tile, by the Committee on Building Block and Cement Products, hereafter to be known as the Committee on Concrete Products; some minor revisions in the specifications for concrete sidewalks and for concrete floors, by the Committee on Sidewalks and Floors, and revised Recommended Practice on Portland Cement Stucco, to supersede the present Standard Specification on the same subject by the Committee on Concrete Surfaces. The Committee on Concrete Sewers submitted for the second time a Specification for Monolithic Concrete Sewers and added thereto Specifications for Reinforced-Concrete Pipe Sewers. For a second time the convention returned the specifications to the committee for revision. The opposition this year centered mainly on the fact that the specification contained too many pure contract provisions, although there was decided opposition to the elimination of limestone as an aggregate.

The recommended practice for stucco is particularly to be commended. There has been a specification for this subject but it was not satisfactory to the committee, which is headed by J. C. Pearson of the Bureau of Standards. This year the committee made a complete revision, and accompanied the formal specification with running comments so that the whole makes the most complete compendium of this subject of stucco ever issued.

The Committee on Fireproofing summarized the results of recent tests on the fire resistance of concrete columns, including the paper by W. A. Hull, at the present and at last year's convention, describing tests at the Bureau of Standards, and other actual conflagration tests. The results, which strongly condemn gravel aggregate for fire resistance, will be summarized in a future issue. The Committee on Nomenclature submitted some definitions and that on Roads and Pavements some revisions of the recommended practice which took 50 pages of last year's Proceedings of the Institute. As these revisions were not submitted to the membership before the convention, they will not go to letter ballot but are to be printed for reference and possible action next year. They relate mainly to consistency and surface finish. The Committee on Reinforced-Concrete Highway Bridges and Culverts, under the new chairmanship of A. B. Cohen of the Lackawanna Railroad, has embarked on an ambitious program toward the preparation of standard specifications for concrete highway bridges. This contemplates recommended practice on details of design, assumptions in design, general specification of materials and performance of work and methods of construction, the latter to be revised from year to year with new developments. As outlined in the report of the chairman, the work of the committee promises to furnish a much needed addition to engineering literature.

Building Laws Report

Two years ago the Committee on Reinforced Concrete and Building Laws presented some proposed Standard Building Regulations for the Use of Reinforced Concrete, which in some respects, went counter or differed from the provisions of the then new "final" report of the Joint Committee on Concrete and Reinforced Concrete, of which the American Concrete Institute is a member. The A. C. I. committee this year brought in a revision of these building regulations, but they had not been fully considered by all of the committee and were therefore ordered printed as information. It might be said that while a number of the provisions of the Joint Committee are incorporated in these new regulations there are still many points of divergence, particularly in the sections on columns and flat slabs, the regulations as a rule being more liberal in design.

This feature was criticized by several members on the floor.

Papers on concrete properties included "Effect of Vibration, Jigging and Pressure on the Strength of Concrete," by Prof. Duff A. Abrams; "Test of Concrete Tanks for Oil Storage," by J. C. Pearson and G. A. Smith; "Fire Tests of Concrete Columns," by W. A. Hull, and "Structural Laboratory Investigations in Reinforced Concrete Made by Concrete Ship Section, E. F. C.," by W. A. Slater. The first two are abstracted on page 16; both give definite new data on concrete. The matter on the vibration of concrete is particularly useful in pointing out that the value of methods of agitation lies mostly in the distribution of the concrete in the form, except with dry concrete in which they seem to increase the efficiency of the water, and therefore strengthen the concrete.

Professor Slater's investigations cover the wide range of studies required for the concrete ship work of the government, and while devoted to that specialized subject are nevertheless widely applicable to all types of reinforced-concrete work. The subjects covered are corrosion of reinforcement, bond tests of coated bars, bond tests with lapped bars, reversal of stress, impact on thin shells, effect of brackets, and web reinforcement.

Light-Weight Aggregate for Building Construction Discussed

Design of concrete structures was treated in several papers. One by A. W. Stephens, of the Turner Construction Co., was an analytical investigation into the economics of light-weight aggregate for building construction. The results were somewhat disappointing to those who have anticipated a possible development of this material on account of the reduction in dead load and consequent saving in material. Mr. Stephens found in a typical six-story building the saving of a 99-lb. aggregate over a 145-lb. of the same strength to be only about 10%, which is far below any present or prospective relative cost of the materials. This low value is apparently due to the fact that the sizes of floors are largely dependent on factors other than load, so that savings must come mostly in the columns and footings. A higher building, of course, would show greater saving.

H. B. Andrews, consulting engineer of Springfield, Mass., read a paper on "The Design of Reinforced Concrete Fuel Oil Reservoirs," with a supplementary paper by J. W. Lord of Boston Manufacturers Mutual Fire Insurance Co., on fire hazards in such tanks, both of which summarize adequately the present status of what is a development of the war, the extensive storage of fuel oil near industrial plants in concrete tanks or reservoirs.

A final paper on design was one on "The Design of Concrete Ships," by J. Gluettli, Jr., of the Concrete Ship Section, which summarized the knowledge gained by the Government in the strenuous year in which it was designing this new type of marine structure. A. L. Bush, of the same office, read a paper describing the layout of the five big concrete yards, with special attention to the reasons for the use of side launching in these yards. Concrete ship development was rounded out by an illustrated talk by J. E. Freeman, of the Portland Cement Association, on such craft in this country outside of the Emergency Fleet Corporation, and the developments in foreign countries. S. C. Hollister, also of the Concrete Ship Section, described the methods of construction of the concrete barges for the New York State Barge Canal, which, as told in *Engineering News-Record*, Feb. 6, 1919, were built in four different yards. F. R. McMillan's paper on the strainagraph, and a paper by A. C. Irvin, on "Concrete Railway Track Support," completed the list of papers.

Presentation of Medals

A pleasant interlude in the technical proceedings was the award of four medals. One of these was a special medal struck off for the Institute and awarded to W. Leslie Comyn, of San Francisco, Calif., for, to quote the medal itself, "his faith and courage in building the first American ocean-going concrete steamship," the "Faith." The others were the Wason medals, the gift of Past President Leonard C. Wason, of Boston, for the most meritorious paper presented to the Institute in the year. On account of the war, the award has never been made, so three were awarded this year: For 1916, to Prof. A. B. McDaniel, for his paper, "The Effect of Temperature on the Strength of Concrete"; for 1917, to Maj. Charles W. Gow, for his paper, "The History and Present Status of the Concrete Pile Industry," and for 1918, to Prof. Duff A. Abrams, for his paper, "Effect of Time of Mixing on the Strength and Wear of Concrete."

Practically the same officers have been continued for the ensuing year, with Prof. W. K. Hatt, of Purdue University, as president. It was announced that next February the Institute would return to its regular practice, broken during the war, of holding its convention in the winter, and would meet in Chicago.

Sacramento Votes $1,800,000 for Filtered Water

More than the necessary two-thirds majority of votes for $1,800,000 of bonds to provide filtered water from the Sacramento River were cast at the election held at Sacramento, Calif., June 26. Editorial comment on the long delays in settling the water-supply question at Sacramento appeared in *Engineering News-Record*, June 5, 1919, p. 1091. Following the favorable vote it was announced that an 18-story business block which has been under consideration for some time would be commenced at once.

Southwestern Not to Join American Water Works Association

Important actions taken at the convention of the Southwestern Water Works Association held in Kansas City, Mo., June 23-26, include a decision not to accept the invitation of the American Water Works Association to affiliate with the latter and a decision to publish a monthly journal. The territory of the association was enlarged to take in Nebraska, and the name changed to the South-West Water Works Association, the hyphen indicating that the organization proposes to serve the South and the West—Mississippi, Colorado and one or two other states are under contemplation as prospective territory. Objections raised to joining the national organization were that such affiliation would eliminate the local secretary, would return only 25% of the fees collected and that the journal was practically the only tangible return the majority of the members would receive for the 75% retained. The value of the prestige and advantages of a nation-wide association in presenting a solid unit with once voice on national problems was upheld by H. V. Knouse, of Omaha, but he was alone in the debate and voting.

Two issues of the journal have been circulated already among the members and prospects in the territory, sufficient advertising having been obtained to more than defray the cost, $245. The subscription price is $2 a year. A committee was appointed to arrange terms with R. O. Gresham, Temple, Texas, a newspaper editor, as editor and publisher. The secretary of the association was voted $150 in addition to his regular $300 salary to act as business manager. The financial report showed a balance of $27 at the end of the fiscal year, April 1, with $250 due the secretary.

W. L. Benham presented an illustrated talk on the "Operation of the Camp Funston Utilities," together with a description of a manual of operation finally adopted as standard for all of the camps under the Maintenance and Repair Division. In the discussion of meters as detectors of waste, J. Smith, of Emporia, Kan., described a home-made clock device applicable to household meters which would make a continuous record of the consumption. In a round-table discussion of the question "At What Charge Per Month Can a ¾-in. Meter Be Installed and Maintained When Owned by the City?" J. F. Anderson, who has kept meter records in Kansas City for 26 years, stated that the cost of setting varied from 50c. to $7.50, and the annual maintenance from 3c. to $2.50 annually. No more definite statement was made.

Leon I. Kahn, Shreveport, La., was elected as president and E. L. Fulkerson, Waco, Tex., as secretary. New Orleans gets the 1920 convention and the time is changed to October instead of June or July.

Motor Transport Corps To Make Ocean to Ocean Trip

An ocean to ocean trip is being planned by the Motor Transport Corps of the United States Army for the fourfold purpose of: (1) Giving an extended service and performance test of the various standardized types of army motor equipment; (2) to collect detailed data for use in connection with the technical training of the personnel of the corps; (3) to demonstrate the practicability of long distance motor commercial transportation and the consequent necessity for the expenditure of governmental appropriation for highways, and (4) to provide an opportunity for procuring recruits for the Motor Transport Service.

Two complete truck companies, of war strength, consisting of a total of 42 army trucks, including all of the standard makes used by the government during the war, will participate, accompanied by motor cycles, ambulances, tank-trucks, mobile steel kitchens, mobile repair shops and signal corps searchlight trucks, and a personnel of 209 army officers and men. The start will be made from Washington on July 7, proceeding by way of Frederick, Md., to Gettysburg, Pa., from which point the Lincoln Highway will be followed to San Francisco. It is planned that the convoy will reach the Presidio at San Francisco about Sept. 1.

Chicago to Liverpool by Steamer

A direct voyage from Chicago to Liverpool by the Great Lakes, the St. Lawrence River and the Atlantic Ocean was started June 26, when the steamship "Lake Granby" sailed from the Chicago River. This is one of the steamers built in Chicago for the U. S. Shipping Board, and its cargo consisted largely of Chicago products. Two boats built at Duluth are to take cargoes at Chicago for a similar voyage. Several years ago two steamers were sent from Chicago to European ports, but it is understood that the aggregate charges and delays incident to the passage to the ocean were so great that the venture was not successful commercially and was abandoned after the first voyage. Under present conditions the through water rate is said to be materially lower than the combined rail and water rate.

Department of Public Works

(*Concluded from p.* 41)

officers of the United States Army detailed on non-military work are to be assigned by the Secretary of War to like duties under the new departments for not over two years, and members of the Corps of Engineers may under the direction of the Secretary of Public Works be detailed by the Secretary of War to temporary duty in the new department for such instruction, training and experience as may be desired.

Engineering Educators Take Significant Action at Annual Meeting of S. P. E. E.

Record Attendance and Marked Enthusiasm for New Developments Result from War Experience and Dr. Mann's Report

Welcomed by an unusual paper by President Goodnow at Johns Hopkins University, members of the Society for the Promotion of Engineering Education held an enthusiastic series of discussions last week at the 27th annual meeting. Record attendance, a promising report on membership — there are now 1445 individual members and 70 institutions, the University of Texas being admitted this year — and an exceptional number of resolutions tending toward progressive and significant development in the society, especially in its relations to the other national societies and to the practicing engineer, marked the convention. Resolutions following recommendations in Dr. Mann's report on engineering education (see *Engineering News-Record*, Oct. 24, 1918, p. 742) and for the appointment of coördinating committees were adopted. The move to establish local sections of the society is pregnant for the future. The only criticism expressed was of the tendency toward long-winded discussion and the reading of papers of great length.

President Frank J. Goodnow, of Johns Hopkins University, delivered an address of welcome with the happy title "First Thoughts in Engineering Education," which seemed to strike the keynote of the convention. He raised the question as to the purpose of engineering education and discussed the three elements: (1) General education, which should be both intellectual and moral; (2) professional education, which should follow the "case" system as used in law and medical schools to give direct contact with world needs, and (3) research, principally to determine practicability for quantity production. In reply President John F. Hayford called attention to the fact that Johns Hopkins University was the earliest to start research in American universities, and that it had the youngest engineering college.

Mann Report Discussed

Most of the first session was devoted to the report of a special committee on the Mann report. This was presented by its chairman, W. E. Mott, in the form of six definite resolutions. All of these, except one, were carried after amendment or revision. The first recommended that, as a matter of experiment and research, psychological, "objective," "trade" or other similar tests be given to students after admission, the rating thus obtained to be compared with their subsequent scholastic progress. A supplementary resolution provided that this should be sent to all deans with the request that it be put into effect next autumn. Two papers explaining how these mental tests were applied aided greatly in the discussion—one by L. L. Thurston, Division of Personnel and Psychology, Carnegie Institute of Technology, and one by W. C. Magruder, of the Ohio State University.

The second resolution recommended the establishment and adoption of similar standards whereby the mental growth of students might be evaluated during the course of study. In reply to a question, it was explained that the engineering aptitude tests differ from ordinary examinations in the fact that the student has never been instructed in the subject matter of the test. The third resolution, providing for a limitation of the hours per week to 48 and the number of subjects requiring preparation to five, was lost principally because the preparation time for lecture hours was considered to be too indefinite and because of a fear of any impression that time requirements were limited and of supporting the idea of a labor union week

Advise Business Training

The fourth and fifth resolutions were revised, amended and carried as follows: "4. That engineering students be required to pursue courses which will develop their business and administrative qualities. These courses should involve constant and continuous training in the use of English, both oral and written." "5. That the standing committee on mechanical engineering be requested to study and report to the society the most desirable methods of carrying on shop-work instruction for students pursuing engineering courses." The sixth resolution provided that the society should cooperate with the national engineering societies to establish a classification of work, or positions, including specifications as to preparation and qualifications so that undergradute students would have a clear understanding of the work for which they are preparing themselves, and instructors would have a constant reminder of the main purpose of their teaching work.

The exhaustive analysis of the "case" system for the study of law presented by Prof. C. F. Allen, Massachusetts Institute of Technology, clearly developed the application to engineering education—research for truth by the use of the corkscrew, not the ram-rod followed by the stomach-pump method. This and the symposium at the last session on the changes in curricula will be abstracted in detail in a later issue.

A significant resolution providing for the establishment of local sections of the society was passed unanimously, these sections to be fixed geographically. The

(*Concluded on p.* 45)

Economic and Business Training for Engineers

Washington Conference of Prominent Educators and Representatives of Engineering Firms

At the final session of a two-day conference, held in Washington June 23-24, resolutions proposed by the conference committee of prominent educators were passed favoring the addition to engineering curricula of courses in general economics, cost accounting and business law and urging that the economic phases of engineering subjects should be emphasized in commercial instruction and that the institutions which have departments of engineering and economics or commerce be urged to consider some plan of coördination to develop a course to prepare students to meet the demand for large numbers of technically trained men for both foreign and domestic commerce.

This conference was called by the Commissioner of Education through Dr. Glen L. Swiggett, specialist in charge of commercial education in the Bureau of Education, and a representative committee of educators. There were about 155 present from all sections of the country, the discussion centering on the announced subjects of business training for engineers and engineering training for students of business, and on the results of the war experience as affecting technical education and foreign trade.

Engineering Salesmanship

At the first session, Dean Anson Marston, of Iowa State College, led the discussion on business training for the engineer. His paper will be abstracted in a later issue. Spencer Miller, vice president of the American Society of Mechanical Engineers and of the Lidgerwood Manufacturing Co., New York, placed first the need for developing character and outlined the qualities needed in engineering salesmen and the golden opportunities awaiting them. In the discussion was pointed out the danger of attracting too many men from the fields of design and research work, and the fact that it would be a mistake for all colleges to begin to train business engineers. Prof. G. H. Follows, head of the department of commercial engineering, Carnegie Institute of Technology, Pittsburgh, outlined by chart the course given in his department, and declared that a complete commercial training filled four years, it being almost impossible for men who had taken ordinary engineering courses to become managers of men.

Prof. Walter Rautenstrauch, Columbia University, in discussing engineering training for commercial enterprises, insisted that no worth while instruction could be given without highly paid teachers. E. F. Dubrul, president of the Pyro Clay Products Co., Cincinnati, claimed that the science of business was as broad and its ethics as high as any profession, and that executives are highly paid because they control both the engineering production and the commercial or distribution phases of industry. Money will be provided by business men if the educator will show willingness to adopt new methods for supplying the kind of graduate they need—the course to be devised in conference. He called attention to the new college of engineering and commerce at the University of Cincinnati as offering a coöperative course of large promise.

War Experience and Education

The third session was devoted to the significance of the war experience for engineering education, a paper by Maj. Gen. John F. O'Ryan, of New York, being read by Mr. Swiggett.

Dr. Charles R. Mann, chairman of the advisory board, committee on education and special training of the War Department, pointed out that both army men and practicing engineers place character first. He raised the question as to just what is meant by the "fundamentals" which so many advocate, and claimed that these fundamentals are at once apparent if the army method of beginning with a definite job is followed. Thus the motive—motivation—is developed, and results follow because the student is doing something definite and learns to think on the job. Morale is a dominant factor, better than character as a test, and he would judge class work by group morale. The teacher should be a friendly investigator trying to lead the student to his best attainments rather than one who merely tries to meet certain set standards—and generally failing in a large proportion of cases. The classification and rating system of the army should be applied, helping to measure accomplishments.

The work of the Engineer School at Camp Humphreys was described by Dean Evans, Toledo University, who had inspected the work in mechanics and by Professor Hatt, of Purdue University, who inspected the work in engineering. Both testified to the evidence of high morale attained through the assignment of concrete problems, forcing the men to face a real design or investigation situation, used as the basis for developing principles. Professor Hatt emphasized the need for developing a science of education.

Improving Palo Verde Valley Levee System

The Palo Verde Joint Levee District on the lower Colorado River has completed, since October, 1918, about 13 miles of new levee and of standardizing work on old levees. Quarries have been opened up for revetment work to be undertaken soon. The district has voted $1,285,000 for a railroad track on the entire levee system which totals 34 miles in length. This is to be laid as part of the season's construction work after the subsidence of this year's river flood.

Contract Set for Westerly Sewage Works at Cleveland

After four years of experimental work and two years of discussion of the obtained results, Cleveland has awarded the contract for the construction of the westerly sewage treatment works. The Masters & Mullen Construction Co., of Cleveland, were the successful bidders at a price of about $678,000, and the work included comprises practically a complete plant with full equipment.

The westerly sewage plant is one of three that are proposed. It is designed to serve a population of 300,000. It is located on the west side of the city at the lake front near the Edgewater Bathing Beach; a condition which requires a higher degree of sewage treatment during the summer than during the remaining months of the year.

The plant comprises bar screens, grit chambers, two-story settling tanks, disinfection equipment and a submerged outfall. It is proposed to operate the bar screens, grit chambers and tanks the entire year, while the disinfection equipment will operate only during the bathing season. The settling tanks are designed with a detention period of 100 minutes.

During the earlier years of operation it is proposed to dispose of the sewage sludge by dumping it into the lake at the government dumping grounds. The dumping grounds are off the shore about three miles, and have been used for a considerable period for disposing of river dredgings. Should the barging of the sludge to the lake prove undesirable, land is available at the treatment site for sludge beds covered with greenhouse construction.

As the sewage plant is near one of Cleveland's large parks and well-traveled boulevards, particular care has been taken to harmonize the architectural features of the plant with the surroundings.

The contractor has stipulated July 1, 1920, as the time of completing the work. Robert Hoffman is city engineer and George B. Gascoigne sanitary engineer.

A. A. E. Gets Navy Engineers and Washington Office

The Navy Technical Association, consisting of 700 civilian engineers at the United States navy yards, has been amalgamated with the American Association of Engineers. The latter waived the entrance fees and will continue branches of the former in connection with its own chapters. The wide campaign that is being made in the interests of engineers in public service under Federal, state, county and municipal government has made it necessary to have a representative at Washington. The American Association of Engineers, therefore, has engaged R. C. Bradley, former president of the navy association, as its assistant secretary, with office at Washington.

Engineering Educators Meet

(*Concluded from p. 43*)

two sessions devoted to the effect of war on engineering education and to military training in engineering schools, led by Dean Anson Marston, of Iowa State College, and by Col. F. J. Morrow, chairman of the committee on education and special training of the War Department, respectively, reflected the educators' reaction to war experience and furnished an opportunity to match minds with the military men. In the latter effort, certain definite questions by Pres. C. S. Howe, of the Case School of Applied Science, were read and partially discussed, but the army officers could not give definite information because the final ruling on the revision of general order 49 has not been made.

Colonel Morrow made a stirring plea for wide adoption of the college units of the Reserve Officers' Training Corps, stating that of 126 engineering schools of the country there were 99 who have established the R. O. T. C. units. He stated that 7000 officers per year would be required if plans for a 5,000,000 standing army matured. Maj. H. Tilghman described the work of the Artillery Corps, stating that for their men physical training could take the place of drill. A motion was carried expressing the thanks of the meeting to Colonel Moore and Major Tilghman, as well as the other army officers present, and also the high appreciation of the colleges for their work and the purpose to back up the movement for preparedness in case of further difficulties. Three new names were added to the committee appointed to coöperate with the War Department on this matter: A. L. Williston, Wentworth Institute; W. T. Magruder, Ohio State University, and W. M. Thornton, University of Virginia.

Training in English Emphasized

The report of the committee on English emphasized the value of constant supervision of English throughout the course, as at the University of Cincinnati, combined with coördination between the teachers of English and of other engineering subjects, the use of technical articles, training in debates, society papers, after-dinner speeches, etc. College English, according to Miss F. A. Harbarger, of New York City, should continue throughout the four-year course, for opportunity in self-expression, with insistence upon original ideas and training in the expression of those ideas. A definite philosophy of engineering should be developed.

Discussing the paper by Prof. George R. Chatburn, past president, on the history of the society, Prof. C. J. Tilden, who has just accepted the position as head of the department of applied mechanics, Sheffield Scientific School, Yale University, pointed out the need for a history of the engineering profession which could be used to inspire the students. Some discussion of the five-year course was started, and continued at the informal smoker the same evening; the general feeling seemed to be that the five- or six-year courses should be built as integral wholes in order to be successful, that relatively few students could afford to take them (in spite of Professor Flather's statement that 75% of the students at the University of Minnesota returned for the fifth year), and that the serious question whether such courses furnished the student with value received should be considered.

Dean E. O. Leuschner, University of California, asked for full coöperation with the committee on degrees of the Association of American Universities in setting up ideals and reducing the absurdly large number of degrees now offered in American colleges. A motion for a committee of five to so cooperate was carried.

The inspection trip to the United States Naval Academy on Friday gave opportunity to learn of the work of the students, and for inspection of the experiment station. At the banquet the preceding evening President Hayford urged as a slogan "Education for service as engineers," saying that emphasis should be placed alternately on specialization and general education, practice and theory.

College Administration Weaknesses

The feature of the last session was the address by Pres. Ira N. Hollis, of Worcester Polytechnic Institute, who preceded the interesting symposium on changes in engineering courses. He defined administration as everything that interferes with giving entire time to the education of the student, regreting every year in administration which he had been forced to take up, saying that it was not a promotion when a good teacher was given an administrative position. The whole future of an institution depends upon whether the teacher has leisure to properly prepare his courses.

The problem of the 20th century, he said, is the development of efficiency in the mass of humanity, any partial efficiency is worse than useless. The pernicious effects of the desire for selling at profit were emphasized. Boards of trustees, made up of manufacturers, have the wrong attitude, judging teachers by what they do outside of their class work; he is hoping to make an investigation to prove that the present business administration is radically wrong and in need of reformation. He claimed that nothing better has been developed since 500 B.C., when the Greek college master and disciple developed the best in literature, in art and laid the foundations of modern science. Every man who studied under Agassiz at Harvard University attained to eminence.

He cited the work of a committee of the American Society of Mechanical Engineers which proposes (1) a syllabus for work of students outside of the classroom, (2) to establish a number of scholarships in various universities and (3) to appoint a traveling investigator to visit all engineering colleges. In conclusion, he claimed that the time of the teacher to improve his courses should be definitely provided, no more half-time teachers who give full time to outside work should be tolerated. The students should present and discuss subjects not in the regular class work; engineering societies should encourage the educators in the broadening of the courses.

A resolution was carried by which the president is to appoint a committee for the purpose of coöperating with the national engineering societies in the formation of local student sections, and in the work of their committees on engineering education. A special vote of thanks to President Hollis was also carried over his protest.

A paper on "Visual Industrial Courses," by Prof. C. P. Bliss, of New York University, explains the progress made in developing moving picture courses, under an advisory board headed by Charles M. Schwab, by experts in film production and college professors.

The officers for the ensuing year are: Arthur M. Greene, Rensselaer Polytechnic Institute, president; A. A. Potter, Kansas State Agricultural College, vice-president; F. P. McKibben, now at Union College, Schenectady, N. Y., vice-president; F. L. Bishop, University of Pittsburgh, secretary; W. O. Wiley, New York City, treasurer.

Returned Units of the 23rd Engineers

The War Department at Washington reports that up to June 21 the following units of the 23rd Engineers had returned to this country: Cos. A, B, C, D, E, F, G, H, I, K, L, M; wagon Cos. 1, 2, 3, 4 and 5; train Cos. 1 to 10, inclusive.

Western Society of Engineers Holds Jubilee Meetings

Observance of the 50 anniversary of this society took the form of two meetings held on June 27 and a "family" picnic at "the dunes" of the south shore of Lake Michigan on June 28. A review of the society's history and development was presented by the secretary, E. S. Nethercut. The society was organized in May, 1869, under the name of the Civil Engineers Club of the Northwest and was incorporated under the present name in 1880. Charles Paine was the founder and the call for the first meeting was sent out by R. B. Mason, who was the first president.

Military preparedness combined with systematic athletic training as an economic necessity in preventing future waste of human life and energy was the keynote of an address by Col. Henry

A. Allen, 108th Engineers, who returned recently from France. Developments in special lines were the subject of addresses at the meeting: railway engineering, Samuel O. Dunn; steam power plants, J. R. Bibbins; electric light and power, J. R. Cravath; electrical communication, F. F. Fowle; sanitary engineering, John W. Alvord. Brief addresses were made also by some of the past presidents.

New York Public Service Engineers Hold Meeting

The Rapid Transit Engineers' Association, an organization of the employees of the Public Service Commission, First District, New York, discussed ways and means of obtaining increases in salary commensurate with the rise in the cost of living at the meeting June 25, noted in these columns last week.

The meeting resolved itself into a discussion as to the advisability of affiliating with the American Federation of Labor. The result was a decision to hold another meeting on July 14 at the Municipal Building, where unionization will be debated and later submitted to a referendum before affiliating with the A. F. of L.

The association was founded as a consequence of the wrangle between the Board of Estimate, New York City, and the Public Service Commission, resulting in the peremptory dismissal of some 300 engineers on Dec. 31, 1918.

City Wages Advance in Seattle

The Board of Public Works of the City of Seattle, Wash., according to a dispatch to the New York *Times* from Ole Hanson, mayor, was recently ordered by the mayor "to ascertain how much the cost of living had advanced since the signing of the armistice and to increase the wages of our 5000 employees in proportion." In the 15 months since he became mayor Mr. Hanson states that wages have been increased from $3.50 to $4 and then from $4 to $4.50 a day. He says further:

"Our employees must and shall be paid enough to live in decency and comfort. It is neither good business nor good morals to underpay any one. The number of dollars one receives for work is not the true measure. The question is —how much flour, beef, beans, rent, shoes, etc., these dollars will purchase.

. . . . . .

"No concerted demand has been made by city employees, nor should employers wait until forced by threats of strikes, etc., to do justice to their employees. If the workmen are entitled to better wages and living condition, give it to them without asking and without pressure. . . . . .

"Peace is now signed. Let us now give our best efforts to understand, if possible, to solve this great problem. When this problem is solved the greatest cause of unrest is wiped out."

U. S. Forest Products Laboratory Gets Chicago Support

Problems now facing the U. S. Forest Products Laboratory at Madison, Wis., were considered at a meeting organized by the Chicago Association of Commerce and held at the Union League Club on June 26, with about 40 representatives of engineering and architechtural societies and varied industries. Mr. Winslow, director of the laboratory, outlined the conditions as follows: Prior to the war the laboratory had an annual appropriation from Congress of $140,000 and employed something over 80 people. During the war this appropriation was supplemented by allowances from the War and Navy departments, while the number of employees was over 500. During 1918 the allowances from these departments aggregated about $700,000, but they were to cover specific investigations and were not as beneficial to trade in general as those which were carried on under the appropriation of $140,000.

A bill which has passed both the House and Senate appropriates $175,000 for the current year, which is insufficient to maintain the present organization. In addition, the laboratory is occupying buildings loaned by the State of Wisconsin and some of these must be vacated soon for the use of the University of Wisconsin. There is present need for an additional appropriation of $300,000 to carry on necessary industrial investigations, while about $500,000 will be needed later for a permanent home. It has been suggested that the laboratory be located in Chicago.

A resolution was passed for the appointment of a committee to present the matter to the industries affected, with a view to securing appropriations sufficient for carrying on the work of the laboratory.

State Will Build Grain Elevators

State construction and ownership of grain elevators, state manufacture of flour, a state bank, official state newspaper in each county and broad powers as to other industries being taken up by the State of North Dakota were authorized last week by some 7000 majority in a referendum vote on the Non-Partisan League program adopted by the Legislature last winter.

Civil Service Examinations

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Assistant designing engineer, Naval Ordnance Plant, South Charleston, W. Va., $9.20 per diem. July 8. File applications before July 8.

Assistant inspector of engineering material (aircraft), $5.92 per diem, July 15. File applications before July 15.

Chief ship draftsman, U. S. Navy Department, $10 to $12 per diem; draftsman, grade A, $8 to $9.60 per diem; draftsman, grade B, $6 to $7.20 per diem; draftsman, grade C, $5.20 per diem. No date specified. Applications should be filed without delay.

Chief draftsman, general engineering, architectural, power plant, heating and ventilating, electrical, U. S. Navy Department, $10 to $12 per diem; draftsman, grade B, $6 to $7.20 per diem; draftsman, grade C, $5.20 per diem. No date specified. Applications should be filed without delay.

Valuation engineer, $3600-$4800 per year, and assistant valuation engineer, $2500-$3600 per year; technical staff, income-tax unit, Bureau of Internal Revenue, Treasury Department. No date specified.

Master computer, $2400 to $1800 per year, computer (Grade I) $1800 to $1400 and computer (Grade II) $1400 to $900, Ordnance Department. Applications will be received until further notice.

NGINEERING SOCIETIES

Calendar

Annual Meetings

NEW ENGLAND WATER WORKS ASSOCIATION; Tremont Temple, Boston; Sept. 30, Oct. 1-3. Albany, N. Y.

The Rochester Society of Technical Draftsmen was addressed by Leslie S. Wood, who spoke on experiences in construction work in the tropics, at the annual meeting, held June 26. The following officers were elected for the year: President, H. Hewes Sullivan; vice-president, Jesse C. Franklin; secretary, A. L. Angevine, Jr., Eastman Kodak Co.; treasurer, Arthur Hooper. Committees on employment, research, and publications were appointed.

The Pennsylvania Railroad Section of the American Association of Engineers held its first annual meeting in Pittsburgh June 28. W. C. Bolin, supervising pilot engineer, Baltimore & Ohio R.R., who has been actively engaged in connection with the hearings before the Wage Board of the United States Railroad Administration, addressed the meeting in reference to salary adjustments for railroad technical engineers. Other papers were: "What Can Be Done to Make the Railroad Engineer's Position More Attractive?" by C. V. Potter; "What Can the Railroad Section Do Toward Increasing the Professional Abilities of Its Members?" by H. M. Sommerville and C. W. Haasis;

"Should Construction Work Be Handled by the Division?" by S. O. Klinger, and "The Schedule of Salaries of the American Association of Engineers," by C. E. Adams. The following officers were elected: President, F. E. Sawyer; vice-presidents, A. L. Ware and C. V. Potter; secretary and treasurer, A. Sommerville.

The Elgin, Joliet & Eastern R.R. Section of the American Association of Engineers has been organized, with headquarters at Joliet, Ill., with the following officers: President, F. C. Stuart, signal engineer, E., J. & E. R.R.; vice-president, E. B. Scott, designing draftsman; secretary, R. D. Rogers, designer.

The Chattanooga Club of the American Association of Engineers adopted a constitution and by-laws at a meeting June 18, at which it was decided to petition the American Association of Engineers for a charter chapter. R. E. Elgen presented a paper on "The Individual's Duty to the Local Engineering Club." At the previous meeting J. L. Gotschall and H. B. Smith spoke on the purposes and aims of the club.

The Brownsville (Penn.) Club of the American Association of Engineers has been organized with the following officers: President, J. W. Boyd; vice-president, Charles L. Moore; secretary, R. G. Crippen; treasurer, M. F. Burt.

The Oregon Society of Engineers opened its new club rooms in the Tilford Building, Portland, at a meeting June 27.

The Austin (Tex.) Engineers' Club was recently organized with the following officers: President, R. G. Tyler, vice-presidents, F. E. Rightor and M. C. Welborn; secretary-treasurer, W. W. Carson, Jr.

PERSONAL NOTES

GEORGE ELLERY HALE, director, Mount Wilson Observatory, California, and foreign secretary, National Academy of Sciences, who for the last ten years has been a correspondent of the Academie des Sciences, Institut de France, has been elected Associe Etranger, taking the place of Adolph von Baeyer, declared vacant by the Academy. The number of foreign associates is limited to 12, the Americans being Simon Newcomb and Alexander Agassiz. Recently the National Research Council created and bestowed in perpetuity upon Dr. Hale the title of Honorary Chairman, in recognition of his services to the National Research Council and to science and research in assisting the Government during the war.

E. C. MILLER, for the past two years testing engineer, Kilbourne-Clarke Manufacturing Co., Seattle, has resigned to enter partnership with his father, G. M. Miller, under the firm name of G. M. Miller & Son, engineers, and will specialize in hydraulic work, with offices in the Burke Building, Seattle.

COL. H. J. LAMBE, D. S. O., Canadian Expeditionary Forces, who was previously district engineer, Canadian Department of Public Works, has returned to Canada after four years and eight months' service overseas, and has been appointed superintending engineer, Province of Ontario, with headquarters at Toronto, with supervision of river and harbor work.

CARL B. ANDREWS, chief engineer, Oahu Railway & Land Co., has resigned to become associated with the Pampanga Sugar Development Co. to lay out a railway system to serve a central sugar mill in Manila, P. I. The properties of the company are in the central valley of Luzon, about 50 miles north of Manila, and the work is expected to cover a period of about a year and a half.

J. J. STALEY and T. H. MORRIS have become associated under the firm name of Staley & Morris, engineers, with offices at 2009 Market St., Philadelphia. In addition to conducting a general engineering practice, the firm is representing F. D. Cummer & Son Co., Cleveland; Littleford Bros., Cincinnati, and Edward F. Terry Manufacturing Co., New York City.

LOUIS D. FOUGUET, who for the past year has been engaged as advisory engineer for the firm of Day & Zimmermann, supervising engineers on the construction of the Philadelphia Quartermaster Terminal for the U. S. Army, has resigned to enter private business at Fishkill, N. Y. Mr. Fouget was engineer of outfitting basins during the construction of the Hog Island shipbuilding plant of the American International Shipbuilding Co., and from 1909 to 1916 was engineer of the Sewer Division, Public Service Commission, in the construction of the dual system of subways in New York City. He was previously assistant to the chief engineer of the Public Service Commission, First District. He expects to resume professional practice in August or September.

LIEUT. COL. ELMER K. HILES, Engineers, U. S. A., who went to France as a captain in the 15th Engineers, has just returned to this country after nearly two years' service. He will join the Pittsburgh Testing Laboratory, as manager of laboratories, with headquarters at Pittsburgh.

M. W. STRAIT, Zanesville, Ohio, has been appointed city engineer of Anderson, S. C.

C. T. FELPS, previously of the 23rd Engineers, A. E. F., has been appointed division engineer, State Highway Commission of Kansas.

PAUL C. GAUGER and E. O. KORSMO have become associated in partnership under the name of the Gauger-Korsmo Construction Co., and will engage in a general engineering and construction business, with headquarters in the Central Bank Building, St. Paul.

A. B. HUNGERFORD, who was appointed city engineer of Hudson, Kans., several weeks ago, has been appointed city manager.

G. C. STANLEY, assistant county highway engineer, Cherokee County, S. C., has been appointed highway engineer succeeding N. C. Hughes, resigned.

LIEUT. COL. CLARENCE S. SMITH, 107th Engineers, U. S. A., has received his discharge from the service and will return to his work with the Bates & Rogers Construction Co., Chicago, as manager of the Cleveland office.

GEORGE H. WILLITS, for the past two years city engineer of Galveston, Tex., has resigned to become assistant to J. F. Witt, county engineer, Dallas, Tex., and will aid in carrying out the roadbuilding program for which the county recently voted $6,500,000.

RAYMOND G. SHERMAN, superintendent, Deerfield River Power Co., has been appointed superintendent of the Connecticut River Power Co., both concerns being under the management of the New England Power Co.

T. J. BIVENS, principal assistant engineer, maintenance of way, Union Pacific R.R., has been appoined assistant division engineer, Nebraska division, with headquarters at Omaha.

O. J. EIDMANN, assistant bridge engineer, State Highway Commission of Kansas, has resigned to enter the Southwestern Engineering Co., with headquarters at Hutchinson, Kans.

A. S. MCFADDEN, assistant engineer, State Highway Commission of Kansas, has resigned to enter the Kansas Engineering Co., Topeka, of which he is one of the organizers.

WINSTON E. WHEAT, junior engineer, U. S. Engineer Office, Fort Barrancas, Fla., has been appointed county engineer, Escambia County, Fla., with headquarters at Pensacola.

C. C. JONES, formerly county engineer, Watunsee and Osage counties, Kansas, has been appointed division engineer for the State Highway Commission of Kansas.

OBITUARY

WILLIAM G. FORD, consulting engineer, Brooklyn, N. Y., died in New York City, June 23, at the age of 58. He graduated from the Naval Academy at Annapolis in 1881 and later left the Navy to enter the service of the U. S. Coast and Geodetic Survey. Afterward

he entered the New York State Fisheries Department, and in 1891 was placed in charge of survey work for New York City, preparing plans for the Manhattan and Queensborough bridges, for which he made the original surveys and triangulations. He also made the surveys for the Pennsylvania R.R. Hell Gate bridge. In 1894 he organized the Second Naval Batalion of Brooklyn, and about the same time was also engaged in the organization of the Brooklyn Engineers' Club, of which he was a past president. In 1907 he was appointed to the Jamaica Bay Improvement Commission, and served for four years.

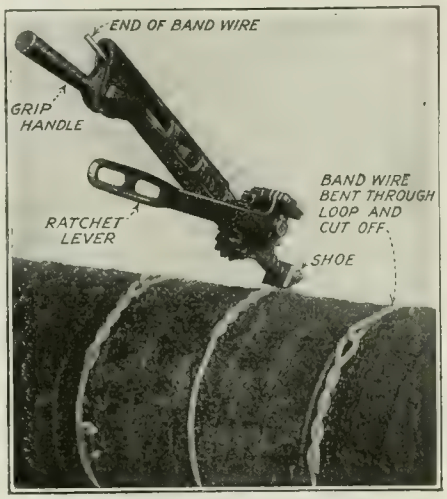
EMMETT PHILLIPS, a member of the California State Highway Commission, died in Sacramento, June 18, at the age of 52.

MAJ. JAMES NESBIT HAZELHURST, Engineers, U. S. A., who died in Brussels, Belgium, was born in 1864 and received his early education at Kirkwood Military Academy and the University of the South, Sewanee, Tenn. In 1884 Major Hazelhurst resigned as superintendent of construction of the New Orleans and Mississippi Valley Ry. to become manager of the Lookout Iron Works, Chattanooga, Tenn. In 1895 he was engineer in charge of design and construction of water-works and paving for the city of St. Augustine, Fla., later becoming chief engineer, Board of Public Works, Tampa, Fla. In 1900 he resigned to become chief engineer of the Miles Salt Co., New Orleans, and a year later was elected chief engineer of the Board of Public Works, city of Mobile, Ala., for a period of five years, after which he resigned to enter private practice in Atlanta, Ga. When this country entered the war he was commissioned as major of engineers and assigned to the staff of Maj. Gen. Leonard Wood, commander of the Department of the Southeast, as officer in charge of water-supply. In September, 1917, he was ordered overseas as principal assistant to the officer in charge of water-supply section at Chaumont, France, and was later transferred to Tours in the water-supply section. In October, 1918, he was ordered to the southeastern part of France as engineer officer in charge of construction and as water-supply officer, Base No. 6, including territory between the Riviera and the Italian frontier. Three months later he was ordered to Paris as a member of the American Commission to Negotiate Peace, assigned to the department of finance and economics of the War Damage Section, in the capacity of director of the division investigating damages to structures in Belgium.

JOHN C. FREY, contractor, Lafayette, Ind., died in that city, June 20. He had been engaged in the contracting business for some years in partnership with his brother, the late William F. Frey.

New Device Tightens and Clamps Wire Pipe-Bands

A new pipe-banding device, for use particularly in the construction and repair of wood-stave pipe, but adapted also to the repair of iron and steel pipe, is shown in the accompanying illustration. This shows the device as used to apply additional bands for reinforcing old wood-stave pipe. Leaks at decayed spots, or at the ends of new staves inserted for repair, may be stopped by



WIRE BANDS PLACED ON PIPE BY TIGHTENING DEVICE

applying a rubber gasket with a piece of wood stave or iron placed over it and held in place by one or two bands.

Galvanized steel No. 4 or No. 6 wire is used, cut to length and having one end bent and twisted to form a loop. This is placed around the pipe, the free end being passed through the loop and into the barrel of the machine, where it is clamped. With one hand holding the machine barrel, the ratchet lever is worked by the other hand to draw the wire tight. Then the machine is turned over to the opposite direction from that shown, thus clamping the wire on the loop. The machine is then released, the wire cut off and the end hammered down, which completes the operation.

This tool is the invention of R. H. Corey, general manager of the Coos Bay Water Co., Marshfield, Ore. It is manufactured by the Corey Mfg. Co., of that city.

BUSINESS NOTES

THE WATSON-STILLMAN CO., of New York City, have removed their general sales and advertising department from Aldene, N. J., to 50 Church St., New York City.

THE LIGHT RAILWAY EQUIPMENT CO., of Pittsburgh, Penn., has been acquired and is controlled by the L. B. Foster Co., of Pittsburgh, and a new factory has been completed at Holmes, near Philadelphia, Penn. The company specializes in light rails, frogs, switches, portable and industrial tracks, turntables, dump-cars, flat-cars, coal-charging cars, and manufactures industrial cars of special designs. It also acts as consulting engineer in studying transportation problems in industrial plants. H. A. Ellis is in charge of the manufacturing, while B. H. Behrens, formerly connected with the Koppel Co., will handle sales.

THE CAMP CONDUIT CO., the BARKWILL-FARR CO., and the CLEVELAND BUILDERS SUPPLY CO., all of Cleveland, Ohio, have amalgamated. The purpose of the amalgamation is to facilitate the distribution of brick made by the Camp organization.

THE LEWIS F. SHOEMAKER & CO., manufacturers of steel bridges and building, Pottstown, Penn., has changed its corporate name to Shoemaker-Satterthwait Bridge Co., effective July 1, 1919. The management and personnel remain unchanged.

THE MCMYLER-INTERSTATE CO., of Cleveland, Ohio, announces that it has opened a branch office in San Francisco, in the Merchants Exchange Bldg., with L. A. Somers in charge. Mr. Somers has had considerable experience in sales, having been sales manager of various large companies.

TRADE PUBLICATIONS

The following companies have issued trade publications:

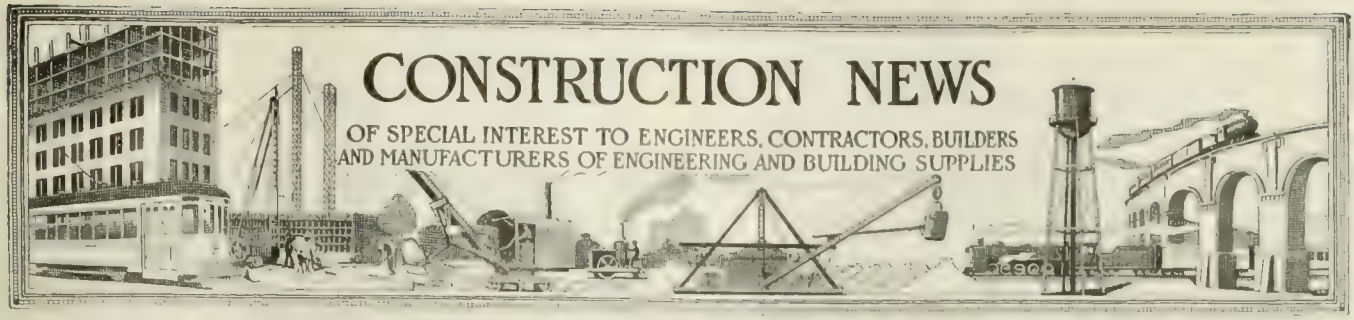
THE AUSTIN CO., industrial engineers and builders, of Cleveland, Ohio; catalog 11 x 8½ in., 63 pages, illustrated; explains the Austin method of factory construction, including engineering data and descriptions of the 10 types of Austin standard factory buildings.

THE KOEHRING MACHINE CO., Milwaukee, Wis.; folder, 7 x 8 in., 9 pp., illustrated; describes small concrete mixers equipped with light duty hoists.

THE BASTIAN-BLESSING CO., of Austin Ave. and La Salle St., Chicago, Ill.; catalog, 8 x 10 in., 36 pp., and booklet, 4 x 9 in., 10 pp.; describes a new type of welding and cutting apparatus.

THE AMERICAN TRUCK BODY CO., of Martinsville, Va.; booklet 3½ x 8½ in., 8 pages, and an illustrated folder; both describe the "Fontaine" demountable truck body.

THE R. D. NUTTAL CO., 2133 Conway Bldg., Pittsburgh, Penn.; booklet, 6 x 8¾ in., 16 pp., illustrated; describes the various kinds of gears manufactured by the company.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

Price advances are indicated by heavy type; declines by *italics*.

PIG IRON

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$30.35	$30.35
Northern Basic	27.55	27.55
Southern Ohio No. 2	28.55	28.25
NEW YORK, tidewater delivery		
2X Virginia (silicon 2.25 to 2.75)	31.90	31.90
Southern No. 2 (silicon 2.25 to 2.75)	33.95	33.95
BIRMINGHAM		
No. 2 Foundry	26.25	26.25
PHILADELPHIA		
Eastern Pa.	30.65	30.65
Virginia No. 2	30.85	30.85
Basic	30.90	30.90
Grey Forge	29.90	30.90
CHICAGO		
No. 2 Foundry Local	26.75	26.75
No. 2 Foundry Southern	*8.00*	32.00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	28.15	28.15
Basic	27.15	27.15
Bessemer	29.35	29.35

*F. o. b. furnace. †Delivered.

RAILWAY SUPPLIES

STEEL RAILS. The following quotations are per net ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c per 100 lbs. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	$45.00	$55.00	$45.00	$65.00
Standard openhearth rails	47.00	57.00	47.00	67.00
Light rails, 8 to 10 lb.	2.58½*	3.13	2.82½*	3.13
Light rails, 12 to 14 lb.	2.54*	3.09	2.79	3.09
Light rails, 25 to 45 lb.	2.45*	3.00	2.70*	3.00*

*Per 100 lb.

TRACK SUPPLIES.—The following prices are base per 100 lbs. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				San
	Current	One Year Ago	Chicago	St. Louis	Francisco
Standard spikes, ⅝-in. and larger	$3.35	$3.90	$4.27	$4.44	$5.65
Track bolts	4.35	4.90	5.17	Premium	6.65
Standard section angle bars	3.00	3.25	4.22	Premium	4.60

RAILWAY TIES.—For run sized orders, the following prices per tie hold:

		7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	$1.48	$1.33
San Francisco	Douglas Fir, Green	1.35	.96
San Francisco	Douglas Fir, Creosoted	2.72	1.92

Prices per tie at Missouri mills, St. Louis prices about 25c higher.

Untreated, A Grade, White Oak, 6x8x8		Untreated, A Grade, Red Oak, 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak (No. 4)	.80	No. 5	.87

Note.—Add 30c each for treatment.

PIPE

STEEL.—From warehouses at the places named the following discounts are allowed for steel pipe:

	New York	Chicago	St. Louis
¼ to 3 in. butt welded	47%	57½	45%
2½ to 6 in. lap welded	42%	53%	41

	New York	Chicago	St. Louis
¼ to 3 in. butt welded	31%	44%	30%
2½ to 6 in. lap welded	27½%	41%	27½%

Malleable fittings, Class B and C, from New York stock sell at 15% list prices. Cast-iron standard sizes 10% off.

CAST-IRON PIPE.—The following are prices per net ton for carload lots:

	New York						
	Current	One Month Ago	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4 in.	$57.00	$55.70	$64.35	$54.80	$48.00	$72.50	$59.10
6 in. and over	52.00	52.70	61.35	51.80	45.00	69.50	56.00

Gas pipe and 10-ft. lengths are $1 per ton extra.

CLAY DRAIN TILE.—The following prices are per 1000 lin. ft.

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35.00	$35.00	$22.50	$30.00		$33.44
4	51.00	51.00	27.00	40.00	$45.00	50.16
5	65.00	65.00	45.00	50.00	65.00	62.70
6	90.00	90.00	55.00	60.60	90.00	83.60
8	130.00	130.00	100.00	80.80	150.00	133.76

SEWER PIPE.—The following prices are in cents per foot for carload lots:

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$0.081	$0.117		$0.09	$0.09	$0.132
4	.081	.117		.09	.15	.132
5	.1215	.1755		.135	.1875	.207
6	.1215	.1755	$0.16	.135	.225	.207
8	.189	.273	.21	.21	.3375	.2875
10	.283	.4095	.29	.315	.45	.4025
12	.365	.5265	.37	.405	.60	.5175
15	.480	.702	.56	.54	.9375	.7475
18	.675	.975	.91	.875	1.275	.9775
20	.81	1.17	1.14	1.05	1.71	1.15
22	1.08	1.56	1.46	1.40		1.495
24	1.215	1.80	1.56	1.80	2.125	1.725
27	2.015	2.60	1.90	2.75		2.5875
30	2.232	2.88	2.57	3.45		3.1625
33	2.79	3.60	3.09	4.00		4.025
36	3.18	4.10	3.37	4.85		4.60

	3	5	8	12	24	36†
Boston	$0.093	$0.1395	$0.217	$0.4185	$1.395	$4.6125
St. Paul	12	18	28	45	2.00	4.75
Denver	105	16	25	425	1.57	
Seattle	15		3375	64	2.00	
Kansas City	12	18	25	50	1.50	4.60
Los Angeles	0825	1375	2475	44	1.50	
New Orleans			50 per cent. off			
Cincinnati	08	12	19	36½	1.21½	2.76½
Atlanta			34	55	2.00	
Montreal			40 per cent. off			
Winnipeg	09	16	30	50	2.00	

†4-in., 6-in., 30-in. respectively.

ROAD AND PAVING MATERIALS

ROAD OILS.—Following are prices per gallon in tank cars 8000 gal. minimum f. o. b. place named:

	Current	One Month Ago
New York, 45-65% asphalt	$0.05½	$0.05
New York, heavy asphalt	.060	.065
New York, binder	.06½	.07
New York, flux	.07½	.05
St. Louis, 40% asphalt	.06	.06
Chicago, 15-20% asphalt	.10	.10
Chicago, 100% dust layer	.11	.11
Dallas, 40-50% asphalt	.08	.09
Dallas, 60-70% asphalt	.08	.10
Dallas, 75-90% asphalt	.10	.10
San Francisco, 72-95% asphalt, net f.o.b.	2.10	2.10

ASPHALTUM.—Price per ton in two-bags and bulk in carload lots:

	Brand	Package	Bulk
New York	Texaco	$20.00	$17.00
Chicago	Mexican	33.00	31.00
San Francisco	California	17.00	13.75
Dallas	Texaco and Mexican	32.00	30.00
Seattle	D grade	23.10	
Denver	Trinidad	45.00	
Denver	California	38.00	
St. Paul	Mexican	21.00	
Kansas City	Mexican	28.00	26.00
Atlanta	Standard	24.00	19.80
New Orleans		16.50	
St. Louis	Standard	24.90	18.40

PAVING STONE.

Chicago	About 4x8x4 dressed	2.45 sq.yd.
	About 4x8x4 common	2.20 sq.yd.
San Francisco	Basalt block 4x7x8	57.75 per M.
Kansas City	Granite	2.75 sq.yd.
Boston	5-in. granite	110.00 per M.
St. Paul	Sandstone	1.75 sq.yd.
New Orleans	No. 1 granite	1.70 sq.yd.

FLAGGING.

New York	Bronx	$0.20 sq.ft.
	Manhattan	.21 sq.ft.
	Queens, 5 ft. to 8 ft.	.20 sq.ft.
	1.5x20-in. cross-walk	.70 lin.ft.
Chicago	18 in. wide	.70 lin.ft.

WOOD BLOCK PAVING.

	Size of Block	Treatment	Per Sq.Yd.
New York	3	16	$3.25
New York	4	16	3.50
Chicago	4	16	3.10
Chicago	3½	16	2.95
Chicago	City specifications		3.10
St. Louis	3½	16	2.45
St. Louis	4	16	2.70
Seattle	4	16	2.55
Kansas City	4	16	3.00
St. Paul	3		2.15
Dallas	3½	18	3.17
Dallas	4	18	3.56
New Orleans	3½	16	2.25

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu yd.

	Gravel 1½ In Current	Gravel 1½ In One Yr Ago	Gravel ¾ In Current	Gravel ¾ In One Yr Ago	Sand Current	Sand One Yr. Ago
New York	$2 00	$2 00	$2 00	$2 00	$1 25	$1 25
Denver	1 60	1 55	1 60	1 55	1 25	1 10
Chicago	1 [illegible]	1 40	[illegible]	1 40	1 35	1 30
Kansas City	2 50	2 15	3 00	3 00	1 00†	† 80
St. Louis*	1 78	1 00	1 82	1 00	1 68	1 10
Seattle	1 25	1 00	1 25	1 00	1 25	1 00
Dallas	2 00	2 00	2 00	2 00	1 50	1 40
St. Paul	1 25	1 00	1 35	1 40	60	1 50
San Francisco	1 15	1 00	1 15	1 00	1 15	1 00
Boston	1 60	2 00		2 00		1 70
New Orleans	[illegible]	[illegible]	[illegible]	[illegible]	1 20	
Cincinnati		1 15		1 15	1 35	1 15
Los Angeles	1 02	85	1 02	85	70	‡ 65
Atlanta	[illegible]‡				1 10‡	
Montreal	1 20‡				1 10‡	
Winnipeg	1 85				2 10	

*Fine white sand, Pacific and Ottawa per ton, $6 †Kaw River sand is $1.50 per yd ‡ per ton.

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.

	1½ In Current	1½ In One Year Ago	¾ In Current	¾ In One Year Ago
New York	$1 65-1 75	$1 60	$1 75-1 85	$1 75
Chicago	1 [illegible]	1 20	1 [illegible]	1 20
St. Louis	1 35	1 08	1 35	1 08
Dallas	2 25	1 51	2 25	1 55
San Francisco	1 15	1 00	1 15	1 00
Boston	3 00*	1 75	3 00*	1 75
St. Paul (lime)	1 15†	1 00	1 25	1 10
Denver		1 55	1 60	1 55
Kansas City	1 90	1 70	2 00	1 80
Seattle	1 50	1 10	1 50	1 10
Atlanta	2 25*		2.35*	
Cincinnati		1 30		1 30
Montreal	1 90*		2 15*	
Winnipeg	2 60		2 85	

*Per ton at crusher †Limestone, traprock, $1.60 and $1 80 per ton for 1½ and ¾-in., respectfully

LIME—Warehouse prices

	Hydrated per Ton Finished	Hydrated per Ton Common	Lump per 300-Lb. Barrel Finished	Lump per 300-Lb. Barrel Common
New York	$17 50	$14 50	$2 90	$2 65
Kansas City	22 00	21 00	2 30*	2 20*
Chicago	18 00	17 50	1 80*	1 10*
St. Louis	22 00	18 00		1 75*
Boston	22 75	18 75	3.75	3.40
Seattle	30 00		2.75†	
San Francisco	19 00			2 00*
St. Paul	23 00	18 00	1.50*	1 40*
New Orleans		2 00		2 20
Atlanta		1 90*	1.75*	1 75*
Cincinnati	12 95	11 95	10.70‡	2.50*
Denver	20 00	20 00		15 00‡
Montreal	20 00		15.00‡	
Winnipeg	16 35		.45 (bu.)	2.40

* 200-lb barrels † Per 180-lb barrel. ‡ Per ton.
NOTE—Refund of 10c per barrel

NATURAL CEMENT—Price to dealers for 500 bbl. or over, f.o.b., exclusive of bags

St. Paul (Austin)	$1 45
Kansas City (Ft. Scott)	1 40
New Orleans	2 52

PORTLAND CEMENT—Current prices are for barrels in carload lots, without bags, to contractors

	Current	One Month Ago Without Bags	One Year Ago With Bags
New York	$2 30	$2 30	$2 59
Jersey City	2 27	2 27	2 50
Boston	2 42	2 42	2 81
Chicago	2 00	2 00	2 45
Pittsburgh	2 05	2 05	2 45
Cleveland	2 32	2 32	2 62
Detroit	2 08	2.08	2.68
Indianapolis	2.27	2.27	2.62
Toledo	2 12	2 12	2 62
Milwaukee	2 11	2 11	2 56
Duluth	2 10	2 10	2 60
Peoria	2 12	2 12	2 56
Cedar Rapids	2 18	2 18	2 68
Davenport	2 14	2 14	2 64
St. Louis	2 20	2 20	2 66
San Francisco	2 40	2 40	2 80
New Orleans	2 36	2 44	
St. Paul	2 20	2 20	2 68
Denver	[illegible]	2 67	2 99
Kansas City	2 26	2.26	2.62
Seattle	2 53	2 53	2 83
Dallas	2 03	2 03	2 60
Atlanta	2 60	2 60	
Cincinnati	2 90		2 41
Los Angeles	2 78	2 78	2 30
Montreal	2 50	2 50	
Winnipeg	3 40		

NOTE—Bag charge is generally 15c each.

TRIANGLE MESH—Price per 100 sq. ft. in carload lots

PLAIN 4-INCH x 4-INCH MESH

Style Number	Steel Area Square Inches per Ft.	Width	Pittsburgh	New York	Chicago	St. Louis	Dallas	San Francisco
032	0 032		$0 92	$1 16	$0 98	$0 99	$1 13	$1 32
049	0 049		1 18	1 48	1 26	1 26	1 43	1 67
068	0 068		1 44	1 86	1 53	1 56	1 79	2 06
093	0 093		1 85	2 39	1 97	2 00	2 41	2 65
126	0 126		2 28	3 02	2 43	2 47	2 92	3 28
153	0 153		2 72	3 59	2 90	2 95	3 48	3 93
180	0 180		3 12	4 13	3 33	3 39	3 99	
245	0 245		4 12	5 44	4 40	4 47	5 27	
287	0 287		4 76	6 29	5 08	5 16	6 10	6 86
336	0 336		5 52	7 30	5 89	5 99	7 06	
395	0 395		6 40	8 45	6 83	6 94	8 19	

PAVING

036P	0 036	$0 71	$0 92	$0.76	$1.77	$0.80	. .
053P	0 053	1 00	1 28	1 06	1.08	1.12	. .
072P	0 072	1 26	1.66	1 34	1.37	1.46	.
097P	0 097	1.62	2.12	1.73	1.76	1.88	
049R	0 049	1 00	1 28	1 06	1.08	1 12	.
067R	0 067	1 26	1.65	1 4	1.37	1 46	
089R	0 089	1 62	3 11	1 73	1 76	1 88	

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in width in rolls 150-, 200- and 300-ft lengths Galvanized is about 10% higher

EXPANDED METAL LATH—Prices in carload lots per 100 yd for painted are as follows:

Gage	Weight	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
27	233	$29 10	$34 07	$[illegible]	$29.00	$34 00	$33.00
26	250	30 45	35 23	[illegible]	30 00	35.00	35 00
25	300	31 90	36 51	[illegible]	....	37.00	37.00
24	340	33 50	37 73	[illegible]	33.00	40.25	40 00
22	450	36 60	40 48		....	.....	42.00

About 10% additional for smaller quantities.

BARS, CONCRETE REINFORCING—Following quotations are per 100 lb.:

ROLLED FROM BILLETS

In.	Mill Pittsburgh	New York Current	New York One Year Ago	Chicago	St. Louis	Dallas	San Francisco
½ and larger	$2.35	$3 37	$4 14½	$3 37	$3 69	$4.50	$4.60
⅝	2 40	3 42	4 19½	3 42	3.74	4.55	4 65
¾	2 45	3 47	4 24½	3.47	3 79	4.60	4.70
⅞	2 60	3 62	4 39½	3 62	4 04	4.75	4.85
1	2 85	3 87	4 64½	4 87	4 19	4 95	5 10

Twisted bars cut to length take extra of 27½c per 100 lb. Extra on deformed bars, uncut, 7½c

ROLLED FROM RAILS

	Chicago	St. Louis	Dallas
½ in. and larger	$3 45	$3 45	$4 55
⅝	3 50	3 50	4 70
¾	3 55	3 55	..

	Chicago	St. Louis	Dallas
⅞	$3 70	$3.70	.
1	3.95	.....	

BRICK—To contractors price per 1000 in cargo or carload lots is as follows:

	Common Current	Common One Month Ago	Common One Year Ago	Paving Brick	Paving Block
New York	$15 00	$15 00	$11.50	No Quotations	
Chicago	12 00	12 00	11.00	.....	.....
St. Louis, selected	16 00*	16 00	15.00	$26.00	.....
St. Louis, salmon	10 00	10.00	9.00	.....	.....
Denver	12 00†	12 00†	9.50	.....	.....
Dallas	18 00	18 00	10.50	26.50	.....
San Francisco	12 50	12 50	12.00	.....	.....
Boston	18 00	18 00	15.00	30.00	45.50
New Orleans	17 50	16 25	.....	18.50	.....
St. Paul	10 25	10 25	9.00	30.00	36.50
Kansas City	15 00	15 00	11.00	42.50	.....
Seattle	15 00	15 00	12.00	36.00	.....
Cincinnati	16.00		12.00	.....	.....
Atlanta	15 00	15 00	.....	40 00	.....
Los Angeles	12 50	12 50	7.00	.....	.....
Montreal	15 00	14.50	.....	80.00	.....
Winnipeg	12 00	.....	.....	.....	.....

* Hard brick, $14 † Salmon is $10 in Denver.

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12	$0 11475*	$0 10125	$0 08	$0 08	$0 1125	$0.1072	.....
6x12x12	.153*	13500	112	.105	.15	.1474	$0.1512
8x12x12	.204*	.	144	.15	.....	.2010	1944
10x12x12	.	.	168	.173	.....	.2546	.2268
12x12x12	.	.	.208	208	.....	.3082	.2916

*Delivered below 72nd St.

	4x12x12	8x12x12	12x12x12
Boston	$0 15	$0 25	$0 30
St. Paul	056	.11	162
Cincinnati	0645	.12075	.177
Kansas City	0786	.15	.205
Denver	125	.18	.25
Seattle	09	.175	30
Atlanta	10	.13	21
Los Angeles	.082	.154	.236
New Orleans	165	.22	.325

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh, together with quotations per 100 lb. from warehouses at places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in	$2 45	$3 47	$4 24½	$3 54	$3 47	$4 45	$4 50
Channels, 3 to 15 in	2 45	3 47	4 24½	3 54	3 47	4 45	4 50
Angles, 3 to 6 in., ¼ in. thick	2 45	3 47	4 24½	3 54	3 47	4 45	4 50
Tees, 3 in. and larger	2 45	3 52	4 24½	3 54	3 47	4 70	4 50
Plates	2 66	3 67	4 49½	3 54	3 67	4 90	4 70

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	New York Current	New York One Yr Ago	Chicago	St. Louis	San Francisco	Dallas
½ in. and larger	$4 20	8½ 22	$6 14½	$4.72	$4 79	$6 05	$5 90

CONE HEAD BOILER

½ in. and larger	4 30	½ 87	6 24½	4 82	4 89	6 15	6 00
⅝ and ¾	4 45	½ 02	6 39½	4 97	5 04	6 30	6 15
⅞ and 1	4 70	[illegible]	6 74½	5 32	5 29	6 65	6 50

Lengths shorter than 1 in. take an extra of 50c Lengths between 1 in. and 2 in. take an extra of 25c

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.
No. 1 grade	$1 45	$1 70	$1 80	$2 05	$2 15	$2 40
No. 2 grade	1 30	1 55	1 60	1 85	1 90	2 15

Asbestos asphalt-saturated felt (14 lb. per square) costs $156 per 100 lb

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.00 per roll in carload lots and $2 25 for smaller quantities

Shingles, red and green slate finish, cost $5.00 per square in carloads; $5 25 in smaller quantities, in Philadelphia

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago

	Carload Lots		Less Than Carload Lots	
	N. Y.	Chicago	N. Y.	Chicago
Tar felt (14 lb. per square of 100 sq. ft.)	$60 00	$60 50	$61 00	$61 50
Tar pitche (in 400-lb. bbls.)	21 00	18 00	22 00	19 00
Asphalt pitch (in barrels)	33 00	34 00	37 50	37 50
Asphalt felt	[illegible]	[illegible]	[illegible]	[illegible]

SHEETS—Quotations are in cents per pound in various cities for [illegible] also the base quotations from mill

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Year Ago
No. 10	3 55	4 64	4 57	5 80	4 67	5 [illegible]
No. 12	3 60	4 69	4 62	5 75	4 [illegible]	5 [illegible]
No. 14	3 65	4.74	4.67	5 90	4 67	5 [illegible]
Black						
Nos. 18 and 20	4 15	5 24	5 17	6 75	5 17	6 [illegible]
*Nos. 22 and 24	4 20	5 29	5 22	6 80	5 22	6 [illegible]
*No. 26	4 25	5.34	5 27	6 95	5 27	6 [illegible]
*No. 28	4 35	5.44	5 37	7 05	5 37	6 [illegible]
Galvanized						
No. 10	4 70	5 79	5 72		5 50	6 [illegible]
No. 12	4 80	5 89	5 82	7 30	5 [illegible]	6 [illegible]
No. 14	4 80	5 89	5 82	7 30	5 60	6 [illegible]
Nos. 18 and 20	5 20	6 19	6 12	7 60	5 90	7 [illegible]
Nos. 22 and 24	5 25	6 34	6 25	7 75	6 00	7 [illegible]
*No. 26	5.40	6 49	6 42	7 90	6 20	7 [illegible]
*No. 28	5.70	6 79	6 72	8 20	6 50	7 [illegible]

*For painted corrugated sheets add 30c. per 1000 lb. for 25 to 28 gage, 2c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

LINSEED OIL—These prices are per gallon

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel	$1 90	$1 61	$2 00	$1 70	$2 10	$1 66
5-gal. cans	2 03	1 71	2 25	1 85	2 40	1 86

WHITE AND RED LEAD—Base price per pound

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current 1 Yr. Ago Dry and In Oil Current	White Current 1 Yr. Ago Dry and In Oil 1 Yr. Ago
100-lb. keg	13 00	14 50	11 25	11 00	13 00	10 50
25 and 50-lb. kegs	13 25	14 75	11 50	11 25	13 25	10 75
12½-lb. keg	13 50	15 00	11 75	11 50	13 50	11 00
5-lb. cans	15 00	16 50	13 25	13 00	15 00	13 00
1-lb. cans	16 00	17 50	13 25	13 00	16 00	13 00

500 lb. lots less 10% discount. 2000 lb. lots less 10-2½% discount.

LUMBER

San Francisco—Prices of rough Douglas fir No. 1 common, in more than carload lots

	Lumber Prices in Yards at San Francisco 6-8-12 and 14 Ft.	10-16-18 and 20 Ft.	25 to 32
3x3 and 4	$29 50	$30 00	$33 00
3x6 and 8	30 50	31 00	34 00
4x4–6 and 8	31 00	32 00	35 00
3x10 and 12	31 00	32 00	35 00
3x14	31 50	32 50	35 50
4x10 and 12	31 00	32 00	35 00
4x14	32 00	33 00	36 00

	24 Ft. and Under	25 to 32 Ft.	33 to 40 Ft.
6x10	$30 50	$32 50	$33 50
6x14	32 00	34 00	35 00
8x10	30 50	32 50	35 50
8x14	32 00	34 00	35 00

New York, Chicago and St. Louis

	Southern Pine New York* 20 Ft. and Under	New York* 22-24 Ft.	Chicago 20 Ft. and Under	Chicago 22-24 Ft.	Yellow Fir St. Louis 20 Ft. and Under	St. Louis 22-24 Ft.
3x 4 to 8x 8	$43 00	$44 00	$41 00	$42 00	$37 00	$39 00
3x10 to 10x10	46 00	47 00	42 50	43 50	40 50	42 00
3x12 to 12x12	49 00	50 00	47 00	48 00	42 00	43 50
3x14 to 14x14	52 00	53 00	52 00	53 00	47 00	49 00
3x16 to 16x16	59 00	60 00	55 00	56 00	50 00	52 00
3x18 to 18x18	64 00	65 00	59 00	60 00	54 00	55 00
4x20 to 20x20	74 00	75 00	65 00	66 00		

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For non-bantable add $2 for sizes 10 x 10 and under. For price add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In. x 20-Ft. and Under—Fir	Hemlock	Spruce	12 x 12 In. 20 Ft. and Under—Fir	Fir
Boston	$50 00	$49 00	$48 00	$48 00	$50 00
Cincinnati	40 00	45 00	41 00	46 00	48 00
Kansas City	42 50	45 25	45 25	45 25	47 50	46 25
Seattle	21 50	21 50	21 50	21 50	21 50	21 50
New Orleans	40 00			45 00		
St. Paul	50 00	53 00	46 00	46 00	57 00	53 00
Denver		42 00	42 00	42 00		43 00
Atlanta	48 00	53 00	48 00	58 00	58 00	63 00
Montreal						B.C. 65 00
Winnipeg	38 00	38 00	38 00	38 00	38 00	38 00

	1-In. Rough, 10 In. x 16 Ft. and Under—Fir	Hemlock	2-In. T. and G. 10 In. x 16 Ft.—Fir	Fir
Boston	$50 00	$50 00	$48 00	$50 00	$50 00
Cincinnati	41 00	43 00	41 00	39 00	41 00
Kansas City	58 75	62 75	62 75	60 75	69 00
Seattle	21 50	21 50	21 50	21 50	21 50
New Orleans	40 00			50 00	
St. Paul	51 00	47 00	40 00	51 00	46 00
Denver		43 50	43 50		40 00
Atlanta	37 50	55 00		45 00	55 00
Los Angeles		36 00	35 00		
Montreal	60 00	58 00	44 00	60 00	
Winnipeg	105 00	105 00			

Dallas—Yellow pine. Price per M.

2x4 to 2x12—12, 14 and 16	$45 00
2x4 to 2x12—10, 18 and 20	47 50
2x4 to 2x12—22 and 24	50 00
4x4, 4x6, 6x6, 8x8 and 3x8	52 50
8x10, 10x10 and 3x10	
2x12 and 3x12	57 50

NAILS—Trade discount quotations are per keg for [illegible]

	Mill	St. Louis	Chicago	San Francisco	Dallas
[illegible]	$4 25	$4 60	$4 60	[illegible]	$5 00
[illegible]	4 25	[illegible]	[illegible]	6 40	6 40

FREIGHT RATES

On finished steel products in the [illegible] territory, including plain and fabricated structural material, bar iron and bar steel, pipe, [illegible] and galvanized sheets, nails, wire, [illegible] and plain wire products, the following rates are in effect from the mill [illegible] to the points named in cents per 100 lb.:

[illegible]	$ [illegible]	New Orleans	$0 [illegible]
[illegible]	12	New York	[illegible]
[illegible]	[illegible]	Pacific Coast (10 cents)	1 [illegible]
[illegible]	[illegible]	Pennsylvania	[illegible]
[illegible]	17	St. Louis	[illegible]
[illegible]	22	St. Paul	[illegible]
[illegible]	[illegible]		

Add 5c. transportation tax. * Minimum carload 80,000 lb.

Contractors' Miscellaneous Supplies

STEEL SHEET PILING—The following prices in [illegible] per 100 lb. f.o.b. Pittsburgh, with [illegible] of one and one year ago:

Current	One Month Ago	One Year Ago
$2 35	$2 35	$4

WIRE ROPE—Discounts from list prices on various grades of bright and galvanized iron and steel wire rope:

	New York and St. Louis
Crucible cast steel plow	[illegible]
Crucible cast steel [illegible]	75
Bright [illegible] steel	35
Bright iron steel	22½
Extra [illegible] and iron [illegible]	5

San Francisco—Galvanized less 5%; bright, less 25% off.
Chicago—Galvanized 50-2½% off; bright [illegible]

MANILA ROPE—For rope smaller than [illegible] the price is 1c. to 2c. extra, while for [illegible] than one inch there is an extra charge of 1c. The minimum length per piece is as follows: [illegible] ft., 8 in., 6 ft., 4 in., 4 ft., [illegible] 2 in. 10 ft., 1 in. 2 ft. 4 in. Following is price per pound for [illegible] carload lots of 1200 lb. each:

Boston	$0 26	Kansas City	$0 28
New York	27	New Orleans	27½
Cincinnati	29	Los Angeles	26
Chicago	26½	Seattle	27
St. Paul	28	St. Louis	26
San Francisco	26	Montreal	30
Atlanta	28	Winnipeg	33½
Denver	29½		

EXPLOSIVES—Price per pound at distributing point in small lots and price per 25 lb. keg for black powder:

	Less Freight 20%	Gelatin 40%	60%	80%	Black Powder
New York		$0 27	$0 30		$2 40
Boston	$ 2225	2425	2675	$ 3100	2 40
Cincinnati	18 75	21 25	25 25		2 35
Kansas City	19	2375	2625	30	2 45
New Orleans	222	241	261	301	
Seattle	1425	1650	225	315	1 90
Chicago	1875	2125	2350	2975	2 15
St. Paul	19	2375	2675		2 45
St. Louis	19	234	254	30	2 35
Denver	1775	22	245	2875	2 45
Dallas	189	225	288	342	2 75
Atlanta	20	225	245		2 45

POLES—Prices per pole delivered New York. Cut prices as follows:

[illegible] butts, [illegible] length 26-30 ft.	$9 00
[illegible] butts, [illegible] length 30-40 ft.	11 50
[illegible] butts, [illegible] length 41-50 ft.	12 50
[illegible] butts, [illegible] length 51-60 ft.	21 00
[illegible] butts, [illegible] length 61-71 ft.	24 50

Note—As the [illegible] it is impossible to give accurate prices on poles. The above are only [illegible]

	Dallas
6-in. x 20-ft.	$4 60
6-in. x 40-ft.	7 10
8-in. x 30-ft.	8 45
8-in. x 45-ft.	10 58

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges:

	New York	Chicago	St. Louis
No. 1 cast and wrought	$45 50	$17 00	$18 50
Steel plate	15 50	17 00	17 00
No. 1 machinery cast	21 50	21 50	23 50
Miscellaneous turnings	9 00	6 65	9 00
Cast borings	9 50	9 50	9 00
Iron and steel couplings	14 00	16 00	15 50

SHIP SPIKES—Current prices per 100 lb.:

	San Francisco Coast	San Francisco Black	Seattle Black
[illegible]	$8 50	$8 50	$8 [illegible]
[illegible]	7 85	7 85	8 25
[illegible]	9 70	7 70	8 50

Discount from $1.50 per 100 lb.

COMMON LABOR IN UNITED STATES AND CANADA

	Cents per Hour	Remarks
[illegible]	35	[illegible]
[illegible]	30 40	[illegible]
[illegible]	45	[illegible]
[illegible]	45 50	[illegible]
[illegible]	70	[illegible]
[illegible]	35	[illegible]
[illegible]	30	[illegible]
[illegible]	50	[illegible]
[illegible]	57½	[illegible]
[illegible]	60½	[illegible]
[illegible]	50	[illegible]

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
July 7	Brainerd, Minn.	June 26
July 7	Price, Utah	July 3
July 14	Mt. Pleasant, Utah	July 3
July 15	Denton, Mont.	June 19
July 16	Milwaukee, Wis.	June 26
July 16	Decorah, Ia. Adv. June 12 and 19	June 12
July 25	Akron, O. Adv. July 3.	July 3
Aug. 1	Litchfield, Minn.	July 3

SEWERS

July 7	Muskegon, Mich. Adv. July 3.	July 3
July 7	St. Paul, Minn.	
July 8	Clayton, Mo.	July 3
July 8	Leesburg, Fla	July 3
July 9	Dearborn, Mich. Adv. June 26.	June 26
July 10	Marysville, Kan.	July 3
July 10	Milwaukee, Wis.	June 26
July 14	North Mankota, Minn. Adv. June 19.	June 19
July 15	Newman Grove, Neb.	July 3
July 16	Milaca, Minn.	June 19
Aug. 19	Kansas City, Mo Adv. July 3.	July 3

BRIDGES

July 7	McAlester, Okla. Adv. June 12 and 19.	June 19
July 7	Monroe, Ga.	June 19
July 7	Camden, N. J. Adv. June 26.	June 26
July 7	Adna, Wash.	June 26
July 7	Walnut Cove, N. C.	June 26
July 7	Miles City, Mont.	June 26
July 7	Duluth, Minn.	June 26
July 8	Reading, Pa. Adv. June 26.	June 26
July 10	Adrian, Mich Adv. June 26.	June 26
July 10	Riparius, N. Y. Adv. June 19.	June 19
July 14	Princeton, Minn.	June 19
July 14	Annapolis Royal, N. S.	July 3
July 15	Brookston, Minn.	June 26
July 15	Cedar Rapids, Mich Adv. June 19.	June 19
July 17	Elmira, N. Y. Adv. June 19.	June 19
July 29	Jacksonville, Fla	July 3
Aug. 4	Little Rock, Ark	July 3
Aug. 19	Statesboro, Ga.	July 3
Aug. 20	Swainsboro, Ga.	July 3

STREETS AND ROADS

July 5	Omaha, Neb.	June 12
July 5	Brunswick, Ga. Adv. June 5 and 12.	June 12
July 5	Ford, Mich.	June 26
July 6	Montreal, Que.	June 26
July 7	Port Angeles, Wash.	June 26
July 7	Alexandria, Pa.	June 26
July 7	Indianapolis Ind.	June 5
July 7	Leesburg, Fla.	June 19
July 7	Sanford Fla.	June 19
July 7	Albert Lea, Minn.	June 19
July 7	Woodstown, N. J. Adv. June 19.	June 19
July 7	Riverside, Cal.	June 19
July 7	Oakland, Cal.	June 26
July 7	Coffeeville, Miss.	June 26
July 7	Ortonville Minn.	June 26
July 7	Poteau, Okla.	June 26
July 7	Ellsworth, Kan.	June 26
July 7	Washington	June 26
July 7	Bay City, Mich. Adv. July 3.	July 3
July 7	Harrisburg, Pa.	July 3
July 7	Pleasant Hill, Mo.	July 3
July 7	Abeville, S. C.	July 3
July 7	Louisiana	
July 8	Fairfield, Tex.	July 3
July 8	Bronson, Fla.	June 26
July 8	Nashville, N. C. Adv. June 26.	June 26
July 8	Jersey City, N. J.	June 26
July 8	Fayetteville, Ark.	June 26
July 8	Omaha, Neb.	June 26
July 8	St. Louis, Mo.	June 26
July 8	Pipestone, Minn.	June 19
July 8	Harrisonville, W. Va.	June 19
July 8	Kingston, N. C.	June 19
July 8	Elkins, Va. Adv. June 12 and 19.	June 12
July 8	Geneva, N. Y. Adv. July 3.	July 3
July 9	Mantorville, Minn.	July 3
July 9	Halifax, N. S.	July 3
July 9	Wisconsin	July 3
July 9	Florida	July 3
July 9	Delaware	June 19
July 9	New Jersey	June 26
July 9	Springfield, Ill.	June 26
July 9	Palmerton, Pa. Adv. June 26.	June 26
July 9	Illinois	June 26
July 10	Tennessee Adv. June 26.	June 26
July 10	Georgetown, Del.	July 3
July 10	Indianola, Miss.	July 3
July 10	Port Huron, Mich.	July 3
July 10	Logan, Utah	July 3
July 10	Utah	July 3
July 10	Excelsior Springs, Mo.	July 3
July 11	Ohio	July 3
July 11	New Jersey	June 26
July 11	Appleton, Minn.	June 26
July 12	Racine, Wis.	June 26
July 12	Jamestown, N. D.	July 3
July 12	Windsor, Ont.	July 3
July 13	Galt, Ont.	July 3
July 14	Grand Rapids, Minn.	June 26
July 14	Fayetteville, W. Va.	June 26
July 14	Ivanhoe, Minn.	June 26
July 14	Cambridge, Minn.	June 26
July 14	Worthington, Minn.	June 26
July 14	Ebensburg, Pa. Adv. June 26 and July 3.	July 3
July 14	Hollidaysburg, Pa. Adv. July 3.	July 3
July 14	Washington	July 3
July 15	St. Louis, Mo.	June 26
July 15	Vermont	July 3
July 15	Huntington, W. Va.	July 3
July 15	Rochester, Minn.	July 3
July 16	Faribault, Minn. Adv. July 3.	July 3
July 16	Indianapolis, Ind.	July 3
July 16	Springfield, O.	June 19
July 17	Red Wing, Minn.	July 3
July 17	Boston, Mass.	July 3
July 17	Pittsburgh, Pa.	
July 19	Brainerd, Minn.	July 3
July 20	Litchfield, Minn.	July 3
July 22	Rome, Ga.	July 3
July 25	St Louis, Mo	June 26
July 25	Kent, O. Adv. July 3.	July 3
July 30	California	June 19

EXCAVATION AND DREDGING

July 10	Provo, Utah	July 3
July 15	Wapello, Ia. Adv. June 26.	June 26
July 15	Marshalltown, Ia. Adv. June 26.	June 26
Aug. 6	Kenton, O.	July 3

INDUSTRIAL WORKS

July 7	Sheboygan, Wis.	July 3
July 7	New York, N. Y.	July 3
July 8	Fond du lac, Wis	July 3
July 9	Los Angeles, Cal	June 19
July 15	Flushing, N. Y.	June 19
July 15	London, Ont.	July 3
July 20	Omaha, Neb.	July 3
Aug. 1	Duluth, Minn	June 26
Aug. 1	Hastings, Minn.	May 15

BUILDINGS

July 4	West Bethlehem, Pa.	June 12
July 5	Mountain Lake, Minn.	June 19
July 7	Brooklyn, N. Y.	June 26
July 7	Sanitorium, N. C.	June 26
July 7	Chetek, Wis.	July 3
July 7	New York, N. Y.	July 3
July 7	Woodbury, N. J.	July 3
July 7	San Diego, Cal.	July 3
July 7	Brooklyn, N. Y.	July 3
July 7	Fredericksburg, Va	July 3
July 8	Montclair, N. J. Adv. July 3.	July 3
July 8	Wichita, Kan.	July 3
July 8	Philadelphia, Pa	
July 8	Palatka, Fla.	June 26
July 8	Wellington, Kan.	June 26
July 9	Duluth, Minn.	June 26
July 9	Three Rivers, Que.	June 26
July 10	Port Jervis, N. Y.	June 26
July 10	Blooming Prairie, Minn.	June 19
July 10	Watertown, Conn.	July 3
July 11	Merced, Cal.	June 26
July 11	Gunnison, Colo.	July 3
July 11	Decatur, Mich.	July 3
July 15	Crookston, Minn.	July 3
July 15	Fraserville, Que.	June 12
July 15	Greybull, Wyo.	June 26
July 15	Brainerd, Minn.	June 26
July 17	Malone, N. Y.	June 26
July 17	Thiells, N. Y. Adv. July 3.	July 3
July 18	Ivanhoe, Minn.	July 3
July 23	Montmatre, Sask.	July 3
July 23	Lorain, O.	June 26
July 23	Mechanicsburg, O.	July 3
July 24	Winona, Minn.	July 3
July 24	Minneapolis, Minn.	July 3
July 24	Bemidji, Minn.	July 3
July 29	Utica, N. Y. Adv. June 26 and July 3.	July 3
July 30	Austin, Minn.	June 26
Aug. 1	Gastonia, N. C.	June 26
Aug. 1	Kenosha, Wis.	May 15
Aug. 1	Virginia, Minn.	June 19
Aug. 1	Duluth, Minn.	July 3
Aug. 5	Willmar, Minn.	July 3
Aug. 24	St. Paul, Minn.	July 3

FEDERAL GOVERNMENT WORK

July 7	Steel—Philadelphia, Pa. Adv. June 5, 12 and 19.	June 5
July 7	Paving Material—Galveston, Tex.	June 26
July 7	Locks and Dam—Pittsburgh, Pa Adv. June 12 and 19.	June 12
July 7	Gas Mains — Stapleton, N. Y. Adv. June 19.	June 19
July 8	Gate—Operating Machinery —Cincinnati, O. Adv. June 12 and 19.	June 12
July 8	Post Office — Pittsburg, Tex.	June 12
July 9	Post Office — Montevideo, Minn. Adv. June 5, 12 and 19.	June 12
July 10	Post Office—Vinton, Ia.	June 19
July 15	Officers Quarters—Washington, D. C.	June 26
July 15	Officers Quarters—Wilmington, N. C.	June 26
July 16	School—Rapid City, S. D.	June 26
July 18	Silt Diversion Works—Los Angeles, Cal. Adv. June 19	June 19
July 21	Dredging—New York, N. Y. Adv. June 26.	June 26
July 21	Dredging Savannah, Ga. Adv. June 26	June 26
July 21	Dredging Baltimore, Md. Adv. June 26.	June 26
July 22	Dredging—Sault Ste Marie, Mich Adv. June 26.	June 26
July 22	Post Office Andalusia, Ala	June 26
July 23	Cottage—Sorrento, Idaho.	June 26
July 23	Bridges Leupp, Ariz.	June 26
July 23	Removing Wreck — New York N. Y. Adv. June 26.	June 26
July 24	Jetty—Jacksonville, Fla. Adv. June 26.	June 26
July 24	Coal—Jacksonville, Fla. Adv. June 26.	June 26
July 25	Dredging — Philadelphia, Pa. Adv. June 26.	June 26
July 28	Stone Cincinnati, O. Adv. July 3.	July 3
July 28	Dredging and Filling—San Juan, P. R. Adv. July 3.	July 3
July 31	Storehouse — Wilmington, Del. Adv. July 3.	July 3
Aug 26	Dredging—Honolulu, H. T. Adv. June 26.	June 26

MISCELLANEOUS

July 7	Lighthouse Tower—Ottawa, Ont.	June 26
July 7	Incinerator—Sedalia, Mo.	June 26
July 7	Revetment—Toledo, O.	July 3
July 7	Cast Iron Pipe—Providence, R. I.	July 3
July 8	Cast Iron Pipe—Jersey City, N. J.	June 26
July 8	Masons Materials—Jersey City, N. J.	June 26
July 8	Water Gate-Boxes and Covers and Sewer Manholes—Furnaces and Boxes, Jersey City, N. J.	July 3
July 9	Wharf—Naramata, B. C.	June 26
July 11	Lift Gates—Los Angeles, Cal	June 26
July 11	Wharf—Thessalon, Ont.	June 26
July 12	Copper Cable, etc., Winnipeg, Man.	July 3
July 14	Road Gravel—Cambridge, Mass Adv. June 12 and 19.	June 26
July 14	Fishway—Lawrence, Mass. Adv. July 3.	July 3
July 15	Wharf — Connaught Sta., Ont	July 3
July 15	Freight and Trailers, etc.—New York, N. Y.	June 19
July 15	Wharf—Ottawa, Ont.	June 26
July 16	Pumping Engine—Milwaukee, Wis	June 26
July 24	Wharf—Berthier, Que.	July 3

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Md., Baltimore—Brooklyn Center Co., 1025 Munsey Bldg., having plans prepared laying 4000 ft. 6 and 8 in. c.i. pipe in Brooklyn (city's new annex), to connect with city water system. About $8000. J. S. Howard, 12 East Lexington St., engr.

S. C., Batesburg—City election July 11 to vote on $60,000 bonds to extend waterworks system. Engineer not selected.

S. C., Orangeburg—City plans election to vote on $100,000 bonds to lay 4.1 mi. water mains in various streets. J. W. Hawes, city engr.

Ga., Royston—City having plans prepared building waterworks and sewerage systems. About $15,000. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, engrs.

Fla., Ft. Myers—City election in August to vote on $45,000 bonds to extend water mains.

Fla., Marianna—See "Streets and Roads."

Ga., Ebenezer—City plans to build waterworks system. About $50,000

Neb., Lincoln—City having plans prepared by G. W. Bates, city engr., for rein.-con. reservoir, 2,000,000 gal. capacity About $35,000.

Okla., Okmulgee—City having plans prepared by Burns & McDonald, engrs., Interstate Bldg., Kansas City, Mo., improving waterworks including construction of dam and installation of equipment.

Ont., Acton—Town engaged James, Loudon & Hertzberg, engrs., 36 Toronto St., Toronto, to make surveys and submit preliminary report for complete new waterworks system. About $90,000.

BIDS DESIRED

N. Y., Thiells—See "Buildings."

O., Akron—Until July 25, by H. S. Morse, dir. pub. serv., Delaware Bldg., building elevated concrete water tank, 150,000 gal. capacity, supported by tower 70 ft. high to low water line; bids will be received on alternate designs shown on plans as follows: "A" monolithic tower and tank of rein.-con., "B" steel tower and tank enclosed in rein.-con. shell. H. H. Frost, supt. water works; advertised in this issue.

Minn., Litchfield Until Aug. 1, by City Council, building addition to waterworks system and sewers About $55,000. L. P. Wolff, 1001 Guardian Life Bldg., St. Paul, engr.

Utah, Mt. Pleasant—Until July 14, by A. Millson, city recdr., furnishing and laying 17,500 ft. 5 in. cement pipe, 16,000 ft. 6 in. wooden pipe and 33,000 lin.ft. trenching. Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs.

Utah, Price—Until July 7 by M. Gilmer, city recdr., furnishing and laying 24.5 mi. cement, wood and c. i. water pipes. Jones & Olson, Price, engrs. Noted May 22.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., New York—N. J. Hayes, comr. water supply, gas and electricity Municipal Bldg., let contract furnishing, delivering and laying watermains and appurtenances in Riverside Dr., West 134th and West 142nd Sts., Manhattan Boro., and in East 147th, East 170th, Amethyst, Emmett and Rosewood Sts., and in Matthews, Newton, Olinville and Rhinelander Aves. and in Crotona Parkway, Elsmere Pl. and Unionport Rd., Bronx Boro., to C. Del Blasio, $28,300. Noted June 19

★N. Y., Ossining See "Buildings."

★N. Y., Schenectady—Bd. Contr. & Supply let contract laying watermains in various streets, to E. B. Edgar, 737 Brandywine Ave., $14,925.

★O., Akron—Coventry Land & Impvt. Co. let contract furnishing and laying 217 tons 6 and 8 in. c.i. water pipe and specials in Firestone Park, to T. E. McShaffrey Constr. Co., 173 South Forge St.

O., Bellevue—City received lowest 3 bids building impounding reservoir, involving 100,000 cu.yd. earth excav. and embankment, 20 x 26 ft. low service pumping station and 1500 to 3000 ft. 18 in. vitr. tile pipe, from F. R. Jones Co., Wayside Rd., Cleveland, $105,159, Gust Bros., Bellevue, $105,840, Harrington Bros., 3959 Flad Ave., St. Louis, Mo., $108,000, furnishing and erecting 2 gas engine driven centrifugal pumping units, from Baker-Dunbar-Allen Co., 1900 Euclid Bldg., Cleveland, $7600, Standard Mfg. Co., $8157, J. L. Skeldon Eng. Co., 242 Water St., Toledo, $13,260; furnishing and delivering chlorinator, from Wallace & Tiernan Co., $424, Baker-Dunbar-Allen Co., $500, R. E. Carey Co., $600 Noted May 22.

★O., Toledo—Comrs. Lucas Co. let contract to S. L. Cothrel, 341 Ohio Bldg., laying water line No. 7 in Norwood Dist., cost $39,421; water line No. 8 in North Collingwood Park, $43,491; water line No. 10 in Forest, Hickory and Upton Aves., $12,278. Noted June 5

Minn., St. Paul—See "Streets & Roads."

Idaho, Buhl—City received bids improving waterworks system from Methesen Co., Buhl, steel pipe, $17,902, Snyder & McGarry, Buhl, iron pipe, $50,707

Sewers

PROPOSED WORK

N. Y., Binghamton—Common Council plans to install sanitary sewer in Emma St. About $18,000. J. Giles, comr. pub. wks.

Md., Baltimore — Brooklyn Center Co., 1025 Munsey Bldg., having plans prepared laying 5600 ft. 8-18 in. double strength terra cotta pipe, involving 9000 yd. grading, in Brooklyn (city's new annex), to connect with municipal sewerage system. Cost between $12,000 and $18,000. J. S. Howard, 12 East Lexington St., engr.

W. Va., Clarksburg—See "Streets and Roads."

S. C., Batesburg—City election July 11, to vote on $40,000 bonds to build 3 mi. sewerage system in principal business and residential streets. Engineer not selected.

S. C., Orangeburg—City plans election to vote on $75,000 bonds to lay 4.4 mi. sanitary sewers and 1.7 mi. storm sewers in various streets, etc. J. W. Hawes, city engr.

Ga., Royston—See "Waterworks."

O., Cincinnati—City plans election in August to vote on $1,015,000 bonds to improve sewerage system.

O., Dayton—See "Streets and Roads."

O., Lakewood—City plans to build circular brick sewers in Edgewater Dr. from Nicholson Rd. to Webb Rd. E. A. Fisher, city engr.

Mich., Detroit—Dept. Pub. Wks. soon receives bids builing vitr. crock lateral sewers with standard brick manholes in alley No. 3070 in blocks bounded by Yosemite, Yellowstone, Joy and Elmhurst Aves., No. 3158 in Charlevoix Ave., from Connors Ave. to Connors Creek, No. 3159 in Waterloo Ave. from Connors Ave. to Connors Creek No. 3160 bounded by Wilkemere, Linwood, Highland and Leslie Aves., No. 3161 bounded by Dexter, Lawton, Highland and Leslie Aves., No. 3162 bounded by Fairview and Lillibridge Aves., north of Warren Ave. No. 3163 bounded by Lillibridge, Benitau, Warren and Shoemaker Aves., No. 3164 bounded by Philip, Alter and Maek Aves. and north line Lodge sub-division, No. 3167 bounded by Martin St., Tyrnow and Vernor Aves., and South line Harrah's Western Sub-division, No. 3168 bounded by Dexter, Lawton, Leslie and Buena Vista Aves., No. 3169 bounded by Wilkemere, Linwood, Leslie and Buena Vista Aves. No. 3068 bounded by Ohio, Tireman and Mackenzie Aves. and Detroit Terminal R. R., No. 3170 bounded by Richard and Cabot Sts. north of Woodmere Ave.

Minn., Hinckley—City voted $10,000 bonds to build sewerage system. A. J. Hunt, clk.

Neb., Madison—City plans to lay 3400 ft. 30 in. storm sewer in 3rd St. About $15,000. W. D. J. Steckelberg city engr.

S. D., Brookings City voted $48,000 bonds to build storm sewers in various streets.

N. D., Grand Forks—See "Streets and Roads."

Wash., Yakima—City plans election soon to vote on $350,000 bonds to extend trunk sewerage system. C. F. Wilson, city engr.

Cal., South San Francisco—City voted $35,000 bonds to build sewerage system.

Ont., Acton—Town engaged James, Loudon & Hertzberg, engrs., 36 Toronto St., Toronto, to prepare preliminary surveys and submit report for building complete new sanitary sewerage system About $60,000.

Ont., Comber—Twp. plans to expend $60,000 to build drainage system. S. T. Anderson, clk. J. J. Newman, Davis Blk Windsor, engr.

BIDS DESIRED

N. Y., Thiells—See "Buildings."

Fla., Leesburg—Until July 8 by city, building sewers in various streets. About $50,000. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, Ga., engrs.

Mich., Muskegon—Until July 7, by B. H. Tellman, city recdr., furnishing labor and material for building main and lateral sewer in Sewer Dist. No. 29, to be known as Highland Park Sewer Dist. No. 29, involving 1144 ft. 20 in. and 6588 ft. 8 in. sewer, etc.; advertised in this issue.

Minn., Litchfield—See "Waterworks".

Minn., St. Paul—Until July 7, by H. W. Austin, purch. agt., City Hall, building storm water sewer in section Fairview Ave., also building sewers in Ross, Griggs, and Juno Sts., Dudley, Byard and Hamline Aves.

Kan., Marysville—Until July 10, by City Clk., laying 60,050 ft. 12-60 in. vitr. pipe, 13 manholes and 21 catch basins. C. McCrea, Republic Bldg., Kansas City, Mo. engrs.

Neb., Newman Grove—Until July 15, by city, building sanitary sewers in various streets involving 16,420 ft. 8 in., 2380 ft. 10 in., 2120 ft. 12 in., and 1060 ft. 15 in. vitr. pipe. W. E. Standeven, 141 Bee Bldg., Omaha, engr.

Mo., Clayton—Until July 8, by C. H. Holekamp, chn., Sewer Comn. of St. Louis Co., Joint Sanitary Sewer Dist. No. 1, at office of Co. Clk., building joint district sewers in St. Louis Co. L. C. Diatzko, special sewer engr.; advertised in this issue.

Mo., Kansas City—Until Aug. 19, by Bd. Pub. Wks., City Hall, building Turkey Creek Sewer. Work involves 2 sewer pumping stations, 1¼ mi. rein.-con. sewer and 3¼ mi. concrete, segment and clay pipe. Cost between $1,500,000 and $1,750,000. A. D. Ludlow, City Hall, engr of sewers; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Conn., Hartford—City let contract building 500 ft. 48 in. concrete or block sewers in Nook Farm, to N. C. Casciano & Co., 208 Front St., $11,623. Noted June 26.

★N. Y., Binghamton—Schenectady Sewage Disposal Co., foot of Anthony St., Schenectady, sub-let contract completing Sect. 1 Binghamton Intercepting Sewer, to W. I. Fitzgerald, Binghamton About $60,000.

★N. Y., Utica—Bd. Contr. & Supply let contract building sanitary sewer beginning at Eagle and St. Vincents Sts. and extending to Brookside Park Pl. and storm sewers in Mortimer, Leah, Eagle and St. Vincent Sts. and Conkling, Taylor, Brinckerhoff, Dudley and Seymour Aves. to E. M. Johnson, $15,355 and $29,568, respectively Noted May 15.

★O., Akron—Dir. Pub. Serv. let contract building 2850 lin.ft. Wolf Ledge Run Storm Sewer, from Sherman to Kling Sts., involving 1480 lin.ft. 8-10 in. brick or rein.-con. sewer and 1370 lin.ft. 18-24 in. vit. pipe, to J. Duff Constr. Co., Marshall Bldg., Cleveland, $98,602

O., Cleveland—City received bids building 1510 ft. 2 ft. 6 in., 4 ft. brick sewers and 480 ft. 12-24 in. vitr. pipe in Euclid Ave. from Ivanhoe Rd. to Reyburn Ave., from River Constr. Co., 12109 Mayfield Rd., $25,198; Manson Co., The Arcade, $27,225; W. P. Gibbons, 340 Leader News Bldg., $29,184

★O., Toledo—Comrs. Lucas Co. let contract building 30,300 ft. sewer in North Collingwood Park, involving 29,307 ft. 6-12 in. vitr. pipe, 1100 branches, 74 manholes

Sewers (Continued)

1000 ft. 6 in. c.i. force main, 200 gal. centrifugal pump and concrete sewage lift, to J. N. Bick, 601 Nasby Bldg., $58,996; 1737 ft. 6-15 in. vitr. sewr pipe, etc., in Harris St., to T. J. Kelly, 626 Avondale St., $6401. Noted June 5.

★**Mich., Detroit**—Dept. Pub. Wks. let contracts building 10,513 ft. 13-18 ft. concrete arch sewer in Wetherby Ave., Sects. 1 and 2, to Nash Bros., 10 South La Salle St., Chicago, $990,479; 1251 ft. 5 ft. cylinder brick sewer in Harper Ave., Sects. A and B, to C. H. Bennett, 1008 Ford Bldg., $54,042; 8604 ft. 9-10 ft. cylinder concrete sewer in Lynch Rd., Sects. 3 and 4, to J. Connelly Constr. Co., Dime Bank Bldg., $438,700; 6000 ft. 10 ft. 6 in cylinder concrete block sewer in Six Mile Rd., Sect. 1, to O'Rourke Eng. & Contg. Co. and Hoag & Dall, Commercial Bank Bldg., Cleveland, $379,560; 6709 ft. 10 ft. 6 in. cylinder concrete segmental block sewer on Six Mile Rd., Sect. 2, to Brandon & Hanna, 1624 Dime Bank Bldg., $422,000. Noted June 12.

★**Minn., Duluth**—City let contract building sanitary sewer in Wallace Ave. from 5th to Luther Sts., to C. R. McClean & Son, Duluth. About $47,000. Noted June 19.

Minn., St. Paul—See "Streets & Roads."

Okla., Oklahoma—City let contract building 4800 ft. sewers etc., in North Highland Park, to Municipal Excav. Co., 200 East Main St. About $21,000.

Cal., San Francisco—See "Streets and Roads."

Bridges

PROPOSED WORK

N. Y., Watertown—City voted $60,000 bonds to build rein.-con. bridge over Black River on Pearl St. Concrete Steel Eng. Co., engrs., 21 Park Row, New York City, will design and supervise engineering. Noted Mar. 6.

N. J., Rahway—Bd. Freeholders Union Co. (Elizabeth) soon lets contract building 93 ft. concrete and steel bridge over Rahway River, on Monroe St., 60 ft. wide. About $35,000. J. L. Baur, 120 Bway., Elizabeth, engr. Noted Apr. 3.

Fla., Miami—City having plans prepared building lift bridge over Miami River, on Ave. "G." About $70,000. C. W. Murray, city engr.

Wis., Sheboygan—Sheboygan Co. plans to build 330 ft. rein.-con. bridge with 7 arches, 40 ft. wide, over Waldo Cascade, concrete flooring, creosote block pavement and concrete foundation. About $25,000. G. Ubbelohde, Court House, engr.

Mont., Columbus—Stillwater Co. election Sept. 2 to vote on $12,000 bonds to build bridges. G. N. Cardoza, Columbus, engr

Mont., Thompson Falls—Sanders Co. election Sept. 2 to vote on $75,000 bonds to build bridges. T. Johnston and A. M Johnson, Thompson Falls, engrs.

Ont., Newmarket — Town having plans prepared by James, Loudon & Hertzberg, engrs., 36 Toronto St., Toronto, building 3 concrete slab and girder bridges, 28 to 40 ft. spans. About $40,000.

Roumania—Roumanian Bridge Comn., Hotel Cumberland, 54th St. and Bway., New York City, will consider proposals for submittal to Roumanian Government for furnishing and erecting all or part of bridges destroyed during war. Total amount of steel required is about 25,000 tons, largest bridge to be across Borcea branch of Danube River; advertised in this issue.

BIDS DESIRED

Ga., Statesboro—Until Aug. 19 (change of date), by Comrs. Bulloch Co., building 7 rein.-con. bridges on Dixie-Overland Highway. Total cost, $40,000. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, engrs. Noted May 15.

Ga., Swainsboro—Until Aug. 20, by Comrs. Emanuel Co., building rein.-con. bridge over Big Ohoopee River. About $40,000. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, engrs.

Fla., Jacksonville—Until July 29, by F. Brown, clk., Duval Co., building 2100 ft. bridge over St. Johns River. Noted Apr. 17.

Minn., Red Wing—See "Streets & Roads."

Neb., Lincoln—Until July 7, (change of date) by clk. Lancaster Co. building 100 ft. rein-con. bridge over Oak Creek, on 14th St. About $16,000. A. H. Edgren, co. engr. Noted June 26.

N. D., Jamestown—Until July 12, by A. Blewett, aud. Stutsman Co., building 12 wood and concrete bridges.

Ark., Litle Rock—Until Aug. 4, by Bridge Comrs., 213 West 2nd St., building 1450 ft. rein.-con. bridge over Arkansas River, on Main St., 40 ft. wide between curbs, 8 ft. sidewalks on each side, 300 lin.ft. rein.con. approaches, 9 main piers extending from spring of arches to depth of from 10-80 ft. bedrock; also one 1091 ft. rein.-con. bridge over Arkansas River, on Bway. St., 40 ft. wide between curbs, 8 ft. sidewalk on each side, 1700 lin.ft. rein.-con. approaches, 6 principal piers extending from spring of arches to depth of from 40-63 ft. bedrock. each span 195 ft. long. Hedrick & Hedrick, Kansas City, Mo., bridge engrs.; advertised in this issue.

N. S., Annapolis Royal—Until July 14, by Provincial Highways Bd., Halifax, building 1360 ft. bridge, 28 ft. 6 in. wide, over Annapolis River, involving 710 cu.yd. concrete, 1100 cu.yd. stone and 6870 cu.yd. earth approach and fill. About $34,220. J. W. Roland, c/o Highway Bd., Halifax, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Pa., Harrisburg—State Highway Dept. received bids building bridges in counties as follows: (a) Adams Co., (1) 30 ft. span in Franklin Twp., (2) two 28 ft. spans, Franklin Twp., (3) 30 ft. Cumberland Twp., (4) 14 ft., Cumberland Twp., (5) 20 ft., Mt. Joy Twp.; (b) Clinton Co., (1) 10 ft. Beach Creek Twp., (2) 18 ft., Beach Creek Twp.; (c) Cumberland Co., 8 ft., Middlesex Twp.; (d) Dauphin Co., (1) 10 ft., Mifflin Twp., (2) 6 ft., Upper Paxton Twp.; (e) Juniata Co., (1) 8 ft., Fermanagh Twp., (2) 24 ft., Delaware Twp., (3) 20 ft., Delaware Twp., (4) 20 ft., Delaware Twp., (5) 20 ft., Monroe Twp., (6) 30 ft., Fayette Twp., (7) 30 ft., Delaware Twp.; (f) Lancaster Co., (1) 12 ft., Sadsbury Twp., (2) 12 ft., Earl Twp.; (g) Lebanon Co., (1) 5 ft., Union Twp., (2) 24 ft., South Londonderry Twp., (3) 8 ft., South Annville Twp., (4) 16 ft., East Hanover Twp., (5) 10 ft., Bethel Twp., (6) 12 ft. Bethel Twp., (7) 12 ft., Bethel Twp., (7) 12 ft., Bethel Twp.; (h) 24 ft., Carrol Twp., Perry Co.; (i) Snyder Co., (1) 12 ft., Washington Twp., (2) 12 ft., Perry Twp., (3) 12 ft., Spring Twp., (4) 12 ft., Beaver Twp., (5) 12 ft., Spring Twp., (6) 16 ft. Washington Twp., (7) 16 ft., Washington Twp., (8) 8 ft., Washington Twp., (9) 8 ft., Washington Twp., from W. H. Murphy & Sons, Harrisburg, (a1) $4060, (a2) $9654, (a3) $4957; G. W. Ensign, Inc., Harrisburg Bank Bldg., (a1) $3850, (a2) $7959 (a3) $4701, (a4) $1800, (c) $1323, (d1) $2248, (d2) $2161, (e1) $1811, (e5) $3707, (e6) $6198, (f1) $4573, (f2) $3941, (g1) 1531, (g3) 1897, (g4) $2783, (g5) $2361, (g6) $2361, (g7) $2526, (i1) $1986, (i2) $2189, (i6) $2325, (i8) $1343, (i9) $1345; S. W. Shoemaker & Son, 1545 North 6th St., (a1) $4504, (g4) $2961, (g5) $2278, (g6) $1635, (g7) $1785, (h) $5667; G. L. Shore & Son, Keswick, Va., (a2) $9077. (a5) $2797, (e1) $2064, (e5) $3802, (e6) $7137; O. B. S. Co., Phila., (a3) $5223, (e2) $3690; W. H. Drawbaugh, Dover, (a4) $1671, (a5) $2777, (c) $1730, (f1) $2242, (f2) $2409; J. W. Hartley, York, (a4) $1827, (a5) $2569; T. Leete, Coudersport, (b1) $1297, (b2) $2248; F. M. Shadel, Williamsport, (d1) $2064; J. H. Forney, Berrysburg, (d1) $1641, (d2) $1637; M. E. Wilt, Millersburg, (d2) $2296; Trimpey & Whipkey, Casselman, (e1) $1578, (e2) $3434, (e3) $2823, (e4) $2823, (e5) $3487, (e6) $6536, (e7) $4216, (i1) $1582, (i3) $1867, (i4) $1867, (i5) $1787, (i6) $2076, (i7) $2176, (i8) $1309, (i9) $1309; M. J. McHale (trading as McHale & Co.), Norwood, (e2) $3239, (e3) 2$755, (e4) $2755, (e7) $4090; H. F. Mackey, East Stroudsburg, (e3) $2871, (e4) $2871, (e7) $4356, (i7) $2350; A. R. Kreider Lancaster, (f1) $1753, (f2) $1728; W. Swanger & Son, Lebanon, (g1) $1290, (g2) $2730, (g3) $1549, (g4) $2171, (g5) $1715, (g6) $1733, (g7) $2035; E. B. Keener, Colebrook, (g2) $3348; J. M. Eshleman, Landisville, (g2) $3082, (g3) $1867; A. Fauver, Laurelton, (i1) $1683, (i6) $1942, (i7) $1942, (i8) $1157, (i9) $1157; L. E. Sprecht, Beavertown, (i3) $1724, (i4) $1724, (i5) $1739. Noted May 29.

★**Ga., Metter**—Comrs. Candler Co. let contract building rein.-con. bridges and culverts, to Kreis & Waldrep, Knoxville, Tenn. About $26,000.

★**Ga., Swainsboro**—Comrs. Emanuel Co. let contract building 7 rein.-con. bridges on Dixie-Overland Highway, to Kreis & Waldrep, Knoxville, Tenn. About $84,000. Noted June 5.

★**Ga., Valdosta**—Lowndes Co. will build 2 rein.-con. slag bridges, 16 ft. wide, 350 and 400 ft. long, respectively. About $50,000. Work will be done by day labor.

★**Mich., Flint**—City let contract building 256 ft. steel truss bridge over Flint River on Texas Ave., 50 ft. wide, with 6 ft. walk on either side, to Illinois Steel Co., 1623 Monadnock Blk., Chicago. About $90,000.

★**Minn., Elk River**—Comrs. Sherburn Co. let contract building Bridge No. 3093, four 55 ft. rein.-con. girder spans, 20 ft. roadway, to W. S. Hewett, 530 Metropolitan Life Bldg., Minneapolis, $44,875.

★**Ariz., Cottonwood** — State Highway Comn., Phoenix, and Yavapai Co., let contract building 280 ft. Luton arch, rein.-con. bridge over Verde River, 7 mi. below Clarksdale, to Topeka Bridge & Iron Co., Stormont Bldg., Topeka, Kan., about $38,000. Noted June 12.

★**Cal., King City**—State Highway Comn., 515 Forum Bldg., Sacramento, let contract building bridge over Salinas River, here, Monterey Co., to Healy-Tibbetts Co., 9 Main St., San Francisco. Noted June 5.

★**Man., Carman**—Municipal Council let contract building rein.-con. bridge on Portage Ave., to P. O. Petersen, 196 Johnston St., Winnipeg. About $17,290.

Reinforced Concrete

PROPOSED WORK

N. Y., Buffalo—See "Industrial Works."

N. J., Rahway—See "Bridges."

Ill., Chicago—See "Buildings."

Neb., Lincoln—See "Waterworks."

Cal., Sacramento — See "Industrial Works."

Ont., Toronto—See "Industrial Works."

BIDS DESIRED

Ga., Statesboro—See "Bridges."

Ga., Swainsboro—See "Bridges."

Minn., Red Wing—See "Streets and Roads."

Ark., Little Rock—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ga., Metter**—See "Bridges."

★**Ga., Swainsboro**—See "Bridges."

★**Ga., Valdosta**—See "Bridges."

Minn., Elk River—See "Bridges."

★**Ariz., Cottonwood**—See "Bridges."

★**Man., Carman**—See "Bridges."

Streets and Roads

PROPOSED WORK

Mass., Malden (Boston P. O.)—City having plans prepared building 6-10 ft. granolithic walks in various sections. About $10,000. H. W. Esty, city engr.

Pa., Dormont (Pittsburgh P. O.)—Boro. Council soon lets contract grading, paving and curbing Pinehurst Ave. from Peermont to Biltmore Aves., Latonia Ave. from Peermont Ave. to Scott Rd., grading Ordnance Ave. from Bway to Ocean Aves. Work involves 2980 sq.yd. vitr. brick, 2530 lin. ft. concrete curbing and guttering and 2980 cu.yd. earth excav. Douglass & McKnight, Columbia Bank Bldg., Pittsburgh, engrs.

Pa., Pittsburgh—City soon lets contract grading, paving and curbing Montooth St. from Climax St. to Taff Ave., Beltzhoover Ave. from end of present pavement to Charles St., Dilworth St. from Gray to Cowan Sts., widening Main St. at its intersection with Liberty St.; paving and curbing Marshall Ave. from Linwood Ave. to Brighton Rd. and regrading, repairing and recurbing Sylvania Ave. from Taff to Gearing Aves. and Taff Ave. from Montooth St. to point 350 ft. north. N. S. Sprague, city engr.

Pa., Washington—Washington Co. soon receives bids building roads. Bonds for $1,000,000 voted for project. Noted May 15.

Streets and Roads (Continued)

W. Va., Charleston—Kanawha Co., Elk Dist. plans election soon to vote on $400,000 bonds to improve roads. F. C. Burdette, engr.

W. Va., Clarksburg—City election July 15 to vote on $900,000 bond issue for street and sewer improvements and other work.

W. Va., Clarksburg—Comrs. Harrison Co. having plans prepared and soon receives bids building 2.5 mi. Fairmont-Clarksburg Pike. Work involves 23,315 sq. yd. brick pavement on concrete foundation. About $88,000. J. R. Wilson, Clarksburg, engr.

W. Va., Elkins—Randolph Co. plans election soon to vote on $150,000 bonds to improve roads in Beverly Dist., and $90,000 bonds to improve roads in Montrose Dist. F. A. Parsons, Elkins, co. engr.

W. Va., Fayetteville—Fayette Co. soon receives bids building 2.63 mi. Fayette Rd., bituminous macadam. About $35,000. J. K. McGrath, co. engr.

W. Va., Fayetteville—Fayette Co. voted $194,000, bonds to improve roads in Quinnimont Dist. J. K. McGrath, co. engr. Noted May 29.

North Carolina—State Highway Comn., Raleigh, plans to gravel 14 mi. road from Yanceyville to state line, Caswell Co., cost $40,000; 20 mi., 9 ft. wide, in Avery and Watauga Counties, $100,000; 5½ mi. from Buffaloe Mills to Gaston Co. line, $13,750, 8 mi. from No. 6 Twp. line to Burke Co. line, $25,000, both in Cleveland Co.; 9 mi. Wicksville-Salisbury Rd., 3 mi. Yadkinville Rd. and one 6 mi. stretch, all in Davie Co.; hard surface 15¼ mi. Asheville-Marion Rd., 16 ft. wide, $240,000, and 4¼ mi. other roads, 16 ft. wide, $50,000, both in Buncombe Co.; 2¼ mi. from Kings Mt. to Gaston Co. line, Cleveland Co., $68,000; 6 mi. township roads, 16 ft. wide, Anson Co., $40,000; 2¼ mi. Old Causeway, 18 ft. wide, Brunswick Co.; 1¼ mi. Greensboro-Winston Rd., Guilford Co.; 12 mi. Haysville-Briston Rd., Clay Co.; 7 mi. Atlanta-Asheville Highway, Cherokee Co.; 50 mi. Boardman-Wilmington Rd., Columbus Co.; also improve 6 mi. Winston-High Point Rd., Davidson Co., and 7 mi. Concord-Abbeville Rd., Cabarrus Co. W. S. Fallis, engr.

N. C., Albemarle—Comrs. Stanley Co. plan to gravel 10 mi. Sanford-Albemarle Rd., 16-18 ft. wide. About $30,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr., $30,000.

N. C., Bayboro—Comrs. Pamlico Co. plan to top soil 22 mi. Oriental Bayboro Rd., 16-18 ft. wide. About $77,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Bryson City—Comrs. Swain Co. plan to gravel 4 mi. various roads, 16-18 ft. wide. About $10,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Carthage—Comrs. Moore Co. plan to gravel 28 mi. Sanford-Albemarle Rd., 16-18 ft. wide. About $84,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Charlotte—Comrs. Mecklenburg Co. plan to hard surface 14 mi. Charlotte-Monroe Rd., 18-20 ft. wide. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Clinton—Comrs. Simpson Co. plan to gravel 24 mi. Clinton-Dunn Rd., 16-18 ft. wide. About $48,000. S. W. Fallis, Raleigh, engr.

N. C., Danbury—Comrs. Surrey Co. plan to gravel 22 mi. Danbury-Dobson Rd., 16-18 ft. wide, cost $55,000; 20 mi. Mt. Airy-Winston Rd., 16-18 ft. wide, $50,000. W. S. Fallis, c/o State Higway Dept., Raleigh, engr.

N. C., Elizabeth—Comrs. Pasquotank Co. soon let contract hard surfacing 25 mi. roads, 9-18 ft. wide, vitr. asphalt or concrete. T. L. Higgs, 336 Hinton Bldg., engr.

N. C., Franklin—Comrs. Macon Co. plan to gravel 11 mi. Bryson City-Franklin Rd. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Goldsboro—Comrs. Wayne Co. plan to gravel 15.6 mi. Goldsboro-Duplin Rd., 16-18 ft. wide. About $35,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Greensboro—Comrs. Guilford Co. plan to hard surface 1.5 mi. Asheboro Rd., 20 ft. wide; 1.5 mi. Greensboro-Charlotte Rd., and 1 mi. Stokesdale Rd., and 2 mi. Stokesdale-Rockingham Rd. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Henderson—City rejected bids received June 17, for 55,000 sq.yd. of asphalt, bitulithic, concrete, brick, or other pavement, 7000 lin.ft. of granite or concrete curb, 7000 lin.ft. of concrete gutter, 9000 sq.yd. of sidewalks, 18,000 cu.yd. grading, etc. Work indefinitely postponed. G. C. White, Durham, engr. Noted May 29.

N. C., Kinston—Comrs. Lenoir Co. plan to hard surface 19 mi. Goldsboro-New Bern Rd. W. Fallis, c/o State Highway Dept., Raleigh, eng.

N. C., Monroe—Comrs. Union Co. plan to gravel or top soil 6 mi. Monroe-Charlotte Rd., 16 ft. wide. About $10,230. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Nashville—City plans to pave 1¼ mi. Washington Ave. and Depot St., 30 ft. wide. About $50,000.

N. C., Raleigh—Comrs. Wake Co. plan to hard surface 6.8 mi. Raleigh-Carey Rd., 18-20 ft. wide. About $200,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Sanford—Comrs. Lee Co. plan to gravel 10 mi. Sanford-Albemarle Rd., 18 ft. wide. About $30,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Smithfield—Comrs. Johnston Co. plan to gravel 8 mi. Fayetteville Rd., 16 or 18 ft. wide. About $16,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Tarboro—City soon lets contract paving 30,000 sq.yd. Main St. W. M. Piatt, Durham, engr.

N. C., Troy—Comrs. Montgomery Co. plan to gravel 25 mi. Sanford-Albemarle Rd., 16-18 ft. wide. About $75,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Washington—Comrs. Beaufort Co. receive bids about Aug. 1 paving various roads. About $1,000,000. G. C. White, Durham, engr.

N. C., Waynesville—Comrs. Haywood Co. soon let contract improving 8 mi. Waynesville-Canton Highway, 30 ft. wide, sand clay or gravel surface. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Waynesville—Comrs. Haywood Co. plan to gravel 6.7 mi. Waynesville-Asheville Rd. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C. Webster—Comrs. Jackson Co. plan to gravel 12 mi. Sylva Rd. to Haywood Co. line, 20 ft. wide. About $120,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

S. C., Allendale—Comrs. Allendale Co. plan to relocate, grade, drain and surface 15 mi. Augusta-Beaufort Highway from here to Millette 30 ft. wide. About $45,000. J. R. Pennell, c/o State Highway Dept., Columbus, engr.

S. C., Batesburg—City election July 11, to vote on $30,000 bonds to pave 1.5 mi. streets in business section, 40-50 ft. wide. Engineer not selected.

S. C., Bennettsville—Comrs. Marlboro Co. plan to relocate, grade, drain and surface 20 mi. road from Cheraw Bridge on Chesterfield Co. line to Dillon Co. line, via Bennettsville and Clio, 30 ft. wide. About $56,000. J. R. Pennell, c/o State Highway Dept., Columbia, engr.

S. C., Darlington—Comrs. Darlington Co. plan to relocate, grade drain and surface with local materials, 10 mi. roads from Darlington to Chesterfield, via Hartsville, 30 ft. wide. About $40,000. J. R. Penell, c/o State Highway Dept., Columbia, engr.

S. C., Greenwood—Greenwood Co. soon lets contract relocating, grading, draining and topsoiling 7.3 mi. road, from here to Hodges 30 ft. wide, involving 55 cu.yd. concrete, 22,857 cu.yd. earth excav. and 20,272 cu.yd. topsoil. B. R. Cowherd, Jr., Greenwood, engr. Noted June 26.

S. C., Orangeburg—City plans election to vote on $450,000 bonds to pave 9 mi. various streets, 30-50 ft. wide, lay 20.8 mi. cement sidewalks, 25 mi. granite curbing, etc. J. H. Hawes, city engr.

Ga., Folkston—Charlton Co. receives bids in about 60 days building 20 mi. Dixie Highway. Estimated cost $300,000. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, engrs.

Fla., Ft. Myers—City election in August to vote on $50,000 bonds to pave various streets.

Fla., Lake City—Comrs. Columbia Co. plan to build road. About $5,000. Federal Government will appropriate toward cost. J. A. Leslie, chn.

Fla., Marianna—City having surveys made and plans prepared paving various streets and improving waterworks. About $75,000. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, Ga., engrs.

Ala., Mobile—Comrs. Mobile Co. voted to issue $100,000 bonds to improve roads. Federal Government may appropriate like amount.

Miss., Holly Springs—Bd. Superv. Marshall Co. soon lets contract building 8 mi. sand and clay road, in Cayce Separate Rd. Dist. W. D. Heddleston, engr.

La., Morgan City—City Council plans to issue $62,000 bonds to build roads in Dist. No. 1 and $43,000 bonds to build and repair streets within corporate limits of city. T. T. Thorgeson, city engr.

Ky., Newport—Campbell Co. soon receives bids improving 4 mi. River Rd. from Ross to Ten Mile, waterbound macadam. A. Thornton, engr.

Ohio—State Highway Comn., Columbus, plans to grade, build bridges and culverts and pave 76 mi., Sect. "O" Columbus-Sandusky Rd., 24 ft. wide, brick, 72 mi., Sect. "M" Columbus-Sandusky Rd., 24 ft. wide, brick, Franklin Co.

O., Cincinnati—City election in August to vote on $2,267,100 bonds to improve streets.

O., Dayton—Dayton View Land Co. acquires 250 acre tract north and east of Salem Ave. and plans to build streets, sidewalks and sewers.

Mich., Coleman—R. A. Turrel, city clk., soon lets contract grading, draining and surfacing with gravel Railway St., from 4th St., S. E., to city limits and from 7th St., N. W., to city limits; 6th St. from Railway to Monroe Sts., Gladwin Rd. from Monroe St. to north city limits; 4th St. from Washington to Adams Sts.; Adams St. from 4th to 2nd Sts.; 2nd St. from Adams St. to Section Line Rd.; Section Line Rd. from 2nd St. to east city limits. R. W. Roberts, Federal and Franklin Sts., Saginaw, engr.

Mich., Detroit—Dept. Pub. Wks. soon lets contract paving with sheet asphalt on 6 in. concrete foundation, Berea, Medina or Amherst curbstone, Kulick Ave. from Junction Ave. to Pere Marquette R.R., Konkel Ave. from Junction to Wessen Aves., Kopernik Ave. from Lockwood Ave. to Pere Marquette R.R., all 26 ft. wide, with asphaltic concrete on 6 in. concrete foundation, Canfield Ave. from Crane to Rohns Aves., Fairview Ave. from Charlevoix to Mack Aves., Gladstone Ave. from Wilson to 12th Sts., Hurlbut Ave. from Warren to Shoemaker Aves., all 26 ft. wide, Griffin Ave. from Elmwood Ave. to easterly terminus of 48th St., 24 ft. wide, Harper Ave., Sect. 2, from Montclair to Connors Aves., 30 ft. wide; with brick on 6 in. concrete foundation Platt St. from west end of street to west line Moran St., 26 ft. wide, involving 23,091 cu.yd. excav., 25,713 lin.ft. curbstone, 40,362 sq.yd. paving, etc. C. W. Hubbell, city engr.

Mich., Detroit—Dept. Pub. Wks. soon receives bids paving with asphaltic concrete on 6 in. concrete foundation, Berea, Medina or Amherst curbstone, Green Ave. from Fort St. to Chatfield Ave., $32,190; Northfield Ave. from Warren to Tireman Aves., $40,660; Granger Ave. from Baldwin to Van Dyke Aves., $7830; Louis Ave. from Holcomb to Belvidere Aves., $4130; Springle Ave. from Kercheval to Charlevoix Aves., $22,870; Pingree Ave. from Linwood Ave. to Dexter Blvd., $35,810, all 26 ft. wide. C. W. Hubbell, city engr.

Ill., Chicago—Bd. Local Imprvts. rejected bids received June 4, paving (a) alley between Harrison and Flournoy Sts., Spaulding and Homan Aves.; (b) alley between Van Buren and Congress Sts., Washtenaw and California Aves.; (c) alley between Blackhawk and Division Sts., Holt and Dickson Aves.; (d) alley between Wabausia and North Aves. and Kedzie and Sawyer Aves.; (e) alley between Montrose and Cullom Aves., Ashland Ave. and Paulina St., also West 18th St. from Central Park Ave. to 1st alley west and alley between West 16th St., Ogden Ave., Central Park and Millard Aves. Noted June 19.

Ill., East St. Louis—Chamber of Commerce plans to build 5 mi. concrete road from here to Madison, 100 ft. wide. J. N. Fining, secy.

Ill., Rock Island—City Council plans to pave 37th Ave. from 12th to 18th Aves., 12th Ave. from 37th to 38th Sts., involving 5820 sq.yd. asphaltic concrete and 2460 cu.yd. excav. About $23,530. W. Treichler, city engr.

Wis., Sheboygan—City soon lets contract grading and paving 2.9 mi. St. Clair Ave. and North 11th St., 20 ft. wide, involving 10,000 sq.yd. 2 course concrete and 4500 lin. ft. concrete curb and gutter. About $30,000. C. U. Boley, city engr. Noted June 19.

Streets and Roads (Continued)

Minn., Duluth—J. A. Farrell, city comr., soon lets contract paving 1600 ft. House St. from Commonwealth to 105th Aves., W., 18 ft. wide, 1 course concrete. About $14,958. Work involves 2688 sq.yd. concrete, 2250 cu.yd. excav. and 2738 ft. 3 in. drain tile, etc. E. K. Coe, Engr.'s Office, City Hall, engr.

Minn., Duluth—J. A. Farrell, city comr., soon lets contract paving 8300 ft. East 3rd St., from Lake to 18th Aves., 24-26 ft. wide, asphalt. About $139,638. Work involves 69,166 sq.yd. asphalt, 16,600 lin.ft. concrete curbing, etc.

Kan., Eureka—Greenwood Co. soon receives bids building 14¼ mi. Fort Scott-Wichita Rd. from Eureka to Butler Co. line, 18 ft. wide, gravel and concrete. F. E. Ross, Eureka, engr.

Kan., Lyons—Rice. Co. soon receives bids building 10 mi. brick road west of here, near Sterling, 18 ft. wide. S. Ainsworth, Lyons, engr.

Kan., Marysville—Marshall Co. plans to build 33 mi. White Highway from Nemaha Co. line to Washington Co. line through Vermillion and Blue Rapids, 18 ft. wide, concrete. P. F. Gallup, Marysville, engr.

Kan., Paola—Miami Co. plans to build 30 mi. Jefferson Highway from Linn Co. line to Johnson Co., through Osawatomie, 18 ft. wide, bituminous macadam. H. Stockwell, Paola, engr.

Kan., Salina—Saline Co. having plans prepared building 7½ mi. highway, 18 ft wide, concrete, brick or bituminous macadam. Southwestern Eng. Co., Hutchinson, engrs.

Kan., Topeka—Shawnee Co. having plans prepared building 9 mi. Central Ave. Rd. from Topeka to Jackson Co. line, 18 ft. wide, concrete, brick, bituminous macadam or gravel. J. E. Williams, 1311 Clay St., engr.

N. D., Grand Forks—City plans to pave and build sewers in Chestnut, Walnut and Cottonwood Sts., Paving Dist. No. 15; also 5th, 6th, 7th, 8th, 9th and 10th Aves., Paving Dist. No. 20. About $125,000. C. S. Giles, Grand Forks, engr.

N. D., Grand Forks—City rejected bids received June 20, paving, curbing, grading and draining 47,358 sq.yd. in Paving Dists. No. 10 and 16, 20-30 ft. wide, Portland cement concrete. Noted June 26.

Mont., Anaconda—Deer Lodge Co. election Sept. 2 to vote on $150,000 bonds to build roads. E. Cralle, Anaconda, engr.

Mont., Lewistown—Fergus Co. election Sept. 2, to vote on $700,000 bonds to build roads. H. C. Tilzey, Lewistown, engr.

Mont., Townsend—Broadwater Co. election Sept. 2 to vote on $100,000 bonds to build roads. L. K. Pool, Townsend, engr.

Mo., Benton—Scott Co. soon receives bids building 27.5 mi. road from Sikeston to south line of Cape Girardeau Co., 16 ft. wide, local bank gravel; 7 mi. road from north line of New Madrid Co. to west line of Mississippi Co., 16 ft. wide, local bank gravel. M. S. Murray, Sikeston, engr.

Mo., Benton—Scott Co. soon receives bids building 7 mi. Poplar Bluff-Cairo Rd., 16 ft. wide, gravel. About $59,000. M. S. Murray, Benton, engr.

Mo., St. Louis—Bd. Pub. Serv. having plans prepared widening 2 mi. Palm St. and Natural Rd., cost, $1,000,000; widening 2 mi. Gravois St. from Grand to Geyer Aves., and Geyer Ave. to 12th Sts., from 60-100 ft., $1,500,000. H. Bartholomew, city engr.

Mo., Shelby—Shelbina Co election July 12, to vote on $1,000,000 bonds to build roads. B. Hewitt, Shelbina, engr.

Tex., Angleton—Comrs. Brazoria Co. plan to clear, grub and grade (about 6400 ft.), shell surface, and build pile trestles, timber and concrete slab bridges, on 9.47 mi. highway from Jones Creek through Freeport to Quintana, 16 ft wide. About $140,000. W. A. Randle, Angleton, engr.

Tex., Comanche—Comrs. Comanche Co. plan to rock and gravel surface, also pave with concrete, and build drainage structures, on 28.31 mi. Highway No. 10 from Brown Co. line to Erath Co. line, 16 ft. wide. About $250,000. W. E. Dickerson, Comanche, engr.

Tex., Corpus Christi—Comrs. Court of Nueces Co. plans election July 26, to vote on $2,000,000 bonds to build roads.

Tex., Farmersville—City voted $10,000 bonds to pave various streets.

Tex., Madisonville—Comrs. Madison Co. plan to clear, grub, grade, gravel and surface with stone, also build concrete drainage structures on 20.5 mi. State Highway No. 32 from Leon Co. line, southeast to Walker Co. line, 16 ft. wide. About $177,000. P. A. McCarthy, Lufkin, engr.

Tex., Marble Falls—Burnet Co. election July 12 to vote on $55,000 bonds to improve roads in Dist. No. 2.

Tex., Quitman—Comrs. Wood Co. plan to improve, grade, haul and place iron ore gravel surface and build drainage structures, on 11.55 mi. Highway No. 37, known as Jim Hogg Highway, to here from Mineola, 16 ft. wide. About $83,000. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Tex., Quitman—Comrs. Wood Co. plan to grade, haul and place iron ore gravel surface and build drainage structures on 21.68 mi. Highway No. 15, (Dixie Highway) east from Mineola, 16 ft. wide. About $127,000. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Okla., Sapulpa—Creek Co. soon receives bids paving 28 blocks various streets and laying 25 blocks sidewalks.

Idaho, Cottonwood—Comrs. Idaho Co. plan to improve and complete North and South Highway and other county roads. Bonds for $90,000 sold for work,

Idaho, Harrison—Latah Co. Lakeside Dist., voted $75,000 bonds to grade and gravel Lakeside Highway. D. P. Olson, c/o State Highway Dept., Boise, engr.

Idaho, Moscow—Troy Dist. voted $125,000 bonds, Bovill Dist., $175,000 and Deary Dist., $120,000 to improve roads in Latah Co. D. Olson, c/o State Highway Dept., Boise, engr.

Idaho, Sandpoint—City plans to pave various streets, involving 285,000 sq.ft. concrete. About $60,000.

Idaho, Spirit Lake—H. A. Sewell, engr., Panhandle Highway Dist., Bank of Spirit Lake Bldg., soon let contract grading, gravel surfacing, clearing, curbing and building culverts and drainage structure on Seasons-Spirit Lake Rd.

Utah, American Fork—City having surveys made paving 3000 ft. Main St. from 2nd N. to 3rd S. Sts., 32 ft. wide. Huddlestone & Fiero, McIntyre Bldg., Salt Lake City, engrs.

Utah, Brigham—City plans to pave 1.5 mi. Main St., 18-40 ft. wide. About $65,300. C. O. Raskelly, city engr

Wash., Prescott—City plans to grade and pave 12 blocks A St., 20 ft. wide, 12 ft. macadam.

Wash., Seattle—City rejected bids received June 20, grading and paving Empire Way, et al., involving 44,000 sq.yd. 6 in. concrete, 20,100 lin.ft. concrete curbing, 17,600 cu.yd. earth excav. and 4350 lin. ft. 8 in. sewer. About $329,962. Work will be readvertised. A. H. Dimock, city engr.

Wash., Vancouver—City plans to improve 22nd St. from Main to Reserve Sts., cost $30,000; 29th St. from Main St. to Kauffman Ave., also hard surface, build concrete curbs and sidewalks on H St. from 22nd to 26th Sts. W. S. Schwarz, city engr

Wash., Walla Walla—City plans to pave, curb and build sidewalks on Clinton, Madison, 6th and 4th Sts., concrete Cost to exceed $10,000. H. H. Crampton, supt. streets.

Ore., Bend—Deschutes Co having plans and estimates made by G. I. Stebbins, engr., c/o State Highway Comn., Portland, building Bend-Sisters-Trail Crossing Rd. About $100,000. County will appropriate $60,000 and state balance of cost.

Ore., Eugene—City plans to grade and gravel surface Lawrence St from 19th Ave. to 17th St. About $10,000. G. Stearns, recdr.

Ore., Portland—City soon lets contract building artificial stone or asphaltic concrete sidewalks on concrete foundation not less than 3 in. deep, on East 71st St. from Thorburn Ave. to East Glisan St., East 70th St. from East Davis to East Glisan Sts., East Flanders St from Jonesmore to East 71st Sts., East 69th St. from Thorburn Ave. to East Davis St., East Everett St. from East 70th to East 72nd Sts., East 70th St from Thorburn Ave. to East Davis St., East Davis St from Jonesmore to East 71st St., paving with concrete No. 1 or 2, Cable St. from Terrace Rd. to Mill St., with crushed rock or gravel macadam, Vernon Ave. from Alberta St. to Killingsworth Ave., with asphaltic concrete Nos. 1 or 2 on crushed rock base, Minnesota Ave. from Emerson St. to Killingsworth Ave. and East 62nd St. from Sandy Blvd. to Fremont St. O. Laurgaard, city engr.

Cal., San Diego—A. H. Wright, city clk., soon lets contract grading, paving and improving Garnet St., Grand and Balboa Aves., involving 4569 cu.yd. excav., 4771 cu. yd. embankment, 238,064 sq.ft. 1½ bitulithic wearing surface on 4 in. concrete base, building 62 lin.ft. cement curbing, 36 lin.ft. 24 in. double strength cement pipe culverts. F. A. Rhodes, city engr.

N. B., Shediac—Town soon lets contract building 2 mi. Main St., bituminous macadam, 40 ft wide. About $12,000. J. McQueen, Shediac, clk. Noted June 5

Que., Laprairie—J. A. Sicotte, secy., soon lets contract paving with bituminous macadam 14 mi. roads of St. Francis Xavier Range and Lamont de la Tertue, St. Ignace Range. About $35,000. M. Henry, c/o Dept. Rds., Quebec, engr.

Que., Montreal—City voted $21,700 bylaw to pave ¼ mi. Redpath St., 40 ft. wide. A. E. Doucet, city engr.

Ont., Bridgeburg — Town having plans prepared by C. Miller, engr., building asphaltic pavements on various streets. About $50,000.

Ont., Casselman—Town voted $14,000 bylaw for building 2½ mi. bituminous macadam streets, 35-40 ft. wide. J. Martin, engr.

Ont., Pembroke—Town had plans prepared by W. A. Moore, engr., for 10,000 sq. yd. asphaltic pavement on concrete base, 20 ft. wide. About $38,000.

BIDS DESIRED

Vermont—Until July 15, by State Highway Comn., Montpelier, building 9.6 mi. gravel roads, Irasburg, Williston, Sherburne and Marlboro Twps., 2.4 bituminous macadam road, Fairlee Twp. S. B. Bates, state highway engr.; advertised in this issue.

Mass., Boston—Until July 17, by Park Comn., 33 Beacon St., grading and building drives and walks in park and playground. About $12,000. Former bids rejected. C. E. Putnam, 33 Beacon St., engr. Noted May 22.

N. Y., Geneva—Until July 8 (change of date), by Bd. Pub. Wks., paving High, West and Brook Sts., involving 5400 cu.yd. excav., 8750 lin. ft. curbing and guttering, 175 lin. ft. header, 8750 lin. ft. 3 in. drain tile, 3000 lin. ft. vitr. pipe, 10,000 sq.yd. brick or rein.-con. H. K. Seyboldt, supt.; advertised in this issue. Noted June 12.

N. J., Hoboken—Until July 8, by city, improving Jackson, Jefferson, Grand and Clinton Sts., asphalt. J. O. Whittemore, city engr. Noted June 12.

N. J., Jersey City—Until July 8, by city, repaving Grand St. from Mile Creek to Communipaw Ave., Communipaw Ave. from Morris Canal Bridge to westerly block line of Grand St. and south side of Communipaw Ave. to westerly block line of Park St granite block About $50,000. Noted May 15.

N. J., Jersey City—Until July 15, by Comr Essex Co., repairing roadway of Lincoln Highway between here and Newark. About $11,000. Noted June 26.

Pa., Ebensburg—Until July 14, by Supervs. Croyel Twp., c/o Controller Cambria Co., rebuilding 10¼ mi. highway in Croyle Twp, with 16-ft. roadway of vitr. brick paving block on combination base and curb Work is to be let in 3 contracts as follows: Contr. No. 1, Jackson Rd., from Summerhill Boro. line to Cambria Twp. line, 3.35 mi. long; Contr. No. 2, Frankstown Rd., from Lambs Bridge to Summerhill Twp. line, 4 mi.; Contr. No. 3, Perkins Hill Rd from Village of Lovett to Summerhill Twp. line, 2.9 mi. long. Bids will also be received separately for about 1,200,000 No. 1 repressed vitr. paving block, delivered f.o.b. cars Lambs Bridge and Summerhill, 1,500,000 No. 1 repressed vitr. paving blocks, delivered f.o.b. cars Lambs Bridge and Summerhill, and 1,050,000 No. 1 repressed f.o.b. cars, Lovett O. P. Thomas, Leader Bldg., Johnstown, engr.; advertised in this issue

Pa., Harrisburg—Until July 7, by W. H. Lynch, supt. streets and pub. impvts., Commonwealth Trust Bldg., paving sections of Elizabeth, Orange and Brensinger Alleys,

Streets and Roads—(Continued)

Hillside Rd., Walnut, Oxford, Oak, Sprague, Brensinger, Emerald, Bailey, Cameron, Turner, Home, David, Helen, Kunkel, York, Ethel and Chestnut Sts., involving 17,881 sq.yd. sheet asphalt, 1450 sq.yd. bituminous concrete paving and 10,617 lin.ft. curbing.

Pa., Holidaysburg—Until July 14, by Boro. Council, paving 5300 sq.yd. with either 2 course rein.-con. or vitr. brick on concrete base, 3200 lin.ft. concrete curb and 2500 cu.yd. excav. J. L. Henry, boro. engr. H. L. Stutz, chn. street comn.; advertised in this issue.

Pa., Pittsburgh—Until July 17, by Allegheny Co. Controller, building 2800 ft. Bower Hill Rd., Mt. Lebanon Twp., 24 ft. wide, vitr. brick and asphaltic concrete, and 15,350 ft. Gibsonia Rd., Richland and McCandless Twps., 16 ft. wide, rein.-con. R. V. Warren, Court House, engr.

Del., Georgetown—Until July 10, by Sussex Co. Highway Impvt. Comn., building 13.5 mi. highways, sand asphalt surface with slag foundation. C. M. Upham, c/o State Highway Dept., Dover, ch. engr.; advertised in this issue.

W. Va., Harrisville—Until July 7, by Ritchie Co. building 5 mi. road from Ellenboro to Pennsboro. About $112,000. R. O. Benshaw, Huntington, engr. Noted May 8.

W. Va., Huntington—Until July 15, by Cabell Co., grading, draining and paving with No. 1 brick block on concrete base, also building concrete curb and culverts on 1 mi. Wayne Rd. Olive & Maupin Eng. Co., City Hall, engrs.

S. C., Abbeville—Until July 7, by city, paving Main St., involving 50,000 sq.yd. paving, 8000 cu.yd. excav., 20,000 lin.ft. curb and gutter, 5000 lin.ft. gutter and 5000 sq.yd. sidewalk. About $175,000. W. A. Sanders, Abbeville, engr.

S. C., Bamberg—Until July 7, by City Council, paving Main St., involving 500 sq. yd. asphalt or concrete, 2461 lin. ft. curbing and 2178 lin.ft. concrete sidewalk. About $18,000. G. D. Ryan, Bamberg, engr.

Ga., Rome—July 22, by Comrs. Floyd Co. grading and top-soiling roads. About $30,000. J. B. McCrary, 3rd Natl. Bank Bldg., Atlanta, engr.

Florida—Until July 9 by State Highway Comn., Tallahassee, paving and draining, 18 mi. road, 18 ft. wide. About $400,000.

Miss., Indianola—Until July 10, by W. R. French, city clk., for 25,000 sq.yd. concrete or asphaltic concrete pavement. J. N. Harbert Eng. Co., engrs.

Louisiana—Until July 7, by State Highway Dept., Room 736 Maison Blanche Annex, New Orleans, paving 1.42 mi. Shreveport-Greenwood Highway in Caddo Parish and building 12.56 mi. Hammond-Mississippi Highway, Tangiphoa Parish. D. Buie, State Highway, engr.

Ohio—Until July 11, by State Highway Comn., Columbus, building roads in following counties:

Ashtabula Co., Sect. "C" Youngstown-Conneaut Rd., 5 mi., grading, constructing bridges and culverts and paving with monolithic brick or concrete. Estimated cost, $155,601.

Columbiana Co. Sect. "E" Cleveland-East Liverpool Rd., 3 mi., grading, constructing bridges and culverts and paving with concrete or waterbound macadam. $84,774.

Sect. "E-1" Lisbon-Canton Rd., 51 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $17,930.

Sect. "J" Salem-Alliance Rd., 4.12 mi., grading, constructing bridges and culverts and paving with brick, $146,408

Crawford Co., Sect. "M-1" Bucyrus Galion Rd., 1.74 mi., grading, constructing bridges and culverts and paving with bituminous macadam or semi-monolithic brick, $67,239.

Sect. "M-2" Bucyrus-Galion Rd., 2.75 mi., grading, constructing bridges and culverts and paving with bituminous macadam or semi-monolithic brick, $110,314.

Defiance Co., Sect. "E" Hicksville-Defiance Rd., 3.21 mi., grading, constructing bridges and culverts and paving with rein.-con., $84,489

Sect. "F" Hicksville-Defiance Rd., 2.04 mi. grading, constructing bridges and culverts and paving with rein.-con., $53,300.

Delaware Co., Section "L" Columbus-Sandusky Rd., 6.18 mi., grading, constructing bridges and culverts and paving with bituminous macadam or rein.-con., $192,606.

Fayette Co., Sect. "A" Columbus-Washington C. H. Rd., 5.01 mi. grading, constructing bridges and culverts and paving with waterbound macadam or bituminous macadam, 115,554

Sect. "B" Columbus-Washington C. H. Rd., 3.68 mi., grading, constructing bridges and culverts and paving with waterbound macadam or bituminous macadam, $84,754.

Sect. "C" Columbus-Washington C. H. Rd., 4.11 mi., grading, constructing bridges and culverts and paving with waterbound macadam or bituminous macadam, $95,664

Geauga Co., Sect. "J" Cleveland-Meadville Rd., 2.30 mi., grading, constructing bridges and culverts and paving with concrete, $43,404.

Guernsey Co., Sect. "I-1" Cambridge-Caldwell Rd., 1.26 mi. grading, constructing bridges and culverts and paving with concrete, $39,128

Sect. "I-2" Cambridge-Caldwell Rd., 3.13 mi., grading, constructing bridges and culverts and paving with concrete, $115,410

Hancock Co., Sect. "D" Lima-Sandusky Rd., 6.05 mi., grading, constructing bridges and culverts and paving with concrete, bituminous macadam or brick, $238,654.

Hancock Co., Sect. "D, E, C-2, A-1 and C-1" of the county roads, bituminous surface treatment, $12,335.

Harrison Co., Sect. "N-1" Cadiz-Carrollton Rd., 2.40 mi., grading, constructing bridges and culverts and paving with macadam, $50,816

Sect. "N-2" Cadiz-Carrollton Rdd., 48 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $9,570.

Henry Co., Sect. "C" Bryan-Napoleon Rd., 2.4 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $55,118.

Sect. "D-1" Bryan-Napoleon Rd., .90 mi., grading, constructing bridges and culverts and paving with waterbound macadam. $25,825

Sect. "A" Ottawa-Napoleon Rd., 3.01 mi., grading, constructing bridges and culverts and paving with macadam, $66,482.

Knox Co., Sect. "P" Columbus-Wooster Rd., 5.08 mi., grading, constructing bridges and culverts and paving with concrete, $170,817.

Lake Co., Sect. "J" Chardon-Madison Rd., 2.33 mi., grading, constructing bridges and culverts and paving with rein.-con. $58,742.

Logan Co., Sect. "C" Bellefontaine-Lima Rd., 1.27 mi., grading, constructing bridges and culverts and paving with rein.-con., $39,271.

Sect. "E" Bellefontaine-Wapakoneta Rd., 3.22 mi., grading, constructing bridges and culverts and paving with rein.-con., $102,749.

Sect. "F" Bellefontaine-Wapakoneta Rd., 3.05 mi., grading, constructing bridges and culverts and paving with rein.-con., $118,629.

Sect. "G" Bellefontaine-Wapakoneta Rd., 3.69 mi., grading, constructing bridges and culverts and paving with rein.-con., $119,170.

Madison Co., Sect. "D-1" National Rd., 2.47 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $49,837.

Sect. "A-2" Natl. Rd., 5.92 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $157,944.

Mahoning Co., Sect. "P" Unity-Salem Rd., 2.15 mi., grading, constructing bridges and culverts and paving with brick, $93,510

Montgomery Co., Sect. "N" Dayton-Indianapolis Rd., in 2 contracts, 2.67 mi., and .38 mi., grading, constructing bridges and culverts and paving with rein.-con., $98,535. and $25,550

Morgan Co., Sect. "H" McConnellsville-New Lexington Rd., 3.26 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $79,615

Seneca Co., Sect. "Q" Lima-Sandusky Rd., 1.22 mi., grading and paving with bituminous macadam, $15,641.

Sect. "G and H" Upper Sandusky-Tiffin Rd., 4.28 mi., grading, constructing bridges and culverts and paving with bituminous concrete, brick, concrete or bituminous macadam, $163,812

Trumbull Co., Sect. "N-1" Youngstown Conneaut Rd., 1.93 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $5,000.

Sect. "A" Warren-Burton Rd., 1.16 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $33,169.

Sect. "B" Warren-Burton Rd., 3.51 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $102,017.

Sect. "C" Warren-Burton Rd., 2.21 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $73,974

Sect. "D" Warren-Burton Rd., 3 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $11[illegible]6

O., Cleveland—City receiving bids paving Scranton Rd. from Seymour to Clark Aves., involving 25,700 sq.ft. 5 in. brick paving on 6 in. concrete base and 2500 ft. 5 in. stone curbing; West 30th St. from Broadview Rd. to Colburn Ave., 18,000 sq.ft. 4 in. brick on 6 in. concrete base and 1550 ft. 5 in. stone curbing; West 59th St. from Storer to Gilbert Rds., 14,000 sq.ft. 4 in. brick on 6 in. concrete base and 1190 ft. 5 in. stone curbing; Fidelity Ave. from West 101st St. to West Blvd., 14,500 sq.ft. 4 in. brick on 6 in. concrete base, and 1100 ft. 5 in. stone curbing; Franklin Ave. from Franklin Circle to West 65th St., 5600 sq. ft. Medina block, 900 sq.ft. 6 in. concrete base, 22,100 sq.yd. asphalt and 1000 ft. 5 in. stone curbing; Loretta Ave. from West Blvd. to West 101st St., 28,750 sq.ft. 4 in. brick on 6 in. concrete foundation and 2240 ft. 5 in. stone curbing; West 19th St., from Dennison to Kenneth Aves., 15,400 sq.ft. 4 in. brick on 6 in. concrete base, and 1420 ft. 5 in. stone curbing; Scranton Rd. from Parafine to Howard Aves., 25,500 sq.ft. 5 in. brick on 6 in. concrete base, and 2000 ft. 5 in. stone curbing; Scranton Rd. from Howard Ave. to Auburn Rd., 25,500 sq.ft. 5 in. brick on 6 in. concrete base and 2000 ft. 5 in. stone curbing; Scranton Rd. from Auburn Rd. to Seymour Ave., 25,400 sq.ft. 5 in. brick on 6 in. concrete base and 2000 ft. 5 in. stone curbing. R. Hoffman, city engr.

O., Kent—Until July 25, by W. W. Reed, village clk., grading, draining, curbing and paving 8500 sq.ft. Lake St. R. C. Harvey, engr.; advertised in this issue.

Ind., Indianapolis—Until July 16, by Comrs. Marion Co., grading, paving and building culverts on 7990 ft. road, beginning at 30th St. southerly to Crawfordsville Rd., 50 ft. wide, bituminous concrete; 14,873 ft. Allisonville Rd., north from intersection of White River, 50 ft. wide, concrete; 3600 ft. Keystone Ave. beginning at intersection of Allisonville Rd. south to J. W. Roberts Rd., 50 ft. wide. About $71,850, $105,335 and $33,242, respectively. J. J. Griffith, Indianapolis, engr.

Ind., Indianapolis — Until July 18, by Comrs. Marion Co. grading and paving 8724 ft. road from Andy Smith Gravel Rd. to north line of Marion Co., 20 ft. wide, concrete, cost $84,826; also 26,218 ft. Pendleton Pike, 20 ft. wide, rein-con. J. J. Griffith, co. engr.

Mich., Bay City—Until July 7 by city, building 24,500 yd. pavement, asphalt, concrete and brick. W. H. Reid, compt.; advertised in this issue

Mich., Port Huron—Until July 10, by D. D. Worcester, co. rd. mgr., County Bldg., grading, surfacing and building drainage structures on 2½ mi. Assessment Dist. Rd. No. 20, Lynn Twp., St. Clair Co. 16 ft. wide. D. Belyea, co. engr.

Wisconsin—Until July 9, by Wisconsin Highway Comn., Div. No. 5, La Crosse, improving Voriqua-Sparta Rd., Monroe Co., Federal Aid Project No. 67, involving 6 acres clearing and grubbing, 30,901 cu.yd. earth, 2040 cu.yd. earth (Creek channel), 2051 cu.yd. rock and 9 cu.yd. borrow excav., 285.79 cu.yd. Class "A" concrete, etc.; Prairie du Chien-Viroqua Rd., Crawford Co., Federal Aid Project No. 83, 1 acre clearing and grubbing, 29,250 cu.yd. earth, 2620 cu.yd. rock, and 311 cu.yd. borrow excav., 271 cu.yd. Class "A" concrete and 44 cu.yd. Class "B" concrete; La Crosse-Sparta Rd., La Crosse Co., Federal Aid Project No. 29, 29,183 sq.yd. bituminous macadam or 31,129 sq.yd. concrete surfacing. Noted Jan. 30

Wisconsin—Until July 8, by Wisconsin Highway Comn., Madison, improving Dunbarton-Darlington Rd., Lafayette Co. Federal Aid Project No. 86, involving 1.48 acres clearing and grubbing, 17,604 cu.yd. earth, 2139 cu.yd. rock and 272 cu.yd. borrow excav., 234 cu.yd. Class "A" concrete, 2942 sq.yd. concrete surfacing, 35,949 lbs. structural steel, 138 sq.yd. Class "A" bridge paving, etc.; Wonewoc-La Valle Rd., Sauk Co. Federal Aid Project No. 97, 14,813 cu.yd. earth, 496 cu.yd. rock and 23 cu.yd. borrow excav., 239 cu.yd. Class "A" concrete, 30,892 sq.yd. gravel surfacing, etc.

Minn., Brainerd—Until July 19, by and Crow Wing Co., grading, graveling and surfacing 23 mi. Federal Aid Project No. 51, 24 ft. wide, surfacing 18 ft. wide. About $125,000. C. L. Mott, Brainerd, engr. Former bids rejected. Noted May 22.

Streets and Roads—(Continued)

Minn., Faribault—Until July 16, by Aud. Rice Co. building 13 mi. Federal Aid Project No. 64, State Rd No. 5, Div. A, involving 27,457 cu.yd. excav., furnishing and installing culverts, etc.; Div. B, 49,649 cu.yd. excav., culverts, etc.; Div. C, 30,945 cu.yd. excav., 136,982 sq.yd. pavement, culverts, etc. About $200,000. W. P. Chapman, Faribault, engr.; advertised in this issue. Noted May 22.

Minn., Litchfield—Until July 20, by City Council, paving 22 blocks of streets. About $75,000. L. P. Wolff, 1001 Guardian Life Bldg., St. Paul, consult. engr. Noted June 12.

Minn., Mantorville—Until July 9, by G. L. Taylor, aud. Dodge Co., grading and graveling 12 mi. Federal Aid Project No. 66, State Rd. No. 1, Job No. 1802, 24 ft. wide. About $60,000. R. D. Jorgens, Hayfield, engr. Former bids rejected. Noted June 19.

Minn., Red Wing—Until July 17, by C. H. Meyer, aud. Goodhue Co., graveling 21.25 mi. Project No. 20, State Rds. Nos. 1 and 3, 24 ft. wide, also building State Bridge No. 3108, two 30 ft. rein.-con. spans, on State Rd. No. 2. About $121,000. J. A. Prior, Red Wing, engr.

Minn., Rochester—Until July 15, by Aud. Olmsted Co., building Job No. 1908, State Rd. No. 2, involving 78,702 cu.yd. earth and 6898 cu.yd. sand rock excav., etc. G. H. Smith, Rochester, engr.

N. D., Bottineau—Until July 8, by Bottineau Co., building 8.01 mi. earth road, Federal Aid Project No. 40, and 10.31 mi. gravel road, Federal Aid Project No. 43. W. H. Robinson, c/o State Highway Comn., Bismarck, engr.

Mo., Excelsior Springs—Until July 10, by W. L. Silvers, city clk., paving 400 ft. Spring St., 27 ft. wide, involving 1200 sq.yd. vertical fibre brick with asphalt filler on old base. C. A. Shockley, 740 Reserve Bank Bldg., Kansas City, engrs.

Mo., Pleasant Hill—Until July 7, by B. D. West, city clk., paving 5400 ft. 1st St., 15 ft. wide, involving 9000 sq.yd. waterbound macadam and 1900 cu.yd. embankment. About $11,000. Shockley Eng. Co., 740 Reserve Bank Bldg., Kansas City, engrs. Noted June 26.

Tex., Fairfield—Until July 8, by S. W. Robinson, judge Freestone Co., improving 10.04 mi. Highway No. 7 from Limestone Co. line to Teague, 24 ft. wide. Work involves 1.7 acres, clearing and grubbing, grading, hauling and placing gravel macadam road and building concrete drainage structures. About $150,000. Noted June 26.

Tex., Seymour—Until July 7, by Clk. Baylor Co., grading 12.35 mi. Highway No. 30 from Seymour to west county line, involving 27,255 cu.yd. earth excav., 3.27 mi. grading, 1.83 mi. reshaping, 135 cu.yd. class "A," and 70 cu.yd. Class "B" concrete, 11,084 lbs. reinforcing steel, etc. Noted May 22.

Utah—Until July 10, by State Highway Comn., Salt Lake City, paving 38 mi. Forest Rd. from Logan to Garden City, 18-24 ft. wide, involving 10,600 cu.yd. rock and 74,000 cu.yd. earth excav., 1500 cu.yd. rubble masonry and 5000 lin.ft. corrugated iron pipe. B. J. Finch, Hudson Bldg., Ogden, dist. engr.

Utah, Logan—Until July 10 by city clk. paving sidewalks in sidewalk Dist. No. 26, involving 82,000 sq.ft. 4 in. concrete, 3500 sq.ft. 6 in. concrete, 13,000 lin.ft. cement curbing and 13,000 lin.ft. cement guttering. W. H. Chambers, city engr.

Washington—Until July 14, by State Highway Bd., Olympia, clearing, grading, draining and surfacing with gravel, 6.3 mi. Olympic Highway, west from Olympia, Thurston Co.; 4.2 mi. Olympic Highway from Brady to Elma, concrete, Grays Harbor Co.; 2.9 mi. Olympic Highway northwest from Hoquiam, Gray Harbor Co.; 6.7 mi. Pacific Highway from Salmon Creek north, concrete, Clarke Co.; 3.8 mi. Inland Empire Highway from Walla Walla to Buroker, concrete, Walla Walla Co.; 3 mi. Inland Empire Highway from Parker to Donald, concrete, Yakima Co.; 4.8 mi. Inland Empire Highway, west of Sunnyside, concrete, Yakima Co.; 4.3 mi. North Bank Highway from Vancouver to Fisher, concrete, Clarke Co.; 3.3 mi. North Bank Highway from Ellsworth to Camas, concrete, Clarke Co.; 6.7 mi. Pacific Highway from Castle Rock north, gravel, Cowlitz Co. J. Allen, state highway engr.

Wash., Seattle—Until July 14, by Comrs. King Co., building 4 mi. Bellevue-Newport Rd., 24 ft. wide, involving 5000 cu.yd. gravel surfacing, 30,000 cu.yd. earth excav., and building 2500 ft. creosoted pile trestle. About $68,000. S. J. Humes, co. engr.

Cal., San Diego—Until July 7, by A. H. Wright, city clk., improving portions of India, Pierce, California and Taylor Sts. and La Jolla San Diego Ave., 5194.31 lin.ft. in all, involving 2456 cu.yd. excav., 326,359 sq.ft. bitulithic wearing surface (Warrenite), 1½ in. thick on 5 in. concrete base, 7160 lin. ft. cement concrete curbing, etc. F. A. Rhodes, city engr. Noted Mar. 27.

N. S., Halifax—Until July 9, by F. W. Doane, city engr., paving streets. Work involves 23,000 sq.yd. granite block, 30,000 sq.yd. bituminous concrete, 33,000 lin.ft. concrete curbing and guttering, and 133,000 sq.yd. bituminous macadam.

Ont., Galt—Until July 13, (change of date), by W. H. Fairchild, city engr., paving, curbing and guttering West Main St. About $25,000. Noted June 12.

Ont., Wallaceburg—Town receiving bids paving and repairing various streets. About $40,000. L. G. McNeice, Margaret Ave., engr.

Ont., Windsor—Until July 12, by city, building concrete pavements and curbs on MacDougal Ave. and Huron St. About $22,864. M. A. Dickinson, acting engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Massachusetts—State Highway Comn., Boston, received bids June 24, for 5600 ft. road, Falmouth Twp., involving 9300 sq.yd. macadam and 5600 lin. ft. excav., from Thomas & Murphy, Keene, N. H., cost $12,540; 11,200 ft., road, Great Barrington Twp., 3840 cu.yd. concrete, 5240 cu.yd. earth and 100 cu.yd. rock excav., from Lane Constr. Co., 37 Colony St., Meriden, Conn., $55,808, Menaguali & Blanchi, Great Barrington, $60,640, W. D. Smith Co., Springfield, $61,273; 2000 ft., road, Avon Twp., 9600 gal. bituminous macadam, 660 cu.yd. earth excav. and 1300 cu. yd. broken stone, from E. C. Sargent Co., Quincy, $7987, Powers Bros., Brockton, $8610, W. F. Loud Co., Quincy, $9093. Noted June 5 and 19.

★**Massachusetts**—State Highway Comn., Boston, let contract building 3100 ft. concrete road, West Springfield Twp., to Middlesex Constr. Co., Medford, $20,499. Work involves 1420 cu.yd. concrete, 1250 cu.yd. tar macadam and 2000 cu.yd. excav. Noted June 19.

★**Mass., Boston**—Comr. Pub Wks. let contract, to B. E. Grant Co., 27 School St., paving Tremont St., involving 21,740 sq.yd. granite block, 6620 lin.ft. stone curbing, 7000 sq.ft. concrete sidewalk, cost $77,749; to J. M. McCourt Co., 46 Wait St., Brookline, Summer St., 7570 sq.yd. granite block, 1100 lin.ft stone curbing and 700 sq.yd. concrete sidewalk, $28,195.

★**Mass., Boston**—Comr. Pub. Wks. let contract paving Cambridge St., to Central Constr. Co., 27 School St., $14,329. Work involves 7200 sq.yd. granite block, 592 lin. ft. stone curbing, and 2000 lin.ft. brick sidewalks.

★**Connecticut**—State Highway Comn., Capitol, Hartford, let contract improving 51,691 ft. 3 in. bituminous macadam over 7 in. native stone base on Norwich Westerly Rd., Preston, Ledyard, North Stonington and Stonington Twps., to L. Suzio Constr. Co., State and Brooks Sts., Meriden, $355,000; 6600 lin.ft. 3 in. bituminous macadam over 4 in. stone base, on Abington Rd., Pomfret Twp., to J. H. Grozier Co., 721 Main St., Hartford, $40,000; 3000 lin.ft. 7 in. native stone macadam on North Granby Rd., Granby Twp., to H. L. Immich Co., State St., Meriden, $20,000. Noted June 19.

★**Conn., Milford**—City let contract building 10,000 ft. Beach Rd., from Devon R. R. Sta. to Walnut Beach, to Connecticut & Rhode Island Co., Inc., Hall and Lewis Bldg., Meriden. About $50,000. Noted Feb. 20.

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres., let contract regulating and laying cement sidewalks on both sides of Bay Ridge Pl., to Grimm Constr. Co., $941; Bay 38th St., to J. J. Guinan Co., 2314 Gravesend Ave., $2001; 64th and 76th Sts., to Brooklyn Alcatraz Asphalt Co., 407 Hamburg Ave., $10,443 and $911,158 respectively. Noted June 19.

N. Y., Geneva—Bd. Pub Wks. received bid paving various streets, from Oatka Constr. Co., Warsaw. About $75,000.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids regulating and repaving (a) 13th St. from 2nd to 9th Aves., College Point, 3rd Ward; (b) Main St. from Bway. to Jamaica Ave., 3rd Ward; (c) Jackson Ave. from Bridge Plaza to Thompson Ave., 1st Ward; (d) Jackson Ave. from Bridge Plaza to 2nd Ave., 1st Ward; (e) Jackson Ave. from 2nd Ave. to Old Newtown Rd., 1st Ward, from Peace Bros., 20 Main St., Flushing, (a) $37,652, (b) $21,681, (c) $21,001, (d) $18,115, (e) $65,137; F. J. Mason, (a) $38,694, (b) $22,533, (c) $20,700, (d) $17,860, (e) $60,040. Noted June 19.

★**N. Y., New York**—H. Bruckner, pres. Bronx Boro., let contract resetting curbs and repaving with sheet asphalt on concrete foundation, roadway of Cypress Ave. from East 135th to East 136th Sts., to Union Paving Co., Bway. and 112th St., $5674; repaving with granite blocks on concrete foundation, roadway of Cypress Ave from East 132nd to East 138th Sts., to S. Davis, 225 West 110th St., $55,779. Noted June 19.

N. Y., New York—F. L. Dowling, pres. Manhattan Boro., received bids June 25, regulating and repaving with sheet asphalt on concrete base, roadway of (a) Lexington Ave., (b) Lenox Ave., (c) 110th St., (d) 119th St., (e) 121st St., (f) West Bway., (g) Moore St., (h) repaving asphalt pavement in roalroad area, from Sicilian Asphalt Paving Co., 41 Park Row, (a) $55,126, (b) $188,462, (c) $27,973, (d) $27,183, (e) $21,783, (h) $17,400; Uvalde Asphalt Paving Co., 1 Bway., (a) $58,387, (b) $193,421, (c) $27,099, (d) $26,494, (e) $20,475, (h) $15,720; Asphalt Constr. Co., 2197 Madison Ave., (a) $61,242, (b) $197,634, (c) $28,201, (d) $27,882, (e) $22,322, (f) $81,674, (g) $8128, (h) $17,700; Cleveland Trinidad Paving Co., Flushing, L. I., (b) $182,732, (d) $26,742, (e) $22,104; Davney Asphalt Paving Co., foot of Quinby Ave., (c) $27,643, (d) $26,102, (e) $21,624; M. J. O'Hara, (f) $81,236, (g) $8392; P. J. Kerns, (f) $82,045, (g) $4872; M. J. Sachs, (g) $8277; W. J. Fitzgerald, 547 West 45th St., (f) $82,675, (g) $8374. Noted June 19.

★**N. Y., Rochester**—City let contract paving Mellville St., to F. W. Brotch Co., E and B Bldg., $19,927; Elmwood Ave., to T. Holohan, $39,051; Atlantic Ave., to Whitmore, Rauber & Vicinus, 279 South Ave., $63,608; Thurston Rd., to Rochester Vulcanite Paving Co., Exchange Pl. Bldg., $18,-949, all asphalt.

N. Y., Utica—Bd. Contr. & Supplies received bids, from H. W. Roberts, 610 Lansing St., resurfacing with (a) bitulithic, (b) sheet asphalt, (c) asphaltic concrete, Eagle St. from Genesee St. to Park Ave., (a) $2800, (b) $2720, (c) $2620; John St. from Main to Catharine Sts., (a) $9661, (b) $9253, (c) $8743; Whitesboro St. from Genesee to Seneca Sts., (a) $13,997, (b) $13,453, (c) $12,773; Seneca St. from Erie Canal to Columbia St., (a) $10,035, (b) $9651, (c) $9171; Bway. from Columbia to Court Sts., (a) $12,406, (b) $11,982, (c) $11,452; Arthur St. from Steuben to West Sts., (a) $4376, (b) $4265, (c) $4125; Cornelia St. from Lafayette to Cooper Sts., (a) $7677, (b) $7420, (c) $7119; John St. from Bleecker to Elizabeth Sts., (a) $5647, (b) $5423, (c) $5143.

★**N. Y., Watertown**—City will pave South Massey St. from Ives to City limits, macadam. About $10,000. Work will be done by day labor. Noted June 19.

★**N. J., Jersey City**—Bd. Freeholders Hudson Co. let contract improving Paterson Turnpike, to Hudson Contg. Co., 452 Montgomery St., 107⅞ per cent. $83,441 (engineers estimate). Noted June 12.

★**N. J., Newark**—City let contract paving and curbing 12,023 lin.ft McAllister, Dupont, Eeus, Paine, Nesbit, Chestnut, Union and Banta Sts., 35 ft. wide, to J. Dorer, Irvington, $125,000. Work involves 12,033 lin.ft. concrete curbing, 11,600 sq.yd. asphalt, 20,733 sq.yd. concrete and 21,500 cu. yd. earth excav.

Pennsylvania—State Highway Dept., Harrisburg, received bids June 24 building roads in counties as follows:

(a) Blair Co., 1269 lin.ft. rein.-con.;

(b) Columbia Co., (1) 9122 ft. bituminous surface course on concrete foundation, (2) 10,870 ft. bituminous surface course on concrete foundation and Hillside vitr. brick.

(c) Dauphin Co., (1) 24,765 ft. rein.-con. (2) 12,725 ft. bituminous surface course on concrete foundation or rein.-con.;

(d) Lancaster Co., 21,506 ft. bituminous surface course on concrete foundation or rein.-con

Streets and Roads—(Continued)

(e) McKean Co., 31,548 ft. rein.-con. on concrete foundation or vitr. brick;

(f) Northumberland Co., (1) 25,698 ft. rein.-con. and Hillside vitr. brick, (2) 9641 lin.ft. bituminous surface course on concrete foundation or rein.-con., from Standard Contg. Co., Altoona Trust Bldg., Altoona, (a) $19,880; G. I. Thompson & Co., Clearfield, (a) $20,844; Boyle Constr. Co., Wilkes-Barre, (b) $84,630, (b2) $169,621; T. L. Evans Sons, Danville, (b1) $93,666, W. P. McDonald Constr. Co., Phila., (b1) $97,894, (b2) $156,345; Eastern Paving Co., Colonial Trust Bldg., Phila., (b2) $165,087, (c2) $159,614; H. Nawn Contg. Co., Phila., (c1) $186,863, (c2) $143,812; Mason & Hanger Co., Inc., Chambersburg, (c1) $191,009, (f) $199,627; Hamilton-Kapnek Constr. Co., Phila., (c1) $192,313; J. McGraw Co., Commercial Trust Bldg., Phila., (c2) $144,889; Claiborne-Johnston & Co., 10th Ave. and 6th St., Baltimore, (d) $162,093, (f) $202,002; J. F. Shanley, Commercial Trust Bldg., Phila., (d) $166,803; Souder Constr. Co., 214 East Orange St., Lancaster, (d) $177,699; Lesher & Roess, 700 West Front St., Oil City, (e) $231,680; E. M. Love & Son, Cameron Blk., Corry, (e) $263,154; E. A. Corson, 739 Asbury St., Ocean City, N. J., (f) $207,680; Wertley & Houser, Pottsville, (g) $64,007; Gifford Constr. Co., Jamaica, N. Y., (g) $71,814; Warren Bros. Co., 142 Berkeley St., Boston, (g) $72,368. Noted June 12.

★**Pa., Canonsburg**—Boro. let contract grading, curbing and paving with concrete, 1823 ft. Van Eman, Chartiers, Hutchinson and Hawthorne Sts., 14-24 ft. wide, to R. W. Wilson, Canonsburg, $13,046. Noted June 26.

★**Pa., Coatesville**—City let contract paving various streets, to Dunleavy Bros., Coatesville, cost $92,204. Noted June 12.

Pa., Pittsburgh—Allegheny Co. received bids improving 17,000 ft. Butler Pike, Shaler and Hampton Twps., 20 ft. wide, involving 25,000 sq.yd. Hillside vitr. brick, 12,000 sq.yd. asphaltic concrete, 15,450 lin. ft. raised integral and concrete, curbing, etc., from McDonald, McNeil Co., Pittsburgh, $161,858, Booth & Flynn, 1942 Forbes St., $165,019, Columbus Asphalt & Paving Co., Keystone Bldg., $166,320; also 8000 ft. Bakerstown & Warrendale Rd., Pine Twp., 2950 sq.yd. Hillside vitr. brick, 12,700 sq.yd. rein.-con., 22,000 cu.yd. earth excav., 3300 sq.yd. concrete base and shoulders, etc. from T. Cronin Co., South 17th and Muriel Sts., $84,163, J. McQuaide & Sons, Bakewell Bldg., $100,245, T. McNally, Oliver Bldg., $100,299. Noted June 5.

★**Pa., Somerset**—Town Council let contract paving South West St., concrete, to F. H. Ziegler, Somerset, cost $11,134.

★**Md., Chestertown**—Comrs. Kent Co. let contract resurfacing 5 mi. Betterton-Still Pond Rd., waterbound macadam, 3½ in. stone base, to Sutton Contg. Co., 640 Heed Bldg., Phila.

★**Va., Norton**—City let contract for 20,000 yd. Trinidad Lake sheet asphalt paving on 6 in. concrete base, to J. J. Curley, 406 East Baker St., Richmond, $4.30 per sq.yd.

W. Va., Winfield—Putnam Co. received bids building 4 mi. Midland Trail Rd., from Cullonden toward St. Albans, involving 30,000 cu.yd. excav. and 37,000 sq.yd. concrete, from T. Pietro, Morgantown, $124,704; Keeley Constr. Co., $133,683, and Brown & Floyd, $135,839.

★**N. C., Gastonia**—City let contract paving 3 mi. Pleasant Ridge Rd., 18 ft. wide, to Simmons-Whitton Co., Charlotte. About $75,000. Noted May 22.

★**N. C., Hillsboro**—Orange Co. let contract grading, top-soiling and building culverts on 18 mi. road from Durham Co. line to Alamance Co. line, 16-18 ft. wide, to W. S. & L. A. Crawford, Mebane, $33,813. Work involves 6 cu.yd. concrete, 13,500 cu.yd. earth excav., 60 lin.ft. standard vitr. pipe and 41,500 cu.yd. soil surfacing.

★**S. C., Columbia**—City let contract resurfacing Main St., from Gervais to Scott Sts., 60 ft. wide, involving 30,000 sq.yd. sheet asphalt, etc., to R. M. Hudson Co., Union Natl. Bank Bldg., $1.35 per sq.yd.

★**Ga., Dublin**—City let contract paving, draining, curbing and guttering 40,000 sq.yd. with bituminous concrete, 2 in. top, to Ely Constr. Co., Lamar Bldg., Augusta. About $98,000. Noted June 5.

★**Louisiana**—State Highway Dept., New Orleans, let contract building 1.66 mi. bituminous macadam highway branching from Alexandria-Camp Beauregard Rd. to United States Reconstruction Base Hospital, in Rapides Parish, to Southern Bitulithic Co., Weis Bldg., New Orleans. About $60,000. Noted June 12.

O., Cleveland—City received bids paving Eichorn Ave. from West 45th to 54th Sts., from Roehl Bros., West 25th St. and Clark Ave., cost $25,013, Baldwin Bros., 4500 Euclid Ave., $26,375, Rieley Bros., 357 The Arcade, $26,454; Nordica Ave. from West 73rd to 80th Sts., from M. P. Platten, 2013 Columbus Rd., $12,931, Freshwater Constr. Co., 11,712 Detroit Ave., $11,605, Rieley Bros., 357 The Arcade, $11,644. Noted June 19.

★**O., Cleveland**—City let contracts to Cleveland Trinidad Paving Co., The Arcade, paving South Moreland Blvd. from Shaker Blvd. to Buckeye Rd., cost $14,786; South Moreland Blvd. from Shaker Blvd. to Drexmore Ave., $20,000; Ripley Ave. from Hampton Rd. to Ashwood Ave., $12,359; North Moreland Blvd. from Shaker Blvd. to Woodland Ave., $11,887; Ludlow Ave. from East 132nd St. to city limits, $27,148; Livingston Rd. from East 132nd St. to Abell Ave., $32,036; Keswick Rd. from Hampton Rd. to city limits, $10,081; Hampton Rd. from East 132nd St. to Albion Ave., $32,851; Drexmore Rd. from South Moreland Blvd. to city limits, $14,134; Corby Rd. from Hampton to Ludlow Rds., $11,099; Becket Rd. from Hampton Rd. to city limits, $26,447; Albion Rd. from Hampton Rd. to city limits, $15,153; East 132nd St. from Shaker Blvd. to Griffing Ave., $63,049; Chadbourne Ave. from Drexmore Ave. to city limits, $11,556; Ashwood Ave. from East 132nd St. to city limits $31,355. Noted June 19.

★**O., Toledo**—Comrs. Lucas Co. let contracts, to M. P. Hannin, 430 Valentine Bldg., grading, draining, curbing and paving 1½ mi. Perkside roads and streets, 4 ft. wide, 3 in. vertical fibre vitr. brick, cost $107,729; 7966 ft. Yondota Rd., 16 ft. wide, waterbound macadam, $28,098; to R. A. Garrigan, 434 Valentine Bldg., 4.39 mi. Sylvania-Alexis Rd., 16 ft. wide, 6-8 in. concrete, $117,357; to Warner & McKechnie, 320 Nasby Bldg., 1.87 mi. Key St., 16 ft. wide, 1-2-3 concrete, $40,579; to A. Langenderfer, 437 Spitzer Bldg., 6905 ft. Lyon Rd., 16 ft. wide, waterbound macadam, $25,391. Noted June 5.

Ind., Indianapolis—City received bids resurfacing over brick with Trinidad asphalt or brick, (a) Chesapeak St. from Illinois to Pennsylvania Sts., (b) Vermont St. from East to West Sts., with Trinidad lake asphalt, (c) Henry St. from Meridian to Illinois Sts., (d) Alabama St. from Washington to Ohio Sts., (e) Alabama St. from Washington to Maryland Sts., improving (f) alley east of Ruckle St. between 20th and 21st Sts., paving (g) Blackford St. from Washington St. to tracks south of canal, (h) alley south of 15th St. from alley east of Hudson to Alabama Sts., (i) 44th St. from Bway. to Central Ave., (j) 36th St. from Central to College Aves., from Union Asphalt Constr. Co., 308 Amer. Central Life Bldg., (a) asphalt, $2.73 per lin. ft., (b) asphalt $7.14, (d) asphalt, $6.02, (e) asphalt, $9.03; Columbia Constr. Co., Indianapolis, (a) brick, $4.00, (f) brick, $3.00, concrete $2.45, (g) brick, $7.50 concrete, $5.90, (h) brick, $3.70, concrete $3.20; Amer. Constr. Co., 108 North Delaware St., (b) asphalt, $7.39, (g) asphalt, $7.30, (i) asphalt, $6.42, bituminous concrete, $6.08, (j) asphalt, $6.10, bituminous concrete, $5.70; Marion Co. Constr. Co., 367 South Illinois St., (c) asphalt, $6.40; Abl Bros., 402 Amer. Central Life Bldg., concrete, $2.45.

Ind., Indianapolis—City received bids resurfacing (a) 749 ft. North St. from Noble to Pine Sts., 27 ft. wide, Trinidad asphalt, (b) 420 ft. North St. from Meridian to Pennsylvania Sts., 40 ft. wide, Trinidad asphalt, (c) 2556 ft. Shelby St. from 1st alley south of Prospect Ave. to Pleasant view bridge, 40 ft. wide, asphalt, (d) 870 ft. Ohio St. from Senate Ave. to West St., 40 ft. wide, Trinidad asphalt, (e) Ohio St. from Capitol to Senate Aves., asphalt, from Premier Constr. Co., 1023 Lemcke Annex (a) $5.43 per lin. ft., (b) $5.55, (c) $3.25, (d) $5.66, (e) $7.08. Union Asphalt Contg. Co., 308 Amer. Life Bldg., (a) $5.95, (b) $5.55, (c) $3.30, (d) 6.00, (e) $7.00. Marion Co. Constr. Co., 1600 South West St., (e) $5.55.

★**Ind., Indianapolis**—City let contract resurfacing Michigan St. from East St. to Indiana Ave., to Premier Constr. Co., 1023 Lemcke Bldg., $7.05 per lin.ft., total cost $51,635; Vermont St. from East to West Sts., to Union Asphalt Paving Co., 308 Amer. Central Life Bldg., $7.19 total cost $57,632. Noted June 19.

★**Ind., Indianapolis**—City let contract, to Marion Constr. Co., 1600 South West St., resurfacing with asphalt, Maryland St. from Senate Ave. to West St., $12,923, Kentucky Ave. from Illinois to Georgia Sts., $18,887, Senate Ave. from Washington St. to Kentucky Ave., $11,087, Senate Ave. from Washington St. to Indiana Ave., $28,140; Amer. Constr. Co., 108 North Delaware St., Washington St. to point 55 ft. west of Meisendorff St., $63,096.

Mich., Detroit—Dept. Pub. Wks. received bids paving with sheet asphalt or asphaltic concrete on 6 in. concrete foundation, Amherst or Berea curbstone, (a) Moran St., (b) Arizona Ave., (c) Brandon Ave., (d) Garfield Ave., (e) Minnesota Ave., (f) Maxwell Ave., (g) Philadelphia Ave., (h) Richter St., (i) Solvay Ave., (j) Walbridge St., from Detroit Asphalt Paving Co., 20 McGraw Bldg., (a) $7280, (b) $8548, (c) $7376, (d) $57,376, (e) $22,985, (f) $11,518, (g) $35,298, (h) $9591, (i) $38,358, (j) $7867; W. B. Brady Constr. Co. 1972 Grand River Ave., (a) $7399, (b) $8579, (c) $7737, (d) $57,700, (e) $23,296, (f) $12,046, (g) $35,068, (h) $9641, (i) $39,307, (j) $8239; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a) $7125, (b) $8395, (c) $7813, (d) $58,338, (e) $22,811, (f) $11,756, (g) $35,916, (h) $9943, (i) $39,781, (j) $8155. Noted May 22 and June 12.

★**Mich., Hamtramck**—City let contract grading, widening and paving 1900 ft. Joseph Campau Ave. from village limits to Grand Trunk Ry. crossing, 26-30 ft. wide, creosoted wood block on new 6 in. concrete foundation, to Lennance Bros., 809 Union Trust Bldg., Detroit. Noted Feb. 13.

★**Mich., Pontiac**—City let contract, to Globe Constr. Co., Pontiac, paving with bitulithic macadam, Fairgrove Ave., 28 ft. wide, cost, $13,231; West Huron St., double roadway, 18 ft. wide each, $16,824; Ottawa Dr., $39,640.

★**Ill., Chicago**—Bd. Local Impvts. let contract paving (a) Archer Ave., (b) Devon Ave., (c) Hayne Ave., (d) Karlov Ave., (e) Keating St., (f) Kolin St., (g) Lawrence Ave., (h) Leavitt St., (i) Longwood Dr., (j) Morgan St., (k) Otto St., (l) South Chicago Ave., (m) South Park Ave., (n) West 35th Pl., (o) South Wabash Ave., (p) Windsor Ave., (q) Lafayette Ave., (r) North Claremont, Oakley and Irving Sts. and Rosemont, Highland and Thome Aves., (s) Cornelia, Rosecoe, Henderson, School, Melrose, Karlov, Kedvale, Keeler and Lowel Aves., to Reidy & Callaghan, 133 West Washington St., (a) $66,452; Smith & Brown Co., 128 North La Salle St., (b) $19,569; R. F. Conway Co., 133 West Washington St., (c) $34,395, (e) $30,806, (n) $14,642, (p) $11,888; Standard Paving Co., 29 South La Salle St., (d) $35,007, (f) $11,455; Ryan Co., 4500 West Division St., (g) $99,267, Central Paving Co., 179 West Washington St., (h) $5250; Amer. Asphalt Paving Co., 133 West Washington St., (i) $39,758, (j) $10,148, (k) $14,812, (q) $59,261; Calumet Coal & Teaming Co., 9022 Commercial Ave., (l) $57,046; Farr Bros. Co., 356 West 111th St., (m) $76,378, (o) $5494; J. A. McGarry & Co., 189 West Madison St., (r) $61,381; White Paving Co.; 17 North La Salle St., (s) $110,149. Noted June 19.

Ill., Chicago—Bd. Local Impvts. received bids June 26, paving (a) alley between Lake St., Park Ave., Paulina and Hermitage Sts., involving 590 sq.yd. 7 in. cement, 226 cu.yd. grading;

(b) alley between Washington Blvd., Madison and Kilpatrick Sts., and Cicero Ave., 584 cu.yd. grading, 1320 sq.yd. 7 in. cement, 240 ft. 10 in. tile sewer, 1 brick catch basin, etc.;

(c) alley between Colorado Ave., Jackson Blvd., Whipple St. and Albany Ave., 1720 ft. cement curbing, 450 cu.yd. excav., 1360 sq.yd. 7 in. cement paving;

(d) alley between East 65th St., Marquette Rd., Maryland and Cottage Grove Aves., 220 cu.yd. grading, 880 sq.yd. 7 in. cement pavement, 2 brick catch basins;

(e) alley between West 86th Pl., West 87th St., Vincennes Ave. and Sangamon St., 225 cu.yd. grading, 1140 sq.yd. 7 in. cement pavement;

(f) Augusta St., from Kedzie to Grand Aves., 1060 ft. concrete curbing, 831 cu.yd. grading, 1620 sq.yd. asphalt pavement on 6 in. concrete base, etc.;

(g) Belmont St., from Bway. to Sheridan Rd., 2540 ft. cement curb, 2000 cu.yd. excav., 5200 sq.yd. asphalt pavement on 6 in. concrete base, etc.;

(h) Besley Court from West North Ave. to Wabansia St., 1600 ft. sandstone curbing, 1475 cu.yd. grading, 2660 sq.yd. vitr. brick on 6 in. concrete base, etc.;

Streets and Roads—(Continued)

(i) Clyde Ave. from East 73rd to East 75th Sts., 2500 ft. cement curbing, 1500 cu.yd. grading, 3600 sq.yd. asphalt pavement on 6 in. concrete base, etc.;

(j) Ellen St. from Wood to Lincoln Sts., 1300 ft. cement curbing, 910 cu.yd. grading, 2100 sq.yd. asphalt pavement on 6 in. concrete base, etc.;

(k) La Crosse Ave. from West End to Park Aves., 800 ft. cement curbing, 1028 cu.yd. grading, 1210 sq.yd. asphalt pavement on 6 in. concrete base, etc.;

(l) North Racine Ave. from Grace to point 395 ft. north, 360 ft. cement curbing, 1200 cu.yd. grading, 1400 sq.yd. pavement with 8 in. blast furnace slag or limestone on 2½ in. grading or traprock;

(m) Shields St. from West 59th to West 58th Sts., 890 ft. concrete curbing, 600 cu.yd. grading, 1430 sq.yd. asphalt pavement on 6 in. concrete base, etc.;

(n) Shields St. from West 35th St. to point 631 ft. south, 500 ft. concrete curbing, 1000 cu.yd. grading, 2760 sq.yd. vitr. brick pavement on 6 in. concrete base; 205 ft. 12 in. tile sewer, etc.;

(o) South Union Ave. from West 101st to West 102nd Sts., 1200 ft. concrete curbing, 800 cu.yd. grading, 2000 sq.yd. pavement with 8 in. blast furnace slag or limestone on 2½ in. granite or traprock;

(p) Wabansia St. from Kedzie Ave. to Chicago, Milwaukee & St. Paul R.R. tracks, 7120 ft. concrete curbing, 4700 cu.yd. grading, 11,420 sq.yd. asphalt pavement on 6 in. concrete base, 210 ft. 10 in. tile sewer, etc.;

(q) West Walton St. from Keeler Ave. to Kilbourne St., 3960 ft. concrete curbing, 3432 cu.yd. grading, 6400 sq.yd. asphalt pavement on 6 in. concrete base, etc.;

(r) Wolfram St. from Ashland Ave. to Paulina St., 1300 ft. concrete curbing, 900 cu.yd. grading, 2000 sq.yd. asphalt pavement on 6 in. concrete base;

(s) East 71st and East 72nd Sts. from South Shore Dr. to point 122 ft. east, 1490 ft. concrete curbing, 2200 cu.yd. grading, 2410 sq.yd. asphalt pavement on 6 in. concrete base, etc.;

(t) South Richmond St. from West 63rd to West 67th Sts., South Sacramento Ave. from West 63rd to West 67th Sts., West 64th and West 66th Sts., from Sacramento Ave. to Francisco St., 14,280 ft. concrete curbing, 6000 cu.yd. grading, 21,250 sq.yd. asphalt pavement on 6 in. concrete base, etc.;

(u) South Marshfield Ave. from Hermitage to Paulina Sts., Wood St. from West 72nd to West 74th Sts., Lincoln St. from West 71st to West 74th Sts., Winchester St. from West 71st to West 74th Sts., West 71st, West 72nd and West 73rd Sts. from Ashland Ave. to Robey St., 36,900 ft. concrete curbing, 23,000 cu.yd. grading, 59,360 sq.yd. asphalt on 6 in. concrete base, etc.;

(v) Potomac Ave. from Homan Ave. to Chicago Milwaukee & St. Paul R.R. tracks, St. Louis Ave. from Evergreen St. to Potomac Ave., 2940 ft. concrete curbing, 4500 cu.yd. grading, 4700 sq.yd. asphalt pavement on 6 in. concrete base, 110 ft. 10 in. tile sewer, etc., from

J. A. Ross & Co., 4561 Armitage Ave., (a) $1765;

P. J. O'Brien, 29 South La Salle St., (a) $1770, (b) $4544, (d) $2731, (e) $3008;

Marquette Constr. Co., 133 West Washington St., (a) $1800, (b) $4643, (h) $15,-931, (n) $15,006;

J. Dillon & Co., 179 West Washington St., (b) $4603, (d) $2685, (e) $2972;

White Paving Co., 17 North La Salle St., (c) $4725, (g) $20,366, (i) $15,723, (j) $9919, (r) $7535, (u) $248,972;

Amer. Asphalt Paving Co., 133 West Washington St., (c) $4840, (f) $6753, (g) $20,780, (i) $15,189, (j) $10,004, (k) $5369, (m) $5372, (p) $45,527, (q) $27,698, (s) $10,791, (t) $67,939, (u) $246,320, (v) $99,573;

R. F. Conway & Co., 133 West Washington St., (c) $5260, (m) $5634, (r) $7776, (s) $11,443, (t) $68,713, (u) $244,090;

Central Paving Co., 179 West Washington St., (d) $2724, (e) $3052, (l) $4904, (o) $7053;

F. P. McCormick & Co., 133 West Washington St., (f) $6821, (g) $20,545, (i) $15,-943, (j) $10,058, (k) $5334, (m) $5478, (p) $45,210, (q) $28,000, (r) $7741, (s) $10,767, (v) $22,726;

Contg. & Material Co., 10 South La Salle St., (b) $15,984, (l) $4989, (n) $11,818, (o) $6925;

Smith & Brown, 128 North La Salle St., (h) $16,026, (n) $15,037;

Standard Paving Co., 29 South La Salle St., (f) $6737, (k) $5285, (p) $15,976, (q) $28,022, (t) $68,751, (v) $22,248;

J. A. Sackley & Co., 179 West Washington St., (l) $5010;

Farr Bros. Co., 356 West 111th St., (o) $6809.

Ill., Rock Island—City received only bid paving 5th Ave. from 2nd to 13th Sts., involving 9668 sq.yd. asphaltic concrete, 7251 lin.ft. curbing, from C. F. Cruksensuch, Rock Island, $37,001.

★**Wisconsin**—State Highway Comn., Green Bay, let contract grading and concrete surfacing 4 mi. Appleton-Dale Medina Rd., 16 ft. wide, Outagamie Co. to Greunke Bros., Appleton, $92,000; Stiles Jct.-Oconto Falls Rd., 15 ft. wide, Oconto Co., C. Kinney, Stiles, $25,000; 5½ mi. Green Bay-Appleton Rd., 16 ft. wide, Brown Co., Jorgensen Constr. Co., Denmark, $120,000. Noted June 5.

★**Wis., Chilton**—City let contract grading and paving, 4.8 mi., Division and Main Sts., 18 ft. wide, involving 19,000 sq.yd. sheet asphalt on concrete base and 8500 lin.ft. concrete curb and gutter, to F. P. Coughlin, Grand and Wells St., Milwaukee, $57,362. Noted June 5.

★**Wis., Milwaukee**—Bd. Pub. Wks. received lowest 3 bids paving 8th, 56th, 57th, 58th and Clinton Sts., Shepard and Kinnickinnic Aves., from Blodgett, Clayton Constr. Co., 204 Grand Ave., $20,725; Badger Constr. Co., 97 Wisconsin St., $22,869; White Constr. Co., 425 East Water St., $25,007. Work involves 10,176 cu.yd. earth excav., 21,732 cu.yd. concrete, 6044 ft. cement sidewalks, 1136 ft. cement and 1204 lin.ft. limestone curb, 19,450 sq.yd. asphalt and 6435 sq.yd. hard sandstone pavement. G. Staahl, engr. Noted June 26.

★**Wis., Milwaukee**—City let contract paving Cherry St. from 10th to 11th Sts., asphalt and granite block, to Badger Constr. Co., 97 Wisconsin St., $3081; Commerce St. from Poplar to Walnut Sts., asphalt and granite block, to Manager & McGucken, 332 22nd Ave., $39,187.

★**Wis., Oshkosh**—Comrs. Winnebago Co. let contract grading and concrete surfacing 2 mi. Appleton-Menasha Rd., 18 ft. wide, to J. Young Bros., Oconto, about $38,-000; 1 mi. Oshkosh-Fond du Lac Rd., 18 ft. wide, to Hutter Lewis Co., Fond du Lac, $25,000; 5 mi. Oshkosh-Winneconne Rd., 16 ft. wide, to Manger & McGuken, 332 Layton Blk., Milwaukee, $111,000. Noted June 5.

Wis., Plymouth—City received lowest 3 bids grading and paving 5.8 mi. Reed and Selma Sts., 18 ft. wide, involving 23,000 sq.yd. vitr. brick, asphalt or concrete and 13,000 lin.ft. concrete curb and gutter, from Murphy Constr. Co., Manitowoc, $2.03 and $2.23 per sq.yd.; F. P. Coughlin Co., Humboldt and North Sts., Milwaukee, $3.20; F. Radloff, Main St., $3.25 and $3.02. Noted June 12.

Wis., Racine—City received lowest bid from Western Impvt. Co., 9th St., improving Grange Ave., involving 7750 sq. yd. paving, $2.67 per sq.yd., sheet asphalt, $3.12 per sq.yd., brick, $2.39 per sq.yd., asphaltic concrete, 3975 lin.ft. curb and gutter, $0.79 per lin.ft.; Osborne Blvd., involving 8970 sq.yd. paving, $2.77 sheet asphalt, $3.22 brick, $249 asphaltic concrete, $3.08 vertical fibre brick, and 3179 lin.ft. curb and gutter, $0.82. Noted June 5.

★**Wis., Racine**—City let contract, to Western Impvt. Co., 9th St., improving Main St., Hilker and Davis Places, involving 3247 sq.yd. sheet asphalt, at $2.48 per sq.yd., 2324 lin.ft. curb and gutter $0.84 per lin.ft.; Blake Ave. 8400 sq.yd. sheet asphalt, $2.73, 4400 lin.ft. curb and gutter, $0.82; 10th St., 3634 sq.yd. asphaltic concrete, $2.46, 2436 lin.ft. curb and gutter, $0.82; Howe St., 10,050 sq.yd. sheet asphalt, $2.70, 5313 lin.ft. curb and gutter, $0.82; to J. Cape & Co., Water St., Howland Ave., 2370 sq.yd. grading, 2880 sq.ft. sidewalks, 2763 sq.yd. asphaltic macadam, $2.60, 1812 lin.ft. curb and gutter, $0.82; Lake Ave., 4590 sq.yd. paving, Barr brick, $3.16, vertical fibre, $2.86, 2766 lin. ft. curb and gutter, $0.82; 7th St., 1460 sq.yd. paving, Barr brick, $2.35, vertical fibre brick, $2.05, 2400 lin.ft. curb and gutter; Milwaukee Ave., 17,700 sq.yd. paving, brick $2.30, vertical fibre, $2., 7740 lin.ft. curb and gutter, $0.82; Yout St., 13,895 sq.yd. paving, Barr brick $3.16, vertical fibre brick, $2.86, 7232 lin.ft. curb and gutter, $0.82; Prospect St., 3850 sq.yd. paving, brick $3.16, vertical fibre brick $2.86, 2762 lin.ft. curb and gutter, $0.82. Noted June 5.

★**Minn., Duluth**—J. A. Farrell, city comr., let contract paving 4520 ft. Cooke St. from 40th Ave. E. to Superior St., to A. A. Bodin & Son, 408 Columbia Bldg., $59,996; 3600 ft. 59th Ave., W., from Main to Elinor St., to A. N. Nelson, 1014 East 6th St., $58,-810; 3500 ft. East 8th and 9th Sts., to D. H. Clough & Co., 914½ East 1st St., $18,337. Noted June 19.

★**Minn., Minneapolis**—Comrs. Hennepin Co. let contract grading 4 mi. County Rd. No. 9, Medina Twp., to S. J. Groves & Sons, 100 Kasota Bldg., $19,630. Noted June 5.

Minn., St. Paul—H. W. Austin, purch. agt., City Hall, received lowest bid paving and building water and sewer connections in Woodlawn Ave. between St. Clair and Goodrich Ave., Fairmount Ave. between Woodlawn and Cretin Aves., Princeton Ave. between Cretin Ave. and Mississippi River Blvd. and Mt. Curve Blvd. between Fairmount Ave. and St. Clair St. from Fielding & Shepley, 216 University Ave., entire job $105,900, for labor and materials exclusive of sewer and water connections, $3,200, for water connections $6000.

★**Kan., Junction City**—Geary Co. let contracts, to Ziegler & Dalton, Junction City, building 7.47 mi. Golden Belt Rd., 18 ft. wide, concrete, at $2.40 per sq.yd., total, $220,520; 4068 ft. 8th St. Rd., 18 ft. wide, concrete, at $2.30 per sq.yd. total, $21,490. Noted May 22.

★**Kan., Pratt**—City let contract for 53,-600 sq.yd. vitr. brick pavement and 22,524 ft. concrete gutter and curb to W. R. Amerman, Salina, $226,125. Noted June 12.

★**Neb., Madison**—City let contract paving 3400 ft. 2nd, 3rd and 8th Sts., 24-50 ft. wide, to Abel Constr. Co., 318-19 Terminal Bldg., Lincoln, $53,101. Noted June 19.

★**Neb., Wahoo**—Comrs. Saunders Co. let contract, to Allied Contractors, Inc., 304 Bee Bldg., Omaha, for 64,000 yd. paving $3.48 per yd. 28,000 lin.ft. combination curb and gutter, 75c. per ft. and 26,000 yd. grading, 60c per yard.

★**Wyo., Casper**—City let contract paving streets in Dist. No. 8, 46-56 in. wide, to Warren Constr. Co., Journal Bldg., Portland, Ore., $138,484. Work involves 6060 lin.ft. concrete curb, 7915 lin.ft. combined curb and gutter, 5000 cu.yd. earth excav. and 40,100 sq.yd. bitulithic concrete on 5 in. concrete base.

★**Mo., St. Louis**—City will grade aerial mail service landing field, 1400 x 1800 ft. in Forest Park. About $19,000. Work will be done by day labor.

★**Mo., St. Louis**—City let contracts to Eyermann Constr. Co., 1216 South Grand St., paving 1982 ft. Walsh St. from Virginia to Grand Aves., 36 ft. wide, vitr. brick, granite curbing, cost $40,164. 954 ft. Minnesota St. from Bates to Eichelberger Sts., 30 ft. wide, vitr. brick, concrete curbing, $15,547; J. E. Perkinson, 3237 Carter St., paving 3270 ft. Alcott Ave. from Bircher to Thelka Sts., 26 ft. wide, vitr brick, concrete curbing, $49,800, 857 ft Leahy Ave. from Euclid St. to Kings Highway, 24 ft. wide, vitr. brick, granite curbing, $11,087; Skrainka Constr. Co., Security Bldg., paving 3225 ft. Thrush Ave. from West Florissant to Lillian Sts., 30 ft. wide, vitr. brick, concrete curbing, $53,199, 1317 ft. Claxton St. from Bircher to Lillian Aves., 30 ft. wide, vitr. brick, granite curbing, $20,502

Tex., Houston—Comrs. Harris Co. received lowest 3 bids improving 4.24 mi Highway No. 12 on Richmond Rd. from Main St. Blvd. to railroad crossing, 14 ft. wide, crushed or gravel surface with shell binder, drainage structures, etc., involving 10,713 cu.yd. earth excav., and 1704 tons shell binder, from Smith & James, Houston, $21,572; Horton & Horton, McKinney and Velasco Sts., Houston, $22,894; M. M. Craven, Missouri City, $24,256. Howe & Wise, 628-9 Chronicle Bldg., Houston, engrs.

★**Okla., Oklahoma** — City let contract paving and improving 13th St. from Kentucky to Pennsylvania Sts., and 5th St. from Western to McKinley Sts., to Western Paving Co., Terminal Bldg., $18,945 and $30,000 respectively. Noted June 12

★**Idaho, Buhl**—City let contract paving Walnut St. and 9th Ave. also Main St. from 14th to City Hotel, and Bway. from railroad crossing to city limits, bitulithic, to Warren Constr. Co., Journal Bldg., Portland, Ore., $123,825.

★**Utah** State Highway Comn., Salt Lake City, let contract paving 6.3 mi. state road from Logan to Smithfield, 18 ft. wide, Cache Co., involving 66,500 sq.yd. concrete and 1700 cu.yd. earth excav., to P. J. Moran, Filt Bldg., Salt Lake City, $141,225; 4.81 mi. state road from Provo to Spanish Fork.

Streets and Roads—(Continued)

18 ft. wide, Provo Co., to J. W. Meelen, Auditorium Bldg., Salt Lake City, $120,915; 8.13 mi. state road from Logan to Wellsville, 18 ft. wide, Cache Co., involving 85,852 sq.yd 6-8 in. concrete and 6000 cu yd. grading, to O. Nelson, Logan, $190,904

★**Utah, Provo**—City let contract paving 36,000 ft. Center St. from 1st E to 7th E Sts., 36 ft. wide, to Wasatch Grading Co., Dooly Bldg., Salt Lake City, $56,418. Noted April 17.

Utah, Salt Lake City—Comrs. Salt Lake Co., received bids improving 6 mi. Bingham Highway from State St. to Welby, 18 ft., wide, involving 64,800 sq.yd. 2 in. bituminous surface, from Clifton Applegate Toole Co., Billings, Mont., $177,933; J. W. Mellen, Auditorium Bldg., $222,507; Strange & McGuire, Utah Savings & Trust Bldg. $207,959. Noted Jnue 5.

★**Utah, Salt Lake City**—Comrs. Salt Lake Co. let contract paving 6 mi. state road from 33rd St. to Bingham Highway, 18 ft. wide, involving 65,600 sq.yd. 6-8 in. concrete and 9000 cu.yd grading, to Ryberg Bros., Atlas Blk., $147,595.

★**Wash., Enumclaw**—City let contract grading and hard surfacing with concrete, in Impvt. Dist. No. 7, to Larson Constr. Co., Perkins Bldg., Tacoma, $64,068. Noted June 12.

★**Wash., Wenatchee**—City let contract paving 1.2 mi. Wenatchee Ave., concrete, to Burke & Singfelder, 1321 9th Ave., Spokane, $34,900. Noted May 22.

★**California**—State Highway Comm., Forum Bldg., Sacramento, let contract building Sect. D, Route 10, Div. 6, state highway between Coalinga and Oil King School, Fresno Co., to J. G. Donovan, 2202 South Westmoreland St., Los Angeles, $128,997. Noted June 19.

★**Cal., San Francisco**—City let contract improving Howth St., to Raisch Impvt. Co., 46 Kearny St., $24,821. Work involves grading, brick and asphalt paving, concrete curbs, artificial stone sidewalks, brick catch basins and 8-12 in. vitr. pipe sewers.

★**N. S., Halifax**—Provincial Highway Bd. let contract building 4 mi. bitulithic macadam highway, 16 ft. wide, from here toward Bedford, to Barrett Co., Ltd., Halifax. About $72,000.

★**Que., Frampton**—City will build 7 mi. St. Malachie-Frampton Rd. Work will be done by day labor.

★**Ont., Ford City**—City let contract building sidewalks, to C. Desgardin, Main St. About $30,000.

★**Ont., Toronto**—City will pave Coleman, Cortleigh, Crescent, Dartwell, Delaware and McLean Aves., concrete. About $15,000. Work will be done by day labor.

Railways

PROPOSED WORK

Oregon—St. Helens Dock & Terminal Co., St. Helens, recently incorporated with $200,000 capital, plans to build 1.5 mi. railroad to connect Milton Creek Logging Co. with Spokane, Portland & Seattle R.R., cost $60,000; also build 2500 ft. loading dock on slough at Sauvies Island, first unit 500 ft. Address H. F. McCormick, c/o St. Helens Lumber Co., St. Helens, vice pres.

Excavation and Dredging

PROPOSED WORK

Mich., Detroit—Excavation—See "Streets and Roads."

Cal., Bakersfield—Irrigation—A. L. Fellows, federal irrigation engr., reported project to irrigate lands in Kern River Delta Dist. feasible, and interested parties have appointed committee headed by H. T. Miller, Bakersfield, to perfect organization of irrigation district under state law. Engineer recommended acquisition of water rights and distributing systems in district, construction of drainage ditches, pumping plants, storage facilities for more than 1,500,000 acre ft., development of power, etc. District will comprise 684,160 acres and will probably be known as Kern River Delta Irrigation Dist. Noted Mar. 20.

N. B., Cape Tormentine—Dredging—C. B. Brown, Moncton, engr. Canadian Natl. Rys., Montreal, Que., soon lets contract dredging at ferry terminal here. About $150,000.

BIDS DESIRED

O., Kenton—Excavation—Until Aug. 6, by Bd. Dir. of Upper Scioto Drainage and Conservancy Dist., improving channel and building levee along Scioto River through here. Work involves 1,006,000 yd. dipper dredgework, 6290 yd. submarine rock excav., 13,713 cu.yd. leveling waste bank and 12,736 cu.yd. removing waste bank. About $400,000. Morgan Eng. Co., City Natl. Bank Bldg., Dayton, engrs. Noted May 2.

O., Toledo—Dredging—See "Miscellaneous."

Mich., Port Huron—Drainage—See "Streets & Roads."

Utah, Provo—Canal—Until July 10, by A. Badsgaard, secy., North Lake Shore D. D., burding canal, involving 3,000,000 ft. 12-36 in. drain tile, 35,000 ft. trenching and refilling, 9000 cu.yd. open canal work and 1500 cu.yd. levee or fill. Cardwell & Richards, Vermont Bldg., Salt Lake City, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. C., Greenville**—Excavation—Pitt Co. let contract excavating 30 mi., involving 2,000,000 cu.yd. floating dredgework, to drain about 35,000 acres, to Wilson Constr. Co., Wilson, $0.113 per cu.yd.

★**Ga., Gainesville**—Dredging—Comrs. Hall Co. D. D. No. 1, let contract for 5 mi. drainage ditches, involving 150,748 cu.yd. dredge work, to W. W. Williams, Monroe, $.09½ per cu.yd.

★**La., Thornwell**—Canal—Thornwell D. D. No. 1, Lake Charles, let contract building drainage canal involving 100,000 cu.yd. excav. to Lake Arthur Dredging Co., Lake Arthur; $0.16½ per cu.yd. Noted June 12.

Industrial Works

PROPOSED WORK

R. I., Riverpoint—H. T. White soon lets contract building mill. About $50,000.

R. I., Westerly—Bilderbeck & Langdon, Inc., engrs., Barrows Bldg., New London, Conn., receives bids about July 20 building 1 story, 130 x 300 ft. factory and 1 story, 30 x 40 ft. power house, brick and concrete, rein.-con. flooring, concrete foundation, for Rhode Island Silk Co., Westerly. About $120,000.

Conn., Bridgeport—City plans to construct 2 story brick building at Seaside Park to include stables, garage, etc. About $50,000. E. G. Southey, 985 Broad St., archt.

Conn., Hartford—W. T. Marchant, archt., 36 Pearl St., preparing plans for 1 story, 50 x 150 ft. factory and 2 story, 37 x 75 ft. office, brick and mill construction, concrete foundation. About $40,000. Owner's name withheld.

Conn., New Haven—R. W. Foote archt., 185 Church St., soon receives bids building 1 story, 60 x 220 ft. brick and steel garage, salesroom and service station, rein.-con. flooring, concrete foundation, on Bway., for N. B. Whitfield, 296 Elm St. About $50,000.

Conn., New Haven—M. Massari, 142 Bradley St., soon receives bids building 1 story, 55 x 86 ft. garage with two 16 x 18 ft. ells, brick and concrete, rein.-con. flooring, concrete foundation, on Bradley St. About $25,000. R. W. Fabian, archt.

Conn., New Haven—P. Sellers, engr., 207 Orange St., soon receives bids building 2 story, 60 x 94 ft. brick and steel factory, concrete foundation, on Kensington St., for J. G. Missirian, 102 Kensington St. About $30,000.

Conn., Waterbury—City having plans prepared by C. Gilbert, archt., 244 Madison Ave., New York City, for 1 story el-shaped, brick and concrete garage for Bd. Constr. & Supply. About $[illegible]. Noted Apr. 24.

Conn., Waterbury—F. A. W[illegible], engr., 51 West Main St., soon receives bid building 1 and 2 story 50 x 167 ft. brick and mill construction, [illegible] foundation, on Meadow Ave. and Bronson St., for Sunnyside Mfg. Co., Pearl Lake Rd. About $20,000.

N. Y., Albany—P. J. Gl[illegible] plans to build 2 story brick, [illegible] garage at 257 Hudson Ave. About $[illegible].

N. Y., Buffalo—Motorcar Motor Co. has had plans prepared by [illegible] & Hansen, archts., for [illegible] for [illegible] additions to plant at [illegible] and Ave. B. Plans include 1 [illegible] story 50 x [illegible] ft. addition, 1 [illegible] story 50 x [illegible] ft. addition, [illegible] story 50 x [illegible] ft. addition, [illegible] story 50 x [illegible] ft. addition,

Industrial Works (Continued)

O., Cleveland—Chester Realty Co., Williamson Bldg., plans to build 2 story, 55 x 120 ft., concrete, steel and brick garage, rein.-con. flooring, on East 65th St. and Carnegie Ave. About $50,000. Architect not selected.

O., Cleveland—Cleveland Metal Products Co., 1141 Ivanhoe Rd., plans to build 1 story, 12 x 29 x 54 ft. storage building, cost $60,000; 1 story, 120 x 300 ft. addition to foundry, $75,000; 3 story, 72 x 266 ft. addition to machine shop, $75,000; 3 story, 60 x 90 ft. addition to assembling room, $120,000; all rein.-con., steel and brick. Architect not selected.

O., Cleveland—Crucible Steel Castings Co., Canel Rd. and Champlain Ave., plans to build 2 story, 125 x 300 ft., rein.-con., steel and brick factory, on Almira and Denison Aves. About $100,000. Architect not selected.

O., Cleveland—Grabler Mfg. Co., 6565 Bway. Ave., having plans prepared by Christian Schwartenberg & Gaede, archts., 1900 Euclid Ave., for 4 story, 89 x 110 ft., concrete, steel and brick addition to machine shop. About $80,000. Noted June 26.

O., Cleveland—H. E. Hedges, 428 Guardian Bldg., plans to build 1 story, 50 x 250 ft., concrete, steel and brick garage at 2040 East 105th St. About $60,000. Architect not selected.

O., Cleveland—Ideal Tire & Rubber Co., East 17th St. and Euclid Ave., plans to build 3 story, 100 x 200 ft., rein.-con., steel and brick addition to factory on Warner Rd. About $125,000. Architect not selected.

O., Cleveland—Peerless Motor Car Co., East 93rd St. and Quincy Ave., plans to build 1 story, 45 x 160 ft. addition to machine shop; 5 story, 40 x 120 ft. addition to assembly room; both concrete, steel and brick. About $25,000 and $40,000, respectively. Architect not selected.

O., Cleveland—Sixth City Realty Co., Guardian Bldg., plans to build 4 story, 167 x 370 ft., concrete, steel and brick garage, on East 6th St. and St. Clair Ave. About $1,300,000. Architect not selected.

O., Cleveland—Templin, Crockett, Bradley Co., 5700 Detroit Ave., soon receives bids building 3 story, 60 x 76 ft., reincon., steel and brick addition to factory. About $50,000.

O., Cleveland—Theunor Norton Provision Co., West 63rd St. and Stock Ave., plans to build 3 story, 32 x 50 ft., concrete, steel and brick addition to factory. About $30,000. Architect not selected.

O., Cleveland—United Motors Service Co., East 40th St. and Prospect Ave., plans to construct 2 story, 100 x 200 ft., rein.-con., steel and brick service and sales building. About $200,000.

O., Cleveland—Vitreous Enameling Co., 6800 Grant Ave., had plans prepared building 1 story, 90 x 120 ft., concrete, steel and brick factory, on East 71st St. and Grant Ave. About $35,000. S. Weil, pres.

O., Loudenville—Schenk & Williams, archts., Mutual Home Bldg., Dayton, soon receive bids building 2 story, 50 x 200 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, for Flexible Side Car Co. About $25,000.

O., Steubenville—Hartje Paper Co., 113 Wood St., Pittsburgh, Pa., having plans prepared for 2 story, rein.-con. and steel engine room, rein.-con. flooring, concrete foundation, here. About $50,000.

O., Toledo—B. R. Bldg. Co. plans to construct 3 story, 60 x 100 ft. service and auto display building on Adams and 10th Sts. About $75,000. T. Davies, 225 Ohio Bldg., secy. Architect not selected.

Mich., Detroit—Fisher Body Co., Oakland and Piquette Aves., plans to build 6 story, 165 x 338 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Theodore and Riopelle Sts. L. Kamper, Book Bldg., archt.

Mich., Detroit—A. Kahn, archt., Marquette Bldg., soon lets contract building 1 story, 241 x 446 ft. addition and 3 story, 80 x 225 ft. extension to factory, rein.-con. and steel, rein.-con., metal tile and wood block flooring, concrete foundation, on Bellevue and Concord Aves., for Packard Motor Car. Co., West Grand Blvd.

Mich., Detroit—Solomon Bros., c/o W. H. Adams, engr., Vinton Bldg., having plans prepared for 6 story, rein.-con. terminal warehouse, covering 500,000 sq.ft. floor space, rein.-con. flooring, concrete foundation on Fort St., W., and Ferdinand St.

Ill., Chicago—Ilg Electric Ventilating Co., 154 Whiting St., having preliminary plans prepared by A. S. Alschuler, archt., 28 East Jackson St., for factory, main building to be 4 story, rein.-con., rein.-con. flooring, concrete foundation, with several smaller buildings on Crawford Ave. and George St. About $750,000. Noted Feb. 13.

Ill., Chicago—Mid City Cold Storage Co., c/o A. A. Salzman Eng. Co., engrs., 30 North La Salle St., plans to build 5 story, rein.-con. cold storage plant with 50,000 sq.ft. floor space. About $1,000,000.

Ill., Moline—Natl. Licorice Co., 2334 4th Ave., soon receives bids building 1 story, 116 x 136 ft. mill construction addition to mill, on 4th Ave. and 23rd St. About $30,000. Whitsitt & Schulzki, 610 Peoples Bank Bldg., archts.

Wis., Sheboygan — Commercial Engraving Co., 101 North 8th St., plans to build 3 story, 60 x 170 ft. brick shop, brick foundation, on 8th St. About $150,000. Architect not selected.

Wis., Sheboygan — R. R. Jahn, archt., Betsy Ross Bldg., soon lets contract building 2 story, 50 x 110 ft., brick, rein.-con. and steel garage, rein.-con. flooring, brick foundation, on 8th and Niagara Sts., for Sell Bros., c/o C. Sell, 901-907 North 8th St. About $60,000. Noted June 19.

Minn., Minneapolis—G. N. Crawford, archt., 649 Plymouth Bldg., preparing plans for 3 story, 60 x 135 ft., stone and mill construction factory and warehouse. About $50,000. Owner's name withheld.

Mo., St. Joseph—Grant Motor Co., Frederick Ave., soon lets contract building 2 story, 120 x 140 ft., rein.-con., steel and brick garage, rein.-con. flooring, concrete foundation, on 10th and Edmond Sts. About $55,000. R. Meier, Lincoln Bldg., archt.

Tex., Dallas—Lockwood, Green & Co., engrs., Healey Bldg., Atlanta, Ga., soon lets contract building cotton mill for Miller Mfg. Co., 5112 Swiss Ave. About $200,000. Noted Mar. 6.

Ore., Marshfield—Eastern investors purchased site on Coos Bay, and having plans prepared for two 2 story, 60 x 200 ft. veneer plants, concrete or frame and concrete. About $30,000. B. Ostlind, Marshfield, acting representative.

Ore., Scofield—(Buxton P. O.)—Standard Box & Lumber Co. plans to rebuild sawmill at Tillamook branch of Southern Pacific R. R. to replace one recently destroyed by fire. Loss $225,000. S. B. Cobb, mgr.

Ore., Toledo—Fischer-Scordy Lumber Co. plans to rebuild mill recently destroyed by fire. About $50,000. Address A. Fischer, Corvallis, stockholder.

Cal., Long Beach—Long Beach Transfer & Warehouse Co., having plans prepared by W. H. Austin, archt., 222 1st Natl. Bank Bldg., for 4 story, 60 x 118 ft., rein.-con. and steel storage building and 1 story brick garage, on 15th St. and California Ave.

Cal., Los Angeles—International Harvester Co., 606 South Michigan Ave., Chicago, purchased site here and plans to build 6 story, rein.-con. warehouse and assembling plant. About $250,000.

Cal., Modesto—M. Maddox had plans prepared by A. Mauzerette, archt., Home Realty Bldg., for 2 story, rein. con. garage and shop, concrete foundation, on 10th and G Sts. About $50,000.

Cal., Sacramento—Bd. Supervs. Sacramento Co. having plans prepared by R. A. Harold, archt., Forum Bldg., for 2 story, rein-con. and hollow tile service building and rein.-con. power house, concrete foundation, on County Hospital grounds. About $100,000.

Cal., Sacramento—California Rice Milling Co., 1st Natl. Bank Bldg., San Francisco, having plans prepared for 3 story, rein.-con. warehouse, here. About $100,000.

Cal., Sacramento—G. Stam plans to build 320 x 340 ft. warehouse near wharf on Y St.

Cal., San Diego—See "Miscellaneous."

Cal., San Diego—San Diego Ice & Cold Storage Co., 110 9th St., having plans prepared for 4 story, rein.-con. cold storage plant to be erected on 100 x 200 ft. site on 8th St. and Imperial Ave. About $25,000.

Cal., San Francisco—C. Winters having plans prepared by MacDonald & McKahn, archts., Rialto Bldg., for 5 story, rein-con. grocery building on Spear and Folsom Sts. About $200,000. Hass Bros., Sacramento and Davis Sts., lessee.

N. S., Sydney—C. R. Brown, engr., Moncton, soon receives bids building coaling plant and sand house here, for Canadian Natl. Rys., Ottawa. About $80,000.

Ont., Oshawa—Gen. Motors Co. of Canada, Walkerville, plans to build 4 story, 80 x 400 ft. rein.-con. and brick factory, concrete foundation on King St., here. About $175,000. R. S. McLaughlin, Walkerville, engr.

Ont., Strathroy—R. Pincombe plans to build brick flour mill, here. About $30,000. Owner preparing plans.

Ont., Toronto—Northern Aluminum Co., 158 Sterling Rd., plans to build 8 story, 60 x 280 ft. rein.-con. factory, concrete foundation. About $450,000. C. A. P. Turner, 38 South Dearborn St., Chicago, engr.

BIDS DESIRED

R. I., Providence—N. Hickey, 246 Thurbers Ave., receiving bids building 1 story, 50 x 200 ft. mill construction and brick garage and service station, concrete flooring, concrete foundation, on Thurbers Ave. and Eddy St. About $30,000. Private plans.

N. Y., New York—Until July 7, by G. M. McCabe, archt., 96 5th Ave., building 2 story, 99 x 188 ft. brick and steel garage, rein.-con. flooring, concrete foundation, at 388-394 11th Ave., for H. S. Coffin, 44 Pine St. About $100,000. Noted May 29.

N. Y., Thiells—See "Buildings."

Pa., Pittsburgh—T. Pringle, archt., 410 Oliver Ave., receiving bids building 2 story, 50 x 120 ft., rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on Baum Blvd., for A. W. Mellan, to be occupied by Keystone Buick Co. About $35,000.

Wis., Fond du Lac—Until July 8, by H. J. Esser, archt., Camp Bldg., Milwaukee, building 4 story, 55 x 275 ft. brick and mill construction factory, for Nunn, Bush & Weldon Shoe Co., 1110 5th St., Milwaukee. About $150,000. Noted June 19.

Wis., Milwaukee—Pawling & Harnischfeger, 38th St. and National Ave., and Kirchhoff & Rose, archts., 221 Grand Ave., receiving bids building 1 story, brick and steel factory addition, concrete foundation. About $100,000.

Wis., Sheboygan—Until July 7, by Juul & Smith, archts., Imig. Bldg., building 4 story, 60 x 150 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation on 14th St. and Kentucky Ave., for Natl. Box & Novelty Co., Pennsylvania Ave. About $60,000. Noted June 19.

Kan., Wichita—Until July 8, by O. J. Motor Co., building 5 story, 64 x 136 ft., rein.-con., steel and brick warehouse, rein.-con. flooring, concrete foundation. About $110,000. L. Schmidt, 121 North Market St., Wichita, archt., and H. Noble, Kansas City, Mo., engr.

Neb., Omaha—Until July 20, by J. Latenser & Sons, archts., 632 Bee Bldg., for 1 story, 44 x 110 ft. rein.-con. and brick boiler house, on 42nd St. and Dewey Ave. About $75,000.

Ont., London—Until July 15, by Canadian Oil Co., 2 Strachan Ave., Toronto, building 3 story, 40 x 100 ft., steel and brick warehouse, concrete foundation, on Main St., here. About $50,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Sanford**—Sanford Mills Co. let contract building 1 story, 122 x 270 ft. rein.-con. addition to weave shed, rein.-con. flooring, concrete foundation, to Turner Constr. Co., 45 Milk St., Boston, Mass.

★**Mass., Boston**—A. S. Knight, et al, 309 Sears Bldg., let contract building 1 story, 90 x 233 ft. rein.-con. garage and service station, rein.-con. flooring, concrete foundation, on West Dedham St. to Adams Pond Co., Dorchester. About $75,000.

★**Mass., Fall River**—D. J. Dennis, 362 5th St., let contract building 1 story, 80 x 115 ft., brick and mill construction garage, rein.-con. flooring, on 6th St., to J. H. Donnelly, Worthington St. About $25,000.

★**Mass., Gardner**—Lee & Hewett, archts. and engrs., 1123 Bway., New York City, let contract, to W. F. Kearns Co., Cambridgeport, building two 4 story, brick additions to factory, concrete foundation, for Heywood Bros. and Wakefield Co., 206 Central St. Noted May 22.

Industrial Works (Continued)

★**Mass., North Bellingham**—Bellingham Woolen Co. let contract building 3 story, 50 x 120 ft. brick and mill construction storehouse, to Eastern Constr. Co., 660 Winter St., Woonsocket, R. I. About $40,000.

***Mass., Springfield**—A. H. Phillips, Inc., Napier St., will build 2 story rein.-con. and brick addition to warehouse, rein.-con. flooring, concrete foundation. About $25,000. Private plans. Work will be done by day labor.

★**Mass., Springfield**—J. Weisenberg, 112 Everet St., let contract building 1 story, 105 x 143 ft., brick, concrete and steel garage, rein.-con. flooring, concrete foundation, on Howard St., to P. T. Curtis, 117 Jefferson Ave. About $40,000.

★**R. I., Central Falls** (Pawtucket P. O.)—Hemphill Mfg. Co., 131 Clay St., let contract building 2 story, 38 x 153 ft. and 2 story, 25 x 48 ft. el-shaped factory, 1 story, 38 x 189 ft. forge shop, brick and timber, concrete foundation, on Clay St., to Humes Constr. Co., 76 Dorrance St., Providence. About $65,000.

★**R. I., Olneyville**—Paragon Worsted Co. let contract building 2 story, 60 x 85 ft. brick and mill construction addition to plant, to E. Turgeon, 86 Weybosset St., Providence. About $25,000.

★**R. I., Providence**—Atlantic Refining Co., 503 Turk Heads Bldg., let contract building 1 story, 40 x 100 ft. storehouse, 1 story, 30 x 40 garage and 14 x 14 ft. service station, brick, steel and concrete, rein.-con. flooring, concrete foundation, on Elmwood Ave., to Metzger & Fisher Co., Otis Bldg., Phila., Pa. About $25,000.

★**R. I., Providence**—Texas Co., Allens Ave., will build 4 story 91 x 97 ft. 36 x 61 ft. and 37 x 54 ft. brick, steel and rein.-con. storehouse, rein-con. flooring, concrete foundation. Work will be done by day labor.

★**Conn., New London**—Bilderbeck & Langdon, Inc., archts. and engrs., 253 State St., let contract to J. H. Grozier Co., 721 Main St., Hartford, building 2 story, 80 x 101 ft. rein.-con. garage, rein.-con. flooring, concrete foundation, on Main St., here, for M. A. Avery, 176 Main St. About $50,000. Noted Apr. 10.

★**Conn., Winnepauk** (Norwalk P. O.)—Clover Mfg. Co., Day St., South Norwalk, let contract building 1 story, 60 x 465 ft., 1 story, 90 x 300 ft. and 1 story, 40 x 60 ft. brick, steel and concrete factory, rein.-con. flooring, concrete foundation, to Austin Co., 217 Bway., New York City. About $200,000.

★**N. Y., Brooklyn**—Moller & Shuman, Marcy Ave., let contract building 2 story brick and steel factory, rein.-con. flooring, concrete foundation, on Gerry and Wallabout Sts., to P. Guthy, 926 Bway., New York City. About $80,000. Noted May 8.

★**N. Y., Brooklyn**—A. Paolello, 810 4th Ave., will build 1 story, 22 x 41 x 76 x 102 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on 27th St. and 4th Ave. About $45,000. Work will be done by day labor. Noted Mar. 6.

★**N. Y., Brooklyn**—W. H. Reid, 21 Willoughby Ave., will build 5 story, 40 x 90 ft. brick and steel warehouse and salesroom, rein.-con. flooring, concrete foundation, on Pearl St. near Willoughby Ave. About $50,000. Work will be done by day labor.

★**N. Y., Buffalo**—R. C. Fayfield, archt., Iroquois Bldg., let contract, to Turner Constr. Co., Prudential Bldg., for 6 story, 50 x 100 ft. rein.-con. warehouse, rein.-con. flooring, concrete piling foundation, for Robertson Cataract Co., 151 West Montauk St. About $80,000. Noted May 29.

★**N. Y., New York**—Anheuser-Busch Brewing Co., 9th and Pestalozzi Sts., St. Louis, Mo., let contract altering 5 story brick, concrete and steel warehouse, rein.-con. flooring, on 11th Ave. and 36th St., here, to C. A. Cowan, 30 East 42nd St. About $30,000.

★**N. Y., New York**—C. Bianci, 54 Mt. Morris Park West, will alter 3 story brick and steel factory, rein.-con. flooring. About $35,000. Work will be done by day labor.

★**N. Y., New York**—C. Dahlen, 341 East 142nd St., will build 2 story, 50 x 95 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on East 173rd St. About $25,000. Work will be done by day labor.

★**N. Y., New York**—Gould Constr. Co., 233 Bway., will build 1 story, 100 x 175 ft. brick and steel machine shop, rein-con. flooring, concrete foundation on Grand St. About $25,000. Private plans. Work will be done by day labor.

★**N. Y., New York**—A. Gindone, 52 Vanderbilt Ave., will build 1 story, 100 x 100 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on Harlem River Terrace and Fordham Rd. About $25,000. Work will be done by day labor.

★**N. Y., New York**—F. P. Vacarelli, 1475 Bway., will build 1 story, 60 x 155 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on Quarry Rd. and 3rd Ave. About $25,000. Work will be done by day labor.

★**N. Y., New York**—W. J. Wilgin, 165 Bway., will build 1 story, 75 x 100 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on 149th St. and Park Ave. About $155,000. Work will be done by day labor.

N. Y., Potsdam—Education Dept., Potsdam Normal School, received bids June 26, building boiler house, general contract from H. M. Weed, New York City, $42,300, Curran & Swarthout, Rochester, $43,085; heating, from H. J. Brandeles Co., 435 Lafayette St., Utica, $36,000, H. C. Peterson, 20 Oneida St., Utica, $47,500, W. F. Devendorf & Co., 470 Court St., Rochester, $41,985. Noted June 19.

★**N. Y., S. I., Port Richmond**—V. Perosi, 275 Morningstar Rd., will build 1 story, 50 x 105 ft., rein.-con. and steel garage, rein.-con. flooring, concrete foundation, on Prospect St. and Morningstar Rd. About $25,000. Work will be done by day labor.

★**N. Y., Yonkers**—Federal Sugar Refining Co., 91 Wall St., New York City, let contract building rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation here, to Westinghouse, Church, Kerr, 37 Wall St., New York City. About $200,000. Cost plus percentage basis.

★**N. J., Elizabeth**—Singer Mfg. Co., Elizabethport, let contract building 3 and 4 story, 176 x 258 ft. foundry, to Turner Constr. Co., 244 Madison Ave., New York City.

★**Pa., Scranton**—Lockwood, Greene & Co., archts., 101 Park Ave., New York City, let contract to Turner Constr. Co., 244 Madison Ave., New York City, building 3 story, 72 x 140 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, for Scranton Lace Co., Glenn and Meyler Sts. About $80,000. Noted June 8.

★**W. Va., Huntington**—Empire Furniture Co. let contract building 3 story, 60 x 180 ft. brick addition to factory, to C. H. Smith, Robson-Prichard Bldg. About $40,000.

★**O., Cleveland** — Euclid Chester Co., Guardian Bldg., let contract building 2 story, 100 x 112 ft., concrete, steel and brick warehouse, at 2900 Chester Ave., to C. Curtiss Co., Guardian Bldg. About $100,000. Noted June 26.

★**O., Cleveland**—Foster Bolt & Nut Mchy. Co., 3556 East 72nd St., let contract building 2 story, 77 x 123 ft., concrete, steel and brick factory, to McMillan Co., 1794 East 55th St. About $40,000. Noted June 26.

★**O., Cleveland**—Natl. Lamp Assn. of Genl. Electric Co., Nela Park, let contract building 4 story, 112 x 300 ft., rein.-con., steel and brick addition to factory, to S. W. Emerson, 1900 Euclid Ave., cost $250,000; 1 story, 63 x 194 ft., concrete, steel and brick garage, at 1141 East 152nd St., to Heller Bros., Furnace St., Youngstown, $50,000. Noted May 1.

★**O., Dayton**—Borchers Automobile Co., 6th and Canal Sts., let contract building 4 story, rein.-con. garage and salesroom, rein.-con. flooring, concrete foundation, on South Main and Warren Sts., to Frank Hill Smith Co., Inc., East 3rd St. About $175,000. Noted May 15.

★**O., Dayton**—Jennings Auto Sales Co., 32 West 2nd St., let contract building 3 story, 115 x 120 ft., rein.-con. garage and salesroom, rein.-con. flooring, concrete foundation, on Main and Apple Sts., to C. Hoolihan, 524 River St. About $85,000.

★**O., Dayton**—Stomps Auto Sales Co., South Main St., let contract building 4 story, 60 x 150 ft., rein-con. garage and salesroom, rein.-con. flooring, concrete foundation, to Industrial Bldg. Co., 757 Reibold Bldg. About $60,000. Noted June 26 under "Buildings."

★**O., Springfield**—Crowell Publishing Co., High and Wittenberg Sts., let contract building 5 story, 66 x 180 ft., rein.-con. and steel printing plant, rein.-con. flooring, concrete foundation, on West High St., to Frank Hill Smith Co., Inc., West 3rd St., Dayton. About $100,000. Noted June 19.

★**O., Springfield**—J. Leffel & Co., Lagonda Ave., let contract building 1 story, 85 x 1020 ft. machine shop, 60 x 110 ft. foundry, 60 x 140 ft. pattern shop, 50 x 140 ft. pattern storage building, 50 x 105 ft. power plant and 50 x 105 ft. coal bunkers, all rein.-con., steel and brick, wood block flooring, concrete foundation, on East St., to Concrete Steel Constr. Co., 415 Mitchell Bldg. Cost, including equipment, $500,000.

★**Ind., Indianapolis**—Nordyke & Marmon Co., 250 North Meridian St., let contract building 5 story, 80 x 600 ft. rein.-con. factory, West Morris St. to Bedford, Stone & Constr. Co., 810 Fletcher Savings & Trust Bldg.; 1 story, 100 x 800 ft. rein.-con. and steel factory, Morris St., to H. J. Ferguson Co., 6523 Euclid Ave., Cleveland.

★**Mich., Detroit**—Cuyahoga Spring Co., Berea Rd., let contract building 2 story, 80 x 146 ft. factory, to Austin Co., 16,112 Euclid Ave., Cleveland, $57,000.

★**Mich., Detroit**—Detroit Seamless Steel Tube Co., 841 West Jefferson Ave., let contract building 2 units of factory, each 1 story, 90 x 550 ft.; also 70 x 100 ft. heating plant, concrete, brick and steel, concrete foundation, on Wyoming and Warren Aves., to A. A. Albrecht & Co., 1130 Penobscot Bldg. About $1,700,000. Noted Apr. 17.

★**Mich., Mt. Pleasant**—Transport Truck Co. let contract building 1 story, 160 x 330 ft., brick and steel assembling plant, concrete foundation, to Stoolman Constr. Co., Champaign, Ill. About $175,000. Noted May 22.

. . Ill., Chicago—Anderson Bros. Storage Co., 3131 Sheffield Ave., let contract building 5 story, 45 x 115 ft. rein.-con. and brick warehouse, rein.con. flooring, concrete foundation, at 3135 Sheffield Ave., to O. W. Rosenthal Co., 80 East Jackson Blvd. About $50,000.

★**Minn., St. Paul**—Griggs, Cooper & Co., 3rd St. and Bway., let contract building 5 story, 150 x 220 ft. factory, to C. Skooglum, 502 Ryan Annex. Cost between $350,000 and $500,000.

★**Mo., Kansas City**—Natl. Cloak and Suit Co., 24th St., New York City, let contract building 12 story, 100 x 200 ft. and 120 x 300 ft. rein.-con. and steel factory, rein.-con. flooring, concrete foundation here, to Wells Bros., 914 Monadnock Bldg., Chicago. About $2,500,000.

★**Mo., St. Louis**—St. Louis Mfg. Corp., 5401 Bulwer St., let contract building 2 story, 96 x 150 ft., concrete and brick power house, concrete foundation, at 5405-11 Natural Bridge Ave., to A. H. Haeseler Bldg. and Constr. Co., Wainwright Bldg. About $125,000.

★**Colo., Denver**—Spray Tea & Coffee Co., 639 15th St., let contract building 1 story, 50 x 125 ft. rein-con., factory, rein.-con. floor and foundation, to C. S. Lambie Co., 312 Tramway Bldg. About $28,000.

★**Cal., Hanford**—California Peach Growers Inc., Malaga St., Fresno, let contract building 2 story, 90 x 250 ft., rein. con. packing plant, concrete foundation, to R. Pedersen, 446 Clark St., Fresno. Cost, including equipment, $100,000. Noted Apr. 24.

★**Cal., Lemon**—G. C. Power let contract building 1 story, 140 x 250 ft., concrete and frame packing house, to include boiler house, workmen's quarters, etc., to W. Slater Co., 2314 Santa Fe Ave., Los Angeles. About $70,000, cost plus percentage basis.

★**Cal., San Francisco**—Sharon Estate Co., Sharon Bldg., will build 1 story, 150 x 200 ft., brick foundry and machine shop, on 4th and Bryant Sts. About $40,000. Krenz Cooper & Brass Wks., c/o G. W. Kelham, archt., Sharon Bldg., lessee. Work will be done by day labor.

★**Cal., Vernon**—California Provision Co. let contract constructing 2 story, 88 x 142 ft. packing house and refrigeration building, 20 x 32 ft. boiler house, 32 x 32 ft. office, loading docks, etc., all timber, concrete foundations, to C. B. Harp, 1102 Baker-Detwiler Bldg., Los Angeles. About $50,000.

★**Que., Sherbrooke**—Dominion Carriage Co., Ltd., let contract building 3 story, 60 x 75 ft. brick, steel and concrete factory,

Industrial Works (Continued)
concrete foundation, on St. Agnes St., to Graize Chauvin, 98 Darling St., Montreal. About $50,000. Noted May 8.

★**Que., Three Rivers**—Three Rivers Cold Storage Co. let contract building concrete and steel cold storage plant, to Arsenault & Plamondon, 70 St. James St., Montreal. About $75,000.

★**B. C., Prince Rupert** See "Miscellaneous."

Buildings

PROPOSED WORK

Mass., Boston—Bank—State St Trust Co., 33 State St., having plans prepared by Richardson, Barott & Richardson, archts., 8 Beacon St., for rein.-con. and steel, rein.-con. flooring, concrete foundation, on State and Washington Sts.

Mass., Springfield—Synagogue — Congregation Kadimah, 25 Lenox St., plans to build 1 story stone and brick, on Piney Pl and Dickinson St. About $50,000. M. Ehrlich, chn. Architect not selected.

Conn., Bridgeport—Church—Grace Methodist Episcopal Society, Fairfield and Clinton Aves., plans to build on Clinton Ave. About $60,000. Architect not selected.

Conn., Bridgeport—School—St. Patrick's Roman Catholic Society, 865 North Ave., plans to build fireproof school on Wells St. About $75,000. J. C. Lynch, pastor. Architect not selected.

Conn., Bridgeport—School, Convent, etc—St. Cyril & Methodius Roman Catholic congregation, Church St., plans to build 16 room school and assembly hall, 16 room convent and brick rectory, all fireproof. About $250,000. J. Panik, pastor. Architect not selected

Conn., Bristol—Business—M Volkenheim, 458 Main St., New Britain, having plans prepared by C. C. Palmer, archt., 272 Main St., New Britain, for 3 story, 50 x 101 ft. brick and concrete, brick and concrete foundation, on Main St., here. About $50,000.

Conn., Hartford—Office—See "Industrial Works."

Conn., Middletown—School—City plans to build brick addition to Johnson School on Green St. About $60,000. E. B. Sellew, supt. schools. Architect not selected.

Conn., Norwalk—Hotel—G. F. Shepard, archt., 14 Kilby St., Boston, soon receives bids altering and converting Royal James Hotel on Wall St. into hotel and business building, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, for Norwalk Realty & Impvt. Co., Ann St., South Norwalk. About $125,000. Noted Feb. 27.

Conn., Waterbury—Bank—Citizens Natl. Bank, West Main St., purchased site on Leavenworth St. and Kendrick Ave. and plans to build new bank. Architect not selected.

N. Y., Brooklyn—Exchange—McKenzie, Voorhees & Gmelin, archts. and engrs., 1123 Bway., New York City, soon let contract building 4 story, 60 x 125 ft. brick and steel brick foundation, on 14th Ave., here, for New York Telephone Co., 15 Dey St., New York City. About $200,000. Noted June 19.

N. Y., Buffalo—Theatre—H. L. Spaun, archt., Mutual Life Bldg., soon receives bids building 1 story, 57 x 150 ft. brick, steel and rein.-con., rein.-con. flooring, concrete foundation, on Triangle St. for G. C. Hall and G. F. Hanny, 2228 Seneca St. About $50,000.

N. Y., Malone—Gymnasium—Village Bd soon receives bids building brick and concrete gymnasium. About $80,000. G. T. Whipple, secy.

N. Y., Manlius—Barracks—St. John's School, recently incorporated with $650,000 capital stock, soon receives bids constructing new barrack building Cost, $200,000. Address W. P. Hitchcock, Central Bldg., Syracuse.

N. Y., New York—Church—5th Ave. Baptist congregation having plans prepared by H. C. Pelton & Allen & Collen, archts and engrs., 35 West 39th St., for 3 story, 80 x 98 ft. brick and steel, brick foundation, on 64th St. and Park Ave. About $100,000

N. Y., New York—Nurses' Home—St. Mary's Free Hospital, 107 West 34th St., soon receives bids building 5 story, 45 x 50 x 100 ft. brick and steel, brick foundation. About $75,000. C. P. H Gilbert, 1123 Bway., archt and engr. Noted Apr. 10.

N. Y., New York—Office—E Margolies, 19 East 33rd St., having plans prepared by H. J. Krapp, archt., 114 East 16th St., for 16 story, 56 x 150 ft., brick and steel, at 309-311 5th Ave About $450,000

N. Y., New York—Theatre—A Lewisohn, 61 Bway., having plans prepared by G. M Pollard, archt., 347 5th Ave., for 1 story, 83 x 176 ft. brick and steel, brick foundation, at 4023 Bway. About $120,000.

N. J., Bayonne—Memorial—City plans to construct memorial building to soldiers and sailors of late war. About $500,000.

N. J., Hackettstown — Church — G. I. Lovatt, archt., 416 Walnut St., Phila., soon lets contract building 2 story, 22 x 30 ft., concrete and stone, for Church of Assumption, here.

Pa., Phila.—Bank—Union Natl. Bank, 3rd and Arch Sts., having plans prepared by J. T. Brugger, archt., 5610 North Mascher St., building 2 story, 50 x 75 ft. brick, bronze and marble.

N. J., Paterson—School—Bd. Educ. plans to build school on Park Ave. About $800,000. H. T. Stephens & Co., 152 Market St., archts.

Pa., Phila.—Sales and Supply—C Kahn, 309 Morris Bldg., soon receives bids building 3 story, 25 x 200 ft. stone and brick, at 3318 North Broad St. L. B. Rothchild 1225 Sansom St., archt.

Va., Lexington—Alumni Quarters—Virginia Military Institute Alumni Assn. plans to build alumni quarters on university grounds. About $100,000. M. B. Coarse, secy. and treas. Architect not selected.

Va., Richmond—Bank—First Natl. Bank of Richmond, 9th and Main Sts., having plans prepared by F. A. Bossom, archt., 366 5th Ave., New York City, for 4 story, brick, steel and stone, brick foundation. About $75,000.

N. C., Charlotte—Store—J. B. Efird, 47 East Trade St., soon receives bids building store. About $500,000.

N. C., Nashville—Courthouse—Nash Co plans to build 2 story brick on Washington St. About $75,000.

S. C., Columbia—Hospital—Baptist Hospital, 1519 Marion St., plans to build hospital on Marion St. About $200,000. W M. Whitesides, supt. Engineer and architect not selected.

S. C., Columbia — Memorial — Memorial Comm. plan to build campus of University of South Carolina. About $500,000. R. A. Cooper, chn. Engineer and architect not selected.

S. C., Columbia—Theater—Capitol Theater Co. plans to build 2 story, 54 x 208 ft. on Main St. About $100,000.

S. C., Orangeburg — Memorial — State Colored College plans to construct memorial building on campus of State Colored College, here, R. S. Wilkerson, pres. Engineer and architect not selectd.

O., Alexandria—High School—Bd. Educ. plans to build 2 story, 50 x 80 ft., fireproof. About $60,000. F. S. Rusk, Brunson Bldg., Columbus, archt.

O., Bucyrus—Schools—Bd. Educ. plans to build one 3 story, 90 x 250 ft. and one 2 story, 60 x 200 ft., rein.-con. and brick. Total cost, $300,000. McLaughlin & Hulsken, Savings Bldg., Lima, archts.

O., Cincinnati—Theatre and Store—Ascher Bros., 220 South State St., Chicago, had plans prepared by H. L. Newhouse, archt., 4630 Prairie Ave., Chicago, for 1 and 2 story, 100 x 135 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on 7th and Vine Sts., here. About $250,000.

O., Cleveland—Bank—Cleveland Trust Co., East 9th St. and Euclid Ave., soon receives bids building 3 story, 40 x 100 ft., steel and brick addition, on East 105th St. and Euclid Ave. About $50,000 G B Post & Co., 1109 Schofield Bldg., archts. Noted May 15.

O., Cleveland—Bank and Office—Volea Bldg. & Loan Assn., 5733 Bway. Ave., having plans prepared by F. Hronek, archt., 3655 East 31st St., for 2 story, 40 x 96 ft., concrete, steel and brick, on Bway. and Portage Aves. About $50,000.

O., Cleveland—Club House and Gymnasium—Ohio Athletic Assn., 819 Guardian Bldg., plans to build 3-8 story, 200 x 400 ft., rein.-con., steel and brick. About $500,000. Architect not selected.

O., Cleveland — Commercial — Huron Impvt. Co., East 12th St. and Huron Rd., plans to build 6 story, 100 x 240 ft., concrete, steel and brick. About $150,000. Architect not selected.

O., Cleveland—Hospital—Cuyahoga Co. Memorial Assn., Court House, having plans prepared by W S Lougee, archt., 500 Marshall Bldg., for 5 story, 150 x 200 ft., concrete, steel and brick, on West 14th St. and Fairchild Ave. About $300,000.

O., Cleveland—Office—Cleveland Metal Products Co., 1141 Ivanhoe Rd., plans to build 1 story, 60 x 200 ft., concrete, steel and brick addition, at 1111 Ivanhoe Rd. About $50,000. Architect not selected.

O., Cleveland—Office—Lakewood Eng. Co., West 117th St. and Berea Rd., plans to build 1 story, 87 x 150 ft., concrete, steel and brick addition. About $75,000.

O., Cleveland—Temple—Temple congregation, East 55th St. and Central Ave., plans to build 2 story, 100 x 200 ft., concrete, steel and brick, on West 107th St. and Wade Park. About $500,000. Hubbell & Benes, 4500 Euclid Ave., archts.

O., Cleveland—Theatre—Haddam Impt. Co., Hippodrome Bldg., plans to build 8 story, 156 x 239 ft., concrete, steel and brick, on East 105th St. and Euclid Ave. About $400,000. Architect not selected.

O., Fairpoint—School—Bd. Educ. plans to build 2 story, 50 x 80 ft., brick. About $65,000. F. S. Rusk, Brunson Bldg., Columbus, archt.

O., Middletown—Hotel—Company being organized to build hotel. About $250,000. F. S. Hughes, Dayton, archt. Address F. Howell, 957 Reibold Annex, Dayton, in charge of preliminary organization.

O., Springfield—School—Bd. Educ. plans to build 3 story, rein.-con. and brick, rein.-con. flooring, concrete foundation, in Ridgewood Addition. About $60,000. Hall & Lethly, Springfield, archts.

Ind., Hammond—Theatre and Hotel—Gumbiner Bros., c/o Rapp & Rapp, archts., State-Lake Bldg., Chicago, having plans prepared for 6 story, 150 x 210 ft. brick and rein.-con., rein.-con. flooring, concrete foundation, on Homan and State Sts. here. About $500,000.

Mich., Detroit — Mercantile — Bingham-White Co., Fort St. and Junction Ave., soon lets contract building 4 story, 75 x 100 ft. brick and steel addition. About $75,000. Varney & Varney, 307 Palmer Bldg., archts.

Mich., Detroit—Service Grace Hospital, 277 West Grand Blvd., soon lets contract building 3 story, 35 x 70 ft., concrete, brick and steel, rein.-con. flooring, concrete foundation, in connection with hospital. A Kahn, Marquette Bldg., archt. Noted Jan. 23.

Mich., Detroit—Theatre and Stores—C H. Crane and E. G. Kiehler, archts., 2325 Dime Bank Bldg., soon let contract building 2 story, 80 x 230 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Michigan and General Aves., for H. Kramer & Sons, 1697 Gratiot Ave. About $250,000.

Mich., Flint—Church—St. Mathew's congregation plans to build 1 story, rein.-con. and brick, rein.-con. flooring, on Beach St. About $150,000. Van Leyen, Schilling & Keough, 1115 Union Trust Bldg., Detroit, archts.

Mich., Wyandotte—Theatre and Office—B. C. Wetzel & Co., archts., 2317 Dime Bank Bldg., Detroit, preparing plans for 2 story, brick and steel, concrete foundation, on Biddle Ave. About $180,000. Owner's name withheld.

Ill., Chicago—Hotel—Bryn Mawr Hotel Co., c/o W. W. Ahlschlager, archt., 111 West Washington St., having plans prepared for 9 story, 100 x 150 ft. rein.-con., rein.-con. flooring, concrete foundation, on Bryn Mawr and Kenmore Aves. About $1,250,000.

Ill., Moline—Church—Sacred Heart Parish, 419 East 11th St., having plans prepared by Davis & Davis, archts., 64 East Van Buren St., Chicago, for 1 story, 81 x 140 ft. brick and steel, concrete foundation. About $75,000. Noted May 1.

Minn., Austin—High School—Independent School Dist. No. 29 voted $450,000 bonds to build high school. J. E. Grippen, secy.

Minn., Minneapolis—Bank and Office—G. N. Crawford, archt., 649 Plymouth Bldg., preparing plans for 7 story, 66 x 120 ft. About $225,000. Owner's name withheld.

Minn., Minneapolis—Bank and Office—G. N. Crawford, archt., 649 Plymouth Bldg., preparing plans for 3 story, 50 x 60 ft., stone. About $100,000. Owner's name withheld.

Minn., Northfield—Hall—St. Olaf College had plans prepared by N. E. Mohn, archt., 596 Endicott Bldg., St. Paul, for 3 story, 76 x 200 ft., science hall, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on campus. About $200,000. Noted Apr 24

Buildings (Continued)

Minn., Owatonna—Club—Country Club, c/o Jacobson & Jacobson, archts., Owatonna, having preliminary plans prepared for 1 story, 60 x 140 ft. About $62,000. F. Tustison, Auditorium Bldg., Minneapolis, engr.

Kan., Eldorado—School—Bd. Educ. having plans prepared by W. H. Simon, archt., Eldorado, for 2 story, 100 x 170 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $175,000.

Kan., Leavenworth — City Hall — City election July 16, to vote on $400,000 bonds to build city hall and convention auditorium. Architect not selected.

Kan., Marysville—Theatre—Turner Theatre Co. soon receives bids building 2 story, 50 x 132 ft., brick and stone, rein.-con. flooring, concrete foundation. About $53,000. C. Boller & Bro., Kansas City, Mo., archts.

Kan., Salina—Temple—F. & A. M. Lodge plans to build 3 story temple. About $750,000. W. T. Schmidt, Oklahoma, Okla., archt.

Kan., Wichita—Academy—Sisters of St. Joseph having plans prepared by E. Forsblom, archt., 501 Michigan Bldg., for 3 story, rein.-con. and brick addition to Mt. Carmel Academy, rein.-con. flooring, concrete foundation. About $75,000.

Kan., Wichita—School—Bd. Educ. having plans prepared by L. Schmidt, archt., 121 North Market St., building 2 story, rein.-con. and brick, rein.-con. flooring, concrete foundation, to be known as Roosevelt Intermediate School. About $180,000.

Mont., Choteau—High School—Teton Co. election Sept. 2 to vote on $100,000 bonds to build high school. M. A. O'Neil, co. clk.

Mo., Fayette—Hospital—Howard Co. election Sept. 20, to vote on $75,000 bonds to build here. I. T. St. Clair, co. clk.

Mo., Kirksville—Temple—C. Banks, chn. bldg. comn., receives bids in July or August building 3 story, on Harrison and High Sts., for Masonic Assn. About $80,000.

Tex., Farmersville—High School—City voted $80,000 bonds to build high school.

Tex., Ft. Worth—Bank and Office—Farmers & Mechanics Natl. Bank, 712-14 Main St., receives bids about Sept. 1, building 24 story, 95 x 100 ft. brick, rein.-con. and steel, rein.-con. flooring, rock foundation. About $1,500,000. J. W. Spencer, pres. Sanguinett & Staats, 1st Natl. Bank Bldg., Ft. Worth and Mauren-Russell-Crowell, Chemical Bldg., St. Louis, Mo., archts. Noted Dec. 5.

Tex., St. Jo—High School—Bd. Educ. plans to build 2 story school. About $50,000. Page Bros. and Voelcker & Dickson, Wichita Falls, archts.

Okla., Tulsa—Office—P. C. Alexander, 244 Robinson Bldg., plans to build 5 story, at 410 South Main St. About $500,000. Engineer and architect not selected.

Okla., Tulsa — School — Catholic Parochial School Assn., 9th and Boulder Sts., plans to build 3 story, 104 x 125 ft. About $125,000.

Colo., Denver — Office — See "Miscellaneous."

Colo., Greeley—Auditorium—City soon receives bids building 1 story, 120 x 190 ft., rein.-con., rein.-con. flooring and foundation. About $150,000. W. N. Bowman, Central Savings Bank Bldg., Denver, archt.

Colo., Montrose—Court House—City and Montrose Co. soon receive bids building 3 story, 65 x 130 ft., stone and steel, rein.-con. foundation. About $125,000. W. N. Bowman, Central Savings Bank Bldg., Denver, archt.

Idaho, Caldwell—Hotel—Caldwell Citizens and Commercial Club plan to build 3 story, 100 x 150 ft. hotel. About $150,000. Address B. M. Holt, Caldwell. Architect not selected.

Utah, Salt Lake City—High Schools—Bd. Educ. having tentative plans prepared by Scott & Welch, archts., Dooley Bldg., building Junior High School on west side, about $125,000, also one on south side, about $120,000.

Utah, Salt Lake City—Schools—School Bd. having plans prepared by F. D. Rutherford, archt., Vermont Bldg., for 5 story addition to East Junior High School, 13th St., E., cost $150,000, also addition to Irving Junior High School, 12th St., E. and 21st St., $150,000

Utah, Salt Lake City—Schools—School Bd. having preliminary plans prepared by Cannon & Fetzer, archts., Templeton Bldg., for high school and technical school on 4th St. W., and 1st St., N. About $1,100,000.

Utah, Salt Lake City—School—School Bd. having plans prepared by Pope & Burton, archts., Newhouse Bldg., for addition to Grant School at 625 South 1st West St.; also 4 story addition to Hamilton School on 8th East and 8th South Sts. About $65,000 each.

Utah, Salt Lake City—School—School Bd. having plans prepared by Ware & Treganza, archts., Utah Saving & Trust Bldg., for 3 story addition to Franklin School, 2nd and 7th Sts., cost $65,000, also 4 story addition to West Junior High School, 3rd St., W., $100,000.

Ariz., Morenci—School—School Trustees rejected bids received June 17, building 1, 2 and 3 story, rein.-con., concrete foundation. About $135,000 available. C. L. Wilson, Monrovia, archt. Noted June 5.

Wash., Spokane — Hospital — Scandia Hospital Assn. plans to build brick or granite hospital. About $400,000. C. E. Fogelquist, c/o Swedish Amer. League, pres.

Wash., Spokane — Sanapractorium — Washington Associates of Drugless Physicians plan to build sanapractorium. About $1,000,000, including equipment.

Cal., Anaheim—Clubhouse—B. P. O. E. plans to build clubhouse here. About $70,000. Address H. Stern, chn. bldg. com.

Cal., Berkeley—Schools—Bd. Educ. plans to build high school to cost $92,000, also grade schools. Bonds for $2,321,000 voted to build schools. W. C. Hays, 1st Natl. Bank Bldg., San Francisco, official school archt.

Cal., Claremont—Hall—Pomona College plans to build chemistry hall; $100,000 donated for same.

Cal., Hollister—School—City election soon to vote on $140,000 bonds to build school. W. H. Weeks, 75 Post St., San Francisco, archt.

Cal., Santa Ana—Bank and Office—First Natl. Bank plans to build 5 or 6 story bank and office on 4th and Main Sts. Address W. A. Huff, c/o owner. Architect not selected.

Cal., South San Francisco—Hall—City having plans prepared by C. Warner, Phelan Bldg. and A. O. Coffey, Humboldt Bank Bldg., San Francisco, archts., for brick and steel. Bonds for $84,000 voted for project.

Cal. Turlock—Theatre—W. H. Weeks, archt., 75 Post St., San Francisco, preparing plans for theatre on Main St. About $100,000. Owner's name withheld. Turner & Dahnken, 134 Golden Gate St., San Francisco, lessee.

Que., Donnacona—Community — Deslisle & Floyd soon lets contract building 3 story, 75 x 80 ft. steel and brick, concrete foundation. About $50,000.

Ont., Hamilton—Postal Station—Dept. Pub. Wks., Ottawa, soon lets contract building 3 story, 50 x 75 ft. concrete, steel and brick, concrete foundation, on Main St. here. About $100,000.

Ont., London—Collegiate Institute—Bd. Educ. election in January to vote on $100,000 by-law to build brick collegiate institute. Watt & Blackwell, Bank of Toronto Bldg., archts.

Ont., Toronto—Astronomical Observatory—Royal Astronomical Society plans to build 2 story, brick and stone, on Bathurst St. and St. Clair Ave. About $150,000. Site for same has been donated by city. Architect not selected.

BIDS DESIRED

Conn., Watertown—School — Until July 10, by School Bd., building 2 story brick, concrete and steel addition, rein.-con. flooring, concrete foundation, on Oakville St. About $50,000. L. Asheim, 211 State St., Bridgeport, archt. Noted Mar. 20.

N. Y., Brooklyn—School—Until July 7, by C. B. J. Snyder, supt. school bldgs., Municipal Bldg., New York City, building addition to P. S. 73, McDougal St. and Rockaway Ave.

N. Y., New York—Office and Loft—Until July 7, (change of date) by R. H. Almiroty, archt., 220 5th Ave., building 6 story, 27 x 100 ft. brick and steel, brick foundation, at 31 West 57th St., for Sohmer & Co., 315 5th Ave. About $75,000. Noted June 5.

N. Y., Thiells—Cottage etc.—Until July 17, by F. A. Vanderlip, pres. bd. mgrs., Letchworth Village, 7 Wall St., New York City, building eight 1 story, 34 x 150 ft. steel cottages, with 36 x 46 ft. wing, concrete foundation, cost $350,000; 1 story, 40 x 80 ft. steel industrial building, concrete foundation, $115,000; 1 story, 49 x 145 ft. service building, with 64 x 100 ft wing, concrete foundation, $40,000; underground tunnel and conduit, hot water and steam connections, distributing equipment, underground sewer, water connections and electric service, $130,000. L. F. Pilcher, Capitol, Albany, State archt.; advertised in this issue. Noted Jan. 30.

N. Y., Utica—Hospital—Until July 29, by State Hospital Comn., Capitol, Albany, building 3 story, 40 x 206 ft. hospital, with 3 wings 35 x 58 ft., cost $350,000, and 3 story hospital, with 3 wings, 41 x 83 ft., both brick and rein.-con., cost $400,000, for Utica State Hospital, Marcy Div. E. S. Elwood, secy. state hospital comn.; advertised in this issue.

N. J., Montclair—School—Until July 8, by L. L. Jackson, secy. bd. educ., 22 Valley Rd., for alterations to Watchung School. Starrett & Van Vleck, 8 West 40th St., New York City, archts. Noted June 26; advertised in this issue.

N. J., Woodbury—Bank—Until July 7, by C. R. Peddle, archt., 136 South 4th St., building 1 story, 35 x 106 ft., brick, for 1st Natl. Bank, Woodbury. About $125,000. Noted June 12

Pa., Phila.—Bank—Second Natl. Bank, 4350 Frankfort Ave., receiving bids for 1 story, 72 x 100 ft., rein.-con., steel and brick. About $50,000. Stearns, Woodnut & Schmidt, 21 South 12th St., archts. Noted Oct. 24.

Pa., Phila.—Stations—Until July 8, by Dept. City Transit, 1211 Chestnut St., building two 40 x 40 ft. and two 20 x 50 ft. concrete and steel stations on Front St. at York and Daphin Sts. and on Girard Ave., for Frankfort Ave. Elevated Ry.; also entrance closures for stations at Ruan and Church Sts. and at Margaret and Orthodox Sts. C. T. Biswanger, c/o Dept. City Transit, engr. Noted June 19.

Pa., Phila. — Sunday School — Bethany Temple Presbyterian congregation, Spruce St., receiving bids building 3 story, 84 x 120 ft., concrete and stone. About $50,000. G. E. Savage, 1321 Walnut St., archt.

Va., Fredericksburg—School—Until July 7, by City Council and Bd. Educ., building 3 story, 78 x 125 ft., brick, concrete foundation, on Potters Field. About $125,000. P. N.Stern, Fredericksburg, archt.

O., Canton—Rest House—Pennsylvania Lines West of Pittsburgh, receiving bids building 4 story, 55 x 240 ft., brick, concrete foundation, here. T. Rodd, Pittsburgh, ch. engr.

O., Mechanicsburg—School—Until July 23, by R. C. Gotwald, archt., Gotwald Bldg., Springfield, building 3 story, 60 x 120 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, for Bd. Educ. About $75,000.

Ind., Hammond—Synagogue—H. C. Newhouse, archt., 4630 Prairie Ave., Chicago, receiving bids for 2 story, 55 x 115 ft. brick and timber, rock foundation, at 305 Sibley St. for Anshe Aneseth Israel congregation. About $50,000.

Mich., Decatur—School—Until July 14, by Bd. Educ., building 2 story, rein.-con. and brick. About $135,000. R. A. LeRoy, 122 Pratt Blk., Kalamazoo, archt.

Ill., Chicago—Convent—F. B. Byrne, archt., 104 South Michigan Ave., receiving bids for 3 story, 50 x 100 ft. brick and timber, concrete foundation, at 1220 East 55th St., for St. Thomas the Apostle congregation, c/o archt. About $65,000.

Ill., Chicago—Sales — Foltz & Brand, archts., 111 West Washington St., receiving bids for 3 story, 110 x 150 ft. rein.-con., rein.-con. flooring, concrete foundation, on 22nd St. and Union Ave., for H. F. DuPont, c/o archt. About $125,000.

Ill., Chicago—Theatre, Stores and Office—N. Thomasson, 4813 North Kedzie Ave., receiving bids for 3 story, 125 x 175 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, on Kedzie Ave. and Ainslie St. About $375,00. Foltz & Brand, 111 West Washington St., archts.

Wis., Chetek—School—Until July 7, by Bd. Educ. building 2 story, 60 x 100 ft. rein.-con. and brick high and grade school. About $50,000. W. L. Alban, 247 Endicott Bldg., St. Paul, Minn., engr. Noted June 5.

Minn., Bemidji—Dormitory—Until July 24, by State Bd. Control, Capitol, St. Paul, building 3 story, 42 x 120 x 120 ft., rein.-

Buildings (Continued)

con. and brick, brick foundation, at Norman School here. About $100,000. C. H. Johnston, Capital Bank Bldg., St. Paul, archt. Noted June 12.

Minn., Crookston—Dining Hall—Until July 15, by C. H. Johnston, archt., 715 Capital Bank Bldg., St. Paul, building 3 story, 50 x 130 ft., brick with wing 40 x 40 ft., at State Experimental Farm, here, for University of Minnesota. About $85,000. Noted June 19.

Minn., Duluth—Church—Until Aug. 1, by N. F. Russell, chn. com. Lakeside Presbyterian church, building 1 story, 60 x 140 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 45th Ave., E. and McCulloch St. About $60,000. P. M. Olsen, Sellwood Bldg., archt. and engr.

Minn., Ivanhoe—Courthouse—Until July 18, by A. L. Swenson, aud. Lincoln Co., building 2 story, 60 x 108 ft., brick and stone. About $125,000. H. C. Parsons, 600 Builders' Exch., Minneapolis, archt. Noted June 12.

Minn., Minneapolis—Business, etc.—Until July 24, by State Bd. Control, Capitol, St. Paul, building 6 story, 120 x 180 ft., rein.-con., brick and steel business building and storehouse, rein.-con. flooring, brick foundation. About $125,000. C. H. Johnston, 715 Capitol Bank Bldg., St. Paul, archt. Noted June 19.

Minn., Rochester—Hotel and Cafeteria—C. Grassie, 110 South Bway. St., receiving bids for 5 story, 80 x 88 ft., brick. About $175,000. A. Rose, 632 Blders. Exch., Minneapolis, archt. and engr.

Minn., St. Paul—Hotel and Theatre—Until Aug. 24, by Toltz, King & Day, archts. and engrs., 1410 Pioneer Bldg., for 16 story, rein.-con. and brick, rein.-con. flooring, rock foundation, on St. Peter St., for Ramm, Ruben & Finkelstein, Palace Theatre, Minneapolis. About $1,000,000.

Minn., Sauk Center—Cottages—State Bd. Control, Capitol, St. Paul, receiving bids for two 2 story, 35 x 80 ft. frame cottages at State Home for Girls, here. About $25,00 each. C. H. Johnston, 715 Capital Bank Bldg., St. Paul, archt.

Minn., Willmar—Service—Until Aug. 5, by State Bd. Control, Capitol, St. Paul, building 2 story, 45 x 120 ft., rein.-con. and brick, brick foundation, at State Asylum here. About $85,000. C. H. Johnston, 715 Capitol Bank Bldg., St. Paul, archt. Noted June 12.

Minn., Winona—School—Until July 24, by State Bd. Control, Capitol, St. Paul, building, 3 story, 42 x 120 ft., rein.-con. and brick, normal school. About $100,000. C. H. Johnston, 715 Capitol Bank Bldg., St. Paul, archt.

S. D., Redfield—Service—State Bd. Control, St. Paul, Minn., receiving bids for 2 story, brick and tile, at State Feeble Minded School, here. About $85,000. C. H. Johnston, 715 Capital Bank Bldg., St. Paul, archt.

Colo., Gunnison — High School — Until July 11 by High School Comn. Gunnison Co. building high school. About $50,000. W. B. Itther, Educatinal Bldg., St. Louis, Mo., archt.

Sask., Montmartre—College—Until July 23, by A. Fortin, archt., Gravelbourg building 3 story, steel and brick, concrete foundation, for Congregation of Our Lady. About $100,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Clinton**—Bank—First Natl. Bank let contract building 2 story brick and concrete, concrete foundation, to G. A. Fuller Co., 710 Bd. Trade Bldg., Boston. About $75,000.

Mass., New Bedford—School—City received only bid building 3 story, grammer school, from Corrigan & Hoag Constr. Co., 23 Rodman St., Fall River. About $261,000.

★**Mass., Springfield** — School — Bd. Educ. let masonry, carpentry and painting contract building 2 story, 12 room brick, concrete and steel addition to Homer St. school, rein.-con. flooring, concrete foundation, to include assembly and auditorium, to E. J. Pinney, 264 Main St., $91,955. Noted Feb. 13.

★**N. Y., Albany**—School—Bd. Educ. let contract building P. S. 19, 3 story, 41 x 160 ft., brick and rein.-con., concrete foundation, on New Scotland Ave., to Bame & Cardell, 176 Warren St. About $135,000. Noted May 15.

★**N. Y., Brooklyn**—Salesroom—See "Industrial Works."

★**N. Y., Brooklyn**—Theatre—M. L. B. Constr. Co., 438 Ashforth St., will build 1 story, 80 x 200 ft. brick and steel, brick foundation, on Chester St. and Pitkin Ave. About $75,000. Work will be done by day labor.

★**N. Y., Buffalo**—Store and Office—T. and E. Dickinson Co., Inc., Main St., let contract building 3 story, 40 x 112 ft., steel and concrete, rein.-con. flooring, to C. Everitt, Auburn Ave. About $60,000. Cost plus percentage basis.

★**N. Y., New York**—Auditorium and Office—Metropolitan Life Insurance Co., 1 Madison Ave., let contract building 16 story, 75 x 150 ft., brick and steel, brick foundation, at 11-15 Madison Ave., to A. A. Volk Constr. Co., 550 West 20th St. About $800,000, cost plus percentage basis. Noted June 26.

★**N. Y., New York** — Exchange — McKenzie, Voorhees & Gmellin, archts. and engrs., 1123 Bway., let contract to H. H. Oddie, 12 East 44th St., building 4 story, 103 x 115 ft. brick and steel, brick foundation, 167th St. and Grand View Pl., for New York Telephone Co., 15 Dey St. About $391,000. Noted June 5.

★**N. Y., New York**—Store and Office—Buckley-Newhall Co., 125th St. and 5th Ave., let contract building 12 story, 100 x 125 ft. brick, stone and steel, rock foundation, on 41st St. and 6th Ave., to Cauldwell Wingate Co., 381 4th Ave. Noted June 12.

★**N. Y., New York**—Theatre—Selwyn & Co., 229 West 42nd St., let contract building two 3 story, 100 x 200 ft. brick and steel, brick foundation, at Times Sq., to O'Day Constr. Co., 234 West 51st St., cost plus percentage basis.

N. Y., Ossining—Hall, etc.—C. F. Rattigan, supt. state prisons, Hall Records Bldg., New York City, received bids June 24, building mess hall and kitchen No. 4, detention No. 5, outside cell No. 7, clinic No. 8, pumphouse, reservoir, also sanitary, heating and electric work on same, from P. J. Carlin Constr. Co., 1123 Bway., New York City, $956,780, P. Keeler, 425 Orange St., Albany, $1,083,777, A. F. Stevens Co., New York City, $1,157,000. Noted June 12.

N. Y., Rochester—Bathhouse—Bd. Contr. & Supply received bids building new bathhouse, masonry, from A. Freidericks Sons Co., $85,575; marble and tile work, from Nell Bros. & Kern, $48,150; carpentry, from J. Luthers Sons Co., 176 North St., $24,416.

★**N. J., Asbury Park**—Church—Methodist Episcopal congregation let contract building 2 story, 70 x 190 ft., brick and steel, brick foundation, to H. H. Moore, Spring Lake. About $150,000. Noted Jan. 9.

★**Pa., Phila.**—Art Museum—City let contract building 1 story, 425 x 550 ft., concrete, at Fairmount Park, to F. W. Mark Constr. Co., Inc., Finance Bldg., $425,550.

★**Va., Richmond**—Bank—Federal Reserve Bank, 1109 East Main St., let contract building 5 story, 120 x 130 ft., concrete and steel, rein.-con. flooring, concrete foundation, on 9th and Franklin Sts., to J. T. Wilson Co., Inc., Mutual Bldg. About $1,000,000.

★**Fla., West Palm Beach**—Stores and Offices—F. Sheen let contract building 2 story addition, to E. A. Fonda, West Palm Beach. About $300,000.

★**O., Cleveland**—Commercial—C. Graber, 15703 Detroit Ave., let contract building 3 story, 67 x 94 ft., concrete, steel and brick, to E. Kline, 26 Warren Rd. About $100,000. Noted June 26.

★**O., Dayton**—Bank and Office—Winters Natl. Bank, 2nd and Main Sts., let contract building 5 story, 72 x 80 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, to Frank Hill Smith Co., Inc., West 3rd. St. About $250,000. Noted June 12.

O., Dayton — Salesroom — See "Industrial."

★**O., Pitsburg**—School—Bd. Educ. let contract building 2 story, brick addition, to L. S. Foltz & Son, Columbus, $83,100.

★**Mich., Royal Oak**—School—Bd. Educ. let contract building 2 story, 84 x 97 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Berkley Ave., to States Eng. Co., 514 Free Press Bldg., Detroit. About $130,000. Noted May 29.

Wis., Milwaukee — School — Bd. School Dirs., 10th and Prairie Sts., received bids building rein.-con. and brick, rein.-con. flooring, concrete foundation, on Grand Ave. between 27th and 28th Sts., from E. D. Kiesslich, 456 40th St., $98,000; W. Buchholz, 615 1st Ave., $80,625; H. Jahn, 1915 Chestnut St., $34,600. Noted June 26.

★**Minn., Duluth**—School—Bd. Educ. let contract building 1 story, 115 x 260 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Minnesota Ave., to G. H. Lounsberry, 322 East Superior St., $106,364. Noted June 12.

★**Minn., St. Cloud**—Hotel—Granite City Investment Co. will build 5 story, 120 x 200 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 9th and St. Germain Sts. About $300,000. Work will be done by day labor under supervision of H. Brien. Noted May 8.

★**Mo., St. Louis**—Exchange—Bell Telephone Co., Bway. and Olive Sts., let contract building 1 story, 50 x 160 ft., rein.-con., steel and brick addition, rein.-con. flooring, on 10th and Olive Sts., to Murch Bros., Constr. Co., Ry. Exch. Bldg. About $50,000.

★**Tex., Amarillo**—High School—Independent School Dist. let contract building 65 x 132 ft. brick and frame high school to W. Rice Constr. Co. About $70,000. Noted Apr. 10.

★**Tex., Ft. Worth**—Temple—Carpenter's Local Union No. 208 let contract building 100 x 115 ft. rein.-con. labor temple on 3rd and Calhoun Sts., to B. F. and C. M. Davis, Reynolds Bldg. About $80,000. Noted Jan. 2.

★**Idaho, Boise**—School—City let contract building 2 story, concrete and brick, concrete foundation, to O. W. Allen, 2310 Ada St. About $60,000.

★**Idaho, Lewiston**—Administration—State Bd. Educ. let contract building 2½ story, 60 x 140 ft., rein.-con., terra cotta and brick, concrete foundation, on campus of State Normal School, here, to Roth Constr. Co., Lewiston, $136,312. Noted June 6.

Cal., Downey — Psychopathic — Bd. Supervs. Los Angeles Co., received bids building 1 story, 60 x 269 ft., timber, rein.-con. flooring, concrete foundation, from G. F. Barber, 4342 Flower St., $61,590; Willard-Brent Co., Baker-Detwiler Bldg., $68,947; J. F. Atkinson, Story Bldg., $71,000, contractors all of Los Angeles.

★**Cal., Long Beach**—Church—First Christian Church let contract building brick and stone, concrete foundation, on 5th St. and Locust Ave., to J. D. Sherer, 1466 West 1st St. About $125,000, cost plus percentage basis. Noted Mar. 27.

Cal., Los Angeles—School—Bd. Educ. received bids building 2 story, 132 x 220 ft., on East 7th St., (a) brick walls, (b) hollow tile walls, from J. V. McNeil, H. W. Hellman Bldg., (a) $103,300, (b) $101,000; M. N. Yesberg, 1650 Morton Ave., (a) $104,800, (b) $103,800; J. F. Atkinson, Story Bldg., (a) $ or (b) $105,887. Noted May 29.

★**Cal., San Francisco**—Office—R. Dollar Co. let contract building 5 story, concrete addition on California and Battery Sts., to Dinwiddie Constr. Co., Crocker Bldg., $213,695.

Cal., Vernon—Office—See "Industrial Works."

★**Ont., London**—Store—T. F. Kingsmill, 130 Dundas St., let contract building 3 story, 37 x 59 ft., rein.-con., steel and brick, concrete foundation, on Dundas St., to R. G. Wilson, Dundas St. About $50,000. Noted June 5.

Federal Government Work

PROPOSED WORK

Conn., New London—Distributing System—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install, here; Spec. 3989. About $275,000.

Pa., Phila.—Wet Pipe System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received no bids June 25, installing wet pipe system for automatic sprinkler in Building No. 7; Spec. 3957. Noted June 19.

Va., Hampton Roads — Bridge — Bureau Yards and Docks, Navy Dept., Wash., D. C., rejected bids received June 18, building transfer bridge at Operation Base, here; Spec. 3907. Noted June 26.

La., New Orleans—Coaling Wharf— U. S. Naval Sta. Eng. Dept., plans to extend and increase capacity of coaling wharf and plant. About $90,000.

Federal Government Work (Continued)

La., New Orleans—Power House—U. S. Naval Sta., having plans prepared for steel power house, rein.-con. flooring, concrete foundation, near Mississippi River. About $120,000.

Ill., Great Lakes—Sewage Disposal Plant—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to alter and build addition to sewage disposal plant, here; Spec. 3995. Bids will be received at local yard.

Mo., St. Louis—Levee Work—Secy. Mississippi River Comn., 1311 International Life Bldg., rejected bids received June 19, for 200,000 cu.yd. earthwork by hydraulic method in Muscatine—Luisa Island Levee Dist., Ia. Noted May 22.

Cal., Ft. Bidwell—School—Comr. Indian Affairs, Dept. Interior, Wash., D. C., rejected only bid received May 27, building school, here. Noted June 5.

Cal., Mare Island—Torpedo Storage and Compressor Building—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build; Spec. 3991. About $60,000.

P. R., Cayey—Radio Buildings—Bureau Yards and Docks, Navy Dept., Wash., D. C., rejected bids building addition to operators' quarters and 2 cottages at High Power Radio Sta., here; Spec. 3902. Noted June 26.

BIDS DESIRED

Del., Wilmington — Storehouse — Until July 31, by U. S. Engr. Office, Wilmington, building here; advertised in this issue.

O., Cincinnati — Stone — Until July 28, by U. S. Engr. Office, Customhouse, furnishing and delivering stone at Dam No. 39, Ohio River; advertised in this issue.

P. R., San Juan—Dredging and Filling—Until July 28, by U. S. Engr. office, 39 Whitehall Bldg., New York City and U. S. Engr. office, San Juan, dredging San Juan Harbor and filling adjacent swamp lands with material dredged; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Addition to Shipfitters' Shop—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building addition to shipfitters' shop at structural shop, here, (1) work complete from Levering & Garrigues, 552 West 23rd St., New York City, (1) $412,699, (165 days); (2) add $65, deduct $15; (3) add $2, deduct $0.50; (4) $3; (5) add $21, deduct $10; (6) add $0.80; deduct $0.10.

F. G. Fearon Co., 280 Madison Ave., New York City, (1) $418,056, (165 days); (2) add $50, deduct $15; (3) add $200, deduct $0.50; (4) $23,000; (5) add $35, deduct $10; (6) add $1; deduct $0.25.

G. A. Fuller Co., 131 State St., (1) $424,861, (165 days); (2) add $47, deduct $18; (3) add $1.50, deduct $0.60; (4) add $9254; (5) $20.50, deduct $10; (6) $0.95, deduct $0.10. Noted June 19.

Mass., Hingham—Officers' Quarters—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 28, building 2 buildings for officers' quarters, at Naval Ammunition Depot, here, from C. S. Cunningham & Sons Constr. Co., 80 Boylston St., Boston, $33,959, (120 days); J. Miles & Sons Co., 393 Main St., Worcester, $34,464, (150 days); H. S. Roberts, 1123 Bway., New York City, $34,750, (150 days). Noted June 26.

R. I., Coaster's Harbor—Extending and altering Fire Alarm System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bid June 25, extending and altering at Naval Training Sta., here, from Gamswell Fire Alarm Telegram Co., 70 East 45th St., New York City, $19,062, (90 days). Noted June 19.

R. I., Coddington Point—Extending and Altering Fire Alarm System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bid June 25, extending and altering at Naval Training Sta., here, from Gamswell Fire Alarm Telegram Co., 70 East 45th St., New York City, $19,062, (90 days). Noted June 19.

R. I., Coddington Point—Tank and Tower—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 18, erecting tank and tower at U. S. Naval Camp, here, from Pittsburgh Des Moines Steel Co., 959 Munsey Bldg., Wash., D. C., $8500, (120 days). Noted June 12.

★R. I., Melville—Steel Pipe—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing steel pipe, to Pole & Tube Wks., Ave. D and Murray St., Newark, N. J., $1700 (30 days).

R. I., Newport—Extending and Altering Fire Alarm System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bid June 25, extending and altering at Naval Training Sta., here, from Gamswell Fire Alarm Telegram Co., 70 East 45th St., New York City, $19,062, (90 days). Noted June. 19.

★N. Y., Brooklyn—Fire Protection Lines—Local Navy Yard let contract installing fire protection lines, here, to J. Burns, 103 East 125th St., New York City, $25,900, (90 days).

★N. Y., Brooklyn—Pipe Line and Tunnel—Local Navy Yard let contract building tunnel and service pipe line, here, to Austin Heating Co., 121 West 42nd St., New York City, $12,775, (60 days).

★N. Y., Brooklyn—Repairs to Boiler Furnaces—Local Navy Yard let contract repairing boiler furnaces, here, to G. Allen & Son, 1511 3rd Ave., New York City, $15,935, (86 days).

N. Y., Montauk—Power House—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building at Naval Air Sta., here, from Fanning & Quinn, 105 West 40th St., New York City, 8495, (60 days); King Lumber Co., Charlottesville, Va., $11,400, (75 days). Noted June 19.

N. Y., Montauk—Sewers—Bureau Yards and Docks, Navy Dept., Wash., D. C., received bids building additional sewers, here, from Gargord & Co., Inc., 503 5th Ave., New York City, $9499, (30 days); E. F. Monahan, 195 Hastings St., Manhattan Beach, $11,322, (30 days); C. Meads & Co., 38 Park Row, New York City, $11,640, (time as specified). Noted June 19.

N. Y., New York—Crane Runaway—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, furnishing crane runaways for Shipbuilding Slip No. 1 and for Bulkhead Handling and Storage, here, (1) work complete, from McClintic Marshall Co., 715 Munsey Bldg., Wash., D. C., (1) $403,936, (200 days); Bethlehem Steel Bridge Corp., 3rd St., Bethlehem, Pa., $427,000, (200 days); Amer. Bridge Co., Wilkins Bldg., Wash., D. C., $449,000, (180 days). Noted June 19.

N. Y., New York—Elevators—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building 2 electric freight elevators and shipping ways No. 1, here, (1) work complete, from Albro Clem Elevator Co., D St. and Erie Ave., Phila., Pa., (1) $15,785, (120 days); Otis Elevator Co., 220 Bway., (1) $16,386 (120 days), (2) $14,996, (120 days); Warner Elevator Manufacturing Co., 113 Warren St., (1) $17,000. Noted June 5.

N. Y., New York—Rebuilding Shipbuilding Ways—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, rebuilding Shipbuilding Ways No. 1, here, (1) work complete from Underpinning & Foundation Co., 290 Bway., $697,897, (2) $30, (3) $10; Snare & Triest, 8 West 40th St., $817,000, (270 days), (2) $30, (3) $15; Jarrett & Chambers Co., 30 East 42nd St., (1) $859,275, (270 days). Noted June 5.

N. Y., Rockaway—Electric Light and Power Distributing System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, installing at Naval Air Sta., from Hamilton Electric Co., 357 3rd St., Brooklyn, $43,143, (80 days), $41,975, (75 days), $41,000, (75 days); Hatzel & Bender, 3734 4th Ave., New York City, $51,000, (90 days); United Electric Contg. Co., 1727 Samson St., Phila., $51,750, (90 days). Noted June 19.

N. Y., Rockaway—Extension to Steam Heating System—Bureau Yards & Docks, Navy Dept., received bids June 28, extnding steam heating system at Air Sta., here, (1) work complete, from

Rutzler Co., 404 East 19th St., New York City, (1) $10,740, (50 days), (2) $269; (3) $284; (4) $140; (5) $287.

T. B. Connelly, 339 Thames St., Newport News, Va., (1) $18,700, (60 days); (2) $200; (3) $550; (4) $50; (5) $400.

Raisler Heating Co., 129 Amsterdam Ave., New York City, (1) $19,500, (60 days); (2) $480; (3) $490; (4) $340; (5) $495. Noted June 26.

N. Y., Rockaway—Latrine and Washroom—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 28, building at Air Sta., here, from Rangley Constr. Co., 405 Lexington Ave., New York City, $9400, (40 days); H. S. Roberts, 1123 Bway., New York City, $11425, (40 days); T. E. Thomas, 125 5th Ave., Bay Shore, $16,675 (40 days). Noted June 26.

N. Y., South Brooklyn—Storage Building—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, constructing compass storage building on roof of Building S-2, at Fleet Supply Base, here, from Barney-Ahlers Constr. Co., 110 West 40th St., New York City, $13,110, (60 days); Rangeley Constr. Co., 405 Lexington Ave., New York City, $13,600, (60 days); B. Diamond, 12 Bergen St., Brooklyn, $13,750, (75 days). Noted June 19.

N. J., Cape May—Cell House—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building cell house at Naval Training Camp, Wissahickon Barracks, here, from Pauly Jail Bldg. Co., 215 Dekalb St., St. Louis, Mo., $9450, (40 days); Eaton, Brown & Simpson, 90 West St., New York City, $19,177; alternate $13,377, (60 days). Noted June 19.

N. J., Cape May—Flood Lighting System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, installing in Wissahickon Barracks, here, from Carroll Electric Co., 714 12th St., N. W., Wash., D. C., $4450, (45 days); Blumethal-Kahn Co., 505 North Eutaw St., Baltimore, Md., $5570, (time as specified); G. E. Eng. Co., 22 Laight St., New York City, $5864, (75 days). Noted June 19.

★Pa., Ft. Mifflin—Cleaning, Repairing and Resurfacing Roads—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract cleaning and repairing existing roads and resurfacing with bituminous dressing, to M. J. McCruden, 805 Franklin Trust Bldg., Phila., (1) and (2), $1870, (15 days). Noted June 19.

Pa., Ft. Mifflin—Tank and Tower—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building 1 elevated steel water tank and tower, here, for Delaware River water, (1) work complete, from Pittsburgh Des Moines Steel Co., 959 Munsey Bldg., Wash., D. C., (2a) $5500, (105 days); Chicago Bridge & Iron Co., 30 Church St., New York City, (2) $5635, (120 days); A. Stang, 1220 Locust St., Phila., (2) $9500, (3) $8500, (60 days). Noted June 19.

Pa., Phila.—Assembly Shop — Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building extension to assembly shop, at Naval Aircraft factory at Navy Yard, here, (1) work complete, from

M. H. McClosky, Jr., 1620 Thompson St., (1) $632,861, (180 days); (2) add $30, deduct $11; (3) add $.60, deduct $.02

Irwin & Leighton, 126 North 12 St., (1) $654,000, (150 days); (2) add $29, deduct $19; (3) add $1, deduct $.10.

Hughes Foulkrod, 1406 Commonwealth Bldg., (1) $664,043, (180 days), alternate $657,634; (2) add $33, deduct $20; (3) add $1.32, deduct $.10. Noted June 12.

Pa., Phila.—Fire Escape—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25 constructing fire escape for Building No. 6, from J. Baizlex Iron Co., 514 Delaware Ave., S., $1650 (60 days); Rich & Kemp, 21st St. and Washington Ave., $1900, (60 days); Gutleib & Scholl, 225 East 138th St., New York City, $1984, (60 days). Noted June 19.

Pa., Phila.—Pattern Shop—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building, here, (1) work complete, from

M. H. McClosky, 1620 Thompson St., Phila., Pa., (1) $262,262, (120 days), (2) deduct $13,000; (3) deduct $34,556; (4) deduct $37,010; (5) add $18, deduct $6; (6) add $0.60; deduct $0.2; (7) add $42, deduct $20; (8) add $1.60, deduct $0.60.

T. Riley, 1616 Thompson St., Phila., Pa., (1) $265,100, (120 days); (2) add $4; (3) deduct $34,600; (4) deduct $31,280; (5) add $12, deduct $9; (6) add $0.60; (7) add $34.35, deduct $21; (8) add $1.35, deduct $0.85.

Warren Moore Co., Colonial Trust Bldg., Phila., Pa., (1) $265,852, (time as specified); (2) add $2036; (3) deduct $34,908; (4) deduct $33,243; (5) add $20, deduct $9; (6) add $1; deduct $0.10; (7) add $60, deduct $15; (8) add $2; deduct $50. Noted June 5.

Pa., Phila.—Paving and Resurfacing, etc.—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, paving and resurfacing existing roads, ballasting railroad tracks, extensions, alterations and drainage, from Curtis Bros., Longshore and Tulip Sts., Tacony, $102,000, (120 days); E. C. Fish Co., 704 Real Estate Trust Bldg., $106,780, (120 days). Noted June 19.

Pa., Phila.—Pipe System of Automatic Sprinkler—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, installing combination wet and dry pipe

Federal Government Work (Continued)

system of automatic sprinklers in Building No. 87, (1) work complete, from General Fire Extinguisher Co., 1220 Stock Exch. Bldg., (1) $26,450, (2) $5.50, (3) $5.50,(120 days); H. G. Vogel Co., 25 South Orinna St., $28,920, (2) $6. Noted June 19.

Pa., Phila.—Sprinkler System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, installing dry system of automatic sprinklers in Building No. 336, here, (1) work complete, from Gen. Fire Extinguisher Co., 1220 Stock Exch. Bldg., (1) $27,200, (2) $5.50, (3) $5.50, (4) $0.15, (5) $0.15, (6) $0.50; H. G. Vogel Co., 85 Orinna St., (1) $29,995, (2) $6. Noted June 19.

★**Md., Annapolis**—Painting Towers—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract painting radio towers, here, to Kootz & Banks, 416 High St., Portsmouth, Va., $10,584 (30 days). Noted June 19.

Md., Indianhead—Housing Development—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids building 84 houses, water supply, fire protection, sewer and electric distributing systems, roads and walks at Naval Proving Grounds, here, (1) work complete, from H. S. Roberts, 1123 Bway., New York City, (1) $159,350, (180 days), (2) $37,750, (4) add $1.25 to $9, $1.10 to $8; King Lumber Co., Charlottesville, Va., (1) $248,000, (180 days), (2) $20,000; (4) $.80 to $5. Noted June 10.

★**Md., Indianhead**—Piping and Electrical System—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing piping and electrical system, here, to Almirall & Co., 1 Dominick St., New York City, $25,800, (150 days). Noted June 19.

★**Md., Indianhead**—Power Plant—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building extension to power plant, here, to Levering & Garrigues, 552 West 23rd St., New York City, $250,572, (200 days). Noted June 19.

Md., Indianhead—Toilet Buildings—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, constructing toilet buildings and additions at Powder Factory Reservation, here, from H. S. Roberts, 1123 Bway, New York City, $69,750, (120 days); Newport Contg. & Eng. Co., Silsby Bldg., Newport News, Va., $78,595, (120 days); De Kimpe Constr. Co., Dispatch Bldg., Union Hill, N. J., $97,000, (150 days). Noted June 19.

D. C., Anacostia—Buildings, Hangars, Roads and Distributing Systems—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building and installing, here, (1) work complete, from

J. Gill & Sons, 1302 Citizen Bldg., Cleveland, O., (1) $366,000, (time as specified), (2) $50, deduct $15; (3) $1.50, deduct, $0.25; (4) deduct $200.

Boyle-Robertson Constr. Co., 601 Evans Bldg., Wash., D. C., (1) $370,258, (180 days); (2) add $20, deduct $10; (3) add $70, deduct $0.10; (4) deduct $400; (5) deduct $65,000.

King Lumber Co., Charlottesville, Va., (1) $394,600, (180 days); (2) add $15, deduct $5; add $.80, deduct $0.40; (4) add $1000; (5) deduct $55,000. Noted June 19.

D. C., Anacostia — Platform — Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids building elevated wooden platform, here, from L. E. Breuninger, Colorado Bldg., Wash., $1150, (45 days); Boyle-Robertson Constr. Co., 601 Evans Bldg., Wash., $2493.

D. C., Bellevue—Pier and Fire Protection System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 28, building pier and installing fire protection system at Naval Magazine, here, (1) work complete, from

Hyde & Baxter, 711 13th St., N. W., Wash., (1) $51,00, (time as specified) (2) $26,000, (100 days); (3) $9,000, (30 days); (4) $27,000, (180 days); (5) $9,500, (45 days); (6) $1,000, (10 days); (7) $15; (8) add $30, deduct $20; (9) add $.60, deduct $.20; (10) add $135, deduct $110

Boyle-Robertson Constr. Co., 601 Evans Bldg., Wash., (1) $51,915, (200 days); (2) deduct $24,624, (50 days); (3) deduct $10,350, (50 days); (6) deduct $600; (7) $25; (8) add $18; (9) add $.50, deduct $.50.

McLean Contg. Co., 1415 Fidelity Bldg., Baltimore, Md., (1) $52,711, (220 days); (2) $28,000, (50 days); (3) $9350, 10 days); (4) $29,759, (140 days); (5) $11,000, (120 days); (6) deduct $350; (7) $25; (8) add $40, deduct $10; (9) add $.90, deduct $.05; (10) add $150, deduct $100 Noted June 26

D. C., Takoma Park—Garage, Sidewalks, alterations and additions to Mess Hall, etc. —Constr. Quartermaster, Walter Reed Army Hospital, received bids June 24, building garage, concrete sidewalks, additions and alterations to mess hall, etc., from J. Troutt Constr. Co., 937 Shepherd St., $41,182; Spinker & Parrett, 1416 F St., N. W., $53,514; E. L. Wagner, 1723 F St., N. W., $62,500. Contractors all of Wash.

★**D. C., Wash.**—Equipment—First Asst. Postmaster General let contract furnishing mechanical equipment for post office garage, here, to I. Freund, 1315 7th St., N. W., $10,-352. Noted June 26.

★**D. C., Wash.**—Garage — First Asst. Postmaster General let contract building garage at Post Office, here, to A. C. Moses Constr. Co., 918 New York Ave., N. W., $51,649. Noted June 26.

D. C., Wash.—Kitchen, Cafeteria and Boiler House—Treas. Dept., Wash., received only bid June 26, building kitchen, cafeteria and boiler house, at War Industries Building, from W. P. Lipscomb, 1406 G St., N. W., $17,291, (30 days).

★**D. C., Wash.**—Pavement—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract paving with vitr. brick and curbing with concrete at Marine Barracks, here, to Costigan & Maloney, 407 Colorado Bldg., $4933, (30 days). Noted June 26.

D. C., Wash. — Pump House — Dist. Comrs., Dist. Bldg., received bids June 20, building pump house at Municipal Fish Market, Water St., from H. S. Hatton & Co., $750, (15 days); T. C. Henderson, $847, (30 days); H. R. Dedney, $815, (30 days) Contractors all of Wash. Noted June 19.

Va., Hampton Roads—Fire Alarm System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, installing fire alarm system, in East Camp of Naval Training Sta., here, (1) work complete, from Gamswell Fire Alarm Co., 71 East 45th St., (1) $9600, (60 days), (2) $1246; E. J. Installation Electric Co., 221 West 33rd St., (1) $7671, (90 days), (2) $930, (3) $8300, (4) $1000; G. E. Eng. Co., 22 Laight St., (1) $10,281, (90 days), (2) $1098. Contractors all of New York City. Noted June 19.

Va., Hampton Roads—Railroad Extension—Bureau Yard & Docks, Navy Dept., Wash., D. C., received bids June 25, building at Naval Air Sta. and Naval Operating Base, here, (1) work complete, from Porter & Dewett, Army Supply Co., Base, Norfolk, (1) $38,150, (2) $6, (90 days), Carroll Electric Co., 714 12th St., N. W., Wash., D. C., (1) $48,127, (2) $9.50, (100 days). Noted June 19.

Va., Hampton Roads—Surfacing, Grading, Filling and Sodding—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids, surfacing, grading, filling and sodding 300 acres at Naval Operating Base, here, (1) grading 300 acres, (2) 5000 cu.yd. overhaul, (3) 210,000 cu.yd. cinder on slag fill, (4) 242,000 cu.yd. top soil fill, (5) 300 acres sodding, from

McLean Contg. Co., 1415 Fidelity Bldg., Baltimore, Md., (1) $138, (18 months); (2) $1.044; (3) $2.98; (4) $2.65.

J. Gill & Sons, 1302 Citizens Bldg., Cleveland., O., (1) $295, (time as specified); (2) $1.75; (3) $4.14, alternate $.90 to $1.75; (4) $3.77; (5) $2100, alternate (1) $155; (2) $425.

Claiborne, Johnson & Co., 910 Garrett Bldg., Baltimore, Md., (1) $300, (120 days); (2) $2; (3) $3.03; (4) $3.04. Noted June 5.

Va., Hampton Roads—Tank and Tower—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 18 erecting tank and tower at U. S. Marine Barracks, here, from Pittsburgh Des Moines Steel Co., 969 Munsey Bldg., Wash., D. C., $8680, (120 days). Noted June 12.

Va., Norfolk—Boat Shed and Dredging—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids building boat shed and dredging at Naval Operating Base, (1) work complete, exclusive of dredging, (2) unit price additional for each linear foot of pile in excess of 58 ft. of length, (3) unit price deduction for each linear foot even of pile less than 58 ft. of length, (4) unit price in addition for each cubic yard of dredging based on 2000 cu. yd., from H. P. Converse & Co., 31st and Colonial Aves., (1) $30,480, (75 days), (2) $1, (3) $.30, (4) $2; McHard Barton Co., 171 Madison Ave., New York City, (1) $32,400, (75 days), (2) $.75, (3) $.20, (4) $2; J. Gill & Sons, 1302 Citizens Bldg., Cleveland, O., (1) $34,750, (time as specified), (2) $2, (3) $.10, (4) $2.

Va., Quantico—Grading, Concrete Roads and Platforms—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids grading, buildings concrete roads and platforms at Marine Flying Field, here, (1) work complete from

McLean Contg. Co., 1415 Fidelity Bldg., Baltimore, Md., (1) $83,338, (180 days); (2) deduct $16,500; (3) $19,500, (60 days); (4) $18; (5) $45; (6) 8 in., $210, 10 in. $420; (7) add $20, deduct $1; (8) add $1, deduct $0.05.

Boyle-Robertson Constr. Co., 601 Evans Bldg., Wash., D. C., (1) $99,527, (120 days); (2) $18,500; (4) $25; (5) $40; (6) 8 in. $584, 10 in. $900; (7) add $25, deduct $15; (8) add $1, deduct $10.

G. A. Fuller Co., 1138 Munsey Bldg., Wash., D. C., (1) $99,728, (150 days); (2) $22,000, (60 days); (3) $22,500, (60 days); (4) $18; (5) $50; (6) add $400, deduct $700; (7) add $14, deduct $7; (8) add $0.70, deduct $0.35. Noted June 26.

★**Va., Quantico** — Storehouses — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building 12 metal storehouses, here, to Hugh Foulkrod Co., Commonwealth Bldg., Phila., Pa., $280,000, (60 days). Noted June 26.

Va., Yorktown — Buildings — Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, constructing 11 buildings at Naval Mine Depot, here, (1) work complete, from Newport Contg. & Eng. Co., Silsby Bldg., Newport News, (1) $289,331, (270 days); H. S. Roberts, 1123 Bway., New York City, (1) $289,611, (270 days); King Lumber Co., Charlottesville, (1) $314,900, (180 days); (2) deduct $2000. Noted June 26.

Va., Yorktown—Machine Shop—Bureau Yards & Docks, Wash., D. C., received bids June 28, building at Naval Mine depot, here, (1) work complete, from McLean Contg. Co., 1415 Fidelity Bldg., Baltimore, Md., (1) $6000, (70 days), (2) $1.50; Newport Contg. & Eng. Co., Silsby Bldg., Newport News, (1) $6780, (70 days); (2) $2, Boyle-Robertson Constr. Co., Evans Bldg., Wash., D. C., (1) $7904, (70 days), (2) $3. Noted June 26.

Va., Yorktown—Road—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids building concrete road at Naval Mine Depot, (1) work complete, based on length of road of 4 mi., including excavating and grading, from

McLean Contg. Co., 1415 Fidelity Bldg., Baltimore, Md., (1) $199,000, (150 days); (2) $1000; (3) $500; (4) $1.45; (5) $16 to $30; (6) $45,000; (7) $2.50.

Porter & Dewitt, Army Supply Base, Norfolk, (1) $253,300, (120 days); (2) $1178; (3) $100; (4) $1.50; (5) $8.25 to $14; (6) $60,000; (7) $278,000.

S. R. Curtis, Lee Hall, (1) $333,360, (150 days); (2) $1580; (3) $200; (4) $0.90; (5) $12.50 to $22; (6) $112,000; (7) $530. Noted June 19.

★**S. C., Charleston** — Building — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing amusement building, here, to D. F. Brandon, 806 James Bldg., Chattanooga, Tenn., $36,774, (120 days). Noted June 26.

S. C., Charleston—Quarters for Guards—Electric Lighting Water Supply and Fire Protection Systems—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 28, building and installing at Naval Ammunition Depot, here, (1) work complete, from Simons-Mayrant Co., Peoples Office Bldg., (1) $49,873, (180 days), (2) $25, (3) $.25; H. S. Roberts, 1123 Bway., New York City, (1) $68,665, (180 days), (2) add $40, deduct $20, (3) add $.80, deduct $.40. Noted June 26.

★**S. C., Paris Island**—Power House—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building extension to power house, here, to Newport Contg. & Eng. Co., Law Bldg., Newport News, Va., $10,385, (60 days).

S. C., Paris Island—Tank and Tower—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 18, erecting tank and tower at East Camp of U. S. Naval Training Sta., here, from Pittsburgh Des Moines Steel Co., 959 Munsey Bldg., Wash., D. C., $9000, (120 days). Noted June 12.

S. C., Paris Island—Water Supply System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building fresh water supply system, at Marine Barracks, here, (1) work complete, from

Noland Clifford Co., 220 28th St., Newport News, Va., (1) $58,150, (120 days); (1a) $53,600; (2) deduct $3600; (6) $6; (7) $0.16 to $1.80.

Federal Government Work (Continued)

Newport Contg. & Eng. Co., Law Bldg. Newport News, Va., (1) $73,915 (120 days); (1a) $70,915; (2) deduct $3000; (6) add $6 to $4; (7) add $0.31 to $3; deduct $0.20 to $2.40.

Charleston Eng. & Constg. Co., 58 Broad St., Charleston, (1) $86,843, (120 days); (2) $3300; (5) $83,543, (120 days); (6) $5.50; (7) $0.20 to $4. Noted June 19.

Fla., Key West—Oil Burning Equipment—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, furnishing oil burning equipment for boilers in central heating plant, from South Florida Contg. & Eng. Co., Key West, $5800, (120 days); A. M. Lockett & Co., 533 Baronne St., New Orleans, La., $5915, (70 days); Carroll Electric Co., 714 12th St., N. W., Wash., D. C., $6590, (120 days). Noted June 19.

Fla., Key West—Power House, Electric Generator Equipment and Fire Protection System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building power house and installing electric generator equipment and fire protection system, from South Florida Contg. & Eng. Co., Key West, $97,000, (180 days); Newport Contg. & Eng. Co., Silsby Bldg., Newport News, Va., $112,140, (180 days). Noted June 19.

Fla., Key West—Sewer—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building intercepting sewer at Naval Air Sta., here, (1) work complete, from Carroll Electric Co., 714 12th St., N. W., Wash., D. C., (1) $9750, (120 days); Southern Florida Contg. & Eng. Co., Key West, (1) $14,000, (120 days), (2) $6100. Noted June 19.

Fla., Pensacola—War Heads and Detonator Storehouses—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bid June 25, building at Naval Air Sta., here, from C. H. Turner Co., 30 East Garden St., $5492, (80 days). Noted June 19.

★O., Cincinnati — Boilers — Treas. Dept., Wash., D. C., let contract installing 2 boilers in Post Office and Custom House, here, to Heine Safety Boiler Co., 1432 Union Trust Bldg., $20,430. Noted June 19.

★O., Cincinnati—Lock and Abutment—U. S. Engr. Office, Cincinnati, let contract building lock, abutment and esplanade for Dam 32, Ohio River, to Dravo Contg. Co., Diamond Bank Bldg., Pittsburgh, Pa., $1,099,379. Noted Apr. 10.

Ill., Great Lakes — Drainage — Bureau Yards & Docks., Navy Dept., Wash., D. C., received bids draining at Naval Training Sta., Camp Paul Jones, (1) work complete, from

H. D. Hallett, 132 Donner Pl., Aurora, (1) $13,378, (30 days); (2) $0.45 to $1.22; (3) $0.25; (4) $50; (5) $5; (6) $25; (7) $1.20.

J. A. Sackley, 133 West Washington St., Chicago (1) $18,658; (2) $0.82 to $2.98; (3) $0.41 to $2.98; (3) $0.41; (4) $116.84; (5) $10; (6) $41; (7) $3.05.

C. E. Carson, 155 North Clark St., Chicago, (1) $38,348, (30 days).

Amer. Sewer & Drain Constr. Co., 2816 Washtenaw Ave., Chicago, Ill., (1) $21,879, (30 days); (2) $1.50 to $3.50; (3) $0.50.

Ill., Great Lakes—Road Work—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, improving roads at Naval Training Sta., here, (1) work complete, from

Contg. & Material Co., 3219 Michigan Ave., Chicago, (1) $32,460, (50 days); (2) $2.30; (3) $1; (4) $2.50; (5) $2.50; (6) $0.60 and $1; (7) $20; (8) $0.60 and $1 (9) $20.

J. A. Sackley, 123 West Washington St., Chicago, (1) $35,000, (50 days); (2) $2.92; (3) $1.25; (4) $2.25; (5) $3; (6) $0.90 and $1.30; (7) $45; (8) $0.90 and $1.30; (9) $45.

C. E. Carson Co., 155 North Clark St., Chicago, (1) $58,000, (50 days). Noted June 19.

Mich., Houghton — Post Office —Treas. Dept., Wash., D. C., received bids June 27, building post office, here, (a) limestone, (b) sandstone, from Northern Constr. Co., Colby Abbott Bldg., Milwaukee, Wis., (a) $76,989, (b) $77,889; W. D. Lovell, 1415 8th St., S. E., Minneapolis, Minn., (a) $81,000; A. W. Lane, 19 South La Salle St., Chicago, Ill., (a) $90,456. Noted May 29.

★Wyo., Laramie — Road Work — Dist. Engr., U. S. Forest Serv., Denver, Colo., let contract grading 7 mi. Woods Creek Project in Medicine Bow Natl. Forest, 16 ft. wide, involving 15,200 cu.yd. earth and 10,300 cu.yd. rock excav., to C. Baker, Cowdrey, Colo., $24,833.

PIER—PHILADELPHIA, PA.

Bids were received by Department of Wharves, Docks & Ferries, June 23, for constructing, with appurtenant work, Penn Treaty Recreation Pier No. 5, North Delaware River, from (A) Simpson & Brown, 90 West St., New York City; (B) Snare & Triest Co., Pennsylvania Bldg.; (C) Armstrong & Latta Co., Land Title Bldg.; (D) J. H. Terry & Co., 969 Drexel Bldg., $92,825; (E) Latta & Roberts, 767 Drexel Bldg., $91,874; (F) Arthur McMullen Co., 1309 Finance Bldg., $95,270; (G) McLean Contg. Co., 1415 Fidelity Bldg., Baltimore, $135,245. The unit bids of the lowest 3 bidders were as follows:

	A	B	C
Entire work (lump sum)	$52,105 00	$59,900 00	$63,677 00
Removal of timber boat landing	100 00	500 00	300 00
10,000 cu.yd. dock dredging	41	.40	37½
3,500 tons gravel or cobble filling	1 38	1.20	1.40
500 hours mechanics with tools	1 10	1 00	1.49
500 hours laborers with tools	75	.60	1.00
Unit prices for bulkhead and park work			
1,000 cu.yd. excavation	2 83	3.30	3.00
40 piles, removal of piles	4 20	12.00	10 00
54 piles, vertical or bearing piles	28 80	25.00	24.00
20 shoes, pile shoes	2.58	2.00	3 00
27,000 ft b.m. new sawed timber	133 00	150 00	156 00
3,500 lin.ft. tie and drag logs	52	34	.46
1 concrete inlet	48 00	80 00	100 00
750 cu.yd. filling	90	1 00	.25
800 sq.ft. bulkhead walkway	.70	50	95
3,200 sq.ft. park footwalks	.45	.30	.60
100 lin.ft. granolithic coping	.90	60	1.00
150 lin.ft. steel corner bar	.24	.30	.25
4 cast steel cleats	60 00	30 00	50.00
Extended totals	$75,165	$82,225	$87,755
Unit prices for additional work			
Vertical or bearing piles	$34.50	$25 00	$30.00
Inclined or spur piles	41.75	28 00	40.00
Pile shoes	3.10	2.00	3.00
New sawed timber (substr.)	159.50	130.00	150.00
New sawed timber (superstr.)	165.50	110.00	160.00
Bolts, nuts, washers, spikes, etc	09	06	.10
No. 1 concrete	29.00	25.00	32.00
No. 2 concrete	24.00	15 00	20.00
Reinforcing steel	.06	.05	.10
Hard cement finish	.15	.10	.25

ROAD WORK—SALT LAKE CITY, UTAH

Bids were received by Commissioners of Salt Lake County (lowest 5), for constructing Bingham Highway from State St. to Redwood Rd. and from Redwood Rd. to Welby, from (A) Clifton, Applegate & Toole, Billings, Mont.; (B) Strange & McGuire Paving Co., Utah Savings & Trust Bldg.; (C) Heuser-Packard Co., Atlas Bldg.; (D) J. W. Mellen, Auditorium Bldg.; (E) Owen H. Gray Co., Dooley Bldg. The unit bids were as follows:

	A	B	C	D	E
8,526 cu.yd. excavation as per plans without classification	$1 10	$1 15	$1 20	$1 22	$1 30
64,800 sq.yd. bituminous concrete pavement 2 in. thick surface	54	65	75	.80	.
3,168 cu.yd. gravel fill measured in wagons delivered on work, including spreading and rolling	1 20	1 50	1 50	1 30	1 30
64,800 sq.yd. crushed stone 4-in. thick after compression	30	29	30	36	
64,800 sq.yd. concrete pavement as per plans 6 in. to 8 in. thick. Materials to be furnished by county	1 07		1 10	1.00	1.02
64,800 sq.yd. steel mesh reinforcement in place to be furnished by county	02		.03	.025	.025
28,078 lb. in structures, twisted plain or deformed steel bars, bending and placing, to be furnished by county	015	.03	015	.015	.015
79,866 lb. in paving, twisted plain or deformed steel bars, bending and placing, to be furnished by county	015	03	015	.015	.015
14,580 lin.ft. elastic or Sarco expansion joint filler in place. To be furnished by county	02		015	.02	.02
10,800 cu.yd. crushed rock measured in wagons delivered on work, including spreading and rolling	1 80	1 75	1 50	2.15	....
64,800 sq.yd. concrete base as per plans 4-in. to 6-in. thick. Materials to be furnished by county	70	65	80	.77	. . .
192.16 cu.yd. concrete in structures, materials furnished by county, price to include bending and placing reinforcing, class "A"	15 00	21 00	18 00	25.00	16 00
164.38 cu.yd. concrete in structures, materials furnished by county, price to include bending and placing reinforcing, class "B"	14 00	21 00	18 00	22 00	16 00
87.26 cu.yd. excavation for concrete structures above water line	1 25	1 75	1 40	1 25	1.25
109.26 cu.yd. excavation for concrete structure below water line	5 00	6 50	4 00	3 25	10 00
50 lin.ft. 18 in. vitrified pipe. Pipe to be furnished by county	50	.60	1 00	.55	.50
50 lin.ft. 18-in. reinforced concrete pipe. Material to be furnished by county	60	.70	1 00	60	.50
50 lin.ft. 18-in. galvanized corrugated iron pipe to be furnished by county	40	40	1 00	35	.35
9,410 tons mixed black base or bituminous concrete foundation	3 25	4.90	5 00	5.25	...
900 cu.yd. extra excavation	1 10	1 10	1.50	1.40	1.00
5,132.9 cu.yd. road haul	80	75	1 00	.90	.85
1,300 lin.ft. lineal feet of "penetration of timber piles" untreated	1 25	1 70	1 00	1.25	1 75
Extended totals bituminous surface on concrete base	$205,157	$214,540	$231,281	$234,067	.
Extended totals bituminous surface on crushed rock base	160,135	172,369	179,132	188,333	..
Extended totals bituminous pavement surface on black base	177,933	207,959	215,044	222,557	
Extended totals plain concrete pavement	189,466	.....	195,552	189,865	$190,293
Extended totals reinforced concrete pavement	205,707	.... ..	212,506	206,463	206,890

Federal Government Work (Continued)

★**Mont., Kalispell**—Road Work—Bureau Pub. Rds., Missoula, let contract building 30 mi. North Fork National Forest Rd., Flathead Co., here, to Carlson, Norman & Co., Spokane, Wash., $126,000. Noted May 29.

Cal., San Diego—Distributing System—Bureau Yards & Docks, Navy Dept., Wash., D. C., received only bid June 25, building underground electric distributing and street lighting system at Naval Air Sta., here, from Carroll Electric Co., 714 12th St., N. W., Wash., D. C., $56,900. Noted June 5.

Cal., Tiburon — Engine House — Navy Yard, Mare Island, received bids June 18, building engine house, here, (1) work complete, from Gutleben Bros., New Call Bldg., (1) $17,691, (97 days), (2) $10,801, (35 days), (3) $3531, (35 days); K. E. Parker Co., North 519 California St., (1) $18,187, (100 days), (2) $7770, (100 days), (3) $4100; (100 days); Lindgren Co., Monadnock Bldg., (1) $20,593, (150 days), (2) $7969, (150 days), (3) $8422, (150 days). All contractors of San Francisco.

Miscellaneous

PROPOSED WORK

Transmission Line—Lowville, N. Y.—Northern New York Utilities, Inc., Light and Power Bldg., Watertown, having surveys made for high tension steel tower transmission line from power house at Belfort to here, a distance of 20 mi. Address H. G. Davis, ch. engr.

Bakery Ovens—Tarentum, Pa.—H. Reitner soon lets contract building 2 bakery ovens, brick. About $15,000. McCormick Co., Century Bldg., Pittsburgh, archts.

Athletic Field—Lexington, Va.—Virginia Military Institute Alumni Assn. plans to build athletic field, including rein.-con. grand stand, on ground east of barracks. About $50,000. M. B. Coarse, secy. and treas.

Park Amusements—Columbia, S. C.—Victory Amusement Park, Inc., plans to build swimming pool, scenic railway, and similar devices at Victory Park, formerly (Hyott Park). About $30,000. B. H. Berkman, pres. Engineer not selected.

Lighting Fixtures—Orangeburg, S. C.—City plans election to vote on $30,000 bonds to provide and install 1.5 mi. ornamental lighting fixtures. J. H. Hawes, Orangeburg, engr.

Car Barn—Massillon, O.—Northern Ohio Traction & Light Co., Hamilton Bldg., Akron, preparing plans for 1 story, 40 x 100 ft., brick car barn, steel roof trusses, here.

Sea Wall—Rockwood, Mich.—Port Mouille Shooting Club, Rockaway, soon lets contract building 750 ft. rein.-con. sea wall supported on wooden piles, at lake shore. About $20,000. W. H. Adams, Vinton Bldg., Detroit, engr.

Breakwater—Racine, Wis. — Bd. Pub. Wks. soon receives bids building rubble mound breakwater, involving 2500 ft. lakeshore protection. About $225,000. P. H. Connolly, city engr.

Steam Road Roller—Sheboygan, Wis.—City receives bids about July 1, delivering steam road roller, 15-20 ton capacity, f.o.b. Sheboygan. About $30,000. C. U. Boley, city engr.

Bankers, etc.,—Madison, Minn.—School Bd. soon lets contract building new coal bunkers, 1000 bbl. cistern, new steam boilers and air washer for high school. H. A. Sullwood, 639 Endicott Bldg., St. Paul, engr.

Foundation—Denver, Colo.—State soon receives bids building foundation for 5 story, 112 x 114 ft. office building to cost $500,000. W. N. Bowman, Central Savings Bank Bldg., archt.

Transmission Line — Sacatone, Ariz.—State plans to build 11,000 volt transmission line from here to State Penitentiary at Florence, 25 mi. About $50,000. T. Maddock, Phoenix, state engr.

Dike—Woodland, Wash.—Bd. Supervs. Diking Impvt. Dist. No. 5 rejected only bid received June 10, building dike near here, involving 213,235 cu.yd. excav. Cost about $0.25 per cu.yd. Work will be readvertised. G. J. Poysky, Kelso State Bank Bldg., Kelso., engr. Noted June 5 under "Excavation and Dredging.

Pipe—Portland, Ore.—P. McIntosh, asst. purch. agt., City Hall, soon lets contract furnishing 40,000 lbs. 2 in. galvanized pipe for Bur. Waterworks.

Tanks—Portland, Ore.—Pub. Docks Comn., foot Stark St., soon lets contract furnishing, delivering, fabricating and erecting 6 steel tanks, 1000-5000 bbl. capacity. About $48,000. G. B. Hegardt, c/o Dock Comn., engr. Noted June 12.

Dock—St. Helens, Ore.—See "Railways."

Wharf — Sacramento, Cal. — City having plans prepared for rein.-con. wharf at foot of Y St. About $21,000. F. C. Miller, city engr.

Pier—San Diego, Cal.—City plans to build pier and warehouse. F. A. Rhodes, city engr.

Fire Alarm System—South San Francisco, Cal.—City voted $10,000 bonds for fire alarm system.

Park and Electroliers—Tracy, Cal.—City election soon to vote on $10,000 bonds for park and $10,000 bonds for electroliers.

Train Shed—Halifax, N. S.—C. B. Brown, engr., Moncton, soon lets contract building ocean terminals at new South Station for Canadian Natl. Rys., Montreal, Que. About $75,000.

Freight Shed—Rothesay, N. B.—C. R. Brown, engr., Moncton, soon lets contract building 40 x 150 ft., concrete, steel and brick, concrete foundation, at railway terminals, here, for Canadian Natl. Rys., Ottawa, Ont. About $100,000.

Hydro-Electric System—Teeswater, Ont.—Town Council having plans prepared installing hydro-electric system for lighting and power distribution. A. Flint, 190 University Ave., engr. Address J. A. Constantine, Teeswater.

Hydro-Electric System—Wingham, Ont.—City Council plans to install hydro-electric system for lighting and power distribution. A. Flint, 190 University Ave., Toronto, engr. Address J. F. Groves, Wingham.

BIDS DESIRED

Fishway—Lawrence, Mass.—Until July 14, by Comrs. Fisheries and Game, building rein.-con. fishway. W. C. Adams, chn.; advertised in this issue.

Cast Iron Pipe—Providence, R. I.—Until July 7, by Bd. Contr. & Supply, furnishing 91 ton c.i. water pipe.

Water Gate Boxes, Covers, etc.—Jersey City, N. J.—Until July 8, by city, furnishing 20 tons water gate boxes and covers, and sewer manhole frames and covers.

Repressed Vitrified Paving Blocks—Ebensburg, Pa.—See "Streets and Roads."

Revetment—Toledo, O.—Until July 7, by C. A. Benedict, dir. pub. welfare, building timber revetment, involving two hundred and two 24 in. oak piles, 24 ft. long, 89,316 ft. B. M. 3 in. oak piles, 13,332 ft. B. M. 6 x 8 in. pine walling, 10,500 lb. iron bars, bolts and nuts and 28,800 cu.yd. hydraulic dredgwork, etc. About $125,000. P. Wright, 311 Valentine Bldg., engr.

Wharf—Berthier, Que.—Until July 24, by Dept. Pub. Wks., Ottawa, Ont., building and repairing wharf here. R. C. Desrochers, secy.

Wharf — Connaught Sta., Ont. — Until July 15, by R. C. Desrochers, secy. dept. pub. wks., Ottawa, building timber pilework wharf, here.

Copper Cable, etc.—Winnipeg, Man.—Until July 12, by Dept. Pub. Wks., furnishing copper cable and steel transmission towers for transmission line between here and Portage La Prairie, 30 mi. long. G. A. Greirson, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Coal Pocket—Bridgeport, Conn.**—S. & S. Coal Co., Housatonic Ave., let contract building 49 x 110 ft. timber coal pocket, to D. Schine & Son, 729 Union Ave. About $10,000. Noted Apr. 10 under "H. Schurr."

★**Cast Iron Pipe—Brooklyn, N. Y.**—N. J. Hayes, comr. water supply, gas and electricity, Municipal Bldg., New York City, let contract furnishing, delivering, unloading, stacking and storing c.i. pipe, to J. Fox & Co., 253 Bway., New York City. About $15,300. Noted June 19.

★**Bulkhead—Newark, N. J.**—City let contract building bulkhead on Passaic River, to Linde & Griffith, foot 4th St., $16,500. Noted June 26 under "Hackensack."

★**Pier — Phila., Pa.** — Dept. Wharves, Docks and Ferries, Bourse Bldg., let contract building appurtenant work, Penn Treaty Recreation Pier, No. 57, North Delaware River, to Simpson & Brown, 90 West St., New York City, $75,165. Noted June 26.

★**Bakery Ovens—Lorain, O.**—Essig Baking Co. let contract building 2 rein.-con., steel and brick ovens, rein.-con. flooring and concrete foundation, to M. T. Nuhn, Lorain. About $30,000. Noted June 5.

★**Castings, Pipe, etc.—Detroit, Mich.**—Dept. Purchases & Supplies, Municipal Courts Bldg., let contracts, to U. S. Cast Iron Pipe & Foundry Co., East Burlington, N. J., furnishing 500 tons castings as follows: 12 ft. lengths, plain c.i. pipe, $53.50 per ton; 12 ft. lengths with lugs, $58.50; 8, 12, 16 and 20 in., c.i. pipe, with bell and spigot ends, from 9 ft. and less than 12 ft., $73.50; 8, 12, 16 and 20 ft., c.i. pipe, less than 9 ft. long, without lugs, $93.50; 8, 12, 16 and 20 in. special castings, with spigot or flange ends, with or without lugs, $148.50; 4 in. Class "A" drain pipe with bell and spigot ends in 12 ft. lengths, $55.50; 4 in. Class "A" special castings, Y's, T's, crosses and taps with bell and spigot ends, $130.50, all f.o.b. cars Detroit; Flower Valve Mfg. Co., Clayton and Parkinson Aves., 58 gate valves as follows: 8 in., $112 each; 12 in., $255; 16 in., $385; 20 in., $670; A. P. Smith Mfg. Co., East Orange, N. J., furnishing high pressure fire hydrants as required by fire dept. for year, $175 each; Michigan Steel Castings Co., 248 Goin St., rough steel castings such as elbows, T's and crosses as required by fire dept., $0.15 per lb. Noted June 19.

Conduit—Detroit, Mich.—Pub. Lighting Comn. received bids building conduit in John R. and Chene Sts., Cass, Grand River, Kercheval and Junction Aves., involving 5½ mi. 1 and 4 duct conduit, 175 manholes, 170 handholes and 350 lamp pole foundations, from Contg. & Material Co., South La Salle St., Chicago, $213,583; F. Porath, 305 Free Press Bldg., $217,729; J. A. Mercier, 216 Hammond Bldg., $308,853. Noted June 19.

★**Miscellaneous Supplies—Detroit, Mich.**—Dept. Purchases & Supplies, Municipal Courts Bldg., let contract, to Owen & Graham Co., 2845 East Grand Blvd., furnishing model 101 "GMC" truck with horizontal hydraulic hoist and equipment, $5305; to Flower Valve Mfg. Co., 107 Parkinson St., 400 double nozzle fire hydrants at $98.50 each total $39,400, four hundred 6 in. gate valves, $27.30 each, total $10,920, c.i. T's sleeves and bends, $0.064 per lb.; to Fibre Conduit Co., Orangeburg, 15,000 ft. 4 in. fibre conduit, 5 ft. lengths, ¼ in. wall, 5000 ft. 3 in. fiber conduit, ends prepared for tapered sleeve, four hundred 3 in. bends, 90 degrees, one hundred 3 in. 45 degree bends and 100 tapered sleeves for 45 degree bends, $1834.

★**Dock—Wyandotte, Mich.**—City let contract building 36 x 100 ft. rein.-con. dock with retaining walls on wood piling, filled with earth and cinder fill with concrete top, old piles to be capped under water, to A. J. Dupuis & Co., 1022 Ford Bldg., Detroit, $16,000. Noted June 12.

★**Hollow Tile and Brick—St. Paul, Minn.**—H. W. Austin, city purch. agt., City Hall, let contract furnishing face and backing tile in various quantities for requirements this year, to Twin City Brick Co., Capital Bank Bldg., $13.20 to $70.00 per M; 21,500 rough face brick, to Corning-Donohue Brick Co., 613 Ryan Bldg., $31 per M. Noted June 19.

★**Water Meters—St. Paul, Minn.**—H. W. Austin, purch. agt., City Hall, let contract furnishing 300 5½ in. disc type water meters as required by Bureau of Water for 1919, to Badger Meter Co., South Boston, Mass., $9.87 each. Noted June 12.

★**Clearing — Woodland, Wash.** — Bd. Supervs. Diking Impvt. Dist. No. 5, let contract clearing 160 acres of right of way for dikes, canals and drainage ditches, to Pacific Bridge Co., Salmon St., Portland, Ore., at $135 per acre. Total cost, $21,600.

★**Cement — McMinnville, Ore.** — State Highway Comn., Portland, let contract furnishing 23,000 bbls. cement, to H. Cowell Lime & Cement Co., Ry. Exch. Bldg., Portland, $2.69 per bbl., total cost, $61,870.

★**Pipe—Anaheim, Cal.**—City let contract to Pacific Pipe & Supply Co., 1002 Santa Fe Ave., Los Angeles, furnishing 1350 ft. 12-in. c.i. pipe, at $66.80 per ton, 300 ft. 4-in. c.i. pipe, $71.80 per ton, specials and fittings, $123 f.o.b. Anaheim; to Krogh Pump & Mchy. Co., 206 North Los Angeles St., Los Angeles, furnishing pump, $2410. Bids for motors rejected. Noted May 15.

★**Pipe—Santa Monica, Cal.**—City let contract, to Pacific Pipe & Supply Co., 1002 Santa Fe Ave., furnishing 7350 ft. Class "B," c. i. bell and spigot pipe, 16 ft. lengths, $11,287, fittings, $373; Amer. Cast Iron Pipe Co., Citizens Natl. Bank Bldg., 6000 lb. pig lead, $354, 200 lb. oakum, $18; Allis-Chalmers Mfg. Co., Title Insurance Bldg., booster pump, $895; contractors all of Los Angeles. Noted June 26.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—James H. McGraw, President

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, Editor — Charles Whiting Baker, Consulting Editor

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Making Gravel Concrete Fire-Resistant

FOR years there was long argument as to the relative strength of gravel and broken stone concrete. Many figures were advanced on both sides, but in time it became well established that no superior strength could be claimed for either aggregate. As much cannot be said for the fire-resisting qualities of concrete made from the two materials. The tests of the Bureau of Standards, reported by Mr. Hull at the American Concrete Institute meeting and abstracted on other pages of this issue, are confirmed by several conflagration experiences on both sides of the Atlantic. Gravel, particularly siliceous gravel, tends to pop under extreme heat, and concrete made of it may be expected to disintegrate at conflagration temperatures. There are places, however, where gravel is about the only aggregate possible. For such localities the Bureau of Standards has been making studies of plaster coatings; in other words, gravel-concrete columns are being fireproofed. So far the results have not been conclusive, but indications are that the necessary additional protection can be achieved by slight increase in cost. Favorable results may be had in the use of some kind of a plaster or mortar form in which the column can be poured and which remains in place as the fire protection for the column itself. The economic results of such a detail, as well as the fire-resisting qualities of the column so protected, will be looked for in the reports of next year's tests.

Wanted—Better Distribution of Food Products

BETTER distribution of farm and other produce is believed by many to offer the only solution of the problem of the high cost of living. It has been suggested that the use of the motor truck, with one terminal at the farm and a coöperative merchandising medium in the city, would not only give the farmer more for his products, but also make a large reduction in the cost of that produce to the consumer through the elimination of middlemen's profits. While well established city market terminals, where the farmer may rent space for selling purposes, may not entirely meet the requirements of a proper merchandising medium directly from producer to consumer, they would help toward solving the problem. Now that the motor truck has proved its utility for such work, why not establish motor terminals in many sections of the large cities, as suggested on p. 38 of our issue of July 3, 1919. This would eliminate some of the freight-terminal charges, and cartage from terminals to salesrooms and thence to consumers. There can be no doubt that several well equipped terminals with sales sections, cold storage facilities, etc., would materially lessen the cost of foodstuffs in our metropolitan centers. The cost of handling has been demonstrated in many instances to be twice or three times the total price received by the farmer.

Typhoid and Suicide Deaths

BY COINCIDENCE the death rates from typhoid fever and from suicide in the registration area of the United States were each 13.4 per 100,000 in 1917. Low as is this figure compared with the earlier typhoid rates, it is still so much higher than it would be if well known personal and public measures were generally adopted, that the rate may be said to partake of both suicide and murder—the latter through contributory community negligence. This view is strengthened when it is remembered that many cities and towns easily maintain a typhoid rate that is far below this average and is constantly falling, so the average means a much higher rate for many places. Every city that has not attained a typhoid rate of 5 per 100,000 should aim to reduce its rate to that figure, and those which have reached that goal should place the mark at 3 or 2 or 1, according to their standing.

More Authority for Engineers

A SORE spot in the relations of engineers to the public is touched upon in the letters by F. A. Churchill and "A Practical Engineer" published in our issue of July 3, 1919, pp. 37 and 38. The practice of delegating engineering authority to persons without engineering knowledge is too common in public work in this country. As regards paving work, it is a matter of common knowledge among material men and others who deal constantly with public works officials that often the engineer stands in the anteroom while inside a board consisting of grocers, blacksmiths and shoemakers confers, hears various arguments and selects the type of pavement, without recourse to engineering advice. In a great many cases, this is carried still further, particularly in municipal work, and the council, willing to dodge responsibility for a selection, allows the decisions to be made by local preferences through petitions of the abutting property owners or otherwise. Moreover, this practice is often fixed by state and municipal laws. While elected city officials are seldom qualified to make such selection, the general public is much less qualified, and the futility of such petitioning has often been demonstrated. It is not uncommon for one material interest to father a petition to property owners abutting on a street and get as much as 90% of the frontage, and then, during the succeeding week, another material interest steps in and obtains signatures for its material from 75 to 80% of the same frontage. This only demonstrates the fact that a loquacious material man can twist the property owner around his fingers. Under such conditions, it is manifest that the abutting property owner does not know what he wants. Common sense would indicate that one who does know—the qualified engineer—should be clothed with final authority on all engineering problems.

Overhead Exceeds Cost Plus 10 Per Cent

WHY contractors are averse to doing extra work under a contract which limits their compensation for this work to the net cost of labor and materials plus 10%, is indicated by the overhead cost figures given by A. P. Roscoe on p. 89 of this issue and p. 1164, June 12, 1919.

These costs, as cited, all relate to elevated-railway construction in New York City and were doubtless increased somewhat by delays due to war conditions and to other causes. They, however, indicate clearly enough that the contractor who does extra work for 10 or even 15% more than the net cost of labor and materials is fortunate if he must not dip into his pocket to meet some portion of its cost to him. This should not be.

Ignorance of the magnitude of overhead expenses and uncertainty in the practice of recording them are the reasons for the low percentages over the direct cost which most specifications allow the contractor for extra work. Unfortunately, contractors themselves are often not as certain about their overhead costs as they well might be. More often they take every means possible to conceal these costs. Yet it is plain that if the engineer is to be convinced that he is underestimating overhead, the contractor must be certain of his figures and must write them down plainly for the engineer to read, as has been done in the articles to which reference has been made.

Voting Membership Qualification in Local Engineering Societies

IN THE statement of Dr. Charles Warren Hunt (found in part elsewhere in this issue) which is being sent out by the American Society of Civil Engineers with the report of the development committee, there is expressed an idea that should have very careful consideration. He proposes that the *voting membership* of local and sectional societies be limited to those who hold membership in any grade in any national society of engineers.

The fundamental character of the suggestion lies in the fact that it is a method for securing the adoption by all engineering societies of the standards adopted by the nationals.

There can be no doubt regarding the desirability of the general adoption of the very highest standards by all engineering societies. Moreover, standards of membership are attained not by the writing of constitutions and by-laws, but by their administration, by the strictness with which the electing boards interpret the meaning of the written word. The loose interpretation and the variation of interpretation to be expected in different communities would be avoided by the method proposed by Dr. Hunt.

At the same time his plan might bring measurably nearer the making of a definition of what constitutes an engineer. If all locals demanded for voting privileges that a man be a member of a national society it would be obvious that there would be general acceptance in the profession of the statement than an engineer is one who is a member of a national engineering society or who has the qualifications for membership.

As put by Dr. Hunt, the suggestion obviously involves a compromise—and one that may be necessary in order that the idea may get wide acceptance or even discussion. We do not concede that juniors and associates in the national societies are engineers, nor is it likely that we could permanently stand back of a proposal that would endow juniors and associates with such standing. Standards, however, are progressive. For the time being it might be desirable to let all be voting members of the locals who held national membership in *any grade*, but were the idea accepted it would seem inevitable that there be a later step by which voting membership in the nationals would be necessary for voting membership in the locals.

It is obvious that there would be another advantage in the plan—the closer tying together of the whole profession.

Of course the suggestion will meet with opposition. It runs exactly counter, for example, to the proposal that one of the requisites for membership in a national society be membership in a local. Nevertheless, both suggestions are made with the same end in view—the strengthening of the local. The one, however, lays great stress on the quality feature—a thought, now that war is over, which is again getting greater attention.

The Motor Truck and the Railway

EVERY engineer interested in transportation questions—and what engineer is not?—will be repaid by a study of the special report in this issue on the relations of the railway and the highway as means for economic transportation. As the report shows, this question is not one capable of a single answer. The problem should be studied and solved by engineers for each individual locality. The report presents a solution for a typical case and gives the information and general principles which should enable a competent engineer to determine which transportation system will be most economical for a specific location.

In considering the rival claims of the railway and the highway as means of solving the transportation problem it is always well to recall that terse and significant definition of an engineer given by E. H. McHenry many years ago: "An engineer is a man who makes a dollar earn the most interest." That definition originated in railway location, where it was customary, in work under Mr. McHenry's direction, to compute the saving in operating expenses that would result from a given reduction in the grades of a railway line. The same principle should be applied in studying the question, what sort of a transportation line in a given location will render the service desired at the lowest cost. If engineers competent to make such studies are given the necessary authority, they can effect an enormous saving in expenditures for the further development of transportation.

There is now more reason than ever before why, in the public interest, the rule that transportation development should be undertaken only on the basis of careful engineering studies should be established. The cost of a large part of this transportation development seems likely to be met hereafter from the public treasury. Where such work is done by private enterprise somebody must show that the work will pay before capital can be secured; and in order that a work shall pay, it must be of public benefit somewhere in proportion to its cost. But when work is to be paid for by public funds this safeguard is taken away. In very few cases is any computation undertaken to determine

whether the work will be worth while. The engineer is not called in until after a decision to build has been made. His ability to render the largest public service, by finding how the public's dollar may earn the most interest, is rarely utilized. There is a large field for educational work here in order that the potent force of public opinion may demand and secure the best engineering services available to guide all expenditures of public funds for transportation service.

The investigation noted in the opening paragraph demonstrates that the extension of our railway network is greatly needed, notwithstanding the coming of the motor truck. Although the field of the motor truck is enormous, its chief function is to supplement the railway service rather than directly compete with it (see *Engineering News-Record*, Jan. 16, 1919, p. 120). The development of both railway and truck service, moreover, needs to be studied from new angles. For instance, the value of the service rendered by the branch railways carrying light traffic has never been fully appreciated. It might well be given careful study.

Other points suggested by our survey of the rival claims of the motor truck and the railway might be discussed here but so many of them are considered at length in the article already mentioned that in conclusion only one further remark will be made. It is that the motor truck service needs a better business organization, more complete knowledge of costs, and public regulation sufficient at least to prevent ruinous competition and the rapid destruction of roads provided at public expense.

Bridge Specifications and Stress Reversal

STUDY of the best current bridge-design specifications, such as those summarized in a comparative table in our issue of July 3, p. 33, reveals a distinct element of doctrine founded on the convictions of former days rather than on what is today regarded as established fact. This is prominently exemplified by the clauses governing the dimensions of members subjected to stress reversal. The rules require that such members be made much heavier than would suffice for any stress they will be called upon to carry; curious as it may seem, they must be proportioned to bear safely not only the full stress which comes upon them at any particular moment, but in addition a large part of the stress which existed several seconds (or minutes) previously. In effect, it would seem, the rules make an allowance for time-lag of stress.

It is probable that these reversal clauses originated, years ago, in a desire to secure protection against "crystallization" of metal, or fatigue effect—that is, against the supposed greater susceptibility of the material to failure under repeated or alternated stresses. The crystallization hypothesis has been so thoroughly discredited that it may be said to have been out of existence for a score of years at least. Fatigue ideas have recently been revived, it is true, but in the guise of a laboratory fiction, and their application, if any, is to machinery whose parts are expected to outlast many hundreds of millions of stress repetitions, and not at all to bridges. Yet the stress-reversal clauses have held their place in bridge specifications throughout the changes of scientific thought; specifications of fifteen years ago contain them, as do those of today.

The mechanical and structural mind probably has an inherent tendency to believe in a lag of stress-strain actions. Every practical experience teaches something of slow recovery from deformation, suggesting the existence of a slight amount of viscosity, or perhaps plasticity, in our constructional materials. And it is natural to believe that such delay in recovery from strain calls for some allowance in the way of more ample proportioning. It is far from certain, however, that such ideas have application to the low stresses and gradual reversals that are found in bridge members.

Unfortunately, another circumstance affects the life of the bridge members which are subject to stress reversal, and for this reason it is difficult to estimate how much influence the lag idea exerts. The members in question, it happens, are precisely the ones on which increase of live load has most serious influence. Because of the continuous increase of train weights in the course of railway development, the whole history of bridge construction constitutes a record of bridges made obsolete by growth of traffic loading. When the moving loads become heavier, the web members are affected in a degree out of all proportion to the load increase, since one of the stresses which they must withstand is the difference between a dead-load and a live-load effect. Therefore it has been true that any rule of design which made reversed-stress members heavier than simple principles of proportioning would require operated to lengthen the probable life of the bridge. This well understood fact doubtless was an influence, and may have been the chief influence, in the perpetuation of the reversed-stress clauses.

Independent provision for increase of live load is made in some of the best specifications, and the wisdom of such provision is obvious enough to require no comment. Once this point is taken care of adequately, the matter of stress-reversal stands on its own merits, and the retention of reversal clauses alongside those providing for live-load increase is therefore significant. Since no test evidence showing deterioration of bridge members under repetition or alternation of stress has been brought forward, it must be concluded that these clauses have survived because of a decided belief on the part of bridge engineers in the harmful nature of stress lag, or hysteresis, or fatigue, which ever name is preferred.

Specifications are not so phrased that the reasons underlying their several provisions are directly evident. This makes more difficult the problem of reaching the desired clearness and definiteness in the matter under discussion, since it involves separate action on such matters of importance as impact, the possibility of future live-load increase, and the deterioration of material under repetition of stress. Years ago these widely different matters were lumped into a single allowance. Great progress has already been made in providing separately for impact and for live-load increase; it remains to complete the work by independent and adequately reasoned consideration of "fatigue."

In the present state of structural knowledge, it is hardly open to doubt that separate effects bearing on strength and safety should be separately and explicitly provided for. Where one purpose is masked by another, or where overlapping effects (to coin a term) are dealt with in blanket fashion, the resulting lack of clearness may reduce the efficiency of design, and may even reduce safety.

The Relative Economy of Freight Transport by Railway and by Motor Truck

By Charles Whiting Baker
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THE greatest opportunity for raising the efficiency of the country's transportation lines lies at the terminals.

Hauling goods to and from railway stations and on light-traffic railways now costs ten to a hundred times as much per ton-mile as movement over trunk-line railways.

The motor truck finds its greatest advantage at the city ends of the railway network, because it can carry goods from origin to destination, eliminating rehandling and heavy railway terminal costs.

At the country ends of the railway network, there are locations where competition between the railway and the motor truck becomes possible, and the cost of each is here investigated, including in each case the cost of the roadway used.

For hauling between terminals, where the volume of traffic is sufficient, the railway can handle freight at a small fraction of its cost by motor truck. Thus, the motor truck has not made the light-traffic railway obsolete, as is often supposed. On the contrary, such lines should be improved and greatly extended. The motor truck in country districts has still a large field where its ability to climb steep grades, to use the public highway instead of a private right-of-way, to cut out rehandling at terminals, to collect local business, and to collect, haul and distribute loaded trailer wagons, places it in a different class from the railway as a tool of transportation.

Better business organization and more economical methods of operation are needed for both the light-traffic railway and the motor-truck line. The services of engineers should be utilized to determine the most economical system for a given location and the most efficient methods for its operation.

I. The Light-Traffic Problem: Its Important Relation to the Public Welfare

"UPON the efficiency of the transportation machine in America depends in great measure the future prosperity of the nation." Thus wrote Director-General McAdoo in a letter to Congressman Sims just before resigning his office. Every economist and engineer, at least, will appreciate the truth of this statement.

It is not yet a century since the railway era began. The economic and social changes of that century which have resulted from the railway, and would have been impossible without it, are far greater than those which occurred in all previous time since the dawn of history. The railway has become an economic necessity.

But "the transportation machine," referred to by Mr. McAdoo, means not alone the railway but the whole chain of transportation from the original producer to the final consumer. The cost of transportation is a tax which must be added to the price the consumer pays for every product, or deducted from what the producer receives. This tax is laid on every individual. It enters into every business transaction. It influences the wages that can be paid to workmen. Upon the size of this tax depends the opening of new markets, the establishment of new industries, the outreach to new sources of food and raw materials.

And now for the important and little comprehended fact with regard to this transportation tax. *The great opportunity for its further reduction lies at the terminals.* The statement that the railway has annihilated distance is not a mere figure of speech. It costs today as much to haul a ton of farm produce ten miles to a railway station as it does to haul it a thousand miles over a heavy-traffic trunk-line railway. It often costs more today to transport a ton of merchandise from its arrival in a long train in the freight yard on the outskirts of a great city to its deposit in the warehouse of a merchant four or five miles away, than it has cost to haul it over a thousand miles of railway line.

These statements may seem incredible to many, and it is well to support them by actual figures. Taking in each case the cost of hauling alone and omitting the charge for use of the road over which the haulage is done, the cost of hauling farm produce over country highways was not less than 25c. per ton-mile under normal price conditions before the war, and it has risen since. The cost of hauling freight over the road on trunk-line railways of heavy traffic, apart from terminal expenses, was not over 2½ mills per ton-mile in 1916.*

Let us understand the significance of these figures. They show that the farm or mine or mill which has to haul its products more than 10 miles to a railway shipping point is by that short distance made as remote from its market as Illinois is from New York City. They show that the producer 20 miles from a railway

*The operating expenses of railway companies reported to the Interstate Commerce Commission lump together those of the light-traffic branches and the heavier-traffic main lines. By selecting companies which have a small mileage of branches in comparison to their extent of main line, it is possible, from the Interstate Commerce Commission statistics, to obtain a fair idea of the cost of moving freight over the road on heavy-traffic lines. This has been done for a few selected roads in the accompanying table. By applying the percentage of operating expenses to gross earnings to the average earnings per ton-mile, there is obtained the average cost of hauling freight per ton-mile given in the last column. These figures, however, *include the terminal expenses* of the railway as well as the cost of hauling over the road. The Hon. Robert W. Woolley of the Interstate Commerce Commission in a recent statement before a Senate Committee showed that of the total operating expenses of the railways of the United States one-third is chargeable to operations in railway terminals. Deducting one-third from the figures in the last column of the table, it will be seen that the average costs fall considerably below 2 mills per ton-mile. Were it possible to obtain figures of the cost of main-line operation alone, apart from the branches, for such trunk-line railways as the Pennsylvania R.R. or the New York Central R.R. they would doubtless show equally low costs.

Name of Road	Miles Operated	Revenue per Ton-Mile Mills	Per Cent. Operating Expenses to Earnings	Cost per Ton-Mile Mills
Bessemer and Lake Erie	204	4 50	51 87	2.33
Western Maryland	688	5.01	64.40	3.22
Chicago & Erie	269	4.38	61.41	2.70
Hocking Valley	350	4.06	66.84	2.68
Toledo & Ohio Central	575	4 00	74 59	2.98
Kanawha & Michigan	176	3 82	62.77	2.39
Chesapeake & Ohio	2,385	3 80	65 90	2.50
Norfolk & Western	2,085	4 20	56 16	2 35
Virginian Ry	505	3 40	53 02	1.77
Carolina, Clinchfield & Ohio	283	5 82	49.80	2.90
Chicago & Alton	1,052	6.18	71 07	4 39

line has a transportation tax of at least $5 per ton on all the goods he sends to market in competition with the producer near the railway station. That means a lower price for every bushel of wheat or corn, for every bale of cotton, every quart of milk. It means that the world can only draw its supplies of food and minerals and raw materials from regions which have been penetrated by the railway.

The figures here set forth also make clear another important fact. We cannot expect to reduce much further the cost per ton-mile of freight movement on heavy-traffic railway lines. The genius of the ablest engineers in the profession has been concentrated on this task for half a century, and their achievements are one of the miracles of modern times. The opportunity for further reductions of cost lies at the terminals.

Terminal Costs Have Increased

While the cost of hauling freight over the railway has been steadily going down, the cost of handling freight in terminals at the city end of the line has been rising as steadily. A large part of this increase has been an inevitable result of the growth of cities. The Pennsylvania R.R. Co. operates as large a mileage of yard track and sidings as it does of main line. These yard tracks occupy lands worth several times as much as the lands over which the main lines run. The New York Central R.R. Co. has one-third as many switching locomotives as locomotives in freight service.

Much larger than the terminal costs borne by the railway are those borne by the shipper and receiver of goods in large cities. The cost of handling goods from the railway car to the consumer in a great city is today one of the biggest items in the transportation tax.

And at the country ends of the railway network the cost of transportation has also risen. It costs today more per ton-mile to haul freight over the highway than it cost a century ago.

The Light-Traffic Railway

The problem before us relates not merely to the transportation to and from the railway station. It has to do with the light-traffic branch-line railways, on which the cost of hauling freight per ton-mile is often ten to twenty times as great as on the heavy-traffic railways. Almost without exception, these light-traffic railways do not pay. Their construction has come to a stop. Investors will not furnish money to build them, and the great railway companies also have ceased to build branch lines. There has been an awakening to the fact that such extensions are generally a burden on rather than a benefit to the company.

The railway network of the United States, instead of being extended, is actually being reduced. A large mileage of railway lines has been abandoned during the past three years. The owners of moribund properties have taken advantage of the abnormally high prices for second-hand rails and rolling stock to save something from the wreck of enterprises for which high hopes were once entertained.

Who knows what the effect has been on the communities which relied on these abandoned lines for transportation? How have their farms and industries fared when thrown back upon the highway for transportation? If these communities are injured, if their products are shut out from market, the matter is one of public importance; but at present it is nobody's business, in either Federal or state government, to inquire into this. Government authority over the railway has been plentifully exerted to regulate and restrict; but not since the early days of the railway era has it been recognized that the Government should aid the development of such transportation facilities as a boon of enormous public benefit.

Good Roads and Motor Trucks

There is a widespread belief that the good road and the motor truck are destined to supersede the light-traffic railway. The motor truck for freight transporta- is now carrying on a lively competition with the railway in handling merchandise freight on many routes.

While the building of branch-line railways is at a standstill, the building of good roads is proceeding on an enormous scale. Bond issues of $50,000,000 and $60,000,000 for good roads have been approved in Illinois and Pennsylvania; and other states are following.

At the same time, the motor-truck traffic is doing damage to good roads already built which will require many million dollars to repair. It is agreed that roads must now be built heavy enough and costly enough to withstand motor-truck traffic. This means, even with prices reduced to the same basis, a cost per mile for construction probably at least four times as great as the cost per mile of the standard macadam road in general use in the United States a quarter century ago, previous to the advent of the automobile.

Fields of the Railway and the Motor Truck

It is surely, then, worth while to investigate from an impartial standpoint the relative economy of the railway and the highway. It is obvious, of course, that each has a field in which it is supreme; but in the field where they do compete with each other it is important that investigation should determine the relative economy.

There is, of course, no possible competition of the highway with the railway in hauling low-class freight over long distances. Railway average freight charges on lines of heavy traffic range from two mills to six mills per ton-mile. Motor-truck average hauling costs are 12c. to 25c. or more per ton-mile, and this does not include, as in the case of the railway, the interest and maintenance charge on the road which the motor truck uses.

This comparison of ton-mile costs between the motor truck and the railway, however, is incomplete, because the motor truck renders a service that the railway cannot. The motor truck can carry goods from origin to destination without rehandling, and this eliminates the cost of hauling the goods to and from the railway station at each end of the journey and the cost of rehandling there.

It is in this elimination of terminal costs and rehandling that the great advantage of the motor truck lies. This advantage insures it an enormous field of usefulness even though its costs per mile of haul are many times that of the railway.

Furthermore, because terminal costs to the railway and shipper are highest at the large cities, it is evident that the motor truck finds its largest field of usefulness

there rather than at the country terminals of the railway network, where the terminal costs are comparatively low.

Again, since the terminal costs to both railway and shipper are highest on merchandise, especially when shipped in less-than-carload lots, it is this class of freight that will gravitate to the motor truck. On the bulk freight shipped in carload lots, which makes up the principal tonnage of railway traffic, the motor truck cannot possibly compete. The railway is supreme, too, in handling carload freight, or even less-than-carload, where it can run its cars directly into a manufacturing plant or a warehouse and often not merely reduce its own terminal costs to a very small figure, but the cost of transport within the plant itself.

On the other hand, the motor truck has an advantage which will doubtless be responsible for a great increase in the use of trucks, in being able to reduce the cost of packages. On many classes of merchandise the cost of the cases and packing necessary for rail transport is much more than the freight charge over any moderate distance. If a factory or a merchant can distribute goods by motor truck and deliver them direct to destination, the cost of packages can frequently be cut to a very low figure.

A further advantage which is responsible for a great diversion of business from the railway to the motor truck is the promptness of delivery. Goods shipped by motor truck from New York to Philadelphia are put on the truck in the afternoon, carried to Philadelphia during the night and delivered to the consignee there before noon next day. If the same goods are shipped by rail, the railway also gives a daily service. The goods are put on board a car during the day and the car will be hauled to Philadelphia during the night. There are in that city, however, over 50 local freight stations of the Pennsylvania R.R., and it may be one to three days before the car is switched over the maze of terminal tracks so as to land the goods at the station nearest to the consignee's warehouse. Then a notice of the arrival of the goods has to be mailed to the consignee. On receipt of this he orders a truckman to go after the goods. By the time they are delivered it will probably be at least five days from the time they were started. This is typical of the quickest delivery practicable with rail shipments. On routes where direct car service is not furnished, or is furnished only on certain days, a shipment may take a week or two for a journey of a hundred miles.

Comparing the Cost of Railway and Highway Traffic

There have been repeated published expressions of a desire for a complete and accurate comparison of the cost of railway transport and of highway transport. Those who express such a desire probably have failed to realize that no statement of costs is possible which will be generally applicable. The cost per ton-mile on any transportation line is bound to vary enormously with the tonnage moved, with the character of the traffic and with the local conditions. The only way in which to determine the relative cost of highway and railway transport is to assume a specific case and estimate the cost on each system as applied to that case.

There is no question that motor-truck traffic in the vicinity of the great cities is here to stay. There is a question, however, whether the railway or the highway is in future to be preferred for railway feeder lines in country districts. It is worth while therefore to compare the cost of moving traffic in such a location by each system.

In making this comparison, each system must be charged with the cost of building and maintaining the roadway to be used, as this is obviously the only correct basis, although in the ordinary competition of motor trucks with railways, the truck has the advantage of having the road it uses built and maintained by the taxpayers.

Relation of Traffic Density to Type of Road

The most important element in fixing the economic type of road is the volume of traffic to be handled. Obviously, the volume of traffic may be so small that an earth road will show the lowest total cost. A heavier traffic may warrant the building of a narrow gravel road. A still heavier tonnage will call for a pavement fit to stand motor-truck travel, and, finally, a volume of traffic will be reached that will make the railway the only really economical carrier.

The proper unit for measuring density of traffic is the tons moved over the road annually, since this eliminates variations in volume of traffic at different seasons of the year. Since the tonnage moved may vary on different parts of the road, the average density for the whole road is determined by dividing the total ton-miles for all the freight carried by the number of miles of road affected. We thus obtain the familiar traffic-density unit of railway statistics, "ton-miles per annum per mile of road."

In the comparison below, the traffic density assumed is 25,000 ton-miles per annum per mile of road, which is equivalent, of course, to the passage of 25,000 tons over the road from end to end. Let us see what such a traffic density means.

If we assume that there are 300 days of traffic movement per year, the average tons per day will be 84. If we assume, further, that two-thirds of this traffic is carried in one direction and one-third is carried on the return trip, 56 tons per day on the average will be carried one way. If this were moved in two-ton, horse-drawn wagons, 28 such wagons would pass a given point daily, going one way. If moved in five-ton motor trucks, fully loaded, there would be 11 such trucks each way daily, or about one every hour of daylight. It will be obvious from the above that 25,000 tons per annum is a very light traffic compared with what many main highways are now carrying.

Topographic Conditions

In order to make such a comparison as we are attempting, it is necessary to estimate the cost of the roadway; and the cost of either a railway or a highway will of course vary within very wide limits according to the country in which it is built. It is necessary, therefore, to make an assumption as to the local conditions, and it will be assumed that the road is to be built through a favorable country, such as would permit the building, say, of a common earth road, at a cost for grading, ditching, culverts, bridges and fencing of $1000 per mile.

To summarize, then, the problem presented is to carry freight amounting to 25,000 tons per annum between a

railway station and a terminal ten miles distant, two-thirds of the freight being carried in one direction, and the country between being so favorable for road construction that a common road can be built at a cost of $1000 per mile. What will be the cost of moving it: (1) By a highway fit for motor trucks; (2) by a railway, and (3) by horses and wagons over the unimproved country road?

For the solution of this problem there must be determined for each type of roadway, first, its cost of construction; second, its annual expense for maintenance, and, third, the probable life of the roadway, at the end of which time it may be assumed the road down to the foundation course will require complete renewal. The life may also be influenced by the factor of obsolescense—the risk that through changes in population or other local conditions the traffic using the road may dwindle until its maintenance is no longer justified.

The annual cost of the road will equal the interest on the cost of construction, plus a sinking fund contribution which will repay the cost of the worn-out part of the road at the end of its life, plus the annual cost of maintenance. If we divide this sum by the number of tons per annum carried over the road, the quotient will be the cost per ton chargeable to the use of the road.

II. Highway and Railway Construction and Maintenance Costs

It is almost needless to say that experience in the use of heavy motor trucks on highways is too recent—and, it may be added, too destructive—to admit of any estimates on the cost of roads for motor-truck traffic that will not be challenged by many as either too low or too high. The writer, however, has obtained the opinions of leading highway engineers who have had most experience in building and maintaining roads subjected to heavy motor-truck traffic, and the figures below are based on these opinions.

One important element in the cost is, of course, the width to be adopted for the paved surface. Engineers are generally agreed on a minimum width of 18 to 20 ft. for roads to be used by heavy motor trucks. For the present purpose, however (comparing the motor-truck road and the railway), a single track motor-truck road, 9 ft. in width, is assumed. For the small volume of traffic here proposed, this narrow roadway can be made to carry motor trucks, with perhaps some provision for scheduling their movement and meeting at turnouts, which is no more than the railway has to do with its traffic.

Without doubt, the road as actually built would almost inevitably be given a much wider paved surface in order better to accommodate other vehicles. The cost of the additional width, however, should be chargeable to this other traffic and not the motor-truck operation.

As to the material for the paving, the opinion of engineers is now fairly well agreed that concrete, either as a foundation for a wearing surface or as the entire pavement, is essential for a road which is to endure motor-truck traffic. This means a cost of probably $2 per square yard if concrete is adopted or $3 to $4 per square yard for concrete covered with brick or asphalt, or a still higher price for granite or wood blocks. We will assume the lowest figure, giving a cost for the paving alone of $19,560 per mile. The grading, drainage and bridging of the road to the subgrade preparatory to the paving will cost much more than for a cheap dirt road, and $2000 per mile is little enough to allow for this in addition to the $1000 assumed as the cost of a dirt road on the same location. The total cost of the motor-truck road, then, will be 13,560 per mile.

The annual cost of maintenance is, further, assumed as $160 per mile and the life as 15 years, at the end of which time, it is assumed, the concrete will be covered with asphalt, the concrete becoming the foundation course. Doubtless, these figures will also be challenged. Concrete roads which have a much heavier traffic are being maintained at considerably lower cost per mile. On the other hand, the cost of annual maintenance may be expected to increase year by year as the concrete road grows older. The assumption of 15 years of life will be criticised as too short by many partisans of the concrete road; but the error, if it be an error, tends to make the concrete road a safe choice as against a pavement of still greater durability.

At the end of 15 years the concrete road should still be worth 75c. per square yard as foundation for a new pavement. The annual depreciation charge, then, will be the sinking fund contribution sufficient to accumulate $1.25 per square yard of road in 15 years. At 5% interest this will mean an annual sinking fund payment of about $300 per mile per year.

In most locations such as are here considered, a part of the first cost of the road might well be charged to the other vehicles which use the road, instead of placing it all on the motor-truck traffic. If desired, such an apportionment could, of course, be made, and also an estimate of the amount of maintenance and annual depreciation chargeable to each class of traffic. Since the present computation is intended chiefly to illustrate the method of making such determinations of road cost, it is deemed unnecessary to introduce such refinements of calculation here.

Cost of Railway Construction and Maintenance

The cost of railway building varies, of course, enormously, according to the kind of railway which is to be built and the local conditions of construction. In the present case, since the traffic to be handled is so very small, it will be assumed that the railway is located with liberal use of steep grades and sharp curves where necessary to cut down cost of grading. It will be assumed, further, that special light rolling stock is used, permitting the use of light rails and ties and cheap bridges and reducing the cost of track maintenance. In favorable country, where a common road can be built for $1000 a mile, such a standard gage railway line, may be assumed to cost $4000 per mile for grading, draining, bridging and all other expenses to the completed subgrade ready for track, in addition to the $1000 assumed as the cost of grading, etc., sufficient for a common earth road. The track may be assumed to add $5000 to this, or $10,000 per mile for the completed line. This estimate includes only the same class of construction items as enter into the cost of the highway for motor trucks just considered. Right of way and promotion expenses, for example, are not included.

Turning now to the cost per mile per annum for track maintenance, this is assumed at $500 per mile per annum. It is true that some railways of very light

traffic have under the stress of necessity maintained their tracks for a considerably lower figure; but the fact must be faced that railway ties and track labor, two of the largest items in the cost of track maintenance, will be considerably higher in the future than in the past.

It is not customary to make a separate charge for the depreciation of railway track, the usual assumption being that maintenance offsets all depreciation, as indeed it usually does. In the present case, however, a charge for depreciation is justified because of the risk of obsolescence. Such light-traffic railways are inevitably subject to the risks that, through changes in population or traffic conditions, they may become unprofitable and be abandoned. Any investor in such a proposition would be justified in demanding that the company should earn enough in addition to interest to repay the cost of the road in not more than 25 years. In this case obsolescence should be figured not merely on the track but on the entire cost of the line, $10,000 per mile. To provide thus for amortization of the cost of the road will require a sinking fund payment, at 5% interest, of $210 per mile per year.

Cost of An Earth Road

The first cost of an earth road in the given locality has already been assumed at $1000 per mile. What will it cost to maintain such a road with an average traffic over it of 25,000 tons per annum? As previously shown, this will require the movement over the road for 300 days in the year of 28 two-ton wagons each way daily, all loaded one way and half of them loaded on the return trip. Such an earth road, however, would in a large part of the United States be impassable by wagons with such loads during several weeks or months of the year, on account of mud or snow, so the business would have to be concentrated into probably not over 200 days of the year.

The cost of maintaining such a road would range from a very small sum in the arid regions of the West, or in other sections where the natural soil is adapted to roadmaking, to several hundred dollars per mile in sections where the road is built over sticky clay or deep swamp. For our present purpose we may take the cost of maintenance as $250 per mile of road per annum. The depreciation may be omitted, since the original cost of the road was only $1000 and the earth road, under the annual maintenance outlay above assumed, will be perpetually as good as or better than when originally completed, and hence no definite life can be assumed for it.

Comparison of Roadway Costs

We may now present in tabular form the cost of the different roadways and the cost per ton-mile *chargeable to the use of the roadway*, for each system of transport, as follows:

TABLE I. COSTS PER MILE OF ROADWAY

	Earth Road	Motor-Truck Road	Railway
Construction cost	$1,000	$13,560	$10,000
Annual interest charge at 6 per cent	60	813	600
Annual cost of maintenance	250	160	500
Annual sinking fund for depreciation		300	210
Total annual cost	$310	$1,273	$1,310.
Cost per ton-mile for 25,000 tons per annum	1.34c	5.09c.	5.24c

III. The Cost of Moving Traffic by Railway and by Highway

(A) *COST OF MOTOR TRUCK OPERATION*

Notwithstanding the great amount of traffic carried by motor trucks during the past three years, there is surprisingly little complete and accurate information available as to the ton-mile cost of freight haulage by motor truck. One reason for this is that very few motor-truck users have kept complete and accurate records of their costs. Emphasis may well be laid on the word *complete*. There are many partial cost records available. Of this class are most of those sent out by motor-truck manufacturers. When it comes to the items of depreciation and overhead charges the motor-truck operator often deceives himself as to the cost of carrying on his business.

The most detailed figures thus far published are those compiled by the Motor Truck Association of America. They appeared in *Engineering News-Record* of Feb. 27, 1919, p. 438, and are reprinted with the accompanying explanation as follows:

The cost of operating a five-ton gasoline truck, shown in detail in Table II. was prepared by one of the largest operators of trucks in the East, with the recommendation

TABLE II COST PER DAY OPERATED FOR FIVE-TON GASOLINE MOTOR TRUCK BASED ON 50 MILES PER DAY PER TRUCK AND 300 DAYS PER YEAR

	Amount	Totals
Direct Charges		
Driver	$5 00	
Tires, based on present cost of tires (guaranteed basis)	3 00	
Oil, grease, kerosene, graphite, etc.	.50	
Gasoline, 3½ miles to gallon equals 14 gallons at 25c per gallon, (average)	3.50	
		$12 00
Indirect and Overhead Charges		
Depreciation, 20% on $6,000 investment	$4 00	
Interest, 6% on $6,000 investment	1.20	
Insurance, averaged at $4.50 per year	1.50	
Garage, rental, upkeep, etc., $300 per year per car	1 00	
Maintenance, minor repairs, supplies, tire chains, tools, lamps, springs, spark-plugs, equipment, etc (estimated)	1 00	
Overhaul, complete, pro-rated, $600 yearly	2.00	
License fee	.20	
Body upkeep, repairs and painting	.30	
		11.20
Supervision, based on 10% of above costs		2.32
Lost time—time lost in repairs, no work, weather, or other causes, 20% of total less gas, tires and oil, etc., $7		3.70
Total cost per day operated		$29.22

that it be sent out to truck operators, requesting them to criticise it and submit their own costs for the information of the association.

The table is based upon actual experience. It is assumed that the truck makes 50-miles per day and works 300 days per year. The direct charges are accumulating only while the truck is under operation, while the indirect are those which are accumulating whether the truck runs or not. Supervision includes all office expenses, stationery, printing, advertising, office help, telephone charges, outside men, etc. The cost of mechanical garage equipment, power, spare parts, etc., with interest on the same, and depreciation, is included in maintenance and overhaul.

Average operating conditions as to load were used in compiling this table. Up to the present time these have equaled a full load one way or, for a 50-mile day, transportation of 125 ton-miles at about 24c. per ton-mile. The costs are actual, no profit being included to cover risks, etc.

Table III. gives the costs as sent in by six trucking companies in answer to the inquiry. The averages shown in the last two columns include the figures in Table II.

In considering the returns, it will be noted that many of the differences are in such elusive items as overhead, supervision, and lost time. The averages in the last two columns were obtained by adding the amounts together and dividing by the number of reports on that item. The average total cost per day, while somewhat less than in Table II, in the main agrees with it very well.

The figures as given apply particularly to operation of trucks in large fleets, such as those employed by the interurban haulage companies. They were furnished by companies operating out of New York City

These figures will be more convenient for study if rearranged to show the overhead expenses in costs per year and the direct operation expenses in costs per mile, and to eliminate an inaccuracy due to the method used in computing the effect of idle time in Table III. Thus rearranged, the figures in Table II are as follows:

TABLE III. COSTS REPORTED BY SIX MOTOR TRUCK OPERATORS, COMPILED ON THE SAME BASIS AS THE COSTS IN TABLE I

Truck Operator	A	B	C	D	E	F	Average	Total
Direct Charges, per Day								
Driver	$5 00	$5.20	$5.00	$5 00	$5.17	$5 50	$5 13	
Tires	3.00	3 75	2 00	2.00	2 00	3 00	2.68	
Oil, etc	30		.30	.50	.25	.25	.35	
Gasoline	3 00	4 00	3.50	4.65	2.08	3.75	3.50	
								$11.66
Indirect Charges, per Day								
Depreciation	$3 50	$4 19	$3 60	$3.40	$3.67	$4.00	$3 77	
Interest	1 20	1 26	1 08	1.22	1 10	1.00	1.15	
Insurance	1 50	2.54	1.26	2.10	.86	50	1.47	
Garage	1 00	1.20	1 00	1.00	.89	1 00	1 01	
Maintenance	.50		.50		1 00		.75	
Overhaul	1.33	2 75	1.80	1.60	2.00	3.00	2.07	
License	17	.27	.20	.20	.20	.20	.20	
Body upkeep	.25		.30	.10	.40		.27	
								10.69
Supervision	.50	2.93	2.05	1.90			1.90	1 90
Lost time	2.20		1.67	3.40	2.50	1.97	2.57	2.57
Total	$23.45	$28.09	$24.26	$27.07	$22.12	$24.17		$26.82

TABLE IV. OVERHEAD CHARGES PER YEAR FOR A 5-TON CAPACITY GASOLINE MOTOR TRUCK RUNNING AN AVERAGE OF 50 MILES PER DAY FOR 240 DAYS PER YEAR

*Driver's Wages	$1500
Depreciation (20%, on $6,000 investment)	1200
Interest (6% on $6,000 investment)	360
Insurance	450
Garage (rental, upkeep, etc.)	300
Maintenance, minor repairs, oil, supplies, tire chains, tools, lamps, springs, equipment, etc. (estimated)	300
Complete overhaul once a year	600
License fee	60
Body upkeep, repairs, painting, etc.	90
Supervision	696
Total per annum	$5,556
Overhead charges per day for 240 days in the year, actual operation	$23 15
Overhead charges per mile for 50 miles per day	46 30c

Direct Charges Per Day and Per Mile for 5-Ton Truck Operated as Above

	Cost Per Day	Cost Per Mile
Tires (based on present tire guarantee)	$3 00	$0 06
Lubricants	.50	.01
Gasoline (3½ miles per gal., 14 gal. at 25c.)	3.50	.07
	$7 00	$0 14
Total of overhead and direct charges for 240 days per year operation, per day	$30 15	
Per mile	60 30	
Cost per ton-mile for full loads one way and empty return	24 12c	
Cost per ton-mile for full loads one way and half load returning	16c	

*In the above table the driver's wages have been placed under overhead charges because the driver is paid by the month and his wages continue even though the truck is idle because of repairs, bad weather or lack of business, unless, of course, the idleness should be of long duration, when the driver might be laid off.

Motor-Truck Traffic, New York and Philadelphia

One of the most-used routes for motor-truck interurban traffic is that between New York and Philadelphia. Half a dozen or more trucking companies are operating a daily service over this route, and numerous others send trucks over it more or less frequently, as business requires. Most of the business is done in five-ton trucks which make the run of about 95 miles in 9 to 10 hours, and with extra mileage to pick up freight average about 100 miles per day. The railway rate from New York to Philadelphia per 100 lb. varies from 33c. on Class I. freight to 14½c. on Class VI. freight. This rate on first-class freight is equivalent to $6.60 per ton, or for the 90-mile rail haul, 7.3c. per ton-mile. The motor-truck rate for small shipments is $1 per 100 lb., or $20 per ton. On larger shipments this rate is reduced, and some companies will carry full five-ton shipments for $65, or $13 per ton. If the total length of haul is taken as 100 miles, this last is equivalent to a rate of 13c. per ton-mile paid by the shipper. The service rendered by the motor truck, however, in order to be compared with that rendered by the railway, must have added to the railway charge the cost of transfer to and from the railway station at each terminal. At the lowest rate of $13 per ton charged for the shipment by truck, the shipper would pay $3.20 per ton for cartage at each end to make the total cost of the rail shipment equal the cost of the shipment by truck.

In competition with the express companies the motor trucks have a still better chance for profit. The express charge per 100 lb., New York to Philadelphia, is $1.15, and this rate is, of course, much increased for the smaller and lighter packages. The motor truck's rate is therefore lower than the express rate, and it gives an equally prompt delivery.

The cost per mile of opearting trucks on the New York-Philadelphia run is much lower than for the trucks whose expenses are considered in Tables II to IV, because the average daily mileage is 100 miles instead of 50 miles.

There are, however, two items of expense on the New York-Philadelphia service which should be added to those already ascertained. The first of these is the driver's expense account. The driver must be provided with meals and lodging when away from home. One of the New York-Philadelphia companies allows its drivers $2 per day for expenses, or $480 per year for a year of 240 days. The second of these is the expense of carrying on the business, especially the handling of express parcels. This is much higher than the $696 per truck allowed under the head "Supervision" in Table IV. There is the rental of warehouses at each end to be provided for, and the wages of billing clerks, loaders, and collectors. In other words, the motor-trucking concern carrying on an express business has to have quite a terminal organization and terminal expenses of its own.

The amount of these terminal expenses will obviously vary greatly according to whether a concern is hauling chiefly freight in sizable consignments or small parcels.

For a tentative estimate of the annual overhead expenses of a five-ton truck in the New York-Philadelphia business we may add to the $5556 in Table IV the following items:

Depreciation (additional)	$300
Repairs (additional)	200
Driver's expense allowance	480
Conducting business (estimated)	400
	$1,780

We thus have a total of $7336 as the annual overhead charges or for a year of 240 days, $30.44 per day.

In ordinary operation the trucks make one trip over the road daily and return the next day. For this 200-mile round trip the total cost will be

Overhead charges, 2 days at $30 44	$60 88
Direct charges, gasoline, tires and lubrication, 200 miles at 14c	28 00
	$88 88

Average cost per mile $88.88 ÷ 200 = 44.4 cents.

If a motor truck could always run fully loaded, both ways, the cost per ton-mile of transporting freight by it on the basis of the above figures would be only

44.4c. ÷ 5 = 8.88c. per ton-mile. But no transportation business ever has such ideal conditions. The motor trucks, on this particular run, on account of the large volume of business available, can generally get a fair-sized load one way; and at least a partial load on the return trip. If a truck carries five tons one way and one ton on the return trip, it will accomplish 600 ton-miles of transportation on the two days' round trip and the cost per ton-mile would be, according to the above estimates, of $88.88 ÷ 600 = 14.81 cents.

It will be obvious from the above figures, as from the earlier tables, that the success or failure of a motor-trucking concern depends chiefly on its ability to keep its trucks moving with full loads.

Interurban Motor Truck Traffic in Ohio

Figures for the cost of motor-truck operation on interurban routes in Ohio which were published in *Engineering News-Record* of Apr. 10, 1919, p. 717, are noteworthy because they show results with trucks of smaller capacity than those above considered, and also because of the inclusion of items for driver's expenses and for helpers on the run. The figures cover the operation of 12 trucks of 3½ tons capacity which have been operated for a year between Cleveland and Akron, and Cleveland and Youngstown. The Cleveland-Akron run was a round trip of 100 miles, including movement in the city to pick up and deliver goods.

In this service the cost of truck operation was found to be as follows, using the same form as in Table IV:

ANNUAL OVERHEAD EXPENSES

Driver's wages	$1500
Driver's expense account	300
Part time of helper	100
Depreciation (20% on $5000)	1200
Interest (6% on depreciated value)	180
Insurance	450
Complete overhaul	600
Overhead including supervision, license, taxes, warehouse rental and all help other than drivers, helpers and repair men.	1600
	$6438

DIRECT EXPENSES PER MILE RUN

Gasoline, 3.2 miles per gallon at 25c	7.81c.
Lubricants	0.94c.
Tires	5.77c.
Total	14.52c.

The trucks made an average of 16,500 miles per year, so the total of overhead and direct expenses was 53.52c. per mile. The average load was 4.25 tons from Cleveland to Akron and 2.15 tons on the return trip, or a total of 320 ton-miles for the round trip of 100 miles, or an average cost of 16.7c. per ton-mile.

It will be noted that while these trucks were of a normal capacity of 3½ tons, they were regularly overloaded, carrying over 20% in excess of their rating, on the average. The expense of operation was not materially less than for five-ton trucks in any item except interest and depreciation, which were less on account of the smaller first cost. This result agrees with the experience of some of the companies which have operated 2½-ton trucks on the New York-Philadelphia run, and find a reduction of only a couple of dollars or so per day below the cost of operating five-ton trucks. The cost per ton-mile for hauling with the small-capacity truck is therefore much greater. This would be more apparent in the above figures for the 3½-ton trucks in the Cleveland-Akron service except for the habitual overloading.

The motor-trucking concerns on this Ohio route are in a condition similar to that of those operating between New York and Philadelphia. Goods have been carried at very low rates, in many cases less than cost, because the truck operators did not know what their costs were. This fact, with the competition of the trucking concerns which run only an occasional trip, has made the business generally unprofitable; and it is stated that of some twenty trucking companies which have carried freight between Cleveland and Akron, there are only two still in business which have lasted over a year.

Cost of Operating Fifth Avenue Omnibuses

Some very low figures for the cost of motor-vehicle operation are given in the official report of the New York Omnibus Co., which operates a fleet of over 200 motor omnibuses in New York City. These vehicles weigh five tons and have seating accommodations for 44 passengers. The average load carried is probably not over half a ton, but the frequent stopping and starting and the operation in crowded traffic are of course unfavorable to economy in fuel and repairs. The smooth asphalt pavement and very easy grades over which the buses run are, on the other hand, far more favorable than the average roads used by motor trucks, and the omnibuses average 72 miles per day as compared with the 50 miles per day assumed in Tables I to IV. Lost time is also, of course, very small.

The total operating expenses of the Fifth Ave. omnibuses in 1916, according to the company's official report to the New York Public Service Commission, were 18.22c. per bus-mile or $13.13 per day (excluding wages of conductors). The cost per mile for tires was only 1.11c. and for fuel, 2.18c. The drivers were paid only 30c. per hour.

These omnibuses may be considered as about equivalent to a two-ton motor truck, run fully loaded (part of the weight of the double-deck body being considered as load). On this assumption the operating cost of these vehicles would be 9.11c. per ton-mile. The reported operating cost omits interest on the investment and profit, but is supposed to include depreciation.

It will be readily understood that the operation of such a large fleet of vehicles over regular routes makes possible many operating economies that would be out of the question on a country line where only five or six vehicles are used, and where conditions of road and load are much less favorable.

Motor Trucks Handling Excavated Material on a Short Haul

In the construction of the Army base storage warehouses in Brooklyn, N. Y., in 1918, 185,350 cu.yd. of excavated material was hauled by motor trucks from the site to a dump 3.2 miles away, and careful records were kept of the hauling cost separate from the loading cost. The trucks worked 10 hours per day and averaged 57.6 miles per day, including of course the return trip empty. The average load hauled was 4.35 tons. The haul was over paved streets. The trucks averaged nine round trips per shift. The cost of haulage, including payroll, supplies, a commission of 6% on the cost of supplies and plant rental, was 23½c. per ton-mile.

There are a great number of places throughout the country where hauling is being done with motor trucks at prices that appear very low compared with the figures of cost which have been given above. Careful investigation generally shows that those who are carrying

freight at very low figures are doing so because they do not understand the necessity of including interest and depreciation in their costs if they would escape bankruptcy.

What is perhaps a typical example of much of the motor-truck competition now going on is furnished by motor-truck freighting between two towns in Montana, Whitefish and Kalispell. These towns are 18 miles apart by highway, while the distance by rail is 25 miles and the rail route is not direct. The highway has been improved for the whole distance with gravel or macadam and the grades are generally practically level. The railway rates from Kalispell to Whitefish for l.c.l. shipments are: Per 100 lb.; first-class, 27½c.; second-class, 24c.; third-class, 19c.; fourth-class, 16½ cents.

A motor-truck line is run between the two towns by a man who also operates a motor omnibus over the same route and runs an automobile livery business. He operates two two-ton trucks for freight-handling and carries freight from Kalispell to Whitefish for 20c. per 100 lb. for ordinary freight and 25c. per 100 lb. for perishable freight. At this rate he gets three-quarters of the less-than-carload shipments, while the railway handles the balance and the carload business.

His two trucks average one round trip daily each week-day for 10 months in the year, and generally get full loads one way, but no return load worth mentioning. At the 20c. per 100 lb. rate, the charge per ton for the 18-mile haul is $4, or 22c. per ton-mile. When carrying a full load, each motor truck will earn $8 per day. Gasoline costs 29c. per gallon, or $1.50 per round trip. This leaves only $6.50 to cover cost of tires and lubrication, wages of driver, interest, depreciation, repairs and all the other overhead expenses enumerated in the preceding tables.

The owner of the truck says he "is making a good comfortable living out of the business." He is doubtless sincere in the belief, but he is typical of many motor-truck operators who, like the early drivers of the "jitney" cars, are using up their capital without knowing it.

Handling Farm Products by Motor Truck

A bulletin on "Motor Transportation for Rural Districts" was issued by the Bureau of Markets of the United States Department of Agriculture, Jan. 29, 1919. It records the results of investigations of 60 motor-truck express routes in various parts of the country. Very few truck operators were found who had any accurate records of the cost of conducting their business. The Bulletin says:

> It is a regrettable fact that there are practically no rural truck operators whose general plans are worth study by less experienced operators. Practically nowhere have rates for truck transport been fixed by adding a percentage for profit to the cost of service. Cost of operation is not well understood by most operators and very few have any authoritative information in this connection. The bureau found numerous cases where truck operators who thought they were making a profit were, as a matter of fact, gradually using up their original investment for current expenses.

In the concluding portion of the bulletin the limiting factors to the development of motor trucking in rural districts are summarized as follows:

> The chief factor limiting development in the field of rural motor hauling is the cost of operation as compared with that of railroads, electric lines and boat lines. Careful attention to effecting economies may offset this limiting feature to some extent, but in the main the operator cannot change his costs of operation to a very marked degree. This means that he must cater to a class of business which will pay a small additional premium for a speedier, more dependable or more complete service.

Motor-Truck Costs Under Country Conditions

The figures in Tables II. to IV. above represent the costs prevailing in or near the large cities. It is important to consider what changes may be expected in these figures in operating motor trucks in a country district on such a line as is here considered.

Driver's Wages—Recent action by the labor organizations ordering an increase of wages and reduction of hours for truck drivers will raise the pay of drivers considerably above the $1500 given in Table III. In country districts, however, where living is cheap and labor unions are less powerful, drivers could probably be hired for regular runs, on an annual salary, for not over $1200 per year.

Interest and Depreciation—The charges for interest and depreciation are based on a five-ton truck costing $6000 new, or $1200 per ton capacity. This price is higher than the average cost of trucks, but is that charged for a make of truck which has a high reputation for reliability and freedom from breakdowns.

One of the striking features of Table III is the revelation it makes that of the cost of hauling freight by motor trucks about three-fourths is overhead charges which go on just the same whether the truck is working or idle. To save $1000 in the first cost of a truck, therefore, would be very poor economy if the saving in cost means that material and workmanship are of a sort that will increase the percentage of breakdowns and the time the truck has to stand idle for repairs.

On the other hand, present prices for trucks are based on war-time costs of labor and material. There is sharp competition in motor-truck manufacture, and a material reduction in prices will eventually result.

Garage—The figure for garage rental of $300 per year per car is doubtless fair for large cities, but it is too high for country conditions where both land and labor are comparatively cheap. Half the amount would probably be better representative of conditions there.

Repairs and Supplies—The figures for repairs and supplies plus annual overhauling amounting to $900 per year are probably high, judging by the figures given in Table III, although several of those who report approve them as they stand. Under country conditions of lower labor cost, and with the prospect of reduced prices for supplies in the near future, probably $600 per year would be a fair estimate.

License—The license fee of $60 per year is doubtless the actual amount; but a general heavy increase in motor-truck license rates must be expected. Illinois is issuing $50,000,000 of bonds for road construction on the assumption that the interest and sinking-fund charge on the issue will be paid from motor-license receipts. The motor truck, because of the heavy burden it has placed on road departments, is sure to be assessed heavily for its license in the near future.

Superintendence—The item of "supervision," amounting to about $700 per year per truck, covers the whole cost of carrying on the business, office rent, salaries and

the entire office expenses. For operating, say five trucks to carry 25,000 tons per year, this would mean a total of $3500 to carry on the business. It would seem difficult to do it for any less.

Direct Costs—The bill for tires should be reduced, as tire prices are likely to fall after war conditions cease, and in operating over regular routes the tires often do better than the guarantee. The lubricant estimate is probably high in Table II. For future price conditions and in country operation, a total cost for tires and lubrication of 5c. per mile is reasonable.

The future cost of motor fuel is a subject on which much might be written. There is no doubt that the consumption of liquid fuel in internal combustion engines is increasing much more rapidly than the supply. The cessation of the war relieves the situation for a time, but higher prices for gasoline in the future appear inevitable. Some help may be afforded by the development of a satisfactory kerosene carburetor; yet this will not last long, as the consumption of kerosene also would then soon increase and overtake the demand. On the whole, the fuel item may well stand as in Table II.

Omitted Items—In the preceding tables two notable omissions are, first, taxes, which the motor-truck owner cannot expect to escape, and second, profit, which the truck operator must have, at least in sufficient amount to cover the inevitable risks of the business.

Lost Time—All the items of expense above considered are computable within fairly close limits. The variations noted make no very great difference in the total of operating expenses. We come now, however, to an item whose variation does very greatly alter the ton-mile cost of motor-truck transport—the item of lost time. How many days in the year can a motor truck operate? What average mileage will it make on these days? What average load will it be able to obtain? On the answers to these questions usually turns the success or failure of a motor-truck business.

Deducting Sundays and holidays, there are about 300 business days in the year. In Table II it is assumed that 60 of these days, or a little over two months, will be idle time because of repairs, the annual overhaul, roads impassable on account of winter snows or ice or stormy weather, or lack of business. This is surely a very moderate allowance. Indeed, it is too low for average winter conditions in the northern part of the United States.

Peak Loads in Handling Farm Products

The conditions of operation shown in Table II. represent the experience of a large operator of motor trucks having a fleet of over 75 vehicles and doing hauling by contract in various parts of the country. The conditions which we are here discussing are those of motor trucks carrying traffic on a branch line from a railway station to an outlying town, and everything depends on the character of the traffic to be handled. If coal from a mine is to be hauled to the railway, then something like a uniform traffic the year round may be expected. On the other hand, suppose the line penetrates a grain-growing region where wheat or corn or barley is shipped to market during three or four months following harvest, and there is only a light business during the rest of the year. In such a case there must be trucks enough to carry "the peak of the load," and several of them may have to stand idle a good part of the year.

The figures given in Table IV, are based on an average of 240 operating days per year and 50 miles per day. Under the branch-line conditions which we are discussing, the average days of operation per year, on account of lack of business in the slack season, might fall to say 200. On a line only 10 miles long, the daily mileage, even in the rush season, allowing for delays at each end, would hardly exceed 50 miles.

The figures given in Table IV, when revised to apply to the conditions on a country branch line as indicated above, and with the lower prices for labor and equipment that may be fairly expected in the future, would be as follows:

TABLE V. ESTIMATED OVERHEAD CHARGES PER YEAR FOR A 5-TON GASOLINE MOTOR TRUCK OPERATED ON A COUNTRY BRANCH LINE UNDER NORMAL PRICE CONDITIONS AND AVERAGING 50 MILES PER DAY FOR 200 DAYS PER YEAR

Driver's wages	$1200
Depreciation (20% on $5000 investment)	1000
Interest (6% on $5,000 investment)	300
Insurance	450
Garage	150
Maintenance and annual overhaul	600
License fee	100
Body upkeep	60
Supervision	696
Taxes (2% on $5,000)	100
Profit (10% on $5,000)	500
Total per annum	$5,156
Total per day for 200 days	$25.78
Total per mile for 50 miles per day	51.56c.
Direct Charges Per Mile	
Tires and lubricant	5c.
Gasoline	7c.
	12c.
Total of overhead and direct charges per day	$31 78
Total of overhead and direct charges per mile	63 56c
Cost per ton-mile for full loads one way and half load returning	16 90c.

From this table it is again evident how much more the ton-mile cost is influenced by the annual mileage made and the tonnage carried than it is by changes in the figures for operating expenses, even when the changes are of considerable amount.

(B) *COST OF OPERATING LIGHT-TRAFFIC RAILWAYS*

We next desire to know the ton-mile cost of hauling freight over the light-traffic railway whose construction cost was estimated above. To make the figures directly comparable with those assumed above for the motor truck, they should include maintenance and depreciation charges on the rolling stock, but should exclude those on the roadway itself, since these have already been separately estimated.

There are no railway statistics from which such figures can be directly obtained. To give a basis for an estimate, Table VI has been compiled from the Interstate Commerce Commission statistics for 1916. It gives figures of operating cost for nine railway companies of Class II (those having gross earnings between $100,000 and $1,000,000 per annum) which have a traffic density less than 20,000 ton-miles per annum per mile of road.

Omitting two of the companies named in Table VI which carried less than 6000 ton-miles of freight per mile of road, the average freight charges on the other six roads varied from 2.91c. to 5.30c. per ton-mile. This freight rate was generally high enough to pay the operating expenses (which includes the cost of track maintenance), but left very little balance for a return on the investment. There should be deducted from these ton-mile charges, therefore, a sufficient amount to cover the expenditure on track maintenance, and there should be added a sufficient amount to cover interest and depre-

ciation on the rolling stock used. On any light-traffic railway such as we are considering, maintenance of way will cost much more than interest, maintenance and repair of rolling stock.

Reference to Table VI shows that the ton-mile costs are closely influenced by the size of the train hauled. The Ouachita & Northwestern R.R. hauled 120 tons of freight per train, charged 2.91c. per ton-mile and earned $3.38 per freight-train-mile. Its entire expense for conducting transportation and maintaining its rolling stock was $1.47 per freight-train-mile. Hence, after adding to this last-named figure a reasonable amount to cover interest and depreciation on the rollong-stock equipment, it is clear that its average freight rate of 2.91c. per ton-mile was probably nearly double the operating cost, omitting the roadway expenses.

The Ohio River & Northwestern Ry. had an average freight-train load of only 23.68 tons and earned $1.03 per freight-train-mile from its ton-mile charge of 5.03c. Its expenses for conducting transportation and maintaining rolling stock were 48c. per mile run by all trains, passenger as well as freight, indicating a cost of perhaps 3c. per ton-mile.

The investigation might be continued at much greater length, but the figures already quoted are sufficient, probably, to show, first, how greatly the operating cost per ton-mile varies with the size of trainload, and, second, how great is the advantage of the railway over the motor truck in being able to handle its traffic in large units.

(C) *COST OF HAULING OVER EARTH ROADS*

As has been pointed out, the drawback of the earth road as a highway is not merely the high cost of transportation over it, but the blockade of transportation over it by mud for a considerable part of the year. This blockade is a much more serious matter for motor trucks than for horses and wagons, on account of the very high overhead charges shown above.

Before the war a common price in many parts of the country for the hire of a team of horses and driver was $5 per day. Such a team might haul a two-ton load over a good earth road in good weather for 10 miles and return with the empty wagon for a day's work. This gave a total of 20 ton-miles per day at a cost of $5, or 25c. per ton-mile. This figure was reduced in some cases by the use of three or four horses, which on a gravel road or on an earth road in a dry climate would enable the load to be increased to three or four tons.

Under the conditions of a dozen years or more ago, hauling freight by highway was done at the lowest ton-mile cost, not over the good roads of the East, but on some of the long hauls over very primitive roads in the Far West. Here freight hauling was an important business. Long strings of 6 to 10 horses or mules were attached to a heavy, broad-tired wagon, behind which were often attached one or more trail wagons. At that time horses and mules were raised at very small cost on the great Western stock ranches. As two men could manage a freighting outfit carrying 6 to 8 tons, the ton-mile cost was brought down to a low figure.

The war ended this condition. Prices of horses, mules, harness and feed were doubled in a short time, and the cost of labor was likewise doubled. It will be a long time before these prices sink to their former level and it may well be doubted whether the former conditions can ever be reproduced.

Government Statistics on Cost of Hauling Farm Produce

In 1906 the Department of Agriculture collected information from its county crop correspondents in all parts of the United States concerning the cost of hauling farm produce from the farms to shipping points over common roads. Recently that inquiry has been repeated, and the results of both inquiries were published in the Department's "Monthly Crop Report" for

TABLE VI. RAILWAY COMPANIES HAVING FREIGHT TRAFFIC LESS THAN 20,000 TON-MILES PER ANNUM PER MILE OF LINE IN THE YEAR ENDING JUNE 30, 1916

	Central New York and Southern (N.Y.)	Ohio River and Western (Ohio)	Fidewater and Western (Virginia)	Wadley Valley (Georgia)	Electric Short Line (Minnesota)	Gilmore and Pittsburgh (Montana)	Ouachita and Northwestern (Louisiana)	San Joaquin and Eastern (California)	Tanana Valley (Alaska)
Name of Company									
Length of road, miles	38	112	93	89	59	120	66	56	45
Locomotives	4	11	6	5	4	4	9	7	4
Freight cars	19	204	138		193	242	213	1	24
Passenger cars	9	20	10	1	25	13		2	2
Character and Density of Traffic									
Ton-miles per mile of road	18,348	16,748	19,883	16,349	17,039	18,289	12,749	5,311	5,537
Passenger-miles per mile of road	66,246	47,324	8,697	11,465	92,153	4,126		8,600	11,450
Freight and mixed train miles per mile of road	889	707	688	657	469	881	1,057	664	763
Passenger train-miles per mile of road	3,208	1,454	80	214	5,274				229
Tons per freight train	20	23 68	28 85	25 68	36 35	32 0	120 65	7 99	7 25
Tons per loaded freight car	6 46	5 91	9 02	8 79	12 29	17 26	8 87	8 40	7 67
Passengers per passenger car	15 47	17 27	4 89	4 20	25 06	8 57		3 49	11 95
Earnings per ton-mile cents	4 09	5 08	3 51	4 23	4 57	5 50	2 91	10 45	28 32
Earnings per passenger train-mile	2 28	2 01	3 37	2 78	1 85	4 63		6 29	7 21
Earnings per freight train-mile	$0 84	$1 03	$0 95	$1 06	$1 53	$2 54	$3 38	$0 67	$2 05
Earnings per passenger train-mile	$0 53	$0 84	$0 28	$0 29	$0 53	$0 84		$0 41	$1 02
Earnings per loaded freight car	$2,839	$1,985	$888	$3,086	$2 509	$1 178	$3,634	$723	$2,636
Earnings per mile of road	$2,297	$1,985	$817	$1 136	$2,17	$985	$3,302	$1,650	$2,479
Distribution of Operating Expenses									
Maintenance of way and structures	$12,370	$85,149	$27,305	$27,498	$17 116	$32 208	$102,077	$35 827	$36,234
Maintenance of equipment	12,341	42,559	9,849	17,227	11 210	35,461	34 736	17 539	10,526
Conducting transportation	46,794	74,840	27,651	46 524	63 518	41,181	67,827	25,310	49,056
General Financial Results									
Investment in road and equipment	$1,104,114	$1,383,828	$638,496	$1 468 428	$1 772,478	$5,405,340	$548,176	$1,197,158	$2 118,790
Investment per mile	29,060	12 390	6,870	16 500	30,000	45 040	8,300	21,300	47,080
Gross earnings	106,925	221 780	8	26 73	115,777	140 755	238,197	40,433	117 809
Operating expenses	86,514	221,786	7	102 765	100,299	117 787	216 419	92 266	110,799
Net earnings	20,412	6	6 088	99 2	15,483	23 168	21,778	51,833	7,010
Per Cent Operating Expenses to Gross Earnings	80 91	100 00	92 54	396 22	86 63	83 56	90 86	228 19	94 05
Paid interest on bonds	$50,000	$30,915	$12,000	$40,196		$240,000		$50,000	$34,500
Paid dividends									

October, 1918. The averages for the entire United States are briefly as follows:

	Horses and Wagons		Motor Trucks
	1906	1918	1918
Distance hauled, miles	9 7	9 0	11.3
Round trips per day	1 2	1 2	3.4
Bushels carried per load:			
Corn	39	39	58
Wheat	55	56	84
Cost of hauling per ton-mile:			
Corn	19c	33c	15c
Wheat	19c	30c.	15c.

In presenting these figures, the author of the report, Frank Andrews, of the Bureau of Crop Estimates, says that while most of the hauling from farms is done by the farmers themselves, the estimated costs reported are based largely upon the usual charges in the various counties for hiring a team and wagon or motor truck by the day.

These figure show the great advance that has taken place in the cost of hauling by horses since the war. The figures of cost reported are subject, however, to a very large percentage of error. The table of costs of haulage in different sections of the United States in the "Crop Report" bears internal evidence that the ideas of the various correspondents and their informants as to what constituted the cost of transport varied widely. Costs per ton-mile for wagon haulage reported in 1906 varied from 16 to 28c., and in 1918 from 22 to 52c. For motor trucks, the reported costs per ton-mile vary from 36c. in the Rocky Mountain region to 9c. in the North Central States.

In studying these figures it should be borne in mind further that the motor trucks used for hauling farm produce are generally of small capacity, one or two tons only, and that their use for hauling farm produce can cover only a small part of the year. From the analysis of motor-truck operating costs which has preceded, it appears altogether probable that the figures for haulage cost reported by the Department of Agriculture's correspondents, in many cases, at least, include only the direct cost and omit such important factors as interest, depreciation and other overhead expenses.

IV. Road Costs and Hauling Costs Combined

On the foundation laid by the preceding discussion, a comparison may now be made of the cost of highway traffic and railway traffic, by adding to the figures per ton-mile for the use of the road, given in Table I, suitable figures for the cost of hauling traffic over the road.

It will be clear from the preceding discussion, also, that the choice of any particular figure to set down must be made arbitrarily and represents merely an assumption to fit a hypothetical set of local conditions. What has been determined is that the cost of moving traffic by the three methods considered varies between wide limits. Motor-truck hauling costs under the country branch-line conditions here assumed might range from 12c. to 25c. or more per ton-mile; railway operating costs from 1½c. to 5c. or more per ton-mile; haulage with horses and wagons from 20c. to 40c. or more per ton-mile. In Table VII, in which the road costs and hauling costs are combined, medium values are taken in each case.

Doubtless, many engineers will be surprised that the cost per ton-mile for hauling by motor trucks is so much greater than the ton-mile cost on a light-traffic railway. Yet it needs only a direct comparison of the conditions of operation to see how great is the advantage of the rail line in moving freight. The railway locomotive, even on a light-traffic line, hauls 20 to 100 tons or more of paying freight, as compared with five tons hauled by the motor truck. The railway locomotive develops its power from coal costing $1 to $3 per ton,

TABLE VII. COMPARATIVE COST OF HAULING 25,000 TONS OF FREIGHT PER ANNUM OVER A LINE 10 MILES LONG BY THREE DIFFERENT METHODS

	Cost per Ton per Mile for			
Kind of Road	Use of Road, Cents	Hauling, Cents	Total, Cents	Total Cost per Ton for 10-Mile Haul
Earth road	1 24	35	36.24	$3.02
Motor-truck road	5 09	16	21.09	2.11
Railway	5.24	3	8.24	.82

while the motor truck burns gasoline at 25c. or more per gallon. The railway car has chilled cast-iron wheels rolling on steel rails. The wheels and rails cost perhaps $30 per ton, and their wear is very small. The motor truck rolls on rubber tires, whose cost per ton-mile of traffic moved may be nearly as great as the entire cost per ton-mile of operating the light-traffic railway.

The motor truck in five-ton units costs about $1200 per ton of carrying capacity and has a life of only five or six years. A railway freight-car of moderate capacity, such as would be used on a light-traffic road, costs perhaps $25 per ton of carrying capacity. A light locomotive would cost as much more per ton of hauling capacity or a total for the railway rolling stock of about one-twenty-fifth as much per ton carried as a motor truck costs. Cars and locomotives, which roll on rails, have a very long life, at least 20 to 25 years on the average. The motor truck or any vehicle which travels over highways, even when the latter are well paved, is subjected to shocks and wear and tear that limit its useful life to five or six years.

Reference has been made in the preceding discussion to the difficulty a motor-truck line experiences in handling peak loads economically. The contrast in the cost per ton capacity of the railway freight car over the motor truck makes it evident why the railway can handle its peak loads at a small fraction of the cost of a motor-truck line. In Table IV the overhead expense of a five-ton motor truck was shown to be at the rate of about $5500 per annum, when the truck is in active use. When such a truck is out of commission for a long time because of lack of business these overhead expenses would be reduced to perhaps $2000 per annum, or $400 per ton of capacity. This figure is easily fifty times the cost to a railway of its idle freight cars per ton of capacity.

The railway has a special advantage in handling peak-load conditions on a branch line if the track of the branch will stand the operation over it of standard freight cars. Not only is transfer of freight at the junction with the main line saved, but cars of foreign roads are brought in to move the crops or other seasonal business, and are taken elsewhere when the rush season is over.

V. Conditions Which Favor Motor-Truck Operation

The preceding comparison of the highway and the railway has been made on the assumption that the two lines would be built on substantially the same route

between terminals. It very often happens, however, that motor trucks compete with the railway under conditions which handicap the rail route either in cost of construction or in cost of operation or both.

Steep Grades—The motor truck can in case of necessity climb grades as steep as 20%, while 10% is about the limit of what the railway can negotiate and grades above 5 to 6% require either operation of the railway with motor cars or else such expedients as very heavy geared locomotives and a small load hauled in proportion to the weight

It often happens that a highway for motor trucks can be built between two terminals which will be one-half or one-third as long as a railway line between the two points. This of course heavily handicaps the railway in the competition.

Limited Right-of-Way—If a branch-line railway is built it must generally be located on its own right-of-way, and there must be a public highway besides to reach the same point. There are many locations where the right-of-way for the railway line will involve difficulty and large expense. It is a very great advantage of the motor truck that it operates on a highway which is usable by other traffic as well.

Right-of-way difficulties for railway construction have multiplied manyfold since the days of active railway building thirty years ago. The mere fact that the motor trucks now available to move traffic over an improved road helps to satisfy the public demand for cheaper transportation and lessen the possibility of success in obtaining at any reasonable figure the right-of-way for a branch railway line.

Handling Local Business—In the comparison of cost above it was assumed, for the sake of simplifying the computation, that the traffic was all moved from terminal to terminal. In nearly all cases, however, the traffic on a country branch line should be picked up and delivered all along the route. The motor truck running on the highway has a great advantage in serving the population along the line of the road over the railway operating on its own right-of-way.

Again, the motor truck's ability to take its load from origin through to destination, while less important than at the city terminal, has a value in the country as well. On a certain part of the traffic handled by the railway there must be added a transfer charge at one or both ends of the line before the cost of rail haul can be directly compared with the cost of the motor-truck haul.

Short Railway Spurs No Longer Practicable—It is evident too, that the coming of the motor truck has ended the construction of very short branch or spur-line railways, except when these are designed to handle special traffic such as the output of a mine or an industrial plant, or a timber tract. Of course, where a branch can interchange cars with the main line and avoid transference of freight at the junction point, it can often save materially by delivering freight nearer to its final destination and shortening the final haul over the highway.

The cost of operating very short branch-line railways, however, is disproportionately high, and it is so difficult to get a rate for the short distance that will compensate for the cost that there is no incentive for the building of such roads.

When the railway era began, the cost of railway freight transportation was several times what it is today. Can a like reduction be expected in the evolution of the highway and the motor truck? Undoubtedly, motor truck costs will be reduced; but the inherent limitations under which the truck operates forbid hope of any such great reduction as has occurred on the railway. Passenger fares by rail, it may be noted, are not greatly changed from those in force seventy-five years ago. The cost of freight haulage has been reduced chiefly by handling traffic in larger units large cars and long trains. No change of such great extent is possible with the motor truck operating on the public highway. There are, however, certain economies that may be made by hauling trailer wagons behind the motor trucks and thereby increasing the tonnage hauled in a single outfit.

Examples of the Use of Trailers

The Highways Motor Transport Co., of Cleveland, Ohio, has been operating for a year past a fleet of Troy trailer wagons of three tons capacity. These are hauled behind Packard trucks and operate from Cleveland to points as far east as Conneaut, 70 miles, and west to Toledo, 120 miles. It is stated that these trailers are operated at an average cost of 8.3c., per mile, and have an overhead charge of $3.50 per day for interest and depreciation on the investment, insurance, garage expense and a helper at $3 per day. Assuming an average daily mileage of 50 miles per day, these overhead charges amount to 13c. per mile. Adding the direct expense of 8.3c. per mile, we have a total of 21.3c., or 7.1c. per mile per ton carried.

Another trucking concern, the Liberty Highway Co., has for some time operated trains consisting of a four-wheel drive five-ton motor truck hauling two Troy five-ton trailer wagons between Toledo and Detroit, a distance of 70 miles. The trip is made in 7½ to 9 hours and two trips are made in three days. Detailed figures of cost are not obtainable; but from the preceding review of the cost of motor-truck operation it will be evident that the much larger tonnage handled in one unit will cut down the cost per ton-mile very greatly. The first cost of the trailer wagon per ton of capacity is less than half the cost of the motor truck, and its depreciation and repairs are very much less. Of course, there is an increase in the operating cost per mile for fuel and for repairs, when a truck is used as a tractor; a helper for the driver is required, and the speed is materially reduced.

From such figures as are available, it appears to be a fair estimate that where road conditions make possible the hauling of ten tons of freight on trailers behind a five-ton truck, and the business is sufficient to obtain fair loads, the cost of hauling per ton-mile should be cut in half compared with the cost of carrying with the truck alone.

There is no doubt that the use of trailers is bound to increase rapidly. A dozen enterprising manufacturers are already building trailer wagons for use behind motor trucks. Even for short hauls in and around cities the use of trailers is rapidly increasing; and the saving by their use is much greater where they are used for longer hauls and are operated between terminals over regular routes.

There is another most important possibility in the operation of trailers, and that is their use to distribute

and collect freight without rehandling at the end of the run. As already noted, it does not pay to use a five-ton truck to collect small shipments, and roads radiating from the terminal would often be too weak to carry such a truck. Trailer wagons of one to three tons capacity, however, could be hauled by horses or light motor-trucks to farms or stores or mills to be loaded or discharged, and then returned to the terminal to be made up into trains to be hauled over the main road.

There is without doubt more or less of a tendency to discourage the use of trailers by imposing legal restrictions. These restrictions are justified where steel-tired vehicles are hauled behind motor trucks over hard roads. The injury to the road done by steel-tired wheels hauled at motor-truck speeds justifies legal restrictions on the use of such trailers. The wear and tear on the vehicle so operated is pretty certain to limit its use closely, even in the absence of official road ordinances.

The use of trailer wagons with rubber-tired wheels behind motor trucks, however, appears favorable to the highways rather than otherwise. Where trailers are hauled, some of the temptation to overload the truck itself is removed. Still more important, probably, is the reduction of speed where trailers are hauled.

There is every reason to believe that overspeeding of heavy trucks is as important a cause of injury to improved roads as overloading. The impact of a motor truck, carrying nine tons or more on the rear axle and traveling at 10 to 20 miles an hour, as its wheels roll over the unavoidable imperfections in the paved surface, is evident to the senses of anyone standing beside the road as the truck passes.

Without doubt, the speed of motor trucks should be strictly limited by automatically locked governors which would not only shut off power but apply brakes when speed limits are exceeded, to prevent overspeeding down grades. Truck drivers have been prolific, however, in finding ways to beat speed governors; and where a truck's speed is held down by hauling trailers, the road is saved from a certain amount of impact.

Economic Capacity of Motor Trucks

The question will inevitably be raised whether the cost of motor trucking might not be reduced by using larger trucks of capacity, say 10 tons, and building the road strong enough to carry them. From all information available, the cost of roads capable of enduring such a heavy loading would be out of all proportion to the saving made.

The five-ton truck fully loaded imposes a load of some 18,000 lb. on the rear wheels, and requires a tire some 10 in. wide on these wheels. To double this load would require doubling the width of face of the tire; but such very broad tires do not distribute the stress equally. The tires, the trucks themselves and the roadway are all sure to suffer. The 10-ton truck has a field, doubtless, on paved city streets; but for country roads the five-ton truck appears to be fully as large a vehicle as practical road-building conditions warrant, especially as it is not uncommon to see such trucks actually carrying a load of six to seven tons.

There will not be lacking engineers, doubtless, who will argue that the five-ton truck is too heavy and that a three-ton truck, which would permit a cheaper roadway that would have a longer life with less cost for maintenance, would be, in the long run, more economical. Experience in the operation of heavy motor trucks is still too limited to permit a final answer to this question. The most that can be said is that the opinion of engineers who have had the best opportunity to observe the behavior of roads under heavy motor-truck traffic is that roads can be built within practicable limits of cost which will give satisfactory service under the five-ton truck.

It may be noted here, also, that the answer to this question will be influenced by climatic conditions. In the mild and arid climate of California, for example, where heaving from frost is unknown and where drainage is comparatively simple, the road engineers do not worry over 10-ton sugar-beet trucks passing over the roads. In a humid climate, where frost penetrates the ground 3 to 4 ft. in an ordinary winter, the road engineer may be excused for an unfriendly feeling toward heavy motor trucks in general.

VI. Making Light-Traffic Railways Pay

The importance of the light traffic railway as a part of the whole transportation machine is demonstrated by the preceding discussion. What can be done to put these lines on a better basis?

The first and most obvious thing is to permit them to charge, so far as the traffic will bear it, rates high enough to cover their operating expenses and fixed charges. That railway rates should be sufficient to cover at least the cost of service is now accepted by everyone. In conformity with this principle, the light-traffic lines should be made to pay their way. The practice of operating these lines at a loss and making up the deficit from the profits earned on the main line is economically unsound and effects an unjust distribution of the transportation tax.

The other way to make the light-traffic railways pay is by operating them at lower cost, and, in the case of newly built roads, constructing them at low cost so as to keep down fixed charges.

Few realize, probably, that the railway of today is far inferior to the railway of half a century ago for handling light traffic economically. American engineers, faced with the necessity of handling heavy, long-distance traffic at low cost, have led the world in increasing the size and capacity of railway cars and locomotives. The result has been as injurious to the light-traffic lines as it has been beneficial to the roads of heavy traffic.

A great deal has been written concerning the enormous saving in transportation cost through the interchange of freight cars, by which a freight shipment travels from origin to destination over many different lines of railway without breaking bulk. But on branch lines of light traffic this means at the present day that track and bridges must be capable of carrying cars of 100,000-lb. capacity. Indeed, on the heavy-traffic lines in the East it is recognized that the coming freight car is the 200,000-lb. car. It is already a very important problem on many branch roads whether large amounts of money should be spent in strengthening track and bridges or whether an embargo must be laid on cars of high capacity. On branch lines of considerable length which handle only light traffic there can be little doubt as to the answer. Notwithstanding the protests of individual shippers and consignees, such as

coal merchants, it will often be a more economical proposition to transfer the loads of exceptionally heavy cars than to build and maintain track and structures capable of carrying them safely.

On the lines of lightest traffic, this principle may be carried further still and special, light rolling stock may be used. Of course this applies rather to lines hereafter constructed than to present lines, since there are hardly any standard-gage roads now in operation which have not been built to carry ordinary standard-gage rolling stock.

It will require courage to defend this light-rolling-stock proposition, because in the public mind the idea has become firmly fixed that big cars and big locomotives are synonymous with economical transportation. Engineers who have studied European railway methods with an open mind, however, have been impressed with the fact that what is suited to one set of conditions may not be at all adapted to another set of conditions. The small-capacity freight cars on English railways, for example, have many advantages for handling their short-distance, small-consignment traffic, which would be lost were American 60,000-lb. or 100,000-lb. freight cars substituted. Even in American railway practice the increase in capacity of cars has on many roads more than kept pace with the ability of the operating departments and the traffic departments to keep the cars loaded to a reasonable percentage of their capacity.

On branch lines of very light traffic, say 20,000 to 50,000 tons per annum, especially those of considerable length, where low cost of track construction and maintenance is imperative, the large-capacity freight car is an economic absurdity.

Narrow Gage or Standard Gage

The older members of the profession, at least, are aware that the narrow-gage railway when first introduced was heralded as filling the long-felt want for a low-cost type of railway adapted to handle light traffic economically. Many millions of dollars were invested in narrow-gage railway construction on the strength of this fallacious idea. But, save in exceedingly rough, mountainous country, where very sharp curvature is essential, with heavy embankments and cuts, the difference in cost of construction between the standard gage and the narrow gage is trifling. The real advantage of the narrow gage in reducing construction cost is that its light cars and locomotives permit the use of a lighter track and lighter structures.

If a branch line were to be planned from the beginning with the idea that it would use its own light-weight rolling stock and not attempt to interchange cars with the standard-gage line with which it connected, there would then be no reason why a narrow gage might not be adopted instead of the standard gage.

Even in such a situation, it is difficult to make out a good case for the narrow gage. Standard-gage locomotives and cars can be built of as light weight and as small capacity as narrow-gage cars. The cost of hauling standard-gage rolling stock from car or locomotive works is much less. The small saving in construction cost of narrow-gage roadbed over that of the standard gage is often fully offset by the more careful maintenance required on narrow-gage track because of the narrower support afforded to the rolling stock.

A very practical advantage of the standard gage is the fact that all locomotive and car shops are accustomed to standard-gage work and all tools and materials are adapted to it, while narrow-gage work is special and inevitably involves greater cost of construction per ton of capacity. It is common practice, also, to use on standard-gage branch lines locomotives and cars which on account of light capacity have become obsolete for main line use.

Electric Traction Not Feasible for Light Traffic

On railways built in rough country, when it is attempted to economize in cost of construction by adopting steep grades, it becomes necessary to use locomotives of considerable tractive power to haul paying trains. These locomotives have heavy wheel loads, which require an added weight of rail. If tractive power is increased by increasing the number of coupled driving wheels, then either a limit is set to the degree of curvature which can be used or the locomotives cause heavy expense in track maintenance.

When the electric railway was first introduced many engineers felt that it opened up new possibilities in economic transportation, since it made it possible for the first time to apply power to all wheels of a car or train and thus to ascend grades up to 10 to 12%. Also, it was expected to make possible the use of lighter rails on light-traffic roads, since the heavy steam locomotive was no longer required. But for handling light traffic an electric railway is handicapped by the investment necessary for the power station and transmission lines. Besides adding very materially to the first cost of construction, the power station and transmission line establish a fixed expense for operation which has to continue for practically the entire 24 hours unless the line is able to purchase current from an existing power station.

It has seemed well to set down these general considerations, well known though they are to most engineers, since they demonstrate pretty clearly that the light-traffic railway lines cannot find salvation by conversion from steam to electric traction.

Maintenance-of-Way Expenses

The cost per mile of maintenance-of-way is one of the heaviest items in the light-traffic railway's expense account. Higher cost of ties and of track labor—two of the largest items in track maintenance—are likely to be permanent conditions hereafter. Most light-traffic railways keep down their roadway costs, through the compulsion of poverty, by sheer neglect. Lower costs will probably be secured in the long run, however, where a company can afford to invest enough in its road to provide good drainage, ballast, and creosoted ties, even if the latter are of cheaper wood. Such a track with light rolling stock and a small volume of traffic should reduce to a small amount the labor required for maintenance.

Independent Motor Cars

For handling light traffic on branch-line railways the theoretical advantages of an independent motor car carrying its own motive power, and capable of operation with a much smaller crew than a train hauled by a steam locomotive, have long been evident. For more than a quarter century, in various countries of the world, experiments have been made in the construction

and operation of such cars, often on a considerable scale.

Motor cars propelled by steam power are in fact almost as old as the locomotive. Gasoline-electric cars, in which a gasoline or oil engine drives a generator which furnishes current to electric motors which drive the car, have been extensively exploited, often in combination with storage batteries to assist the car in starting and climbing grades.

The greatest commercial success thus far attained by any type of railway motor car has been achieved by the McKeen gasoline motor car, which was originated 14 years ago by W. R. McKeen, Jr., then superintendent of motive power of the Union Pacific R.R. This car is driven by a gasoline engine with a silent chain connection direct from the engine shaft to the car axle. Over 125 McKeen cars have been built and put in service on railways in the United States and foreign countries. The Union Pacific R.R. has had the largest experience in the operation of such cars, having 20 of them in service.

Operating Expenses of McKeen Gasoline Cars

The operating sheet for the McKeen cars on the Union Pacific system for the year 1917 (the last figures published) shows average direct operating expense for these cars of 36.39c. per motor-car mile. Of this total, 17.90c. was spent for repairs, 8.29c. for fuel, 1c. for lubricants and supplies, 1.43c. for cleaning and watching and 7.77c. for motormen and other trainmen. The cars averaged 107.4 miles run per day. The failures in service averaged one for each 5236 miles run, or one for every 49 days of service. The depreciation charged for the year on the 20 cars was $15,098.40, an average of $754.92 per car or 3½c. per car-mile.

The McKeen Motor Car Co. builds cars equipped with engines of either 200 hp. or 300 hp., and weighing 66,000 to 74,000 lb. for the cars with the smaller engines and 78,000 lb. to 86,000 lb. for the cars with the larger engines. Practically all the cars built have been for passenger service, or else combination cars, with a separate compartment for baggage, express and light freight. The larger cars can be arranged for seats for 105 passengers. Assuming a car weight of 25,000 lb., this would be a weight of 724 lb. per seated passenger.

The designers of railway motor cars have, almost without exception, followed the conventional lines of railway rolling stock in their work. Therein lies the reason why the independent motor car has never attained the success for handling light traffic that has been predicted for it.

The cars are too costly for the light-traffic railways to afford their purchase. They are too heavy for light track. They are too expensive in operation, especially in the outlay for repairs; and the lost time in the shop is too great. In 1916 the Union Pacific railway motor cars averaged one-fourth of their time in the shop.

Even with this showing, the independent motor car for branch-line passenger service represents a material economy compared with trains hauled by steam locomotives. It is doubtless true, also, that the designers of these cars have built such cars as railway officers demanded. But herein lies the real root of the trouble. Little study has been given to the special problems involved in handling light traffic economically; and few have appreciated how radically different are the conditions from those on heavy-traffic roads.

The development of the automobile has revolutionized many fields of mechanical engineering, and the lessons it can teach have only begun to be learned. There is no reason why a car which rolls on smooth, steel rails need be any heavier than a vehicle which travels on highways and is constantly subjected to severe shocks; yet a motor omnibus weighing with its motor equipment only five tons may carry 50 persons while a railway car without any motor equipment and carrying 70 passengers often weighs 35 tons, or five times as much per passenger carried.

Car Designers Should Study Automobile Practice

Making all allowance for the necessity of provision for traction and buffing shocks in railway cars moved in long trains, and for other limiting conditions, it is evident that the designers of rolling stock for light-traffic railways need to study the achievements in automobile design.

There ought to be developed, for use on light-traffic branch-line railways, an independent motor car of light weight and low cost, seating 25 to 40 passengers, and with an engine of probably not over 50 to 100 hp. It should be *manufactured*, not "built," with standard parts, so that repairs and renewals could be quickly made without long detention in the shop. Such a car should handle express and package freight demanding frequent service, either in a separate compartment or in a light trailer car, hauled by the motor car. It should be possible to operate such a car in country districts, under such price standards as prevailed prior to the war, for not more than 15 to 25c. per mile. Light freight cars operated by one man could be run for even less.

There is a real opportunity here for some of the enterprise and capital now being lavishly expended in the motor-truck field, where competition is intense, to be diverted in a direction where no effective work is now being done and where the need is great.

"Rail Wagons" to Reduce Terminal Cost

The great advantage of the motor truck over the railway is in eliminating rehandling and consequent cost at the terminals. The great advantage of the railway over the motor truck is in its low cost of hauling over the road.

The Bonner "rail wagon" plan of freight transport described in *Engineering News-Record* of Oct. 24, 1918, p. 783, is a scheme to reduce the cost of terminal handling on goods transported by rail. A car body suitable for use on either a steam or electric railway is so built that freight wagons of a special type with their wheels straddling the car frame can be moved over the car body and then raised so as to rest on the car body by compressed air jacks. These "rail wagons" are loaded with goods, and then hauled by horses or motor trucks to the railway line. They are then placed on the railway car and carried to the city or town to which they are destined. Here the wagons are taken off the car and hauled through the streets to the consignee.

Of course, for long-distance rail hauls the extra weight of the "rail wagons" and the smaller capacity of a freight car loaded with them would increase the cost of the haul. For shorter distances, such as the transportation of market-garden products from out-

lying districts to a city over an interurban electric railway, the system promises to effect a large saving in the total cost of transport.

VII. The Business Organization of the Light-Traffic Railway and of Motor Truck Lines

No review of the competition between the motor truck and the railway would be complete without a word as to the contrast in their relative business positions and as to changes needed to put each on a more efficient basis. One would go far to find a sharper contrast than that between the business position of the light-traffic railway and the motor truck at the present time.

On the one hand are the truck manufacturers lavishing millions of dollars in the development of their machines and in pushing them into use, while hundreds of millions are being expended on the highways and many thousands of concerns are undertaking motor-truck operation.

On the other hand are the light-traffic railways, "dead broke" financially, unable to spend any money to better their methods or machinery, and with public opinion confirmed in the belief that the industry is a hopeless failure.

There is a partial explanation of this contrast in the fact that the motor-truck business is open to free competition, while the railway is a natural monopoly and is subject to regulation by public authority. The free field and the hope of large profit are stimulating enterprise in the manufacture and use of motor trucks, just as railway construction was stimulated half a century ago, before public regulation of the railway was established. The necessity of that regulation is now universally recognized; but few have yet perceived that, the incentive of profit having been taken from the railway business, the further development of the industry must be undertaken by public authority or it will not be done at all.

The preceding review has made it clear that the light-traffic railway has a very important place to fill in the great transportation network. How to build, maintain and operate such railways at low cost is a matter of great public moment. Instead of abandoning such railways, as is now being done, thousands of miles of such lines ought to be put under construction to give cheap transportation to regions now undeveloped. It is useless to look to private enterprise to undertake this work. The betterment and extension of the light-traffic railway, which means so much to the country's prosperity, will have to be undertaken by some Government agency.

Here is an urgent reason for the Federal Department of Transportation which has been recommended to Congress by the railway executives. The greatest hope of improved efficiency for the country's transportation machine lies in the improvement of these light-traffic lines. A Federal Department of Transportation could not begin its career with a more helpful task than this.

This matter closely concerns also the other railway problem—the destinies of the great railway systems. There is a current idea that the branch lines ought to be cut off from the great systems and left to sink or swim under local ownership and management. This idea was fostered by the action of the Government when it took over the entire railway system of the country except certain unprofitable light-traffic branch lines which it refused. In line with this idea, when the roads are returned to the owning companies, if conditions of the past are to be restored, most financiers would be only too glad to prune from the big systems many branches which are only a drain on the company's treasury.

But such a break-up and disorganization of the transportation network would be a serious blow to efficient service. The day of the little railway company as a local enterprise has gone. The necessary overhead expenses of a small organization, and the limitations in the grade of technical ability it can obtain, are among the reasons that enable a large system to lease a branch line and operate it at a profit where an independent company would inevitably fall behind. The objection of the large company to the operation of branch lines will be obviated when the principle is established that the branch line must pay its own way. The service given and the rates charged must be such as will permit this, and the operating company must not be compelled, by pressure of public opinion or by public authority, to furnish a service more expensive than shippers and travelers who use the line are willing to pay for.

Public Regulation of the Motor Truck Business

It has just been noted how greatly the free competition prevailing in the motor-truck field is stimulating its development. A close view of the situation reveals, however, that unlimited competition here produces such waste that its continuance may be to the injury of both the truck owner and the public.

The detailed analysis of motor-truck operating costs which has been given in the preceding has shown that the ton-mile cost depends much more on the volume of business than on the outlay in operating the truck.

With the fierce scramble for business which is now going on, and with new competitors all the time appearing—usually with a general ignorance of operating costs—the inevitable result is to divide up the business to such an extent that no one can obtain full truck loads, profits disappear, and the concerns which try to render a regular and reliable service find themselves unable to carry the burden which such service involves.

This situation has already been recognized in a number of states, where the business of operating motor trucks as a common carrier has been placed under control of the public service commission. The operation of motor-truck service over a given route is governed by a franchise giving one concern the exclusive right to render such service as the franchise specifies, and at agreed rates. Any such monopoly is only partial of course, since it still leaves the use of the road open to the individual truck owner carrying his own goods. It is effective enough, however, to eliminate competitive wastes.

To the highway engineer a very hopeful feature of such public control over motor-truck routes is the possibility it opens of better regulation of truck loads and speeds than has hitherto been possible. Not only will the holder of an exclusive franchise for operating a motor-truck route have his own vehicles under strict official scrutiny, but he will be on the watch for any infringement of weights and speed limits by independent truck owners attempting sporadic competition with him.

Lightning Pushes Sidewalk Off Concrete Bridge

Railing Is Also Displaced for Distance of 90 Feet and Steel Rods Are Pulled Apart in Pure Tension Break

DURING a severe electrical storm on the evening of June 9, 1919, ligtning struck the Burlington St. reinforced-concrete bridge across the Iowa River at Iowa City, Iowa, and displaced the concrete railing on one side, completely severed the concrete sidewalk from the structure proper, and generally caused damage to the extent of about $3,000. The effect of the force of the stroke may be noted from the accompanying views.



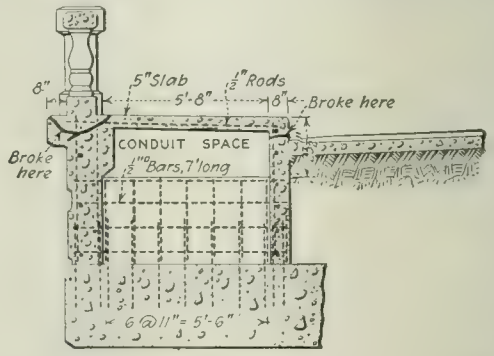
HOW THE SIDEWALK PUSHED OVER BY LIGHTNING CRACKED

According to Stanley M. Hands, city engineer, the greatest force must have acted at the base of the handrail and in a horizontal direction. The bridge is a solid-arch reinforced-concrete structure carrying the sidewalk on longitudinal walls with regularly spaced cross walls, as shown in the detail drawing herewith. The handrail, of concrete, was carried on the outside fascia wall and tied therein by reinforcing rods. The slab itself was reinforced with ½-in. rods in both directions.



LOOKING TOWARD THE BROKEN PLACE WHERE LIGHTNING STRUCK CONCRETE SIDEWALK

As shown in the views the handrail was displaced to the north—toward the river side—and the sidewalk to the south—toward the roadway—the distance from end



SECTION THROUGH SIDEWALK AT IOWA CITY CONCRETE BRIDGE



HANDRAIL DISPLACED AND SIDEWALK BROKEN FROM CONCRETE BRIDGE BY LIGHTNING

to end of the rupture being about 96 ft. The concrete at the base of the handrail was shattered on the surface, but only a clean break about 2 in. wide shows on the bottom of the floor slab.

As stated, the sidewalk and slab are reinforced longitudinally and latterally with ½-in. twisted bars, and a conduit for gas, electric wires and telephones is provided under the sidewalk. These rods were of mild steel. The force of the shock was sufficient to pull the ½-in. twisted rods into two parts, shatter the concrete which gave the bond, and

free the rods from any support. They then fell into the bottom of the conduit with no concrete other than a skin coat clinging to them. All the lateral rods at the point of maximum rupture were pulled apart in like manner, the reduction in section being from the original ½ in. to ¼ in. According to Mr. Hands, there seems to be no explanation why the rods which were pulled apart, had none of the conrete adhering to them. This is strange, he thinks, since the concrete must have furnished the bond which held while the rods were being pulled apart.

Concentrated Load Tests of Yellow-Pine Beams for Shear

Results Show Previous Horizontal Shear Values Used in Design Too Low, and 50 Per Cent. Increase Is Recommended

By L. R. Manville and C. R. Hill

PREVAILING unit stresses in horizontal shear now in use in computing the strength of timber beams are misleading, since they have been established from tests in which two concentrated loads were applied invariably at the third points of the beam span, whereas the position of the applied loads on the beam has a decided influence on the resistance a beam offers in horizontal shear. It is the aim of this article to discuss results of experiments showing how such shear values are so influenced, in order that the computation and unit stresses used in the investigation of old beams, or the design of new beams, may be more intelligently applied. Longleaf yellow-pine beams only were tested and will be considered in this discussion.

Two Main Factors in Beam Design.

The four conditions of stress which should receive consideration in beam design are cross-grain bearing, shear across the grain, shear with the grain, and flexural bending. While the wood fibers take a permanent set at about 600 lb. per square inch in cross-grain bearing this condition is not critical. If any bearing of reasonable width and length is furnished, high bearing stresses should cause little concern, as the local distress in the timber fibers over reaction points, impairs but little the sustaining power of the beam itself. Likewise, cross-grain shear is not a critical stress, the unit vertical shear being equal to the unit horizontal shear, as wood will withstand a unit stress in cross-grain shear several times greater than in horizontal shear. With these two eliminations, timber beam design can then be confined to two considerations—flexural bending and horizontal shear along the grain of the wood fibers.

Flexural Bending—In proportioning a beam for flexural bending stresses, the procedure is familiar, and the strength of beams in bending has been well established by extensive tests—the usual unit designing stress for timber of longleaf yellow-pine grade varying from 1200 to 1600 lb. per square inch will no doubt fulfill all requirements for beams (the ratio of span length to depth of which is within practical limits), irrespective of load positions.

Horizontal Shear—The factor of horizontal shear in a beam in which the ratio of length to depth falls below 10 to 12 usually gives a more critical computed stress than flexural bending. In other words, in beams having a ratio of length to depth less than the ratio of unit stress employed in bending to unit stress employed in shear, the factor of horizontal shear should receive consideration.

Modern Tests

The latest tests, which are reported in the 1912 bulletin of the United States Forest Service and the 1909 bulletin of the University of Illinois, were applied to timber of so-called merchantable grade, passing ordinary commercial inspection. Results of these tests for longleaf yellow pine give an average ultimate bending stress of approximately 5000 lb. per square inch and an average ultimate horizontal shear of about 300 lb. per square inch. Some failures in horizontal shear occurred at 188 lb. per square inch and the reports record a large percentage of failures as taking place in horizontal shear, rather than by tension or compression in bending. As a result, design unit stresses are recommended as low as 120 lb. per square inch for longleaf yellow pine in horizontal shear. (Approved by the American Railway Engineering Association.)

Position of Applied Loads Affects Results—The tests just mentioned were practically all made with two concentrated loads placed at the third points of the beam span. No tests were made to examine the strength of the beam in shear with concentrated loads placed near the point of support where a designer would ordinarily place such a load in order to compute the maximum horizontal shear to proportion properly a given beam for shearing stresses.

It is a fact, as the tests about to be described indicate, that with concentrated loads nearer the point of support than the third point, the resistance a beam offers in horizontal shear becomes very much greater. Hence, if a designer were to determine the size of a beam required to carry a moving load by placing the load in such a position as to obtain the maximum computed horizontal shear—that is, near the point of support—and then use the low unit stress of 120 lb. per square inch (as recommended from tests based on the third-point loadings) he would in most cases find that much larger beams would be required than would be actually necessary, and a waste of material would result therefrom.

With the loads near the point of support, beams will

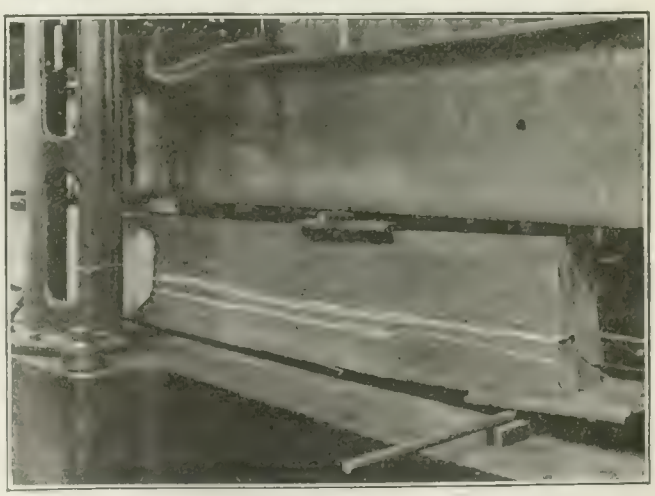


FIG. 1. SPECIMEN IN TESTING MACHINE SHOWING FAILURE BY HORIZONTAL SHEARING

not, in all probability, fail in horizontal shear before they fail by crushing, either under the load or over the reactions. Loads near the points of support produce local compression of the fibers, helping to resist better the tendency of the fibers to slip along each other. In the case of a single concentrated load, this local effect many be sufficient to produce enough friction of wood on wood to overcome largely the tendency toward horizontal shear movement.

In a series of tests on 31 longleaf yellow-pine timber beams of 4 x 10-in. commercial size which have recently been completed by the authors, the effects of the posi

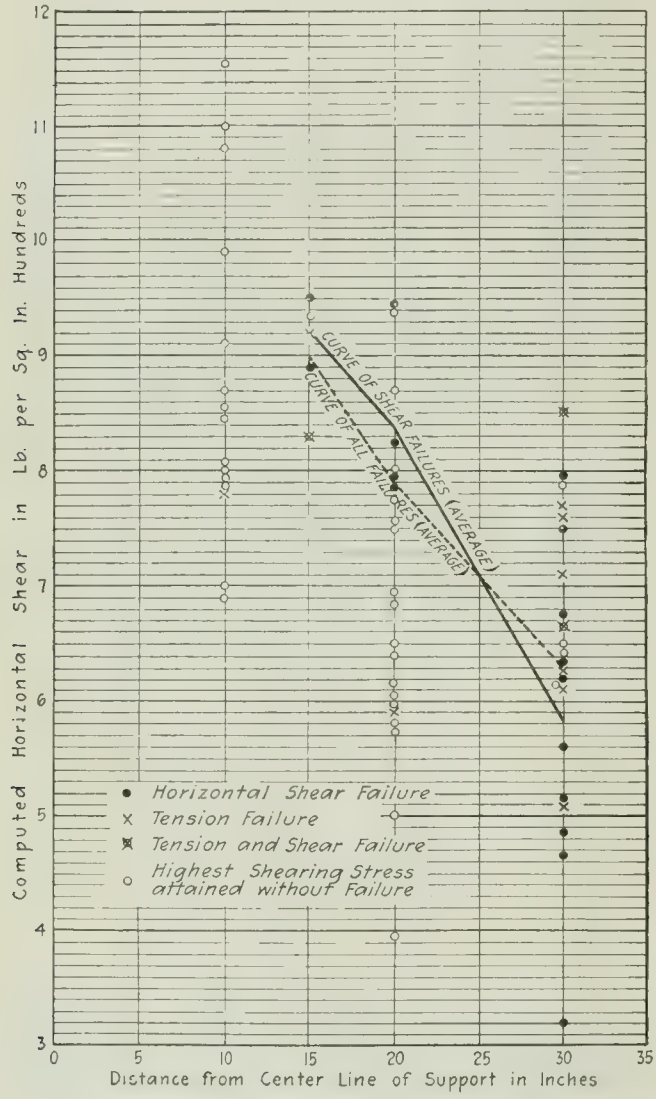


FIG. 2. VALUES OF MAXIMUM HORIZONTAL SHEARING STRESSES IN TEST BEAMS

tion of the applied loads on the beams received special study. Ten of the specimens were creosoted, and practically all of them were 8 ft. long. In general, all sticks were tested according to the following outline:

1. The loads were applied to the beam at a distance from the center line of the reaction equal to the depth of the beam. The load was relieved only when the beam showed distress in cross-grain bearing. A study was made of the distortion of the wood fibers by means of strain gages, to show the local distribution of the loads.

2. After no signs of horizontal shear failure appeared under loading 1, the center lines of the loads were moved away from the supports to a distance of twice the depth of the beam, or occasionally 1½ times this depth. In this position, care was taken to keep the stresses within the elastic limit of the material and to determine about what stresses in horizontal shear the beam was able to stand safely. In a few cases, the load was increased to failure in order to get a fair failing value with the loads in this position.

3. In the larger percentage of the sticks an effort was made to carry such specimens through steps 1 and 2, and then finally to place the center of the applied loads at a distance from the center line of the support equal to three times the depth of the beam, which is the third point of the beam used in these tests, and hence conforms to the two-point loading generally used. With the loads in this position, the beam was tested to failure in order to arrive at a reasonable comparison of the strength of the timber used in these tests with the timber used in other tests.

Results of Tests

By a comparison of the results obtained with the loads at step 3 with the loads at 1 and 2, the effect of the position of the applied load upon the resistance a beam offers to horizontal shear can be directly studied. The diagram, Fig. 2, indicates that very much higher shear values result with the load near the support. This diagram gives the maximum computed stresses in horizontal shear plotted with reference to the position of the applied load. It is upon these plotted results that the most important conclusions reached in these tests will be based.

Fig. 3. gives the results of extensometer readings

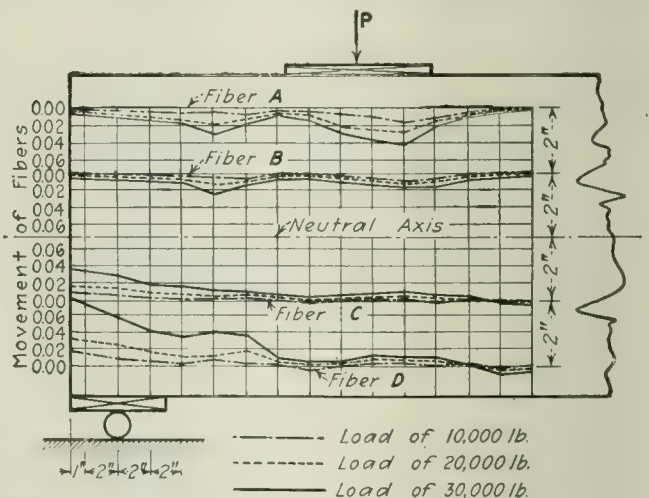


FIG. 3. DISTRIBUTION OF HORIZONTAL FIBERS NEAR SUPPORT

taken near the load points, showing how the fibers are locally compressed with the load near the end of the beam, and how such local compression may create friction which reacts against the tendency toward horizontal shear failure. Specimen 30 was tested with one concentrated load placed at various points on the beam instead of two loads symmetrically placed. The results indicate no change due to this manner of loading. Beam 31 was tested after the stick had been sawed in half along the neutral line. An attempt was made to measure the loads carried, before slipping took place along the neutral axis. No consistant results were obtained, but the beam carried a considerable load, due

to the friction between the halves of the beam and along the neutral axis, before slipping took place.

Comparison With Other Tests—The average horizontal shear failure in these tests with loads applied at the third points of the beam span was 580 lb. per square inch, which is considerably higher than the results obtained by the Forest Service as reported in the 1912 bulletin, or the University of Illinois in its 1909 bulletin. Their results averaged around 315 lb. per square inch. Photographs of their test specimens, however, indicate large knots and irregular graining in many sticks such as would lead one to believe that the timber would not exactly qualify under the inspection

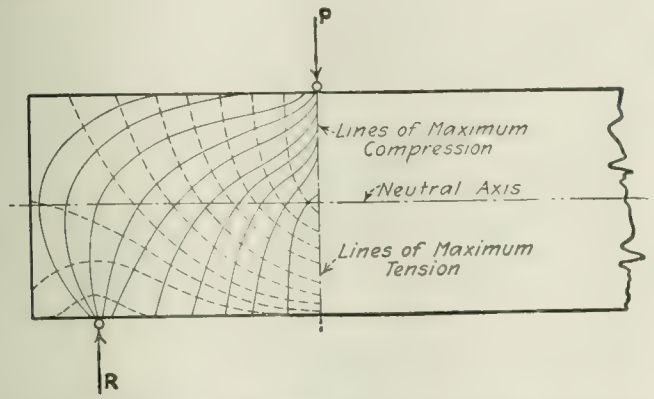


FIG. 4. LINES OF COMPRESSION AND TENSION SHOWING EFFECT OF LOAD DISTRIBUTION

requirements of the U. S. Forest Service—1915—used for the selection of beams here reported.

Observations and Conclusions

1. These tests bear out the fact that with a concentrated load placed a distance from the end support of a beam equal to the depth of the beam, the beam will hold as much as the timber will stand in cross-grain bearing over the supports, and that no horizontal shear failure may be expected. Deflection in a beam is necessary before horizontal shear failure can result; in other words, there can be no tendency toward horizontal slipping of the wood fibers unless there is an accompanying vertical deflection, and such deflection is relatively small with the load near the support.

2. It is recommended that for the strength of beams in horizontal shear values roughly 50% greater than ordinary design unit stresses may be used if the unit shear is computed by the usual method, if heavy concentrated loads occur near the point of support, or within, say, 1½ times the depth of the beam.

3. Design unit stresses in horizontal shear such as 120-lb. per square inch for longleaf yellow pine appear to be very conservative for application to maximum end shear under concentrated loads, although no doubt within safe desig limits with a load three depths of the beam from the support. This stress could be increased as recommended above for applied loads nearer the reaction.

4. Timber inspected and graded under the rules proposed by the United States Forest Service, dated 1915, which would largely eliminate critical defects, may be used with higher unit stresses, especially in horizontal shear in which defects such as checks and shakes so often play an important part.

Rainfall Records at Muscatine, Iowa

RECORDS of 73 years of rainfall and melted snow show an annual average of about 37 in., a maximum of 74.5 in. in 1851 and a minimum of 23.04 in. in 1910, according to a paper presented at the meeting of the Iowa Section of the American Water Works Assiation by William P. Molis, superintendent of waterworks, Muscatine, Iowa. For the first 30 years the annual average was 39.34 in., while for the second 30 years it was 36 88 in. The maximum and minimum monthly records were 8.58 in. for September, 1911, and 0.12 in. for November, 1914. One of the accompanying tables gives the complete 73-year record, while the other shows all rainfalls since 1900 in excess of 15 in. in 24 hours.

TABLE I. AVERAGE RAINFALL AND MELTED SNOW AT CA TINE, IOWA, FROM 1846 TO 1919

Year	Inches	Year	Inches	Year	Inches
1846	34 55	1872	35 41	1896	34 4[illegible]
1847	28 50	1873	28 43	1897	49 7[illegible]
1848	39.62	1874	34.78	1898	34 08
1849	59 16	1875	37.59	1899	27 26
1850	49 08			1900	32 30
1851	74 50	Average	34 63	1901	24 50
1852	59 39			1902	47 57
1853	44.92	1876	53.57	1903	33 68
1854	23.66	1877	44.78	1904	28 22
1855	31.13	1878	39 30	1905	32 59
		1879	33 83		
Average	44.45	1880	35.78	Average	34.44
		1881	45.66		
1856	41.94	1882	46 67	1906	29 51
1857	34.85	1883	41.12	1907	34 26
1858	58.45	1884	45.49	1908	38 31
1859	35.96	1885	39.34	1909	37 62
1860	25.10			1910	23.04
1861	44 23	Average	42.55	1911	39.40
1862	53.16			1912	26 50
1863	28 85	1886	34.22	1913	30 94
1864	32.77	1887	28 30	1914	23.67
1865	34.21	1888	38 89	1915	35 70
		1889	33.49		
Average	38.95	1890	30.30	Average	31.95
		1891	34.90		
1866	32.86	1892	49.71	1916	33 29
1867	32.24	1893	30.68	1917	26 07
1868	40.91	1894	27.82	1918	37.44
1869	43 36	1895	28.09		
1870	24.61				
1871	36.11	Average	33.64	Average	32 27

TABLE II. RAINFALL OVER 1.5 IN. IN 24 HOURS SINCE 1900 AT MUSCATINE, IOWA

Dec. 12, 1904	2 00	Aug. 15, 1908	1 65	Sept. 5, 1914	2 20
Dec. 27, 1904	1 56	Aug. 28, 1909	2 47	May 26, 1915	2 05
Jan. 6, 1905	1.50	June 10, 1909	1 70	Sept. 10, 1915	2 80
June 9, 1905	2 57	Aug. 27, 1909	1 90	Jan. 26, 1916	1 75
July 1, 1905	1 78	Nov. 7, 1909	1 54	Mar. 2[illegible], 1916	1 95
Oct. 16, 1905	2 77	July 28, 1911	1 55	May 1[illegible], 1916	2 02
May 23, 1907	1 45	Sept. 11, 1911	2 00	Sept. 7, 1917	1 50
July 8, 1907	1 86	July 20, 1912	1 77	May 23, 1918	2 00
July 10, 1907	2 10	Oct. 10, 1912	1.94	July [illegible], 1918	2 35
Aug. 15, 1907	1 85	May 1, 1913	2 50	Aug. 17, 1918	1 80
Aug. 11, 1908	3 15	June 22, 1914	1 54	Mar. 16, 1919	3.50

Approximate Timber Resources of the United States

Until a complete census of our timber resources is made, the United States Forest Service states, it hesitates to make any estimates as to the number of years the supply of timber will last, "as there is not available in the United States today reasonably accurate knowledge regarding our remaining timber stands and the rate of growth on cut-over lands. Timber estimates have been made from time to time in various parts of the timber areas of the United States, but different methods were followed, and none of these estimates has been complete in regard to areas covered for the regions that supply the timbers. Roughly, however, the present stand of cypress is estimated at 25 billion board feet; sugar pine, 35 to 40 billion; Eastern red cedar, 1½ to 2; basswood, 8 to 10; yellow poplar, 10; red gum, 40 to 45; Port Oxford cedar, 1 to 2; Eastern white pine, 25; Western white pine, 20 to 25; Eastern spruce, 25; Sitka spruce, 10 to 12; Englemann spruce, 25 billion."

Visualizing the Recent Pandemic in Army Camps

Use of Spot Maps, Growing Columns and Case-and-Rate Curves for Studying Progress of Influenza and Pneumonia in Cantonments and Other Stations

By George A. Soper,
Major, Sanitary Corps, United States Army

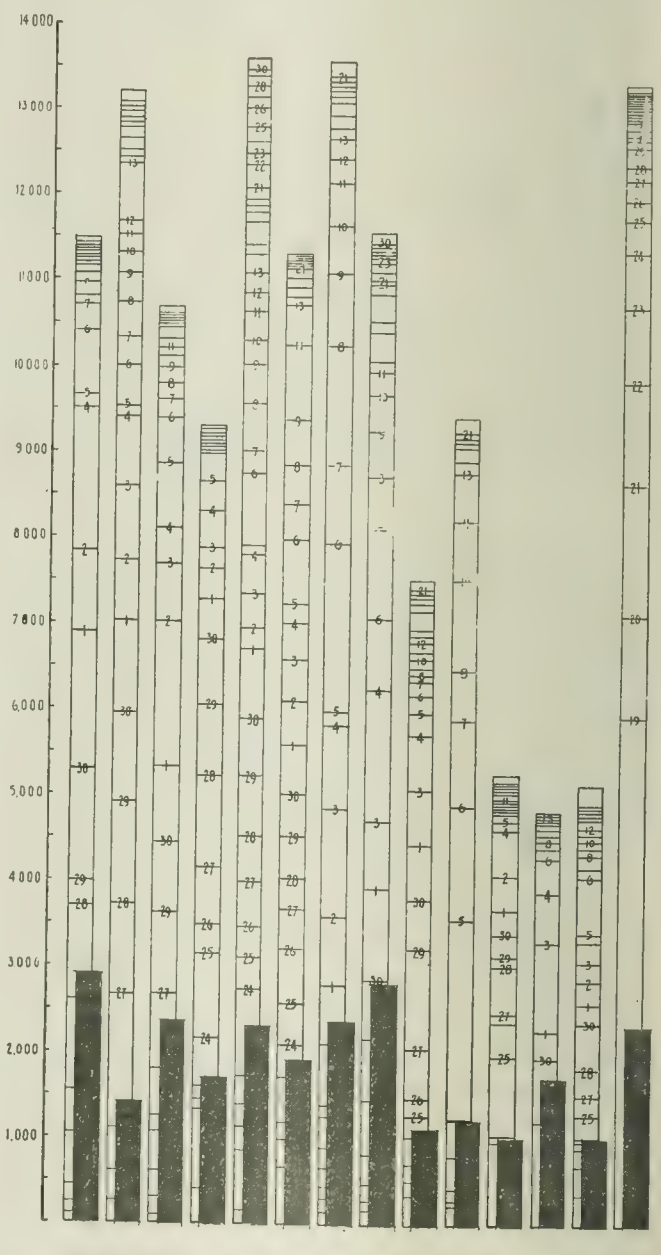
AMONG the manifold uses to which graphic representations of data may be put, none is of greater interest or importance than the illustration of statistics of disease. By this means the progress of an epidemic may be traced from its beginning to its end, its increase or decrease may be detected, and its magnitude compared with the magnitudes of other outbursts. Any peculiarity which makes one outbreak different from others of its kind, or from what might be expected, can be detected instantly. In this way the effect of repressive measures may be studied and clues obtained as to the conditions which accelerate and retard the spread of infection.

It was with these ideas in view that a system for visualizing the pandemic of influenza and pneumonia in the United States Army camps was instituted in the office of the Surgeon General in the early part of September, 1918. As soon as it became apparent that the pandemic constituted a serious danger to the camps, a scheme was devised by which the rate and conditions of spread could be observed continuously. The information which furnished the basis of this scheme was gained through a system of telegraphic reports. Each day a telegram was received from every camp or station where troops were located; it gave the number of new cases of influenza and pneumonia that had occurred in the preceding 24 hours. Another series of telegraphic reports received each week from the same sources provided a check on the number of cases of influenza and pneumonia and gave also the number of deaths which had occurred in the preceding seven days. From these two series of reports sets of tables were prepared and graphs were made to illustrate the facts.

The data obtained from the telegraphic reports were not entirely accurate. In many instances the immense amount of work which was put upon the camps in providing for the immediate needs of the sick made it impracticable to make up precise statistics of each day's occurrences. Nor was any great precision necessary. In the course of time, records deliberately made, revised and final would appear in the annual report of the Surgeon General, in the medical history of the war and in various particular reports and papers. What was wanted at the time from each camp, and what was obtained, was a good working knowledge of the number of cases and deaths which occurred from day to day. The data which are given in this paper, therefore, are to be taken not as the final records but as the best information which was available to the Surgeon General at the time when the pandemic was in progress.

The graphic work may be divided into four main parts: (1) A spot map showing where and how the disease was progressing across the United States; (2) growing diagrams which showed the daily increase in the number of cases and the deaths at the several camps and other stations; (3) a series of curves showing for each camp and other station the daily progress of the pandemic plotted to an accurate scale; (4) a series of diagrams of an analytical type, the object being not merely to illustrate, as in the previously mentioned graphic work, but to study some of the more important details of the several epidemics as they were reported. It is to this fourth group that attention is here invited.

1. *The Spot Map*—The foundation of the spot map was a map of the United States prepared by the Department of the Interior on a scale of about 40 miles to 1 in., lithographed on white paper. The outside dimensions were about 7 x 5 ft. This map was colored in low tones,



DAILY INCREASE IN INFLUENZA AND PNEUMONIA CASES AT PRINCIPAL ARMY CAMPS

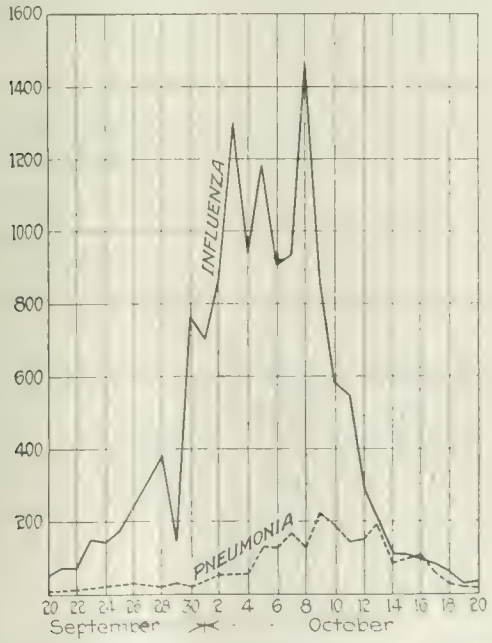
As new cases were reported they were added to the top of the "growing columns." The numbers on the columns are days of the months of September and October, 1918

in order that the several states might be easily and separately distinguished and the rivers and other details of the foundation be not unduly prominent. The names of the camps and other stations were typewritten upon heavy paper and cut out and pasted upon their proper places on the map to show the locations of the troops. The color of these slips, which were about ⅛ in. x 1 in., indicated the type of camp; white was employed for a tent camp, brown for a barrack camp, or, as it is generally called, a cantonment; blue was an aviation field, pink a port of embarkation, yellow was a general hospital, green was an arsenal, etc.

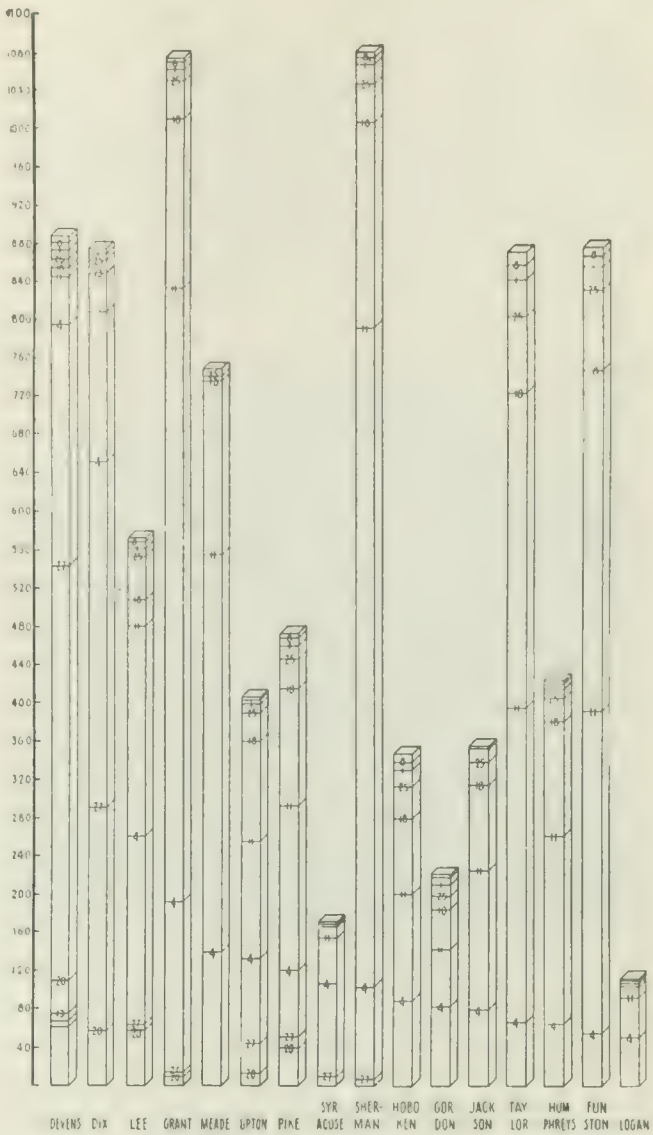
As soon as it became apparent that an epidemic had started at any point that place was spotted, and received two cardboard tags mounted on the ends of separate pins 1½ in. long. One-half of each tag was red and the other blue, the colors representing influenza and pneumonia, respectively. One tag was square, about ½ in. to the side, and the other was long, measuring ½ x 1½ in. On the short tags was written the number of cases, if any, which had occurred during the preceding week. On the long tags was given the number of cases reported from day to day. The tags were revised every 24 hours and completely changed each week.

2. *The Growing Diagrams*—The growing number of cases at the several camps was plotted upon cross-section paper about 3½ ft. high and several feet wide, fastened to the wall. The record of each camp was plotted as a rising band of red ⅝ in. wide. The number of cases reported each day was added to the top of the column as the epidemic progressed. Each top line, and former top line, became a guide to the relative rate at which the number of cases increased. A series of black columns, or bands, made in the same way, was plotted on the same piece of paper to show the cases of pneumonia which were reported. At the bottom of the columns were the names of the camps and their total strength. The vertical scale of cases and of deaths was 500 to the inch.

Deaths were indicated by a diagram approximately



TOTAL CASES OF INFLUENZA AND PNEUMONIA REPORTED DAILY BY ALL CAMPS AND OTHER STATIONS FOR MAXIMUM MONTH IN U. S.



WEEKLY PNEUMONIA AND INFLUENZA DEATHS AT ARMY CAMPS, SEPTEMBER AND OCTOBER, 1918

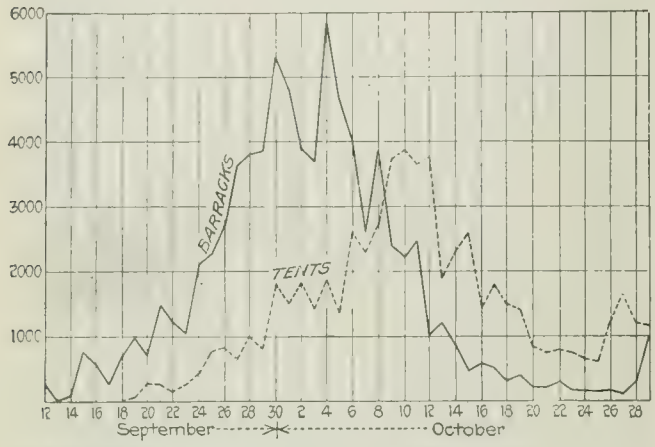
uniform in size and in method of plotting with the diagrams of cases. The rising columns were plotted as isometric solids and colored gray. The vertical scale was 40 deaths to the inch.

3. *The Progress Curves*—Curves representing the progress of each epidemic were plotted on section paper divided in inches and tenths. The horizontal scale was 0.2 in. per day; the vertical scale was 200 cases to the inch. In this way the daily incidence of influenza and pneumonia were plotted together, the influenza curve being in red ink and the pneumonia in blue.

4. *Analytical Graphs*—As the pandemic progressed it seemed desirable to represent the epidemics in the various camps not by the number of cases and deaths alone, but by these figures in relation to the number of troops present in the camp in each case; that is, by rates. This would eliminate irregularities due to changes in the total number of troops from which the sick were drawn. The rates were therefore calculated and were plotted in the same manner here described for the curves which represented the incidence of cases. The horizontal scale was ⅛ in. to the day; the vertical scale was 1 in. per 1500 cases per year per 1000 of strength. The medical department calculates practically all its

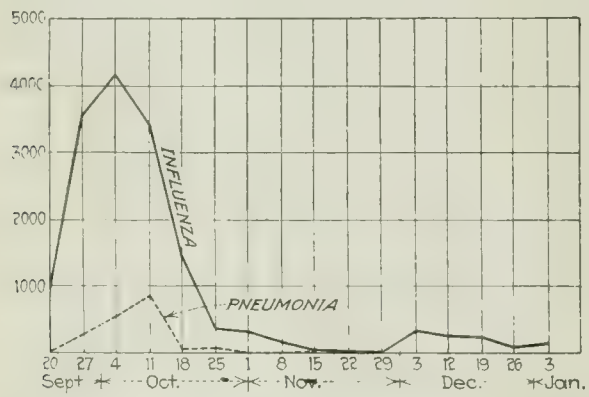
rates on the annual basis and as so many cases or deaths per thousand.

The curves made from the daily reports represented certain irregularities, and it soon became apparent that the daily telegraphic reports were not always accurate representations of the daily incidence of cases. To overcome these inaccuracies as far as possible smooth curves of incidence were made for each camp.



ADMISSION OR SICK RATES FOR INFLUENZA FOR ALL BARRACK AND TENT CAMPS

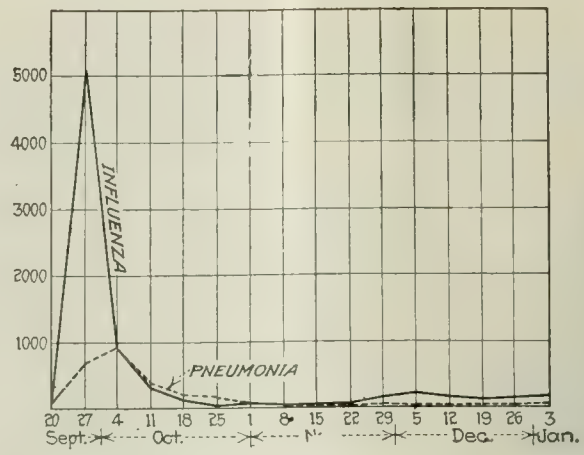
Early in the pandemic an attempt was made to establish a curve which would represent a typical epidemic in the average camp. It was thought that if this could be prepared it would be useful in foretelling the probable course of an epidemic in a given place. In order to make this typical curve the records of seven early and seriously affected camps were brought together in the following manner: The day of the epidemic's maximum prevalence was used as the datum. From this point forward to the end of the epidemic and back-



WEEKLY SICK RATES FROM INFLUENZA AND PNEUMONIA AT CAMP LEE, 1918

ward to its beginning, the average number of cases for the seven camps was plotted from day to day for nine days. The result was a composite curve of the daily incidence of influenza cases. A similarly typical curve was made for pneumonia. The two were plotted on the same sheet, the influenza in red and the pneumonia in blue. They proved to be very useful.

A number of interesting curves were made to represent the pandemic as a whole. Thus, the daily rates of incidence for the barrack camps were compared with the daily rates of incidence for the tent camps; it was found that the tent camps had much less influ-



EXPLOSIVE TYPE OF OUTBREAK AT CAMP DIX SHOWN BY WEEKLY SICK RATES

enza and their epidemics occurred later than was the case with the cantonments.

Finally, attention is again invited to the fact that the examples of graphic work which accompany this article are based on the statistical data which were sent to the Surgeon General of the Army in the stress of the pandemic and are not presented as final, official and complete records.

The New York State "Healthmobile"

At the Public Health Conference recently held at Saratoga Springs, N. Y., under the auspices of the State Department of Health, there was exhibited for the first time a "healthmobile," built for the educational work of the department. According to an official statement, "this is an automobile built especially for the purpose, and equipped with a stereopticon, a moving-picture machine run by power developed in the "healthmobile," and a number of interesting exhibits demonstrating the value of maintaining health and preventing infection. It is planned to send the "healthmobile" with a lecturer into communities remote from the railroads, so that people in the rural and sparsely settled parts of the state may have the same means of public-health education as is available to city dwellers."

St. Paul Meters 91.8 Per Cent. of Water Service

Water meters in St. Paul, Minn., handle 91.8% of the service, 97.7% of the domestic and industrial consumption and 65.8% of the total consumption, while 92.11% of the receipts for water is through metered service, and the revenue from sale of water is 72.66% of the Water Department revenue from all sources. At the end of 1918 there were 34,962 domestic meters and 2418 commercial meters, the latter of 1-in. size and larger. These averaged 136 and 2676 gal. per day, respectively. The average daily consumption was 61 gal. per inhabitant, 77 gal. per consumer and 395 per tap. The cost of supplying water was $37.66 per 1,000,000 gal., figured on the total maintenance, and including also interest on bonds and sinking fund, it was $69.24. These figures are from the annual report of the Board of Water Commissioners, which explains, however, that the city supplies only about 60% of the water consumption. The balance is from individual artesian wells, which have no direct connection with the water-works system and which, for the greater part, supply large consumers.

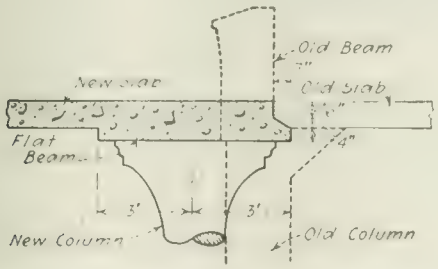
Concrete Building Addition Made at Reasonable Cost

Wartime Work Ran About Fifteen Cents Per Cubic Foot—Old Wall and Columns Torn Out and New Slab Joined to Old

THE total cost of building a large reinforced-concrete addition to a reinforced-concrete building in the Boston district during the war was found to be surprisingly low, in spite of high material and labor unit costs. The addition was made by the Hallet-Grant Construction Co., of Boston, for the A. C. Lawrence Leather Co., at Peabody, Mass. Leaving out some assistance noted hereafter from the owners' engineers, the shell of the building without the service appurtenances amounted to about 15.4c. per cubic foot. This included the cost of tearing out an old end wall and a line of columns, which about balanced the cost of building the usual fourth wall, which in this case was not necessary.

The new work was an 82 x 90-ft. addition to the old seven-story and basement reinforced-concrete building shown in the view. The end torn out had reinforced-concrete columns, with brick curtain walls and steel sash. The work was carried on between January and June of 1918, when the company had a large number of war contracts, and it was necessary to operate all of the old building possible, particularly in the second and third floor, where space clear up to the wall was required. Partitions were put up, as noted in the picture, in these two floors, but carried back a panel in the upper floor.

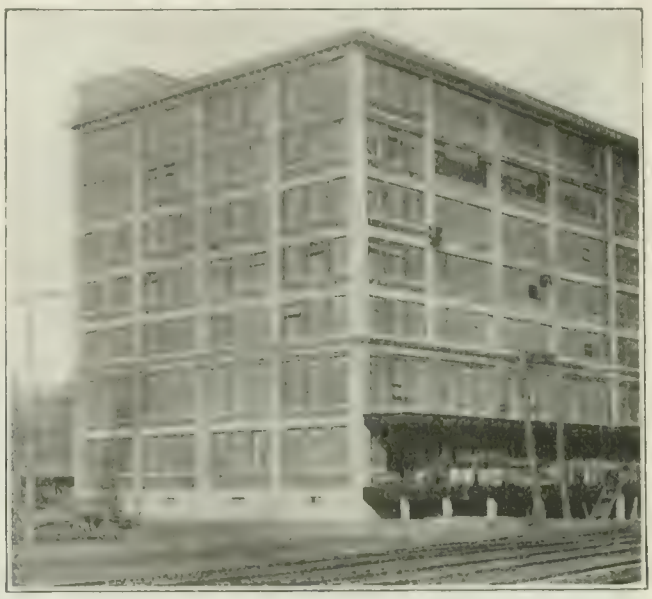
The owner wished to have the old square wall columns replaced with new round columns and to continue the two-way flat-slab system of the old floors through into the new structures. The work of carrying all of this old part out had to be completed before the new foundations for the addition could be put in place, as it was impossible for men to work near the old building on account of the danger of material dropping from above. However, the general excavation, which was about a



DETAIL OF CONNECTION OF OLD AND NEW FLOOR ON LAWRENCE, MASS., CONCRETE BUILDING

6-ft. cut in filled material, was carried along as near to the old work as possible, and some of the distant foundations were also put in. This method of jumping around with the excavation and foundation work tended to make the cost of these items even more than they would have been if the work could have been carried on more evenly. All foundations for the columns were excavated to 9 ft. below basement grade, mostly through muck, which necessitated sheathing each hole about 12 ft. square. A good gravel foundation was found at the required depth, so that it was unnecessary to go deeper than the nine feet.

The new structure was designed to carry 300 lb. live load for the first floor and 250 lb. for the floors above. A two-way flat-slab system was used throughout for the floor, the juncture of the new and old slabs being as shown in the accompanying sketch. The old columns, as noted above, were all torn out and the overhanging slabs carried on struts clear through to the basement. New columns were then placed, carrying a complete transverse beam 14 in. deep and 6 ft. wide, bracketed out to carry the old slab, rods from which were left to penetrate into the new slab. The transverse beam was of such width as to simulate on its outside edge the line



FOUR BAYS ADDED AT END OF REINFORCED-CONCRETE BUILDING FOR LAWRENCE LEATHER COMPANY

of the drop head to the flat slab in the other part of the floor.

The building was comparatively simple except for a 15-in. reinforced-concrete wall forming the basement wall and a heavy cornice and a belt course to complete the appearance of the older part of the building. There was one smoke tower, one concrete stairway and one elevator shaft. The shaft and tower were inclosed in 6-in. tile block, the tower being plastered on both sides and the elevator shaft on one side only. There were two penthouses on the new construction, the wall being of plastered terra-cotta blocks and the roofs being of concrete.

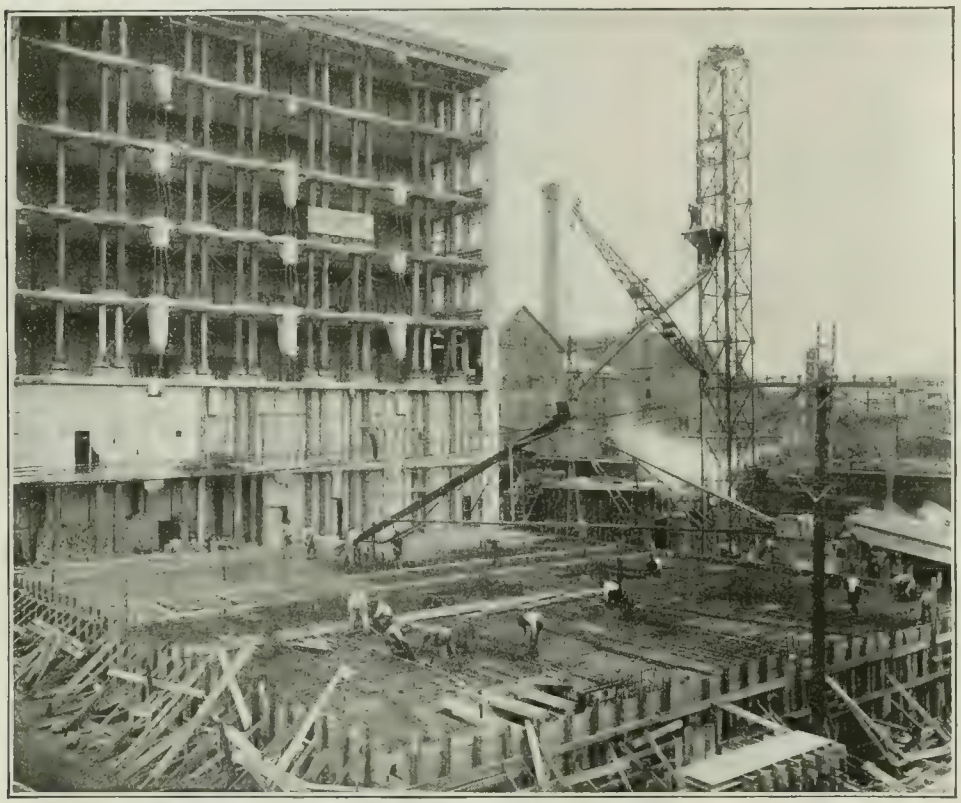
The exterior walls of the building were 12-in. panel brick walls, the face brick costing $26.75 per thousand and the common or backing brick $16 per thousand. Some few of the panels were 8-in. reinforced-concrete. Steel sash were used on concrete sills, the lights on the street side and two of the bays on the side away from the railroad track being of ¼-in. ribbed wire glass, while the rest of the sash was glazed with ¼-in. ribbed plain glass.

Labor conditions were the same as practically all over the country from June, 1918, to January, 1919. Common labor was paid at the rate of 50c. per hour, with time and a half for overtime. To hold the labor at all, it was found necessary that they receive quite a little overtime each week. Carpenters were paid at the rate of 70c. per hour, brick and tile layers, concrete finishers, and mechanics at the rate of 75c. per hour, all with double time for overwork. It was figured that there

were about 14 complete gangs on the work. The plastering, paving, steel-sash erection, plumbing, fire-door erecting and roofing were sublet.

Cement was delivered in bulk, with a saving, according to the contractors' figures, of about 25c. per cubic yard on the concrete. Stone was delivered by truck from a nearby quarry, and sand was shipped in on railway cars. The reinforcing steel was purchased by the owner.

The total cost, with the exception of the sheathing, cold-water paving, electric wiring, sprinkler system and elevator, was $100,108 for a cubical content of 658,000 cu.ft., which figures a unit cost per cubic foot of 15.4c. According to the contractor, the unit cost compared favorably with work done a few years ago when labor was receiving about half of what it receives on this work. The average unit prices for labor only on parts of the work are shown in the following table:



ADDITION TO CONCRETE BUILDING REQUIRED THAT OLD WALL COLUMNS BE TORN OUT

Concrete mixed and placed	$1.10	per cubic yard
Reinforcing steel in place	15.90	per ton
Forms in place	.107	per square foot
Brick face and common combined	15.60	per thousand
Granolithic finish	.105	per square foot
6x12x12-in. tile	.112	per square foot

All concrete was mixed in a ½-yd. mixer and placed from the spouting system shown in the view. Brick and tile were raised to the floor by machinery. In fact, the handling of all material on the job was done as little as possible by hand. Another saving was made by using corrugated metal for the floor forms in place of wood. The contractor states that the work ran along very well, and the low costs were largely due to the coöperation of the engineers and owner's engineer. He gave them every possible help. The plant also furnished steam to the construction boilers without cost to the contractor.

Gravel Aggregate Does Not Make Fire-Resistive Concrete

Fireproofing Committee of Concrete Institute So Concludes, From Tests and Experience, in Report Made to Last Convention

GRAVEL, particularly highly siliceous gravel, has been shown to be a poor sort of aggregate for concrete which may be subject to fire, according to the report of the Committee on Fireproofing of the American Concrete Institute, Walter A. Hull, chairman. The report was presented to the recent annual convention of the institute. The report summarizes the recent tests made by the Bureau of Standards, discussed in detail by Mr. Hull at the same convention, and summarizes, in the following paragraphs, these tests and structural experiences with gravel concrete:

The Bureau of Standards' column tests show, quantitatively, the relative effects of a standard four-hour fire test on various types of columns made with concrete from various aggregates. A thickness of 1½ in. of concrete was provided, outside of the steel, in all cases. The steel was probably more accurately placed in the forms than could ordinarily be expected in actual building operations. In most of the 18-in. round columns, temperatures between 550 and 600° C. (1022 and 1112° F.) were reached in the steel at the end of the four-hour fire test. In the 16-in. square columns, temperatures in the steel were above 600° C. (1112° F.). Steel at these temperatures has lost a large part of its strength. It is evident, therefore, that 1½ in. of protective concrete is not sufficient thickness for the proper protection of the steel where four-hour protection is required.

In three columns in which the protection had been increased 2½ in. by the addition of cement mortar in the form of plaster, with light mesh reinforcement, the temperatures in the steel at the end of the test were approximately 400° C. (752° F.). It is, therefore, recommended that in concrete columns where four-hour protection is required, protective material not less than 2 in. in thickness be provided, over the steel. In columns in which a high percentage of steel is used, increasing the importance of affording it ample protection, the thickness of protective material should be 2½ in. for four-hour protection, and special care should be given to the accurate placing of the steel in the forms, to avoid inadequate protection on one side.

Gravel Aggregate in Conflagrations

Previous fire tests have indicated that there is an important difference in the fire-resistive properties of different aggregates. Ira H. Woolson, in his final report to the American Society for Testing Materials of investigations of the fire-restistive properties of concrete made in 1905, 1906 and 1907, reported adversely on the pure quartz gravel which is extensively used in the vicinity of New York City. Shortly afterward, the British Fire Prevention Committee

reported adversely on the behavior of gravel concrete in a fire test of floor arches. Further evidence was developed by tests made by the Bureau of Standards and reported to the American Society for Testing Materials in 1917. These test results have been so consistent that it appears to have been well established that the physical properties of gravel, that is high in quartz content, are not such as to make it as suitable as other aggregates for fire-resistive concrete.

Investigation of the failure of concrete construction in recent severe fires clearly indicates that the damage was much greater than would have been the case if any one of a number of aggregates, other than gravel of high quartz content, had been used. This was especially true in the case of the fire at Far Rockaway, New York. This fire has been thoroughly investigated. A complete report of the fire and of the condition of the building, with conclusions attributing the damage in large part to the pure quartz gravel aggregate, was prepared for the National Board of Fire Underwriters by its consulting engineer, Ira H. Woolson. Copies of this report are obtainable. A further investigation was made by a special committee of the American Concrete Institute and a report presented by Richard L. Humphrey, dealing with the fire, the condition of the building and the methods used in reconstruction. Great importance was attached to the nature of the aggregate in this report.

To this evidence may be added that of two great factory-building fires which occurred in London in 1917. Both of these latter fires were of great severity and long duration. Both were started by an explosion. It was impossible to determine how much of the damage was caused directly by the explosion, but after thorough investigation the British Fire Prevention Committee attributed a large part of the damage to the inability of the Thames ballast (gravel) concrete to withstand the destructive stresses of a severe fire, as is shown by their reports, from one of which the following two paragraphs may be quoted:

"It is clearly shown that Thames ballast or gravel concrete is an unsuitable material for reinforced concrete in buildings where the risk of a severe fire has to be considered.

"Where a suitable aggregate or combination of materials is used in the future and the reinforcement accorded proper protection, only superficial damage need be expected, i. e., damage repairable without extensive reconstruction."

In the fire tests of concrete columns made by the Bureau of Standards, gravel-concrete columns were shown to be greatly inferior in fire resistance to columns having some other aggregates. While this applies to all types of columns, the contrasts were greatest in round columns, vertically and spirally reinforced, and in vertically reinforced square columns. It is probable that similar results would be obtained from all gravels made up largely of highly siliceous materials such as sandstone pebbles, quartz pebbles and granite pebbles.

Recommendations for Fire-Resisting Aggregate

It is clearly indicated that serious structural damage by fire in concrete buildings could be prevented in large measure by using, where it is economical to do so, either limestone, trap rock, blast furnace slag or burned clay aggregate and, where none of these aggregates can be used economically, by paying special attention to certain structural details. In the case of columns, there is evidence that vertically reinforced round columns, without spiral, resist fire better than square columns without spiral. This applies particularly to gravel-concrete columns. It does not appear to be true of columns made from the more suitable aggregates. Gravel-concrete columns having spiral reinforcement appear to be particularly susceptible to spalling. It has been found that the addition of 1 in. of cement plaster, held in place by light metal mesh, was sufficient to prevent the loss of the protective covering by spalling in the case of spirally reinforced gravel-concrete columns, and that columns so protected lost but little of their original strength in the four-hour test. There seems to be added merit in such protection in the fact that the thickness is uniform over the columns, whereas any inaccuracy in placing steel would result in protective concrete being thinner on one side than on the other.

The following recommendations are therefore made, pending further developments along this line:

1. That for fire-resistive construction, limestone, trap rock, blast furnace slag and burned clay be given a preference over highly siliceous gravels.

2. That in cases where gravel aggregate is to be used, with no additional protective material over the concrete, round columns be given a preference over rectangular ones.

3. That where gravel aggregate is used, all columns, but especially rectangular columns and round columns with spiral reinforcement, be given the additional protection of approximately 1 in. of portland-cement plaster either on metal lath or reinforced by light expanded metal.

Character and Cost of Highways For Motor Truck Use

Will Have Concrete Foundations, Will Be Not Less Than 20 Feet Wide and Will Cost From $35,000 to $40,000 per Mile

By S. Whinery
Civil Engineer, New York City

WHILE much is being written and said about the necessity of designing and building highways strong enough to withstand safely the use of heavy motor trucks, not much attention seems to have been given to the definite character, strength and dimensions of roads suitable for the purpose. No one is yet prepared to say with confidence what kind of road surface ultimately will be found best and most stisfactory for power-truck use. It seems reasonably certain that it will have a concrete foundation, and quite probable that it will be wholly concrete laid in two courses, with a comparatively thin surface treatment of liquid bituminous material and stone chips or gravel, to shield the concrete from abrasion, and renewed occasionally as may be necessary. Whatever the surface may be the concrete foundation must be largely depended upon to support safely the loads to be carried. With a minimum desirable width of surface of 20 ft., and trucks not greater than 7½-ton capacity, roads will probably cost from $35,000 to $40,000 per mile.

In considering the necessary thickness of a concrete-road foundation, it is not wise to place much confidence in the strength or supporting capacity of an earth subfoundation. Unless more care than is usual, or perhaps practicable, is taken in its preparation, it is likely to vary materially in uniformity and density in adjacent areas, and to settle or compress so unequally that the concrete over considerable areas will receive little or no support. The causes that lead to such irregular depression and settlement are so well understood by engineers that it is unnecessary to go into details.

In the great majority of cases, when a concrete foundation has broken down, it has been found to be due to the yielding or settling away of the subfoundation. The liability to yield or compress will increase with the intensity of the pressure, and, considering the inherent natural variations in strength and the probabilities of faulty preparation, it would seem to be prudent in planning streets and roads for the concentrated load of power trucks that the concrete foundation should be designed to carry safely the loads without support

from the subfoundation over circular areas at least 4 ft. in diameter.

Under such conditions, the concrete foundation acts as a circular plate fixed at its edge and loaded at its center. Many attempts have been made to analyze and formulate the stresses upon such plates, but, judging from the lack of agreement in the results reached, some of them differing more than 50% from others—it it is evident that the problem has not yet been satisfactorily solved. Nearly all the solutions proposed agree, however, in the introduction of a factor making the thickness a function of the square root of the load. This is rational, following as it does the accepted law of the strength of beams.

It has been suggested by the writer to the United States Bureau of Standards that the great industrial and financial importance of the proper design of pavement foundations would warrant that bureau in undertaking an adequate investigation of the strength of circular slabs of concrete fixed at their edges and loaded at their centers, and the devising of an empirical formula for their strength, but this would require considerable time. In the absence of any established or generally accepted solution, it seems proper to determine the thickness of concrete-road foundations upon the principle that this thickness varies with the square root of the concentrated load.

Now, experience has fully demonstrated that, for roadways designed for animal power service, where rear-wheel loads seldom exceed 2000 lbs.. a foundation of 1:3:7 concrete, 6 in. thick, is none too strong. In fact, many engineers advocate and specify 7 or 8 in. But accepting 6 in. as a sufficient thickness under a wheel-load of 2000 lb., and applying the principle that for other loads the thickness should be proportionate to the square root of the load, we obtain the following results for some common power trucks:

3½-ton truck, rear wheel load 5700 lb
$\sqrt{2000} : \sqrt{5700} :: 6 : 10.13$
5-ton truck, rear wheel load 8500 lb.
$\sqrt{2000} : \sqrt{8500} :: 6 : 12.37$
7½-ton truck, rear wheel load 10,500 lb
$\sqrt{2000} : \sqrt{10500} :: 6 : 13.75$

Impact Not Considered

These figures make no allowance for increased impact due to the much higher speeds at which the power trucks are operated. Loaded horse-drawn wagons seldom exceed 3 miles per hour, while loaded power trucks average three or four times that speed. While no velocity factor appears in most of the impact formulas accepted by bridge engineers, there is reason to believe that it is a factor of some importance in the effect of vehicle wheels on the more or less uneven surface of highways, and it would seem wise to make some allowance for it in designing roads for motor-truck use.

However for further discussion assume, in round numbers, that foundations of plain concrete for roadways designed for the use of power trucks should have, *at least*, the following thickness: For 3½-ton trucks, 10½ in.; for 5-ton trucks, 12½ in.; for 7½-ton trucks, 14 in.; or, if the concrete is reinforced, such dimensions as will give equivalent strength and rigidity. But the use of reinforced concrete in city or town streets, or in surburban highways underlaid with pipes, conduits, etc., where the roadway must be dug into for construction or repair, is of doubtful expediency.

It is apparant that the paved roadway, as usually constructed on rural highways, is much too narrow, especially where the travel is somewhat dense and of mixed character. Without going into details, it may safely be predicted that main highways for the use of such travel should have a paved roadway not less than 20 ft. wide, with macadam shoulders not less than 3 ft. wide on each side. A graded width of at least 35 ft. ought to be provided.

Estimated Cost

How much are highways of the character we are considering likely to cost?

Estimates based upon the present high cost of materials and labor would doubtless be misleading, for there is every reason to believe that prices will recede. They are hardly likely, however, to fall below those of the early years of the war—say in the working season of 1916—for several years, and estimates based on those prices may be considered reasonable. Of course, prices vary in diferent parts of the country. In the estimates presented in the table, the prices of materials and labor are those quoted for Chicago in June, 1916. The cost of the items "grading," and "bridges and culverts," used in the estimates, are the average estimated cost per mile on 25 Federal-aid road projects approved by the Secretary of Agriculture. (See "Year Book of the Department of Agriculture," 1917, pp. 266-9.) These projects are scattered through several states, in and east of the Mississippi Valley, and presumably represent a fair average.

ESTIMATED COST OF ONE MILE OF HIGHWAY DESIGNED FOR THE USE OF FIVE-TON POWER TRUCKS

Paved roadway 20 ft. wide, with 8-in. macadam shoulders 3 ft. wide. Plain two-course concrete 12½ in. thick, with bituminous carpet coat

Real estate, right-of-way	$ 50.00
Advertising, printing and legal expenses	100.00
Grading	2,200.00
Bridges and culverts	880.00
Minor drainage	200.00
Concrete base, 1:3:7, 10⅜ in. thick—3422 cu.yd. at $6.50.	22,243.00
Concrete surface, 1:2:4, 2 in. thick—652 cu.yd. at $8.50.	5,542.00
Bituminous carpet—11,733 sq.yd. at $0.20	2,347.00
Macadam shoulders, 8 in. thick—3520 sq.yd. at $1.00	3,520.00
Forms for concrete	280.00
Engineering and inspection, 4½%	1,677.00
Administration, 2½%	932.00
Sundries	200.00
Total cost per mile	$40,171.00

If the road is designed for the use of 7½-ton trucks, all the items would be practically the same, except the concrete. If the base course is 11 in. and the surface course is 3 in., the increased cost would be about $3000—a total cost of about $43,000 per mile. The substitution, if thought permissible, of reinforced for plain concrete would probably reduce the cost of the concrete items about 15 per cent.

The tendency at the present time seems to be to limit the use of power trucks to the five-ton class, and, if this should be done, we reasonably may expect that roads suitable for their use will cost from $35,000 to $40,000 per mile.

Slope of Ladders and Inclines

In placing ladders, the preferred angle is 75° and the critical or minimum angle 50°, according to information prepared by the safety engineering department of the Workman's Compensation Service Bureau. For ramps or inclines the angles are 15° and 20° respectively, but these apparently relate to ramps for walking and not for wheeling.

Fabricated-Ship Plant Planned for Later General Use

Mobile Shipbuilding Company Forced to Revise Steel Design to Make Use of Timber at Birmingham Shop for Fabricating Ship Material

By M. E. Allen
Assistant General Manager, Birmingham Steel Corporation, Birmingham, Ala

ONE of the very few fabricating plants in the country, erected and designed primarily for the purpose of producing steel ship material, was recently completed by the Mobile Shipbuilding Co. at Birmingham. The main structural shop was planned for efficient operation in handling material in direct course through the building, from the raw-material yard at one end to the finished-material yard at the other, not only for ship fabrication but for later use in more general fields. After complete designs had been made for a steel mill building type, the War Industries Board refused to allow steel to be used for the buildings, and a combination timber and steel main shop building was designed. The relative costs are given.

During the early summer of 1918, the Mobile Shipbuilding Company, of Mobile, Ala., received a contract from the United States Shipping Board for the construction of twelve 5000-ton steel cargo vessels, a duplicate of a contract which they were at that time executing. Since practically all of the fabricating capacity of the country was then occupied in essential Government work, it was evident that the company would have to provide its own fabricating plant. An arrangement was therefore made with the Emergency Fleet Corporation whereby a fabricating plant could be constructed in Birmingham, Ala., primarily for the purpose of fabricating steel for these vessels.

Plans for this fabricating plant were commenced in August, 1918. It was desired to make provision for supplying the shipyards with fabricated steel at the rate of 4000 tons per month. All of the structures and buildings were designed of steel, and contracts for furnishing and erecting were awarded in September. It was then found that the War Industries Board would not grant a permit for the steel required, on the basis that it was not absolutely essential, and that a timber frame could be used. Accordingly, the structures were all redesigned for the use of timber.

Relative Costs

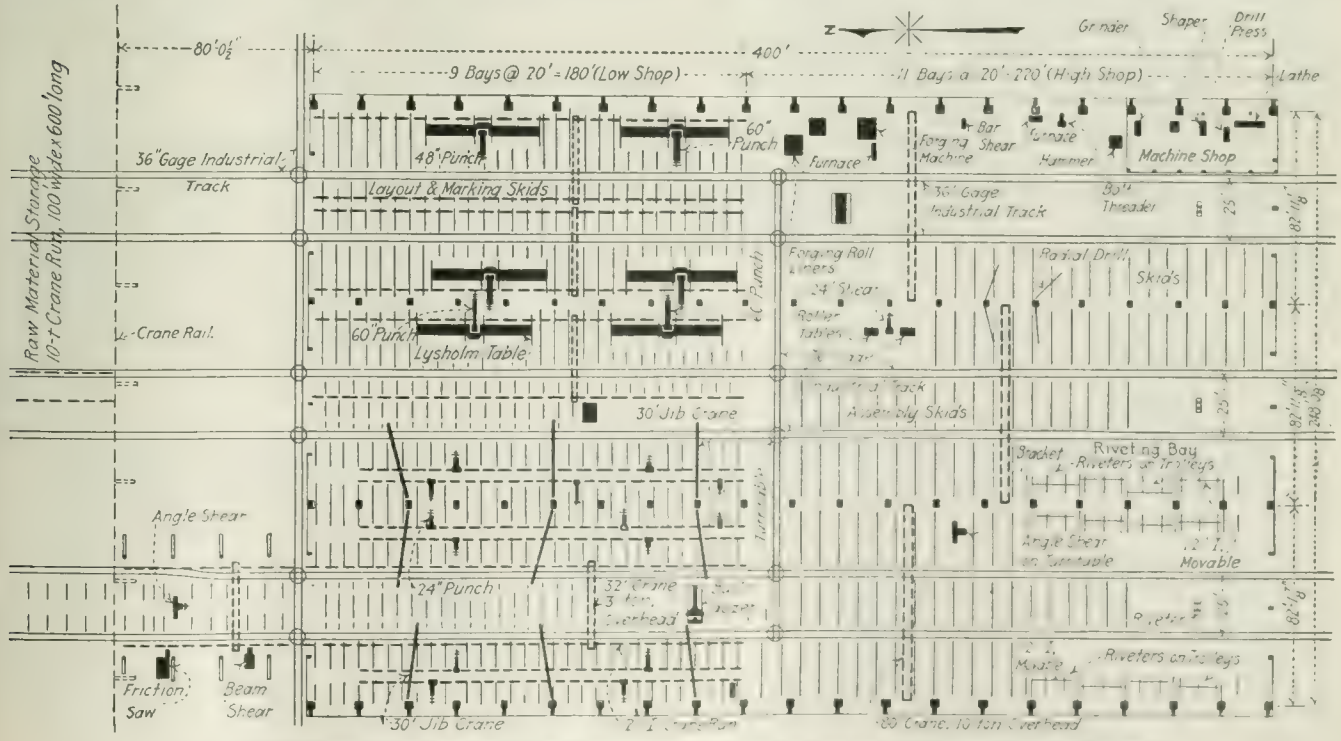
The quantities and cost of the steel frame design of the shop building were as follows:

Estimated total cost, exclusive of equipment, $300,000—including 1680 tons of steel, estimated at $140 per ton erected.

The total cost of $900,000 for the plant, as constructed, is made up as follows:

Structural shop	$215,000
Templet shop	7,000
Brick office building	40,000
Motor generator building	3,000
Machinery and electrical equipment	450,000
Fire protection system	35,000
Yard crane runways	50,000
Plant tracks, grading and miscellaneous items	100,000
Total	**900,000**

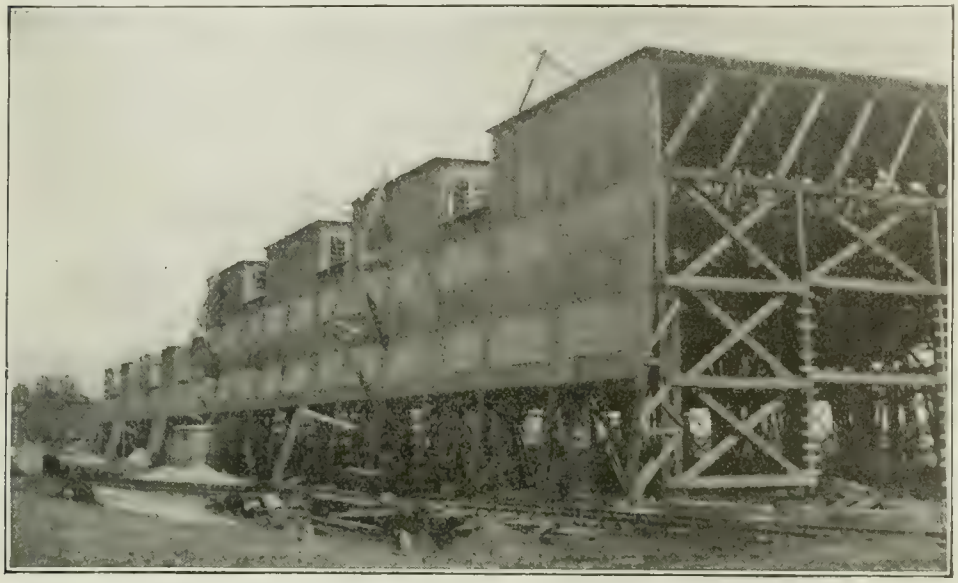
General Layout—At the north end of the main shop building, as illustrated in the ground plan herewith, is a raw-material crane runway 100 ft. wide and 600 ft. long. On the standard-gage track in the center of this yard, 12 to 15 cars of raw material can be stored at one time. Instead of the usual crane-girder bridge, two crane trusses of the Pratt type, 12 ft. apart and 12 ft. deep at the center, with curved upper chords, are used. The five-ton two-motor Shepard electric hoists are operated on the bottom chords, consisting of two 12-in. 20½-



PLAN OF SHOPS, SHOWING ARRANGEMENT OF MACHINERY, TRACKS AND CRANES

lb. channels. The maximum elevating capacity for the two hoists is 10 tons, five tons for each hoist. The plans contemplate two bridges, but at present only one has been installed.

The main shop building, designed as a combination timber and steel structure, approximately 250 ft wide, has three 80-ft. bays 400 ft. long, with an extension 40 x 80 ft. on the north end of the center portion.

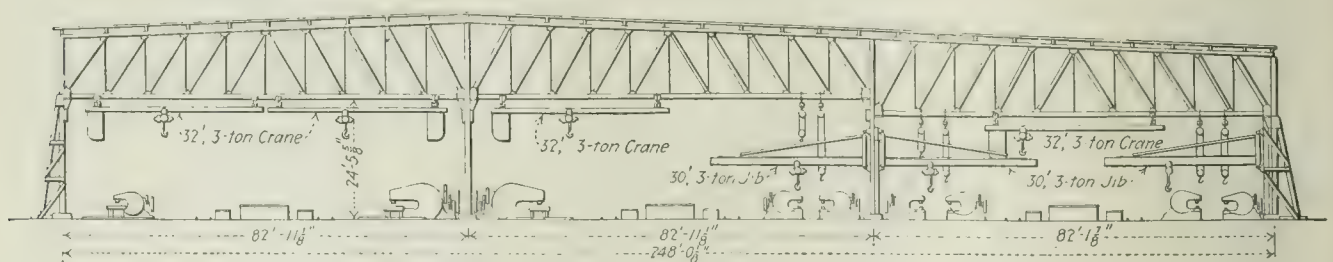


VIEW FROM SOUTHWEST CORNER—HIGH-LOW-BAY END OF THE MAIN BUILDING

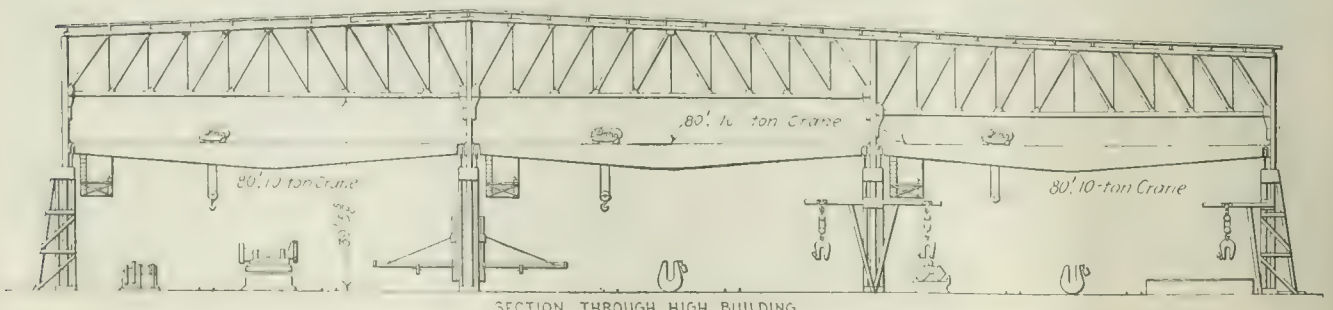
One end is of low-roof construction, and the other of the high-low roof type of construction. The low-roof construction, for a length of 180 ft. at the north end, is built with the lower chord of the roof trusses varying from 21 to 24½ ft. above the floor of the shop. The south end of the building, 220 ft. in length, is from 36 to 40 ft. from the floor to the lower chord of trusses. This difference in height is required, to allow the necessary clearance for cranes to handle large units in the fabricating process. In the high portion of the shop 80-ft. 10-ton eelctric traveling cranes handle the assembled material to the riveters and assembling skids. In the low portion of the building, wnere the punches are placed, it is not expected to handle material over two or three tons as a maximum. Light three-ton traveling cranes serve this portion of the shop, and their travel is limited to the point where the larger 80-ft. cranes operate.

Machinery Layout—Each of the three 80-ft. bays has two industrial tracks 25 ft. apart and approximately 29 ft. from the adjoining columns. These tracks extend outside of the building to the center of the raw-material storage yard and likewise to the center of the finished-material storage yard planned for the future at the south end. There are three rows of turntables to serve the transverse tracks. Only two rows are shown, the other being about 10 ft. south of the south end of the building.

In the west unit of the shop and the west half of the central unit it is planned to fabricate all of the structural work, while the plate work is to be done in the east half of the central unit and the west half of the east unit. The material will be delivered to the layout marking skids either by the industrial tracks or by the 32-ft. traveling cranes, and after being laid out and marked will be handled by the 30-ft. jib cranes on each of which operates a three-ton electric hoist. Jib cranes carry the material from the marking skids to the skids adjacent to the machines, and from these it will be handled by two-ton chain hoists suspended on trolleys from 12-in. I-beams arranged longitudinally over the punches. In the plate shop are five 60-in. punches and one 48-in. punch, each equipped with a Lysholm table and a 32-ft. three-motor electric traveling crane to handle the material from the plate-marking skids to the



SECTION THROUGH LOW BUILDING



SECTION THROUGH HIGH BUILDING

CROSS-SECTIONS THROUGH MAIN BUILDING LOOKING SOUTH—ARRANGEMENT OF CRANES

table and from the table to the industrial tracks or to the high portion of the shop where the shears and countersink drills are placed.

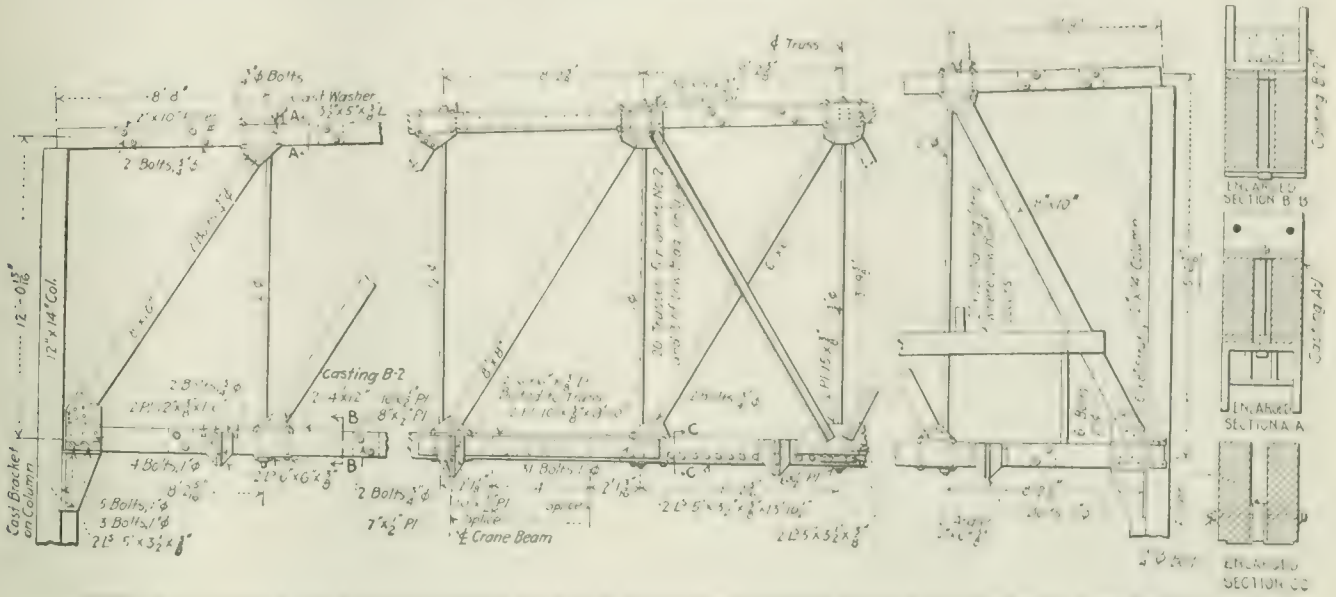
In the southeast portion of the shop, for a width of 30 ft. and a length of 60 ft., are the machine tools necessary for the upkeep of the machines. In the southeast part of the building are blasksmith tools and furnaces. Here 10 x 30-ft. plate furnaces, with a bending floor at each end, are being installed.

Plans for the finished-material storage yard provide for a runway 400 ft. long and 80 ft. wide, served by two 15-ton electric traveling cranes. Of this runway 80 ft. will be placed under cover for the purpose of installing a milling machine and providing space for such work as riveting. The original plans included the design of a structural shop four units in width, and the foundations have already been provided for the fourth unit, although it is doubtful that this will be constructed in the near future.

Planning the Layout—The considerations in the design of this layout, planned to insure the most direct and rapid progress of materials through the shop, were governed by the desire to provide a plant that would not only be particularly adapted to fabrication of ships as its primary purpose, but also to the fabrication of a general line of structural steel for bridges, tanks and framed buildings. With the dual purpose in mind, all tools were placed on heavy timber foundations to permit moving at no great expense if change in character of work warranted rearranging the tools.

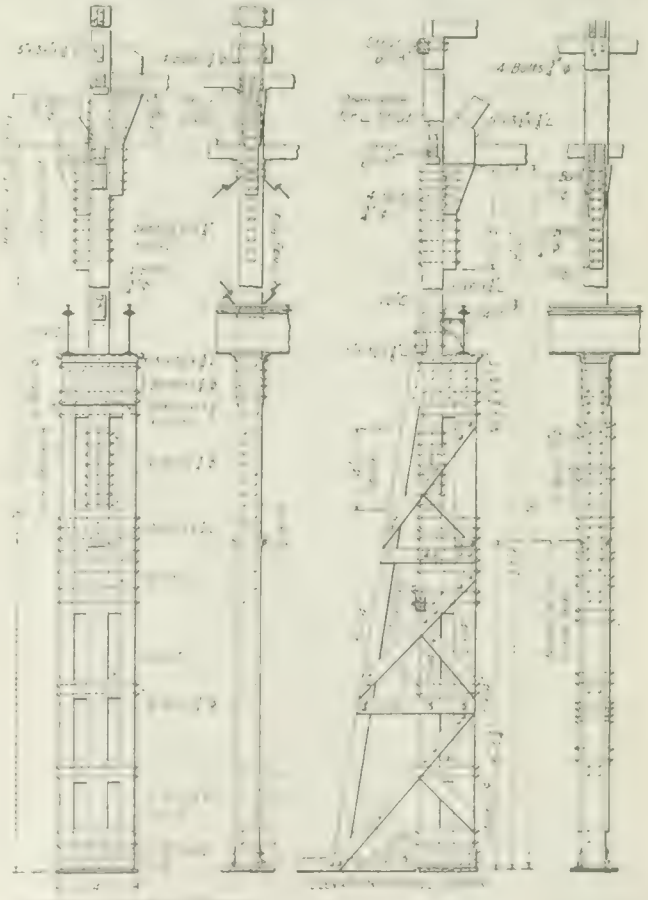
While the large shop building was laid out under one roof, the plate department and angle shop are so separated that either one can be operated economically with the other side closed down. All materials moving into the shop from the raw-storage yard successively pass the saw or shears to the markers, then go to the punchmen and on to the assembly end of the various units, where such operations as reaming, countersinking, burning or welding, chipping and riveting, are executed, after which the finished piece is submitted for final inspection before passing out to finished storage for loading.

The templet shop is located just west of the structural shop and is 60 x 128 ft. in plan. At present the southeast corner is used for a general store room. In this templet shop a full line of woodworking tools is provided, although present arrangements do not include a mold-loft floor, inasmuch as the bow and stern sections of the ship are fabricated at the shipyard.



TYPICAL DETAILS OF ROOF TRUSSES IN MAIN BUILDING—STEEL SPLICE PLATES FOR LOWER CHORD

Fuel-Oil System—Oil is used exclusively for heating rivets and in forming plates, shapes, etc. Suitable furnaces are installed for these purposes in the various units. The oil-storage system includes three second-hand tank cars, each of 4500-gal. capacity, placed in a



TYPICAL DETAILS OF COLUMN SPLICES AND BRACKET CONNECTIONS

concrete pit at the southeast corner of the site at such an elevation that a standard tank car on the adjacent siding can drain into them by gravity, and connected to the discharging tank by means of a swivel joint so that any tank or combination of tanks can be filled or emptied.

Adjacent to the tank pit is the oil pump house, the floor of which is at such an elevation that the oil flows by gravity from the storage tanks to the pumps after passing through a twin strainer. The distribution system is composed of 3-, 2- and 1-in. standard black pipe equipped with suitable valves and fittings, all pipe being laid to grade so that it will drain to a sump located at the pump house.

Three fire ladders on each side of the main shop buildings are provided. They are of heavy, permanent construction, trussed into the building at various points, and are planned in connection with the fire protection system to afford immediate access to the roof in case of fire. A 75,000-gal. steel tank on a 100-ft. tower is also a part of the fire protection system. A complete line of 6- and 8-in. mains completely surrounds the main shop building and templet shop, with hydrant hoses about 50 ft. from the building and not over 150 ft. apart. Chemical fire extinguishers are also placed throughout the shop building and the templet shop. A plant fire marshal directs fire drills at regular intervals.

The design of the various structures and machinery layout was under the supervision of G. S. Bergendahl, chief engineer of the Birmingham Steel Corporation, and his assistant, W. V. Bickelhaupt. The writer, now in charge of plant operation, was in charge of the construction and worked closely with the engineering department. H. L. Brittain and Frank McLoughlin are respectively president and general manager of the Birmingham Steel Corporation, and hold similar offices in the Mobile Shipbuilding Co., Terry Shipbuilding Co., and other Southern dock and repair companies.

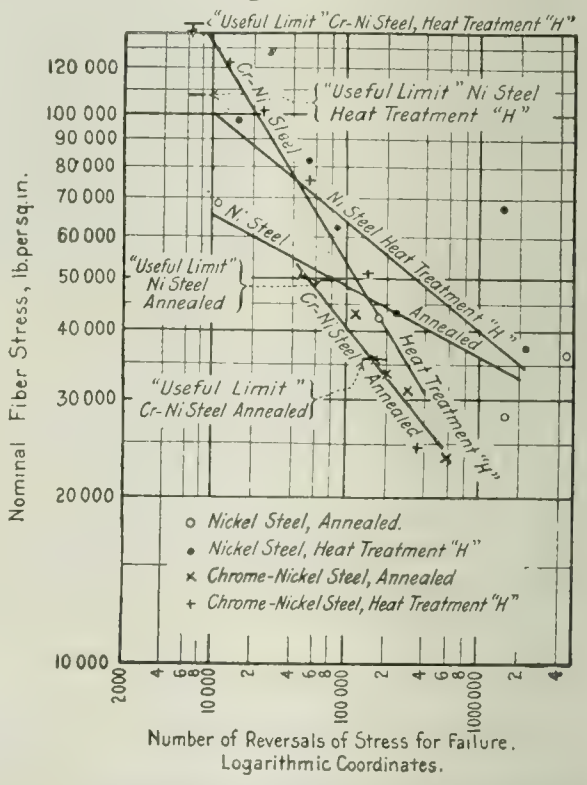
City Consulting Engineer and Works Director

Having decided to carry out a large program of public improvements, the City of Monroe, La., has engaged an engineer who will serve with the title of consulting engineer and director of public works. The appointee is Walter G. Kirkpatrick, who was at one time city engineer of Birmingham, Ala. In 1916 Mr. Kirkpatrick reported on the municipal needs of Monroe. A program of improvements was laid out, but local differences and the war resulted in postponement of action. Recently the commission form of government has been adopted at Monroe, and natural gas has been developed with the promise of the opening up of an oil field nearby. The commission has engaged Mr. Kirkpatrick for the four years' life of its administration, at a salary of $10,000 a year. He is expected to design and supervise the construction of some $2,000,000 worth of public improvements, including new water-works with a filtration plant, a new drainage system, enlargement and improvement of the sewerage system, improved means of waste disposal, a new electric lighting and power station, and improvements in the municipally owned street railway, besides a municipal wharf and elevator and other construction. Apparently most of this program will not be emptied, but will go over into the year 1920.

Comparative Endurance of Chrome-Nickel and Nickel Steels

ALTERNATING stress tests of nickel steel and chrome-nickel steel made at the University of Illinois show that nickel steel has higher endurance qualities, although tests were made at high stress and therefore had a relatively small number of alternations, which would indicate the chrome-nickel steel to have the greater resistance to fatigue. It also appears that hardening and tempering do not improve the fatigue-resisting properties of the metal, but rather have the opposite effect. Both these conclusions, however, are made entirely on the hypothesis of the experimental law connecting stress and number of repetitions or alternations required for failure; in other words, the law under which the logarithmic plot of repetitions and stress would be a straight line.

The report of these tests was presented by H. F. Moore and A. G. Gehrig before the American Society



EFFECT OF REVERSAL OF STRESS ON NICKEL-STEEL

for Testing Materials, in a paper entitled "Some Fatigue Tests of Nickel Steel and Chrome-Nickel Steel." The logarithmic plotting method is used as the basis for all the conclusions drawn, although the experimental points are scattered on both sides of the arbitrarily drawn lines. A typical diagram from the paper is reproduced herewith. It shows the lines for chrome-nickel steel, sloping more steeply than those for nickel steel, and therefore indicating earlier failure under relatively low fiber stresses. The authors say, however, that these test results should not be interpreted to mean that chrome-nickel steel is in general inferior in fatigue resistance to nickel steel. The lines drawn for the heat-treated specimens are of deeper slope, also, than those for the annealed specimens, indicating, according to the author's interpretations, a lower ultimate fatigue strength for the heat-treated specimens than for those not heat-treated. Quoting from their report, "the heat

treatment added but little to the fatigue resistance under repeated reversals at low stress."

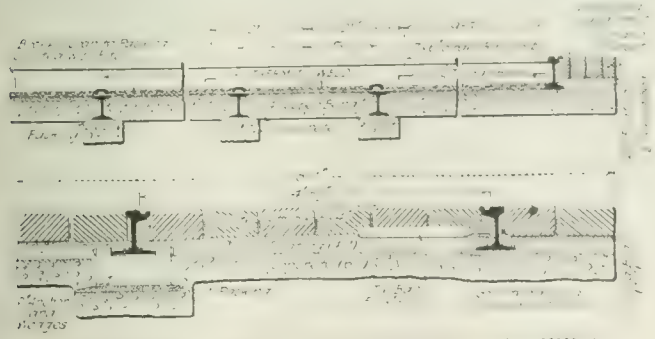
Very decided flattening of the slope of the curves was produced by polishing certain specimens. Comparison with the results obtained for specimens treated in exactly the same way but not polished show a large increase in the resistance to alternating stress, produced by the polishing. Because of the flatter slope of the curve "the superiority in fatigue resistance of the polished specimens over unpolished specimens increases as lower test stresses are used."

Latest British Street-Railway Track Construction

Ties Generally Omitted—Bituminous Granite Chip Packing Under Rails Used—Thermit Welding and Rail Hardening in Place

EXCEPT on high-speed lines or over very poor subsoil, it is not the general practice to use cross-ties in street-railway construction in Great Britain, according to an article in the *Electric Railway Journal* of Apr. 12, 1919. At Leeds only a bituminous granite-chip packing is placed between the rails and the concrete sub-base. Welding the rail points with thermit, hardening the top of the rails in place by the Sandberg "sorbitic" process, and the use of a special rail section, are also practiced at Leeds. The construction shown is that put down by R. Bickerstaffe Holt, who was, until March, highway and permanent way engineer of Leeds and is now a member of the staff of C. P. Sandberg, consulting engineer, London. The following is an abstract of the article describing the design used by Mr. Holt, who is author of "Tramway Track Construction and Maintenance" and a recognized authority on the subject.

Standard street-railway track construction in Great Britain, of which that at Leeds is typical, is radically different from anything used in the United States and



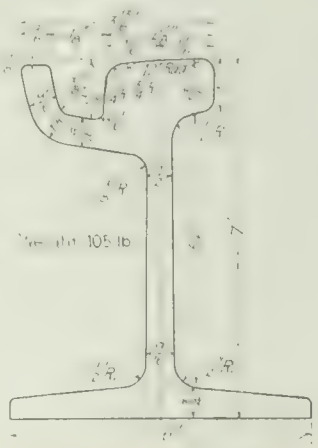
STANDARD TRACK CONSTRUCTION IN LEEDS

Canada. The accompanying cut shows the construction as adopted by Mr. Holt. The concrete sub-base is 6 in. thick, and the mix shown as 6 : 1 corresponds to our 1 : 2 : 4 mixture. The rails are held to gage with tie-rods, and except at anchorages, which are spaced ordinarily on 15-ft. centers and 10 ft. on high-speed lines, the rails are supported only by a granite packing grouted with pitch or some patented compound like "Fibrastic" in which they are embedded. This packing is placed only adjacent to the rail, while over the entire bed, between the concrete base and the paving bed, there is placed a moist 1 : 4 mixture of sand and cement. The paving bed is of the same mixture. When this has set it tends to prevent entrance of water.

In this connection, Mr. Holt points out in his book, mentioned above, that "it is a mistake to suppose that a sand paving bed affords any advantage in the nature of a cushion beneath the paving, after the paving blocks have been rammed; the bed is perfectly hard and unyielding, and in any case it is undesirable to have a resilient cushion between the blocks and the foundation." This is interesting in that it agrees with all kinds of block-laying experience in the United States.

Occasionally, cross-tie construction with the ties on 3½-ft. centers, embedded in concrete and with pitch granite packing under the rails between ties, is used on high-speed lines and in places where clayey soil is encountered. Otherwise, very little tie construction is used. The only advantage of ties other than anchoring the rails is their resiliency in absorbing vibration. This, however, is thought to be lost if the rails rest upon a rigid foundation in any of their lengths. On such a track in Leeds it was necessary to replace the rigid material under the rails with the pitch-granite packing after the track had been used for a time.

Thermit welding is employed at Leeds, but Mr. Holt states that it is unfair to expect perfection when the rail profiles are designed for fish-plate joints, and the web is too thin to withstand molten metal without likelihood of damage. He has designed a new rail section, shown in the illustration, which is 7 in. high and weighs 105 lb. to the yard. Its web is $\frac{1}{16}$-in. thicker than the web of the British standard rail of equal weight and is directly beneath the center of the rail tread. The tread is convex and is inclined toward the groove, the convexity and inclination being arrived at as a result of hundreds of gagings of partly worn rail and wheel-tire sections. This tread section corresponds to that adopted by the Brooklyn Rapid Transit Co. in 1915, although the reason for wanting a cone tread was not the same in the two cases. In the latter case the change was to insure longer life and better traction without reference to any one factor of destruction. More than 7000 English tons of this section have been laid at Leeds since January, 1910, and no extrusion of metal has been observed to date, although as many as 2,000,000 cars, averaging 11 English tons each empty and 15 tons loaded, have passed over one route so equipped.



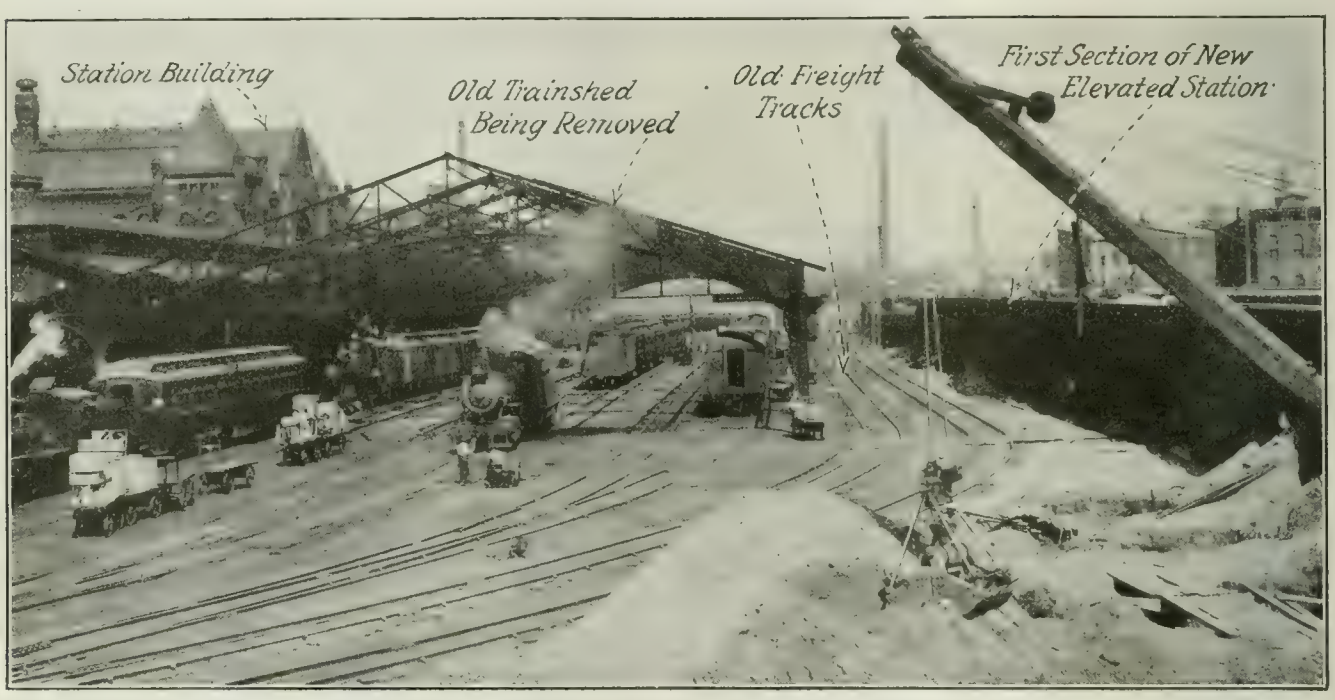
SPECIAL RAIL SECTION USED IN LEEDS

The Leeds system is one of the first users of the Sandberg "sorbitic" process of hardening the head of the rail in place. More than 250,000 cars have run over one section hardened in this manner in two years, yet Mr. Holt has found no evidence of wear. Better still, the incipient corrugations in the rail at the time the hardening process was applied have since disappeared. Hardening need not extend to a depth greater than ¼ in. It is not comparable exactly with case-hardening, as one molecular granulation blends into the next, instead of presenting a line of cleavage.

Union Station is Rebuilt Without Interrupting Traffic

Elevated Trainshed Erected and Tracks Raised and Rearranged at Indianapolis While Carrying 165 Trains Daily—Steel Structure Has Concrete Deck and Roof With High Skylights

STATION reconstruction and track elevation in consecutive parallel sections is the method employed in rebuilding the union station in Indianapolis, Ind., so that trains are operated at both the old and new levels during the progress of the work. This is the most important part of the general scheme of track elevation in the city. Its execution was a difficult problem, as the entire passenger traffic of the numerous railways passes over the connecting link formed by the Indianapolis Union Ry., on which the union station is situated. This traffic averages 165 passenger trains daily, arriving and departing, of which 70 are through trains. In addition, about 60 freight movements are made on two tracks assigned for this traffic, which is mainly for industry service.



RECONSTRUCTION OF UNION STATION IN INDIANAPOLIS, IND.

The track layout had to be enlarged and rebuilt at the new elevation, and the old trainshed replaced with a new structure having the tracks and trainshed on the upper deck. All this had to be done with practically no interruption to the heavy traffic, or interference with the numerous switching movements incidental to terminal operation.

An important advantage rested in the fact that the station was to be widened on the south side, so that the new work could be done on this addition before beginning to interfere with the old station. Thus, the boundary retaining wall, the ends of abutments at cross streets, the baggage tunnel and the pedestal footings for the columns, were built on this section in advance of any extensive work on the existing tracks. The superstructure was erected and the track deck laid for this section, the new tracks being then connected with the main track approaches at each end, so that it was possible to operate trains on this piece of elevated structure, the platforms being temporarily without shelters.

Four elevated station tracks were thus completed and put in service during the summer of 1918. This enabled the adjacent four tracks in the old station to be abandoned for the construction of another four-track elevated section, which was completed in the spring of 1919. The work will be carried on in this way, by the successive abandonment of surface tracks and widening of the elevated structure. After this is completed, the erection of the trainshed roof will be undertaken.

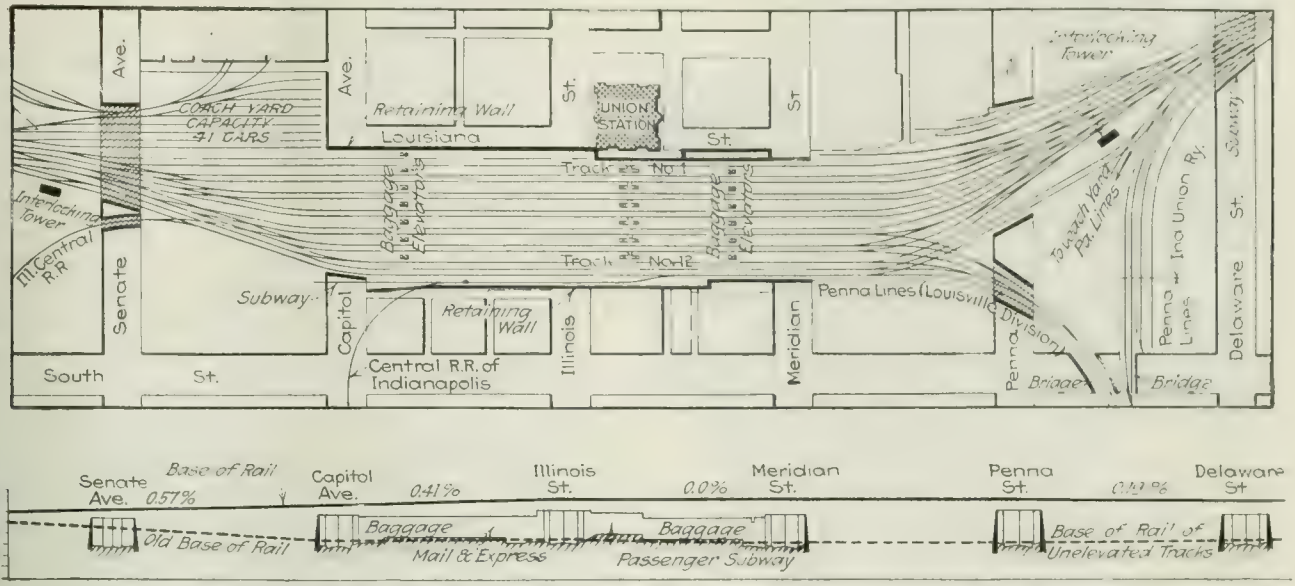
The new station is a double-deck steel frame structure having the track deck about 15 ft. above the first floor, this deck having concrete platforms and track floor. Most of the space on the first floor will be utilized for station facilities. Across it will extend a concourse or corridor 100 ft. wide, opening from the old concourse parallel with the trainshed but having no outlet at the south end. Stairways transverse to the tracks will lead up from the center of this corridor and branch in both directions to the platforms. Concrete ramps having a grade of 16% were provided in the original design, but stairways were substituted, on account of the length of ramp required for the limiting grade. Most of the space east of the lateral concourse will be utilized for the baggage room. On the west side of the concourse will be shops fronting on Illinois St., which passes under the middle of the elevated trainshed; beyond this street will be the mail and express rooms.

A baggage-transfer tunnel 630 ft. long, connecting the ends of the station, is made necessary by the traffic conditions. As trains headed in either direction may occupy any station track, baggage elevators must be provided at both ends of the platforms. Those at the east end are directly adjacent to the baggage room, while those at the west end are served by a transverse passage at the street level. To provide for the movement of baggage trucks between the elevators and the baggage room, a low level subway or tunnel was built

under the south side of the station, passing under Illinois St. This tunnel is 18 ft. wide and 10 ft. high, and has inclined approaches at both ends, starting at the ground level and near the elevators. Tractors and trailers will handle the baggage, mail and express.

transmitting these loads to the soil through the bottom slab acting as an inverted beam. The load on the base of the footings is limited to 2½ tons per square foot.

Retaining walls and abutments are of plain concrete, of gravity section, with footings built directly upon the



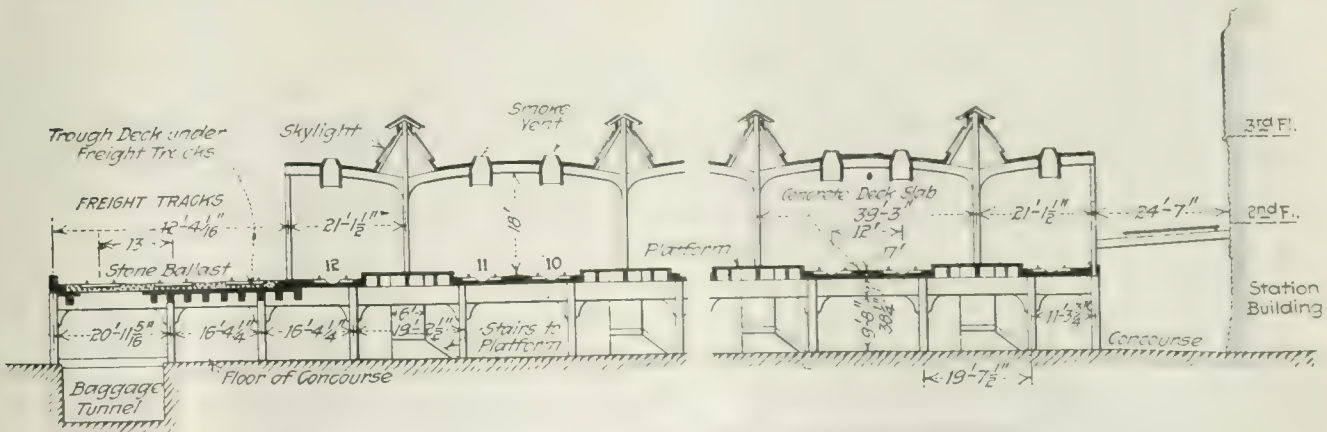
TRACK LAYOUT OF INDIANAPOLIS UNION STATION AND ITS CONNECTIONS

Ticket offices, waiting rooms, dining rooms and other passenger facilities, as well as the railway offices, will remain in the old station building at the north side of the tracks. This is a handsome red brick structure with a main hall 48 x 148 ft., and has ample accommodations, some changes in the interior arrangement having been made a few years ago. The present concourse at the street level, parallel with the tracks, will also remain. Architectural treatment of the fronts of the new elevated structure will mask the trainshed roof with its high skylight and will include decorative entrances to the street-level subway carrying Illinois St. under the trainshed.

Foundations involved complicated design in several instances, owing to underpinning, limited clearance or other structural requirements. Conditions are favorable, however, as the site is on a deep gravel formation, the material of which is practically incompressible. Plain concrete footings are used principally, but some of those for pipe tunnels and subways are 25 ft. below the surface. The baggage-transfer tunnel is of heavy reinforced-concrete construction and carries heavy superimposed column loads directly over its walls, gravel, and the walls having expansion joints at intervals of 30 ft. A bituminous waterproofing coat is applied to the rear, and against this is a backing of dry stone piers which permit drainage or seepage water in the fill to reach tile drains with sewer connections. The south wall, along the right-of-way, is carried up to form a high parapet.

Columns on the first floor support lines of transverse girders, and under the passenger tracks these carry a deck of transverse, shallow troughs built up of Z-bars and plates. For the freight tracks the deck is of deep, longitudinal troughs, between the girders. In both cases the troughs are filled with concrete which forms the deck slab. The platforms are supported at the edges by longitudinal girders along the sides of the Z-bar-trough sections and have intermediate beams resting on the cross-girders.

An unusual amount of skylight area is provided in the trainshed roof, which will be of the low type now generally used at large stations, but having high triangular monitors with skylights over the platforms. It will be of steel-frame construction, supported by columns on the platforms and having a concrete roof



PART CROSS-SECTION THROUGH NEW STATION TRAINSHED



TRACK AND DECK CONSTRUCTION OF NEW UNION STATION IN INDIANAPOLIS

slab with longitudinal openings over the tracks to permit the direct escape of smoke and steam from the locomotives. This roof will be about 930 x 240 ft., with columns spaced longitudinally from 50½ to 63 ft. Over the main low-level concourse running parallel with the trainshed will be an arched skylight roof supported by I-beams extending from the trainshed structure to the station building.

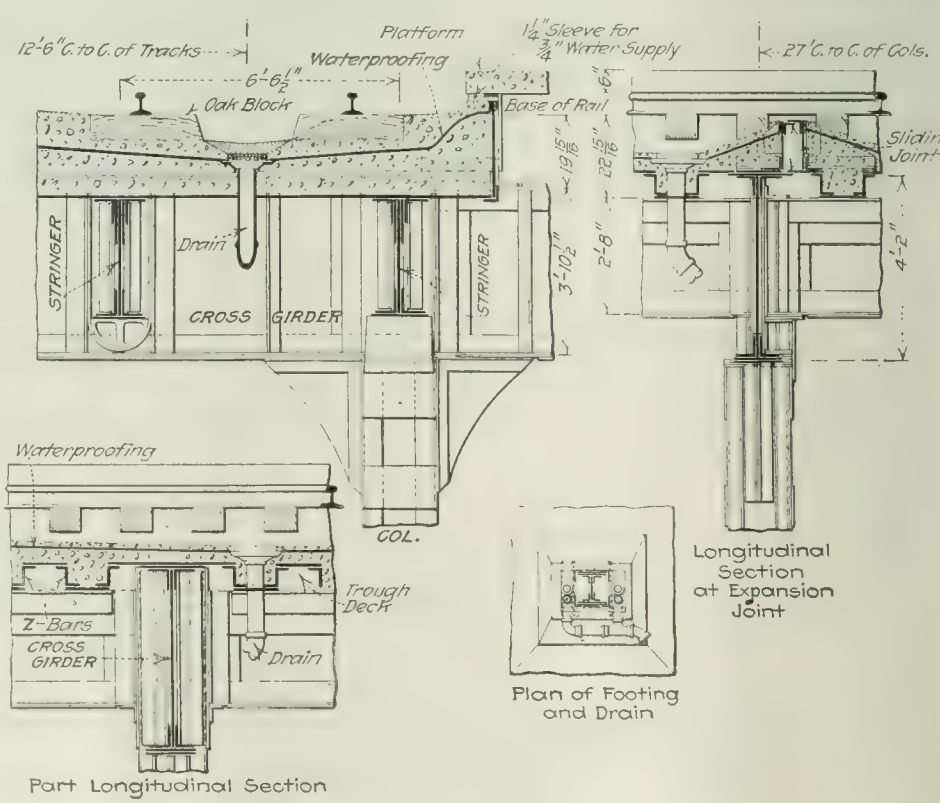
The old steel trainshed, shown in one of the views, was built in 1888 and was of the obsolete lofty-arched type. Steel columns supported trusses of 102 ft. and 68 ft. span with curved bottom chords and having 15-ft. cantilever extensions on the south side. Its length was 703½ ft. and the trusses were spaced from 25 ft. 10 in. to 45 ft. on centers. A glass screen closed each end of the roof and a monitor along the ridge provided ventilation. In spite of the frequent painting of the trusses they had become badly corroded.

In the new station there will be 12 through passenger tracks and a stub track at the west end for baggage, mail and express cars. There will be also three freight tracks on the south side. The 12 station tracks will have capacity for from 12 to 23 cars each, allowing 80 ft. for each car; the shorter ones are at the south side, where they are restricted by junction connections at both ends of the station. As through trains are in the majority, no large yard for coach storage is necessary, but at the west end is a coach yard having capacity for 41 cars. The original double-track approaches are enlarged to four tracks. The old station had eight through tracks in the trainshed, with a short stub track at the east end and two outside tracks for freight, switching and transfer movements.

Track construction for the passenger tracks in the trainshed is similar to that employed for some tunnels and large terminal stations, in which ties and ballast are dispensed with. Separate blocks of white oak support the rails and are set in recesses in the concrete deck slab, the surface of which is shaped to form a drain in the middle of each track. Water connections are provided for supplying the cars and for washing, so that the entire floor can be flushed and washed and kept in sanitary condition. No tie rods are used to connect the rails, the gage being maintained by anchoring the blocks in their pockets. These blocks are 7 x 9 in., 36 in. long, spaced about 22 in. on centers longitudinally. On them are steel tie-plates for the 100-lb. rails, which are secured by screw spikes. The freight tracks have ties laid in stone ballast on the concrete deck.

Development of the track layout has been progressing for several years. Difficulty was experienced in acquiring real estate for a suitable arrangement at the east end, but this was finally overcome and a satisfactory layout made practicable. The removal of the railroad's power station was necessitated by the final plan, but no new power station will be built at present, as electric current and steam will be purchased from the Indianapolis Electric Light & Heat Company.

Two junctions close to the station complicate the track layout. One is for the Illinois Central R.R. at the west end, having 14° curves; the other is for the Louisville division of the Pennsylvania Lines at the east end, with 12° curves. There is a junction curve of 16° at the middle of the station, but this is on the freight tracks only, and is for the industry line known as the Central



UNBALLASTED PASSENGER TRACKS AT LEFT; BALLASTED FREIGHT TRACKS AT RIGHT

Note water connection and drain

R.R. of Indianapolis, which serves several industries.

Slip switches are used rather sparingly in relation to the extent of the layout, there being eight at the east end and 15 at the west end. All these are double slip switches. The Illinois Central R.R. connection includes slip switches giving access to three station tracks, but the Pennsylvania Lines connection at the southeast corner gives access to four tracks by plain turnouts. Turnouts are mainly No. 8, with 16½-ft. switch rails. Three interlocking towers will control train movements.

All plans are passed upon by a board of engineers composed of W. C. Cushing, chief engineer of maintenance of way, Pennsylvania Lines; C. A. Paquette, chief engineer of the Cleveland, Cincinnati, Chicago & St. Louis Ry., and P. J. Landers, superintendent (and formerly engineer) of the Indianapolis Union Ry. Construction work is in charge of T. R. Ratcliffe, engineer of maintenance of way. Price & McLanahan, Philadelphia, prepared the plans for the architectural designs at the station. The McClintic-Marshall Co. and the Mount Vernon Bridge Co. are the contractors for the structural steel work, while the latter company and Powers & Addy have the contracts for its erection. Latham & Walters have the contract for the concrete roof and architectural work and the Marion County Construction Co. has that for concrete foundations, retaining walls and abutments. Filling and track work are done by railway forces.



NEW ELEVATED STRUCTURE REPLACING OLD SURFACE TRACKS THROUGH STATION (MAY, 1919)

Long Road Contracts in Arkansas

Proof of the advantages of letting highway construction contracts in long sections is afforded by experience in Arkansas, giving a practical indorsement to the suggestions along this line made in *Engineering News-Record* of Mar. 13, 1919, p. 503, and Apr. 24, 1919, p. 831. A firm of engineers having considerable road work in that state makes a practice of letting single contracts for 20 to 30 miles of road, and reports that in this way the larger contracting concerns are interested, while with short sections there would be numerous local contractors, without competition from firms perhaps better equipped to execute the work. The work is divided into sections, but as a rule a contractor will bid on the whole work at a cheaper price. In some cases there are no bidders for separate sections, while several bids are made for the entire mileage to be let.

Membership and Functions of Local Engineering Associations

C. W. Hunt, Secretary of the American Society of Civil Engineers, Outlines His Suggestions for Development Committee

ADDRESSING the Development Committee of the American Society of Civil Engineers at its Minneapolis meeting on June 13, Dr. Charles Warren Hunt, indicated his point of view after 27 years' service as secretary of this society by quoting letters written by John W. Alvord, and then proceeded to outline his suggestions regarding the details of membership qualifications and proper functions for local engineering associations. The details of these suggestions follow:

If I am not very much mistaken the original idea of the Development Committee of the American Society of Civil Engineers was the development of the Society itself to meet existing and changed conditions due to the war, etc., and that to its duties was added later the question of co-operation with other bodies for the general good.

I have not been asked, as I understand it, to come here with any suggestion as to improvement in methods of the Society's work, nor do I know to what extent the Committee has decided on suggesting fundamental changes, but I believe that it is entirely proper for me to discuss that part of the problem which relates to the co-operation between organizations, inasmuch as that has nothing whatever to do with the management of the American Society of Civil Engineers. I have therefore ventured to write out, as briefly as possible, a statement of my views, based upon a great deal of careful thought and considerable knowledge of conditions both at headquarters and in various parts of the country.

There are in my judgment two entirely separate phases of the general subject of the condition of the Engineering Profession.

(1) The theoretical, scientific, educational side, which includes the maintenance of high professional and ethical standards, and

(2) The welfare side, which includes all matters relating to the Profession outside of those in No. 1. This means not only the participation of the Engineer in civic and community affairs, but concerted action connected with National, State and Municipal problems, in which the welfare of the members of the Profession both individually and collectively is concerned, such as professional rates of pay, employment of engineers, and all legislation which affects the Profession either locally or nationally.

In my opinion, these two lines of effort cannot be carried on together. The National Engineering Societies are well organized for, and can carry on, the first of these, and they should not be interfered with nor hampered by being forced to undertake the second.

If this be true, then the problem is to so organize the Engineers of the country that they may be able to handle both national and local matters concerning the welfare of the Profession. My experience is that the chief difficulty in the attempts which have been made up to the present time in co-operation among various groups of Engineers is that we have been trying to work from the top down and not from the bottom up. I think that true co-operation must have its source in the individual, or in smaller geographical groups of individuals, which groups shall elect their representatives and instruct them as to the lines on which they wish co-operative effort made. They must also finance that effort in proportion to the numerical strength of each sectional or geographical group.

At present, boards of Engineers elected for the specific purpose of managing an individual organization—and for that purpose only—are transferring certain powers which have been given them—and perhaps a number of others which they have never possessed—to another group of their own appointees. Apart from the question of whether they

have the constitutional right to transfer powers granted them by their constituents, the result is not satisfactory. A man so appointed is not really responsible to anyone—he has no constituents or electors to whom he must report and whatever action he may take on any matter must therefore be entirely dependent on his personal views.

I believe that the Engineers of the country can be organized by forming a truly representative body which might be called "Engineering Council," for want of a better name. The first difficulty which to my mind presents itself is that at present there is no method of determining who may, or who may not, be properly classed as Engineers except by the assumption that all men who have been admitted to a national organization can qualify. With this brief statement I would suggest:

That through the co-operation of the Development Committees of the four National Societies a plan be developed along the following lines:

That in each center of population there be formed a local Engineering Association to be known by the name of the city or by some other distinctive sectional name.

That the voting membership of each of these associations be limited to the membership in any grade of any National Society of Engineers residing in the territory covered by the association. It will be observed that this is not intended to restrict the membership to the four Founder Societies only. That Engineers in the territory who are not connected with any of the National Societies be admitted as "Associates" or "Affiliates," until such time as they become connected with the national organization representing their specialty.

These associations would have two functions, viz:

(1) To act upon all local matters whethers Municipal or State (the latter in connection with similar associations).

(2) To elect directly in proportion to its numerical strength, or, if not large enough, in connection with its neighboring associations, its proportionate representation on a National "Engineering Council," and to contribute in similar proportion to the support of that Council.

The advantages of such associations would apparently be: Added numerical strength in each locality; local recognition of the fact that all members are Professional Engineers—in other words, something definite as to who is and who is not an Engineer—and direct touch through properly elected representatives, responsible to and reporting back to their constituents all actions of the "National Council." In addition to this each would be, so far as local matters are concerned, not responsible to any National Technical Society, which condition at the present time is a more or less troublesome one, for we all know that the question of the relation of the present "Local" association or section both to the parent organization and to similar locals has been, and still is, subject to much debate. In one case at least a parent National Society found it necessary to repudiate action taken by one of its local chapters.

In addition to the representatives elected in accordance with the above each National Technical Society should be authorized to appoint one or more members of the "National Council." These appointees would be the logical representatives of the very large membership in these societies which is not connected with any local association.

If this plan were considered feasible and developed by our Committees in connection with the Development Committees of other Societies, on the present basis of membership of the four Founder Societies alone there would be a general Local Engineering Association of approximately 6600 members in New York City, and in San Francisco it is estimated that there might be more than 800.

Nothing that I have suggested above would interfere with the maintenance of the present Local Associations or Chapters of the Founder Societies, but they would be relieved of the necessity of acting on matters which are not strictly those which belong to the parent Society. In other words, they would act only on matters which affect the policy of the National Societies of which they are Local Chapters.

Convict Labor as Utilized on Arizona Highways

Men Have Low Average Intelligence and Need Special Handling—Free Men Better for Machine Operators and Foremen

STATE convict labor can be employed on highway construction with success and economy, subject to certain important qualifications and conditions, according to the 1916-18 biennial report of B. M. Atwood, former state engineer of Arizona. This opinion is based on nine years of experience of the State Highway Department. One of the principal conditions that must be taken into consideration, if success is to be obtained, is that the low average intelligence of the men requires the use of free labor for all positions involving leadership or handling of machinery. The following notes are from the above-mentioned report and from information furnished by F. M. Holmquist, state engineer.

While prison labor has been discontinued in Arizona since last March, this was not on account of inefficiency, but for the purpose of giving preference to returned soldiers, sailors and marines. There is ample free labor available to take care of all road work in sight for the present year. Furthermore, the appropriation for the maintenance of prison camps was exhausted, and it was necessary to use the state road tax fund for this purpose, which is undesirable.

Records of cost show practically the same result for work done by convict labor as by free labor, according to Mr. Holmquist. As the distance of the camps from the prison was about 400 miles by rail there was considerable expense involved in transporting the prisoners and guards. It is intended, therefore, that when the use of convict labor is resumed it will be employed nearer the prison in order to avoid this expense.

Mr. Atwood reports that convict labor has been employed on heavy mountain work and light grading, on the construction of reinforced-concrete bridges and culverts and in the production of crushed stone, concrete pipe and other road materials. Experience during the nine-year period has been varied. At times the labor has been expensive and inefficient, with poor discipline and with a large percentage of the men in camp idle and under disciplinary detention. At such times the percentage of escapes was apt to be high. On the other hand, much of the convict work was satisfactory, with low cost, high efficiency, good feeling and healthy conditions among the men.

Importance of Leadership

The general conclusion arrived at is that convict labor is capable of producing work of good quality in highway and bridge construction with low costs and few escapes, while the camps may be so managed as to benefit the men physically, mentally and morally. Such labor, as stated above, is more dependent upon the quality of its leadership than is free labor, and it is suggested that where good results are not achieved the responsibility should be laid on the personnel and methods of the management, rather than on the quality of labor employed. This statement is not intended as a criticism of anyone who may fail to make a success of the prison camps, for it is recognized that dealing with prison labor requires somewhat different qualities from those for dealing with free labor.

In the Arizona convict camps there were usually 40 to 55 men, but sometimes as many as 90 to 100. The rising time was 6 a. m., and promptly after breakfast the men boarded motor trucks, leaving camp in time to start work at 8 a. m. Each gang was in charge of a foreman, assisted by armed guards. Dinner was brought out on the trucks, unless the men were near the camps. The working day was limited to eight hours, which is the legal time for free labor in Arizona. The retiring time was 9 p.m. Either bunk-houses or large tents were provided, and were surrounded by a high barbed wire fence. A barber shop, a concrete toilet and a shower bath were included in the equipment of each stockade, and absolute cleanliness was insisted upon. Feeding the men is discussed in an article in *Engineering News-Record*, of May 22, 1919, p. 1032

Taking the men away from the state prison and keeping them actively employed in open-air work has been found to improve their physical and mental tone, but it is important to keep them constantly employed, either at work or in some healthful recreation. The importance of this is so great that when recreation cannot be furnished the men should be assigned to different forms of work on different days, in order to avoid monotony in their employment. In fact, it is considered better to insist on long hours of work rather than to allow idleness without proper amusement.

Provision for some reward for the men who do their work satisfactorily is another important point, and the reward should be such as to show clearly that these men benefit more than those who fail to render the service and obedience demanded. It may be in the form of scrip that can be exchanged for fruit or candy at the commissary, or a reduction in the term of imprisonment, or perhaps in money to be held in trust for the benefit of the convict or his dependents. In Arizona, the superintendent or engineer in charge of the prison camp sent to the state engineer each month a report recomemnding men for parole or commutation of sentence. The state engineer in turn made his recommendation to the Governor and the parole board.

As advice to those contemplating the use of prison labor, the report urges a visit to some properly conducted convict camp.

Recording Strain-Gage to Measure Stresses in Ships

AN INSTRUMENT to measure and record the strain in various parts of ships under actual loading conditions was devised by the concrete ship section of the Emergency Fleet Corporation during the war. It was described by F. R. McMillan, who had charge of its development, in a paper entitled "The Strainagraph and Its Application to Concrete Ships," presented to the American Concrete Institute meeting. Mr. McMillan's paper included a brief description of the instrument and the story of its development, together with an illustration of its use in determining the stresses in the concrete ship "Atlantus" during its launching at Brunswick, Ga., last autumn. The instrument comprises a revolving paper roll on which, by the multiplication of a series of levers, is recorded the movement between two points on the piece whose deformation is being measured. In its operation on ships two gage points are established at critical places in the ship's frame and hull, and the extending lever of an instrument is fastened to each pair of points. The lever is connected to the recording instrument, which is a development of a recording pressure instrument of the American Steam Gage & Valve Manufacturing Co. designed for studying the air-brake control of trains. Each instrument is motor-driven and they are all tied together by an electric circuit so that synchronous records can be assured. In the investigations on concrete ships there were also installed pressure-recording gages, so that, synchronously with the strain measurements, there could be ascertained the height of the waves outside the ship.

The launching tests on the "Atlantus" give a complete record of the height of water on the ship side as it went into the water, and the flow of the stresses during the launching process. The paper further includes three curves of stresses measured by the instrument and calculated previous to the launching of the ship which show a remarkable agreement of results.

Overhead and Time Cost of Pit and Trench Excavation

Ten Per Cent. in Excess of Direct Cost for Extra Work Does Not Equal Overhead Costs on Simple Excavation

By A. P. Roscoe
Ozone Park, New York

EXCAVATIONS required 3½ man-hours per cubic yard as an average in making 436 pits for elevated railway column footings built in the years 1915 to 1917 in New York City. All the pits were dry. On another group of 24 pits, for which 46% of the excavation was below water level, the labor required was 11.03 hours per cubic yard. Trench excavation required 4.11 hours of labor per cubic yard. The overhead cost on both jobs was nearly one-fifth of the total cost and almost a quarter of the labor and materials cost. In all cases the work included sheeting and excavating, backfilling after the structure was constructed, and hauling away the surplus material. The costs were computed from daily reports made by inspectors.

The pits were located 26 ft. apart transversely and 50 ft. apart longitudinally on an unpaved street 60 ft. wide between curbs, with a double track trolley line in the center. There was very little traffic and few underground structures to interfere with construction. The crossing streets were about 700 ft. apart, and the total length of the work was about 2½ miles.

The average size of the 436 dry pits was 8 x 8 ft. sq. and 10 ft. deep. The material was course sand, and the excavation was all above water level. All excavation was by hand, single cast for the first 5 ft. and double cast for the second 5 ft. Close sheeting of 2-in. plank was driven as the pit was excavated, and two sets of 6 x 6-in. rangers were used in each pit. The average gang was one foreman, two timbermen and 16 laborers; each foreman had one-half the time of a team and driver and one-eighth the time of a three-ton motor truck and driver. A payment line for excavation was set at 1 ft. outside the bottom of the completed footing, and on this basis of measurement the total excavation amounted to 16,227 cu.yd. Sheeting was, however, driven to the neat lines of the footing, so that the actual excavation was only 10,570 cu.yd., or about 65% of that paid for.

Wet-pit excavation involved pumping; the pits varied

from 7 x 7 x 10 ft. to 9½ x 9½ x 12 ft., and the ground-water level ranged from 2 ft. to 9 ft. above the subgrade. Excavation was in sand overlaid by blue clay, peat, black mud and salt marsh. Calculated on neat lines, the yardage was 831, of which 385 cu.yd. was below water level. The pay excavation was 976 cu. yd.; tongue-and-groove sheeting was driven by hand and steam hammer, and the seepage was handled by steam pumps and gasoline-driven diaphragm pumps.

The accompanying table gives the expenditure in labor hours per cubic yard based on both the pay yardage and the actual yardage excavated.

The trench excavation aggregated 7417 cu.yd.; the trench was 3¾ x 5 ft. in dry sand for a 28-way duct-line. Sheeting was required only at manhole approaches and where crossing pipes made necessary a cut deeper than usual. The time cost per cubic yard was:

Item	Hours per Yard
Foreman	0 158
Timberman	0 353
Laborers	3.368
Team and driver	0 147
Motor truck and driver	0 086
Total	4 112

Overhead expenses were computed as follows; General overhead included bond premium; interest on capital invested; lost interest on retained percentages; interests on outstanding accounts; one-fifth of the main office expenses such as salaries, rent, supplies, telephone and legal costs, since there were four other jobs of equal magnitude being carried on at the same time, and field expenses such as superintendence, engineer, rent, supplies, telephone and postage. The total of these items was distributed among the several items of the

HOURS OF LABOR EXPENDED PER CUBIC YARD OF EXCAVATION FOR FOUNDATION PITS

	Dry Pits		Wet Pits	
	Pay	Actual	Pay	Actual
Cubic yards	16,227	10,570	976	831
Foreman, hours	0.111	0 170	0.892	1 048
Timbermen, hours	0 232	0 357	1.529	1.795
Laborers, hours	1 738	2 673	5.550	6.515
Team and driver, hours	0 066	0 102		
Motor truck and driver, hours	0 017	0 026	0 216	0.254
Engineer, hours			0 591	0.694
Pumpman, hours			0.613	0.720
	2.164	3.330	9.391	11 026

work; first, in proportion to the money value of the item and, second, in the ratio of the direct labor cost on each item. The amount charged as general overhead on any item was the mean of these two figures. Specifically, on the dry pit excavation the ratio for money value was $1210 and the ratio for direct labor was $4720. The figure used in the cost analysis was $2965, or one-half of the two sums.

In addition to general overhead there was a charge made for special overhead, figured on each item to cover cost of tools and supplies chargeable to the item, and depreciation of plant. Overhead costs include general and special overhead. They were, for the dry pit excavation: On direct labor, 29.6%; on labor, insurance and material, 23.8% and on total cost, 19.0%. For the trench excavation they were: On direct labor, 26.8%; on labor, insurance and material, 23.8% and on total cost, 19.3 per cent.

These figures indicate why contractors are loath to do extra work under a contract which limits the compensation for such work to the net cost of labor and materials, plus 10 per cent.

Road-Construction Problem in West Virginia Mountains

Narrow, Curved Roads With No Material-Storage Space—Especially Arranged Trucks Used for Hauling Effect Saving

By M. A. Rogers
Engineer in Charge for McDowell County, West Virginia

HIGHWAY construction in a mountainous country such as West Virginia presents many problems. The narrow, tortuous roads, with generally steep grades, make the delivery of materials and their storage upon the right-of-way difficult. A successful solution was reached in McDowell County, in building a concrete road from Welch to the Mercer County line, by the utilization of especially arranged motor trucks dumping batches of aggregate directly into the mixer hopper. This method not only expedited the work, but effected a large saving in labor cost.

A comparison of the cost of building a concrete road by the old method of dumping the aggregate on the subgrade with the method of using sectional trucks



NARROW AND WINDING RIGHT-OF-WAY GAVE LITTLE ROOM FOR STORING MATERIALS

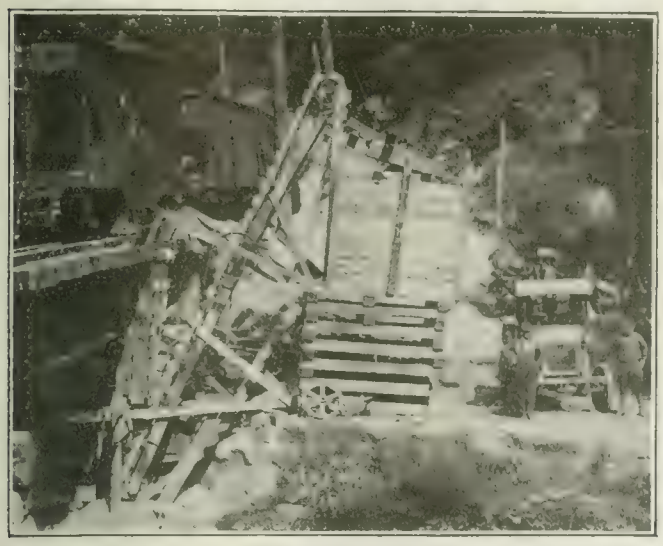
shows that by the former an average of 28 laborers was required at the mixer, while with the latter only from eight to ten were required. Delivery of the materials from the railroad siding to the mixer hopper would cost about the same by either method. Where aggregates were dumped upon the subgrade it was also found that there was an average wastage of about 4% of the material, due to its washing away and being packed into the subsoil.

McDowell County is the most southern county of the state, and is situated in the heart of the Pocohantas coal fields and the Appalachian Mountains. The towns and colliers are in the valleys along the banks of the larger streams. The Norfolk and Western Ry., the only railroad, takes advantage of these valleys, and since there was nothing there previous to the railroad, it took the most advantageous locations, the towns springing up around it.

When roads were built to connect the various towns it was necessary to traverse the same valleys as the railroads. This caused many difficult problems for the locating engineer. As an example, the Class-A road here described crosses the railroad 12 times in a dis-

tance of 22 miles. By passages under railroad bridges and over tunnel portals, eight of these grade crossings have been eliminated; and two more will be eliminated by viaducts, the expense of which is divided between the county and the railroad company. The picture shows one such elimination by passage through an arch culvert. The original location is shown on the right.

Previous to 1917 all road money had been spent upon grading. At that time a bond issue for hard-surfacing the principal county roads was voted, and a contract was let for the Welch-Mercer County line road. It had been located and graded several years previously and had, with one or two exceptions, settled to a permanent position. The alignment had to follow the contour of the



CRUSHER BIN AND ELEVATOR USED FOR UNLOADERS

mountains on either side of the valley, but the grade was held to a maximum of 7%. The original grading allowed for 16 ft. from the toe of the hillside to the edge of the embankment, so it was decided to pave a 9-ft. strip in the center with concrete and place shoulders of macadam 2½ ft. wide on each side.

The native stone in the county is sandstone, and as this was analyzed and found satisfactory for paving purposes, the contractor opened three quarries along the road and started crushing operations. On account of the scarcity of labor these quarries were not very successful, and imported stone was used the second season. A rather novel use was made of part of the crushing plant. The elevators and bins were built over into unloaders for the hopper bottom cars. As electricity was always available, the elevators were operated by a motor. The picture shows such an installation under a railroad bridge, with a wooden hopper supported from the bridge to feed the elevator buckets.

Since the hauling problem is one of the largest items of cost on a road, this matter was studied very carefully by the contractor. A representative from one of the manufacturers of industrial railways spent several days looking over the situation, but could not advise their use on account of the sharp curves and excessive grades, not only in the road under construction, but in the approaches as well. It was also found that on account of the grades teams could not be used to an advantage. Auto trucks were finally selected, and a fleet of ten 2-ton trucks with hydraulic dumping devices were purchased. These trucks solved the hauling problem very satisfactorily, but even they had their disadvantages. When the roads were wet there was great danger in passing, and it was quite often necessary to excavate a considerable quantity of hillside to make safe turning and passing places. A turntable was designed for turning the trucks, but it was found to be too costly to install, on account of its having to be moved so often to keep in advance of the mixer.

During the first season the handling of materials for the concrete slab was done in the usual manner by dumping on the subgrade. This method had numerous disadvantages. Labor was scarce, and often only enough help was available to put a one-bag batch through the mixer. It was also found impossible to dump enough aggregate inside the forms to supply the mixer properly. If the materials were placed after the forms were set up the dumping threw them out of line; if before setting, the aggregate had to be shoveled to permit the placing of the forms. This increased the cost of the forms and undesirable material became mixed with the aggregate. Storing of cement was another problem, as there was no opportunity for hauling along the road after the aggregates were placed. Neither could any great quantity be stored in the roadway, because of its narrowness.

These difficulties were eliminated the past season by a different method of procedure. It was decided to



RAILROAD GRADE CROSSING ELIMINATED BY PASSING THROUGH ARCH CULVERT

operate only two mixers instead of three or four as in the previous season. This concentrated the organization, and the 2-ton trucks were distributed half to each job. The bodies of the trucks were equipped with three transverse partitions, making four separate compartments, each of which held enough of the aggregates for a two-bag batch of 1:2:4 mixture. The aggregates were received at railroad sidings, with a haul which was seldom more than 1½ miles, and which constantly lessened as the mixer advanced.

The bins for stone were placed at a height sufficient to allow a truck to receive its charge by gravity. The amount was measured by a stripe painted along the inside of the truck body. The sand was unloaded by hand and placed in stock piles along the siding. After the truck received its load of stone it went to the sand pile, where hinged measuring boxes which may be seen directly behind the truck in the illustration, were mounted on a narrow-gage car waiting to deposit the proper quantity of sand into each compartment. Four men were able at all times to keep the trucks supplied with sand. A description of the sectional trucks

and the hinged sand boxes was printed in *Engineering News-Record* of May 22, 1919, p. 1032.

When the scheme was first adopted the cement was also placed in the trucks, but this was found unsatisfactory, and special trucks were used to haul the cement to the mixer where it was placed in the mixer hopper while the trucks were discharging their batches. Three men, including the truck operator, handled all the cement, both loading at the storage and placing along the subgrade. When the trucks containing the aggregates arrived near the mixer they were turned and backed to the mixer hopper. The truck body was elevated, and each of the 4 batches was deposited in succession.

This method was a great labor saver, as no wheelers or shovelers of stone and sand were necessary. Other advantages were that the grade was kept clean; there was no foreign matter picked up from the subgrade; there was no waste material, and, above all, each batch contained the same amount, a thing which seldom occurs unless measuring boxes are used.

The records show that on a one-mile haul each truck made two round trips per hour. The entire gang required to get the material to the mixer consisted of six truck drivers, one mechanic and two laborers on the stone, four laborers on the sand, four laborers on cement, and two laborers caring for the grade at the mixer, filling up and cleaning up any material which spilled during the charging.

The mixing plant consisted of one boom-and-bucket type gasolene mixer, and one boom-and-bucket type steam mixer. The gasolene mixer was found to be just as reliable in every way as the steam mixer, and, as it was operated by one man, it proved the more satisfactory. Steel forms were used with much success, but on account of the many sharp curves in the road they were badly bent at the end of the job.

Water for the concrete, boilers, etc., was taken generally from Elkhorn creek. It was not satisfactory, on account of the dilute sulphuric acid from the many coal operations. Occasionally water from some of the collieries proved to be a much better quality. The finishing of the pavement was done by the belt-and-roller method, which proved very satisfactory, giving a smooth surface with a minimum amount of labor.

The work in McDowell County was done under the county officials, H. B. Wright being engineer, and the writer was engineer in charge. The contractor was the Harrison Engineering & Conctruction Corporation, of Buffalo, N. Y. of which H. B. Harrison is president.

Ratio of Fine to Coarse Aggregate Basis for Concrete Mixtures

ANOTHER method of proportioning concrete mixtures is proposed by R. W. Crum, in a paper, read before the American Society for Testing Materials, and entitled "Proportioning of Pit-Run Gravel for Concrete." The method was devised for and is specially applicable to Middle Western gravels which occur in assorted gradings. By its use a proper concrete can be had with any pit gravel by the addition of the correct amount of cement, to be determined by the method. Basically, the author's scheme rests on the assumption that the ratio of cement to air and water voids is an indication of strength. In other words, the nearer the cement content approaches the volume of the voids the greater is the strength of the concrete. He assumes that for certain classes of concrete—that is, for concrete to be used under certain conditions—there is an optimum sand-aggregate ratio. In that ideal mix the cement-void ratio is computed and the amount of cement necessary to bring the actual mix up to that ratio is found. This gives the best mixture—reducing to loose volume—for that particular aggregate. Although the author states that the proper grading depends upon the consistency or amount of water in the mixture, and although he says specifically that one must get a concrete which will yield a workable mixture for the conditions under which it is placed, he does not tell in the paper just what degree of workability is reached by his method nor the standard of consistency or workability which was used in making the tests. He claims that the method gives results about midway between the fineness-modullus method of Abrams and the surface-area method of Edwards. Analyses of prospective aggregates may be readily made in the field for the method, inasmuch as it requires only to be known the gradings above and below a No. 4 sieve.

Fireproofing Concrete Columns with Plates

Certain kinds of aggregate, particularly quartz gravel, have proved to be dangerous components of concrete which may be subjected to fire. In an investigation of the fire resistance of such concrete, Walter A. Hull, of the United States Bureau of Standards, Pittsburgh, made a number of tests on concrete columns under simultaneous load and fire conditions. These tests were reported at the recent meeting of the American Concrete Institute. An interesting feature of them was the use of a plaster coating of one kind or another as a fire-resistant medium. These coatings were applied both as a plaster and as an original form in which the concrete column was cast.

Mr. Hull's deductions as to the somewhat limited tests already made are as follows: "Observations made in casting columns and forms made by covering the spiral reinforcement with metal lath indicate that such an expedient would be practicable in cases in which it might appear desirable to substitute other protective material for the protective concrete ordinarily provided. Gravel concrete columns with vertical and spiral reinforcement over which part or all of the thickness of the protective covering had been provided in the form of cement plaster gave better results than columns of the same type with the usual concrete protective coating, but much poorer than columns from trap rock, blast-furnace slag and limestone aggregates with protective concrete in the usual form. The comparatively poor results shown by these plaster protected columns are consistent with the observations reported, namely, that a large part of the outer coats of plaster separated and fell off, leaving practically only the fire coat for protection during the latter part of the fire tests. One column, in which the protective covering was a special mixture, mainly asbestos, portland cement and sand applied in the form of plaster on the column, made by pouring concrete in metal lath placed on the outside of the spiral withstood the test of 3480 lb. per sq.in. at the end of the 4-hour test and failed under a load of 4930 lb. per sq.in." The report of the Committee on Fireproofing of the American Concrete Institute abstracted on p. 76 is of interest in this connection.

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

Kansas City Club to Get Growth Data On Which to Base Civic Opinion

The collection of basic data on traffic and transportation, and the future requirements therefore, has been undertaken in a comprehensive manner by a recently appointed committee of the Kansas City Engineers Club. The committee grew out of a desire on the part of the club to be able to express itself as a unit on matters of civic interest. It had long been recognized that many worthy projects died from lack of political support, and the latter was too often given only when the compelling motive of self interest was dominant rather than a wholesome knowledge on the part of the voters that the matter under consideration was of vital interest to the city as a whole.

In the first progress report of the committee, June 27, Howard P. Treadway, chairman (they call each other by their first names in Kansas City), outlined the scope of the work. It is the intention to have many sub-committees, thus putting many of the new and younger members to work. Some of the topics to be taken up by the sub-committees are as follows: Population growth as affected or indicated by freight house statistics, by registration of voters, by the school census, by auto licenses, by building permits, by the distribution of gas mains, by the street car traffic, by the electricity demands, and by the growth and relations of small business and industrial centers. There is no city planning commission functioning in Kansas City. The engineers may make it unnecessary.

Question Asked Members About Pending Congressional Legislation

How one local engineering society is serving its members and the public at the same time is shown by the following extracts from a recent multigraph bulletin issued by W. H. Woodbury, secretary Duluth Engineers' Club:

LEGISLATION UNDER CONSIDERATION BY THE 66TH CONGRESS

Good Roads Act—Proposes to take administration, construction and maintenance of roads out of Department of Agriculture and place in the hands of a special commission of three or five $10,000-a-year men. Is it advisable to disrupt present organization which is coöperating with the state road officials? Secretary Houston makes statement of reasons for his opposition and sets forth some very cogent arguments. Is a commission the best method of administration? Is it well for the Federal roads to be administered independently of the state officials? Should the salary of the directors of the Bureau of Public Roads be raised to $6000 from $4500? Is $6000 enough?

Engineering Research—One bill provides for engineering experiment stations in each state. Annual cost $2,400,000. It opens the door for endless controversies between various colleges seeking preference. Another bill (see *Engineering News-Record*, June 5, p. 1131) provides $15,000 for each state (total of $720,000), to be expended in research under the direction of a board.

Flood Control of the Colorado River—A bill providing $50,000,000 to build flood control dams and lease power rights. Is the plan feasible? Will the storage basins soon fill with mud? Would power companies develop the power? Are levees a better plan? Shall the U. S. Government take on this job? Our Congressmen must vote on this proposition. How do we want them to vote?

The National Budget—Several bills are proposed. One by Chairman of House Committee on Appropriations. This committee has opposed a budget in the past. It is now probably ready to accept this reform, for which the country should be thankful. This bill provides a budget bureau subordinate to the President that shall group information as to governmental finance, income and outlay. The bill also provides for a joint committee of three members from each house of Congress to consider income and outlay. Best of all, Secretary of the Treasury is to revise, change, unify and otherwise consider all such matters to prevent loss, waste, etc. Several other bills have been presented and since most any change would be an improvement we may have hopes.

Mining on the Public Domain—There are several bills to permit development of natural resources. Seemingly fairly good and safe measures have been lost in wrangles over petty details or by filibusters in the recent Congresses. This legislation is undoubtedly needed and it would seem that engineers should study and advise their representatives, aiding them in rightly solving the problem. Several water-power bills are again up and it would seem time some constructive action were taken. More occasion for engineers to assist in a correct solution. If not engineers, who? (See *Engineering News-Record*, June 5, p. 1130.)

If we don't acquaint our representatives as to our wishes how can they act upon them? Our duty as citizens demands that we give our country the benefit of our peculiar training in these matters of grave public interest. Otherwise we are slackers.

Engineers who have had experiences with the War Department that give cause for just complaint, or engineers who find themselves unable to induce the Department to fairly review their claims or complaints, are invited to state their case to the National Service Committee, M. O. Leighton, chairman, McLachlen Building, Washington, D. C. A typical case is described in *Engineering News-Record*, June 5, p. 1132.

Engineering News-Record, May 29, p. 1073, carries an article on what engineers in Iowa accomplished regarding desired legislation. Read it. It contains a typical speech. Perhaps engineers get about as much consideration as they deserve. We can get results if we go after them.

Milwaukee Society Has Active Committee On Civic Affairs

When a bill affecting the public interests of Milwaukee, Wis., by changes in the membership of the sewerage commission was introduced in the Wisconsin legislature recently, the matter was taken up by the Engineers' Society of Milwaukee through its committee on civic affairs. After investigation a report adverse to the proposed amendment was printed and distributed, giving the following three reasons for opposition: Lack of necessity of the proposed change; failure of the change to effect its purpose owing to certain conditions outside of the law in question, and desirability of avoiding the political influences which would be introduced. The bill was passed by the legislature but the opposition was such as to lead the governor to veto the bill.

This committee was appointed last winter and is expected to keep the society continually in touch with public affairs, thus enabling it to perform its civic duties to better advantage. It has now three subjects under consideration: The qualifications for the position of city building inspector and the organization of

his office; the arterial highway system now being studied by the public land commission in connection with city planning; the city's water filtration plant and its location. It reports to the council of the Society and this body alone has authority to make the results public.

Previous to the appointment of this committee the Society's work in regard to public affairs had been done partly through special committees. In 1914 a committee on street lighting made a report which was adopted by the Society and the recommendations of which have been followed by the city. Another special committee was appointed in 1916 to consider the feasibility of closing the Milwaukee River to navigation by large vessels and replacing the drawbridges with fixed structures. The report, noted in *Engineering News-Record* of Sept. 27, 1917, page 608, was adopted by the society but has not been acted upon by the city.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Accident-Prevention Highway Spurs at Railroad Grade Crossings

Sir—When approaching a railroad crossing the other day, in company with a civil engineer, I made the remark that it would be a splendid thing for both automobilist and the railroad if the railroad would construct at each grade crossing a road running parallel with the tracks, so that if an automobilist were threatened with collision, he could turn his car to the right or left, and thus avoid hitting the locomotive or the moving train. Such a road should be banked, so that the automobilist could make a short turn without difficulty, even though the car were traveling as fast as 30 miles an hour. The civil engineer thought so well of the idea that he urged me to write you.

Experience has shown me that it is impossible for the automobilist to see, at 99 grade crossings out of 100, whether a train is approaching from either direction, until his car is either upon the tracks or so near them as to make it practically impossible for him to stop if a train were approaching. A banked road running parallel with the railroad tracks on both sides would enable him to escape accident in the majority of cases, and need not be more than 150 ft. in length.

For example, a chauffeur turned to the left at the Leonia, N. J., crossing of the Northern R.R. of New Jersey the other day, but, having no roadway to run upon, he was compelled to take to the rails, and the car was overturned, killing the chauffeur, but saving the lives of the passengers, none of whom was seriously injured. Had there been a roadway as suggested above, the driver could undoubtedly have saved both himself and his machine.

No doubt the maintenance-of-way departments of the railroads will declare that in a great many cases it would be impossible to build such a roadway, owing to the lack of room and other reasons, but this could be overcome.

This leads me to point out another fact, which is common to the experience of automobilists; and that is, that the rattling of the auto makes it almost impossible for one to hear crossing bells, should a bell be ringing; for which reason the railroad should place a signal at least 150 ft. distant from the railroad tracks, which would warn the automobilist that a train is approaching.

Crossing signals, consisting of red lights, have been installed by the electric railway between Paterson, N. J., and Suffern, N. Y., over all grade crossings. When lighted, even in the day time, the red lights are visible at a considerable distance, so that there is ample time for a driver to stop his car. A signal of this kind should be installed by the railroads, so that the driver may depend upon his eyes for the warning signal, rather than upon his ears.

I trust that these two suggestions may receive reasonable consideration, as the application of them would undoubtedly save many lives, prevent many grade-crossing accidents, and save the railroads thousands of dollars in damage suits to which they are now subjected.

It is needless to argue that most automobilists are reckless, because the average driver has no desire to risk his own life, or the lives of his family and friends, and only a very few take wilful chances.

ALBERT L. WYMAN,
Paterson, N. J. Secretary, Employers' Association.

"Common Surveying" and Engineers' Unrest

Sir—President Palmer C. Ricketts, of Rensselaer Polytechnic Institute, makes some statements in his letter published in your issue of May 29, 1919, p. 1075, which may disclose one cause for the tendency toward unionism among young engineers. In commenting upon letters heretofore published relative to compensation for engineers he says: "The complaining letters are most frequently written by surveyors and draftsmen. The difficulty is that common surveying and ordinary drafting are not difficult to learn, and the law of supply and demand takes care of the pay for this kind of work."

Not having studied unionism as it may apply to the engineers, I make no comments thereon. I have but little to say about drafting. It is recognized that engineering schools are not preparing young men as real draftsmen today. Where art had some recognition in required courses of study twenty years ago, commercialism now controls the field. Engineering schools attempt to "supply" the "demand" rather than to prepare young men for leadership in this branch of engineering.

Apparently, the only antidote for drudgery is unionism. The man who masters his work, however trivial it may seem in the eyes of others, falls in love with it. He never has time to become despondent. His work is his stimulation. "Common surveying" and "ordinary drafting" are terms that he never employs. If our engineering schools were to eliminate much of the professional work of the last year or two, and devote the time thus made available to instruction in courses that are fundamental to engineering, young engineers would have a better chance to grow naturally in their professional careers. In order that engineering schools may acquaint young men with a few small areas within

the great field of professional practice, many fundamentals have been crushed and their inspirational qualities have been almost destroyed.

Rare individuals among engineers have been able to prepare themselves properly while struggling toward the final goal of success. The rank and file lag behind these leaders, largely because they have not been inspired by anything that has come to them in the classroom, the laboratory or the field. Some of these leaders look back occasionally from the heights they have attained, and, as they view the multitude, their brethren, they lapse into philosophical dissertation. They are inclined to apply laws, almost obsolete in the realm of economics, in support of their judgment of those who try to climb the professional ladder under handicaps unknown when engineering training was more catholic and inspiring.

Surveying is generally designated as common when not performed properly or not performed at all. Too many schools teach surveying as an automobile demonstrator teaches a timid woman to drive a car. Students enter classes in surveying to receive instruction in the use of the transit and the level and to apply some of the simple formulas of plane trigonometry. Instruction of this kind may deceive young men. It may satisfy the conscience of the rough-and-ready educator. Some schools may "get by" under such a practice for a long term of years. In the meantime, however, surveying is neither an applied science nor a stimulating branch of engineering theory. Until engineering educators recognize conditions and apply remedies, the country will continue to suffer because of poor surveying and our young engineers will continue to talk of unionism.

Those who classify branches of engineering in the light of compensation paid for service should analyze the cause for unrest among young engineers. If these young men had been trained in fundamentals before they undertook the study of surveying, they would afford an uplifting influence in the latter field. But few branches of engineering are more exacting than surveying. To the man whose ambition centers about a swivel chair and who hopes to avoid physical exercise while earning his daily bread, surveying will probably never offer inducements. The young engineer who has never been inspired by the study of surveying will not be likely to prosper in the practice thereof.

Any branch of engineering becomes unattractive when engineering schools cease to give instruction in the fundamentals that should support it. Surveying is not based altogether upon applications of trigonometry. It does not consist altogether in the use of surveying instruments. Find the man who loves surveying and you find a contented citizen and a leader of his community. He will be able to tell you something about the probable error of measurements made under varying conditions. He will know something about the proper balance in degree of accuracy between lineal and angular measurement. He will understand how the cost of work increases with precision. He will not entertain arguments designed to induce him to lower limits of accuracy, and hence the cost of surveys, because of land values. He realizes that land values fluctuate, and he does not want his reputation ta fluctuate therewith. He will understand something of the economics and law of surveying. Instead of juggling with the formulas of trigonometry exclusively, he also applies analytic geometry, descriptive geometry, calculus, least squares, astronomy, physics and even chemistry in his every-day activities. Geology, botany and forestry will guide him in many of his field operations.

His work might be designated as "common" by the casual onlooker. Engineers should not join the layman who thus passes judgment. The survey of property, political and geographical boundaries, has always been and will always be his most important field.

No branch of engineering makes a greater appeal for aid and sympathy than surveying. Probably the greatest losses suffered by employers of engineers have occured in this field. We failed to provide highly trained men when they were sorely needed, and it was necessary to draft incompetents to the service to build up the army that subdivided the public domain. These men, at a later date, naturally became local practitioners of surveying. While other countries placed work of this kind on a scientific foundation, the politician and the land speculator have dominated here. The engineer did not have courage enough, evidently, to fight the system. By his silence he has passively given it his approval.

When engineers begin to lay a foundation for a profession, one of the cornerstones must be surveying. When this stone has been properly wrought and carefully bedded in the cement of fundamental training, the engineers of the country will have taken a step which will guarantee the respect of a great element which estimates all kinds of engineering from a superficial view of activities in this most general branch. Engineering educators should proceed on the theory that any kind of engineering may be made pleasant and profitable when properly supported by the essential fundamentals. Fundamentals furnish the soil in which professional pride and satisfaction may grow. Every branch of engineering that is now popular, because of the high compensation it affords, is threatened with a blight which spreads as engineering schools increase the burden of required professional work at the sacrifice of things that guarantee stability, self-reliance and contentment in the realm of practice.

CLARENCE T. JOHNSTON.
Professor of Geodesy and Surveying, College of Engineering, University of Michigan.
Ann Arbor, Mich.

Transit or Plane-Table for Topography?

Sir—I see occasionally in your publication articles on topographical surveying by engineers who have almost invariably used a transit, and have used ingenious and what seems to me laborious methods, to accomplish what could have been done more easily with a plane-table. I am not alone in this opinion, having heard it expressed often by former railroad engineers who have joined the United States Geological Survey, where all topography is done with the plane-table.

To operate a plane-table efficiently, one has to be an accurate draftsman and have considerable experience. I think an experienced plane-table man can work as rapidly as a transitman, get results as accurate as can be plotted and pick up all mistakes in the piece. I would like to see this discussed.

HARGRAVES WOOD,
Martinsburg, W. Va. United States Surveyor.

HINTS FOR THE CONTRACTOR

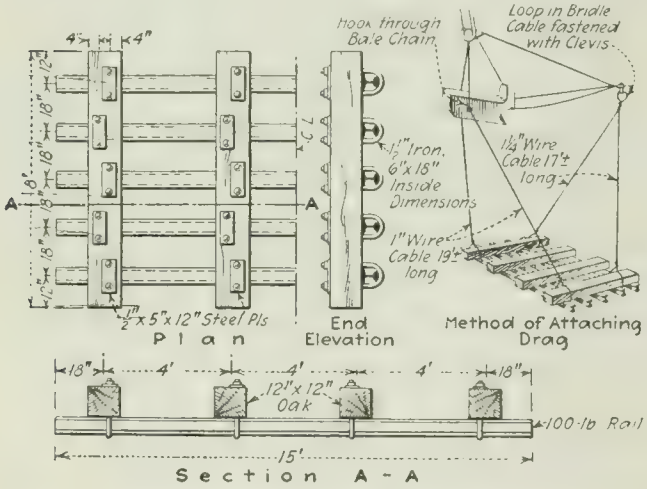
DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Special Drag Finishes Channel Slopes Dug by Dragline Excavator

By B. Louis Zull
Dayton, Ohio

FINISHING channel slopes, which were formed with a dragline excavator, by dragging them with a special device formed of steel rails, has been resorted to on the Dayton, Ohio, channel work of the Miami Conservancy district. A 3½-cu.yd. dragline bucket was found to be impracticable for finishing to grade the river channel slopes, as it left ridges on either side of the bucket at every drag. Even the surface under the bucket, while smooth, was wavy. A heavy drag, constructed as shown in the accompanying sketches, was finally built and found to be very satisfactory in obtaining the finish.

The drag, as constructed of 100-lb. rail and oak timbers, weighed in the neighborhood of 4500 lb., and when in use was attached to the regular dragline as shown in the sketch. After the dragline had dressed the channel slope to the approximate surface, the drag was hooked to the bucket and pulled over the rough



DETAILS AND ATTACHMENT OF THE CHANNEL-SLOPE FINISHING DEVICE FOR DRAGLINE EXCAVATION

surface. If humps were left after the first trip, they were cut down either with the bucket or by a second trip of the drag carrying extra weight. Holes were filled in with the bucket and leveled off with the drag. About 25 to 30 lin.ft. of slope was cut to grade and dragged at each move of the machine, and probably 10 min. of working with the drag finished the section to a smooth surface.

Most of the channel slopes were between 3 and 5% and extended from the toe of the new levees to a point near the center line of the channel. Less than half of this was covered by water, and this portion was not dragged, except about 20 ft. from the water edge. Each of the two big electric dragline machines on the Dayton work was equipped with finishing drags of this type.

C. A. Bock is the division engineer of the Dayton channel improvement work, and H. A. Honson is superintendent and responsible for the construction of the drag.

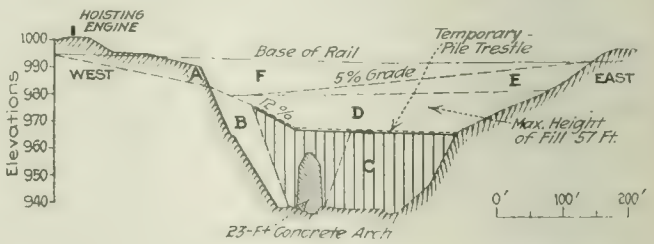
Other Articles in This Issue of Interest to Contractors:

The Relative Economy of Freight Transport by Railway and by Motor Truck — Page 52
Concrete Building Addition Made at Reasonable Cost — Page 75
Overhead and Time Cost of Pit and Trench Excavation — Page 89
Road Construction Problem in West Virginia Mountains — Page 90

Cable Incline Handles Dump Cars in Building Wet Fill

TO BUILD a lead track giving access to the site of a new car-repair plant for the Pennsylvania Lines at Richmond, Ind., it was necessary to cross a ravine by a fill about 600 ft. long and having a maximum height of 57 ft., and to commence this work in advance of the 23-ft. concrete arch culvert. The work had to be done from the west end, where grading for the repair plant required an average cut of 10 ft., but there was no track connection with either end, while a hill and a second unfinished bridge lay beyond the east end, so that the work was inaccessible for heavy construction equipment. Furthermore, no timber suitable for a high dumping trestle was available under war conditions, and shortage of labor made it necessary to use light equipment which could be operated by a small force.

A small revolving steam shovel was operated along the top of the west slope until it reached the center line of the new lead track, at which point it was 10 ft. below grade, as shown at A in the accompanying section. The shovel then worked westward along the line of the



PROFILE SHOWS STAGES OF BUILDING A HIGH FILL

lead track, loading dump wagons which made the first part of the fill at B. While this work was in progress a temporary pile trestle 30 ft. high was built across the ravine.

Dump cars of 3-yd. capacity on a track of 3-ft. gage were loaded by the steam shovel and hauled by a dinkey engine, but this engine could not operate on the 12% incline from the track level to the trestle. A hoisting en-

gine was installed, therefore, near the top of the slope with its cable operating two-car trains for making the fill C, east of the concrete arch, which was then under construction. After the arch had been completed the fill was extended over it and then the upper part of the fill, shown at D, was made by dumping material along the top and jacking up the construction track as the filling progressed. Only two men were required on the fill to dump the cars and raise the track as the fill was brought up to grade.

Operation on section D was carried on in this way as long as there was sufficient grade to run the loaded cars by gravity to the east end. Then the east end of the track was taken up and the 3-yd. cars and the dinkey at the west end started the fill E, with an ascending grade of 5% to the east. By the time this had been completed the construction of the second bridge (to the east) had progresed sufficiently to permit of reaching the work with heavier equipment, and fill F was then built by standard-gage dump cars and spreaders, bringing the top to the finished subgrade level.

The cost of that part of the work which was carried out by the light equipment was 22.5c. per cubic yard, including the cost of the trestle.

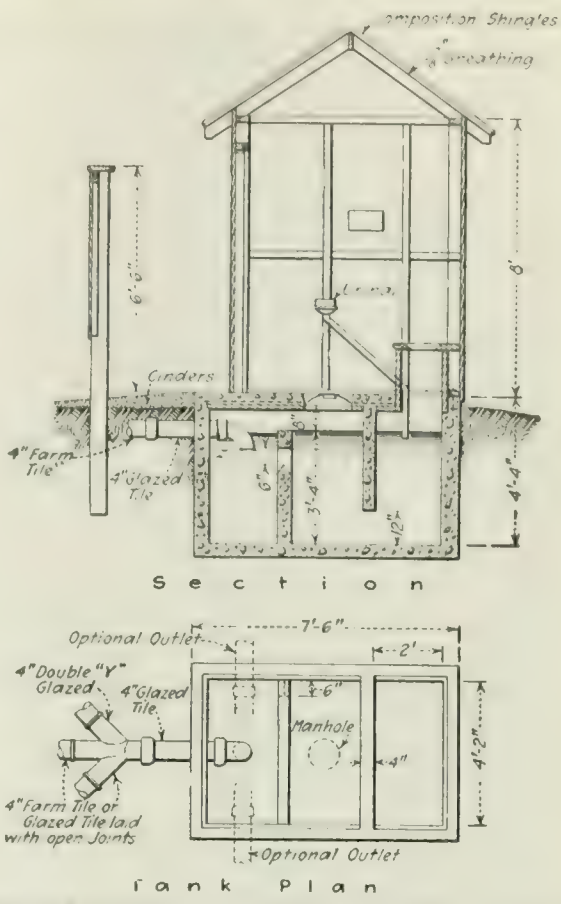
Considerable slipping occurred in this fill and in an adjacent fill of about the same height for widening the freight yards, due to the fact that they were made with yellow clay which when wet had an angle of repose of only about 10°. As the fills slipped and settled they were topped with cinders to carrythe construction track and then raised again by dumping more clay. Water getting into these successive strata of cinders and unable to escape through the clay flowed out at the sides and caused washing of the slopes. The trouble was stopped by blanketing the slope with a bed of cinders through which the water flowed.

This filling was done by railway forces. W. C. Wolfe was engineer in charge of construction, under S. W. Hodgin, division engineer, and Robert Trimble, chief engineer of construction of the Pennsylvania Lines.

Camp Sanitary Closet With Septic Tank

A SANITARY closet with septic tanks, for temporary or permanent camps, based on a standard design used by the Nashville, Chattanooga & St. Louis R.R. at section headquarters and small outlying railway stations, is suggested by the committee on economics of railway labor, American Railway Engineering Association. The design used by the railway is shown in the accompaning drawing, but the committee omits the urinal and considers that the tank might be of either concrete or wood. Additional units could be built as required. Ordinarily, the discharge pipe terminates in a bed of cinders, streams being seldom available on this railway. The manhole cover is of concrete, made in a tin form, and has a sloping top. The form is set on the floor form and concrete is poured around it, the cover being raised carefully to loosen it before the floor concrete has taken its final set.

Instructions on the railway company's blueprint direct that before the house is erected the tank be filled with water and five shovelfuls of well rotted horse manure added "to start the chemical [bacterial?] action"; also that at least 4 gal. of water be poured into the tank daily through the seat. This is for locations where water cannot be piped to the tank. The instructions also call for the provision of toilet paper and forbid the use of newspapers as a substitute.



SANITARY CLOSET AND SEPTIC TANK FOR RAILROAD

BILL OF MATERIAL FOR SANITARY CLOSET WITH SEPTIC TANK

25 sacks cement
2 5 cu yd sand
4 5 cu yd crushed stone
6 pcs 2x4-in., 10-ft. 0-in. plates and rafters, No. 1 common pine.
4 pcs 2x4-in. 12-ft 0 in plates, No. 1 common pine
5 pcs 2x4-in., 16 ft 0 in studs, No. 1 common pine
4 pcs 4x4-in. 8 ft. 0 in studs, No. 1 common pine
1 pc 2x6-in. 10 ft 0 in plates, No. 1 common pine
2 pcs 6x6-in. 10 ft 0 in posts, No. 1 common pine D45
1 pc 2x8-in. 10 ft 0 in. cap, No. 1 common pine D45
2 pcs 1¼x4-in. 10 ft 0 in verge boards, No. 1 common pine D45.
250 ft 1x6-in. shiplap siding No. 105, No. 1 common pine
8 pcs 1x4-in. by 8 ft. 0 in. corner boards, B fin pine D45
6 pcs 1¼x5½-in. 10 ft 0 in. No. R-C flooring forms, pine D & M.
1 pc 1¼x20-in. 5 ft 0 in. closet seats, B-grade white ash
1 pc 1¼x22-in. 5 ft. 0 in. closet seats, B-grade white ash
2-12x12-in. louvres
110 ft No. 1-C flooring, ⅝x3¼-in. D & M pine
200 ft No. 2-C 1x6 in. flooring, forms D. & M. pine.
80 ft ⅞ in. sheathing, No. 2 common pine, 1x6 D & M
2 sqs composition shingles, red
1 joint glazed pipe, 4 in.
1 4-in. round L, glazed pipe
1 4-in. double Y, glazed tile
6 joints, 4-in. farm tile
8 ⅝-in. bolts, 6-in. long, machine bolts with nuts
40 sq ft expanded metal at 6 lb. sq ft., diamond mesh
5 lb 20-d nails
18 lb 8-d nails
4 lb 6d nails
8 lb trimer's nails
1 pr 6-in. T hinges
1 gal. 15 green, and 2 gals 23 yellow paint
1 4 lock complete
1 urinal complete, L.M. Ramsay Mfg. Co's. No. 1 plate 1023 lb. Flat back, painted
2 45-deg. turns, 4-in. pipe
4 in. ft 4 in. pipe
1 toilet paper rack and 1 case toilet paper
1 enamel sign, giving directions

The bill of materials drawn up by the engineering department of the railway is reprinted herewith. The approximate cost of the closet and septic tank is placed at $142.

NEWS OF THE WEEK

New York, July 10, 1919

Gulf to Atlantic Canals Proposed

A bill has been introduced into the House of Representatives (H.R. 6560) providing for a survey and estimate of cost of a sea-level or lock ship canal from the Atlantic Ocean to the Gulf of Mexico. The proposed route is from the mouth of the Altamaha River in Georgia through a series of rivers in Georgia to the Apalachicola River in Florida, thence down that river to its mouth in the Gulf of Mexico. Another bill (H.R. 6558) provides for the survey of a similar canal from Cumberland Sound, on the Atlantic Ocean, up the St. Marys River, across the States of Georgia and Florida, to some point at or near St. Georges Sound on the Gulf of Mexico.

Congress Authorizes State Agreement Concerning Hudson Tunnel

Permission was granted by Congress during the past week for the States of New York and New Jersey to agree together in the matter of the construction of the Hudson River tunnel. This permission is necessary under the Federal constitution. No financial aid by the United States is in question, the two states having already provided money for beginning the work.

Joint Committee on Concrete Pipe Organized

Organization has been effected of the joint committee of various societies to prepare specifications on concrete pipes and culverts. The societies joining in are the American Railway Engineering Association, the American Association of State Highway Officials, the American Concrete Institute, the American Society for Testing Materials, and the Concrete Pipe Association. The first sub-committee which is actively to begin work is one which is to prepare specifications on culvert pipe.

States Rapidly Taking Allotment of Federal-Aid Funds

The rapidity with which the states are taking advantage of the Federal-aid funds appropriated at the last session of Congress is indicated by the fact that during the month of April Federal aid in agreements and approved statements to the amount of $9,559,571 was allowed on work which will cost $20,861,958. Some states took record amounts of aid, among which was Pennsylvania, which has the record for any one month, the amount of Federal aid approved being $1,444,967.

In a single project in Illinois, which was approved, $818,222.75 of Federal money, which is half the cost, will be used. The total of approved statements and agreements made by the Bureau of Public Roads during April was a considerable increase over the March record, the number of projects being 174 as against 150 in March, with a mileage of 1444 as against 1270. This was an increase in allowances of about $2,820,000.

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment Service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago. Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 233 Broadway, New York City.

French Engineers Visit This Country

Six French engineers, architects and contractors, forming an official commission, are visiting this country to study various American developments which would aid the French Government in their reconstruction plans. The party is composed of Jacques Greber, architect; Pierre Nugue and Victor Perreaud, engineers; Réné Bonhommé, building contractor; Charles Jacob, sanitary engineer, and Dr. Paul P. Cret, who before the war was professor of architecture at the University of Pennsylvania. The commission is studying particularly the various housing developments in this country and is visiting besides industrial centers for the purpose of studying mill construction and operation. It probably can be reached by addressing Dr. Cret at the University of Pennsylvania.

New Highway Bill in Congress Provides New Department

A bill has been introduced in the House of Representatives by Mr. Osborne of California to establish a national highway system, to promote efficient and economical highway transportation, and amend the Federal-Aid road laws so as to create a Department of Federal Highways. The bill is similar in intent to the Townsend Highway bill, but appropriates a much larger amount of money, and establishes a new government department with a new cabinet portfolio instead of a commission.

If the bill should pass it would appropriate $1,700,000,000, divided as follows: $100,000,000 to become available 30 days after the enactment of the bill, $200,000,000 for the fiscal year ending July 1, 1920, and a like amount for each of the following seven years. All of these sums would remain available until expended. The bill also provides for a secretary at a salary of $15,000 per annum, appointed by the President and confirmed by the Senate, and an assistant secretary at $10,000, with such other employees as may be necessary. Except for special employees, the force would be under the classified civil service. Following is a quotation from a summary of the bill appearing in the weekly review of the Chamber of Commerce:

> The department would provide a connected system of highways sufficient to maintain interstate commerce, furnish adequate post road facilities and provide for the national defense. It would establish trunk lines of national highways (a) from the Atlantic to the Pacific (not less than three in number), (b) from the northern to the southern boundary of the United States (not less than two in number) and (c) intersecting and feeder lines (not less than two) in each state. These trunk line roads would form a national highway system.
>
> The Secretary of Federal Highways would determine (1) the routes upon which national highways would be constructed, (2) the highways to be included in the system, and (3) the order in which they are to be built and maintained. In making selections he would be required to keep in mind the formation of a national system of trunk line roads with intersecting and connecting highways adequate for the purposes of the bill. The Secretary would have charge of all work in connection with the construction, maintenance, etc., of these roads, preparing estimates, plans specifications, and might make arrangements with states, counties and municipalities for the taking over and administration as part of the federal highway system of roads in these subdivisions.
>
> The roads included in the National Highway System would be built, and maintained entirely at the expense of the United States, and administered through the Secretary of Federal Highways. Beginning July 1, 1919, and annually thereafter until the first day of July, 1926, the Secretary of the Treasury would be authorized to issue National Highway Bonds to the amount of the appropriation provided for that year. The rate of interest, time, etc., as to each issue would be determined by the Secretary of the Treasury.

California Highway Bond Issue Carries by Large Majority

The bond issue for $40,000,000 has been carried in California by a large majority. The vote for the proposition is reported to stand about 7 to 1, with every precinct in the state voting in the affirmative. This is the third bond issue for highways authorized in California and makes a total of $73,000,000 for this purpose in the last decade.

By this bond issue the completion of the present state highway system and the construction of many new highways distributed throughout the state in such a manner as to round out the present system and to adequately serve the entire state is provided for. The state system has 4500 miles of highways. This adds another to the growing number of states which have voted large highway bond issues during the last year.

Second Large Concrete Ship Launched

At the Mobile, Ala., yard of the United States Emergency Fleet Corporation, there was launched on June 28 the second of the 7500-ton reinforced concrete vessels designed by the Concrete Ship Section of the Board. This ship was named the "Selma" and was built in the yard which was under the direction of Fred T. Ley & Co. as contractors before the government took over the operation of all of the concrete shipyards.

Milwaukee Sewerage Commission To Remain Unchanged

Although a bill proposing to amend the present sewerage law of Wisconsin by making city engineers eligible to appointment on such commissions was passed by the legislature, it was vetoed by the Governor. The bill was opposed by the civic affairs committee of the Engineers' Society of Milwaukee. In its report on the subject the committee stated that the bill "seems to have been introduced because of a certain amount of dissatisfaction with the sewerage commission of Milwaukee, which resulted in certain charges being made against its chief engineer some time last fall."

Two arguments in favor of the amendment were mentioned in the report. One was that the city should have a representative on the board who is capable of checking the plans and informing the city government as to the progress of the work. The other is that when the works are completed they will be turned over to the city for operation and maintenance. The committee considered that the city engineer now has the privilege of examining and checking the plans and that as the progress of the work has been made a matter of public record there is no ground for suspicion of secrecy. The committee saw no objection to the appointment of an engineer as a member of the board, but urged that he should act as a commissioner only and not as an engineer, since the latter system would introduce danger of divided responsibility.

As to operation and maintenance, it was pointed out that the city engineer's term is limited by charter to three years, so that there is no assurance that an engineer appointed as a member of the board during the period of design and construction would be connected with the future work of operation. Further, it was pointed out that with the "grostesquely low salaries offered by the American municipality for its professional help" there is no assurance that the city's representative would be competent to intelligently review and check plans for sewage disposal in a city such as Milwaukee.

The strongest argument, however, seems to have been that the amendment would introduce a political element into the board. The committee stated that the intent of the original law was to place the work in the hands of a body of men as free as possible from political influences and ties. For this reason the law excluded all persons holding any city, county or state office or office in any political organization. The committee stated that the bonds for the work were voted on this understanding and that to permit this bill to become law "would be to break faith with those who voted in favor of the bond issue."

Cost of Bonds on Construction Contracts in Dispute

The construction contracts of the War Department during the war, placed upon a cost-plus basis, include the list of costs for which the contractor was to be reimbursed by the government—"such bonds as the contracting officer may approve or require." Contractors were required to furnish bonds for the faithful performance of the contract and for payment of all bills for labor and material. The language of the contract form declares that the contractor shall furnish such bond "prior to commencing the said work." The disbursing officers of the United States uniformly accepted this as sufficient authority for reimbursing a contractor for the premium on his bond, paid by him.

No doubt was entertained on this subject until quite recently, when some decisions of the comptroller's office led to an inquiry by a disbursing officer as to his authority. The assistant comptroller, in an opinion recently rendered, declared that the form of cost-plus contract in use by the Construction Division does not authorize reimbursement to contractors of such premiums. This has been reaffirmed in another advance opinion by the comptroller. It is understood that disbursing officers who have already made such payments are charging the payments back to contractors and deducting them from their final vouchers.

The understanding is also that premiums paid on earlier construction contracts will be deducted from the final payments on later construction contracts, and that if the decision is adhered to finally an effort may be made to collect the premiums already reimbursed upon settled contracts. The matter is of wide interest, as the total sum involved is of magnitude. Daniel A. Garber, president of the Associated General Contractors, Inc., has taken this subject up with the intention of securing a reversal of the present ruling either by the comptroller on review or, failing that, by the Court of Claims. With this end in view, he has obtained the opinion of King & King, of Washington, D. C., attorneys for government contractors, to the effect that the deduction is not authorized by law and by the contract and that, in all probability, the contractors can be protected in their right to this reimbursement. Steps have been already taken toward the presentation of a test case.

Texas Association of Contractors

The Texas Association of General Contractors, comprising contractors engaged in general construction work in Texas, which was recently organized, has opened offices in the First National Bank Building of Houston.

The following officers have been elected: President, George F. Horton; vice-presidents, George Watson and Robert J. Potts; treasurer, Charles M. Davis; secretary, Jerome Cochran, Houston.

St. Paul Increases Tax Limit

As an aid to a readjustment of its finances to meet after-war conditions, the voters of St. Paul, Minn., have just approved a charter amendment which will permit city expenditures up to $30 per capita, instead of $24. The latter figure was fixed in 1914. Since then the per capita budget appropriations have been: $18.57; $20.75; $20.73; $22.02, and $23.85.

Imparting Accident Prevention Knowledge to Workmen

According to a booklet just issued by the Working Conditions Service of the United States Department of Labor, entitled "How To Give Illustrated Lectures on Accident Prevention to Workmen," it is stated that the most effective way is through the use of short talks of about 30 or 40 min. in length. These talks should be illustrated with slides and moving pictures showing the results of accidents rather than how to avoid them. Where the lectures are to be given to a large percentage of foreigners, they should be held at the noon hour in the dining room of the men, or, in the case of evening meetings, at 7.30 or 8 p.m. The evening meetings should be held at some central location and should be made an affair of interest to the workmen's entire families. The booklet mentioned, which may be obtained on request from the Department of Labor, gives a description of how to prepare addresses for delivery.

Presented to Builder of First Concrete Ship



MEDAL PRESENTED W. LESLIE COMYN, OF THE SAN FRANCISCO SHIPBUILDING CO., BY THE AMERICAN CONCRETE INSTITUTE, AT ITS CONVENTION AT ATLANTIC CITY, JUNE 28, 1919.

Selling Plan Announced by Fleet Corporation

Sale of all surplus and used property of the Emergency Fleet Corporation, including supplies, material and equipment, is to be carried on according to elaborate selling plans just announced. The items to be disposed of include manufacturing plants, shipyards, dry docks, ships completed and partly completed, yard equipment and material.

Requests for information concerning the items or conditions of sale should be directed to the U. S. Shipping Board office at Washington, with respect to completed ships; to the secretary's office, Emergency Fleet Corporation, Philadelphia, with respect to partially completed ships; to the Shipyard Plants Division of the Fleet Corporation at Philadelphia with respect to shipyards, dry docks, marine railways, and manufacturing plants; to the Transportation and Housing Division of the Fleet Corporation at Philadelphia with respect to housing and transportation projects; and to the Supply and Sales Division of the Fleet Corporation at Philadelphia or to the district supply and sales offices in New York, Philadelphia, New Orleans, Chicago and Portland with respect to all other materials. Foreign sales will be handled until the first of September by the American Steel Export Co., 233 Broadway, New York City, which has been awarded a contract for this service.

A sales review board has been established by the Fleet Corporation to study market conditions and fix or approve prices. Sales will be made by open bidding on advertised items or by purchase from the board's price lists. Efforts will be made to confine sales to those having actual use for the property, except in cases where sales for purposes of resale will not disturb market conditions. The Fleet Corporation will coöperate with other government departments and with the Chamber of Commerce of the United States in ascertaining market conditions. Open sales for items in excess of $5,000 must be approved by the sales review board.

It is stated to be the intention to move all property and material as quickly as possible consistent with the welfare of all interests involved. Proposed sales will be advertised widely, and it is also planned to circularize direct the firms and concerns that may appear to be possible buyers. Any persons or concerns interested in the sales may have their names placed upon mailing list to receive notice of all sales contemplated, upon request to the Shipping Board.

Large Sale of Steel Ships

Nineteen steel vessels were sold by the United States Shipping Board, recently. They range from 5350 to 9600 dead-weight tons' carrying capacity, and total 128,472 tons. The prices paid range from $210 to $225 per dead-weight ton, and amount to $27,821,120. Seven purchases are involved, one of them taking six of the vessels and another four. Of the 19 ships, 12 are fabricated.

With the sales noted, a total tonnage of 332,045 dead-weight tons, or 221,363 gross tons, of ships has been sold by the Shipping Board, for an amount exceeding $50,000,000.

Chicago Sanitary District Will Build 60 Miles of Road

Plans for a trunk highway about 60 miles long from Chicago to Waukegan and Joliet, Ill., along the right-of-way of the drainage canals are to be prepared under the direction of George Y. Wisner, chief engineer of the Sanitary District of Chicago. The type of construction is not determined, but large quantities of rock from the old spoil banks are available. From Chicago to Waukegan an 18-ft. road will suffice, but from Chicago to Joliet it is intended to have a width of 30 ft. in view of the possibilities of motor-truck traffic.

Observations by the National Service Committee

M. O. LEIGHTON, Chairman

PUBLISHER'S NOTE: The space occupied under the caption is donated to serve as a means of frequent and intimate communication between the Washington office of Engineering Council and the members of the profession. The contributor takes full authority for the statements made.

AN ENGINEER'S UNFORTUNATE EXPERIENCE AND THE WAR DEPARTMENT'S REPLY

A letter from a former engineer officer of the Army, resident in the Philippines, relating certain facts concerning his discharge from the Army at Washington, D. C., and his subsequent necessity for paying his own expenses back to the Philippines and of sustaining a loss of two months' time in transit, without compensation therefor, led to a letter of inquiry being sent by the National Service Committee to the Secretary of War. This has brought reply from the Chief of Engineers, U. S. A., to which is attached a copy of a memorandum sent by him to the Adjutant General in response to official reference from the latter's office. As this memorandum covers the case in a comprehensive and satisfactory way, it is quoted in part, as follows:

It appears that legislation is necessary before a satisfactory answer can be given to either of the questions raised in the letter from the Chairman, National Service Committee, Engineering Council.

Authority to pay mileage to first station is given in H.R. No. 100 introduced by Mr. Osborne on May 19, 1919. If passed, it will provide funds for the payment of mileage to officers commissioned in the National Army on joining their first station. It would remove the inequality now existing between officers in this class and officers in the Reserve Corps. In this connection attention is invited to memorandum from this office to the Legislation Branch of the War College dated Jan. 23, 1919, copy herewith. This memorandum explains in detail the circumstances under which about 800 Engineer officers were deprived of receiving mileage to their first stations although the same had been promised them.

The grounds for the complaint made in the second part of the letter quoted by Mr. Leighton appear to be well taken. This matter was first brought to the attention of the Chief of Engineers by letter from Captain Harry D. Cranston, Engineers, dated Jan. 4, 1919, in which he requested that instead of being discharged at Camp Humphreys, orders be issued by the War Department directing his return to Manila, the place where he was ordered to active duty, and that he be discharged there. This request was forwarded to the Adjutant General by the Chief of Engineers, recommending approval. By Paragraph 4, Special Orders 16-0, Jan. 20, 1919, the War Department ordered him to proceed to Manila and report in person to the Commanding General, Philippine Department, for discharge.

Under date of Mar. 1, 1919, Captain John B. Findley, Engineers, who was ordered to active duty at Manila on the same order as Captain Cranston, requested orders to the Philippine Islands for discharge. This request was returned to the Chief of Engineers by the Adjutant General by 5th indorsement dated Mar. 18, 1919, stating that orders would issue directing Captain Findley to proceed to San Francisco for discharge and that "It is contemplated officers ordered to active duty outside the United States and who desire to return to their homes, will be discharged at the demobilization center in the United States nearest to their homes." This communication was returned to the Adjutant General by the Chief of Engineers by 8th indorsement inviting attention to the case of Captain Harry D. Cranston, but the Chief of Engineers was informed under date of Mar. 25, 1919, by 9th indorsement from the Adjutant General that here-

after the policy as stated above would be followed.

The criticisms voiced in this letter are evidently not without justification, and it is recommended that a draft of suitable legislation be submitted to Congress to correct, so far as the War Department can, the iniquities herein described.

(Signed) W. M. BLACK,
Major General, Chief of Engineers.

It is apparent from the memorandum above quoted that there are about 800 similar cases. The invitation given in our first communication on this subject, namely, that the former Engineer officers having had like experience should communicate with the National Service Committee, is here urgently repeated. It is obvious that Congress cannot be expected to take the time to pass corrective legislation if those in whose benefit it is proposed are too indifferent to relate the facts as they know them.

Grateful acknowledgment has been made to the reply of the Chief of Engineers above cited, and such assistance as the National Service Committee may properly give has been proffered. This committee can do nothing unless it has the coöperation of the engineers most interested in the matter.

Let Entire Water Front at Private Lease

Private control of the entire water front of the city of Berkeley, Calif., will be granted if a lease authorized by the City Council is completed. The lease was sold at auction and was granted to Rufus P. Jennings of Oakland, Calif., at a rental of $100 per month. An ordinance was thereupon passed by the City Council authorizing the lease. This will not become effective until July 24 and may be vitiated before that time by certain legal procedures. By the provision of the lease $1,000,000 must be expended on the leased premises and $2,000,000 on property adjacent to the leased land within the city of Berkeley. It is understood that plans are ready to provide for the building of a series of piers extending a long distance into the bay and carrying warehouses and industrial buildings. Under the terms of the lease Jennings is given a year in which to begin development work.

A. A. E. Committee on Engineers' Pay

An organization committee has been named by the American Association of Engineers to formulate a plan for promoting the non-technical interests of engineers in public service and to make a national study of proper pay for engineers. This is in line with a resolution adopted at the annual convention. The committee consists of F. H. Newell, president of the association; A. N. Johnson, consulting highway engineer for the Portland Cement Association; A. R. Hirst, state highway engineer of the state of Wisconsin, and S. C. Hadden, the editor of *Municipal and County Engineering*.

Chicago Smoke Problem Civic More Than Engineering

The pressing necessity of abating the smoke nuisance in Chicago was discussed, June 24, at a joint luncheon of the Western Society of Engineers and the City Club. That present ordinances are sufficient and need only proper enforcement was the opinion of Joseph Harrington, formerly of the United States Fuel Administration, who remarked that conditions are almost as bad as before the agitation for smoke abatement. Smoky plants discredit the designers and operators. Engineers agree that smokeless combustion of Illinois fuel can be accomplished and the matter involves civics, public sentiment and education rather than engineering.

A chief smoke inspector, who is an engineer thoroughly informed on combustion matters and who can present these to business men and boiler-room men, is indispensable, but the present salary is insufficient to attract such a man. The former smoke commission, composed of business men of high standing, was successful in getting results, and Mr. Harrington advocated its revival, together with a well organized city smoke-inspection department and a high-grade chief inspector.

Domestic consumption as a part of the problem was dealt with by Harold Almert, consulting engineer. Of the soft coal in Chicago, 85% is burned by industrial plants and 15% by domestic consumers, but this 15% of coal causes 70% of the smoke. There is plenty of Illinois coal suitable for domestic use, and it can be burned without smoke in furnaces, kitchen ranges and hot-water heaters. As a first step, Mr. Almert suggested the creation of a desire for civic cleanliness, which he estimated would save about $75,000,000 per year. The city's smoke-inspection department was not represented at the meeting.

Water Power Legislation Still Hangs Fire

Although water power bills have been introduced into the House and the Senate and although it was expected before this that at least the House bills would have been passed, the vote in each case has been postponed from time to time. There does not appear to be any immediate possibility of the passage of the bills.

Civil Service Examinations

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Assistant designing engineer, Naval Ordnance Plant, South Charleston, W. Va., $9.20 per diem. July 8. File applications before July 8.

Assistant inspector of engineering material (aircraft). $5.92 per diem, July 15. File applications before July 15.

Supervising draftsman, bureau of steam engineering, Navy Department, $12.80 to $13.60 per diem. Applications must be filed before August 19.

Chief ship draftsman, U. S. Navy Department, $10 to $12 per diem; draftsman, grade A, $8 to $9.60 per diem; draftsman, grade B, $6 to $7.20 per diem; draftsman, grade C, $5.20 per diem. No date specified. Applications should be filed without delay.

Chief draftsman, general engineering, architectural, power plant, heating and ventilating, electrical, U. S. Navy Department, $10 to $12 per diem; draftsman, grade B, $6 to $7.20 per diem; draftsman, grade C, $5.20 per diem. No date specified. Applications should be filed without delay.

Valuation engineer, $3600-$4800 per year, and assistant valuation engineer, $2500-$3600 per year; technical staff, income-tax unit, Bureau of Internal Revenue, Treasury Department. No date specified.

Master computer, $2400 to $1800 per year, computer (Grade I) $1800 to $1400 and computer (Grade II) $1400 to $900, Ordnance Department. Applications will be received until further notice.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

NEW ENGLAND WATER WORKS ASSOCIATION; Tremont Temple, Boston; Sept. 30, Oct. 1-3, Albany, N. Y.

The Engineers' Club of the Canal Zone held a meeting June 21 at Balboa Heights, C. Z. which was addressed by Harry F. Deitz, Bureau of Entomology, U. S. Department of Agriculture, who spoke on "Some Dangers in the Transporting of Plants from their Native Homes to Other Parts of the World."

The Colorado Association of Members of the American Society of Civil Engineers held its annual meeting June 14 at which the following officers were elected: President, W. C. Huntington; vice-president, Oliver T. Reedy, and secretary-treasurer, A. N. Miller.

The Union Pacific R.R. Section of the American Association of Engineers formed a permanent organization at a meeting held June 27, at which the following officers were elected: President, L. M. MacArthur; vice-president, C. W. Bivens; secretary and treasurer, J. G. True.

The Kansas City Engineers' Club held a meeting, June 27, which was preceded by an inspection trip to the

Turkey Creek Tunnel, which is driven through rock under Grey Stone Heights for the diversion of Turkey Creek, as the guests of the Raymond Concrete Pile Co. Over 100 members of the club made the inspection trip.

PERSONAL NOTES

LOUIS C. DUPUIS, assistant resident engineer, maintenance of way, Canadian National Railways, has been appointed division engineer, Saguenay division, with headquarters at Quebec. After a few years' experience in county engineering work he entered railroad service in 1910 on the construction of the National Transcontinental, and in 1911 was appointed assistant engineer, Intercolonial Railway, and later assistant resident engineer. In 1916 he was appointed assistant resident engineer, maintenance of way.

T. M. BOLE, assistant engineer, Pennsylvania Lines West, with headquarters at Pittsburgh, has been assigned the field work formerly handled by J. H. Minton, senior assistant engineer, resigned to enter the service of the United States Steel Corporation, as noted elsewhere.

CASIMIR S. GZOWSKI, JR., has been appointed special engineer to the vice president, Canadian National Railways, with headquarters at Toronto. He entered railroad work in 1897 in the construction department of the Canadian Pacific and remained in railroad construction work until 1914, when he entered private practice. He was appointed on the Royal Commission of Engineering Railways on valuation work.

JOHN H. LANCE, for the past 22 years chief engineer, Spring Brook Water Supply Co., Wilkes-Barre, Penn., has resigned to engage in private practice with offices in the Second National Bank Building, Wilkes-Barre. He will, however, retain a connection with the Spring Brook company in an advisory capacity.

L. P. STRUBLE, assistant engineer, Pennsylvania Lines West, with headquarters at Pittsburgh, has been assigned the office work previously handled by J. H. Minton, senior assistant engineer, resigned to enter the United States Steel Corporation, as noted elsewhere.

LIEUT. COL. GEORGE A. JOHNSON, Construction Division, U. S. A., whose association in partnership with Maj. W. L. Benham was recently announced in these columns, has been promoted to the rank of colonel. Colonel Johnson entered the service in the spring of 1918 as a major and was promoted to the rank of lieutenant colonel, November, 1918. He is now second in command of the Operation and Repair Branch of the Construction Division of the Army, which has charge of the operation and maintenance of camp utilities, including roads, railroads, buildings, water supply and sewage at the various army establishments.

MAJ. LYMAN GRISWOLD, Corps of Engineers, U. S. A., who served with the expeditionary forces in France, recently returned to this country and to civil life. He has opened offices in the Railway Exchange Building, Portland, Ore., to engage in practice as a consulting civil engineer.

A. M. BURT, assistant general manager, Northern Pacific R.R., has been appointed assistant director of the Division of Operation, United States Railroad Administration, with headquarters at Washington, D. C., in charge of engineering and maintenance, succeeding Charles A. Morse, who recently resigned to resume his former position as chief engineer, Chicago, Rock Island & Pacific Ry., as noted in a recent issue. Mr. Burt entered railroad service in 1885 as a rodman on the Colorado Midland, and a few years later became assistant engineer on the Northern Pacific and afterward on the Adirondack & St. Lawrence, the Wisconsin Central and the Chicago & Northwestern. In 1897 he reëntered the service of the Northern Pacific as supervisor of bridges and buildings, and four years later was appointed assistant superintendent. Until 1914 he served as superintendent of various divisions, and in 1918 became chief engineer, maintenance of way. He was then appointed acting general manager, Lines East of Paradise, Mont., and later became assistant general manager of the Eastern Lines with headquarters at St. Paul.

W. THOMAS WOOLEY, formerly city engineer of Auburn, N. Y., Hoosick Falls, Schenectady and Syracuse, has been appointed engineer in charge of construction of the new state prisons at Sing Sing and Wingdale.

W. F. MONFORT has resigned as acting professor of sanitary chemistry, University of Illinois, to resume private practice in the examination and treatment of water supplies, with offices at 506 N. Vandeventer Ave., St. Louis.

E. C. JOHNSON, acting chief engineer, Pacific Electric Railway, has been appointed chief engineer, with headquarters at Los Angeles, succeeding George E. Pillsbury, retired. The office of assistant chief engineer has been abolished.

J. H. MINTON, senior assistant engineer, Pennsylvania Lines West, has resigned to enter the service of the United States Steel Corporation with headquarters at Pittsburgh.

MAJ. H. B. HOMMON, Sanitary Corps, U. S. A., formerly in charge of water supply, Advance Section, A. E. F., recently returned to this country and received his discharge from the service. He will resume his former work with the United States Public Health Service, with headquarters at Cincinnati.

J. X. COHEN, who for the past year served as office engineer on the construction of the artillery cantonment at Camp Knox, Ky., has returned to his duties as designing engineer, Syracuse, N. Y., Intercepting Sewer Board.

ADOLPH JUDELL, for the past eight years engineer-member of the Board of Public Works of San Francisco, has resigned to become vice-president and general manager, Blanchard, Crocker & Howell Construction Co.

EARL STORER, 303rd Engineers, has received his discharge from the service and resumed his work in the engineering department of Mercer County, N. J.

RALPH ARNOLD, having completed his Government service, has resumed his practice as a consulting engineer, with offices in the Union Oil Building, Los Angeles, and at 120 Broadway, New York City.

W. L. BLACKMON, Montgomery, Ala., has been appointed assistant engineer, river plant, Montgomery waterworks, succeeding F. B. Jenkins, who died last May.

CHARLES E. HENDERSON, district engineer, United States Housing Corporation, has been appointed principal assistant engineer, with headquarters in Washington, D. C.

T. KEARNEY, assistant engineer, Canadian National Railways, Montreal, has been appointed resident engineer, Montreal division.

NELSON I. RAYMOND, Marshall, Mich., has been appointed city engineer of Owosso, Mich., succeeding E. S. Brewer, resigned.

WALTER FRICKSTADT has resigned as assistant city engineer of Oakland, Calif., to become a senior engineer, U. S. Bureau of Public Roads.

C. H. N. CONNELL, district engineer, Quebec district, Canadian National Railways, has been transferred from Montreal to Quebec.

W. G. TINNEY has been appointed division engineer, Colorado Division, Union Pacific R.R., with headquarters at Denver, succeeding C. M. Thompson, resigned.

OBITUARY

WILLIAM M. KNOELLER, contractor, Binghamton, N. Y., died Jun 16.

THOMAS N. HOOPER, president, Davenport Water Co., Davenport, Iowa died in that city June 27.

Asphalt Association Service Department

Details of the service to be rendered to public officials by the service department of the newly formed Asphalt Association have just been announced.

The idea of the association is that by raising the standard of asphalt work in all communities up to that attained by the most successful communities the interests of both the taxpayers and the asphalt industry will be materially benefited.

The names of the engineers forming the preliminary organization were given in the *Engineering News-Record* of June 26, p. 1286. They will work from the head office at 15 Maiden Lane, New York, and from branch offices in various parts of the country. Various lines of service have been proposed, among which may be named: (1) Coöperation with colleges and other educational institutions, through lectures and otherwise, to the end that the young engineer on graduation may have an accurate knowledge of the uses and limitations of asphalt; (2) a research department to coöperate with public officials in the selection of asphalt and the types of construction; (3) coöperation with officials in the proper construction of asphaltic roads; (4) collection and distribution of information of economic and statistical character.

New Semi-Trailer Sprinkler and Flusher With Detachable Tank

A new semi-trailer street sprinkler and flushing machine, as shown in the accompanying illustration, is being put upon the market by Charles Hvass & Co., of 511 E. 18th St., New York City. The avantages claimed for this apparatus are its extra tank capacity and the fact that the trailer may be detached and the truck used for other purposes.



SEMI-TRAILER STREET FLUSHER AS USED IN BUFFALO, N. Y.

A five-ton Pierce-Arrow truck is used for the motive power and support of the various sprinkling nozzles. The tank holds 2000 gal. and is attached to the truck through a plate bearing with motion in two directions, thus giving great flexibility. All the nozzles, of which there are four flat nozzles for flushing and two round nozzle sprinklers, are operated by levers from the driver's seat. Buffalo, N. Y., has six of these machines in operation and nine more ordered. In the winter the tank is detached and the truck is used for other purposes.

Business Notes

THE LAKEWOOD ENGINEERING CO., of Cleveland, Ohio, has engaged Lawrence L. Rogers, an experienced contractor, as plant service engineer, to render service and advice to contractors and public officials in solving construction plant problems on highway work. Mr. Rogers was formerly treasurer and field manager of Rogers Brothers Co., Los Angeles, Calif.

THE BLAW-KNOX CO., of Pittsburgh, Penn., announces that the sale of its plant located at Wheatland, Penn., is in line with its program to concentrate all of its manufacturing at Hoboken, Penn., where it is building a plant to take care of the work previously handled at Wheatland. The new plant at Hoboken will be completed within the next few weeks. A welding plant, in which steel mill and chemical plant specialties will be manufactured, is also being built at Hoboken.

THE ADVANCE MACHINERY CO., of 1234 Real Estate Trust Bldg., Philadelphia, Penn., announces that Alfred H. Wynkoop, formerly president of the Ralph R. Lewis Co., of Philadelphia, has severed his connection with that firm to become associated with the former company in a selling capacity. He will handle a complete line of contractors' roadmaking and railway equipment.

THE EDISON STORAGE BATTERY CO. announces the election of Maj. Charles E. Sholes as vice-president, director and general sales manager, succeeding Harrison G. Thompson, who has resigned to organize and conduct the Transportation Engineering Corporation of New York. Major Sholes has heretofore been identified with the construction, operation and management of chemical industries. He served in the war in the Ordnance Department, Chemical Branch, and is chairman of the Society of Chemical Industry.

THE HARRISON SAFETY BOILER WORKS announces that it has acquired the "Monash" line of pressure-reducing valves and pump governors formerly manufactured by the Monash-Younker Co., of New York, and will manufacture and market the valves under the trade name "Cochrane-Monash." Repair parts for valves now in use will also be furnished.

Trade Publications

The following companies have issued trade publications:

THE ACME MOTOR TRUCK CO., Cadillac, Mich.; folder, 9¼ x 11¾ in., 4 pages, illustrated; gives testimonials and costs of handling coal by motor trucks, including a 5-mile haul from mine to city.

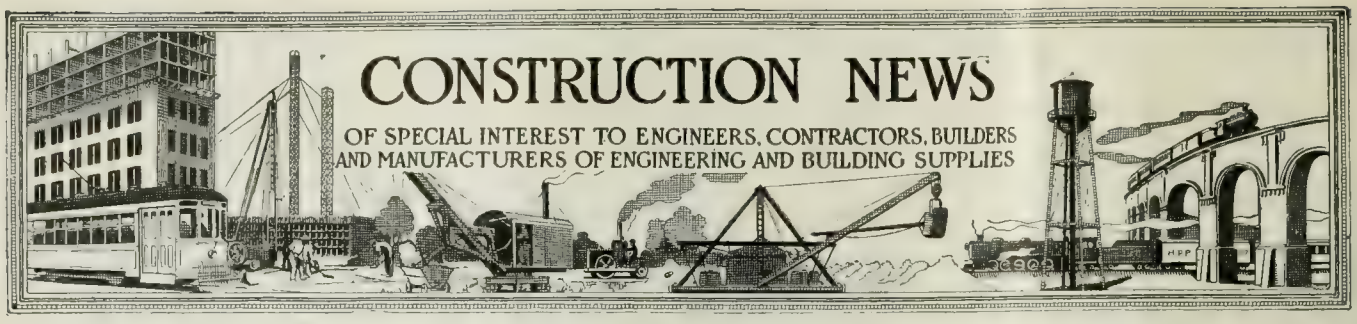
THE THOMPSON-STARRETT CO., New York City; book, 5½ x 8 in., boards, with linen back, illustrated; reproduces photographs of the Municipal, Woolworth, Equitable and other buildings in New York City and elsewhere constructed by the company, together with a brief descriptive text. The book is handsomely made and includes a view of the sky-line of New York City, showing a number of buildings, power houses, industrial plants and United States government works executed by the company.

THE INTERNATIONAL STEEL TIE CO., Cleveland, Ohio; folder, 8½ x 11 in., illustrated; describes the use of steel guards for edging for concrete paving.

THE WALLACE & TIERNAN CO., INC., New York City; catalog, 7 x 10 in., illustrated; the subject of the booklet is "Protecting the Water Supply of Greater New York." They have also issued a folder 8½ x 11¾ in., 4 pages, illustrated; entitled "How Much is Three Billion Gallons?" Both describe sterilization of water by the use of liquid chlorine.

THE GENERAL CONSTRUCTION CO., of Chicago, Ill.; leaflet, 8½ x 11 in., one page, illustrated; describes a rivet forge.

THE GEORGE C. ZIDETTO MACHINERY CO., Pittsburgh, Pa.; folder, 9 x 12 in., 8 pages, illustrated; gives specifications and describes various kinds of concrete and material-handling machinery.



PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
July 14	Mt. Pleasant, Utah	July 3
July 15	Denton, Mont.	June 19
July 16	Milwaukee, Wis.	June 26
July 16	Decorah, Ia. Adv. June 12 and 19.	June 12
July 19	Lincoln, Neb.	July 10
July 21	Eagle Rock, Cal.	July 10
July 21	Hinckley, Minn.	July 10
July 22	Ashland, O. Adv. July 10.	July 10
July 24	Ashland, Ky. Adv. July 10.	July 10
July 25	Akron, O. Adv. July 3.	July 3
Aug. 1	Litchfield, Minn.	July 3

SEWERS

July 14	North Mankota, Minn. Adv. June 19.	June 19
July 15	St. Cloud, Minn.	July 10
July 15	Newman Grove, Neb.	July 3
July 16	Milaca, Minn.	June 19
July 18	Goldsboro, N. C. Adv. July 10.	July 10
July 22	Bradley, Ill.	July 10
July 24	Harrison, Ont.	July 10
July 25	Milan, Mo.	July 10
Aug. 5	Wakefield, Neb.	July 10
Aug. 19	Kansas City, Mo. Adv. July 3.	July 3

BRIDGES

July 10	Adrian, Mich. Adv. June 26.	June 26
July 10	Riparius, N. Y. Adv. June 19.	June 19
July 14	Princeton, Minn.	June 19
July 14	Annapolis Royal, N. S.	July 3
July 14	Du Bois, Pa.	July 10
July 15	Crookston, Minn.	June 26
July 15	Cedar Rapids, Mich. Adv. June 19.	June 19
July 17	Pilkington, Ont.	July 10
July 18	Punxsutawney, Pa.	July 10
July 18	Summerville, Pa.	July 10
July 18	Watertown, N. Y.	July 10
July 21	Arkansas	July 10
July 21	Phoenix, Ariz. Adv. July 10.	July 10
July 22	Walker, Minn.	July 10
July 24	Beaufort, S. C.	July 10
July 25	Livingston, Mont.	July 10
July 25	Toston, Mont.	July 10
July 29	Jacksonville, Fla.	July 3
Aug. 4	Little Rock, Ark.	July 3
Aug. 19	Statesboro, Ga.	July 3
Aug. 20	Swainsboro, Ga.	July 3

STREETS AND ROADS

July 12	Kingston, Ont.	July 10
July 12	Columbus, Miss.	July 10
July 13	Galt, Ont.	July 3
July 14	Grand Rapids, Minn.	June 26
July 14	Fayetteville, W. Va.	June 26
July 14	Ivanhoe, Minn.	June 26
July 14	Cambridge, Minn.	June 26
July 14	Worthington, Minn.	June 26
July 14	Ebensburg, Pa.	July 10
July 14	Long Island, N. Y.	July 10
July 14	Long Island City, N. Y.	July 10
July 14	St. Paul, Minn.	July 10
July 14	Duluth, Minn.	July 10
July 14	Baird, Tex.	July 10
July 14	Ebensburg, Pa. Adv. June 26 and July 3.	July 3
July 14	Hollidaysburg, Pa. Adv. July 3.	July 3
July 14	Washington	July 3
July 14	Fayetteville, W. Va.	July 10
July 14	Clintonville, Wis.	July 10
July 15	Anacortes, Wash.	July 10
July 15	Utah	July 10
July 15	Santa Fé, N. M.	July 10
July 15	Huntington, W. Va.	July 10
July 15	Indiana Adv. July 10.	July 10
July 15	St. Louis, Mo.	June 26
July 15	Vermont	July 3
July 15	Huntington, W. Va.	July 3
July 15	Albany, Mo.	July 10
July 15	Rochester, Minn.	July 3
July 16	Wisconsin	July 10
July 16	Faribault, Minn. Adv. July 3.	July 3
July 16	Indianapolis, Ind.	July 3
July 16	Springfield, O.	June 19
July 16	Doylestown, O.	July 10
July 16	Brooklyn, N. Y.	July 10
July 16	Litchfield, Minn.	July 10
July 16	Ebensburg, Pa.	July 10
July 17	Lisbon, O.	July 10
July 17	Red Wing, Minn.	July 3
July 17	Boston, Mass.	July 3
July 17	Port Huron, Mich.	July 10
July 17	Wisconsin	July 10
July 17	Pittsburgh, Pa.	July 10
July 18	Caledonia, Ont.	July 10
July 18	Adrian, Mich. Adv. July 10.	July 10
July 18	Ohio	July 10
July 18	Quebec	July 10
July 18	Owen Sound, Ont.	July 10
July 19	Brainerd, Minn.	July 3
July 19	Fair Haven, Ill.	July 10
July 20	Litchfield, Minn.	July 3
July 21	Arkansas	July 10
July 21	Burbank, O.	July 10
July 21	Welland, Ont.	July 10
July 22	Rome, Ga.	July 3
July 22	New York	July 10
July 23	Bethany, Mo. Adv. July 10.	July 10
July 23	Quebec	July 10
July 25	St. Louis, Mo.	June 26
July 25	Kent, O. Adv. July 3.	July 3
July 25	Jersey City, N. J.	July 10
July 26	St. Joseph, Mo.	July 10
July 28	Junction City, Kan.	July 10
July 29	Pennsylvania Adv. July 10.	July 10
July 29	New York Adv. July 10.	July 10
July 30	California	June 19
Aug. 24	Denver, Colo.	July 10

EXCAVATION AND DREDGING

July 14	West Warren, Mass.	July 10
July 15	Wapello, Ia. Adv. June 26.	June 26
July 15	Marshalltown, Ia. Adv. June 26.	June 26
July 15	Chicago, Ill.	July 10
July 15	Sheboygan, Wis.	July 10
July 18	Owen Sound, Ont.	July 10
July 20	Columbus, Mont.	July 10
Aug. 6	Kenton, O.	July 3

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
July 12	Brooklyn, N. Y.	July 12
July 15	Omaha, Neb.	July 10
July 15	Flushing, N. Y.	June 19
July 15	London, Ont.	July 3
July 20	Omaha, Neb.	July 3
Aug. 1	Duluth, Minn.	June 26
Aug. 1	Hastings, Minn.	May 15

BUILDINGS

July 12	Sheboygan, Wis.	July 10
July 12	Sault Ste Marie, Ont.	July 10
July 12	Toronto, Ont.	July 10
July 14	Halifax, N. S.	July 10
July 14	Decatur, Mich.	July 3
July 15	Crookston, Minn.	July 3
July 15	Fraserville, Que.	June 12
July 15	Greybull, Wyo.	June 26
July 15	Ste. Annedes, Que.	July 10
July 15	Junction City, Kan.	July 10
July 15	Brainerd, Minn.	June 26
July 15	Detroit, Mich.	July 10
July 15	Hamtramck, Mich.	July 10
July 15	Harlowton, Mont.	July 10
July 15	Helena, Mont.	July 10
July 16	Hastings, Minn.	July 10
July 16	Wahjamego, Mich.	July 10
July 16	Oaklandon, Ind.	July 10
July 16	Centerville, Minn.	July 10
July 17	Malone, N. Y.	June 26
July 17	Thiells, N. Y. Adv. July 3.	July 3
July 18	Ivanhoe, Minn.	July 3
July 20	Salt Lake City, Utah.	July 10
July 21	Wellington, Kan.	July 10
July 22	Detroit, Mich.	July 10
July 23	Rock Hill, S. C.	July 10
July 23	Montmatre, Sask.	July 3
July 23	Lorain, O.	June 26
July 23	Mechanicsburg, O.	July 3
July 24	Winona, Minn.	July 3
July 24	Minneapolis, Minn.	July 3
July 24	Bemidji, Minn.	July 3
July 25	Salt Lake City, Utah.	July 10
July 28	Murray, Utah	July 10
July 28	Montreal, Que.	July 10
July 28	Shawenegan Falls, Que.	July 10
July 28	Woodstock, Ont.	July 10
July 28	Cap de la Madeleine, Que.	July 10
July 29	Utica, N. Y. Adv. June 26 and July 3.	July 3
July 29	Omaha, Neb.	July 10
July 30	Austin, Minn.	June 26
July 31	Lincoln, Neb.	July 10
Aug. 1	Gastonia, N. C.	June 26
Aug. 1	Kenosha, Wis.	May 15
Aug. 1	Duluth, Minn.	July 10
Aug. 1	Virginia, Minn.	June 19
Aug. 1	Duluth, Minn.	July 3
Aug. 5	Willmar, Minn.	July 3
Aug. 15	Casper, Wyo.	July 10
Aug. 15	New Bedford, Mass.	July 10
Aug. 15	Omaha, Neb.	July 10
Aug. 24	St. Paul, Minn.	July 3

FEDERAL GOVERNMENT WORK

July 15	Officers Quarters—Washington, D. C.	June 26
July 15	Officers Quarters—Wilmington, N. C.	June 26
July 16	School—Rapid City, S. D.	June 26
July 18	Silt Diversion Works—Los Angeles, Cal. Adv. June 19.	June 19
July 21	Dredging—New York, N. Y. Adv. June 26.	June 26
July 21	Dredging—Savannah, Ga. Adv. June 26.	June 26
July 21	Dredging—Baltimore, Md. Adv. June 26.	June 26
July 22	Dredging—Sault Ste Marie, Mich. Adv. June 26.	June 26

Bids Close		See Eng. News-Record
July 22	Post Office — Andalusia, Ala.	June 26
July 23	Cottage—Sorrento, Idaho.	June 26
July 23	Bridges—Leupp, Ariz.	June 26
July 23	Removing Wreck — New York, N. Y. Adv. June 26	June 26
July 24	Jetty—Jacksonville, Fla. Adv. June 26	June 26
July 24	Coal—Jacksonville, Fla. Adv. June 26.	June 26
July 25	Dredging — Philadelphia, Pa. Adv. June 26.	June 26
July 25	Post Office—Dawson, Ga.	July 10
July 25	Mechanical Equipment — Stapleton, N. Y. Adv. July 10.	July 10
July 25	Kitchen and Mess Hall—Stapleton, N. Y.	July 10
July 28	Stone—Cincinnati, O. Adv. July 3.	July 3
July 28	Dredging and Filling—San Juan, P. R. Adv. July 3.	July 3
July 29	Crib—Chicago, Ill.	July 10
July 30	Heating Apparatus — St. Augustine, Fla.	July 10
July 30	Dredgnig—New York, N. Y. Adv. July 10.	July 10
July 31	Boat House, Wharf and Boat Basin — Galveston, Tex.	July 10
July 31	Remodeling Elevator—Providence, R. I. Adv. July 10.	July 10
July 31	Storehouse — Wilmington, Del. Adv. July 3.	July 3
July 31	Rubble Mound Protection, etc.—Buffalo, N. Y.	July 10
Aug. 1	Dredging, Wharf and Retaining Wall — Boston, Mass.	July 10
Aug. 1	Lock and Dam—Cincinnati, O.	July 10
Aug. 2	Dredging and Rock Removal—Jacksonville, Fla. Adv. July 10.	July 10
Aug. 4	Sewers—Washington, D. C. Adv. July 10.	July 10
Aug. 7	Dredging and Rock Removal —New York, N. Y. Adv. July 10.	July 10
Aug. 26	Dredging—Honolulu, H. T. Adv. June 26.	June 26
Sept. 2	Miscellaneous Equipment—Washington, D. C. Adv. July 10.	July 10

MISCELLANEOUS

July 14	Road Gravel—Cambridge, Mass. Adv. June 12 and 19.	June 26
July 14	Fishway—Lawrence, Mass. Adv. July 3.	July
July 14	Gas Mains—Duluth, Minn.	July 10
July 14	Paving Materials—Staten Island, N. Y.	July 10
July 15	Wharf — Connaught Sta., Ont.	July 3
July 15	Freight and Trailers, etc.—New York, N. Y.	June 19
July 15	Wharf—Ottawa, Ont.	June 26
July 16	Pumping Engine—Milwaukee, Wis.	June 26
July 20	Breakwaters — Port Colborne, Ont.	July 10
July 22	Furnishings, Apparatus and Equipment—Albany, N. Y. Adv. July 10.	July 10
July 22	Wharf—Cornwall, Ont.	July 10
July 23	Wharf—St. Annede Beaupre, Que.	July 10
July 24	Wharf—Berthier, Que.	July 3
July 25	Wharf—Soaichton, B. C.	July 10
July 31	Wharf—Powell River, B. C.	July 10
July 31	Harbor Improvement—Atlantic City, N. J. Adv. July 10.	July 10

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Md., Baltimore—Bd. Awards rejected only bid received June 11, furnishing and erecting one 25 and one 15 k.w. turbo-generator set and switchboard for Mt. Royal Pumping Sta. W. E. Lee, City Hall, water engr. Noted May 22.

Fla., West Palm Beach—City having plans prepared by G. Simmons, Jr., c.o State Bd. Health, Jacksonville, building filtration plant. About $75,000.

O., Toledo—Standard Oil Co., E. O. Gas Bldg., Cleveland, having plans prepared for 15,000,000 gal. pumping plant, distribution and fire pressure system, also sewerage system, in 800 acre tract on Bay, here, to be used in connection with proposed new oil refineries. R. W. Pratt, Hippodrome Bldg., Cleveland, engr.

Minn., Wells—See "Industrial Works."

Kan., Phillipsburg—City voted $30,000 bonds to improve waterworks system. Engineer not selected.

Mo., Fairfax—City having plans prepared improving water and sewerage systems. About $40,000. Archer & Stevens, 609 New England Bldg., Kansas City, Mo., engrs.

Cal., Red Bluff—City having plans prepared by Olmsted & Gillelen, engrs., 1112 Hollingsworth Bldg., Los Angeles, for waterworks system.

Cal., Tracy—City voted $15,000 bonds to build water and sewer extensions. Noted June 26.

N. B., St. John — Nashwaak Pulp & Paper Co. plans to lay 9 mi. 12 in. rein.-con. water mains from Manchester Corners to Spruce Lake.

Ont., Smiths Falls—Town plans to build extension to waterworks system. About $11,514. J. A. Lewis, clk.

BIDS DESIRED

Ky., Ashland—Until July 24, by Bd. Water Comrs., building pumping station and filtration plant. Alvord & Burdick, 8 South Dearborn St., Chicago, Ill., engrs.; advertised in this issue.

O., Ashland—Until July 22, by R. A. Davis, dir. pub. serv., building filtration plant of 1,500,000 gal. capacity, and auxiliary pumping station with pumping equipment and necessary appurtenances. Contr. No. 1; 3375 ft. 24 in. and 5900 ft. 16 in. c.i. or rein.-con. pipe line. Contr. No. 2; storage reservoir consisting of earth dam and dikes, involving 47,000 yd. grading, concrete core wall, overflow and outlet chambers, pipe lines, gate valves, sluice gates, etc., Contr. No. 3. R. W. Pratt, Hippodrome Bldg., Cleveland, consult. engr.; advertised in this issue.

Minn., Hinckley—Until July 21, by R. N. Pearson, village clk., building distribution pipe system, involving 1880 lin.ft. 8 in. and 3390 lin.ft. 6 in. c. i. pipe, 13 fire hydrants and 11 gate valves, also building 100,000 gal. tank on 100 ft. tower. L. P. Wolff, 1000 Guardian Life Bldg., St. Paul, consult. engr. Noted June 19.

Neb., Lincoln—Until July 19, by T. H. Berg, city clk., building 16 x 193 ft. rein.-con. reservoir, 2,100,000 gal capacity. Work involves 1241 cu.yd. rein.-con. and 12,174 cu.yd. earth excav. About $33,000. G. W. Bates, city engr.

Cal., Eagle Rock—Until July 21, by B. B. Martsolf, city clk., furnishing deep well turbine pump of centrifugal runner type to have capacity of 350 gal. per min. on 125 ft. lift.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Poughkeepsie**—State Hospital Comn., Capitol, Albany, let contract building additions and altering water supply system to include additional filter, changing watermains, building reservoir, at Hudson River State Hospital, here, to Baker-Dunbar-Allen Co., Stock Exch. Bldg., Phila., Pa. About $52,000. Noted June 12.

N. J., Morris Plains—Dept. of Architecture, 142 West State St., Trenton, received only bid laying 6-10 in. water mains at State Hospital, here, from U. S. Cast Iron Pipe & Foundry Co., Morris Bldg., Phila., $10,000. Noted June 12.

★**Minn., Bemidji**—G. Stein, city aud., let contract extending and improving waterworks system, to Phelps-Drake Co., Hibbing, $30,852. Noted June 19.

★**Wyo., Lusk**—City let contract furnishing and installing 24,000 ft. 4-12 in. c.i. pipes, to Gordon Constr. Co., 334 Century Bldg., Denver, Colo., $72,512. Noted June 12.

★**Mont., Laurel**—City let contract extending water mains, 6 in. pipe, to Security Bridge & Constr. Co., 502 North 32nd St., Billings, $8841.

★**Mont., Roundup**—City let contract building water mains and hydrants in Impvt. Dist. No. 29, to Security Bridge & Constr. Co., 502 North 32nd St., Billings, $10,061. Noted May 8.

Idaho, Caldwell—City received lowest 3 bids replacing wooden water mains with c.i. mains, from Caldwell Plumbing & Heating Co., Caldwell, $27,958; Green Constr. Co., Salt Lake City, Utah, $27,926; J. H. Forbes Co., Caldwell, $28,069. Noted May 1.

Sewers

PROPOSED WORK

R. I., Providence—City soon receives bids building sewers in Magnolia, Delaware, Reservoir and Laurel Aves. and Freeman Pkway. About $75,000. M. D. Bronson, City Hall, city engr.

N. J., Morris Plains—Dept. of Architecture, 142 West State St., Trenton, rejected bids received June 26, building sewerage system at asylum here. About $10,000. Work will be readvertised. F. H. Bent, 142 West State St., Trenton, engr.

N. J., Trenton—City plans to build sewage disposal plant. About $500,000. J. R. Fell, 134 North Montgomery St., engr.

O., Dayton—City plans to build sewers in sections of Bway., Bancroft, Frizell, Reist, Summit and Frederick Sts., involving 4000 ft., 12-10 in. vitr. pipe. F. O. Eichelberger, city. engr.

O., Toledo—See "Waterworks."

Mich., Pontiac—City soon lets contract furnishing labor and material for building lateral sewers in Howard, Adelade, Harriet, Pingree, Francis, Ridge, Going, Edith, Elm and Osmun Sts., involving 12,212 ft. 8-12 in. pipe. C. W. Ham, city clk.

Wis., Janesville—Bd. Pub. Wks. soon lets contract building sewers in Center Ave., Galena and Holmes Sts., Sewerage Dist. No. 3, Franklin St., Dist. No. 4, Franklin St., and alley south of West Side Sta., Dist. No. 5, Hickory and Glenn Sts., Dist. No. 10, 4th Ave., Yuba, Walker and Glenn Sts., Dist. No. 11, North Bluff St., Dist. Dist. No. 11, North Bluff St., Dist. No. 12, Garfield and Ruger Aves., Walker and Ringold Sts., Dist. No. 14, Racine St. and Garfield Ave., Dist. No. 15, Vista Ave., N., and Sharon, Fremont and Carrington Sts., Dist. No. 16. Work involves 18,125 lin. ft. 8-15 in. sewer pipe, 48 manholes, etc. C. V. Kerch, city engr.

Wis., Sheboygan — C. U. Boley, engr., City Hall, soon lets contract excavating and laying 21 mi. sewer in South 9th St. from Clara to Union Ave., involving 3500 ft. 10-12 in. vitr. pipe, necessary water and gas connections, etc. About $22,000. Work to be completed by Oct. 1.

Ia., Strawberry Point—Town plans to build 1 mi. sanitary sewers and sewage disposal plant. H. R. Green, Union Blk., Cedar Rapids, engr.

Kan., Eldorado—City soon lets contract building sewers in Dists. 36 and 41. Work involves 22,400 ft. 8-12 in. vitr. pipe, 75 manholes, 6 flush tanks and 1 small pumping station with sewage pump. L. E. Foley, clk.

Wyo., Lusk—City voted $30,000 bonds to extend sewerage system. R. F. Gray, city engr.

Mo., Fairfax—See "Waterworks."

Tex., San Antonio—City election July 26 to vote on $500,000 bonds to build sewers. H. Helland, city engr.

Ore., Portland—City Council plans to build vitr. or cement pipe sewers in East 24th St., cost $3300, East 9th St., $2465, East 29th St., $1109; also plans to improve East 38th St., $1442, East Sherman St., $1512, and Oak St., $1691. O. Laurgaard, city engr.

Cal., Oakland—City soon lets contract building sewers and drainage structures on 8216.7 ft. 10th, Cedar, Goss and Bay Sts. and right-of-way adjacent to 7th St. About $240,000. P. Brown, city engr.

Cal., Santa Barbara—See "Streets and Roads."

Cal., Tracy—See "Waterworks."

BIDS DESIRED

N. C., Goldsboro—Until July 18, by J. M. Cashell, city mgr., building 7 mi. pipe sewers 8-12 in. diam., also furnishing sewer pipe; advertised in this issue.

Sewers (Continued)

Ill., Bradley—Until July 22, by Bd. Local Impvts., laying 40,000 ft. 10-48-in. vitr. tile pipe and brick sewers, involving 24,000 cu.yd. rock excav. About $70,000. Marr, Green & Co., 17 North La Salle St., Chicago, engrs.; advertised in this issue

Minn., St. Cloud—Until July 15, by A W. Buckman, city clk., laying 30 blocks 48 in. and 10 blocks 72 in double ring or 2 piece vitr. segmental block sewers.

Minn., St. Paul—See "Streets and Roads."

Neb., Wakefield—Until Aug. 5, (change of date) by city clk., building 17,240 ft. of 8 in., 4943 ft. of 10 in., 3320 ft. of 12 in. and 1405 ft. 15 in. vitr. stone sewers in various streets. About $30,000. W. E. Standeven, 414 Bee Building., Omaha, engr.

Mo., Albany—See "Streets and Roads."

Mo., Milan—Until July 25, by city, building sanitary sewers and sewage disposal plant. About $40,00. Archer & Stevens, 609 New England Bldg., Kansas City, engrs.

Ont., Harrison—Until July 24, by W. D McLellan, twp. clk., laying 17,932 ft. sewer.

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★**Pa., Meadville**—City let contract furnishing and laying 2 mi. 8 and 10 in. sanitary sewers, to T. Trifolletti, Loraine, Ohio, cost $1.25 per ft. for 8 in. and $2.50 per ft. for 10 in. pipe; pump station and two 200 gal. ejectors, to Keystone Constr. Co., Meadville. Noted May 15.

★**O., Braberton**—Dir. Pub. Serv. let contract building West End Sanitary Lateral Sewers to W. J. Irwin, Greenville. About $130,000. Noted June 19.

★**O., Springfield** — City let contract laying 12-24 in vitr. pipe sewers in North Limestone St. from North to Columbia Sts., to M. S. Cooney, Springfield, $4823; Warder Park Addition, to J. Doyle, 935 Avondale Ave., $9780; Clay, Catherine, Linden and Rose Sts., to P. Caffrey, 609 Linden Ave., $7703. Noted June 26.

★**Mich., Birmingham**—City let contracts to Gilles & Hosmer, Pontiac, laying 600 ft. 8 in. and 238 ft. 6 in. sewer in Brown St., cost, $1198, 2130 ft. 8 in., 406 ft. 6 in. sewer, 40 ft. 8 in. c.i. pipe in Maple Ave., $3396; C. Mike, Pontiac, 800 ft. 8 in. and 369 ft. 6 in. sewer in Purdy St., $2177; C. Johnson, Pontiac, 1985 ft. 8 in. and 982 ft. 6 in sewer in Southfield Ave., $4539; T. Evanoff, Pontiac, 1470 ft. 8 in and 644 ft. 6 in. sewer in Pierce St., $3569. Noted June 26.

★**Kan., Pratt**—City let contract building sanitary sewers in Dist. No 4, involving 23,400 lin.ft. 8 in. pipe, to Burt & Tripp, Hutchinson, $32,919. Noted June 19.

★**Mo., Macon**—City let contract building sewage disposal plant, to W. McClurken, 3807 Westminister Ave., St. Louis. About $16,000.

★**Que., Montreal** — City let contracts building sewers in Alexander and Girouard Aves., to De Keyser Wauters & Co., Montreal, $22,740; in Oxford Ave., to Federal Eng. & Contg. Co., Montreal, $10,785.

★**Ont., Ingersoll** — See "Streets and Roads."

★**Ont., Mimico**—See "Streets & Roads."

Bridges

PROPOSED WORK

Conn., Bristol—City plans to build 2 reincon. bridges, one on Main St., and one on Laurel St. About $25,000. Sperry & Buell, Inc., 175 Main St., engrs.

Va., Rectortown—Comrs. Fauquier Co. soon receive bids building 60 ft., cement concrete bridge over Goose Creek. Address D. D. Crenshaw.

N. C., Goldsboro—Wayne Co. plans to build 175 ft. steel and concrete bridge, 16 ft. wide. About $20,000. S. D. Scott, Goldsboro, engr.

Ga., Chatsworth — See "Streets and Roads."

Ill., Chicago—D. R. Francis, comr. pub. wks., 401 City Hall, receives bids about July 15, for substructure of 2 leaf rein.-con. bascule bridge over Chicago River on Madison St. Bids for superstructure to be called for later. Total cost $800,000. T. G. Pihlfeldt, bridge engr.

Wis., Sheboygan—G. Ubbelohde, engr., Court House, soon lets contract building 125 ft. steel bridge, 28 ft. wide, concrete abutements, in Herman Twp., involving 2900 lin.ft. wood piling and 3000-4000 cu.yd. earth approach and fill, cost $15,000; 490 ft. steel bridge, 30 ft. wide, in Mosel Twp., 4000 lin.ft. wood piling and 5000-6000 cu.yd. approach and fill, cost between $19,000 and $29,000.

N. D., Bismarck—Burleigh Co. plans to build bridge over Missouri River, here, to have three 400 ft. spans, filling and approaches, totaling distance of 5 mi. About $750,000. C. A. P. Turner, 627 1st Ave., N., Minneapolis, Minn., engr.

Tex., San Antonio—City election July 26 to vote on $200,000 bonds to build bridges. H. Helland, city engr.

Colo., Castle Rock — Comrs. Douglas Co. soon let contract building 16 ft. rein.-con. bridge near Tomah and 30 ft. rein.-con. bridge between Greenland and Larkspur, on Denver-Colorado Springs Rd. About $20,000. D. Stewart, Castle Rock, engr.

Wash., Richland—State Highway Bd., Olympia, rejected bids received June 23, building 190 ft. steel span bridge over Yakima River, near here, Benton Co. Noted June 19.

Wash., Spokane—City having plans prepared for 180 ft. concrete bridge over Hangman Creek, 35 ft. wide, with 5-6 ft. sidewalks. About $24,000. A. D. Butler, city engr.

N. B., Sackville—Canadian Natl. Rys. Ottawa, soon lets contract building substructure of double track bridge, with three 200 ft. spans, over Tantramar River, near here. About $125.000.

Ont., Markham—Town having plans prepared by James Loudon & Hertzberg, engrs., 36 Toronto St., Toronto, for 9 concrete beam culverts, 9 to 27 ft. spans. About $30,000.

Ont., Parry Sound—Town Council soon lets contract building Cascade Bridge, to have 2 steel spans, concrete abutments and center pier. About $15,000.

BIDS DESIRED

N. Y., Watertown—Until July 18, by city, building rein.-con. bridge over Black River on Pearl St. Concrete Steel Eng. Co., 21 Park Row, New York City, engrs. Noted July 3.

Pa., Du Bois—Until July 14, by city, building 104 ft. bridge on Brady St., 46 ft. wide. G. A. Flink, 301-303 Commonwealth Trust Bldg., Harrisburg, engr.

Pa., Punxsutawney—Until July 18, by Jefferson Co., Brookville, building 48 x 148 ft., rein.-con. bridge, here. G. A. Flink, 301 Commonwealth Trust Bldg., Harrisburg, engr.

Pa., Summerville—Until July 18, by Jefferson Co., Brookville, building 48 x 182 ft., rein.-con. bridge, here. G. A. Flink, 301 Commonwealth Trust Bldg., Harrisburg, engr.

S. C., Beaufort—Until July 24, by Comrs. Beaufort Co., setting 6 rein.-con. piers under 500 ft. steel girder bridge over Whale Branch, tearing out wooden piling and concreting steel caisson turn pier, involving 550 cu.yd. rein.-con. and 3.9 tons reinforcing steel. About $13,000. J. R. Pennell, c/o State Highway Dept., Columbia, engr.

Minn., Walker—Until July 22, by C. D. Bacon, aud. Cass Co., building bridge No. 3070 on Highway No. 24, 710 ft. long. About $15,000. A. W. Moulster, Pine River, engr.

Mont., Huntley—Until July 25, by State Highway Comn., Helena, building 950 ft. bridge over Yellowstone River, Huntley Twp., Yellowstone Co., 16 ft. wide, consisting of five 190 ft. steel spans on concrete piers and abutments. P. D. Pratt, state highway engr. Noted Mar. 20 under "Billings."

Mont., Livingston—Until July 25, by State Highway Comn., Helena, building Carter Bridge over Yellowstone River, near here, Park Co., 270 ft. long, 16 ft. wide, consisting of 3 span concrete arch. P. D. Pratt, state highway engr. Noted Mar. 13.

Mont., Toston—Until July 25, by State Highway Comn., Helena, building 529 ft. steel bridge over Missouri River, 16 ft. wide, Broadwater Co. P. D. Pratt, state highway engr.

Arkansas—Until July 21, by Comrs. Helena-Old Town Rd. Impvt. Assn., at office of State Highway Comn., Little Rock, building one 30 ft. steel and one 645 ft. wooden bridge, 30 ft. wide, in Phillips Co. J. M. Quarles, Helena, engr.

Ariz., Phoenix—Until July 21, by T. Maddock, state engr., building 120 ft. rein.-con. arch bridge over Queen Creek on Mesa-Superior Highway; advertised in this issue.

Ont., Pilkington—Until July 17, by S. Aitcheson, engr., Elora, building steel bridge, 75 ft. long, over Grand River, with concrete abutment.

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★**R. I., Washington**—State Bd. Pub. Rds. let contract building rein.-con. bridge on Noose Neck Hill Rd., here, to Randall-Stoddard Co., Chelsea, Mass. About $18,450.

Conn., New Haven—City received bids building bridge over West River on Washington Ave., rein.-con., concrete, steel and stone, from C. W. Blakeslee & Sons, 58 Waverly St., $66,941; C. W. Murdock, 185 Church St., $67,040; C. A. Sibley, 902 Chapel St., $77,808. Noted May 1.

Conn., New Haven—City received bids repairing Neck Bridge on State St., rein.-con. and steel, from C. W. Blakeslee & Sons, 58 Waverly St., $21,606; C. A. Sibley, 902 Chapel St., $21,932; C. W. Murdock, 185 Church St., $23,881. Noted Feb. 13.

★**Pa., Leetsdale**—Comrs. Allegheny Co. (Pittsburgh) let contract building 100 ft. stone and concrete bridge, with 37 ft. arch, over Sewickley Creek, between Allegheny and Beaver Counties, 50 ft. wide, to E. W. Falck, Leetsdale, $48,500. Work involves 9000 lbs. dowels and reinforcement steel, 1100 cu.yd. earth approach and fill, 500 cu.yd. masonry in foundations and 1250 cu.yd. masonry above foundations. Noted June 19.

★**Minn., Litchfield**—Comrs. Meeker Co. let contract building Bridges Nos. 3116 and 3117 on State Rd. No. 6, Federal Aid Project No. 40, to Guaranty Constr. Co., 834 Palace Bldg., Minneapolis, $12,290. Noted June 12 under "Streets and Roads."

★**Ont., Orangeville**—Town let contract building 40 ft. rein.-con. arch bridge over Grand River, to J. Tilker, Harriston. About $21,000.

★**Ont., Pickering**—Provincial Government, Toronto, let contract building 150 ft. steel span bridge, here, to Dominion Bridge Co., Imperial Life Bldg., Toronto. About $100,000.

Reinforced Concrete

PROPOSED WORK

Ont., Markham—See "Bridges."

BIDS DESIRED

Pa., Pittsburgh—See "Industrial Works."
Minn., Rochester—See "Buildings."

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★**Pa., Johnstown**—See "Industrial Works.
Minn., Russell—See "Buildings."
★**Ont., Orangeville**—See "Bridges."

Streets and Roads

PROPOSED WORK

R. I., Providence—City soon receives bids paving Union, Pocasset and Kinsley Aves. and Delaware St., asphalt. About $70,000. M. S. Bronson, City Hall, city engr.

Conn., Wallingford—Town plans to improve State Rd., asphalt. About $20,000. W. A. MacKenzie, engr.

N. Y., Rochester—City Council plans to grade and build walks on 13th St., cost $14,300, and Morrill St., $8700, pave Tryon Park, $32,750, Averill Ave., $23,400, Dartmouth St., $18,600, De Neve St., $82,400, Main St., E., from Culver to Winton Rds., $133,000, Clifford Ave., $4700, all asphalt; traprock resurfacing with Tarvia, University Ave., $10,600, building walks on Genesee St., $1460, also extending McArdle St., $1000, McGuckin St., $2500 and Handy St., $2500. C. A. Poole, city engr.

N. J., Bogota—City plans to improve Cane St. from Leonia Ave. to Borough line. About $10,000.

N. J., Jersey City—City had plans prepared paving Baldwin Ave., from Pavonia to Newark Aves., asphalt, cost, $10,000; improving Jackson Ave. from Fulton to McAdoo Aves., probably granite block. C. A. Van Keuren, city engr.

Streets and Roads (Continued)

Pa., Butler—City rejected bids paving 1152 sq.yd Oak St., 1365 sq.yd Summit St., 6915 sq.yd. Jefferson St., 1917 sq.yd. Wayne St. and 4175 sq.yd Center Ave. Noted May 22.

Pa., Clarksville—Boro rejected bids received June 10 laying 1300 lin.ft. waterbound macadam and one course concrete pavement. Noted Apr. 3.

Pa., Pittsburgh—Allegheny Co. Controller soon lets contract building 2000 ft. Troy Hill Rd., Reserve Twp., 16 ft. wide, Telford macadam. A. V. Warren, co. engr.

Pa., Reading — City rejected bids for 9000 sq.yd. vitr. brick pavement. Work has been re-advertised and contract will soon be let. Noted June 12

Md., Baltimore—City Council considering ordinance providing for appropriation of $150,000 for enlargement of City Springs Sq., 350 x 400 ft., bounded by Spring, Caroline, Pratt and Lombard Sts. Buildings to be razed, lot regraded and cement paving.

W. Va., Lewisburg — Comrs. Greenbrier Co. plan to grade 6 mi. Ft. Springs-Ronceverte Rd. About $45,000. F. Rader, Lewisburg, engr.

W. Va., Lewisburg—Comrs. Greenbrier Co. plan to build 2 mi road, from Lewisburg to Frankford bituminous macadam. About $35,000. R. B. Holt, co. engr.

W. Va., Morgantown - Monongahia Co., Grant Dist., voted $325,000 bonds to build 19 mi. roads, vitr. brick. L. Cox, Morgantown, engr. Noted June 12.

W. Va., Pineville—Comrs. Wyoming Co. plan election soon to vote on $91,000 bonds to grade 4 mi. Elmore-Herndon Rd

W. Va., Spencer—Comrs. Roane Co. plan election soon to vote on $67,000 bonds to improve 7½ mi. roads in Ready Dist. H. R. Muldoon, Spencer, engr.

N. C., Durham — Durham and Orange Counties plan to build 8 mi. Durham-Chapel Rd. About $300,000. Five different kinds of hard surface material will be used, plans being for an experimental roadway. State and Federal Government will appropriate toward cost. W. L. Fallis, c/o State Highway Comn., Raleigh, engr.

N. C., Elizabeth City—Comrs. Pasquotank Co. rejected bids paving 9 mi. road from here to Weeksville Rd., 15 ft. wide. Noted July 3.

N. C., Greensboro — City soon lets contract paving various roads, involving 80,000 sq.yd. asphalt on concrete base and 10,000 sq.yd asphalt on macadam base. W. B. Bandy, city engr

N. C., Mocksville—Comrs. Davie Co. plan to build roads. Cost between $50,000 and $100,000.

Ga., Blairsville—Union Co. voted $60,000 bonds to build roads. Federal Government will appropriate like amount.

Ga., Chatsworth—Murray Co. election July 16 to vote on $100,000 bonds to build roads and bridges.

Ga., Sylvester—Worth Co., voted $400,000 bonds to build roads. Noted May 22.

Miss., Ashland—Benton Co voted $200,000 bonds to build roads.

Miss., Columbus City voted $50,000 bonds to pave streets in business section. R. M. Waters, city engr

O., Akron—Summit Co. soon lets contract building 3.89 mi. Arlington-Greensburg Rd., Sect. 4, A and B; 2.37 mi. North Springfield Rd., and 3.01 mi. Brittain-Massillon Rd., Sect. A and B-1, brick, rein.-con. or bituminous concrete. C. J. Costigan, co. engr.

O., Columbus—City plans to grade, curb, pave and lay water mains in alley north of Norwich Ave. from High St. to Indianola Ave., 1890 ft. long, 20 ft. wide, brick or asphalt, cost $17,237; also alley north of Menlo Pl. between Taylor and Parkwood Ave., 740 ft. long, 15 ft. wide, brick or asphalt. H. A. Maetzel, city engr

O., Dayton—City plans to pave Carlisle Ave. from St. Charles to Demphle Sts., 30 ft. wide, involving 2700 sq.yd. waterbound macadam, 8000 sq.ft. cement sidewalk and 1600 ft. cement curbing, cost $3527; (b) 3rd St. from west corporation line to point 1708 ft. west, 36 wide, 6800 sq.yd. brick block, $52,017; (c) alley east of Main St., 16 ft. wide, 500 sq.yd. granite durax or wood block, $1942. F. O. Eichelberger, city engr.

O., Oakwood - City plans to pave 2000 ft. Forrer Rd. from Far Hills to Oakwood Ave., 30 ft. wide, wood block, concrete or bituminous macadam. Cost between $25,000 and $40,000. F. Seybold, 504 Ludlow Bldg., Dayton, engr.

Ill., Chicago—Forest Preserve Comrs. of Cook Co. soon let contract grading and paving 4732 ft. Carpenter Rd. from Elston Ave. to city limits, 18 ft. wide. About $30,000. W. D. Flavin, County Bldg., engr

Wisconsin State Highway Comm., Div. Office No. 6, Eau Claire, soon lets contract improving Mondovi-Durand Rd. Federal Aid Project No. 78 Pepin Co., involving 31 acres clearing and grubbing, 9540 cu.yd earth and 740 cu.yd borrow excav., 120 cu.yd class A concrete, 13,138 sq.yd. gravel surfacing etc.

Wis., Kiel—City soon lets contract grading and paving ½ mi Main St., 18 ft. wide, 2 course rein.-con. Cost between $30,000 and $40,000. F. Muth, City Hall, engr. Noted June 19.

Ia., Strawberry Point — Town having plans prepared by H. R. Green, engr., Union Blk., Cedar Rapids, paving 2¼ mi. and curbing and guttering 4½ mi. streets

Kan., Independence—Montgomery Co. soon receives bids building 1½ mi South Coffeyville Rd., 1½ mi Coffeyville-Edna Rd., 10 mi. Cherryville-Coffeyville Rd. and 10 mi Ozark Trail, 18 ft. wide, gravel or bituminous concrete, concrete curbing and guttering. H. K. Hibbard, Independence, engr.

Kan., Kinsley—City soon lets contract for 18,800 sq.yd vitr. brick paving, 8000 lin.ft. concrete curbing and 8000 lin.ft. concrete guttering. G. W. Ellis, Pratt, engr.

Kan., Mound City—Linn Co having plans prepared building 28½ mi Jefferson Highway, 18 ft. wide, concrete or waterbound macadam. J. M. Mumbell, Mound City, engr.

Neb., Omaha—Douglas Co. plans to pave 115 mi roads throughout county, brick on 6 in concrete base. About $5,000,000; $3,000,000 of which has already been voted, $1,000,000 to be received from state and $1,000,000 from Federal Government. First work will be paving of Lincoln Highway, O. L. D. Rd. south to Gretna and Washington Highway north of Florence. L. A. Adams, Court House, engr. Noted May 22.

Neb., Superior—L. L. Carpenter, city clk., soon lets contract paving 20 blocks streets, 25 ft. wide, involving 25,000 sq.yd asphaltic concrete on 5 in. concrete base or alternate bids on 6 in. concrete, and 15,000 lin.ft. concrete curb and gutter. About $75,000. A. A. Cummins, Superior, engr

Montana—State Highway Comm., Helena, rejected bids received May 14 for road work in Dawson and Carbon Counties.

Montana—State Highway Comm., Helena, plans to pave 5.5 mi. Yellowstone Trail, Gallatin Co., cost $148,154; grade 23 mi. County Rd. No. 1, Meagher Co., $45,900; 24 mi Plains-Hot Springs Rd., Saunders Co., $20,000; 6 mi. Goose Hill Rd., Choteau Co., $10,000; 11 mi Edwards-South Rd., Choteau Co., $10,000; 35 mi. Jordan-Miles Rd., $16,000, 6 mi. Sand Springs-Sumatra Rd., Garfield Co., $10,000; 23 mi Horse Creek Rd., $20,000, 15 mi Sand Creek Rd., McCone Co., $18,000; gravel surface 10 mi Avon-Finn Rd., Powell Co., $30,000; 35 mi. Yellowstone Trail, Yellowstone Co., $150,000; 8 mi Pumpkin Creek Rd., $20,000, 6 mi. Miles-Ismay Rd., $20,000, 8 mi. Jordan Rd., $20,000, 10 mi. Yellowstone Trail, Custer Co., $30,000. Federal Government asked to appropriate toward cost. P. D. Pratt, state highway engr

Mont., Big Timber—Sweetgrass Co. election Sept. 2 to vote on $125,000 bonds to build roads. D. J. Walwoord, Big Timber, engr.

Mont., Bozeman—City soon lets contract bithulithic paving, curbing and grading, 7200 sq.yd 7th Ave. from Main to Lamme Sts. and Lamme St. from 5th to 7th Aves., also 3720 sq.yd. College St. from 8th to 11th Sts. C. Widener, city engr. Noted June 5.

Mont., Broadus — Powder River Co. election Sept. 2 to vote on $150,000 bonds to build roads. F. L. Funkenbusch, Broadus, engr

Mont., Chinook — Blaine Co. election Sept. 2 to vote on $100,000 bonds to build roads. C. R. Hanke, Chinook, engr

Mont., Choteau—Teton Co. election Sept. 2 to vote on $150,000 bonds to build roads. F. Daly, Choteau, engr.

Mont., Columbus -Stillwater Co. election Sept. 2 to vote on $165,000 bonds to build roads. G. N. Cardoza, Columbus, engr.

Mont., Forsyth—Rosebud Co. election Sept. 2 to vote on $100,000 bonds to build roads. P. D. Pratt, c/o State Highway Dept., Helena, engr.

Mont., Harlowton – Wheatland Co. election Sept. 2 to vote on $200,000 bonds to build roads. C. C. Jewell, Harlowton, engr.

Mont., Harve—Hill Co. election Sept. 2 to vote on $150,000 bonds to build roads. J. E. Peterson, Harve, engr.

Mont., Philipsburg—Granite Co. election Sept. 2 to vote on $150,000 bonds to build roads. E. B. Patten, Philipsburg, engr.

Mont., Red Lodge – Carbon Co. election Sept. 2 to vote on $100,000 bonds to build roads. A. B. Cooley, Red Lodge, engr

Mont., Shelby—Toole Co. election Sept. 2 to vote on $200,000 bonds to build roads. H. B. Rawson, Shelby, engr.

Mont., Thompson Falls—Sanders Co. election Sept. 2 to vote on $75,000 bonds to build roads. T. Johnston, Thompson Falls, engr.

Mont., Virginia City—Madison Co. election Sept. 2 to vote on $150,000 bonds to build roads. C. C. Adams, Virginia City, engr.

Tex., De Leon—City election July 15 to vote on $750,000 bonds to build permanent roads.

Tex., Ft. Worth—Tarrant Co. election July 26 to vote on $3,500,000 bonds to build highways. H. P. Hays, c/o Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Tex., Hallettsville—Lavaca Co. voted $200,000 bonds to build highway from Schulenburg to here and from Sweet Home to Yoakum

Tex., Linden—Comrs. Cass Co. plan to improve 13.23 mi. Highway No. 1-A from point near Queen City to Sulphur River, 16 ft. wide, including building iron or gravel surfaced road and necessary drainage structures. About $75,000. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Tex., Montague—Montague Co. soon lets contract grading, gravel surfacing and building concrete bridges and culverts on 9.84 mi. Meridian Highway, State Highway No. 2, 16 ft. wide, involving 9353 cu.yd earth, 1129 cu.yd. loose rock, and 45,482 cu.yd. borrow excav., 16,363 lbs. reinforcing steel and 345 cu.yd. classes A, B, C, concrete. About $101,323. J. R. Hill, Bowie, engr. Noted May 22.

Tex., San Antonio — City election July 26 to vote on $950,000 bonds to widen and open streets, $900,000 to pave same and $50,000 to build sidewalks. H. Helland, city engr.

Okla., Enid—City soon lets contract paving 22,000 yd., concrete. B. F. Lewis, city engr.

Colo., Denver—City soon lets contract surfacing 82,000 sq.yd in North Denver Surfacing Dist. No. 5, slag, sand and loam, paving 9 blocks in 14th Ave. Paving Dist., asphalt, grading, curbing and building sidewalks in North Denver Improv. Dist. No. 30. Cost $40,000, $45,000 and $80,000 respectively. J. B. Hunter, city engr.

Idaho, Troy — City voted $125,000 bonds to build and improve roads here.

Nev., Carson City—Comrs. Mineral Co. plan to build 10 mi. Walker Lake Rd. About $148,000.

Wash., Aberdeen—Bd. Pub. Wks. rejected bids received June 20, building concrete sidewalks on Grant, E. Market and Chicago Aves. Work will be readvertised. A. H. Blood, city engr

Wash., Vancouver—City soon lets contract paving and building concrete curbing and sidewalks on 22nd St. from Main to Reserve Sts., 30 ft. wide, bitulithic concrete or asphaltic concrete. W. Schwarz, city engr. Noted July 3.

Oregon—State Highway Comm., Portland, soon lets contract grading and paving 3.4 mi Canyon Rd. from Beaverton to county line, Washington Co., involving 19,000 cu.yd excav., 13.1 mi Dallas-Salem Rd., Polk Co., 10,000 cu.yd excav., bitulithic or concrete, ½ mi. Seufert Sect. Columbia River Highway, Wasco Co., 6800 cu.yd excav.; grading and macadamizing 7.9 mi Yamhill-Gaston Rd., Yamhill Co., 29,000 cu.yd excav., 700 ft. Comstock Overhead

Streets and Roads (Continued)

Crossing, Douglas Co., 300 cu.yd. macadam, 173 cu.yd. concrete, 5750 cu.yd. excav.; grading 6.3 mi. Oregon City-Oswego Rd., Clackamas Co., 37,500 cu.yd. excav.; paving 4.2 mi. Salem-Brooks Sect. Pacific Highway, Marion Co.; 10.5 mi. Clatskanie-Westport Sect. Columbia River Highway, Columbia Co., bitulithic or asphaltic concrete; 8 mi. Svensen-Rock Creek Sect. Columbia River Highway, and 9.5 mi. Rock Creek-Westport Rd., both Clatsop Co., concrete or bitulithic; macadamizing 2.5 mi. Stage Rd. Pass Sect. Pacific Highway, Douglas Co., 5250 cu.yd. macadam. H. Nunn, Salem, state highway engr.

Oregon—State Highway Comn., Portland, soon lets contract paving 6.1 mi. Unit 1 and 6.1 mi. Unit 2, Eugene-Junction City Rd., Lane Co., bitulithic or concrete. H. Nunn, Salem, state highway engr. Noted June 26.

Oregon—State Highway Comn., Portland, soon lets contract grading and macadamizing 7.7 mi. Yoncalla Sect. Pacific Highway, Douglas Co., involving 10,000 cu. yd. excav. and 16,000 cu.yd. macadam. Noted June 26.

Oregon—State Highway Comn., Portland, soon lets contract grading and graveling 16.7 mi. Central Oregon Highway from Burns to Lawen, involving 95,000 cu.yd. earth and rock excav. and 15,400 cu.yd. gravel; grading 4.4 mi. road from Baker to Cornucopia, 50,000 cu.yd. earth and rock excav.; grading 49 mi. John Day Highway from Dayville to Fossil, 359,000 cu.yd. earth and rock excav. H. Nunn, Salem, state highway engr.

Ore., Marshfield—City Council received no bids June 25, paving and building sidewalks on Vernon Ave. O. Laurgaard, city engr.

Ore., Marshfield—City Council plans to pave (a) Jerome Ave., 36 ft. wide, 1½ in. rock asphalt on 6 in. concrete base, (b) 4th St., 26 ft. wide, 1½ in. rock asphalt on 5 in. concrete base or 6 in. concrete, with parkway 5 ft. wide and 6 ft. concrete sidewalks. Total estimate on rock asphalt on concrete base, $49,448; concrete, $46,471. E. K. Burton, city engr.

Ore., Ontario—City Council plans to pave 3 mi. Oregon St. and side branches, and California Ave. from Oregon St. to city limits, asphaltic concrete or bitulithic. Cost to exceed $10,000.

Ore., Portland—City soon lets contract paving 72nd, 61st, 77th, East 33rd, East Madison and Ramona Sts. and Vernon Ave., asphaltic concrete on crushed rock base, concrete Nos. 1 and 2, concrete curbing and artificial stone or asphaltic concrete sidewalks. Cost to exceed $10,000. O. Laurgaard, city engr.

Cal., Chula Vista — City rescinded contract let to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, building 4 mi. road. Legality of proceedings has been questioned by property owners. Noted June 5.

Cal., Oakland—City plans to improve 1000 ft. 38th Ave., involving 52,850 sq.ft. grading, 2030 lin.ft concrete curbing, 6237 sq.ft. concrete gutter, 3934 sq.yd. oil macadam pavement and 107 lin.ft. 8-24 in. corrugated iron and concrete culvert. P. Brown, city engr.

Cal., Oakland—City plans to grade, curb, gutter and pave 23rd and 29th Aves. About $60,000. Work involves 6258 lin.ft. concrete curbing, 7594 sq.ft. brick gutter, 1442 ft. 10-21 in. pipe conduit and 14,413 sq.yd. asphalt paving. P. Brown, city engr.

Cal., San Jose—Comrs. Santa Clara Co. had plans prepared paving 3 mi. and grading 10,000 ft. on Rodfish Mill Rd. J. Ryder, co. surv.

Cal., Santa Barbara—H. L. Hitchcock, 1919 De la Vina St., et al, plans to subdivide 350 acres between Riviera and Mountains into residential lots and build gravel streets, concrete curbs and gutters, cement sidewalks and sewers. About $50,000.

Cal., Taft—City had estimates prepared by E. M. Lynch, engr., Central Bldg., Los Angeles, for 92,000 sq.ft. macadam paving 1,220,000 sq.ft. grading, oiling and screening surfacing, 52,910 lin.ft. cement curbs and 234,000 sq.ft. cement walks. About $230,000.

Cal., Tracy—City voted $15,000 bonds to pave street intersections. Noted June 26.

Que., Chateauguay—Town soon receives bids building 2½ mi. macadam road from New York Central R.R. Bridge to Chateauguay limits. About $10,000. E. Laberge, clk

Que., Greenfield Park—Town voted $20,000 by-law to build 8½ mi. macadam roads and ditch same, G. Reakes, St. Lambert, engr.

Ont., Exeter—Town Council plans to expend $25,000 to pave streets. J. Senio, clk.

Ont., Owen Sound—Town Council plans to expend $300,000 to build roads. D. H. Fleming, town engr.

Ont., Toronto — Bd. Wks. recommended that Gilmour and Skipper Aves. and Northcliffe Blvd. be paved. Work involves 12,000 sq.yd. bitulithic pavement on 6 in. concrete base, concrete curbing and guttering. About $49,239. R. C. Harris, City Hall, engr.

Ont., Toronto—City plans to build pavements on Bristol and Greenwood Aves., Linder St. and Weston Rd., involving 23,000 sq.yd. asphalt on 6 in. concrete base. About $93,950. R. C. Harris, City Hall, engr.

B. C., Vancouver—City Council soon lets contract paving Pacific St. from Granville to Broughton Sts., and various other streets, 16 ft. wide, asphaltic concrete. About $50,000. F. L. Fellowes, City Hall, engr.

BIDS DESIRED

New York—Until July 22, by State Highway Comn., Capitol, Albany, improving roads in following counties: Cattaraugus Co., 4.6 mi. Bradford-Carrolton, Part 1, Rd. No. 8007, concrete;

Chautauqua Co., 4.29 mi. Fredonia-Silver Creek, Part 2, Rd. No. 8003, concrete;

Chenango Co., 4.78 mi. Rockwell Mills-South New Berlin, Rd. No. 1497, bituminous macadam; 5.57 mi. Oxford, Part 1, Rd. No. 8001, concrete; 5.87 mi. Oxford, Part 2, Rd. No. 8002, concrete;

Lewis Co., 4.74 mi. Barnes Cors-Copenhagen, Part 2, Rd. No. 1442, bituminous macadam;

Onondaga Co., 27 mi. Solvay-State Fair-Syracuse, Rd. No. 1353 A, concrete;

Rensselaer Co., 1.44 mi. Riders Mills-Brainard, Rd. No. 1521, bituminous macadam;

Suffolk Co., 3.85 mi. Smithtown-Fort Salonga, Part 1, Rd. No. 1048-A, concrete.

Completing roads in following counties: Cayuga Co., 8 mi. Auburn-Weedsport, Rd. No. 1317; 6.06 mi. Fleming-Scipio, Part 2, Rd. No. 1327-A, bituminous macadam concrete; 5.45 mi. Venice Center-Genoa, Rd. No. 1414, concrete;

Chautauqua Co., 3.9 mi. Fredonia-South Dayton, Part 3, Rd. No. 1381, concrete;

Chenango Co., 7.12 mi. Afton-Coventry, Part 1, and Afton-Bettsburg, Rd., No. 1171, waterbound macadam; 7.9 mi. Norwich-South New Berlin, Part 2, and South New Berlin-New Berlin, Part 1, Rd. No. 1394, waterbound macadam; 3.06 mi. Otselic-Smyrna, Part 1, Rd. No. 1473, bituminous macadam;

Franklin Co., 10.36 mi. Malone-Chateaugay, Rd. No. 5613, bituminous macadam;

Niagara Co., 7.79 mi. Youngstown-Lockport, Part 1, Rd. No. 800, concrete;

Oswego Co., 6.36 mi. Sandy Creek-Smartville, Rd. No. 1428, bituminous macadam;

Saratoga Co., 6.1 mi. Rexford Flats-Wait Corners-Groom Corners, Rd. No. 1117, bituminous macadam; 5.74 mi. Mechanicsville-Clifton Park, Rd. No. 1345, bituminous macadam;

Seneca Co., 4.89 mi. Waterloo-Burns Corners, Rd. No. 1400, concrete; 2.13 mi. Willard-Ovid, Rd. No. 1401-A, concrete.

Repairing roads in following counties: Allegheny, Steuben and Schuyler Counties, Rds. No. 5502, 1420, 742, 850, 904, 1000-A, 1102, 1200, 5211, 5253, 5348, 5564, 5611, Repair No. 1231;

Oswego Co., Rds. No. 5251 and 5276, Repair Contr. No. 1215;

Suffolk Co., Rd. No. 743, Repair Contr. No. 1210; completing repair roads in following counties: Chenango Co., Otselic-South Otselic, Part 1, Rd. No. 664, Repair Contr. No. 1024;

Cortland Co., State Rd.-Homer, Rd. No. 380, State Rd.-Scott, Rd. No. 381, Repair Contr. No. 1037. F. S. Green, comr.

New York — Until July 29, by State Highway Comn., Albany, improving roads in Chautauqua and Jefferson Counties, also completing highways in Allegany, Cattaraugus, Cayuga, Dutchess, Franklin, Jefferson, Livington, Monroe, Oneida, Onondaga, Orange, Schuyler and Wayne Counties. F. S. Greene, comr.; advertised in this issue.

N. Y., Brooklyn—Until July 16, by E. Riegelmann, boro. pres., regulating, grading, curbing and laying sidewalks on East 39th St. from Ave I to new street north of Ave. I; 87th St. from 4th to 5th Aves; regulating and paving with permanent asphalt pavement on 6 in. concrete foundation East 39th St. from Ave I to new street north of Ave I, President St. from Utica to Rochester Aves., Snediker Ave. from Riverdale Ave. to Newport St., West 11th St. from Ave. S to Ave. T, Woodbine St. from Irving to Knickerbocker Aves.; regulating and restoring pavements within railroad area removed and damaged in connection with construction of sewers in roadway of Ocean Ave., from Ave. O to Ave. V; regulating and repaving with special granite pavement on present concrete foundation roadway of Washington Ave. from President St. to Empire Blvd.

N. Y., Long Island City—Until July 14, by M. E. Connolly, pres. Queens Boro., Queens Subway Bldg., 68 Hunterspoint Ave., regulating and paving with permanent asphalt on concrete foundation, curbing and laying sidewalks (where not already laid to grade and in good condition) in Edison Pl. from Myrtle Ave. to Cypress Hills Cemetery, 2nd Ward; regulating and grading sidewalks where necessary on west side 109th St. from 101th St. to Liberty Ave. and in intersections of 109th St. with 103rd Ave.; regulating, grading, curbing and paving with permanent asphalt on 6 in. concrete foundation, Lotus Ave. from Cypress Hills Rd. to Cooper Ave., from Harold to Gosman Aves., Silver St. from Anthon Ave. to Buchman Ave., 2nd Ward, Summerfield St. from Wyckoff to Myrtle Aves., 2nd Ward, Trowbridge St. from Willow St. to Van Alst Ave., 1st Ward.

N. Y., S. I., St. George—Until July 15, by C. D. Van Name, pres. Richmond Boro., repairing with bituminous concrete pavement roadways of Richmond Ave. and Old Stone Rd. from Blackford Ave. to Richmond Hill Rd. and Innis St. from Morningstar Rd. to John St.

N. J., Jersey City—Until July 25, by Blvd. Comn. Court House, repaving Hudson Co. Blvd. from Paterson Plank Rd. to Hackensack Plank Rd., bituminous pavement on concrete surface. About $75,000. Noted June 26.

Pennsylvania—Until July 29, by State Highway Dept., Harrisburg, building roads in Adams, Beaver, Bradford, Chester, Delaware, Crawford, Erie, Fayette, Jefferson, Lawrence, Mifflin, Montgomery, Bucks, Northampton, Susquehanna, Union, Washington and Westmoreland Counties. L. S. Sadler, state highway comr.; advertised in this issue.

Pa., Ebensburg—Until July 14, by Supervs. Allegheny Twp., c/o Controller of Cambria Co., improving 17,490 ft. Carrolltown Rd., 17 ft. wide, vitr. brick on concrete base, involving 35,000 lin.ft. cement curbing, etc. About $125,000. D. W. Dillman, 8081 Altoona Trust Bldg., Altoona, engr.

Pa., Ebensburg—Until July 16, by Spangler Boro. Council, c/o Cambria Co. Controller, rebuilding 1800 ft. road from Bigler Ave. to Barr Twp., Spangler Boro. About $20,000. L. J. Pfeister, boro. engr.

Pa., Pittsburgh—Until July 17, by Allegheny Co., paving between tracks 2540 ft. Glass and West Run Rds., in Homestead and Hays Boros., 14 ft. wide, with Ligonier Block edging and vitr. brick, concrete base. R. V. Warren, Court House, engr.

W. Va., Fayetteville—Until July 14, by Comrs. Fayette Co., grading 3 mi. road from Fayette to Lansing, involving 45,000 cu.yd. excav. J. K. McGrath, Fayetteville, engr.

W. Va., Huntington — Until July 15, by Cabell Co., building 1 mi. Hamlin-Huntington Rd., vitr. brick. J. H. Sanborn, Huntington, engr.

W. Va., Williamson — Until July 19, by Mingo Co., building 4 mi. earth road from Matewan to Thacker.

Fla., Sea Breeze—Until July 24, by city paving 42,000 sq.yd. Main St., involving 34,000 lin.ft. curbing 7000 cu.yd. excav., etc.

Miss., Columbus—Until July 12, by Highway Comrs. 4th Supervs. Dist., building 30 mi. road, all local gravel and long haul. G. E. Hauser, Columbus, engr.

Streets and Roads (Continued)

Ohio—Until July 18, by State Highway Comn., Columbus, building roads in following counties:

Ashland Co., Sect "B" Ashland-Wooster Rd., 3.8 mi. grading, constructing bridges and culverts and paving with concrete, cost $133,454.

Butler Co., Sect "B" Oxford-Millville Rd., 4.05 mi. grading, constructing bridges and culverts and paving with mastic or monolithic brick, bituminous concrete or sheet asphalt, $155,417.

Sect. "C-2" Oxford-Millville Rd., 3.60 mi grading, constructing bridges and culverts and paving with mastic or monolithic brick, bituminous concrete or sheet asphalt, $142,635.

Sect. "A2" Hamilton-Middletown Rd., 1.36 mi., paving with bituminous macadam, $22,834.

Clinton Co., Sect. "B" Wilmington-Xenia Rd., 3.3 mi., resurfacing with waterbound macadam and repairing shoulders, $22,640.

Coshocton Co., Sect. "C-2" Newark Coshocton Rd., 2.04 mi. grading, constructing bridges and culverts and paving with monolithic brick or rein.-con. $77,781

Franklin Co Sect. "M" Columbus-Sandusky Rd., 0.72 mi grading, constructing drainage structures and paving with brick on concrete base, $41,157.

Sect. "O" Columbus-Sandusky Rd., 0.76 mi. grading, constructing drainage structures and paving with brick on concrete base, $43,245.

Geauga Co., Sect. "T, U, & V-1" Chagrin Falls-Greenville Rd., 8.17 mi. grading, constructing bridges and culverts and paving with concrete, $305,175.

Guernsey Co., Sect. "K" Cambridge-Coshocton Rd., 2 mi grading and paving with brick, $8400

Miami Co., Sect. "D" Dayton-Covington Rd., 3.59 mi. grading, constructing bridges and culverts and paving with rein.-con., $100,623.

Sect. "H" Piqua-Urbana Rd., 0.53 mi. grading and paving with rein.-con. $15,800.

Summit Co., Sect. "A, B, C, D & E" Akron-Cleveland Rd., 16.70 mi. grading, constructing bridges and culverts and paving with brick or rein.-con. $881,622.

O., Burbank—Until July 21, by Comrs. Wayne Co., Wooster, paving Wooster-Burbank Rd., bituminous macadam, cost $15,757. L. Smith, co. clk.; advertised in this issue.

O., Doylestown Until July 16, by Comrs. Wayne Co., Wooster, paving Doylestown Hill, cost $2787; Portage St., $49,359, both bituminous macadam. L. Smith, co. clk.; advertised in this issue.

O., Lisbon—Until July 17, by Comrs. Columbiana Co., grading, draining and macadamizing with waterbound macadam, 10,578 ft. Lisbon-Salineville Pub. Rd., Washington Twp., involving 22,165 cu.yd. excav., 10,578 lin.ft. finishing bermes and ditches, 16,455 sq.yd. waterbound macadam and bridges and culverts. About $43,664. C. E. Hamilton, clk.

O., Yorkville—Until Aug. 4, by Village Council, paving Pub. Rd. St. from Ohio Valley Turnpike to terminus on west corporation line, hard burnt vitr. brick set on edge, hard burnt vitr. block or concrete. J. A. Hagan, clk.

Indiana—Until July 15, by State Highway Comn., Indianapolis, building highways in St. Joseph, Johnson and Marion, Putnam and Hendricks, Wayne, Marion, Marion and Hamilton, St. Joseph and Elkhart and Jackson Counties; advertised in this issue.

Ind., Shelbyville — Until July 23, by Comrs. Shelby Co., building 10,600 ft. gravel road between Shelby and Hancock Co., also improving 10,600 ft. Marshall-Millburn Rd. between Shelby and Hancock Counties. F. W. Fagel, co aud.

Mich., Adrian—Until July 18, by G. P. Love, city clk., laying bituminous macadam pavement, 30 ft wide, curbing and guttering where not at present laid, from north line Seeley St. to north line Albert St., also from North line Albert St. to city line on north; advertised in this issue.

Mich., Port Huron—Until July 17, by Comrs. St. Clair Co., County Bldg., grading, shaping, draining and building drainage culverts and surfacing 6½ mi. road known as Lynn-Mussey Rd. in vicinity of Capac, Assessment Dist Rd No 22; also 4½ mi. gravel road known as Harris Rd. in vicinity of Lake Shore, Assessment Dist. Rd. No. 20. D. Belyea, co. engr Noted May 8

Ill., Fair Haven—Until July 19, by J. F. Plumer, town clk., Chadwick, building 4.9 mi. Route "A," Project No. 1, gravel or macadam

Wisconsin—Until July 16, by State Highway Comn., Div. No 5, La Crosse, improving Fountain City-Winona Rd., Buffalo Co., Federal Aid Project No. 87, involving 38,099 cu.yd earth, 2619 cu.yd rock, 149 cu.yd. borrow and 731 cu.yd. earth (creek channel) excav., 257 cu.yd. Class "A" and 12 cu.yd. Class "B" concrete, 133 sq.yd concrete surfacing, etc

Wisconsin—Until July 17, by State Highway Comn., Div. No. 4, Grand Rapids, improving Portage-Stevens Pt. Rd., Marquette Co., Federal Aid Project No. 93, involving 17,745 cu.yd. earth and 151 cu.yd. borrow excav., 138 cu.yd. Class "A" concrete, 36,881 sq.yd. gravel surfacing, etc.

Wis., Clintonville—Until July 14, by L. P. Pelishek, engr., City Hall, grading and paving 3 mi Main and Elm Sts., 18 ft. wide. Noted June 12.

Minn., Duluth—Until July 14, by J. A. Farrell, comr., laying 24 ft concrete roadway and 6 ft. concrete walk on 1312 ft. 64th Ave. W. from Grand Ave to Roosevelt St About $22,108. Work involves 2562 lin.ft concrete curbing, 7130 lin.ft concrete sidewalk, 4175 cu.yd. earth and 20 cu.yd. rock excav., 4175 sq.yd concrete, 1312 ft. 12-24 in. pipe, etc.

Minn., Duluth—W. H. Borgen, aud. St. Louis Co., receiving bids improving 5 mi. road as follows: clearing and grubbing 1½ mi Walsh road, ditching and grading 1½ mi. Goodell Rd., clearing and grubbing 1 mi. Ralph Rd., clearing and grubbing portion of Brown Rd., clearing, grubbing, grading, ditching, corduroying and installing culverts on Graham Rd., grading, grubbing, ditching and installing culverts on Woodland Rd., clearing, grubbing, ditching, corduroying and installing culverts on Mason Rd and side ditching 3048 cu.yd., 1578 cu. yd. offtake ditch and 46 cu.yd culverts trenches on Victor Rd Separate bids will be received on clearing and grubbing. R. W. Acton, 115 8th Ave., E., engr.

Minn., Litchfield—Until July 16, by F. O. Holm, village recdr., grading, paving and curbing various streets, Sect. 1, involving 5275 cu.yd. grading, 23,531 sq.yd. paving and 7746 lin.ft. curbing; Sect. 2, 4668 cu yd. grading, 15,343 sq.yd. paving and 3517 lin.ft. curbing. L. P. Wolff, Guardian Life Bldg., St. Paul, engr

Minn., St. Paul—Until July 14, by H. W. Austin, purch. agt., City Hall, paving Como Ave., between Rice St. and Great Northern R.R. bridge, involving 15,141 sq. yd. 3½ in. southern pine creosoted wood blocks, 2900 bbls. Portland cement, 1347 cu.yd. concrete sand, 2247 cu.yd. crushed stone or gravel, 1809 cu yd cushion sand, 105,987 lbs. pitch filler, 1000 lbs. asphalt filler, 2997 ft B. M. No. 1 rough pine lumber, 3 x 12 in., 625 lin.ft 12 in. V. C. sewer pipe, 9200 sewer bricks, 139 lin.ft 20 ft., 212.7 lin.ft. 15 ft., 126 lin.ft. 2 ft. sandstone curb, etc.

Kan., Junction City—Until July 28, by city, for 50,000 sq.yd 3 in. vertical fibre brick No 1 brick block, concrete or asphaltic concrete pavement, 10,000 cu.yd. excav. and 20,000 lin.ft. curb and gutter J. N. Bridgman, city paving engr.

Neb., Lincoln—Until July 21, by T. H. Berg, city clk., paving 19th, Park, 24th, 16th and Dudley Sts., 25 ft wide, involving 434 sq.yd. vertical fibre brick, 17,964 sq.yd. asphaltic concrete, 1335 sq.yd. concrete, 696 lin.ft. concrete curbing, 13,676 lin.ft. curbing and guttering, and 2339 cu.yd earth excav. About $65,100. No bids received on former advertisement. G. W. Bates, city engr Noted June 26

Mo., Albany—Until July 15, by city, for 25,000 sq.yd vertical fibre brick pavement, 10,000 cu.yd. grading, 14,000 lin.ft. combined curb and gutter 1500 lin.ft storm sewer, 16 catch basins and 7 manholes Archer & Stevens, 609 New England Bldg., Kansas City, engrs

Mo., Bethany—Until July 23, by Harrison Co. Court, grading, paving with concrete 9 ft. wide, laying macadam shoulders etc., on 9.4 mi State Rd Project No 8 M. G. Hall, Centerville, Ia., engr.; advertised in this issue.

Mo., St. Joseph—Until July 26, by Buchanan Co Court grading and paving 2.2 mi state road from St Joseph to One Hundred and Two River, 2½ in. asphaltic concrete 18 ft. wide J. D. Mohler, St. Joseph, special highway engr. Noted June 26

Arkansas—Until July 21, by Comrs Old Town Rd Improv Dist of Phillips Co at office of State Highway Comn., Little Rock, building 15 mi concrete highway J. M. Quaries, Helena, engr; advertised in this issue.

Tex., Baird—Until July 14, J. R. Black, Judge Callahan Co., surfacing with crushed rock and gravel 34.85 mi Highway No 1 from Eastland Co line to Taylor Co. line, 16 ft wide. About $6000 per mi. H. H. Fielder, Cisco, engr. Noted June 26.

Colo., Denver—Until Aug. 24, by city, paving Alley Paving Dist No. 50 and 51, concrete About $25,589 and $22,505 respectively. J. B. Hunter, city engr.

New Mexico—Until July 15, by State Highway Comn., Santa Fe, building Sects. 3, 4 and 5 State Rd. No. 6, Federal Aid Project No 4, Valencia Co. L. A. Gillett, state highway engr.

Utah—Until July 15, by State Highway Comn., Salt Lake City, paving 3.2 mi. state road from Roy to Ogden, 18 ft wide, 2 in bituminous concrete over existing tarvia base, also 3 mi. from North Ogden to Utah Hot Springs, 18 ft. wide, I. R. Browning, c/o State Highway Dept., Salt Lake City, engr.

Wash., Anacortes—Until July 15, by City Council, paving 8396 ft. 7th, 8th, 9th and K Aves., 16 ft. wide, bitulithic concrete. About $37,329. W. B. Short, city engr.

Quebec—Until July 18, by Dept Rds., Quebec, graveling 75 mi. Provincial Roads. 30, 35 and 40 ft. wide, between Yamaska and Sorel. About $100,000. M. Henry, c/o Dept. Rds., engr.

Quebec—Until July 23, by Dept Rds., Quebec, building 9 mi. waterbound macadam roads in town of St. Antoine. About $36,000. M. Henry, c/o Dept. Rds., engr.

Que., St. Johns—Town receiving bids building 6 mi. concrete roads and sidewalks. About $34,090. W. H. Bourassa, Town Hall, engr.

Ont., Caledonia—Until July 18, by town, building 22,700 sq.yd. 3 in. tar penetration roads, on 6 in. stone base. Work involves 1400 lin.ft. 6 in. curbing and 1500 cu.yd. earth excav., tar penetration roads. J. W. Avery, clk

Ont., Owen Sound—Until July 18, by D. H. Fleming, engr., Owen Sound, resurfacing 30,000 sq.yd. macadam with asphaltic concrete, about half requiring concrete base, also constructing 3 mi. curbs and gutters. Noted June 19.

Ont., Kingston—Until July 12, by city, for 8000 ft. pavement, 24 ft wide, asphalt, asphaltic concrete, asphalt or bituminous macadam or tarvia macadam, 10,500 ft combined curb and gutter, 6200 ft. concrete gutter and 25,000 sq.yd. 5 in. concrete base. R. J. McLelland, city engr.

Ont., Welland—Until July 21, by Welland Co., building 10 mi. waterbound or bituminous penetration macadam and ½ mi. concrete roads, 22 ft. wide. About $150,000. G. Ross, Welland, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Cranston**—City let contract resurfacing 22,858 sq.yd. Cranston St., sheet asphalt, to E. P. Tracy, 200 Olivia St., Derby, Conn., $1.52 per sq.yd., total cost $34,744. Noted April 17.

New York—State Highway Comn., Capitol, Albany, received bids July 1, improving roads in following counties: (a) Albany Co., 3.98 mi. Schenectady Co. Line-Guilderland Rd., No 5636,

(b1) Herkimer Co., 5.84 mi. Vanhornesville-Starkville Rd No 1362, (b2) 5.67 mi Barnes Hollow-Stone House, Rd. No 1363,

(c) Oneida Co., .45 mi. North Western-Boonville, Pt. 3, Rd. No 1462,

(d) Putnam Co., 3.33 mi. Westchester Co. Line-Mahopac Falls, Rd. No. 1512,

(e1) Saratoga Co., 9.06 mi. Schuylerville-Gansevoort, Rd No 1461, (e2) 1.52 mi Wait Cors-Lape Cors, Rd. No 1523;

(f1) Suffolk Co., 6.59 mi Bridgehampton-Devon, Pt. 1, Rd. No. 1495, (f2) 4.99 mi Bridgehampton-Devon, Pt 2, Rd. No 1524; completing roads in following counties:

(g) Cayuga Co., 6.98 mi. Port Byron-Weedsport, Rd No. 5609;

(h) Cortland Co., 6.07 mi. Solon-Gee Brook, Pt. 1, Rd. No. 1435;

Streets and Roads (Continued)

(i) Erie Co., 6.03 mi. Wales Center-Wales, Rd. No. 924-B;
(j) Franklin Co., 1.99 mi. Main and Elm Sts., Malone Village, Rd. No. 5602;
(k) Hamilton Co., 5.01 mi. Tupper Lake-Long Lake, Pt. 1, Rd. No. 1258;
(l) Jefferson Co., 4.05 mi. Carthage-Antwerp, Pt. 4, Rd. No. 5618;
(m) Niagara Co., 8 mi. Cambria-Wilson, Rd. No. 1315;
(n) Schenectady Co., 5.62 mi. Schenectady-Duanesburg, Pt. 2, Rd. No. 5545;
(o) Wayne Co., 5.85 mi. Sodus-Alton, Rd. No. 5632; also repairing roads in following counties:
(p) Rensselaer Co., Rd. No. 490. Repair No. 1208;
(q) Ulster Co., Rd. No. 16, Repair No. 1224, from
Veeder Contg. Co., Inc., Delevan, (a) $108,213,
Brown, Lowe & Parker, Schenectady, (a) $113,751,
Latus & Hawkins, Albany, (a) $116,279,
F. V. Brotsch Co., 1 and B Bldg., Rochester, (b1) $213,423, (b2) $193,112, (c) $28,964;
Rosoff Eng. Co., 15 Park Row, New York City, (b1) $215,503; (k) $91,669,
D. J. Phelan & Co., Utica, (c) $28,283,
McCarthy & Rock, Winthrop, (c) $30,008,
S. Beskin, Beacon, (d) $83,175,
F. G. Fowler Constr. Co., Mt. Kisco, (d) $86,210,
Hughes & Gardner, North Tarrytown, (d) $93,854,
McArthur Bros., 120 Bway., New York City, (e1) $339,793, (f1) $306,435, (f2) $270,063,
Harradine Bros. Co., Inc., Spencerport, (e2) $38,683, (o) $9305,
Pearl Investing Co., Inc., Albany, (e2) $38,782,
H. A. Schaupp, Inc., Guilderland, (e2) $39,628, (n) $73,594,
Good Rds. Eng. & Contg. Co., Inc., Portchester, (f1) $242,205, (f2) $214,111,
C. D. Schlemmer, Islip, (f1) $251,345, (f2) $221,362,
Underpinning & Foundation Co., 290 Bway., New York City, (f1) $258,580, (f2) $231,694,
J. J. McDermott, Port Washington, (f1) $259,018, (f2) $226,522,
Kennedy Constr. Co., Albany, (g) $29,-256,
Hendrickson-McCabe Constr. Co., Rochester, (g) $29,817, (o) $8518,
I. M. Ludington Sons, Inc., Powers Bldg., Rochester, (g) $32,231,
D. W. Robbins, Inc., Utica, (h) $111,470,
T. Grady, Rochester, (h) $114,821,
Felton Constr. Co., Buffalo, (i) $81,567,
A. F. McConville, Ogdensburg, (j) $25,-974,
J. M. Allen, Newark, N. J., (k) $93,578,
A. J. Rockwood, Rochester, (k) $97,961,
Dale Eng. Co., Mann Bldg., Utica, (l) $66,385,
L. J. Devlin, Rensselaer, (m) $62,560,
P. J. Mumm Contg. Co., Inc., Buffalo, (m) $129,755,
O. M. Singer, Wilson, (m) $135,407,
J. J. Malloy, Schenectady, (n) $66,450,
Cleveland & Sons, Brockport, (o) $13,-934,
Troy Contg. Co., Troy, (p) $85,689,
J. Fitzgerald, Hoosick Falls, (p) $87,090,
J. F. Gallagher, Kingston, (q) $54,295,
F. W. Hamilton, Rochester, (q) $57,857. Noted June 12.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids June 26, regulating, grading, curbing and laying sidewalks on (a) 93rd Ave., (b) Olmstead Pl., (c) 16th Ave., (d) Hancock St., from R. A. Hess, Inc., (a) $2247; Scott & Kurth, (a) $2301, (b) $3309; Grimm Constr. Co., (a) $2344, (b) $3182; C. Gallagher, (a) $2354, (b) $3037; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (c) $5783, (d) $4955; Uvalde Asphalt Paving Co., 1 Bway., New York City, (c) $5935, (d) $5249; Borough Asphalt Paving Co., 1301 Metropolitan Ave., Brooklyn, (c) $6180, (d) $5411. Noted June 19.

N. Y., Utica—Bd. Contr. & Supply received only bid building parkway extension, beginning at Welsh Bush Rd. and extending along Thomas Proctor Park, to Rutgers St., from H. W. Roberts, 610 Lansing St., bitulithic, $37,240, sheet asphalt, $33,934, asphaltic concrete, $36,196.

New Jersey—State Highway Comn., Broad St. Bank Bldg., Trenton, received bids building State Highway Route No. 1, Sect. 3, Robbinsville to Windsor, Mercer Co., from Hugh Nawn Contg. Co., 1211 Chestnut St., Phila., $149,562; H. Wilhelm Sons, Inc., Elizabeth, $157,548; Harop & Shannon, Inc., Garfield, $159,991. Noted June 19.

★**N. J., South Orange**—Village let contract paving sidewalks andcurbing 15,000 ft. Irving Ave., to J. Sellitto, 163 Church St., $24,246. Work involves 2850 lin.ft. curbing, 11,500 lin.ft. sidewalk, 1400 cu.yd. excav.

★**Pennsylvania**—State Highway Dept., Harrisburg, let contracts to H. Nawn Contg. Co., Phila., for 19,706 ft. rein.-con. pavement on Route No. 140 and 24,765 ft. on Route No. 199, Dauphen Co., cost $143,812 and $186,863 respectively; to Mason & Hanger, Inc., Chambersburg, for 25,402 ft. rein.-con. and Hillside vitr. brick, on Route No. 161, Northumberland Co., $199,629; to Boyle Constr. Co., Wilkes-Barre, for 9148 ft. bituminous surface course on concrete foundation, Routes Nos. 239 and 249, Columbia Co., $84,630; to W. P. McDonald Const. Co., Phila., for 10,802 ft. bituminous surface course on concrete foundation, Routes Nos. 3 and 4, Columbia Co., $157,433; to Standard Contg. Co., Altoona Trust Bldg., Altoona, 1269 ft. rein.-con., Route 260, Blair Co., $19,880; to Claiborne-Johnston Co., 10th Ave. and 6th St., Baltimore, Md., for 21,506 ft. rein.-con., Route No. 136, Lancaster Co., $162,093. Noted July 3.

★**Pennsylvania** — State Highway Dept., Harrisburg, let contract building roads in counties as follows:
Blair Co., 890 ft. rein.-con., Gaysport Boro., to Standard Contg. Co., Altoona Trust Bldg., Altoona, $5872; 23,075 ft. repair work, Logan Twp., to Eastern Paving Co., Colonial Trust Bldg., Phila., $27,200.
Bradford Co., 6640 ft. concrete, Athens Twp., to Valley Constr. Co., Athens, $38,540.
Cambria Co., 32,180 ft. rein.-con. and Hillside vitr. brick, Jackson Twp., to Nicola Bldg. Co., Penn and Denniston Aves., Pittsburgh, $259,956.
Centre Co., 27,940 ft. bituminous surface ocurse or rein.-con. Boggs Twp., to Vipond Constr. Co., 2222 Beale Ave., Altoona, $215,711.
Chester Co., 2932 ft., bituminous surface course or rein.-con., Oxford Boro., to Juniata Co., Empire Bldg., Phila., $21,602.
Cumberland Co., 24,275 ft. rein.-con. and Hillside vitr. brick, Upper Allen Twp., to Langthorne Co., New York City, $181,605.
Crawford Co., 9067 ft. rein.-con., Woodcock and Hayfield Twps., to Keystone Constr. Co., Meadville, $62,627.
Erie Co., 4854 ft. bituminous surface course on concrete foundation and Hillside vitr. brick, Girard Boro. and Twp., to Mayer Bros. Constr. Co., Commerce Bldg., Erie, $86,634; 20,200 ft. rein.-con., Wayne Twp., Highway Constr. Co., Erie, $136,532; 27,409 ft. bituminous surface course and Hillside vitr. brick on concrete foundation, Mill Creek and Fairview Twps., to Campbell Bros. Co., Stambaugh Bldg., Youngstown, O., $237,684.
Lancaster Co., 37,684 ft. bituminous surface or rein.-con., East and West Hempfield Twps., to Freeland Constr. Co., Freeland, $247,273.
Lycoming Co., 39,319 ft. rein.-con., Platt and Woodward Twps., to W. J. Gephart, Pittsburgh, $322,931.
Mercer Co., 3678 ft. bituminous surface course or rein.-con., on concrete foundation, Grove City Boro., to Brackenridge Sand & Gravel Co., Brackenridge, $44,169.
Potter Co., 26,400 ft., bituminous surface course or rein.-con. on concrete foundation, Eulalia and Roulette Twps., to Horn & Devling, Main St., Galeton, $215,048.
Warren Co., 6544 ft. rein.-con., Youngsville Boro., to J. McCormick & Bros., Erie, $39,907.
York Co., 40,712 ft. bituminous surface course on concrete foundation and Hillside vitr. brick, or rein.-con. and Hillside vitr. brick, Carroll and Franklin Twps., to Langthorne Co., New York City, $297,908. Noted June 26.

★**Pa., Clairton**—Boro. let contract grading, paving, curbing and sewering section of Miller Ave., to C. Donatella, 1313 Collier St., Pittsburgh. About $54,000. Noted June 19.

★**Pa., Crafton** (Pittsburgh P. O.)—Boro. let contract grading, paving and curbing Barr St. from Keever to Williard Sts. and Harris Ave. from Barr to Clearview Sts., to J. Creary. About $8000 and $20,000 respectively. Noted May 22.

★**Pa., Dormont** (Pittsburgh P. O.)—Boro. let contract grading, paving and curbing Pinehurst and Latonia Aves., to J. P. Gary, Kensington House, New Kensington. About $17,782. Noted July 3.

★**Pa., Greensburg**—Westmoreland Co. let contracts building 3.10 mi. Greensburg-Scottdale Rd., to Corrado & Galiardi, cost $140,436 brick, $125,931 concrete; 2.88 mi. road in Ligonier Twp., to J. Hermann, $96,010 brick, $75,734 concrete. Noted June 5.

★**Pa., Pittsburgh**—Allegheny Co. let contract building 5700 ft. Painters Run Rd., in Bridgeville Boro., to T. Cronin, South 17th and Muriel Sts., $53,137. Work involves 625 sq.yd. vitr. brick, 7915 sq.yd. concrete, 1000 sq.yd. paved gutter, 12,000 cu.yd. earth excav. and 3100 ft. 6 in. vitr. pipe drain. Noted Apr. 24.

★**Pa., Pittsburgh**—Allegheny Co. let contract grading, paving and curbing 2050 ft. Main St., in Baldwin Twp., from Library Rd. to Carrick Boro. line, 24 ft. roadway, to M. Ott & Co., 414 Warrington Ave., $34,-135. Noted June 5.

★**Pa., Pittsburgh**—Allegheny Co. let contracts improving 5280 ft. McCoy Rd., 18 ft. wide, to J. H. McQuaide & Sons Co., Bakewell Bldg., $46,040; 3 mi. Bull Creek Rd., 16 ft. wide, concrete base and asphaltic concrete surface, to Booth & Flynn, 1942 Forbes St., $104,254. Noted June 26.

★**Pa., Reading**—City let contract for 10,-000 sq.yd sheet asphalt pavement, to Dewey Cement Gun Constr. Co., 836 Hamilton St., Allentown. Noted June 12.

★**Pa., Washington**—Washington Co. let contracts improving 5400 ft. Beallsville-Zollarsville Rd., 14 ft. wide, concrete, to Donora Constr. Co., 1st and 2nd Sts., Donora, $32,424; 1400 ft. West Alexander-Mechanic St. Rd., 24 ft. wide, rein.-con., to Tarentum Sand & Gravel So., Tarentum, $12,223; 6600 ft. Avella-Cross Creek Rd., 14 ft. wide, concrete, to G. S. White & Co Jenkins Arcade, Pittsburgh, $39,883; 9500 ft. Midway-Primrose Rd., 16 ft. wide, rein.-con., to McPherson Bros., 421 Chestnut St., Sewickley, $58,073; 8800 ft. Burgettstown-Bulger Rd., 16 ft. wide, rein.-con., to Federal Constr. Co., Pittsburgh, $56,135. Noted June 5.

★**Pa., Williamsport** — City let contract paving sections of Cemetery, Race, Maynard, William and Locust Sts. and Park Ave., to Busch & Stewart, Trust Bldg. About $10,000.

★**Md., Baltimore**—Bd. of Awards let contracts to Arundel Constr. Co., 911 Eastern Ave., grading, curbing and paving Crooked Lane, involving 340 sq.yd. granite block relaid with 5 in. concrete base, and Washington Pl., 1540 sq.yd. Hillside vitr. brick block with cement filler on 5 in. concrete base, Contr. No. 164, cost $7547, also Brevard St. and 2 alleys running therefrom, 2910 sq.yd. 6 in. cement concrete, Contr. No. 165, $7058; P. Reddington & Sons, 2 East Lexington St., Arch, Vine and Pierce Sts. and Penn Alley, involving 11,920 sq.yd. 6 in. cement concrete, Contr. No. 166, $33,-365. Noted June 12.

Virginia—State Highway Comn., Richmond, received bids building 2.69 mi. road from Ryans Mill to Coleen, waterbound macadam, Project No. 33, Nelson Co., from Royers & Shumway, Buchannon, $59,438, and J. L. Chandler, Virgilina, $39,797; 4.27 mi. road from Fairfield to Timber Church, waterbound macadam, Project No. 35, Rockbridge Co., from W. Z. Johnson, Lexington, $64,500, and L. R. Colbert, Fredericksburg, $68,000. Noted June 12.

★**W. Va., Wheeling** — Comrs. Ohio Co. let contract building 1 mi. National Rd. to Valley Grove, to Cass & Otto, Wheeling. About $35,056.

★**S. C., Spartanburg**—Comrs. Spartanburg Co. let contract relocating, grading, draining, building drainage structures and surfacing with top soil, 6.7 mi. road from Reidville to Duncan, Federal Aid Project No. 1213, 30 ft. wide, involving 35 cu.yd. concrete, 31,720 cu.yd. earth and 500 cu.yd. rock excav., 570 lin. ft. vitr. pipe and 23,628 cu.yd. top soil, to Cooley & Gillespie, Greenville, $31,510.

★**Ga., Washington** — City let contract paving, draining and curbing 118,000 sq.yd. main streets, to Ely Constr. Co., Lamar Bldg., Augusta. About $83,000. Noted June 26.

★**Fla., West Palm Beach**—Comrs. Palm Beach Co. let contract grading and hard surfacing 16.5 mi. road from here to Lake Okeechobee, to Bryan & Snyder Co., Ft. Lauderdale, $129,975.

Streets and Roads (Continued)

O., Cleveland—City received bids paving (a) East 125th St. from Luke to Abell Aves. involving 18,200 sq.ft. 4 in. brick paving on 6 in. concrete base and 1520 ft. 5 in. stone curbing, (b) East 63rd St. from Francis to Watterman Aves., 28,000 sq.ft. 4 in. brick on 6 in. concrete base and 2000 ft. 5 in. stone curbing, (c) East 55th St. from Howard to Brew Aves., 19,000 sq.ft. 5 in. brick paving on 6 in. concrete base and 1360 ft. 5 in. stone curbing, (d) East 4th St. from Huron to Bolivar Rds., 31,020 sq.ft. Medina block paving on 6 in. concrete base and 1000 ft. 5 in. stone curbing, (e) East 4th St. from Huron Rd. to Prospect Ave., 13,000 sq.ft. 5 in. granite block on 6 in. concrete base and 770 ft. 6 in. curbing, from A. M. Pejsa, 2359 East 93rd St., (a) $11,581, (b) $17,825. Baldwin Bros., 4500 Euclid Ave., (a) $11,659, (b) $17,457, (c) $13,251, (d) $25,952, (e) $12,892; Rieley Bros., 357 The Arcade, (a) $11,867, (b) $17,282, (c) $13,187, (d) $25,298, (e) $12,780; Cleveland Trinidad Paving Co., The Arcade, (c) $10,223; R. P. Burnett, Society for Savings Bldg., (d) $25,004, (e) $12,582.

★O., Dayton—City let contract paving 2000 ft. 3rd St. from Perry to St. Clair Sts., 60 ft. wide, involving 13,400 sq.yd. oil A wood block, 4200 lin.ft. granite curbing, and 2000 sq.ft. cement sidewalks, to E. D. Murray, 10 Cambridge Ave., $93,304. Noted June 26.

★O., Toledo—City let contract grading, draining, curbing and paving with rein.-con. 1248 ft. Martha St., 24 ft. wide, involving 1149 cu.yd. earth excav., to Peters Bros., 237 Marion St., cost $16,132; 2581 ft. Oakdale Ave., 26 ft. wide, rein.-con., involving 5012 cu.yd. earth excav., to Russel & Jennison, 2463 Bway., $32,718. Noted June 26.

★Mich., Ford (Wyandotte P. O.)—Village let contract paving and curbing 3000 ft. Goddard Rd. from Biddle Ave. to west village limits, 30 ft. wide, and 1400 ft. Hudson St. from Middle Ave to Detroit, Toledo, & Ironton R.R., 24 ft. wide, to Rice Constr. Co., Wyandotte. Noted June 26.

★Illinois—Dept. Pub. Wks. & Bldgs., Div. of Highways, Springfield, let contracts improving Sects. G, H, C, P-15d, and D, to J. Black Masonry & Constr. Co., 212 West Washington St., Chicago, $680,000; Sect. A1 and A2, to Holm Page Co., 1604 4th Ave., Rockford, $118,300; Sects. E, F and L-15d, to W. F. Smith & Co., Renssalaer, Ind., $307,986. Noted June 19.

★Wis., Jefferson—Bd. Pub. Wks. let contract grading and paving 9000 sq.yd. C St., from Rock River to 1st Ave., etc., to McNamara Constr. Co., Dubuque, Ia., $18,180. Noted June 5.

★Minn., Blue Earth—J. J. Herring, aud. Fairbault Co., let contract grading and graveling 20 mi. Federal Aid Project No. 36, 24 ft. wide, to H. Enke, Tyler, $115,000. Noted June 12.

★Minn., Litchfield—Comrs. Meeker Co let contract improving 16.7 1 mi State Rd No. 6, Federal Aid Project No. 40, to S J. Groves & Sons, 100 Kasota Bldg., Minneapolis, $107,689. Noted June 12.

★Minn., Marshall—R. D. Houdersheldt, aud. Lyon Co., let contract grading and graveling 9 mi. Federal Aid Project. State Rd. No. 6, to Spencer & Chambers, Marshall, cost plus percentage basis. Noted June 12.

★Minn., Morris—Comrs. Stevens Co. let contract paving 10 mi. State Rd. No. 2, Federal Aid Project No. 67, to Foley Bros., 209 Gilfillan Bldg., St. Paul, $280,167. Noted May 22.

★Kan. Mankato—City let contract paving, curbing and guttering various streets, vitr. brick on concrete base, to Central Bridge Co., Mankato, $35,392.

★Neb., Ainsworth—Village let contract to Bauer & Johnson, 201 Farnam Bldg., Omaha, paving 19,340 sq.yd. with rein.con. at $2.90 per yd., 6520 lin.ft curb and gutter, $1.10 per ft. and 4800 ft. of soft steel protection plates. Total cost, $62,968. Noted June 12.

★Neb., Omaha—Douglas Co. let contract paving 6 blocks Gilmore Ave. from Railroad Ave. to Harrison St., 30 ft. wide, involving 10,466 sq.yd. vitr. brick on 6 in. concrete base, 5540 lin.ft. curbing and 2700 cu.yd. earth excav., to Natl. Constr. Co., 4811 South 24th St., $36,939

★Neb., Stromsberg—Comrs. Polk Co. let contract to Hugh Murphy Constr. Co., 204 Karbach Blk., Omaha, paving 19,926 sq.yd., with 3 in brick blocks on 4 in concrete base at $3.78 per yd., also 6900 ft 24 in. combination and 1700 ft 7 x 20 in straight curbing and guttering, $1.12½ per ft. Total cost about $86,000.

★Montana — State Highway Comn., Helena, let contract gravel surfacing 2.02 mi. Hardin-Custer Rd., 18 ft wide, Big Horn Co., to A. Carlson, Columbus, $16,811. Noted May 1.

★Montana — State Highway Comn., Helena, let contract gravel surfacing 4 mi Tongue River Rd., Sec. No. 1, Custer Co., to Schlueter Bros., Miles City, $20,014 Noted June 12.

★Mont., Laurel—City let contract paving 2¼ mi. streets, to F. G. Steinmetz, Laurel, $20,668.

Tex., Bonham—Comrs. Fannin Co. received lowest 3 bids improving 7.121 mi. Bonham-Sherman Rd. from Ector to Grayson Co. line, 14 ft.-16 ft. wide, from J. W. Rooks, McAlester, Okla., $59,237; Allhands & Davis, Wills Point, $75,368; Womack Constr. Co., Dallas, $79,755. Noted June 12.

★Tex., Houston—Comrs. Harris Co let contract building 9.213 mi. Highway No. 3 A, known at Katy Rd., to Snyder Bros., Bay City, $16,525. Noted May 8.

Tex., Jasper—Comrs. Jasper Co. received lowest 3 bids grading and gravel surfacing 16.21 mi. Highway No. 7 from Jasper, west to county line, 12 ft. wide, from Smith Bros. & Bland, Jasper, $122,046; Allhand & Davis, Wills Point, $127,467, J. S. Moore, Lufkin, $131,077. Noted June 12.

★New Mexico—State Highway Comn., Santa Fe, let contract building 12 mi. Federal Aid Project No. 15, from Las Cruces to Mesquite, Dona Ana Co., to Lee Moor Constr. Co., 312 Two Republics Bldg., El Paso, Tex. About $300,000.

★Ariz., Bisbee—City let contract for 40,000 sq.yd. concrete paving, 8 in. thick with wearing surface, cement curbs and walks, to F. V. McPeak, 2415 Gramercy Park, Los Angeles, Cal. About $105.000.

★Washington—State Highway Comn., Olympia, let contract paving 8 mi. Pacific Highway from Mt. Vernon to Snohomish Co. line, concrete, to McAdam & Co., Seattle, cost $244,664; 3 mi. Olympic Highway from Montesano west, concrete, to Aberdeen Paving Co., Aberdeen, $80,333; 3.2 mi. road from end of Montesano paving to east of golf links, 18 ft. wide, involving 41,200 sq.yd. 1 course concrete, to Blake Contg. Co., Montesano, $80,000. Noted June 12.

★Washington—State Highway Bd., Olympia, let contract paving 7 mi. Pacific Highway from Forest to Toledo, Post Rd No. 27, concrete, Lewis Co., to T. M. Morgan, Auburn, cost $221,644; 4.5 mi. Sunset Highway from Deep Creek west to county line, Project No. 22, concrete, to Standard Asphalt Paving Co., 517 Lincoln St., Spokane, $131,358. Noted June 12.

★Washington—State Highway Bd., Olympia, let contract paving 3.9 mi. Sunset Highway east of Spokane Co., Spokane Co., to Clifton, Applegate & Todd, Hutton Bld Spokane, $116,895; 2640 ft. Pacific Highway east of Everett, Snohomish Co., to J. V. Hoover Co., Everett, $32,204; 5.5 mi. Pacific Highway from Woodland to Martins Bluff, Cowlitz Co., to D. A. Williams, Bradley Rd. and Prospect Hill, Tacoma, $34,038; clearing, grading, draining and surfacing 7 mi. Pacific Highway from Olympia to Tenon, Thurston Co., to Alberton, Cornell & Simpson, Tacoma, $150,200; 7.8 mi. Chelan-Okanogan Highway from Tonasket to Oroville, Okanogan Co., to Anderson & McDowell, Molson, $51,325; 7.8 mi. Chelan-Okanogan Highway from Brewster to Malott, Okanogan Co., to R. A. Sloane, Seattle, $56,654; 4.9 mi. Sunset Highway east of Hartline, Grant Co., to A. A. Prouix, Almira, $44,268. Noted June 19.

★Wash., Aberdeen—City Council let contract building 15 blocks concrete sidewalk on Bway., G, H, I, K, L, 1st, 2nd, 3rd, 4th, 5th and 8th Sts., 6 ft. wide, involving 18,000 sq.yd. 4 in. concrete, to Haukeli, Hegg Co., Aberdeen, $19,953. Noted June 5.

★Wash., Aberdeen—City Council let contract clearing, subgrading, paving, building sidewalks and drainage, business on Wishkah St. from Washington to Division Sts., 30 ft. wide, involving [illegible] sq.yd. concrete, 2070 lin.ft. concrete curbing and 1410 sq.yd. 6 in. concrete sidewalks, to Grays Harbor Constr. Co., Aberdeen, $18,363. Noted June 12.

Wash., Bremerton—City received only bid paving Washington St., concrete, from Baldioto & Hulett, Seattle, $49,495.

★Wash., Seattle—Bd. Pub. Wks. let contracts to John & Bressi, Seattle, paving 32nd Ave. N. E., et al, involving 13,350 sq.yd. 6 and 7 in. concrete, 6680 lin.ft concrete curbing and 3300 cu.yd. earth excav., cost $66,816, King St., et al, 30,300 sq.yd. concrete, 11,000 lin.ft. concrete curbing and 16,600 cu.yd. earth excav., $182,943; to F. McLellan, Seattle, paving East 50th St., et al, 26,940 sq.yd. concrete, 18,500 lin.ft. concrete curbing and 9200 cu.yd. earth excav., $101,079; to F. McHugh, Seattle, paving Rainier Ave., et al, 17,250 sq.yd. concrete on 6 in. concrete base, 7410 lin.ft. concrete curbing and 13,600 cu.yd. earth excav., $139,480. Noted June 12.

★Wash., Vancouver—Comrs. Clarke Co., let contract paving 4.75 mi. Feleda-Hazel Dell Rd., gravel bitulithic, to Warren Constr. Co., Journal Bldg., Portland, Ore., $110,283. Noted May 29.

★Ore., Beaverton — City let contract paving with bitulithic concrete, grading, draining and building concrete curbing on 12 blocks, to Warren Constr. Co., Journal Bldg., Portland, $15,514. Noted June 19.

Ore., Portland—City Council received bids grading and building sidewalks on East Flanders, East Davis, East Everett, East Burnside, East 69th, 70th and 71st Sts., from Alaska Plumbing and Heating Co., 413 East Morrison St., $12,552; M. Hansen & Co., $14,107; S. Simonsen, 841 East 10th St., $14,190; paving and building sidewalks on Cable St. from Terrace Rd. to Mill St., concrete No. 1, from Cochran Bros., $7600; East 62nd St. from Sandy Blvd. to Fremont St., from Warren Constr Co., Journal Bldg., asphaltic concrete on crushed rock base, $9189; Cochran Bros., concrete No. 1, $9784; Minnesota Ave. from Emerson St. to Killingsworth Ave., from Cochran Bros., concrete No. 1, $3259.

★Cal., Oakland—City let contract paving 54th Ave., to Hutchinson Co., 444 17th St., $12,565. Wrk involves 2031 lin.ft. redwood curbing, 5931 lin.ft. concrete gutter, 9085 lin.ft. cement sidewalk and 19,788 sq.ft. oil macadam pavement.

★Que., Ste. Anne de Bellevue—Dept Pub. Wks., Ottawa, let contract for grading and other road work at Military Hospital, here, to I. Kert & Son, Montreal. About $22,882.

★Ont., Ingersoll—Town let contract to Frid Constr. Co., Sun Life Bldg., Hamilton, for concrete pavements at $2.15 per sq.yd., concrete curbing, $0.30 per lin.ft., 8 in. sewer, $1 per lin.ft., 4 in. tile, $0.16 per lin.ft. and catchbasins, $30 each. Total cost about $80,000.

★Ont., Mimico — Town let contract building 1¾ mi. concrete pavement, 18 ft. wide, including curbing and sewering, to Archibald & Wright, Toronto. About $80,000, and $5000 for rental of equipment plus $3000 profit.

★Ont., St. Thomas—City let contract to Standard Paving Co., Central Chambers, Ottawa, paving 20,000 sq.yd. with asphalt on 6 in. concrete base, at $3.35 per sq.yd 10,000 lin.ft. concrete curbing and guttering at $ 86½ per lin.ft. and paving between tracks at $3.73 per lin.ft. Total cost about $45,000. Noted June 5.

Railways

PROPOSED WORK

Louisiana—Pub. Belt R.R. City Hall, New Orleans, plans to sell $600,000 bonds to extend line. A. F. Barclay, engr.

California—E. F. Stahle, chn. com. transportation of chamber of commerce of La Jolla, has announced that arrangements have been made for financing construction of electric car line at La Jolla. It is planned to take over present line of Bay Shore R. R. which connects with Point Loam Electric R. R. at Ocean Beach and runs through Mission Beach, and build new 4½ mi line, using 60 lb rail, which is to be operated as an adjunct of San Diego Electric Ry., now operating Point Loma line.

Railways (Continued)

Nova Scotia—C. B. Brown, ch. engr. Canadian Natl. Rys., Moncton, N. B., soon lets contract grading 9.13 mi. for double-track line from Springhill to Maccan, about $180,000; also 7.57 mi. for additional main line from Truro to Belmont, about $249,000.

New Brunswick—C. B. Brown, ch. engr., Canadian Natl. Rys., Moncton, soon lets contract grading 3.35 mi. cut-off at Moncton Yards, involving about 150,000 cu.yd. clay. About $75,000.

Quebec—C. B. Brown, ch. engr., Canadian Natl. Rys., Moncton, N. B., soon lets contract grading 4.70 mi. for double-track diversion, between St Rosalie and Charlotte. About $57,000.

Ontario—W. F. Tye, engr., Montreal, submitted report to officials of Canadian Pacific Ry., Windsor St. Sta., Montreal, and Grand Trunk Ry., McGill St., Montreal, for interswitching tracks of two lines at Owen Sound, railway stations of which are on opposite sides of Sydenham River. About $100,550.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ohio**—Cuyahoga Co. let contract building spur track in Cleveland to connect with Lake Shore R.R. tracks, to R. E. Carey Constr. Co., 1500 West 112th St., Cleveland. About $10,000.

Excavation and Dredging

PROPOSED WORK

Tex., San Antonio—Channel—City election July 26 to vote on $200,000 bonds to build river channel. H. Helland, city engr.

Colo., Las Animas—Dam—Whiting and Laird, archts., Exch. Bldg., Denver, soon let contract building Muddy Creek dam, 25 mi. south of here, for Mutual Carey Irrigation Co., Exch. Bldg., Denver. Work involves 620,000 yd. fill, 50,000 yd. additional earth work and 1330 cu.yd. concrete.

Ore., Bandon—Dredging—Port of Bandon plans to remove rocks from jetty to include dredging, blasting, etc. About $127,000. Federal Government will bear one-half cost.

Cal., Berkeley — Dredging — See "Miscellaneous."

B. C., Victoria—Canal—Provincial Government soon lets contract building and completing 8 mi. irrigation canal from point of diversion on Okanagan River, with excavations for structures as may be necessary. About $100,000. E. A. Cleveland, c/o Dept. Lands, Victoria, engr.

BIDS DESIRED

N. J., Atlantic City—Excavation—See "Miscellaneous."

Minn., Duluth—Ditch—See "Streets and Roads."

Mont., Columbus—Drainage—Until July 20, by H. M. Ray, drain comr., Stillwater Co., building lake drain, involving 59,130 cu.yd. open canal, 20,440 cu.yd. trenching and 3 mi. 20 in. tile. H. C. Rothwell, Columbus, engr.

B. C., New Westminster — Dredging — Dept. Pub. Wks., Ottawa, Ont., receiving bids dredging north arm of Frazer River, between here and Marpole.

B. C., Powell River—Dredging—See "Miscellaneous."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

★**Mo., Grant City**—Drainage—Worth Co. D. D. No. 1 let contract building 13 mi. drainage ditches, involving 993,000 cu. yd. earth excav., to Reise Constr. Co. 320 North 15th St., Kansas City. About $119,000. Noted May 1.

★**Ore., Portland**—Channel—Pub. Dock Com. let contract digging channel from Columbia Slough to Columbia River, to pacific Bridge Co., foot of Salmon St., $309,450. Noted July 3.

★**Ont., Cobourg** — Dredging — Dominion Government, Ottawa, let contract for 57,000 cu.yd. excav., here, to Ottawa Contractors, Ltd., Elgin St., Ottawa, $15,390.

Industrial Works

PROPOSED WORK

Mass., Holyoke—Hall's Dairy, Inc., 11 Brooks Ave., plans to build 2 story 60 x 75 ft., brick building, rein.-con. flooring, concrete foundation on Sargeant St. About $40,000. G. P. B. Alderman & Co., People's Savings Bank Bldg., archts.

Mass., Palmer—Clinton-Wright Wire Co., Hammond St., Worcester, plans to build 1 story plant here. About $100,000. Architect not selected.

Mass., Turners Falls—Esleeck Mfg. Co. plans to build 5 story brick addition to factory here. About $75,000.

R. I., Westerly—Arnold Rudd Co., 318 Bank St., New London, Conn., plans to build warehouse here. About $40,000.

R. I., Woonsocket—McClintock & Craig, engrs., 33 Lyman St., Springfield, Mass., soon receives bids building 1 and 2 story 60 x 120 ft. brick and concrete dyeing and finishing plant for Gold Mark Knitting Co., Water St. About $300,000.

Conn., Bridgeport—Schwerdtle Stamp Co., 41 Cannon St., plans to construct 3 story, 30 x 60 ft. manufacturing building, brick and concrete, rein.-con. flooring, concrete foundation, on Cannon St. About $25,000. Private plans.

Conn., Middletown—New York, New Haven & Hartford R.R. plans to rebuild round house at freight yard here. About $25,000. E. Gagel, New Haven, ch. engr.

Conn., New Haven—S. D. Woodruff & Sons, Orange, soon receive bids building 1 story, 80 x 140 ft. garage with wing 40 x 80 ft., concrete and brick, rein.-con. flooring, concrete foundation, on Whalley Ave., here. About $35,000. Shiner & Appel, 185 Church St., archts.

Conn., New London—M. Rosoff, 90 Park St., soon receives bids building 1 story steel and brick garage, rein.-con. flooring, concrete foundation, on College St. About $30,000. J. Weinstein, 6 Church St., New Haven, archt.

N. Y., Brooklyn—I. Canry Mfg. Co., c/o W. T. McCarthy, archt., 16 Court St., soon receives bids building 3 story brick and steel factory, rein.-con. flooring, concrete foundation, on Belmont and Georgia Aves. About $200,000.

N. Y., New York—H. O. Chapman, archt., 334 5th Ave., receives bids about July 12, building 7 story, 50 x 100 ft. brick and steel publishing house, brick foundation, for Street & Smith, 161 West 15th St. About $125,000.

N. J., Trenton—Freihofer Baking Co., Indiana and 20th Sts., Phila., plans to build bakery, here. About $300,000. Architect not selected.

Pa., Phila.—A. Finmore, 902 South 10th St., soon lets contract building 4 story, 30 x 40 ft. brick, steel and timber warehouse. H. D. Dagit, 4527 Pine St., archt.

Pa., Pittsburgh—Basic Mineral Co., 834 Columbus Ave., having plans prepared by Leffler & Schubert, archts., North Side, building 2 story, 75 x 75 ft. rein.-con. and brick addition, rein.-con. flooring, concrete foundation, on Columbus Ave., to include storerooms, laboratory, mill and electric furnace. About $25,000.

Md., Baltimore—W. B. Cassell & Co., 1027 South Howard St., having plans prepared for 4 story, 35 x 145 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Cross St. and Key Highway. About $60,000. H. F. Doelman, 507 North Charles St., engr.

Md., Baltimore—Genl. Coffee & Tea Co., Light and Lee Sts., having plans prepared by G. R. Callis, Jr., archt., 55 Knickerbocker Bldg., for 5 story, 83 x 197 ft., rein.-con. and brick warehouse, concrete foundation. About $65,000. J. Posey, 925 Fidelity Bldg., consult. engr.

Md., Baltimore—W. Schluderberg & Son, 4th and Bank Sts., having plans prepared by C. B. Comstock, archt. and engr., 110 West 40th St., New York City, for first unit of packing plant, to be 4 or 5 story, rein.-con., concrete foundation, on East Baltimore St. between 5th and 7th Sts., About $250,000. Total cost $500,000.

Md., Cumberland—Amer. Cellulose Mfg. Co. preparing plans for 1 and 2 story, concrete, iron and steel additions to plant. About $1,000,000.

Md., Curtis Bay (Baltimore P. O.)—C. S. Walton Co., 3rd and Vine Sts., Phila., plans to build factory on 10 acre site at junction of Cabin Branch and Baltimore & Ohio R.R., here. Cost between $40,000 and $50,000.

Md., Highlandtown (Baltimore P. O.)—Jones & Lamb Co., Pennsylvania and Fulton Aves., soon lets contract remodeling plant of Monumental Brewery Co. and constructing several rein.-con., steel and brick buildings, rein.-con. flooring, rein.-con. foundation, on Lombard St. About $500,000. This item incorrectly noted in June 19 issue.

W. Va., Parkersburg—Parkersburg Rig Reel Co. soon receives bids building 1 story, 105 x 220 ft., brick and steel foundry. About $75,000. Day & Zimmerman, 611 Chestnut St., Phila., archts. and engrs.

La., New Orleans—Charity Hospital, Tulane Ave., having plans prepared by A. W. Lewin, engr., c/o Assn. Commerce, 635 Common St. for 2 story, concrete, steel and brick power house, on Tulane Ave. About $90,000.

O., Akron—Swirsky & Miller, archts., Peoples Trust & Savings Bldg., soon let contract building 3 story, 50 x 110 ft., brick and steel factory and warehouse, rein.-con. flooring, concrete foundation, for Akron Mattress Co., Railroad and Miami Sts. About $80,000.

O., Cleveland—Arjo Realty Co., 214 Williamson Bldg., plans to build 2 story, 80 x 109 and 100 x 405 ft., concrete, steel and brick addition to factory, at 6545 Euclid Ave. About $250,000. Architect not selected.

O., Cleveland — Cleveland Illuminating Co., Illuminating Bldg., soon lets contract building 1 story, 70 x 167 ft., concrete, steel and brick garage, at 6500 Cedar Ave. About $60,000. P. H. Cobb, Illuminating Bldg., archt.

O., Cleveland—Cleveland Metal Products Co., 1141 Ivanhoe Rd., having plans prepared by G. S. Rider, archt., 612 Century Bldg., for 1 story, 29 x 54 x 12 ft. storage building, cost $60,000, and 3 story, 60 x 90 ft. addition to assembling room, $120,000; concrete, steel and brick. Noted July 3.

O., Cleveland—H. E. Hedges, 428 Guardian Bldg., had plans prepared by C. S. Griese, archt., 1321 West 85th St., for 1 story, 50 x 250 ft., concrete, steel and brick garage, rein.-con. flooring, at 2040 East 105th St. About $60,000.

O., Cleveland—Gabriel Mfg. Co., 1407 East 40th St., plans to build 2 story, 40 x 151 ft., concrete, steel and brick addition to factory. About $30,000. Architect not selected.

O., Cleveland—Peerless Motor Car Co., East 93rd St. and Quincy Ave., having plans prepared by W. J. Carter, archt., 723 Illuminating Bldg., for 1 story, 45 x 160 ft. addition to machine shop, cost $25,000, also 3 story, 40 x 120 ft., addition to assembling room, $40,000; both concrete, steel and brick. Noted July 3.

O., Cleveland—Theuner Norton Provision Co., West 65th St. and Stock Ave., had plans prepared by F. J. Anders, archt. and engr., 430 Erie Bldg., for 3 story, 32 x 50 ft., concrete, steel and brick addition to factory. About $30,000. Noted July 3.

O., Columbus—Timken Roller Bearing Co., Dueber Ave., Canton, plans to build branch plant here, to cost between $1,000,000 and $1,500,000. Main building to be 300 x 500 ft., modern saw-tooth type construction.

O., Dayton—Dayton Steel Co. purchased plant on Howell and Parker Sts., and plans to enlarge same for manufacture of fabricated structural steel and bridges. About $35,000.

O., Dayton—Dayton Eng. Laboratories Co., East 1st St., soon receives bids building 6 story, 200 x 200 ft., rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation. About $250,000.

O., Dayton—Gem City Auto Sales Co., Monument and Stratford Sts., plans to build 2 story, 60 x 130 ft., rein.-con. and brick garage and sales building, rein.-con. flooring, on Monument St. About $100,000. Architect not selected.

O., Dayton — Mitchell-Ite Explosive Co., 808 Dayton Savings and Trust Bldg., plans to build plant on tract south of here, to consist of several 1 story buildings. About $100,000.

Mich., Detroit—Amer. Seed Co., Fort and 21st Sts., having plans prepared by B. C. Wetzel & Co., archts., 2317 Dime Bank Bldg., for 5 story, 40 x 60 ft., factory and 2 story, 24 x 76 ft. garage, rein.-con., brick and steel, rein.-con. flooring, concrete foundation.

Mich., Detroit—Swedish Crucible Steel Co., Butler St. and Grand Trunk Ry., having plans prepared by Raseman & Freer, archts., 1302 Penobscot Bldg., for 1 story, 240 x 240 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Conant Ave.

Industrial Works (Continued)

Mich., River Rouge—H. Ford & Son, River Rouge, having plans prepared by A. Kahn, archt., Marquette Bldg., Detroit, for 2 story, 250 x 1700 ft. and 3 story, 250 x 400 ft. assembling plant, rein.-con. and steel.

Ill., Chicago—G. C. Nimmons & Co., archts., 122 South Michigan Ave., soon lets contract building 4 story, 100 x 120 ft. mill construction addition to factory, concrete foundation, on Ashland Ave. and 30th Sts., for Stein-Hall & Co., 111 West Washington St. About $225,000.

Wis., Kenosha—Arneson Fdry. Co., 319 Exchange St., had plans prepared for 1 story, 70 x 200 ft. foundry. About $30,000. O. Arneson, pres. Private plans.

Wis., Milwaukee—G. A. Dick, archt., 811 State St., soon lets contract building 3 story, 35 x 120 ft., rein.-con. and brick addition to factory, for Janke Shoe Mfg. Co., 762 32nd St. About $25,000. Noted June 19.

Wis., Milwaukee—Van Ryn & De Gelleke, archts., 114 Grand Ave., soon let contract building 1 story, 70 x 250 ft. erecting shop, rein.-con., brick and steel, and 3 story, 70 x 70 ft. office, for Koehring Machine Co., 31st St. and Concordia Ave. About $65,000.

Wis., Port Washington — City having plans prepared by Douglas & Cahill, engrs., 301 Gross Bldg., Milwaukee, building 1 story, 20 x 40 ft. concrete and brick power house addition. About $30,000.

Wis., Sheboygan—H. C. Prange, 731 North 8th St., having plans prepared by W. C. Weeks, archt., 730 Ontario Ave., for 2 story, 80 x 120 ft., brick, rein.-con. and steel garage, rein.-con. flooring, brick foundation, on Wisconsin Ave. About $60,000. Noted May 29.

Wis., Sheboygan—Wald Mfg. Co., 18th St. and Martin Ave., plans to build 3 story, 80 x 115 ft., brick, rein.-con. and steel factory, brick foundation, on Martin Ave. About $30,000. E. Pawsat, pres. Architect not selected.

Minn., Wells—City soon lets contract building power plant, electrical distribution system and concrete reservoir. About $40,000. C. L. Pillsbury Co., Metropolitan Life Bldg., Minneapolis, engrs. Noted June 26.

Neb., Lincoln — Lincoln Paint & Color Co., 811 M St., soon receives bids building 2 story, 50 x 80 ft., brick and rein.-con. paint factory, on 7th and M Sts. About $25,000.

Neb., Lincoln — Nebraska Buick Auto Co., 13th and P Sts., soon receives bids building 5 story, 142 x 150 ft. brick sales building and warehouse, rein.-con. flooring, on 13th and Q Sts. About $250,000. P. V. Hyland, Omaha, archt.

Neb., Omaha—Kimball Laundry Co., 1507 Jackson St., has purchased site and plans to build 7 story, 88 x 132 ft., rein.-con. laundry on 15th and Jones Sts. About $200,000.

Mo., St. Louis—St. Louis Metalware Co., 2507 North Bway, having sketches made for 250 x 450 ft. factory, on Natural Bridge Rd. and Belt St. About $200,000. R. L. Niedringhous, c/o owner, engr. Architect not selected.

Tex., San Antonio—Magnolia Petroleum Co., Bedell Bldg., plans to build 2 story, 80 x 120 ft., rein.-con. and brick warehouse, with garage and storage tanks, rein.-con. flooring, concrete foundation, on West Caroline St. About $175,000.

Ariz., Phoenix—Melczer Wholesale Grocery Co. plans to build 3 story, 137 x 150 ft., rein.-con. building, on 4th Ave. and Jackson St. About $200,000. L. Melczer, pres.

Wash., Kelso—Union Oil Co. of California, Mills Bldg., San Francisco, plans to build oil distributing plant, here. Plans include warehouse, one 20,000 gal. distillate tank, one 20,000 gal. gasolene tank, and one 20,000 gal. coal oil tank, concrete foundations. C. C. Ireland and W. H. Stillman, c/o Union Oil Co., Kelso, representatives.

Wash., Spokane—International Steel Co. purchased 5 acre site along Chicago, Milwaukee & St. Paul R.R. and plans to build steel rolling mill. About $100,000. L. L. Bair, Spokane, pres.

Cal., Berkeley — See "Miscellaneous."

Cal., Lindsay—City voted $85,000 bonds to build gas system. Olmsted & Gillelen, 1112 Hollingsworth Bldg., Los Angeles, engrs.

Cal., Los Angeles—Goodyear Tire & Rubber Co., Market St., Akron, O., purchased 320 acre site in southeastern part of city and plans to build group of buildings for factory. About $4,000,000. Pacific Coast Cotton Mill Co., will be incorporated as subsidiary company, and plans to build cotton mill on same site, to operate in conjunction with tire factory, cost, $1,500,000

Cal., Tulare—California Co-operative Canneries Co. plans to build cannery About $250,000. Address C. L. Larimer, supt.

Que., Pointe aux Trembles—National Abbatoris Co., Ltd., plans to build 75 x 100 ft. brick plant. About $95,000. Architect not selected.

Ont., London—C. S. Hyman, Richmond St., plans to build tannery. About $300,000. W. F. D. Jarvis, Mgr., Architect not selected.

Ont., Toronto—Baldwins of Swansea, Wales, plans to lease site here, on Ashbridges Bay, and build steel rolling mills. About $3,000,000. Architect not selected.

BIDS DESIRED

Mass., West Warren—Until July 14, by Warren Cotton Mills, building 3 story, 80 x 135 ft. mill addition; 2 story, 130 x 335 ft. card room, and 1 story, 135 x 107 ft. picker house, brick and mill construction, rein.-con. flooring, concrete foundation. About $400,000. Leary & Walker, Purchase St., New Bedford, engrs.

N. Y., Brooklyn—Until July 12, by Zipkes, Wolff & Kudroff, archts. and engrs., 25 West 42nd St., New York City, for 4 story, 100 x 125 ft. brick and steel warehouse, rein.-con. flooring, concrete foundation, on North Portland Ave. About $75,000. Owner's name withheld. Noted June 26.

Pa., Pittsburgh—Wolverine Supply Co., Page and Fontella Sts., North Side, receiving bids building 4 story, 75 x 100 ft. rein.-con. factory, concrete foundation. About $125,000. Hunting-Davis Co., Century Bldg., archts. Noted Apr. 24.

Mich., Detroit—See "Buildings."

Mich., Hamtramck (Detroit P. O.)—See "Buildings."

Ill., Chicago—Until July 15, by Holabird & Roche, archts., 104 South Michigan Ave., building two 2 story, 40 x 84 ft., rein.-con. and brick sub-stations, (1) at 6806 Throop St., and other at 2644 Irving Park Blvd., for Commonwealth Edison Co., 120 West Adams St. About $175,000.

Wis., Sheboygan—Until July 12, by Haack Motor Co., c/o C. Haack, Jr., building 2 story, 43 x 120 ft. brick, rein.-con. and steel garage, rein.-con. flooring, concrete foundation on Indiana Ave. Cost between $50,000 and $60,000. Private plans. Noted June 26.

Wis., Sheboygan—Until July 15, by North Side Garage, 1210 Michigan Ave., building 2 story, 60 x 110 ft. brick and steel garage, rein.-con. flooring, brick foundation, on 13th St. and Michigan Ave. About $60,000. Private plans.

Neb., Omaha—Until July 15, by G. L. Fisher, archt., 1529 City Natl. Bank Bldg., building 6 story, 44 x 133 ft. rein.-con. warehouse on 109-111 South 10th St., for A. Hospe, 1513 Douglas St. About $85,000.

Ont., Owen Sound—Until July 18, by Dominion Oil Co., building 3 story, 38 x 70 ft. steel and brick plant, concrete foundation, on Grand Trunk Ry. About $30,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

★**Mass., New Bedford**—Nashawena Mills Corp., Belleville Ave., let contract building 2 story, 155 x 265 ft weave shed addition; 4 story, 150 x 250 ft. spinning mill, rein.-con., steel and brick, rein.-con. flooring, concrete foundation, to J. W. Bishop Co., 11 Foster St., Worcester. About $450,000. Noted June 12.

★**R. I., Pawtucket**—R. I. Textile Co., Prairie Ave., let contract building 2 story, 60 x 100 ft. brick addition, to O. D. Purrington & Co., 624 Industrial Trust Bldg., Providence. About $30,000.

★**Conn., Burnside** — Case & Marshall, Inc., let contract building 1 story power house, concrete and brick, rein.-con. flooring, concrete foundation, to J. H. Grozier Co., 721 Main St., Hartford. About $25,000. will be done by day labor.

★**Conn., New Haven** — Larkin-Carey Realty Co., 166 Brewery St., will build 2 story, 60 x 165 ft. concrete and steel garage, rein.-con. flooring, concrete foundation. About $40,000. Work will be done by day labor.

★**Conn., Putnam**—Nightingale Morse Mills, Inc., let contract building concrete hydro-electric plant, here, to H. Wales Lines Co., 134 State St., Meriden. About $30,000

★**Conn., Torrington**—Torrington Co., 59 Field St., let contract building 2 story, 50 x 300 ft., steel and brick addition to plant, concrete foundation, on Laurel St., to Torrington Bldg. Co., 197 Water St. About $50,000.

★**Conn., Waterbury**—E. M. McGrath, 115 Willow St., let contract building 1 story, 70 x 80 ft. garage and 2 story, 32 x 80 ft. showroom, concrete, steel and brick, rein. con. flooring, concrete foundation, to G. A. Upham, West Main St. About $35,000.

★**N. Y., Brooklyn**—B. & A. Realty Co., 44 Court St., will build 1 story, 50 x 150 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on 31st St. and 3rd Ave. About $30,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Pirika Chocolate Co., 972 Dean St., let contract building 3 story, 78 x 120 ft., rein.-con. and steel factory, rein.-con flooring, concrete foundation, on Dean St. and Carlton Ave., to Turner Constr. Co., 244 Madison Ave., New York City. About $90,000. Noted Apr. 10.

★**N. Y., Brooklyn**—Rockwood & Co., Park and Waverly Aves., let contract building 7 story factory at 37-39 Waverly Ave., to W. L. & G. H. O'Shea, 29 Bway., New York City. About $100,000.

★**N. Y., Long Island City**—Globe Thread Co., Pierce Ave., let contract building 50 x 141 ft. brick and steel factory, rein.-con. flooring, concrete foundation, on Pierce and 7th Aves., to L. Barth & Son, 32 Union Sq., New York City. About $100,000.

★**N. Y., Long Island City**—L. Gold, 44 Court St., Brooklyn, will build 2 story, 75 x 190 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on William St. near North James St. About $110,000. Work will be done by day labor.

★**N. Y., Long Island City**—Pratt & Lambert, 185 Madison Ave., let contract building 2 story, 110 x 200 ft. warehouse and office, with 84 x 119 ft. extension, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Freeman Ave. between 5th and 6th Sts., to Turner Constr. Co., 244 Madison Ave., New York City, cost plus percentage basis.

★**N. Y., Long Island City** — Latham Lithographing & Printing Co., 33 West 42nd St., will build 3 story, 200 x 200 ft., rein.-con., brick and steel factory, rein.-con flooring, concrete foundation, on Woodside Ave and Middleburg St. About $150,000. Work will be done by day labor

★**N. Y., New York**—A. G. Koenig, archt and engr., 405 Lexington Ave., let contract to Hubener & Escher, 748 Melrose Ave., converting 3 story, 62 x 84 ft. rein.-con. and steel brewery into ice plant, rein.-con. flooring, concrete foundation, on 169th St. and 3rd Ave. for J. Eichler Brewing Co., 3582 3rd Ave. About $37,000. Noted June 19.

★**N. Y., New York**—F. Munnich, 260 East 140th St., will build 1 story, 74 x 100 ft., brick and steel garage, rein.-con. flooring, brick foundation. About $30,000. Work will be done by day labor.

★**N. J., Camden**—Custer & Gill, archts., 304 Market St., let contract building storage warehouse, to A. Raff Co., 1635 West Thompson St., Phila. About $50,000. Owner's name withheld.

★**N. J., Newark**—Patton Paint Co., Chester Ave., let contract building 2 story, 61.6 x 121.6 ft., rein.-con. factory, to C. R. Heddon Co., Prudential Bldg., $63,465. Noted June 5.

★**N. J., Trenton**—J. E. Thropp Sons Co., Lewis St., let contract building 2 story, brick and steel machine shop, to S. W. Mather & Sons, 30 South Clinton Ave. About $65,000.

★**Pa., Johnstown**—Johnstown Tribune let contract building 3 story, 45 x 127 ft. rein.-con. printery, concrete foundation, to H. Shenk, 132 7th St., Pittsburgh. About $100,000.

★**Pa., Phila.**—Abrasive Co., James and Fraley Sts., will build 2 story, 61 x 95 ft., concrete and brick factory on Fraley St., west of James St. About $25,000. Work

Industrial Works (Continued)

★**Pa., Phila.**—Largeman Bros., 129 North 12th St., let contract building 2 story, 45 x 300 ft. fein.-con., steel and brick factory for manufacture of knit goods, on Frankfort Ave. and Ontario St., to Robbins Constr. Co., 1137 North Front St. About $55,000.

★**Pa., Phila.**—Mutual Hosiery Co., Paterson, N. J., let contract building 2 story, 50 x 110 ft. and 43 x 82 ft. brick factory, on Cottman and Tulip Sts., here, to A. Ahlers, 3425 Howell St. About $40,000.

★**Pa., Phila.**—Snyder & Co., 134 North 10th St., let contract building 5 story, 31 x 104 ft., brick, steel and concrete warehouse, at 17-19 North 10th St., to W. R. Graham, 3649 Filbert St. About $50,000. Noted June 12.

★**Pa., Pittsburgh** — Campbell-Niedringhaus Tire Service Co., Baum Blvd., let contract building 2 story, 40 x 112 ft. rein.-con. and brick garage and tire service station, rein.-con. flooring, concrete foundation, to E. A. Wehr, Highland Bldg. About $40,000. Noted June 26.

★**Pa., Pittsburgh**—Dilworth-Porter Co., 4th and Bingham Sts., let contract building 1, 2 and 3 story, 110 x 250 ft. rein.-con., steel and brick machine shop, foundry, forge shop and stores, rein.-con. flooring, concrete foundation, on 6th and Bingham Sts., to McClintoc-Marshall Co., 1217 Oliver Bldg. About $110,000.

★**O., Akron**—White Motor Sales Co., 200 East Market St., let contract building 3 story, 100 x 270 ft., rein.-con., steel and brick garage, salesroom, etc., rein.-con. flooring, on North Union St., to T. E. McShaffrey Constr. Co., 170 South Forge St. About $150,000.

★**O., Cleveland**—Cleveland Bricklayer's Assn., 2416 East 9th St., let contract building 4 story, 40 x 61 ft., concrete, steel and brick garage and dance hall, at 2101 East 21st St., to J. A. Moffett Co., 1836 5309 Prospect Ave. About $300,000.

★**O., Cleveland**—Grabler Mfg. Co., 6565 Bway. Ave., let contract building 4 story, 89 x 110 ft., concrete, steel and brick addition to machine shop, to S. W. Emerson Co., 1800 Euclid Bldg. About $80,000. Noted July 3.

★**O., Cleveland**—H. S. Rivitz Co., 2120 Ontario St., let contract building 3 story, 140 x 180 ft., concrete, steel and brick warehouse, on East 40th St. near New York Central R.R., to Minnick Gibbons Co., 5309 Prospect Ave. About $300,000

★**O., Cleveland**—Templin-Crockett-Bradley Co., 5700 Detroit Ave., let contract building 3 story, 60 x 76 ft., concrete, steel and brick addition to factory, to F. A. Skeel Co., 3719 Cypress Ave. About $50,000. Noted July 3.

★**O., Dayton**—G. W. Shroyer & Co., Main and 2nd Sts., let contract building 1 story, 50 x 200 ft., concrete and brick garage and service station, concrete foundation, on North Main St., to Blanchard Bldg. Co., Chapel Rd. About $60,000. Noted May 1.

★**O., Dayton**—Edwards Specialty Co., 1133 South Brown St., let contract building 2 story, 60 x 125 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Main and Bruen Sts., to Frank Hill Smith Co., Inc., East 3rd St. About $50,000. Noted June 19.

★**O., Springfield**—Springfield Spring Co., East Pleasant St., let contract building 1 story, 30 x 273 ft. warehouse and 1 story 30 x 76 ft. machine shop, steel and brick, brick foundation, to Concrete Steel Constr. Co., 415 Mitchell Bldg. About $65,000. Noted June 26.

★**Ill., Chicago**—Pettibone-Mulliken Co., 725 Marquette Bldg., let contract building rein.-con. and steel foundry, rein.-con. flooring, concrete foundation, to Westinghouse, Church, Kerr, 37 Wall St., New York City. About $200,000, cost plus percentage basis.

★**Wis., Carrollville**, (Otjen, P. O.)—H. J. Esser, archt., 82 Wisconsin St., Milwaukee, let contract to Reisen & Sons, 1018 Humboldt Ave., Milwaukee, building 2 story, 67 x 219 ft. and 3 story, 50 x 50 ft. brick, rein.-con. and steel plant, rein.-con. flooring, concrete foundation, for U. S. Fertilizer Co. About $100,000. Noted June 26.

★**Wis., Milwaukee**—Hercules Rack Co., 1566 26th St., let contract building 2 story, 22 x 30 ft. brick, tile and concrete factory and three 30 x 48 ft. garages, to J. T. George, 3806 Lisbon Ave. About $35,000.

★**Wis., Milwaukee**—H. W. Voelz, archt., 86 Michigan St., let contract building 2 story, 36 x 78 ft. rein.-con. and brick factory, rein.-con. flooring, on 22nd and National Aves., to J. L. Stanage, 144 Oneida St. About $25,000. Owner's name withheld.

★**Wis., West Allis**—Motor Castings Co., 56th St., let contract building 1 story, 110 x 160 ft. brick and steel foundry, to Reisen Bros., 425 East Water St., Milwaukee. About $40,000.

★**Neb., Omaha**—Corey & McKenzie Printing Co., 1407 Harney St., and Baker Bros. Engraving Co., 1216 Howard St., let contract building 5 story, 44 x 132 ft., rein.-con. and brick printing and engraving building, brick foundation, rein.-con. flooring, on 12th and Harney St., to Home Bldrs., Brandeis Theatre Bldg. About $96,000; cost plus basis.

★**Neb., Omaha**—Omaha Structural Steel Wks. plans to build 1 story, 80 x 119 ft. foundry building, cost $20,000; also 41 x 278 ft. machine shop, $25,000, on 48th and Leavenworth Sts., both brick and steel. Work will be done by day labor.

★**Utah, Mt. Pleasant**—S. W. Hinckley Auto Co. let contract building 2 story, 60 x 200 ft., brick garage here, to H. G. McKean, 440 South 13th St., Salt Lake City, $50,148.

★**Wash., Kennewick**—Church Mfg. Co. let contract remodeling old structure and building 3 story, 52 x 80 ft. factory, hollow tile, concrete walls, rein.-con. flooring covering 14,000 sq.ft., to Meyers & Tellander, Hutton Bldg., Spokane. About $60,000.

★**Wash., Seattle**—West Coast Rubber Co., 4060 Occidental Ave., let contract building 1 story, 112 x 153 ft. factory, masonry construction, rein.-con. flooring, on 7th and Mercer Sts., to J. W. Johnson, 171 McGraw St. About $26,000.

★**Cal., Los Angeles**—Keystone Iron & Steel Wks., 973 North Main St., let contract building 1st unit of new plant, to be 2 story, 76 x 100 ft., brick and rein.-con. pattern shop and office on Santa Fe Ave. and 37th St., to Pozzo Constr. Co., 421 Macy St., $31,000. Noted Jan. 2.

★**Cal., Los Angeles**—Wilshire Fireproof Storage Co., 1724 Cahuenga Ave., let contract building 7 story, 70 x 130 ft., rein.-con. storage building, rein.-con. flooring, concrete foundation, on 3rd St. and Western Ave., to F. L. Meline, 6779 Hollywood Blvd. About $150,000.

★**Que., Montreal**—T. Davidson Mfg. Co., 187 Delisle St., let contract building 75 x 100 ft. brick and steel factory, to A. F. Byers Co., 340 University St. About $75,000.

★**Ont., Elmira** — Great West Felt Co., Arthur St., let contract building addition to factory to W. Hallman, 51 Blenheim St., Galt. About $25,000.

★**Ont., Windsor**—Champion Spark Plug 14-16 Sandwich St. W., let contract building rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, to J. V. Gray Constr. Co., Confederation Life Bldg., Toronto. About $60,000. Noted May 1.

Buildings

PROPOSED WORK

Mass., Palmer—School—Town appropriated $51,000 to build 2 story school at Three Rivers.

Mass., Turners Falls — School — Town plans to build 2 story school. About $50,000. Architect not selected.

Mass., Turners Falls—Theatre—D. J. Shea, Avenue A, plans to build 2 story brick and steel theatre. About $60,000. Private plans.

Conn., Bridgeport—Business—E. H. Dillon, 1111 Main St., plans to build 10 story, 52 x 80 ft. business building. Architect not selected.

Conn., Bridgeport—Office—Hincks Bros. & Co., 207 State St., soon receives bids building 1 and 3 story, 38 x 120 ft., brick and terra cotta, rein.-con. flooring, concrete foundation, on Main St. About $60,000. Private plans.

Conn., Bridgeport—Parish Hall—Olivet Congregational Church, 2140 Main St., having plans prepared building 2 story parish house on Main St., brick, concrete and steel. About $50,000. W. J. Skinner, 1188 Main St., archt. Noted Apr. 10.

Conn., Middletown—School—City having plans prepared building 2 story concrete, steel and brick addition to Johnson School, on Greene St., rein.-con. flooring, concrete foundation. About $75,000. Brown & Von Beren, 185 Church St., New Haven, archts. Noted July 3.

Conn., Thompsonville — High School — town of Enfield plans to build new fireproof high school, here. About $150,000. Address H. R. Cooper, Thompsonville. Architect not selected.

Conn., Waterbury—Office—Scovill Mfg. Co., 99 Mill St., plans to build office building and garage on Cole, Baldwin and Mill Sts. About $125,000. Private plans.

Conn., Waterbury—School—St. Margaret's School, Rose Hill, having plans prepared building 3 story school, rein.-con., steel and brick addition, rein.-con. flooring, concrete foundation, on Grove and Cook Sts., About $100,000. Murphy & Dana, 311 Madison Ave., New York City, archts. Noted June 19.

N. Y., Brooklyn—College—Adelphi College, Clifton St. and St. James Pl., having preliminary plans prepared by McKimm, Mead & White, archts., 101 Park Ave., New York City, for 4 story brick and steel, brick foundation, on Washington Ave. About $800,000.

N. Y., New York—Loft—Ballinger & Perrott, archts. and engrs., 47 West 34th St., soon let contract building 9 story brick, steel and rein.-con. addition, concrete foundation, on Spring and Varick Sts., for Butterick Publishing Co. About $1,200,000.

N. Y., New York—Store and Office—Krim Realty Co., 426 West 14th St., having plans prepared by M. Schwartz, archt., 309 Bway., for 3 story, 25 x 100 ft. brick and steel, brick foundation, at 143 West 33rd St. About $100,000. M. Krim, pres.

N. Y., New York—Store and Loft—St. Regis Lunch Co., c/o A. Levingson, archt. and engr., 405 Lexington Ave., having plans prepared for 3 story, 60 x 100 ft. brick, steel and stone, brick foundation, at 42-46 West 33rd St. About $80,000.

N. J., Trenton—School—Bd. Educ., 9 South Stockton St., plans to build 3 story, brick and stone additon to Jefferson School on Brunswick Ave. About $196,000. W. A. Poland, 1 Woodside Ave., archt.

Pa., Blairsville—Hospital, etc.—Western State Hospital for Insane, Altoona, having plans prepared by F. McC. Crooks, archt., 530 4th Ave., Pittsburgh, for hospital and group institutional buildings, near here. Noted incorrectly May 22.

Pa., Eddystone—School—A. Reid, secy. bd. educ., soon lets contract building 2 story, 70 x 80 ft. concrete and brick addition. Cost between $60,000 and $70,000. Ritter & Shay, North American Bldg., Phila., archts.

Pa., Johnstown — Lodge — Johnstown Lodge No. 48, Loyal Order of Moose, purchased 50 x 175 ft. site on Bedford St. and plans to build 4 story, brick and stone. C. A. McKeown, trustee. Architect not selected.

Pa., Reading—Theatre—Carr & Schad having plans prepared by W. H. Lee, archt., 32 South 17th St., Phila., building 1 story, 113 x 200 ft., concrete, steel and brick, on 9th and Spring Sts., here. About $80,000. Address owner in care of archt.

Md., Baltimore—Church—Luther Memorial Lutheran congregation plans to build 1 and 2 story, 75 x 150 ft., stone and brick, rock foundation, on Guilford Terrace and University P'kway. About $100,000. L. L. Sieber, 345 Ilchester Ave., pastor. J. Freund, 11 East Lexington St., archt.

Md., Baltimore—Dormitory and Swimming Pool—St. Mary's Industrial School, Wilkens Ave., plans to build 4 story, 63 x 131 ft., rein.-con. and brick dormitory, stone and concrete foundation, and 30 x 75 ft., concrete swimming pool. About $200,000. H. I. Kavanaugh, 913 North Charles St., archt.

Md., Baltimore—Memorial Dormitory—Johns Hopkins University Alumni Assn. raising $300,000 fund to build memorial dormitory on university grounds at Homewood. G. L. Radcliffe, Fidelity Bldg., chn. executive comn.

Va., Bedford—Church, Sunday School and Rectory—St. John's Episcopal congregation plans to build 60 x 100 ft. church, and 60 x 110 ft. Sunday school and rectory; native stone, limestone trim. Craighill & Cardwell, 517 People's Bank Bldg., Lynchburg, archts.

Buildings (Continued)

Va., Norfolk—Church—St. Andrew's Congregation plans to build 1 story church. About $50,000. Peebles & Ferguson, Law Bldg., archts.

Va., Richmond—Bank—Planters Natl. Bank, 12th St., plans to build 1 story, brick and stone, concrete foundation, on East Main St. About $200,000. Carneal & Johnston, 707 Chamber of Commerce Bldg., archt.

Va., Richmond — Hospital — Johnston-Willis Hospital, 6th and Franklin Sts., plans to build 6 story, on Boulevard and Kensington Sts. About $200,000. Architect not selected.

Va., Richmond — Nurses Home — Johnston-Willis Hospital, 6th and Grace Sts., plans to build 4 story, on Kensington Ave. About $80,000. Architect not selected.

Va., Richmond—Sunday School—Union Theological Seminary, Ginter Park, plans to build 2 story, 60 x 160 ft., brick. About $50,000. Baskerville & Lambert, Travelers Bldg., archts.

Va., Williamsburg — School — Bd. Educ. plans to build school. About $50,000. H. V. Vaden, supt. Carneal & Johnston, 707 Chamber of Commerce Bldg., Richmond, archts.

W. Va., Huntington—School—State Bd. Control, Charleston, rejected bids received July 2, constructing 2 story, 86 x 156 ft., brick, rein.-con. and steel Physical Education Building at Marshall College. About $106,000. Noted May 29.

N. C., Reynolds—School—P. J. Reynolds plans to build 1 story, 63 x 300 ft., brick, to be known as P. J. Reynolds Memorial School. About $50,000. C. B. Keen, 1218 Chestnut St., Phila., archt.

Fla., Jacksonville — School—Duval Co. voted $325,000 bonds, $150,000 of which will be used to build new school, and erect addition to others.

Fla., Tampa—Hotel—L. B. Skinner, pres. Hillsboro Hotel Co., plans to build 9 story, 70 x 110 ft addition to hotel facing on Madison St.

O., Bellefontaine—School—R. G. Gotwald, archt., 54 Gotwald Bldg., Springfield, soon receives bids building 3 story, rein.-con. and brick, concrete foundation, for Bd. Educ. About $100,000.

O., Cleveland — Office — Lakewood Eng. Co., West 117th St. and Berea Rd., having plans prepared by Walker & Weeks, archts., 1900 Euclid Bldg., for 1 story, 87 x 150 ft., concrete, steel and brick, on West 117th St. About $75,000.

O., Dayton—Church—Grafton Reformed congregation plans to build 1 story, 60 x 110 ft., stone, on Grafton Ave. About $50,000. Architect not selected.

O., Dayton — Church — St. Andrews Episcopal congregation, Buckeye and Pulaski Sts., plans to build stone church. About $50,000. Architect not selected.

O., Middletown — Bank and Store — First Natl. Bank, 3rd and Main Sts., plans to build 3 to 5 story, 70 x 110 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $200,000. Architect not selected.

O., Springfield—Bank and Store—Farmer's Natl. Bank, 9 South Limestone St., having plans prepared by Frank Hill Smith Co., Inc., archts., East 3rd St., Dayton, for 5 story, 85 x 100 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on High and Limestone Sts. About $200,000.

O., Springfield — Hospital — Clark Co. Memorial Com. plans to build memorial hospital, here. About $500,000. C. F. McGilvray, Lagonda Ave. and Farlow St., chn.

O., West Park—Schools—Bd. Educ. plans to build 2 story, 26 x 48 ft., on Settlement Rd., cost $50,000; 2 story, 36 x 80 ft., on Longmead Ave., $50,000; 2 story, 90 x 90 ft., on Riverside Ave., $60,000, all concrete, steel and brick. Architect not selected.

O., Youngstown—Bank—First Natl. Dollar Bank plans to build 2 story, 45 x 200 ft. addition at Central Sq. to cost $150,000, or 16 story, $1,000,000.

Ind., Decatur — Sanitorium — City plans to build tuberculosis sanitorium. About $100,000

WATER MAINS—DEARBORN, MICH.

Bids were received by city for furnishing and laying water mains from (A) Monie-Dunbar Contg. Co., 901 Chemical Bldg., St. Louis, Mo. (awarded contract); (B) T. C. Brooks & Son, Detroit, (C) Agrios & Harrop, 623 J. M. S. Bldg., South Bend, Ind. The unit bids were as follows.

	A	B	C
27,600 ft. 6-in. pipe	$1 32	$1.38	$1.74
7,100 ft 8-in pipe	1 97	1 92	2.35
7,150 ft 10-in pipe	2 25	2 49	2.90
123 6-in. valves	23 20	23 00	30 00
13 8-in. valves	33 35	34 00	40 00
19 10-in valves	50 00	52 00	60 00
155 valve boxes	7.00	7 00	6 70
65 hydrants	68.25	68.00	73 00
Extended totals	$76,265	$79,288	$96,578

HIGHWAY—CALIFORNIA

Bids were received by State Highway Commission (lowest 3), Forum Bldg., Sacramento, for constructing highway in Monterey Co., Div. 5, Route 2, Sect. 7, from (A) Healey-Tibbitts Constr. Co., 9 Main St.; (B) Clinton Constr. Co. of California, 357 Pine St.; (C) Cahill-Vensano Co., 110 South St.; contractors all of San Francisco. The unit bids were as follows:

	A	B	C
14 steel spans	$8,059 60	$7,966 00	
56 cast iron drums	5 00	6 40	$7 00
536 cu yd. Portland cement concrete, class "A" (piers above elevation 277 92)	15 00	19 15	14 30
790 cu yd. Portland cement concrete, class "A" (pier footings), below elevation 277 92 and above elevation 256 00	20 00	63 23	59 30
762 cu yd. Portland cement concrete, class "A" floor on steel spans	15 00	12 60	16.90
1,324 cu yd. Portland cement concrete, class "A" trestle approach-1, reinforced concrete piles	20 00	18 40	18 65
6,560 lin ft making and driving wooden piles	3 50	1 18	1.75
3,375 lin ft per footings, double pile	1 50	72	1.25
2,200 lin ft. continuous dikes	10 00	5 80	7 40
760 lin ft. cross dikes	4.25	3.22	4.50
6,200 sq.yd. asphalt surface	1.00	1.60	1.00
Extended totals	$234,317	$241,359	$242,872

Mich., Bellevue—School—City plans to build 2 story school. Bonds for $100,000 voted for project. Billingham & Cobb, Kalamazoo, archts.

Mich., Detroit—Hotel—Henry Clay Hotel plans to build 14 story, concrete, brick and steel on John R. and Center Sts., containing 350 rooms. F. E. Ellsworth, proprietor. Architect not selected.

Mich., Pontiac—Office—Comrs. Oakland Co. having plans prepared by J. E. Mills & Son, archts., 1305 Kresge Bldg., Detroit, for 3 story, rein.-con., brick and steel addition to county office building.

Ill., Marion — High School — City voted $60,000 bonds to build addition to high school.

Wis., Milwaukee — Office — See "Industrial Works."

Wis., Neenah—Temple—Masonic Lodge, 145 West Wisconsin Ave., having plans prepared by R. A. Messmer & Bros., archts., 221 Grand Ave., Milwaukee, for 3 story, 60 x 120 ft., brick, terra cotta and stone. About $60,000. E. J. Lackmann, Water St., chn. Noted June 19.

Wis., Viroqua—Hospital — City having plans prepared by Parkinson & Dockendorf, archts., Linker Bldg., La Crosse, for 2 story, 40 x 38 ft. About $50,000.

Wis., Wauwatosa — Church — Herbst & Kuenzli, archts., 114 Grand Ave., Milwaukee, soon let contract building 1 story, 108 x 160 ft. brick, concrete and stone, here, for First Congregational Church. About $50,000.

Kan., Ellsworth—Asylum—Ellsworth Co. plans to build 2 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $75,000. Mann & Gerow, Hutchinson, archts.

Kan., Lorraine—School—Bd. Educ. plans to build 2 story, 68 x 87 ft., rein.-con. and brick, concrete foundation. About $50,000. S. S. Voight, 410 Barnes Bldg., Wichita, archt

Kan., Stockton—Court House—Rooks Co. plans to build 3 story, 80 x 100 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $200,000. F. C. Squires, 628 Kansas Ave., Topeka, archt.

Neb., Lincoln — Sanitorium — Bailey Sanitarium plans to build 2 story, 40 x 108 ft., brick, on Normal Blvd. About $65,000. Fiske & Meginnis, 533 Bankers Life Bldg., archts.

Neb., McCook—Hotel—Company has been organized here to build hotel to be known as "The Keystone." About $150,000. P. Walsh, mn. bd. dirs.

Neb., Omaha—Bank, Stores and Offices—M. F. Shafer, pres. Amer. Bank Bldg. Co., 18th and Farnam Sts., having preliminary plans prepared by J. & A. McDonald, archts., 908-12 Omaha Natl. Bank Bldg., building 20 story, 90 x 133 ft., steel and brick, on 19th and Farnam Sts. About $1,250,000.

Wyo., Sheridan—School—School Dist. No. 7, receives bids in August building 2 story, brick. About $100,000; $50,000 bonds having been voted toward same and remainder to be raised from sale of present school. C. S. Mills, chn.

Mont., Forsyth—Hospital—Rosebud Co. election Sept. 2 to vote on $70,000 bonds to build hospital. McIver, Cohagen & Marshall, 407 Electric Bldg., Billings, archts.

Mont., Sidney—Courthouse—Richland Co. election Sept. 2 to vote on $50,000 bonds to build courthouse. L. Linker, clk. Architect not selected.

Mo., Rockport—Memorial—Atchison Co. having plans prepared by J. A. Hogg, archt., 947 New York Life Bldg., Kansas City, Mo., for brick and concrete, here. Cost between $45,000 and $50,000. G. W. Boettner, chn. bldg. com.

Mo., St. Louis—Cathedral—Scottish Rite Cathedral Assn., 7 Westmoreland Pl., having plans prepared by W. B. Ittner, archt., Bd. Educ. Bldg., for 150 x 200 ft., on Lindell St. near Grand Ave. About $1,000,000. A. G. Cochran, pres.

Mo., University City—(St. Louis P. O.)—Schools—Bd. Educ. plans to build two (10 room) grade schools and addition to high school. Bonds for $290,000 voted for project. L. T. Ward, 8 Princeton Pl., pres.

Tex., Dallas—Memorial—Southern Methodist University plans to build memorial hall. About $400,000. J. E. Cockrell, pres. bd. trustees.

Tex., Eastland—Bank—First Natl. Bank plans to build 5 story, rein.-con. and brick, concrete foundation, on Lamore and West Sts. About $250,000. Lang & Witchell, Southwestern Life Bldg., Dallas, archts.

Tex., Ranger—Hotel—M. Gohlson plans to build 5 story, 85 x 140 ft., rein.-con. and brick. Beshgetoorian & Cobelli, Ranger, archts. About $200,000

Tex., San Antonio — Market — City election July 26 to vote on $200,000 bonds to build market house. H. Helland, city engr.

Buildings (Continued)

Tex., San Antonio — Auditorium — City election July 26 to vote on $500,000 bonds to build auditorium. H. Helland, city engr.

Okla., Jenks — High School — City voted $75,000 bonds to build high school. Architect not selected.

Okla., Tulsa—Store—C. A. and J. D. Mayo, 5th and Main Sts., plan to build 5 story, 63 x 140 ft. concrete and steel, at 424 South Boulder St. About $150,000. Engineer and architect not selected.

Utah, Panguitch — Hotel — L. B. Church soon lets contract building 3 story, 60 x 75 ft., brick, on Main St. About $60,000. Cannon & Fetzes, Templeton Bldg., Salt Lake City, archts. and engrs.

Cal., Arcadia—School—City voted $50,000 bonds to build school. Address F. W. Treen, trustee. Architect not selected.

Cal., Long Beach—Hotel—Virginia Hotel Co. having plans prepared by J. C. Austin, archt., 1121 Baker-Detwiler Bldg., Los Angeles, for 200 room rein.-con. addition. About $200,000.

Cal., Martinez—High School—Trustees Alhambra Union High School Dist. election July 15, to vote on $125,000 bonds to build high school.

Cal., Modesto—Lodge and Theatre—Lodge of Elks plans to build lodge and theatre. About $175,000. Adress C. H. Bertram, chn. bldg. com. Architect not selected.

Cal., Modesto—Store, Office and Lodge—Moose Lodge having plans prepared by A. Mazurette, archt., Home Realty Bldg., for 5 story, rein.-con., at 11th and I Sts. About $250,000.

Cal., San Bernardino—City voted $250,000 bonds to build three 10 room, one 8 room and two 6 room schools. W. C. Seccombe, pres. bd. educ. Noted June 12.

Que., Bristol—Church—A. McLeod, archt., Bristol, soon lets contract building 50 x 66 ft. brick and steel, concrete foundation, on Main St., for Presbyterian congregation. About $50,000.

Que., Montreal—Market—City receives bids in fall, building 2 story, 60 x 210 ft. steel and brick, concrete foundation, on St. James St. About $130,000. A. E. Soucet, City Hall, engr.

Que., Quebec—Bank—E. Tanguay, archt., D'Aiguillon St., soon receives bids building 10 story, rein.-con. steel and brick, on St. Peters St., for Natl. Bank, St. Peter St. About $200,000.

Que., Quebec—Seminary—J. S. Bergeron, archt., St. John St., soon receives bids building 4 story, rein.-con., steel and brick, rein.-con flooring, concrete foundation, on St. Famille St., for Quebec Seminary. About $300,000.

Ont., Niagara Falls—Collegiate Institute—Bd. Educ. having plans prepared by C. M. Borler, archt., Main St., for 3 story, concrete and brick, concrete foundation. About $90,000.

Ont., Port Arthur—School—H. E. Owen and W. Hood, C. P. R. Telegraph Bldg., soon let contract building 2 story, concrete, steel and brick for School Bd. About $80,000.

Ont., Windsor — School — United School Bds. of Ford, Walkerville, Sandwich and Windsor plan to build 3 story brick. About $200,000. Address A. Gairn, Collegiate Institute, Windsor.

Sask., Yorkton — School — Rutherian School Bd. having plans prepared by Storey & Van Egmond, archts., Regina, for 3 story, 60 x 100 ft., concrete and brick. About $100,000.

B. C., Oak Bay—School—School Bd. soon lets contract building 3 story, brick and mill construction school. About $70,000. C. E. Watkins, Victoria, archt.

BIDS DESIRED

Mass., New Bedford—Hotel—Until Aug. 15, by Clinton & Russell, archts., 32 Nassau St., New York City, building 200 room hotel, for New Bedford Hotel Co., Pleasant St. About $1,000,000. Noted June 26.

Conn., New Britain—Business—C. C. Palmer, 272 Main St., receiving bids building 3 story, 65 x 110 ft., brick and steel, concrete foundation, on Church St., for George C. Rogers, Fairview St. About $50,000

Conn., New Haven—Business—Until July 15, by Brown & Von Beren, archts., 185 Church St., building 4 story, rein.-con., rein.-con. flooring, concrete foundation, on Chapel St., for Besse, Ritchey & Co., 784 Chapel St. About $50,000. Noted May 1.

N. C., Wilson—Business—Until July 15, (change of date), by Benton & Benton, archts., Wilson, building 3 story, 115 x 130 ft., brick, on Barnes and Lodge Sts., for B. Harrell Co., Wilson. About $50,000. Noted June 26.

S. C., Rock Hill—College—Until July 23, by Winthrop College Bldg. Com., constructing 3 story, 100 x 225 ft., students building on campus. About $80,000. D. B. Johnson, chn. Edwards, Sayward & Leitner, 500 Chamber of Commerce Bldg., Atlanta, Ga., archts.

Ind., Oaklandon—Hospital—Until July 16, by Comrs. Marion Co., building tuberculosis hospital here.

Mich., Detroit—Church and Rectory—L. Kamper, assoc. archt., 752 Book Bldg., receiving bids for 1 story, 112 x 220 ft. church, 3 story, 56 x 58 ft. rectory and 36 x 38 ft. garage, concrete, brick and steel for St. Hyacinth congregation, McDougall and Frederick Aves. About $250,000. S. I. Kilkiewicz, 888 Frederick Ave., pastor. E. Brielmaier & Sons, 432 B'way, Milwaukee, Wis., archts. Noted Jan. 16.

Mich., Detroit—Hospital—Until July 22, by J. McNamara, pres. pub. welfare comn., City Service Bldg., for 4 story, 50 x 87 x 216 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on St. Antoine and Macomb Sts. About $429,000 J. Scott & Co., 2326 Dime Bank Bldg., archts.

Mich., Detroit—School—Until July 15, by C. A. Gadd, business mgr. bd. educ., 50 B'way., building 2 story, 125 x 130 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Georgia and Crane Aves., to be known as "Holmes" School. Also for fireproof stairways to replace present wooden stairs in Bennet, Houghton, Maybury, Doty, Greusel, Ives and Crossman Schools. Malcolmson & Higginbotham, 404 Moffat Bldg., archts.

Mich., Hamtramck (Detroit P. O.)—School—Until July 15, by C. A. Gadd, business mgr. bd. educ., 50 B'way., Detroit, building 2 story, 104 x 127 ft. school and 1 story, 42 x 42 ft. boiler room, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Carpenter and McDougall Aves. Malmolmson & Higginbotham, 404 Moffat Bldg., Detroit, archts.

Mich., Wahjamega—Hospital—Until July 16, by E. R. Dunlop, archt., 709 Hammond Bldg., Detroit, building 1 story, 43 x 265 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, for Michigan Colony for Epileptics here.

Minn., Centerville—School—Until July 16, by Bd. Educ., building 2 story, 50 x 62 ft., concrete, brick and tile. About $50,000. Magney & Tusler, Bldr's Exch., Minneapolis, archts. and engrs. Noted Apr. 17.

Minn., Duluth—Until Aug. 1, by German & Jenssen, archts. and engrs., Exch. Bldg., constructing 3 story, 80 x 135 ft., rein.-con. and brick building, rein.-con flooring, concrete foundation, on North Central Ave., for Y. M. C. A. About $100,000.

Minn., Hastings—Asylum—Until July 14, (change of date) by State Bd. Control, Capitol, St. Paul, building rein.-con. and brick power plant at State Asylum for Insane. About $150,000. C. L. Pillsbury Co., 813 Metropolitan Life Bldg., Minneapolis, engrs. Noted June 19.

Minn., Rochester—Hotel—Kahler-Roberts Corp., Rochester, receiving bids for 8 story, 50 x 140 ft., rein.-con. About $1,000,000. F. M. Ellerbe, 692 Endicott Bldg., St. Paul, archt. Noted Jan. 16.

Minn., St. Paul—Theatre—Amer. Theatre Co., 491 Bidwell St., receiving bids for 42 x 50 x 120 ft., rein.-con., brick and steel addition, brick foundation, at 1077 Payne Ave. About $55,000. G. A. Blewett, 646 Endicott Bldg., archt.

Kan., Junction City — Hospital — Until July 15, by city, building 2 story, rein-con., steel and brick, rein.-con. flooring. About $55,000. J. E. Weist, clk. W. E. Hulse & Co., Hutchinson, archts.

Kan., Wellington — Auditorium — Until July 21 (change of date), by city, building 2 story, 120 x 190 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. C. Boller & Bro., 508 Ridge Bldg., Kansas City, Mo., archts. Noted June 26.

Neb., Lincoln—School—Until July 31, by J. G. Ludlam, secy. school bd., 15th and N Sts., building 2 story, 73 x 138 ft., brick and rein.-con., rein.-con. flooring and foundation, on 33rd and Vine Sts. About $80,000. Fisk & Meginnis, Bankers Life Bldg., archts.

Neb., Omaha — Hospital — Until Aug. 15, by J. Latsner & Sons, archts., 632 Bee Bldg., building 6 story, 108 x 108 ft., rein.-con., brick facing, on 26th St. and Dewey Ave., for Dr. E. C. Henry, 14th St. and Capitol Ave. About $250,00.

Neb., Omaha—Police Station and Jail—Until July 29, by City Council, building 3 story, 86 x 132 ft. rein.-con. and brick. About $200,000. G. L. Fisher, 1529 City Natl. Bldg., archt. Noted Apr. 17.

Wyo., Casper—High School—Until Aug. 15, by Natrona Co., building 3 story vocational high school. About $120,000. M. Hamilton, secy. school bd. Dubois & Goodrich, Casper, archts. Noted May 15.

Mont., Harlowton—School—Until July 15, by School Dist. No. 16, Wheatland Co., building school. J. C. Teague, Harlowton, archt. Noted May 22.

Mont., Helena—Laboratory—Until July 15, by State Bd. Examiners, building laboratory. Haire & Link, Power Bldg., archts. Noted Mar. 20.

Utah, Murray — School — Until July 28, by School Bd. of Granite School Dist., 3212 South State St., Salt Lake City, building 2 story, brick addition to Whittier School here. About $60,000.

Utah, Salt Lake City — High School — Until July 20, by School Bd., building brick high school on 33rd St., S. About $150,000. Cannon & Fetzer, Templeton Bldg., engrs. and archts.

Utah, Salt Lake City—Hospital—Until July 25, by Comrs. Salt Lake Co., building 3 story, 200 x 200 ft., brick, on South State St. About $200,000. Pope & Burton, Newhouse Bldg., engr. and archts.

N. S., Halifax—Office, Recreation, Canteens, etc.—Until July 14, by S. P. Dumaresq., archt., Halifax, building 4 story, 60 x 110 ft., rein.-con. and steel, rein.-con. flooring, on South and Barrington Sts. for Navy League of Canada. About $125,000.

Que., Cap de la Madeleine—Academy—Until July 28, by J. Caron, archt., 69 St. Francis Xavier St., Three Rivers, building 4 story, 66 x 100 ft., concrete, steel and brick, concrete foundation, for Catholic School Bd. About $70,000. Noted June 5.

Que., Montreal—Church—Until July 28, by Vandal & Gascon, archts., 502 St. Catharine St., E., building 60 x 100 ft. stone, brick and steel, concrete foundation, for Church of Holy Redeemer, Park St. About $250,000.

Que., Shawinigan Falls — Exchange — Until July 28, by Bell Telephone Co., 118 Notre Dame St. W., Montreal, building 3 story, 40 x 50 ft. concrete, brick and steel, concrete foundation. About $50,000. W. J. Carmichael, 29 Hospital St., Montreal, archt.

Que., Ste. Anne des Monts—Church—Until July 15, by J. B. A. Rioux, curate, Parish Congregation, building 1 story, rein.-con. and steel. About $100,000. T. Raymond, 45 Caron St., Quebec, archt.

Ont., Saulte Ste. Marie—Court House—Until July 12, by C. F. Findlay, archt., Sault Ste Marie, building 2 story, stone, brick and concrete, for Provincial Government, Toronto. About $200,000. Noted Jan. 9.

Ont., Toronto—Banks—Until July 12, by Darling & Pearson, archts., 2 Leader Lane, building two 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, for Dominion Bank of Canada, King and Yonge Sts. About $100,000. Noted June 26.

Ont., Woodstock—Exchange—Until July 28, by Bell Telephone Co., 118 Notre Dame St., N., Montreal, Que., building 3 story, 40 x 50 ft., concrete, steel and brick, concrete foundation. About $50,000. W. J. Carmichael, 29 Hospital St., Montreal, Que., archt.

Buildings (Continued)

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Office—Henderson, Robinson & Ross, Brookline, let contract building 6 story, 50 x 65 ft. brick and concrete, concrete foundation, at 148 State St., here, to J. J. Prindeville, Framingham. About $300,000.

★**Mass., New Bedford**—Bank—New Bedford Textile Trust Co., let contract building rein.-con., steel and brick, on Pleasant St., rein.-con. flooring, concrete foundation, to E. A. Abbott Co., 3 Park St., Boston. About $100,000.

★**Mass., Waltham** (Boston P. O.)—School—City let contract building concrete and brick school, to J. P. Keating Co., Westboro, Mass. About $197,900. Noted June 19.

★**R. I., Central Falls** (Pawtucket P. O.)—Convent—Sisters of Notre Dame, Broad St., let contract building convent, to J. B. Morin Co., 125 Hunt St. About $50,000. Noted June 5.

★**R. I., Providence**—Brown & Sharpe Mfg. Co., Promenade, let contract building 6 story, 64 x 99 ft. and 3 story 64 x 75 ft., rein.-con.. additions to factory, rein.-con. flooring, concrete foundation, to W. H. Hamlyn & Son, Inc., 35 Greenwich St. About $125,000.

★**Conn., New Britain**—Church—All Saints congregation let contract building 1 story, 60 x 111 ft., brick, concrete foundation, on Wilcox and West Sts., to J. Wooley, 756 Main St., Hartford. About $50,000. Noted May 15.

★**Conn., New Haven** — Business — E. Malley Estate, 902 Chapel St., let contract building 2 story, 70 x 75 ft., concrete and brick, rein.-con. flooring, concrete foundation, on Temple St., to Larkin-Carey Realty Co., 166 Brewery St.

★**Conn., New Haven** — Business — N. Miller, 135 Temple St., let contract building 2 story, 55 x 150 ft., brick and concrete, rein.-con. flooring, concrete foundation, to F. H. Dusinberri, Port Washington, N. Y., about $50,000.

Conn., New Haven — Hospital — Grace Hospital Assn., 1418 Chapel St., received only bid building 5 story, 100 x 140 ft., brick and steel and rein.-con., rein.-con. flooring and concrete foundation, on Orchard St., from Dwight Bldg. Co., 24 Center St. About $300,000. C. S. Palmer, 191 Church St., archt.

★**Conn., Storrs**—Hall—Connecticut Agricultural College let contract building 1 story dining hall on campus, concrete and brick, rein.-con. flooring, concrete foundation, to H. Wales Lines Co., 134 State St., Meriden. About $60,000. Noted Apr. 24.

★**N. Y., Brooklyn**—Theatre—Long Island Amusement Co., Garden Theatre, Jamaica, will build 130 x 145 ft., brick and steel, brick foundation, on Fulton St., near Church St. About $400,000. Work will be done by day labor.

N. Y., Middletown—Hospital—State Hospital Comn., Albany, received lowest 3 bids July 1, building 40 x 320 ft. hospital with 3 wings, concrete foundation, for State Hospital, here, general contract, from A. E. Stephens Co., 318 Main St., Springfield, Mass., $283,333, M. Kantrowitz, 20½ Market St., Albany, $295,400, P. Keeler Bldg. Co., 425 Orange St., Albany, $312,100; heating, from C. H. Darmstadt, 352 West 43rd St., New York City, $38,992, J. C. Williams, Inc., 233 Bway., New York City, $40,972, Adams, Britz & Co., 1761 Park Ave., New York City, $42,157; sanitary work, from C. H. Darmstadt, 352 West 43rd St., New York City, $32,392, Kenny Moran Co., 33 Old Bway., New York City, $32,530, E. Joy Co., 133 Market St., Syracuse, $39,350. Noted June 12.

★**N. Y., New York**—Theatre, Store and Office—C. Hensle Realty Co., 3879 10th Ave., will build 2 story, brick and steel, brick foundation, on Dykman St. between Nagle and Post Aves. About $300,000. Work will be done by day labor.

★**N. Y., Ossining**—Hall, etc.—C. F. Rattigan, supt. state prisons, Hall Records Bldg., New York City, let contract building mess hall and kitchen, No. 4, detention No. 5, outside cell No. 7, clinic No. 8, pumphouse, reservoir, also sanitary heating and electric work on same, to P. J. Carlin, 1123 Bway., New York City, $956,780. Noted July 3.

★**N. J., Lakewood**—Hotel—Hotel Elisberg Constr. Co., 55 Liberty St., New York City, let contract building 5 story, 100 x 175 ft., brick and steel, concrete foundation, to L. Barth & Son, 32 Union St., New York City. About $500,000. Noted Apr. 24.

★**N. J., Trenton**—College—Rider-Moore & Stewart, 12 South Broad St., let contract building 5 story, 75 x 100 ft., concrete, brick and steel, on State and Carroll Sts., to S. W. Mather & Sons, Greenwood and Allen Sts. About $125,000.

★**N. J., Trenton**—Psychopathic—Dept. of Architecture, 143 West State St., let contract building 4 story, 45 x 93 ft., concrete and stone, at State Hospital for Insane, here, to Standard Constr. Co., 1713 Sansom St., Phila., $306,000. Noted June 12.

★**N. J., Union Hill**—School—Bd. Educ. let contract building 3 story, 105 x 192 ft., brick and steel, brick foundation, on Hudson Ave., between 1st and 2nd Sts., to De Riso Bros., 17 Bergenline Ave. About $200,000. Noted May 29.

★**N. J. Vineland**—Home—Dept. of Architecture, 142 West State St., Trenton, let contract building 1 story addition to State Home for Children, to J. D. Pasquale, Vineland. About $60,000.

★**Pa., Phila.** — Bank — Kensington Trust Co., Kensington and Allegheny Aves., let contract building 1 story, 54 x 78 ft., concrete and brick bank, with 15 x 54 ft. addition, to F. B. Davis, 240 North 16th St. About $50,000. Noted May 22.

★**Pa., Phila.** — Loft — L. B. Rothchild, archt., 1225 Sansome St., let contract to The Wark Co., 1737 Filbert St., building 7 story, 101 x 150 ft., rein.-con. and brick, for J. C. Kahn, Morris Bldg. About $300,000. Noted May 22.

★**Pa., Wayne**—School—School Dist. Radnor Twp., let contract building two 2 story, 35 x 47 ft. brick wings to primary school, to J. D. Lengel, Bank Bldg., $54,606.

★**Md., Baltimore**—Bank—Maryland Trust Co., Calvert and Redwood Sts., let contract remodeling entire first floor, to Fraine Bros. & Haigley, 18 Clay St., $52,500. Noted May 29.

★**Md., Baltimore**—Bank—Seaboard Bank, Park Ave. and Fayette St., let contract altering 5 story, concrete and steel, to Fraine Bros. & Haigley, 18 Clay St. About $60,000. Noted Feb. 6.

★**Md., Baltimore**—Parish School—St. Bernard's Catholic congregation, Gorsuch Ave., let contract building 2 story, 60 x 140 ft., rein.-con. and brick, concrete and brick foundation, on Gorsuch Ave. and Independent St., to J. J. O'Connor, 427 East Lexington St. About $50,000, cost plus percentage basis.

★**Md., Baltimore** — Theatre — Wizard Theatre Co., 30 West Lexington St., let contract remodeling theatre, to Consolidated Eng. Co., 243 Calvert Bldg. About $50,000.

★**Va., Bon Air** — Administration — Virginia Home & Industrial School for Girls let contract building 2 story, 40 x 100 ft., to J. Dicks, Westhampton St., Richmond. About $50,000.

★**Va., Charlottesville** — Sanitarium — Virginia State Bd of Health let contract building sanitarium, to Charlottesville Lumber Co., Charlotesville, $81,000.

★**W. Va., Charleston** — Business — S. Cohen let contract building 6 story, 25 x 100 ft., brick, on Virginia and Bridge Sts., to W. A. Abbitt, 12 Columbus Blvd., Charleston. About $60,000.

★**W. Va., Keyser**—Bank and Office—First Natl. Bank let contract building 3 story, 50 x 110 ft., brick and steel, to C. D. Keyser, Bellaire, O. About $75,000.

★**O., Akron** — Salesroom — See "Industrials."

★**O. Akron**—School—Bd. Educ. let contract building 3 story, 88 x 200 ft., rein.-con., steel and brick annex, rein.-con. flooring, brick and concrete foundation, on West Crosier St., to Drummond-Miller Co., Guardian Bldg. Cleveland, $197,650.

★**O., Cleveland** — Bath House and Gymnasium — City let contract building 2 story, 70 x 76 ft., concrete, steel and brick, on East 26th St. and Central Ave., to W. Moore Co., 1278 West 4th St. About $100,000. Noted May 1.

★**O., Cleveland** — Dance Hall — See "Industrials."

★**O., Dayton**—Bank and Office—Pretziger & Musselman, archts., 1155 Reibold Bldg., let contract to Industrial Bldg. Co., Reibold Bldg., building 6 story, 40 x 50 ft. rein.-con. addition, rein.-con. flooring, on 3rd and Main Sts., for J. D. Richards, c/o City Natl. Bank. About $350,000. Noted Mar. 13.

★**O., Pittsburg**—School—E. S. Mountstephen, archt., 803 Union Bank Bldg., Dayton, let contract to Foltz & Son, Columbus, building 3 story, 80 x 140 ft., rein.-con. and brick, concrete foundation, for Bd. Educ. About $91,000. Noted June 19.

Mich., Detroit—Schools—C. A. Gadd, business mgr., bd educ., 50 Bway., received bids building (a) addition to Moore St. School on Alger and Cameron Aves., (b) addition to Dwyer School on Hawthorn and Caniff Aves., (1) masonry, (2) carpentry, (3) heating, ventilating and plumbing, from M. A. Mahoney, Penobscot Bldg., (a1) $96,000; A. J. Smith Constr. Co., Campau Bldg., (a1) $101,900, (b1) $112,900; Corrick Bros., 507 Owen Bldg., (a1) $104,813, (b1) $110,923; E. Thiede, 287 Berlin Ave., (a2) $27,629, (b2) $28,785; Harcus & Co., 774 Russell St., (a2) $32,538, (b2) $32,175; H. M. Martins Co., 221 Moffat Bldg., (a2) $34,009, (b2) $32,660; J. W. Partlan, 51 Park Pl., (a3) $56,661, (b3) $55,295; R. L. Spitzley, 403 Vinton Bldg., (a3) $57,522, (b3) $56,302; M. B. O'Connor, Penobscot Bldg., (a3) $61,391; Ernst Bros., 35 Bagg St., (b3) $60,216. Noted June 19.

Mich., Port Huron—Gymnasium and Auditorium—City received lowest bid building 2 story, rein.-con., brick and steel, concrete foundation, in connection with Washington School on White St., general contract, A. W. Schultz, Port Huron, $52,500; heating plant, Bryce Heating and Ventilating Co., $11,798. Noted June 19.

Ill., Chicago—School—Bd. Educ. received lowest 3 bids building 3 story, 169 x 262 ft., steel and brick, concrete foundation on West 18th St. and South Keeler Ave.; masonry, from F. A. Siebold & Son, 133 West Washington St., $93,480, S. N. Nielsen & Co., 3059 Augusta St., $96,279, H. Schrik & Co., 3722 Chicago Ave., $99,319; cut stone, C. G. Fanning & Co., 1616 South 52nd Ave., $51,844, Olson & Nelson Cut Stone Co., 3401 South La Salle St., $52,764, J. A. Hagen, 1620 South Laramie Ave., $53,500; structural iron, Hausell-Elcock Co., Archer and Normal Aves., $39,750, Duffin Iron Co., 4837 South Kedzie Ave., $41,200, South Halsted St. Iron Works, 2607 South Halsted St., $41,515; carpentry, H. Schrik & Co., 3722 Chicago Ave., $41,762, B. J. Regnall & Co., 19 South La Salle St., $41,791, H. Reminga, $41,798; fireproofing, Natl Fireproofing Co., 2600 Shields Ave., $26,837; Egan Fireproofing Co., 133 West Washington St., $29,130, Illinois Fireproofing Constr. Co., 209 South La Salle St., $31,776. Noted June 12.

★**Ill., East St. Louis** — Community — Natl. Catholic Community Center Service, c/o P. Murray, Union Trust & Savings Bank, let contract building 3 story, brick and concrete, concrete foundation, on 5th and St. Louis Aves., to Keeley Constr. Co., 2100 State St. About $150,000. Noted Mar. 20.

★**Wis., Milwaukee** — Sanatorium — Sacred Heart Sanatorium, 545 Layton Blvd., let contract building 3 story, rein.-con. and brick addition, to P. Reisen & Sons, 1018 Humboldt Ave. About $66,000.

★**Ia., Britt**—School—Bd. Educ. let contract building 2 story, 104 x 242 ft., rein.-con. and brick, brick foundation, to Madsen Constr. Co., 848 Bldr.'s Exch., Minneapolis, Minn., $131,779. Noted June 12

★**Minn., Anoka** — Administration—State Bd. Control, Capitol, St. Paul, let contract building 2 story, 45 x 140 ft., at State Asylum, here, to Laurence Constr. Co., 544 Bldr.'s Exch., Minneapolis, $67,594. Noted May 8.

★**Minn., Duluth**—Club—Northland Country Club, East Superior St., let contract building 2 story, 100 x 120 ft., frame and stucco, rein.-con. flooring, concrete foundation, to McLeod & Smith, 508 Sellwood Bldg. About $80,000. Noted Feb. 6.

★**Minn., Russell**—School—Bd. Educ. let contract building 2 story, 60 x 75 ft., rein.-con. consolidated school, to J. Schilt, Redwood Falls. About $50,000. Noted June 12.

★**Minn., St. Hilaire**—School—Bd. Educ. let contract building 2 story, 57 x 90 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to L. D. McAdams, Thief River Falls, $50,800. Noted June 19.

Buildings (Continued)

★**Kan., Great Bend** — School — Bd. Educ. let contract building 1 story 130 x 140 ft., brick, hollow tile and stucco, concrete foundation, to T. C. Cork, Great Bend. About $50,000. Noted June 19.

★**S. D., Rapid City**—Church—Methodist Episcopal congregation let contract building 1 story, 50 x 100 ft., brick and rein.-con., to A. J. McDonald Constr. Co., 734 Soo Line Bldg., Minneapolis, Minn. About $52,000. Noted May 8.

★**Mo., St. Louis** — School — Principia School, Page and Belt Aves., let contract building 2 story, 75 x 151 ft., concrete, steel and brick addition, at 1342 Montclair Ave., to Dickie Constr. Co., Syndicate Trust Bldg. About $60,000.

★**Mo., St. Louis**—Store—Stix Baer & Fuller Co., 7th and Washington Sts., let contract wrecking present building and erecting 11 story, 90 x 226 ft., rein.-con., steel and brick, rein.-con. flooring, rock foundation, to Westlake Constr. Co., 717 Locust St. About $1,000,000.

★**Idaho, Blackfoot** — Tabernacle — Mormon Church let contract building 2 story, brick, on Main St., to M. E. Anderson, 1915 South 7th East St., Salt Lake City, $62,554.

★**Ariz., Flagstaff**—Training—Comn. State Institutions, Phoenix, will build two 2 story, 60 x 120 ft., rein.-con. limestone and tile, at State Normal School here. Lescher & Ribbey, Bank of Arizona Bldg., Phoenix, archts. Work will be done by day labor.

★**Wash., Wenatchee**—Theatre — Wenatchee Realty & Investment Co. let contract building 2 or 3 story, 70 x 120 ft., masonry construction, to Dow & Ryden, Wenatchee. About $150,000.

★**Cal., Downey**—Psychopathic—Bd. of Supervs. Los Angeles Co. let contract building 2 story, 60 x 269 ft., concrete and frame, at Couty Farm, to G. F. Barber, 4342 South Flower St., Los Angeles, $61,590. Noted July 3.

★**Cal., Los Angeles**—Office—See "Industrial Works."

★**N. S., Ferrona Junction**—Asylum—Pictou Co. let contract building concrete, steel and brick, at Riverton, near here, to J. Johnson, New Glasgow. About $100,000.

★**Ont., Kingston**—Collegiate Institute—City let contract building 2 story, brick, to Pigott-Healy Constr. Co., 36 James St., S. Hamilton, $324,884.

★**Sask., Regina**—Recreation Hall, etc.—Dept. Pub. Wks., Ottawa, Ont., let contract building recreation and Red Cross halls, residence, power house and drainage system, in connection with Qu'Appelle Sanitorium, to Poole Constr. Co., Regina. Total cost, $75,000.

Federal Government Work

PROPOSED WORK

Mass., Boston—Addition to Shipfitters Shop—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 25, building at Structural Shop, here; Spec. 3920. Noted July 3.

Mass., Boston—Post Office—Treas. Dept., Wash., D. C., has had plans prepared for 2 story post office, on West Bway. About $150,000.

Mass., Hingham—Officers' Quarters—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 28, constructing 2 buildings for officers' quarters at Naval Ammunition Depot, here; Spec. 3804. Noted July 3.

N. Y., Montauk — Painting Building — Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to paint buildings, here; Spec. 3999. Bids will be received at Brooklyn Navy Yard.

N. Y., Montauk—Power House—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 25, building at Naval Air Sta., here; Spec. 3889. Noted July 3.

N. Y., Brooklyn—Storgae Building—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 25, constructing compass storage building on roof of Building S-2, at Fleet Supply Base in South Brooklyn; Spec. 3948. Noted July 3.

N. J., Cape May—Cell House—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 25, building at Wissahickon Barracks, Naval Training Camp, here; Spec. 3943. Noted July 3.

Pa., Phila — Assembly Shop — Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 25, building extension to assembly shop at Naval Aircraft Factory, here; Spec. 3927. Noted July 3.

Pa., Phila—Paving, Resurfacing, etc.—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 25, paving and resurfacing existing roads, ballasting railroad tracks, extensions, alterations and drainge; Spec. 3963. Noted July 3.

Pa., Phila. — Roof Covering — Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to cover roofs of Buildings Nos. 352, 360, 400 and 401; Spec. 3981.

D. C., Anacostia—Buildings, Hangars, Roads and Distributing Systems—Bureau Yards & Docks, Navy Dept., Wash., D. C., reject. bids received June 25, building and installing, here; Spec. 3905. Noted July 3.

Va., Hampton Roads—Surfacing, Grading, Filling and Sodding—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 28, surfacing, grading, filling and sodding 300 acres at NavalOperating Base, here; Spec. 3930. Noted July 3.

Va., Quantico—Road, Floor, etc.—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 28, grading, building concrete road and platforms at Marine Flying Field, here; Spec. 3980. Noted June 26.

S. C., Charleston—Quarters for Guards, Electric Lighting, Water Supply and Fire Protection Systems—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 28, building and installing at Naval Amunition Depot, here; Spec. 3977. Noted July 3.

Fla., Key West—Power House, Electric Generator Equipment and Fire Protection System—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 25, building power house, here, and installing electric generator equipment and fire protection system; Spec. 3956. Noted July 3.

Fla., Key West—Sewer—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received June 25, building intercepting sewer at Naval Air Sta., here; Spec. 3959. Noted July 3.

Ore., Bend—Road Work—Bureau Pub. Rds., U. S. Dept. of Agriculture, 628 Post Office Bldg., Portland, soon lets contract improving 15.51 mi. McKenzie River Natl. Forest Rd., in Deschutes Natl. Forest, Deschutes Co., involving 51 acres clearing, 78,000 cu.yd. earth and 12,000 cu.yd. rock excav., 1850 lin.ft. log or pipe culverts, etc. L. I. Hewes, dist. engr.

BIDS DESIRED

Mass., Boston—Dredging, Wharf and Retaining Wall—Until Aug. 1, by Light House Supt., Boston, dredging and building new wharf and retaining wall at Light House Depot, Chelsea.

R. I., Providence—Remodeling Elevator—Until July 31, by Treas. Dept., Wash. D. C., remodeling electric passenger elevator in Post Office, Courthouse and Customhouse, here. J. A. Wetmore, superv. archt.; advertised in this isssue.

N. Y., Buffalo—Rubble Mound Protection, etc.—Until July 31, by U. S. Engr. Office, 540 Federal Bldg., constructing rubble mound protection and sand fill protection on Presque Isle Peninsula, Erie Harbor, Pa.

N. Y., New York—Dredging—Until July 30, by U. S. Engr. Office, 39 Whitehall St., dredging in Raritan River, N. J.; advertised in this issue.

N. Y., New York—Dredging and Rock Removal—Until Aug. 7, by U. S. Engr. Office, 39 Whitehall St., dredging and removing rock in East River; advertised in this issue.

N. Y., Stapleton—Kitchen and Mess Hall—Until July 25, by Treas. Dept., Wash., D. C., building here. J. A. Wetmore, superv. archt.

N. Y., Stapleton—Mechanical Equipment—Until July 25, by Treas. Dept., Wash., D. C., furnishing mechanical equipment for kitchen and mess hall and certain outside service in U. S. Marine Hospital, here. J. A. Wetmore, superv. archt.; advertised in this issue.

D. C., Wash.—Miscellaneos Equipment—Until Sept. 2, by Gen. Purch. Agt., Panama Canal, Wash., purchasing cargo handling cranes, air compressors, electric motors and spares, starting panels, motor-driven triplex pump, Hamilton-Corliss engine, vacuum-cleaning machine, Hughes electric oven, water-cooling boxes, fiber conduit bends, steel dump cars, wooden flat cars and locomotives. A. L. Flint, purch. agt.; advertised in this issue.

ROAD WORK—NEW YORK

Bids were received by State Highway Comn., June 17, for constructing Road No. 1507, from Baldwinsville to Plainville, Onondaga Co., from (A) Pathfinder Constr. Co., Fulton; (B) J. H. Corbett & Sons Co., Union Arcade, Pittsburgh, Pa.; (C) Morrison & Quinn Co., Inc., Rochester; Road No. 1496, from Westport to Elizabethtown, Essex Co., (A) Kennedy Contg. Co., Inc., Albany; (B) Dale Eng. Co., Mann Bldg., Utica; (C) John B. Dower, Ballston Spa.; Road No. 5626, from Oppenheim to Dolgeville, Fulton Co., (A) Dale Eng. Co., Mann Bldg., Utica; (B) Rosoff Eng. Co., 15 Park Row, New York City; (C) F. V. Brotsch Co., E & B Bldg., Rochester; Road No. 5635, from Marilla to Wales Center, Erie Co., (A) Cold Spring Constr. Co., Buffalo; (B) Frank J. Foote, Nunda; (C) J. S. Stabell, Inc., 1127 Niagara St., Buffalo. The unit bids were as follows:

ROAD NO. 1507

	A	B	C
Clearing and grubbing (lump sum)	$150 00	$150.00	$150 00
30,000 cu yd. earth excavation	1 05	1 00	1 00
100 cu.yd. rock excavation	2 00	3.00	3.00
50,000 cu yd overhaul, per cu.yd 100 ft	01	.01	.01
350 lin ft. vitr. clay pipe, 10 in diameter	65	.61	.65
140 lin ft. vitr. clay pipe, 15 in. diameter	90	1 00	.95
1,000 lin ft. 6-in. porous tile underdrain	.22	20	.20
6 catch basins	75 00	80 00	75.00
2 changing elevations of manholes	5 00	4 45	5 00
40 tons cast iron pipe	80 00	76 00	75.00
100 lin ft. relaying old pipe	20	20	.20
1,000 ft.b.m. timber and lumber	65.00	65.00	60 00
52 cu yd. 2nd class concrete	12 00	12 50	12.00
220 cu yd. 3rd class concrete	11.50	11.00	11.10
55 lin ft stone curbing and headers	1 25	1.30	1.25
610 lin ft. concrete curbing	70	.80	.75
1,100 sq.yd. cobble gutters, sand joints	1 00	1.00	1.00
1,600 sq.yd. cobble gutters, cement joints	.75	.80	.75
2,700 lb. metal reinforcement	.10	.10	.10
1,500 lb miscellaneous iron and steel	10	.10	.10
5,800 lin ft. wooden guard railing	.35	.45	.45
70 cu yd screened gravel	3 00	2.80	2.80
80 cu.yd. broken stone	3 50	4 00	4 00
265 cu yd. concrete foundation	9 50	9 00	9.50
12,800 cu yd cement concrete pavement			
1,865 sq.yd. brick pavement	2 90	2.75	2.75
300,000 sq ft metal reinforcement for pavement	01	02	02
1,000 cu yd run of bank gravel	3 10	3 00	3 00
Extended totals	$225,984	$240,003	$248,911

Road Work—New York (Continued)

ROAD NO. 1496

	A	B	C
Clearing and grubbing (lump sum)	$200 00	$700 00	$2,000 00
39,000 cu yd. earth excavation	1 10	65	1 00
2,300 cu yd. rock excavation	2 50	1 00	1 00
10,000 cu.yd. overhaul, per cu.yd. 100 ft	01½	01	01½
30 lin.ft. vitr. clay pipe, 12 in. diameter	1 00	65	1 00
12 lin.ft. vitr. clay pipe, 16 in. diameter	1.25	80	125
80 lin.ft. vitr. clay pipe, 18 in. diameter	1.50	1 20	1 50
1,000 lin.ft. 6-in. vitr. clay underdrain	45	25	40
25 tons cast iron pipe	80 00	70 00	70 00
100 lin.ft. relaying old pipe	.20	15	20
30 cu yd. stone filling	3 00	2 50	2 00
2,000 ft.b.m. timber and lumber	5.00	50 00	40 00
280 cu.yd. riprap	3 00	2 50	3 00
160 cu.yd. 2nd class concrete	11 00	11 00	11 00
510 cu.yd. 3rd class concrete	10 00	10 00	10 00
1,070 sq.yd. cobble gutters, cement joints	1 00	1 20	1 25
1,100 sq.yd. cobble gutters, sand joints	50	80	80
220 sq.yd. concrete gutters	2 00	1 80	2 00
7,000 lb. metal reinforcement	10	07	10
2,000 lb. miscellaneous iron and steel	10	06	10
5,900 lin.ft. wooden guard railing	.40	40	40
235 cu.yd. broken stone	2.70	2 20	2 70
15,350 cu.yd. foundation course, field or quarry stone	3 20	3.50	3 20
4,825 cu.yd. bottom course, broken stone	4.60	4 30	5 00
145 cu.yd. concrete foundation for pavement	11 00	12 00	11 00
7,300 cu.yd. top course, bituminous macadam, penetration method	5 00	6 75	6 00
1,000 sq.yd. stone block pavement	7 00	7.50	7 00
172,500 gal. bituminous material	08	13½	13
Extended totals	$196,955	$198,749	$208,606

ROAD NO. 5626

	A	B	C
Clearing and grubbing (lump sum)	$150 00	$150 00	$150 00
22,000 cu.yd. earth excavation	65	1 00	1 00
500 cu.yd. rock excavation	1 00	1 00	3 00
50 lin.ft. vitr. clay pipe, 18 in. diameter	1 30	01	1 50
500 lin ft 6-in porous tile underdrains	.25	01	40
2 tons cast-iron pipe	80.00	01	80 00
5M. ft.b.m. timber and lumber	60 00	02	50 00
50 cu.yd. riprap	3 00	3 00	3 00
115 cu.yd. 2nd class concrete	11 00	12 00	12 00
280 cu.yd. 3rd class concrete	10 00	11 00	11 00
2,560 sq.yd. cobble gutter, cement joints	1.00	1.25	1 50
1,470 cu.yd. cobble gutter, sand joints	70	1 00	1 00
3,050 lb. metal reinforcement	07	10	10
300 lb. miscellaneous iron and steel	06	10	10
2,830 lin.ft. wooden guard railing	40	45	45
294 cu.yd. broken stone, No. 1 size	2 60	3 00	3.10
160 cu.yd. broken stone, No. 2 size	2.60	3.40	3 45
8,230 cu.yd. foundation course, field or quarry stone	4 80	4.45	4 30
3,875 cu.yd. top course, waterbound macadam, broken stone	8 20	8 10	7 40
15,500 gal. surface treatment with bituminous cold application	15	01	20
18 tons commercial granulated calcium chloride	29 00	01	29
Extended totals	$99,849	$103,336	$101,824

ROAD NO. 5635

	A	B	C
Clearing and grubbing (lump sum)	$600.00	$600 00	$600 00
33,000 cu.yd. earth excavation	1 30	1 15	1 00
75 cu yd. rock excavation	2 00	3 00	3 00
1,600 lin.ft. 6 in. vitr. clay underdrains	35	35	35
14.5 tons cast iron pipe	90 00	90	90
100 lin.ft. relaying old pipe	.20	20	25
1M.ft.b.m. timber and lumber	60 00	01	60 00
110 cu.yd. 2nd class concrete	16 50	16.25	16 50
420 cu.yd. 3rd class concrete	15.40	15 25	15 40
2,150 sq.yd. concrete gutters	2 00	2 40	2 75
4,600 lb. metal reinforcement	12	08	12
200 lb miscellaneous iron and steel	10	10	12
4,000 lin.ft. wooden guard railing	50	50	50
175 cu.yd. screened gravel	3.10	3 00	3 10
8,475 cy.yd. cement concrete pavement	14.25	15 50	16 25
300 cu.yd. run of bank gravel	3.20	3 50	4 20
415,500 sq.ft. metal reinforcement	02½	.02½	02½
Extended totals	$193,409	$198,682	$202,451

D. C., Wash.—Sewers—Until Aug. 4, by Dist. Comrs., Dist. Bldg., constructing 9600 lin.ft. trunk sewers, ranging in size between 2 and 9 ft. in diameter; advertised in this issue.

Ga., Dawson — Post Office — Until July 25, by Treas. Dept., Wash., D. C., building here. J. A. Wetmore, superv. archt.

Fla., Jacksonville—Dredging and Rock Removal—Until Aug. 2, by U. S. Engr. Office, Jacksonville, dredging and removing rock in St. John's River; advertised in this issue.

Fla., St. Augustine—Heating Apparatus—Until July 30, by Treas. Dept., Wash., D. C., furnishing and installing heating apparatus. J. A. Wetmore, superv. archt.

O., Cincinnati—Lock and Dam—Until Aug. 1, by U. S. Engr. Office, 1st Dist., Cincinnati, building lock and abutment for Dam No. 34, Ohio River, near Chilo. Noted May 1.

Ill., Chicago—Crib—Until July 29 by U. S. Engr Office, 508 Federal Bldg., constructing concrete caisson breakwater and light house crib at Indiana Harbor, Ind.

Tex., Galveston — Boathouse, Wharf and Boat Basin—Until July 31, by Treas Dept., Wash., D. C., building new boathouse, wharf and boat basin for U. S. Quarantine Sta., here. J. A. Wetmore, superv. archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Coddington Point**—Bridge, Wharf, Seawall, Etc. — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to W. L. Miller, 171 Alford St., Boston, Mass., (1) $171,893, (149 days), (4) $28,978, (120 days). Unit prices for (2) and (3) also accepted.

★**R. I., Coddington Point** — Tank and Tower — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract erecting tank and tower at U. S. Naval Camp, here, to Chicago Bridge & Iron Co., 30 Church St., New York City, $7940, (120 days). Noted July 3.

★**R. I., Newport** — Extending and Altering Fire Alarm System — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract extending and altering fire alarm system, here, to Gamewell Fire Alarm Telegraph Co., 70 East 45th St., New York City, $19,062, (90 days). Noted July 3.

N. Y., Brooklyn — Cranes — Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids July 2, installing 7 electric traveling cranes in Shipbuilding Way No. 1 and Bulkhead Handling Ways Nos. 1 and 2, at Navy Yard, here, (1) net price and time for one 10-ton and four 10 ton cranes and runway conductors for their runways, complete in accordance with drawings and specifications, (2) net price and time for two 15 ton cranes and runway conductors for their runways, complete, in accordance with drawings and specification; (3) amount and time to be deducted from net price and time stated under (2) for omission of 15-ton cranes and its runway conductors, from Niles Bement Pond, 111 Bway., New York City, (1) $85,165, (150 days), (2) $46,600, (3) $23,300; V. R. Browning, 17701 Lake Shore Blvd., Cleveland, O., (1) $91,329, (165 days), (2) $17,460, (180 days), (3) $24,480; Bedford Fdry. & Machine Co., Bedford, Ind., (1) $53,100, (180 days), (2) $26,100. Noted June 26.

★**N. Y., Brooklyn** — Rebuilding Shipbuilding Ways — Bureau Yards & Docks Navy Dept., Wash., D. C., let contract reconstructing shipbuilding ways, here, to Phoenix Constr. Co., 41 Park Row, New York City, $697,897, (240 days). Unit prices for (2) and (3) also accepted. Noted July 3.

★**N. Y., New York**—Dredging—U. S. Engr. Office, 39 Whitehall St., let contract dredging in narrows of Lake Champlain, N. Y. and Vt., to Amer. Pipe & Constr. Co., 112 North Broad St., Phila., Pa., $79,500. Noted Apr. 10.

★**N. Y., New York**—Dredging—U. S. Engr Office, 39 Whitehall St., let contract dredging in East River, to Bowers-Southern Dredging Co., 914 Amer. Natl. Insurance Bldg., Galveston, Tex., $586,500. Noted May 22.

★**N. Y., New York** — Elevators — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building 2 electric elevators at Shipbuilding Way No. 1, here, to Albro-Clem Elevator Co., D St. and Erie Ave., Phila., Pa., $15,785, (120 days). Noted July 3.

★**N. Y., Rockaway** — Electric Light and Power Distributing System—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to Hamilton Electric Co., 357 3rd St., Brooklyn, $45,143, (80 days). Noted July 3.

★**N. Y., Rockaway**—Extension to Steam Heating System—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building extension to steam heating system, at Air Sta., here, to E. Rutzler Co., 401 East 15th St., New York City, (1) to (5), $11,720, (50 days). Noted July 3.

★**N. Y., Rockaway** — Latrine and Washroom — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building at Air Sta., here, to Rangley Constr. Co., 405 Lexington Ave., New York City, $9400, (40 days). Noted July 3.

N. Y., Stapleton—Gas Mains—Treas. Dept., Wash., D. C., received bid furnishing and laying gas mains at U. S. Marine Hospital, here, from Hickey Contg. Co., 841 Bway., New York City, $1200, (14 days). Noted June 19.

★**N. J., Cape May** — Flood Lighting System — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing in Wissahickon Barracks, here, to Carroll Electric Co., 714 12th St., Wash., D. C., $4450, (45 days). Noted July 3.

★**Pa., Ft. Mifflin** — Repairs to Roads — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract repairing roads at Navy Yard, here, to M. J. McCrudden, 805 Franklin Trust Bldg., Phila. Noted June 19.

Federal Government Work (Continued)

★**Pa., Ft. Mifflin** — Tank and Tower — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building 30,000 gal. steel tank on 80 ft. tower, here, to A. Stang, 1220 Locust St., Phila., $95,000, (60 days). Noted July 3.

Pa., Phila.—Building—Pub. Wks. Officer, Local Navy Yard, received bids completing erection of portable steel building, at Navy Yard, from Stang & Mitchell, Real Estate Trust Bldg., $26,457, (60 days); Belmont Iron Wks., 22nd and Washington Ave., $27,777, (60 days); G. F. Pawling & Co., 143 South Penn Sq., $28,300. Noted June 26.

★**Pa., Phila** — Fire Escape — Bureau Yards & Docks, Navy Dept., Wash. D. C., let contract constructing fire escape for Building No. 6, here, to J. Baizley Iron Wks., 514 Delaware Ave., $1650 (60 days). Noted July 3.

★**Pa., Phila.** — Paving — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract paving, here, to E. C. Fish Co., 703 Real Estate Trust Bldg., $83,000, (150 days).

★**Pa., Phila.**—Pipe System of Automatic Sprinkler—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing wet and dry pipe system of automatic sprinklers, in Building No. 87, to General Fire Extinguisher Co., 1220 Stock Exch. Bldg., $26,450. Noted July 3.

★**Pa., Phila.** — Recoating Roofing, Etc. —Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract recoating roofing, here, to Amer. Insulator Co., Robert Ave. and Stickley St., $610.

★**Pa., Phila.** — Scrap Storage Yard — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to M. H. McCloskey, Jr., 1620 Thompson St., $27,408, (90 days).

★**Pa., Phila.** — Sprinkler System — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing, here, to General Fire Extinguisher Co., 1220 Stock Exch. Bldg., $13,895, (120 days).

★**Pa., Phila.**—Storehouse—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building, here, to Stang & Mitchell, 629 Real Estate Trust Bldg., $26,457, (60 days).

★**Md., Indianhead** — Housing Facilities —Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building here, to H. S. Roberts, 1123 Bway., New York City, $59,350, (180 days). Noted July 3.

★**Md., Indianhead** — Toilet Buildings — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing toilet buildings and additions at Powder Factory, here, to H. S. Roberts, 1123 Bway., New York City, $59,750, (120 days). Noted July 3.

★**D. C., Bellevue** — Pier and Fire Protection System — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building pier and installing fire protection system, here, to McHarg-Barton Co., 171 Madison Ave., New York City, (1) $47,000. Unit prices for (7), (8), (9) and (10) also accepted. Noted July 3.

★**D. C., Wash.**—Mess Hall, Garage and Sidewalks—Constr. Quartermaster. Walter Reed Hospital, let contract building mess hall, garage and concrete sidewalks, to Skinker & Garrett, 1416 F St., N. W., $53,514.

★**D. C., Wash.** — Sewer — Dist. Comrs., Dist. Bldg., let contract constructing Luzon Ave. trunk sewer, to W. F. Cush, 2nd and R Sts., N. E., (1) $2.85, (2) $15.50, (3) $45, (4) $24. Noted June 26.

★**Va., Hampton Roads**—Boat Shed and Dredging—Bureau Yards and Docks, Navy Dept., Wash., D. C., let contract building boat shed and dredging, here, to H. P. Converse Co., 31st St. and Colonial Ave., Norfolk, Va., (1) $30,480, (75 days). Unit price for (4) also accepted. Noted June 26.

Va., Hampton Roads — Crane and Bridges — Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids installing 1 electric traveling crane and 2 transfer bridges in 3 story storehouse at Naval Operating Base, here, (1) work complete, from R. Browning & Co., 17701 Lake Shore Blvd., Cleveland, O., (1) $8920, (120 days), (2) $4652, (120 days); Cameron Eng. Co. East Stroudsberg, Pa., (1) $8015, (120 days), (2) $8800, (120 days); Camden Iron Wks., 2nd and Chestnut St., Camden, N. J., (1) $6966, (120 days). Noted May 15.

★**Va., Hampton Roads** — Fire Alarm System — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing fire alarm system in East Camp of Naval Training Sta., here, to E. J. Electric Installation Co., 221 West 33rd St., New York City, $8300, (90 days). Noted July 3.

★**Va., Hampton Roads** — Railroad Extension — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building at Naval Operation Base, here, to Porter & De Witt, Army Supply Base, Norfolk, $36,500, (90 days). Noted July 3.

★**Va., Yorktown** — Buildings — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing 11 buildings at Naval Mine Depot, here, to Newport Contg. Co., Law Bldg., Newport News, $289,331, (270 days). Noted July 3.

★**Va., Yorktown** — Machine Shop — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building at Naval Mine Dept, here, to McLean Contg. Co., 1415 Fidelity Bldg., Baltimore, Md., (1) $6000, (70 days). Unit price for (2) also accepted. Noted July 3.

★**Va., Yorktown** — Road — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building concrete road at Naval Mine Depot, here, to McLean Contg. Co., 1415 Fidelity Bldg., Baltimore, Md., $179,560, (150 days). Noted July 3.

★**S. C., Charleston**—Boilers and Superheaters—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing at Navy Yard, here, to Heine Safety Boiler Co., 1120 Pennsylvania Bldg., Phila., Pa., $41,750 (140 days). Noted June 19.

★**S. C., Paris Island** — Tank and Tower —Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract erecting elevated tank and tower at East Camp of U. S. Naval Training Sta., here, to Chicago Bridge & Iron Co., 30 Church St., New York City, $8340, (120 days). Noted July 3.

★**S. C., Paris Island** — Water Supply System — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building fresh water supply system at Marine Barracks, here, to Noland-Clifford Co., 330 28th St., Newport News, Va., $53,600. (120 days). Noted July 3.

★**Fla., Key West** — Oil Burning Equipment—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing oil burning equipment for boilers, here, to Southern Florida Contg. & Eng. Co., Eaton and Elizabeth Sts., $5800, (125 days). Noted July 3.

★**Fla., Pensacola** — Incinerator — Bureau Yards & Dock, Navy Dept., Wash., D. C., let contract building here, to C. H. Turner Co., Brent Bldg., $5760, (40 days). Noted June 5.

Ind., Evansville—Water Mains—Treas. Dept., Wash., D. C., received bids laying water mains at U. S. Post Office, here, from H. G. Newman Plumbing Co., 511 U 4th St., $7450 (90 days); E. H. Hartig, Evansville, $7765; Noland-Clifford Co., 330 28th St., $11,300.

★**Ill., Great Lakes** — Drainage — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract draining at Naval Training Sta., Camp Paul Jones, here, to H. D. Hallett, 132 Downer Pl., Aurora, Ill., $13,378, (30 days). Unit prices for (2) to (7) inclusive, also accepted. Noted July 3.

★**Ill., Great Lakes** — Road Work — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract improving roads, here, to Contg. & Material Co., 3219 Michigan Ave., Chicago, $34,460, (50 days). Noted July 3.

★**Ill., Great Lakes** — Sewage Disposal Plant — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract remodeling sewage disposal plant, here, to Hansen Bros. Co., 126 North Dearborn St., Chicago, $17,481, (60 days). Noted July 3.

★**Ill., Great Lakes** — Track — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building track in Cold Storage Yard, here, to Elgin, Joliet & Eastern R.R. Co., $41,493.

Wis., Tomah—Post Office—Treas. Dept., Wash., D. C., received bids July 1, building post office, here, from W. D. Lovell, 1415 South East 8th St., Minneapolis, Minn., $51,400; Northern Constr. Co., 445 Milwaukee St., Milwaukee, $54,998; A. W. Lane, 19 South La Salle St., Chicago, Ill., $55,256. Noted June 5.

★**Tex., Ft. Worth** — Wells — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract drilling 2 wells at Helium Production Plant, here, to Q. D. Lewis, North Ft. Worth, $9000, (60 days). Noted June 5.

Cal., Mare Island — Cranes — Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids July 2, installing electric traveling cranes in structural shop, here, (1) net price and time for one 80-ton, three 15-ton (span 96 ft. 4 in.) one 15-ton (span 57 feet 3 in) and two 5-ton bridge cranes, complete with runway conductors, and pulpit-control systems for 80-ton and 15 ton Smithery cranes, in accordance with drawings and specification; (2) net price and time for ten 5-ton (reach 20 ft.) and six 3-ton wall cranes, complete with runway conductors, in accordance with drawings and specifications, from V. R. Browning & Co., 17701 Lake Shore Blvd., Cleveland, O., (1) $115,091, (240 days); (2) $92,198, (195 days); Toledo Bridge & Crane Co., Toledo, O., (1) $101,700, (150 days), (2) $112,500, (150 days); Cleveland Crane & Eng. Co., Wickliff, O., (1) $103,000, (240 days), Niles Bement Pond Co., 111 Bway., New York, N. Y., (1) $112,600; (2) $115,000, (195 days). Noted June 26.

★**Cal., San Diego**—Administration Building, Roads and Walks—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing administration building, roads and walks, here, to W. E. Kier, 502 Amer. Natl. Bank Bldg., (1) $203,394, (270 days); (4), (5) and (6) also accepted. Noted June 5.

★**Cal., San Diego** — Building, Hangar, Etc.—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing main building, kite balloon hangar and concrete floors, here, to F. W. Steffger c/o Pub. Wks. Office, Timker Bldg., (1) to (5) inclusive, $9274, (60 days). Noted May 15.

★**Cal., San. Diego** — Distributing System — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building underground electric distributing system and street lighting system at Naval Air Sta., here, to Brelin Co., c/o Pub. Wks. Office, Timker Bldg., $42,750, (120 days). Noted July 3.

★**Cal., San Diego** — Pipe Line — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building gas pipe line system, here, to T. Haverty Co., 517 South Los Angeles St., Los Angeles, $6875, (60 days). Noted June 12.

★**Cal., San Francisco** — Radio Towers — Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract erecting two 450 ft. steel radio towers, here, to Pittsburgh Des Moines Steel Co., 959 Munsey Bldg., Wash., D. C., $87,776, (180 days). Noted June 19.

★**P. R., Cayey**—Radio Buildings—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building addition to operators' quarters, here, to R. Corbia, Radio Sta., El Cayey, $32,650, (150 days). Noted June 26.

★**H. T., Honolulu**—Dredging—U. S. Eng. Office, Honolulu, let contract dredging Kahului Harbor, to Hawaiian Dredging Co., Honolulu, $95,921.

H. T., Pearl Harbor—Hospital—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids June 25, building here, (1) work complete, from

Hawaiian Dredging Co., Honolulu, (1) $379,745, (270 days); (2) $328,808, (270 days); (3) $50,937, (210 days); (4) $28,128, (30 days); (5) add $2000.

C. L. Wold Co., 75 Sutter Street, San Francisco, Cal., (1) $385,400, (270 days); (2) $295,000, (270 days); (3) $60,074, (270 days); (4) $30,326; (5) $1250.

Hanna Bros., 142 Sansom Street, San Francisco, Cal., (1) $391,315, (310 days); (2) $299,400, (300 days); (3) $64,330, (300 days); (4) $32,230; (5) $1365. Noted June 12.

Miscellaneous

PROPOSED WORK

Monument — Uxbridge, Mass. — City plans to build soldiers' and sailors' monument on "Common," rein.-con. and marble. About $10,000. Hutchins & French, 6 Beacon St., Boston, archts.

Pumping Machinery—Trenton, N. J.—City plans to purchase new machinery for pumping station. J. R. Fell, 134 North Clinton Ave., engr.

Miscellaneous (Continued)

Ovens—Greensburg, Pa.—E. J. Shaller having plans prepared by McCormick Co., archts. and engrs., Century Bldg., Pittsburgh, building 1 story brick ovens. About $30,000.

Garbage Incinerator—Monessen, Pa.—Boro. having plans prepared by Chester & Fleming, engrs., Union Bank Bldg., Pittsburgh, for 20 ton capacity incincerator.

Kettles, Asphalt, etc.—Pittsburgh, Pa.—Allegheny Co. soon lets contract for twelve 100 gal. asphalt heating kettles and 250 tons natural rock asphalt. J. P. Moore, co. controller.

Swimming Pool—Baltimore, Md.—See "Buildings."

Wharf — New Orleans, La. — Dock Bd. will build banana wharf. About $400,000. Work may be done by day labor. J. D. O'Reilly, 833 Canal St., ch. engr.

Trenching Machine, Steam Shovel, etc. —Chicago, Ill.—Moore Bros., 39 South La Salle St., plans to purchase 10 Buckeye trenching machines, revolving steam shovel, 3 drum hoists and locomotive crane.

Fire Alarm System—San Antonio, Tex.—City election July 26 to vote on $150,000 bonds to install fire alarm system. H. Helland, city engr.

Incinerator — San Antonio, Tex. — City election July 26 to vote on $100,000 bonds to build incinerator. H. Helland, city engr.

Parks—San Antonio, Tex.—City election July 26 to vote on $200,000 bonds to build parks. H. Helland, city engr.

Dikes—South Bend, Wash.—Pacific Co. plans to establish diking district on both sides of Nasal River to reclaim 1440 acres of tide lands. About $1,000,000. H. A. Gibbs, co. engr.

Piers, Etc. — Berkeley, Cal. — R. P. Jennings leased entire waterfront with exception of 100 ft., for 50 years, and plans to spend $2,000,000 within 5 years and $1,000,000 additional within 10 years of signing of lease to build piers or moles, warehouses, etc., and dredging waterway 3000 ft. wide.

Conduit—Oakland, Cal.—See "Streets and Roads."

Pipe Lines—Santa Barbara, Cal.—City voted $110,000 bonds, $40,000 being needed to complete Gibralta dam under contract now held by Bent Bros., 825 Central Bldg., Los Angeles, $54,000 to build 9000 lin.ft. 24 in. pipe line from dam to Mission reservoir and $16,000 to lay service mains. Pipe line will probably be of continuous redwood staves. Address Bd. Water Comrs. Noted Apr. 10.

Dam — Annapolis, N. S. — Landowners near township plan to build dam to protect property from tidal damage. About $130,000. In connection with this they have requested Highway Comn. of Province of Nova Scotia to raise present highway crossing marsh lands and put in flood gates, thus providing for dam and also permanent highway. G. E. Corbett, chn. landowners com.

Dam, Flume, etc.—Berwick, N. S.—Town soon lets contract building dam, flume and other requirements for electric light plant. Bonds for $27,500 sold for project.

Vault—Montreal, Que.—City voted $65,000 bonds to build fire and waterproof vault. A. E. Doucet, City Hall, engr.

Dry Dock—Sorel, Que.—Sorel Shipbuilding Co. plans to build dry dock and necessary building. About $150,000. J. N. Leclair, Sorel, engr.

Pier—Toronto, Ont.—Dept. Pub. Wks., Ottawa, soon lets contract rebuilding portion of superstructure of east pier at eastern entrance to Toronto Harbor, 400 ft. long, 30 ft. wide; stone fill core, cribwork, concrete blocks and concrete cap. E. Lafleur, c/o Dept. Pub. Wks., ch. engr.

Harbor Improvements, Vancouver, B. C. —Dominion Government appropriated $5,000,000 for general improvements to harbor here, including wharves and equipment for same. R. G. Swan, Ottawa, Ont., engr.

BIDS DESIRED

Ferry Boat—Boston, Mass.—Until July 15, by T. J. Sullivan, comr. pub. wks., reconstructing ferry boat "John H. Sullivan." About $25,000.

Furnishings, Apparatus and Equipment—Albany, N. Y.—Until July 22, by H. M. Biggs, comr. health, state department of health, Capitol, furnishing experimental extraction and distilling apparatus, water still, autoclaves, etc.; advertised in this issue.

Paving Material—St. George, S. I., N. Y. —Until July 14, by C. D. Van Name, pres. Richmond Boro., furnishing and delivering 1600 cu.yd. 1½ in. and 700 cu.yd. ¾ in. broken stone, 70 cu.yd. screenings, 100 cu. yd grits in Dist. No. 1; 1050 cu.yd 1½ in and 80 cu.yd. ¾ in broken stone, 420 cu yd screenings of trap rock and 450 cu yd grits in Dist. No. 2; 800 cu.yd. 1½ in. and 60 cu yd ¾ in. broken stone, 320 cu yd screenings of trap rock and 130 cu.yd. grits in Dist. No. 3.

Harbor Improvements—Atlantic City, N. J. — Until July 31, by city, improving harbor, involving 723,000 cu.yd. excav., 4000 lin.ft. sod banks for retaining fill, 1080 lin.ft. wood bulkhead, 25 x 200 ft. wharf and 1300 lb. cleats. J. B. Thompson, dir. dept. pub. safety.; advertised in this issue.

Gas Mains—Duluth, Minn.—Until July 14, by G. P. Phillips, comr., laying 3820 ft. 8 in. high-pressure steel gas mains in South Grand Ave. from 71st Ave., W., to 84th Ave., W. About $11,269. Work involves 1300 cu.yd. earth and 20 cu.yd. rock excav., etc.

Wharf—Ste. Anne de Beaupre, Que.—Until July 23, by R. C. Desrochers, secy. dept. pub. wks., Ottawa, Ont., rebuilding and repairing wharf here.

Wharf—Cornwall, Ont.—Until July 22, by R. C. Desrochers, secy. dept. pub. wks., Ottawa, building wharf here.

Breakwaters—Port Colborne, Ont.—Until July 20, by Dept. Pub. Wks., Ottawa, repairing west breakwater, 781 ft. long, cribwork, stone fill and concrete cap; also east breakwater, 35 x 130 ft., mass concrete base, concrete top, involving 1000 cu.yd. concrete. E. Lafleur, c/o Dept. Pub. Wks., ch. engr.

Wharf—Powell River, B. C.—Until July 31, by Dept. Pub. Wks., Ottawa, building addition to wharf and dredging here. About $16,500. E. Lafleur, c/o Dept. Pub. Wks., engr.

Wharf—Saanichton, B. C.—Until July 25, by R. C. Desrochers, secy. dept. pub. wks., Ottawa, Ont., repairing wharf here and at Sydney, also repairing float and approach at Roberts Bay.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Pipe, Etc.—Hartford, Conn.—Bd. Water Comrs. let contract furnishing c.i. pipes and special iron castings, to Warren Fdry. & Machine Co., 11 Bway., New York City. About $48,338.

★Coal Trestle, etc.—Willimantic, Conn. —Amer. Thread Co., 260 West Bway., New York City, let contract building rein.-con. coal trestle and loading platform, here, to Aberthaw Constr. Co., 27 School St., Boston, Mass. About $15,000.

Coal and Ash Handling Apparatus—Central Islip, N. Y.—State Hospital Comn., Capitol, Albany, received bids July 1 for coal and ash handling apparatus for Central Islip State Hospital, from Guarantee Constr. Co., 140 Cedar St., New York City, $59,350. R. H. Beaumont, Drexel Bldg., Phila., Pa., $68,825, Giffin-Wood Co., Hudson, $87,000. Noted June 19.

★Grounds Improvements—Jersey City, N. J.—City let contract beautifying Lincoln Highway School grounds and building 6 ft ornamental iron fence with massive gates, to M. T. Connolly Contg. Co., 238 17th St., $159,900; who sublet contract for grading, digging, seeding and sodding, to E. J. Flaherty Co., 76 Montgomery St., $34,700

★Aluminum Wire — Yorkhaven, Pa. — Yorkhaven Water & Power Co. let contract for 62 mi. steel reinforced aluminum wire, to be used in connection with transmission line from here to Anville, to Aluminum Co. of America, Widener Bldg., Phila.

★Brass Service Pipe Fittings, etc.—Baltimore, Md.—Bd. Awards let contract to A. P. Smith Mfg. Co., Norman St., East Orange, N. J., furnishing brass service pipe fittings, including 4800 stop cocks (all sizes), 825 brass plugs, 400 special couplings, 300 tail pieces, 4700 assembled services, etc., cost $15,632, to Lead Lined Iron Pipe Co., Wakefield, Mass., lead lined iron pipe and couplings, including 50,000 ft. ¾ in., 1200 ft. 1 in. and 1000 ft. 1½ in. lead pipe, $10,884. Noted June 19.

★Dry Dock—Pensacola, Fla.—Bruce Dry Docks Co. of Pensacola plans to build 5000 ton dry dock here. About $450,000. T. H. Johnson, chn. Work will be done by day labor.

★Conduit—Detroit, Mich.—Pub. Lighting Comn. let contract furnishing labor and material for building 5½ mi. conduits, to Contg. & Material Co., South La Salle St., Chicago, $213,583. Noted July 3.

★Sheds—Duluth, Minn.—Marshall, Wells Co., Lake Ave., S., let contract building 1 story, 100 x 120 and 100 x 300 ft., rein.-con., brick and steel storage sheds, rein.-con. flooring, concrete foundation, to Austin Co., 16112 Euclid Ave., Cleveland, O., $36,250.

Paving Material—St. Paul, Minn.—H. W. Austin, purch. agt., City Hall, received bids furnishing following material to be used for paving Woodlawn, Fairmont, Princeton, Sargent and Goodrich Aves., St. Clair St. and Mt. Curve Blvd.; 5364 sq.yd. vertical brick paving blocks, from Purmgton Paving Block Co., $1.25 f. o. b. St. Paul; 4950 bbl. Portland cement, St. Paul Builders' Material Co., 606 Ryan Bldg., $2.35 per bbl., Gopher Lime and Cement Co., Griffs St. and Fuller Ave., $2.35 per bbl.; 2124 cu.yd crushed rock, St. Paul Crushed Stone Co., Stewart and Victoria Sts., $2.45; J. L. Shiely Co., 202 Bartles Flat Iron Bldg., 2124 cu.yd concrete sand, $1.70, 406 cu.yd crushed rock or granite for curb, $2.65, 559 cu.yd. fine asphalt sand, $1.50, 418 cu.yd. coarse asphalt sand, $1.25; 53,640 lb. asphalt filler, Sun Co., 2824 10th Ave., S., Minneapolis, $23.10; 402,520 lb. apshalt cement, Camden Petroleum Co., 208 South La Salle St., Chicago, $18.95, tank cars; 442,772 lb. limestone dust, Minnesota Crushed Stone Co., 1500 N. E. Johnson St., Minneapolis, $4.60; trap rock for asphalt concrete, W. T. Lemon, 1204 Pioneer Bldg., $2.50; rough pine headers, Brooks Bros., 1923 University Ave., $46 per M; sewer brick, Cornin & Donohue Brick Co., 613 Ryan Bldg., Gopher Lime and Cement Co., and Builders' Material Co., each $18; 296 lin.ft. curb reinforcing bar, Concrete Steel Co., 440 Builders' Exch., Minneapolis, $0.145; V. C. sewer pipe, Gopher Lime and Cement Co. and St. Paul Builders Material Co., both $0.50; 6 standard catch basin tops, W. H. Ulmer Co., foot Chestnut St., $16.25; 5430 lin.ft. 6 in. V. C. sewer pipe connections, Gopher Lime and Cement Co., and St. Paul Builders' Material Co., both $0.20.

Tanks—Portland, Ore.—Pub. Dock Comn. received bids building (a) two 5000 bbl., (b) two 2500 bbl., (c) two 1000 bbl. steel tanks, from Astoria Marine Iron Works, Corbett Bldg., (a) $14,048, (b) $4255, (c) $2556; R. Wakefield, Worcester Bldg., (a) $13,591, (b) $4738, (c) $3294; McDougall-Overmire Co., Portland, (a) $14,600, (b) $4600, (c) $3000. Noted July 3.

Pier—Manhattan Beach (Manhattan P. O.), **Cal.**—City received bids building deck and upper works of rein.-con. pleasure pier, from Foundation Co., Holbrook Bldg., San Francisco, $32,690; C. D. Sotiras, 775 East 14th St., Los Angeles, $38,105; W. M. Ledbetter Co., Pacific Electric Bldg., Los Angeles, $44,500. Former bids rejected. Noted Apr. 17.

★Wharf—St. John, N. B.—City let contract building wharf, to Engrs. and Contractors Ltd., 102 Prince William St. About $28,500.

★Wharf—Magog, Que. — Dominion Government, Ottawa, let contract building here, to T. P. Charleson, 149 Gilmour St., Ottawa, 19,924.

★Ice Breakers—Richmond, Que.—Dept. Pub. Wks., Ottawa, Ont., let contract rebuilding ice breakers, to T. P. Charleson, 179 Gilmour St., Ottawa, Ont. About $10,407. Noted May 22.

★Breakwater—Ft. William, Ont.—Dominion Government, Ottawa, let contract building breakwater as extension to revetment wall and wharves at entrance to Mission Channel, here, to Port Arthur Constr. Co., Ltd., Excelsior Life Bldg., Toronto About $381,000. Noted May 29.

★Tower—Prince Rupert, B. C.—Dept. Marine, Ottawa, Ont., let contract building rein.-con. lighthouse tower, 40 ft. high, and frame dwelling on Barrett Rock, here, to M. Stockley, Prince Rupert. About $20,000 Noted Apr. 24.

★Wharf—Victoria, B. C.—Dept. Pub. Wks., Ottawa, let contract repairing 41 x 482 ft. wharf at Williams Head Quarantine Station, 9 mi. southwest of here, to W. Greenlees, 47 Cordova St., Vancouver About $19,415. Noted Apr. 17

OFFICIAL PROPOSALS

OFFICIAL PROPOSALS

Bids: July 15.

Barge Canal Terminals

STATE OF NEW YORK
OFFICE OF SUPERINTENDENT OF PUBLIC WORKS

Albany, June 16th, 1919.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until 12 o'clock noon of Tuesday, July 15, 1919, at which place and hour they will be publicly opened and read, for the construction of Barge Canal terminals pursuant to the provisions of Chapter 746 of the Laws of 1911, and of the acts amendatory thereof, as follows:

—1—

TERMINAL CONTRACT NO. 43

For constructing a Barge Canal terminal and a frame freighthouse at Flushing, Borough of Queens, New York City.

Contract plans, sheets 1 to 10, inclusive.

—2—

TERMINAL CONTRACT NO. 112.

For furnishing, delivering and testing industrial freight-handling trailers and stevedore freight-handling trucks for Barge Canal terminals in New York City:

Contract plans, sheets 1 and 2.

Plans may be seen and detailed specifications, engineer's estimate of quantities, proposal blanks, forms of contract and bonds required and other information for proposers may be had at the office of Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y., at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., at the canal office, Spaulding's Exchange, Buffalo, N. Y., and at office of State Engineer, Hall of Records, New York City.

Copies of detailed plans or drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the City of Albany or New York, issued by a national or state bank or trust company in good credit within the state and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

Special price for Official Proposals, $3.60 an inch — Copy for Official Proposals can be received until Wednesday, 10 a.m., for issue out the next morning.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

OFFICIAL PROPOSALS

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the state for doing the work, and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner, if, in the judgment of the undersigned, the interests of the state will be enhanced thereby.

E. S. WALSH,
Superintendent of Public Works.

OFFICIAL PROPOSALS

Bids: July 22.

Highway Work

Albany, N. Y.

OFFICE OF THE STATE COMMISSION OF HIGHWAYS, ALBANY, N. Y.

Seald proposals will be received by the undersigned at their office, No. 55 Lancaster Street, Albany, N. Y., at one o'clock p.m., on Tuesday, July 22nd, 1919, for the improvement of the following highways:

CATTARAUGUS.....(one highway: 4.60)
CHATAUQUA.....(one highway: 4.29)
CHENANGO.....(three highways: 4.78; 5.57; 5.87)
LEWIS.....(one highway: 4.74)
ONONDAGA.....(one highway: 0.27)
RENSSELAER.....(one highway: 1.44)
SUFFOLK.....(one highway: 3.85)

Also for the completion of the following highways:

CAYUGA.....(three highways: 8.00; 6.06; 5.45)
CHATAUQUA.....(one highway: 3.90)
CHENANGO.....(three highways: 7.12; 7.09; 3.06)
FRANKLIN.....(one highway: 10.36)
NIAGARA.....(one highway: 7.79)
OSWEGO.....(one highway: 6.36)
SARATOGA...(two highways: 6.10; 5.74)
SENECA.....(two highways: 4.89; 2.13)

And also for the repair of the following highways:

ALLEGANY, SCHUYLER & STEUBEN... (one contract—surface treatment)
OSWEGO.....(one contract—resurfacing)
SUFFOLK..(one contract—reconstruction)

And also for the completion of: Repair contracts

CHENANGO...(one contract—resurfacing)
CORTLAND...(one contract—resurfacing)

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commission in Albany, N. Y., and also at the office of the division engineers in whose division the roads to be improved, completed and repaired are located. The addresses of the division engineers and the counties of which they are in charge will be furnished upon request.

The especial attention of bidders is called to "eGneral Information for Bidders" on the itemized proposal, specifications and contract agreement.

FRED'K STUART CREEME,
Commissioner.

ROYAL K. FULLER,
Secretary.

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., June 27, 1919.—Sealed proposals will be opened in this office at 3 p.m., July 25, 1919, for furnishing materials for the construction of the United States Post Office at Dawson, Georgia, including materials for concrete, reinforced concrete, stone, granite, brick, structural terra cotta, structural steel, miscellaneous iron and steel work, composition roofing, slate roofing, sheet-metal work, skylights, plastering, interior marble, sanitary slate, lumber, millwork, painting, glazing, hardware, plumbing, heating, electric work, etc., in accordance with drawings, specifications and bills of quantities attached thereto, copies of which may be obtained from the Custodian of site at Dawson, Ga., or at this office, in the discretion of the Supervising Architect. Jas. A. Wetmore, Acting Supervising Architect.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—James H. McGraw, President

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, Editor — Charles Whiting Baker, Consulting Editor

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Excess Water in Cement Glue

CEMENT, sand and stone without water will not become concrete, but water beyond that necessary to provide the right consistency of glue to hold together the inert materials is a weakening element, not only because it reduces the strength of the glue but because it permits voids. It is only within recent years that the glue strength theory has been studied, but ever-growing tests are indicating its plausibility. Thus, the high-pressure tests reported on another page by Professor Wiskocil were apparently initiated on the void theory. The more water squeezed out of concrete, the closer together the particles would pack, and consequently the higher the strength which would result. Within limits this was proved, but it was also shown that strength did not increase proportionately with density. Evidently, some of the water squeezed out of the concrete was waste material in so far as helping in the development of a maximum strength glue was concerned.

City Transit Developments

STRIKINGLY new aspects of transit improvement in large cities are brought to view by recent developments in Pittsburgh and Cleveland. Both cities are on the way to shelving their plans for rapid transit and taking up instead means for increasing the efficiency of their surface-car systems by facilitating car movement in the congested districts. Pittsburgh, by vote of the people, has just adopted the administration's bond-issue proposal, and thereby decided in favor of building a $6,000,000 underground street-car loop encircling the business district, a project described in *Engineering News-Record* of May 29, 1919, p. 1059. Cleveland has been advised by its consulting engineers on rapid transit to undertake a similar enterprise, different only in detail. These events mark a significant change in thought on transportation problems in large cities, which hitherto has concerned itself with little other than rapid transit. The long-haul possibilities of the existing surface-car systems are evidently attracting attention strongly enough to justify the study of radical schemes for developing them. Much further growth of thought in this direction may be anticipated. But there is another significant point to be realized. Hitherto it has been only dimly appreciated that the study of city transit problems is the municipal engineer's responsibility—and one of his most weighty and most difficult responsibilities. Transportation, the city's life current, is presenting ever more complex problems, and the municipal engineer ultimately must deal with them. Today they are only too generally left unconsidered. Such developments as that at Pittsburgh, however, make it clear that we are approaching a definite realization of the fact that municipal engineering includes transportation.

Street-Car Loop Subways

REMOVAL of street cars from the surface of crowded business districts has many attractive possibilities. Commercial life is nowadays so seriously hampered by street obstruction that when the street cars are removed from the surface large benefits will unquestionably be derived. These benefits, however, have not yet been explored by study or determined by experience. The subject is in effect brand new; Boston and Philadelphia can hardly claim to furnish adequate data. Outside of the consequential benefits, however, street-car subways hold out little promise of producing cash returns. There will, no doubt, be a large traffic increase when the cars can move freely instead of having to pierce the downtown traffic blockade, which will mean increased revenue. But on the other side of the ledger is a very great first-cost item—six millions for Pittsburgh, fifteen millions for Cleveland. And this must be charged wholly to street-car operation, for it is idle to expect that the subway loop will later on be taken away from the street-car system and given over to rapid transit. It will remain a permanent item of the street-car plant. The investment is so large, moreover, that it is sure to delay rapid-transit construction by some years. It is therefore of primary importance that the costly loop projects should be worked out on sound engineering principles; otherwise they may easily bring disappointment. Capacity and traffic distribution are matters needing specially careful study. Unless the traffic capacity is increased and unless concentration of traffic is reduced, the full benefit of the system cannot be obtained. It remains to be seen whether the plan of turning a dozen or more lines into two terminal tracks, as the Pittsburgh project contemplates, will allow the radiating car lines to develop maximum capacity. The Cleveland project, which we hope to be able to describe next week, is interestingly different in its terminal characteristics. On the other hand, distribution of traffic as secured by the Pittsburgh ring-main of transit is sure to prove advantageous. Downtown centralization is an ever-present evil in the growing city.

Engineers Should Study Legislative Bills

THAT engineers need to consider the wording as well as the general purpose of legislative bills which affect them or their work, is indicated by an incident connected with the bill recently passed by the Illinois legislature for the proposed deep waterway from the Chicago Drainage Canal to the Illinois River, which is estimated to cost some $20,000,000. As drafted, the bill provided that proposals for all contracts over $5000 and proposals for the lease of water power should be advertised "for at least four weeks in a daily newspaper printed in the City of Chicago and in such other publica-

tions as may be deemed proper." Whether this was due to lack of understanding or to the unenlightened policy of trying to limit the work to local bidders is not evident. In the bill as amended in the house and now signed by the Governor this clause relating to the publication of notices of proposals provides as follows: "Notices shall be previously published at least once a week for four weeks in two daily newspapers printed in the City of Chicago and in two engineering and contracting journals of general circulation in the United States and in such other publications as may be deemed proper." Whoever proposed and secured this important change did good work in the interest of the State of Illinois as well as in that of the engineering construction industry.

The Tale of a Bypass

"FOR want of a horseshoe nail" might well be paraphrased as follows: But for a bypass filter valve many a mother in Moline, Ill., might still be supported in comfort by her son taken by typhoid.

A chain of circumstances is usually responsible for a sudden single outbreak of typhoid, but modern sanitary science has so well educated those placed to control these circumstances that the germ has little chance of getting to its victim past all the sentinels. In the first place, physicians and nurses are supposed to sterilize or burn all dejecta. Then, in many cases, sewage is treated before discharge into water courses, and, once it is discharged, the dilution is so great that the separate bacteria die out in an untoward environment. Most water-works intakes are located far enough away from sewer outlets to permit this action to take place. Once inside the modern water-works system, the life of a germ is constantly jeopardized by long-time settling, coagulant entanglers, efficient filters, and finally, a death-dealing dose of chlorine. Even then, in case of an emergency break-through, citizens contribute one last hurdle in the way of boiling.

Moline typhoid germs seem to have been plentiful and of a particularly hardy nature. In addition, as explained on page 1264 of our issue of June 26, 1919, the pathway along the whole typhoid route seemed to have been mercifully easy for the germ.

It is reported that lawsuits have been started in Moline to recover damages, but the fact that citizens have not, long ago, smashed out the particular bypass valve which admits the germs to the water system testifies to the forbearance or indifference of an apparently normal, well informed Middle West city.

Railway-Tie Preservation

PRESERVATIVE treatment of track ties is no longer an experiment. Its important relation to track maintenance and to timber conservation has been proved; yet the use of treated ties increases too slowly. Inertia and doubt on the part of railway purchasing and executive officials, lack of uniform care on the part of the manufacturer, and lack of understanding between the two parties, contribute to this result. The lack of mutual understanding is so prominent as to affect even cases where manufacture and consumption are closely related, as in a railway's own tie-preserving plant.

Occasional unsatisfactory results of tie treatment form no adequate reason for denying its advantages. They may be traced usually to carelessness in selection or handling of the ties. Good results cannot be expected where the preservative is applied to ties already rotting, where good ties awaiting treatment are stacked in such a way as to invite incipient rot, or where the impregnation is not adequate. But when ties are selected, stored, seasoned and treated properly they will always give efficient and economic service.

In tie preservation as in other matters, satisfactory experience is apt to get less notice than unsatisfactory. But there is no dearth of facts as to the success of tie treatment. Thus, one railway, with a large supply of tie timber that will give a life of only three to five years, found from advance calculations that treatment which would increase the life to eight years—the life of the untreated ties of better kinds of timber—would be economical. As a matter of fact, these treated ties promise to average 18 years' life. Again, a treated tie recently exhibited has been in main track on a French railway for 47 years and is still sound; and this one tie represents many thousands of similar ties. The larger European countries have, in fact, accumulated so much favorable experience that the use of treated ties is regarded as no more an experiment than that of steel rails or steel bridges.

War conditions have affected the tie-treating industry severely and have dislocated the programs of railway maintenance. With the more favorable conditions now opening, however, there is an opportunity to consider economies rather than emergencies. Preservative treatment of ties promises economy, reduction in track work, and improved track condition due to less frequent disturbance for tie renewals, besides conserving the timber resources of the country. These are strong arguments for a much wider use of preservative processes—and perhaps for more care in their application.

A Movement Without Definite Purpose

WISE prudence was displayed by the authorities of the American Society for Testing Materials when they decided, at the recent Atlantic City meeting, to defer action on the reorganization proposal of the Engineering Standards Committee. The committee would reorganize by making itself independent of the societies that founded it; setting up as an association, no longer under the control of the societies but standing above them and controlling work that they originated and fostered. For the American Society for Testing Materials this means virtually complete subordination, since all its essential work is the making of standard quality specifications. The society, in other words, is asked to become a subordinate committee; as the Standards Committee itself has described it, the proposed association would occupy the same relation to the societies as these now occupy toward their technical committees. Wisely, therefore, the society postponed action and concluded to take up the question in conference with the other societies.

Though the five societies are not at present equally concerned in the issue, they will unquestionably reach a sound final decision. The Mechanical and the Electrical Engineers have developed standardization and normalization in fundamentally important manner; the Civil Engineers and the Mining Engineers have done but little in this field. It would not be unnatural, then, were the latter societies to regard the question with in-

difference, since their present work would be but slightly affected. In principle, however, the issue is vital for all the engineering societies: Shall they subordinate themselves to an outside organization with respect to some of their best work?

Serious consideration is also invited by the conditions that led up to the reorganization proposal. The authorities of the American Society for Testing Materials were impressed with the fact that the committee appears to have made no sincere endeavor to carry out its original instructions, and this, no doubt, formed the basis for their disapproving statement that the proposed reorganization "is not looked upon with favor at this time." The statement gives a hint that the Standards Committee failed to consider the situation in which it placed itself and the societies, that it misappreciated the psychology of the relation. Formed by five engineering societies only last October, under specific instructions from and responsibility to these societies, the committee now, after very few months, comes before the societies without any showing of work done, without any evidence of having tried to carry out its mandate, and asks for wider authority and less responsibility—in fact, unlimited authority and complete abrogation of responsibility. This is not a course of action to command confidence.

Actually, the case is even a little worse. The original constitution of the committee was drawn virtually by the leading men of the committee itself, as they also were leaders in the organizing committee that developed the entire project. Nearly two years were spent in working out the form of organization; yet hardly had the societies given their approval and the committee been organized when it lost faith in its own constitution and undertook to start over again on a radically altered basis. Obviously, stability of purpose, that indispensable ingredient, was lacking. A great national movement was attempting to get under way lacking the backbone of stable purpose.

Has any definite purpose been exhibited by the committee at any time? Its actions must supply the answer: They consistently evidence lack of aim, of objective. From its first days the committee has gone no farther than to say that it would deal with "engineering standards"—a term that means many things to many men. Had the committee been animated by a vital, forceful conception of its mission and its field of work, we may be sure that that conception would have impressed itself on the organic document of the whole movement, the constitution. Definite purpose would have inspired the committee, when it took up active work, to institute a survey of its field and map out its course. But this, too, was not done.

There was no purpose, no definite objective, to guide the committee itself last January, when another group of men met in Washington to plan for writing advisory rules on fire protection and safety of elevators and ladders, industrial protection, and perhaps building ordinances. No one knew whether the term "engineering standards" was elastic enough to stretch over this field. The decision was reached to absorb the Safety Code Conference, by reorganizing the committee; yet not a word concerning this is to be found either in the new constitution or in the statement and argument presented in support of the reorganization proposal, nor is there any certainty that the important safety code work will, if the reorganization goes through, be carried on, or whether it will be allowed to die. Lack of aim has been the dominant characteristic throughout.

Clearly, some purposeful planning must be done if the right end is to be attained. There is need, too, for thinking of the broadly coöperative nature of the standardization project. Information concerning the object, scope, and proposed means must be spread widely if the support of engineers throughout the country is to be obtained. No such educational process has been carried on by the committee. It has not sought publicity. It has been rather resentful of public discussion. Much must be done, and much must be undone, if the profession is to join actively in the work of either committee or association—as the societies may decide.

Because engineers have had no opportunity to become familiar with the standardization movement, the numerous desires for centralized action of one kind or another toward the preparation of uniform rules have remained formless, and have not been weighed or coördinated. Unfortunately, many of them are narrow in interest and clearly not suited for national action; their proponents, however, rightly seeking the advantage of most authoritative decree, are hopeful that they may be able to back their purposes with the strength of all the national engineering societies, through a joint standardizing body. The situation is large in its good and evil possibilities. Purposeful clearness of thought will do much toward sifting out and coördinating the many heterogeneous notions now afloat. On the governing boards of the societies now rests the burden of bringing about this result, primarily by outlining the vital objects and limits of central standardization.

We have said that "engineering standards" means many things to many men. Few words, indeed, are so popular or so loosely used. Engineers talk of standard highway signs and pavement crowns, standard bridge loadings and details, standard car couplers, airbrakes, and pullman cars; standard fireproof construction, I-beams, screw threads, and wire splices; standard inches and standard frequencies, standard aëro engines, ships and life preservers. The word is applied in miscellaneous variety of meanings to boilers, bushels, and building ordinances, to train order codes, trolley wheels, and shovels, to catchbasins, auto parts, door sizes, and pipe taps; it is applied to time, to thermometers, to fire hose, and sometimes even to coal sizes, water purity, milkfat percentages, and college curricula. And President Clamer recently suggested that factory cost-keeping systems might be included in "engineering standards." Equally inchoate are the purposes animating different men in discussing standardization; among them are commercial convenience, interchange, foreign trade, safety, legislative uniformity, and broad ideas of internationalism. Which are purposes that may properly be the basis for action by engineering societies? What kinds of products, processes and rules are proper subjects for "engineering standards"?

It may be possible to crystallize a sound program of action out of the existing infinite mass of vague possibilities. Could the committee have applied its varied abilities to a broad-gage study, a sorting and coördinating from which such a program would have emerged, one proper for technical societies to carry out, it might have done the country and the engineering profession a service of lasting value. But because of the committee's fundamental lack of purpose, that work remains to be done by the societies.

Dam Foundation Placed by Suspended Pneumatic Caissons

Difficult Problem in Getting in Footing in Deep and Swift Water in Narrow Gorge at Lowest Part of Canadian Dam—Caissons Sunk in Rock Formation

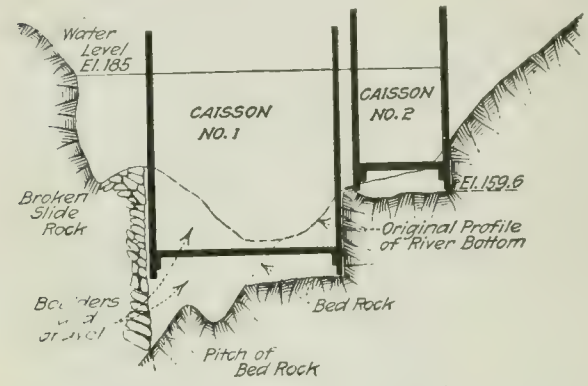
CONCRETE pneumatic caissons were used in making the closure of the Spanish River at High Falls, in northern Ontario, in the foundation of the new concrete dam being built there for the International Nickel Company.

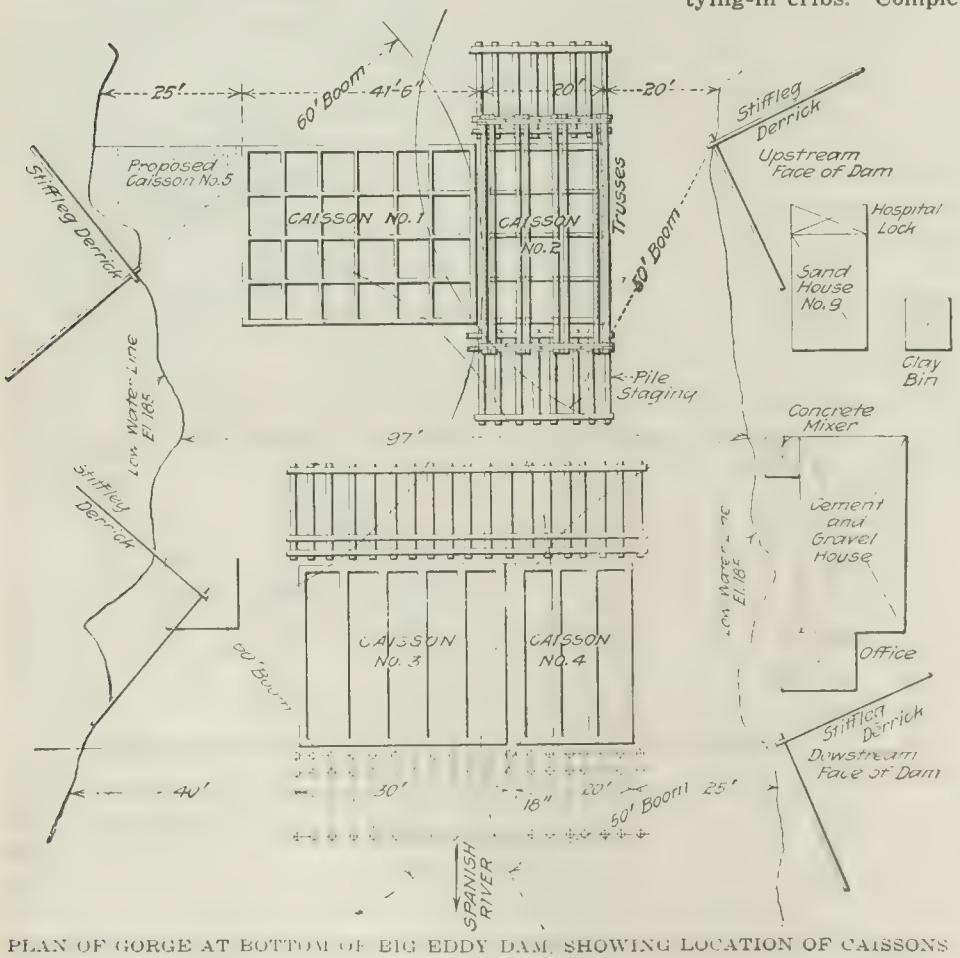
Furthermore, because of the difficulties found in launching and the use of a concrete working chamber, the caissons were built in place suspended from temporary trusses and were lowered to the rock through which they were then sunk. The work was all carried on through the severities of a Canadian winter, in a district that is well isolated from the centers of population.

The structure, which is known as the Big Eddy dam, is to provide storage in connection with an existing power plant which supplies current to the company's plant at Copper Cliff, Ont., 25 miles distant. The project in general besides the dam includes clearing the flooded area, which consists of approximately 6000 acres extending 20 miles north of the dam. The dam itself is a gravity concrete section about 1000 ft. long, 100 ft. high above the existing water level, and 145 ft. above the river bottom. The river at this location runs normally through a narrow rock gorge, which is only 130 ft. wide and has a normal water depth of about 45 ft. and a maximum depth of 55 ft. During flood stages the flow rises as high as 16,000 sec.-ft., and the minimum flow is 1600 sec.-ft. The only underwater work for the dam was that in the closure of this narrow gorge.

The original scheme of construction contemplated the sinking of two reinforced-concrete caissons at the upstream and the downstream limits of the dam footing, and with these caissons as cofferdams to lay dry the intermediate area and to fill in the footing with concrete.

So far this scheme has been carried out as designed, except for the addition of a smaller concrete caisson at one upstream side of the gorge, where a fault in the rock formation was found which required a more complete closure than that which would have been afforded by the cribbing designed to extend from the caissons to the sides of the rock wall. So far the four main caissons have been placed and work is now going on in the construction of the smaller caisson and of the tying-in cribs. Complete closure will be made by driving sheet piling to close up the small openings between the caissons.





PLAN OF GORGE AT BOTTOM OF BIG EDDY DAM, SHOWING LOCATION OF CAISSONS

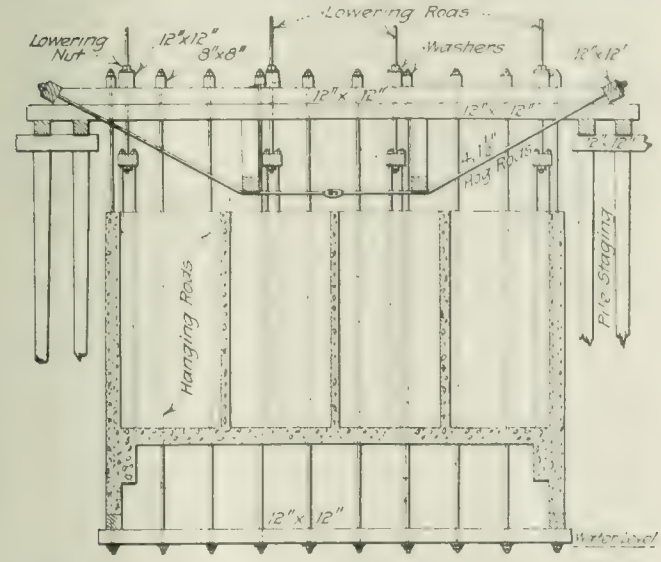
Because the caissons could not be launched, a special method of suspending them had to be devised. This consisted in placing up and downstream of each caisson temporary pile trestle bents, between which timber trusses were built. From these trusses the concrete caissons were hung during their construction, and they were lowered until they reached the rock through which they were driven. The sketch plan of the gorge and the caissons shows all five caissons, but illustrates the timber suspension system for only one, caisson No. 2.

The procedure was as follows: First, a templet giving the correct size of the caisson was made of timber and floated into position. Timber pile bents, six piles to each bent, were then framed on shore for their full height after soundings had been taken to determine that



GORGE ON SPANISH RIVER IN ONTARIO WHERE PNEUMATIC CAISSONS WERE SUNK FOR DAM FOUNDATION

height, and were swung into place by the derricks seated on the adjacent rock wall. These piles had no penetration, but to make certain that their bearing



METHOD OF SUSPENDING CONCRETE CAISSONS FROM TEMPORARY TIMBER TRUSSES

was good the pile points were packed about on the bottom with concrete in bags placed by divers, and the bents were thoroughly interbraced. The trestles, as noted, were only up and downstream of the caissons and not on the sides. The wooden trusses, as shown in one of the views and in the detail of the suspension system were then seated on the bents to carry the load of the caisson during its erection. Long rods, at the bottom of which were fastened wooden timbers, were suspended from these trusses, and on the timbers the cutting edges were placed and located in their proper positions. Concrete forms were then built up, the reinforcement was placed, and the concrete caisson was built as high as clearance permitted. After the concrete had set up, the load was transferred to a set of threaded rods which had been embedded in the roof of the working chamber, and the main suspension rods and the carrying timbers below were removed.

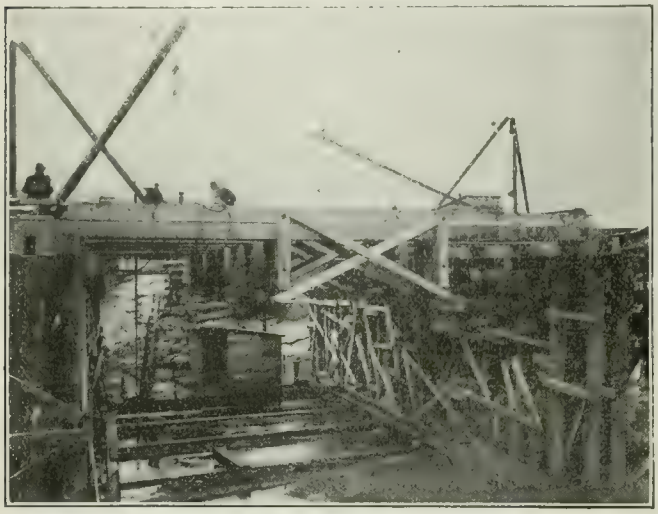
The threaded rods passed through nuts on plates carried on the top chords of the trusses. By the loosening of these nuts the caissons were lowered as required. As they were lowered and the load was reduced on account of the buoyancy of the water, additional heights of the caisson were built up.

Before the caissons were placed, the river bottom, which was very irregular, was roughly leveled off by means of submarine drilling and blasting. As shown in one of the views, this drilling was accomplished with 3½-in. steam drills erected in leads on small floats. The depth of the holes was approximately 20 ft., and as there was about 20 ft. of water where they were working, the steel used was 42 ft. long. The bottom thus blown out was sounded, and if not level enough to seat the caissons uniformly it was further leveled by means



CAISSONS NOS. 1 AND 2 AT UPSTREAM FACE OF DAM FOOTING

proceeded in the usual manner, except that it had to be all through rock, which added somewhat to the difficulty of the operation, on account of the necessity of considerable mudding to provide against excessive loss of air. The rock in most instances was very hard, though that on the west side was somewhat softer. Where it appeared the contact between gneiss and schist resulted in the additional caisson being sunk. At

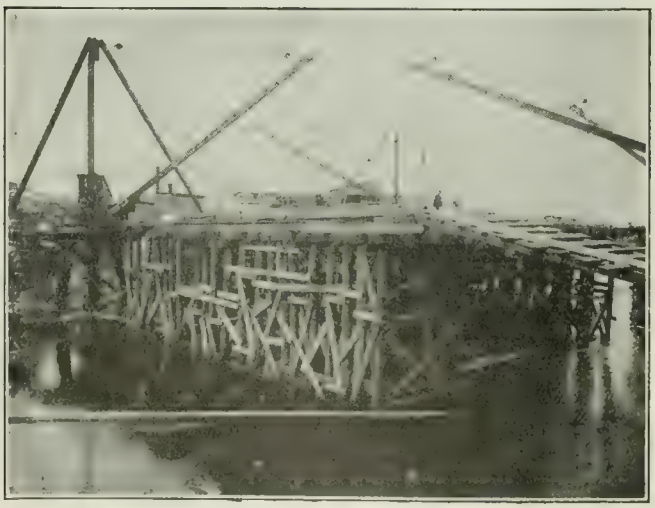


TRUSS SUSPENSION FOR REINFORCED-CONCRETE PNEUMATIC CAISSONS

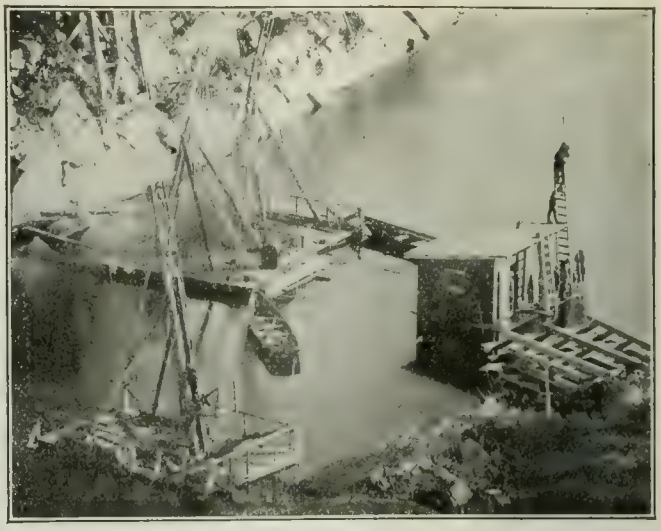
this location concrete bag piers were built up for the cutting edge to rest on and were cut out as the caisson sank in the same manner as was done with the adjacent rock.

The work was carried on through an Ontario winter, which, while somewhat above normal, was very cold for anyone not used to such weather. The contractors were particularly fortunate in that the temperature did not get below —28° F. Frazil ice interfered somewhat with the work, owing to its tendency to lodge on the pile bents and build up a temporary dam. One time such a dam caused the difference of 4 ft. between the upstream and the downstream levels of the water.

Air went onto the caissons Dec. 15, 1918, and was taken off Mar. 17, 1919. During this time considerable care was exercised in protecting the placed concrete



TIMBER TRESTLES FROM WHICH CAISSONS FOR DAM FOUNDATION WERE HUNG



THREE-INCH STEAM DRILLS PREPARING BOTTOM FOR CAISSON SEATING

against cold by means of tarpaulins outside of the caissons and salamanders inside. A fairly elaborate camp and construction equipment layout was provided for the work, although there was not so much of this needed for the part which has been described. A power house for furnishing air to caissons and drills had to be put in, because the nickel company needed all the power it had to take care of its war work in its other plants. The camp accommodated 700 men of all classes of labor, of whom 105 were sandhogs.

All the work is being done by Fraser Brace & Co., contractors, of New York City, for the International Nickel Company.

Tunnel on Pennsylvania Railroad Damaged by Gasoline Fire

A train fire in the Sabula tunnel of the Pennsylvania R.R. on April 30 did serious damage to the tunnel. It resulted from the wrecking of a freight train in which were two tank cars containing 15,000 gal. of gasoline; these were destroyed by the fire. The tunnel is single-track, 1964 ft. long, 26 ft. wide, with semi-circular arch, and is lined with sandstone; it has been in service since 1874. From a report made to the operating department of the railroad, the main facts of the remarkable accident are: An eastbound train was stopped, just after the engine had emerged from the east portal, by a break between the eighth and ninth cars, the ninth car being about 100 ft. inside the tunnel portal at the time. Some distance back of this point a fire was seen in the tunnel, at the location of the gasoline tank cars already referred to. Within 10 or 15 minutes rock could be heard failing from the roof of the tunnel. The rear half of the train was uncoupled by a brakeman and hauled out. The fire burned for 42 hours, and destroyed eight of the 16 cars left in the tunnel. Fire engines from Dubois, Penn., helped in extinguishing the fire by pumping water from a nearby lake. Subsequent examination showed that 155 ft. of the tunnel roof had caved in, covering five cars and completely blocking the tunnel. For a distance of 600 ft. west of here the arch stones were so badly burned that they crumbled easily, and the arch was distorted, sagging as much as 22 inches in places.

Sewer-Construction Records Used at Scarsdale, New York

Daily Record Blank, Rock Book and Sample Headings From Final Estimate Book Used on 22 Miles of Sewers

By Perry Thompson
Yonkers, N. Y.

FIELD-OFFICE records of sewer construction at Scarsdale, N. Y., were more complete than usual, partly because the field work was begun in January of a severe winter when the instrument men were compelled to stay in on many days. The time thus made available was devoted to a variety of work preparatory to record keeping. This facilitated the work of the resident engineer when the rush of construction was on. Samples of the record, with comments, are here given. The aim was to combine simplicity, accuracy and completeness.

As the work was begun during a period of depression, just before the great war, when labor and material were plentiful and cheap, and was completed during the war, when the opposite condition prevailed, no attempt was made to keep a record of unit costs other than that obtained by averaging with the use of total quantities and total costs.

The well-known unit-cost system, so flexible and specially suited to sewer work with its many uncertainties, was adopted, and although an effort was made to cover every contingency, the system was supplemented

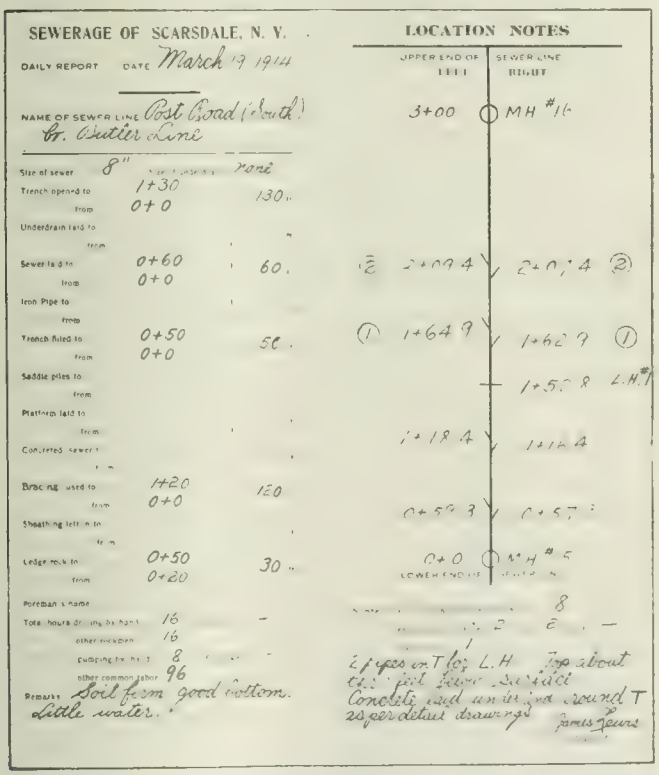


FIG. 1. DAILY RECORD BLANK OF SEWER CONSTRUCTION
Original on 8 x 11-inch sheets

by the percentage system for use in case a price agreement could not be reached on work not originally provided for. This gave the engineers and the village an opportunity to order changes, with satisfaction to both parties to the contract and without risk of litigation.

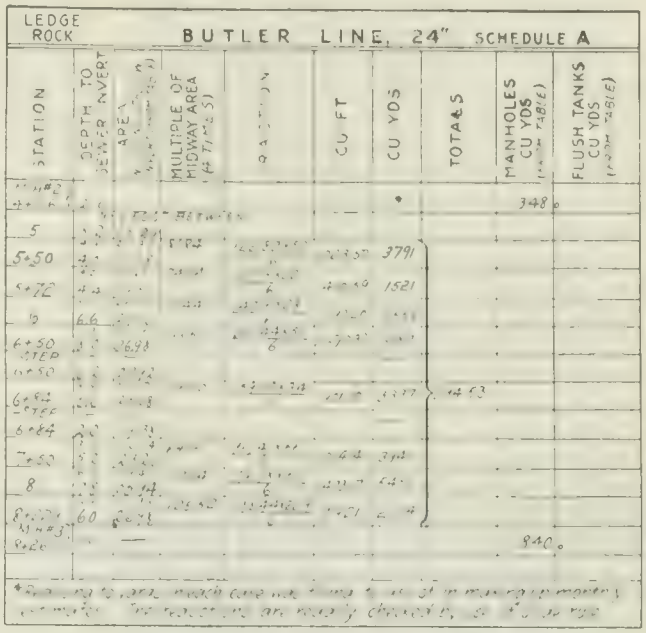


FIG. 2. ROCK BOOK ON SEWER-CONSTRUCTION WORK

The work comprised some 22 miles of sewers. There was much rock excavation, 26½ ft. being the deepest trench. The main contract work extended from March, 1914, to October, 1915, but four contracts for extensions continued the work until December, 1917. Hagar & George, of White Plains, N. Y., were the principal contractors. Waring, Chapman & Farquhar, of New York, were engineers, and the writer was resident engineer.

Some of the winter work already mentioned as preparing the way for record-keeping was: Indexing rate books, profiles (front, center and ends of rolls by reference to letters along tops of same); preparing rock books, final-estimate book, etc., as far as such work could be carried at that time; making index maps on white prints by showing in different colors the locations and numbers of manholes, drop manholes, lamp-holes and flush tanks, and the number of location book or grade book in which any line could be found; preparing grade books and from them lists of cuts for field and office use; numbering pages of record-books for manholes, lamp-holes and flush tanks (these needed no indexing because the page numbers corresponded with the manhole numbers, etc.); preparing cross-sectional area tables for rock in trenches accommodating different-sized sewers at depths from 0 to 26 ft. or more, with an increase of 0.1 ft. and a slope corresponding to the specifications, allowing 6 in. below sewer invert; preparing quantity tables for rock in manhole (plain and drop, with amounts to be added in case an underdrain ran beneath) and flush-tanks; preparing a table of quantities of concrete to be laid around pipes in standard and special sections per foot of sewer; making lists of manholes, drop-manholes, lamp-holes and flush-tanks, with their numbers; making a list of sizes, amounts and locations of iron pipe needed; preparing a list of schedules according to street names and private property lines (sometimes two schedules to one street if long, especially if there were two sizes of sewer); placing headings in rock book (Fig. 2) allowing eight lines per 100 ft. of sewer; and placing headings in final-estimate book (Fig. 3), allowing plenty of space for indeterminate quantities.

The list of cuts was taken from the last column of each page of the grade books; it was made in duplicate and proved to be one of the most useful things made during time which would otherwise have been lost. The carbon copy was of great assistance to inspectors and foremen, the former in making out their daily reports (Fig. 1), while the original copy was used in the office for determining quantities of various classes of work, recording extras and checking up and making monthly estimates. It was specially useful when an estimate of cost of completion of work was desired or when the leveler had the grade-books in the field. But the list of cuts was not allowed to take the place of the grade-books, which were carefully watched for changes made in the field.

The engineer visited each trench daily and collected the reports, which were taken to the field office. The various regular and extra items, excepting ledge rock, were entered under appropriate headings on yellow pad sheets which were found to save time and confusion due to rehandling the daily reports. As each item was recorded it was checked off on the report, and the report was then handed to the draftsman, who plotted the Y-branches, lamp-holes, manholes, etc., checked off the report and filed it away under its schedule. When a stretch between two manholes was completed, the totals were transferred from the yellow pad sheets to the final estimate book, and they were checked off on the pad sheets.

In the case of Y-branches, etc., these totals were compared with the plotting of the work as constructed. The main items, consisting of the various classes of sewer completed, were taken from the list of cuts and checked by the grade-books when in the office.

For extra work, extra orders were issued to the contractors, and were on printed forms arranged to give two carbon copies and numbered. One copy was retained by the engineer, and the other was furnished to the sewer commissioners.

Levels on ledge rock were taken by the leveler at every change of direction of its surface. Where the surface was uniform, the stations were taken at some multiple of 6 ft. (averaging 18 ft.) to facilitate the use of the prismoidal formula in calculating its volume. The notes were kept in numbered and indexed level books, and were checked off as plotted on the sewer profile, where the rock surface was shown in brown to distinguish it from the street surface in black and the sewer invert line in red. In some cases, where uniform, the rock surface was averaged by a fine pencil line on the profile, but in most cases all the stations and cuts were entered in the rock book (Fig. 2), where the areas of cross-sections were taken from a table previously prepared, as described above. As each section was transferred it was checked off in pencil on the profile.

As soon as a stretch of work between two manholes or at a manhole or flush-tank was excavated, the total quantity of rock was entered in the final-estimate book and checked off in the rock book. All rock calculations—and, in fact, every calculation—was checked by an assistant who used his initial as a check mark.

The daily records of manholes, flush-tanks, etc., were kept in small notebooks which were carried by the engineer because such construction work was frequently located at great distances from the inspectors, who had no means of transportation. When a manhole or flush-tank was finished it was entered in the final-estimate book and checked off in the notebook.

Monthly estimates of the value of work completed, on which part payments were allowed to the contractors, were started about the end of the third week in each month by getting ready the outline and the headings of the various schedules, some of which were complete and could be entered and closed; others could be partly included with safety. This permitted issuing the estimates promptly on the first of each month. As each item was transferred from the final-estimate book to a monthly estimate it was checked off by means of a small circle placed just before the amount in the final-estimate book. Each monthly estimate was a complete account of the value of work completed to that date, so that the final estimate was the same in form, and it checked the final-estimate book within a few cents, which discrepancy was due to an accumulation of fractional parts of a cent in the rock account.

24" VIT. SEWER
6 FT. TO 8 FT. DEEP, INCLUDING 8 FT.

1914		LOCATION	SCHEDULE	FEET	PRICE	AMOUNT
April	7	Between MH #4 & MH #5 (Butler Line)	A	2000	$.203	$406.00*
"	"	" " "				

*This sign indicates that the item has been included in the monthly estimate

Y-BRANCHES ON 24" PIPE

1914		LOCATION	SCHEDULE	NUMBER	PRICE	AMOUNT
April	8	Between MH #4 & MH #5 (Butler Line)	A	6	$4.00	$24.00*
"	"	" " "			"	

MANHOLES 6 FT TO 8 FT

1914	NUMBER OF M H	LOCATION	SCHEDULE	PRICE	AMOUNT
April 10	5	Butler Line, Angle S. of Butler & Ridge roads	A	$10.00	$50.00*
"				"	

MANHOLE DEPTHS EXCEEDING 8 FT.

1914	NUMBER OF M H	LOCATION	SCHEDULE	FEET	PRICE	AMOUNT
	91	Butler Line, North of Northrup Line	K	4.3	$3.00	$12.90*

ROCK
IN SEWER TRENCH

1914	LOCATION	SCHEDULE	CU.YDS	PRICE	AMOUNT
May 24	Between MH #4 & MH #5 Butler Line S. of Northrup Road	A	532.1	$.215	$114.83*
"	" " "			"	

ROCK
IN MANHOLE EXCAVATION

1914	STATION	NUMBER OF M H	LOCATION	SCHEDULE	CU.YDS	PRICE	AMOUNT
	0+0	191	Terrace Road, West of Parkway (Parkway 2 C Fridley 12 C)	F	140.4	$.215	$30.29*

CONTINGENT EXTRAS
STANDARD-A-SECTION
CONCRETE FOR SEWERS

LENGTH	SIZE OF SEWER	EXTRA ORDER NUMBER	LOCATION	SCHEDULE	CU YDS	PRICE	AMOUNT
273.5	24	3	Between MH #2 & MH #3, 54+16 & 234+72	A	21.02	$8.00	$248.16*
"	"	"	" " "				

CONTINGENT EXTRAS
— C —
SHEETING & SHORING

1914	EXTRA ORDER NUMBER	LOCATION	SCHEDULE	BOARD FT.	PRICE	AMOUNT
May 16	8	Between MH #5 & MH #6 (Upham Road)	P	1140.	$.3500	$39.90*

FIG. 2. SAMPLE HEADINGS FROM FINAL ESTIMATE BOOK, SEWER-CONSTRUCTION WORK

Concrete Pipe Fails From Unequal Expansion of Shell

Longitudinal Cracks in Unreinforced Pipe Conduit Seem To Be Due to Differential Movement Because of Partial Wetness

By G. E. P. Smith
Professor of Irrigation Engineering, University of Arizona
Tucson, Ariz.

FAILURE of a plain concrete pipe line in the arid country near Tucson, Ariz., was unexplainable except by some new theory of pipe failure. It has been decided that the characteristic longitudinal cracking of the failure was due to differential expansion of the shell of the pipe.

On account of the lack of scientific control in concrete pipe making in the past, there have been many failures of pipe lines. The most usual failure has been that due to crushing as a result of the weight of the backfill. Quite recently investigations have been made to determine the downward pressure of earth filling under various conditions, and a rational formula has been developed. It is expected that external-pressure testing machines for cement pipe will be established at each pipe factory, and that in the future pipe will be so designed that failures will become rare.

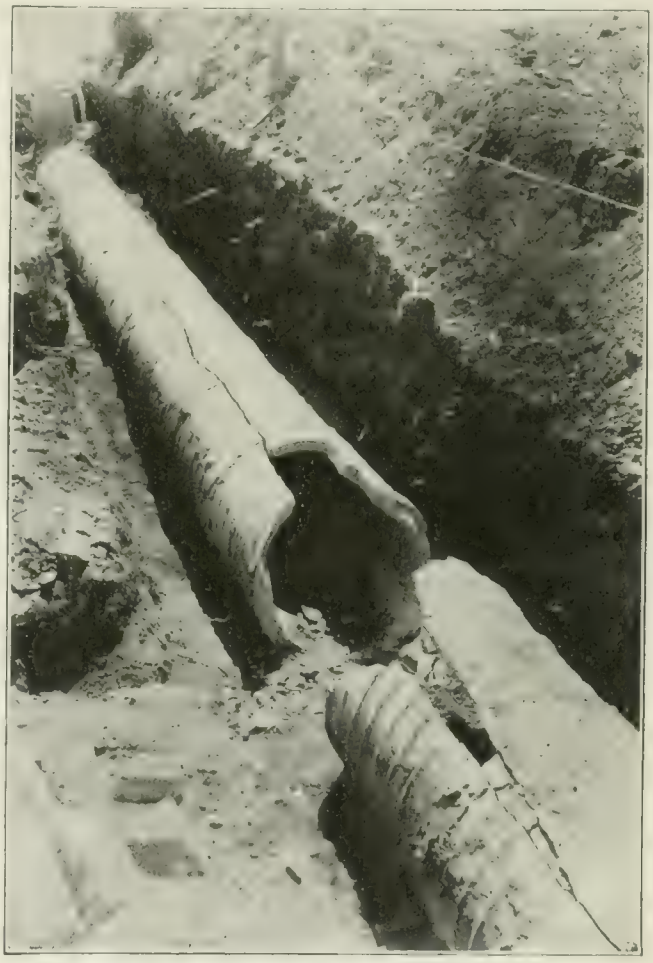
The design for internal pressure is simple, and pipe tests for resistance to internal pressure are not difficult to make. There have been few failures from this cause, and those only where hand-tamped pipe has been subjected to rather high heads. Improper design of pipe lines has been the cause of some failures due to water-hammer, especially where air has been trapped, in some instances the pipe being torn apart and thrown out of the trench. Unequal settlement and contraction soon after the pipe has been laid, usually the first night, have caused contraction cracks, which, however, are not considered serious and are quickly repaired.

The new type of failure recently occurred on a long main supply line near Tucson. This line is part of a large contract which had been under construction for some time. The pipe was made on a McCracken packer-head machine, and is exceptionally strong and dense. The main supply line is 20 in. in diameter. The failures have been by long, longitudinal cracks, usually at top and bottom. A view of a cracked pipe is shown herewith. Usually the cracks occurred soon after water was turned into the line, but in some instances cracks occurred where it was thought that no water had been admitted, although the soil was wetted from rain. As soon as the line was repaired and cured, and water was admitted, another crack would occur in some other part of the line, so that for two months the line could not be used. A crop that had been planted was lost, and the water-supply remained idle.

There seemed to be no assignable cause for these cracks. The hydraulic pressure was light. The depth of backfill in one instance was only 6 in., and the design was such that no air could be entrapped.

These failures were accompanied by the destruction of gate pits and division boxes also. A drawing which shows the cracks on the four sides of one of the gate pits is shown herewith. The nature of these cracks, and the measurements that were taken, show that the destruction of the gate pits was caused by the longitudinal thrust of the pipe lines. The expansion of the pipe lines could not have been due to change of temperature, but was due to change in moisture content. The 20-in. pipe was made during the summer of 1917, and was stored in the stock yard for several months prior to the laying. It was subjected, therefore, to the hot sunlight and the drying winds of a semi-arid climate. The expansion due to saturation after the pipe line was laid was sufficient to destroy the 4-in. concrete walls of the gate pits. Lines of pipe smaller than 20 in. in diameter, although subjected to drying out in the stock yard, did not fail by longitudinal cracks, but they did thrust themselves into the gate pits.

But how could longitudinal pressure cause longitudinal cracks? This was the difficult problem. It so happened that the first break occurred at a point where



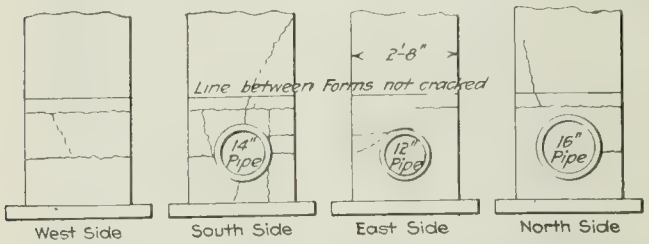
CONCRETE PIPE LINE CRACKED LONGITUDINALLY THOUGH EACH PIPE WAS WELL MADE

Through break was made by sledge in study of failure

the pipe line bends in a gentle curve of about 30°. It was thought possible that the failure was due to longitudinal shear, analogous to what is called horizontal shear in beams. Consequently, an analysis was made to show the relation between the longitudinal compression and the resultant longitudinal shear for any given deflection from a straight line. Assuming the most reasonable constants, the analysis showed that, while the longitudinal shear on a bend may be greater than the resistance to shear of 1:3 mortar, yet the deflection from a straight line due to the failure of pipe layers to maintain accurate alignment alone would not cause destructive shear, although it would produce stresses which at

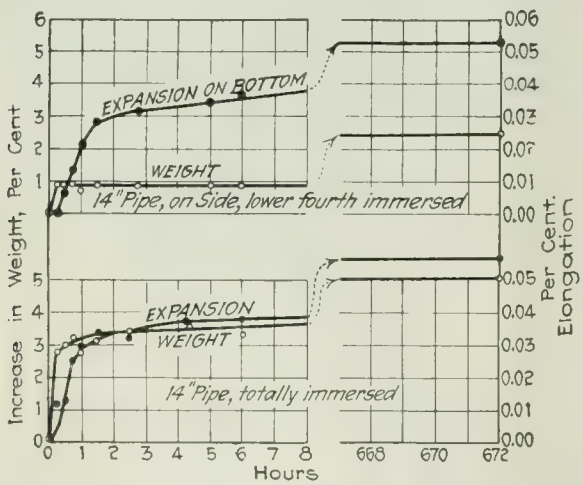
the crown are additive to the tension due to hydraulic pressure and weight of earth filling.

Some laboratory tests were made on specimens of the McCracken pipe which were known to be thoroughly dry. Two of these tests are reported in the accompanying diagram. The two pipes were provided with metal disks 20 in. apart, so that the expansion could be



CRACKS ON FOUR SIDES OF GATE PIT DESTROYED BY EXPANSION OF CONCRETE PIPE LINE

accurately taken with an extensometer. The pipes were carefully weighed. One of them was totally immersed in water, and the other was laid on its side so that only the lower quarter of the center line of the shell was immersed. The diagram gives the absorption-time and expansion-time curves. It appears that the absorption of water is very prompt, but that the expansion lags considerably behind. If the absorption were wholly from the inside, it would be much slower under the same head, because of the dense internal skin made by the revolving packer-head. During the test the pipe that was quarter submerged developed a crack 5 in. long on the inside at the crown. This crack came at the tongue end, which is the densest part of the whole tile, as shown by the slow creeping upward of water by capillarity. While in two months the water had crept upward about 5 in. in the center of the tile, it had during the same period of time crept upward in the tongue less than 1 in. The expansion was about 0.00056 of the length. The "flow" of the concrete could not relieve the resulting stresses.



PARTLY WET PIPE EXPANDS DIFFERENTLY FROM ONE FULLY WET

Some tests on cross-expansion were made also, using a broken pipe from the internal-pressure testing machine. During the early part of the test the crack closed as though the pipe were a compound spring; but after the moisture penetrated beyond the center the crack reopened.

Assuming the initial run of water in a pipe line to fill the pipe partially, then the cross-expansion of the invert, together with the fact that the upper part does not become wetted by capillarity, must develop a bending moment at the crown, and a crack may open on the inside.

While tests were being made in the internal-pressure machine, some peculiar breaks occurred. Pipe that to all appearances should have withstood the full city pressure broke at from 5 to 15 lb. It was discovered that the breaking pressure was greatly reduced by making a test for percolation just prior to making the internal-pressure test. When one of these pipes that had failed at a very low pressure was broken open, it was found that the water from the interior had penetrated about one-fourth of the thickness of the pipe. The following explanation is offered: The expansion of the inner quarter of the shell creates a tension in the outer three-fourths, which may cause failure in the outer portion which still remains dry; this failure permits full expansion of the inner one-fourth along the line of the crack, and the inner fourth then becomes unable to stand the low hydraulic pressure. Similar failures may occur in a concrete pipe line.

The expansion of the inner portion of the shell and the expansion of the invert were the principal factors in causing the failures shown in the view. The tension in the crown, due to several causes combined, exceeded the tensile resistance of the mortar.

Another factor involved is that the normal strength of the pipe doubtless is reduced by wetting, as was shown by Van Ornum several years ago. Pipe of the same quality as that shown in the view were tested for external pressure. In one series of tests, pipe taken from the stock yard at the age of 28 days had an average strength of 2624 lb. per lineal foot, while similar pipe after immersion in water for five hours broke at 1790 lb. per lineal foot.

The mortar used in making the Arizona pipe was a brand which has a high-magnesia content, and it is believed that a high-magnesia cement has a high rate of change in volume with change in moisture content. Tests made by the United States Bureau of Standards indicate this quite clearly.

There was, therefore, a combination of unfavorable condition: A large pipe, high-magnesia cement, a rich mixture, long period in the stock yard, and an arid climate. If any one of these conditions had been absent, the failures would not have occurred. The remedies to be applied in cases where the pipe to be laid are of large size and may have become bone-dry are: Expansion joints in the vicinity of the pipe-line structures, and, preferably, passing the pipe through a dipping process before laying, at such a rate that each pipe will be in the vat not less than 1½ or 2 hours. In the case of small pipes the dipping may not be necessary, but it is desirable to run the water through the line promptly after laying, and to flood the ditch by leaving the valves off at the risers.

A trip was made through California in a search for similar failures. None was found in southern California, and this is due to the fact that none of the pipe makers carried any stock. Moreover, the climate is very much mitigated by the fog, usually the high fog or vela cloud. In the San Joaquin Valley, however, numerous failures similar to those in Tucson have occurred, although the true cause has never been ascer-

tained. The climate of the San Joaquin Valley is similar to that of southern Arizona.

It has just come to the writer's attention that in the building of eight miles of 30-in. reinforced pipe a few years ago many scores of pipe were lost in the pipe yard or along the side of the trench through the opening of longitudinal cracks. These failures may have been caused by the rapid drying of the pipe, the reverse of the failures by wetting noted above.

It is believed that this type of failure—that is, by differential expansion or contraction in a concrete shell or wall—may occur in other lines of construction, such as concrete pavements and certain portions of concrete bridges and buildings. Such failures may be restricted to western America and to other parts of the world where arid conditions prevail for at least a part of the year.

Concrete pipe lines are of the greatest importance to agriculture in the West. Were it not for some form of conduit that is impervious but of low cost, the irrigated area in southern California would be reduced nearly one-half.

Easily Memorized Method for Finding Safe Beam Loads

By Manton E. Hibbs
Structural Engineer, Bureau of Building Inspection, Philadelphia

IN THESE days of slide rules, adding machines and handbooks, much of the so-called drudgery of engineering has been eliminated, although with this elimination has come a certain lessening of skill, and engineers are now to be found who cannot multiply unless the slide rule is in their vest pocket. The following scheme was worked out by the writer when time was so valuable as to preclude even the opening of a beam book. The original intention was to give a quick and accurate method to check up a number of beams uniformly loaded, but its application has been so useful in many ways that it may be of value to other engineers.

A table of standard steel I-beams, reproduced herewith, was made, with depths printed in bold-face type.

SECTION MODULI OF STANDARD I-BEAMS

Depth In.	Weight per Ft. Lb.	Section Modulus, In.³	Factor	Approximate Section Modulus
6	12.25	7.3	1.25	7.5
7	15	10.4	1.5	10.5
8	18	14.2	1.75	14
9	21	18.9	2	18
10	25	24.4	2.5	25
12	31.5	36	3	36
15	42	58.9	4	60
18	55	88.4	5	90
20	65	117	6	120

These depths, ranging from 6 to 20 in., were placed in the first column of the table, while in the second and third columns were placed the weight per lineal foot and the section modulus. In the fourth column was placed a factor derived by the writer. This constant multiplied by the corresponding depth gives a theoretical section modulus, placed in the fifth column.

To memorize this table, the key is found in the 12-in. I-beam. The sum of the figures of its height (1 + 2) gives the factor 3, which multiplied by 12 equals 36, the section modulus. Then the constants for 15-in., 18-in., and 20-in. beams, in order, are 4, 5 and 6. When the depth is less than 12 in. the decrease in the constant is ½ until the 9-in. beam is reached, when the factor varies by ¼. Fifteen minutes of this memory course will definitely fix these values so that it will be practically impossible to forget them.

Now consider the formula for a uniformly distributed load W on a beam of length l ft. at a unit stress of 16,000 lb. per square inch.

$$W = \frac{S \times 16{,}000 \times 8}{12 \times l} = \frac{S}{l} \times 10{,}666$$

and substituting 11,000 for 10,666 it is seen that the section modulus divided by the span in feet is a factor to be multiplied by 11,000 to give the load. Loads calculated in this way will vary from the true value only as much as six per cent, and that only in the case of a 20-in. beam, while the others vary less than 5 per cent.

The writer has so often made use of this mentally that he has not used the tables for nearly ten years, and has used it also frequently as a test against a man with a beam book, and beat him to the result. Since it is no longer fashionable to wear detachable cuffs, this scheme might be valuable to candidates taking civil-service examinations.

Ruling Against Discriminatory Water Rates to Railway

DISCRIMINATORY water rates in favor of the Chicago & Alton Railroad Co., as compared with the City of Slater, Mo., have been ruled against by the Missouri Public Service Commission. (*Public Utility Reports, Annotated*, June 5, 1919). The Saline Water & Power Co. has as its chief customers the railway company and the city named, supplying an average of about 70,000 gal. a day to the city and 312,000 gal. to the railway. Electric power is used for pumping, at a cost of some 14.32c. per 1000 gal. for current alone. The price paid by the water company for power was recently increased, by permission of the utility commission, from 1⅓ to 4c. per kilowatt-hour. A 20-year contract made in 1916 provided that the company should supply the railway with water at 8c. per 1000 gal. for quantities ranging from 300,000 to 500,000 gal. a day and at 5c. for all in excess of the latter amount. Subject to a minimum charge of $25 a day, water has been sold to the city at the following rates per 1000 gal.: First 100,000 gal. a day, 25c.; second, 20c.; all above 200,000 gal., 5c. The company petitioned the commission for a general increase in rates that would give it an average yield of 21.2c. per 1000 gal., with such adjustment between the city and the railway as the commission might see fit to make. The commission held the railway contract rate "unduly preferential and unreasonably discriminatory as against other consumers, especially as against the City of Slater," noting that the rate was about half the cost for current to pump the water, with no allowance for either operating expenses or for capital charges. It held that the contract is not binding as against the order of the commission in setting aside so discriminatory a rate, and that the jurisdiction of the commission is not affected by Federal control of the railway in question.

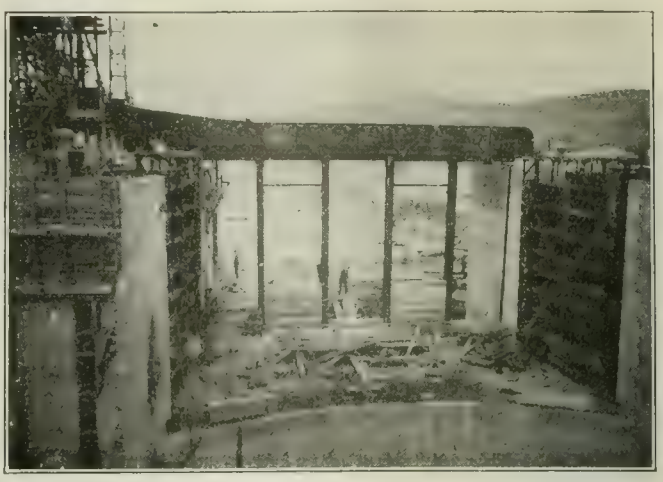
As to future rates the commission suggests: (1) That the city pay a fire protection charge of $4000 a year and (2) that there be a uniform charge to all consumers of 25c. per 1000 gal. for all water used up to 3,000,000 gal. a month (100,000 gal. a day); 22c. for any part of a second like monthly amount; and 20c. for all above 6,000,000 gal. a month.

Dam Supported by Bascule Bridge Closes Canal Lock

Steel Beams and Panels Placed From Bridge Form Temporary Dam Permitting Repair Work in Trolhattan Canal

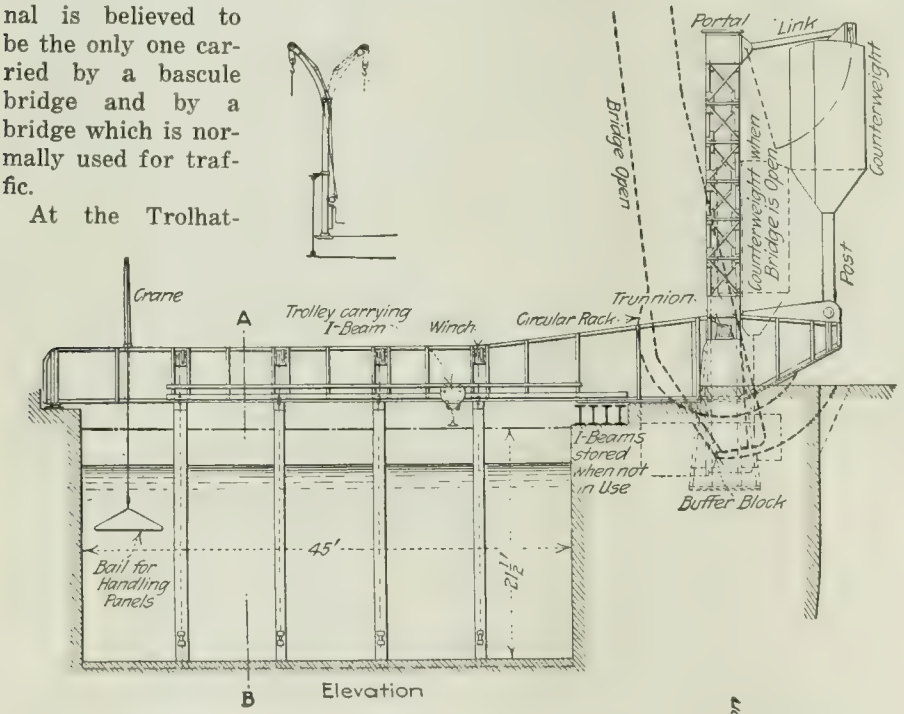
TO CLOSE the lock of the Trolhattan Canal at Strom, Sweden, in order to permit of repairs to the lock or gates, a movable emergency dam of the panel type is provided, and is carried by a highway bascule bridge which spans the lock channel. The dam is attached to the bridge only when the channel is to be closed. The Government canal was described in *Engineering News* of Feb. 22, 1917, p. 297. Particulars and drawings of the bridge and emergency dam have been furnished by K. A. Froman, chief assistant engineer of the canal work, under Lieutenant A. Ekwall, Corps of Royal Engineers.

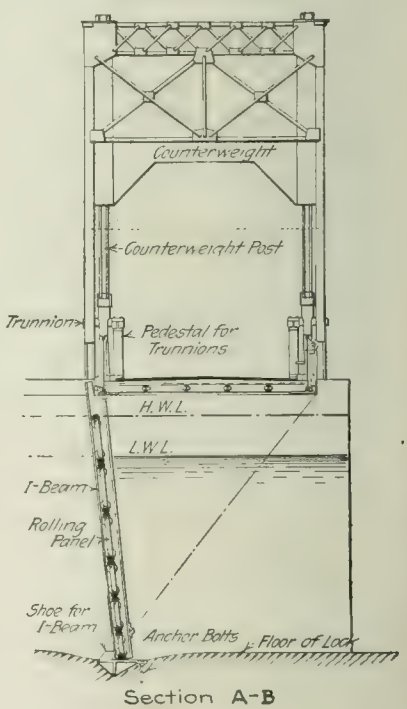
Larger dams of this type, but carried by swing bridges, are in use at locks on the Panama and Sault Ste. Marie Canals. In these structures, however, the framing of the dam is attached permanently to the span, which does not serve traffic purposes but stands normally in the open position and is only swung across the channel when the dam is to be closed on account of accident to the gates or necessity for repairs. The movable dam at the Trolhattan Canal is believed to be the only one carried by a bascule bridge and by a bridge which is normally used for traffic.

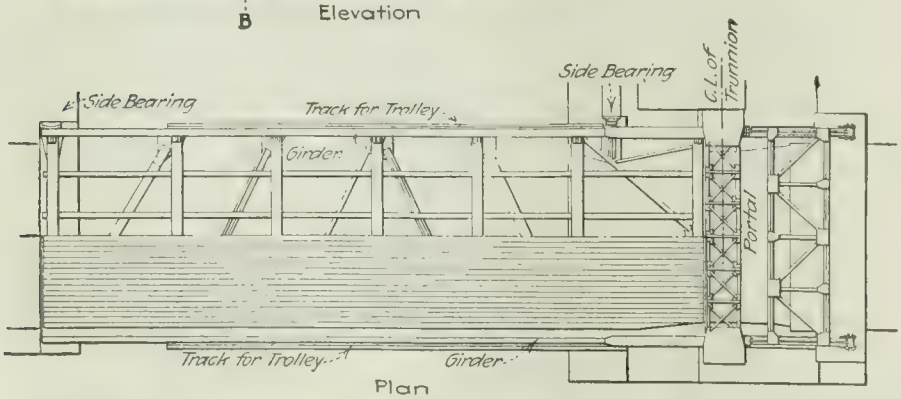


LOCK CAN BE CLOSED BY DAM ATTACHED TO BRIDGE

At the Trolhattan Canal the lock channel has a width of 45 ft. and a total depth of 25½ ft. below the roadway level, providing for 21½ ft. of water at high-water stage. The bridge is of plate-girder construction. Four inclined 22-in. I-beams spaced 9½ ft. on centers form the main frame of the dam, having their upper ends supported by the bridge and their lower ends resting against shoes in a recess across the floor of the lock.







BEAMS LOWERED FROM BASCULE BRIDGE CARRY PANELS FORMING EMERGENCY DAM IN CANAL LOCK

A similarly inclined 15-in. I-beam is installed in a recess in the face of each lock wall. Steel panels close the spaces between the beams. Normally, the four larger I-beams stand on the wall of the lock, beneath the bridge.

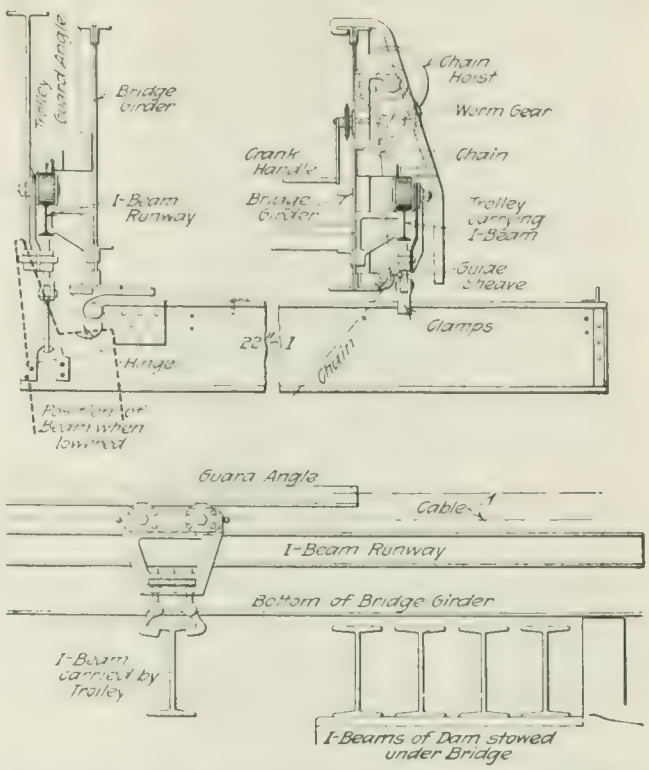
Outside of each girder of the bridge are brackets carrying an I-beam runway for a trolley, and above this is a guard angle to prevent the flanged wheels of the trolley from leaving the runway. On the downstream side is a

trolley having a hanger which engages a loop or stirrup on the end of the I-beam. On the upstream side is a trolley which carries the end of the I-beam by a pair of screw-operated clamps which hook over the top flanges of the beam, as shown in the bottom part of the drawing at the right. This end of the beam has an attachment for a chain, and the bridge girder has a chain hoist or winch attached to its web at each position for a beam forming the dam. The winch is operated by a crank handle and worm gear. Each trolley is operated by an endless cable, passing over sheaves on the girder.

The end sheave on one side is driven by a crank handle, the corresponding sheaves on the opposite girder being driven from this by a train of gears with shaft under the bridge floor, as shown in the upper part of the drawing at the right.

When the lock is to be closed, the two trolleys pick up the first I-beam and carry it out under the bridge into position. This brings its heel pivot into engagement with a hook or hinge bearing attached to the bottom of the downstream girder, and the chain on the upstream girder is hooked to the lug on the free end of the beam. When two beams have been carried out and are held in the horizontal position they are connected by cross-pieces to form a rigid frame and this is then lowered by paying out the chains, until the lower end of each beam rests against the stop or shoe in the floor of the channel.

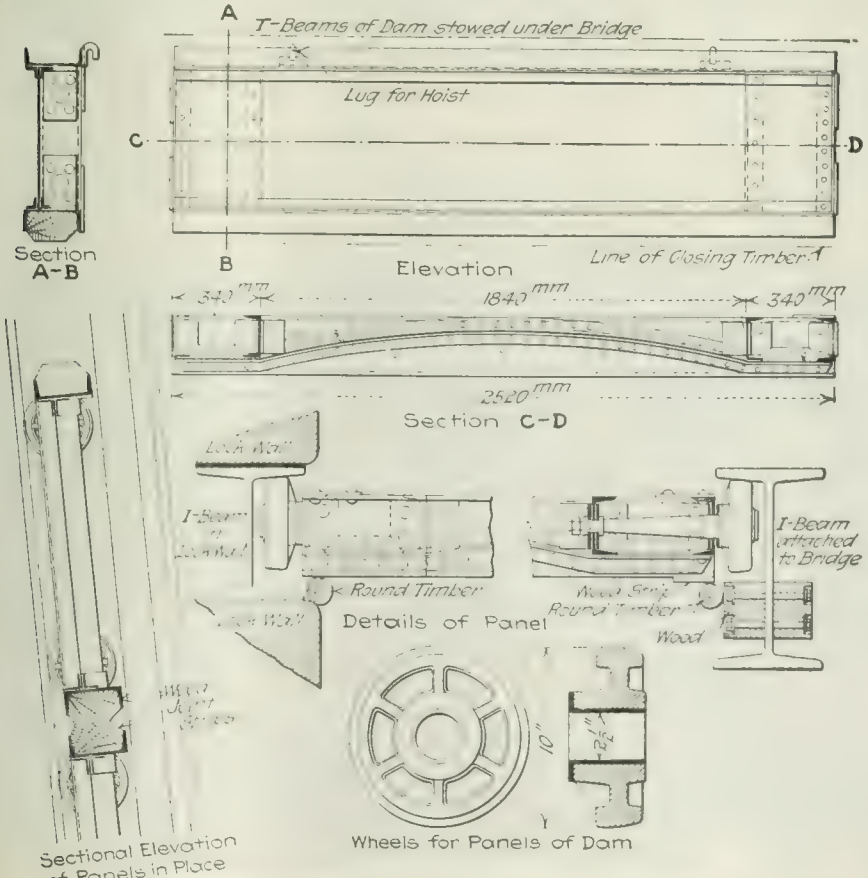
When the four beams are in position, the steel panels are carried out on a truck on the bridge floor, and are swung out over the up-stream girder by a crane of the davit type, which then lowers them in place between the I-beams. This crane is of 1½-ton capacity, operated by hand, and is set in sockets provided along the girders.



BEAMS FOR DAM ARE HANDLED BY TROLLEYS ON RUN WAYS ATTACHED TO THE BRIDGE GIRDERS

The cable of the crane carries a bail with hooks engaging lugs on the panels. These panels are of three sizes. Each is made of a buckle plate, with flange angles, and is fitted with four 10-in. cast-iron wheels having bronze bushings and casehardened rims shaped to fit the flanges of the I-beams. Wood sills on the panels provide for making the horizontal joints water-tight. For the vertical joints there are wood strips secured to the sides of the panels, a round stick closing each joint by fitting against these strips and a sill bolted to the web of the I-beam. At the joint at each side wall is another round stick closing the opening between the panels and the masonry.

Horizontal diagonal bracing is used in the floor system of the bridge in order to provide rigidity for resisting the horizontal pressure due to water against the dam. This thrust is taken up by side bearings anchored in the ground and engaging shoes on the side of the downstream girder. The bridge is of the trunnion bascule type and has two plate girders with floor-beams resting on the bottom chords and I-beam stringers between them. Floor planking is spiked to sills resting upon the stringers and upon shelf angles on the webs of the girders. These girders are spaced 19 ft. c. to c., but the inner pedestals for the bearings reduce the roadway width to 15½ ft. The outer pedestals form part of the portal columns to which is attached the counterweight.



ROLLING PANELS FORM THE FACE OF THE DAM

Segmental racks on the heels of the girders engage with operating pinions on a cross-shaft driven by gearing from a 24-hp. motor. Hand operation is also provided for, and there is a safety brake of sufficient power to hold the bridge in any position. Designs for this structure were made by the Strauss Bascule Bridge Co., Chicago, under the direction of the Royal Waterfalls Commission.

American Engineers Make Records In Bridging the Rhine

In Successive Trials Army Engineers Reduce Time of Ponton Construction Across River to Forty-One Minutes

American Army engineers are engaged in friendly competition at the Ponton School at Hönningen, Germany, where they are making records in throwing ponton bridges across the Rhine. Two of these records were recently made, and each has been reported by officers concerned.

Second Engineers Take Fifty-Eight Minutes

By James M. Farrin
Captain, Corps of Engineers, U. S. A., A. E. F., Germany

AMERICAN engineers built a bridge across the Rhine at Hönningen on May 25, 1919, in 58½ minutes. The structure, shown in the two airplane views, was a ponton bridge and was put up by the Second Engineers of the Second Division of the Army of Occupation. One of the pictures shows the entire structure completed and was taken from an altitude of 1000 m., while the other from an altitude of 200 m. shows the progress of the construction, the disposition of the working parties, and other details of the bridge.

The 3rd Corps Ponton Bridge School is located at Hönningen, where has been collected a large supply of German ponton material, and where also each engineer regiment of the 3rd Corps sends details for a 10 days' instruction course. The Rhine at this place is 1440 ft. wide and has a current of nearly 7 km. per hour. It is approximately 25 ft. deep in midchannel, and in general has a rocky bottom. These facts alone are sufficient to make its bridging no easy matter.

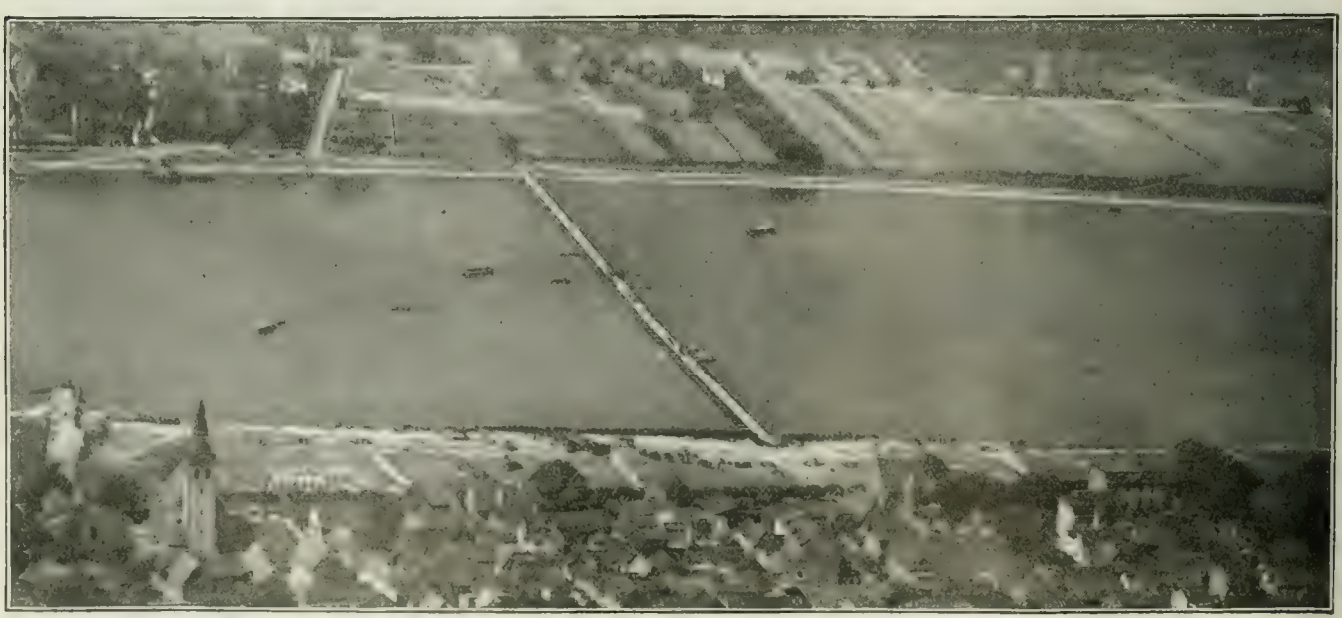


AMERICAN BUILT PONTON BRIDGE ACROSS THE RHINE AT HÖNNINGEN

Authority had been secured to suspend all traffic on the Rhine in this vicinity for two hours on Sunday morning, May 25. At 9:15 a.m. on that day the abutment was started, and at 10:13½ a.m. the last side-rail lashing was finished. The method of "successive pontons" was used throughout; the average time for the construction of a bay being 1¼ minutes. The construction proceeded without mishap and with clocklike precision to a junction in the center, where the bridge was closed without any difficulty whatever.

Each boat was equipped with a 125-lb. anchor, which was cast at a point about 150 ft. upstream from the bridge. In such a swift current and with a rocky bottom it was expected that some of the anchors would drag, but fortunately this only happened in one case. This boat was quickly pulled back to position by a launch stationed nearby. In addition to the boat anchors there were 500-lb. anchors placed in midstream as a safeguard and every fourth boat had a downstream anchor.

The equipment used in the construction was all captured German ponton equipage, and consisted of 91 steel boats and 3 trestles, making 95 spans in all, of which 49 were laid from the right-hand bank and 46 from the

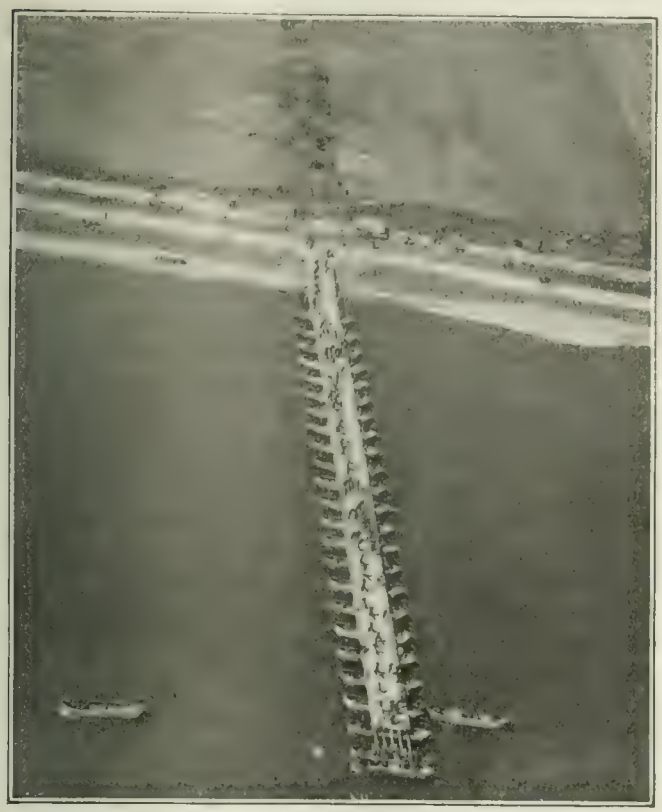


BUILDING A PONTON BRIDGE ACROSS THE RHINE AS SEEN FROM AN AIRPLANE 200 METERS UP

left; 665 pieces of 6 x 4 in. by 18 ft. balk; 1615 pieces of 1½-in. flooring plank; 190 pieces of 6 x 4-in. guard rail and 1330 pieces of ½-in. lashing.

Soon after the bridge was completed, Battery B of the Twelfth Field Artillery crossed with full equipment.

The Ponton School at Hönningen was established by Col. H. C. Fiske, Chief Engineer, 3rd Corps. The bridge



ARMY ENGINEERS WORKING ON RHINE PONTON BRIDGE PHOTOGRAPHED FROM AIRPLANE

detail comprised 400 men, half of whom had received 10 days of training, the other half only three days. The ends of the bridge were in charge of Capt. William C. Atwater, Company F, and First Lieut. Lyman McE. Chase, Company D, working under the direction of Maj. Theodore Wyman, Jr., and with the supervision of the regimental commander, Col. Stuart C. Godfrey.

First Engineers Build Bridge in Forty-One Minutes

By Sam H. Andrews
First Lieutenant, Engineers, U. S. A., A. E. F., Germany

On JUNE 8, at Hönningen, Germany, the First U. S. Engineers, commanded by Col. E. J. Atkisson, by bridging the Rhine River in 41 min. 8⅔ sec., accomplished a feat which should be made known to the entire engineering world.

The bridge was built by successive bays from both banks of the river. The material was piled on the bank and the men were in company formation when the signal to start was given.

Every man of every detail was working 100% efficient to beat the splendid record established by the Second U. S. Engineers when they completed the bridge with the same material at the same place and with the same number of men in 58½ minutes. The data in making the record are as follows:

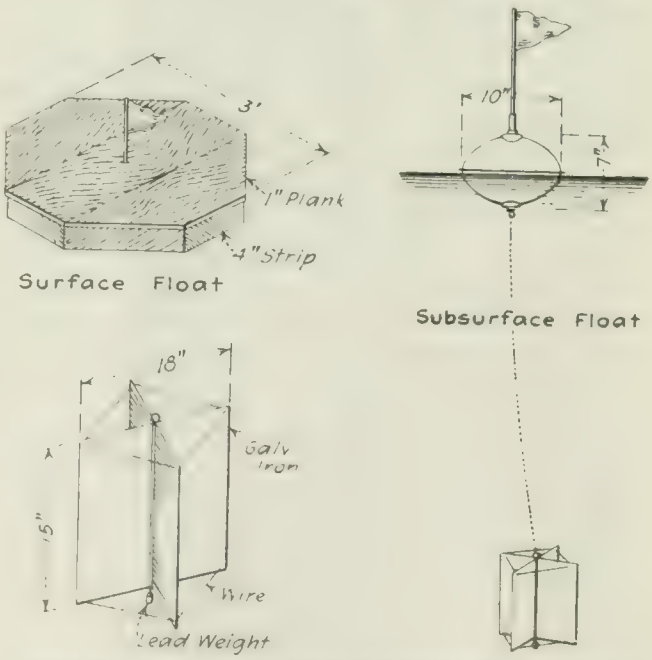
Weather:	Fair, downstream 8-mile wind.
Current:	4 miles per hour.
Span:	1450 ft.
Time:	41 min. 8⅔ sec.
Detail:	1 major, 4 captains, 8 lieutenants, 3 master engineers, 398 men and N. C. O.'s.
Material:	92 boats (9-ton displacement), 3 trestle bents, 500 balk (4 x 5½ in. x 25 ft.), 192 side rails (4 x 5½ in. x 19 ft.), 1632 chess (1 x 10 in. x 11 ft.), 102 anchors (175 lb.), 20,500 ft. 1¼-in. rope, 2900 ft. ¾-in. rope, 192 hand-rail supports, 576 rack sticks,
Best previous record by Germans:	1 hr. 30 min., under same conditions.

The bridge was designed to carry divisional traffic, including artillery, and immediately after the completion of the structure a long line of automobiles together with foot troops crossed to the other shore.

Floats Show Course of River Currents

IN OBSERVATIONS of currents at the mouth of the Southwest Pass or outlet of the Mississippi River, both surface and submerged floats were employed to determine the movements of surface and subsurface currents. These floats are shown on the accompanying drawing and are described by T. E. L. Lipsey, assistant engineer in charge, in a paper in the "Professional Memoirs of the Corps of Engineers, United States Army," January-February, 1919.

Surface floats were flat, octagonal in plan, 3 ft. wide, and built up of 1-in. boards on 4-in. strips placed diagonally and across the perimeter. The size was made as large as could be handled conveniently, in order



SURFACE AND SUBSURFACE FLOATS FOR CURRENT OBSERVATIONS

to present as large an area as possible to the current and to reduce to a minimum the effect of wind on the small staff and flag necessary to make the float discernible in the water. The total surface area was 180 sq. in., while the surface presented to the wind was 6 sq. in., and as the staff was round the ratio of wind effect to current effect was about 1 in 50.

The submerged float was made of two L-shaped pieces of heavy tin, or No. 20 galvanized iron, riveted together in the form of a cross, and having the wings tied together with wire, as shown, a small weight being attached to the bottom to maintain the float in a vertical position in the water. It was suspended at the required depth by means of a fine braided line attached to a copper buoy carrying a small staff and flag. The shape of the buoy, an oblate spheroid, practically eliminated impact of the surface current, while the skin-friction effect of the current was almost negligible. With the submerged float attached the buoy had a draft of about four inches.

In making observations, Mr. Lipsey explains, the floats were dropped from the tug at the desired starting points and located at intervals of from 15′ to 45′ by sextant readings to fixed marks on shore and by ranges on shore whenever these were available. Each location was determined by two angles and checked by a third angle and by ranges whenever possible. A protractor was arranged with the circles representing the loci of points, subtending equal angles from the fixed points on shore and with all available ranges drawn in. On this the locations were plotted on the boat as the observations were made. In this way from two to six floats, started from different points, could be followed at a time by one party.

Compositions and Efficiencies of High-Speed Steels

LOW-CARBON high-tungsten steel was developed in 1902, and this development constituted the origin of modern high-speed steels as distinguished from the earlier Mushet air hardening steels, says John A. Mathews in a paper on "Modern High-Speed Steel" read before the American Society for Testing Materials. In recent years a further transformation has been gone through, with the addition of vanadium, and today the term "modern high-speed steel" must be interpreted as meaning a vanadium-containing steel.

High manganese was an important feature of Mushet steel, but in the later '90s chromium replaced manganese in most of the air hardening steels. Manganese is no longer important in high-speed steels. Apparently through accident, it was later discovered that abnormally low carbons enabled abnormally high results to be obtained from the steels, and as a result the reduction of carbon and the increase of tungsten in high-speed steels was quite general during the first few years of the century.

Typical analyses of well known steels, the samples collected in 1901 and 1902, respectively, are grouped in Tables I and II. They show only high carbon and moderate tungsten in 1901, and in the following year, without exception, low carbon and high tungsten. Very careful, long continued study of high-speed steels has been carried on by Mr. Mathews, and in particular the magnetic properties of alloy steel have been examined

TABLE I. SELF-HARDENING STEELS, 1901

Maker No.	Carbon, per Cent.	Manganese, per Cent	Chromium, per Cent.	Tungsten, per Cent.	Molybdenum per Cent.
1	2.19	1.32	0.50	5.63	....
2	1.69	0.45	3.73	7.63	....
3	1.14	0.33	2.09	7.98	....
4	1.79	0.50	3.96	....	4.54
5	1.55	0.24	3.22	7.80	....
6	1.55	0.21	3.67	9.42	1.10
7	1.78	1.18	....	7.22	....
8	1.40	1.65	3.69	....	4.59
9	1.75	3.92	..	6.61	....

TABLE II. HIGH-SPEED STEELS, 1902

Maker No.	Carbon, per Cent.	Manganese, per Cent	Chromium, per Cent.	Tungsten, per Cent.	Molybdenum per Cent.
21	0.63	....	4.00	....	6.00
22	0.42	....	4.95	10.75	....
23	0.57	0.43	3.30	11.58	....
24	0.75	....	....	19.50	....
25	0.37	....	5.10	13.83	....
26	0.62	....	6.50	21.06	....
27	0.84	0.07	2.76	11.25	....
28	0.56	....	2.95	9.74	....
29	0.60	0.30	....	....	9.25

carefully. However, neither physical nor magnetic measurements show such differences between essentially different steels as would enable proper discriminations to be made. Four steels have been subjected to a specially careful study. These are modern high-speed steels with analyses as given in Table III. Cutting tests made according to the method described by Frederick W. Taylor rank these four steels about as follows: Taking No. 33 as 100% in efficiency, No. 34 rates 70%, No. 32 66%, and No. 31 only 45 per cent.

Vanadium is the only general addition, says Mr. Mathews, that has been made to the earlier types of high-speed steels which seems to afford universal improvement in quality. It benefits tungsten-chrome as well as molybdenum-chrome steels. Cobalt and uranium

TABLE III. ANALYSES OF FOUR STEELS USED IN TESTS

Steel No.	Carbon, per Cent.	Silicon, per Cent.	Manganese, per Cent.	Chromium, per Cent.	Tungsten, per Cent.	Vanadium per Cent.
31	0.63	0.19	0.26	4.21	13.10	0.25
32	0.61	0.19	0.36	3.34	16.28	0.40
33	0.63	0.27	0.31	2.99	16.87	0.85
34	0.64	0.22	0.24	5.35	18.99	0.15

have been discussed as ingredients which will improve high-speed steels, and even cerium and zirconium have been tried, so far without conclusive indication of their value.

While the introduction of vanadium and the improvement in the quality of raw materials have been important factors in improving high-speed steels, yet it appears that steel-making rather than chemical analysis is the first consideration. In a very elaborate series of tests, including over fifty analyses, it was noted that in those fields included in the first group as to merit, the compositions varied from 12.70 to 18.59% of tungsten, from 1.70 to 5.58% of chromium, from 0.40 to 1.73% of vanadium and from 0.52 to 0.81% of carbon; and the steels rated as second and third class in general covered almost identically the same materials.

Air Patrols to Detect Forest Fires

Airplane fire patrols over the great forest reserves of California were recently inaugurated. Forest fires can be located from the air within a few miles of their actual position. Two patrols daily, leaving Warner's Hot Springs at 10 a.m. and 3 p.m., cover a route about 110 miles in length in that portion of the Cleveland National Forest adjacent thereto. Wireless telephones are used to communicate with the base, which at once telephones to the nearest forest rangers' post.

Rules for Drafting Practice

Cover Concisely Dimensions of Drawings, Allowable Scales, Character of Lettering and Many Other Points

SOME ten years ago H. N. Savage, then with the United States Reclamation Service and now hydraulic engineer for the City of San Diego, Calif., drew up the following rules regarding drafting practice. They have been in use ever since on his projects, with excellent satisfaction:

Drawings should conform to the following sizes, several sheets being used if necessary, supplemented with an index sheet:

Out to Out	Inside Border
8 × 11 in.	7 × 10 in.
11 × 16 in.	10 × 15 in.
16 × 22 in.	14½ × 20½ in.
22 × 32 in.	20½ × 30½ in.
32 × 44 in.	30½ × 42½ in.

Drawings of 10-in. vertical dimension, inside border, may be made any length necessary over 15 feet.

Trimming lines for drawings should be drawn on each tracing and the tracing cut ¼ in. outside these lines. Paper drawings should be cut to the same dimensions as tracings.

Tops of drawings should orient with north cardinal point.

Maximum dimension of drawings should be horizontal.

Do not abbreviate any words on drawings.

Sufficient legends should be used to identify all parts of a drawing.

Drawings must be independently checked with a degree of accuracy commensurate with the importance of the work involved.

The initials of the persons who draw, trace and check a drawing should be shown in the lower left-hand corner thereof. Those of the checker should be affixed by him in writing; the others should be printed.

The names of the supervising and project engineer or engineer in charge should appear on all drawings, but may be printed on drawings not requiring approval. Drawings of projected work and drawings involving policy, after being signed by the project engineer or engineer in charge, and before construction is begun, must be submitted to the supervising engineer, and if they are approved separate prints will be furnished to the project or feature office. Approved tracings will usually be retained in the files in the supervising engineer's office.

The subject of the drawing should form the major feature of the title, as, "Lower Yellowstone Dam." Such words as "map," "plat," "sketch," "location," "proposed," etc., should not be used in titles.

Drawings accompanying correspondence should be stamped on the margin "Transmitted to.....with letter dated.....19..," or, "Received from .....with letter dated .....19..", appropriate name and date being written in ink.

Paper drawings and prints should be folded right side out to letter size, title on top.

Only a minimum amount of work should be done on pencil drawings which are to be traced. Whenever practicable, preliminary penciling should be done directly on the tracing cloth.

Every tracing, in advance of its making, should receive an appropriate title and project number. Project and supervising engineers' file numbers should be placed on the margin in the lower right-hand corner.

Lettering on drawings should be placed to be read from the lower right-hand corner of the drawing. Plain single-stroke letters should be used except on drawings requiring distinctions between different kinds of names. Liberal and uniform spacing should be provided between words. Inclined Gothic lettering should be used on structural and mechanical drawings; capitals for special emphasis and in titles; lower case for general description and notes. Lettering on drawings 11 x 16 in. or over should be of sufficient size to be legible when the drawings are reduced to one-half the original dimensions.

Contract drawings, except profiles, for photolithographic reproductions should be prepared for a reduction to about two-thirds the original dimensions, and to come down to a vertical dimension of 10 in. between the border lines. Profiles should be prepared for reduction to one-half the original dimensions, with a vertical dimension of 10 in. between the border lines. Where possible, two lines should be placed on a sheet. The horizontal scale of profiles should be made as small as practicable. Lettering on contract drawings intended for photolithographic reproduction should be in pencil, the final lettering being left to be put on in the director's office with standard type.

Drawings of land should show legal subdivisions or other coördinate lines referred to some fixed point, as section or quarter-section corners.

True north, also magnetic north if known, should be indicated on each drawing of land unless section lines are shown.

Vertical sections and elevations taken across a stream or canal should be shown looking downstream. Vertical sections and elevations taken along a stream or canal should, wherever practicable, show stream flowing from left to right. Stationing of profiles should, wherever practicable, increase from left to right of the drawing.

The direction of streams and of canals through structures should be shown by arrows.

Contours should be in 1-, 2-, 5-, 10-, 20- or 100-ft. intervals. Contours and figures showing their elevations should be in burnt sienna. Distinguishing contours should be of deeper color.

Graphic scales should be shown on each drawing. Following are approved scales:

For maps and allied drawings, 10, 20, 40, 100, 200, 400, 500, 1000 and 2000 ft. and ½, 1, 2, 5 miles, and even multiples of 2 and 5, to an inch.

For engineering structures, ⅛, ¼, ½, 1, 3 and 6 in. per foot, and 10, 20 and 40 ft. to an inch.

For mechanical and architectural drawings, 1/16, 1/8, ¼, ½ and full size.

Public Comfort Station Law in Wisconsin

Every city and incorporated city in Wisconsin must "provide and maintain a sufficient number of suitable and adequate public comfort stations for both sexes," under a law passed recently by the state legislature and signed by the governor. It is provided that the State Board of Health shall establish rules and regulations governing the location, construction, equipment and maintenance of such stations and may also prescribe minimum standards that shall be uniform throughout the state.

Building the New Orleans Army Supply Base

Features of the Work Are the Large Concentration of Equipment, the Use of Seven Miles of Temporary Railway Track and the Rapid Construction of So Large a Project

SPEED and efficiency of construction in the New Orleans Army supply base were not obtained by any novel methods, but by the application on an extensive scale of those already well tried. In consequence, this third largest of the great overseas port terminals for the Army, a project totaling $15,000,000 in cost, is being carried to completion in record time.

The base, which was described in detail in *Engineering News-Record* of Apr. 24, 1919, p. 823, is located on a 48-acre tract of land along the Mississippi River, and consists of three warehouses, each 140 x 600 ft., six stories high, constructed of reinforced concrete on pile foundations; a creosoted-pile and timber wharf surmounted by a wharf house 140 ft. by 2000 ft., two stories high, constructed of structural steel, with galvanized corrugated-iron siding; and three multiple-story bridges connecting the warehouses with the wharf. One of these bridges has ramps at four levels and two have ramps at two levels, each bridge being about 400 ft. long by 26 ft. wide, constructed on pile foundations of structural steel with reinforced-concrete floors and galvanized corrugated-iron siding and roof.

In addition to these principal structures, there is a great deal of collateral construction, including railroad tracks and yards, totalling approximately nine miles of single-track equivalent, reinforced-concrete pavements around the warehouses, a complete fire-protection and water-supply system, a sewerage and drainage system, and an electrical distribution system including six transformer stations, a telephone system, and a fire alarm and watchman's supervisory system. The cost of the entire project is approximately $15,000,000.

In the construction of so large a project in a short time, the storing and handling of large quantities of materials constitute one of the most important problems. The large quantities of materials of the various classes noted which are required in the construction are apparent from the following table, which gives the approximate quantities of the principal item:



SHORE END OF WAREHOUSE GROUP AT NEW ORLEANS ARMY BASE UNDER CONSTRUCTION

Piles	53,000 pieces
Sand	52,500 cu.yd.
Gravel	105,000 cu.yd
Cement	187,000 bbl
Reinforcing steel	8,000 tons
Structural steel	5,500 tons
Steel sash	136,000 sq.ft.
Form lumber	9,000,000 ft.b.m.
Creosoted timber	5,000,000 ft.b.m.
Untreated timber	2,000,000 ft.b.m
Creosoted wood-block flooring	37,000 sq.yd.
Roofing	5,320 squares

The material storage and handling problem has been complicated by the location of the work adjacent to the industrial ship canal in course of construction, which totally cuts off the project from one side. The work is, however, located immediately adjacent to a bend in the Public Belt R.R., which provides it with rail connections. This is of particular value, as all construction

material is received by rail. A complete system of some seven miles of temporary track has been installed, connecting the construction work with the belt railway on both sides of the bend, with the Louisiana Southern Ry. near the work, and connecting the various portions of the work with the material-storage yards, located approximately one-half mile distant.

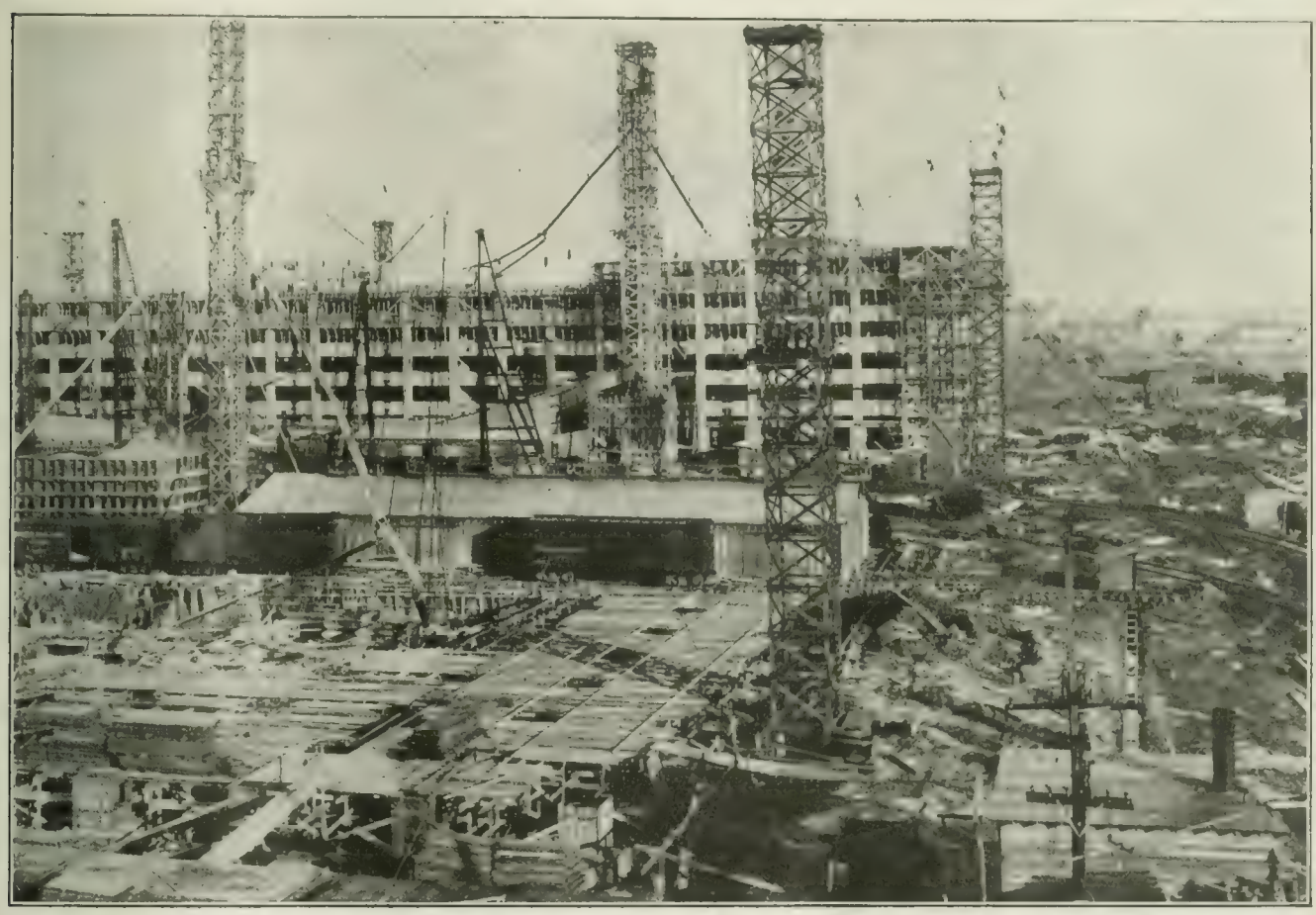
Incoming materials are delivered directly to the unit in which they are to be used, or, if not immediately required, to storage yards. The material-handling equipment includes seven locomtives, 12 locomotive cranes and nine derricks. Six of the locomotives are rebuilt six-wheel Mogul-type locomotives from the Panama Canal, which handle practically all of the switching, being supplemented by a small standard-gage saddleback locomotive.

The ample material-handling equipment has been an important factor in making possible the several construction records established on this job. The record day's work for car unloading is 207 cars, and at all times the requisite flow of materials has been maintained to permit, simultaneously, the rapid construction of all of the structures comprising the base. After the completion of the foundations for the warehouses, upon which no very fast progress could be made on account of the conditions encountered, the work has gone forward rapidly, an average of a complete floor being poured every week on each warehouse. The concrete in the superstructure of the last warehouse to be completed was poured in 34 working days, the foundation being completed Mar. 25 and the roof slab May 3.

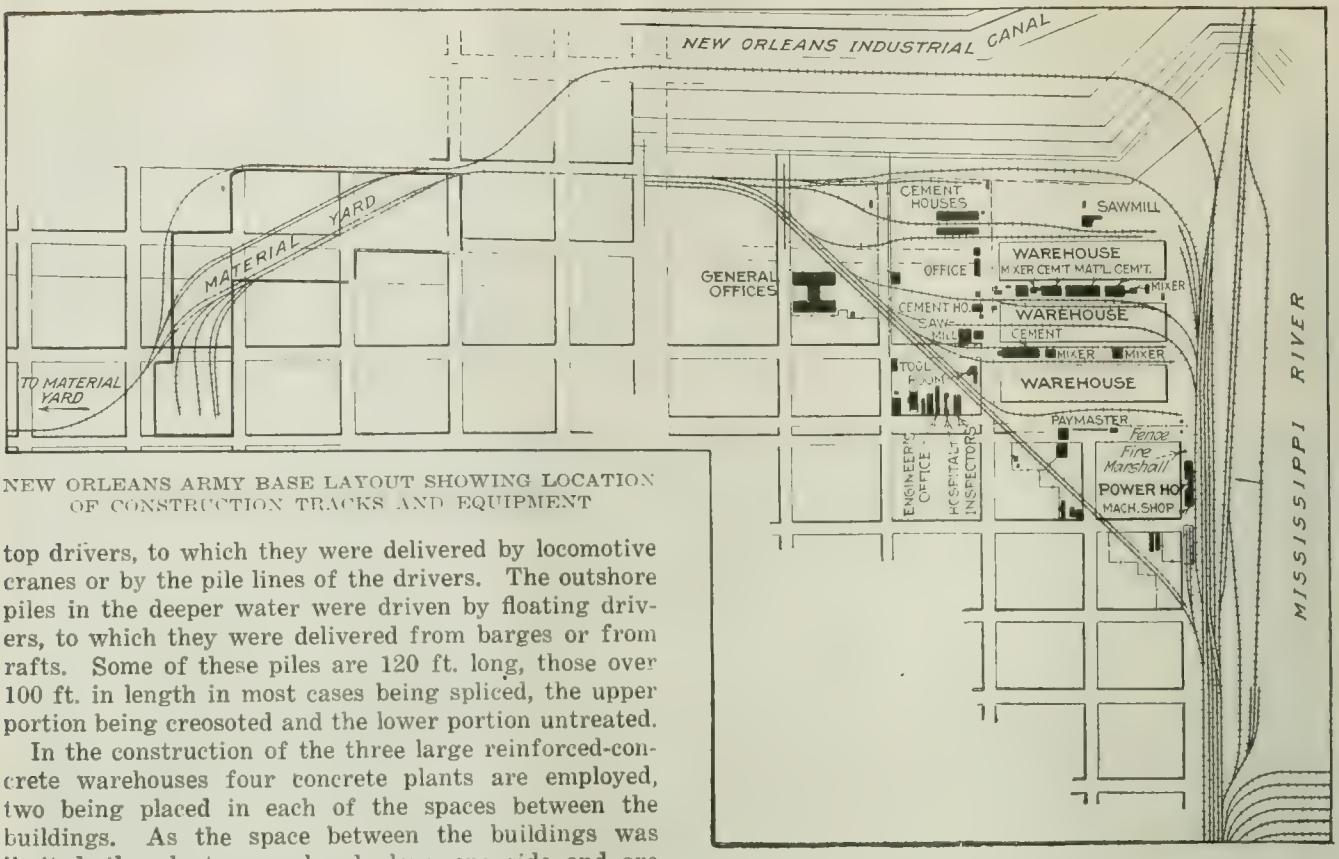
Ample construction equipment is provided, mechanical devices being used wherever possible, to expedite the work. Bulk excavation for the warehouse foundations was handled by dragline excavators which delivered the material to railroad cars, from which it was unloaded mechanically. After the completion of the piledriving, the small amount of excavation remaining was done by hand.

Untreated piling was driven under two of the warehouses to a point below the plane of saturation of the ground. This was driven by ordinary top drivers equipped with steam hammers. The piles were unloaded from cars immediately adjacent to the work and were handled to the drivers by the pile lines of the drivers themselves. In the middle warehouse, the execavation was avoided by the use of composite piles. An ordinary, untreated wooden pile with a turned head was driven to the ground level with an ordinary pile-driving rig and followed down to below the saturation plane with a Raymond steel collapsible core carrying with it a spirally reinforced steel shell. After this core was withdrawn dowels were driven into previously bored holes in the top of the wooden pile and the shell was filled with concrete, thus forming a composite pile of wood below the saturation plane and of concrete above. These piles were capped by a combined foundation cap and first-floor slab, the bottom of which is at approximately the original ground level. One of the finished composite piles withstood a 40-ton test load and showed no measurable settlement.

In the wharf the piles near shore were driven by



RIVER END OF WAREHOUSES (CONNECTING WITH VIEW ON OPPOSITE PAGE)—DOCK AT RIGHT NOT SHOWN

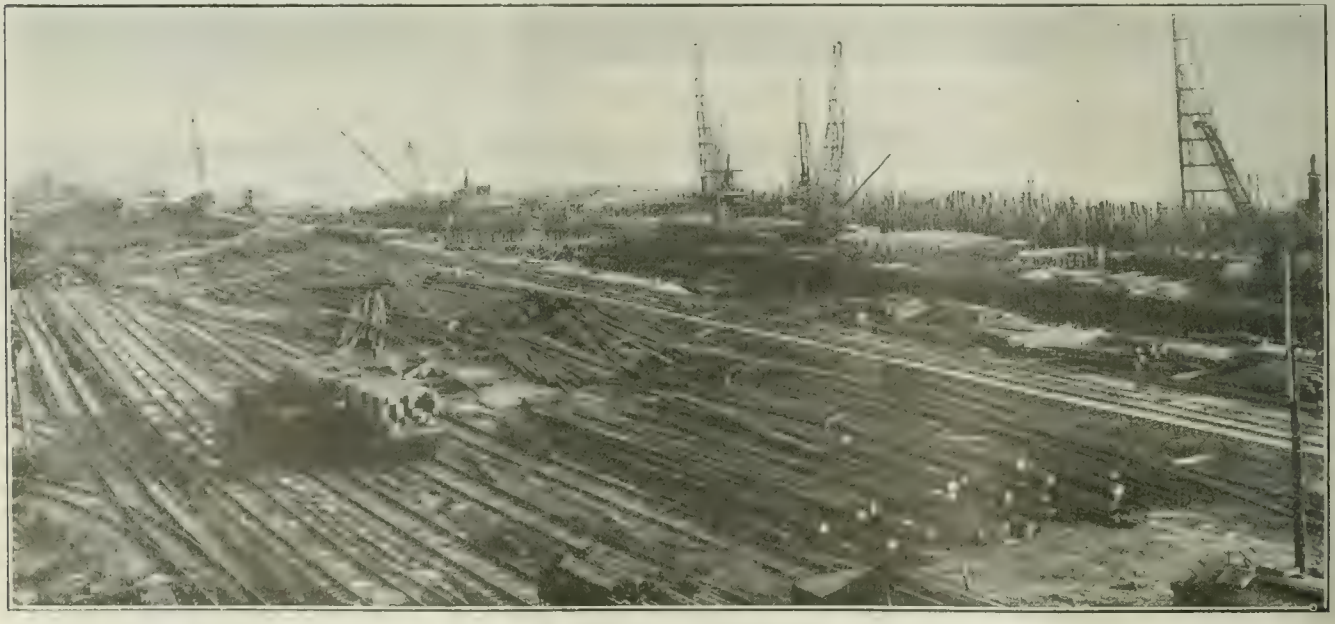


NEW ORLEANS ARMY BASE LAYOUT SHOWING LOCATION OF CONSTRUCTION TRACKS AND EQUIPMENT

top drivers, to which they were delivered by locomotive cranes or by the pile lines of the drivers. The outshore piles in the deeper water were driven by floating drivers, to which they were delivered from barges or from rafts. Some of these piles are 120 ft. long, those over 100 ft. in length in most cases being spliced, the upper portion being creosoted and the lower portion untreated.

In the construction of the three large reinforced-concrete warehouses four concrete plants are employed, two being placed in each of the spaces between the buildings. As the space between the buildings was limited, the plants are placed along one side and are served by a railroad track along the other side of the space. Each mixer plant consists of a 28-cu.ft. mixer with stationary steel measuring hoppers feeding directly into the drum, and an automatic water measuring tank. The measuring hoppers are fed from wooden bins above them. The cement is raised to the hopper floor from cars or a storage shed on a belt conveyor which runs the full length of the cement shed and which dumps the cement into a wide steel-lined chute leading close to the measuring hoppers. By this arrangement the cement handling is made as light work as is possible with cement in bags. The sand and gravel bins over the mixer are fed by belt conveyors from storage bins into which the sand and gravel are placed from the cars by a derrick equipped with a clamshell bucket of 1½-yd. capacity. The concrete is hoisted in a 1-yd. bucket and chuted to place or to floor hoppers, from which it is buggied to place. Line gates are provided along the length of the main chute so that concrete may be taken into branch chutes at any one of several points.

In the construction of the platforms surrounding the buildings, and of the reinforced-concrete roadways, the concrete is conveyed from a central mixer plant to its destination in hoppers mounted on railroad cars handled by a switch engine. Two cars are used, one carrying



BUILDING THE ARMY BASE WHARF ON THE MISSISSIPPI LEVEE

four 2½-yd. hoppers, and one carrying two 7-yd. hoppers, or a total of 24 yd. The reinforced-concrete canopies surrounding the buildings are poured from hoppers raised to the proper elevation by a locomotive crane, the concrete being mixed at a central plant and carried in hoppers mounted on railroad cars to a track immediately adjacent to the work. Concrete firewalls constructed at intervals of 200 ft. in the wharf house are likewise poured from hoppers hoisted to the required elevation by a locomotive crane, this concrete being mixed in a plant mounted on railroad cars on a track adjacent to the work.

List of Equipment

The forms for the reinfroced-concrete work are, wherever possible, made up in units fabricated in a mill. These units are carefully marked to indicate their destination, and are very rapidly erected in place. Concrete spreader blocks are used for wall forms, and concrete blocks for supporting the reinforcement. These are made under roof in suitable moulds, the spreader blocks being cast with a hole through them formed by a steel rod. The blocks are cured on pallets until they have received their initial set, and are later cured in stacks before being used. The spreader blocks make a firm separation for the wall forms, and will not fall out as the tie rods pass through them. They have the further advantage of permitting the easy withdrawal of the tie rods which pass through the holes in them.

28-ft. concrete mixers, electrically driven	4
¾-yd. concrete mixer on wheels, steam driven	1
¾-yd. concrete mixers on wheels, electrically driven	5
¾-yd. concrete mixers on wheels, gasoline engine	3
Electric hoists, 50 to 90 hp	8
Steam hoisting engines, averaging about 40 hp	20
Clam-shell buckets, 1- to 1½-yd. capacity	10
Concrete chutes, 30-ft. sections	67
Concrete carts, two-wheeled	99
Locomotive cranes	12
Locomotives, 62-ton, six-wheel Mogul type	6
Locomotive, 24-ton, standard-gage saddleback type	1
Floating derrick	1
Stiffleg derricks	9
Hoist booms on towers	12
Floating pile-drivers	4
Tugboat	1
Land piledrivers	16
Centrifugal pumps, 2½-in. to 6-in.	8
Air drill, hammers, etc.	100
Air-compressor, portable, 190-cu ft. capacity	1
Air-compressor plant, 750-cu ft. capacity	1
Air-compressor plant, 250-cu ft. capacity	1
Machine shop with three lathes, three drill presses, shaper, power saw, forges, etc.	1
Carpenter shop with five steel table saws, two swinging cut-off saws, two band saws, planer, boring machines, etc.	1
Automobiles and trucks	50

When necessary for the rapid completion of the project the work has been carried on with two shifts of eight hours each, and for a short time three shifts were employed. For the work done at night a complete installation of electric flood lights is in place and is supplemented, where necessary, by strings of incandescent lights. The flood lights are set at different elevations on the various construction towers and on the completed portions of the buildings, and furnish very satisfactory illumination for night construction work.

As the concentration of equipment on the job is rather unusual, and as such excellent results have been obtained by its use, the following list of principal equipment is thought to be of interest.

Throughout the construction of the project, complete progress charts and schedules have been used, thereby keeping each administrative and executive office informed as to the exact status of each feature of the construction work. Charts have been prepared showing the anticipated progress or program of the work. A vertical column of subdivisions of the work, and a horizontal scale of time divided into weeks, form the axes of these charts. Heavy horizontal lines indicate the programmed duration of each subdivision of the work, and alongside these are posted at frequent intervals the actual amount of work completed to the date of posting. This is indicated by a line of length proportional to the percentage of work completed and having at its end the date of posting. A glance at such a chart indicates immediately just which items are behind or ahead of schedule. These diagrams are supplemented by time-percentage diagrams or curves for each complete structure of the project and for the project as a whole, the anticipated progress being indicated by a line of one color and the actual progress by a line of another color.

Pictorial Charts Used

In addition to the above diagrams, pictorial charts representing a longitudinal section of each building are used to indicate the general progress of the work. On these charts border lines, of various colors indicate forms placed, forms removed, etc., another symbol shows reinforcing steel placed, a tint of a certain color indicates concrete poured, and a tint of another color shows structural steel placed, and so on. Where the work has not been completed entirely across one bay of the building, outer lines or tints on that bay are shown broken, and in the case of vertical members are extended to a height proportional to the percentage completed.

All equipment is indicated by pins with variously colored heads representing different types, which are stuck into a map showing their location on the entire project.

The construction of the New Orleans Army supply base is under the general supervision of Brig. Gen. R. C. Marshall, Jr., U. S. A., chief of the Construction Division of the Army, and under direct charge of Lieut. Col. A. Pearson Hoover, constructing quartermaster, who went direct from the Boston Army supply base. Capt. C. R. Barnett is assistant constructing quartermaster. Ford, Bacon & Davis are supervising engineers of the base. The firm is represented by George H. Davis, member of the firm; Charles J. Hardy, New Orleans resident engineer, and Frank J. Trelease, engineer in charge. The George A. Fuller Co. is the general contractor for the entire work, and is represented by Walter T. Smith, vice-president of the company. The wharf and wharf-house construction was sublet by the general contractor to the Holbrook, Cabot & Rollins Corporation of Boston.

Why Engineers Are Not Appreciated

Seven reasons for the lack of appreciation of the engineering profession by the public were given by W. W. K. Sparrow, corporate chief engineer of the Chicago, Milwaukee & St. Paul Ry., in a recent installation address before the Cincinnati Chapter of the American Association of Engineers. They are as follows: Inadequate compensation; lack of organization; lack of initiative in public affairs; lack of publicity concerning the engineer and his worth and his relation to the better health, comfort and welfare of the community; lack of proper public regulation in the form of licensing; improper application of the definition of the term "engineer," and lack of general education and inability to speak well.

Opening Old Railroad Fill Reveals Reasons for Track Trouble

Embankment Originally Built Nearly 90 Years Ago Had Pockets of Gravel in Section Widened Much Later

By R. Reimann
Assistant Engineer, Baltimore & Ohio Railroad, Baltimore, Md.

METHODS of making railroad embankments could be materially improved if in every case where there was trouble a cross-section of the fill could be obtained. On account of the construction of a state road under the tracks of the Baltimore & Ohio R.R. at Elkridge, Md., a 90-year old fill there had to be opened some time ago, with resulting instructive results.

The Washington branch of the Baltimore & Ohio R.R. was constructed as a double-track line in 1833-1835, but only one track was laid; the second track was added about 1861. On section C-D of the accompanying drawing the original fill at the location in question is very clearly shown; it consists of a yellow clay with horizontal layers of red clay, which proves that the fill was built from the bottom in horizontal layers, presumably with the use of teams. Section C-D shows also the original longitudinal string pieces and a sleeper or cross-tie underneath. The original track construction consisted of cross-ties or sleepers spaced about 4 ft. apart, upon which rested longitudinal string pieces (measuring 6 x 6 in); upon the latter the flat iron rails were nailed. The sleepers were partly embedded in the natural ground, and were supported on ballast at both ends. The ballast was placed in excavated cavities, each containing about 1½ cu.ft. of broken stone.

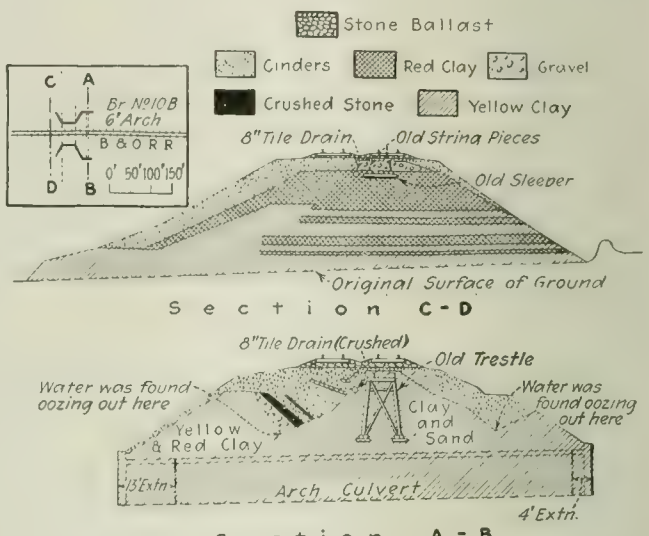
On Section A-B is shown a portion of the original trestle across the little stream. It appears that the fill was first built just high enough to cover the arch. The horizontal layers are clearly visible, but have not been shown on the section; they are extremely thin, probably to facilitate the tamping over the arch. On top of these horizontal layers of clay the trestle rested upon mud sills. It appears that the material was dumped in when the trestle was subsequently filled, since there is no evidence of horizontal lavers above the mud sill.

Trouble With Track Grade

For many years trouble was experienced in keeping the track up to grade at this place. Whether this goes back to the time when there was only a single track, or started after the second track was added, cannot be stated, but it is certain that the widening of the bank on account of the second track aggravated the trouble. This is very clearly evidenced by Section A-B, since the sliding of the alternate layers of gravel, crushed stone, cinders and the stone ballast has taken place on the side of the second track. It seems particularly clear that the presence of the gravel, which began to form a pocket, was the real cause of the trouble, since the red clay, shown by Section C-D, is holding up well. Even the red clay on the outside of the original fill for the second track is in fine condition and forms a solid bank together with the yellow clay. The cinders on the outside of the red clay have, however, caused trouble.

It appears that the base of the rail at present is 4 ft. higher than originally, and since the adding of ballast accounts for at least 18 in., the present subgrade at this place can be said to have been raised about 2 ft. On account of this raise, as well as on account of the greater width of the roadbed and track centers, it became necessary to increase the width of the bank. This was done with cinders and has not proved very satisfactory, since the rain water has readily sunk through the cinders and soaked the underlying clay. On Section C-D this situation is not quite as bad as on Section A-B, where it was aggravated by the presence of the pocket of gravel, etc., on the inside of the fill. The headwall of the culvert also had a retarding effect upon the run-off. This combination of causes has been keeping this part of the fill continually wet. During construction of the undergrade crossing a part of the bank slid and tore off a portion of the headwall of the culvert.

Various means have been tried to remedy conditions in this fill. In 1912 several cross-drains (1 ft. wide



SECTIONS THROUGH RAILROAD FILL ORIGINALLY PLACED IN 1833

and 3½ ft. deep), built of one-man stones, were put in below subgrade, but did very little good. Some years previous, the 8-in. tile drain shown on Section C-D was put in. On Section A-B this pipe is shown as it was found when the section was measured; it was crushed and had slid down three feet.

From this examination the following conclusions as to railroad fills might be made:

Where the material is clay, or partly clay, the bank should be built in layers approximately horizontal.

It is important that the surface of the bank is sloped about 1 in 30 to make the rainwater run off. To be sure that this is really accomplished, the bank should become thoroughly settled before the track is laid.

If a clay bank is to be raised or widened, the same or similar material should be used. Particularly, cinders or gravel should be avoided where the original fill consists of clay, since both materials are pervious, and the clay will be continually wet where it is in contact with the cinders or gravel, and being covered will not dry out, as it would if it were exposed.

It is very important that the additional fill be allowed to settle thoroughly, and then it should be made certain that the surface of the new fill is sloped in exact continuation of the 1 in 30 slope of the old fill, being neither higher nor lower.

If a pocket has already been formed in an old fill, the

only way of curing the trouble is to remove the pocket and rebuild the fill in layers of the same material as used in the original fill, taking care that each layer is thoroughly compacted and given a slight slope (1 in 30) away from the center of the bank.

Unfortunately, with our present day methods, using steam shovels and filling from a construction trestle, it is hardly ever practicable to follow the method of construction outlined above, although, if it could be done, the additional cost would no doubt prove a paying investment.

Narrow-Gage Railway Operation at Munition Plant

Eight Miles of Industrial Track at Edgewood Arsenal Used to Transfer Shells Operated as a Regular Railway System

By James A. Silsbee
First Lieutenant, C. W. S., U. S. A., Edgewood Arsenal, Md.

NARROW-GAGE railways have a distinct value in large industrial plants. How one was built and operated during the war at the Edgewood Arsenal, near Baltimore, Md., may be of value to engineers contemplating the use of similar equipment.

On account of the peculiar layout of the buildings containing the shell-filling machinery at the arsenal, one of the important items in the operation was the system of conveying the shells from the standard gage railroad, through the filling process, and back to the standard gage again. Edgewood Arsenal is the place where the United States manufactured poison gas, put it in hollow steel shells, corked up the shells with steel "boosters" containing the explosive, and shipped the shells to France. This entire process was done by machinery.

The plant consisted of a chemical group of buildings where the gases were made, and three separate units where shells were filled, all separated by 1000 to 1500 ft. Two of these units consisted each of four long, narrow buildings arranged radially about a central compressor house. The shells were unloaded in boxes from standard-gage cars at any one of three long sheds or shell dumps. Here they had to be unpacked, fitted with boosters and conveyed to the filling buildings where they received their charge of poison and were sealed up, after which they had to be conveyed to another or outgoing shelldump to be painted, labeled, repacked in boxes and shipped to France.

For conveying the shells through this process and for hauling the chemicals from the chemical plant to the filling buildings, an extensive system of narrow-gage railroad was constructed. The track used was 16 lb. rail, 21½ in. outside gage. This track is built up at the factory with steel ties. The tangents are in 20-ft. lengths. The curves are all bent on a 12-ft. radius at the center of track, and are made in lengths varying from $\frac{1}{3\frac{1}{2}}$ of a circle up to $\frac{5}{3\frac{1}{2}}$, that is, there are curves the length of which are $\frac{1}{3\frac{1}{2}}$, $\frac{2}{3\frac{1}{2}}$, $\frac{3}{3\frac{1}{2}}$, $\frac{4}{3\frac{1}{2}}$, or $\frac{5}{3\frac{1}{2}}$ of a circle, and these can be combined by suitable castings to make any desired length of curvature; $\frac{1}{3\frac{1}{2}}$ gives a central angle of 11¼°, $\frac{8}{3\frac{1}{2}}$ gives 90°, etc. The switches were all of cast iron and of four types, right hand, left hand, two way, and three way. The right hand and left hand were a combination of straight track and a $\frac{3}{3\frac{1}{2}}$ curve to right or left. A combination of a right-hand switch and a $\frac{5}{3\frac{1}{2}}$ curve would give a 90° turnout to the right from a tangent. A two-way switch consists of two $\frac{3}{3\frac{1}{2}}$ curves in opposite directions producing a "Y". A three-way switch consists of two opposite $\frac{3}{3\frac{1}{2}}$ curves with a straight track through the center producing a right and left turnout from a straight track at the same point. Cast-iron crossovers were also made up in angles corresponding to all the curves.

Owing to the soft soil, a combination of clay and sand with no gravel or stones, it was necessary to use 6 x 6 x 36-in. wood ties under the tracks in addition to the steel ties. These were spaced every 5 ft. under tangents and every 2½ ft. under curves. The switches were laid on 6 x 6 in. by 6-ft. wood ties. The entire system was ballasted with mixed medium and fine slag.

The cars were four-wheeled ball-bearing, outside flanged. There were flat cars of 2- and 5-ton capacity; shell cars of same capacity which consisted of flats fitted with steel racks for holding the shells standing on end; tank cars for hauling chemicals and steel dump cars for hauling cinders from the boiler room.

The motive power consisted of ten Hunt electric storage battery eight-drive wheel, chain-driven, and five Lakewood storage battery, eight-drive wheel, geared locomotives.

The general plan of the track layout was a main line from the empty shell dump to the inside end of the filler buildings, thence around the outside end of the filler buildings and to the full shell dump. A train of empty shells would start from the dump and leave a car of empty shells at the inside end of each filler building where the shells were put on a conveyor through the filling machines. At each building the train would pick up the empty cars which had previously been left, and as it came around to the outside ends of the buildings it would leave an empty car at each and pick up a car of full shells. When it had called at all four buildings in the unit, it would go to the full shell dump where the train was left and the locomotive was ready for the next trip with a new train. As there were three filling units, there were three railway systems of this sort, but all conveniently connected.

Operating Force Large

For construction, maintenance and operation, the personnel of the railroad consisted of about 150 enlisted soldiers and one first lieutenant. This force was divided up into train crews, yardmasters, dispatchers, switchmen, oilers, car repair men, riggers, store keepers and section gangs. The trains were operated 24 hours per day. Each crew consisted of a motorman, conductor and two trainmen. On the day shift for operation there were four train crews of four men each, and one yardmaster, one oiler, two car repair men, one switch man and one sergeant in charge of operation. The two night shifts consisted of three crews each, one yardmaster and one switchman. All told, about 50 men were assigned to the operation alone.

The trains were made up of from three or four to as many as 25 cars. A steel dump car loaded with sand or ballast or wet cinders would probably weigh four tons and the locomotive weighed five tons, so that loads of 100 tons were frequently hauled with a single locomotive. The maximum grade did not exceed 2 per cent.

In order to prevent waste of power and loss of time by stopping trains at junction points, a set of signals

was arranged. At one junction point in particular, trains went by bound for ten different destinations. The tracks were on long up grades in all directions from this point, and it would have cost considerable power, time and wear and tear to stop and start all trains on these grades. To prevent this each locomotive was provided with six round galvanized iron disks 10 in. in diameter, two of which were painted white, two green, and two red. Ten combinations of these were arranged, each train destination being assigned one combination, e.g., one white disk on an approaching locomotive meant it was going to the mustard gas plant, one red disk and one green meant the train was bound for the 75 mm. plant, one white and one red designated the chemical plant, etc.

For night work a small box containing an electric light was placed on each of the four corners of each locomotive. The side away from the locomotive consisted of three pieces of glass, one white, one red, one green. Shutters were arranged over the glass so that only the desired color need be shown. Keys to the signals were prepared consisting of 8 x 10-in. paper mounted or cardboard and shellacked, on which each combination was shown by a small picture of an approaching locomotive with signals in color. Each locomotive was furnished with one of these keys, as were also the switchmen stationed at the junctions. The switchman could tell where a train was bound while it was several hundred feet away. It was his duty to set all switches before the train arrived and to block all other trains necessary, so that through trains on down grade could pass at full speed without hesitation.

For maintenance the system was separated into five divisions. Each division had its own section foreman and gang consisting of about ten to twelve enlisted men each. No section gang was allowed to work outside of its own division. This system started a spirit of competition which resulted in some unusually excellent roadbeds. The entire maintenance work was under direct charge of a corporal who had had considerable experience on standard-gage work before his enlistment.

For construction work there were four gangs each consisting of a foreman and six or eight other soldiers. Steam shovels, teams, scrapers and dump wagons were also used at times, which were operated by civilians. The following list of quantities will give a fair idea of the magnitude of the construction work, and amount of rolling stock used in operation. The entire system was constructed during the summer of 1918.

Total embankment	12,000 cu.yd
Total excavation	9,000 cu.yd.
Total ballast	6,228 cu.yd.
Total length of track over which a train could make a continuous trip	40,231 ft
Total switches	239
Total length curves built up 12 ft. radius	2,707 ft
Total 3-ft. ties	8,084
Total 6-ft. ties	1,185
Total fish plates	6,805
Total track bolts	13,610
Total spikes	37,034
Cars all kinds	481
Locomotives	15

The construction, maintenance and operation of this road was assigned to the Civil Engineering Department of Edgewood Plant, Edgewood Arsenal, of which Lieut. James E. Cuff, C. W. S., U. S. A., was in charge. The writer had entire charge of the 21½-in. gage railroad for Lieutenant Cuff, and was assisted by the non-commissioned officers and enlisted men assigned to the work.

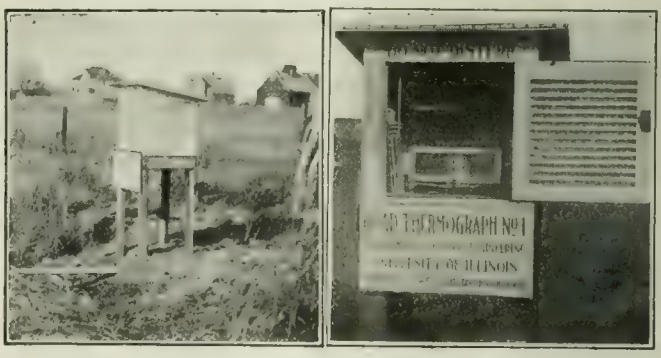
Comparison of Road Subgrade and Air Temperatures

University of Illinois Erects Thermograph To Study Variations—Changes in Air Temperature Slow To Affect Subsoil

By C. C. Wiley
Associate in Civil Engineering, College of Civil Engineering, University of Illinois, Urbana

THERMOGRAPHIC measurements to study the variations in temperature between the atmosphere and the subsoil of hard-surface pavements have been inaugurated by the Department of Civil Engineering of the University of Illinois. While these studies have not gone far enough to warrant definite conclusions, they have shown that changes in temperature are transferred very slowly from the air to the subsoil, giving evidence of much less range, and that the extremes in the subgrade graphs lag somewhat behind those of the air graphs. The investigations were started in the belief that some of the phenomena of cracking and heaving of brick and concrete roads can be explained by a study of the range and rate of change in temperatures within the pavement and in the underlying soil. The observations will extend over a considerable period of time to obtain data concerning some of these factors.

The initial installation of equipment was made early in December, 1918, on a brick road about a mile outside the city of Champaign, Ill. This road was built by state aid in 1914, and consists of a brick pavement 10 ft. wide with earth shoulders of the same width on each



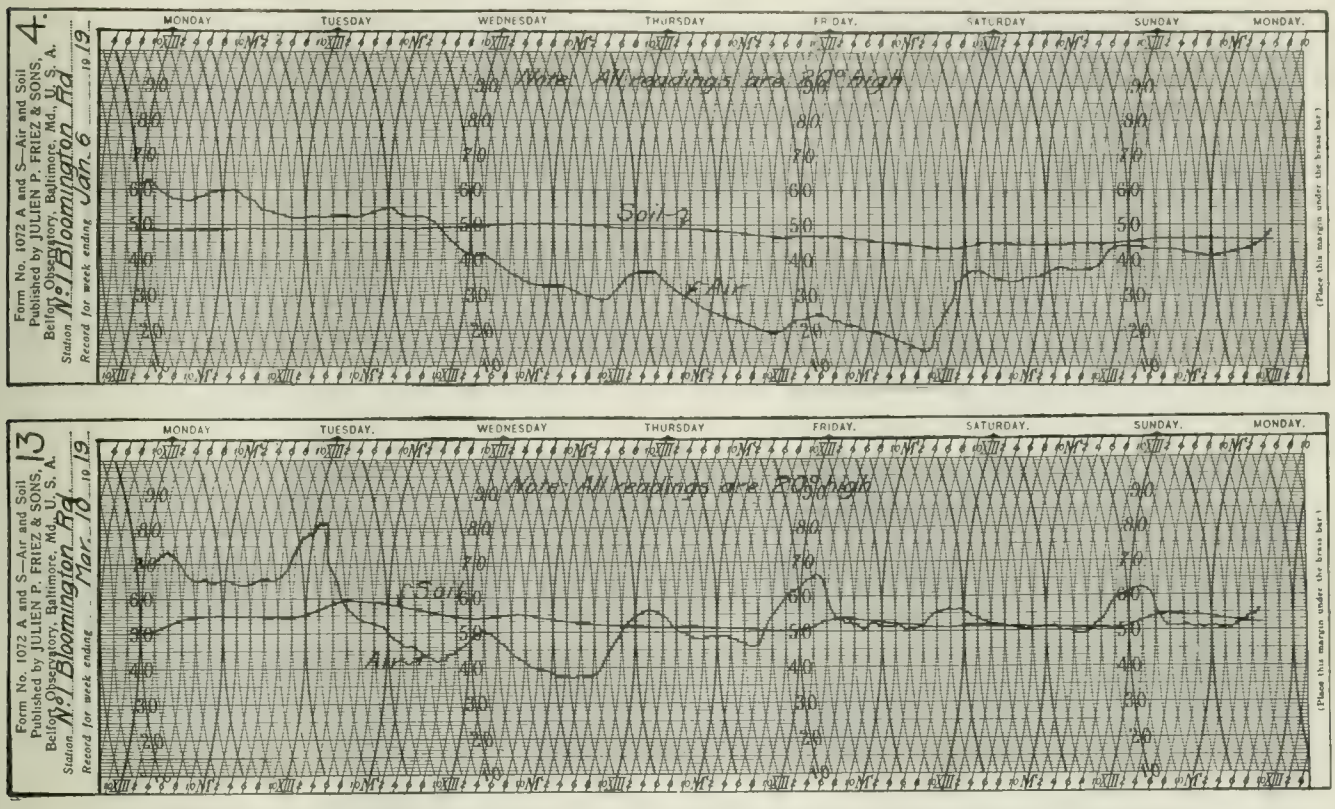
LOCATION AND CLOSE-UP VIEWS OF A SUBGRADE THERMOGRAPH STATION

side. The pavement is of the sand-cushion, grout-filler type made up of a 5-in. concrete base, a 1-in. sand cushion, and standard 4-in. paving block.

A point for observation was selected about 10 ft. from a small culvert, at the bottom of a slight sag, as being the most likely place to give maximum effects of freezing and thawings. The conditions are such that the ground water probably stands at a relatively high level, and the soil in contact with the pavement is frequently saturated. The soil is a rather heavy black loam for a depth of about 2 ft. below which is a heavy, gumbo-like clay.

The installation consists of a ventilated instrument house mounted on posts just outside the ditch line and containing a double soil thermograph, the general arrangements of which are shown in the illustration. An ordinary thermometer and a maximum and minimum thermometer are also used to check the recording instrument. The thermograph is the same as used by the

United States Agricultural Experiment Stations and is made by Julian P. Friez & Sons of Baltimore. One bulb of this instrument is suspended in the center of the instrument house to record the air temperatures, while the other is carried through a 1¼-in. iron pipe to a point under the center of the pavement slab, and in contact with the lower surface of the concrete base.



TEMPERATURE GRAPHS OF FROZEN AND UNFROZEN SUBSOILS OVER SEVEN-DAY PERIODS

There is thus obtained a continuous graphical record of the temperatures both of the air and of the soil immediately under the pavement.

Additional equipment will be added in the near future, so arranged as to give records of the temperature at the surface, at mid-depth of the slab and, possibly, in the soil at varying distances from the center to the edge of the slab. Provision will also be made to measure the elevation of the ground water, and changes in elevation of the slab from time to time. The data obtained will be combined with those of the local weather station and the soil temperatures of the agricultural experiment station, and is expected that some interesting and valuable information will be obtained.

Two of the thermograph charts are here reproduced. These were chosen to show several points which seem to be characteristic of the temperature curves.

Chart No. 4, for the week which ended Jan. 6, 1919, shows the period of extreme cold for the winter which, as a whole, was extremely mild. It ill be noted that with three consecutive days of low temperature with a minimum of —6° F. the temperature under the pavement (where the soil had been frozen by cold weather of the preceding week) dropped only 6° and immediately began to rise when the air temperature passed the low point. It was characteristic of charts taken where the ground was frozen to show little variation due to air temperature changes.

In contrast with this, note that Chart No. 13, for the week which ended Mar. 10, 1919, when the frost had gone out of the ground, shows fluctuations in the soil temperatures parallel to those of the air, even for small daily ranges in the air temperatures. It will be noted, however, that the soil temperatures lag several hours behind those in the air and are very much smaller in magnitude.

The fact that the changes of temperature at the bottom of the slab are considerably slower and much less in magnitude than those of the air may be worth considering in connection with protecting a new pavement from freezing. Also, it may be noted that the change from maximum to minimum temperatures in the slab take place over a considerable length of time, during which the slab and subgrade have an opportunity to adjust themselves to the changed conditions. When the data are more complete and combined with other facts available, it should be possible to determine with fair certainty some critical points in pavement design which now are little more than guessed at.

Cement Production Fell Off In 1918

Complete statistics of the output of cement in 1918 indicate a marked decrease from the output in 1917, and show that the production of portland and other cements in 1918 was the lowest since 1909. The final statistics of shipments, production and stocks are about 1% lower than those given in the United States Geological Survey's preliminary estimate, published in January. The shipments of portland cement in 1918 amounted to 70,915,508 bbl., valued at $113,153,513, compared with 90,703,474, valued at $122,775,088, in 1917, a decrease in quantity of 21.8% and in value of 7.8%. The production in 1918 was 71,081,663 bbl., compared with 92,814,202 in 1917, a decrease of 23.4%. Stocks in the mills increased from 10,353,838 bbl. in 1917 to 10,453,950.

Pressing Out Mix Water Adds To Cement Mortar Strength

Tests Made With Special Apparatus Permitting Pressures Up to 30,000 Pounds Per Square Inch Give Very High Compressive Values

By C. T. Wiskocil
Assistant Professor of Civil Engineering, University of California, Berkeley, Calif.

EXCEPTIONALLY high strengths of cement mortar have recently been obtained in a series of tests conducted by the writer, in which was used a special apparatus designed to subject the specimen to an extremely high pressure which squeezes out or expresses much of the water of mixing. A controlling detail in the apparatus is the use of a perforated mold which permits the escape of the expressed water. The results seem to be of importance, particularly in the development of cast concrete products.

The maximum strength of the combination of any aggregate, cement and water can be secured only by reducing the voids to a minimum. Pore spaces are caused by air entrapped during the mixing and all water which does not combine chemically with the cement. Any attempt to reduce these voids must necessarily be made before the cement sets.

Tamping dry concrete improves its strength by reducing the air voids. (See H. Burchartz, "The Influence of Tamping on the Strength of Concrete," *Engineering Record* of Sept. 22, 1906, p. 332.) Compacting it in layers under pressure accomplishes the same results; the actual increase, according to experiments by F. P. McKibben, noted in *Engineering News-Record* of Dec. 5, 1918, p. 1031, may be as much as 51 per cent.

With wet concrete, which inherently has fewer air voids, tamping is not so effective. Nevertheless, it is employed to force the concrete into all corners of the forms, or the forms may be vibrated by hammer blows to secure similar results. These methods do not affect the homogeneity of the concrete. The finishing of concrete road surfaces with rollers will, however, improve the strength of the hardened concrete when wet mixes are used. Experimental slabs made by this method were increased 10% in strength, indicating that the water voids had been decreased. (See A. N. Johnson, "Tests of Concrete to Determine the Effect of Removing Excess Water Used in Mixing," "Proceedings," A. S. T. M., Vol. XVII, Part II, p. 379.)

Water cannot be effectively removed from fluid mixes by rolling; it must be expressed or squeezed out by applying pressure to confined masses. By such methods the water and air voids can be reduced to a practical minimum. It is evident, however, that water cannot be squeezed out of concrete after it has been placed in forms for monolithic construction. But, inasmuch as precast concrete made in the usual way from wet mixes is coming into such wide use, and since pressure methods are already in use for producing precast shapes from dry concrete and mortar mixes, a study of the possible improvement in strength by a positive method of decreasing the air and water voids seemed warranted. Such an investigation was started in 1917 in the Materials Testing Laboratory of the Department of Civil Engineering of the University of California.

The chief difficulty encountered in the investigation was the construction of a mold or container in which the fresh mortar could be compressed. The mold used as shown in the accompanying drawing, was made entirely of steel. It is a hollow cylinder, with a solid plunger in each end. The space between the plungers, which fit perfectly the interior of the cylinder, forms the pressure chamber. The cylinder is essentially in two parts, an outer shell and a tapered lining in four sections, all of which are perforated with small holes terminating in longitudinal grooves in its outer surface. The grooves permit the escape of the water forced out of the pressure chamber.

The materials used were Santa Cruz portland cement from Davenport, Calif., and a poorly graded sand containing considerable mica. All of the sand passed a No. 10 sieve. The amounts, by weight, retained on other sieves were as follows: One per cent. on a No. 20,

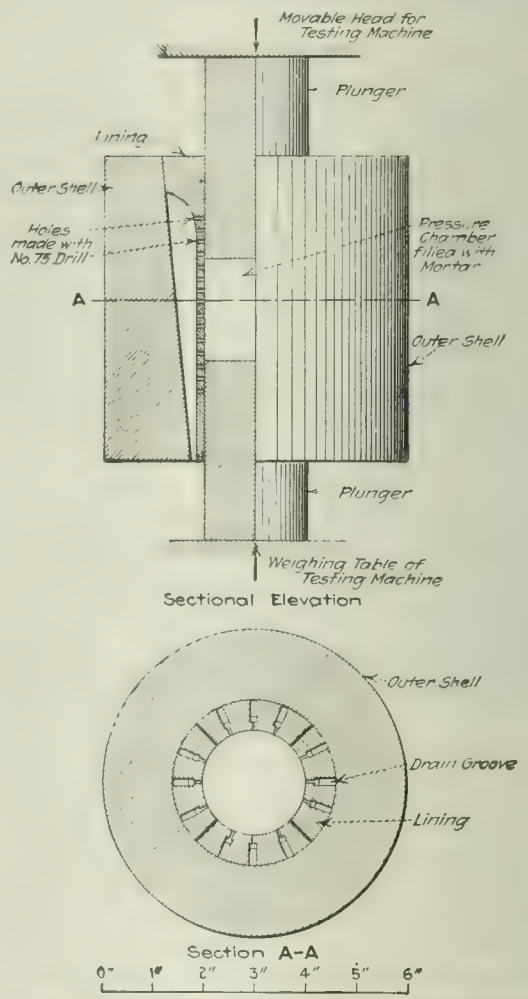


FIG. 1. TEST APPARATUS TO PRESS OUT WATER FROM CONCRETE MORTAR SPECIMEN

3% on a No. 30, and only 14% on a No. 40 sieve. Its weight was 93 lb. per cubic foot while the percentage of voids and specific gravity were 43% and 2.67, respectively.

In molding a specimen, the applied pressure was immediately released when it had reached the predetermined amount. The lining of the mold was slipped out and lifted apart to free the hard cylinder of fresh mortar, which was then placed in a standard moist

closet to cure. The control specimens, which were made without pressure, were removed from their molds 48 hours after being cast and then stored with the pressure specimens.

The first group of specimens was made to study the effect of expressing the water from various cement and sand mixes which ranged from neat to 1 : 5 by weight Six specimens were made from each batch, three without pressure in 2 by 4-in. cylindrical molds, as controls, and three were molded under pressure. The latter were 2 in. in diameter and approximately 4 in. long. The percentage of mixing water, on the basis of dry materials, was the same for each mixture, namely, 25%, by weight.

In the second series the mix, one part cement to four parts sand, was kept constant, and the amount of water expressed was varied. Each batch was mixed with 24% water, by weight of cement plus sand, yielding sufficient mortar for six specimens, three of which were molded in 2-in. cubes as controls. The three pressure specimens were 2 in. in diameter and about 2 in. long.

The effect of expressing part of the mixing water can be clearly seen in the results of the first series, as shown graphically in Fig. 2 and in detail in Table I. The greater percentage increase in the strength of the lean mixes was caused by the higher relative water content of the mortar as based on the amount of cement used. The stiffer consistency of the richer mixes produced relatively greater strengths in the controls and lower strengths in the pressure specimens.

TABLE I. VARIOUS MORTARS, CONSTANT PRESSURES

(Showing percentage changes in various properties of mortars as affected by expressing the mixing water under constant pressure, 19,000 lb. per sq. in., series 1.)

Mix	Strength, Lb. per Sq.In. Specimens 7 Days Old Controls	Pressure	Percentage Increase Strength	Solidity	Weight	Percentage Decrease Water Content
1:5	194	1,070	451	38	9	78
1:4	242	1,757	626	30	14	68
1:3	597	2,520	322	28	12	70
1:2	1,170	4,240	262	23	13	72
1:1	2,370	6,930	192	28	15	68
Neat	6,870	14,230	110	40	20	76
Neat*	2,530	17,080	575	56	27	77

* Pressure 30,000 lb. per sq. in.

The neat controls weighed 124 lb. per cu.ft. which was increased to 158 lb. per cu.ft. by pressure. The corresponding change in solidity was from .493 to .768.

This explanation was verified by making a special batch of neat cement mortar with 37.25% water by weight of cement. Pressure specimens made from this mixture were 6¾ times stronger than the controls. The molding pressure, 30,000 lb. per square inch, thus produced an increase of 575% in the compressive strength. The average strength of the pressure specimens made from mortar mixed with 25% water was 14,230 lb. per square inch. Pressure specimens made from the wetter mortar averaged 17,080 lb. per square inch. The greatest strength obtained, 18,360 lb. per square inch, is quite remarkable 7-day strength even for neat cement. The strength of ordinary 2-in. cubes of neat cement one year old will not exceed 14,000 lb. per square inch.

Increasing the amount of water expressed has a decided effect on the strength, especially at the lower pressure. At 10,000 lb. per square inch the percentage increase in strength is about 570%, while the maximum pressure (30,000 lb. per square inch) raises this percentage increase to 810. These relations for a 1:4 mix are indicated in Table II. It should be remembered that all pressure applied by the plungers is not transmitted throughout the mortar, because of the high friction on the mortar against the inside of the cylinder while the water is being squeezed out. Also, the diameter of the plunger is increased at the high molding pressures, thus producing a further loss in applied force. No attempt has been made to estimate these frictional losses, hence the actual pressures available for expressing the water are not known. The curve in Fig. 3, in which nominal molding pressure is used, is consequently flatter for the higher pressures.

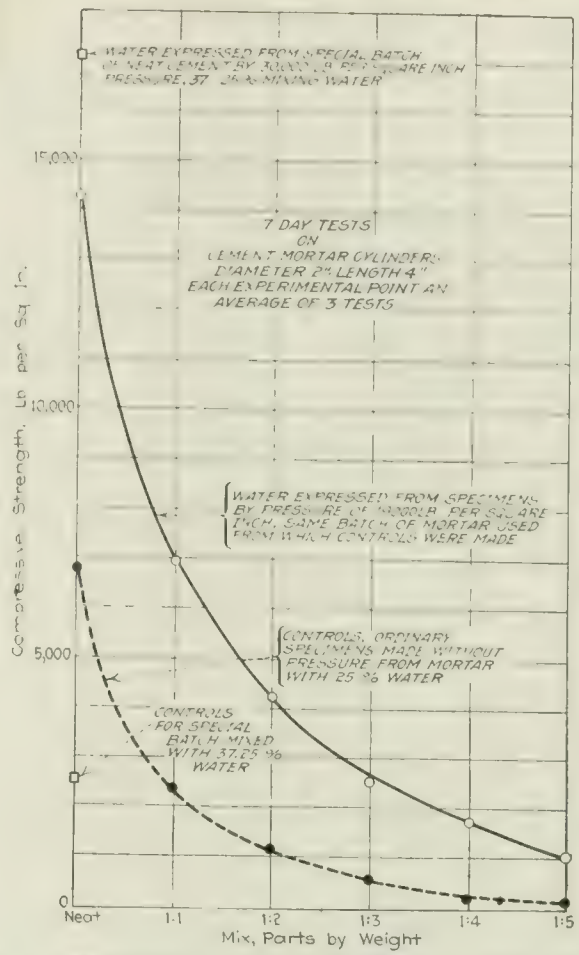


FIG. 2. STRENGTH OF VARIOUS CEMENT MORTARS AS INFLUENCED BY EXPRESSING MIXING WATER

TABLE II CONSTANT MORTAR, VARYING PRESSURES

Showing percentage changes in various properties of 1:4 mortar as affected by expressing water under varying pressures, Series 2

Molding Pressure Pounds per Square Inch	Compressive Strength Pounds per Square Inch	Percentage Increases Strength	Solidity	Weight	Volume	Percentage Decrease Water Content When Molded
1,600	1,080	237	16	6	16	41
3,180	1,280	300	20	10	19	50
5,000	1,680	425	24	10	21	56
6,370	1,800	463	26	12	22	61
10,000	2,250	603	28	13	24	59
12,700	2,310	622	30	13	25	67
15,000	2,400	650	31	14	26	65
20,000	2,650	728	33	15	26	68
25,000	2,710	747	34	15	27	74
25,500	2,730	753	36	16	27	73
30,000	2,910	810	36	17	28	73

The properties of 28 control specimens, nine different batches, from which the above values were computed, were as follows: Molding pressure 0, solidity .602, weight when tested 126 lb. per cu.ft., water content 24%, and pressive strength 320 lb. per sq.in. All controls were 2-in. cubes.

All pressure specimens were two inches in diameter and about two inches long.

All specimens were tested seven days after being molded.

It is interesting to note that the 810% increase in strength is accompanied by only 17% increase in weight.

In spite of the loss in cement which is carried in suspension by the expressed water, and the unequal distribution of molding pressure throughout the mortar specimens, the strength of 1:4 mortar molded under the highest pressure was 2910 lb. per square inch. This is 12.2 times stronger than the same mortar which was allowed to set and harden under the usual conditions indicated by the controls.

Pressure machines used in the molding of sand-lime bricks exert a force of 20,000 lb. per square inch on the face of the brick. Similar methods could be adapted to the production of precast cement mortar products in which the pressure used to express the mixing water

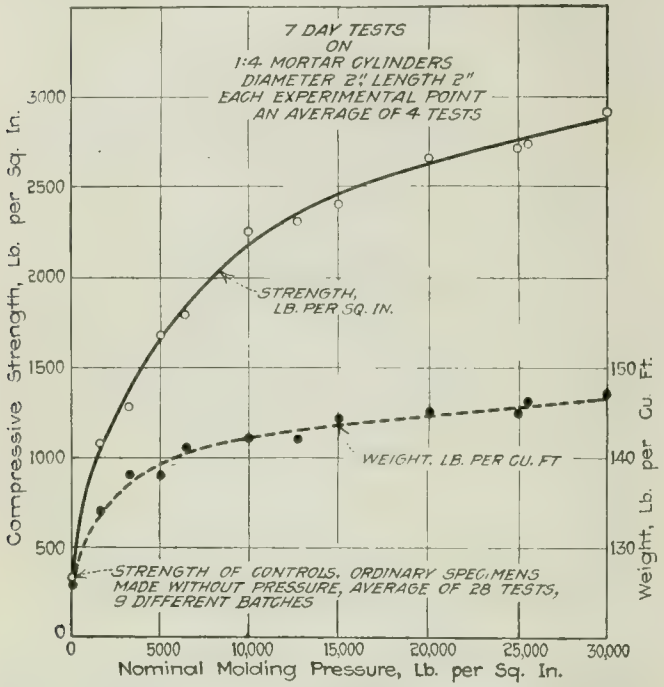


FIG. 3. EFFECT OF EXPRESSING MIXING WATER UNDER DIFFERENT PRESSURES; 1:4 MORTAR

from the mortar would increase its solidity by reducing both the air and water voids. In addition to improving the strength of the hardened mortar this process would insure exact dimensions, perfect faces and sharp edges on the finished product. Furthermore, with pressure-molding the rate of manufacturing any precast cement product would be greater than by methods now in use.

Maximum Sounding in Trinidad Asphalt Lake

Recent borings made in the asphalt lake on the Island of Trinidad have reached a new low level record of 150 ft. The previous record, made in 1893, was 135 ft. On both occasions the asphalt was found to be of uniform character throughout. Great difficulties attend any attempt to sound the lake, as it is in constant although almost imperceptible motion. The pressure of the mass of asphalt against the drilling apparatus causes it to bend, and the deflection makes further boring impossible. After completion of the test, the hole was observed to shift at the surface 25 ft. in six weeks. The movement was shown to exist to a depth of 100 ft., and there was evidence that the direction was reversed at a depth of from 25 to 50 ft. The movement of the asphalt is believed to be similar in many respects to the ascending and descending currents in a kettle of boiling water.

Properties of Malleable Cast Iron

Paper Read Before American Society for Testing Materials Gives Strength Data Obtained From Tests of Commercial Specimens of Material

WORKING data on commercial specimens of malleable cast iron were summarized by H. A. Schwartz, of the National Malleable Casting Co., in a paper presented before the American Society For Testing Materials, at the recent Atlantic City meeting. These data were obtained through extensive series of tests conducted by the company named. They apply to material of commercial character, passing the specifications of the American Society for Testing Materials, and not of selected superior quality, though known to be free from effects such as shrink holes or blow holes. In

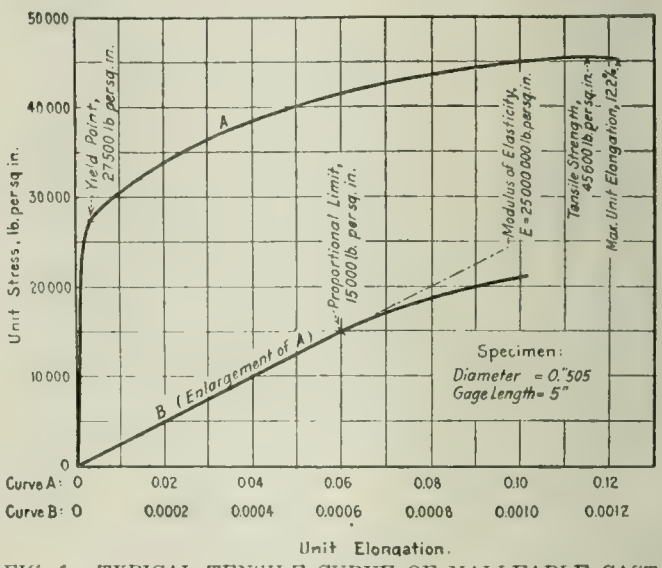


FIG. 1. TYPICAL TENSILE CURVE OF MALLEABLE CAST IRON SHOWS GOOD ELASTIC QUALITIES

certain cases the test specimens were machined to size (after annealing) or ground (before annealing), but it does not appear that the results differ very greatly from those which would have been obtained with material not finished by a mechanical process. Detailed studies of the relation between chemical composition and tensile strength, for many thousands of heats, are stated to have shown that the amount and form of the

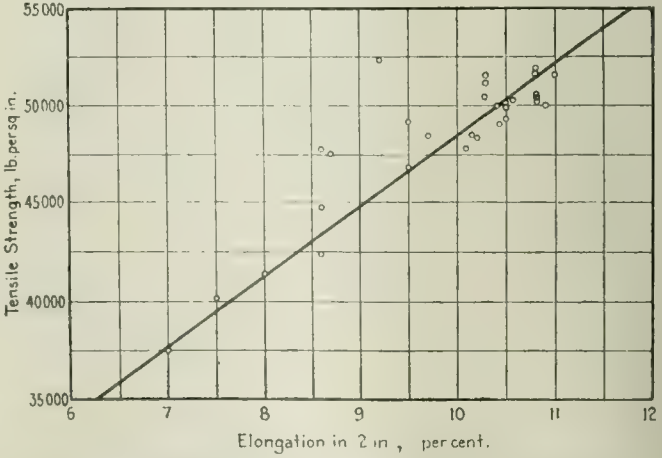


FIG. 2. INCREASE OF ELONGATION WITH TENSILE STRENGTH CHARACTERISTIC OF MALLEABLE CAST IRON (PLOT SUMMARIZES 840 HEATS)

free carbon present in the finished piece is the determining factor of quality; satisfactory commerical practice limits the composition so as virtually to eliminate variation due to the composition of the ferrite.

Tensile Strength—The standard tensile strength now specified is 45,000 lb. per square inch, with elongation 7½% in 2 in. The probable actual average of commercial naterial is 48,000 to 50,000 lb. per square inch, with elongation in 2 in. of 10 to 15%. Fig. 1 reproduces a typical stress strain diagram recorded by Prof. H. A. Thomas (but elongation measured on 5 in.). This piece was machined from a large block, 4½ x 9 x 14 in., and yet shows very satisfactory qualities. A set of tests on material rather better than the regular commerical run, on specimens cast to test size and ground before annealing, showed tensile strength ranging from 55,100 to 55,200 lb. per square inch, elongation (in 2 in.) from 13 to 19%, and reduction in area from 18 to 23 per cent.

Elongation Increases with Strength—Tests of specimens taken from 340 heats summarized in Fig. 2, bring out the striking peculiarity of malleable cast iron, that elongation increases with tensile strength. The relationship is not considered absolutely quantitative, yet is a general characteristic.

Compressive Strength—The elastic properties in tension and in compression are believed to be approxi-

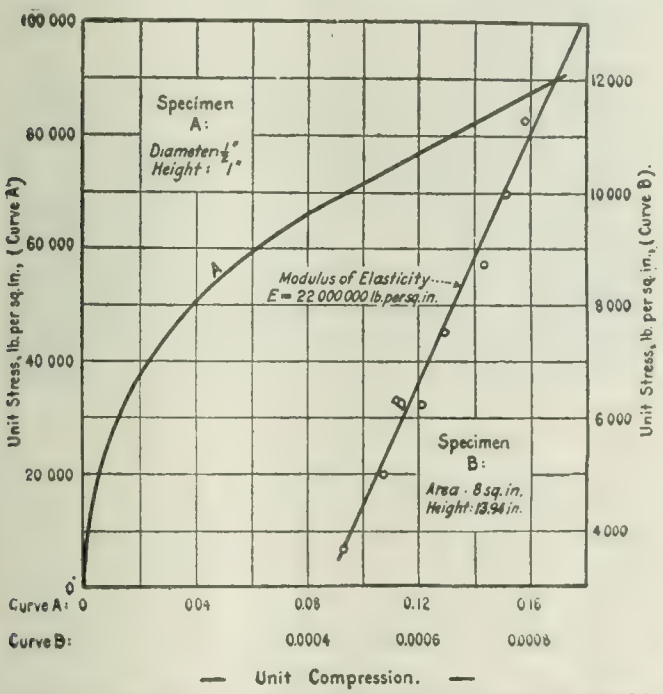


FIG. 3. CURVES FOR TWO COMPRESSION TESTS ON SMALL AND LARGE SPECIMENS

mately the same. Two compressive tests are plotted in Fig. 3. The curved line, for a small specimen, has a proportional limit of about 15,000 lb. per square inch; the large specimen (curve B) has a proportional limit exceeding 12,500 lb. per square inch.

In tests on specimens ⅝ in. in diameter by 10.6 in. long, acting as square-end columns, a straight-line stress strain curve was obtained up to a loading of about 25,000 lb. per square inch.

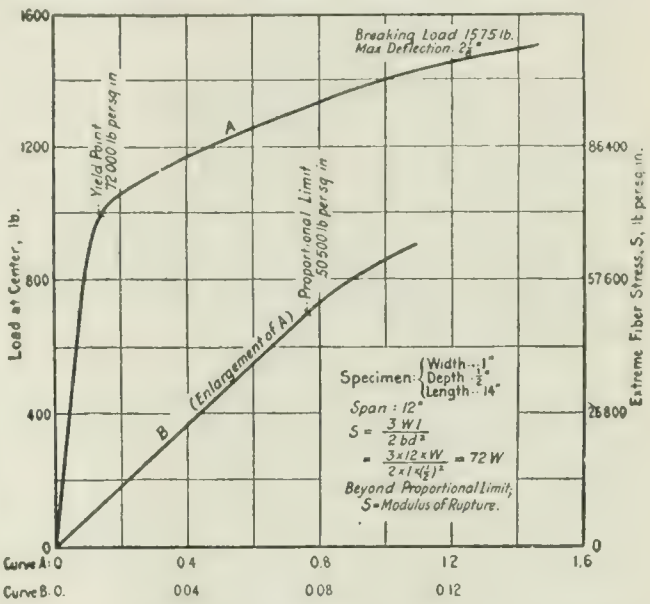
Cross-Bending Strength—Material that passes the A.S.T.M. tensile test specifications always displays a cross-bending strength corresponding to a modulus of rupture above 64,000 lb. per square inch. The figure named is roughly that represented by the cross-bending test requirements of the United States Railway Administration specification R-17 of May 1, 1918.

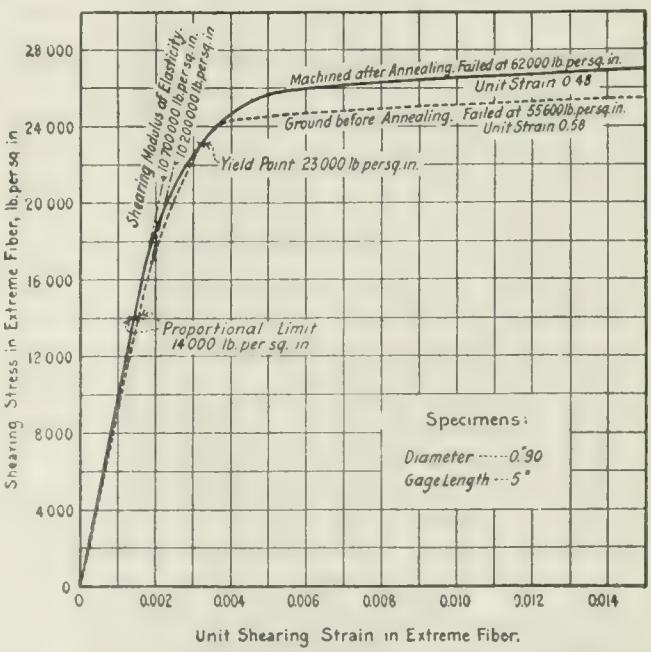
A typical cross-bending diagram for an unmachined specimen ½ x 1 x 14 in. loaded at the center of a 12-in. span is shown in Fig. 4.

Shearing Strength—Slightly different results were obtained in three different tests, one by punching a 1-in. round hole through a ½-in. plate (unmachined), one by applying double shear to a ⅞-in. pin (machined after annealing), and the third by the same double-shear test on a pin ground to size before annealing. The ultimate shear values in pounds per square inch for these three tests were: 45,152, 40,340 and 41,350.

Similar slight differences between ground and machined specimens were found in torsion tests, but here the machined specimens showed the higher strength, 62,000 lb. per square inch against 55,600.

Other Properties—Brinell hardness of malleable cast





FIGS. 4 AND 5. GRAPHICAL RECORDS OF CROSS-BENDING AND TORSION TESTS (BENDING SPECIMENS UNMACHINED, TORSION SPECIMENS FINISHED BY TWO METHODS)

iron ranges from 101 to 145 (110 average). Material with a hardness of 102 gives Shore scleroscope readings of about 15. The Brinell number varied approximately with tensible strength and inversely with carbon content.

Maximum flux density in magnetization tests, about 12,000; maximum permeability, about 2,300. Specific

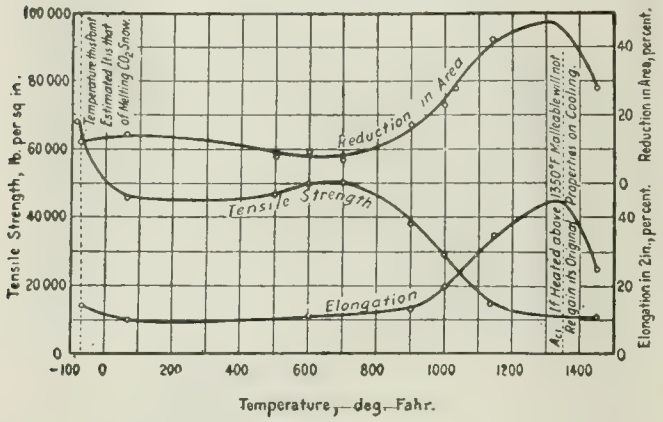


FIG. 6. EFFECT OF TEMPERATURE ON TENSILE STRENGTH AND DUCTILITY OF MALLEABLE CAST IRON

resistance (one average sample), 0.000041 ohms per centimeter cube at 75° F. Density before annealing about 7.7, after annealing about 7.35, ranging from 7.45 to 7.25 as the carbon percentage is increased from 2.3 to 3.2. Thermal expansion coefficient is approximately $1 + 0.000006\ t + 0.0000000125\ t^2$, where t is the temperature in degrees Centigrade. This curve fits the observed values between 0 and 1100° F. very closely.

The first critical point of malleable cast iron is not materially different from that of hard iron, or about 1350° F. (732.5° C.) for the heating curve and 1280° F. (693.5° C.) for the cooling curve.

Strength and ductility are affected by temperature at a lower value. The results are summarized in the diagram, Fig. 5, which refers to tests on specimens 0.634 in. in diameter ground to size before annealing.

Historical Cast-Iron Bridges Jacketed with Concrete

Two very old cast-iron bridges in Shropshire, England, dating from the time of Thomas Telford, are being made safe for modern heavy traffic by concrete incasement of the main ribs. Recent news given in the *Times Engineering Supplement* says that the first bridge to be treated in this way is situated on the main road between Shrewsbury and Ludlow, and was built 95 years ago. A careful examination made last year showed that two of the cast-iron ribs had cracked badly at the haunches. The bridge had long been considered unfit for heavy traffic. A. T. Davis, county surveyor, recommended reinforced-concrete incasement of the arch ribs and the recommendation was approved by the county authorities. No disturbance of the road surface or hand railing was required in carrying out the work, it being done from suspended staging. Further, the external appearance of the bridge has not been materially altered. Another cast-iron bridge, also built by Telford, but five years earlier than the other one, is located on the main road between Shrewsbury and Wenlock. This bridge is also inadequate for modern traffic and the same strengthening procedure is to be applied to it.

Tests of Thin-Base Monolithic-Brick Road

By Harlan H. Edwards
Highway Engineer, Urbana, Ill

THIN-BASE monolithic-brick pavements have been proved a success by recent investigation of such construction in Illinois. Practice has proven correct the conclusions drawn from tests made at the highway laboratory of the University of Illinois three years ago, (described in *Engineering Record* of Jan. 15, 1916, p. 86 and in *Engineering News-Record* of Nov. 1, 1917, p. 820) and from an experimental road near Danville, Ill., described in *Engineering Record* of Sept. 30, 1916, p. 400. These experiments showed that a monolithic-brick slab was as strong as or stronger than a 1:2:3 gravel-concrete of the same thickness; in fact, that the monolithic-brick slab was in effect but a two-course concrete slab having an extremely coarse aggregate (paving brick) in its wearing surface in place of a granite or traprock topping.

A monolithic-brick pavement three years old having a very thin layer of concrete for the lower portion has been examined recently and found in perfect condition. This road, which was built by Stockland Township, Iroquois County, Ill., in 1916, was made of 4-in. wire-cut lug brick laid and grouted on a 1-in. layer of 1:2½:4



ROAD IN STOCKLAND TOWNSHIP, ILL., AFTER NEARLY THREE YEARS OF SERVICE

concrete, using roofing gravel for the coarse aggregate. There were 6½ miles of this pavement, in which the slab was 9 ft. wide, with 8-ft. earth shoulders on each side, costing in all $8500 per mile. Many different kinds of soil—brown-silt loam, black loam, timber soil, clay, sand and gravel—were encountered. In all these soils, however, good drainage was provided for the road, thus enabling the thin slab to carry the heavy loads. The road has been used through three winters, and is in perfect condition, with no longitudinal cracks. Over it grain and other agricultural products are hauled to town, and coal and other heavy supplies returned, providing a medium-heavy traffic. The traffic and condition of the surface are shown in the illustration.

Considering this experience as well as many others of this general type, it would seem that the thin-base monolithic pavement has a place in our road designs, and that it should not be discriminated against, as seems to be the custom, by the requirement that the thickness of slab shall be from 20 to 35% greater than the beam acting portions of other types. Engineers now seem to be going to extremes in proportioning the thickness of slab in pavement construction, and are neglecting the

most essential feature of good roadbuilding—effective subdrainage and good surface. In many places a little more expense incurred in tiling and ditching to keep the sub-grade,which finally must carry the load, in a dry condition, would provide a foundation which could withstand much heavier loads at all times, and thus permit a thinner slab to support the traffic and take the wear.

Swimming Tank On Third Floor of Concrete Building

Deflection Limited to Avoid Cracks—Long Girders Carrying Columns Have Horizontal Spiral Reinforcement

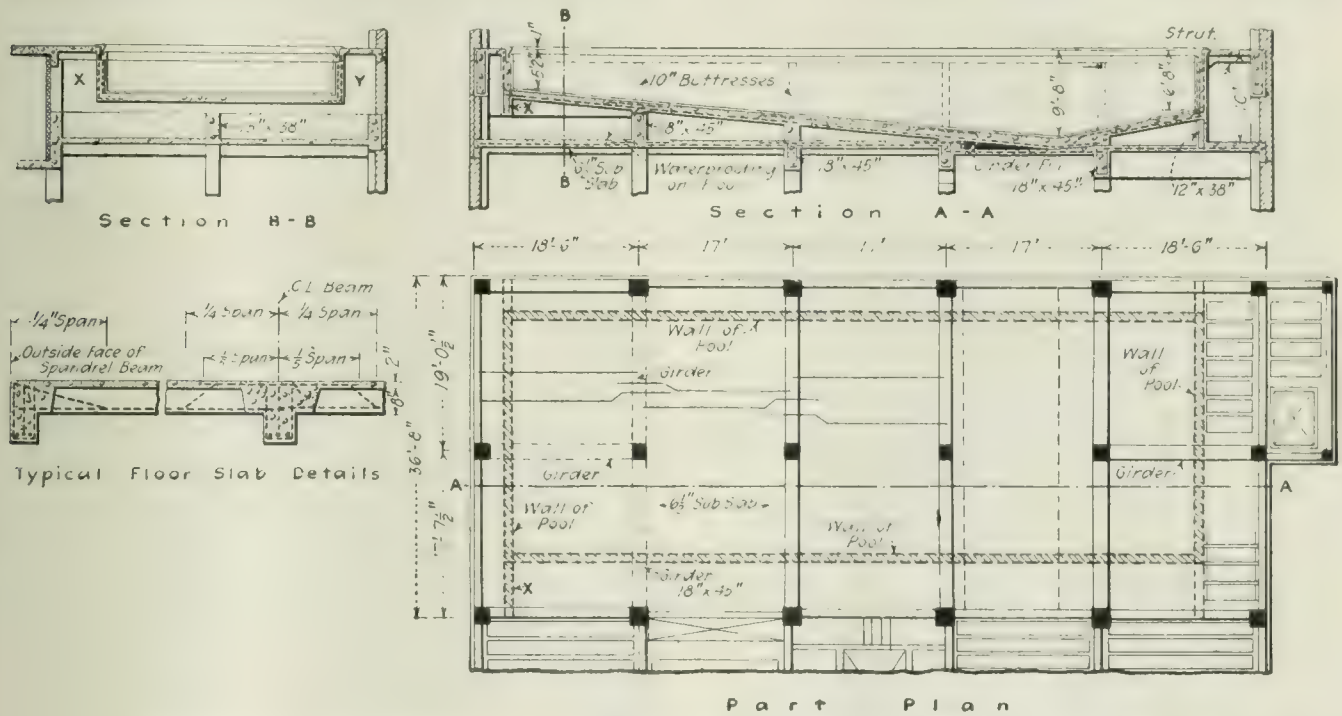
By L. R. Viterbo
Of Brussel & Viterbo, Consulting Engineers, St. Louis, Mo.

A 120,000-GALLON swimming pool, 27 x 76 ft., on the third floor of the new eight-story, reinforced-concrete building of the Omaha Athletic Club, Omaha, Neb., necessitated unusual construction for the support of the tank and the support of the floors above it. This location was selected because it is within easy reach of the gymnasium and locker rooms, and all available space in the basement had been appropriated. As one row of interior columns is stopped at the third-floor level on account of the tank, the fifth floor is supported over the swimming room by heavy girders upon which are seated columns for the upper floors and roof, while hanger rods in these girders support the outer edge of a 4½-ft. balcony around the room at the fourth-floor level. The depth of water in the pool is from 5 to 11 feet.

The building is about 132 x 118 ft. in plan, with eight floors and basement, together with two mezzanine floors beneath the third and fourth floors. The columns and footings are designed to carry two additional stories. Normal column spacing is about 17 x 15 ft., with corner panels 18½ x 16¾ ft. Girders run only in the longer direction of the building, except in the end walls and at some special points. Spread footings of reinforced-concrete on good yellow clay soil form the foundations. For those footings which support the swimming tank the load per square foot of base is limited to 3500 pounds.

The concrete tank is an integral part of the structural framing. Transverse girders 18 x 45 in. at the mezzanine floor below the third floor support the inclined bottom slab of the pool, which is 12 to 14 in. thick. The 12-in. walls are reinforced as cantilever slabs to resist the full hydrostatic pressure. As an extra precaution, vertical reinforcement was placed near the outer faces of these walls, thus making them act as supported slabs, designed for half the full water pressure. These slabs have a bearing on the bottom of the pool and on horizontal beams formed in the top rim, the beams bearing against buttresses or horizontal struts which deliver the thrust directly into the columns.

Waterproofing of the floor and sides of the tank is provided for by using a rich concrete mix of 1:1½:3 with hydrated lime in the proportion of 10% of the weight of the cement. The pool is lined with three layers of asphalt and has a facing of ceramic tile. Severe tests of the structural and waterproofing features gave satisfactory results.

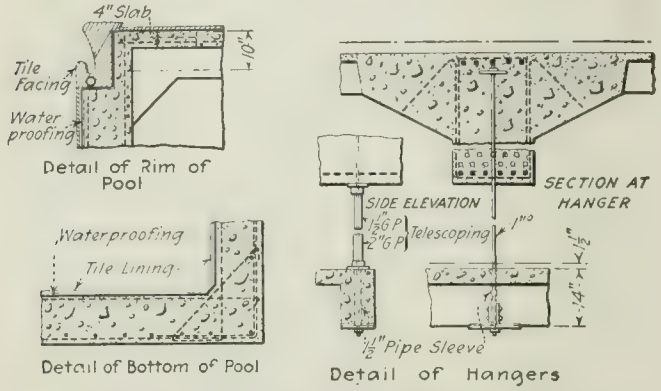


CONCRETE GIRDER FRAMING SUPPORTS THIRD-FLOOR SWIMMING TANK IN CLUB BUILDING

With the pool full the capacity is 120,000 gallons, giving an estimated weight of 500 tons. The bottom of the pool was designed to carry this load, 320 to 600 lb. per square foot according to depth, together with all dead load and an evenly distributed live load of 100 lb. per square foot. This live load represents the load superimposed by the swimmers in the pool and the waterproofing and tile finish on the bottom. In designing the members an extreme fiber stress of 700 lb. per square inch was allowed in the concrete and 18,000 in the steel high elastic limit. It was aimed to limit the deflection to 1/600 of the span for girders and slabs supporting the tank, since deflections which might be of no im-

portance in an ordinary floor might tend to crack a tank bottom and cause leakage.

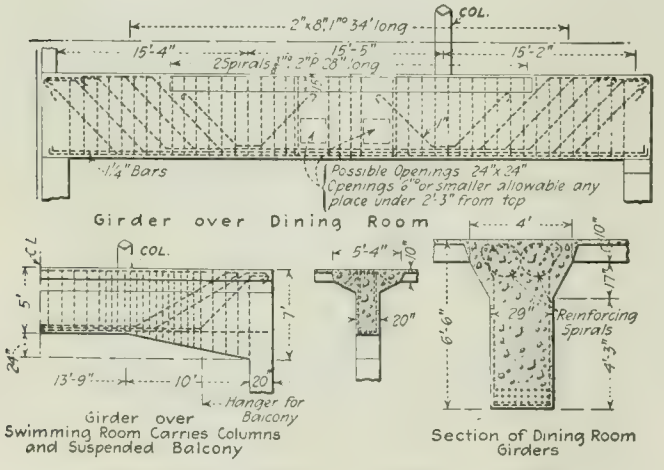
Girders at the fifth floor span the clear width of the swimming room, 33 ft. 9 in., and support two rows of columns for the upper floors and roof, besides carrying a suspended balcony around the swimming room. These girders are 29 in. thick, with a depth of 5 ft. at the middle and 7 ft. at the ends. In each end of each of



DETAILS OF CONCRETE SWIMMING TANK AND SUSPENDED BALCONY

these girders is embedded a 1-in. hanger road 13 ft. long, whose lower end carries a bearing plate or seat for a longitudinal girder forming the edge of a balcony slab, as shown in one of the detail drawings. The other side of the slab is supported by a wall girder. This balcony is designed for a live load of 100 lb. per square inch.

Girders with horizontal spiral reinforcement are used in the fifth-floor framing to support the floors over the



DETAILS OF LARGE CONCRETE GIRDERS

dining room. Each girder carries two intermediate columns for the upper portion of the structure. These girders are of 46 ft. span, 6½ ft. deep and 29 in. thick, the thickness being increased to 48 in. at the top to form a tapering flange, as shown in one of the accompanying drawings. In the compression zone of the top of the girder are two horizontal spirals 28 ft. long which provide for the very high compressive stresses. Part of the dining-room floor is carried by a pair of 46 ft. girders 23 x 48 in. in section.

John Latenser & Son, Omaha, were the architects, with Brussel & Viterbo, Chicago and St. Louis, as designing and consulting engineers for the structural features. The general contractor was the Selden-Breck Construction Co., St. Louis, Mo.

It may be noted that a swimming pool on the 10th floor is a feature of the Union League Club, Chicago. This has a steel tank, 30 x 60 ft., supported on steel columns independent of the columns of the building, the tank being incorporated in a three-story addition to the original height of the building. This was described in *Engineering News* of Jan. 11, 1917, p. 56

To Better Philadelphia City Government

THE enforcement of Philadelphia city contracts, the prosecution and punishment of the violators of any such contracts or of peculators of city funds, the investigation of municipal affairs, the dissemination of information designed to improve the government of the city, and the furtherance of measures for the immediate improvement of the bookkeeping and accounting of the city are the specific objects to which the income from the residuary estate of Thomas Skelton Harrrison of Philadelphia is to be devoted under the will noted in *Engineering News-Record*, June 5, 1919, p. 1132. The portion of the will specifying these objects are:

1. To secure the honest and impartial enforcement of the terms of all contracts made by the City of Philadelphia providing for the furnishing by contractors of labor, or for the erection of buildings, the construction of public improvements, the cleaning of streets, the removal of refuse, including the proper method of carting ashes and garbage, etc., the furnishing of water, gas, electricity or transportation facilities or the performance of any other work, or the furnishing of any other supplies of any kind or nature for the said city.

2. To obtain the prompt prosecution of and just punishment of all persons guilty of violating contracts with said city or of peculation from its funds either directly or indirectly.

3. To investigate municipal affairs in the City of Philadelphia, and obtain and disseminate information in relation thereto, to aid the officers of departments of the city by advice as to the methods of municipal work, to frame proper legislation in regard thereto, and to aid in the inauguration or conduct of movements for municipal reform and generally for such purposes as will contribute toward the improvement of governmental conditions in the City of Philadelphia.

4. To assist in any special investigation in aid of any special public movement, in the investigation of any department of the city, to assist in the prosecution of any class of frauds or crimes, including frauds against the election laws, and in any other public service that they may deem proper.

5. To further the immediate adoption by the City of Philadelphia of a wise, clear and accurate system of bookkeeping and accounting, including as a feature thereof the frequent publication of lucid statements as to its financial condition.

6. But it is my will that the funds at the disposal of said board shall never be used to further the interests of any political party, or to secure the election of any officer of the municipal government, or for any similar purpose, it being my intention that this fund shall be used for the express purposes of this trust, and not as an instrument of partisan politics, for which reason I have endeavored to have the trustees selected by the most representative and public spirited corporate bodies of the City of Philadelphia.

The seven trustees of the bequest are to be named one each by the Franklin Institute, the Law Association of Philadelphia, the College of Physicians, the City Club of Philadelphia, the Board of Trade, the Board of City Trusts, the University of Pennsylvania.

The latest estimates place the probable size of the trust fund at a half million dollars instead of a million dollars, as published in *Engineering News-Record* of June 5, 1919.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

The New Edition of Trautwine

TRAUTWINE'S CIVIL ENGINEER'S POCKET-BOOK—By John C. Trautwine, Civil Engineer; Revised by John C. Trautwine, Jr., and John C. Trautwine, 3d., Civil Engineers, 20th Edition. Philadelphia, Penn.: Trautwine Co. London: Chapman & Hall, Ltd. Montreal: Renouf Publishing Co. Flexible Cover; 4 x 7 in.; pp. 1528; illustrated. $6.

Practically the only change in the new edition of "Trautwine" is the expansion of the section on railways from 70 to 327 pages. This section of the book was referred for review to H. R. Safford, engineering assistant to the regional director, Central Western region, United States Railroad Administration, who expresses the following views:

The Expanded Railway Section

"In the section on track, the treatment of turnouts should be specially helpful to the younger engineer; its diagrams are unusually clear and complete, some of the more complicated diagrams being printed in black and red to represent practical and theoretical conditions, respectively. The use of the terms 'sweep' and 'sharpness' of curves in lieu of "central angle' and 'degree of curve,' respectively, is an innovation against which no special criticism can be offered, though it is unlikely that the new expressions will meet with general acceptance.

"The discussion relating to the use of chords less than 100 ft. in length is pertinent and shows clearly that this method should be adopted for very sharp curves. On the other hand, transitmen must not be made to feel that the use of the 100-ft. chord is not sufficiently accurate for the ordinary conditions of railroad work. The matter on resurveys of curves and the 10-chord spiral is a helpful addition to this section, which covers practically all phases of curve work but seems better adapted for reference purposes than for field use.

"Signaling is explained as to its fundamentals and the basic types of signals and signal systems. Yards and stations are discussed in comprehensive outline and the treatment of the elementary features of yard development seems to be complete. In view of the extended discussion of curves it would seem desirable that the section on earthwork, in addition to the quantitative tables given, should include a treatment of methods of staking and computing earthwork. The cost data will be helpful in estimating, being based on an arbitrary rate which may be converted to prevailing wage schedules.

"Rolling stock is treated in a nontechnical manner, with tables of weights and dimensions and data on locomotive performance, all of which is required by engineers engaged in the construction and maintenance of railways. The matter on train resistance is a summary of the better known and more important experiments, but omits the simple and very satisfactory general formula given in the 1915 'Manual' of the American Railway Engineering Association. In the section on train operation cost which is devoted to the economics of railway location, the application of the formulas is based on ratios taken from the Interstate Commerce Commission report of 1911, but while these ratios have been materially altered in the past few years, this does not detract from the value of the methods given. The treatment of construction-cost estimates is commendable because the locating or constructing engineer must now be well versed in cost analysis and methods of accounting as prescribed by the Interstate Commerce Commission. The cost data have been derived from appraisals prior to 1914 and must be adjusted for estimating under present conditions.

"The use of much material from the 'Manual' of the American Railway Engineering Association is commendable on account of the earnest work of that body in developing the science of railway maintenance and operation to a higher standard than has existed heretofore."

Need for Further Revision

Comment upon the new "Trautwine" in general is an appropriate supplement to the foregoing review of its railway section. That the addition of some 250 pages on railways and railway engineering should be practically the only change seems surprising in view of the great number and variety of subjects included in the "Civil Engineer's Pocket-Book," and in view also of the developments during the 10 years since the previous edition. In that edition (1909) there was a great enlargement of the section on concrete; this remains almost unchanged, although there have been important developments. Highways are now much more prominent than railways in engineering affairs, yet the book has practically nothing on this important subject. Information on dams is limited to brief explanation of the design of masonry dams and the construction of timber dams. There is nothing in regard to arched dams, earth dams, rock-fill dams or buttressed dams. The list of largest bridges is dated 1902.

Assuming that an enlargement of, say, 250 pages was considered practicable, it would appear that the value of the book could have been increased very greatly by apportioning this additional space among certain subjects which are of special importance or in which special progress has been made. As an illustration, over 100 pages are devoted to railway curves and 36 to cost of construction, but there is nothing as to highway curves or cost. Other examples might be cited, all indicating a lack of proportion, both in compilation and revision.

That a more general and diversified revision would have produced a better balanced and more valuable book seems indisputable. It is evident that such a book cannot go into detail on each and every subject, but it should cover adequately the various general branches of engineering work. This result cannot be attained by simply adding detailed treatment of individual subjects at long intervals.

Shore Processes and Shoreline Development

SHORE PROCESSES AND SHORELINE DEVELOPMENT—By Douglas Wilson Johnson, Associate Professor of Physiography, Columbia University. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6 x 9 in.; pp. 583; illustrated. $5.

Knowledge of the operation of natural forces has to be part of the equipment of every engineer. Particularly must this be so with those engineers who are building, maintaining or operating structures in or near great bodies of water. The movement of the shore—that is, the border between water and land—is the base of a science in itself. Engineers cannot be expected to study such a science in all of its details; that must be left to the geologist who is concerned with age-long phenomena, but the engineer can profit by the geologist's study, and skim the cream from his work.

Professor Johnson's book will have just this value for the engineer. It was written, so the author states, in order to set down fully all of the known facts on which could be based arguments as to the progressive subsidence of the Atlantic coast of North America within historic time. To do this it seemed necessary to inquire somewhat fully into the fundamental principles of shore processes and shoreline development. He has, therefore, set himself the task of bringing together the results of shoreline study, published in different languages, of analyzing and criticizing conclusions and of presenting a digest of those fundamental principles which should prove to be best established by the independent work of various students and supported by his own observations.

The result is a formidable volume to the engineer who is not accustomed to the methods of pure science. It is heavy with bibliography and reference to published work, but the impression is unavoidable that it is authoritative. Any engineer who is concerned with marine structures, with the protection of shore and coast line, with the maintenance of harbors, the construction of harbor structures, or the development of the mouths of rivers, will profit by a study of the book. It sets down in considerable detail all of the known facts regarding waves and currents and the phenomena of shore building and destruction. While the treatment is mainly a geological one, which means that geological eras rather than human eras are considered, still the engineer who deals only with the human era can learn with profit how the geological processes work.

Statically Indeterminate Problems

ANALYSIS OF STATICALLY INDETERMINATE STRUCTURES by the Slope-Deflection Method—By W. M. Wilson, Assistant Professor of Civil Engineering, F. E. Richart, Instructor in Theoretical and Applied Mechanics, and Camillo Weiss, Instructor in Structural Engineering. University of Illinois, Urbana, Ill.: Engineering Experiment Station. Paper; 6 x 9 in.; pp. 218; illustrated.

Applying the fundamental relations of the slope-deflection method to many practical cases of rigid frames acted upon by various loadings, the authors of this bulletin have developed useful equations to aid in the solution of relatively difficult statically indeterminate problems. All solutions are based upon an assumption of constant moment of inertia, a fact which should have been stated more definitely in outlining the assumptions underlying the analysis.

The treatment includes: Girders with fixed ends; continuous girders, including a derivation of the theorem of three moments; two-legged rectangular bents, fixed and hinged; trapezoidal bents; frames consisting of a large number of rectangles under various symmetrical loadings; three-legged bents, fixed and hinged. The effect of settlement or rotation at supports is included in the analyses, and examples given indicate the relatively large moments introduced by such movements. In the conclusions, various advantages of the slope-deflection method are mentioned, and the belief is expressed that the principles brought out will throw new light on indeterminate problems.

American Air Service

THE AMERICAN AIR SERVICE: A Record of its Problems, its Difficulties, its Failures, and its Final Achievements (Problems of War and Reconstruction). By Arthur Sweetser, Sometime Captain, Air Service, U. S. A.; with an Introduction by Newton D. Baker, Secretary of War. New York and London: D. Appleton & Co. Cloth; 5 x 8 in.; pp. 384; illustrated. $2.50.

It may be too soon after the confusion of charges and countercharges surrounding our aviation program for anyone to read dispassionately the history of the United States' eighteen months of war flying. Actual figures a year ago were scarce. Rumors were plenty, and even today there are few who know whether the rumors or the announced figures of those days were correct. In this book Captain Sweetser sets down soberly the chronicle of the American air service in the war. It is an absorbing history, and one which all of the credulous parties of 1918 should read, if for no other reason than to set up in their own minds the difference between cold facts and current rumors.

Watertown Arsenal Tests

TESTS OF METALS AND OTHER MATERIALS: Report Made in the Ordnance Laboratory at Watertown Arsenal, Massachusetts, During the Fiscal Year Ended June 30, 1917—Washington, D. C.: Chief of Ordnance. Cloth; 6 x 9 in.; pp. 275; illustrated.

Some matters of exceptional interest are included in the recently issued report on Watertown arsenal work during the year ending with July, 1917. Impact testing of steel by the Charpy test formed a prominent feature of most of the tests and researches reported upon. The preface states that the resulting data form material for a general study of the significance of the Charpy test, but no separate report on the subject is included. Transverse tensile test pieces from forgings were studied in a number of cases, and the results indicated that this is a most important field of investigation. Triangulation of micro structure was observed in some nickle-steel specimens. The report abounds with excellent reproductions of micrographs.

An interesting portable polishing device for use on large and heavy specimens was developed at the arsenal; this is fully described and illustrated in the present volume. It consists of a small motor with grinding and lapping heads directly attached and a guide tube for holding the working head steady and giving a true surface.

Our Production of Munitions

AMERICA'S MUNITIONS, 1917-1918; Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions—Washington, D. C.: War Department. Cloth; 6 x 9 in.; pp. 592; illustrated.

Assistant Secretary Crowell is to be complimented upon the complete record of the munitions efforts of the United States which is exhibited in this book. During the war we heard much that was rumor but very little that was fact. Now that the war is over the real facts can be made public. The magnitude of our war efforts can well be measured by the magnitude of our munitions production which this book describes in full detail. "Munitions" these days means many things. So

the book, in its separate chapters, takes up the various products of the War Department during the war. These include not only ordnance, which is by right included under the term, but also the air service, the engineer corps, chemical warfare, the quartermaster department, the construction division, and the signal corps. What American industry, mobilized for war service, could really do in eighteen months was marvelous. Every true American ought to read the record and be proud.

New Searles and Ives' Handbook

FIELD ENGINEERING: A Handbook of the Theory and Practice of Railway Surveying, Location and Construction—By William H. Searles, M. Am. Soc. C. E. 18th edition, revised and enlarged by William H. Searles and Howard Chapin Ives, Professor of Railroad Engineering in the Worcester Polytechnic Institute. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Flexible Leather; 4 x 7 in.; Vol. I, text; pp. xviii + 309; 4 illustrations. Vol. II, tables; pp. vi + 326. Bound in one volume, $3 net; bound separately, $2, net, each.

This latest addition of Searles' well-known handbook on railroad curves differs from the previous edition (which was reviewed in *Engineering News*, Jan. 20, 1916, p. 116) by the addition of the American Railway Engineering Association spiral, together with the new tables necessary to simplify the application of the same. The method of treatment in the discussion of this spiral is somewhat original. The total issue of the handbook is 59,000 with this edition.

Peddle's "Graphical Charts" Revised

THE CONSTRUCTION OF GRAPHICAL CHARTS—By John B. Peddle, Professor of Machine Design, Rose Polytechnic Institute. Second Edition. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 158; illustrated. $2.

In bringing out a second edition of his work on graphical charts, Professor Peddle has added an interesting chapter giving an ingenious and very resourceful method for constructing alignment diagrams. While determinants are used in carrying out this method, no great mathematical difficulty is involved, and it should be suitable for very wide use. With this exception the book is substantially unchanged. As in the first edition, therefore, main emphasis is laid on alignment diagrams, which the author appears to favor because of their wide range of utility. The first edition of this work was reviewed in *Engineering News* of Nov. 17, 1910, p. 46.

French and American Government

HOW FRANCE IS GOVERNED—By Raymond Poincaré of the French Academy and President of the Republic; Translated by Bernard Miall. New York: Robert M. McBride & Co. Cloth; 5 x 8 in.; pp. 336. $2.

THE GOVERNMENT OF THE UNITED STATES, NATIONAL, State and Local—By William Bennett Munro, Ph. D., LL.B., Professor of Municipal Government in Harvard University. New York: The Macmillan Co. Cloth; 6 x 9 in.; pp. 648. $2.75

With light but firm touch President Poincaré sketches the government of France, both in its development and as now constituted. Some attention is given to the commune and the department but most of the space is devoted to the national Government.

In his much larger volume on the United States Professor Munro covers Federal, state, county and municipal government, from Colonial times to the present day. Constitutional principles, limitations and interpretations are given careful attention. Comparisons of American and European systems are made. The need for improvement in state administration is urged. Stress is laid on the advantages of the commission plan of city government and particularly of the commission-manager plan, but here, as elsewhere throughout the book, disadvantages are also presented. The volume is a worthy addition to Professor Munro's series of books on government.

Walls, Bins and Grain Elevators

THE DESIGN OF WALLS, BINS AND GRAIN ELEVATORS—By Milo S. Ketchum, C. E., Dean of the College of Engineering and Professor of Civil Engineering, University of Colorado; Consulting Engineer; M. Am. Soc. C. E., etc. Third Edition. New York: McGraw-Hill Book Co., Inc. Cloth; 6 x 9 in.; pp. 556; illustrated. $4.

To this standard work there has been added enough material to bring it up to date. This consists mainly in the abstract of the report on the design of retaining walls by the American Railway Engineering Association, which, as the author truly says, "for the first time has defined a standard practice for the design of retaining walls and abutments." With the added matter, the book is more than ever a necessary part of the engineer's working library.

Machine-Made Pipe

MACHINE-MADE CEMENT PIPE FOR IRRIGATION SYSTEMS AND OTHER PURPOSES—By G. E. P. Smith, Agricultural Experiment Station, The University of Arizona. Tucson, Ariz.: The Station. Paper; 6 x 9 in.; pp. 171; illustrated.

Professor Smith has had a large experience in the arid West with the use of concrete pipe. This bulletin is an abstract of this experience and contains probably more authoritative, unbiased information on this subject than any other similar publication. It not only describes in some detail the various machines for the manufacture of concrete pipe, but elaborates from known failures methods by which better pipe may be obtained.

"Building for Victory"

A spirited article entitled "Building for Victory," by Col. William A. Starrett, has been reprinted from *Scribner's Magazine* for November, 1918, by the Thompson-Starrett Co., New York City. At the time the article was written Colonel Starrett was head of the Emergency Construction Section, War Industries Board. The article is devoted largely to the $50,000,000 powder plant built at Nitro, W. Va., by the company already mentioned, but the article does not give the name of the contractor.

Books on War Work

Two very elaborate and handsome books describing the war activities of special organizations have just been published. One of these is entitled "A Record of War Activities" and published by the Turner Construction Co., of New York. The other, entitled "Shell Loading at Amatol, N. J.," is published by the Atlantic Loading Co., of New York City. Both are handsome examples of the bookmaker's art and both represent the commendable desire on the part of their publishers to make a permanent record of the effective aid they rendered to the Government during the war.

The Turner company's book recites in detail, with appropriate line and halftone illustrations, the numerous buildings, mostly of reinforced concrete, that the company erected during the war. At the head of these is, of course, the United States Army Base in Brooklyn, N. Y., one of the largest individual contracts of the war, but there are a number of other buildings, including the Navy Base at Brooklyn, the Coast Artillery Barracks at New York, the buildings for the Bureau

of Standards at Washington, concrete office buildings at Washington, and a number of varied jobs for the United States Navy.

The Atlantic Loading Co.'s book is a description, prepared by Victor F. Hammel, M. Am. Soc. C.E., of the shell-loading plant and town called Amatol, built especially for the Ordnance Department on a sandy waste about half way between Philadelphia and Atlantic City. Here on a tract of 6,000 acres was put up an enormous plant in which ammunition for the Western front was loaded.

Bridge and Culvert Surveys on Iowa Roads

For securing uniform and complete information in investigating sites for bridges and culverts, detailed instructions have been prepared by the Iowa Highway Commission, issued to the field engineers in the form of a 24-page pamphlet 4½ x 7 in. The instructions are not simply brief and more or less imperative rules, but are in a readable and explanatory style and give particular attention to the reasons why certain things should be done or observed. After the location of the structure by its position, local name, road and stream, the present structure is to be described as to its type, dimensions, condition and waterway efficiency. The location of the new structure is then to be described and considerable space is given to outlining the information which should be shown on the plans. Finally, there are notes as to the engineer's recommendations for the new design, including its type, span arrangement, width, elevation, foundations and special or future loading requirements.

PUBLICATIONS RECEIVED

[So far as possible the name of each publisher of books or pamphlets listed in these columns is given in each entry. If the book or pamphlet is for sale and the price is known by the editor the price is stated in each entry. Where no price is given it does not necessarily follow that the book or pamphlet can be obtained without cost. Many, but not all, of the pamphlets, however, can be obtained without cost, at least by inclosing postage. Persons who are in doubt as to the means to be pursued to obtain copies of the publications listed in these columns should apply for information to the stated publisher, or, in case of books or papers privately printed, then to the author or other persons indicated.]

BOILER CHEMISTRY AND FEED WATER SUPPLIES—By J. H. Paul, B.Sc., F.I.C., Consulting and Analytical Chemist New York and London: Longmans, Green and Co. Cloth; 6 x 9 in.; pp. 242; illustrated. $4.50.

CAMBRIA STEEL: A Handbook of Information Relating to Structural Steel—Prepared and Compiled by George E. Thackray, C. E., Special Engineer, Cambria Steel Co. 12th Edition. Philadelphia, Penn.: Cambria Steel Co. Flexible Cover; 4 x 7 in.; pp. 603; illustrated. $1.50.

Enlarged by about one-fifth as compared with the 11th edition (1917), the revised Cambria contains many new tables. New steel sections are shown, including bulb angles, channels, T-bars and various miscellaneous sections. The beam connection angles of previous editions have been modified "in view of well recognized practice."

CHEMICAL AND BIOLOGICAL SURVEY OF THE WATERS of Illinois: Report for 1917. Urbana, Ill.: Department of Registration and Education. Paper; 6 x 9 in.; pp. 133; illustrated.

CITY PLAN FOR AKRON: Prepared for Chamber of Commerce by John Nolen, City Planner. Akron, Ohio: City Improvement Committee. Paper; 8 x 11 in.; pp. 91; illustrated.

The latest of six planning studies by the author for the improvement of Akron. After a general review of the existing plan and its various elements, this report takes up main thoroughfares, the downtown district, parks and zoning. The law relating to city planning for Akron is reviewed by Frank B. Williams, of the New York Bar.

CONCRETE-STEEL CONSTRUCTION, PART 1—BUILDINGS: A Treatise Upon the Elementary Principles of Design and Execution of Reinforced-Concrete Work in Buildings—By Henry T. Eddy, C.E., Ph.D., Sc.D., LL.D., and C. A. P. Turner, C.E. Second edition, rewritten and embodying the most advanced theoretical developments. Minneapolis, Minn.: The Authors. Cloth: 6 x 9 in.; pp. 502; illustrated. $10.00.

CONNECTICUT HIGHWAY COMMISSION: Annual Report of the Highway Commissioner to the Governor, Oct. 1, 1917-18. Hartford, Conn.: The Commission. Paper; 6 x 9 in.; pp. 89; folding tables.

ELASTIC STRESSES IN STRUCTURES: Translated from Castigliano's "Theorem de L'Equibre des Systemes Elastiques et Ses Applications"—By Ewart S. Andrews, B.Sc., Eng. (Lond.), Consulting Engineer, etc. London: Scott, Greenwood & Son. New York: D. Van Nostrand Co. Cloth; 7 x 10 in.; pp. 360; folding plates. $9.00

EXCAVATION, MACHINERY METHODS AND COSTS: Including a Revision of "Excavating Machinery"—By Allen Boyer McDaniel, S.B., M. Am. Soc. C. E.; Principal Engineer, Construction Division of the Army. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 542; illustrated. $5.

FARM WATER SUPPLY—By F. H. Peters, Commissioner and Chief Engineer of Irrigation, Department of the Interior. Calgary, Can.: The Commissioner. Paper; 6 x 9 in.; pp. 27; illustrated.

Designed for distribution to farms in the semi-arid districts of Alberta and Saskatchewan Provinces. Deals principally with volume of water required for house and stock use; earth reservoirs; rain catchers (for roof water); and methods of treating water.

FORESTS OF BRITISH COLUMBIA—By H. N. Whitford, Ph.D., and Roland D. Craig, F.E., Under the Direction of Clyde Leavitt, Chief Forester, Commission of Conservation. Ottawa, Can.: The Commission. Paper; 7 x 10 in.; pp. 409; illustrated.

AN INDUSTRIAL HOUSING DEVELOPMENT at Union Park Gardens, Wilmington, Del., for the United States Shipping Board, Emergency Fleet Corporation. Philadelphia, Penn: Ballinger and Perrot. Paper; 7 x 10 in.; pp. 23; illustrated.

INDUSTRIAL TRAINING IN REPRESENTATIVE INDUSTRIES: A Survey of Practical Value to the Man Who Wants to Know How Training Departments Operate. Washington, D. C.: U. S. Department of Labor. Paper; 6 x 9 in.; pp. 15.

KENTUCKY ROAD LAWS, 1918: Compilation of Road Laws Other Than Those in Carroll's Statues, 1909. Frankfort, Ky.: Department of Public Roads. Paper; 6 x 9 in.; pp. 127.

THE LAW OF GOVERNMENT CONTRACTS—By R. Preston Shealey, LL.M., of the Bar of the Supreme Court of the United States, and of the District of Columbia. New York: Ronald Press Co. Cloth; 6 x 9 in.; pp. 300. $4.

METHOD OF ADMINISTERING LEASES OF IRON-ORE DEPOSITS BELONGING TO THE STATE OF MINNESOTA—By J. R. Finlay. Washington, D. C.: Bureau of Mines. Paper; 6 x 9 in.; pp. 40. 5c. from Superintendent of Documents.

NEW MEXICO LAWS ON HIGHWAYS AND BRIDGES—Santa Fe, N. Mex.: State Highway Commission. Paper; 6 x 9 in.; pp. 67. $1.25.

NEW YORK PUBLIC SERVICE COMMISSION: Report, 1918—Albany, N. Y.: The Commission. Cloth; 6 x 9 in.; pp. 653.

OPPORTUNITIES IN CHEMISTRY—By Ellwood Hendrick [Opportunity Books]. New York and London: Harper & Brothers. Cloth; 5 x 7 in.; pp. 101. 75c. net.

Information, entertainment and suggestion are offered by this familiar "talk" on the opportunities of chemistry as a profession. The volume is well worth reading by those who wish to know something of what chemistry embraces, even though they may have no idea of practicing it.

POWER WAGON REFERENCE BOOK, 1919: A Handbook of Practical Information for Makers, Sellers and Owners of Motor-Driven Vehicles for Commercial and Agricultural Purposes—Edited by Stanley A. Phillips, Editor of the *Power Wagon*, Chicago, Ill.: The Power Wagon Publishing Co. Cloth; 9 x 12 in.; pp. 368; illustrated. $2.50.

REPORT UPON THE CONSTRUCTION AND MAINTENANCE OF MILITARY AND POST ROADS, BRIDGES AND TRAILS, ALASKA; Board of Road Commissioners for Alaska in Charge. Extract from Annual Report of the Chief of Engineers, 1918 (Washington, D. C.). Paper; 6 x 9 in.; pp. 24; illustrated.

THE SPACING AND DEPTH OF LATERALS IN IOWA UNDERDRAINAGE SYSTEMS AND THE RATE OF RUNOFF FROM THEM WITH DATA FROM INVESTIGATIONS—By W. J. Schlick, Drainage Engineer, Engineering Experiment Station, Iowa State College of Agriculture and Mechanic Arts. Ames, Iowa: The Station. Paper; 6 x 9 in.; pp. 119. Illustrated.

STABILIZING THE DOLLAR IN PURCHASING POWER—By Irving Fisher, Professor of Economics, Yale University, etc. Reprinted from "American Problems of Reconstruction." Address the Author, New Haven, Conn. Paper; 5 x 7 in.; pp. 30

STATISTICAL ABSTRACT OF THE UNITED STATES, 1918—Washington, D. C.: Bureau of Foreign and Domestic Commerce. Cloth; 6 x 9 in.; pp. 881. 50c. from Superintendent of Documents.

STATISTICS OF GOVERNMENT RAILWAYS: Report for 1916 to the Minister of Communications. Peking, China: The Minister, Department of Railways. Paper; 10 x 13 in.; pp. 48; illustrated.

STRUCTURAL WATERPROOFING: A Waterproofing Handbook and Reference Guide for the Use of Architects, Engineers, Building Contractors and Others interested in the General Subjects of Waterproofing and Dampproofing. Detroit, Mich.: The Truscon Laboratories. Paper; 8 x 11 in.; pp. 87; illustrated.

Although containing a special plea for the use of the waterproofing compounds manufactured by the Truscon Co., this booklet has as preliminary chapters some very good analyses of the theory of waterproofing and the pplications of the various methods employed.

THE THEORY OF UNDERDRAINAGE—By W. J. Schlick, Drainage Engineer, Engineering Experiment Station, Iowa State College of Agriculture. Ames, Iowa: The Station. Paper; 6 x 9 in.; pp. 57; illustrated.

Physical, agricultural, engineering and financial aspects discussed by the drainage engineer of the institution named.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Corps of Engineers Not Behind Auxiliary Engineer Corps

Sir—Your issue of June 19, 1919, p. 1232, contains a letter from M. O. Leighton, chairman of the Engineers, Architects and Constructors' Conference on National Public Works, with the heading "The Reply of the Corps of Engineers, United States Army," in which it is affirmed that the Corps of Engineers is engaged in a campaign to militarize the public works functions of the Federal Government, and is advocating the passage of a bill designated "S. 1376, Sixty-sixth Congress, First Session," providing for an "Auxiliary Engineer Corps."

In order that members of the engineering profession, who are not in a position to keep in touch with the progress of current legislation, may not be under any misapprehension on the subject, I take pleasure in informing you that the Corps of Engineers has not interested itself in any manner whatever in the bill in question.

It is supposed that the bill was drawn by one of the clerks in a field office, who has been interesting himself in the subject in question, and that the measure was introduced at his request. When the matter came to the attention of the Chief of Engineers, the view was taken that the activities of the employee in question were probably within his privileges as a citizen, were undoubtedly prompted by patriotic motives (however impractical the scheme proposed), and were consequently not an appropriate basis for official action looking toward their suppression.

It may be remarked that the *Army and Navy Journal*, in its issue of June 28, 1919, printed a statement that the Chief of Engineers is in no way responsible for the bill, and that he believes the proposed legislation impracticable, and that it would be detrimental to the public interest. The most casual inquiry at the Office of the Chief of Engineers would have elicited similar information.

You will, I am sure, give this letter the publicity that is merited by such a wholly unwarranted, if somewhat absurd, attack on the probity of the Corps of Engineers. W. M. BLACK,

Major General, Chief of Engineers.

Washington, D. C.

Stop College Supply of Graduate Engineers

Sir—The American Association of Engineers, the Engineering Council, and the Draftsmen's Union, are attempting to plug the dyke with their fingers whilst the great deluge of engineers strive to break in. Colleges know nothing of the law of supply and demand, and care less—their interests are in endowments and legislative grants.

Now comes a course in highway transport engineering. Who is going to employ the coming flock of H. T. E.'s? The United States is full of engineers working at everything else but engineering. Who wants a highway transport engineer, anyhow? No advertisements have yet appeared in the *Engineering News-Record* for such a man. There is no question that the subject of motor-truck terminals is acute in the large cities, but we do not need a new flood of engineers to show us the way out. The course for a highway transport engineer reminds me of the prospectus of our old friend Tom—of Yukon gold fame.

The engineering profession needs a closed season for a few years to adjust itself, otherwise a boy will come out of college with a degree in civil engineering and be met at the gate by a delegate of the union; and the chances are that he will not be out in the cold world very long with his little oyster fork before a union will look good to him. F. N. HARRIS.

Olympia, Wash.

Commends Development Committee Report

Sir—The highly commendable and progressive report of the Committee on Development of the American Society of Civil Engineers very forcibly illustrates the benefits that may be derived from a truly representative body. In this report is promise of real reform. The 22 delegates who came to the deliberations from direct intimate contact with the 22 local associations felt the need of reform and could speak with authority as to the wishes of their constituents. I am convinced that the governing body of the society should be composed of direct responsible representatives from local units. Why not make the "annual conference of representatives from local associations," which the report suggests, the governing body? This suggestion, combined with the one "that every member of the society be a member of a local association," will solve the present unresponsive conditions that hamper the society's management.

We may well take great pride in the society's past achievements and its present high standing, but reform and progress must be the program of the immediate future if deterioration and decay are not to destroy the very things in which we take much pride.

The committee has made a splendid beginning but it is only a beginning. The next move will be working out and putting into operation the suggested reforms. If the rank and file of the membership continues the attitude of listless indifference that has been so prevalent in the past, all these much desired improvements will die aborning. The 22 local associations, having a total membership of less than 25% of the membership, have the movement well under way. If, however, the unattached members do not rally to its support there will be no ultimate reform.

I am convinced that the vast majority of the membership desires reform (not revolution), but instead of assisting they merely criticize or are coldly indifferent.

This will as surely defeat the hopes of progress as active resistance. The ultraconservative elements are able to, and do, take full advantage of this passivity. The time seems ripe for an immediate forward movement and the nonactive membership alone will be responsible if it does not occur.

The ultimate goal that should be kept in view is broad engineering unity, and the greatest steps toward it will

be by reform in the older national societies and the unstinted support of the entire profession to Engineering Council in its high-minded, far-reaching efforts to serve.

W. H. WOODBURY,
M. Am. Soc. C. E.
Duluth, Minn.

British and American Building Prices

Sir—It may be of interest to many of your readers to read a comparison of prices of American building materials with the prices of those sold in England.

In the *Daily Mail* overseas edition, builders' supplement, are prices of various building materials. The majority of the items are quoted delivered London, and, for comparison, the long ton and pound sterling have been converted into short ton and dollars.

A few of the items are quoted below:

	Delivered London	Delivered Boston
Cement	$2.72 bbl.	$2.37 bbl.
Reinforcing steel	89.50 ton	60.00 ton
Spruce lumber	70.00 thousand	45.00 thousand
Lime	11.32 ton	25.00 ton
Brick	11.43 thousand	18.00 thousand

It will be noticed that brick and lime are the items of material quoted above which are cheaper in England. The brick sold in England is a larger-size brick than the one sold in America.

Of course, the majority of the buildings and dwellings are constructed of brick in England and the brick industry is therefore very large. Clay and chalk are plentiful, hence the reason for cheapness of lime. In this country lime has gone up considerably during the last few months.

ALBERT G. DUKE,
Estimating Department, Aberthaw Construction Company.
Boston, Mass.

Function of Corporate Contract Bonds

Sir—All contractors and engineers should be greatly indebted to H. W. Swart for his interesting and illuminating article published in the *Engineering News-Record* of June 19, 1919, p. 1212, on the "Function of Corporate Contract Bonds—How Obtained," as the subject is one which is not fully understood by many, and articles such as Mr. Swart's will be read with profit by most engineers and contractors.

In general, contractors of experience well understand the intimate and confidential relationship that should exist between them and their bonding companies, that the business cannot be conducted on any other basis, and very freely impart the information needed by the bonding companies to consider properly their applications; but frequently some contractor gets a contract which perhaps is very much larger than any he has previously handled and is much surprised to find that the bonding company desires to make a full investigation of his financial standing, the adequacy of the prices bid, etc., before writing his bond. He perhaps resents it a little and does not realize that when the bonding company goes on his bond they are really extending him credit to the amount of the bond, and getting their suretyship is very much like getting a loan from a bank.

He might get $10,000 loans from his bank very easily, but the bank's investigation would be much more thorough if he tried to obtain a $75,000 loan, and very frequently the bank can afford to take more of a chance on the contractor than can the bonding company, because the bank is in a position to keep constantly informed of his financial prospects and can reduce its credit, obtain assignments of payments or get off altogether, if it finds the contractor is not progressing favorably. The bonding company, however, once on, has to stay on until the job is completed, all bills paid and official acceptance made.

Engineers, reputable contractors and bonding companies are all interested in the elimination of the irresponsible bidder, and one of the surest and quickest ways of doing this is for the first two to encourage the bonding companies to make full investigations of all bond applications. The good contractors can stand it, while the other kind cannot. The engineers could help present conditions by allowing more time between the awarding of the contract and the filing of the bond, because the interval usually permitted is quite short for a full investigation, or arranging for the reinsurance which is generally considered desirable on most of the larger risks. They also can assist by seeing that the contractor is supplied, for the bonding company, with a copy of the contract properly filled out, with options accepted as it will be executed, a set of the drawings and a tabulation of all the bids.

Bonding contractors is not like writing insurance for them, and the data submitted must prove the contractor is worthy of the confidence and suretyship of the bonding company, and engineers are frequently called on to tell what they know of the ability and experience as well as the honesty of contractors who have done work for them. In investigating the adequacy of the prices bid, it is always desirable to know the prices bid by the other bidders; but sometimes the surety company is told that the engineer or owner considers these data as private and will not impart them. The writer believes it is for the best interests of the owners and their engineers, if they will coöperate with the surety companies for full investigations before bonds are written, and also will supply information when called on for this purpose.

EDWARD W. BUSH,
Home Office Engineer, Ætna Casualty & Surety Co.
Hartford, Conn.

Consulting Engineers in France

Sir—A few years ago I read in the *Engineering News* or the *Engineering Record*, I forget which, an editorial on consulting engineers in Europe. From the editorial I gained the impression that the engineer in private practice is comparatively unknown in continental Europe, and seemed to be confined to the British Empire and the two Americas. The facts above stated were obtained as one result of an investigation made by the American Society of Consulting Engineers.

After a residence in France of two years I am forced to the conclusion that someone made an error. In France the engineer in private practice is not by any means unknown. I am informed that he is numerous throughout all Europe. This statement is made as a result of numerous inquiries on my part. Since the armistice went into effect my opportunities for judging have been improved, as I am now engaged in the settlement of damage claims.

In practically every place of any importance there are architects and geometers. Sometimes the geometer is also an architect. Generally the architect is also a geometer. A geometer is our old friend the surveyor. He not only makes surveys but he estimates costs of

building work, repairs and dilapidations. He prepares an *Etat de Lieux* before a lease is signed and an *Etat de Proprieté* before final payments are made on the termination of the lease. He values damages to crops, etc. In short, he does all kinds of work in which a knowledge of mathematics is required, and occasionally he is referred to as an expert mathematician.

The work "expert" over here is in common use, and not used half derisively as in the United States. By the way, it is sometimes difficult for an American to keep a straight face when a new-found friend calmly announces himself as an "intellectual." An intellectual seems to be a university graduate who does not labor with his hands and who occasionally contributes articles to magazines and is called upon more or less frequently to make public addresses.

I find the "geometers" in France enjoy (?) about the same general prosperity as men in similar work in the United States. They seem also to be about as contented (?) with their choice of a profession.

In the larger cities, especially in Paris, there are not only numerous architects but there are men who practice engineering. *L'ingenieur conseil* is by no means unknown. The greater part of his work is not on important enterprises but from observations made by me he is not different from his American colleagues. Not all enterprises are conducted by the Government and private initiative is allowed considerable scope. There exists therefore a field for the engineer in private practice. This field is as well occupied as it is in America. That is, if there were fewer men engaged in private practice as engineers the general lot would be improved.

The engineer, however, is an intellectual; that is, a highly educated man, and as such his social condition is good. He may, in common with all intellectuals, including army officers, maintain his social position by espousing the daughter of a well-to-do man who is not an intellectual. If he does this he is relieved of considerable mental distress as his living is assured and he can pick his work and specialize in high-grade clients. He may even branch out into contracting work.

Tours, France. ERNEST MCCULLOUGH,
Lieutenant Colonel, R. R & C. Service, A. E. F.

Federal Employees' Union and Strike Methods

Sir—Relative to the Draftsmen's Union and your editorial in that connection in the issue of June 12, 1919, and the question as to the methods to be used in enforcing collective bargaining and recognition of the union and its demands, I would call your attention to the fact that the Federal employees of the United States are now unionizing, and local unions are being rapidly formed not only in Washington but all over the country.

The objects and methods of the Federal Employees' Union is set forth in their constitution, and shows how they hope to secure recognition and results by other than the so-called "union methods," as follows:

"In order to promote the welfare of the members of the Federal service, to make the Federal service a more useful agency in good government, and to secure, through combined effort, the protection and security demanded by modern economic conditions, . . . we adopt this constitution.

"The methods of attaining these objects shall be petition to Congress, by creating and fostering public sentiment favorable to proposed reforms, by coöperation with Government officials and employees, by suggestions to the Civil Service Commission for the improvement of the service, and by legislation and other lawful means; provided, that under no circumstances shall this union engage in or support strikes against the United States Government."

It is believed, the results already secured would indicate that the belief is well founded, that results will be secured without resorting to the strike and other of the so-called "union methods" of the labor organizations. H. F. ROBINSON.

Albuquerque, N. M.

Actual Case Shows Something Wrong With Engineers' Remuneration

Sir—I was extremely pleased to see in your issue of June 19 several letters which you have received in reply to the letter of Mr. Ricketts.

It appears to me from Mr. Ricketts' letter that he is quite ignorant of the present salaries paid to engineers, even those holding positions of considerable responsibility and requiring high-class technical education. As a matter of fact, even Lucien Alter is under a misapprehension when he thinks that the average engineer, three years after graduation, would receive a salary of $2000 a year. The writer can evidence scores of cases where engineers, corporate members of technical societies, having many years of experience and holding positions of responsibility, are receiving salaries below the $2000 mark.

Mr. Ricketts is afraid that the letters published in *Engineering News-Record*, complaining about the remunerative value of engineering, might have a serious effect upon young readers who were thinking of becoming engineers. I believe if these letters do nothing else than prevent some young men from taking up engineering, by informing them of the true conditions that exist in the profession, they are quite justified. In my opinion, it is not only the duty of the press but even the duty of our universities, in justice to themselves, to the profession and to the prospective students, to carry on a campaign of information among high-school gradutes informing them of what they have to expect if they take engineering as their vocation. Let them know that on average engineering salaries they will not be in a position to support a family unless they have other income, that they will not be able to live up to the same standard as members of the ordinary trades unions and that they will be the beggars in the community.

Only recently an actual case was brought to my attention which amply proves my statement. The individual concerned is well known to me, and the facts that I wish to relate may serve to open the eyes of Mr. Ricketts to appreciate fully that the statement that "services receive the payment they are worth" may be true of every other trade or profession, but it certainly is not true in engineering. The facts are as follows:

About fifteen years ago two young men, "A" and "M," learned the same trade, garment making. Their earnings at that time were about $9 to $12 per week, the working hours being long, about 56 hours per week.

"M" was indifferent and apparently satisfied, but "A" was ambitious and desired to improve his position. Just at that time his attention was drawn to several articles which appeared in a magazine describing the great achievements of engineers. "A" always had a "hankering" after the engineering profession, which seemed to him to be the real backbone of industrial development, and decided to take up engineering as his vocation. His announcement was met with considerable discouragement from his friends and associates. The task seemed almost impossible, as "A" had no parents nor relatives who could help him. However, he worked in the factory during the day and studied at night for his matriculation. He saved up a little money and finally was successful in entering college. In order to cover his expenses he had to rise at 3 a.m. to peel potatoes in the boarding house for his board. In spite of his struggles, his class work was well done and during his last year at college, in addition to his purely technical work he chose for his electives such subjects as political economy, sociology and commercial law. With borrowed money he succeeded in completing his course and received his diploma in civil engineering.

He went into actual practice, worked hard, continued his studies, followed up current technical literature and at present, after 7 to 8 years' practical experience holds a responsible position as structural designer, handling the design of movable and fixed bridges and industrial buildings, at the magnificent salary of less than $170 per month.

While "A" was preparing for college "M" also saved up a little money and started work for himself, investing the money in cloth. Today he is a garment manufacturer rated at over $40,000.

Furthermore, what perhaps is of greater interest to Mr. Ricketts is that garment workers have only recently secured an agreement in which the minimum wage is fixed at $50 per week, with men of average ability receiving more. The working hours have now been reduced to 44 hours per week with time and a half for overtime.

Is it any wonder that "A" is dissatisfied with engineering, when after the struggles he has gone through and after being successful so far as technical attainments are concerned, he finds that he is unable to attain to the same standard of living as the men who are now following the trade which he had thrown over fifteen years ago to become an engineer?

Surely there is something wrong with engineering remuneration.

W. S. HARVEY,
Associate Member, Engineering Institute of Canada, and Institution of Civil Engineers.
Toronto, Canada.

Government Specifications Should Not Misplace Responsibility

Sir—There has appeared recently in your publication an interesting exchange of ideas, regarding the just and equitable form of Government contract. Most of your contributors appear to have been in favor of a cost-plus-fixed-fee contract, similar to those in vogue during the war. Apparently those in power at Washington have either not read these discussions or have quite contrary views on the matter, as can be readily seen by quoting a few articles from a recent Government specification:

Article 20, Method of Procedure:

The Government reserves the right to require the method of procedure to be such that the construction of the foundations of the crane runways will take precedence over other work, to the end that these foundations may be completed in time to avoid delay to the erection of the crane runways. The contractor will be required to leave the underwater portion of his work unwatered, until the steel work for the crane runway is completed, *if in the opinion of the officer in charge such procedure will expedite its completion.*

Article 24, Buried Constructions:

Such information as the Government possesses regarding sewers, pipes, and other construction beneath the surface of the ground on the site of the work may be obtained from the public works officers of the navy yard.....*The Government does not guarantee the information given to be correct,* or that other buried constructions will not be encountered, *and does not assume any risk or responsibility in connection therewith.* Intending bidders will have the privilege of examining the site, and they should satisfy themselves as to the existing conditions. In the event of interference developing between new construction and any obstructions on the site, the contractor shall be required to make all provisions necessary for the removal of such interference, as directed by the officer in charge, *without increased compensation.* In event of interference between new constructions and existing service lines, sewers, etc., to be maintained in place, it shall be incumbent upon the contractor to make provisions necessary for maintaining such services *as directed by the officer in charge.* Any valuable material salvaged shall be removed and stored as directed by the officer in charge.

Article 26, Pile Data:

The length of piles required in the construction of the .....*will be determined by the contractor.* Lengths of piles used in the construction of.....adjacent to the site are given on the drawings, and complete pile-driving data on these piles may be obtained from the officer in charge, but *the Government does not guarantee the accuracy of any of the aforesaid data,* and the contractor *must assume full responsibility for use of same* in connection with the new structure.

Article 37, Work to be Accomplished in the Dry:

The bidder's attention is invited to the requirement that all work on this project be placed in the dry, hence the use of cofferdams or other approved methods of unwatering the site will be required. The contractor shall submit to the officer in charge drawings, showing details of the cofferdam or cofferdams proposed to be constructed, *but any approval given thereon by the officer in charge shall not operate to relieve the contractor from full responsibility for the sufficiency of such constructions.*

Very little comment is required regarding the above quotations. These specifications apparently give the officer in charge about as much power and authority as the late lamented czar of Russia, leaving the successful contractor with very little beside his skin. It would seem as though all responsibility were thrown on the contractor, and that the Government was not willing to pay for what it might be getting.

Paragraphs such as these quoted are absurd and beyond all reason, and no self-respecting engineer would wish to be vested with the unbridled authority such specifications would give him. Is it not about time that a reasonable set of specifications be adopted by the Government?

E. D. BUEL.
New York, N. Y.

[Unfortunately this practice of writing specifications which relieve the engineer of responsibility for even his own work is not confined to the Federal Government, but is all too common in state, county and municipal work.—EDITOR.]

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Lost Time Reduced by Shifting Crews

BY ALBERT S. FRY
Morgan Engineering Co., Memphis, Tenn.

LOST time from shutdowns of equipment is reduced by a definite plan for shifting crews in the dredging operations on the Inter-River Drainage District in Missouri. These crews, being paid by the month, receive full pay during any minor shutdown.

On the work named, if highwater shuts down one machine, or if a part breaks which cannot be replaced for some days, the monthly men are transferred to that other part of the work where they can be most useful. Each crew on each machine has one shift off a week. If for any reason a machine is not running, it is an easy matter to put its crew on the first machine whose crew is taking time off, and thus accomplish work which otherwise would not be done. If this is not practicable, the men may be put in the repair shop, where there is always something for them to do. Keeping the men busy also has a tendency to reduce breakdowns, because the men know that they will have to work somewhere and will not be allowed, if there is a breakdown, to loaf and draw their pay. J. W. Radford is construction superintendent on this work.

Other Articles in This Issue of Interest to Contractors

Dam Foundation Placed by Suspended Pneumatic Caissons — Page 108
Sewer-Construction Records Used at Scarsdale, New York — Page 111
Building the New Orleans Army Supply Base — Page 122
British and American Building Prices (Letter) — Page 142
Function of Corporate Contract Bonds (Letter) — Page 142
Government Specifications Should Not Misplace Responsibility (Letter) — Page 144

Blasting Tests Show TNT Stronger Than Forty Per Cent Dynamite

TWO concrete piers that had to be blasted out by mudcapping recently gave an opportunity to compare TNT (trinitrotoluene) directly with 40% dynamite. C. E. Munroe and S. P. Howell of the Bureau of Mines, reporting on the results, say that these piers were 10 ft. long, 3½ ft. thick at the bottom, and 1½ ft. thick at the top, and 7 ft. high. They were broken up by dobey shots, using moistened clay for capping. When TNT was used, six shots, totaling 10.7 pounds of the explosive, removed 159.5 cu.ft. of concrete, or 14.9 cu.ft. per pound of TNT. With the dynamite, five shots, totaling 9.6 pounds, removed 135 cu.ft. of concrete, or 14.1 cu.ft. per pound.

Tests of the power of various explosives when fired in cavities in lead blocks, according to the standard method of the Bureau of Mines, gave the following results: Taking 40% dynamite as standard of power, or 100%, the series of explosives arranged according to increasing strength is as follows: Black powder, 10.5%; 40% gelatine dynamite, 73%; 40% straight dynamite, 100%; 50% straight dynamite, 105.2%; granulated TNT, 113.1%; 60% straight dynamite, 120.2%; blasting gelatine, 149.8 per cent.

Large quantities of TNT have been taken over by the Department of the Interior for industrial use. The material is a granular powder of yellowish or brownish color, different grades ranging from a fineness of 12 mesh to a fineness of 30 mesh. It is packed in wooden boxes containing 100 pounds. A No. 8 detonator must be used with this powder, where dynamite can be exploded by a No. 6. TNT is less sensitive to friction and less sensitive to percussion than gelatin dynamite, ammonia dynamite, picric acid, and 40% dynamite. The powder is quite poisonous. Further, 47% of the products of combustion is carbon monoxide, a poisonous gas, which makes it necessary to give time for the clearing away of the gases before approaching the face after a shot.

Except for the use of a heavier detonator, the handling of TNT is similar to that of dynamite. Munroe and Howell say: "TNT should be charged into bore holes, primed, tamped, and stemmed in the manner customarily followed in the use of high explosives in blasting, special care being taken in charging wet holes not to tear or break the cartridge case or wrapper while loading it into the hole and tamping it. It may be used in chambering holes for subsequent charging with black blasting powder just as dynamite is used. When TNT shots are fired, if the detonation is complete there will be produced large volumes of dense black smoke."

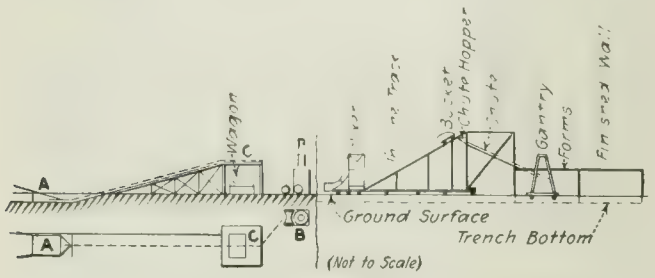
Traveling Mixer Plant Concretes Wall

A MIXER with incline hoist, and chute, mounted on a rolling platform, is building concrete retaining wall at Columbus, Ohio. The platform wheel gage is wide



MIXER AND INCLINE HOIST ON WHEELED PLATFORM

enough to straddle the footing trench which has been excavated ahead. Following the traveling mixer is a gantry which shifts the wall form. The procession of operations is indicated by the diagram. About 700 ft. of wall is being built ranging from 32 ft. to 17 ft. high with footing, but most of it is of the lesser depth. For



PROCESSION OF OPERATIONS CONSTRUCTING RETAINING WALL

the shallower wall the footing trench is not deep and it is being dug by a wide scraper, A, hauled by cable from hoisting engine B, up an incline to a platform trap C, and then dumped into wagons. The mixing plant is charged by wheelbarrows from trench side stock piles, but all other operations into the forms are mechanical. The wall forms are wood and are carried ahead, without being knocked down, by a gantry crane which straddles the wall. Hickey Bros., St. Louis, Mo., are the contractors for this work.

Dragline Excavator Lowers Water Main

WATER mains crossing the Miami River at Dayton, Ohio, have been successfully uncovered and lowered by the 200-ton dragline excavators which are deepening and widening the channel for flood protection. The view shows one of these operations in progress. The excavator opens a pit, removing the overlying earth to within about 2 ft. of the pipe, and then digs deeper on each side. The earth is piled to form a cofferdam which is unwatered by one of the portable electric pumping outfits described in *Engineering News-Record* of Mar. 6, 1919, p. 490.

Men with shovels complete the uncovering of the

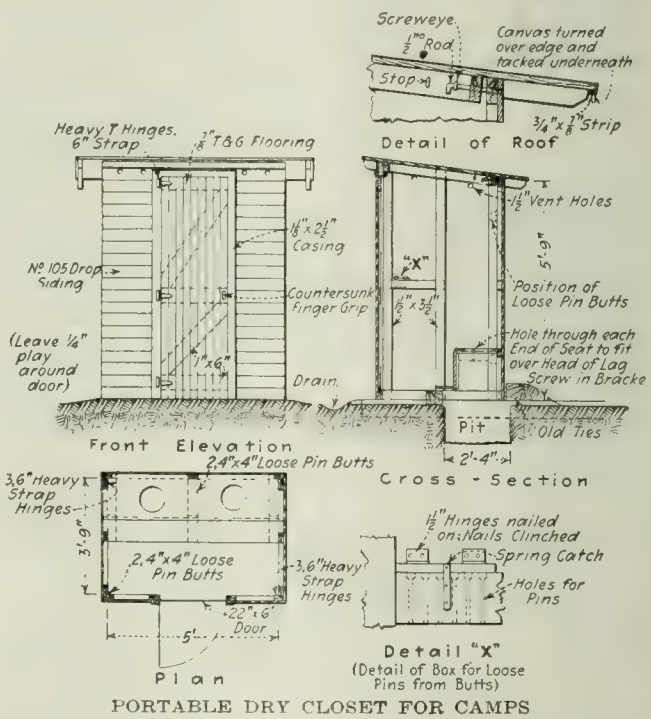


DRAGLINE EXCAVATOR LOWERS WATER MAIN CROSSING THE MIAMI RIVER

pipe, and it is then separated into one or more sections by melting out the proper joints with an acetylene torch. The sections are moved to one side and the dragline excavates the new and deeper trench for the relocated main. Several crossing mains have been successfully lowered in this manner. The river improvement at Dayton, Ohio, is a part of the flood-control construction work in the Miami Conservancy district. Arthur E. Morgan is chief engineer, Charles H. Paul is assistant chief engineer, and C. H. Locher is construction manager.

Folding Portable Dry Closet

A STANDARD design of dry closet, with folding portable building, designed for temporary use by bridge gangs, etc., on the Nashville, Chattanooga & St. Louis R.R., and adapted also for use at construction camps, is shown in the accompanying cut. One end is hinged to the back and the other to the front, so that the building can be folded up for transportation. Three heavy 6-in. strap hinges are used at each of these corners. The other two corners are each fitted with two 4 x 4-in. loose pin butts for holding the building to-



PORTABLE DRY CLOSET FOR CAMPS

gether when it has been assembled, a box being provided for holding the pins when the building is dismantled.

The drip board is provided with two pieces of No. 27 galvanized iron, 12 x 19 in., centered on holes at the front of the seat. The foot board, drip board and seat are connected by 5-in. strap hinges so that these three parts can be folded together.

For the roof, the plank sheathing receives a coat of white lead and linseed oil, and while this is wet it is covered with heavy roofing canvas secured by flat-head copper tacks. Two coats of white lead and oil are then applied. Screws and cement-coated nails are used in the building, which gets two coats of paint inside and outside. The design was prepared under the direction of Hunter McDonald, chief engineer.

NEWS OF THE WEEK

New York, July 17, 1919

Bill for Illinois Deep Waterway Is Signed

The bill for a deep waterway connecting the Chicago Drainage Canal with the Illinois River, thus linking the Great Lakes and the Mississippi, has been signed by the Governor of Illinois, together with a bill authorizing a bond issue of $20,000,000 for this purpose, as already approved by public vote.

The project must be submitted to the War Department for approval. From the water-power plant of the Sanitary District of Chicago, at Lockport, the end of the Drainage Canal, the route will follow the tailrace, the Des Plaines River and the Illinois & Michigan Canal through Joliet, and then the Des Plaines River and Illinois River to a point on the latter near Utica, Ill. If the utilization of the two rivers is not considered practicable, the route may be changed to the Illinois & Michigan Canal or to new channels outside of the rivers. A bottom width of not less than 150 ft. is specified, with a depth of not less than 8 ft. in earth and 10 ft. in rock. For the locks, minimum dimensions of 110 x 600 ft. are specified, with 14 ft. of water on the miter sills. Through Joliet the water level is to be not higher than 40.5 ft. below Chicago datum, or 41 ft. if certain shoals are deepened, while the width must not be less than 270 ft. Through Ottawa, the level must be not higher than 120.5 ft. below Chicago datum.

Sewer connections must be built for these cities, and all dams must provide for quick disposal of flood waters. Provision is made for the lease of surplus water or water power. The construction, maintenance and operation of the waterway and its appurtenances are in the hands of the State Department of Public Works and Buildings, which may let contracts or carry out the work with its own forces.

Rapid Transit Engineers Vote in Favor of Unionization

At a special meeting of the Rapid Transit Engineers' Association of New York City, held July 14, to decide whether the association should affiliate with the American Federation of Labor, it was voted as the sense of the meeting that the members should join the Union of Technical Men as individuals. This action was taken when it was found that the association could not be accepted as a body, because the Union of Technical Men already existed in the district as an affiliate of the American Federation of Labor.

There were present about 200 of the 700 members of the association, which was organized the first of the year and is making a strong effort to get a fair increase in salaries for engineers of the Public Service Commission. The president of the association, R. A. Fiefel, presided; the meeting was also addressed by Kay B. Knudsen, secretary of the New York Chapter of the American Association of Engineers, who presented a plea for affiliation with that association.

The vote in favor of unionization was practically unanimous; the argument which swung this vote seemed to be that the unions, through the weight of thorough organization, had the power to enforce their demands.

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 233 Broadway, New York City.

Chicago to Vote on $28,000,000 Bonds for Improvements

Chicago will submit to public vote in November several bond issues for public improvements, as follows: Widening and extending Robey St., $9,200,000; Ashland Ave. improvement, $5,400,000; extension of Ogden Ave. across the city, $5,400,000; reconstruction and double-decking of South Water St., $3,800,000; widening and extending Western Ave., $2,400,000; completing the Michigan Ave. link, $2,000,000.

Sewer Tunnel Contract Again Abandoned

Charles A. Haskins, contractor for the outfall tunnel section of the Passaic Valley sewer, under the City of Bayonne and New York Bay, has notified the Passaic Valley Sewerage Commission that he has abandoned his contract, because of 40% increase of cost since he entered into the contract in 1916. His bid totaled about $1,900,000. The work was let to Haskins as a compressed-air job following abandonment by the O'Rourke Engineering Construction Co., which was working under a free-air contract. The commission has instructed W. M. Brown, chief engineer, to investigate and recommend whether the contract should be readvertised or the work completed by force account.

House Passes Water-Power Bill

The House of Representatives has passed the water-power bill in substantially the same form as that passed by the House of Representatives at the last session of Congress. The measure is now before the Commerce Committee of the Senate, and will be taken up by a subcommittee of that body shortly after Aug. 1.

Friends of water-power legislation in Washington predict the early passage of the bill by the Senate, but in legislative circles at the capitol it is well understood that the question of foreign affairs relating to the peace treaty and the League of Nations will have an important effect upon the early passage of any legislation.

Patent Hearings in Progress Before House Committee

Public hearings on three bills relating to reorganization of the Patent Office are now being held by a House committee in Washington. Judge Learned Hand, of New York, pointed out the need for a single court of patent appeals, and emphasized the necessity for an increased force and better facilities in the Patent Office. The consensus of opinion of the inventors who have appeared before the committee seems to indicate that there is great need of an easier means of determining money recovery in case a patent has been infringed. One inventor asserted that if the salaries of Patent Office employees were made five times as large it would be an economy to the country, because the time of courts would be freed and inventors would not be distracted by the inadequacy of the Patent Office equipment.

Large Bond Issue Approved by Pittsburgh

By vote of the people, July 8, Pittsburgh approved a bond issue of $22,000,000 for permanent improvements. The largest item in the list is a $6,000,000 street-car subway in the downtown district. Another is Monongahela Boulevard, a roadway along the north bank of the Monongahela River from Grant St. and Second Ave. east to Craft Ave., to cost about $2,000,000. Widening Second Ave. between Liberty Ave. and Grant St. from 50 ft. to 80 ft. is included at $1,410,000. Nearly $1,500,000 is to be spent on improvement of the water system, including $490,000 for machinery in five pumping stations, $87,000 for renewals at the filtration plant, $90,000 for relining the Herron Hill reservoir, $400,000 for meter extensions, and $319,000 for pipeline extensions. Minor items in the list are $120,000 for six public comfort stations, and $600,000 for acquiring park lands in Sawmill Run Valley and at other points, and for park development.

The proposed street-car subway was described in *Engineering News-Record* of May 29, 1919, p. 1059, where a map of the subway location was shown.

Geological Survey Creates Division of West Indian Surveys

The United States Geological Survey is about to supervise extensive topographic mapping in the West Indies. The Republics of Santo Domingo and Haiti have made appropriations sufficient to complete the surveys of their countries and have requested the Geological Survey to take charge of the work and to furnish the technical personnel. It is probable that Porto Rico and the Republic of Cuba will take similar action. In order to provide for this work the Division of West Indian Surveys is created in the Topographic Branch. The chief of the Division will handle directly all matters pertaining thereto, except those which affect the general policy of the Geological Survey or of the Topographic Branch. Lieut. Col. Glenn S. Smith is relieved from his duties in connection with military surveys and is designated as topographic engineer in charge of the Division of West Indian Surveys.

Unusual War Service Record

In announcing the return of his son, Capt. Merlin L. Dappert of the 130th Infantry, 33rd (Prairie) Division, who was in the Army of Occupation at Luxembourg after participation in the Somme and the Meuse-Argonne offensives, J. W. Dappert, president of the Illinois Society of Engineers, also gives as follows, in the war-service record of the other members of the family associated with him in his office at Taylorville, Ill. One son, Lieut. J. Ivan Dappert, was killed in action near Albert, France; Lieut. John V. Dappert is now in the Fort Sheridan hospital, Chicago, under treatment for his eyes as a result of severe gassing; Lieut. Anselmo F. Dappert, of the Heavy Tank Corps, landed in New York, July 5; Sergeant Boyd H. Dappert, of the 306th Engineers, is still in France; Lucy C. Dappert was in Government service in Washington.

Hurley Retires as Chairman of Shipping Board

Edward N. Hurley, chairman of the United States Shipping Board, has tendered his resignation to President Wilson, to take effect Aug. 1, and the President has accepted the resignation. Chairman Hurley has been in charge of the organization of the Shipping Board and the Emergency Fleet Corporation since the early stages of the war, and he resigns at the present time from a desire to leave public life and have more time for personal affairs.

Airship Completes Round Trip Across the Atlantic Ocean

Landing at Pulham, England, at 6.56 a.m., July 13, the British dirigible R-34 completed the first round-trip air voyage from England to the United States. The homeward trip required approximately 75 hours, the take-off at Mineola, Long Island, having been made at 11.59 p.m., July 9, but the homeward journey started after New York City was circled for about one hour.

On the trip to this country the R-34 covered 3200 nautical miles in 108 hours 12 min., or an average speed of 29½ knots. The return trip, although handicapped by the breaking of one of the engines, was made in much better time, averaging about 42½ knots.

Shipbuilding in United States Decreases 25 Per Cent

June production of the United States shipyards amounted to 118 vessels delivered, of 578,583 dead-weight tons (388,402 gross tons). This compares with 136 vessels of 768,025 dead-weight tons delivered in May, as recorded in *Engineering News-Record* of June 12, 1919, p. 1181. The reduction is chiefly in steel ships, of which only 70, totaling 414,283 dead-weight tons, were delivered in June as against 87, totaling 594,425 tons, in May.

As compared with June of last year, the month's deliveries represent an increase of 106%, the production a year ago being 280,400 dead-weight tons. Furthermore, the past month's work represented about twice the production of the United States for the entire year of 1916, the highest pre-war year, when 38 seagoing vessels of over 1500 dead-weight tons each were completed, a total tonnage of 285,555.

Launchings for June also showed a decrease from the May figure, the total being 98 hulls of 504,200 tons for June as compared with 137 hulls of 705,958 tons for May.

Canadian Government Railway Operation Shows Loss

In a report to the Canadian House of Commons at Ottawa, the Hon. J. D. Reid, Canadian minister of railways, gave the estimated earnings and expenses of the Canadian Government railways for the current year, indicating an anticipated loss, in connection with operation, of about $28,000,000. This, he stated, includes interest on the cost of the Canadian Northern, but not on the capital expenditures of the other Government railways.

Estimates of money that must be provided for the railways during the coming year were stated by Mr. Reid as follows:

Loss, as stated above, $28,000,000; construction, $11,121,000; equipment and rolling stock, $20,000,000; betterment, $21,421,000, making a total of $80,542,000. The following contracts had already been given out: Locomotives, $2,350,000; freight equipment, $8,650,000, and passenger equipment, $4,450,000.

Highway Bond Issue for $20,000,000 Passed in Canada

Government aid to encourage the construction and improvement of highways to the extent of $20,000,000 was passed by the Canadian House of Commons July 2, received its third reading by the Senate July 4, and only awaits the formal assent of the Governor General to become law. The bill calls for appropriations of $20,000,000 during a period of five years. Of that sum, $80,000 is to be granted to each province each year, and the balance is to be allowed in proportion to the population of the respective provinces of the Dominion.

The bill provides that grants are to be made only in consideration of work actually done for the improvement of particular highways and in accordance with agreement between the Federal Government and the province concerned. These agreements shall set forth the cost, description and specifications of the proposed highway and the manner in which the work is to be supervised by the Federal and provincial officials. The aid to be given by the Federal Government is to be 40% of the actual and necessary cost of the construction, and the expenditures are to be made by tender and contract, unless for special reasons the Governments of the Dominion and the province concerned agree to a different method of procedure.

Daylight Saving Continued

An organized effort to repeal the daylight-saving act by means of a rider attached to the agricultural appropriation bill has been defeated by the veto of the entire bill by the President on account of the rider. An attempt to pass the bill over the veto failed in the House by 15 votes.

Contributions from Engineers, Architects and Constructors' Conference on National Public Works

M. O. LEIGHTON, Chairman

PUBLISHER'S NOTE: The space occupied under this caption is donated to serve as a means of frequent and intimate communication between the Engineers, Architects and Constructors' Conference on National Public Works, and the members of the profession. The contributor takes full authority for the statements made.

THE PUBLIC WORKS BILL

The Jones-Reavis bill introduced into Congress to create a national Department of Public Works, and sponsored by this organization, is receiving wide praise from the engineers, architects and constructors of the country. A few constructive criticisms and suggestions are being received, and the officers of this organization solicit many more. Copies of the bill have been widely distributed, but more are available and anyone who desires one may obtain it on application to conference headquarters.

Much is being said of late concerning the engineer as a citizen and the methods by which he may acquire "influence" in Governmental affairs. In response to suggestions made by delegates who attended the Chicago conference certain remarks made by the chairman of the conference during a discussion of campaign methods are here given:

It is very clear that the way to run a campaign of the kind we propose is to have an organization in Washington, and many others in every state. It frequently happens that local organizations are either dead or moribund. Here and there is a live one, but for the most part, when it comes to getting concerted action and the headquarters at Washington sounds an alarm or sends out for information and advice, it is a good deal like pouring water down a rat hole.

Now, talking very frankly about the call for this meeting, about 180 invitations were issued. We received declinations from ten or twelve, acceptances from about 80, and dead silence from all the remainder.

I don't suppose that there is one engineer in a hundred who realizes how poorly engineers are regarded in Washington so far as potentiality in political affairs is concerned. You don't stand as high as the undertakers, and when you are compared with trade unions you are so far behind that no one knows you exist.

Some of us remember when a committee of most distinguished engineers went to Washington to give advice to a Senate committee on an important engineering matter. You would have supposed that the cream of the engineering profession of the United States would have secured a respectful hearing. They barely got inside the door of the committee room. The Senate committee promptly adjourned. They wouldn't treat a plumbers' union like that, nor a committee from the American Bar Association, nor yet a conclave of Presbyterian ministers. They have fallen into the habit of discounting engineers. The facts are, you don't count at all, and it is simply and solely the result of your indifference as illustrated by the response to the invitation of Engineering Council to come to this conference.

I realize that I am talking to the wrong people. Your societies came forward and you are here, but you are the exceptions that prove the rule. You can pick out the best committee in the engineering profession to take charge in Washington, but that committee isn't going to do you one bit of good unless you, here, represented at this conference, take the pains to dig out the dead societies and the moribund members and shake them up.

Why don't you authorize that Washington committee to spend a little money to dig out these engineering societies and get them to work? In other words, my friends, why don't you use the intelligence of a carpenters' union or a plumbers' union or the American Federation of Labor? Sometimes it seems as though you are temperamentally unfit for that kind of a job. Perhaps you are not, but believe me, gentlemen, you act as though you were. Influence means influx. That is what the engineers lack—influx. You don't flow into things. You stand on the outside looking in.

ORGANIZATION

The organization of the conference on public works has been completed by the appointment of a finance committee and a treasurer. The former consists of D. A. Garber, chairman; Francis Blossom, J. Parke Channing, Col. Peter Junkersfeld and W. H. Nichols, Jr. The treasurer is Milton E. Ailes, vice-president of the Riggs National Bank, Washington, D. C.

The following is a list of the chairmen of the state campaign committees, appointed to date, which will conduct the campaign of education within their respective jurisdictions. Organizations in states not here mentioned are in process of formation.

States	*Chairmen*	*Addresses*
Arizona	Col Epes Randolph	Tucson
Arkansas	Charles H Miller.	Little Rock
California	C. E. Grunsky	San Francisco
Colorado	Richard A. Parker	Denver
Florida	G. R. Benton	Gainesville
Georgia	Earl F. Scott	Atlanta
Idaho	A J. Wiley	Boise
Illinois	W. L. Abbott	Chicago
Indiana	H. O. Garman	Indianapolis
Iowa	J H Dunlap	Iowa City
Kansas	Lloyd B. Smith	Topeka
Louisiana	Major W. B. Gregory	New Orleans
Maryland	J E. Greiner	Baltimore
*Massachusetts	George F Swain	Cambridge
Michigan	Gardner S Williams	Ann Arbor
Minnesota	W H. Hoyt	Duluth
Mississippi	W L. Thompson	Greenville
Missouri (Eastern)	Baxter L Brown	St. Louis
Missouri (Western)	J. Lyle Harrington	Kansas City
Montana	M. H. Gerry	Helena
Nebraska	G. E. Condra	Lincoln
Nevada	J G. Scrugham	Carson City
New York (Eastern)	George W Fuller	New York
New York	Wm B Powell	Buffalo
North Carolina	Col J H Pratt	Chapel Hill
North Dakota	E. F. Chandler	University
Ohio	E G Bradbury	Columbus
Oklahoma	Max L Cunningham	Oklahoma City
Pennsylvania (Eastern)		
Pennsylvania (Western)	Morris Knowles	Pittsburgh
South Carolina	S. B. Earle	Clemson College
South Dakota	Homer W. Doerr	Pierre
Texas	T. U. Taylor	Austin
Utah	R C Gemmel	Salt Lake City
Virginia	Thomas L. Watson	Charlottesville
West Virginia	Mayo Tolman	Charleston
Wisconsin	F A Vaughn	Milwaukee

*And all New England

French House Rebuilding Let to Canadian Architect

Georges Vannier, a Canadian architect, has announced that he has a contract for rebuilding 2000 houses at Soissons, France, and for a number of other buildings in many of the neighboring towns and villages. He has offices at 15 Rue de Miromesnil, Paris, and is in the market mainly for concrete reinforcement.

Federal Aid During June

During June the Department of Agriculture, through the Bureau of Public Roads, approved Federal-aid project statements to the number of 133, involving the improvement of 1390 miles of road, at an estimated cost of $24,220,000. The Federal aid on the above will be $11,034,000. This was a record over every previous month. Project agreements to the number of 60 were also executed, involving 507 miles, at an estimated cost of $7,566,000 and Federal aid of $3,404,000.

The total mileage and amounts involved to date in the various classifications are: (1) Approved project statements, 1319; mileage, 12,790; estimated cost, $133,833,000; (2) project agreements executed, 677, involving 5776 miles; estimated cost, $56,367,000. Federal aid amounts to considerably less than half the total.

Civil Service Examinations

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Valuation aid, $1200 to $1500 per year; valuation engineer, $3600-$4800 per year, and assistant valuation engineer, $2500-$3600 per year; technical staff, income-tax unit, Bureau of Internal Revenue, Treasury Department. No date specified.

Master computer, $2400 to $1800 per year, computer (Grade I) $1800 to $1400 and computer (Grade II) $1400 to $900, Ordnance Department. Applications will be received until further notice.

Electrical assistant, signal service at large, War Department, for duty at Manila, Philippine Islands, $1500 to $2000 per year. Applications must be filed before the close of business on Aug. 19.

Technical assistant, field of civil engineering, $3200 per year, and technical assistant, torpedo design, $3000 per year. Applications must be filed by Aug. 19.

Supervising draftsman, bureau of steam engineering, Navy Department, $12.80 to $13.60 per diem. Applications must be filed before August 19.

Chief ship draftsman, U. S. Navy Department, $10 to $12 per diem;

draftsman, grade A, $8 to $9.60 per diem; draftsman, grade B, $6 to $7.20 per diem; draftsman, grade C, $5.20 per diem. No date specified. Applications should be filed without delay.

Chief draftsman, general engineering, architectural, power plant, heating and ventilating, electrical, U. S. Navy Department, $10 to $12 per diem; draftsman, grade B, $6 to $7.20 per diem; draftsman, grade C, $5.20 per diem. No date specified. Applications should be filed without delay.

ENGINEERING SOCIETIES

Calendar

Annual Meeting

NEW ENGLAND WATER WORKS ASSOCIATION; Tremont Temple, Boston; Sept. 30, Oct. 1-3, Albany, N. Y.

The South Carolina Association of Civil Engineers was formed at Columbia, July 8. There were 75 engineers present who took part in the organization. The following officers were elected: President, J. E. Sirrine, of Greenville; first vice-president, G. E. Spand, of Columbia; second vice-president, W. L. Lee, of Sumter; secretary and treasurer, John McCrady of Charleston.

The Chattanooga Chapter of the American Association of Engineers held a regular meeting July 2, at which the following permanent officers were elected: President, H. C. Sherer; vice-president, H. D. Scantlin; secretary, Ray Dunlap; treasurer, J. L. Fergus, and member-at-large, R. C. Morrison. Discussions at the meeting centered on the Gronna bill, the National Highway Council, and the subject of the abolishment of the Department of the Interior. Special committees were appointed to investigate and recommend what action the chapter should take regarding these bills.

PERSONAL NOTES

FRANK C. EMERSON has been appointed state engineer of Wyoming. For the past 15 years Mr. Emerson has been in charge of large irrigation enterprises in that state. At the time of becoming state engineer, in addition to a general consulting practice, he was superintendent of the Big Horn Canal Association and the Lower Hanover Canal Association, with headquarters at Worland, Wyo.

GEORGE M. SCHWAB, during the war purchasing agent at Camp Pike, Arkansas, has been made chief engineer of the Wolverine Brass Works, at Grand Rapids, Mich.

CAPT. HERBERT SPENCER, of the 23rd Engineers, American Expeditionary Forces, has received his discharge from the service, and has resumed his position with the Standard Oil Co. While in France he was engaged largely in highway work.

H. M. STOFFLET, formerly superintendent of construction for the Austin Co. at Indian Head, Md., has been transferred to the Philadelphia division in charge of the construction work on the Liggett & Myers Tobacco Company's building.

JOHN D. MOHLER, assistant city engineer, St. Joseph, Mo., has resigned to accept the position of special highway engineer, in charge of road construction, Buchanan County, with headquarters at St. Joseph, Mo. The county recently voted $2,000,000 in bonds for hard-surface roads.

HANS VON UNWERTH and J. C. BYRD, consulting structural engineers, have formed a partnership, using the firm name of VON UNWERTH & BYRD, with offices at 505 Finance Bldg., Kansas City, Mo. Mr. Byrd has just returned from overseas service as captain with the 314th Engineers.

RUDOLPH P. MILLER, formerly superintendent of buildings for Manhattan and chairman of the board of standards and appeals, and GEORGE E. STREHAN, formerly assistant engineer in the bureau of buildings and the board of standards and appeals, have become associated in the general practice of engineering, with offices at 112 W. 42nd St., New York City.

WALTER W. MCGUIRE, recently with the St. Louis Water Division, has resigned to become associated with the du Pont Engineering Co. on the construction of the General Motors Corporation's new plant at Union and Natural Bridge Roads, St. Louis.

CHARLES S. LEMON, a division engineer of the Pennsylvania State Highway Department, has been appointed engineer for the Bureau of Township Highways.

H. R. MOFFITT, formerly assistant engineer of the Pennsylvania State Highway Department, has been appointed to succeed CHARLES S. LEMON, whose transfer is noted above, as engineer of the Blair-Cambria-Somerset-Bedford district.

LIEUT. ROBERT J. H. WORCESTER, having received his discharge from the Army, has returned to his former position as engineer and superintendent of roads and bridges for the town of Concord, Mass. Lieutenant Worcester served with the 42nd (Rainbow) Divisional Engineers at St. Mihiel, in the Argonne and in the Army of Occupation.

P. J. DAVIS and F. M. KUCHAR, assistant construction superintendent and principal assistant engineer, respectively, with the J. G. WHITE ENGINEERING CORPORATION on the construction of the 60,000-kw. steam power plant at the United States Nitrate Plant No. 2, Muscle Shoals, Alabama, have resigned to form the DAVIS-KUCHAR CO., with offices at Miami, Fla. They will engage in general contracting and consulting engineering.

LIEUT. COL. EDWIN VAN RENSSELAER PAYNE, 25th Engineers, U. S. A., has received his discharge from the service and has returned to his work with the department of the State Engineer and Surveyor of New York. His present location is the New York City office in the Hall of Records.

J. H. SAWKINS, formerly instructor in drawing and descriptive geometry, department of civil engineering, Union College, Schenectady, N. Y., has resigned to accept the position of designing engineer in the department of grounds and buildings of the General Electric Co. of that city.

M. B. BAIR, who formerly was principal assistant engineer of the division of sanitary engineering, Ohio State Department of Health, has been appointed chief engineer of the bureau of sanitation of the Arkansas State Board of Health, with offices in the state capitol at Little Rock.

J. C. WALTON, a member of the MACKINTOSH-WALTON CO., consulting enegineers, has been elected mayor of Oklahoma City, Okla. Previous to his election he was commissioner of public works and handled the problems of straightening the North Canadian River through the city, eliminating grade crossings and developing an intercepting-sewer system and sewage-disposal plant.

CAPT. W. V. BUCK, of the 23rd Engineers, U. S. A., has been appointed assistant state highway engineer of Kansas. Before entering the service Mr. Buck was in charge of the construction work of A. Jaicks Co., general paving contractors, Kansas City, Mo

MAJ. CARL A. HEINZE, assistant engineer in charge of distribution and maintenance in the bureau of power and light, Los Angeles, Calif., has returned to duty in the department after more than two years' military service. He has been identified with the aqueduct and power development work from its inception.

CAPT. EDGAR L. TENNEY, 108th Engineers, U. S. A., has received his discharge and has taken up practice as consulting engineer for bridge, building and foundation work, with office at 1642 Monadnock Block, Chicago.

FRANK S. EASTON, hydro-electric engineer with the British Columbia Electric Railway Co., of Vancouver, B. C., has resigned to enter the employ of the Mexican Light & Power Co., with headquarters in Mexico City, Mr. Easton will have charge of certain hydraulic and electrical work for the company, under the direction of G. R.

G. CONWAY, managing director, who was formerly chief engineer of the British Columbia Electric Railway Company.

MAJ. EDWARD BARTOW has returned from his service in France with the sanitary corps of the American Expeditionary Forces and will resume his position as chief of the Illinois State Water-Survey Division, with offices at Urbana, Ill.

F. J. VON ZUBEN, city engineer of Fort Worth, Texas, since 1905, has resigned to engage in private business.

FRANK F. FOWLE and JAMES R. CRAVATH have formed a partnership for the practice of electrical, illuminating and mechanical engineering, under the firm name of FOWLE & CRAVATH, with offices at 1201 Monadnock Block, Chicago. Both were formerly consulting engineers of that city.

LIEUT. COL. H. L. TROTTER, D. S. O., lately in command of the 11th Battalion, Civil Engineers, has become a partner in the firm of HENRY HOLGATE, consulting engineer, Montreal, Que.

H. B. PEARSON, JR., formerly with the Alan-Wood Iron & Steel Co., of Swedeland, Penn., has left that company to become resident engineer of the Breaker Island project of the Connellsville Coal & Coke Byproducts Co., Albany, N. Y.

ALFRED MCKEEL has resigned his position as assistant engineer to the North Dakota State Highway Commission to become highway engineer under F. O. LANG, county engineer of Polk County, at Des Moines, Iowa.

D. L. LEWIS, formerly building inspector of Fort Worth, Texas, has been elected city engineer to succeed F. J. VON ZUBEN, whose resignation is noted elsewhere.

Weekly Bulletin Issued by Bridgeport District Salvage Board

The Bridgeport District Salvage Board, Ordnance Department, U. S. A., is issuing a weekly bulletin containing a list of all Government property within the Bridgeport district available for sale. This property comprises buildings, building equipment, power equipment, factory supplies, tools, machinery, etc. The bulletin will be mailed weekly to any one applying to the board at 945 Main St., Bridgeport, Conn.

Trade Resumed with Germany and Some Other Countries

Resumption of commercial relations between the United States and Germany, effective July 15, has been authorized by our Federal authorities. Reservations have been made against the importation of dyes, potash, drugs, chemicals and wheat, and the export of wheat will remain under control of the Grain Corporation. Operations under the control of the Alien Property Custodian are not affected by the orders. The trading with the enemy act remains in force, technically, but by means of blanket licenses it will be suspended on application. The same system applies to other countries which have been under the ban, except Hungary and parts of Russia. The blanket licenses are issued by the war trade board section of the Department of State, Washington, D. C., to which application may also be made for various exceptions and restrictions. Mail, cable and money exchange with Germany was also resumed July 15.

Small Motor Truck May Have Dump or Fixed Body

The three-wheel motor truck with 1-yd. dump body shown in the accompanying views is intended for use in hauling concrete, concrete materials and excavated materials on construction work, as well as for handling rock in quarries and mines and delivering coal and other supplies at industrial plants. The machine may have a fixed platform or box body for carrying packages and freight at manufacturing plants and warehouses and has a drawbar connection for use as a tractor.



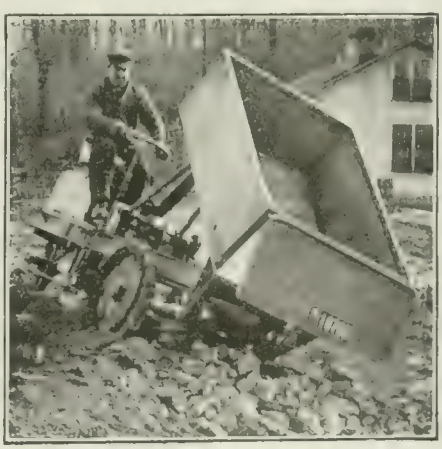
GAS TRACTOR WITH AUTOMATIC DUMP BODY

Being strongly built and gas driven, a wide range of usefulness is claimed for the new truck. It is not considered, exactly, a competitor of the electrical tractors ordinarily used around industrial plants, for although it is applicable for such use, it has sufficient and uniformly constant power for travel on country highways and over steep grades for long distances.

In operating the truck, the driver sits at the rear, so that he has a good view of the body while dumping. As equipped with a dump body the truck weighs 2450 lb., and has overall dimensions of 46 x 125 in., with a wheelbase and turning radius of 7 ft. Its carrying capacity is 1½ tons. The steering is done by the single trailer wheel.

Two types of dump body are shown, one of which is automatic, being released by the operator and dumped by the chain and spring at the forward end, the other, which is seen operating on country road grading, has to be unlatched at the dumping end before tipping.

Power is furnished by a four-cylinder 25-hp. gasoline engine, and is applied to the front wheels through an internal gear-drive axle. Metal disk-wheels are used, with wide steel flanges or rubber tires. This machine is built by the Clark Tructractor Co., 80 East Jackson St., Chicago, and is sold by the Liberty Steel Products Co., Inc., Woolworth Building, New York City.



GAS TRACTOR ON ROAD GRADING

Coöperative Publicity Work

The Manufacturers' Publicity Bureau, of 140 So. Dearborn St., Chicago, is now issuing a monthly publication entitled *Successful Methods—a Magazine of Construction Service.* It is intended for contractors, engineers and others engaged in all sorts of construction work as well as in mining, quarrying, clay working, and cement production, and may be had free on application. The July issue contains articles on road and other construction work, general contracting, aids to manufacturers in selecting machinery best suited to the work in hand, and miscellaneous articles.

Material-Handling Machinery and Factory Appliance Exchange

An international material-handling machinery and factory appliance exchange has been organized by the Merchants and Manufacturers' Exchange of New York, in connection with the taking over of the Grand Central Palace for the purpose of turning it into a mammoth trade clearing house. This will be one of the eight permanent industrial expositions

which will fill eight floors of the large structure. The remainder of the building will be used for short-time expositions of various kinds. C. R. Ringenberg, formerly of the Material Handling Machinery Manufacturers' Association, is secretary and manager of the new exchange, with offices at 405 Lexington Ave., New York City. Fred W. Payne is general manager of the Merchants and Manufacturers' Exchange, and will have supervision of all the expositions in the building.

National Highway System Booklet

An attractive illustrated booklet, entitled "The National Highway System," has just been issued by the American Automobile Association. Among the subjects dealt with are: The basic reason for a national highway system; motor traffic a dominant highway influence of today; Federal highway supervision vs. Federal inspection, with many other chapters of less length on various subjects. The booklet should be of value to all those who are interested in the promotion of a national highway commission and a national system of roads.

Business Notes

THE READING VALVE AND FITTINGS CO., of Reading, Penn., has just completed a $250,000 addition to its plant, including increased foundry facilities and modern machine shop for manufacturing flanged and screwed fittings and flanges of both iron and steel.

THE CORRUGATED BAR CO., INC., of New York, has taken over the entire assets and liabilities of the Corrugated Bar Co., a Missouri corporation, and is continuing the business of the latter company. Control of the company now passes to A. L. Johnson, who has been connected with it since July, 1895.

THE BLAW-KNOX CO. has opened offices in the Little Bldg., corner of Boylston and Tremont Sts., Boston, Mass., and in the Owen Bldg., Detroit, Mich. A. W. Ransome, formerly of the New York office, assumes the duties of New England manager, and H. J. Desson has been transferred from the Pittsburgh office to Detroit to assume the duties of manager of the Michigan district.

THE MASSEY CONCRETE PRODUCTS CORPORATION, of the People's Gas Bldg., Chicago, has made the following appointments: Paul Kircher, resident manager of the Eastern district, including Eastern Canada, with headquarters at 50 Church St., New York; G. H. Redding, resident manager in charge of sales in the Central district, with headquarters in Chicago; H. E. Burns, resident manager in charge of sales in the Southwestern district, with headquarters in the Sumpter Bldg., Dallas, Tex.

THE MAHER ENGINEERING CO. has been organized at Chicago, with offices in the Michigan Boulevard Building, to handle the sales and installation of pumps, engines and machinery for fertilizer and sulphuric acid.

THE MIDWEST ENGINE CO., of Indianapolis, has opened offices at four new locations with the following representatives: D. J. Carrison, Florida Life Bldg., Jacksonville, Fla.; Chester B. Loomis, Southwestern representative, 303 Caples Bldg., El Paso, Tex.; B. H. Downing, Eastern sales manager, 111 Broadway, New York City, and J. R. Lowe, Southern representative, 617 Maison Blanche Bldg., New Orleans, La.

THE EDISON PORTLAND CEMENT CO., of New Jersey, has a new representative in New York City, W. D. Cloos, with office at 8 W. 40th Street.

THE HOLT MANUFACTURING CO., of Peoria, Ill., has appointed E. A. White, formerly head of the division of agricultural engineering, University of Illinois, as chief of the company's research division. Fred W. Jones has been appointed advertising manager; he goes to the Holt company from the advertising department of the International Harvester Co. of America.

THE AMERICAN STEAM CONVEYOR CORPORATION, engineers and contractors, 326 W. Madison St., Chicago, Ill., announces that S. F. Joor, a consulting engineer of Chicago, has joined its organization as sales engineer. At one time Mr. Joor was Western manager and sales engineer of the Jeffrey Manufacturing Company.

THE CARR MACHINERY CO. has been organized by C. H. Carr, with offices at 615 Reliance Bldg., Kansas City, Mo. The new firm sells the lines manufactured by the Ferry Steam Turbine Co. and the Alphons Custodis Machinery Co. Mr. Carr was formerly with the Allis-Chalmers Co. in the Kansas City office.

THE ABERTHAW CONSTRUCTION CO., of Boston, Mass., has opened a permanent office in Atlanta, Ga.; it will be under the direction of H. McL. Sage.

THE CHICAGO PNEUMATIC TOOL CO., of the Fisher Bldg., Chicago, has appointed L. C. Sprague, formerly district manager of sales at New York, as manager of Western railroad sales, with headquarters in the Fisher Bldg., Chicago. H. G. Barbee has been appointed manager of Eastern railroad sales, with headquarters at 52 Vanderbilt Ave., New York City, and Nelson B. Gatch, formerly assistant manager of sales at Chicago, is now district manager of sales at New York, succeeding Mr. Sprague.

Trade Publications

The following companies have issued trade publications:

THE GENERAL FIREPROOFING CO., of Youngstown, Ohio; folder, 6¼ x 9¼ in., 12 pages, illustrated; describes method of fireproofing walls.

THE CARBO-HYDROGEN CO. OF AMERICA, of the Benedum-Trees Bldg., Pittsburgh, Penn.; catalog, 6¼ x 9 in., 27 pages, illustrated; describes the use of Carbo-Hydrogen apparatus for cutting steel and wrought iron.

THE THEW AUTOMATIC SHOVEL CO., of Lorain, Ohio; bulletin, 8½ x 11 in., 19 pages, illustrated; industry bulletin No. 30; describes the operation of steam shovels upon highway construction.

THE DAYTON-DAWD CO., of Quincy, Ill.; bulletin No. 240, 7½ x 10½ in., 16 pages; describes design and gives information regarding the selection of centrifugal pumps.

THE MERCURY MANUFACTURING CO., of 4118 S. Halsted St., Chicago, Ill.; catalog, 6 x 9 in., 18 pages; subject "Trackless Train"; describes rubber-tired tractors and trailers in train.

THE ALLIS-CHALMERS MANUFACTURING CO., of Milwaukee, Wis.; bulletins Nos. 1096, 1105 and 1816, 8 x 10½ in., 8, 20 and 16 pages, respectively, illustrated; describe sanitary and portable air-compressor equipment, direct-current motors and generators and crushing rolls.

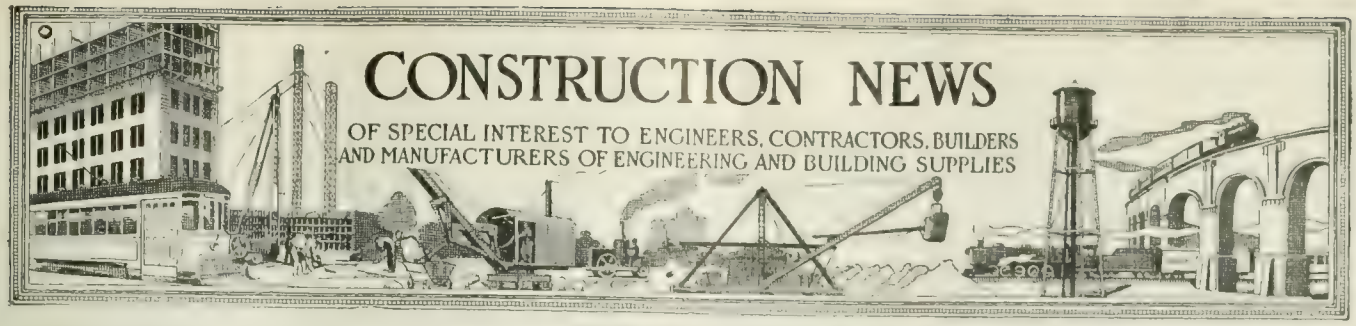
THE PORTABLE MACHINERY CO., of Passaic, N. J.; folder, 8½ x 11 in., two pages, illustrated; refers to scoop conveyor infringement and warns against purchase.

THE AMERICAN MANGANESE BRONZE CO., of Holmesburg, Philadelphia, Penn.; catalog, 3¾ x 9 in., 24 pages, illustrated; gives information regarding manganese bronze valve stems.

THE BALDWIN LOCOMOTIVE WORKS, Philadelphia, Penn.; catalog, 9 x 6 in., 21 pages, illustrated; describes various types of locomotives, shells, ordnance and railway artillery used in the war.

THE SOUTHERN PINE ASSOCIATION, of New Orleans, La.; folder, 8½ x 11 in., 2 pages, illustrated; shows the various kinds of signs advocated by the association for the prevention of accidents in mills.

THE GEORGE C. VIDETTO MACHINERY CO., Pittsburgh, Penn., was printed Zidetto in last week's issue by mistake.



PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
July 21	Eagle Rock, Cal.	July 10
July 21	Hinckley, Minn.	July 10
July 22	Ashland, O.	July 10
	Adv. July 10 and 17.	
July 24	Ashland, Ky.	July 10
	Adv. July 10 and 17.	
July 25	Akron, O.	July 3
	Adv. July 3.	
July 25	Parkersburg, W. Va.	July 17
July 25	Clarinda, Ia.	July 17
July 28	Montevideo, Minn.	July 17
July 31	Warsaw, N. C.	July 17
Aug. 1	Litchfield, Minn.	July 3
Aug. 1	Akron, O.	July 17
	Adv. July 17.	
Aug. 5	Zebulon, N. C.	July 17

SEWERS

July 22	Bradley, Ill.	July 10
July 22	Westmont, N. J.	July 17
July 23	Michigan.	July 17
July 24	Harrison, Ont.	July 10
July 24	Corning, Ia.	July 17
July 25	Milan, Mo.	July 10
July 28	New Bethlehem, Pa.	July 17
	Adv. July 17.	
July 29	Phœnix, Ariz.	July 17
July 29	Wamego, Kan.	July 17
July 29	Kings Park, N. Y.	July 17
July 31	Newton, Mass.	July 17
Aug. 2	Lincoln, Neb.	July 17
Aug. 4	Idabel, Okla.	July 17
Aug. 4	Birmingham, Ala.	July 17
Aug. 5	Wakefield, Neb.	July 10
Aug. 19	Kansas City, Mo.	July 3
	Adv. July 3 to 17.	

BRIDGES

July 22	Walker, Minn.	July 10
July 24	Beaufort, S. C.	July 10
July 25	Livingston, Mont.	July 10
July 25	Toston, Mont.	July 10
July 28	San Diego, Cal.	July 17
July 29	Jacksonville, Fla.	July 3
Aug. 4	Little Rock, Ark.	July 3
Aug. 7	Marion, Ark.	July 17
Aug. 19	Statesboro, Ga.	July 3
Aug. 20	Swainsboro, Ga.	July 3

STREETS AND ROADS

July 21	Burbank, O.	July 10
July 21	Welland, Ont.	July 10
July 21	Lewiston, Idaho.	July 17
July 21	South Glen Falls, N. Y.	July 17
	Adv. July 17.	
July 21	Norfolk, Va.	July 17
	Adv. July 10 and 17.	
July 21	Trenton, N. J.	July 17
July 21	New York.	July 17
July 21	Duluth, Minn.	July 17
July 21	Bayboro, N. C.	July 17
July 21	St. Paul, Minn.	July 17
July 21	Albany, N. Y.	July 17
July 22	Newton, N. C.	July 17
July 22	Greenspring, O.	July 17
	Adv. July 17.	
July 22	Wisconsin.	July 17
July 22	Rome, Ga.	July 3
July 22	New York	July 10
	Adv. July 10 and 17.	
July 22	Michigan	July 17
July 22	Jersey City, N. J.	July 17
July 22	Ottawa, Ont.	July 17
July 22	Wynne, Ark.	July 17
July 22	Seekonk, Mass.	July 17
July 23	Staten Island, N. Y.	July 17
July 23	Illinois.	July 17
	Adv. July 17.	
July 23	Bethany, Mo.	July 10
	Adv. July 10 and 17.	
July 23	Quebec	July 10
July 23	Chicago, Ill.	July 17
July 24	North Bergen, N. J.	July 17
July 24	Marion, Ark.	July 17
July 24	Louisiana.	July 17
July 24	Grand Haven, Mich.	July 17
July 25	Danbury, Conn.	July 17
July 25	St. Louis, Mo.	June 26
July 25	Kent, O.	July 3
	Adv. July 3.	
July 25	Jersey City, N. J.	July 10
July 25	Osceola, Ark.	July 17
	Adv. July 17.	
July 25	Salt Lake City, Utah.	July 17
July 26	St. Joseph, Mo.	July 10
July 26	Marshall, Ark.	July 17
July 28	Junction City, Kan.	July 10
July 28	Kalamazoo, Mich.	July 17
	Adv. July 17.	
July 29	Columbuh, O.	July 17
July 29	Pennsylvania	July 10
	Adv. July 10 and 17.	
July 29	New York	July 10
	Adv. July 10 and 17.	
July 29	Fayetteville, N. C.	July 17
	Adv. July 17.	
July 29	Tecumseh, Neb.	July 17
July 30	California	June 19
July 30	Gallitizen, Pa.	July 17
	Adv. July 17.	
Aug. 4	Birmingham, Ala.	July 17
Aug. 4	David City, Neb.	July 17
Aug. 4	Huntington, W. Va.	July 17
Aug. 4	Fremont, Neb.	July 17
Aug. 4	Seneca, Kan.	July 17
Aug. 5	New York, N. Y.	July 17
	Adv. July 17.	
Aug. 5	Lexington, N. C.	July 17
	Adv. July 17.	
Aug. 6	Delaware.	July 17
	Adv. July 17.	
Aug. 6	Arkansas.	July 17
	Adv. July 17.	
Aug. 12	Meadville, Pa.	July 17
	Adv. July 17.	
Aug. 12	Washington, N. C.	July 17
Aug. 12	Albany, N. Y.	July 17
	Adv. July 17.	
Aug. 15	Farmington, Utah	July 17
Aug. 16	St. Albans, W. Va.	July 17
	Adv. July 17.	
Aug. 18	Walnut Ridge, Ark.	July 17
	Adv. July 17.	
Aug. 24	Denver, Colo.	July 10

EXCAVATION AND DREDGING

July 20	Worcester, Mass.	July 17
July 21	Pickering, Ont.	July 17
July 22	Jersey City, N. J.	July 17
July 23	Lynn, Mass.	July 17
July 24	Three Rivers, Quebec.	July 17
July 28	Alamosa, Colo.	July 17
July 30	New Westminster, B. C.	July 17
Aug. 6	Kenton, O.	July 3

INDUSTRIAL WORKS

July 21	Detroit, Mich.	July 17
Aug. 1	Duluth, Minn.	June 26
Aug. 1	Hastings, Minn.	May 15

BUILDINGS

July 21	Wellington, Kan.	July 10
July 21	Clintonville, Wis.	July 17
July 21	Fall View, Ont.	July 17
July 21	East Moline, Ill.	July 17
July 21	West Montreal, Que.	July 17
July 21	Toronto, Ont.	July 17
July 21	Detroit, Mich.	July 17
July 22	Detroit, Mich.	July 10
July 23	Rock Hill, S. C.	July 10
July 23	Montmatre, Sask.	July 3
July 23	Lorain, O.	June 26
July 23	Mechanicsburg, O.	July 3
July 24	Winona, Minn.	July 3
July 24	Minneapolis, Minn.	July 3
July 24	Bemidji, Minn.	July 3
July 24	Ithica, N. Y.	July 17
	Adv. July 17.	
July 24	Pontiac, Mich.	July 17
July 24	Morris, Minn.	July 17
July 25	Salt Lake City, Utah.	July 10
July 25	Milford, Utah.	July 17
July 25	Toronto, Ont.	July 17
July 28	Murray, Utah	July 10
July 28	Montreal, Que.	July 10
July 28	Shawenegan Falls, Que.	July 10
July 28	Woodstock, Ont.	July 10
July 28	Cap de la Madeleine, Que.	July 10
July 29	Utica, N. Y.	July 3
	Adv. June 26 and July 3.	
July 29	Aurora, Minn.	July 17
July 29	Omaha, Neb.	July 10
July 30	Austin, Minn.	June 26
July 30	Two Rivers, Wis.	July 17
July 31	Lincoln, Neb.	July 10
July 31	New Philadelphia, O.	July 17
July 31	Grand Rapids, Mich.	July 17
	Adv. July 17.	
Aug. 1	Vinita, Okla.	July 17
Sept. 1	Omaha, Neb.	July 17
Aug. 1	Gastonia, N. C.	June 26
Aug. 1	Kenosha, Wis.	May 15
Aug. 1	Duluth, Minn.	July 10
Aug. 1	Virginia, Minn.	June 19
Aug. 1	Duluth, Minn.	July 3
Aug. 5	Willmar, Minn.	July 3
Aug. 5	Toms River, N. J.	July 17
Aug. 15	Casper, Wyo.	July 10
Aug. 15	New Bedford, Mass.	July 10
Aug. 15	Omaha, Neb.	July 10
Aug. 24	St. Paul, Minn.	July 3

FEDERAL GOVERNMENT WORK

July 21	Cable—Buffalo, N. Y.	July 17
	Adv. July 17.	
July 21	Dredging—New York, N. Y.	June 26
	Adv. June 26 to July 17.	
July 21	Dredging—Savannah, Ga.	June 26
	Adv. June 26 to July 17.	
July 21	Dredging—Baltimore, Md.	June 26
	Adv. June 26 to July 17.	
July 22	Dredging—Sault Ste Marie, Mich.	June 26
	Adv. June 26 to July 17.	
July 22	Post Office — Andalusia, Ala.	June 26
July 23	Cottage—Sorrento, Idaho.	June 26
July 23	Bridges—Leupp, Ariz.—.	June 26
July 23	Removing Wreck — New York, N. Y.	June 26
	Adv. June 26 to July 17.	
July 24	Jetty—Jacksonville, Fla.	June 26
	Adv. June 26 to July 17.	
July 24	Coal—Jacksonville, Fla.	June 26
	Adv. June 26 to July 17.	
July 24	Chimney—Roseback, N. Y.	July 17
	Adv. July 17.	
July 24	Boiler, etc.—Matoon, Ill.	July 17
	Adv. July 17.	
July 25	Dredging — Philadelphia, Pa.	June 26
	Adv. June 26 to July 17.	
July 25	Post Office—Dawson, Ga.	July 10
July 25	Mechanical Equipment — Stapleton, N. Y.	July 10
	Adv. July 10.	
July 25	Kitchen and Mess Hall—Stapleton, N. Y.	July 10
July 28	Stone—Cincinnati, O.	July 3
	Adv. July 3 to 17.	

Bids Close		See Eng. News-Record
July 28	Dredging and Filling—San Juan, P. R. ..... Adv. July 3 to 17	July 3
July 29	Crib—Chicago, Ill ..... Adv. July 10 and 17.	July 10
July 30	Heating Apparatus — St. Augustine, Fla.	July 10
July 30	Dredging—New York, N. Y. Adv. July 10 and 17.	July 10
July 30	Steel Sash—Spec 3914—South Charleston, W. Va... Adv July 17.	July 17
July 31	Boat House, Wharf and Boat Basin — Galveston, Tex.	July 10
July 31	Remodeling Elevator—Providence, R. I. ..... Adv. July 10.	July 10
July 31	Storehouse — Wilmington, Del. ..... Adv. July 3.	July 3
July 31	Rubble Mound Protection, etc.—Buffalo, N. Y..... Adv. July 10 and 17.	July 10
Aug. 1	Dredging, Wharf and Retaining Wall — Boston, Mass.	July 10
Aug. 1	Lock and Dam—Cincinnati, O. ..... Adv. July 10 and 17.	July 10
Aug. 1	Material and Labor—San Francisco, Cal. ..... Adv. July 17.	July 17
Aug. 2	Dredging and Rock Removal—Jacksonville, Fla.. Adv. July 10 and 17.	July 10
Aug. 4	Sewers—Washington, D. C. Adv. July 10 and 17.	July 10
Aug. 4	Post Office—Salem, Va...	July 17
Aug. 6	Paving—Washington, D. C.. Adv. July 17.	July 17
Aug. 7	Dredging and Rock Removal —New York, N. Y..... Adv. July 10 and 17.	July 10
Aug. 8	Pumps, etc.—Cairo, Ill.... Adv. July 17.	July 17
Aug. 11	Dredging—Buffalo, N. Y... Adv. July 17.	July 17
Aug. 11	Pass and Weir Horses, Props, etc.—Wheeling, W. Va.	July 17
Aug. 20	Metal and Glass Work—Key West, Fla..... Adv. July 17.	July 17
Aug. 26	Dredging—Honolulu, H. T. Adv. June 26.	June 26
Sept. 2	Miscellaneous Equipment—Washington, D. C. ..... Adv. July 10 and 17.	July 10

MISCELLANEOUS

July 20	Breakwaters — Port Colborne, Ont.	July 10
July 20	Dam, Wolfville, N. S.....	July 17
July 21	Pipe, Fulton, N. Y.....	July 17
July 21	Sand—New York, N. Y...	July 17
July 22	Furnishings, Apparatus and Equipment—Albany, N. Y. Adv July 10 and 17.	July 10
July 22	Valves, Jersey City, N. J...	July 17
July 22	Wharf—Cornwall, Ont.....	July 10
July 22	Flume, Sheboygan Falls, Wis.	July 17
July 23	Wharf—St. Annede Beaupre, Que.	July 10
July 24	Wharf—Berthier, Que.	July 3
July 24	New London, Conn.	July 17
July 25	Wharf—Soalchton, B. C...	July 10
July 26	Paving Materials — New York, N. Y.	July 17
July 30	Dam, San Francisco, Cal... Adv. July 17.	July 17
July 31	Wharf—Powell River, B. C.	July 10
July 31	Harbor Improvement—Atlantic City, N. J..... Adv. July 10.	July 10
July 31	Laundry, Float and Approaches—Port Essington, B. C.	July 17
Aug. 1	Cast Iron and Special Castings—Akron, O. ..... Adv. July 17.	July 17
Aug. 5	Wharf, Okanagan, Center, B. C.	July 17

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Mass., Pittsfield—City plans to replace water mains in Pomeroy Ave., with larger mains and water pipe extensions in Holmes Rd. and Parker tract, cost $20,000; also water extensions in Swamp Rd., $5000.

Mass., Worcester—City plans to rebuild and enlarge Tatnuck reservoir. About $200,000. Work will not be started until next year.

N. Y., Herkimer—City election July 22, to vote on $750,000 bonds to build water system from Gravesville, Russia Twp., to city. Address C. L. Earl, Herkimer.

Fla., Ft. Myers—City election Aug. 18 to vote on $5000 bonds to extend waterworks.

Minn., Elk River—Sherburne Co. voted $38,000 bonds to build waterworks system. C. S. Wheaton, aud.

Neb., Alliance—City voted $10,000 bonds to build extensions to water mains. C. Calder, clk.

Mont., Virginia City—City election in July to vote on $15,000 bonds to install water system. G. R. Allen, Virginia City, clk.

Mo., Mt. Vernon—Bd. Mgrs. soon lets contract building water system, consisting of 100,000 gal. steel tank, on 75 ft. tower, furnishing and erecting deep well pump, steam exhaust pump, discharge and supply lines, etc. Hohenschild & Pearce, Odd Fellows Bldg., St. Louis, engrs.

Okla., Tulsa—City voted $5,000,000 bonds to build waterworks system; water to be taken from Spavinaw Creek. H. A. Pressey, Hotel Tulsa, engr. Noted June 19.

Cal., Glendale—City defeated $180,000 bond issue to improve water system. Noted Mar. 20.

Cal., Sacramento—City voted $1,800,000 bonds to purchase site and build filtration plant, pumping plant and caisson in Sacramento River. F. C. Miller, City Hall, engr. Noted Apr. 24.

Que., St. Colomb de Sillery—Municipal Council plans to build new waterworks system, also install equipment. About $50,000. E. Hamel Co., 51 St. Peter St., Quebec, engr.

Ont., Bridgeburg—Town Council soon receives bids building concrete and brick pumping station and installing new intake. About $15,000. J. D. Fitzgibbon, engr.

Ont., London — Utilities Bd. will have plans prepared by E. V. Buchanan, engr., Hydro Offices, for new concrete reservoir to have capacity of 20,000,000 gal. and water mains. About $300,000; by-law to be submitted to ratepayers. P. Pocock, c/o London Shoe Co., chn.

Ont., Port Colborne—Town Council plans to build waterworks system, including pumping equipment. About $100,000. A. Lair, clk. Engineer not selected.

Ont., Toronto — R. C. Harris, city engr., preparing plans for new pumping plant with 60,000,000 gal. daily capacity, filtration plant, new mains and intake, at Victoria Park. About $2,000,000.

BIDS DESIRED

W. Va., Parkersburg—Until July 25, by city, installing crib system in filtration plant. J. P. Leaf, Pittsburg, Pa., engr.

N. C., Warsaw—Until July 31, by mayor, laying 2½ mi. 6-8-10 in. c.i. pipe, together with hydrants, valves, tower, tank, boiler, pumps, etc., also 3 mi. 8-12 in. sewers. About $125,000. W. M. Piatt, Durham, engr.

N. C., Zebulon—Until Aug. 5, by mayor, improving waterworks. Work involves 4 mi. 6-10 in. c.i. pipe, water hydrants, pumping station, tank and tower pumps and reservoir. Bids will be received at same time for laying 4 mi. 8-12 in. sewers. About $150,000. W. M. Piatt, Durham, engr.

S. C., Florence—Until July 29, by H. K. Gilbert, mayor and City Council, improving waterworks. Work will consist of furnishing and installing motor driven air compressors, motor driven centrifugal pumps, air lift deep well apparatus, and steel storage reservoir, G. C. White, Durham, engr.; advertised in this issue.

O., Akron—Until Aug. 1, by H. S. Morse, dir. pub. serv., furnishing and delivering 2 horizontal centrifugal pumps, normal capacity 1000 gal. per min. against total head of 80 ft. wide, direct connected to electric motors, for water works. Contr. 144. G. G. Dixon, engr.; advertised in this issue.

Ia., Clarinda—Until July 25, by H. Traxler, city clk., improving waterworks. About $75,000. Burns & McDonald, Interstate Bldg., Kansas City, Mo., engrs.

Minn., Montevideo—Until July 28, by B. O. Bonn, city clk., extending waterworks system; Sect. No. 1 to include 400,000 gal. concrete reservoir, 750 gal. per min. centrifugal pump with motor, switchboard and piping; Sect. No. 4, 2000 ft. 10 in. water mains hydrants, valves and fittings, Sects. Nos. 2, 3 and 4, 742,100 ft. 6 in. water mains, hydrants, valves and fittings, etc. W. E. Skinner, Montevideo, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mich., Ferndale (Royal Oak P. O.)—Village let contract laying watermains in Woodward Ave., et al, to J. A. McDace Co., 920 Fairview Ave., Detroit, $84,595. Noted June 19.

Wis., Durand—See "Sewers."

★Wis., Marshfield—Bd. Pub. Wks. let contract excavating and back filling for 12,849 ft. 6 in. and 500 ft. 4 in. water mains, also setting 22 hydrants, to Farnum & Yahr, Antigo, $0.40 per ft.

★Minn., Harmony—T. S. Brokken, city clk., let contract building 10 x 40 ft. compressed air water tank and pump house, to Chicago Brick & Iron Co., 38 South Dearborn St., Chicago, $5301. Noted June 19.

Wash., Seattle—Bd. Pub. Wks. received bids June 27, building water mains in East 80th St., involving 5960 ft. 6 in. and 275 ft. 2 in. wooden pipe and 100 lb. special castings, from Fiorito Bros., $12,708; Scalzo & Co., $12,911; C. Christoforo, $13,396; contractors all of Seattle.

★Cal., San Francisco — Spring Valley Water Co. let contract building rein.-con. reservoir at Francisco and Larkin Sts., to Martin & Messner, c/o General Contractors' Assn., Sharon Bldg.

Sewers

PROPOSED WORK

Mass., Pittsfield—City plans to build tile drains in Springdale Ave., Abbott, Harold and Boylston Sts.; also vitrified sewers in Benedict and Peck Rds. About $15,000.

Mass., Worcester — City appropriated $10,000 to prepare plans for installing Imhoff system of sewerage purification. Total cost $250,000.

Conn., Wilson—City soon lets contract building 1800 ft. 8 in. vitr. sewer for Wilson Fire District. About $20,000. C. A. Armitage, 29 Wilson Ave., chn.

N. Y., Albany—Bd. Contr. & Supply soon lets contract building monolithic concrete sewer (part rein.-con.) in Maiden Lane. F. R. Lanagan, city engr.

W. Va., Martinsburg—City voted $100,000 bonds to build complete sewerage system. C. D. Bromley, city engr.

W. Va., Wellsburg—City soon lets contract building lateral sewers in 3rd Ward. E. Boyd, city engr.

O., Barnesville—M. Knowles, engr. Jones-Law Bldg., Pittsburgh, submitted report to municipality for construction of sewerage system and 2 disposal plants. About $100,000. Citizens now running campaign to raise necessary funds.

O., Bellaire—City Council receives bids about August building 375 ft. 13 x 16 ft. rein.-con. culverts in Indian Run. About $17,000. H. C. Althar, Bellaire, engr.

O., Columbus—City plans to build 13,642 ft. 8-20 in. pipe sewers in Hayden Park Dr. and various other streets. About $21,971. H. A. Maetzel, city engr.

O., Springfield—City plans to build 2500 ft. 6-24 in. vitr. tile sanitary sewers in Laurel, Cora and Florence Sts. About $10,000. O. E. Carr, city mgr.

Sewers (Continued)

O., Springfield—City soon receives bids furnishing and laying 950 ft. 6-24 in. vitr. tile sanitary sewers in Yellow Springs St. from Grant to Cedar Sts., and Grant St. from Race to Plum Sts. About $10,000. O. E. Carr, city mgr.

Mich., Saginaw—City soon lets contract building vitr. pipe laterals in Delaware St., Marshon St. from Congress to Cooper Sts., and from Cooper to Houghton Sts., Wiplinger St. from Hermansau to Benjamin Sts., Granger St. from Division St. to Belt Line Ry., Charles St. from Cooper to Congress Sts., Brenner St. from Cooper to State Sts., Reed St. from Hermansau to Benjamin Sts., Martindale and Wisner Sts. from Hess to Thatcher Sts. and Thatcher, Wisner and Durand Sts. About $64,270. R. F. Johnson, comr.

Wis., Kiel—City plans to excavate and lay 3.8 mi. sewers in Main and Elm Sts., involving 9000 ft. 8-10-12 in. vitr. pipe. Cost between $40,000 and $50,000. F. Muth, City Hall, engr.

Wis., Madison—City Council adopted resolution to issue $20,000 bonds to make permanent changes at sewage disposal plant, also to appropriate $2000 to survey Lake Monona.

Wis., Sheboygan—City plans to excavate and lay 3.9 mi. sewers in Superior Ave., from 13th St. to city limits east, involving 5090 ft. 10 in. vitr. pipe. About $35,000. C. U. Boley, city engr.

Neb., Alliance—City voted $55,000 bonds to build storm sewers. C. Calder, clk.

S. D., Elk Point—City voted on $50,000 bonds to build sewers.

Colo., Hayden—Town plans to build sewerage system. About $25,000.

N. M., Santa Fe—See "Streets and Roads."

Que., St. Johns—City voted $10,000 bonds to extend Risdon outlet. W. Grant, 110 Dundas St., engr.

Ont., Toronto—Officials of city examining activated sludge unit plant in Milwaukee, Wis., with view to constructing one here. Experimental plant will be built and if same proves satisfactory, larger plant will be installed. About $50,000. R. C. Harris, city engr.

BIDS DESIRED

N. Y., Kings Park—Until July 29, by State Hospital Comn., Capitol, Albany, building extension to sewage disposal plant at Kings Park State Hospital, here. About $11,800. Noted Jan. 30.

N. Y., Long Island City—Until July 21, by M. E. Connolly, pres. Queens Boro., building sanitary and storm water sewers and appurtenances in 32nd Ave. from Union St. to Lawrence Ave. and in Lawrence Ave. from 32nd Ave to Willetts Point Blvd.; storm water sewer and temporary screening plant and appurtenances in Willetts Point Blvd. from Lawrence Ave. to Flushing River, and cut-off and overflow chamber and appurtenances in Linden St. at 32nd Ave. together with so much of pumping station at Linden St. and 32nd Ave. as may be necessary to provide for pumping flow at rate of 576,000 gal. per day. 3rd Ward

N. J., Westmont (Camden P. O.)—Until July 22 by Haddon Twp. Com., building sanitary sewerage system, involving 9 mi 5-12 in. terra cotta pipe sewers and house connections, 126 manholes, 18 flushtanks, pumping station and disposal plant. R. Griffith, twp. clk.; advertised in this issue.

Pa., New Bethlehem—Until July 28, by Town Council, building complete vitr. pipe sanitary sewers, to consist of main intercepting and various lateral sewers, ranging from 8 to 18 in. sizes, manholes, etc. D. M. Geist, secy., E. W. Hess, Du Bois, engr.; advertised in this issue.

N. C., Warsaw—See "Waterworks."

N. C., Zebulon—See "Waterworks."

Ia., Corning—Until July 24, by W. C. Chubb, city clk., building extensions to sanitary sewers. About $40,000. Archer & Stevens, 609 New England Bldg., Kansas City, Mo., engrs. Noted Apr. 3.

Kan., Seneca—See "Streets and Roads."

Kan., Wamego—Until July 29, by City Clk., building 12,500 ft. concrete and tile sanitary sewers involving flush tanks, manholes, etc.

Neb., Lincoln—Until Aug. 2, by T. H. Berg, city clk., building 14,800 ft. sanitary sewers, involving 7770 ft. 15 in. concrete, 1630 ft. 30 in. vitr. and 5400 ft. 36 in. segmental block pipe and 24,000 cu.yd. earth trenching. About $65,000. G. W. Bates, city engr.

Okla., Idabel—Until Aug. 4, by Town Clk., constructing main sewers and sewage disposal plant. Work involves 196 lin.ft. 8-15 in. vitr. pipe, 2851 lin.ft. trenching and backfilling, etc. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs. Noted Feb. 6.

Ariz., Phoenix—Until July 28, by V. A. Thompson, city mgr., building vitr. clay or cement drainage system to lower water level. About $100,000. L. B. Hitchcock, city engr. H. Phillips, International Life Bldg., St. Louis, Mo., consult. engr. Noted Jan. 2.

Ont., Aurora—Until July 25, by James, Loudon & Hertzberg, engrs., 36 Toronto St., Toronto, laying 15,000 ft. 12-15 in. vitr. pipe sanitary sewers, in Yonge St. About $50,000. Noted May 1.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Boston—City let contract building 1221 ft. concrete sewer, to M. De Sisto, 192 LaGrange St., West Roxbury, $13,665. Work involves 10 tons steel and 300 cu.yd. rein.-con.

R. I., Westerly—Town received lowest bid building pumping stations in connection with sewerage system, from R. A. Sherman's Sons Co., about $39,389. Noted May 29.

★R. I., Westerly—Town let following contracts building complete sewerage system: sewer pipe and specials, to R. A. Sherman's Sons Co., $17,000; manhole frames and covers, Mt. Carmel Iron Wks., Easton, Pa., $2197; pumping machinery, Power Equipment Co., Boston, Mass., $6572; laying pipe, D'Onfro Bros., Leominster, Mass., $151,176.

★N. Y., Syracuse—Bd. Contr. & Supply let contract building Sect. "D", west branch of 17th Ward Sewerage System, to F. S. & A. Sposato, Syracuse, $71,581.

N. J., Jamesburg—Dept. of Agriculture, 142 West State St., Trenton, received lowest bid building sewerage system at State Home for Boys, from G. L. Robinson, 39 East 28th St., New York City, about $10,000. Noted June 12.

★Pa., Wilkinsburg—Boro. let contracts laying sanitary and storm sewers in Penn Ave. and Northern Pike, to Critelli, Ricca & Zappa, Sharpsburg, $2400, Anderson St. from Sadie St. to boro. line, to M. O'Herron, South 1st and McKean Sts., Pittsburgh, $5763, in sections of Wallace Ave., Hay and North Sts., to Manella Constr. Co., Pittsburgh, $4144. Noted June 19.

Mich., Dearborn—City received bids laying (a) 12,068 ft. 12 in. pipe, (b) 8840 ft. 15 in., (c) 2933 ft. 18 in., (d) 1343 ft. 20 in., (e) 428 ft. 22 in., (f) 1708 ft. 24 in., (g) 1098 ft. 30 in., (h) 660 ft. 36 in., (i) 86 manholes, from G. B. Cooke, 1260 Penobscot Bldg., Detroit, (a) 150 ft. total, $18,102, (b) $1.90, $16,796, (c) $2.60, $7626, (d) $2.90 $3895, (e) $4.20, $1798, (f) $3.80, $6490, (g) $5.95, $6533, (h) $6.50, $4290, (i) $65 each, $5590; G. B. Hoag Constr. Co., 510 Commercial Bank Bldg., Cleveland, (a) $2, $24,136, (b) $2.50, $22,100, (c) $2.90, $8506, (d) $3.33, $4472, (e) $4.95, $2119, (f) $4.20, $7174, (g) $8.95, $9827, (h) $9.05, $5973, (i) $125, $10,750; Monie & Dunbar Constr. Co., Chemical Bldg., (a) $1.98, $23,895, (b) $2.44, $21,570, (c) $3.10, $9092, (d) $4.70, $6312, (e) $6, $2544, (f) $5, $8540, (g) $8, $8784, (h) $11.50, $7293, (i) $100, $8600. Noted June 26.

Mich., Detroit—City received bids building (a) Joy Rd. Pub. Sewer, (b) Charlevoix Ave. Sewer Arm, (c) Linwood Ave. Pub. Sewer, Sect. 3, (d) Lynch Rd. Pub. Sewer, Sect. 6, (e) Lynch Rd. Pub. Sewer, Sect. 5, from O'Rourke Eng. & Constr. Co., 17 Battery Pl., New York City, (a) concrete, $988,218; J. Porath, 34 McGraw Bldg., brick or concrete, (a) $1,292,678, (c) brick or concrete, $161,340, (d) brick or concrete, $132,460, (e) brick or concrete, $167,871; Jaynes & Affeld, 1208 Ford Bldg., (a) brick or concrete, $1,339,000, (c) brick or concrete, $155,500; Walker & Teetaert, 442 St. Clair St., (b) $11,880; Lannane & McIlvenna, 809 Union Trust Bldg., (b) $12,369; N. Mancini, 256 Hague Ave., (b) $13,640; Gawn Contg. Co., Cleveland, O., (c) concrete, $135,506, (e) concrete, $146,388; J. Winterbottom, Commercial Bank Bldg., Cleveland, O., (d) concrete, $112,378; J. A. Mercier, 216 Hammond Bldg., (d) brick or concrete, $122,000, (e) brick or concrete, $157,509. Noted June 19 and 26.

Mich., Detroit—City received bids furnishing labor and material (except manhole rings and covers) for building and finishing complete, laterals sewers Nos. (a) 3131, (b) 3140, (c) 3153, (d) 3156, (e) 3160, (f) 3161, (g) 3164, (h) 3167, (i) 3168, (j) 3169, (k) 3068, from Walker & Teetaert, 442 St. Clair St. (a) $2004, (b) $26,660, (g) $21,425, (k) $29,566; C. Melevin, 400 Penobscot Bldg., (a) $1895; J. C. Sprague, 1027 Euclid Ave. (b) $26,885; Lennane & McIlvenna, 809 Union Trust Bldg., (c) $10,000 (d) $8950, (e) $8500 (f) $9500, (i) $9000, (j) $8250; Western Constr. Co., 1208 Ford Bldg., (c) $11,545, (d) $9929, (e) $7129, (f) $9217, (g) $22,691, (h) $12,465, (i) $8949, (j) $8216, (k) $38,314; Detroit Contg. Co., 1102 Penobscot Bldg., (c) $7948, (f) $10,112, (g) $22,691 (h) $12,513, (i) $9320, (j) $9100; Liberty Constr. Co., Penobscot Bldg., (g) $21,500 (k) $39,645; G. B. Hoag Constr. Co., 510 Commercial Bank Bldg., Cleveland, (h) $15,700 Noted May 22 and July 3.

★Mich., Port Huron—City let contract building tile sewer in vicinity of 31st and Wood Sts., to C. E. Mugovero, Port Huron, $10,292. Work involves 1400 ft. 8 in. vitr. pipe.

Wis., Durand—City let contract installing sewerage system and extending water mains to W. T. Frazer, 707 Guardian Life Bldg., St. Paul, Minn., $64,894. Noted May 29.

Minn., St. Paul—City received bids building storm water sewers, from O'Neill & Preston, 60 East 6th St., $88,400; Thornton Bros., 304 Scandinavian Amer. Bank Bldg., $94,737; E. T. Webster, 437 Beacon Ave., $102,518 Noted July 10.

★Kan., Eldorado—City let contract building sanitary sewer, involving 24,947 lin.ft. 8-12 in. pipe, 80 manholes, 7 flush tanks and 7900 cu.yd. solid excav., to Chanute Constr. Co., Chanute, $77,396. Noted July 10.

★Cal., Los Angeles—City let contract building sewers in 63rd Pl. Sewer Dist., to M. Chutuk, 1650 Pleasant St., $79,229 Noted May 8.

Bridges

PROPOSED WORK

Conn., Bristol—City soon receives bids building concrete and steel bridge over North Creek on Laurel St. About $15,000. Sperry & Buell, 175 Main St., engr.

Conn., New Haven—City rejected bids repairing Neck Bridge on State St. About $20,000. Work will be readvertised. Noted July 10.

N. Y., Watertown—E. W. Sayles, city engr., soon lets contract building double decked rein.-con. bridge over Black River on Court St. About $260,000. Noted March 27.

N. J., Jersey City—Comrs. Essex Co., Court House, Newark, soon let contract painting and repairing structural steel work on Hackensack bridge on Paterson Plank Rd., here. About $15,000.

Md., Pocomoke City—State Rds. Comn., 601 Garrett Bldg., Baltimore, submitted plans to U. S. Engr.'s Office, 309 Custom House, Baltimore, for 270 ft. rein.-con. bridge over Pocomoke River, between Somerset and Worcester Counties, 24 ft. wide between curbs with draw opening 60 ft. in clear, wooden piles, etc. About $150,000. J. N. Mackall, state highway engr.

W. Va., Clay—Comrs. Clay and Braxton Counties having preliminary plans prepared building 200 ft. span bridge, 16 ft. wide, over Elk River between 2 counties. About $25,000. J. S. Chase, Court House, engr.

N. C., Charlotte — Mecklenburg Co. (Charlotte), and York Co. (York, S. C.), plan to build steel bridge over Catawba River on line between two counties. About $55,000 Engineer not selected.

Miss., Columbus—See "Streets and Roads."

O., Eaton—Preble Co. soon receives bids building 7 rein.-con. girder bridges, 18 to 30 ft. long, and 3 rein.-con. box culverts on various roads. About $16,000. J. Ryder, co. engr.

Bridges (continued)

Ill., Pittsfield—Pike Co. plans to build 5 rein.-con. bridges, with 14-35 ft. spans and 18 ft. roadway. About $10,000. G. Lyons, engr.

Minn., Grand Rapids Comrs. Itasco Co. plan to build 3 bridges, each 50 ft. concrete arch span, on Deer River-Grand Rapids-Coleraine Highway. About $10,000. O. J. Lidberg, Grand Rapids, engr.

Kan., Morganville—Comrs. Clay Co. receive bids about Aug. 1, building 226 ft., steel bridge, 18 ft. wide, with concrete pier and abutment, over Republican River, here. E. L. Bell, Clay Center, engr.

Mont., Victor—Ravalli Co. plans to build Bell Crossing Bridge, 224 ft. long, 16 ft. wide, over Bitterroot River, near here, consisting of two 112-ft. steel spans on concrete piers and abutments. P. D. Pratt, c/o State Highway Dept., Helena, engr.

Wash., Spokane City receives bids about Aug. 1 building 180 ft., concrete bridge, 35 ft. wide, with 5 ft. sidewalks, on West Riverside Ave. About $25,000. A. D. Butler, city engr.

Oregon—State Highway Comn., Portland, soon lets contract building bridge over Cow Creek, near Glendale, Douglas Co., consisting of six 70 ft. wooden truss spans, involving 420 cu.yd. Class "A" concrete and 450 lin.ft. wooden piling; 1 rein.-con. bridge over U. S. Recl. Serv. Drainage Ditch, near Hermiston, Umatilla Co., 120 cu.yd. Class "A" concrete and 12,000 lb. reinforcing steel; 35 ft. concrete span over Beaver Creek, near Rainier, on Columbia River Highway, Columbia Co., 78 cu.yd. Class "A" concrete, 8100 lb. reinforcing steel and 80 lin.ft. handrail; 2 wooden trestles 1 mi. northwest of Central Point, Jackson Co., 1200 lin.ft. wooden piling; 6 rein.-con. bridges over Furnish Canal on Old Oregon Trail, near Nolin and Echo, Umatilla Co., 415 cu.yd. Class "A" concrete, 38,500 lb. reinforcing steel and 370 lin.ft. reinforced handrail; 7 rein.-con culverts and 2 cattle passes on Elgin-Minan section of La Grande-Enterprise Highway, Union Co., 185 cu.yd. concrete. H. Nunn, Salem, state highway engr.

Ore., Newberg—Yamhill Co. Court, McMinnville, soon lets contract building 580 ft., rein.-con. viaduct on Newberg Rd. near here, involving 1400 yd. concrete, 181,500 lb. reinforcing steel, 450 lin.ft. timber piling and 1225 lin.ft. hand rail. Cost to exceed $10,000. C. B. Wilson, c/o clk.

Cal., Oakland—Bd. Supervs. Alameda Co. on May 19th, appointed W. J. Hamilton, supervisor, com. of one to consult with U. S. Engr. Col. Heuer and officials of Southern Pacific R.R. relative to proposed construction of bascule bridge over Oakland Estuary to cost, $1,800,000. County voted $900,000 for project before war, upon railroad company's agreement to furnish like amount, but U. S. R.R. Administration held up work. Practically all of necessary land has been acquired by county.

Ont., Burlington—Dept. Pub. Wks., Ottawa, having plans prepared and soon receives bids building bridge over Burlington Canal at entrance to Hamilton Bay, here. About $100,000. E. Lafleur, c/o Dept. Pub. Wks., Ottawa, engr.

BIDS DESIRED

Ala., Birmingham — Until Aug. 4, by Bd. Revenue Jefferson Co., building bridge on 3rd Ave., Atlanta, Birmingham and Atlantic Ry. Crossing. About $12,000.

Michigan—Until July 23, by F. F. Rogers, state highway comr., Lansing, furnishing labor and material building State Trunk Bridge No. 112 over Carp River north of St. Ignace, one 60 ft. arch span, 18 ft. roadway, involving 950 cu.yd. rein.-con.; No. 204 over Grand River near Ionia, concrete floor and sidewalks; No. 103 over Baltimore River, Stannard Twp., Ontonogan Co., two 12 ft. abutments, 26 ft. concrete floor, 75 ft. steel trusses, 107 cu.yd. rein.-con.; No. 261 over Pigeon River near West Olive, Ottawa Co., 50 ft. rein.-con. arch span, 400 cu.yd. rein.-con.; No. 274 near Zeeland, Ottawa Co., two 35 ft. concrete girders, 20 ft. roadway, two 8 ft. abutments, one 8 ft. pier, 125 cu.yd. rein.-con.; No. 292, 6 mi. east of Zeeland, one 35 ft. concrete girder, two 6 ft. abutments, 118 cu.yd. rein.-con.; No. 290 over Mason River at Dundee, Monroe Co., two 30 ft. rein.-con. girders, two 15 ft. abutments, one 15 ft. concrete pier, 433 cu.yd. rein.-con.; No. 269 over Cedar River at Gladwin, two 50 ft. arches, 23 ft. roadway, two 5 ft. sidewalks, 750 cu.yd. concrete.

Neb., Lincoln—Until July 21, by Comrs. Lancaster Co., building 100 ft. rein.-con. bridge over Oak Creek, on 14th St. Former bids rejected. A. H. Edgren, co. engr. Noted July 3.

Ark., Marion—Until Aug. 7, by Comrs. Rd. Impvt. Dist. No. 9, Crittenden Co., building one 50 ft. steel girder span, 24 ft. wide; one 50 ft. steel girder span, 20 ft. wide; one 168 lin.ft. concrete viaduct, 24 ft. wide, and one 160 lin.ft. concrete viaduct, 20 ft. wide. Morgan Eng. Co., Memphis, Tenn., engrs.

Cal., San Diego—Until July 28, by Bd. Supervs. San Diego Co., building rein.-con. bridge near Cardiff. About $10,000. J. B. McLees, clk.

Ont., Toronto—Dept. Highways receiving bids building bridge on Rouge Rd., with steel superstructure and concrete substructure. About $50,000. W. A. McLean, c/o Dept. Highways, engr.

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★Me., Holland—State Highway Comn., Augusta, let contract rebuilding bridge in Holland Twp. to Cyr Bros. Co., Waterville, $48,975. Work consists of shoring up present steel bridge and building 3 new piers and abutments, involving 1050 cu.yd. concrete, 9400 lb. steel and 172 wooden piles.

Me., Lincolnville — State Highway Comn., Augusta, received only bid building 55 ft. rein.-con. girder bridge in Lincolnville Twp., 20 ft. wide, from Cyr Bros. Co., Waterville, $18,840. Work involves 125 cu.yds. rein.-con., 500 cu.yds. concrete, 37,500 lbs. steel, 216 cu.yd. stone and 50 cu.yds. earth approach and fill.

★Conn., Bristol—City let contract building concrete and steel girder bridge on Main St., to Berlin Const. Co., Depot Rd., Berlin. About $15,000.

N. J., Camden—Comrs. Camden Co. received bids building rein.-con. arch bridge over Newton Creek on Nickolson Rd., from J. M. Kelley Contg. Co., 507 Federal St., $59,180 and A. McMullen Co., Finance Bldg., Phila., $73,400. Noted June 26.

★Pa., Reading—Berks Co. let contract building rein.-con. girder bridge across West Branch Creek, in Washington Twp., about 2 mi. from Barto Sta., to Reading Contg. Co., 622 Court St., Reading. Noted June 26.

★Mich., Watervliet—F. F. Rogers, state hignway comr., Lansing, let contract building 75 ft. trunk line bridge No. 252, steel, over Paw Paw River, to C. F. Briscoe, Highland Park, $10,896. Noted June 19 under "Michigan."

★Wis., Manitowoc—Manitowoc Co. let contract building 610 ft. bridge on 8th St., 28 ft. wide, double leaf bascule type, earth and wooden piling, approach and fill, to McMullen & Pitz, Dempsey Bldg.; about $153,000.

★Kan., Emporia—Lyon Co. let contract building concrete bridge, 18 ft. wide, near here, to Koss Constr. Co., 2818 5th St., Des Moines, Ia., $46,280.

★Wash., Adna — State Highway Bd., Olympia, let contract building 220 ft., steel span bridge over Chehalis River on Ocean Beach Highway, near here, to J. M. Nichols, California Bldg., Tacoma, $31,887. Noted June 26.

Cal., Oakland—See "Streets and Roads."

★Manitoba—See "Excavation and Dredging."

Structural Steel

PROPOSED WORK

Kan., Morganville—See "Bridges."

Nova Scotia—See "Buildings."

BIDS DESIRED

Ont., Toronto—See "Bridges."

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★Pa., Phila.—See "Buildings."

Reinforced Concrete

PROPOSED WORK

Md., Pocomoke City—See "Bridges."

O., Eaton—See "Bridges."

Oregon—See "Bridges."

Nova Scotia—See "Buildings."

Ont., London—See "Waterworks."

BIDS DESIRED

N. S., Wolfville—See "Miscellaneous."

Ont., Toronto—See "Bridges"

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★Pa., Phila.—See "Buildings."

★Pa., Reading—See "Bridges."

Streets and Roads

PROPOSED WORK

Massachusetts—State Legislature appropriated $10,000 to build 6 mi. road between Amherst and Belchertown. A. W. Dean, c/o State Highway Comn., Boston, engr. Noted Jan. 30.

Rhode Island—State Highway Comn., State House, Providence, soon lets contract paving 3930 ft. Warwick Ave., bituminous concrete, Cranston Twp.; 11,080 ft. West Shore Rd. and 3170 ft. Centerville Rd., bituminous macadam, Warwick Twp.; 5200 ft Farnum Pike, bituminous macadam, Smithfield Twp.

R. I., Providence—City soon receives bids paving Fountain St., granite blocks. About $20,000. M. S. Bronsdon, city engr.

Conn., East Hartford—(Hartford P. O.)—City soon lets contract building bituminous macadam road on Hillstown Rd. About $20,000. E. H. Oldstead, 1175 Main St., Hartford, engr.

Conn., Shelton—City having plans prepared paving various streets, bituminous concrete, waterbound or bituminous macadam on concrete base. About $90,000. V. B. Clark, City Hall Bldg., Ansonia, engr.

Conn., Torrington—City plans to pave various streets. About $300,000.

N. Y., Albany—Bd. Contr. & Supply soon lets contract improving portion Western Ave. from Manning Blvd. to west city line. Plans include cement concrete pavement, rebuilding and extending culverts, guard rails, etc. F. R. Lanagan, city engr.

N. Y., Albany—City plans to improve Bway. from Pleasant St. to north city line, cost, $69,000; grade and pave Western Ave. from Manning Blvd. to west city line, $75,000. F. R. Lanagan, city engr.

N. Y., Binghamton—City plans election to vote on $50,000 bonds to build roads in parks, macadam or bituminous. W. E. Weller, city engr.

N. Y., Buffalo—City having plans prepared paving with asphalt, Tamarack St. from Abbot Rd. to Cumberland St., Blake St. from Genessee St. to Sacjaquada Creek, Elmer St. from Kensington Ave. to Amherst St., Richlawn Ave. from Le Roy Ave. to north end of street, Amherst St. from South Park Ave., west, 900 ft., all 26 ft. wide, Kilhoffer St. from East Ferry St. to north end of street, 24 ft. wide. G. H. Norton, city engr.

N. Y., Gowanda—City election July 22, to vote on $5000 bonds to pave Chapel St. from Water to Jamestown Sts. Total cost $25,000; $20,000 of which is now available.

N. Y., Syracuse—City plans to extend pavement in East Genesee St. to new city line in Salt Springs Rd. About $36,500. J. C. Allen, city engr.

N. J., Hoboken—City plans to pave Jefferson St. from 8th to 13th Sts., stone blocks on concrete base J. O. Whittemore, city engr.

N. J., Trenton—City soon lets contract paving 4100 sq.yd. Sullivan Way, Bridge St. and Burnside Ave., asphalt. About $21,000. A. Swan, City Hall, engr.

N. J., West Hoboken—Town Council plans to improve Summit Ave. and Spring St., granite block. About $50,000. J. G. Gallo, supt. of streets.

Pennsylvania—State Highway Dept., Harrisburg, rejected only bid received July 8, building 12,355 lin.ft. bituminous surface course or rein.-con. road on concrete foundation in Centre Co. Noted June 19.

Pa., Beaver Falls—Boro. voted $150,000 bonds to pave various streets. Noted Apr. 24.

Pa., Mercer—Mercer Co. voted $1,500,000 bonds to build roads. Noted Mar. 6.

Pa., North Braddock (Braddock P. O.)—Boro. rejected bids improving Poplar Way from Bowers to South Sts. New bids in August. Noted June 12.

Pa., Ridley Park—Boro. voted $40,000 bonds to improve streets.

Streets and Roads (Continued)

Md., Baltimore—Bd. Awards soon lets contract paving 29th and 34th Sts., 41 ft wide, involving 7700 sq.yd. 6 in. cement concrete, 4900 lin.ft. armored concrete curbing and 6000 cu.yd. grading. J. M. Cummings, city engr.

W. Va., Charleston—Comrs. Kanawha Co. plan to surface 3 mi. Sessorville Rd., 13 ft. wide, with asphaltic concrete. About $20,000. J. C. Burdette, engr.

W. Va., Harrisville—Comrs. Ritchie Co. soon receive bids grading and draining 4 mi. Harrisville-Smithville Rd., 26 ft. wide. About $35,000. F. O. Renshaw, Pennsboro, engr.

W. Va., Hinton—Comrs. Summers Co. having plans prepared building 2.7 mi. Greenbrier-River Rd., grading 20 ft. and surfacing 9 ft. wide, involving 2000 cu.yd. excav. and 12,500 sq.yd. cement concrete surface. About $34,000. J. D. French, Hinton, engr.

W. Va., Marlinton—Comrs. Pocahontas Co. plan to improve 5.5 mi. Marlin's Bottom-Huttonsville Turnpike, 16 ft. wide, involving 8800 sq.yd. resurfacing and 39,000 sq.yd. new bituminous macadam. About $84,000. F. Baxter, Marlinton, engr.

W. Va., Princeton—Comrs. Mercer Co. soon receive bids resurfacing 4.7 mi. Princeton-Athens and Princeton-Bluefield Rds., 16 ft. wide. About $28,000. C. E. Barton, Bluefield, engr.

W. Va., Ripley—Comrs. Jackson Co. and state plan to surface 1.06 mi. streets in Ravenswood Twp., 20 ft. wide, involving 12,500 sq.yd. concrete surfacing and 3500 cu.yd. excav.; sewers, drains and curbs to be provided by town. About $35,000. Engr. not selected.

W. Va., St. Mary's—Comrs. Pleasant Co. plan to build 5.4 mi. River Rd., grading 22 ft. wide, involving 32,400 cu.yd. excav. and drainage structures. About $30,800. Wood & Alexander, Parkersburg, engrs.

W. Va., Summersville—Comrs. Nicholas Co. plan to build 2.33 mi. Richwood-Summersville Rd., grading 20 ft. wide, involving 18,000 cu.yd. excav. and drainage structures. About $22,000. R. Williamson, Richwood, engr.

W. Va., Union—Comrs. Monroe Co. had plans prepared grading, draining and paving with waterbound macadam, 4 mi. Union Salt Sulphur Rd., grading 26 ft. wide, surfacing 16 ft. About $50,000. J. W. Hancock, Union, engr.

W. Va., Winfield—Comrs. Putnam Co. receive bids about Aug. 1, grading 4 mi. Midland Trail. About $32,000. J. S. Parkins, Paradise, engr.

N. C., Nashville—Comrs. Nash Co. plan to hard surface 10 mi. road from Rocky Mount to here, 18-20 ft. wide. About $250,000. Engineer not selected. Noted June 26

S. C., Camden—Comrs. Kershaw Co. plan to relocate, grade, drain and surface 14 mi. Washington-Atlanta Highway, from here to Cassatt, 30 ft. wide. About $88,000. J. R. Pennell, c/o State Highway Dept., Columbia, engr

S. C., Newberry—Comrs. Newberry Co. plan to relocate, grade, drain and surface with topsoil, 6.74 mi. Piedmont Highway from here to Prosperity, 30 ft. wide. About $36,000. J. R. Pennell, c/o State Highway Dept., Columbia, engr.

Ga., Athens—Clarke Co. voted $250,000 bonds to build roads. Federal Government will appropriate like amount. Noted May 22.

Ga., Cairo—Grady Co. voted $250,000 bonds to improve roads. Federal Government will appropriate like amount.

Fla., Ft. Myers—City election Aug. 18 to vote on $50,000 bonds to pave streets.

Fla., Kissimmee—City voted $30,000 to pave various streets

Miss., Columbus—Highway Comn. Artesia Rd. Dist., Lowndes Co., soon lets contract improving 5.4 mi. Federal Aid Rd. No. 28, between Corinth and Gulfport. Work involves 4 acres clearing and grubbing, 24,000 cu.yd. grading, 8400 cu.yd. gravel, 220 cu.yd. concrete, 125 lin.ft. culvert pipe and one 30 ft. and one 40 ft. concrete bridge. X. A. Kramer, c/o State Highway Dept., Magnolia, engr.

Ohio—State Highway Dept., Columbus, plans to grade, build bridges and culverts and pave Federal aid roads in following counties:

Belmont Co., 4 mi. Barnesville-Woodsfield Rd. and 4.45 mi. Morristown-Athens Rd., waterbound macadam, $40,000 each.

Defiance Co., 2.04 mi. Hickville-Defiance Rd., concrete, $27,750.

Fayette Co., 12.08 mi. Columbus-Washington C. H. Road., bituminous macadam, $128,000.

Fulton Co., 6.2 mi. Bryan-Wauseon Rd., waterbound macadam or concrete $62,000.

Logan Co., 4 mi. Bellefontaine-Lima Rd., waterbound macadam, $175,000.

Montgomery Co., 6.05 mi. Dayton-Indianapolis Rd., concrete, $70,000.

Perry Co., 4.84 mi. Newark-New Lexington Rd., concrete or bituminous macadam, $66,100.

Washington Co., 3.026 mi. Marietta-Whipple Rd., concrete, $50,000.

Williams Co., 2.98 mi. Bryan-Styker Rd., concrete, $35,000

O., Columbus—City plans to grade, curb and pave alley north of Bryden Rd. from 18th to 20th Sts., 750 ft. long, 15 ft. wide, (a) brick or (b) concrete, estimated cost, (a) $1600, (b) $3125, curb, lay water mains and resurface 1200 ft. Buetles Ave. from High St. to Dennison Ave., 34 ft. wide, asphalt, $16,443. H. A. Maetzel, city engr

O., Covington—Village Council plans to pave 900 ft High St., from Bridge St to Pennsylvania R.R., 30 ft. wide, brick or sheet asphalt. About $15,000.

O., Dayton—City plans to pave 800 ft. Superior Ave. from Yuncker St. to Deal Ave., 40 ft. wide, involving 1500 cu.yd. grading, 3800 sq.yd. macadam, 1650 ft. cement curbing and guttering and 4000 sq.ft. 4½ in cement sidewalk. About $10,500. O. E. Eichelberger, city engr

O., Findlay—Comrs. Hancock Co. receive bids about August improving 6 mi. Lima-Sandusky Rd. Bonds for $150,000 sold for work.

O., South Charleston—City election about August to vote on $12,000 bonds to pave 900 ft. Chillicothe St., bituminous macadam or asphalt.

Mich., Detroit—City soon lets contract paving following alleys with 1 course concrete; No. 1037 between Lenox, Drexel, Freud and Jefferson Aves., 18 ft. wide, No. 1038 between Cass, Woodward, Warren and Putnam Aves., 15-20 ft. wide, No. 1039 between Greenwood, 4th, Hancock and Warren Aves., 16-20 ft. wide, No. 1040 between 2nd, Woodward, Calvert and Collingwood Aves., 20 ft. wide, No. 1041 between Rivard and Russell Sts. and Frederick and Kirby Aves., 18 ft. wide, No. 1042 between Wilson, Buron, Edison and Atkinson Aves., 20 ft. wide, No. 1043 between Oakland, Cameron, Mt. Vernon and Melbourne Aves., 18 ft. wide, and No. 1044 between Walker, Adair, Franklin and Woodbridge Sts., 10-20 ft. wide, involving 4280 cu.yd. excav., 12,574 sq.yd. paving, etc. C. W. Hubbell, city engr.

Mich., Detroit—Dept. Pub. Wks. soon receives bids paving Radcliffe Ave. from Central Ave. to Lonyo Rd., 26 ft. wide, cost $24,120; Central Ave. from McGraw to Radcliffe Aves., 22 ft. wide, $28,860; Helen Ave., from Harper to Strong Aves., 26 ft. wide, $8230; Springwells Ave., from Malta to Michigan Aves., 26 ft. wide, $20,160, asphaltic concrete on 6 in. concrete base. Berea, Amherst or Medina curbstone; alleys between 30th and 28th Sts., Horatio and Herbert Aves., 20 ft. wide, $3890, between 16th, 15th, Linden and Poplar Sts., 20 ft. wide, $3645, between 18th, 17th and Magnolia Sts. and Myrtle Ave., 20 ft wide, $3645, between Hastings, Rivard, Catherine and Sherman Sts., 20 ft. wide, $4920, 1 course concrete.

Mich., River Rouge—Village having plans prepared by J. Jerome, engr., 1331 Majestic Bldg., Detroit, paving with 1 course concrete, concrete curbing, Burke Ave. from Dearborn to Jefferson Aves., Henry Ave. from Burke Ave. to easterly line lots 120 and 153; Maple St. from Jefferson Ave. to point east of east line lots 86 and 119, Burke and Riopellis sub-division; Pine St. from Jefferson Ave. to point 10 ft. east of east line lots 52 and 85, Burke and Riopellis sub-division. R. J. Peters, 9 South Dearborn Ave., clk.

Ill., Belleville—Rd. & Bridge Com., of St. Clair Co. soon receives bids paving 2.6 mi. road from Shiloh to Scottfield, concrete. About $60,000 D. O. Thomas, Belleville, engr. and supt. highways.

Ill., Chicago—Bd. Local Imprvts. rejected bids received June 26, paving alleys between Colorado Ave., Jackson Blvd., Whipple St. and Albany Ave.; between West 86th Pl., West 87th St., Vincennes Ave. and Sycamore St.; Belmont St. from Broadway to Sheridan Rd., Clyde Ave. from East 73rd St. to East 75th St.; Shields St. from West 35th St. to point 631 ft. south; Wabansia St. from Kedzie Ave. to Chicago, Milwaukee & St. Paul R.R. tracks; East 71st and East 72nd Sts., from South Shore Dr. to point 122 ft. east; Potomac Ave. from Homan Ave. to Chicago, Milwaukee & St. Paul R.R. tracks and St. Louis Ave. from Evergreen St. to Potomac Ave. Work will be readvertised. Noted July 3.

Ill., Chicago—Sanitary Dist., under act passed by Illinois State Legislature, plans to build 60 mi hard road along Sanitary Dist. canals, from Chicago to Lockport and Joliet, Blue Island to Sag, and Chicago to Waukegan. G. L. Wisner, 910 South Michigan Ave., ch. engr.

Ill., Silvis—City plans to pave 5th, 6th and 7th Sts., brick, involving 11,784 sq.yd. vitr. brick, 9219 lin.ft. cement curb and gutter and 4047 cu.yd. earth excav. About $47,954. W. Treichler, Rock Island, engr.

Wisconsin — State Highway Comn., Madison, Div. No. 1, soon lets contract improving Portage-Wyocena Rd., Columbia Co., Federal Aid Project No. 51, involving 3.62 acres clearing and grubbing, 24,296 cu.yd. earth and 18,604 cu.yd. borrow excav., 252 cu.yd. concrete, 45,200 lbs. structural steel, 44,610 sq.yd. gravel surfacing, etc.; Watertown Plank Rd., Jefferson Co., Federal Aid Project No. 59, 14,601 cu.yd. earth and 371 cu.yd. borrow excav., 88 cu.yd. Class "A" concrete, etc.; County line road, Dodge and Jefferson Counties, Federal Aid Project No. 72, 15,171 cu.yd. earth and 286 cu.yd. borrow excav., 129 cu.yd. Class "A" concrete, etc.; Beloit Janesville Rd., Rock Co., Federal Aid Project No. 96, 18,028 cu.yd. earth and 969 cu.yd. borrow excav., 277 cu.yd. Class "A" concrete, 63,312 sq.yd. concrete surfacing, etc.

Wisconsin—State Highway Comn., La Crosse, received no bids improving Viroqua-Sparta Rd., Monroe Co., Federal Aid Project No. 67. Noted July 3.

Wisconsin—State Highway Comn., Madison, received no bids improving Dunbarton-Darlington Rd., Lafayette Co., Federal Aid Project No. 86. Noted July 3.

Wis., Racine—Racine Co. soon lets contract grading and paving with 1 course concrete, Middle Rd., 16 ft. wide, involving 14,004 sq.yd. concrete, 2398 cu.yd. earth excav., concrete culverts, etc. About $32,000.

Wis., Shelboygan—C. U. Boley, city engr., soon lets contract grading and paving 2.8 mi. Martin Ave. from North 15th St. to Calumet Dr., 20 ft. wide, involving 8500 sq.yd. concrete and 4400 lin.ft. concrete curb and gutter. About $30,000 Noted June 19.

Wis., Sheboygan—C. U. Boley, city engr., soon lets contract grading and paving, with 2 course rein.-con., 1.8 mi. Georgia Ave. from South 2nd to 18th Sts., 20 ft wide, involving 820 sq.yd. vitr. brick, 16,950 sq.yd. concrete and 8250 lin.ft. concrete curb and gutter, all hills to be paved with Hillside brick. About $45,000.

Wis., Sheboygan—City plans to grade and pave 2 mi. Logan Ave. from Superior to Geele Aves., 20 ft. wide, involving 12,500 sq.yd. concrete and concrete curb and gutter. About $15,000 C. U. Boley, city engr

Wis., Sheboygan—City plans to grade and pave 2 mi. East Water St. from Jefferson to Pennsylvania Aves., 18 ft. wide, involving 5600 sq.yd. concrete and 2980 lin.ft. concrete curb and gutter. About $15,000 C. U. Boley, city engr.

Wis., Sheboygan—Sheboygan Co. having plans prepared by G. Ubbelohde, engr., grading and repaving 8.2 mi. Sheboygan-Howard Grove Rd., 14 ft. wide, involving 45,000 sq.yd. concrete and concrete culverts. About $45,000.

Ia., Adair—City rejected bids received June 26 for 20,678 sq.yd. street paving, 513 sq.yd. alley paving, and 15,542 lin.ft. curb and gutter. Work has been readvertised and new contract will soon be let. T. S. De Lay, Creston, consult. engr. Noted June 19

Ia., Des Moines—City having plans prepared grading 14th St. from Grand to Locust Sts. About $75,000. J. M. Wells, city engr.

Ia., Des Moines—Comrs. Polk Co. voted on $2,000,000 bonds to build hard surface roads.

Ia., Mason City—Comrs. Cerro Gordo Co. voted $750,000 bonds to build roads. G. E. Frost, aud.

Streets and Roads (Continued)

Ia., Spencer—Comrs. Clay Co. plan election July 22 to vote on $800,000 bonds to build hard surfaced roads. A. W. Chamberlain, aud.

Minn., Bemidji—A. D. Johnson, aud Beltrami Co., receives bids in August grading and graveling 25 mi. Cass Lake-Bemidji-Solway Highway, 24 ft. wide, under Babcock Project. About $165,000. S. D. Snyder, Bemidji, engr.

Minn., Bemidji—Comrs. Beltrami Co. will receive bids in fall, grading and graveling 30 mi. Bemidji-Blackduck Rd., cost, $70,000; 20 mi. Bemidji-Renville Rd., $75,000; 25 mi. Clemenson-Roosevelt Rd., via Raudette, $25,000; 60 mi. Kelliher-Baudette Rd., all 24 ft. wide, $175,000. S. D. Snyder, Bemidji, engr.

Minn., Duluth—Comrs. St. Louis Co. voted $7,500,000 bonds to build 270 mi. roads under Babcock law. R. W. Acton, co. engr. Noted June 12.

Minn., Duluth—J. A. Farrell, city comr. soon receives bids to pave Railroad St. from 7th Ave., W., to Garfield Ave., 30 ft. wide. About $83,113. L. Ayres, city engr.

Minn., Minneapolis—Comrs. Hennepin Co. having plans prepared grading ½ mi. of approaches to Savage bridge over Minnesota River, 30 ft. wide. About $25,000. E. E. Terrell, co. surv.

Kan., Columbus—Cherokee Co. having plans prepared building 11½ mi. Columbus-Oswego Rd., 7 mi. Crest Line Rd., and 11½ mi. Hoover Rd., all 18 ft. wide, concrete on concrete base. C. M. Cooper, Columbus, engr.

Kan., Concordia—Cloud Co. having surveys made and plans prepared for 20 mi. Federal aid highways near Glasco. Tuttle, Ayers, Woodward, Reliance Bldg., Kansas City, Mo., engrs.

Kan., Meade—Meade Co. having plans prepared building 5 mi. Meade Rd., 24 ft. wide, waterbound macadam. Southwestern Eng. Co., Hutchinson, engrs.

Kan., Oswego—Labette Co. having plans prepared building 10 mi. gravel roads, 18 ft. wide. R. J. King, Oswego, engr.

Neb., Alliance—City voted $[illegible],000 bonds to pave streets. C. Calder, clk.

Neb., McCook—City rejected bids received June 24 paving various streets. Work has been readvertised. Archer & Stevens, 609 New England Bldg., Kansas City, Mo., engrs. Noted June 12.

Mo., Burlington Junction—City soon lets contract paving Main St., involving 7553 sq.yd. concrete on concrete base, 3057 lin. ft. concrete curbing, 460 cu.yd. earth excav. and 325 cu.yd. embankment. R. H. Rees, clk.

Mo., Westplains—Howell Co. voted $500,000 bonds to build hard surface roads near here. Engr. not selected.

Tex., Boston—Comrs. Bowie Co. plan to improve 22 mi. State Highway No. 5, 12 ft. wide, involving 71,595 cu.yd. earth excav., 1987 cu.yd. ditching, placing, spreading, scarifying and surfacing with gravel, and building concrete drainage structures. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Tex., Cameron—Milam Co. plans to gravel surface and build concrete drainage structures on 9.5 mi. State Highway No. 36 A. from Bell Co. line to Robertson Co. line, 14 ft. wide. About $45,000. A. F. Mitchell, Cameron, engr.

Tex., Clarksville—Red River Co. plans to haul, place, spread and surface with gravel, 16.02 mi. Highway No. 35, from Lamar Co. line to Franklin Co. line, 14 ft. wide, cost $110,000; gravel surface 2.18 mi. Highway No. 37, running north to south, near southern part of county, 14 ft. wide, including concrete drainage structures and 3800 ft. concrete surface, $30,000. P. V. Creager, Clarksville, engr.

Tex., Fairfield—Freestone Co. plans to build and surface with sand clay, also build concrete drainage structures, on 14.657 mi. Henry Exall Highway (State Highway No. 32), from Fairfield to Leon Co. line, 24 ft. wide. About $4000 per mi. J. J. White, Fairfield, engr.

Tex., Jasper—Comrs. Jasper Co. rejected bids improving 16.21 mi. Highway No. 7 running west to county line, 16 ft. wide. Work will be readvertised. C. P. Hunter, Jasper, engr. Noted July 10.

Tex., Liberty—Liberty Co. plans to improve 2.73 mi. Sect. No. 1 and 5.72 mi. Sect. No. 2, of Highway No. 35, 16 ft. wide, including building sand clay surfaced road, concrete drainage structures and 12,600 lin.ft. creosoted timber piling. About $125,822. W. S. Bonner, New Orleans, La., engr.

Tex., Mt. Vernon—Franklin Co. soon lets contract improving 12.37 mi. Highway No. 1 from Hopkins Co. to Titus Co. line, 9 ft. wide, including gravel surfacing and building pavement and concrete drainage structures. About $52,000. Wilder & O'Neal, Chronicle Bldg., Houston, engrs. Noted Apr. 3.

Tex., Van Horn—Culberson Co. soon lets contract improving 52,506 mi. State Highway No. 12 from Van Horn north, 24 ft. wide. About $57,486. Wilder & O'Neal, Chronicle Bldg., Houston, engrs. Noted May 22.

Tex., Wharton—Wharton Co. plans to build 12.3 mi. State Highway No. 3 from Ft. Bend Co. to Colorado Co. line, 16 ft. wide. Work involves gravel surfacing (to be covered with bituminous later), building concrete drainage structures and 80 ft. steel span bridge. About $100,000. Work will be divided into 2 projects, 4 mi. Federal aid and 8.37 mi. state aid. D. B. King, Wharton, engr.

Colorado—State Highway Comn., State Museum Bldg., Denver, plans to pave 3 mi. of Lincoln Highway, south of Ft. Collins, this fall. About $75,000. J. B. Hunter, c/o State Highway Comn., engr.

N. M., Santa Fe—City having plans prepared by A. Turley, engr., for paving various streets and building storm sewers.

Idaho, Clearwater—Clearwater Dist. voted $35,000 bonds to build and improve roads. This amount, together with state and county aid, will make $125,000 available for work.

Idaho, Lewiston—Comrs. Nez Perce Co. having plans prepared by A. Burns, city engr., grading, installing cement curb and sidewalks, gutters and storm sewers in G St., from 18th to 21st Sts.; Carson St., from 18th to 21st Sts.; 7th Ave., from 14th to 21st Sts.; 8th Ave., from 13th to 21st Sts.; 9th Ave., from 14th to 18th Sts., and all intersecting streets.

Idaho, Nampa—Nampa Rd. Dist. voted $500,000 bonds to build 130 mi. main roads, cross roads and cement culverts. L. Cook, Nampa, dist. engr.

Washington—State Highway Bd., Olympia, rejected only bid received grading 7.83 mi. Central Washington Highway from Cheney to Sprague, involving 21,820 cu.yd. common and 7840 cu.yd. rock excav., 16,700 cu.yd. overhaul, 15.97 acres clearing 9.97 acres grubbing, 12,451 cu.yd. crushed rock, 152 sq.yd. concrete and 260 ft. concrete pipe. J. Allen, state highway engr.

Wash., Centralia—City plans to pave 17 blocks of Iron and Silver Sts., concrete. About $36,553.

Wash., Walla Walla—City voted $70,000 bonds to build concrete road from here to Dixie.

Ore., Ontario—City soon lets contract paving various streets, involving 51,213 sq.yd. concrete or bitulithic, 7666 lin.ft. concrete curbing and 57,656 sq.yd. mixed excav. Cost to exceed $10,000. L. C. Kelsey, city engr.

California—State voted $40,000,000 bonds to complete present and build new highways. A. B. Fletcher, Forum Bldg., Sacramento, ch. engr. Noted Mar. 6.

Cal., Eagle Rock—City plans election soon to vote on $57,000 bonds to surface 70 blocks, oil and rock screenings or crushed rock, and $33,000 bonds to make Central Ave. a boulevard. Address B. B. Martsolf, city clk.

Cal., El Centro—Imperial Co. voted $1,500,000 bonds to pave 125 mi. county highways. G. R. Wade, Brawley, ch. engr. highway comn. Noted June 12.

Cal., Ventura—Bd. Supervs. Ventura Co. plan election to vote on $500,000 bonds to pave 35 mi. county roads.

Ont., Fenelon Falls—City plans to pave 5 mi. Queen, Lindsay, Colborne and Adelaide Sts., bituminous macadam. About $20,281.

Ont., North Bay—H. J. McAuslan, town engr., soon lets contract improving Main St., involving 5600 lin.ft. curbs and gutters, 14,000 sq.yd. asphalt, asphaltic concrete or bitulithic pavement on concrete base, 14,000 sq.ft. sidewalk widening, installing necessary sewer connections and renewing all water services. About $21,000.

BIDS DESIRED

Massachusetts—Until July 22, by State Highway Comn., 212 State House, Boston, building 13,500 ft. bituminous macadam road in Seekonk Twp. and 7100 ft. in Randolph Twp. A. W. Dean, state highway engr.

Rhode Island—Until July 30, by State Bd. Pub. Rds., State House, Providence, building 5 mi. Post Road in Westerly and Charlestown Twp., advertised in this issue.

Conn., Danbury—Until July 25, by City Clk., repaving roadway of Main and Ros Hill Sts., sheet asphalt on Portland cement concrete foundation; also regulating and repaving roadway of White, Elm, River and Rose Sts., napped reclipped granite blocks on concrete foundation. Advertised in this issue.

New York—Until Aug. 5, by F. S. Greene, state highway comr., Albany, improving roads in Warren Co., also completing roads in Broome, Franklin, Genesee, Rensselaer, St. Lawrence, Warren and Wyoming Counties; advertised in this issue.

N. Y., Albany—Until July 21, by Bd. Contr. & Supply, City Hall, improving Barclay St. and Delaware Ave., westerly about 720 ft., and Summit Ave. from Barclay to Federal St., granite curb, asphalt or asphaltic concrete pavement on concrete foundation; also paving with asphalt or vitr. shale blocks on concrete foundation Oneida Tr. from Norton Ave. southerly about 450 ft. I. Wachsman, secy. F. E. Lanagan, city engr.

N. Y., New York—Until July 21, by F. L. Dowling, pres. Manhattan Boro., regulating and repaving with granite block on concrete foundation roadway of Mail St. from Park Row to Bway.

N. Y., Rome—A. Plunkett, city engr., receiving bids paving Jay St. from Elm to Clinton Sts., cost, $7968; Bloomfield St. from Jay to Expense Sts., $8510; Ridge St. from George to Madison Sts., $7184; Williams St., $8337.

N. Y., South Glen Falls (Glen Falls P. O.)—Until July 21, by village, building concrete pavement with and without integral curbing, through Upper Main St. C. E. Moore, pres.; advertised in this issue.

N. Y., S. I., St. George—Until July 23, by C. D. Vanderbilt, pres. Richmond Boro., repairing with wood block pavement roadway of Richmond Terrace from York Ave. to Sailors Snug Harbor dock.

N. J., Jersey City—Until July 22, by city, repairing asphalt pavements. About $10,000. C. A. Van Keuren, city engr.

N. J., North Bergen—Until July 24, by Town Council, improving 34th and 35th Sts., bituminous concrete. About $80,000. Noted June 12.

N. J., Trenton—Until July 29, Bd. Freeholders Mercer Co., building 1600 ft. Sect. 2-A River Rd., bituminous concrete surface on macadam foundation, Hopewell Twp., involving 3786 sq.yd. paving. About $35,000. H. J. Harris, co. engr.

Pa., Gallitizen—Until July 30, by H. F. Conrad, boro. secy., building 6000 sq.yd. vitr. brick pavement on concrete base, on Church St., involving 3000 cu.yd. excav. and 175 lin.ft. stone protection curb. D. W. Dillman, 80-81 Altoona Trust Bldg., Altoona, engr.; advertised in this issue. Noted June 26.

Pa., Meadville—Until Aug. 12, by city, for 34,513 sq.yd. brick pavement and 24,518 lin.ft. concrete curb and gutter. F. G. Kiebort, clk.; advertised in this issue.

Delaware—Until Aug. 6, by State Highway Dept., Dover, building 2.01 mi. Concord Pike, New Castle Co., cement concrete, Contr. No. 19. C. M. Upham, ch. engr.; advertised in this issue.

Va., Norfolk—Until July 21, by C. E. Ashburner, city mgr., paving Plume and Church Sts., City Hall, Monticello and Princess Anne Aves., involving 40,456 sq.yd. wood block or Durax, 25,300 sq.yd. Durax, and 26,500 sq.yd. sheet asphalt, etc.; advertised in this issue.

W. Va., Huntington—Until Aug. 4, by Comrs. Cabell Co. building 1 mi. Hamilton Pike Rd., 16 ft. wide, vitr. brick on 4 in. concrete base. About $32,000. J. M. Oliver, Huntington, engr.

W. Va., St. Albans—Until Aug. 16, by L. A. Edwards, city clk., for 2900 lin.ft. curb and gutter, 100 lin.ft. edging, 50 lin.ft. 12 in. tile laid, 2900 cu.yd. excav. and 7200 sq.yd. paving; advertised in this issue.

Streets and Roads (Continued)

N. C., Bayboro—Until July 21, by Comrs. Pamlico Co., constructing 7 mi. dirt road, including clearing of right-of-way. Z. V. Rawls, co. atty.

N. C., Fayetteville—Until July 29, by J. Underwood, mayor, for 21,000 sq.yd. street pavements, 1000 sq.yd. concrete gutters and building necessary drainage. E. C. Derby, city engr., advertised in this issue.

N. C., Lexington—Until Aug. 5, by J. T. Hedrick, mayor, and Ed. Town Comrs., paving various streets involving 35,000 sq.yd. asphaltic concrete or bitulithic surface on existing macadam, 25,000 sq.yd. asphalt, bitulithic, brick or other pavement on concrete foundation, 15,000 lin.ft. granite or concrete curb, 15,000 lin.ft. concrete gutter, 10,000 sq.yd. sidewalk and 9000 cu.yd. grading, G. C. White, Durham, engr. Advertised in this issue.

N. C., Newton—Until July 22, by L. F. Long, mayor, paving various streets, involving 19,500 sq.yd. bitulithic, sheet asphalt, asphaltic concrete or one course concrete, 10,714 lin.ft. combined curb and gutter, concrete, 3000 lin.ft. 8 in. terra cotta sewer, 7000 cu.yd. excav., 3000 sq.yd. concrete sidewalks, 5951 lin.ft. 4 in. Class "B" iron water pipe and [illegible] J. Gaither, clk. J. W. Webb, Newton, engr.

N. C., Washington—Until Aug. 12, by W. B. Rodman, Jr., mayor, paving various streets, involving 51,000 sq.yd. asphalt, bitulithic, concrete or brick, 30,000 lin.ft. granite or concrete curb, 30,000 lin.ft. concrete gutter, 20,000 sq.yd. of sidewalk 18,000 cu.yd. grading, 2½ mi. storm drains, 3 mi. water pipe, and 1 mi. sanitary sewer. G. C. White, Durham, engr. Advertised in this issue.

N. C., Washington—Until Aug. 12, by Comrs. Beaufort Co., paving highways, involving 270,000 sq.yd. asphalt, bitulithic, concrete or brick, 150,000 cu.yd. grading and ditching, 5000 lin.ft. pipe drains, 1500 lin.ft. box culverts, 820 cu.yd. of bridge concrete and 150,000 lbs. reinforcing bars. G. C. White, Durham, engr. Advertised in this issue.

Fla., Quincy—Until Aug. 8, by city, paving 27,000 sq.yd. Main St., also building necessary drainage structures. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, Ga., engrs.

Ala., Birmingham—Until Aug. 4, by Bd. Revenue Jefferson Co. for 3 mi. grading and macadamizing on McCalla and Buckville Rd., 4 mi. grading and 4 mi. crushed rock on Taylors Ferry Rd., 7 mi. grading on Lock 17 Rd., 2 mi. grading from Taylors Ferry Rd. to Alliance, 4 mi. cinders on road from Marine to Alliance, 1 mi. crushed rock on Oak Grove and Lock 17 Rds., 6 mi. cinders on Flat Top-Bessie Rd., 1 mi. grading, from Edgewater to Macks Chapel, 6 mi. grading from Mt. Olive to Partridge Cross roads, resurfacing 3rd Ave. from 23rd to 26th Sts., and 26th St. from 1st to 8th Aves. and paving 1st Ave. from 41st to 47th Sts. and from 75th St. to Roebuck Springs. Cost between $175,000 and $200,000. S. R. Batson, co. engr.

Ala., Montgomery—Until July 29, by G. W. Barnett, city treas., paving 15,000 sq.yd. Bell St. from western end of Bell St. Bridge to city limits, brick, asphalt, bitulithic, mineral rubber,' wood block, concrete or asphaltic concrete, advertised in this issue.

Louisiana—Until July 24, by State Highway Comn., New Orleans, gravel surfacing 8.35 mi. Shreveport-Arkansas Highway, from Myra to Arkansas line, Caddo Parish. D. Buie, state highway engr.

O., Columbus—Until July 29, by G. A. Borden, serv. dir., grading, draining and repaving 1200 ft. Franklin Park, W., from Broad St. to Franklin Park, S., 30 ft. wide, involving 2950 sq.yd. asphalt and 1250 sq. yr brick gutter; grading, draining, laying water mains and paving alley west of Neil Ave. from 2nd Ave. to Taffan St., 290 ft. long, 16 ft. wide, concrete. H. A. Maetzel, city engr.

O., Greenspring—Until July 22, by F. B. Reed, village clk., for 2000 cu.yd. excav., 2400 tons crushed rock foundation, 14,000 sq.yd. brick paving, 4500 lin.ft. stone curbing, 4900 lin.ft. stone curbing reset and 500 lin.ft. storm sewer. L. A. Boulay Co., 1250 Nicholas Bldg., Toledo, engrs.; advertised in this issue.

Michigan—Until July 22, by State Highway Comn., Lansing, grading, draining, gravel surfacing, [illegible] and building drainage structures on 3.780 mi. State Trunk Line Rd. in St. Ignace Twp., Mackinaw Co., and 5 mi. State Trunk Line Rd. between Pickford and Rudyard, Chippewa Co., both 16 ft. wide. F. F. Rogers, comr.

Mich., Kalamazoo—Until July 28, by H. H. Freeman, city engr., paving 22,000 sq.yd. and curbing and guttering 13,000 lin.ft. Oakland Dr., brick, sheet asphalt or asphaltic concrete. Noted May 29, advertised in this issue.

Illinois—Until July 23, by Dept. Pub. Wks. & Bldgs., Div. of Highways, Springfield, building roads in following counties:

Ogle Co., 23,194 ft. Sect. 10, Lincoln Highway, 16 ft. wide.

Ogle-Lee Counties, 32,921 ft. Sect. 11, Lincoln Highway, 16 ft. wide.

Cook Co., 28,362 ft. Sect. A, Chicago-Joliet Highway, 18 and 24 ft. wide, 350 sq.yd. 3-in. sand-cement brick pavement with bituminous filler.

Putnam Co., 30,675 ft. Sect. C, and 3372 ft. Sect. F-29, Morris-Henry Highway, 26 ft. wide, graded earth.

Bureau Co., 26,269 ft. Sect. D and 17,176 ft. Sect. J, Morris-Henry Highway, 26 ft. wide, graded earth.

Madison Co., 18,599 ft. Sect. I, 14,518 ft. Sect. Q, 19,794 ft. Sect. U and 26,571 ft. Sect. W-15 d, Springfield-East St. Louis Highway, 18 ft. wide.

Macoupin Co., 25,840 ft. Sect. 4, 16 ft. wide, and 12,988 ft. Sect. J-15 d, 16 and 18 ft. wide, Springfield-East St. Louis Highway.

Fayette Co., 27,800 ft. Sect. V, National Highway, 16 ft. wide.

Alternate bids will be received on Portland cement concrete, 4 in. monolithic brick, 3 in. monolithic brick, Spec. C1, C2, C3 or C4 bituminous concrete with binder course, except where otherwise noted. F. I. Bennett, dir.; advertised in this issue.

Ill., Chicago—Until July 23, by Bd. Local Imprvts., paving following streets:

Archer Ave. from Kedzie to Central Park Aves., 5200 cu.yd. grading, 1028 sq.yd. granite block pavement on 6 in. concrete base, 11,220 sq.yd. vitr. brick on 6 in. concrete base, 6700 ft. concrete curb, etc. About $41,500;

South Bishop St. from West 59th to West 60th Sts., 800 cu.yd. grading, 2450 sq. yd. 8 in. slag or traprock on 2½ in. granite base, 1400 ft. concrete curb, $7500;

Brompton Ave. from Bway. to North Halsted St., 700 cu.yd. grading, 2130 sq.yd. asphalt on 6 in. concrete base, 1380 ft. concrete curb, etc., $8600;

Cambridge Ave. from Diversey Pkway. to Surf St., 600 cu.yd. grading, 1500 sq.yd. asphalt on 6 in. concrete base, 970 ft. concrete curb, etc., $5500;

Carmen Ave. from Albany to Kedzie Aves., 1870 sq.yd. asphalt on 6 in. concrete base, 1100 cu.yd. filling, 1340 ft. concrete curb, etc., $7000;

Carroll Ave. from St. John's Court to Ashland Ave., 800 cu.yd. grading, 1470 sq. yd. asphalt on 6 in. concrete base, 740 ft. concrete curb, etc., $7680;

West Congress St. from Talman Ave. to Washtenaw St., 250 cu.yd. grading, 580 sq. yd. asphalt on 6 in. concrete base, 360 ft. concrete curb, etc., $2700;

Fairoaks St. from Hazel St. to Bway., 600 cu.yd. grading, 1690 sq.yd. asphalt on 6 in. concrete base, 1240 ft. concrete curb, etc., $7000;

Homer St. from Albany to Kedzie Aves., 480 cu.yd. grading, asphalt on 6 in. concrete base, 870 ft. concrete curb, etc., $4500;

Hutchinson St. from Lockwood to Long Aves., 700 cu.yd. grading, 1650 sq.yd. asphalt on 6 in. concrete base, 1230 ft. concrete curb, etc., $7000.

Keystone Ave. from Lawrence Ave. to Argyle St., 2000 cu.yd. grading, 3630 sq.yd. asphalt on 6 in. concrete base, 2600 ft. concrete curb, etc., $17,500.

North Menard Ave. from Hirsh St. to North Ave., 3100 cu.yd. grading, 4310 sq.yd. asphalt on 6 in. concrete base, 2700 ft. concrete curb, 160 ft. 10 in. tile sewer, $17,000.

Potomac Ave. from Springfield St. to Crawford Ave., 978 cu.yd. grading, 1410 sq.yd. asphalt on 6 in. concrete base, 1100 ft. concrete curb, etc., $7000;

State St. from Madison to Randolph Sts., 4000 sq.yd. creosoted wood block on 8 in. concrete base, $20,500;

St. Louis Ave. from Carmen to Foster Sts., 1950 cu.yd. grading, 3020 sq.yd. asphalt on 6 in. concrete base, 2100 ft. concrete curb, etc., $12,200;

Wabausia Ave. from Kedzie Ave. to Chicago, Milwaukee & St. Paul R.R. tracks, 4700 cu.yd. grading, 11,420 sq.yd. asphalt on 6 in. concrete base, 240 ft. 10 in. tile sewer, 7120 ft. concrete curb, etc., $33,858;

West 42nd St. from Ashland to Marshfield Aves. Marshfield Ave. from West 42nd to West 43rd Sts., 2050 cu.yd. grading, 3750 sq.yd. granite block pavement on 6 in. concrete base, 1920 ft. concrete curb, etc., $27,000;

North Latrobe, North Lockwood and North Long Aves. from Grand to Fullerton Aves.; Dickens St. from Laramie to Lockwood Aves.; Palmer and Belden Aves. from Laramie to Long Aves., 16,850 cu.yd. grading, 31,600 sq.yd. asphalt on 6 in. concrete base, 25 ft. 10 in. tile sewer, 20,300 ft. concrete curb, etc., $159,000;

North Fairfield Ave. from Granville to Devon Aves.; North California Ave. from Paterson to Devon Aves.; Glenlake and Rosemont Aves. from Fairfield to California Aves., 8000 cu.yd. grading, 18,400 sq.yd. asphalt on 6 in. concrete base, 9660 ft. concrete curb, $76,000;

East 103rd and East 104th Pl. from Cottage Grove to Corliss Aves.; East 104th St. from Cottage Grove to Bessemer Aves., East 105th and East 106th Sts. from Cottage Grove to Erickson Aves., East 105th Pl. from Stephenson to Corliss Aves.; East 107th St. from Cottage Grove to Langley Aves., Stephenson Ave. from Cottage Grove Ave. to East 108th St., Langley Ave. from East 105th Pl. to East 108th St., Corliss Ave. from East 103rd to East 106th St., Erickson Ave. from East 104th to East 106th St., 18,000 cu.yd. grading, 51,990 sq. yd. 8 in. blast furnace slag on 2½ in. traprock, 29,110 ft. concrete curb, etc., $121,500.

Wrightwood Ave. from Lake View Ave. to North Clark St., Dodd Ave. from Lehman Court to North Clark St., Pine Grove Ave. from Wrightwood Ave. to Surf St., Hampton Court from Deming to Diversey St.; Lehman Court from Wrightwood Ave. to Diversey St., 6000 cu.yd. grading, 15,160 cu.yd. asphalt on 6 in. concrete, 9750 ft. concrete curb, etc., $61,000.

Wisconsin—Until July 22, by State Highway Comm., 208 Stephenson Bldg., Milwaukee, improving Milwaukee-Waukesha Rd., Federal Aid Project No. 63, Waukesha Co., involving 1441 cu.yd. earth excav., 9542 sq.yd. concrete surfacing, etc.

Minn., Cass Lake—C. Gauley Constr. Co., 1002 Plymouth Bldg., Minneapolis, receiving bids for 10,000 yd. paving, 4000 lin.ft. curbing, 12 blocks sidewalk and 2500 yd. excav., here. About $25,000.

Minn., Duluth—Until July 21, by J. W. Lang, clk. White Twp., paving 1.1 mi. road 18 ft. wide. About $30,000. C. M. Dorway, Eveleth, engr.

Minn., Duluth—J. A. Farrell, comr., receiving bids paving 64th Ave., W., from Grande Ave. to Roosevelt St., 24 ft. wide. About $22,408. L. Ayres, city engr.

Minn., Grand Rapids—F. McVicar, cit. aud., receiving bids paving 34 blocks Houghton Ave., concrete. About $10,000. P. C. Warner, Grand Rapids, engr.

Minn., St. Paul—Until July 21, by H. W. Austin, purch. agt., City Hall, grading and building cement tile sidewalks on Chilcome Ave. between Keston and Doswell Aves.

Kan., Seneca—Until Aug. 4, by city, paving 6 blocks of Main St., involving 14,521 sq.yd. vitr. fibre brick, concrete or asphaltic concrete pavement, 6000 ft. combined curb and gutter, 6351 ft. 10-33 in. storm sewers, 19 manholes and 61 catch basins. Archer & Stevens, New England Bldg., Kansas City, Mo., engrs.

Neb., David City—Until Aug. 1, (change of date), by M. J. Bouse, clk. Butler Co., paving 4360 ft. road from here to Osceola and Schuyler, 18 ft. wide, involving 8720 sq.yd. concrete and 242 cu.yd. concrete cut-off walls. About $27,000. G. E. Johnson, c/o State Highway Dept., Lincoln, engr. Noted May 22.

Neb., Fremont—Until Aug. 1, (change of date), by W. E. Barz, clk. Dodge Co., paving 5.94 mi. Fremont-Ames Rd., 18 ft. wide. Work involves 62,606 sq.yd. and 256 lin.ft. 18 in. concrete pipe. About $160,000. G. E. Johnson, c/o State Highway Dept., Lincoln, engr. Noted May 22.

Neb., Polk—Until July 28, by W. H. Smith, city clk., paving 25,000 yd. streets, 26 to 40 ft. wide, 4 in. base if brick is used, 5 in. base if asphalt is used. About $140,000. Grube & Walker, 204 Bee Bldg., Omaha, engrs.

Neb., Tecumseh—Until July 29, by W. J. Devenney, city clk., paving various streets, involving 9272 cu.yd. grading, 20,664 sq.yd. paving, 220 concrete driveways, 6254 lin. ft. Class "A" and 1905 Class "B" curb and gutter, etc. R. C. Gore, city engr.

Streets and Roads (Continued)

Arkansas—Until Aug. 6, by State Highway Dept., Little Rock, surfacing 10.7 mi. Little Rock-Hot Springs Highway, Pulaski Co., 14-18 ft. wide, involving 113,500 sq.yd. asphaltic concrete or Portland cement concrete and 35,000 tons stone for base. Lund & Hill, Little Rock, engrs.; advertised in this issue.

Ark., Marion—Until July 24, by Bd. Comrs. of Rd. Impvt. Dist. No. 9, Crittenden Co., building 11 mi. earth road embankment. Morgan Eng. Co., Goodwyn Institute Bldg., Memphis, Tenn., engrs.

Ark., Marshall—Until July 28, by Comrs. Rd. Impvt. Dist. No. 3, Searcy Co., improving 13 mi. Marshall-Snowball Highway, involving 90,000 cu.yd. excav., 400 lin.ft. 24 in. pipe, 30 acres clearing and grubbing, 500 cu.yd. solid rock excav., 350 lin.ft. timber trestle bridging, 370 lin.ft steel bridges (all over 100 ft.), 250 cu.yd. rein.con. in culverts, 250 cu.yd. plain concrete in piers and headwalls and 15,000 cu.yd. crushed stone. Bids will be received on work as whole or separately on (1) clearing, grubbing, grading, pipe culverts and trestle bridges, (2) all concrete work, (3) steel bridges, erected, (4) surfacing with stone. Winn Eng. Co., 207-8 Riegler Bldg., Little Rock, engr.

Ark., Osceola—Until July 25, by Bd. Comrs. of Burdette Rd. Impvt. Dist. No. 3, Mississippi Co., building 26 mi. graded earth roads. Pride & Fairley, Osceola, engrs.; advertised in this issue.

Ark., Walnut Ridge—Until Aug. 18, by Comrs. Western Lawrence Co. Rd. Impvt. Dist., Peoples Bank Bldg., Imboden, building 4 systems of roads involving 60 mi. grader work, 56 acres clearing and grubbing, 137,700 cu.yd. earth and 4500 cu.yd. rock excav., 10,056 ft. 15-30 in. metal, vitr. clay or concrete pipe culverts, 1328 cu.yd. Class "A" and 324 cu.yd. Class "B" concrete, 66,400 lb. reinforcing steel, 693 lin.ft. timber bridges and 82,960 cu.yd. local crushed rock surfacing. Pritchett & Hight Walnut Ridge, engrs; advertised in this issue.

Ark., Wynne—Until July 22, by Rd. Impvt. Dist. No. 1, Cross Co., building 10.6 mi. gravel road, involving 13,500 cu.yd. grading and 26,600 cu.yd. gravel. J. A. Guissinger, Wynne, engr.

Idaho, Lewiston—Until July 21, by City Clk., laying 16,900 sq.ft. 4 in. concrete walk, involving 5200 cu.yd. embankment, 3840 lin.ft. concrete curb and gutter, 90 cu.yd. excav. and back fill, tearing up 14,500 ft. concrete walk, 240 ft. 10 in. vitr. pipe, etc. A. Burns, city engr.

Utah, Farmington—Until Aug. 15, by City Comrs., paving sidewalks in Dist. No. 3, involving 76,500 sq.ft. 4 in. and 5700 sq.ft. 5 in. concrete sidewalks. About $20,000. Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs.

Utah, Salt Lake City—Until July 25, by City Comrs., improving 7th St. E., from 5th to 13th Sts., involving 26,750 sq.yd. asphalt on 6 in. concrete base, cost $114,000; 6th Ave. from H to N Sts. and N St. from 3rd to 6th Sts., 15,000 sq.yd. bituminous, 2 in. thick, on 6 in. concrete base, $70,000; curbing and guttering extension No. 24, 55,000 lin.ft. curbing and guttering and 8300 lin.ft. of 24-36 in. storm-sewer, $243,000; 13th St. from State to 5th East Sts., 5 ft. by 4 ft. rectangular storm to be built 3000 ft. long, top of which is to be used for sidewalk, $30,000. S. O. Cannon, City and County Bldg., engr.

Ont., Gloucester—Town receiving bids building 17,425 lin.ft. sidewalks on Prince Albert and Queen Mary Sts., 4 ft. wide. Peterson & Byrne, 71 Sparks St., Ottawa, engrs.

Ont., Ottawa—Until July 22, by Bd. Control, paving Bank St. from Grove St. to Billings Bridge, involving 6700 sq.yd. asphalt, 2752 lin.ft. concrete gutter and 7000 sq.yd. concrete grading; Milbrod St., from Nicholas to Charlotte, 8080 lin.ft. concrete gutter, 13,645 sq.yd. asphalt and 14,545 sq.yd. concrete grading; Slater St. from Bay to Bronson Aves., 1546 lin.ft. concrete gutter, 2690 sq.yd. asphalt and 2800 sq.yd. concrete grading. A. J. McCallum, City Hall, engr. Noted June 12.

Ont., Ottawa—Until July 22, by Bd. Control building asphalt pavement on Bessemer St. from Nicholas to Charlotte Sts. Work involves 12,568 sq.yd. asphalt on 6 in concrete base, 8240 lin.ft. concrete gutter, 13,530 sq.yd. grading, 12,568 sq.yd. binder, 420 lin.ft. headers and 60 concrete catchbasins. A. F. McCallum, City Hall, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—State Highway Comn., Boston, let contrac building 4800 ft. road in Dudley Twp., involving 4700 gal. bituminous materials, 6400 cu.yd. earth and 160 cu.yd. rock excav., to Downey & Toomey, Dudley, $18,737; 10,000 ft. in Quincy Twp., 46,500 gals, bituminous materials, 1360 cu.yd. earth excav., to E. C. Sargent & Co., Quincy, $31,408.

Mass., Attleboro—City received bids paving 1 mi. road from J. McCormick, Taunton Ave., East Providence, $18,300, asphalt penetration method; W. H. Connor, Middleboro, $13,116, asphalt gravel mixture. Noted June 12.

★**Mass., Boston**—City let contract paving West Bway., to Bermudez Co., Cambridge, $18,780. Work involves 2700 sq.yd. asphalt pavement on 7 in. concrete base.

★**Mass. Worcester**—City will improve 2827 ft. Belmont St., involving 16,270 sq.yd. granite block on 5 in. concrete base, 7800 sq.yd. asphalt, 6170 lin.ft. granite curbing, 920 cu.yd. gravel sidewalk and 5400 cu.yd. excav. About $142,000. Work will be done by day labor.

Connecticut — State Highway Comn., Hartford, received bids, July 10, paving (a) 7400 ft. Hall Meadow Rd., Norfolk Twp., (b) 4700 ft. Chesterfield Rd., Montville Rd., (c) 4770 ft. Newent Rd., Lisbon Twp., (d) 5000 ft. Station Rd., Brookfield Twp., all 7 in. native stone macadam, (e) 10,980 ft. Colebrook Rd., Winchester Rd., 5 in. native stone macadam, (f) 59,050 ft. Norwich-Westerly Highway, Federal Aid, Bethel, Redding and Easton Twps., 3 in. bituminous macadam, (g) 6965 ft. Pembroke Rd., Danbury Twp., (h) 4050 ft. Oxford Rd., Southbury Twp., 8 in. gravel, from L. Longhi & Bro., Torrington, (a) $35,349, (d) $14,745, (e) $27,652, (g) $20,949, (h) $9549; J. DeMiehiel, Torrington, (a) $40,155, (e) $40,056; Osborne & Barnes, 20 West St., Danbury, (a) $48,227, (d) $17,176, (g) $23,986, (h) $13,605; J. Arborio, 80 Park St., New Haven, (b) $18,944, (c) $24,413, (h) $10,774; Lane Constr. Co., Meriden, (b) $20,182, (c) $23,972; Gildo Valli, Torrington, (e) $32,954; L. J. Wilcox, Norwichton, (c) $21,617; Francesco Valerio, R. D. No. 30, Stamford, (f) $314,455; W. H. Arthur, Stamford, (f) $357,149; F. B. Hastings, 1200 Wood Ave., Bridgeport, (g) $15,862, (h) $8575; Knapp & Hatch, R. F. D., Danbury, (g) $17,328; B. N. Beard, 464 Howe Ave., Shelton, (h) $8355; Interstate Constr. Co., 272 Main St., Derby, (h) $12,497.

★**Connecticut** — State Highway Comn., Capitol, Hartford, let contract improving 9722 lin.ft. Lebanon-North Franklin Rd., Lebanon Twp., involving 6900 ft. 7 in. native stone macadam and 2822 ft. reconstructed macadam to L. Suzio Constr. Co., State and Brooks Sts., Meriden. About $28,000. Noted June 19.

★**Conn., Hampden— (Hartford P. O.)**— City let contract paving 15,000 sq.yd. Dixwell Ave., concrete, to C. W. Blakeslee & Son, 58 Waverly St., New Haven. About $45,000.

★**New York**—State Highway Comn., Capitol, Albany, let contracts improving following roads: 3.98 mi. Schenectady Co. Line-Guilderland Rd., No. 5636, Albany Co., to Brown, Lowe & Parker, Schenectady, $113,751; 5.84 mi. Vanhornesville-Starkville Rd., No. 1362 and 5.67 mi. Paines Hollow-Stone House Rd. No. 1363, Herkimer Co., F. V. Brotsch Co., Rochester, $213,423 and $193,112 respectively; 0.45 mi. North Western Boonville Rd., Pt. 3, No. 1462, Oneida Co., D. J. Phelan & Co., Utica, $28,283; 3.33 mi. Westchester Co. Line-Lake Mahopac, Mahopac Falls Rd., No. 1512, Putnam Co., S. Beskin, Beacon, $83,175; 1.52 mi. Wait Corners Lape Corners Rd. No. 1523, Saratoga Co., Harradine Bros. Co., Inc., Spencerport, $38,683; 6.03 mi. Wales Center-Wales Rd. No. 924-B, Erie Co., Felton Constr. Corp., Buffalo, $81,485; 6.07 mi. Solon-Gee Brook Rd., Pt. 1, No. 1435, Cortland Co., D. W. Robbins, Inc., Utica, $111,470; 5.01 mi. Tupper Lake-Long Lake Rd., Pt. 1, No. 1258, Hamilton Co., Rosoff Eng. Co., 15 Park Row, New York City, $91,669; 8 mi. Cambria-Wilson Rd. No. 1315, Niagara Co., F. J. Mumm Contg. Co., Inc., Buffalo, $129,755; 5.62 mi. Schenectady-Duanesburg Rd., Pt. 2, No. 5545, Schenectady Co., J. J. Malloy, Schenectady, $66,450; 5.85 mi. Sodus-Alton Rd. No. 5632, Wayne Co., Hendrickson-McCabe Constr. Co., Syracuse, $8518; repairing Rd. No. 490, Repair Contr. No. 1208, Rensselaer Co., Troy Contg. Co., Inc., Troy, $85,689; Rd. No. 16, Repair Contr. No. 1224, Ulster Co., J. F. Gallagher, Kingston, $54,295. Noted July 10.

N. Y., Albany—Bd. Contr. & Supply, City Hall, received lowest bid paving Bway. with redressed and dressed granite blocks, from P. W. Mulderry, 5 St. Joseph's Terrace, $172,692; Bancker St. et al., asphalt and vitr. blocks, M. F. Dollard, Manning Blvd., N., $114,519.

★**N. Y., Binghamton**—Bd. Contr. & Supply let contracts paving North Depot St., granite blocks, to E. V. Chappelle, $12,904; Birch and Collier Sts., both brick, to G. Serafina, $9575, and $10,140 respectively.

N. Y., Buffalo—S. H. Norton, city engr., received bids paving (a) Thorton St., (b) Breckenridge St., (c) Floss Ave., (d) Tifft St., (e) Harriet St., (f) Zenner St., (g) Argus St., (h) Cornwall St., (i) Cassey St., from Rock Asphalt & Constr. Co., Morgan Bldg., (a) $15,333, (b) $7034, (c) $34,047, (d) $22,309, (e) $24,964, (f) $11,038, (g) $12,057, (i) $3252; Erie Contg. Co., Morgan Bldg., (a) $15,400, (b) $8000, (d) $22,600, (e) $25,000, (h) $38,000; B. F. Spire, 24 Colonial Circle, (a) $16,006, (c) $35,003, (d) $22,200, (f) $11,252, (g) $11,701, (h) $37,997; H. P. Burgard Co., 1968 Fillmore Ave., (c) $34,590, (e) $25,165, (f) $11,185, (g) $12,140, (h) $35,900. Noted May 29.

★**N. Y., Ilion**—Bd. Trustees let contract paving Hoefler Ave., Railroad, Spruce, Elm, 4th, Grove and Center Sts. and Weber Ave. to high school, to Warren Bros., 142 Berkeley St., Boston, Mass., $53,270.

N. Y., New York—H. Bruckner, pres. Bronx boro., received bids repaving with sheet asphalt (a) Creston Ave., from East 168th to East 189th Sts., (b) Hughes Ave., from East Tremont Ave. to Fordham Rd., from Union Paving Co., Bway. and 11th St., (a) $45,967; Uvalde Constr. Co., Bway., (a) $47,142, (b) $67,500; Asphalt Constr. Co., 2197 Madison Ave., (a) $47,183, (b) $65,000; Davney Asphalt Paving Co., 1170 Bway., (b) $64,311.

N. Y., New York—F. L. Dowling, pres. Manhattan Boro., received lowest 3 bids regulating and repaving roadways of (a) Bway. on Park Pl., sheet asphalt, (b) Duane St., from Bway. to West Bway., (c) Reade St., from Elm St. to West Bway., (d) North Chamber St., from Park Row to Madison St., and Madison St. to Cherry St., (e) Murray St., from Bway. to West Bway., (f) Grand St., from Contre to Baxter Sts., all granite blocks, from Sicilian Asphalt Paving Co., 41 Park Row, (a) $4307; Uvalde Asphalt Paving Co., 1 Bway., (a) $4601; W. F. Fitzgerald, 547 West 45th St., (b) $22,946, (c) $35,996, (d) $56,903, (e) $25,662, (f) $5580; P. J. Kerns, (b) $23,683, (c) $37,222, (d) $57,382, (e) $26,404, (f) $5382; Asphalt Constr. Co., 2197 Madison Ave., (b) $23,708, (c) $38,205, (e) $27,147; Burnside Consty. Co., 270 Burnside Ave., (d) $57,142, (f) $5394.

N. Y., Rochester—Bd. Contr. & Supply received lowest bid paving Norton St., asphalt, from J. Petrossi Co., Livingston Bldg., $87,416.

N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., received bids paving with bituminous macadam space between rails of tracks and 2 ft. in width outside of inner rails on Richmond Rd., south of Clove Ave. and Amboy Rd., from J. Johnson Sons, West New Brighton, $33,295; J. Curren, $35,787; C. Vanderbilt, 24 Elizabeth St., West New Brighton, $38,505.

★**N. Y., Syracuse**—Bd. Contr. & Supply let contract resurfacing Cortland and South Aves. and Grape and South West Sts., to T. B. Wheeler, $65,359. Noted June 19.

New Jersey—State Highway Comn., Broad St. Bank Bldg., Trenton, received bids building State Highway Route No. 3, Three Mile Run to One Mile Run, Middlesex and Somerset Counties, from O. G. Julian Eng. & Constr. Co., 20 Nassau St., New York City, $201,485; Tappert & Seliknitz, 26 Courtlandt St., New York City, $209,099; M. I. Demarest, Sewarren, $209,945. Noted June 26.

N. J., New Brunswick—Bd. Freeholders Middlesex Co. received bids paving Main St., Milltown Twp., Warrenite on concrete base, from T. H. Riddle, 102 Church St., $63,955; Utility Constr. Co., Peoples' Bank Bldg., Pittsburgh, $72,377; G. Gundrum, South Amboy, $73,000.

Streets and Roads (Continued)

N. J., Jersey City—City received lowest bid improving 10th St. between Erie and Grove Sts., Belgian block on 6 in. concrete base, from E. J. Flaherty Co., 76 Montgomery St., 97 per cent of $10,000 (engineer's estimate). Noted June 26.

Pennsylvania — State Highway Dept., Harrisburg, received bids building roads in counties as follows:

Bradford Co., 45,051 lin.ft. rein.-con. or bituminous surface course and Hillside vitr. brick on concrete foundation, from Towanda Constr. Co., New Albany, $434,985, MacArthur Bros. Co., 120 Bway., New York City, $443,080, T. H. Gill Co., Security-Mutual Bldg., Binghamton, $443,812;

Butler Co., 41,673 lin.ft. rein.-con. and Hillside vitr. brick, from C. Winters Constr. Co., R. F. D. No. 2, Renfrew, $351,334, Atlanta Constr. Co., Atlanta, N. Y., $401,560, Booth & Flynn, Ltd., 1942 Forbes St., Pittsburgh, $410,075;

Clearfield Co., 13,027 lin.ft. rein.-con. and Hillside vitr. brick, from Foundation Co., 233 Bway., New York City, $138,587;

Lehigh Co., 30,079 lin.ft. rein.-con. and Hillside vitr. brick, North Whitehall and Washington Twps., from J. F. Shanley, 605 Lincoln Bldg., Phila., $239,612, G. H. Hardner, Lentz Bldg., Allentown, $248,308, Mainwaring & Cummins, Inc., 5600 Germantown Ave., Phila., $262,524; 16,218 lin.ft. rein.-con., Salisbury Twp., from Hamilton-Kapnek Constr. Co., 1363 Ridge Ave., Phila., $97,231, R. S. Ratbun Constr. Co., 409 Vine St., Bethlehem, $112,711, Mainwaring & Cummins, Inc., $122,886;

Luzerne Co., 22,705 lin.ft. rein.-con. and Hillside vitr. brick, from Hamilton-Kapnek Constr. Co., $163,620, Richardson-Hand Co., Wilkes-Barre, $166,714, B. G. Coon Coon Constr. Co., 274 Union St., Luzerne, $169,435;

Somerset Co., 10,554 lin.ft. rein.-con. and Hillside vitr. brick, Elklick Twp., from B. J. Lynch & Co., Inc., Meyersdale, $92,905; 32,024 lin.ft. rein.-con. and Hillside vitr. brick, Jennertown Boro. and Jenner Twp., from Woy Bros., Somerset, $292,428, Trimpey & Whipkey, Casselman, $304,583, Mason & Hangar Co., Inc., Chambersburg, $322,174;

Sullivan Co., 17,412 lin.ft. bituminous surface course and Hillside vitr. brick or rein.-con., from R. D. Richardson Constr. Co., 828 Connell Bldg., Scranton, $153,315, Valley Constr. Co., Athens, $169,789, T. L. Evans Sons, 344 Ferry St., Danville, $196,514;

Susquehanna Co., 30,335 lin.ft. rein.-con. from M. Stipp & Sons, 435 Moir Court, Scranton, $223,673, E. W. Foley Contg. Corp., 34 Vine St., New York City, $232,877, Foundation Co., $268,220;

Wyoming and Lackawanna Counties, 71,063 lin.ft. rein.-con. or bituminous surface course on concrete foundation, from R. C. Ruthven, 213 Carter Bldg., Scranton, $437,531, Gaylord International Eng. & Constr Co., Cedar and Orchard Sts., Scranton, $447,666, Winston & Co., 240 Fair St., Kingston, N. Y., $483,415;

York Co., 32,744 lin.ft. rein.-con. and Hillside vitr. brick, from J. Goll, 1539 Filbert St., Phila., $254,388, Quinlan & Robertson, Inc., Hamburg, $279,019, D. C. McAleer, 405-6 Phoenix Bldg., Baltimore, $285,299. Noted June 19.

★**Pennsylvania**—State Highway Dept., Harrisburg, let contracts to Mainwaring & Cummins, Inc., 5600 Germantown Ave., Phila. building 14,863 lin.ft. rein.-con. road in Bucks Co., $111,876; to Foundation Co., 233 Bway., New York City, 2903 lin.ft. rein.-con. road in Clinton Co., $28,842; to Union Paving Co., 20th and Locust Sts., Phila., 24,900 lin.ft. rein.-con. road in Delaware Co., $175,750; to Mason & Hangar Co., Inc., Chambersburg, 30,197 lin.ft. rein.-con. road in Fayette Co., $304,483; to Harrison & Co., Inc., Derry, 37,885 lin.ft rein.-con. and Hillside vitr brick road in Somerset Co., $410,241; to Warren-Moore Co., Colonial Trust Co. Bldg., Phila., 28,821 lin.ft. rein.-con. road in Tioga Co., $267,468. Noted June 19.

Pa., Palmerton—Boro. received bids improving streets as follows: (a) concrete on stone base, (b) concrete on slag base, (c) brick on stone base, (d) brick on slag base, (e) Amiesite on stone base, (f) Amiesite on slag base, from R. E. & E. H. Neumeyer, 1416 East 4th St., South Bethlehem, (a) $122,644, (b) $115,684, (c) $165,310, (d) $158,351, (e) $139,589, (f) $132,630; Richardson Constr. Co., Connell Bldg., Scranton, (a) $133,764, (b) 131,040; S. W. Chiles, Bethlehem, (a) $113,582, (b) $110,556, (c) $151,104 (d) $148,078, (e) $122,962, (f) $119,936; McInerney-McNeil, North Natl. Bank Bldg., Easton, (a) $126,538, (b) $122,906, (e) $130,471, (f) $126,840; S. L. Cyphers, South Bethlehem, (a) $113,087, (b) $109,154, (c) $156,057, (d) $152,123, (e) $136,388, (f) $132,454. Noted June 26.

★**Pa., Pittsburgh**—City let contract to M. O'Herron, South 1st and McKean Sts., grading, paving and curbing Montooth St. from Climax St. to Taff Ave., $30,138; Silvania St. from Taff to Gehring Aves., $13,410; Marshall Ave. from Linwood Ave. to Brighton Rd., $68,393. Noted July 3.

★**Maryland**—State Rds. Comn., 601 Garrett Bldg., Baltimore, let contract resurfacing with sheet asphalt 1.72 mi. Sparrows Point Rd., 16 ft. wide, 3 ft. shoulders, to P. Flanigan & Sons, Harford Rd. and Baltimore & Ohio R.R., $36,194.

★**W. Va., Lewisburg**—Comrs. Greenbrier Co. let contract building 2 mi. Marlins-Buttom Turnpike, 16 ft. wide, involving 18,800 sq.yd. penetration macadam, to Dougher & Johnston, White Sulphur Springs. About $27,000.

★**N. C., Greensboro**—City let contract paving various roads, involving 90,000 sq.yd. asphalt on concrete base, to R. G. Lassiter Co., Oxford. About $200,000, based on square yard.

★**N. C., Waynesville**—Comrs. Haywood Co. let contract surfacing with gravel and sand clay 8.5 mi. roads, 16 ft. wide, to Gibson Constr. Co., Knoxville, Tenn. About $50,000. Noted July 3.

★**S. C., Greenwood**—Comrs. Greenwood Co. let contract relocating, grading, draining and surfacing with top soil 7.29 mi. Dixie Highway from here to Hodges, 30 ft. wide, to Milford & Alexander, Greenwood, $26,682. Noted July 3.

★**La., Krotz Springs**—Bd. Supervs. Rd. Dist. No. 1, 4th Police Jury Ward of St. Landry Parish, rejected bids building Krotz Springs Highway. Work will be done by day labor. Noted June 19.

Ohio—State Highway Comn., Columbus, received bids July 11, building roads in following counties:

Columbiana Co., Sect. "E," Cleveland-East Liverpool Rd., 3 mi. grading and paving with concrete and waterbound macadam, Campbell Bros., Stambaugh Bldg., Youngstown, $81,838; C. L. Straw, Paulding, $82,687; J. C. Devine Co., Alliance, $84,500.

Columbiana and Mahoning Counties, Sect. "J," Salem-Alliance Rd., 4.12 mi., grading, constructing bridges and culverts and paving with brick; J. D. Paxson, Salem, $144,668.

Crawford Co., Sect. "M-1," Bucyrus-Galion Rd., 1.74 mi. grading, constructing bridges and culverts and paving with bituminous macadam, Scott, Fike & McNab, Ashland, $49,613; Highway Constr. Co., Elyria, $50,327; W. M. Gray, Bowling Green, $50,429; semi-monolithic brick, L. R. McMichael, Bucyrus, $67,164.

Sect. "M-2," Galion-Bucyrus Rd., 2.73 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Scott, Fike & McNab, $83,184; Highway Constr. Co., $85,474; W. M. Gray, $83,696; semi-monolithic brick, L. R. McMichael, $110,189.

Defiance Co., Sect. "E," Hicksville-Defiance Rd., 3.21 mi. grading, constructing bridges and culverts and paving with rein.-con., Turritan & Figley, Evansport, $84,489, Sect. "F," Hicksville-Defiance Rd., 2.04 mi. grading, constructing bridges and culverts and paving with rein.-con., Turritan & Figley, $53,300.

Delaware Co., Sect. "L," Columbus-Sandusky Rd., 6.18 mi., grading, constructing bridges and culverts and paving with bituminous macadam, S. C. Kissner & Sons, Delaware, $146,638; Dickerson & McNamara, Delaware, $147,633; rein.-con., H. P. Streicher & Co., 319 Terminal Bldg., Toledo, $191,435; Richard H. Shafer Co., Findlay, $191,900.

Fayette Co., Sect. "A," Columbus-Washington C. H. Rd., 5.01 mi., grading, constructing bridges and culverts and paving with waterbound macadam, Bean & Co., Highland, $99,792; Wilson Eng. & Constr. Co., Xenia, $102,646; P. D. Van Camp, Camp Denison, O., $103,137; bituminous macadam, P. D. Van Camp, and Fred M. Mark, Washington C. H., each $113,534.

Sect. "B," Columbus-Washington C. H. Rd., 3.68 mi., grading, constructing bridges and culverts and paving with waterbound macadam, P. D. Van Camp, and O. M. Junk, Chillicothe, $77,172 each; W. Huber, Tippicanoe City, $72,684; bituminous macadam, W. Huber, $80,264; P. D. Van Camp and O. M. Junk, $84,754 each.

Sect. "C," Columbus-Washington C. H. Rd., 4.11 mi., grading, constructing bridges and culverts and paving with waterbound macadam, W. H. Ringwald Sons Co., Chillicothe, $85,879; Neff & Rader, Circleville, $86,067; P. D. Van Camp, $87,219; bituminous macadam, Neff & Rader, $94,513; W. H. Ringwald Sons Co., $94,709; P. D. Van Camp, $95,664.

Guernsey Co., Sect. "I-1," Cambridge-Caldwell Rd., 1.26 mi., grading, constructing bridges and rulverts and paving with plain concrete, W. C. Peters, Marietta, $38,064; Sutton Constr. Co., Pikeville, Ky., $38,892; P. A. McIntyre, New Lexington, $39,053.

Sect. "I-2," Cambridge-Caldwell Rd., 3.13 mi., grading, constructing bridges and culverts and paving with plain concrete, W. C. Peters, $114,234; Sutton Constr. Co. $114,528; P. A. McIntyre, $114,822.

Hancock Co., Sect. "D," Lima-Sandusky Rd., 6.05 mi., grading, constructing bridges and culverts and paving with concrete, Johnson Constr. Co., Chicago, $187,561; Dorsey Constr. Co., Findlay, $190,382; bituminous concrete, Johnson Constr. Co., 38 South Dearborn St., $193,896; monolithic brick, Dorsey Constr. Co., $237,420.

Sect. Ottawa-Findlay and other roads, bituminous surface treatment, S. M. Billiter, Cincinnati, $12,317.

Henry Co., Sect. "A," Ottawa-Napoleon Rd., 3.01 mi., grading, constructing bridges and culverts and paving with rein.-con., Westrick Bros., Napoleon, $64,789; P. G. Watson, Malinta, O., $66,382.

Lake Co., Sect. "J," Chardon-Madison Rd., 2.33 mi., grading, constructing bridges and culverts and paving with rein.-con., Elas, Bates & Keiner, Madison, $58,514.

Logan Co., Sect. "C," Bellefontaine-Lima Rd., 1.27 mi., grading, constructing bridges and culverts and paving with rein.-con., Stone & Hole, $37,377; Hamilton & Bunger, Eldorado, $37,453; McHugh Bros., Springfield, $36,846.

Sect "E' Bellefontaine-Wapakoneta Rd., 3.22 mi., grading, constructing bridges and culverts and paving with rein.-con., Lewis & Copeland, Lima, $95,077; C. L. Straw, Paulding, $96,669; C. F. Smith, Dayton, $98,535.

Sect. "F," Bellefontaine-Wapakoneta Rd., 3.05 mi., grading, constructing bridges and culverts and paving with rein.-con., Lewis & Copeland, $117,009; R. H. Shafer Co., Findlay, $117,700; W. F. Payne, Springfield, $118,206.

Sect. "G," Bellefontaine-Wapakoneta Rd., 3.69 mi., grading, constructing bridges and culverts and paving with rein.-con., C. F. Smith, $113,267; Lewis & Copeland, $113,554; W. F. Payne and McHugh Bros., each $116,045.

Madison Co., Sect. "D-1," National Rd., 2.47 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Billiter & Connell, Dayton, $47,517, Hamilton & Bunger, Eldorado, $48,909; J. C. McCann, Columbus, $48,947.

Sect. "A-2," Columbus-Cincinnati Rd., 5.92 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Billiter & Connell, $146,856; W. M. Graham, Columbus, $152,295; Neff & Rader, $152,402.

Mahoning and Columbiana Counties, Sect. "P," West Unity-Salem Rd., 2.15 mi., grading, constructing bridges and culverts and paving with brick, J. D. Paxson, $93,510.

Montgomery Co., Sect. "N," Dayton-Indianapolis Rd., 2.67 mi., grading, constructing bridges and culverts and paving with rein.-con., Clifton Hoolihan, Dayton, $92,572; W. Huber, $94,348; Swank Eng. Co., Dayton, $97,292.

Sect. "N-2," Dayton-Indianapolis Rd., .38 mi., Clifton Hoolihan, $23,666; W. Huber, $23,766; Swank Eng. Co., $25,550.

Morgan Co., Sect. "H," McConnelsville-New Lexington Rd., 3.26 mi., grading, constructing bridges and culverts and paving with waterbound macadam, Beatrice & Keiner, Moxahala, $79,645.

Seneca Co., Sect. "Q," Lima-Sandusky Rd., 1.22 mi., widening roadway and paving with bituminous macadam, Stone & Hill, Lima, $13,996; J. W. Carey, Ada, $14,463; R. M. Myers, Attica, $14,512.

Sects "G" and "A-1," Upper Sandusky-Tiffin Rd., 4.28 mi., grading, constructing bridges and culverts and paving with bituminous concrete, H. P. Streicher Co., $155,682; Modern Constr. Co., $163,118; Highway Constr. Co., $156,829; bituminous

Streets and Roads (Continued)

concrete (A-2). H. P. Streicher Co., $150,-760; Modern Constr. Co., $157,244; brick, Modern Constr. Co., $163,842; bituminous macadam, Highway Constr. Co., $121,321; Modern Constr. Co., $129,818; W. H. & H. A. Souder, Fostoria, $127,783.

Trumbull Co., Sect. "A," Warren-Burton Rd., 1.16 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Gray Bros., Youngstown, $30,-425.

Sect. "C," Warren-Burton Rd., 2.21 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Seiple & Wolf Co., Youngstown, $73,772.

Sect. "D," Warren-Burton Rd., 3 mi. grading, constructing bridges and culverts and paving with bituminous macadam, Seiple-Wolfe Co., $111,317; Russell & Russell, West Austintown, $113,963. Noted July 3.

O., Cleveland—City received bids paving (a) West 19th St., (b) Franklin Ave., (c) Loretta Ave., (d) Scranton Rd., (e) Scranton Rd., (f) West 59th St., (g) West 30th St., (h) Scranton Rd., (i) Fidelity Ave., (j) Scranton Rd., from Roehl Bros., West 25th St. and Clark Ave., (a) $10,806, (f) $10,950, (g) $11,251, (i) $10,183; Baldwin Bros., 4500 Euclid Ave., (a) $10,894, (c) $18,677, (d) $22,900, (e) $23,010, (g) $11,237, (h) $20,700, (i) $10,000, (j) $19,-468; Freshwater Paving Co., 11,712 Detroit Ave., $10,924, (c) $18,052, (f) $10,846, (g) $11,351; Amer. Paving Co., Marshall Bldg., (b) $38,304; Cleveland Trinidad Paving Co., The Arcade, (b) $41,114, Rieley Bros., 357 The Arcade, (c) $18,795, (d) $22,950, (e) $23,600, (f) $10,960, (h) $21,-060, (i) $10,181, (j) $19,662; R. P. Burnett, Society for Savings Bldg., (d) $21,-009, (e) $22,700, (h) $20,080, (j) $19,078. Noted July 3.

Mich., Detroit—City received bids paving, (a) Harper Ave., Sect. 1, (b) Alley No. 1025, (c) Alley No. 1026, (d) Alley No. 1027, (e) Alley No. 1028, (f) Alley No. 1030, (g) Alley No. 1031, (h) Alley No. 1032, (i) Alley No. 1033, (j) Alley No. 1034, (k) Alley No. 1035, (l) Alley No. 1036, from W. B. Brady Constr. Co., 1972 Grand River Ave., (a) $23,489; Detroit Asphalt Paving Co., 20 McGraw Bldg., (a) $22,345; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a) $23,929; Liberty Constr. Co., Penobscot Bldg., (b) $7765, (f) $5509; T. E. Currie, 20 McGraw Bldg., (b) $7658, (f) $5525, (l) $4709; Otis Cement Constr. Co., 806 Hammond Bldg., (b) $7633, (c) $6939, (d) $6656, (e) $6942, (f) $5582, (g) $4255, (h) $2327, (i) $2647, (j) $2356, (k) $1638, (l) $5132; R. J. Powelson Co., 1577 Iriquois Ave., (c) $7012, (d) $6538, (e) $7024, (g) $4378, (h) $2417, (i) $2715, (j) $2414, (k) $1699, (l) $5132; Talbot Co., 400 Penobscot Bldg., (c) $6834, (d) $6859, (e) $7060, (g) $4219, (h) $2428, (i) $2713, (j) $2412, (k) $1597. Noted June 26.

Mich., Detroit—Dept. Pub. Wks. received bids paving (a) Kulick Ave., (b) Konkel Ave., (c) Kopernik Ave., (d) Canfield Ave., (e) Fairview Ave., (f) Griffin Ave., (g) Gladstone Ave., (h) Hurlbut Ave., (i) Harper Ave., (j) Platt St., from Detroit Asphalt Paving Co., 20 McGraw Bldg., (a) $20,000, (b) $17,181, (c) $30,174, (d) $6223, (e) $25,091, (f) $13,367, (g) $13,342, (h) $35,-330, (i) $25,955, (j) $6981; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a) $20,404, (b) $17,687, (c) $30,737, (d) $6462, (e) $25,862, (f) $13,685, (g) $13,-428, (h) $36,500, (i) $27,091, (j) $7107; W. B. Brady Constr. Co., 1972 Grand River Ave., (a) $20,467, (b) $17,596, (c) $30,881, (d) $6430, (e) $26,208, (f) $14,299, (g) $13,127, (h) $36,766, (i) $27,238, (j) $7145. Noted July 3.

★**Ill., Chicago**—Bd. Local Impvts. let contracts paving (a) alley between Lake St., Park Ave., Paulina and Hermitage Sts., (b) between Washington Blvd., Madison and Kilpatrick Sts. and Cicero Ave., (c) between East 65th St., Marquette Rd., Maryland and Cottage Grove Aves., (d) Augusta St., from Kedzie to Grand Aves., (e) Besley Court from West North Ave. to Wabansia St., (f) Ellen St. from Wood to Lincoln Sts., (g) La Crosse Ave. from West End to Park Aves., (h) North Racine Ave. from Grace St. to point 395 ft. north, (i) Shields St. from West 59th to West 58th Sts., (j) South Union Ave. from West 101st to West 102nd Sts., (k) West Walton St. from Keeler Ave. to Kilbourne St., (l) Wolfram St. from Ashland Ave. to Paulina St., (m) Pine St. from Division to Hirsch Sts., Crystal St., Potomac and Kamerling Aves., from Long Ave. to Central St., (n) South Richmond St. from West 63rd to West 67th Sts., South Sacramento Ave. from West 63rd to West 67th Sts., West 64th, 65th and 66th Sts. from Sacramento Ave. to Francisco St., (o) South Marshfield Ave. from Hermitage to Paulina Sts., Wood St. from West 72nd to West 74th Sts., Lincoln St. from West 71st to West 74th Sts., Winchester St. from West 71st to West 74th Sts., West 71st, West 72nd, West 73rd Sts. from Ashland Ave. to Robey St., to J. A. Ross & Co., 4561 Armitage Ave., (a) $1765; P. J. O'Brien, 29 South La Salle St., (b) $4544; J. Dillon & Co., 179 West Washington St., (c) $2686; Standard Paving Co., 29 South La Salle St., (d) $6737, (g) $5285; Marquette Constr. Co., 133 West Washington St., (e) $15,831; White Paving Co., 17 North La Salle St., (f) $9919, (l) $7535; Central Paving Co., 179 West Washington St., (h) $4904; Amer. Asphalt Paving Co., 133 West Washington St., (i) $5372, (k) $27,698, (m) $67,939, (n) $67,-939; Farr Bros. Co., 356 West 111th St., (j) $6809; R. F. Conway & Co., 133 West Washington St., (o) $244,020. Noted July 3.

★**Wisconsin**—State Highway Comn., La Crosse, let contract improving Prairie du Chien-Viroqua Rd., Crawford Co., Federal Aid Project No. 83, to T. Fulks, New Albion. Noted July 3.

★**Wisconsin** — State Highway Comm., Madison, will build Wonewoc-La Valle Rd., Sauk Co., Federal Aid Project No. 97. Work will be done by day labor with county forces. Noted July 3.

★**Wis., Black River Falls**—Jackson Co. let contract clearing and grubbing Black River Falls-Alma Center Rd., Federal Aid Project 84, to F. Sullivan, Black River Falls. About $24,000.

★**Wis., Delavan**—City let contract grading and paving 2.9 mi. Park and Center Sts., 20 ft. wide, involving 2000 sq.yd. vitr. brick and 21,350 sq.yd. concrete, to P. R. Birdsall Co., 1108 Park Ave., Racine. $22,500.

★**Wis., Kiel**—City let contract grading and paving 1.1 mi. Main St., 20 ft. wide, involving 9000 sq.yd. concrete, to F. Radloff, Plymouth, $12,750. Noted July 10.

★**Wis., Oshkosh**—Winnebago Co. let contract grading, surfacing with concrete and building concrete culverts on Oshkosh-Winneconne Rd., to Manager & McGucken, 332 Layton Bldg., Milwaukee, $111,000.

★**Wis., Racine**—Racine Co. let contract grading and concrete paving Jefferson St. and Milwaukee Rd., Waterford Twp., 18 ft. wide, to W. Koening Co., 2211 Grand Ave., Milwaukee, $52,250; 1.44 mi. Milmine Rd., Mt. Pleasant Twp., 18 ft. wide, to J. Cape & Sons Co., 468 Water St., Racine. $34,086. Noted June 26.

★**Wis., Racine**—Racine Co. let contract grading, paving with concrete and building concrete culverts on Racine-Rochester Rd., Dover Twp., to L. L. Tindall, Waterford, $36,487.

★**Wis., Sheboygan**—City let contract grading and paving 1.9 mi. East Water St. from Center Ave. to 5th St. and North 6th St. to Pennsylvania Ave., 20 ft. wide, to J. Braun Constr. Co., Pennsylvania Ave. About $20,000.

★**Wis., Sheboygan** — City let contract grading and paving 2.2 mi. North 10th St. from Superior to Geele Aves., 20 ft. wide, to Pestien & Nauman, North 15th St., Sheboygan, $29,790. Noted June 23.

★**Wis., Superior** — City let contract paving North 4th St. between Tower and Grand Aves., to J. Diffor, Superior, $21,860.

★**Ia., Creston**—City let contracts to Great Western Paving Co., Chicago, for 20,043 yd. sheet asphalt paving on 4 in. concrete base, at $3.37 per yd. and 16,510 ft. combined curb and gutter, 42 in. wide over all, at $1.60 per ft.; to Leckliter-Davis Constr. Co., Corning, 9387 yd. 3 in. brick asphalt paving on 5 in concrete base, $4.09 per yd. and 5000 ft. combined curb and gutter, 30 in. wide over all, heavy type, $1.60 per ft. Noted June 19.

★**Ia., Elliott**—City let contract to Mid-West Paving Co., Des Moines, for 26,.33 yd. asphaltic concrete paving on 4 in concrete base, at $3.17 per yd., 2050 ft. combined curb and gutter, $1.47 per ft. and 17,489 ft. $1.45, both 42 in. wide over all. Noted June 19.

★**Ia., Sidney**—City let contract for 38,000 sq.yd. vertical fiber brick pavement and 6700 ft. 10-24 in. storm sewers, to Agin & Fuller, Corning, $191,146. Noted June 19.

★**Ia., Tabor**—City let to Leckliter-Davis Constr. Co., Corning, for 21,688 yd. 3 in. brick paving, asphalt filler, on 4 in. concrete base at $3.91 per yd. and 7788 ft. combined curb and gutter, 42 in. wide over all, at $1.67 per ft. Noted June 19.

★**Ia., Villisco**—City let contract to Akin & Flutter, Corning, for 6300 yd. 3 in. brick paving, sand filler, on 4 in. concrete base, at $3.60 per yd., 26,000 yd. asphaltic paving on 4 in. concrete base, $3.15, 20,611 ft. combined curb and gutter, 42 in. wide over all, $1.40 per ft. and 3452 ft. 6 x 18 in. curb, $0.75. per ft. Noted June 19.

★**Kan., Wichita**—Sedgwick Co. let contract building Sect. A of Federal Aid Road Project No. 2, to C. W. Merydith, Eldorado, $131,407; Sect. B, Bickel Constr. Co., Interstate Bldg., Kansas City, Mo., (b) $159,710.

★**Neb., Omaha**—City let contract grading and repaving Dodge St., from 17th to 22nd Sts., 18th, 19th and 20th Sts., from Capitol Ave. to Douglas St., 36-60 ft. wide, to Condon & Bolen, 3634 South 26th St. About $130,000. Noted Apr. 17.

★**Neb., Omaha**—Comrs. Douglas Co. let contract paving 22nd St. from Izard to Clark Sts., 30-40 ft. wide, involving 7812 sq.yd. asphaltic concrete on 6 in. concrete base and 2700 cu.yd. earth excav., to Hugh Murphy Constr. Co., 204 Karbach Block, $21,242.

★**Neb., Omaha**—Comrs. Douglas Co. let contract grading 17 mi. Lincoln Highway from Fairacres to county line, 24 ft. wide, involving 80,665 cu.yd. earth excav. to J. E. Turner, 2922 Izard St., $80,854; 3842 lin.ft. of guard rail and 876 lin.ft. 18-48 in. concrete pipe culverts on same, to Central Bridge & Constr. Co., Wahoo, $7200. Noted June 12.

★**Mo., King City**—City let contract for 12,000 sq.yd. concrete paving on 6 in. concrete base, concrete curbing and guttering, to Reinert Bros. Constr. Co., 1208 North 5th St., St. Joseph. About $40,000. Noted June 19.

★**Mo., Mound City**—City let contract paving various streets, involving 9040 sq.yd. 6 in. concrete on concrete base and 6334 cu.ft. concrete curbing and guttering, to Reinert Bros., 1208 North 5th St., St. Joseph, at $2.61 per yd.

★**Tex., Bonham**—Comrs. Fannin Co. let contract improving 7.121 mi. Highway No. 5 from Ector to county line, 14 and 24 ft. wide, involving 420 cu.yd. concrete, 12,801 cu.yd. earth excav., 23,991 lb. reinforcing steel, 3.817 mi. road machine work, gravel surfacing, building drainage structures, etc., to J. W. Rooks, McAlester, Okla., $59,237.

Tex., Fairfield—Freestone Co. received lowest 3 bids improving 10.04 mi. Highway No. 7 from city limits of Teague to Limestone Co. line, 15 ft. wide, from McElwrath & Rogers, Corsicana, $74,285, T. J. Worthington, Corsicana, $80,667, Morneo-Burkem Co., St. Louis, Mo., $97,898. Noted July 3.

★**Tex., Houston**—Comrs. Harris Co. let contract improving 4.24 mi. Highway No. 12 from Main St. Blvd. to railroad crossing, to Smith & James, Houston, $21,572. Noted July 3.

Tex., Houston—Harris Co. received bids scarifying and rescarifying 7.41 mi. Houston-Crosby Rd., No. 1, 24 ft. wide, involving 300 ft. B. M. bridge lumber and 249 cu.yd. earth excav., from Miller & Johnson, Crosby, $16,112, S. A. Starkey, Houston, $21,017, Horton & Horton, McKinney and Velasco Sts., $21,320; building rein.-con. pavement, temporary bridge, etc., on 1.859 mi. Houston-Crosby Rd. No. 4, 16 ft wide, 5721.8 sq.yd. 1-1½-3 in. concrete and 2660 cu.yd. earth excav., from Houston Constr. Co., 518-19 Com'l Bank Bldg., Houston, $56,066, Horton & Horton, McKinney and Velasco Sts., $56,073.

Tex., Seymour-Baylor Co. received lowest 3 bids grading and building rein.-con. drainage structures on 12.35 mi. Highway No. 30 from point 3 mi. southwest of Seymour to west county line, 24 ft. wide, from A. A. Harrison, Seymour, $13,997, J. T. White, $14,644, Baylor Co., $14,915. Noted July 3.

Col., Pueblo—City received lowest bid for improving Lake Ave. Paving Dist., from Strange & Maguire, Utah Savings & Trust Bldg., Salt Lake City, Utah, $93,432.

★**Idaho, Caldwell**—City let contract for paving 33 blocks Cleveland Blvd., Kimball and other streets, bitulithic and asphaltic concrete, to Warren Constr. Co., Journal Bldg., Portland, Ore. About $50,000. Noted Feb. 6.

Wash., Seattle—Bd. Pub. Wks. received bids paving Railroad Ave., et al., involving 1960 sq.yd. brick block, on 8 in. base, and 200 sq.yd. wood block (a) with surface, (b) without surface, from S. A. Moceri, 1515 West Barrett St., (a) $13,163, (b) $12,313; Ficrito Bros., (b) $13,572; P. Nielon, (b) $14,383.

Streets and Roads (Continued)

★**Wash., Seattle**—Bd. Pub. Wks. let contract paving Boyer Ave., et al., to S. A. Moceri, 1515 West Barrett St., $67,593.

★**Wash., Vancouver**—Comrs. Clarke Co. let contract paving 4.5 mi. Pioneer-Ridgefield Rd., standard bitulithic, to United Contg. Co., Northwestern Bank Bldg., Portland, Ore., $92,090. Noted June 19.

Ore., Astoria—City received only bid paving 2nd St. from Astor St. to Spokane, Portland & Seattle R.R., bitulithic on 5 in. concrete base, from Miller & Bauer, Astoria, cost $7828; Grande Ave. from 29th to 33rd Sts., from H. Makela, Astoria, $6974. Noted May 29 and June 19.

California—State Highway Comn., Forum Bldg., Sacramento, received bids building (a) 2.8 mi. road between Freshwater Lagoon and Orick, Sect. J, Route 1, Div. 1, Federal Aid Project No. 16, Humboldt Co., (b) 7.9 mi. road between Last Chance Slide and Cushion Creek, Sect. B, Route 1, Div. 1, Federal Aid Project No. 17, Del Norte Co., from J. Wilmshurst, San Francisco, (a) $39,977; Mercer & Fraser Co., Eureka, (a) $41,760; A. J. Fairbanks, Willits, (a) $54,794, (b) $236,207; Palmer & McBridge, Hooker & Lent Bldg., San Francisco, (b) $199,840; W. A. Bechtel, 631 Market St., San Francisco, (b) $220,553. Noted June 19.

California—State Highway Comn., Forum Bldg., Sacramento, received lowest 3 bids building 9.4 mi. Sect. A, Route 16, Div. 1 state highway between westerly boundary and Lakeport, Lake Co., from A. J. Fairbanks, Willets, $131,790; Erickson & Peterson, Monadnock Bldg., San Francisco, $135,200; Grant, Smith & Co., Fernwell Bldg., Spokane, Wash., $139,520. Noted June 12.

★**California**—State Highway Comn., Forum Bldg., Sacramento, let contract building 9.7 mi. Sect. A, Route 16, Div. 1, State highway between Hopland and easterly boundary Mendocino Co., Mendocino Co., to J. P. Holland, San Francisco; Sect. A, Route 18, Div. 6, state highway between Merced and easterly boundary Merced Co., Merced Co., J. F. Lee, Tulare. Noted June 5.

Cal., Oakland—City received bids grading, curbing, guttering and paving (a) 87th Ave., (b) 86th Ave., (c) Hopkins, East 37th, Kingsley and Emerson Sts., from P. A. Belser, 625 Market St., San Francisco, (a) $12,093, (b) $14,980; Bates & Borland, Oakland Bank of Savings Bldg., (a) $14,910, (c) $12,538; Hutchinson Co., 444 17th St., (a) $15,056, (b) $16,012, (c) $12,-538; A. H. Kopperud, 2030 High St., (b) $16,115; Oakland Paving Co., 5000 Bway., (c) $12,762. Noted June 26.

Cal., Oakland—Comrs. Alameda Co. let contract grading, paving and building bridges on 22,174 ft. Alvarado-Centerville Rd., 18 ft. wide, to Bates & Borland, Bway, Ave. and 12 St., $156,010. Noted June 26.

★**Cal., San Diego**—A. H. Wright, city clk., let contract paving and improving Garnet St., Grand and Balboa Aves., to Fairchild-Gilmore-Wilton Co., 25 14th St., $61,493. Noted July 3.

★**Cal., Santa Ana**—Bd. Supervs. Orange Co. let contract building 3.6 mi. Santa Ana Canyon Rd., to S. Finley, Santa Ana, $36,-112. Noted June 19.

★**Que., Strathmore**—City let contract paving 10 mi. Lakesake, Dorval and Dixie Sts., waterbound macadam, to Brisbois & Laplaine, St. James St., Montreal, $41,500.

★**Ont., Vankleek Hill**—Town let contract building 2 mi. bituminous macadam road with concrete curbs, 20 ft. wide, to Sutherland & Grant, 339 Chapel St., Ottawa. About $28,000. Noted June 12.

★**Sask., Moose Jaw**—City let contract paving various streets to Moose Jaw Constr. Co., Moose Jaw, $16,390.

Railways

PROPOSED WORK

Ohio—Rapid Transit Comn., Cincinnati, plans to build rapid transit electric loop in September when Miami and Erie Canal will be drained within city limits. F. Krug, city engr., soon receives bids for 1st section, extending from Walnut to Charles Sts. About $1,000,000.

California—Atchinson, Topeka & Santa Fe Ry., Kerckhoff Bldg., Los Angeles, applied to City Council for authority to lay 20 mi. spur track to proposed plant of Goodyear Tire & Rubber Co., Los Angeles. G. W. Harris, ch. engr.

Excavation and Dredging

PROPOSED WORK

Fla., Kissimmee—Drainage. City voted $15,000 bonds to install drainage system.

Ariz., — Phoenix — Drainage — City had plans prepared for tile drainage system to reduce water level to 10 ft. or less below surface. About $100,000. Address A. Thompson, city mgr.

Ore., Baker—Ditch.—Baker Co. plans to extend Big Creek Ditch from 20,000 to 25,000 ft., to be known as Catherine Creek Extension. I. L. Hoffman, co. surv.

BIDS DESIRED

Mass., Lynn—Dredging—Until July 23, by Massachusetts Harbor & Land Comn., 473 State House, Boston, dredging 30,000 cu.yd. from Lynn Harbor and 15,000 cu.yd. from Saugus River. W. F. Williams, 473 State House, Boston, engr.

N. Y., Albany—Barge Canal Work—Until Aug. 12, by E. S. Walsh, supt. pub. wks., completing excavation of Champlain Canal, Sect. 2, between Crocker's Reef and Ft. Edward, Contr. No. 194; building substructure, superstructure and approaches of highway bridge over Erie Canal, Sect. 8, below Lock 28-A, Lyons, Contr. No. 198; completing 2 concrete bridges over Red Creek in Genesee Valley Park, Rochester, Erie Canal, Sect. 9, Contr. No. 144-A; advertised in this issue.

N. J., Jersey City — Dredging — Until July 22, by city, dredging and filling Howell St. dock on Hackensack River. About $15,000.

Colo., Alamosa—Drainage.—Until July 28, by Waverly Drainage Dist. No. 1, building drainage system. About $155,800. W. N. Martin, secy.

Cal., San Francisco — Excavation—See "Miscellaneous."

Que., Three Rivers—Channel—Until July 24, by Dept. Pub. Wks., Ottawa, dredging channel and basin in eastern outlet of St. Maurice River for Dominion Government. About $30,000. K. M. Cameron, Birks Bldg., Sparks St., Ottawa, engr.

Ont., Pickering — Excavation — Until July 21, by W. A. McLean, deputy minister highways, Parliament Bldg., Toronto, for steam shovel excavating required on east and westerly sides of Rouge Hill also at Eagle Hill, both in Pickering Twp. About $40,000. G. Hogarth, Parliament Bldg., Toronto, engr.

B. C., New Westminster Dredging—Until July 30, by Dept. Pub. Wks., Ottawa, Ont., dredging north arm of Fraser River, here. About $100,000. K. M. Cameron, Birks Bldg., Sparks St., Ottawa, engr. Noted July 10.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. C., Beaufort** — Drainage — Comrs. Carteret Co. let contract building 252 mi. of open ditch for draining 33,000 acres in D. D. No. 1, to Northwestern Drainage Co., Grand Rapids, Wis. About $330,000. Noted June 12.

★**Manitoba** — Canal, etc. — Dept. Pub. Wks., Ottawa, Ont., let contract building canal, stoplog dam and pile bridges for diversion of river into Lake Pelican, to Carter-Halls-Aldinger Co., 1010 Union Bank Bldg., Winnipeg, cost, $17,157 (unit prices.) Noted May 1.

Industrial Works

PROPOSED WORK

Mass., Clinton—L. S. Gottlieb, archt., 101 Park Ave., New York City, is preparing plans building 4 story, rein.-con., brick and steel mill. A. Braciner, 110 West 40th St., New York City, engr. Owner's name withheld.

Mass., Fall River—L. E. Danforth, 76 Dorrance St., Providence, R. I., soon receives bids building 1 story, 100 x 156 ft. garage, rein.-con., steel and brick, rein.-con. flooring and concrete foundation, on Main St. About $70,000. Private plans.

Mass., Springfield—Wason Mfg. Co., Brightwood, plans to build 2 story, brick and concrete addition to factory, here. About $100,000. Private plans.

R. I., Cranston—Providence P. O.—United Wire & Supply Co., Auburn, soon receives bids building 2 story, 100 x120 ft. and 50 x250 ft. brick and mill construction additions to factory. About $125,000. Perry & Whipple, 17 Exchange St., Providence, engr.

R. I., Providence—K. B. Ely, Boston, Mass., soon lets contract building auto sales building and service station on Reservoir St. W. R. Walker Son., 117 Custom House St., archts. Noted May 29.

Conn., New Britain—Adkins Printing Co., 66 Church St., plans to build addition to present printing plant. About $50,000. Architect not selected.

Conn., New Britain—Hart & Hutchinson Mfg. Co. plans to build 1 story, 77 x340 ft. factory, brick. About $70,000.

Conn., New Britain—Hart & Hutchinson Co., Corbin Ave., soon lets contract building 1 story, 77 x 340 ft. brick and steel factory addition. About $70,000.

Conn., Putnam—Mannasset Mfg. Co. soon receives bids building 2 story, 100 x 200 ft., brick and mill construction mill. About $125,000. Private plans.

N. Y., Alden — Village Bd. appointed W. B. Snyder, J. Simms and I. N. Chase, as committee, to obtain plans and estimates for water power developments and municipal lighting system. About $100,000. Engineer not selected.

N. Y., Johnson City—R. C. Pratt plans to build artificial ice plant, rein.-con. and brick. About $175,000.

N. Y., New York—J. S. Hannon, 445 West 16th St., soon receives bids building 2 story, 72 x 75 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 433-437 West 16th St. About $50,000. J. S. Maher, 431 West 14th St., archt. and engr.

N. Y., Rochester—Rosenberg Bros. & Co., 436 Portland St., plans to build 4 story, 55 x 299 ft. addition to clothing factory at Fashion Park, with 2 wings 36 x 73 ft. About $200,000.

N. Y., Rochester—Sargent & Greenleaf Co., Court St., plans to build brick factory covering 50,000 sq.ft. floor space. Cost between $150,000 and $175,000. Address W. H. Foxall, vice pres.

N. Y., Silver Creek—A. E. Baxter Eng. & Appraisal Co., archts., Ellicott Sq., Buffalo., soon lets contract building 3 story, 50 x 150 ft., rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, for S. Howes, Silver Creek. About $50,000.

N. J., Jersey City—Amer. Grocers Assn., 183 Morgan St., plans to build 5 story, 100 x 100 ft., rein.-con. warehouse on West Side Ave. About $150,000. F. Grad, 245 Springfield Ave., Newark, archt.

Pa., Shamokin—Hewesco Silk Co. soon receives bids building 2 or 3 story, 59 x 90 ft., rein.-con. and brick factory. W. H. Lee, 32 South 17th St., Phila., archt.

W. Va., Charleston—Pugh Furniture Co., 908 Kanawha St., plans to build 5 story, 41 x 253 ft. brick warehouse. About $75,000. H. R. Warne, Masonic Temple Bldg., archt.

N. C., Gastonia—Winget Yarn Mill Co. soon lets contract building 1 story, 125 x 276 ft. mill construction factory here. R. C. Beberstern, Charlotte, engr.

S. C., Columbia—Coca Cola Bottling Co., 1111 Gervais St., plans to build 2 story, 100 x 190 ft. bottling plant on block 1100 Main St. About $60,000. Engineer and architect not selected.

S. C., Rockhill—C. L. Cobb, A. Long and associates, c/o Peoples Natl. Bank, plan to build 3 or 4 story cotton mill. About $500,-000. Engineer and architect not selected.

Fla., Fountain—St. Andrew Bay Lumber Co., Millville, plans to establish plant here. About $150,000.

Fla., Millville—St. Andrew Bay Lumber Co. plans to improve plant. About $40,000.

O., Cleveland—Arjo Realty Co., 214 Williamson Bldg., having plans prepared by Lehman & Schmidt, archts., 210 Electric Bldg. for 2 story, 80 x 109 and 100 x 405 ft., concrete, steel and brick addition to factory, at 6545 Euclid Ave. About $250,-000. Noted July 10.

O., Cleveland—Cleveland Metal Products Co., 1141 Ivanhoe Rd., having plans prepared by G. S. Rider Co., archts. and engrs., 612 Century Bldg., for 1 story, 120 x 300 ft. addition to foundry; cost, $75,000; also 3 story, 72 x 266 ft. addition to machine shop, $75,000, both concrete, steel and brick. Noted July 3.

O., Cleveland—Chester Realty Co., Williamson Bldg., having plans prepared by Steffens & Steffens, archts. and engrs., 1029 Williamson Bldg., for 2 story, 55 x 120 ft., concrete, steel and brick garage, on East 65th St. and Carnegie Ave. About $50,000. Noted July 3.

Industrial Works (Continued)

O., Cleveland—Interlake Eng. Co., 203 Scotham Ave., plans to build 2 story, 45 x 80 ft. concrete, steel and brick addition to punch shop. About $75,000. Architect not selected.

O., Cleveland—Natl. Copper & Smelting Co., Rose Bldg., plans to build 3 story, 75 x 240 ft., concrete, steel and brick factory, on Babbitt Rd. and New York, Chicago & St. Louis R.R. About $25,000. Architect not selected.

O., Cleveland—Sixth City Realty Co., Guardian Bldg., having preliminary plans prepared by Grieble Eng. Co., engrs. and archts., 517 Sloan Bldg., for 4 story, 167 x 370 ft., concrete, steel and brick garage, on East 6th St. and St. Clair Ave. About $1,500,000. Noted July 3.

O., Dayton—C. L. McAdoo, 3rd and Canal Sts., plans to build 4 story, 40 x 120 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Garfield St. About $50,000. Architect not selected.

O., Dayton—J. C. Turner Novelty Co., Germantown St., plans to build 40 x 80 ft., addition to plant. About $50,000. Architect not selected.

O., Hamilton—City plans election soon to vote on $600,000 bonds to build electric light plant. F. Weber, city engr.

O., Troy—Hobart Mfg. Co. plans to build 30 x 106 ft. machine shop, 66 x 90 ft storage building and 50 by 80 ft. forge shop, all 1 story, steel and brick, brick foundation. About $75,000. J. Hobart, pres.

Ind., Anderson—Laurel Motors Corp. plans to build 1 story, 60 x 125 ft. concrete addition to plant on Sycamore St. C. E. Hayes, genl. mgr.

Mich., Muskegon—Continental Motors Corp., Jefferson Ave., E., Detroit, plans to build 2 story, 180 x 500 ft. engine factory and power plant. About $1,000,000.

Ill., Chicago—S. Birkenstein & Sons, Inc., 377 West Ontario St., having plans prepared by S. M. Eichberg, archt., 64 West Randolph St., for 4 story, 100 x 330 ft., rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, on Kingsbury St. and Chicago River. About $300,000.

Ill., Chicago—C. R. Francis, comr. pub. wks., soon lets contract building 1 story, 65 x 175 ft., brick, tile and timber garage and repair shop, concrete foundation, on 31st St. and California Ave., for Chicago Contagious Hospital. About $35,000. C. W. Kallae, 1019 City Hall, archt.

Ill., Chicago—Geraghty & Co., 3035 west Lake St., plans to build 3 and 4 story, 50 x 89 ft., brick and timber factory, concrete foundation at 3335 West Lake St., about $40,000. W. W. Ahlschlager, 133 West Washington St., archt.

Ill., Chicago—Grip Nut Co., 122 South Michigan Ave., having preliminary plans prepared by F. Brassert & Co., engrs., 122 South Michigan Ave., building 100 x 750 ft., rein.-con. factory, concrete foundation, rein.-con. flooring, on 59th St. and Western Ave. About $500,000.

Ill., Chicago—A. Heft, c/o W. W. Ahlschlager, archt., 133 West Washington St., having plans prepared for 2 story, 50 x 125 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Marshfield Ave. and Kinzie St. About $50,000.

Ill., Chicago—Library Bureau, 1735 Diversey Blvd., having plans prepared by Mundie & Jensen, archts., 39 South La Salle St., for 2 story, 250 x 300 ft., brick and timber factory, concrete foundation, on Homan and Potomac Aves. About $200,000.

Ill., Chicago—Sears Roebuck & Co., Arthington and Homan Aves., plans to build 5 story, rein.-con. and brick, paint factory, rein.-con. flooring, concrete foundation, on Kostner Ave. and Fillmore St. About $250,000. G. C. Nimmons & Co., 122 South Michigan Ave., archts.

Ill., Chicago—Sears, Roebuck & Co., Arlington and Homan Aves., having plans prepared by G. C. Nimmons & Co., archts., 122 South Michigan Ave., for 5 story, 125 x 127 ft., rein.-con., brick and stone addition to factory, rein.-con. flooring, concrete foundation. About $225,000.

Wis., Sheboygan—Amer. Leather Specialty Co., 1102 Wisconsin Ave., plans to build 2 story, 50 x 95 ft., brick, rein.-con and steel factory, brick foundation, on Michigan St. About $25,000. Architect not selected.

Wis., Sheboygan—Ford Motor Co., Highland Park, Detroit, plans to build 5 story, 250 x 50 ft., brick rein.-con. and steel factory, rein.-con. flooring, brick foundation, in Lake View Addition. About $200,000. Architect not selected.

Wis., Two Rivers—Juul & Smith, archts., Imig Bldg., Sheboygan, preparing plans for 2 story, 60 x 190 ft., rein.-con. and brick factory, brick foundation, on Main St. About $30,000. Owner's name withheld.

Ia., Sioux Falls—Hawkeye Mfg. Co., 2700 Floyd River Rd., plans to build 75 x 145 ft. addition to factory. About $30,000.

Minn., Minneapolis — Farwell, Ozmun, Kirk & Co., Fairfield Ave. and Water St., (scuth side) having preliminary plans prepared for 6 story, 110 x 300 ft., rein.-con. and brick addition to storage and distributing plant, rein.-con. flooring, brick foundation. About $200,000. Architect not selected.

Minn., St. Paul—C. Weinhagen & Co., 480 Jackson St., plans to build 4 story, 110 x 230 ft., rein.-con. and brick factory and office, on 14th St., near Pine St. About $200,000. C. Weinhagen, pres. Architect not selected.

Neb., Omaha—Sinclair Refining Co., 111 West Washington St., Chicago, Ill., having plans prepared by company's engineers building 102 x 132 ft. garage, 2 story, 100 x 160 ft., rein.-con. warehouse, machine shop, copperage and barreling plant, on 11th and Seward Sts., also series of service stations at various locations throughout city. About $250,000. W. T. Dinkins, 901-5 Woodmen of World Bldg., local mgr.

Mo., St. Joseph—Roberts Cone Co., 709 North 3rd St., plans to build 5 story, 100 x 140 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, on 3rd St. About $200,000. Architect not selected.

Mo., St. Louis—Laclede Investment Co., 5323 Ridge Ave., plans to build 7 story, 150 x 207 ft. fur storage building on 4th and Market Sts. Cost to exceed $100,000. N. R. Darragh, pres. Architect not selected.

Ore., Portland—E. H. Cahalin, 11th and Stark Sts., having plans prepared by F. M. White, archt., Chamber of Commerce Bldg., for 1 story, 100 x 115 ft., tile and brick garage, rein.-con. flooring.

Ore., Portland—Vick Bros., 264 North High St., plans to build 2 story, 100 x 100 ft., concrete and brick warehouse, rein.-con. flooring, concrete foundation, on East 3rd St. About $50,000. Architect not selected.

Cal., Porterville—City defeated $200,000 bond issue to build gas plant. Olmstead & Gillelen, 1112 Hollingsworth Bldg., Los Angeles, archts. Noted Mar. 20.

Ont., Kitchener—Dumart Bros., Kitchener, plans to build 3 story, rein.-con., steel and brick abattoir and packing plant, concrete foundation. About $75,000.

Ont., Stratford—Kindel Bed Co., 552 Ontario St., having plans prepared by J. Russell, archt., Downie St., for 3 story factory on Ontario St. About $100,000.

Ont., Walkerville—Auto Trimmings Co. preparing plans for 5 story, brick and concrete addition. About $80,000. F. Joyce, secy.

Ont., Walkerville—Peabody Mfg. Co., Ltd., Toronto, plans to build 4 story, rein.-con., textile factory. About $500,000.

Sask., Yorkton—Saskatchewan Co-operative Creamery plans to build cold storage plant. About $60,000.

Alta., Lethbridge—Town Council plans to build factory for the manufacture of soft drinks. Cost including machinery $60,000. W. D. Hardie, mayor.

BIDS DESIRED

Mass., Worcester—Until July 20, by J. J. Manifold, 3 Hawthorne St., building 1 story, 75 x 125 ft., brick garage on Webster St. About $25,000. E. T. Chapin, 340 Main St., archt.

Conn., Bridgeport—Salts Textile Mfg. Co., Kossuth St., is receiving bids building 2 story, 36 x 45 ft. brick, concrete and steel factory and office building, rein.-con. flooring and concrete foundation. About $25,000. Private plans.

O., Canton—McCormick Co., archts., Century Bldg., Pittsburg, Pa., receiving bids building 1 and 2 story, 120 x 209 ft., steel and brick bakery, concrete foundation, here, for Holland Bread Co., Toledo. About $100,000. Noted June 12.

O., Cleveland—A. C. Bishop, archt., 427 Guardian Bldg., receiving bids building 5 story, 118 x 120 ft., concrete, steel and brick factory, on West 46th St. and Train Ave., for Ko-Ko-Mar Co., Leader-News Bldg. About $50,000. Noted May 15.

Mich., Detroit—Until July 21, by Smith, Hinchman & Grylls, archts., 710 Washington Arcade, building 6 story, 156 x 581 ft., rein.-con., paint shop, rein.-con. flooring, concrete foundation, on St. Antoine and Piquette Aves., for Fisher Body Corp., Piquette Ave. Noted July 3.

Ill., Chicago—G. Johnson, 6817 Champlain Ave., receiving bids building 1 story, 125 x 125 ft., brick and timber garage, concrete foundation, at 6730 South Chicago Ave. About $25,000. A. G. Lund, 453 West 63rd St., archt.

Minn., Delano—Farmers' Co-operative Elevator Co receiving bids for 24 x 24 ft. grain elevator, 15,000 bu. capacity. About $30,000.

Ont., Toronto—Until July 25, by Northern Aluminum Co., 158 Sterling Rd., building 10 story, 60 x 280 ft., rein.-con. factory, rein.-con flooring, concrete foundation, at 158 Sterling Rd. About $300,000. C. A. P. Turner, 1005 Lindsay Bldg., Winnipeg, Man., engr. Noted July 3

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Cambridge**—Natl. Casket Co., East Cambridge, let contract building 3 story, brick and concrete store house and factory, to J. T. Scully Co., 185 Devonshire St., Boston. About $300,000.

★**Mass., Fall River**—Borden & Remington, 115 Anawan St., let contract building 2 and 4 story, brick addition to storehouse, to McNally Constr. Co., 84 North Main St. About $25,000.

★**Mass., North Adams**—Hoosac Worsted Mills, Brown St., let contract building 2 story, brick and concrete addition to factory on Brown St., to F. T. Ley & Co., 499 Main St., Springfield. About $125,000.

★**Mass., Springfield**—Springfield Fdry. Co., Indian Orchard, let contract building 1 story, 100 x 100 ft., brick and steel foundry, also 1 story, 40 x 50 ft. finishing building, to E. J. Pinney, 348 Main St. About $35,000.

★**Mass., Springfield**—W. A. Newton Co., 150 Birnie St., will build 1 story, 60 x 106 ft. warehouse and 1 story, 50 x 53 ft. carpenter shop. About $25,000. Work will be done by day labor.

★**R. I., Pawtucket**—New England Lace Co., Main and Thurston Sts., let contract building 1 story, 66 x 100 ft., brick, and 2 story, 30 x 50 ft., brick and steel factories, rein.-con. flooring and concrete foundation, to F. G. Rowley Co., Central Ave. About $30,000.

★**R. I., Pawtucket**—Solway Dyeing & Textile Co. let contract building 2 story, 100 x 105 ft., brick, weave shed, to F. G. Rowley Co., 260 Central Ave. About $50,000.

★**R. I., Westerly**—G. C. Moore Co. let contract building 1 story, 100 x 155 ft., brick, weave shed, to H. Wales Lines Co., 134 State St., Meriden. About $50,000.

★**Conn., East Norwalk (South Norwalk P. O.)**—Neptune Hardware Co., 66 Fort St., let contract building 2 story, 60 x 80 ft., brick and mill construction factory, to Tracy Bros. Co., 52 Bendict St., Waterbury. About $25,000.

★**Conn., Hartford**—S. K. F. Ball Bearing Co., 330 New Park Ave., will alter factory. About $25,000. Work to be done by day labor.

★**Conn., New Haven**—F. E. Fowler, 238 State St., let contract building 3 story, brick and steel addition to factory on State and Crown Sts., to Chatfield Bros., 175 Ellsworth Ave. About $60,000. Noted June 26.

★**Conn., New Haven**—Hygienic Ice Co., 881 State St., let contract building 1 story, 74 x 95 ft., brick and steel boiler and engine room, to Sperry & Treat Co., 39 Church St About $40,000.

★**Conn., New Haven**—Yale Tire & Rubber Co., 827 Elm St., let contract building brick and rein.-con. power house on Dixwell Ave., to C. W. Murdock, 185 Church St. About $30,000.

Industrial Works (Continued)

★**Conn., South Willington**—W. H. Hall let contract building 3 story, 60 x 100 ft., brick and mill construction bleachery, concrete foundation, to O. L. Willard, 240 Walnut St., Willimantic. About $45,000.

★**Conn., Stamford**—Lounsbury & Soule, 128 Broad St., let contract building 2 story, 50 x 100 ft., brick and mill construction factory, on Fairfield Ave., to G. H. Stadel, Shippan Ave. About $28,000.

★**N. Y., Black River** — Northern New York Utilities, Inc., Light & Power Bldg., Watertown, let contracts building rein.-con. power house for installation of three 3000 h.p. generating units, to Walsh Constr. Co., Davenport, Ia.; rein.-con. power dam and 2450 lin.ft. power canal, to Burns Bros. & Haley Bank Bldg., Watertown Total cost $600,000. Noted June 12.

★**N. Y., Buffalo**—Atterbury Motor Car Co. let contract building 1 story, 80 x 181 ft., brick and steel machine shop, concrete foundation, on Hertel Ave., to B. I. Crooker Co., Builders Exch. About $30,000, cost plus percentage basis. Noted July 3.

★**N. Y., Buffalo**—Cold Spring Storage Co., Main St., let contract building 7 story, 59 x 150 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, to Tifft Constr. Co., Iroquois Bldg. About $65,000. Noted June 26.

★**N. Y., Buffalo**—Rogers, Brown Iron Co., Erie Co. Bank Bldg., let contract building 1 and 2 story, 66 x 262 ft., rein.-con., brick and steel machine shop, rein.-con. flooring, concrete foundation, on Hamburg Turnpike, to J. W. Cowper Co., Fidelity Bldg., about $75,000. Noted June 26.

★**N. Y., New York**—C. H. Allen, 138 William St., let contract building 7 story, brick and steel warehouse, rein.-con. flooring, concrete foundation, at 119 Fulton St., to Crow Constr. Co., 103 Park Ave. About $75,000. Noted June 5.

★**N. Y., Potsdam**—Education Dept., Potsdam Normal School, let contracts building boiler house, general, to H. M. Weed, New York City, $42,300; heating, to H. J. Brandeles, 435 Lafayette St., Utica, $36,000. Noted July 3.

★**N. J., Newark**—Great Atlantic & Pacific Tea Co., 1st St., Jersey City, let contract building 3 story, 146 x 249 ft., rein.-con. warehouse, here, to Turner Constr. Co., 45 Milk St., Boston. About $200,000.

★**Pa., North East**—Twp. Supervs. let contract building 8000 ft. rein.-con. pavement, to C. Pianta & Co., Buffalo Rd., Erie Noted June 19.

★**Pa., Phila.**—Mac Paving Constr. Co. let contract building 3 story, 40 x 60 ft. asphalt paving plant, brick, on Niectown Lane and C St., to G. S Monaghan & Loose, 3016 Chestnut St.

★**Pa., Phila.**—Phila. Textile Machine Co., 6th St. and Tabor Rd., let contract building 1 story, 75 x 240 ft. rein.-con. addition to factory, to Hennebeque Constr. Co., 1170 Bway., New York City About $50,000.

★**Md., Baltimore**—Adelphia Garage Co., 2325 Callow Ave., let contract building 1 story, 120 x 240 ft., concrete and brick garage, rein.-con. flooring, concrete foundation, to Consolidated Eng. Co., 243 Calvert Bldg About $55,000.

★**Md., Baltimore**—Gardner Baking Co., 119 South Paca St., let contract altering and building 2 story, 43 x 54 ft. and 3 story, 24 x 56 ft., rein.-con., steel and brick additions to bakery on Preston St. and Madison Ave., to J. C. Mach, 3903 Calloway Ave. About $85,000, including machinery. Noted May 29.

★**Md., Baltimore**—Standard Brewing Co., 1766 North Gay St. let contract building 2 story, 60 x 200 ft., concrete and brick addition to its plant, rein.-con. flooring, concrete foundation, on Gay St. and Patterson Park Ave., to J. H. Miller, Inc., Miller Bldg., Eutaw and Franklin Sts. About $75,000.

★**Md., Baltimore**—C. M. Stieff Piano Co., 9 North Liberty St., let contract building 6 story, 25 x 165 ft., concrete, steel and brick warehouse and store, brick and concrete foundation, at 315 North Howard St., to C. L. Stockhausen Co., Gay and Water Sts. About $150,000 Noted Apr. 17.

★**Md., Frederick**—Price Bros., East Patrick St., let contract building 1 story, 37 x 160 ft. foundry and machine shop, to L. C. Culler, 231 South Market St. About $45,000.

★**O., Cleveland**—Apollo Tire & Rubber Co., 3962 East 93rd St., let contract building 2 story, 80 x 128 ft., concrete, steel and brick factory, to G. W. Hoffman, 3327 Broadview Rd About $30,000 Noted July 3

★**O., Cleveland**—Arno Realty Co. 211 Williamson Bldg. let contract building 2 story, 80 x 109 ft. and 100 x 105 ft., concrete, steel and brick addition to factory at 6545 Euclid Ave., to S. W. Emerson, 1900 Euclid Ave About $250,000 Noted July 10.

★**O., Cleveland**—Cleveland Illuminating Co., Illuminating Bldg. let contract building 1 story, 70 x 167 ft., rein.-con., steel and brick garage, at 6500 Cedar Ave., to F. Hauselman, Illuminating Bldg. About $60,000. Noted July 10.

★**O., Cleveland**—Cleveland Metal Products Co., 1141 Ivanhoe Rd., let contracts to Craig Curtiss Co., Guardian Bldg., for 1 story, 12 x 29 x 54 ft storage building, cost $60,000, and 3 story, 60 x 90 ft. addition to assembling room, $120,000, both rein.-con., steel and brick. Noted July 10.

★**O., Cleveland** Gabriel Mfg Co., 1407 East 40th St. let contract building 3 story, 40 x 151 ft., concrete, steel and brick addition to factory, to W. I. Thompson, 6110 Euclid Ave About $30,000 Noted July 10.

★**O., Cleveland**—H. E. Hedges, 428 Guardian Bldg., let contract building 1 story, 50 x 250 ft., concrete, steel and brick garage, rein.-con. flooring, at 2040 East 105th St., to C. R. Moody, 3240 Brinkley Ave. About $60,000. Noted July 10.

★**O., Cleveland**—Peerless Motor Car Co., East 93rd St. and Quincy Ave., let contracts to Masters & Mullen Constr. Co., Electric Bldg., for 3 story, 40 x 120 ft. addition to factory, cost $40,000, and 1 story, 45 x 160 ft. addition to assembling room, $25,000; both concrete, steel and brick Noted July 10.

★**O., Cleveland**—Theunor Norton Provision Co., 430 Erie Bldg., let contract building 3 story, 32 x 50 ft., concrete, steel and brick addition to factory, on West 65th St. and Stock Ave., to Commercial Constr. Co., 430 Erie Bldg About $30,000 Noted July 10.

★**O., Cleveland**—United Motors Co., East 40th St. and Prospect Ave., let contract building 2 story, 100 x 200 ft., rein.-con., steel and brick service and sales building, to Free Luce Land & Bldg. Co., Winton Hotel Bldg About $200,000. Noted July 3

★**O., Cleveland**—Vitreous Enameling Co., 6800 Grant Ave., let contract building 1 story, 90 x 120 ft., concrete, steel and brick factory, on East 71st St. and Grant Ave., to W. Dunbar Co., 8201 Cedar Ave About $35,000. Noted July 3

★**O., Dayton**—Dayton & Troy Auto Co., 2nd and St. Clair Sts., let contract building rein.-con. and brick garage and sales room, rein.-con. flooring, on 3rd St., near Bway., to H. R. Blagg Co., 1229 East 3rd St About $40,000.

★**O., East Liverpool**—P. Milliron let contract building 2 story brick garage and storage building, to Potters Lumber Co., East Liverpool. About $70,000

★**O., Sidney**—Wagner Mfg. Co let contract building 2 story, 50 x 80 ft. foundry and 3 story, 50 x 70 ft. machine shop, both steel and brick brick foundation, to U. S Structural Steel Co., 3rd and Main Sts., Dayton About $65,000.

★**Ind., Ft. Wayne**—Wayne Knitting Mills let contract building 4 story, 85 x 150 ft., brick and rein.-con. knitting mill, rein.-con. flooring, concrete foundation, to Indiana Eng. Co., 5280 Lincoln Life Bldg., Ft. Wayne About $120,000. Noted May 22

★**Ind., Indianapolis**—G. J. Tire Co., 549 East Georgia St., let contract building 1 story, 40 x 60 ft., brick and steel boiler house, rein.-con. foundation, to W. P. Jungclaus Co., 825 Massachusetts Ave. Cost about $300,000, including equipment. Noted May 22

★**Ind., La Porte**—S. Fox & Sons let contract building 3 story, 60 x 135 ft. mill construction woolen mills, to H. G. Christman Co., 302 Union Trust Bldg., South Bend. About $150,000.

★**Mich., Detroit**—C. B. Bohn Fdry. Co., Hart Ave., let contract building 1 story, 40 x 120 ft addition to core room and 30 x 30 ft. gas house, rein.-con., brick and steel, to C. H. Reisdorf, 753 Greenwood Ave. Noted May 8.

★**Mich., Detroit** — Timken-Detroit Axle Co., Clarke Ave., let contract building 30 x 300 ft., and 60 x 120 ft. factory buildings, to Austin Co., 16112 Euclid Ave., Cleveland, O., about $50,000.

★**Mich., Detroit**—Solomon Bros., c/o W. H. Adams, engr 12th floor, Vinton Bldg., let contract building 6 story, 130 x 950 ft. rein.-con. and brick terminal warehouse, asphalt wood block and rein.-con. flooring, concrete foundation, on Fort and Ferdinand Sts., to Walbridge-Aldinger Co., 2356 Penobscot Bldg. Noted July 3

★**Ill., Freeport**—Furst McNess Co., State Bank Bldg., let contract building 5 story, 75 x 160 ft., rein.-con. factory, to H. W. Horst & Co., Horst Bldg., Rock Island About $125,000

★**Wis., Sheboygan**—Natl. Box & Novelty Co., North 8th St., let contract building 4 story, 60 x 150 ft., brick, rein.-con. and steel factory, brick foundation, on 14th St and Kentucky Ave., to Verhulst Bros., Sheboygan About $38,000 Noted July 3

★**Wis., Two Rivers**—Hamilton Mfg. Co let contract building 4 story, 100 x 160 ft brick, rein.-con. and steel warehouse, brick foundation, on Main St., to W. W. Oetlem 136 Hanover St., Milwaukee. About $52,000

★**Ia., Des Moines**—F. M. Hubbell, Hubbell Bldg., let contract building 2 story garage on 11th and Walnut Sts., to J. F. Tusant & Son, 583 7th St About $60,000

★**Ia., Des Moines**—Northwestern Laundry Co., 107 Grand St., let contract building 3 story, 66 x 127 ft., rein.-con. and stone laundry, to A. Sugarman Constr. Co., 1214 Mulberry St About $60,000.

★**Neb., Omaha**—Nebraska & Iowa Steel Tank Co let contract building 1 story 122 x 233 ft., factory on 13th St. and Willis Ave., to Busk & Wind, 543 Ry Exch., Bldg About $65,000

★**Mo., St. Louis**—Valier & Spies Milling Co., 5036 Marcus Ave., let contract building 62 x 170 ft., concrete, steel and brick grain elevator at 5025 Marcus Ave., to J. Stewart & Co., 110 South Dearborn St Chicago About $75,000 Noted Feb. 20

★**Tex., El Paso**—Standard Grocery Co., 208 Mills St., let contract building 2 story, 120 x 130 ft., rein.-con. warehouse, to J. E. Morgan, 209 North Kansas St., $47,500

★**Tex., Houston**—Garrow, McClain & Garrow, Hermann Bldg., let contract building 2 story, 187 x 430 ft. corrugated iron and brick warehouse on Hill Ave. and Roanoke St., to Central Contg. Co., 523-525 Beatty Bldg About $50,000.

★**Ariz., Phoenix**—Arizona Packing Co let contract building packing plant, to consist of 4 story, 200 x 250 ft., rein.-con building and number of smaller buildings, on Temple Rd., to Packers Architectural Eng. Co., 431 South Dearborn St., Chicago About $500,000. Noted June 5.

★**Cal., Bakersfield**—J. Jameson let contract building 2 story, 122 x 150 ft., rein.-con garage, concrete foundation, on 22nd St. and Chester Ave., to Currie & Dulgar, Bakersfield. About $65,000. Kitchen & Amell, lessees Noted May 1

Cal., Caribou—Great Western Power Co 14 Sansom St., San Francisco, let contract building large power plant to Stone & Webster Co., 147 Milk St., Boston, Mass

Que., Buckingham—Electric Reduction Co. let contract building water power development here, to Foundation Co., Ltd., 224 St James St., Montreal About $30,000

★**Ont., London**—Holeproof Hosiery Co., 186 King St., let contract building 4 story, 200 x 289 ft., rein.-con. factory, rein.-con flooring, concrete foundation, on Bathhurst St to Stone & Webster Co. 142 Milk St., Boston, Mass About $300,000

★**Ont., Owen Sound**—See "Miscellaneous"

Buildings

PROPOSED WORK

Vt. Brattleboro—Hall and High School City plans to build hall and high school in honor of service men About $175,000 Address Soldiers and Sailors Memorial Bldg Assn

Mass., Greenfield—Business—G. W. Wilcox, Federal St., plans to build 3 story business building. About $50,000. Private plans.

Mass., Lexington—School—Town appropriated $75,000 to build school on Bedford St Address J. W. Swan, clk

Mass., Worcester — Houses — Worcester Housing Corp. soon receives bids building sixty 2 story brick workmen's houses on 4 sites About $250,000 J. D. Leland 7 Water St., Boston, archt

R. I., Providence—Temple Knights of Pythias plan to build new temple About $100,000 Address R. Kellogg, Grand Chancellor Providence

Buildings (Continued)

Conn., East Hartford (Hartford P. O.)—High School—Town plans to complete unfinished rooms in new High School on Chapman St. About $50,000. P. S. Bryant, 847 Main St., Hartford, comr. Architect not selected.

Conn., Glastonbury—School—Town plans to build two 1 story brick schools. About $55,000. W. H. McLean, 110 Tremont St., Boston, archt.

Conn., Groton — School — Town having plans prepared building 1 story, 65 x 100 ft., concrete, steel and brick. About $50,000. Bilderbeck & Langdon, Inc., Barrows Bldg., New London, archts.

Conn., Hartford—School—City having plans prepared building 3 story addition to A. E Burr School on Wethersfield Ave., rein.-con., steel and brick, rein.-con. flooring and concrete foundation. About $125,000. Whiton & McMahon, 36 Pearl St., archts.

Conn., Hartford — School Buildings — South School Dist. having preliminary plans prepared by Whiton & McMahon, archts., 36 Pearl St., building 2 story brick addition to school on Wethersfield Ave. R. S. Winsella, chn.

Conn., New Britain—School—City plans to build school in western section. About $200,000. Architect not selected.

Conn., New Haven—Laboratory—State Bd. Health, Capitol, Hartford, plans to build laboratory on Huntington St., here. About $100,000. Architect not selected.

Conn., New London—Synagogue—Ohev Sholum congregation soon lets contract building 2 story, 40 x 82 ft., brick, rein.-con. flooring and concrete foundation on Bliuman St. About $50,000. Reuben Lubschansky, North Main St., pres

Conn., Plainville—Store—Birnbaum & Menus, 66 Arch St., New Britain, having plans prepared building store, here. About $50,000. C. C. Palmer, 272 Main St., New Britain, archt.

Conn., South Manchester—Bank—Manchester Trust Co., 1907 Main St., plans to build brick and stone bank. About $60,000. Architect not selected.

Conn., Torrington—Business—Torrington Bldg. Co., 197 Water St., plans to build modern business building. About $60,000.

Conn., Torrington—Church—St. Peter's R. C. congregation plans to build superstructure, basement already in. About $60,000. Address J. De Michael, 58 High St. Architect not selected.

Conn., Warehouse Point—Home—Hartford County Home, Hartford, having plans prepared building addition, including new school, hospital, heating plant and dormitory. About $200,000. M. J. Unkelbach, 182 Main St., New Britain, archt.

Conn., West Hartford—High School—Town having plans prepared by W. T. Marchant, archt., 36 Pearl St., Hartford, building 2 story, 100 x 100 ft., brick, steel and concrete, on South Main St. About $100,000. Noted Jan. 2.

Conn., Willimantic—Clubhouse—Knights of Columbus, 751 Main St., plan to build 2 story clubhouse, on Pleasant St. About $50,000. Architect not selected.

N. Y., Geneva — Bank — Geneva Trust Co. had plans prepared by A. C. Nash, archt., 345 5th Ave., New York City, for 3 story, concrete, brick and terra cotta. Cost between $150,000 and $175,000.

N. Y., Herkimer—School—Bldg. Com. of Ed Educ. plans election to vote on $220,000 bonds to build school. Address R. D. Moore, chn.

N. Y., Lockport — Bank — Natl Exch Bank having plans prepared by P. A. Davis, archt., 1713 Sansom St., Phila., for 1 story, 50 x 60 ft., steel and stone. About $150,000.

N. Y., New York—Hotel—Allerton House Corp., 143 East 39th St. having plans prepared by A. L. Harmon, archt., 3 West 29th St., building 16 story, 100 x 200 ft., brick, steel and stone, brick foundation, at 551-553 Madison Ave About $1,000,000 Noted May 22.

N. Y., New York—Office—H Phipps Estate, 787 5th Ave., having preliminary sketches drawn by Warren & Wetmore, archts. and engrs., 16 East 47th St., for 3 story office building, on 46th St. and Madison Ave

N. Y., New York—Office—Post & Flagg, 28 Wall St., having plans prepared by G. B. Post & Son, archts., 101 Park Ave., building 6 story, 50 x 100 ft., brick, steel and stone, brick foundation, at 49-51 Broad St.

N. Y., Norwich—High and Ward Schools and Library—City voted $275,000 bonds to build high and ward schools and library. Tooker & Marsh, 101 Park Ave., New York City, archts.

N. Y., Oneida — Theatre — M. J. Kallett purchased site at 77 Main St. and plans to build 2 story, concrete and brick, to seat 1500 persons. About $100,000.

N. Y. Rochester — Firehouse and School—C. A. Poole, city engr., soon receives bids building 2 story, 40 x 75 ft., on Ridge Rd. and Woodside St., cost, $75,000; 2 story, 40 x 70 ft. on Clifford Ave. and 6th St., $60,000; also brick addition to J. Walton Spencer School on Post and Congress Aves., $40,000.

N. Y., Rochester — Temple — Masonic Temple Assn. plans to build 2 story addition. Cost between $150,000 and $200,000. Address F. C. Malling, pres.

N. Y., Schenectady—Theatre—M. Spiegel, Strand Theatre Bldg., New York City, soon lets contract altering exterior and interior of 2 story brick, steel and stone theatre, here. About $100,000. De Rosa & Pereira, 110 West 40th St., New York City, archts. Noted June 26.

N. Y., Troy—Armory—State Armory Comn., Telephone Bldg., Albany, had plans prepared for brick armory, fireproof flooring, concrete foundation, to consist of 2 story, 50 x 180 ft. administration building and 192 x 206 ft. drill shed. About $475,000. L. F. Pilcher, Capitol, Albany, state archt.

N. J., Phillipsburg—Hospital—Warren Co. Memorial Hospital Assn. plans to build hospital. About $185,000. Address H Swern, c/o Berlin-Swern & Randall.

N. J., Trenton — Church and Sunday School—St. Paul's Methodist congregation c/o Sutphin, 3-7 Spring St., having plans prepared by G. E. Savage, archt., Witherspoon Bldg., Phila., for 1 to 3 story, 52 x 115 ft., on Fishers Pl., here. About $60,000.

N. J., Westfield—Bank—Peoples Bank & Trust Co. plans to build bank on Elm St About $50,000.

Pa., Darby — Station — Darby Terminal R.R., having sketches drawn by W. W. Potter, archt., Real Estate Trust Bldg., Phila., building 3 story, 25 x 85 ft., brick. About $50,000.

Pa., Harrisburg—Church—Grace M. E. congregation having plans prepared for altering brick, steel and stone church About $55,000. W. S. Stoddard, 9 East 40 St., New York City, archt.

Pa., Norristown — Bank — Pennsylvania Trust Co. soon receives bids altering interior of 4 story building. About $50,000. Simon & Simon, 249 South Juniper St., Phila., archts.

Pa., Phila.—Bank—Union Natl. Bank, 3rd and Arch Sts., having plans prepared and will receive bids in August building 3 story, 60 x 75 ft., concrete and stone. About $100,000. J. T. Brugger, 505 Chestnut St., archt Noted July 3.

Pa., Phila.—Church, etc.—St. George's congregation, Venango and Richmond Sts., having plans prepared by Fieldstein & Schaef, archt., 1328 Chestnut St., building 3 story, 52 x 92 ft., brick and stone. About $50,000.

Pa., Phila.—Ward—Methodist Episcopal Hospital, Broad and Ritner Sts., having plans prepared by H. W. Castor, archt., 21 South 12th St., for 5 story, 80 x 135 ft., private ward building, brick or stone. Cost to exceed $50,000.

Pa., Pottstown—Memorial—Hill School Alumni Associates having plans prepared and will receive bids in August building 2 story, 48 x 120 ft., concrete and brick hall and library on High St. near Madison St. About $100,000. Hewitt & Ash, 520 Walnut St. Phila., archts. Noted Mar. 6.

Pa., Williamsport—Schools—E. L. Taylor, pres. Bd. Educ., receives bids about July 27, building 2 two story, 150 x 200 ft brick, steel and rein.-con., one on Wayne Ave. and Newberry St. and another on site of Curtin Bldg., north of Braden Park About $150,000 each. E. E. Joralemon, 547 Franklin St., Buffalo, N. Y., archt.

Md., Baltimore—Hotel—Hotel Caswell, Baltimore and Hanover Sts., plans to add 2 or 3 stories to present structure and build 35 x 250 ft., concrete, brick and steel addition, concrete foundation. About $750,000. H. Busick, mgr.

S. C., Charleston—Citadel—Military College of South Carolina, Charleston, has acquired 40 acre site at Hampton Park and plans to build citadel; first unit consisting of two 3 story buildings to be used as barracks and class room; other buildings to be erected later. Project involves grading, draining and landscape work. State Legislature appropriated $800,000 for entire project. J. P. Thomas, Jr., Charleston, chn. bd. of visitors. Lockwood, Greene & Co., Healy Bldg., Atlanta, Ga., archts. and engrs Noted Feb. 27.

Ga., Milledgeville—Home—Bd. Trustees Georgia State Sanitorium rejected bids building nurses home on grounds of institution. A. T. Brown, Forsyth Bldg., Atlanta, archt. Noted June 19.

Tenn., Blountville—Court House—D. A. Barger, chn. bldg. comn., receives bids about Aug. 4 building rein.-con. and brick, here, for Sullivan Co. About $50,000. T. S. Brown, Bristol, Va., archt.

Ky., Louisville—Seminary, etc.—Southern Baptist Theological Seminary, 729 South 5th St., acquired site on Brownsboro Rd., near Reservoir Park, and plans to build seminary, to include lecture hall, president's office, chapel, library, administration building, 2 dormitories, gymnasium, commons and power house, etc. Project also includes driveways, recreation fields, etc

O., Akron—School—Bd. Educ. receives bids about Aug. 1, building 3 story, 100 x 200 ft., rein.-con., steel and brick, on Diagonal Rd. About $260,000. T. R. Ridley, Cottage Pl., archt.

O., Canton—School Bd. Educ. plans to build 2 story, 114 x 200 ft., concrete, steel and brick, on 16th and Vine Sts. About $200,000. Architect not selected.

O., Cincinnati –Hopital—Jewish Hospital plans to build maternity hospital on Burnet Ave. About $150,000.

O., Cleveland—Commercial—Paul Bros., Citizens Bldg., plan to build 3 story, 54 x 189 ft., concrete, steel and brick addition, at 1938 Euclid Ave. About $60,000. Architect not selected.

O., Cleveland—Office—Cleveland Metal Products Co., 1111 Ivanhoe Rd., having plans prepared by G. S. Rider Co., archts and engrs., 612 Century Bldg., for 1 story 60 x 200 ft., concrete, steel and brick addition About $50,000. Noted July 3

O., Cleveland — Theatre — Addison Sq. Investment Co., Addison Rd. and Wade Park Ave., plans to build 3 story, 100 x 200 ft., rein.-con., steel and brick. About $100,000 Architect not selected.

O., Dayton—Business—S. Frank and C. Weisman, 6th and Ludlow Sts., plan to build 3 or 4 story, 80 x 130 ft., rein.-con. and brick, on South Ludlow St. About $100,000. Architect not selected.

O., Dayton—Church—Westminster Presbyterian congregation, 3rd and Ludlow Sts., plans to build church. About $300,000 Architect not selected.

O., West Park — Schools — Bd. Educ. having plans prepared by P. T. Cahill archt., 631 Hippodrome Bldg., Cleveland, for 2 story, 26 x 48 ft., on Settlement Rd., cost $50,000; 2 story, 36 x 80 ft., on Longwood Ave., $50,000; all 2 story, 90 x 90 ft., high school on Riverside Ave., all concrete steel and brick. Noted July 10.

Mich., Cadillac—Church—First Methodist congregation having plans prepared by W. E. N. Hunter, archt., 1306 Chamber of Commerce, Detroit, building 1 story, 80 x 80 ft., brick, brick and concrete foundation. About $50,000.

Mich., Ferndale (Royal Oak P. O.)—School—School Dist No. 9 soon lets contract building 2 story, 138 x 143 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Elsinore Ave. G. J. Haas, 1514 Kresge Bldg., Detroit, archt. Noted June 5.

Mich., Flint—Bank and Office—Hodgson Bros., archts., c/o A. G. Bishop, Flint, soon let contract building 10 story, 44 x 120 ft., brick, steel and stone, concrete foundation on Saginaw and Kearsley Sts., for Genesee Co. Savings Bank.

Mich., Flint—Home—Genesee Co. soon lets contract building 2 story, rein.-con., brick and steel juvenile detention home, concrete foundation. About $160,000. G. H Swift, 105 Armory Bldg., archt.

Buildings (Continued)

Mich., Highland Park (Detroit P. O.)—School—Bd. Educ., Gerald Ave., having plans prepared by W H Adams and Butterfield & Butterfield, archts and engrs., Vinton Bldg., Detroit, building 2 story, rein.-con. and brick addition to Willard School, rein.-con. flooring, concrete foundation, on Hamilton Blvd. and Waverly Ave. About $300,000.

Mich., Jackson—Hospital—Jackson Co. soon receives bids building 4 story, 46 x 145 ft., rein.-con., brick and steel, concrete foundation. About $90,000. E F. Stevens c o H. B. Neagle, archt

Mich., Marquette—School—State Normal College having plans prepared by Smith, Hinchman & Grylls, archts., 710 Washington Arcade, Detroit, building 3 story, rein.-con., brick and steel, training school.

Mich., St. Clair — School — Bd. Educ. having plans prepared by Perkins, Fellows & Hamilton, archts., 814 Tower Court, Chicago, for 2 story, brick and timber, rein.-con. flooring, concrete foundation, here. About $150,000.

Ill., Moline—Bank—Whitsitt & Schulzke, archts., 610 People's Bank Bldg., receives bids about July 22, building 1 story, 40 x 100 ft., rein.-con. and cut stone, on 5th Ave. and 16th St., for Fifth Ave. Trust & Savings Bank. About $70,000.

Ill., Moline—School—Whitsett & Schelzke, archts., 610 People's Bank Bldg., soon let contract building 1 story, 100 x 128 ft., brick, on 16th Ave. and 25th St., for Bd. Educ About $80,000.

Ill., Rock Island — Theatre — Cervin & Horn, archts., 310 Safety Bldg., receive bids about Sept. 15, building 90 x 150 ft., rein.-con., on 19th St and 3rd Ave. for Rosenfield-Hopp Co. About $250,000.

Wis., Manitowoc — Club — Knights of Columbus, c/o P. A. Miller, 8th and Commercial Sts., plan to build 2 story, 100 x 110 ft., brick and tile, brick foundation, on 9th and York Sts. Cost between $50,000 and $60,000. Architect not selected.

Wis., Thiensville—School—School Bd., c/o L. Kieker, plans to build 1 story, 110 x 200 ft., rein.-con. and brick, concrete foundation, on Main St. About $70,000. Architect not selected.

Ia., Belle Plaine—Church—Methodist Congregation having plans prepared by Liebbe, Nourse & Rasmussen, archts., 524 Utica Bldg., Des Moines, building 2 story church. About $50,000

Ia., Clinton—Academy Our Lady of Angeles Academy plans to build addition About $200,000.

Ia., Clinton—Hospital—Jane Lamb Memorial Hospital having plans prepared by Schmidt, Garden & Martin, archts., 104 South Michigan Ave., Chicago, building 4 story, 38 x 133 ft., brick and rein.-con. addition, rein.-con. flooring. About $200,000.

Ia., Storm Lake- Gymnasium—Buena Vista College plans to build gynasium. About $50,000. W. C. Edson, chn. bd. dirs.

Ia., Whiting—School—Bd. Educ. voted $150,000 bonds to build school.

Minn., Bemidji—School—H White, clk. School Bd. Dist. No. 18, receives bids about July 28, for 2 story, 38 x 59 ft. consolidated school. About $52,000. Roberts & Funk, 1st Natl. Bank Bldg., archts.

Minn., Bemidji—Store and Lodge—Odd Fellows plan to build 2 or 3 story, 50 x 140 ft., on Beltrami Ave. and 5th St. About $75,000. Architect not selected.

Minn., Chisholm—Grade School — Bd. Educ. having plans prepared by W. T. Bray, archt. and engr., Torney Bldg., Duluth, for 2 story, 100 x 120 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation About $200,000

Minn., Cloquet—City Hall and Jail—City voted $50,000 bonds to build city hall and jail. J. A. Parks, clk.

Minn., Duluth—Y M C A having plans prepared by German & Jenson, archts., Exch. Bldg., for 3 story, 125 x 140 ft., concrete and brick building, rock foundation, on North Central Ave., near Grand Ave About $100,000.

Minn., Eveleth—Library—City plans to build addition to library Cost between $50,000 and $60,000 C H Williams, clk. Architect not selected

Minn., Gilbert—Schools—School Dist. No. 18, St Louis Co., having plans prepared by W. T. Bray, archt., Torrey Bldg., Duluth, for 2 story, 51 x 71 ft., in Malta location, cost, $55,000; 3 story, 49 x 77 ft. in Hutter location, $75,000.

Minn., Harney — School — Bd. Educ., School Dist No 1, having plans prepared by E. F. Broomhall, archt., 710 Alworth Bldg., Duluth, for 3 story, 69 x 100 ft., brick and steel, in Sect 27.

Minn., Hibbing —Office—T. C. Congdon, 401—3rd Ave., receives bids about July 24, for 2 story, 80 x 125 ft., brick and hollow tile, on Howard St About $60,000

Minn., Minneapolis — Bank and Office—Minneapolis State Bank plans to build 12 story, rein.-con. and brick, rein.-con flooring, rock foundation, on Nicollet Ave. and Lake St. About $1,000,000 Architect not selected

Minn., Minneapolis — Exposition — Minneapolis Automobile Trade Assn. having tentative plans prepared improving old exposition building on 1st Ave., S. E. and 2nd St., for quarters for annual exposition. About $100,000 Architect not selected.

Minn., Minneapolis—Hotel—J. H. Davidson, 723 Plymouth Bldg., having plans prepared for concrete and steel, on 1st Ave., N., and 7th St. About $400,000. Architect not selected

Minn., Moose Lake — Grade School — Bd. Educ. rejected bids received June 16, building 2 story, 62 x 90 ft., brick. About $50,000. F. A. Schweiger, Moose Lake, archt. Work will be readvertised. Noted June 12.

Minn., St. Paul—Office—See "Industrial Works."

Minn., Tyler—Hotel—City plans to build 40 room hotel. About $60,000. P. H. Theissen, clk. Architect not selected.

Kan., Ft. Dodge—Home—State having plans prepared by R. L. Gamble, archt., Topeka, for 2 story, 40 x 51 ft., rein.-con., steel and brick, Soldiers' Home, with 2 wings 35 ft. long, rein.-con. flooring, concrete foundation. About $75,000.

Kan., Hutchinson—Hotel E. Colson having plans prepared by W. E. Hulse & Co., archts., Hutchinson, for 6 story, 60 x 150 ft., rein.-con. steel and brick, rein.-con. flooring, concrete foundation. About $100,000.

Kan., Hutchinson—Theatre—R. E. Johnson having plans prepared by W. E. Hulse & Co., archts., Hutchinson, for 1 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $100,000.

Kan., Ness City—School—Bd. Educ. plans to build 2 story school. Bonds for $55,000 voted for project. Architect not selected.

Kan., Osage City—Church—First Presbyterian congregation having plans prepared by W. E. Hulse & Co., archts., Hutchinson, for 2 story, rein.-con., steel and brick, rein.-con. flooring and concrete foundation. About $50,000.

Kan., Pleasanton — School —Bd. Educ. soon receives bids building 2 story, 72 x 84 ft., concrete, steel and brick, concrete foundation. About $53,000 H. R Primmer, Nevada, Mo., archt

Neb., Blue Springs—School—Bd. Educ. voted $50,000 to build school here.

S. D., Winner—Court House—Tripp Co. plans election in September to vote on $150,000 bonds to build court house.

N. D., Bismarck —Club House—Knights of Columbus having plans prepared building 5 story, brick. About $150,000, $100,000 now available for project.

Mo., Mexico—Dormitory Academic, Hospital, etc.—Hardin College plans to construct five 1 to 3 story buildings on campus, to include dormitory, academic building, hospital, observatory and heating plant About $260,000 J. W Million, pres

Mo., St. Louis—Temple—Masonic Temple Assn., Grand St and Finney Ave., having plans prepared by W B Ittner, archt., Bd. of Educ. Bldg., for 302 x 325 ft., on Grand and Lindell Sts About $1,000,000 K Versburg chn bldg comm Noted Apr 10

Wash., Seattle — Engineering School — Seattle Eng School, 100 West Roy St., plans to build 3 story 165 x 246 ft., masonry gas engine building and garage, rein.-con flooring, on Queen Anne Hill Plans include workshop, gas engine department, boiler rooms, etc About $135,000 S D Ford Lyon Bldg., archt

Ore., Heppner — Lodge Hall — B P O E. of Heppner plans to build 2 story brick About $50,000 I V Bennes, Chamber of Commerce Bldg Portland, archt

Cal., Glendale—School—City election July 24, to vote on $100,000 bonds to build school on Bway., and 3 small kindergarten bungalow on other sites Architect not selected.

Cal., Long Beach—Auditorium and Community Hall, etc —City defeated $1,400,000 bond issue to build auditorium, community building and city hall Noted June 19

Cal., Los Angeles -Store Bullock's Dry Goods store purchased 150 x 150 ft site adjoining present store on 7th and Hill Sts. and plans to build addition. Architect not selected

Cal., Marysville—Hotel—C. W Burrell, archt., 1st Trust Bldg., Oakland, soon receives bids building 4 story, 119 x 150 ft., rein.-con. and brick, here, for Coyt Investment Co., 306 14th St., Oakland About $250,000

Cal., Oakland — Store — Kahn's Dept. Store plans to build addition to store on 16th St. and Bway. Cost between $250,000 and $800,000. Architect not selected.

Cal., Pasadena—High School—Bd. Educ Chamber of Commerce Bldg., having plans prepared by J. C. Austin, archt., 1125 Baler-Detwiler Bldg., Los Angeles, for group of buildings for athletic field at high schoo to include 100 x 160 ft. gymnasium, locker and dressing rooms, etc.

Cal., Pomona—Institution Trustees of Pacific Colony, 2019 West Washington St., Los Angeles, having plans prepared by W. F. McClure, state archt., Forum Bldg., Sacramento, building Institution for Feeble-Minded on Valley Blvd, here. About $100,000. Noted Dec. 5.

Cal., Sacramento — Bank - Sacramento — Fort Sutter Bank plans to build bank on 7th and K Sts. About $1,000,000. Weeks & Dak, Phelan Bldg., San Francisco, archts.

Nova Scotia—Lighthouse—Dept. Marine & Fisheries, Ottawa, Ont., had surveys made building rein.-con. and steel, rock foundation, on Gannet Rock Island, here About $90,000. B. H. Fraser, c o Dept. Marine & Fisheries, engr.

Ont., Kitchener — House of Refuge — Waterloo Co. having plans prepared by C. Knechtel, archt., Courtland Ave., building 2 story, concrete, brick and timber, concrete foundation. About $60,000.

Ont., Niagara Falls—Schools—School Bd having plans prepared by C. M. Borter, archt., 102 Main St., building two 3 story, 66 x 100 ft., brick and steel, concrete foundation. About $50,000 each

Ont., Oshawa — Church — St George's congregation plans to build 1 story, stone About $95,000. Architect not selected.

Ont., Toronto — Hospital — City having plans prepared by W. H Pearse, archt., City Hall, building 2 story, reception hospital, brick. About $100,000.

BIDS DESIRED

N. Y., Ithaca—Laboratory—Until July 24, by C. D. Bostwick, compt., New York State College of Agriculture, Cornell University, building laboratory; advertised in this issue

N. J., Camden—Bank—Central Trust Co., 4th and Federal Sts., receiving bids for 1 story, 58 x 58 ft., concrete, brick and steel addition About $70,000 T Stephen, Temple Bldg., archt.

N. J., Toms River- Jail—Until Aug 5 by E. R. Yoden, chn bldg. com., Bd. Freeholders of Ocean Co., altering and building 2 and 2½ story, 36 x 36 and 26 x 37 ft., rein.-con additions to jail, here About $50,000 T. Stephen, Temple Bldg., Camden, archt.

Tenn., Chattanooga—Theatre—C W and G L. Rapp, archts., 190 North State St., Chicago, receiving bids building 1 story, 100 x 150 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation for Signal Amusement Co., 719 Market St. About $250,000

O., Cleveland Theatre -W. S. Ferguson Co., archts., 1900 Euclid Ave., receiving bids building 2 story, 100 x 120 ft concrete, steel and brick, at 10705 Miles Ave., for Corlett Realty Co., 1261 Miles Ave About $85,000 Noted May 29

O., New Philadelphia — Municipal — Until July 31, by city, building 3 story, 48 x 120 ft., fire-proof G E Arnold, city engr

Ind., Gary—Hospital—Gary Methodist Episcopal Hospital, c/o Schmidt, Garden & Martin, archts., 104 South Michigan Ave., Chicago, is receiving bids building 5 story, 110 x 130 ft., brick and rein.-con hospital, rein.-con. flooring and concrete foundation About $400,000

Buildings (Continued)

Mich., Detroit—Clubhouse—**Until July 21,** by P. J. Rosello, archt., 406 Congress Bldg., building 2 story, 60 x 118 ft., brick and steel, brick foundation, on Farnsworth and Russell Sts., for Deftaptape Romane Society, c/o architect. About $65,000.

Mich., Grand Haven—School—Until July 24, by M. W. Cotton, secy. bd. educ., Central School, building 2 story, 96 x 180 ft., rein.-con. brick and steel, rein.-con. flooring, concrete foundation. About $135,000. E. M. Wood, Alma, archt.

Mich., Grand Rapids — School — Until July 31, by H. N. Morrill, bus. mgr. bd. educ., City Hall, building new Congress School. H. N. Turner, 234 Division Ave., N., archt.; advertised in this issue.

Mich., Pontiac—School—Until July 24, by E. R. Webster, secy. bd. educ., building 2 story, rein.-con., brick and steel additions, concrete foundation, to Perkins and Fellows Schools. About $200,000. Perkins, Fellows & Hamilton, 814 Tower Court, Chicago, acrhts.

Ill., East Moline—School—Until July 21, by Whitsitt & Schultzke, archts., 610 Peoples Bank Bldg., Moline, building 2 story, 47 x 162 ft., brick, on 9th Ave. and 17th St., for Bd. Educ. About $70,000. Noted Mar. 27.

Wis., Clintonville — Bank — Until July 21 (change of date), by Foeller & Schoeber, archts., 123 North Washington St., Green Bay, building 2 story, 50 x 150 ft. brick, tile and steel, brick foundation, on Main and Elm Sts., for 1st Natl. Bank. About $50,000. C. Gibson, pres. Noted May 15.

Wis., Two Rivers — School — Until July 30 (change of date), by Bd. Educ., c/o W. T. Darling, building 3 story, 80 x 155 ft., brick, stone foundation, on Main St. About $130,000. J. D. Chubb, 109 Dearborn St., Chicago, archt. Noted June 12.

Minn., Aurora—High School—Until July 29, by School Dist. No. 13, building 3 story, rein.-con., brick and steel, rein.-con. flooring. About $150,000. Tyrie & Chapman, 320 Auditorium Bldg., Minneapolis, archts. Noted Jan. 30.

Minn., Bemidji — Store, Hotel, etc. — M. Kaplan receiving bids for 3 story, 50 x 140 ft. store, hotel and apartment building, brick, concrete foundation. About $50,000.

Minn., Morris—Dormitory—Until July 24, by State Bd. Control, Capitol, St. Paul, building 2 story, 45 x 120 ft., Boys' Dormitory at State Farm, here. About $75,000. C. L. Pillsbury Co., Metropolitan Life Bldg., Minneapolis, engrs. C. H. Johnson, 715 Capital Bank Bldg., St. Paul, archt. Noted June 19.

Minn., St. Paul—School—C. A. Hausler, city engr., receiving bids for 2 story, 34 x 82 ft., rein.-con. addition to Galtier School, on Charles St. and Hamline Ave. About $50,000.

Neb., Omaha — Church — Until Sept. 1, by H. A. Salisbury & T. R. Kimball, archts., 836 World-Herald Bldg., building 1 story, 60 x 120 ft. brick and stone, rein.-con. flooring, on 41st and Farnam Sts., for McCabe Methodist Church. About $60,000.

Okla., Vinita—Court House—Until Aug. 1 by clk. Craig Co. building 3 story, 75 x 100 ft., brick and stone, rein.-con. flooring. About $150,000. Layton & Smith, 701 Southwest Reserve Bank Bldg., Oklahoma, archts.

Utah, Milford — Hotel — Until July 25 by A. T. Adkins, building 3 story, 100 x 120 ft., concrete, on Main St. About $55,000. J. A. Grunfar, Tribune Bldg., Salt Lake City, engr. and archt.

Que., Montreal West (Montreal P. O.) —Exchange—Until July 21, by W. J. Carmichael, archt., 29 Hospital St., Montreal, building 3 story, 60 x 70 ft., concrete, steel and brick concrete foundation, on Sherbrooke and Walkley Sts., for Bell Telephone Co., 118 Notre Dame St., Montreal. About $50,000.

Ont., Fall View—Assembly Hall — Until July 21 by C. M. Borter, archt., 102 Main St., Niagara Falls, building assembly hall and gymnasium, steel and brick, concrete foundation, on Main St. About $50,000.

Ont., Toronto — Store — Until July 21, by W. Steele & Sons, engrs., Ryrie Bldg., for 7 story, 60 x 299 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on Yonge St., for Adams Furniture Co., 26 Queen St. W. About $250,000. Noted Mar. 27.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Springfield**—School—City let contract building 3 story, brick, concrete and steel addition to Forest Park School on Oakland St., to E. J. Pinney, 264 Main St. About $180,000. Noted May 8.

★**R. I., Providence**—School—Sons of Zion Society, 325 North Main St., let contract building school, to Soren & Kelman, 230 Saratoga St. About $60,000. Noted Mar. 27

★**Conn., Bristol**—Business—M. Volkenheim, 458 Main St., New Britain, let contract building 3 story, 55 x 80 ft., brick and concrete, to Leavitt & Hayes, 9 Court St., New Britain. About $54,000. Noted July 3.

★**Conn., Bristol**—Hotel—H. Perlstein, 82 Oakland Terrace, Hartford, let contract building 4 story, 42 x 80 ft., brick and concrete, on North Main St., here, to Wexler Bldg. Co., Hart St., New Britain. About $50,000. Noted May 15.

★**Conn., New Britain**—Business—G. C. Rogers, Fairview St., let contract building 3 story, 65 x 110 ft., brick and steel, concrete foundation, on Church St., to B. H. Hibbard Co., 153 Arch St. About $70,000. Noted July 10.

★**Conn., New Haven** — Hospital—Grace Hospital Assn., 1418 Chapel St., let contract building 5 story, 100 x 140 ft. brick, steel and rein.-con., on Orchard St., to Dwight Bros. Co., 24 Center St. About $300,000. Noted July 10.

★**Conn., New London**—Business—Bilderbeck & Langdon, archts., 253 State St., let contract building 3 story business block, for L. Hall Estate, to H. Wales Lines Co., 134 State St., Meriden. About $100,000. Noted Mar. 20.

★**Conn., Stamford**—Parish—First Presbyterian congregation, Broad St., let contract altering and building 2 story stone and granite addition to parish house, to H. Parsons, 49 Bank St. About $50,000. Noted June 19.

N. Y., Brooklyn — School — C. B. J. Snyder, supt. school bldgs., Municipal Bldg., New York City, received bids building addition to P. S. 73, from P. Cleary, 115 Marion St., $208,700; E. Diebitsch, $214,900; J. McArthur Co., Cambrelling Ave. and 183rd St., New York City, $236,423. Noted July 3.

★**N. Y., Buffalo**—Theatre—South Park Theatre Co. let contract building 1 story, 47 x 150 ft., brick and steel, rein.-con. flooring, concrete foundation, on Triangle St., to Linwood Constr. Co., Marine Bank Bldg., about $50,000. Noted July 3.

★**N. Y., Middletown** — Hospital —State Hospital Comn., Capitol, Albany, let contracts building 40 x 320 ft. hospital with 3 wings, concrete foundation, brick superstructure, for Middletown State Hospital, here general, to A. E. Stephens Co., 318 Main St., Springfield, Mass., $283,330; heating, sanitary and electric work, C. H. Darmstadt, 352 West 43d St., New York City, $38,992, $32,392 and $8489 respectively. Noted July 10.

★**N. Y., New York**—Auditorium and Office—Metropolitan Life Insurance Co., 1 Madison Ave., let contract building 16 story, 75 x 150 ft., brick and steel, brick foundation, at 11-15 Madison Ave., to G. A. Fuller Co., Fuller Bldg. About $800,000. This item incorrectly noted in our issue of July 3.

★**N. Y., Syracuse** — Store — Children's Shop, 437 South Salina St., let contract building 2 story, 62 x 99 ft., at 535 North Salina St., to Gaswell Constr. Co., about $175,000.

★**N. J., Bayonne**—Y. M. C. A. let contract for 3 story, 81 x 190 ft., brick and steel building on Ave. E between 22nd and 23rd Sts., to Thomnson-Starrett Co., 40 Wall St., New York City. About $500,000. Noted Oct. 10.

N. J., Camden — Bank — Bway. Trust Co., 1009 Bway., let contract building 1 and 3 story, 50 x 85 ft., rein.-con., to J. H. Miller, Eutaw and Franklin Sts., Baltimore, Md. About $200,000. Noted June 5.

★**Pa., Highland Park** (Phila. P. O.)—Church—St. Lawrence's Catholic congregation let contract building 2 story, 100 x 160 ft., to E. Fay & Son, 2 South Mole St., Phila.

★**Pa., Phila.**—Stations—Dept. City Transit, 1211 Chestnut St., let contracts building 2 stations on Front St., one at York St. and the other at Dauphin St., Contr. No 553, to J. Connor, 1317 Arch St., $49,375; 2 stations on Front St. at Girard Ave., Contr. No. 554, to Sandard Contg. Co., 1713 Sansom St., $44,993, all concrete and steel; also entrance closures for stations at Ruan and Church Sts. and Margaret and Orthodox Sts., to I. K. Davis & Co., 20th and Spencer Sts., $5500. Noted July 3.

★**Del., Wilmington** — Church, Parish House and Rectory—St. John's congregation let contract altering interior of church and building 2 story, 50 x 70 ft., stone rectory and parish house, to W. R. Dougherty, 1608 Sansom St., Phila. About $250,000.

★**Md., Baltimore**—Church—Luther Memorial Lutheran congregation let contract building 1 and 2 story, 75 x 150 ft., stone and brick, rock foundation, on Guilford Terrace and University Pkway., to P. C. Mueller Bldg. Co., 22 Gunther Bldg. About $100,000. Noted July 10.

★**Md., Baltimore**—Post Office and Garage—J. S. Bridges, 325 East Oliver St., let contract building superstructure for 1 story, 150 x 400 ft., rein.-con. and brick, concrete foundation, on Maryland Ave., to Gladfelter & Chambers; foundation to J. M. Hammond, both of 36th St. and Roland Ave. About $125,000. U. S. Government, lessee. Noted Apr. 24.

★**Md., Baltimore**—Theatre—Greater Theatre Co., 2706 Philadelphia Ave., let contract building 1 story, 75 x 150 ft., concrete, steel and brick, concrete foundation, on Fayette St. and Philadelphia Ave., to Consolidated Eng. Co., 243 Calvert Bldg. About $80,000. Noted Apr. 17.

★**Md., Havre de Grace**—Hotel—E. F. Piersol Co., 913 South Washington St. will build 4 story, 62 x 128 ft., concrete and steel, rock foundation. About $55,000. Work will be done by day labor.

★**Md., New Windsor**—Dormitory—Blue Ridge College for Boys let contract building 4 story, 43 x 43 ft., concrete, brick and stone, to O. Perry, New Windsor. About $50,000.

Va., Fredericksburg—School—City Council received bids. July 9, building 3 story, 78 x 125 ft., brick, concrete foundation, on Potters Field, from E. G. Heflin, Fredericksburg, $85,267; King Lumber Co., Charlottesville, $99,800; W. P. Thurston Co., Merchants Natl. Bank Bldg., Richmond, $105,000. Noted July 3.

★**Va., Portsmouth**—School—Bd. Educ let contract building 3 story, 67 x 163 ft., to E. C. Ford, 113 West 16th St., Norfolk, $92,510. Noted June 26.

★**N. C., Sanatorium** — Hospital — State Bldg., Com., Raleigh, let contract building concrete hospital, to H. F. Hann & Co., Charlotte, $123,264.

★**Ky., Ashland**—Church—Methodist Episcopal congregation let contract building 2 story, 100 x 142 ft., brick and stone, to J. H. Ketter, Ashland. About $100,000. Noted May 29

★**O., Akron**—Dormitory and Dining Room—Bldg. Comn. of Summit Co. Children's Home let contract building two 2 story, 50 x 80 ft., rein.-con., steel and brick concrete foundation, on South Arlington St. to J. Crisp & Sons Co., 163 Annadale St. About $81,000. Noted June 19.

★**O., Cleveland**—Bank—Cleveland Trust Co., East 9th St. and Euclid Ave., let contract building 3 story, 40 x 100 ft., steel and brick addition, on East 105th St. and Euclid Ave., to G. A. Rutherford Co., 1922 East 18th St. About $50,000. Noted July 3.

★**O., Cleveland**—Office—Cleveland Metal Products Co., 1141 Ivanhoe Rd., let contract building 1 story, 60 x 200 ft., concrete steel and brick addition, to Craig Curtis Co., Guardian Bldg. About $50,000. Noted July 3.

★**Mich., Detroit**—Schools—Bd. Educ., 50 Bway., let contracts building (a) Longfellow School on Indiandale Ave. and 12th St., (b) Roosevelt School, Georgia and Concord Aves., (c) Standard School, Georgia and Helen Aves., (1) masonry, (2) car-

Buildings (Continued)

pentry, (3) heating, ventilating and plumbing, to F. H. Goddard, 516 Franklin Ave., (a1) $59,000, (c1) $188,000; Lemnane Bros., 809 Union Trust Bldg., (b1) $138,407; E. Thiede, 287 Berlin St., (a2) $22,750, (b2) $32,961, (c2) $48,742; J. W. Partlan, 51 Park Pl., (a3) $43,744, (b3) $61,008, (c3) $90,129. Noted June 26.

★Ill., Chicago—Exchange—Chicago Telephone Co., 212 West Washington St., let contract altering and building 3 story, 42 x 66 ft., brick and timber addition to West Exchange, with 6 story, 37 x 90 ft. top addition, rein.-con. flooring, concrete foundation, at 25 South Seeley Ave., to McCarty Bros., 10 South La Salle St. About $120,000.

★Ill., Chicago—Hotel Amer Cities Hotel Co., 111 West Monroe St., let contract building 8 story, 150 x 160 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on Stony Island Ave. and The Midway, to M. Rauen, 111 West Washington St. About $1,400,000.

★Ill., Rock Island — School — Bd. Educ. let contract building 3 story, 160 x 190 ft., brick and steel, on 18th Ave between 33rd and 34th Sts., to H. W. Horst Co., Horst Bldg., $126,772.

★Wis., Beloit—School—Bd Educ let contract building 2 story, 85 x 100 ft., brick and timber, brick foundation, to J Schneiberg, Beloit. About $65,000.

★Ia., Bode—School Bd Educ let contract building school, to Madison Constr. Co., 848 Bldr's Exchange Minneapolis, Minn. About $70,000

★Ia., Dubuque—Hospital—City let contract building 3 story, rein.-con. addition to Sunny Crest Tuberculosis Hospital, here, to A Zwack, 34th and Jackson Sts About $150,000.

★Ia., Newton—Bank—First Natl. Bank let contract building 1 story, 52 x 132 ft rein.-con. and stone, to A H Newmann & Co., 519-20 Hubbell Bld., Des Moines. About $100,000. Noted Mar. 20.

★Minn., Duluth—School—Bd. Educ let contract building 3 story, 100 x 105 ft. rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 7th St. and 5th Ave., E., to H. Fawcett & Co., 3 Mesoba Blk., $85,480. Noted June 26.

★Minn., Minneapolis—School—Bd Educ. let general contract building 2 story, rein.-con. addition to Bancroft School on 14th Ave. and 38th St., to J. & W. A. Elliot, 906 Lumber Exch., $72,487; heating and ventilating, Archibald Heating Co., Minneapolis, $15,423. Noted June 26.

★Kan., Arlington—School—Bd Educ. let contract building 2 story 54 x 93 ft., brick, concrete foundation, to W. C. Barnes, Hutchinson. About $50,000.

★Kan., Marysville—Bank—First Natl. Bank let contract building 2 story, 43 x 72 ft., rein.-con., steel and brick, rein.-con. flooring and concrete foundation, to D. M. Wall, 2617 Agnes Bank Bldg., Kansas City, Mo. About $50,000. Noted June 26.

★Kan., McPherson — Hospital — Comrs. McPherson Co. let contract building 3 story, brick, rein-con. flooring, to Eberhart Constr. Co., Salina. About $115,000. Noted June 78.

★Kan., Topeka—Temple—F. & A. M., 320 West 8th St., let contract building 3 story, 140 x 265 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, to F. M. Spencer & Son, 215 Mulvane Bldg. About $50,000, cost plus percentage basis.

★Mo., St. Louis—Church—St Mark's English Evangelical Lutheran congregation, Newstead and Delmar Aves., let contract building 2 story, 120 x 150 ft., stone and brick, rock foundation, on Clayton Rd., to Victor Corp., 3447 Pestalozzi St About $55,000. Noted June 26.

★Mo., St. Louis—Office—Jane Holding Corp., Wright Bldg., let contract altering old building and erecting 19 story, 30 x 35 ft., concrete, steel and brick addition, rein.-con. flooring, rock foundation, at 201 North 8th St., to J. Hill Constr. Co., Syndicate Trust Bldg. About $240,000.

★Tex., Dallas—Office — E. B Daggett, Texas Bldg., let contract building 6 story, 100 x 100 ft., rein.-con., rein.-con. flooring, concrete foundation, on Young and Lacey Sts., to B. F. & C. B. Davis Co., Southwestern Life Bldg. About $150,000.

★Okla., Norman — University — State Bd., Oklahoma, let contract building 3 story, 80 x 140 ft. Women's Bldg. at State University, to C. A. Popkin, Sapulpa. About $100,000.

★Okla., Okmulgee—Store—Intyre Furniture Co. will build 2 story, 100 x 140 ft. brick store building. About $80,000. Smith, Rea, Lovitt & Senter, Okmulgee, archts Work will be done by day labor

★Okla., Sulphur — School — State Bd., Oklahoma, let contract building 3 story, 80 x 125 ft addition to "School for Deaf," to Ed Davis, Shawnee About $50,000

★Okla., Vinita — Hospital — State Bd., Oklahoma, let contract building 2 story, 60 x 100 ft. ward building at Vinita Hospital for Insane, to J Hicks, Vinita About $150,000

★Colo., Denver—Office—J A Ferguson, 407 Century Bldg., let contract building 1 story, at 17th and Champa Sts., to C. S. Lambie Constr. Co., 312 Tramway Bldg. About $1,000,000.

★Ariz., Phoenix—School—Bd Educ let contract building 2 story, 80 x 210 ft., concrete, brick and hollow tile, to Edwards & Wildey Co., 515 Black Bldg Los Angeles, Cal., $162,500 Noted June 19

★Wash., Cheney — Dormitory — Bd Cheney Normal School let contract building 2 story, concrete and brick on campus, to F Phair, Cheney $77,735

★Cal., Ojai—Hotel Ojai Impvt. Co let general contract building 2 story, concrete, frame and stucco, to T. E Hill & Co., Washington Bldg., Los Angeles, $58,000, heating, to T Haverty Co., 517 South Los Angeles St., Los Angeles, $14,500.

Cal., San Jose—Hall W F McClure, state engr., Forum Bldg., Sacramento, received lowest 3 bids building rein.-con. and brick assembly hall at State Normal School, here, from H. S. Williams, Hearst Bldg., $65,544; E. T. Leiter & Son, Call Bldg., $74,887; E. E. Etherton Co., Monadnock Bldg., $76,542, contractors all of San Francisco. Noted June 12.

★Ont., London—Theatre—Allen Theatre Co., Toronto, let contract building 120 x 250 ft., rein.-con., brick and steel, concrete foundation, on Dundas St, here, to J Hayman & Sons, 432 Wellington St About $200,000. Noted Mar. 27.

★Ont., Toronto — School — Bd. Educ. let general contracts building 2 story, rein.-con., steel and brick, concrete foundation, on Glenholme Ave., to H N Darey, Canadian Pacific Ry. Bldg., $55,305; 2 story, rein.-con., steel and brick, concrete foundation, on Glengrove Ave., to H. Lucas & Sons, 141 Havelock St., $46,358. Noted June 12.

Federal Government Work

PROPOSED WORK

N. Y., Brooklyn—Refrigerator—Spec. 4003—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install in Nurses Quarters, here Bids will be received at Local Yard.

N. Y., Montauk—Sewers—Spec 3955 — Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids building additional sewers, here. Noted July 3

N. J., Lakehurst—Hangars -Spec. 4001—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build 2 dirigible hangars, here. About $1,000,000 each

Va., Norfolk—Roofing—Spec 4005—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to roof hospital buildings, here About $20,000

S. C., Clinton—Post Office—Treas. Dept., Wash., D. C., rejected bids building post office, here. J. A. Wetmore, superv. archt. Noted June 26.

Mich., Houghton — Post Office — Treas. Dept., Wash., D. C., rejected bids building post office, here. J. A. Wetmore, superv. archt. Noted July 3.

Ill., Great Lakes—Groins—Spec 4004—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build groins for shore protection, here Estimated cost, $125,000

Wis., Tomah—Post Office—Treas. Dept., Wash., D. C., rejected bids building post office, here. J. A. Wetmore, superv. archt. Noted July 10.

Cal., Mare Island—Railroad Connection —Spec. 4002—Bureau Yards & Docks Navy Dept., Wash., D. C., plans to build railroad connection to Causeway. Estimated cost, $130,000. Bids will be received at Local Yard.

Cal., San Diego—Hangars and Tower—N. F. Smith, Pub. Wks. Officer, 12th Naval Dist., Timken Bldg., soon receives bids building 2 dirigible hangars, 4 rein.-con. seaplane hangars and one 130 ft steel tower at Naval Air School, North Island.

BIDS DESIRED

N. Y., Buffalo—Cable Until July 21, by Lighthouse Supt, Buffalo, furnishing 4200 lin ft. lead encased armored submarine cable, advertised in this issue

N. Y., Buffalo—Dredging—Until Aug. 11, by U. S. Engr. Office, 540 Federal Bldg., dredging in harbor at Ogdensburg advertised in this issue

N. Y., Rosebank—Chimney Until July 24, by L. E Cotes, health officer, Port of New York, rebuilding chimney on boiler house, Quarantine Sta., Swinburne Island, advertised in this issue

D. C., Wash.—Paving Until Aug 6, by Dist Comrs., Dist Bldg., paving var streets and avenues with sheet asphalt, advertised in this issue

Va., Salem—Post Office Until Aug 4, by Treas. Dept., Wash., D. C., building post office, here J A Wetmore, supervy archt Noted Jan 20

W. Va., South Charleston—Steel Sash Spec 3914—Until July 30, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing steel sash for various buildings About $130,000; $20 deposit required for plans and spec Noted June 5

W. Va., Wheeling — Pass and Weir Horses, Props, etc.—Until Aug. 11, furnishing and delivering pass and weir horses, props, etc., for dams Nos 23, 25 and 27, Ohio River; advertised in this issue

Fla., Key West—Metal and Glass Work —Until Aug 20, by Lighthouse Supt., furnishing and delivering metal work and glass for 2 light towers, 1 on Molasses Reef and 1 on Pacific Reef, advertised in this issue.

Ill., Cairo—Pump, etc. Until Aug 8, by Treas. Dept, Wash., D C, installing new motor-driven triplex pump, etc., in Post Office and Custom House, here; advertised in this issue.

Ill., Mattoon—Boiler, etc Until July 24 by Treas Dept., Wash., D C., furnishing new portable, smokeless, firebox boiler, etc., in Post Office, here, J A Wetmore, supervy archt.; advertised in this issue.

Cal., San Francisco—Material and Labor -Until Aug 1, by Lighthouse Supt, Wash D C., and Lighthouse Supt Custom House, San Francisco, furnishing materials and labor of all kinds, except as stated in specifications, necessary for construction, equipment, completion and delivery of single-screw, steel steam-propelled lighthouse ten Oak, and of first-class, single-screw, steel, steam-propelled Light Vessel No 105, both for use on Atlantic coast, advertised in this issue

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★R. I., Coddington Point—Bridge Spec 3997—Bureau Yards & Docks, Navy Dept, Wash., D C, let contract building steel bascule bridge, here, to Booth & Chase, 562 Davol St., Fall River, Mass., $11,379

★N. Y., New York—Extending Substation—Spec 3870—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building extension to Substation No 14, here, to B Diamond, 12 Bergen St, Brooklyn, $4652, (30 days).

★Pa., Phila.—Pattern Shop—Spec 3478—Bureau Yards & Docks, Navy Dept, Wash, D C, let contract building here, to M. H McClogkey, Jr, 1620 Thompson St, $249,262 (120 days). Noted July 3.

★D. C., Anacostia—Platform—Spec 3998—Bureau Yards & Docks Navy Dept, Wash, D C, let contract building elevator platform here, to L E Eruenninger, Colorado Bldg, Wash., $1150, (45 days). Noted July 3

D. C., Wash.—Cold Storage Building, etc Dist Comrs, Dist Bldg received bids building cold storage room, changing location of switchboard and conduit and installing new conduits, wires, etc., at Municipal Fish Market, 10th and Water Sts., S. W., from J. Troutt Constr. Co., c/o R Troutt, 937 Shepherd St, N W, $5976; T C Henderson, 1239 10th St, N W, $7046.

★D. C., Wash.—Pump House—Dist Comrs., Dist. Bldg., let contract building pump house at Municipal Fish House, to H S Hatton & Co., Wash., $750 Noted July 3.

D. C., Wash.—Refrigerating Equipment —Dist. Comrs., Dist. Bldg., received bids installing refrigerating equipment in cold storage building, from Automatic Refrigerating Co., Munsey Bldg., $1236; Chatard & Noble, 304 Continental Bldg., Baltimore, Md $1490

Federal Government Work (Continued)

★**Va., Hampton Roads**—Crane and Bridges—Spec. 3895—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract (1) installing 1 electric traveling crane in 3 story storehouse; (2) building 2 transfer bridges, to Niles, Bement Pond Co., 111 Bway., New York City, (1) $6600, (120 days); V. R. Browning Co., 17701 Lake Shore Blvd., Chicago, Ill., (2) $4652. (120 days). Noted July 10.

★**Va., Hampton Roads**—Pier—Spec. 3918—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building merchandise pier, here, to Boyle-Robertson Constr. Co., Evans Bldg., Wash., (1) $629,497, (300 days); (3) also accepted. Noted June 26.

★**Va., Truxtum**—School—U. S. Housing Corp., 413 G St., Wash., D. C., let contract building 2 story, 100 x 210 ft. brick school, to W. Linker, 813 Cherry St., $100,000. Noted Apr. 24.

★**Fla., St. Augustine**—Shore Protection—Spec. 3973—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building here, to M. J. Lopez, Anastabia Island, $980. Noted June 26.

Ia., Vinton—Post Office—Treas. Dept., Wash., D. C., received bids July 10, building post office, here, from W. D. Lovell, 1415 South East 8th St., Minneapolis, Minn., $25,680; P. H. Wall Contg. Co., St. Louis, Mo., $32,500. Noted June 19.

Minn., Montevideo—Post Office—Treas. Dept., Wash., D. C., received only bid building post office, here, from W. D. Lovell, 1415 South East 8th St., Minneapolis, $29,200. Noted June 12.

Tex., Pittsburgh—Post Office—Treas. Dept., Wash., D. C., received bids July 8, building post office, here, from A. Blair, Montgomery, Ala., $47,319; W. D. Lovell, 1415 South East 8th St., Minneapolis, Minn., $49,000; J. F. McKnight, Halletsville, $49,900. Noted June 12.

★**Wash., Puget Sound**—Grading, Excavating and Filling—Spec. 3256—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract grading, excavating and filling, here, to Porter Bros. Co., 524 Railroad Exch. Bldg., Portland, Ore., $326,000, (300 days). Noted June 19.

★**Cal., Vallejo**—School—U. S. Housing Corp., 413 G St., Wash., D. C., let contract building 2 story frame school, to W. A. Goericke, Sharon Bldg., San Francisco, $50,000.

Miscellaneous

PROPOSED WORK

Storage Bin and Conveyor—Mt. Morris, N. Y.—Galbraith Milling Co. plans to build addition to tile storage bin and milling grain conveyor, 20,000 bu. capacity.

Power Line—Guntersville, Ala.—Alabama Power Co., Huntsville, having surveys made for 2 power lines, one to run from here toward Gadsden and other toward Decatur. Proposed lines will furnish power to Albertville, Boaz, Guntersville, Huntsville, Decatur and other smaller towns. About $1,000,000. G. S. McInnish, Huntsville, ch. engr.

Coke Ovens and Sheds—Dayton, O.—Maxwell Motor Car Co., Leo St., plans to build coke ovens and three 1 story, 30 x 40 ft., steel and brick sheds, brick foundation, to house same. About $15,000.

Stone—Manitowoc, Wis.—A. H. Zander, city, engr., soon lets contract furnishing and delivering 1000 to 1200 tons crushed stone. Cost between $10,000 and $12,000.

Concrete and Coal Conveyor—Sheboygan, Wis.—W. S. Weeks, engr., Ontario Ave., soon lets contract furnishing concrete and coal conveyor for proposed new factory for Northern Furniture Co., South Water St. About $25,000.

Pipe Line—Port Aransas, Tex.—Texas Mexico Pipe Line & Refining Co., recently organized, plans to lay 400 mi. 8-in. pipe line from Port Aransas north to Red River, via Ranger and Burkburnett, to southwestern Oklahoma. Address R. Galbreath, 1300 South Boulder St., Tulsa, Okla.

Drydock—Vancouver, Wash.—Standifer Ship Bldg. Corp., West 13th St., will donate $100,000 to build drydock here if Government appropriates $150,000 and city $100,000. R. V. Jones, vice pres. J. E. Blackwell, resident agt. of U. S. Shipping Bd. now inspecting harbors.

Athletic Field, Gymnasium, Manual Training Building, etc.—Warrenton, Ore.—City plans election soon to vote on $15,000 bonds to improve athletic field, build gymnasium, manual training building and playground, on 6 acre tract adjoining school. J. Evenden, city aud.

Memorial—Tulare, Cal.—City having plans prepared by W. C. Perry, archt., Newhall Bldg., San Francisco, for Soldiers and Sailors Memorial here. About $60,000. G. B. Sturgeon, Newhall Bldg., San Francisco, engr.

Wharf—Sydney, N. S.—Dept. Pub. Wks., Ottawa, Ont., having plans prepared building wharf here. About $100,000. E. Lafleur, c/o Dept. Pub. Wks., Ottawa, engr.

Park—Three Rivers, Que.—St. Maurice Valley Amusement Co. plans to build amusement park here. About $75,000. E. Decelles, pres.

Wharf—Little Current, Ont.—Dept. Pub. Wks., Ottawa, having plans prepared and soon receives bids rebuilding wharf here. About $54,000. E. Lafleur, c/o Dept. Pub. Wks., engr.

Wharf—Owen Sound, Ont.—Dept. Pub. Wks., Ottawa, having plans prepared and soon receives bids rebuilding wharf here. About $86,000. E. Lafleur, c/o Dept. Pub. Wks, engr.

Pier—Port Maitland, Ont.—Dept. Pub. Wks., Ottawa, Ont., having plans prepared and soon receives bids rebuilding portion of east pier here. About $200,000. E. Lafleur, c/o Dept. Pub. Wks., engr.

Breakwater—Toronto, Ont.—Dept. Pub. Wks., Ottawa, having plans prepared and soon receives bids building breakwater here. About $200,000. E. Lafleur, c/o Dept. Pub. Wks., engr.

Telegraph Lines—Clinton, B. C.—Dept. Pub. Wks., Ottawa, Ont., soon receives beds building branch telegraph line from here to Gong Ranch, via Kelly Lake, Caribou Dist., 50 mi. long. About $10,000. D. H. Keeley, Supt. Govt. Telegraphs, Ottawa, engr.

Drydock—Esquimalt, B. C.—Dept. Pub. Wks., Ottawa, Ont., having plans prepared and soon receives bids building dry dock here. About $500,000. E. Lafleur, c/o Dept. Pub. Wks., engr. Noted Oct. 31.

BIDS DESIRED

Retaining Wall—New London, Conn.—Until July 24, by W. E. Clark, secy. state rivers, harbor and bridge comn., building concrete retaining wall. Work involves 3500 cu.yd. concrete, 1200 cu.yd. excav. and 5000 cu.yd. embankment.

Pipe—Fulton, N. Y.—Until July 21, by G. A. Washburn, city clk., furnishing B. & S. c.i. water pipe and special castings, including 95 tons 12 in. and 649 tons 16 in. Class "D" pipe; advertised in this issue.

Paving Material—New York, N. Y.—Until July 26, by H. Bruckner, pres. Bronx boro., furnishing and delivering 150,000 gal. tar road oil, 3000 bags Portland cement and 5000 cu.yd. 1½ in. broken trap rock stone and 2500 cu.yd. broken trap rock stone screenings.

Sand—New York, N. Y.—Until July 21, by F. L. Dowling, pres. Manhattan Boro., furnishing and delivering 11,000 cu.yd. asphalt wearing surface sand, Grade "B".

Valves—Jersey City, N. J.—Until July 22, by city, furnishing iron body bronze mounted double hub valves. C. A. Van Keuren, city engr.

Cast Iron Pipe and Special Castings—Akron, O.—Until Aug. 1, by H. S. Morse, dir. pub. serv., furnishing 13 tons 16 in. Class "B," 625 tons 12 in. Class "B," 12 tons 12 in. Class "C," 135 tons 10 in. Class "B," 130 tons 10 in. Class "C," 170 tons 8 in. Class "B," 125 tons 6 in. Class "B" and 3 tons 4 in. Class "C" pipe, and 35 tons special castings, Contr. No. 157; advertised in this issue.

Flume—Sheboygan Falls, Wis.—Until July 22, by Brickner Woolen Co., installing steel flume as part of improvement to water power, involving 26 tons steel. About $20,000. J. Hauwert, Sheboygan Falls, engr.

Contractors' Supplies—Minneapolis, Minn.—Until Aug. 1, by H. E. Alexander, purch. agt., City Hall, furnishing elevating grader with standard equipment and tools, also offset engine pole and inter-changeable disc plow; 24 contractor's dump wagons—2 yd., bids on steel axle, wood axle, stiff tongue and drop tongue; 1 revolving steam shovel, ¾ yd., mounted on traction wheels; 1 concrete mixer, capacity 15-16 cu.ft. mixed concrete, equipped with traction drive; 1 self propelled wagon loader, gasoline driven and equipped with malleable buckets with manganese steel digging lips, to be designed for handling crushed stone (2½ in.), gravel (2 in.) and sand; 1 traction drive portable crane equipped with ½ or ¾ yd. clam shell bucket, capacity 4500 lb. at 10 ft. radius; 1 macadam or 3 wheel road roller, 10 ton, 2 cylinder motor driven, bid with and without scarifier; 1 concrete mixer, batch without loader, gasoline driven, capacity 4 cu.ft. mixed concrete, 1 ditcher or trench excavator, gasoline driven for 4½ ft. depth and 20-24 in. width, also quotation on similar machine for 5½ ft. depth; 1 No. 205 drag line, with bucket, clam shell and drag scraper. About $35,000.

Pipe—Minneapolis, Minn.—K. E. Alexander, purch. agt., City Hall, receiving bids furnishing 12,240 ft. 6 in., Class "C", 7000 ft. 8 in. Class "C" and 2400 ft. 12 in. Class "B" c.i. water pipe. About $25,000.

Timber—Minneapolis, Minn.—H. E. Alexander, city purch. agt., City Hall, receiving bids furnishing 500,000 ft. fir timber of various lengths ranging in size from 2 x 10 to 10 x 12 ft. About $20,000.

Dam—San Francisco, Cal.—Until July 30, by Pub. Wks., building Hetchy Dam, arch gravity type with height 212 ft. above stream level and 72 ft. above and 60,600 cu.yd. excav. above stream level, 298,000 cu.yd. cyclopean masonry and 66,850 cu.yd. concrete not included in masonry; M. M. O'Shaughnessy, city engr.; advertised in this issue.

Dam Etc.—Wolfville, N. S.—Until July 20, by C. H. Wright, c/o Wright & Joudrey, Wolfville, building concrete dam, power house and 2 mi. transmission line. Work involves 150 cu.yd. rock excav., 125 cu.yd. reinforced and 1500 cu.yd. mass concrete. Total cost, $40,000. L. H. Wheaton, Halifax, engr.

Wharf—Okanagan Centre, B. C.—Until Aug. 5, by E. C. Desrochers, secy. dept. pub. wks., Ottawa, Ont., building here.

Landing Float and Approach—Port Essington, B. C.—Until July 31, by R. C. Desrochers, secy. dept. pub., wks., Ottawa, Ont., building here.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract

★**Oil Tank—Madison, Me.**—Great Northern Paper Co., let contract building 60 x 91 ft., rein.-con. oil tank, 10½ ft. deep, to T. I. Ellis, 171 Westminister St., Providence, R. I. About $35,000.

★**Cast Iron Pipe—Medford (Boston P. O.), Mass.**—Water and Sewer Comn., 52 Swan St., let contract furnishing 6 in. c.i. water pipe, to Warren Fdry. Co., 201 Devonshire St., Boston, $52.50 per ton. Noted June 19.

Cast Iron Pipe—Providence, R. I.—Bd. Contr. & Supply let contract furnishing 91 ton c.i. water pipe to U. S. Cast Iron Pipe & Fdry. Co., 1421 Chestnut St., Philadelphia, Pa., involving 400 lengths 6 in., $58.10, and 75 lengths 4 in., $61.10.

Dam and Canal—Black River, N. Y.—See "Industrial Works."

Sand and Paving Blocks—Long Island City, N. Y.—M. E. Connolly, pres. Queens Boro., received bids furnishing 6500 cu.yd. sand, from C. A. Myers, $13,000; T. Tuohy, 98 Main St., Flushing, $13,450; W. J. Fitzpatrick $14,130; 80,000 hardwood paving blocks, Alcott Paving Co., $60,800.

★**Bulkhead—Baltimore, Md.**—City let contract building timber bulkhead on McComas St., Spring Gardens, involving 500 lin.ft. wooden piling, to McLean Contg. Co., 1412 Fidelity Bldg., total cost $14,700.

★**Sulphate of Iron—St. Louis, Mo.**—City let contract furnishing 1800 tons of sulphate of iron, more or less, in such quantities as called for during period ending June 30, 1920, to Amer. Steel & Wire Co., 3rd Natl. Bank Bldg., at $14.60 per ton; total, $26,280.

★**Pier and Freight Shed—Astoria, Ore.**—Port of Astoria Comn. let contract building Pier No. 3 and Freight Shed No. 4, to Foundation Co., Astoria, $815,491. Noted June 26.

★**Pier—Manhattan Beach (Manhattan P. O.), Cal.**—City let contract building deck and upper works of rein.-con. pleasure pier, to Foundation Co., Holbrook Bldg., San Francisco, $32,690. Noted July 10.

★**Breakwater—Devils Island, N. S.**—Dept. Pub. Wks., Ottawa, Ont., let contract repairing breakwater here, to M. C. Denton & M. A. Condon, Digby. Cost $11,446. Noted June 19.

★**Elevator—Montreal, Que.**—Dominion Flour Mills, Ltd., 300 St. Ambroise St., let contract building 8 concrete elevators, 91 ft. high, to Feglos Bellows Eng. Co., Ft. William, Ont. About $160,000.

★**Dam—Owen Sound, Ont.**—Town let contract building rein.-con. dam, power house and earth fill, to W. M. Fletcher & Co., 151 Bloor St. W., Toronto. About $64,700.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—James H. McGraw, President

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, Editor — Charles Whiting Baker, Consulting Editor

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An Aërial Disaster

STRUCTURAL engineering resources provide no reasonable means of protecting city buildings from the impact of a falling airship. Such a disaster as occurred in Chicago three days ago, when the car of a flaming dirigible plunged through the skylight of a downtown bank, will remain one of those rare happenings from which little is to learned toward safeguarding the future. Other great Chicago disasters of recent years—the Iroquois Theater holocaust or the capsizing of the "Eastland"—were at least in minute measure redeemed by the resulting progress toward greater public safety. In the present disaster there is no such redeeming consideration, unless it be the lesson that aërial "joy-riding" must be placed under closer surveillance.

Box-Car Shortage Due

IN A few weeks the movement of the largest wheat crop on record will be under way. No one can say just where the movement will be greatest or where the millions of bushels will be stored, but the grain is here and the Government must buy it. At any rate, for some months all of the box cars that can possibly be found will be directed to the wheat traffic. Those concerned with the purchase or sale of commodities using box cars will do well to note this prospect and arrange their business accordingly. Box cars, like all other railroad equipment, have not increased normally in the past few years. When a congestion of demand meets a reduction in supply there is always trouble.

An Unjust Discrimination

EVER since the United States Public Health Service began publishing its directories of health officials in *Public Health Reports*, it has done an injustice to engineers and other technically trained men serving in the capacity indicated. Great care seems to be taken to put "M. D." after the name of every health officer entitled to it, but the engineers, chemists and bacteriologists in the service receive no credit for similar college degrees. To divide public health officials into two great classes—doctors and all others—is unjust discrimination against a large and growing number of highly trained men.

A Hexagonal Diagram

OCCASIONALLY something "new under the sun" emerges. This seems to be true of the ingenious hexagonal diagram for finding the velocity of water in pipes, contributed from beneath the South American sun by Mr. Anthony, and reproduced on p. 169 of this issue. As an example of the uses to which the diagram may be put Robert E. Horton suggests that it can be used to find "the relative capacity of pipes in accordance with the Barnes formulas, in which different exponents are used for each different class of pipe."

Continue the Engineer Training Camps

MILITARY engineering is not a stationary science. The war has proved that, as it has proved the importance of the fighting engineer. Everything in reason must be done to make the training of our future Army engineers as scientific and as resultful as possible. In doing this, no one thing could be of more value than the continuance of Camp A. A. Humphreys, on the Potomac below Washington, as a training camp both for officers and for troops. Economy in public expenditure is, of course, necessary now that war emergencies have passed, but parsimony is dangerous. Civilian engineers join the Corps of Engineers in its plea to Congress that sufficient funds be provided to continue the temporary construction of the camp, so that engineer soldiers can be trained there in the essentials of their business. In time, let us hope, the camp will be made permanent.

Hindering New York Harbor Development

NEW YORK CITY—or at least the administration which at present governs the city—continues to pursue its dog-in-the-manger policy in the development of New York harbor. Not very long ago it managed to put off for another year consideration of the proposals of the interstate harbor board for joint action by the States of New York and New Jersey. Now, through its Department of Docks, it comes forward with the so-called Hulbert plan of port development, which is nothing more than the continued construction of steamship piers, at first on Staten Island and later at scattered points around the city's 600-mile shore line, disregarding entirely the fact that extra provision for steamships will only further complicate the port problem unless some way is devised to take care of the goods coming from or going to these ships. This failure to recognize the elements of port design and management is not due to ignorance, but to the parochial viewpoint common to the politician. Those in charge of the city simply cannot get themselves to admit that New Jersey has any part whatsoever in the natural harbor at the mouth of the Hudson. Meanwhile, private interests are alive to the necessity which the official mind will not admit. Within the past month three separate schemes for elaborate port terminal construction on the lower New Jersey shore of the inner harbor have come to light. Each one envisages the port as a machine through which must move in two directions a large part of the world's business, and not as a mere landing place for steamships. All of these plans are advanced well along in design and each one has a considerable financial backing. It would be no surprising thing if the City of New York found the control of the harbor deliberately taken by the opposite state because the city officials could not see outside their polling places.

Inland Navigation for Ocean Steamers

THERE are two ways for an inland city to become an ocean port—to bring the ocean to the city or to extend the city to the ocean. Los Angeles has not had conspicuous success in the latter process; Manchester, England, has apparently, at last, proved that the former has some virtue. In this country Houston, Tex., is emulating the British inland port and, as noted on p. 156, is obtaining some measure of that port's success. These two comparatively recent projects serve to illustrate the possibilities of inland navigation for large steamers, although they do not necessarily support arguments in favor of such enterprises in general.

For Houston a 50-mile dredged channel along an existing river and creek and through a landlocked bay sufficed to effect communication with the open sea. For Manchester there was required a 35-mile ship canal across settled country, with heavy excavation, and provided with locks and bridges. Including the channel, docks, warehouses and other facilities, the cost to date at Houston has been about $7,000,000, a large proportion of which was paid by the Federal Government for developing the channel. At Manchester the cost had reached $84,000,000 in 1912 and had been met by a private company in which the city had a large investment. Furthermore, Houston is a shipping rather than a manufacturing center, while Manchester was a great manufacturing and commercial city with extensive foreign commerce, at the time when the ship canal was first proposed. The enterprise shown in carrying out this great British project is illustrated by the recent action of the company in displaying full-page advertisements in American daily papers.

Extension of ocean navigation to cities located on inland waterways is often claimed as an argument for costly development of such waterways, natural and artificial. This argument is not universally applicable, however, owing particularly to the factors of difficulty and loss of time in operating large vessels through restricted channels for considerable distances. Economical operation of ocean vessels, as a general rule, requires that they be kept moving at full speed as far as possible, and that terminal delays be avoided. This former factor is perhaps less important for cargo and irregular or tramp steamers than for regular liners, but, generally speaking, it is more economical to operate ocean vessels between ports which are not far from the seaboard.

Where high cost of development is required to open up an inland waterway with a view to ocean connections, thorough and unbiased study is a necessary preliminary. It is to be remembered, for instance, that for many years the Manchester Ship Canal was far from reaching the financial success that had been predicted. On the other hand, its effect in promoting the growth and prosperity of the city was, it was asserted, well worth the cost, although this argument would not appeal very strongly to those who had made investments with the expectation of good returns. In projects of this class, three important elements for investigation are the length and character of the waterway, the prospective traffic, and, especially, the cost of providing the necessary navigation and terminal facilities. Such matters call for expert service and cannot be disposed of by rhetorical display or visions based upon biased imagination.

Centralization of City Traffic

CITY development questions of large bearing are dealt with in the report on Cleveland rapid transit, abstracted in this issue. The report, curiously enough, is not a rapid-transit report at all, in a sense, and if its recommendations prevail it will postpone rapid transit for a number of years. But beyond this it will bring about a concentration of traffic and business in one central spot of Cleveland, in a degree unlike anything to be seen elsewhere. In both respects the report is out of tune with the general tone of civic and engineering opinion.

The fact that the report is against rapid transit is of interest far beyond the confines of Cleveland. The engineers who make the report state that the city is ripe for rapid transit, on the score of both size and long-haul character of traffic. Nevertheless, they do not recommend that the city undertake the construction of a rapid-transit system now. Nor do they report in express terms against it, though they reach the same end by advising that street-railway improvement be carried out at once. Apparently their reasons against rapid transit are mainly financial; they fear that the revenue would not pay the cost, or that it would be taken from the present traffic income of the street-car system.

These views are likely to be a damper to rapid-transit enterprise in other cities, now struggling toward transit improvement. The public opinion on which all such movements rest is easily impressed by analogies from other cities. Yet conditions are essentially different as between city and city, and it would be both illogical and unfortunate for such cities as Cincinnati, Pittsburgh or Detroit to shape their action under influence from the Cleveland report.

While in its bearing on centralization the report has primarily only local meaning, it is this phase of the matter that is really vital. Together with the Public Square union railway terminal recently proposed, the street-car subway loop system now recommended will inevitably tend to mass all the city's passenger traffic in a small area—virtually in a single point. Should experience show the results to be undesirable, or in the long run perhaps intolerable, the cure for the condition created might easily prove to involve formidable losses, out of comparison with the construction cost now involved.

Already centralization of traffic is an evil in Cleveland. It is brought about by the Public Square system, with return looping of all car lines at the Square, necessitating transfer on any through journey. This unique system results in an unusual downtown congestion, a restriction of the real business district to a very small area, a hampering of vehicle traffic, and a tendency to delay the integration of east and west sides into a unified city. The system is a key element in all traffic and city development problems of Cleveland.

In approving this centralization system the engineers who make the present report take issue with the general view that the cure for terminal congestion in large centers is distribution of traffic. Their proposals will indeed intensify the concentration by increasing the capacity of the Square street-car terminal through adding more loops, and thereby making it possible to mass a larger traffic on the Square. In effect they advise that the downtown terminal system which has been

the basis of growth of the half-million Cleveland be made also the basis on which the future one to two-million city is to develop.

We have previously had occasion to discuss the tendency to endure and even seek concentration of traffic by such devices as union terminals. In discussing the proposed railway terminal on the Public Square of Cleveland, in our issue of Jan. 30, 1919, we protested against deliberate seeking after centralization. In another form, the same tendency is expressed in the street-car terminal now recommended, and we might at present repeat, with merely verbal change, the plea for distribution of traffic that we made six months ago.

It will be interesting indeed to observe the further development of the situation. The problem presented has immediate importance only to Cleveland, but it will carry lessons of value to many other communities.

Developing the Engineering Mind

MOST important among the suggestions at the Baltimore meeting of the Society for the Promotion of Engineering Education were those for the training or development of the "engineering mind." In the abstracts on another page of this issue, C. F. Allen, after thorough investigation, presents the advantages found in the "case system" for the study of law; Major More and Captain Duckering describe the "problem method" applied at the Engineer School, Camp A. A. Humphreys, Virginia, and Dean Anthony discusses radical changes at Tufts College, all with this object in view.

These new developments in engineering education are seen to be fundamentally related to the university idea expressed by F. J. E. Woodbridge as follows: "The idea of the university is the idea of the organized discovery of the mind"; this involves "the discovery that the world, although it is moved by its own forces and according to its own laws, is yet controllable just in proportion as it is understood. By itself it is solid and unyielding; penetrated by the mind it is fluid and convertible. By itself, it is man's master; through his mind, it is his servant."

A clear conception of the distinguishing aspects of modern engineering and of the qualities of the engineering mind would aid materially in the notable attempts of engineers and educators to find a basis of common understanding regarding the kind of graduates desired—through the committees, for example, of Engineering Council and of the Society for the Promotion of Engineering Education. Following the conception of the meaning of modern engineering, it is not difficult to formulate the distinguishing qualities of the engineering mind.

Just as the legal mind is distinguished by trained judgment, as applied to human relations, so the engineering mind is marked primarily by ability to measure things, to analyze forces, to compute desired quantities. This involves two phases of mental activity: (1) Truth seeking, by study or research, to determine the characteristics of nature's materials and powers, and to formulate laws of action of nature's forces; (2) the application of these general facts and laws, by computation, design and investigation.

That capacity for both of these principal activities of the engineering mind may be developed by the methods illustrated in the "case system" and the work of the Engineer School is evidenced from reports of results. They apparently build up real engineering judgment—appraisal of the significance of primary assumptions, ability to estimate results from known data, keen interest in unsolved problems or the disputed points in design, and the desire to attain greater facility in the use of the tools of higher mathematics and of reference books for solving such problems. The students also learn to do by doing, through practice in working out similar problems, producing ability to get things done.

The engineering mind also implies a trained imagination, with capacity to conceive structures, machines, railroads or industrial plants with such accuracy that no difficulties are encountered in making the dream come true. If, as one prominent consulting engineer has said, 90% of engineering activity is imitative, there must be something seriously at fault. Is it possible that the educational methods of the past, with their lecture and text book system, are to blame for that lack of vision and initiative which help to explain the unsatisfactory status of the profession in social life?

Breadth of mind is desirable for the engineer, and should include knowledge of the principles of the fine arts—architecture, music, literature. The fact that most of our educated engineers have obtained at best no more than a mere smattering of these is another weakness which helps to explain the engineer's status. Why are the principles of architecture so generally ignored in engineering curricula? Two such closely interrelated professions should certainly be linked by mutual understanding and knowledge. Are they now so linked? Music and literature are the keys to many delightful associations. The world needs the man who can sing at his work, and music offers fields of enjoyment which at the same time widen the opportunity for acquaintance.

Finally, there must be a place in the engineering mind for business knowledge, and ability to place true valuations on both things and human incentives. Only so can the profession keep step with modern progress. Dean Marston has summed up the advantages and needs of business training for engineers, which were thoroughly discussed at the Washington conference reported in our news pages July 3. Economic science, law of contracts, shop management and industrial organization—the underlying principles of all these elements of present-day engineering—are essential.

In the new attempt to meet the demands for exact knowledge and creative capacity in engineering service, it must be remembered that while breadth of knowledge of fundamental principles is needed, a mere superficial knowledge of many things cannot be accepted in place of that intensive, thorough training which makes a man master of one particular thing. Although such mastery may really come only through self-education and cannot result from a college course, yet formal education should contain sufficient test drill in various lines to help the student find himself—to determine his qualifications and help him select his life specialty.

If, as has been said, the moral test of every advance is whether or not it is constructive, the new movement in engineering education is certainly moral. Nature still, in spite of the conquering advance of man, offers the engineering mind many fields for further exploration—adventures into the unknown promising great reward to creative effort.

Harbor Facilities and Development at Houston, Texas

Ship Channel Converts Inland City Into an Ocean Port—City Provides Wharves, Freight Sheds, Warehouse, Railway Connections and Freight-Handling Machinery—Concrete Structures

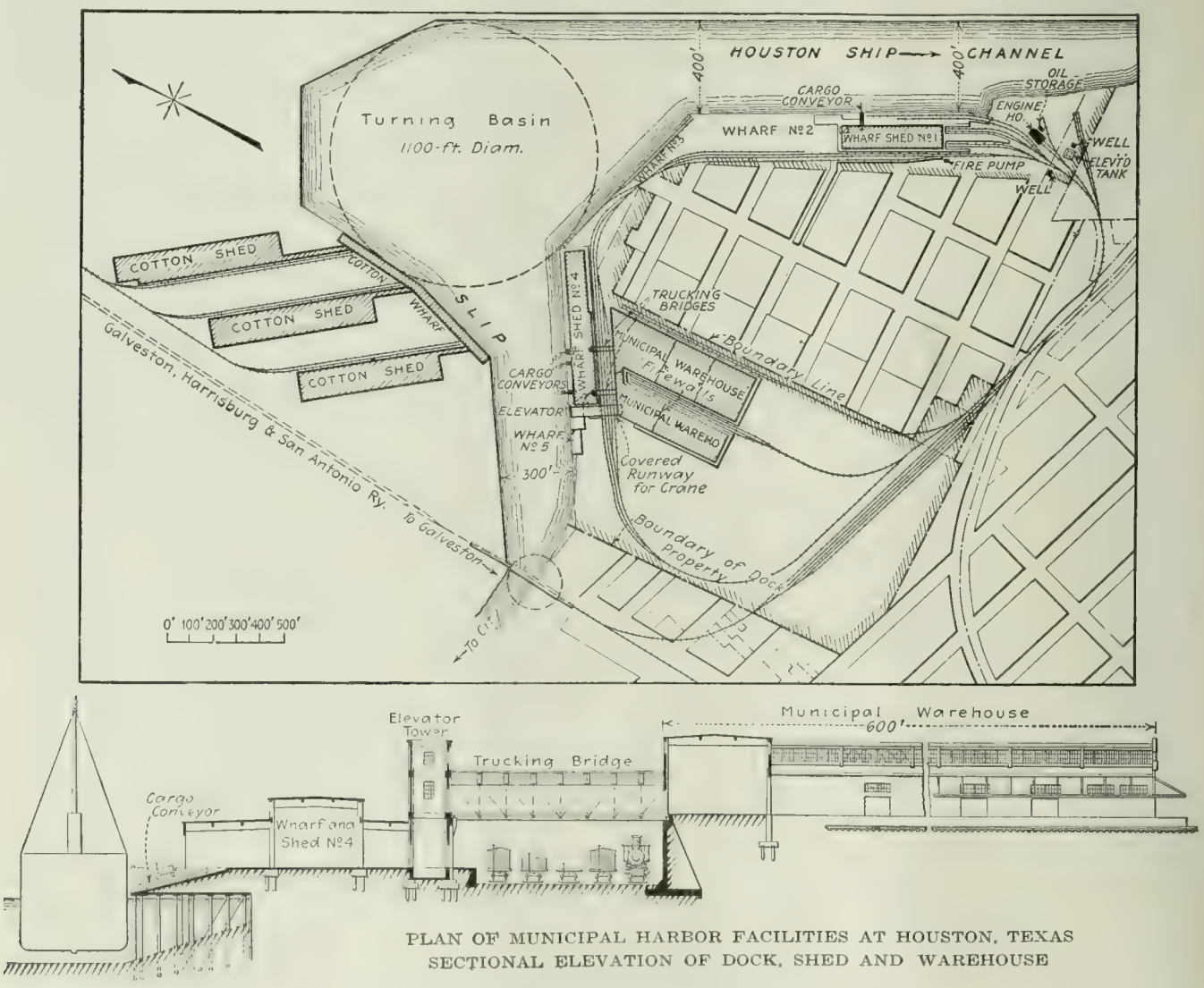
SINCE the establishment of an ocean port at the inland City of Houston, Tex., in 1914, by the completion of a 50-mile ship channel to the Gulf of Mexico, the city has provided wharves, sheds, railway connections and freight-handling equipment to serve the extensive development of shipping trade which is expected when commerce resumes its normal conditions. A description of the project was given in *Engineering News* of May 25, 1916, p. 978. The Houston ship channel extends northwest from the harbor entrance at Galveston across Galveston Bay and through the San Jacinto River and Buffalo Bayon. It terminates in a turning basin, 1100 ft. in diameter, which is about seven miles from the city and is connected by a light draft canal with a wharf at Main St., in the center of the city.

Piers are not used at this port, but wharves aggregating 3730 ft. of water frontage are provided, as shown by the accompanying plan. These include four for general freight, one for cotton and one for barge service. The first freight wharf and the cotton wharf were completed in 1915; the others have been constructed during the period of the war, and some portions were leased by the War Department for use as an aviation supply depot.

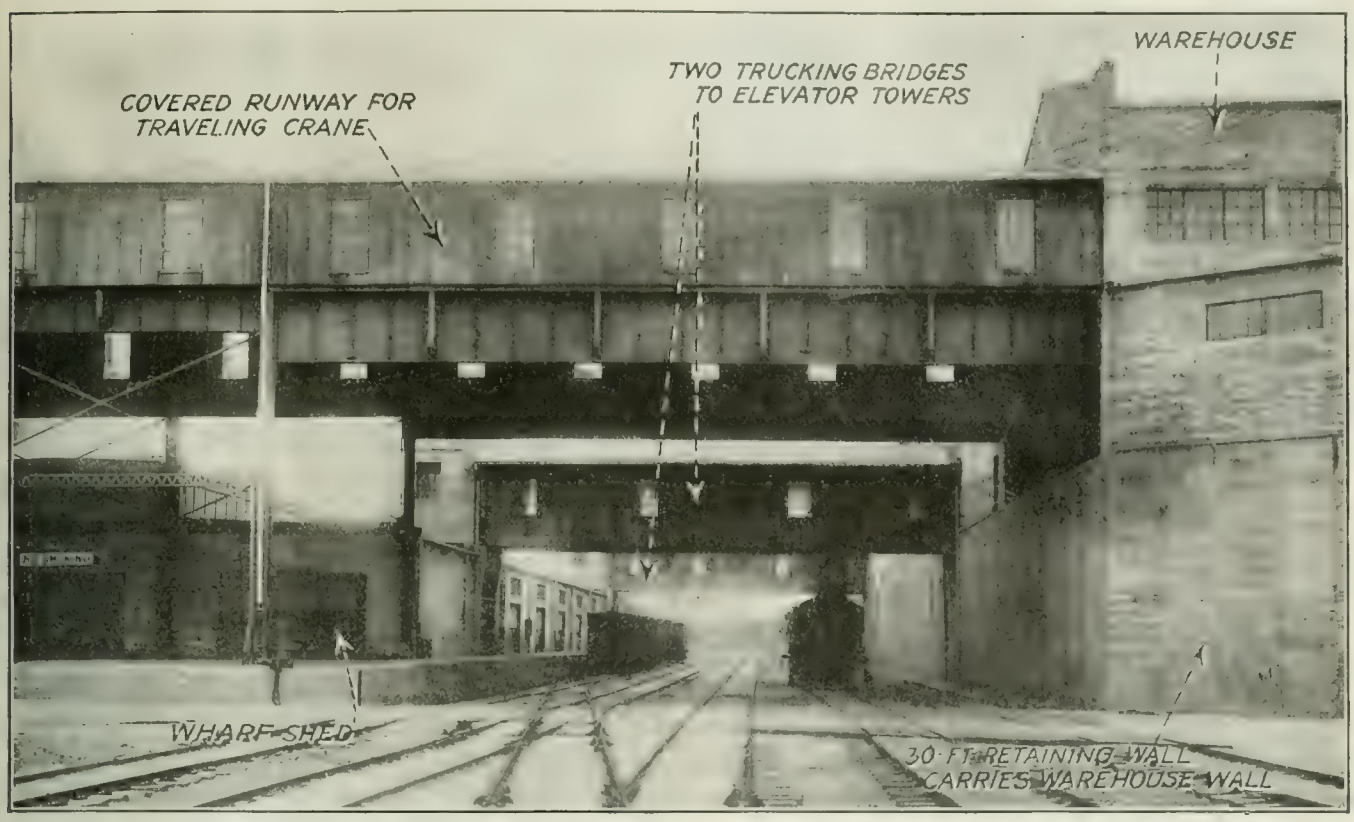
Different types of construction are employed. Wharf No. 1 is of creosoted timber and has a timber freight shed which was constructed with open sides, but has since been closed in for use as a warehouse. No trouble has been experienced with the teredo or other boring worms. About 55 ft. back from the face of the wharf is a reinforced-concrete warehouse 100 x 425 ft. This distance from water front proved to be too great, and for later structures it was reduced to 20 feet.

Wharves Nos. 2, 3 and 4 have concrete bulkhead walls of the counterfort type for the water front. That for No. 4, shown in one of the drawings, has a height of 10 ft. and a floor width of 45 ft., with counterforts spaced 15 ft. on centers. Adjacent to No. 4 is the barge wharf, which is of untreated timber throughout, but is so designed as to permit of cutting off the piles and placing a concrete superstructure upon them.

Creosoted timber is used for the cotton wharf, but the cotton sheds behind it are of untreated timber. All buildings are of the one-story type. No sheds are provided on wharves Nos. 2 and 3, and these are unpaved, being used at present for the storage of timber, ties and heavy material. No. 2, however, is designed for the future erection of a two-story freight shed.



PLAN OF MUNICIPAL HARBOR FACILITIES AT HOUSTON, TEXAS
SECTIONAL ELEVATION OF DOCK, SHED AND WAREHOUSE

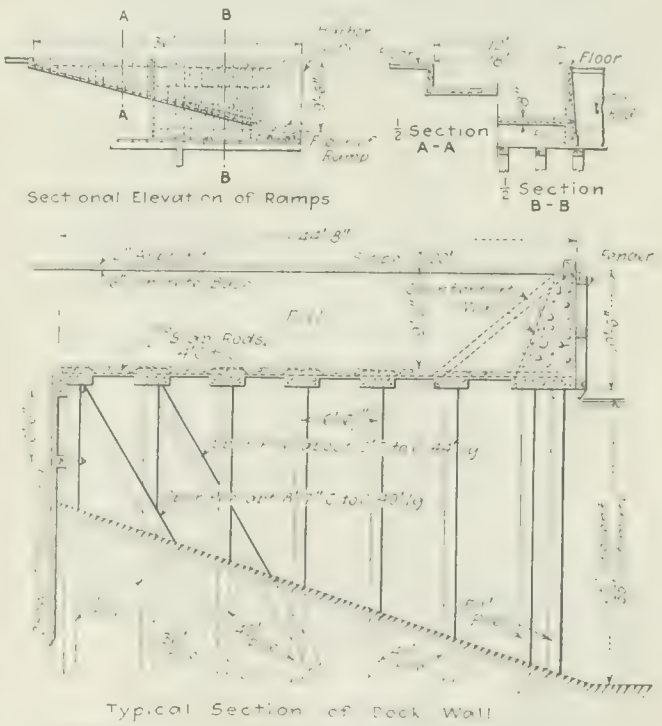


CRANEWAY AND TRUCKING BRIDGES CONNECT WAREHOUSE AND WHARF SHED

A reinforced-concrete shed 662 x 100 ft. is built on wharf No. 4, with its face 20 ft. from the water front and a 10-ft. platform between its rear side and a group of five railway tracks. Its columns are spaced longitudinally 35 ft. on centers. Two interior rows of columns divide the building into three bays, the middle bay being higher than the others and forming a wide monitor whose sides are fitted with pivoted sash. Triangular footings with three concrete piles to each footing form a rather unusual construction for the interior columns, but the wall columns have four-pile clusters. No piles are used under the front wall, however, as this is on the solid fill supported by the concrete floor of the bulkhead wall. Metal folding doors which move vertically are used for the numerous openings; these are 27 ft. wide in the front wall, 12 ft. in the rear and 20 ft. in the ends.

Temporary storage of inbound and outbound freight awaiting shipment or disposition is provided by the wharf shed. For general storage a municipal warehouse of reinforced concrete has been built on the high ground directly behind wharf No. 4. As this ground was cut away along the water front to the level required for the wharf, a large retaining wall of the counterfort type, 30 ft. high and 20 ft. base, was built along the face of the cut. This supports the end wall of the warehouse. Two trucking bridges extend across the tracks from the floor of the warehouse to the roof of the wharf shed, each being served by an 8-ton elevator in the shed.

This warehouse is about 600 by 400 ft., with only one floor; it is U-shaped in plan, with three railway tracks in the open space and two along the east side. Platforms 10 or 12 ft. wide extend along all sides except the river front. One side or wing of the warehouse has five bays 26 ft. 3 in. between centers of columns and the other has seven bays, the middle bay in each case being higher than the others and forming a monitor for light and ventilation. Longitudinally the columns are spaced 27 ft. on centers. Their footings rest directly on the firm clay soil and they carry a room of the girder-and-beam type, having a 3½-in. slab. The



DOCK WALL AND INCLINED RAMP FOR CARGO CONVEYORS

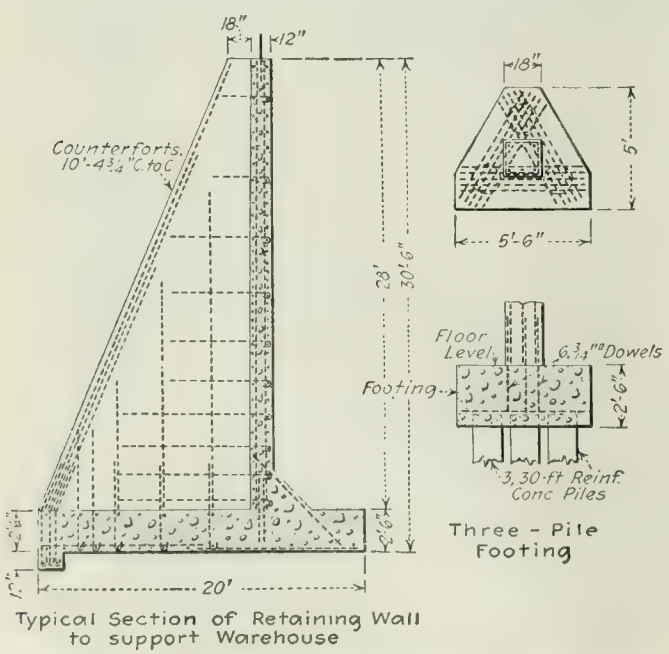


DOCK WALL IS OF COUNTERFORT TYPE

walls are of 9 in. reinforced concrete and similar transverse fire walls divide the interior into five compartments.

One expansion joint across each wing of the warehouse, in the walls and in the roof, provides for a range of temperature from 10° to 120° F. For the walls, the joints are of the mortise type, with ½-in. space packed with tar paper. For the roof, the ends of the longitudinal beams of the sliding section rest on brackets on the adjacent transverse girder of the fixed section; a 2-in. opening in the slab is covered by a semicircular flashing of galvanized iron. Concrete awnings or canopies 10 to 12 ft. wide cover the outside platforms. The 4½-in. slab is built integral with the wall and is stiffened at the outer edge by a rib in which are anchored tie rods or suspension rods attached to the wall above the canopy.

Separate systems of sanitary and storm sewers are provided for the warehouse, the former leading to a septic tank and contact filter bed to avoid pollution of the channel, which has but little current. The flow from the tank passes to two distributing troughs supported on the top of the contact bed, which has about



HIGH RETAINING WALL AND TRIANGULAR FOOTING

4 ft. of crushed stone over 6 in. of coarse screened stone laid upon a bottom course of 4-in. drain tile having ½-in. open joints. The effluent passes out to a cross drain with 12-in. pipe connection to the storm sewer. This plant is designed to handle 4700 gal. of sewage per 24 hours, giving an 18-hour detention period in the tank. A similar plant, differing slightly in arrangement, serves the office toilet in the wharf shed and is located in the fill behind the bulkhead wall. This is designed to handle 1750 gal. of sewage per 24 hours, with the same detention period.

Experiments with different types of floor construction in the sheds were made as follows: Vertical fiber brick paving with asphalt filler on 6-in. concrete base was used in the old shed on wharf No. 1. Some slight settlement has occurred in the portion laid on filled material, but on the whole it is satisfactory. Texas rock asphalt 2 in. thick on a 6-in. reinforced-concrete base was used in the shed and on wharf No. 4. This has had one year's traffic by the United States aviation depot,



WHARF NO. 4, AT HOUSTON, TEXAS, WITH HEADFRAME AND RAMP FOR CARGO CONVEYORS

consisting of electric freight trucks and garage for Army motor trucks.

Concrete 6 in. thick is used in the municipal warehouse. This is a 1:2:4 mixture, with a special hardening finish for the surface, and the slab was covered for seven days with a ½-in. layer of sand which was kept moist. This paving has proved satisfactory under one year's service as the aviation depot. Rolled oyster shells in the cotton sheds require timber runways for trucking.

Freight-handling equipment is provided mainly at wharf No. 4, with the shed and warehouse. Three inclined platform conveyors are provided on the wharf to assist in loading and unloading cargo. They lie in inclined gangways. Each conveyor is pivoted at the inner end and has the outbound end suspended by cables from the steel headframe on the edge of the wharf, so that this end can be adjusted to the level of a ship's deck or cargo port. In the freight shed are two 8-ton electric freight elevators serving the bridges to the warehouse. For handling heavy freight, there is a 20-ton, 50-ft. overhead electric traveling crane in a covered craneway extending across one end of the wharf. This is at such a height that the runway extends into the warehouse, the crane thus serving ships, the wharf,

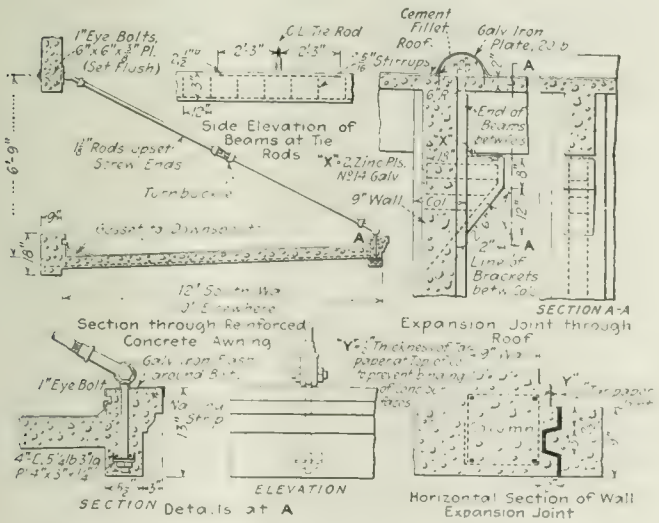
the railway tracks and the warehouse. At wharf No. 1 there is a single inclined conveyor for handling cargo. A monorail trolley system serves the cotton sheds and wharf.

Railway trackage in the vicinity of the turning basin aggregated 8.5 miles, including a storage yard providing capacity for 586 cars, but exclusive of extensions built to refining plants. Traffic is handled over the Houston Municipal Railway under an operating agreement with the Houston Belt & Terminal Ry. Co. The city owns two 70-ton switch engines and a two-stall engine house and is prepared to operate its yard, but for the present it is thought best to allow the company to perform the necessary service.

Fresh water is supplied from two artesian wells to a 150,000-gal. elevated tank. Sprinkler equipment is provided in the warehouse while 62 hydrants are arranged around the building and yards. This service is supplied by two electrically-driven fire pumps having a combined capacity of 2000 gal. per minute at 100-lb. pressure.

The ship channel was excavated through the shallow bay and across low swampy ground for about 35 miles; for the remainder of the distance it was between banks fairly close together and with an average height of 35 ft. No rock was encountered. Suction dredges removed the clay and pumped it through pipe lines to spoil banks. The depth is 25 ft. with a width of 150 ft. in the bay and 100 ft. in the upper portion. Curves have a radius of 2500 ft. or over. Improvements about to be started by the United States Government consist in increasing the depth of 30 ft. for a width of 250 ft. across the bay and 150 ft. above, at the same time easing the curves to 3000-ft. radius.

Expenditures since the first improvement was authorized in 1872 until June 30, 1918, aggregate $6,725,000, of which $5,346,000 was for new work and the balance for maintenance. Of this total the community



EXPANSION JOINTS AND CONCRETE AWNING OF MUNICIPAL WAREHOUSE

paid $1,409,176. The enlargement of the channel by the Government will cost $3,850,000 of which $1,365,000 will be paid from a bond issue of $1,500,000 authorized in May, 1919, by the Harris County navigation district. Maintenance is undertaken by the United States Government, with an annual appropriation of $325,000 for the necessary dredges. This development has resulted in creating a large industrial center, the plants located along the channel including several oil refineries and cotton stores, a portland cement plant and a chemical plant. During 1918 about 2,388,000 tons of merchandise valued at $116,332,000 were moved through the channel by over 15,000 trips of steamers, barges and other vessels.

Port and terminal facilities as now provided are considered ample for the next few years, except that a grain elevator and cotton compress are desirable. Design and construction of the present works were under the direction of E. E. Sands, city engineer, and J. C. McVea, assistant engineer, who has recently succeeded the former as city engineer. E. A. Fretz and H. H. Blake were resident engineers in charge of construction. The municipal warehouse was built by the American Construction Co. and all other structures were built by Horton & Horton.

Control Over Factory Wastes in Wisconsin

FOR the control of the treatment of industrial wastes in Wisconsin the State Board of Health has prepared a list of requirements for the construction and operation of plants for treating various classes of wastes. A copy of these requirements, we are informed by E. J. Tully, state sanitary engineer, is submitted to each concern installing a waste-treatment plant for signature by a responsible official. Of the two witnesses to the signature required one must be the local health officer. The recommendations for the treatment of creamery and cheese-factory wastes follow:

Requirements To Be Fulfilled by Officials of Company in Regard to Construction, Operation and Supervision of Treatment System for Creamery and Cheese-Factory Wastes

Satisfactory purification may be accomplished by definitely following instructions prescribed covering construction, operation and care of treatment system outlined. The State Board of Health, however, does not assume any responsibility in regard to purification. In order to obtain effective treatment, intelligent supervision over the operation of the system is essential, consequently it is necessary for the officials of a company installing a treatment system to agree to fulfill the instructions given below.

Construction—The system shall be constructed in detail as outlined.

Chemical Application—Such preliminary chemical treatment as planned is simple in application. Lime or soda ash, or both, shall be prepared and applied as directed.

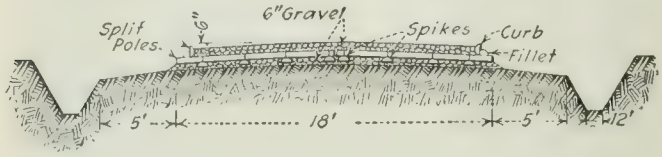
Supervision of Operation of Tank—Scum shall be removed from the sedimentation chambers of the tank once a month and the sludge or deposit shall be removed from each chamber every four to six months, or more often if necessary. Scum and sludge shall be buried, after liming. (The sludge shall in any case be removed when its depth equals one-fourth the depth of the tank.) The surface of the contact filter shall be raked each week.

Supervision of Operation of Gravel Filter—It is necessary in order to prevent clogging of the filters to regularly rake the surface of the sand and occasionally to remove, wash and replace about one inch of material from the surface of the filter. The filter, therefore, shall be raked each week; and about one inch of the surface filtering layer shall be occasionally removed, washed and replaced at least once every four months.

Witness..... Signature.....
Witness..... Title of Official.....
Date.....

British Army Timber Roads in France With Split Poles and Sleepers

CROSS-SECTIONS of the split pole and sleeper roads used by the British forces in France were shown in the June 19 issue of the *Surveyor* of London. One of the striking elements of the construction is the perfect drainage provided. The illustration shows a



GRAVEL ROAD REINFORCED WITH SPLIT POLES USED BY BRITISH FORCES IN FRANCE

cross-section of the split-pole road which consists of gravel reinforced with timber.

After grading as shown, a blanket of gravel is placed over the road 6 in. deep and eight split-pole sleepers are laid longitudinally. These are covered solidly with split poles laid crosswise. Edgings of split poles with fillet supports are used at the sides. The entire construction is then covered with gravel up to the top of the edgings.

Sleeper roads were built in the same form, with the exception that the timber used was 6 in. thick and square.

The timber used on the sleeper roads was bedded in sand, but the flooring was not covered with gravel and the traffic operated directly on the wood. In the sleeper construction a crown of 2 in. was used, instead of 6 in., as on the gravel-covered split-pole roads. In both types of construction deep ditches were used, and the gravel and sand facilitated perfect drainage to the gutter.

Charted Summary of State Concrete-Road Specifications

Information Arranged for Quick Determination of the Main Features — Explanation of and Comments on Chart

By A. N. Johnson
Consulting Highway Engineer, Portland Cement Association, Chicago, Ill.

ACCOMPANYING this article is a charted summary of state highway specifications for concrete roads, which shows at a glance the main features of the latest obtainable specifications of the various highway departments. This chart is not complete, as a few state highway departments have prepared no specifications for concrete roads, while a few others have not responded to requests for copies. However, adequate information is given to show the trend in the practice of constructing concrete roads.

A word of explanation as to the make-up of the chart will make it clear. The headings of the columns indicate the subjects. Where practice is divided between but two or three variations, the column headings so indicate, and those states specifying a particular method are indicated by a dash in the appropriate column. Thus, the relative number of states following the one or the other practice in a given particular is readily seen. Where the variations are greater in number and such variations could be represented numerically, the different sizes, distances or proportions are inserted under the proper column heading, which also shows the unit of measure represented by the numerals.

In general, where blank spaces occur opposite a state name under all the column captions covering a given subject, it indicates the specifications for such a state are silent upon the subject.

SUMMARY OF VARIOUS STATE HIGHWAY DEPART

State	Fine Aggregate			Coarse Aggregate			Mixing						Consistency		Cold Weather		Forms		
	Grading Specified by Sizes	Grading General Only	All to Pass Inches	French Coeff.	Max. Size Inches	Min. Size Inches	Cement Factor Bbls per Cu. Yd.	Proportions	Time of Mix Minutes	Materials to be Measured	Water to be Measured	Mixer Timing Device	Mixer Water Measuring Device	General Provision Only	Specific Requirements	Work Prohibited	Work Permitted with Precaution	Wood	Steel	To be Oiled or Soaped
Alabama	—		¼	8	2	¼		1-2-3	1	—	—	—	—	—		—	—	—	—	
Arizona	—		¼	10	2	½		1-2-4	1	—	—	—	—	—		—		—	—	
Arkansas	—		¼	10	1¾	¾		1-2-3	1	—	—		—	—		—		—	—	—
California	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Colorado	—		¾		2	¼	1.70	1-2-3	1	General	General			—		—		—	—	
Connecticut	—				1¼	½		1-2-4	1½	—				—		—		—	—	
Delaware	—		⅜	2	2	¼		1 2-4	1½					—		—			—	
Florida	—		¼	10	2	¼		1-2-3	1	—	—		—	—			—	—	—	—
Georgia	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Idaho	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▨	○
Illinois	—		1½ or ¾	6	6 or 2½	¼	1.61	1-2 3½	1	—	—			—		—		—	—	—
Indiana	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▨	○
Iowa	—		¼		1½	¼	1.70	1-2-3	1½	—	—			—		—		—	—	
Kansas		—	¼	6 8	1½	¼	1.40-1.61	1-2-3½	1	—				—		—		—	—	
Kentucky	—		¼	10	2	¼		1-2-3	1½	—	—			—			—	—	—	
Louisiana	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▨	○
Maine	—		¼		½	⅛		1-2-4	¾					—		—		—	—	
Maryland	—		¼		2½	¼		¾...1½	¾ to 1		—			—				—	—	—
Massachusetts	—		¼		1½	⅛		1-2-4						—			—	—	—	
Michigan	—		½		2 2½ 2¼	¼		¾...1½-3	1	—				—				—	—	
Minnesota	—	·	½	▨	2	½		1-2 3¼ or 4	1	—	—	—		—	—	—		—	—	
Mississippi	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▨	○	▨	○	▨
Missouri	○	○	○	○	○	○	○	○	○	○	○	▨	○	○	▨	○	○	○	▨	▨
Montana		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▨	○
Nebraska	—		½	8	2	¼	1.70	1-2-3	1	—	—			—		—		—	—	—
Nevada	—		¼	8	2½	¼		1-2-4	1	—	—		—	—		—		—	—	
New Hampshire	—		¼		2	¼		1-2-3	1½	—	—			—		—		—	—	—
New Jersey	—		½		½	3 or 5 ½	1.51-1.91	1-2-3	1½	—	—			—		—		—	—	—
New Mexico	—		3/8	8	2	½		1-2-3	1½	—	—			—		—		—	—	—
New York	—		¼		2½	½		1-1½-3	1	General				—			—	General	Not	Specific
North Carolina	—		½		2	¼		1-1½-3	1½			—	—	—		—		—	—	—
North Dakota		○	○	○	○	○	○	○	○	○	○	○	○	○	···	○	○	○	○	▨
Ohio	—		½	8	2 2	¼	1.75-2.0	1-1½-3	1	—	—			—		—		—	—	—
Oklahoma	—	—	¼	7½	2	¼		1-2-3	1½		—	—	—	—		—		—	—	—
Oregon	—		¼		2 1½ 3½	¼		1-1½-3	1	—				—		—		General	Not	Specific
Pennsylvania	—		¼	10	2	¼		1-2-3	1½		—	—	—	—		—			—	—
Rhode Island										—				—				—		
South Carolina	—		¼		1½	¼		1-2-4	1					—			—	—	—	—
South Dakota	—		¼		2	½	1.70	1-1 2-3	1	—				—			—			
Tennessee	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▨	▨
Texas	—		¼	8	2	¼		1-2-3	1½	—	—	—	—	—		—		—	—	—
Utah		—	¼		2	½	1.50	1-1½ 3½	1	—	—			—		—		—	—	—
Vermont	○	▨	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Virginia	—		¼		2	¼		1-2-4	1	—	—			—		—		—	—	—
Washington	—		¼		3	¼	1.66	1-2-3	1	—	—			—			—	—	—	—
West Virginia	—		¼		2½	¼		1-2-3	1	—	—	—	—	—			—	—	—	—
Wisconsin	—		¼	7	2	¼	1.68	1-2-3½	1	—	—			—			—	—	—	
Wyoming	—		¼		2	½	1.70	1-2-3	1	—				—				—	—	

NOTE: States from which specifications were not available shown thus, ○○○○
Otherwise, a blank space indicates that the specifications are silent on the particular subject indicated at top of column

The printed specifications for a number of states refer to the plans for the details and exact manner in which a certain feature is to be executed. Such occurrences have been so indicated upon the chart; but in those instances not so clear or accurate an indication of the actual practice among the various states is gained. This is particularly true in regard to the reinforcement, thickness of slab, superelevation at turns and other features, about which but little information is gained from the text of the specifications.

Attention is directed to the relatively large proportion of specifications which call for a definite grading by sizes, for fine aggregate. The results of very extended investigations made by Prof. D. A. Abrams at Lewis Institute, Chicago, have shown that these arbitrary divisions of fine aggregate by sizes do not necessarily give a grading that will produce the best concrete or, in fact, be a measure to indicate the quality of the aggregate; and that if many of the gradings specified for fine aggregate were strictly followed it would result in the rejection of much material from which as good concrete could be made as with material that would be accepted under a particular specification.

The French coefficient for wear for coarse aggregate is specified in perhaps a third of the specifications. The requirements vary from 12 to 6. The use of the French coefficient for the purpose of determining aggregate for concrete roads is apt to be somewhat misleading and incomplete. The French coefficient of wear was developed to determine to relative value of crushed rocks for macadam-road work, and, due to the fact that the action of traffic upon aggregate in a concrete road is much different from that in a macadam road, this leads to some misinterpretation. Also, as the test cannot be made upon gravels which are used for coarse aggregate in so much concrete work, its application is incomplete. It is probable that investigations now under way will make possible more uniform requirements in this particular; but it may be pointed out that rock which tests not over 6 or 7 is in successful use in many miles of concrete roads.

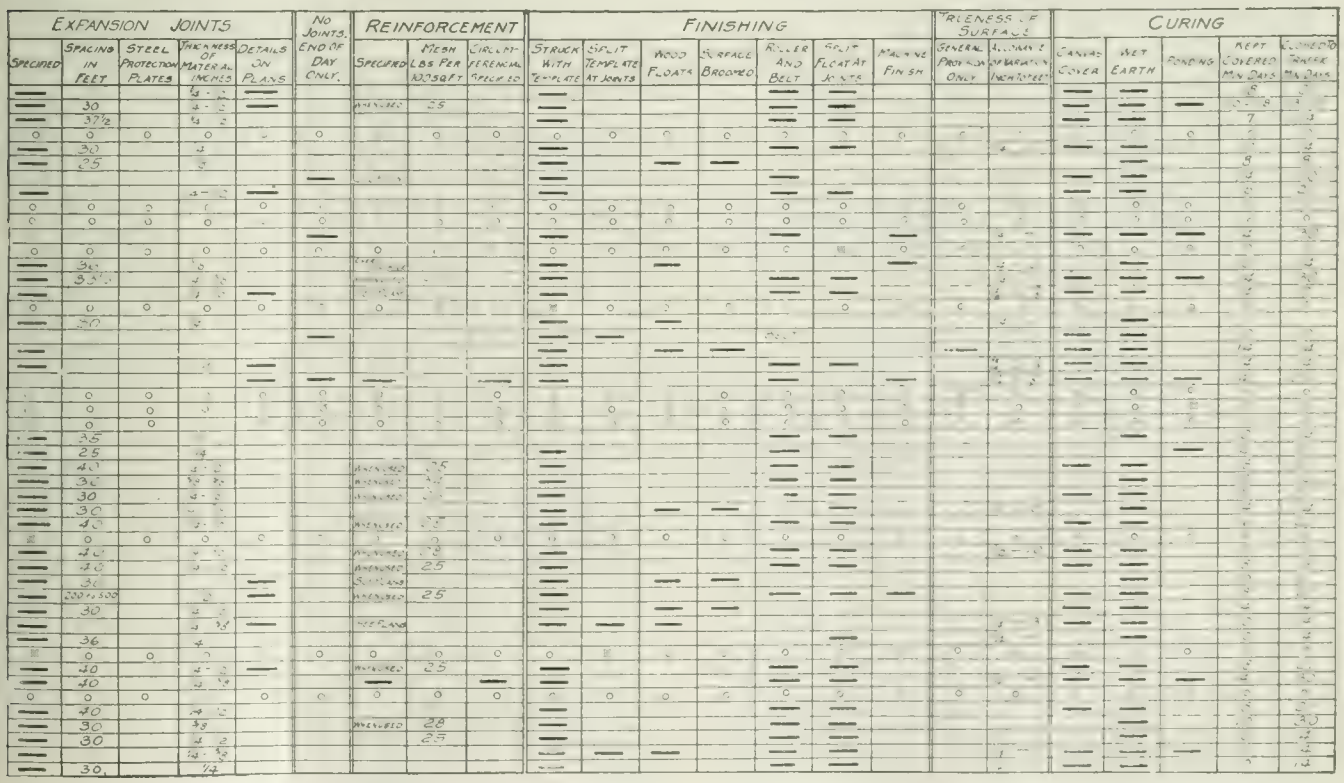
In the mixing there is a very general agreement as to the proportions to be used, the majority of specifications calling for a 1 : 2 : 3 mixture. Most specifications now indicate the time for mixing, the larger number prescribing 1 min., while 10 states require 1½ min. and but one or two as short a time as ¾ minute.

The measuring of materials is generally emphasized, and specific requirements as to how this shall be done are found in many specifications. There is an increasing tendency to require special timing devices and water-measuring devices. Nearly all the state specifications prohibit laying concrete in freezing weather, while a few allow the work to proceed with special precautions.

There is a wide divergence in the provisions for joints. Four states specify no expansion joints at all, the others requiring expansion joints spaced at intervals varying from 25 to 40 ft. The provisions for finishing afford interesting comparisons, the general tendency being to provide those methods which will insure a dense and true surface. Thus, a few states provide for a split templet to be used at the joints, which is an excellent feature. A majority has adopted the roller-and-belt finish, also for a split float to be used at joints. Four states provide for a machine-finished surface.

Provisions regarding the variation from a true surface are lacking in a number of state specifications, while a number make requirements that are so indefinite as to be impracticable. For example, the provision

MENT SPECIFICATIONS FOR CONCRETE ROADS



that the surface shall not vary over ¼ in., without stating the length within which such variation may be allowed, is not a workable specification.

The specifications of a few states make more definite the variation to be permitted, from ¼ in. in 3 ft. to ½ in. in 6 ft., while a number provide for ½ in. in 10 ft. In a few the allowable variation is ½ in. in 10 ft. and not greater than ¼ in. in any 3 ft. This is an important feature of concrete-road building and one to which more attention should be given in the specifications.

Requirements that the concrete be covered with wet earth are general. In a few instances, ponding is specified. This latter method has a much wider application than the few instances where it is specified would indicate. Most states require that the concrete shall be covered from 10 days to two weeks. In one instance it is as low as eight days. There is more variation as to the time a road is to be kept closed to traffic, the limits prescribed being between eight days, which is much too short a time, and 30 days.

Provisions for Consistency

Because of its importance, comment regarding provisions for consistency has been reserved to the last. While there is some mention made of consistency in practically all specifications, it is at most but general, and gives no adequate means by which to determine what the consistency shall be.

The consistency of concrete depends upon the amount of water used with a given amount of materials. It is also well known that the strength of concrete is directly dependent upon the quantity of water used, which should be as little as will give a concrete practicable to handle. Thus, the strength of the concrete depends upon the consistency.

The Illinois specifications (edition of April, 1919), alone give any definite measure by which to determine the consistency; this section is as follows:

569. The consistency of the concrete shall be determined by the following test: A cylinder 6 in. in diameter and 12 in. in length shall be filled with concrete which shall be tamped until all voids are filled and a slight film of mortar appears on the surface. The cylinder shall then be removed and the vertical settlement or "slump" of the concrete noted. This settlement shall not exceed 2 in. when the mechanical finishing machine is to be used and shall not exceed 4 in. when the finishing is to be done by other methods permitted in the specifications.

Bonus for Wisconsin Road Patrol

Patrolmen on road maintenance in Wisconsin who do satisfactory work this year, and who remain in service until the end of the season, will be paid a bonus of $5 per month. By April the necessary men had been hired, and preparations made for the maintenance work, under the direction of A. R. Hirst, state highway engineer. The men employed last year were classified as excellent, good, fair and poor. None of the last class have been reëngaged and only those in the "fair" class who appeared to be capable of improvement. All those of the other classes who desire reëmployment have been hired. The wages are somewhat higher than last year. Men were secured with less difficulty than in 1918; this is, possibly, due in part to the increased salary and bonus, but Mr. Hirst is of the opinion that it is due largely to a growing recognition of the fact that the patrolman's position is a desirable one.

Diagrams for Excess Loss of Head in Pipe Lines

Losses Due to 90-Degree Bends, Increasers, Gate Valves, Reducers and Branches Readily Found — Examples Given

By Frank S. Bailey
Assistant Engineer, Metcalf & Eddy, Boston, Mass.

DIAGRAMS for the purpose of quickly finding losses of head due to 90° bends of various radii, and also the losses of head which occur at increasers, reducers, gate valves or branches in a pipe line, have been prepared by the writer, and are here reproduced. When water flows at a low velocity, say 3 ft. per second or less, through one bend or special fitting, the loss of head is small, and if the pipe line consists mainly of long lengths of straight pipe the loss of head caused by friction in the straight pipe is comparatively so large that the loss in a few bends may be safely ignored. But in complicated systems of piping, such as are found in large office buildings, manufacturing plants, fire-sprinkling systems, sprinkling filters with dosing tanks, etc., which contain numerous bends and branches, the aggregate losses may sometimes reach a surprisingly high amount. In all such systems the losses of head must be carefully estimated and allowed for, or the system will prove to be inadequate to deliver water at the rate required.

Fig. 1 shows the loss of head, in feet, in 90° bends with radii varying from 0 to 60 ft. and also the head lost in gate valves, increasers, and in passing openings. The lines for the 90° bends were plotted from the formula $H = KV\ 2.25$, in which H is loss of head in

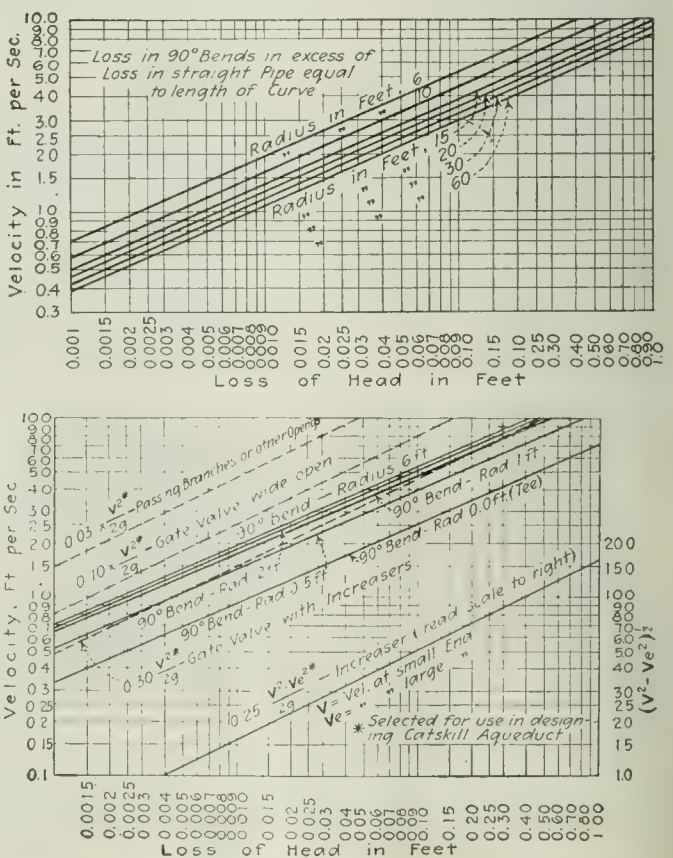


FIG. 1. EXCESS LOSS OF HEAD IN 90° BENDS, GATE VALVES, INCREASERS, ETC.

feet in a 90° bend in excess of the loss in a straight pipe of length equal to the length of the curve at the center of the pipe; K is a coefficient, different for bends of different radii, and V is velocity of water in feet per second. This formula was derived by W. E. Fuller and published in the *Journal* of the New England Water-Works Association for December, 1913.

To illustrate the use of the diagram: Assume that it is desired to know the excess loss of head in a pipe or conduit having a radius to the center line of 2 ft., the velocity of flow being 3 ft. per second. On the upper left-hand scale, Fig. 1, follow the horizontal line 3.0 to its intersection with the diagonal line marked "90° Bend—Radius 2 Ft." and then vertically upward to the scale giving loss of head, in this case 0.03 of a foot.

In cases where the 90° bends are of the standard American or New England Water Works Association patterns reference may be made to the writer's diagram published in *Engineering News* of Mar. 2, 1916, p. 412, where the loss of head in excess of the loss in straight pipe equal in length to the tangents of the curve at the center is shown, and also similar losses in malleable fittings.

The diagram printed herewith is of more extensive scope and shows the excess loss of head for 90° bends of any radius up to 60 ft., by interpolation. It will be noted that the diagram has two diagonal lines, each of which is marked "90° Bend—Radius 6 Ft." The reason for this is that the coefficient K in the formula cited above is a minimum for this radius; K increases as the radius diminishes from 6 ft., and also increases as the radius becomes larger; hence, the diagonal lines for different radii, if plotted together, would overlap so as to be indistinguishable.

How to Use the Diagrams

The formulas for finding head lost in wide-open gate valves, in gate valves with increasers, in passing branches or other openings, and in increasers, are those selected for use in designing the Catskill Aqueduct (see "Water-Works Handbook," by Flynn, Weston and Bogert, p. 583), and are also shown on Fig. 1. As an example, suppose it is desired to find the head lost in a wide-open gate valve, the velocity of flow being 7 ft. per second. On the upper left-hand scale find 7, follow horizontally to intersection with diagonal marked "Gate Valve Wide Open," then vertically upward to scale marked "Loss of Head in Feet," where the loss is seen to be 0.076 ft. To find head lost in gate valves with increasers, and head lost in passing branches or other openings, the scales used are the same as in the last example.

To find the head lost in increasers, it is first necessary to subtract the square of the velocity at the large end from the square of the velocity at the small end and obtain the square root of the difference, then on the scale at the right-hand side marked $(V^2 - V_c^2)^{\frac{1}{2}}$, we find the latter quantity and follow the horizontal line to its intersection with the diagonal marked "Increaser," thence vertically down to scale "Loss of Head in Feet," where the required result is given.

The formula for head lost in reducers, Fig. 2, is given in Merriman's "Treatise on Hydraulics," and applies chiefly to reducers which cause a sudden contraction of section in the direction of the flow, such as vitrified clay or short-body cast-iron reducers. For reducers causing a gradual contraction of section the loss of head is less than that given by the formula.

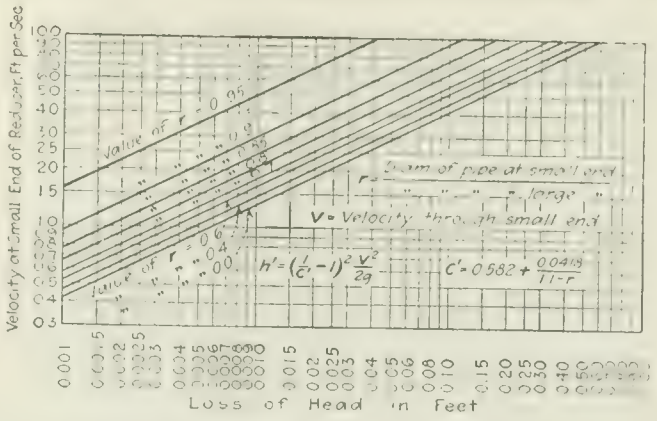


FIG. 2. LOSS OF HEAD IN REDUCERS CAUSING SUDDEN CONTRACTION

As an example of the method of using this diagram, suppose it is desired to find the loss of head in a 10- to 8-in. vitrified-clay reducer (these reducers being of a pattern causing a sudden contraction) with a velocity of flow of 6 ft. per second at the 8-in. end. First find the value of r (diameter of pipe at small end divided by diameter at large end) which in this case equals 0.8; then on the left-hand scale find 6 and follow horizontally to the intersection with the diagonal marked "r-0.8," thence vertically downward to the scale "Loss of Head in Feet," where the loss is found to be 0.087 feet.

Fuller and Markmann's Formulas Compared

In connection with these diagrams, it is interesting to compare the results given by Mr. Fuller's formula for 90° bends with a formula derived theoretically by P. J. Markmann, which is referred to in *Engineering News* of Sept. 29, 1910, p. 328. In the example showing loss of head, as given by the Markmann formula, it is shown that the excess loss of head in a 90° bend of 2-ft. radius with a velocity of flow of 7.3 ft. per second would amount to 4.8 ft. The Fuller formula applied to these conditions gives an excess loss of head of only 0.23 ft. As the latter formula is simply an empirical one designed to agree with such experiments as have been reported—which it does—and as there is so great a difference between the two formulas, there is serious reason for doubting the reliability of the theory on which the Markmann formula is based.

It is not contended, however, that the formulas used in these diagrams will give absolutely accurate results in all cases; exceptional smoothness or roughness of the interior surfaces of bends or fittings will of course affect the loss of head by friction, and these as well as other variations from normal conditions may have an influence on the head lost by change of direction or velocity of the water.

Engine Terminals: Pennsylvania Lines

With reference to the article on "Engine Terminal Improvements: Pennsylvania Lines," in *Engineering News-Record* of July 3, 1919, page 24, Charles B. Johnson & Son, Chicago, state that they should have been mentioned as general contractors for the work at Logansport, Ind.

A Sliding Hillside at Cleveland

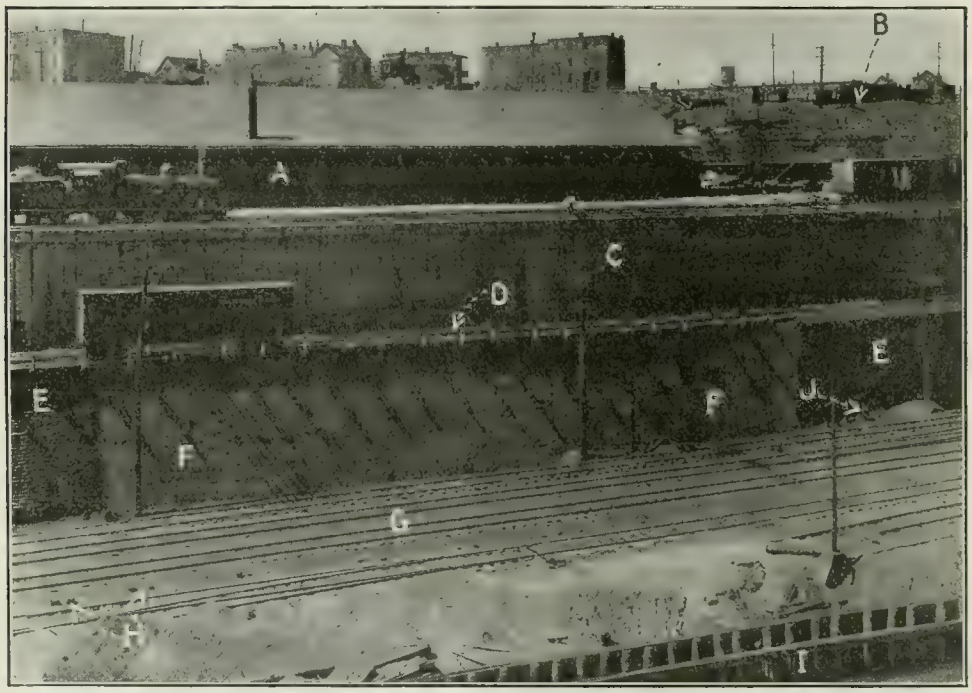
River Front Slope Moves Continuously, Partly Due to Dredging—Retaining Walls Bulged—Piling Checks Movement

LONG-CONTINUED sliding movement of a hillside along the Cuyahoga River at Cleveland, Ohio, has necessitated piling and other measures for the protection of tracks and structures of three railways which are benched along the slope at different levels, while the Wheeling & Lake Erie Ry. has had to rebuild the rest pier of its bascule bridge over the river. The situation is shown by the accompanying drawing and photograph. This movement has been in progress for about 35 years, and extends over a longitudinal distance of about 500 ft. The material is a medium grade of sand, with some quicksand, and the top of the hillside is about 100 ft. above the water level.

A 25-ft. concrete retaining wall 600 ft. long, on three rows of 40-ft. piles, was built in 1914 by the New York, Chicago & St. Louis Ry. to support its line on the upper bench. Up to the end of April, 1919, this had a maximum settlement of about two feet and a maximum outward movement of over three feet. Observations of these movements are recorded in the accompanying table; the figures that are given herewith are for the bottom of the wall; those for the top of the wall are somewhat less.

OUTWARD MOVEMENT OF RETAINING WALL BUILT IN 1914

Distance from West End	March, 1916	Jan., 1917	July, 1917	April, 1919
50	0.38	0 40	0.48	1.04
100	0.86	0 92	0.89	1.23
150	1 38	1.43	1.50	2.04
200	1.77	1.78	1.90	2.56
250	2.01	2.05	2.18	3.02
300	2.17	2.24	2.40	3.27
350	1.98	2 14	2.24	2.91
400	1.46	1 58	1 68	2.18
450	1.04	1 13	1 16	1.58
500	0.67	0.77	...	1.14



SLIDING HIGH GROUND CAUSES TROUBLE TO RAILROADS AT CLEVELAND, OHIO

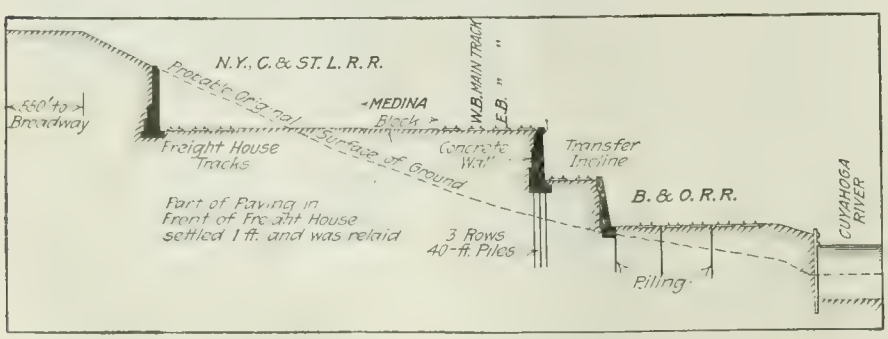
A. New York, Chicago & St. Louis Railway; B. Broadway; C. Concrete wall, 1914; D. Transfer incline; E. Stone wall; F. Concrete Wall, 1902; G. Baltimore and Ohio Railroad; H. Piles driven between tracks; I. Bulkhead wall along river; J. Piling driven 1882.

When this railway was built through Cleveland in 1882 the main tracks for several hundred feet east of the viaduct over the Cuyahoga River were carried on a pile trestle, and a dry rubble retaining wall was built to support the tail track of the transfer connection with the Baltimore & Ohio R. R. at a lower level. A short time after the wall was completed it was found necessary to drive piling in front to stop its outward movement. After a period of observation it was reported that this had been effective, and no further trouble was anticipated. In 1902, twenty years later, some 150 ft. of the rubble wall failed and was replaced by a concrete wall. The remainder of the wall, about 450 ft., shows considerable bulging.

The flood of 1913 washed away or weakened the shore-protection piling along the river front at this point, the location being at a sharp bend, so that the full force of the current was against this piling. Considerable movement of the hillside resulted before the Baltimore & Ohio R. R. could get new piling driven in the river; its engineers, therefore, drove rows of piles between the tracks as an emergency measure. As the City of Cleveland keeps the river dredged to a 23-ft. channel, this condition is favorable to continued movement of the hillside.

Among other effects noted are large cracks in a concrete freight office on the slope above the railways, these being due to both vertical and horizontal movement.

An elevated water tank of the Cleveland Provision Company, located near the foot of the slope, tipped toward the river a distance of about one and a half feet in its height of 24 feet and has been straightened.



CROSS-SECTION OF SLIDING HILLSIDE

South American Railways and the United States

Extensive Development Needed — Multiplicity of Gage Is a Complication — Opportunities for United States Capital

TRANSPORTATION conditions in South America and the United States have a general similarity in the average long distances to the seaports, owing to the great extent of the countries, compelling attention to grades and train loads, for economical operation. This was shown at the recent Pan-American Conference held in Washington, in an address by Percival Farquhar, who pointed out that trunk lines with low grades, capable of carrying heavy train loads, have permitted the carrying on of transportation in the United States at the lowest rates in the world.

One great problem that railways in new countries have to meet is the opening of undeveloped territory, in order to permit of its settlement. Without railways the development may be long delayed, and this has led many South American countries to encourage the construction of railways by a guarantee of interest on the capital necessary to construct them. Where this has taken the form of a guarantee per kilometer or per mile, it has led to the location of the railways with a view to cheap construction. In many cases the meter gage has been adopted, owing largely to the sharper curves which it is supposed to permit and to some small economies of construction. The penalty paid in the operation of the narrow-gage railway has increased with its length, but when once established it is difficult to change. In a country like Argentina, where in general there are no cuts, fills or bridges, the narrow gage adopted by some foreign railway interests and by the Argentine Government has no defense. On the bulk of the railways of Argentina, however, the gage is 5½ ft., but as the cars and locomotives are no wider than American standard-gage equipment these railways are deprived of the advantages of the heavier train loads which the wider gage should give them.

South America Needs Fuel

In fuel, South America has been handicapped, compared with the United States and with Europe. The increase of miners' wages and reduction of hours of labor in Wales, hitherto South America's chief source of supply, emphasize the need of developing local fuels. Pulverized Brazilian and Chilean coal gives good efficiency; there are great areas of oil on the east and west slopes of the Andes, and it is thought that oil may be found in other areas. Cheap fuel is a key to the problem of cheap transportation in South America, and it is not likely that it can be obtained from another hemisphere.

In addition to new construction, there is a vast amount of deferred betterment work on the existing railways, requiring additional rails, rolling stock, sidings and terminal facilities. Mr. Farquhar considers that Government management of the railways has been detrimental to their success.

The railways in Latin America have been financed almost entirely with European (especially British) capital, and the railway companies have been organized, as a rule, in the countries furnishing the capital. Mr. Farquhar pointed out that it cannot now be determined to what extent European countries will be able to finance the requirements of these companies, but it would seem that the demands for capital at home and in their colonies may not leave available sufficient funds for their railways in South America. In such case they may wish the United States to join in this financing and some method or plan should be worked out to provide for such assistance, which would benefit both the United States and the South American countries.

Concrete for Railway Track Support

CONCRETE railway roadbed construction as a means of affording a more substantial and permanent support for the track is an old idea brought up anew by the report of the ballast committee of the American Railway Engineering Association, although the committee does not discuss the subject but simply presents information. In many designs for such construction the concrete, in the form of a stringer or slab, is intended as a substitute for ballast. It has been proposed also to use a concrete slab as a base for the ballast, in order to distribute the load over the roadbed and to provide good drainage. In this latter case it would keep the subgrade dry and firm and prevent the loss of ballast which ordinarily becomes pounded into the roadbed, necessitating the continual addition of fresh material.

Concrete Tried as Direct Support for Track

An extensive trial of concrete as a direct support for the track, with the rails laid on wood blocks or stringers resting directly on concrete slabs, is being made on the Northern Pacific Ry., as described in *Engineering News-Record* of Dec. 12, 1918, p. 1071. This appears to be the only example of such construction on the open line. Experiments with a concrete slab placed between the ballast and the roadbed are more numerous, but are limited to short stretches under track crossings or interlocking plants. Concrete roadbed or track floor construction in large stations and in tunnels and subways is well established, but in such cases the subgrade problem is simple, as the factors of rain and storm are not involved and in some cases the slab is supported on steel floor framing. This unballasted track in a station has an advantage in promoting cleanliness, since the floor of the station can be swept and flushed.

Opinions of engineers in regard to concrete roadbed construction, as quoted in the report, are diverse and conflicting, as might be expected. Some see no value in it or make definite objections. One objection is the liability of disturbance due to settlement of fills, which may continue for several years and would make it difficult to maintain the track in surface. It is suggested also that slabs directly supporting the track would be cracked and shattered under heavy traffic, but this objection is not sustained by experience on the experimental track of the Northern Pacific Ry. On the other hand, several engineers consider the idea as promising, but most of these prefer the use of concrete as a base for the ballast and a protection for the roadbed, rather than as a direct support of the track or a substitute for ballast. Those both favorably and unfavorably impressed refer to the high cost of a continuous slab, but this would be offset to some extent by saving in cost of maintenance and reballasting.

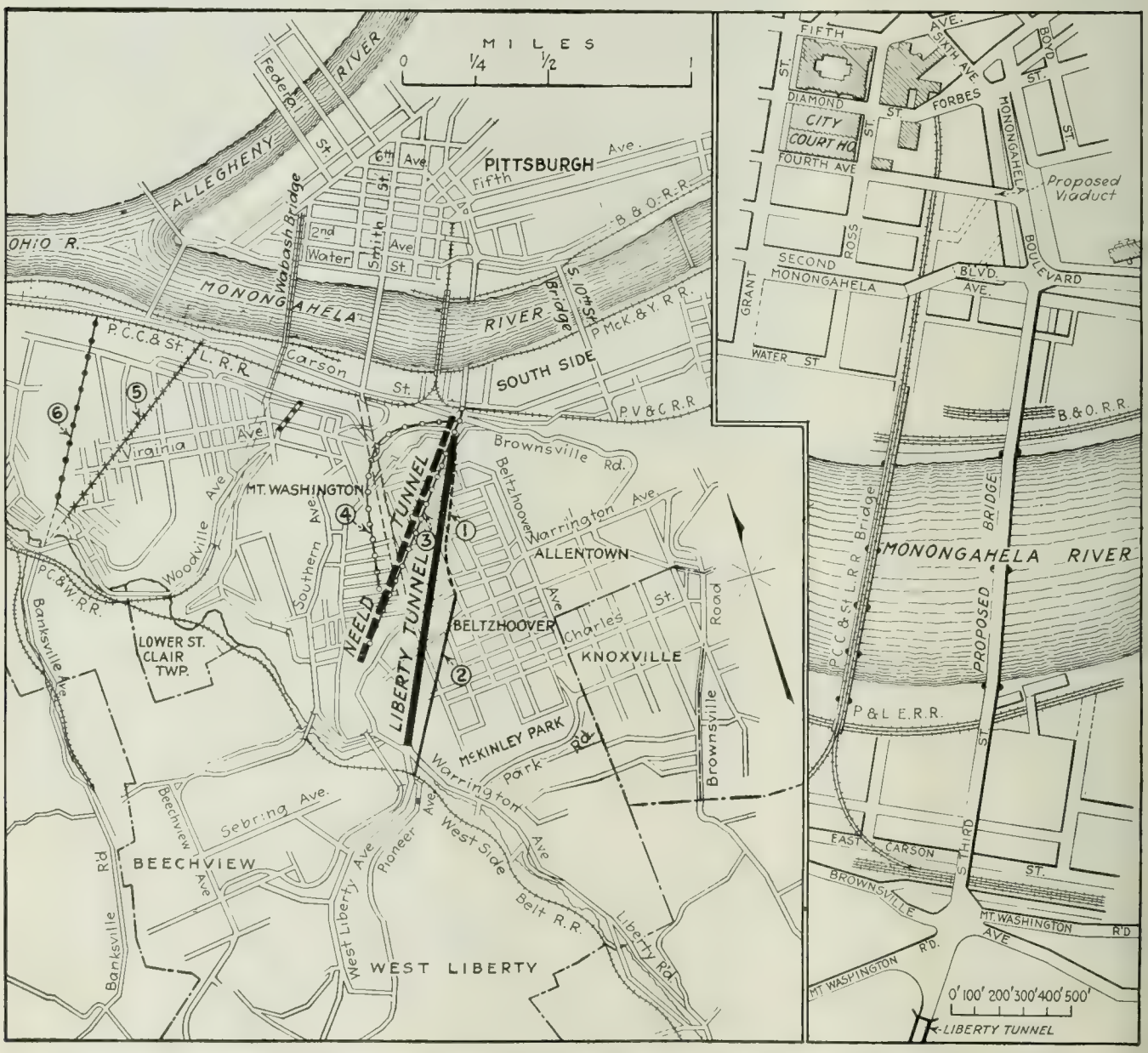
Pittsburgh South Hills Tunnel and Earlier Projects

Present Enterprise for 5500-Foot Tunnel and Its Predecessors—Approach From City By Way of New Bridge

WITH the recent decision of the county commissioners of Allegheny County (Pittsburgh) to contruct a highway tunnel, the "Liberty Tunnel," through the South Hills, connecting the south bank of the Monongahela River with the southerly suburban districts, a public question of long standing and important to the development of Pittsburgh is brought nearer final solution. Four or five years ago a similar tunnel enterprise (see "Neeld Tunnel," on map) was decided upon by the county, and construction was started, but the courts declared it unlawful. However, many other projects have been under discussion within the last dozen years.

Intimately connected with the question of the tunnel location is that of means of access to the tunnel from Pittsburgh. Some of the plans involved a new bridge across the Monongahela to take care of the tunnel traffic, while others depended on the traffic facilities of existing bridges, in most cases the Smithfield St. or the Tenth St. bridge. These are already heavily taxed, the former particularly. The project now adopted by the commissioners includes the construction of a new bridge; this will provide an outlet of large capacity from the business district to the South Hills territory.

In the two plans herewith, some of the chief features of the location and its relation to prior projects are made clear. The general map shows the line of the tunnel with relation to the business district of Pittsburgh, to the south bank of the Monongahela, and to the valley of Sawmill Run, in which the south terminus is located. The location was determined by the county planning commission, to whom the board of county commissioners had referred the question. Special studies were made by E. K. Morse and W. M. Donley. Gen. George W. Goethals was called in as an expert on



SOUTH HILLS TUNNEL LOCATION, PITTSBURGH, AND BRIDGE CONNECTION TO BUSINESS DISTRICT
References to South Hills Tunnel Projects: (1) Haberman tunnel; (2) Haberman tunnel extension; (3) Morse location; (4) Open-cut location; (5) Bigelow-Shalersville tunnel; (6) Alternate Shalersville project.

location, the bridge-approach question, and tunnel ventilation.

The adopted project comprises a tunnel 5500 ft. long extending from a point in the face of the riverside bluff at Brownsville Avenue and South 3rd Street to a point on West Liberty Avenue, near the Bell House Tavern, in Sawmill Run Valley. The profile shows a 2% grade ascending from the north portal for a distance of 2800 ft., and a 1.55% descending grade thence south. The tunnel is to be 44 ft. wide, providing for four lines of traffic, including street cars, and on either side a footwalk. The approach from the city is to be a high-level bridge 2660 ft. long, starting on the city side at Monongahela Boulevard about 800 ft. east of the corner of Sixth Avenue and Forbes Street, and extending to the north tunnel portal on a grade of 0.714%. The deck of the bridge will be 56 ft. above Second Avenue on the Pittsburgh side and 73 ft. above Carson Street on the south side. The city terminus of the bridge is practically the same as that of the Shingiss St. bridge proposed six or eight years ago by the late Hermann Laub as part of a South Hills tunnel project. It is close to the center of the business district and also leads directly into several avenues of traffic to the eastern residential district.

Of the earlier projects the most important is the Neeld tunnel, whose construction was begun by the county four years ago. Its north portal was located not far from that of the Liberty tunnel, but at a lower level, as it was intended to reach Carson St. at grade, and extended 4900 ft. on an ascending grade of 2.88% to a point 67 ft. below the grade of Warrington Ave. near the Pittsburgh Railways Co. car barns. In the present restudy of this location, the planning commission disapproved of the north portal location because of its connecting with Carson St. at grade and thereby interfering with traffic parallel to the river, and of the south portal location because of the heavy grade (6%) of the approach along Warrington Ave. from West Liberty Avenue.

Similar objections were held to condemn projects advanced by E. M. Bigelow for a tunnel from South First and Carson Sts., either to the Bell House portal location (6280 ft. long, with a rising grade of 2.12%) or to the same south portal as that of the Neeld tunnel (4800 ft. long, on a grade of 3.4%). Several projects developed by E. K. Morse, using the south portal location of the Neeld tunnel, were considered objectionable for similar reasons. Another study by Mr. Morse, indicated on the map as "open-cut" location, contemplated tunnel, viaduct, and open cut in combination. Beginning at Brownsville Ave. near South 3rd St., it proposed to ascend on a 5% grade along the face of the bluff, thence proceed southerly by 950 ft. of open cut, 500 ft. of tunnel, 1450 ft. of open cut (maximum depth 200 ft.) and finally, by surface and viaduct roadway including a 1200-ft. crossing over Sawmill Run, to West Liberty Ave. This project was disapproved because of "its heavy grades, indirect routes and viaducts, and the proposed depth of the open cuts."

The line marked "Haberman Tunnel" indicates a high-level project proposed ten or a dozen years ago by Hermann Laub and F. I. Gosser. This contemplated a short tunnel, 1900 ft. long, extending to high ground at Warrington and Haberman Aves., in combination with a double-deck bridge across the Monongahela. The upper deck of this bridge was to rise on a grade of 3.78% from Shingiss St., on the Pittsburgh side, to the north portal of the tunnel. The lower deck was to connect with Carson St., on the south-side river bank. The tunnel would have been about 80 ft. above the Liberty tunnel at the north portal, while its south portal would have been 184 ft. higher than the West Liberty Ave. portal. The Haberman Ave. project was discarded in the present studies because of its heavy grade, the height of the bridge, and the long climb from West Liberty Ave. to its south portal.

The finally adopted location was one of several worked out by W. M. Donley; one of the Donley projects is indicated on the map as "Haberman Tunnel Extension," a scheme which was intended to combine the advantages of access to Warrington Ave. with those of direct connection with Sawmill Run; it involved a total tunnel length of 4600 ft., in two sections separated by 1100 ft. of open cut. The adopted project, as already described, combines the advantages of a north portal above the level of interference with traffic on Carson St., an independent bridge route direct to the business district of the city, and a south portal centrally located in Sawmill Run Valley.

Detail plans for the work are now being prepared under direction of A. D. Neeld, who has been appointed engineer in charge of construction for the county commissioners. When completed the plans will be submitted to the Grand Jury for approval. It is expected that a contract can be awarded by October, and that actual construction can be started before the end of the year.

Lining a Reservoir With Concrete By the Cement Gun

Costs and Progress Made, Given for Operations in Irrigation District During Current High-Price Period

By E. Court Eaton

Superintendent and Engineer, Lindsay-Strathmore Irrigation District, Lindsay, Calif.

CONCRETE lining of reservoirs has become accepted practice in a number of locations where subsoil is pervious and difficulty in holding the water level is anticipated. For such work the cement gun has, in this district, proved very successful, but the costs during the present high prices have not been well established. The accompanying figures are given as an indication of what such work cost on a recent job.

The Lindsay-Strathmore Irrigation District, which



SCREENING SAND ALONGSIDE OF THE CEMENT GUN

has just completed its first irrigating season, has a small reservoir covering about two acres and holding 18 acre-feet of water. The reservoir is known as a "balancing reservoir," and floats on one of the main pipe lines, being used to take up the daily fluctuations in flow, storing a surplus during part of the day, and supplying the shortage during the balance. Unfortunately, the location of this reservoir was necessarily confined to a certain area close to an old stream bed, and the reservoir is excavated in a gravel deposit and had a considerable loss due to seepage, amounting to two to three acre-feet per day. Difficulty was also experienced in making the banks hold, due to water undermining the loose material.

It was decided to line this reservoir with a gunite lining. The total area to be lined was 114,000 sq.ft., and specifications called for a gunite lining 1 in. in thickness, with a mix of one part of cement to 5½ parts of sand; no lime was used in the mixture. The lining was reinforced with galvanized poultry netting, 1½-in. mesh, No. 19-gage wire, placed in the center of the concrete to confine cracks due to expansion to hair cracks, and no expansion joints were used.

This work was let by contract at a price of 10½c. per square foot, including the trimming and preparation of the banks. Work was commenced Jan. 14, 1919, and completed Mar. 19. Because the work had to be done during the winter months the actual number of working days in this time was only 39.

The cement gun used was what is known as the N2 size. It was kept on the upper bank of the canal at a maximum distance of 600 ft. from the compressor, to which it was connected with a 2-in. iron pipe. The compressor was of the portable type, direct-connected to a semi-Diesel type of engine; it was 12 x 12 in. and ran at a speed of 300 r.p.m. A pressure of 42 lb. per square inch was maintained at the compressor, giving about 32 lb. at the gun. A 2-in. rubber hose 200 ft. in length was used from the gun to the nozzle, and the rubber tips in these nozzles lasted nearly one week before requiring replacement. The depreciation on the hose for the period of the job was $200.

In lining the 114,000 sq.ft., 2904 sacks of cement were used, or nearly 39 sq.ft. of lining per sack of cement. The average rate of progress throughout the work was 2900 sq.ft. per working day. The maximum day's run was about 5000 sq.ft., though better average progress would have been made in the dry season, as the principal delays were due to wet sand clogging in the hose and necessitating frequent cleaning out of the machine. A certain amount of moisture is necessary in the sand for this class of work, and the best results were obtained when sufficient water was present so that the sand just failed to hold its shape when squeezed in the hand.

The total quantity of sand used on the work was 600 tons, and the total cost of sand per ton was as follows:

	Per Ton
Loading charge at sand pit	$0.30
Freight	.60
Unloading	.12
Hauling to site	1.50
Total	$2.52

The hauling over the wet roads a distance of two miles was the biggest item. The weight of a cubic yard of sand, which was wet, was 2500 pounds.

The cement was $3.45 per barrel delivered at the site, after an allowance of $1 per barrel was made for sacks. The poultry netting delivered at the site cost $1.17 per 100 square feet.



CEMENT GUN LOCATED ON BANK SUPPLYING NOZZLE COVERING RESERVOIR BOTTOM WITH CONCRETE

The construction crew employed was as follows:

	Per Day
1 Compressor engineer	$7 00
1 Nozzleman	5.00
1 Man placing wire	5 00
2 Mixers at $4	8 00
1 Man loading gun	4 00
1 Nozzleman helper	4 00
1 Gun operator	4.00
1 Man cleaning off rebound	4 00
Total payroll	$41.00

One man was kept continuously close to the nozzleman, his duties being to brush back the rebound at the junction of new and old work and to raise the reinforcement by means of a hook to insure its being placed in the center of the lining.

The fuel used consisted of a fuel oil having a gravity of 27+. Ten drums of this oil of 104-gal. capacity per drum were used. The cost of the oil was $6.55 per drum, delivered to site. The loss by rebound in percentage of the sand used was 8½; this was not wasted, however, as it was collected, screened and used over again with good results, except that only 30 sq.ft. of lining per sack of cement, or 23% less than with new sand, could be gotten when rebound was used, due to the material being coarse and requiring more cement to fill the voids.

Particular attention was paid to the curing, by sprinkling, of the newly completed lining for a period of two days, and up to this time no cracks other than fine hair cracks have developed.

Hexagonal Chart for Finding Velocity of Water in Pipes

Single Diagram Embraces Six Variable Quantities Without Using a Single Curve—Use of Transparent Index Suggested

By C. Warington Anthony
Bahia Blanca, Argentine Republic

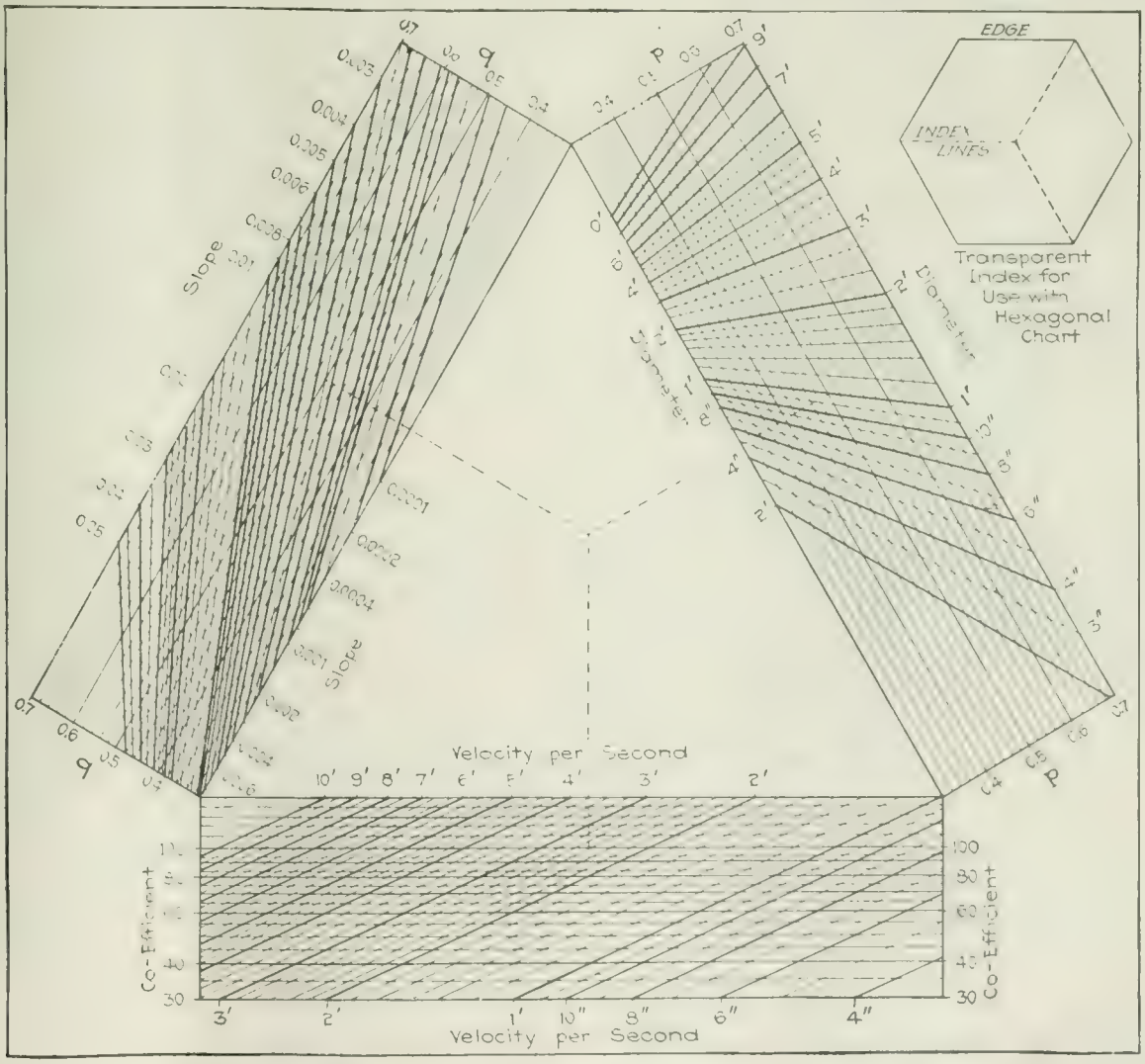
EXPONENTIAL formulas are very much used nowadays in hydraulic problems dealing with the flow of water in pipes and sewers. Many charts or diagrams have been drawn to represent each formula, some taking a variable coefficient into account, which depends on the nature of the inner surface of the conduit, but the writer has never seen one made that does equally well for all the exponential formulas. For this reason I have designed a hexagonal chart that takes care of six variable quantities—the velocity of flow, coefficient of roughness, hydraulic mean radius and slope, together with the powers to which these last two quantities are raised—and yet in spite of all this apparent complexity this chart is as easy to handle as a chart made for working out only one kind of exponential formula. Evidently a chart of this description will prove of great value, since it may be used for rapidly computing and comparing results obtained for a given case by applying different formulas. It may also be used to deduce the best equation to fit in with the results of experiments that have actually been carried out.

The exponential formula is usually written: $V = C\ (D/4)^p\ S^q$, or $V = C\ R^p\ S^q$, since the hydraulic mean radius of a pipe flowing full is the fourth part of its diameter. There will be seen to be three binary scales in the chart, arranged in the form of an equilateral triangle. The coefficient and velocity go together on one scale, and the diameter and slope, together with their respective powers, on the other two scales. The way the diagram is used is illustrated with dotted lines for the following case:

Diameter, 1 ft.; slope, 0.0025; coefficient,100, $p = q = \frac{1}{2}$. The velocity is seen to be $2\frac{1}{2}$ ft. per second.

When using the chart it is convenient to have a hexagonal transparent index, as shown in the upper right-hand corner of the illustration, with its sides parallel to the three index lines. By placing a straight-edge against one side, the index lines may be moved without changing their orientation or displacing the one parallel to the straight-edge.

The great beauty of the chart lies in the fact that it does not contain a single curve, which makes it much easier to draw and at the same time a high degree of accuracy is insured. This is attained by employing logarithmic instead of equally spaced coördinates.



HEXAGONAL DIAGRAM FOR FINDING VELOCITY OF WATER IN PIPES

Report on Cleveland Rapid Transit Recommends Street-Car Loop Subways

Consulting Engineers Find That Surface Relief Is First Need—Street-Car Loop System at Public Square Should Be Retained, but Capacity Increased by Placing Underground—Later Rapid-Transit System

IN REPORTING on rapid transit in Cleveland to the city's rapid transit commission, Barclay Parsons & Klapp, consulting engineers, New York City, have just recommended a system of loop subways for street cars in the center of the city, in order to deal with the transfer traffic now using the Public Square, and relieve the track and street congestion downtown, and also to create the nucleus of a future rapid-transit system. They find that Cleveland is in need of rapid transit, but express doubt as to the financial practicability of an adequate rapid-transit system. They outline a future rapid-transit system comprising an east-west subway line as main stem, and elevated or depressed (open-cut) extension lines; they do not recommend the construction of this system, however.

Improvement of street-car facilities is chosen in preference to rapid-transit construction at the present time for the following reason:

The expense of attempting to reach all the various outlying residential districts from the heart of the city by subway or elevated lines would be so great as seriously to delay the materialization of these facilities. By utilizing the existing street-car systems, the suburban lines and parts of the rights-of-way and other facilities of the Union Terminal Co. in combination with city-built sections of subway in the business district, the minimum investment will produce adequate service and most economical operating costs.

Under the heading, "Physical Character of Proposed Rapid-Transit System," the engineers say, among other things:

In the ultimate analysis the problem resolves itself into the question, "Shall the very successful and well arranged loop system in the Public Square which has satisfactorily handled the surface-car traffic in the past now be supplemented by exterior loops delivering passengers farther away from the center of the business district and only such cars be run to the Square as can be operated through the steadily increasing street congestion?" or, "Shall the facilities to and through this portion of the city be maintained and increased by suitable subsurface routes free from vehicle and pedestrian interference?"

The consulting engineers decide for the latter alternative. At the same time they indicate that no material increase of revenue is to be expected in return for the expenditure required to build the subway loops.

Three maps herewith, Figs. 1 to 3, summarize graphically the recommendations of the engineers. The street-car subway system is outlined in Fig. 1. This system is designed to increase the transportation capacity and speed of the present street-railway system by removing the street-car tracks from the surface, on the main lines approaching the Public Square, and substituting five underground loops for the four loops in the Square through which most of the city's street-car traffic passes at present. In detail the arrangement of the proposed loops is shown by the plan, Fig. 2. Short subway sections prolong these loops to points some distance away from the Square: On Euclid Ave. to 22nd St., on Ontario south to East 4th St., on Superior Ave. east to East 9th St. and west to the high-level bridge. This system is estimated to cost about $15,000,000 when built in four successive stages; built in a single operation it should be somewhat cheaper. As soon as possible the system is to be developed into a real rapid-transit system, a suggestion for which is given by the map, Fig. 3. The portion of lines shown in full black on this map represents subway lines, in extension of the initial Euclid Ave. and Superior Ave. sections connecting with the Public

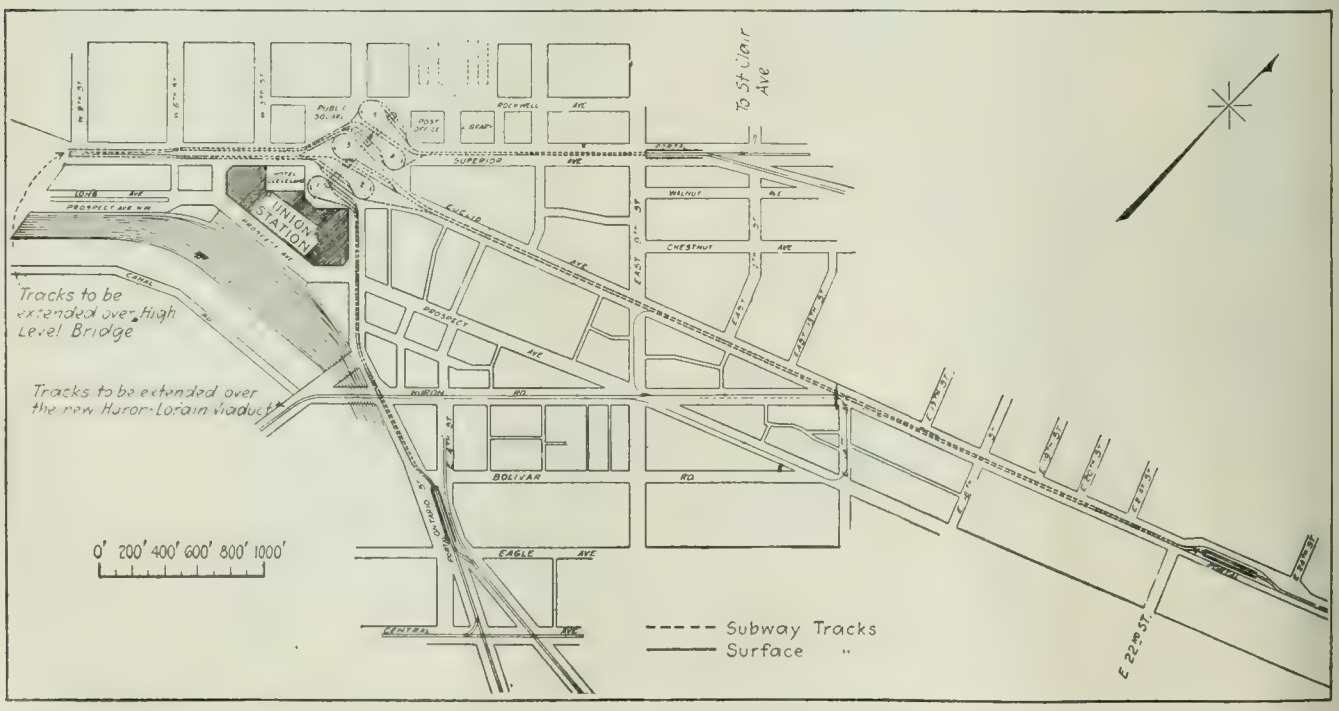


FIG. 1. PARSONS & KLAPP PLAN FOR PLACING STREET-CAR TRACKS IN CENTRAL SECTION OF CLEVELAND UNDERGROUND, WITH LOOPS UNDER PUBLIC SQUARE

Square loops, while the broken lines radiating out from this stem are elevated or open-cut extensions. This suggestion for a rapid-transit system is advanced tentatively, and no costs are estimated.

Finally, as an alternative to the Public Square loop system shown by Fig. 2, the engineers present a simpler system, Fig. 4, which could be constructed at lower cost; they do not recommend this two-loop system, however.

Among the essential data established in the preliminary investigation are these: With a present population of about 850,000, or about 971,000 in the metropolitan area, Cleveland may be expected to grow to 1,500,000 in 1930 and 2,000,000 in 1940. It is now practically at the point of development at which other large cities began rapid-transit construction. As the past growth of the city has been unusually steady, the predictions as to future development may be made confidently and plans developed accordingly. Diversified manufacturing, scattered widely over the city, and equally scattered residential development, and housing, have relation to the steadiness of development and affect traffic conditions.

Both in density of population and in traffic density the city is somewhat below other communities of similar size. Within the street-railway area there are about 18 inhabitants per acre, against 19 for Detroit, 20 for Chicago, and 26 for New York (164 for Manhattan). In spite of the fact that the manufacturing industries are scattered, and that many of the workers live nearby, a very large fraction of the passenger traffic passes through the Public Square, where the street-car lines loop back and passengers exchange. The rush-hour movement is very largely radial, therefore, with an exceedingly heavy congestion at the square. This concentration is partly due to the division of the city into east and west sides by the Cuyahoga River valley, and to topographical peculiarities of this valley which have heretofore tended to confine the business district to the immediate neighborhood of the Square. The engineers conclude, however, that this district will continue to grow eastward along Euclid Avenue.

Needed Traffic Improvements

Density of street-car traffic is not a distinguishing feature of Cleveland. The line of heaviest traffic, that on Euclid Ave., carries only 43,000,000 passengers per year, as against 72,000,000 on Woodward Ave., Detroit. This is in part, however, due to diversion of Euclid Ave. traffic to parallel lines. The traffic is largely long-haul, but the average length of ride with transfer, 3.1 miles, is less than in Chicago (4.16 miles).

Street-car traffic more than doubled in the past ten years, to nearly 400,000,000 passengers per year, and may be expected to increase to 740,000,000 by the time the population reaches 2,000,000; the number of rides per inhabitant is expected to increase from the present figure of something over 325 to about 370.

Comparison with Boston and Chicago shows that as these cities built their first rapid-transit lines when their population was close to the million mark, Cleveland "in the matter of population is at the stage where other cities entered upon development of their rapid-transit systems." However, they conclude that "the rapidly increasing vehicle and pedestrian congestion in and about the Square, together with the further

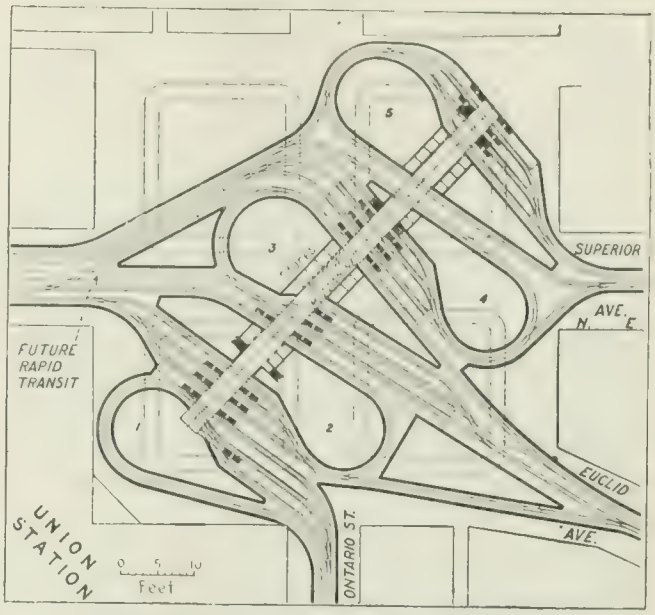


FIG. 2. TRACK ARRANGEMENT IN RECOMMENDED LOOP SUBWAYS UNDER PUBLIC SQUARE, CLEVELAND

tendency toward concentration of traffic at this point which must result from the union station, will make necessary some provision for underground looping of the surface cars in order to continue the present method of general transfer from line to line at this point." Discussing this matter further, they say that, "knowing that subways in the downtown district will require several years to build even for surface car loops, it is evident that a beginning of this work is now warranted. The extent to which this program should be enlarged and whether it should include initial rapid-transit lines at the present time is largely a financial question." On the basis of these considerations, and the fact that the radial arrangement of the city will make it impracticable to reach any large proportion of the outlying territory by a single rapid-transit line, the engineers proceed to develop the plan for improving the surface-car operations by placing the tracks underground in the central portion of the city.

For future rapid-transit development, they conclude that present conditions as well as probable future development indicate Euclid Ave. and Detroit Ave. as the obvious route for an east-and-west rapid-transit line. The scheme shown in Fig. 3 is therefore outlined, comprising a subway stem through Detroit and Euclid Aves., seven or eight miles long, with short lateral extensions, and thence outward elevated or open-cut lines in different radial directions.

Conclusions and Recommendations

The conclusions of the report are, in part:

The unification of street-car and rapid-transit lines into a single system is the most economical and efficient method of developing and operating a satisfactory transportation system for a large city such as Cleveland is destined to be.

The increasing congestion of vehicle and pedestrian traffic in the central part of Cleveland shows that the relief for street-car congestion must come from either looping back a large portion of the cars farther from the city's center or placing them underground in subways in this district, or combining both expedients. It does not appear that any further re-routing or rearrangement of the present surface-

car loops in the Public Square will be of benefit. These loops have in the rush hours practically reached their capacity. Relief for the present street car congestion can be secured by sections of subways built in progressive steps in such a manner as to become a part of through rapid-transit lines, when these latter can be financed.

Definite benefits beyond the improved service to passengers will be derived from the development of street-car and rapid-transit subways in the center of the city even before the main rapid-transit lines are developed. The time-saving will bring the outlying districts nearer the center of the city, and the added capacity for handling traffic in the central district will make possible the handling of passengers drawn from a greater residential area. All of these items tend to enhance real-estate values in all sections of the city.

An increase in speed of about 30% will be possible in the downtown district, by the use of the proposed subway loops in the Public Square and subway approaches. This will result in a saving of time for motormen and conductors, which at the present rate of wages and present car schedules shows a total saving of $112,000. Together with a saving in personal injury damages and track maintenance, this system of operation will save the interest of between $2,000,000 and $3,000,000.

The building of additional lines in the outer zone will be ineffective unless terminal capacity for handling their traffic is supplied in the delivery district at the center of the city.

In a radial city like Cleveland, with a predominating central business district, the congestion must be relieved at the center first and the extensions of the system carried outward.

The report recommends that subway loops, as shown by Figs. 1 and 2, be constructed as rapidly as the money for the work can be found. Effort should be made, it is stated, to provide further routes from the east to the west side by bridges and thus keep out of the central district the passengers who wish to cross the city and who can thus be kept out of the congestion. Vehicle thoroughfares should also be developed to facilitate similar diversion.

It is recommended that the loop subways be built in the following order: (1) Loops 2 and 4 with the subway section from the Detroit-Superior viaduct eastward to the Square, at a cost of $4,400,000; (2) the Euclid Ave. subway from 22nd St. to the Square, and loop No. 3, at a cost of $5,500,000; (3) the Ontario St. subway section and loop No. 1, at a cost of $3,500,000; (4) the East Superior Ave. subway section and loop No. 5, at a cost of $2,400,000. The cost figures are based on present prices of labor and materials.

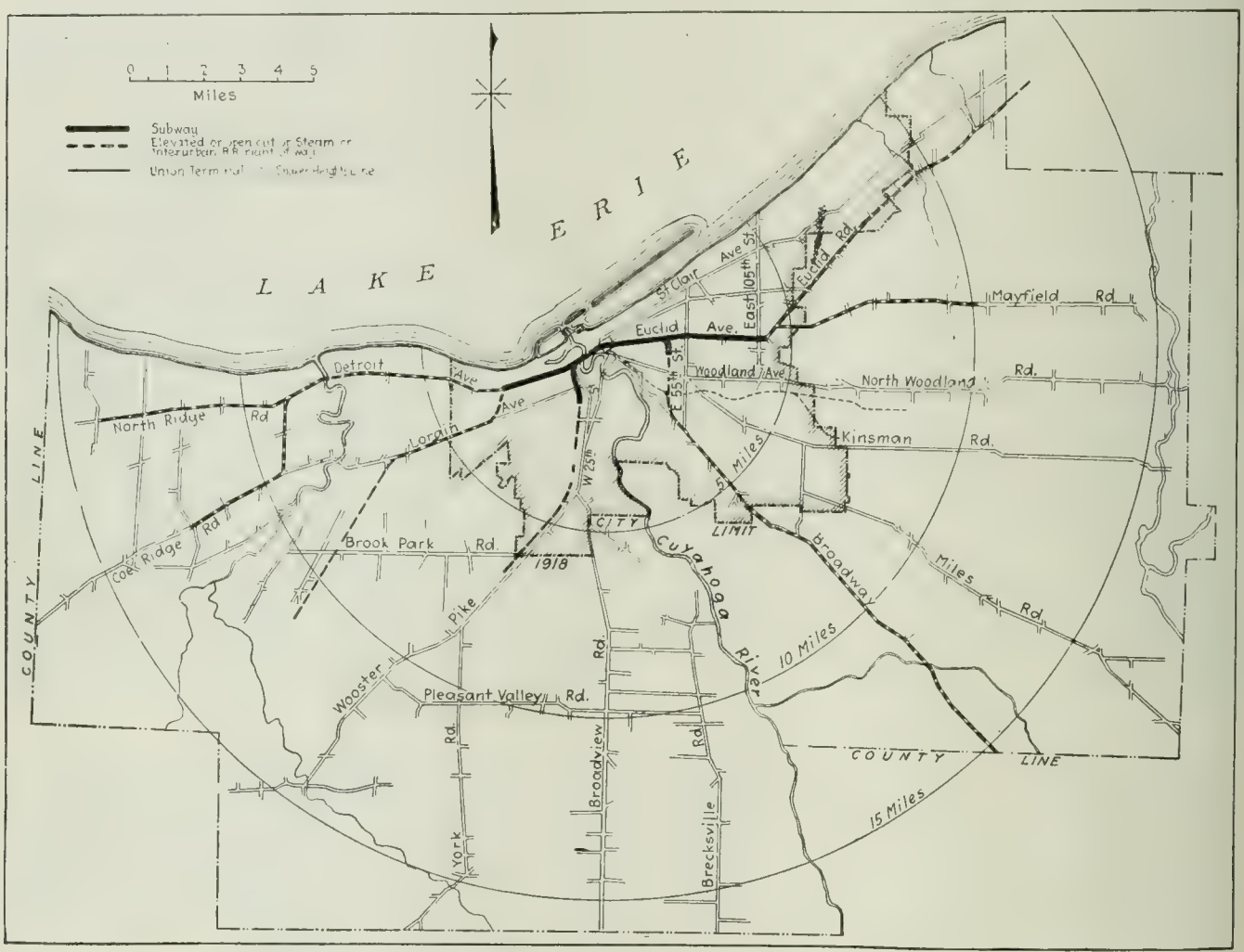


FIG. 3. SUGGESTED RAPID-TRANSIT SYSTEM FOR CLEVELAND

Construction of the rapid-transit system as such would be undertaken subsequently, the system shown in Fig. 3 being developed as rapidly as possible. "An estimate of the cost of such extensions has not been attempted as the character of the construction cannot now be determined."

Unification of all the transportation service in the

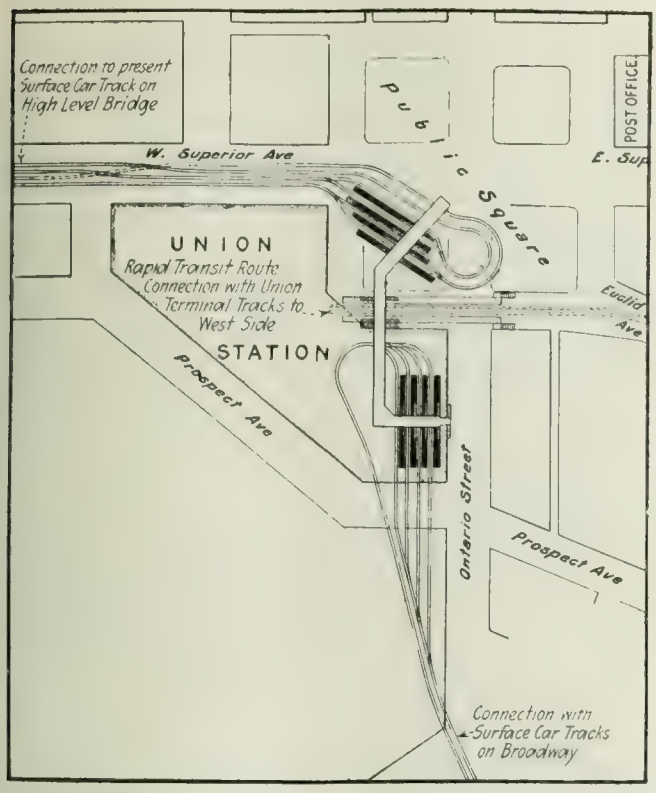


FIG. 1. ALTERNATIVE SUBWAY-LOOP SCHEME SUGGESTED AS CHEAPER THAN THAT SHOWN IN FIG. 2

city is made an essential recommendation fundamental to the entire report. The engineers also conclude that the street-car loops, as well as the rapid-transit system, should be coördinated with the new union station which it is planned to build at the southwest corner of the Public Square.

Seventy-Foot Concrete Flagpole Poured Erect in Place

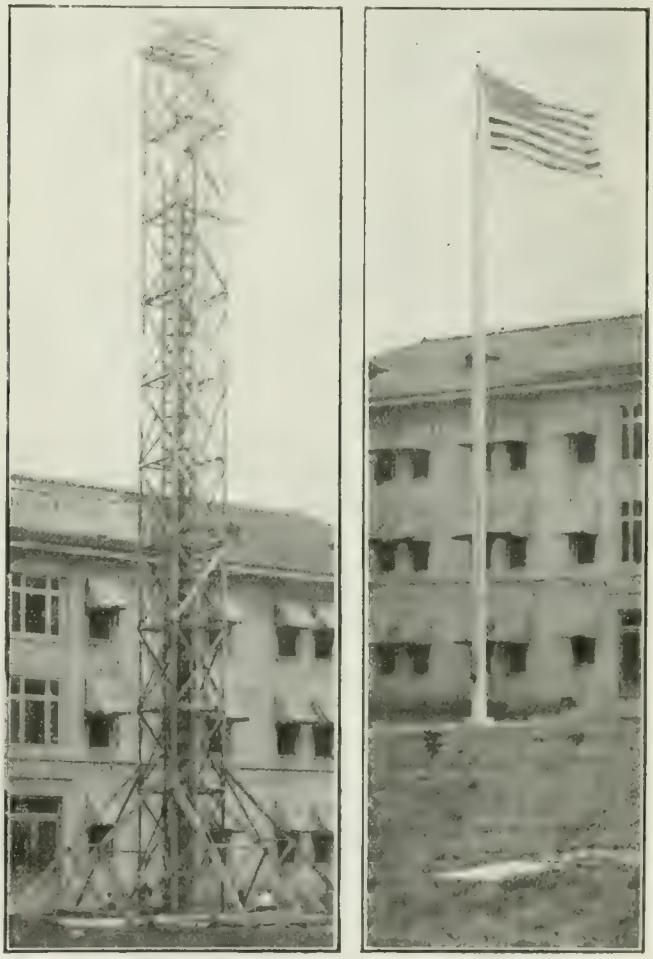
Method Saved Erection Equipment and Extra Reinforcement Required When Pole Is Lifted Into Position

By R. C. Hardman
Acting Municipal Engineer, the Panama Canal, Balboa Heights, C. Z.

INABILITY to obtain a stick of the proper size and length, and the presence of a successful reinforced-concrete flagpole erected for the Panama Canal at Balboa Heights, a few years ago (described in *Engineering News* of Sept. 2, 1915, p. 452), determined the use of the same material for a pole erected in front of the new administration building of the Ancon Hospital Group at Ancon, C. Z. The earlier pole, which is of a rather elaborate design, was poured upon the ground in a horizontal position and later erected, necessitating complicated reinforcement to take the handling strains as well as strains after erection. As the cost of erecting was very high and the location of the proposed pole on a terrace rendered the method still more difficult and costly, it was decided to pour the pole in place. To this end a self-supporting pole was designed, stability being secured by an enlarged base which was extended into the ground 10 ft., the height of the pole above ground being 70 feet.

In design the pole is very simple, being 17 in. in diameter at the base and 8½ in. in diameter at the top, having, of course, the proper entasis at the intermediate sections. It is reinforced longitudinally with eight square bars decreasing in size from 1¼ in. at the base to ½ in. at the top and hooped with ⅜-in. square bars on 2- and 3-ft. centers. The ratio of steel to concrete at the base section is 0.055.

The construction of the pole was effected by means of a light tower similar to a hoisting tower. The forms for the pole, which were made of wood in eight sections, were erected inside this tower, to which they were securely fastened after having been plumbed by the use of two transits at right angles to each other. The forms were placed at the rate of but one 8-ft. section per day, but the steel was erected for the entire pole. The forms, being made in longitudinal halves, were thus easily placed about the steel and filled by means of buckets. The concrete mix used was 1 : 1½ : 3, the pole receiving in addition a float-finish coat immediately upon removal of the forms. No difficulty was encountered in the construction, although great care was necessary in the form erection to secure a creditable result. The pole proved to be so satisfactory, both



TOWER CARRYING FALSEWORK—CAST-IN-PLACE CONCRETE POLE

in cost and appearance, that a second one was soon erected, photographs of which are submitted showing the method of construction and the finished pole.

The pole was designed and built by the forces of the building division of the Panama Canal, Hartley Rowe, resident engineer. Arthur Hall, supervisor, had direct charge of the construction of both poles.

Backfilling Tunnel Through Holes Bored from Surface

Concrete Poured Around 60-Inch Cast-Iron Pipe in 10 x 10-Foot Rock Bore by Dropping It 70 Feet From Trestle Across River

By J. Armstrong
Division Engineer, Greater Winnipeg Water District, Winnipeg, Man.

OVER 1100 ft. of the new Winnipeg Aqueduct is in tunnel under the Red River, with the roof of the tunnel about 70 ft. below the high part of the ground and 40 ft. below the river level. The 60-in. cast-iron pipe carrying the water was concreted here into the 10 x 10-ft. tunnel by concrete dropped through holes bored at intervals from the surface.

The tunnel bore is through the solid limestone rock, the rock roof being some 17 ft. in thickness, with overlying soils of various clays, silts, and other river deposits. The rock was found to be fairly hard but badly seamed both horizontally and vertically and containing many pockets of varying size up to two or three cubic yards, evidently the result of water action at some remote period, but now filled with a white, chalky clay. The first 400 ft. of the tunnel from the eastern end discharged considerable water into the boring from these seams, although not in sufficient quantity to require the aid of compressed air, a 4-in. submerged centrifugal pump handling the water at all times with ease. The remaining 600 ft., although seamed and checked, seemed tighter, and comparatively little water was added from this portion.

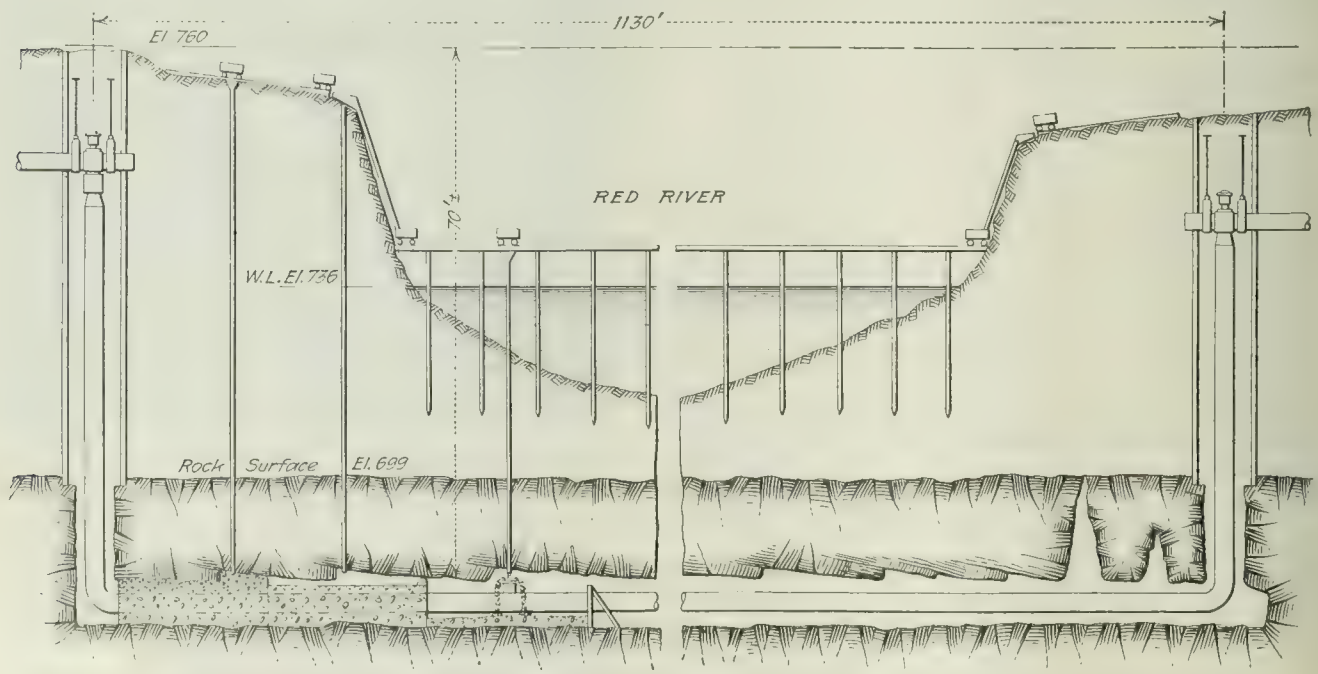
The original tunnel section was designed with a circular roof, but owing to the seamy condition discovered the section was changed to a 10 x 10-ft. square. The eastern shaft is some 2 ft. lower than the western shaft, to facilitate drainage during construction.

The water is conveyed through this tunnel in a 60-in. cast-iron lining. The contract required that after this lining was in place the remaining space in the tunnel bore be backfilled with concrete in such a manner as to guarantee an absolute filling of all irregularities and pockets. The specifications specifically prohibited the use of compressed air in placing the concrete. After much study the method adopted was by means of well holes bored from the surface through the roof of the tunnel. These holes were drilled with an ordinary well-drilling machine and lined with a 6-in. well casing from the surface to the rock. The spacing of the holes was somewhat irregular but averaged 40 ft., the holes being bored to this spacing at the nearest high spot in the tunnel roof.

For the river crossing a light trestle was built consisting of two-pile bents spaced 8 ft. centers with four longitudinal 8 x 8-in. stringers to act as bracing and to bear the light industrial track carrying the concrete cars. A mixing plant was provided at each end of the tunnel consisting of a ¾-yd. mixer, industrial tracks and concrete cars of various types.

The first operation consisted in the pouring of a concrete floor in the tunnel carefully graded to facilitate the placing of the 60-in. cast-iron lining. This concrete, some 250 yd., was all poured down one hole at the western end and distributed by cars using the same track previously employed in the tunnel excavation and later used to transport the cast-iron pipe.

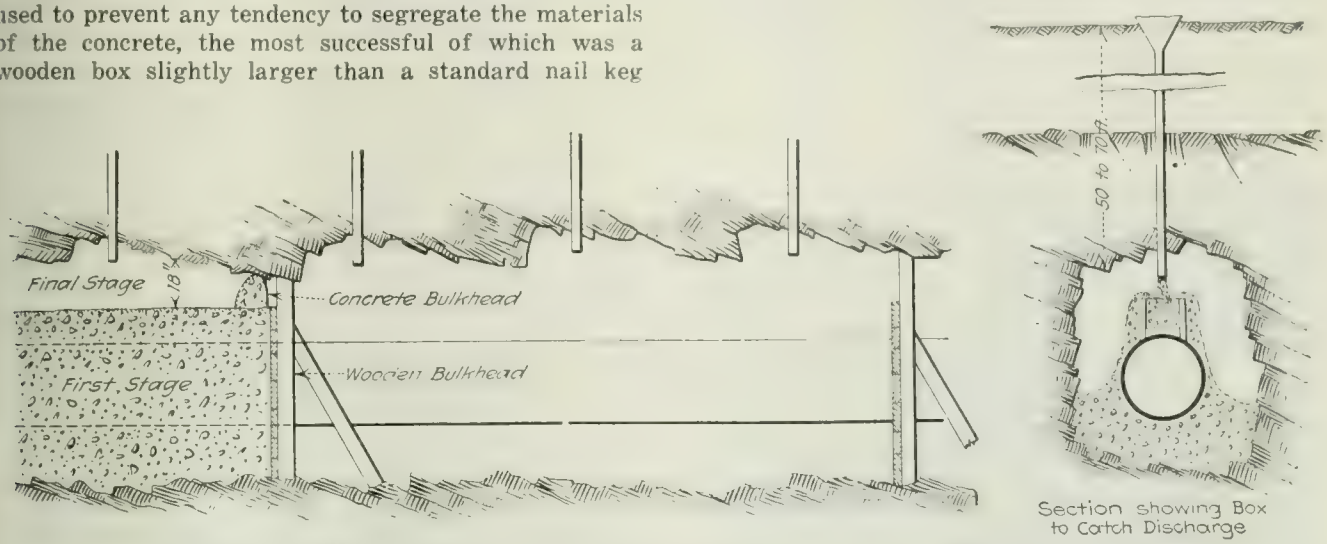
When the lining was in place the tunnel was bulkheaded off in sections of various lengths and concrete poured until within 18 in. or 2 ft. of the roof. This was allowed to set and succeeding sections were poured. During the operation a concrete dam or bulkhead was built back on the set concrete, these dams being about 120 ft. apart, thus leaving three well holes between each two concrete bulkheads. After these concrete bulkheads were sufficiently hardened to withstand the pressure the final concrete was poured. The two end holes in each compartment were used to discharge the concrete, leaving the middle hole for observation purposes. In every instance when the end holes were filled the concrete rose in the middle or observation hole to the same level, showing a practically perfect hydrostatic action. As these holes provided a head of from 55 to 70 ft. of fluid



SECTION THROUGH RED RIVER TUNNEL OF WINNIPEG AQUEDUCT SHOWING METHOD OF CONCRETING PIPE

concrete there seems no doubt that all cavities and seams adjacent to the tunnel section must be completely filled.

For pouring the floor and the main tunnel concrete a mixture of 1 cement to 4 of aggregate was used, all stones passing a ½-in. ring. The stone was kept small to avoid a possibility of choking the pipes. A fairly wet mix was used although nothing approaching sloppiness was required. Observation indicates that aggregate containing stone as large as 1-in. might be safely used in holes of 5½- or 6-in. diameter. Various devices were used to prevent any tendency to segregate the materials of the concrete, the most successful of which was a wooden box slightly larger than a standard nail keg



SECTIONS SHOWING DETAILS OF CONCRETING AQUEDUCT BY DROPPING THROUGH PIPES

fixed on top of the cast-iron pipe and directly underneath the pipe. The force of the concrete discharging into this box full of concrete gave the constituents a very thorough remixing. As a further precaution an inspector and two workmen were kept in the section being concreted, and properly distributed the concrete. These men were able to work in the concrete until it was within 3 ft. of the roof and it was at this stage the concrete dam or bulkhead was built on previously set concrete preparatory to the final or grouting operation. These men usually sank half way to the knees in the concrete, which will give some idea of the wetness of the mixture. Spouts with a hopper swiveled under the holes were also used successfully but were awkward to handle and seemed to involve more extreme effort than collecting in the box and then working along by shovel and tramping. The inspector had a field telephone installed in the tunnel giving ready communication with the mixer when instructions were necessary.

The final stage was the filling of the space left as just described, the mixture used being 1 of cement to 3 of aggregate, the aggregate being in district parlance "rejected sand;" in other words, the excess finer materials screened from the pit run during the process of assembling the standard aggregate. This material was fairly well graded from a coarse sand to fine sand. As before indicated, this concrete was poured down the two outside holes of a three-hole set. A few batches quickly formed a cushion under the hole thus preventing segregation, as was easily proved by samples taken from the middle or observation hole.

The holes with one exception were bored directly on the center line. This exception was at the eastern end where the rock was exceptionally seamy, and a couple of bad caves resulted. The second one developed an opening completely through the rock, letting in a considerable flood of water and earth from above the rock. Fortunately, the hole was small and eventually became choked with stones and earth from above; not, however, before the caving was visible on the surface 70 ft. above.

Some hesitation was felt about driving a hole through this shaky roof, and fortunately one of the large water-worn cavities before mentioned was found here extending some 4 ft. off line of the tunnel. The pouring hole was accordingly driven here without the loosening of any further rock from the roof. Considerable water was coming through the roof in this section and was collected on a sheet-iron roof and run to wooden troughs along the side and carried beyond the concreting in progress.

For the final stage of pouring at this section, a 2-in. pipe was run through the concrete bulkhead and extended upward to near the upper surface of the rock, some 12 or 14 ft. above the roof line of the tunnel. When ready for concreting the wooden troughs were plugged and the compartment allowed to fill with water. When this was completed the concrete was poured into the still water down the pipe. Shortly after commencing the concreting, water began to discharge through the 2-in. pipe leading through the bulkhead. Finally grout began to appear discoloring the water; then the pipe was closed. Concrete was poured into this hole until it finally appeared in the cave-in previously mentioned above the center of the tunnel.

Twenty-three holes in all were bored, the total cost of well boring, casings, temporary trestle over river and segregation prevention being less than $2.50 per cubic yard of concrete. Experience indicates that at least one-third of these holes might have been omitted. Where a 60-ft. head is obtainable the holes may be safely spaced at 80 ft. and with a certainty that all of the cavities will be thoroughly filled.

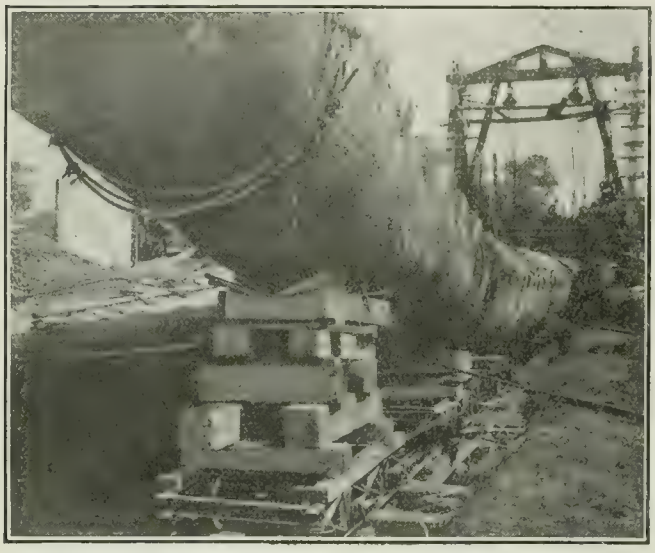
Municipal Ownership Extended at Berlin

Greater Berlin, Germany, acquired the street railway system known as the Metropolitan surface lines on June 26. The purchase price of 100,000,000 marks (or about $24,300,000 on the pre-war exchange basis) was paid in bonds.

Large Concrete-Cased Steel Pipe Laid in One Piece

Six-Foot Submarine Section 452 Feet Long, Built on Shore and Drawn Into Water—Special Methods Used in Launching

LAUNCHING and lowering to position in 26 ft. of water a 452-ft. inverted siphon of 6-ft. steel pipe, incased in 3 in. of wire-reinforced concrete, has been accomplished recently at the Passaic River crossing of the Jersey City water-supply. The pipe is not only of special design, but the methods used in moving it from the erection position on the shore to its position in the trench were also quite uncommon, it being necessary to make sure that there would be no cracking of the concrete casing during the operation. On account of



PIPE SECTION COMPLETED AND READY FOR LAUNCHING

the weight of the pipe, which averaged about one ton per foot, it was necessary to provide supports at short intervals for readjustment to relieve the strain caused by buoyancy and changes of grade as the pipe entered the water.

The water-supply for Jersey City comes from the Boonton reservoir some 20-odd miles from the city through a conduit which crosses beneath both the Passaic and Hackensack Rivers. The construction of the original crossings was described in *Engineering News* of Mar. 12, 1903, p. 232. In brief, the method followed was to erect the pipe on the shore, and, as it was erected, to drag it into the water by means of a hoisting engine on the far shore. The pipe, which was of 6-ft. riveted steel, was cased with precast concrete rings, which were slipped over as the riveted connections were made, the clearance space between the rings and the steel pipe being grouted with portland cement grout. The pipe was of $\frac{11}{16}$-in. steel plate, the concrete rings were 6 in. in thickness and the clearance space was about 2 in., making a total thickness of about 9 in. The concrete covering was not only for the protection of the pipe, but also to give sufficient weight to keep the pipe from floating when pumped out. A special conical-shaped bulkhead was used at the launching end. This method of procedure made it possible to lay the pipe without interfering in any way with navigation.

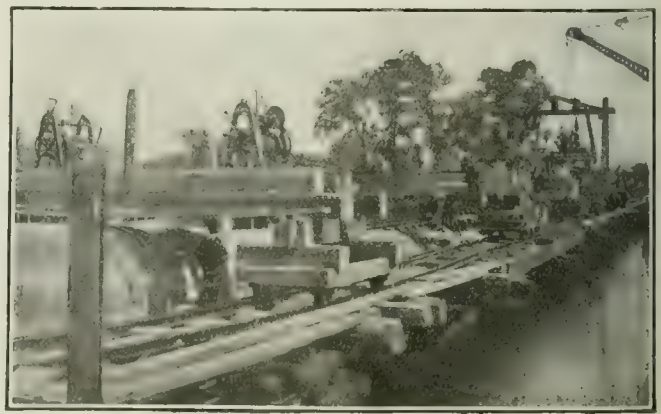
As a part of the work of duplicating portions of the original conduit, it was determined to lay another pipe of 72-in. inside diameter at each river crossing, on a line parallel to the other. Instead of casing the pipe with precast concrete rings, it was decided to cover it with concrete by the use of the cement gun, and to build the entire section on shore and launch it in one piece. The pipe is composed of $\frac{3}{4}$-in. steel plates riveted into sections at the shop, and taken to the site and erected. It was covered with heavy wire mesh, which may be seen at the end of the section in one of the photographs, and concreted as stated above. The plans called for a 3-in. layer of concrete with lugs to support precast concrete weights which were to be placed after the pipe was in position in the river. It was found, however, that it was impracticable to lay the pipe thus weighted at a depth sufficient to give the clearance required by the War Department for navigable rivers, so cast-iron blocks coated with asphaltum will be slung over the pipe at 16-ft. intervals. Each block will weigh $2\frac{1}{4}$ tons, the total weight suspended at each point being $4\frac{1}{2}$ tons. The section is constructed with a level portion in the bed of the river and goose-necks at each shore end.

To prepare the site for the construction and the bed of the river for reception of the pipe, a large trench was dug upon the shore, following the shore section of the pipe line, and extending down to the water's edge. The stream bed was excavated by a dragline excavator operated by a hoisting engine on the shore opposite the erection site.

For the shore launching ways, a narrow-gage track was laid in the bottom of the trench upon which ran small steel cars. These cars were placed at 20-ft. intervals, were lashed together with steel cables, and the steel pipe was blocked up on them and securely wedged as it was erected.

After applying the concrete to the steel pipe with the cement gun and allowing the finished sections to harden, the cars which supported the pipe were moved forward so that the points of original blocking might be covered with concrete.

That there might be no strain which would damage the casing of the pipe, it was considered necessary to support it in the entire movement across the stream. To accomplish this a double line of 30-in. gage light railroad track was built on timber trestles, extending across the river, with 12-ft. clearance between the trestles, which paralleled both the shore and river trenches. Upon these tracks ran light railway cars at 25-ft. intervals, connected with steel cables. Blocked up on these cars and bridging from one trestle to the other were built up beams consisting of four 12 x 12-in.



TRESTLES WITH TRACKS AND ADJUSTMENT BRIDGES

timbers, upon which rested two crabs arranged to raise or lower the pipe as required. These beams were placed on the cars by means of a derrick. The tackle was attached as the pipe was moved into the water. After tightening up with the crabs, the cars below were lifted out with another derrick.

Propulsion was supplied by the same hoisting engine outfit which operated the dragline excavation bucket. A 24-part, ¾-in. line attached to two 1½-in. plow steel cables was used to draw the pipe. At each pull the pipe was moved from 12 to 15 ft., the whole train being kept taut by slacking off cables at the rear end.

Steep banks on each side of the river, giving abrupt changes in grade, combined with the effect of buoyancy as the pipe entered the water, made careful adjustments necessary. At each pull it was necessary to loosen or tighten all the crabs and rearrange the blocking to relieve the strain. A large derrick boat was used to help support the forward goose-neck, and two special trestle bents were used, one near the forward and one



LAUNCHING END OF PIPE, SHOWING BULKHEAD

near the rear end of the pipe. The pipe was given buoyancy by building an air-tight bulkhead in each end. Air and water holes were provided so that either an air pressure or filling with water could be resorted to when necessary, to raise or lower the pipe.

When the pipe reached position, it was sunk by the admission of water, and cofferdams were built at each end to connect it with the land line. The Government regulations require a clearance of 20 ft. between high tide and the top of the pipe. This method that was employed required the blocking of navigation for the time being.

The chief engineer in charge of the work is C. A. Van Keuren of Jersey City. The contract was originally let to O'Neil & Cutler of Jersey City, but they were unable to finish the job, and it was relet to Joseph L. Sigretto & Co., who have installed the pipe at the Passaic crossing and are working on the crossing of the Hackensack, which is upwards of 1000 ft. in length. J. H. Watson is engineer for the contractor and William Jones, who had charge of laying the other crossing 16 years ago, is superintendent.

Democracy or Partnership in Labor Management

BASED on a study at many industrial plants, the Working Conditions Service of the U. S. Department of Labor, Grant Hamilton, director general, has issued Circular No. 6, "Relations Between Employer and Employee," by Dr. William M. Leiserson, chief of the Division of Labor Administration.

The following extracts may induce readers who are interested to send to Washington for a copy of the entire circular.

Democracy or partnership in labor management requires an industrial relations organization designed to place the employees and the employer on an equality in bargaining power and to give them an equal voice in determining working conditions and terms of employment. Such an organization consists of employees' representatives, sometimes known as shop stewards or shop chairmen, employees' committees dealing with wages, hours, grievances and discharges, and an arbitration board of some kind to decide differences between the management and the employees. If the employer is not prepared to give his employees an equal voice in labor bargaining and shop government, he should avoid creating any committees or boards which give the appearance of collective bargaining but not the essence. Employees are quick to sense the difference in their daily experiences in the shop, and they think the employer is trying to deceive them.

The most advanced form of labor administration obtains in a few firms which have a vice-president in charge of labor, or a labor manager equal in rank and authority with the production, sales and financial managers. A large clothing concern, for example, divides its operations into five departments—purchasing, production, labor, sales and finance. At the head of each is a manager, and the five together constitute the executive organization of the business. No important policy is decided upon by any one department without its effects on the others being considered. If any policy is proposed in purchasing, production, or advertising, which may bring overwork for a period and then lay-offs, the labor manager is present to point out the effect on the workers in the plant and thus have the policy changed to prevent disorganization of the labor force. So it is with every other policy affecting labor. In such a plan as this the personnel organization and the industrial relations machinery are directed by the one labor manager. The handling of the personnel problems and the industrial relations are, however, organized separately.

Employers who deal with trade unions or who wish voluntarily to give their employees a voice in determining wages, hours, working conditions and shop government, have, in addition to the above, to operate the machinery for handling the economic or collective labor relations. Where an agreement is made with a union the methods of collective bargaining will be contained in the agreement. Where the employer wishes to inaugurate collective bargaining he will begin this by creating shop committees or an employee representation plan of some kind. Experience has shown that the best method of handling this is for the management not to devise some plan of its own but rather to ask the employees to elect representatives who, together with the management, will work out a plan approved by both. In this way the employees will not be as likely to criticise minor defects in the plan, for they will feel it is of their own making.

Steel and Concrete Framing Combined for Economy

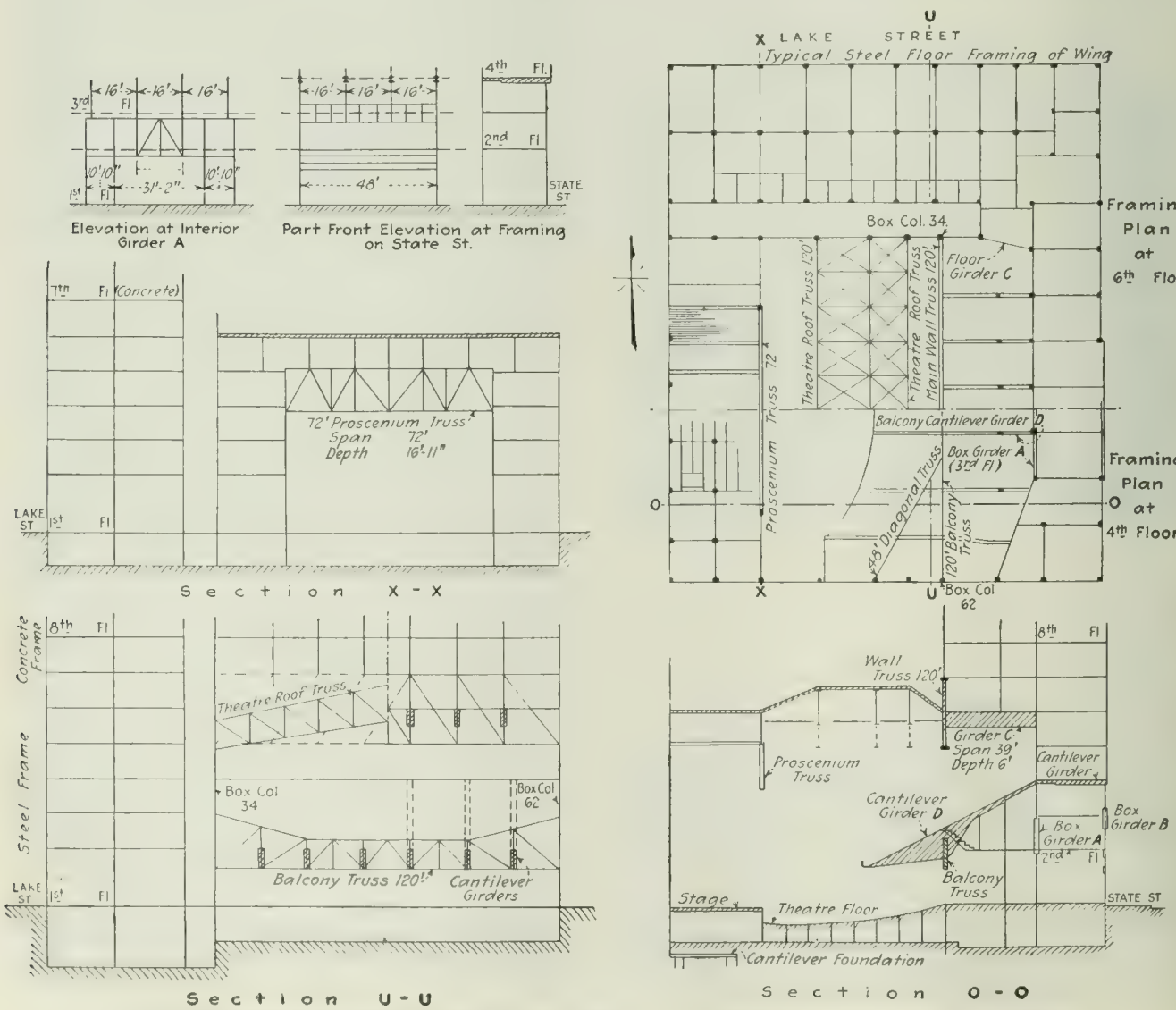
Cost and Space Both Saved in Chicago 12-Story Office Building Carried Over Theater Auditorium—Design Includes Special Heavy Trusses, Girders and Cantilevers

ELIMINATION of columns within the theater portion of a combined theater and office building, and the combination of steel and concrete framing on account of the high price and limited supply of steel, are features in the 12-story State-Lake Building in Chicago. This building is an unusual case of structural design adapted to meet difficult conditions imposed by architectural requirements. With columns prohibited inside the large area of the theater floor, special truss and girder construction was introduced to support the upper floors over this area and also to carry cantilever supports of the large balcony within the theater. Girders in the office portion of the building provide for an unsymmetrical column layout, due to the different space requirements of the lower and upper floors. Cantilever girders support a projecting portion of the front wall and carry the rear wall at the property line.

Steel is used for columns and framing of the first six floors, while concrete is employed in the six upper floors and roof. Concrete is the more economical material at present prices, but if used in the lower portion of the structure it would have necessitated columns of such large size as to be obstructive and undesirable. Furthermore, it would have been difficult to use concrete for some of the long spans required. By combining the two types of construction the advantage of steel is retained where this advantage is of importance. The total cost of the structural work was reduced about 10% by the use of concrete instead of steel for the upper portion.

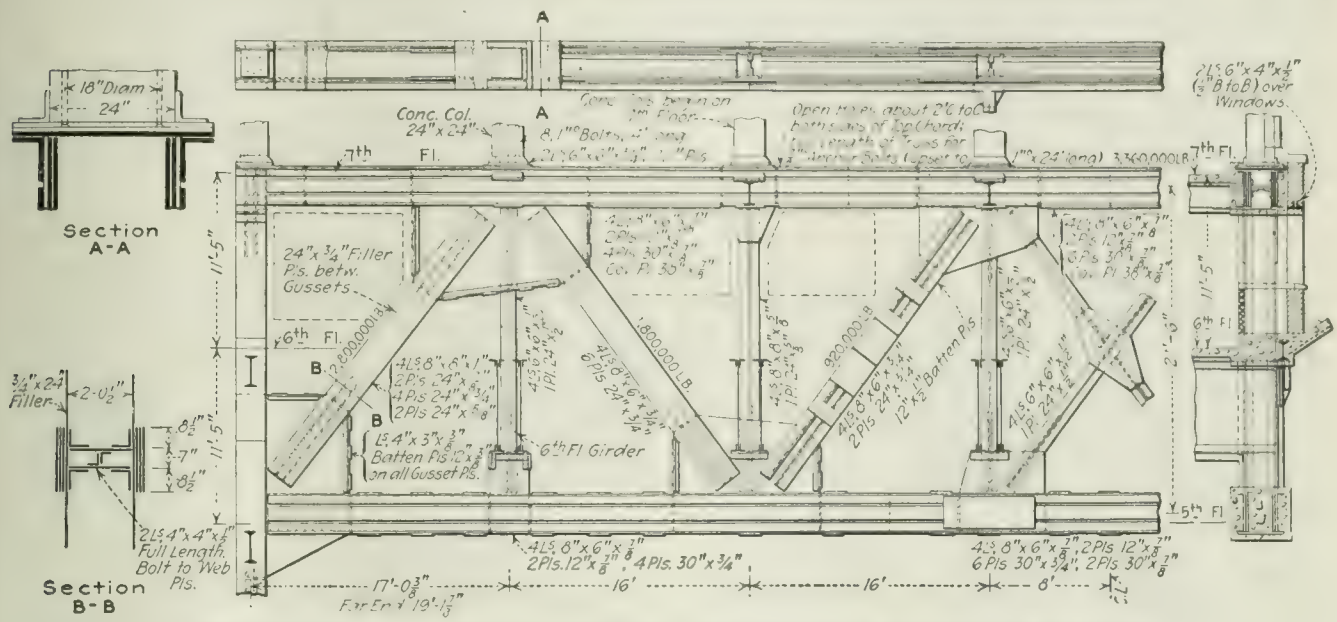
On a site 180 x 168 ft., the theater, including the stage, occupies a space 163 x 130 ft., leaving a wing on each of the two street fronts. In the sixth and upper floors the building is of L shape, with a light court above the theater roof at the sixth floor level. The width of this portion is 65 ft. and 50 ft. on the State St. and Lake St. sides, respectively, and the wider wing extends over the theater space. The general design is shown by the accompanying plan and sectional elevations, on which are indicated the locations of the special structural features described below in more detail.

Six steel trusses are employed. Two of 120-ft. span



and one of 75-ft. span carry heavy loads, while three of 120-ft. span support the theater roof. Avoidance of columns within the floor area of the theater is secured by the introduction of a riveted steel truss, 120 ft. between centers of columns, which spans this space and supports the columns in the west wall of the L-shaped upper structure. Its depth is 21½ ft. between centers of chords, which are at the fifth and seventh floor levels. Details are indicated in the drawing. This truss, therefore, diagonal trusses 48 ft. long and 8 ft. deep frame into the balcony truss and into columns 28 ft. in advance. Entrance passages or corridors are carried through the end panels of the balcony truss.

Spanning the stage front is a truss having a length of 75 ft. and a depth of 17 ft. This carries no very great load. From the lower chord is hung the proscenium arch, which is of concrete. The top chord carries the framing of the fly gallery from which the



TWO-STORY STEEL TRUSS CARRIES WALL OVER THEATER IN CHICAGO BUILDING

truss has a weight of about 170 tons and carries a total load of 2300 tons, which it transmits to a pair of heavy box columns between which it is framed. On the truss posts are angle brackets for the support of pairs of plate girders which form a part of the sixth floor framing.

The second 120-ft. truss is carried by the same columns, but at the lower elevation, and forms the fulcrum support for the concrete gallery cantilevers. While carried by the same columns it is not in the same vertical plane with the two-story truss above it. Thus, while one end is framed against the face of the column the other end is at the side of the column, so that the center lines of the two trusses are coincident at one end and 23 in. apart at the other end. The reason for this is that the lot is not exactly rectangular, and the balcony truss is at right angles to the axis of the theater, while the upper truss is parallel to the building line of State St. This truss is seated on auxiliary columns forming integral parts of the main columns. Owing to the unsymmetrical arrangement noted, this auxiliary support is on the face of one column and on the side of the other column.

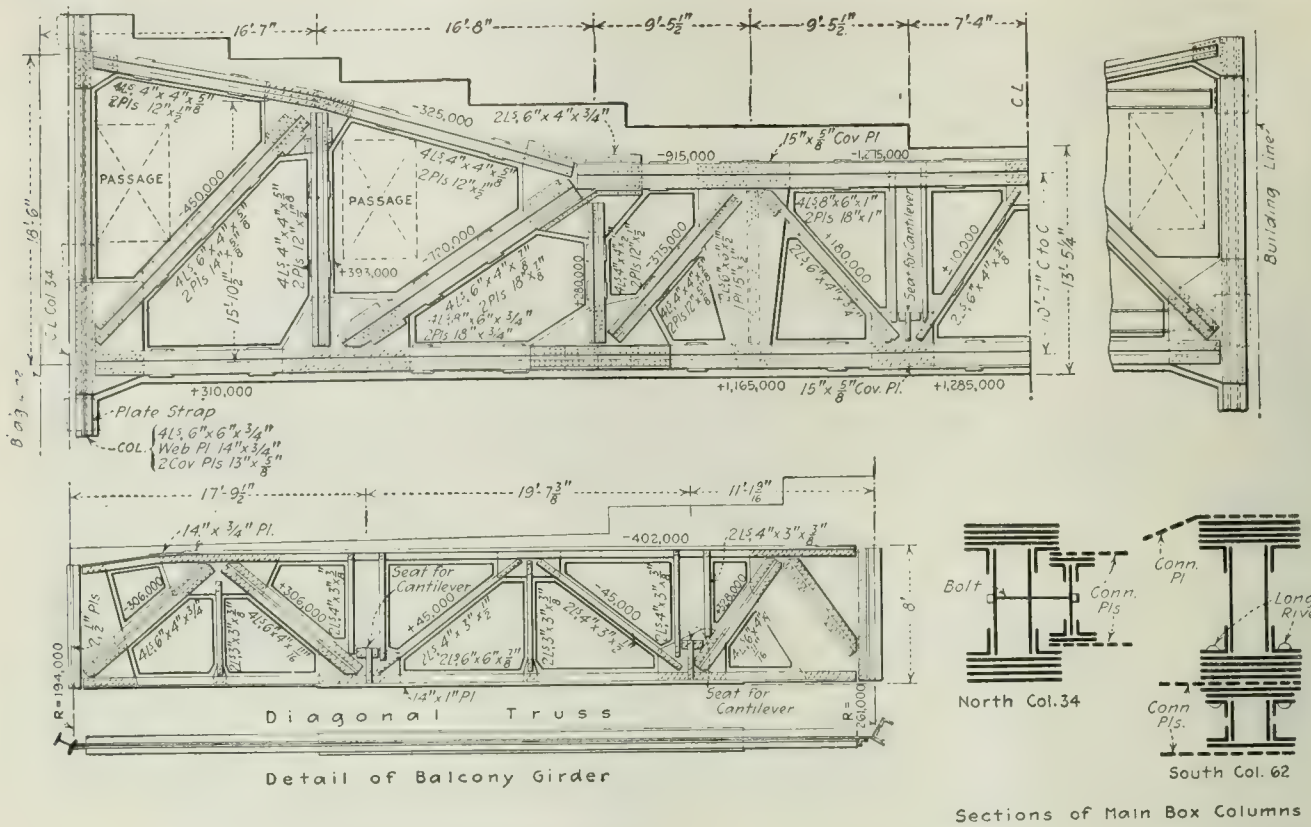
Another feature in this balcony truss is the fact that its top chord is concave, the depth of truss being 18½ ft. at the ends and 12 ft. at the middle. This arrangement was required in order to keep the truss below the sloping floor of this balcony at the center and to allow for tunnel exits through the truss at the ends. It necessitates the use of heavy members in the middle panels.

Owing to the curve of the balcony front, some of its supporting girders are so long that if seated in this truss their cantilever length would be excessive. To provide a fulcrum bearing in advance of the balcony scenery is handled. This consists of pairs of 12-i channels resting on the wall girder and the truss, whil between and parallel with these are 3-in. I-beams spaced 5½ in. on centers. The truss also carries a row of columns supporting the roof over the stage and that over the theater.

The cantilever girders carrying the gallery are of concrete instead of steel, for the reason that this construction was cheaper and obviated the necessity for complicated structural details where the cantilevers pass through the balcony truss. They are inclined to conform to the slope of the balcony floor and have their upper ends at the fourth floor level. The length of the girders varies from 26 ft. for the middle girders to 28 ft. for the side girders, with cantilever lengths of 12 ft. and 10 ft., respectively. The fulcrum bearings are on seats in the 120-ft. balcony truss and its auxiliary diagonal trusses, as described above. These six cantilever girders are 18 in. wide, 2 ft. deep at the upper portion and 9 ft. deep over the fulcrum supports. Between them is the concrete slab forming the floor of the gallery and serving as lateral bracing between the girders, and stepped to form benches for the seats. The entire balcony, including girders and slab, was poured in one continuous operation.

A 48-ft. box plate girder, 12 ft. 8½ in. deep, with an open middle panel, provides for changes in column arrangement. Thus, it is supported by four columns forming a central space of 31 ft. 2 in. for the main entrance to the theater floor, and two side spaces of 10 ft. 10 in. Upon it are supported four other columns spaced 16 ft. on centers.

The open 16-ft. middle panel, in which truss members are used instead of web plates, was adopted in order



120-FOOT AND DIAGONAL TRUSSES WHICH SUPPORT CANTILEVER GIRDERS OF BALCONY

to reduce weight of steel, as there are no shearing stresses in this portion, except for unsymmetrical loading. No web stiffeners are used between panel points, but the deep webs are connected by ⅞-in. tie bolts and by filling the space between them with concrete. The webs are of ½-in. plates, 14 in. apart.

The 65-ft. width of the upper portion of the State St. side of the building extends over the area occupied by the theater and has to be carried above the balcony floor without the support of intermediate columns. At the sixth floor level, therefore, there are steel girders of 39-ft. span, each consisting of a pair of 6-ft. plate girders having their inner ends framed against interior columns of the building, while their outer ends rest on brackets on the posts of the main 120-ft. truss which carries the rear wall of the wing. Upon each of these girders is seated an intermediate column which carries the framing of the upper floors. The girders are designed for a uniform load of 6000 lb. per foot, and the loads which the intermediate columns transmit to them vary from 360,000 to 405,000 pounds.

The two columns which carry the superimposed balcony truss and wall truss of 120-ft. span are of special section. The north column where the two trusses are in the same plane has the added supporting area on the inner web or face of the main column. It is of I-section, with its web parallel to the main web and its flanges inside those of the latter. Through bolts 2 ft. apart connect the three webs. The south column, where the two trusses are not in the same plane, has this added area on the side. It is of box section similar to the main part of the column, but smaller, and long rivets pass through the cover plate and flange angles of both portions.

Box columns carry the 75-ft. proscenium truss and the two 48-ft. girders in the front and interior framing. Most of the other steel columns are 14-in. and 12-in. H-beams, some of which, with long, unbraced lengths, are reinforced by cover plates on the flanges. In the side portions flanking the stage, used for dressing rooms and other theatrical purposes, some of the taller columns are 24-in. I-beams.

Steel floor framing is mainly of I-beams, with girders at certain points carrying a concrete floor of the slab-and-joist type. Steel joists and a flat slab are used for the stage, owing to the number of openings or traps required. The theater floor has a concrete slab, inclined to the proper slope and stepped to form benches for the seats. Floor loads were specified as 100 lb. per square foot for the main theater floor, the stage and the balcony, with 50 lb. for the upper or office floors.

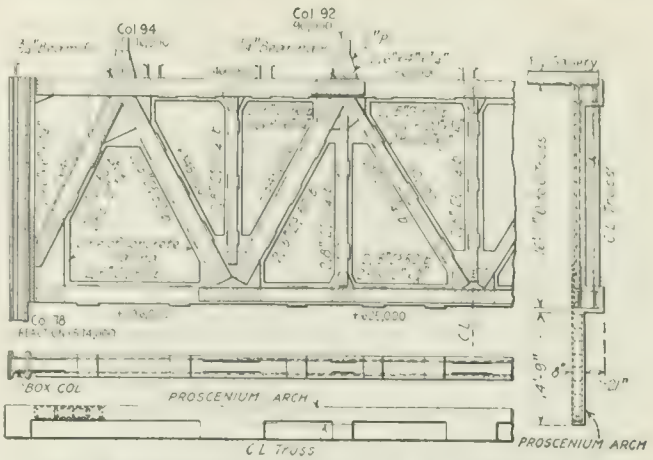
Steel columns terminate mainly about 3½ ft. below the seventh floor, which is the first concrete floor, but some extend to this latter level. They carry shoes for the bases of the superimposed concrete columns. Above the shoes, the columns have short bolts through the web and flanges, in order to form a bond with the concrete columns built around them. In certain columns, also, the flanges are cut or notched for the same purpose.

Concrete columns are rectangular in section, from 23 to 28 in. square at the base, in the sixth floor, although two are 30 in. square. Some extend above the main roof to carry the attic floor and pent-house, but all are 20 in. square at the top. The reinforcement consists of vertical deformed rods and steel spirals, except that ties instead of spirals are used in some cases. The concrete is a 1 : 1 : 2 mix from the sixth to the ninth floor, above which it is 1 : 2 : 4. Four columns at one corner of the wing extend above the attic floor and support four girders with a 6-in. slab for a 30,000-gal. wood tank. Columns supporting the beams of the theater floor are mainly 14 x 14 in., with 2-in. beveled corners

Typical concrete framing for the six upper floors consists of wall girders or lintels with girders across the 50-ft. and 65-ft. widths of this L-shaped part of the building. No interior girders parallel with the walls are used, as the floor slabs are sufficient to carry the loads and serve as interior bracing. The floors are 6 in. thick, with girders 29 to 31 in. deep, including the slab. Wind bracing is provided by special reinforcement in the girders. At the seventh floor, where some of the steel columns extend above the concrete beams, the latter rest on shelf angles and are anchored horizontally by three rows of anchor rods 10 ft. long which extend through the columns.

Over the theater area is a concrete slab roof at about the sixth floor level, carried by three 120-ft. trusses. Purlins of pairs of 6-in. channels extend across these, the outer ends of the purlins being carried by the 120-ft. wall truss and the 75-ft. proscenium truss. Between the bottom chords are framed 7-in. I-beams from which the frame for the ornamental ceiling is suspended by hanger rods. This frame consists mainly of light angles. Electric lamps for decorative indirect lighting are arranged in recesses in the ceiling, and the frame is laid out with gangways to permit men to walk over the ceiling and replace lamps from the inside. Flat-slab concrete roofs cover the office and stage portions of the building.

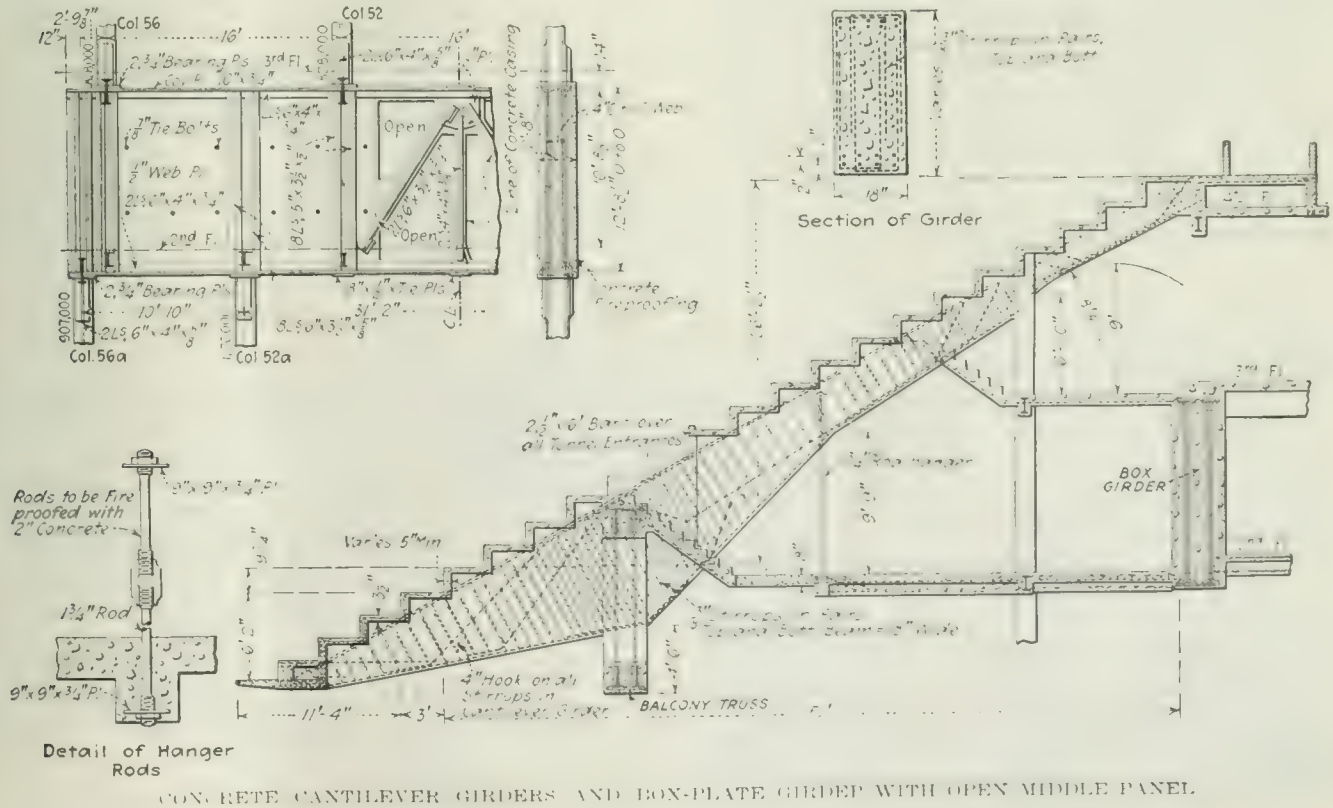
Concrete pier foundations are employed, most of the piers being carried down to hardpan at about 87 ft. below street grade. These have the base belled out to twice the diameter of the shaft. Five piers are carried down to solid rock at 123 ft. below street grade, and these are not belled out. Two of them are 7½-ft. piers, made of 1 : 1 : 2 concrete, for the box columns which carry the two 120-ft. trusses of the balcony and rear wall. Each of these columns has a load of about 2000 tons on the pier.



TRUSS SPANNING STAGE CARRIES PROSCENIUM ARCH AND WORKING FLOOR

Other piers carried to rock are for a portion of the rear wall in which the columns are carried by cantilever girders in order to keep the piers within the property line. These girders are pairs of 30-in. I-beams, resting on a grillage of 12-in. I-beams in the head of the pier. Concrete cantilever girders are used to support other columns in the rear wall, and some of these carry intermediate columns. Concrete footings in firm clay support the short columns of the theater floor.

Large members could not be handled within the building, owing to the numerous columns and to the difficulty of unloading in the street. Therefore the trusses were built up on the site, and large connection plates on the columns were placed in the same way. The 75-ft. truss was assembled at the basement level about 5 ft. forward of its position. It was then raised by derricks until the projecting ends of the bottom chords and end posts came between the connection plates on the columns,



CONCRETE CANTILEVER GIRDERS AND BOX-PLATE GIRDER WITH OPEN MIDDLE PANEL

and held by bolts and drifts while the rivets were driven.

The balcony truss was built up in three sections, the deep end portion in the basement and the shallow central portion on falsework at the final elevation. The derricks then raised the end portions, and they were bolted temporarily to the columns and the central portion while the connections were riveted. All steel work is cased in concrete fireproofing.

Lieberman, Klein & Hein were consulting engineers and prepared the structural design to conform to the plans of C. W. & G. L. Rapp and G. A. Lansburgh, associated architects. The Longacre Construction Co. is the contractor.

The Changed Dollar and the Engineer

THE report of the committee on the classification and compensation of engineers organized by Engineering Council, abstracted in *Engineering News-Record* of June 19, 1919, p. 1198, showed by the record of average prices of staple commodities compiled for many years by R. G. Dun & Co. that the purchasing power of a dollar in 1918 was only about one-third what it was in 1897. In one of the Government departments in Washington a committee of engineers is investigating the high cost of living with the aid of the most reliable statistics available.

This committee has plotted the chart shown in Fig. 1 with the idea of presenting the best and most accurate record available of the changes in the value of the dollar which have taken place in Washington since 1890. The sources are given on the chart, the part A being made up to show the cost of various items. The curve has been compared with a curve obtained by plotting the index numbers of R. G. Dun & Co.'s statistics used by the committee referred to above. In the period from 1900 to 1916 this curve varies nowhere more than five points from the curve made from Dun's index numbers. In the period from 1917 to 1919 the curve shown in the diagram is lower than the Dun curve as much as 30 points in some places. In this period, however, as the curve is taken from actual prices in Washington, it is without doubt more reliable for conditions there than are the figures given by Dun & Co., which represent wholesale prices at market centers.

It will be seen from the broken line in Fig. 1 that while the increase in the union rate of wages for the seven years from 1907 to 1914 just about kept pace with the advance in the cost of living, it has fallen far below it in the five years since the outbreak of the war.

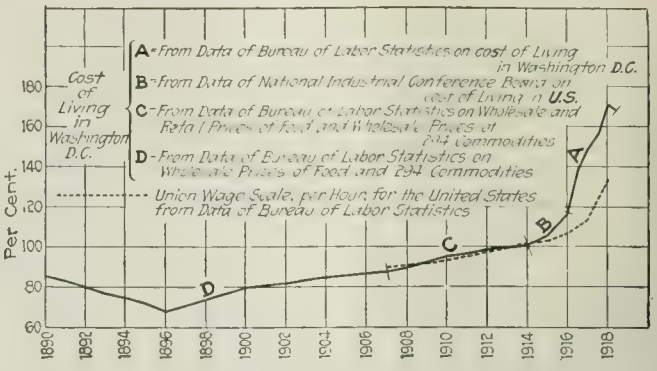


FIG. 1. CHANGES IN THE COST OF LIVING IN WASHINGTON, D. C., SINCE 1890

According to the figures, the resident in Washington, D. C., finds today that a dollar will only buy what could have been bought for 57 cents in 1910. Fig. 2 show the condition of an engineer in the Government service who had a salary of $2,000 a year in 1910, and who has received successive increases up to $3,300 since last July. The dotted line shows that since Jan. 1, 1915, the buying power of his salary has been falling off to such an extent that his salary since April, 1917, or shortly after the United States entered the war, notwithstanding its increase of over one-third, bought less of the necessaries of life than did the salary of $2,000 which he received nine years ago.

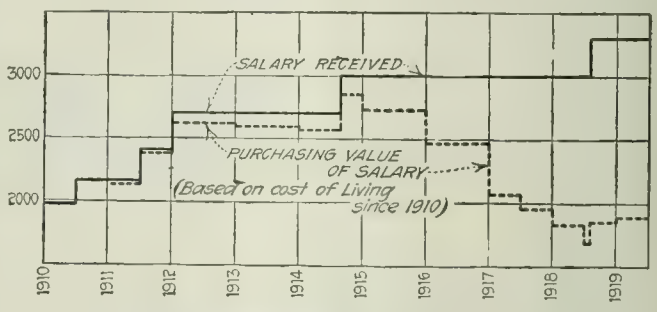


FIG. 2. ILLUSTRATING WHAT HAPPENED TO A GOVERNMENT ENGINEER NOTWITHSTANDING SALARY INCREASE



Rumanian Bridge Wrecked During War

How the Rumanian Army during retreat in 1917 delayed advance of enemy—Cantilever bridge of three equal 140-meter (459-foot) spans over the Borcea branch of the Danube River on line between Bucharest and Constanta—One of the structures mentioned in announcement of desire for American aid in reconstruction, published in "Engineering News-Record" of June 26, 1919, page 1281.

"Case System," Changes in Engineering Curricula, and Business Training for Engineers

Results at Army Engineer School at Camp A. A. Humphreys in Applying Definite-Problem Method —Radical Reorganization in Methods of Instruction Effected at Tufts College and Yale University

Some of the most interesting developments reported and discussed at the recent meeting of the Society for the Promotion of Engineering Education in Baltimore are indicated in the following abstracts of papers there presented. Owing to insufficient time for presenting details at the Baltimore meeting, there is also included here a statement subsequently prepared by Major More and Captain Duckering, of the Army Engineer School at Camp A. A. Humphreys, Virginia, describing in brief the nature of the work there accomplished in applying the definite or concrete problem method to the teaching of engineering mechanics. The radical changes in the engineering curricula at Tufts College and the Sheffield Scientific School, Yale University, are described by Dean Anthony and Professor Tracy, respectively, and the modifications at the Kansas State Agricultural College are given by Dean Potter. In addition, there is included an abstract of Dean Marston's address delivered at the Washington conference of June 23-24 on the subject of business training for engineers.—EDITOR.

"Case System" for the Study of Law

BY C. F. ALLEN
West Roxbury, Mass.

IT WILL first be necessary to understand what is meant by the term "law." The study of law is essentially the study of the common law, so-called. The basis of the common law is right and justice, and in business matters custom often determines what is right and just. Thus, when individuals differred as to rights, courts were resorted to for the purpose of securing an unprejudiced decision. The decisions thus rendered are found in the "cases" reported, and it is customary now to print and bind the reports of cases decided, so that they may be available to lawyers for use in court trials. The decisions thus recorded become the law and the common law rests upon these decisions, and the principles fixed may be derived from the study and comparison of them.

When Professor Langdell was appointed dean of the Harvard Law School in 1870, the course covered one year and a half of work, the instruction was largely by lectures, and there were no examinations. No wonder that he saw the need for something better!

Engineering colleges have found that theory can be taught to the best advantage only in connection with its applications. In the "case system," the pupil studies the cases, and his duty is to discover the principle or rule of law which will be directly associated with the facts. The theory and its application are here brought together. Langdell evidently appreciated the fact that a qualitative understanding of law is more important than a quantitative knowledge of law.

Another feature of the instruction, which may more properly be called Langdell's system, appears to the writer to lie at the root of the success of the "case system" at the Harvard Law School. Quoting Langdell: "It was necessary, first, that the efforts of the students should go hand in hand with mine . . . , secondly, that the study thus required of them should be of the kind from which they might reap the greatest and most lasting benefits; thirdly, the instruction should be of such character that pupils might at least derive greater advantage from attending it than from devoting the time to private study." Again, "I wish to emphasize the fact that a teacher of law should be a person who accompanies his pupils on a road which is new to them, but with which he is well acquainted from often having traveled it before."

The system of instruction adopted was neither lecture nor recitation, but a well considered conference or discussion into which the teacher and the pupil entered on substantially even terms. The teacher assumed the position of leader rather than instructor, all working together in research, seeking for the truth, groping for the truth more often, perhaps, and floundering not a little. The teacher subordinated himself, helping rather than directing. The instrument was a corkscrew rather than a ramrod, and yet not the stomach pump of the recitation. In the Harvard or Columbia law schools, classes of 100 to 150 students engage in this intensive intellectual work. Digressions from the theme are as a rule dismissed by the lecturer with a short remark; if the professor notices a general lack of understanding of the case, he interposes with a lengthy explanation.

With a treatise or a textbook as a basis, it is almost as natural for a pupil to depend upon memory as it is for a fish to swim. With the system of conference and discussion the pupil is called upon to think, to reason, and at short notice, and with the case book as a basis, to reason legally. The thinking and reasoning are in the classroom and memory cannot be substituted. Langdell delayed putting into force his scheme for teaching for a year and a half until he found time to prepare his case. In the medical school, case books are already prepared. In the military school a book of problems was in effect a case book. Will a case system be impossible in an engineering college without a case book? Who will prepare one?

The Problem Method at the Army Engineer School, Camp A. A. Humphreys

BY MAJ. C. C. MORE, AND CAPT. W. E. DUCKERING
United States Army Engineer School, Camp A. A. Humphreys, Virginia

THE primary purpose of the Engineer School at Camp A. A. Humphreys, Virginia, is to stimulate and encourage the student in the exercise of his power of independent thought, reasoning and judgment, and to increase his ability to cope with new situations when confronted with them in engineering practice, rather than merely to provide him with a fund of engineering information and abstract theory, valuable as the latter are as adjuncts in his training. This purpose was laid down as a guiding principle at the very beginning by the Chief of Engineers, Maj. Gen. William M. Black, and was emphasized continually by Col. V. L. Peterson, commandant of the Engineer School. Under the

personal direction of Col. Earl North and with the enthusiastic coöperation of the instructors, this object was attained in the half-year which ended June, 1919, in the department of mechanics of engineering by the use of methods similar to those which have been in successful operation during the past six or seven years at the University of Washington, Seattle.

The major portion of the classroom work was devoted to stimulating mental effort on the part of the student, and to training him in practical methods of attacking, analyzing and solving engineering problems, instead of being devoted to the usual methods which attempt to cover a set amount of textbook material. The student was encouraged to use his own judgment and to make use of ideas which had grown out of his own previous experience. An endeavor was made to lay the foundation for future effort within the student himself, rather than in a text which he could carry under his arm. Every encouragement was offered to the development of what may be called the "engineering mind."

In this method there are two definite phases of the work: First, the phase in which study problems are used, and, second, that in which drill or training problems are used.

Study problems were designed for the purpose of analysis rather than synthesis, with concrete engineering situations used as a basis. Where feasible, the objective ideas corresponding to technical terms used by engineers were presented by means of visits to actual engineering structures. In this manner the students were enabled more easily to visualize and understand the technical language of the engineer.

Principles of Engineering Thought Introduced

For example, a bridge was visited before the first study problem was taken up. The names and functions of the various parts were discussed, and the question was raised as to the path traversed by a load placed upon the bridge, as transmitted through the members of the bridge from its point of application to the ground. This introduced one of the fundamental principles of engineering thought into the minds of the students at an early stage in their training. This visit to the bridge was not made for the purpose of analyzing that particular structure but to introduce the subject of structures in general. The subsequent classroom work dealt with a different type of bridge, and during the course many types of bridges were used in problems, so that the student would not be limited, in his idea of bridges in general, by the one that he happened to inspect first.

In the classroom, the first definite study problem dealt with a pony-truss span, for which were furnished the usual engineering detail drawings showing all dimensions and sections. Military necessity required that a certain heavy howitzer be taken across the bridge. The question was asked: "Is the bridge, in its present condition, safe for this load? Report." With the situation before them, the students were turned loose upon the analysis of the problem. The next step, following naturally from the discussion held at the bridge site when inspecting the structure in the field, was to determine how the structure might fail. Each student was required to use his own ideas and make a list of possible sources of failure.

These lists were then taken up for general discussion, and from this as a starting point the students were led step by step to investigate the various members of the structure. The necessary theoretical analysis was introduced whenever required. The hanger and both chords had purposely been designed too light, thus adding an element of interest to the search for possibilities of failure. When the students discovered these members to be unsafe, they were asked to redesign them in accordance with standard specifications.

Naturally, some phases of the analysis seemed too intricate for immediate treatment in the class; but these were easily deferred. For instance, in the case of the floor system, the investigation was carried to the point where the worst positions of the load were decided upon, and sketches were made showing the probable manner in which the planks, stringers and floor-beams would break, but the determination of the actual fiber stresses in these members was deferred temporarily with the understanding that it would be gone into carefully in subsequent discussions. However, the class was led to make recommendations concerning means of strengthening these parts of the bridge in case they were found to be unsafe.

Importance of Assumptions

At every step in the analysis of study problems, the many possible assumptions underlying the mathematical computations were always discussed at length by the class, and often two or more assumptions were taken as a basis for mathematical analysis before the students were encouraged to make final judgment concerning what appeared to be in line with the best practice. In this manner the student is made to realize that engineering is not an exact science, that the element of judgment plays a very important part in all engineering problems. He also starts his career with a more open mind and a greater capacity for making advances along new lines of engineering thought. He develops a keen interest in engineering literature, especially current engineering periodicals and papers and discussions of engineering societies. Students are not subject to the limitations of a single text, but find it advantageous to refer to several. An inevitable result of this kind of training is the tendency of the student to rely more and more on his own judgment with respect to making assumptions, and in all his work the student shows a greater self-reliance and an increasing desire to do independent thinking.

The chief purposes of the drill problems are to furnish vehicles for training, and for fixing the use and understanding of the fundamental principles firmly in the mind of the student by well directed repetition. Practically all review work had these purposes in view, though it was possible to use these problems as a means of grading the students and of giving them their section rating. The purpose of these problems, held before the mind of the student, is the opportunity to set up good habits of analysis and of work, and to increase, by means of carefully organized and well executed computations and sketches, his power to get accurate results and develop speed, while at the same time each problem makes him more at home in the use of the necessary mathematics and mechanics.

In order to aid in the accomplishment of these purposes, the major problems were broken up into a large number of subproblems so that the arithmetic might be made easy and so that particular attention

might be directed to a great variety of special uses of the fundamental principles. To help the student organize his work with a view to the development of speed and accuracy in execution, and as an aid to clearness of thought, he was required to work in accordance with a definite set of specifications covering the means whereby system, clearness and accuracy may be attained. He was taught to recognize the importance of each step in the solution, as a link in the chain leading to a final result, and to surround his computations with as many safeguards and checks as necessity demanded and time permitted. The result of this training in the mechanical side of analysis was to increase tremendously the accuracy of the work. The student found himself not only getting more definite results but he also developed the power to find and correct his own errors. All this tended to increase his pride in his work and to give him confidence in himself; while at the same time he was forming good habits of thought and work which would be transferred to his engineering practice later on. In short, the classroom work was made to approximate actual engineering experience as closely as possible.

The results obtained make it clear that a system of instruction designed along the lines sketched above does decidedly awaken and hold the interest of the student in the live problems of the engineering world. It does increase the confidence with which the student tackles a problem and stimulates his self-reliance and initiative. At the same time he shows greatly increased industry and speed of learning. This is further accentuated by the fact that no grading is done on study-problem work. The student is left free to take chances in doing independent thinking. The grading for purpose of classification in sections is based entirely upon work done on drill problems. The student is given to understand, however, that the only grades which affect his final passing in the course are those determined in the last four or five weeks of work, when nothing but review problems are taken up. His desire to work for passing marks becomes secondary and is dwarfed by his desire to understand engineering theory in order that he can use it in his work. His career as an engineer has begun.

Tufts College Changes and Their Results

By Gardner C. Anthony
Dean, Engineering Department, Tufts College, Massachusetts

THE sudden departure from the generally accepted curricula of engineering schools which was made at Tufts College last January was not hastily entered into, but in reality was the product of five years of investigation, study and experimenting. This was largely stimulated by the discovery of the apparently universal lowering of scholastic standards during the sophomore year; it appeared that some of the intellectual depreciation was chargeable to the curriculum. The freshman program, rich in fundamentals, failed to inspire because the student was not given the opportunity to orient himself early in his course by direct contact with the applied field of engineering.

As a result of study by several faculty committees in 1913-1914 the following recommendations were made: (1) A reduction in the number of subjects pursued at one time; (2) a closer coördination of the several departments, and consideration of a single course in engineering for three years, with opportunity for specialization in the fourth year; (3) the introduction of engineering subjects earlier in the course; (4) the necessity for closer correlation of theory and practice, together with an inversion of the usual order by introducing laboratory practice previous to the consideration of much theory.

After the upheaval due to the S. A. T. C., the psychological moment for the inauguration of the new course seemed to have come. The ideas aimed at were:

1. To present a survey of a chosen field of engineering previous to a detailed study of fundamentals.
2. To coördinate theory and practice by using projects of a distinctively engineering character involving theory.
3. To reduce the number of subjects studied at one time while intensifying the work done in those subjects.
4. To rate the student by observations on his character as well as by the quality and quantity of his prescribed course.

The most important feature of the new curriculum is the main introductory course conducted on the project plan. For example, in civil engineering the first two projects are the study of two garages, one of wood and one of steel, for which the first students had to meet the following requirements:

Make sketches and measurements of the building; make ¼-in. scale drawings showing plans, sections and elevations; estimate the material; study the structure with respect to the following: Computation of loads on members, discussion of materials used and their suitability, laboratory tests on beams, and consideration of the strength of beams.

The third project was a small highway bridge, and the fourth project was a preliminary layout and survey for an underground tunnel for a central heating plant. These four projects comprise the year's work for the freshmen, with three laboratory periods and three recitation periods per week.

Results of the New Course

The methods used in the introductory course may appear superficial and suggestive of a smattering of professionalism in catering to student interest only, but the results prove the error of this supposition. Interest, enthusiasm and keen desire for the more advanced theoretical work is produced in the eager and receptive mind of the freshman. An increase in observation is one of the noticeable products of the training. Of course, it is heresy to talk about moments of inertia, stresses in trusses and the strength of the structures before a student has acquired a working knowledge of calculus, passed all requirements in physics, and has a working knowledge of descriptive geometry, shades, shadows and perspective, to say nothing of French or German, but "the proof of the pudding is in the eating," and the test of the educational system is an educated man, regardless of the thing he has studied or the progression of the subject matter.

One of the unexpected results of the introductory course was the beneficial effect on the English of the freshman year. The department attributes this to the fact that the students had something to write about, and showed a great desire to express it, not only in writing but from the platform, where they have been called to explain many things to their fellow-students and discuss the course itself.

So-called cultural studies are not necessarily cultural when prescribed at the beginning of the technical course. The desire for these studies should be a natural growth under the influence of instructors who have a sufficiently broad vision to realize that even technical education does not depend entirely upon subject matter, but is an assimilation of everything that goes to build character. If a student of engineering has not acquired some love for literature, art and the humanities through the influence of his course, I can but feel that there is something wrong with something or somebody somewhere.

If a student desires to specialize to a high degree during his senior year, I believe it is wise to open the gate wide to this field of education, and the new course provides amply for such an opportunity.

In conclusion, our aim in the new curriculum is:

1. To utilize the interest and enthusiasm with which a student enters the technical school, by introducing him at once to live engineering problems, and so to vitalize the task that the disciplinary value of study ceases to appear as such.

2. To make the freshman year of such value that if circumstances force the student to discontinue his course he shall have acquired a vision of greater things, and such training as will afford him some preparation for a place in the engineering world.

3. To determine as early as possible the fitness of the student for a special field of labor and, whenever it may be necessary, to make the transition to another field both simple and profitable.

4. To make the entire course so flexible as to adapt it to the continuous changes which takes place in the natural development of the student mind.

May we not hope to make the college course effective for that great class of students who have formerly been declared by our faculties as unfit material for the engineering profession, and yet who later happily disappoint us by becoming leaders in engineering practice?

Complete Reorganization Planned at Yale

By J. C. Tracy

Sheffield Scientific School, Yale University, New Haven, Conn.

THE following complete reorganization of the educational work at Yale University is planned for immediate adoption:

A. Reorganization of the University

1. The undergraduate course in the Sheffield Scientific School has been lengthened to four years.

2. The entrance requirements for Yale College (the academic department) and the Sheffield Scientific School have been made the same. This involved the dropping of Latin as an entrance requirement for Yale College and such higher branches of mathematics as trigonometry and advanced algebra as entrance requirements for the scientific school.

3. A common freshman year for all students, so that a boy will no longer enter Yale College or the Sheffield Scientific School, but Yale University. For this freshman year there will be a separate faculty and dean, members of the faculty to be selected for their ability as teachers of freshmen. This practically establishes a "junior college."

4. The elective system in Yale College to be modified so that there will be prescribed courses leading to various kinds of lifework, a system always followed in the scientific school.

5. A provost who will serve as chairman of the university council and devote his undivided attention to the educational work of the university, responsible only to the president and the Yale corporation.

6. A dean of students to assist the deans of the various schools in promoting morale, and to work with such student organizations as the student councils.

7. Courses in history and government, required of all students who have not had such courses at entrance to college.

B. Reorganization of Engineering Courses

1. Organization of a division of engineering in the graduate school.

2. Readjustment of such fundamental undergraduate courses as mathematics, chemistry, physics and English, in order to determine the scope and content of each course and to correlate these courses with each other and with the engineering courses which follow.

3. Addition of courses in economics, accounting and business finance for all undergraduate students in engineering.

4. Elimination of too highly specialized undergraduate courses in engineering and the broadening of aim in other undergraduate courses in engineering, so that construction and operation, as well as design, will be included to a greater extent than heretofore.

5. Elimination of required courses in foreign languages. (All students must still offer for entrance two years in each of two foreign languages.)

6. A common curriculum for all engineering students for the first two years, with short courses in engineering to promote interest in engineering and to show how the fundamentals of these first two years will be applied later.

7. A reduction in the required number of hours to a maximum of 45 per week, at the same time raising the standard of work.

8. Organization of a new department of engineering mechanics, with Prof. C. J. Tilden as head.

Modifications in Engineering at Kansas State Agricultural College

By A. A. Potter

Dean of the Engineering Department, Kansas State Agricultural College

IN ORDER to arouse and to maintain the interest of engineering students in their work, the Kansas State Agricultural College will require all freshmen engineering students to pursue certain intensive and concrete courses, closely related to the profession for which they are preparing. Each course will count for two semester units of credit and consist of six hours per week of combined classroom work, laboratory practice and supervised study, given by the older and more experienced teachers in the several departments. The details concerning these intensive courses follow:

1. All freshmen engineering students will take a two-unit course for one semester in plain surveying and a two-unit course for one semester in shop practice.

2. Freshmen mechanical engineering students will take a two-unit course for one semester in the elements of steam and gas power engineering. This will be a

nonmathematical course and will deal with the construction and operation of boilers, steam engines, steam turbines, steam power plant auxiliaries, internal-combustion engines, gas producers and power vehicles.

3. Civil engineering students will take surveying during their entire freshman year, six hours per week.

4. Electrical engineering students will take a two-unit course for one semester during their freshman year in electrical machinery and construction. This course will include electric wiring, and the operation and repair of electrical machinery.

The above outline has been tried out during the college year 1918-1919 and those responsible for the curricula feel that these intensive courses, offered during the freshman year, better prepare the engineering students for the more abstract subjects of the later years, while reducing the mortality by maintaining interest. The course, as given, includes about two hours per week of classroom work and four hours per week of laboratory work or supervised study. The teachers feel that a limited amount of supervised study enables the students to work problems independently, while aiding the teachers in making the instruction nearly individual.

In order to make room for the above courses, analytical geometry had to be shifted from the freshman to the first semester of the sophomore year and the course in calculus is given during the second semester of the sophomore year and the first semester of the junior year. One English course is shifted to the senior year.

Business Training for the Engineer

By Anson Marston
Dean, Division of Engineering, Iowa State College, Ames, Iowa

RETURNING last December to resume charge of our engineering college after an absence of a year and a half in the Army, the writer found local conditions opportune for radical improvements in engineering education. Conference with the engineering alumni of our institution showed that they are eager for such improvements but can make comparatively few clear-cut recommendations. On one point, however, they are definite and unanimous—they desire that our engineering students receive some broad training in simple, fundamental business principles, so that they shall not exhibit infantile helplessness in their early efforts to carry engineering enterprises to successful conclusion.

The new thought is: Why should not the engineer be his own employer in great industrial enterprises of an essentially engineering character? Why should he not be the organizer, the president, the manager of great industrial corporations rather than a mere hired expert?

Employers of Engineers Dissatisfied

Another cause for the present demand for business training for the engineer is the widespread dissatisfaction, among employers of engineers, with the product of our engineering schools. During the past fifty years our engineering courses of study and methods of instruction have become standardized to such an extent that it is almost as great a sacrilege for any engineering college to deviate from the general practice as it was for the ancient Egyptian draftsman to vary a line from the orthodox in representing Pharaoh.

The engineer employer needs, above all, men who are qualified for successful executive responsibilities in great industrial undertakings, and he is not satisfied with the product which our engineering colleges are sending out.

Even before the war, then, engineers and engineer employers were demanding business training for the engineer. Since the close of the war comes Uncle Sam himself to tell us that the imperative post-war needs of the United States require great engineer leaders with sound business training to develop our mechanic arts industries for economic and profitable production, transportation, sale and use, at home and abroad.

Wanted—Great Engineer Leaders

What we need is great engineer leaders like Captain Eads, Hugh L. Cooper, Thomas A. Edison, Alexander Graham Bell and John Hays Hammond, men who possess the highest engineering qualifications combined with great business ability, and who can conceive great mechanic arts enterprises, design their engineering details, build their greatest constructions, organize and direct their operations, and who also can interest capital and deliver a fair profit to investors.

I take it that the principal object of all business training (speaking baldly) is financial profit. Public utilities, for example, are successful from the business point of view whenever they make money for their stockholders, although they may poison a city with polluted water, furnish unsatisfactory light and power, cause the traveling public all sorts of inconvenience, or ruin industries by insufficient or inequitable transportation facilities. Toleration of such shortcomings, it is true, might be unwise, but this would be because they might arouse antagonism, cause enaction of legal restrictions, decrease patronage or otherwise operate to decrease profits.

In engineering, on the other hand, profit, though essential, is only one essential to be attained, and achievement in the successful utilization of the principles of the science of mechanics is the great object. The engineer has been trained to give primary attention to the scientific principles of design, to ingenuity in invention, to industrial organization for construction and production on the greatest scale and at the lowest cost. In planning business training for the engineer we should not attempt to lower the great ideals of his profession. We should add business training to the engineer's equipment, not substitute it for engineering qualifications. We should qualify the engineer to take into account, with due weights in the solutions of his problems, the great questions of capital, labor and profits as well as the scientific principles of engineering theory and experience. The engineer's remuneration should no longer be left to be considered as a mere item on the cost side of the books of the enterprise.

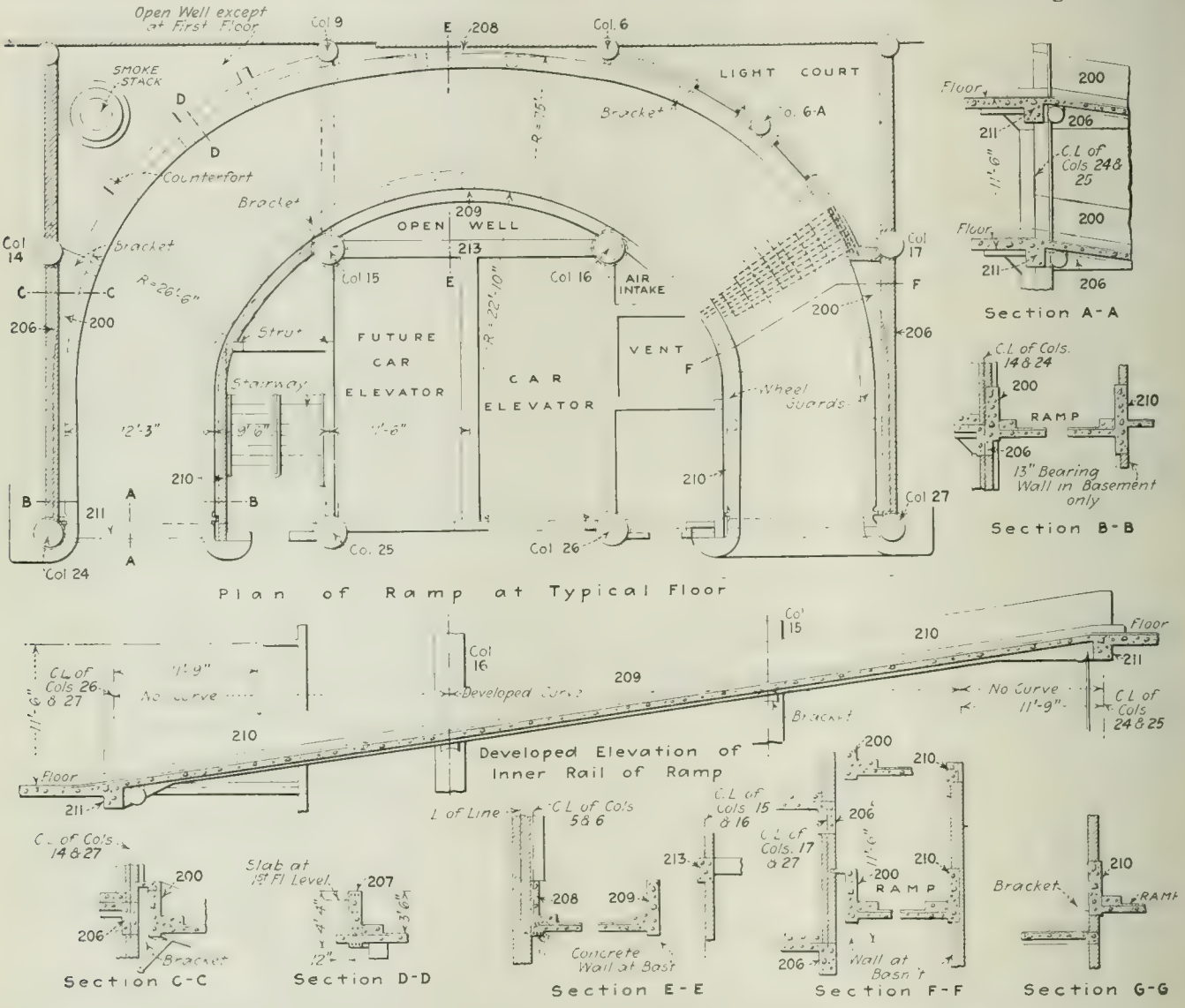
The only really adequate method for providing the business training now needed by engineers is to put it into the regular four-year courses (civil, mechanical, etc.) as required work to approximately the same extent as chemistry or physics. The writer earnestly believes that this should be done. Many curricula already contain certain work along business lines, such as economic science, business law as applied to contracts and specifications, shop management and industrial organization courses. Additional room ought to be provided sufficient for at least 10 semester credit hours of required work.

Curved Drive for Automobiles in Six-Story Garage

Incline Between Floors Gives Better Facilities Than Elevators and Is Made Part of Structural Framing

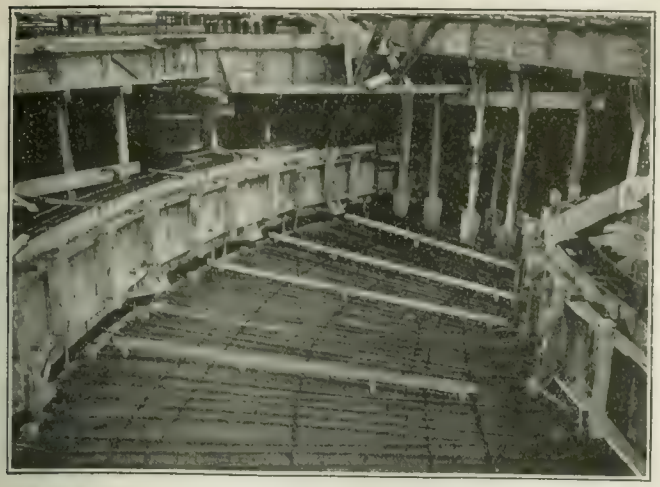
A CURVED concrete ramp or inclined driveway forming an integral part of the building is the means provided for handling automobiles between the floors of the six-story Washington garage and warehouse in Chicago. The building is 181 x 81 ft., and provides facilities for storing, washing, repairing and painting cars. It is of reinforced-concrete construction, with floors of the flat-slab type. At the middle of one side, and occupying half of the width of the building, is an area about 70 x 40 ft. which contains the ramp, the space inclosed within the curve being utilized for elevator shafts, ventilating shafts and a stairway. The elevators can carry cars for painting or repair work, but their combined capacity would be much too small for the general business of the garage. The cost of the incline is considerably less than that of a battery of elevators giving equal capacity, and no operating or maintenance costs are involved.

The driveway approximates a helical curve. Its layout is shown in the accompanying plan, together with the supporting girders, columns and brackets. Its average inclination or rise is 11°, with 13° at the inner curve and 9° at the outer curve. A turn of 180° suffices for each stretch, with a tangent about 12 ft. long leading off the lower floor and followed by a curve which ends in a second tangent opening onto the upper floor. The inner side of the turn has mainly a radius of 22 ft. 10 in. The outer side is a compound curve, with radius varying from 26 ft. 6 in. at the ends to 75 ft. at the middle. The width between wheel guards is 10 ft. 3 in. on the tangents, increased to about 11 ft. on the turns and reduced to 8 ft. at the middle of the curve.



CURVED INCLINE DRIVEWAY CONNECTING FLOORS OF CONCRETE GARAGE IN CHICAGO

Typical construction is shown by the accompanying view and drawing. Supporting girders are formed by the curved inclined curb walls, which are 12 in. thick and 51 in. deep, having their tops 41 in. above the base of the 5-in. concrete slab of the driveway. Broad wheel guards 9 in. high protect the parapets, and the outer parapet is braced by counterforts as a precaution against shocks from runaway cars. Two-way reinforcing is used in the slab, which is designed for a live load of 100 lb. per square foot. A good grip for



CONCRETING THE FLOOR AND GIRDERS ON CURVE OF INCLINED DRIVEWAY

the wheels i insured by leaving the surface of the concrete rough as poured.

While flat-slab floor construction is used, girders are introduced between the columns on the three interior sides of the area occupied by the ramp, in order to form a braced panel. Column spacing is so arranged as to admit and support the ramp and brackets on the main columns support the curved inclined girders. On one side a supplementary column (6 A) is placed to support the outer curved girder, upon which is built a wall inclosing the light shaft. On the opposite side of the turn this column is omitted, as clear space was needed for the mechanical equipment in the basement and there is no wall built upon the girder to inclose a light shaft.

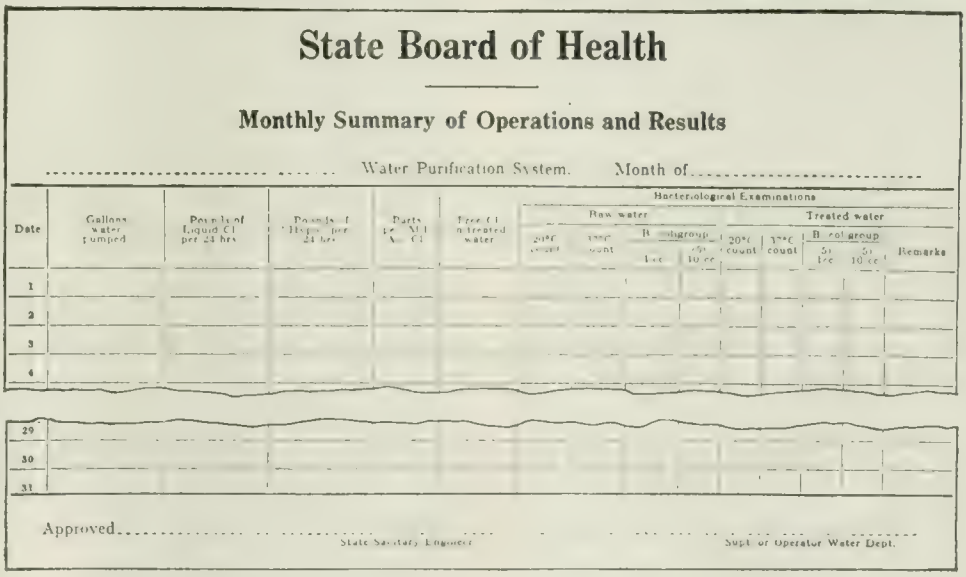
Holabird & Roche were architects and engineers. The contractor was the G. A. Fuller Co.

Single-Leaf Bascule in Double-Leaf Bridge

REVERSAL of a single-leaf bascule span and its utilization as part of a double-leaf bascule bridge is the plan adopted for the new bridge to be built over the Chicago River at 12th St.. This arrangement is made to provide for the straightening of the river, by which the west or trunnion pier of the new bridge now to be built will become the east pier of the future permanent bridge. The construction of the single-leaf span as a temporary crossing of the present channel is necessitated by the demand of the United States Government for the removal of the old swing bridge at this point. Originally, it was proposed to use a bridge of the direct-lift or lever-lift type, as described in *Engineering News* of June 17, 1915, p. 1196. It was proposed to shift the structure bodily to the new position, in that case. The bids were far in excess of the estimates, however. The single-leaf skew bridge now agreed upon will be 175 ft. long, crossing a 140-ft. channel, while the future double-leaf bridge will span a 200-ft. channel. The plan as approved by the city and the Sanitary District of Chicago has been submitted to the War Department.

Report Form for Water-Treatment Plants

AS A part of the system of control of water-purification plants in Wisconsin made a duty of the State Board of Health under recent legislation, a monthly report summarizing operations and results is required. The form employed is shown herewith. The intention of the board is to conduct an efficiency run of each purification plant once a year. E. J. Tully is state sanitary engineer.



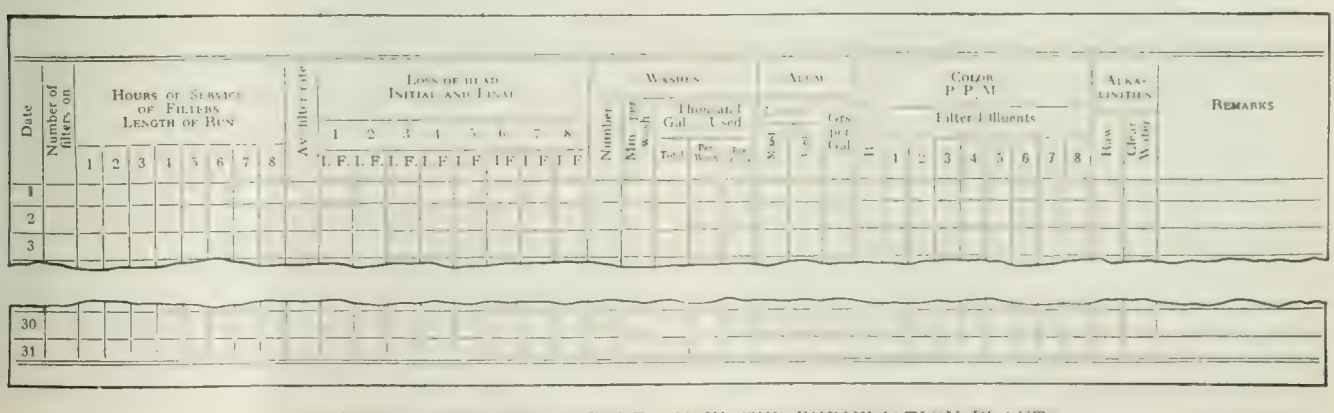
State Board of Health

Monthly Summary of Operations and Results

..... Water Purification System. Month of .....

Date	Gallons water pumped	Pounds of Liquid Cl per 24 hrs	Pounds of Hypo per 24 hrs	Parts per Mil Avail Cl	Free Cl in treated water	Bacteriological Examinations: Raw water 20°C count	Raw water 37°C count	Raw water B coli group 1 cc	Raw water B coli group 50 in 10 cc	Treated water 20°C count	Treated water 37°C count	Treated water B coli group 5 in 1 cc	Treated water B coli group 50 in 10 cc	Remarks
1														
2														
3														
4														
29														
30														
31														

Approved.....
State Sanitary Engineer
Supt. or Operator Water Dept.



Date	Number of filters on	Hours of Service of Filters Length of Run 1	2	3	4	5	6	7	8	Av filter rate	Loss of Head Initial and Final 1	2	3	4	5	6	7	8	Washes Number	Min per wash	Thousand Gal Used Total	Per Wash	Per %	Alum Sol	Sol	Grs per Gal	Color P P M Filter Effluents 1	2	3	4	5	6	7	8	Alkalinities Raw	Clear Water	Remarks
1																																			
2																																			
3																																			
30																																			
31																																			

WISCONSIN FORM FOR REPORT ON WATER-PURIFICATION PLANTS
The form is printed on the two sides of an 8½ x 11-inch sheet

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Suggests Scheme of Organization for National Engineering Council

Sir—At the Conference of Technical Societies held in Chicago in April, 1919, it was plainly set forth by Gardner S. Williams that in organizing the engineering interests of the country there are two distinct phases—namely, the technical and the welfare—calling for two distinct bases for organization; furthermore, that the technical was being well cared for by the founder societies; that it was necessary for them to uphold the high standards of the profession, and that they must not lower their requirements for membership. On the other hand, the organization for the welfare of the profession must include all those who are drawing their income from the engineering profession and that, therefore, the requirements for membership must be much more liberal than in the founder societies.

Referring to the report of the Committee on Development of the American Society of Civil Engineers, we find in the appendix by Charles Warren Hunt the same ideas expressed, with a tentative plan of an organization to develop the welfare phase of engineering. It is here stated that the organization must be loose and must be democratic; that it should consist of a national organization founded on local organizations. The name "Engineering Council" is suggested for the national organization.

If the above conclusions are sound—and we are firmly convinced that they are—the organization of engineers for their common welfare is not receiving the publicity its importance demands. The technical educational and scientific phase of engineering has been well cared for by proper organizations for fifty years, but the profession is groping in darkness to find a suitable organization to represent the welfare of its members, and to assist in giving to the public the best service of which the profession is capable.

The writer wishes to suggest the following scheme of organization, hoping that by discussion definite plans may speedily materialize. This plan would comprise three classes of organizations, as follows: (1) A national organization known as the National Engineering Council, composed of one or more delegates from each state, depending on the number of engineers in the state; (2) a state organization in each state known as the (name of state) Engineering Council, and composed of one or more members from each local engineering organization in the state; (3) local organizations, such as present state engineering organizations, county organizations, city clubs, etc.

To provide uniform and equitable methods of representation in the higher councils, the requirement might be made that each member of the National Engineering Council must be a member of one of the founder societies, and that the basis for determining the number of members from each state should be the number of members of the founder societies residing in the state in question. This would stimulate membership in the technical societies and also furnish an exact and convenient method of apportioning the membership of the national council among the states. All the members of the founder societies residing in a state would then meet and organize the state council. This state council would then consider all organizations in the state having to do with engineering, and after examining their constitutions and requirements for membership decide which ones of these organizations should be represented in the state council.

In financing the entire scheme the local organization would decide on the local dues; to this would be added the state dues fixed by the state council, and, finally, to this sum would be added the national dues fixed by the national council.

Engineering work is occupying the attention of the entire nation in an unprecedented manner and the engineers owe it, not only to themselves, but to the public at large, not to delay an organization that can deal with the business interests of the country.

Topeka, Kan. LLOYD B. SMITH.
Secretary, Kansas Engineering Society.

Wheel Loads on Highway Bridge Floors

Sir—Many highway bridges in the Pacific Northwest are designed with wood floors resting on longitudinal steel or wood stringers, spaced from 2 to 3½ ft. between centers. The floor plank is usually 4 in. thick, laid transversely, and spiked to wood strips, which are bolted either to the top flanges or to the webs of the stringers. The planks are generally 12 in. wide; in some cases 3-in. planking is specified, and in others the thickness is made greater than 4 in. Laminated floors, composed of 2-in., or, more frequently, 3-in. pieces, stood on edge and spiked together, are also used.

When steel stringers are used, they form quite an item in the weight of steel in the superstructure and it becomes a matter of importance to determine what proportion of the wheel loads is supported by any one stringer; also whether the concentrated load may be considered as applied to the stringer at a point or whether it has the effect of a load uniformly distributed over a portion of the length of the stringers.

Investigations have been made by A. T. Goldbeck, W. T. Slater and the Ohio State Highway Commission on the distribution of concentrated loads in reinforced-concrete slabs and the steel or reinforced-concrete beams which support them. We have therefore, within certain limits, reliable information on which to base the design of bridge floors of these types. But we are largely at sea in the proportioning of floors and stringers for bridges having plank floors on wood or steel stringers. There seems to be little information and not much uniformity of opinion on the subject. B. S. Myers reported in the *Iowa Engineer* of the Iowa State College on some experiments made with six-ton and eight-ton steam tractors on a bridge with wood floor and steel beams to show the distribution of the loads. The tractors had wide wheels, and the writer believes that the results would not be correct for motor trucks, which have wheels with much narrower rims in proportion to the loads. A few specifications and several technical books touch the subject lightly, but they are not very satisfactory.

The following questions enter into a consideration of the problem: With planks 6 to 12 in. wide, laid flat, is the wheel load supported entirely by one plank, or by more than one plank? With a laminated floor, what is the width of floor in a longitudinal direction which may be assumed to support the wheel? Can the floor plank be considered as a continuous beam of several spans? Will the spiking or other fastenings at stringers be sufficient to fix it at these points? What effect on the continuity does the deflection of the various stringers produce? Are the outer ends of the planks simply supported, partially fixed, or fixed? What allowance should be made for poor workmanship, insufficient maintenance, and decay?

The writer has settled temporarily on the following: Figure the plank as 1 in. thinner than the thickness specified, to allow for wear and decay. With plank laid flat consider that the wheel load is carried by a single plank. With a laminated floor, consider that the wheel load is supported by a strip of floor having a width equal to four times the thickness of the floor. Figure the wheel load as uniformly distributed over a length of plank equal to the width of tire or rim in contact. Make no allowance for the value of spiking at stringers. Consider the plank as a cantilever on each side of the stringer over or near which a wheel load is placed. Using the fiber stress already given, find the resisting moment of the plank, and add to it the moment produced by the weight of the free end of the plank. Divide this by the distance to the next stringer, and use the quotient for the reaction on this stringer. Subtracting twice this value from the total wheel load will give the maximum load on an intermediate stringer.

For outside stringers place the wheel as near the curb or guard rail as practicable, and figure the plank as simply supported at the outer end, and fixed under the inside wheel. Make outside stringers as strong as intermediate stringers, and do not design any stringer for less than 50% of the wheel load. Consider the load as applied to the stringer at a point, and placed in the position which gives the maximum bending moment.

Use the lightest weight of each size of I-beams, and space stringers so that they are used to the full safe value. Preference is for the deeper I-beams and wider spacing; but the maximum limit for spacing is about 3½ ft. When stringers are riveted to the webs of floor-beams with substantial connection angles they are partially fixed at the ends, and the bending moment obtained by treating the beam as simply supported may be reduced 10%.

When the minimum depth of stringers is taken at about $\frac{1}{10}$ of the span to avoid excessive deflection, the thickness of the floor plank will usually determine the spacing of the stringers. The heavier wheel is placed at or near the center of a length of plank between two stringers, and the plank is assumed to be freely supported outside of the truck or roller, and fixed under the opposite wheel on the axle.

The width of tires in contact with the floor is not more than 10 or 12 in. for many heavy motor trucks. In my opinion, the sizes of beams and channels for beam bridges, American Bridge Co.'s standards, given in Professor Ketchum's "Structural Engineer's Handbook" are too light. A discussion on this feature of bridge design would be valuable.

HENRY F. BLOOD.
Structural Designer.

Portland, Ore.

Defends Aggregate Grading Theories

Sir—I have read with interest the article "Tests of Two Recent Theories of Proportioning Concrete" in *Engineering News-Record*, June 12, 1919. It is important to note that apart from the question of "workability" the authors, after having proved to their own satisfaction the inadequacy of the methods in question, have refrained from a discussion pointing out the probable reasons for the failure of these methods and suggesting possible means for rectifying their deficiencies. In general, the spirit of the article appears to be destructive rather than constructive. The criticisms and the test records it contains are, I venture to think, especially unfair to both the "fineness-modulus" and the "surface-area" methods of proportioning.

Practical considerations do not appear to have entered into the planning of any portion of the entire series of tests. A casual consideration of Table I indicates that more than one-half of the aggregate gradings do not conform to the basic requirements for mortar and concrete aggregates recognized by standard specifications. Furthermore, the test specimens were neither uniform in size nor in shape, and apart from this the number of specimens for any given test was insufficient for the securing of proper, well balanced averages. The inadaptability of these conditions to the investigation of any method or theory for the design of mortar and concrete mixes renders it useless to attempt to analyze the results obtained.

The writer's paper, "Proportioning the Materials of Mortars and Concretes by Surface Areas of Aggregates" (See "Proceedings," American Society for Testing Materials, Vol. XVIII, and *Engineering News-Record*, Aug. 15, 1918, p. 317, gives a very complete description of the development of the "surface-area" method and contains the description and the results of all tests made with this method up to June 1, 1918. The data there shown indicate very clearly that the investigations were entirely confined to the use of aggregates having normal, natural gradings. Even the two sands mentioned as having "rather irregular or freak gradings" would fulfill the requirements of well known sand specifications in general use. It is, therefore, reasonable to assume that the development of this method involved no radical departure from recognized good practice in so far as aggregates are concerned. However, it is to be regretted that a paragraph discussing fully, its inadaptability to "freak" aggregates was deleted from the original manuscript of the paper above mentioned. It was believed that practical utility would dictate the proper limits of its application.

Before proceeding further it is proper to call attention to an evident misunderstanding on the part of the authors, in relation to the very limited concrete investigations described in the A. S. T. M. paper. In the three tests made the water content of the mix was not proportioned by rule, but instead, as the paper states, "the water content of the mix was sufficient to produce a saturated, sticky, semiplastic mortar showing no free water." It further states, that "at the time of making the test specimens (concrete) the approximate areas of broken stone and gravel aggregates had not been determined," and in consequence of this condition the area of the stone aggregate was not taken into account in proportioning the cement in the mixes. However, notwithstanding these shortcomings, the con-

sistent test results obtained were belived to indicate amply the adaptability of the method to concrete mixes, and they were accordingly described in the paper.

The formula quoted by the authors is specifically dealt with under the heading "Mortar Consistency Tests." No reference whatever is made indicating or tending to indicate its adaptability to concrete mixes. Furthermore, the paper contains no formula adaptable to the proportioning of the water content of concrete test specimens.

While the physical conditions involved in commonly used concrete mixes containing one part mortar to two parts stone aggregate preclude the use of the consistency formula adapted to the production of "normal" mortars containing well graded sand aggregate, it is perhaps, unfortunate that this fact was not clearly pointed out. However, it is to be specially noted that while the first paragraph of the article in question indicates very clearly a misconception of the application of the consistency formula above mentioned, yet we find in the third and fourth paragraphs its proper application described with equal clearness.

The "surface-area" method bears no direct mathematical relation to other methods which have been proposed from time to time. It is, therefore, not comparable with the methods used in the tests described in Tables II, III, IV and VI of the article in question. References to it in these tables are, therefore, not only misleading but also entirely out of place. They serve no useful purpose, since they cannot possibly prove or disprove anything. Their use in this conection is unfortunate.

Another feature of this article which appears to be characteristically misleading is the italicized statement that the "surface-area" method leads to the same conclusion as does the "water-cement ratio." The algebraic demonstration following the statement just mentioned proves absolutely nothing. Had the authors assumed with a given sand, say, four mortar mixes in which the cement varied in the relation of one gram to 10, 15, 20 and 25 sq.in. and compared the computed quantities of water and cement they would, doubtless, have discovered that, strictly speaking, the water-cement ratio varies with the richness of the mix and is a dependent function rather than a primary one.

With reference to the assumption made by the writer in his original tests whereby the dust content of the sand aggregate (material passing a No. 100 sieve) was treated as having the same surface area as an equal portion of material passing a No. 80 and retained upon a No. 100 sieve and the cement content proportioned accordingly. Subsequent tests have shown that this assumption was entirely wrong in principle, and that instead we must treat it as a "dilutant" or an "extender" of the cement rather than as a component part of the sand aggregate. Briefly, these tests have shown that in so far as the cement content is concerned no surface-area allowance should be made for sandy dust material and that the water allowance for moistening it is nearly equal per unit of weight to that required for cement.

Space does not permit an attempt to enumerate all the factors influencing the physical properties of mortars and concretes. The work of defining the rolês of each is making slow but certain progress. However, in our efforts to ascribe to each its function, we must constantly bear in mind that these factors are to a marked degree interdependent. We must also keep in view the fact that, broadly speaking, a finished mortar or concrete is composed of (1) materials and (2) making, either of which may at times become the superior, regulating force upon which the quality of the resulting material mainly depends. This combination is awkward. However, it seems entirely rational to assume that, since cement and water are unquestionably the primary materials functioning to produce strength, they form the natural basis upon which to develop methods for the design of mortars and concretes. The "fineness-modulus" and the "surface-area" methods, although differing in other respects, recognize the importance of this basic condition.

The above mentioned interdependence of various fac? tors is indirectly referred to by the authors in their discussion of the mobility of the mix or, to use their words, its consistency, workability, plasticity or flowability. However, they have apparently failed to recognize this interrelation in full and have given it a primary instead of secondary importance by disregarding the fact that a dilution of the cement matrix in the "making" stage results in a final decrease in its strength.

LLEWELLYN N. EDWARDS,
Senior Highway Bridge Engineer,
Washington, D. C. Bureau of Public Roads.

Escaping Water Important in Concrete Tests

Sir—I have read with considerable interest articles published in *Engineering News-Record* with reference to Prof. Duff A. Abrams' water-cement ratio tests, and recent criticisms by Bureau of Standards engineers of the fineness-modulus and surface aggregate methods.

So far as I have been able to see from reading these articles, one very important factor which enters into the final uniformity and ultimate strength of concrete in compression has either been entirely overlooked or has not received publication by these writers.

First of all, it would be very interesting to know the type of molds used in these various tests. Are they practically waterproof? Does the water which is used in mixing remain in the concrete, or does a portion escape through and underneath the molds—and if so, about what percentage does escape? Are the molds filled to overflowing and tamped, rodded or tapped on the sides, and is the excess water which gathers at the top allowed to escape as more concrete is added to fill the mold for a finish? Either of the above methods of handling the concrete after it is placed in the molds has a great bearing on the ultimate strength when tested. In my opinion, based on laboratory tests, it is not so much a question of the amount of mixing water *used*, but rather of the amount of water in the concrete after the final set has taken place—or, in other words, how much of the water is allowed to escape either forcibly by rodding or naturally by evaporation and leaks through the bottom and sides of molds if they are not water-tight, or over the top of the mold when concrete is added to make a full mold?

It has been found through tests made by the writer that the strength of concrete can be increased from 25% to more than 100%, depending upon the amount of rodding and upon the strength of the unrodded concrete—the percentage of increase being highest with the weaker concrete mixes. Most of these tests were

made in 6 x 12-in. No. 18 galvanized-iron molds clamped together on the sides and placed loose on a machined iron baseplate, so that much water escaped through the sides and under the molds. The type of molds in this case was, no doubt, responsible to a great extent for the high increase in strength, which would also be true of other laboratories using molds which would allow water to escape. We have also obtained large increases in strength by this method in water-tight molds.

The writer does not wish to leave the impression that he is advocating the use of more water than is necessary for the proper workability, nor making any adverse criticism to the work of any laboratory, but merely wishes to see if something cannot be done toward making clearer the exact methods, in use in different laboratories, of mixing, placing and handling concrete, the type of molds used, etc. Our tests show that there is a wide variation due to different methods, and until laboratories understand the exact methods of other laboratories and use similar methods of handling, etc., where possible, there will never be the coöperation and progress there should be. G. A. PARKINSON,

Assistant Testing Engineer, University of Texas.
Austin, Texas.

[Professor Parkinson's letter was submitted to the two laboratories concerned and has elicited the following replies.—EDITOR].

Sir—In all of our tests metal molds have been used, with the exception of a few instances in which we made a study to the effect of using cardboard forms. The method of molding the specimens in our laborat ry is described on p. 5 of our bulletin 2 and also on p. 3 of my paper on the effect of vibration and pressure, etc., presented at the recent convention of the American Concrete Institute.

In our laboratory the machined metal form stands on a machined cast-iron baseplate, except that a sheet of paraffined tissue paper is placed between the form and the baseplate. This makes practically a tight joint, so that there is no leakage of water. For the wetter consistencies where leakage might be encountered, we seal the outside of the bottom joint and the vertical slot in the mold by means of paraffin.

In making a study of the effect of consistency of concrete where the water content may be varied, we do not consider it proper to permit the escape of water, since this would, of course, produce a material difference in the strength of the concrete.

Our specimens are molded by placing the concrete in the forms in layers of about 4 in. in 6 x 12-in. cylinders, puddling by means of a $\frac{5}{8}$-in. round bar, pointed at the lower end, with about 25 strokes of each layer. This process of filling and puddling is continued until the mold is full. The last layer generally fills the mold to overflowing. The excess concrete is removed by means of a bricklayer's trowel, and the top of the specimen leveled off. In the very wet mixtures where the excess of water tends to collect at the top, we allow the water to stand for a time, then fill the mold with additional concrete. The fact that the water does stand for a period of 20 min. to one hour before removing seems to produce the same effect on the concrete as if it were allowed to remain indefinitely. D. A. ABRAMS,

Professor in Charge, Structural Materials Research Laboratory.
Chicago, Ill.

Sir—All test specimens made at the Bureau of Standards are molded in iron or brass molds resting on glass plates. They are waterproof and practically water-tight.

In molding, a slight amount of water—or, rather, cement grout—is apparent around the lower end of the mold. This quantity is only a small fraction of 1% of the quantity of water used. The molds are filled full and rodded and possibly a small amount of water escapes before the neat cement paste capping is applied.

I fear that there is really nothing to this argument that a possible loss of water in molding may tend to account for the variation in strengths, since it is evident that the tendency of this water to escape would be greatest in the wettest mixtures and since the latter are those which have the lowest strength, the loss of water from these mixtures would tend to equalize the strengths. J. C. PEARSON,

Acting Chief, Cement Section, Bureau of Standards
Washington, D. C.

Practice in Gagging Rails

Sir—The editorial remarks on "Cracks in Rail Steel," published in *Engineering News-Record* of July 3, 1919, p. 2, contain a statement, near the end of the second paragraph, that should not pass without contradiction. The statement that "gagging affects only the middle part of the rail's length" implies that there is no gagging near the ends of rails. As a matter of fact, there is a great deal, and it may be of the most injurious character. The uniform sweep that rails contain coming off the hot beds requires "working" the rails in the straightening presses to almost the extreme ends. In addition, short bends and frequently kinks occur near the ends, and sometimes so near that a "dutchman" has to be used to support one end of the rail in the straightening press. The blows given near the ends of a rail are apt to be of the most injurious character, as, obviously, almost the full weight of the rail is acting as a lever against the gag and the whipping action is more severe.

Attention has been repeatedly called to the fact that a large amount of gagging can be entirely dispensed with by permitting rails containing a small amount of sweep, say 1 in. in 33 ft., to be shipped unstraightened. Experience shows that such rails can be easily spiked to perfect line and surface. This leniency, if granted in the specifications, would eliminate a vast amount of expensive mill work, leaving opportunity for generous improvement in other directions and, in addition, greatly reduce the suspicion invariably attached to the gagging of high-carbon rails. C. W. GENNET, JR.,

Chicago, Ill. R. W. Hunt & Co., Engineers.

Engineers Have Long Been Underpaid

Sir—Some of the recent discussions regarding compensation for engineers would lead to the belief that it is only recently that the profession has been inadequately paid. As far back as my engineering experience reaches, namely, eighteen years, this feature of low pay for the class of service rendered has been prominent, and it is unnecessary to compare the purchasing power of the dollar today with that of fifteen years ago to reach this conclusion. When a prominent steel works considered at that time that $7 per week was good average starting pay for a graduate engineer in its

drafting room, $9 extra good, but paid $12 in some cases for detailers, the evidence is plain. For $150 per month a large municipality could secure the services of an able engineer for executive charge of a million dollar improvement project. Similar instances can be cited by any engineer who is conversant with those times.

Although salaries have increased somewhat in the past fifteen years, they have nevertheless remained far below their proper basis, and when the recent abnormal conditions brought about a great advance in labor's rate of pay, the engineer's was not visibly affected. Moreover, public improvements were shelved for the time being. What shall we say of a concern employing many thousands of men, which today rewards the head of its large drafting force, who is in responsible charge of specialized work, with a salary of less than $200 per month? And this, too, after seventeen years of faithful service. Truly, engineering service is to be had cheaply, and this has been true for at least two decades; perhaps longer.

It has been said in these columns that the vast majority of engineers will always be employees, whereas the devotees of medicine and law are in large measure free from this feature. True, and the engineer is moreover absolutely dependent upon the activity of capital for a livelihood. If capital is timid, the engineer's services are not required, except for purposes of upkeep and maintenance, regardless of his experience and skill. The physician or legal expert who specializes in some branch of his profession is quite likely to find that a demand for his type of skill will exist many years hence. The engineer, on the other hand, before specializing should be able to look ahead at least forty years, and determine whether or not there may be periods of depression, or wars, which would render his specialized knowledge a drug on the market, or even obsolete. Is it really, then, remarkable that some classes in the profession are contemplating or even taking radical steps to improve their conditions?

When engineers themselves are found more frequently among the promoters of projects, in place of the familiar figure of the booster, we may hope for some betterment. But at present most of us wait for someone else to take all of the initial steps and then offer us a job. Under these conditions we can be but high-grade hired men, subject to the whims of chance.

Philadelphia, Penn. P. M. FOGG.

Nomographic Chart for Solution of Manning Formula

Sir—Professor Sayre's chart, published in your issue of June 5, 1919, p. 1126, is decidedly a step forward in the practical methods for the solution of Manning's formula for the flow of water in pipes or open channels. The accompanying nomographic chart, however, is in my opinion still simpler and more convenient for practical purposes, covering the same wide ranges of the four variables.

The construction of this chart is quite simple, and is based on the following:

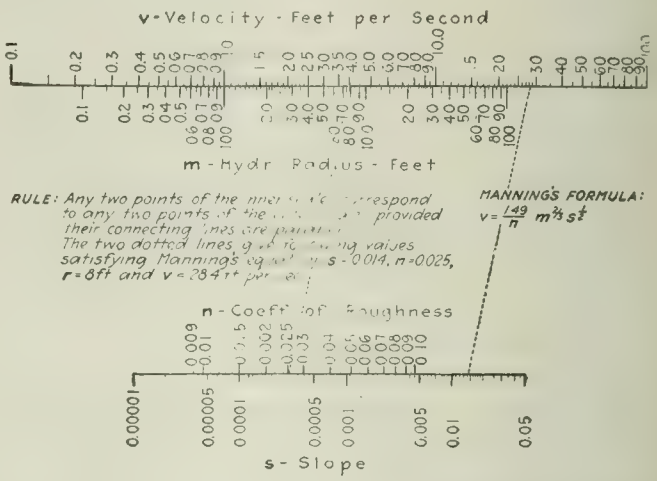
Manning's formula can be written thus: $\frac{v}{m^{\frac{2}{3}}} = \frac{1.49 s^{\frac{1}{2}}}{n}$

hence $\log v - \frac{2}{3} \log m = (\log 1.49 + \frac{1}{2} \log s) - \log n$

Lay off the values of $\log v$ to any convenient scale, say 3 in. = log 10, on one side of a straight line, and the values of $\frac{2}{3} \log m$ on the other side of the same line and from the same starting point (log 1.0).

It is evident that any segment between any two points of that line will equal $\log v - \frac{2}{3} \log m$, v and m being taken on opposite ends of the segment.

On another straight line, drawn parallel to the previous one and at any convenient distance from it, lay off to the same scale the values of n and on the opposite side the values of $\log 1.49 + \frac{1}{2} s$ to the same scale and



NOMOGRAPHIC CHART FOR SOLVING MANNING FORMULA FOR FLOW OF WATER IN PIPES

from the same origin. Any segment between any two points of this line will similarly equal $(\log 1.49 + \frac{1}{2} \log s) - \log n$ to the chosen common scale.

If now the two scale lines are intersected by two parallel lines, these will intercept two segments of equal length, so satisfying the equation $\log v - \frac{2}{3} \log m = \log 1.49 + \frac{1}{2} \log s - \log n$.

Hence, given three variables, the fourth one can be determined by drawing two parallel lines as shown on the chart. M. J. SHAMRAY.

New York City.

Proposes a National Bureau of Art

Joseph Pennell, well-known as an artist who has adopted engineering structures as a field for artistic expression, in an address before the Engineers' Club of Philadelphia, published in the *Journal* of the club for July, mentioned the great artist-engineers of the past, Michael Angelo and Leonardo da Vinci, and advocated a Federal Department of Art. He said in part: "This country should have, as every civilized country in the world has, except Great Britain—and she would have had it if she had not had the war instead—a minister to control, direct, and advise about art, and engineering is a part of it. If you adopt that idea of a minister of art, under him will be included the artists, the architects, the musicians, the players, and even the circus tent, because, to go back again for a moment, when the Greek engineers designed their structurally perfect buildings they always had architects, sculptors, and painters to decorate them. And that is what we have to do again today. You engineers must work with us, and we are bound to work with you."

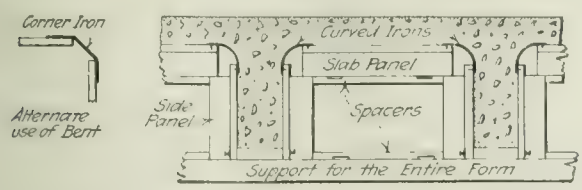
HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Floor Forms Designed for Easy Stripping

BY PROVIDING special curved corner strips of tin, Samuel P. Baird, engineer and contractor, of Columbus, Ohio, has greatly facilitated the stripping of concrete floor forms in his work. The design of the typical form is shown on the accompanying drawing.

In erecting the form, the trestle labeled "Support for the Entire Form" is first put up. Then the beam pieces



EASILY DETACHABLE CONCRETE FLOOR FORM

are placed in exact position and the side panels are nailed, with double-headed nails, to the bottom beam pieces. The lower spacer is then nailed only to the side forms, and the top panel, with the spacer attached, is placed. The curved galvanized-iron pieces are next attached, as shown, by tacks. These pieces are made up in a tin shop and well soldered. They are 16 in. long each way and lapped over the adjoining pieces so that no cutting is required.

When the forms are to be stripped, sufficient additional supports are placed under the beam bottoms, the upper and lower spacers are removed and the trestle support is lowered about 1 ft. by means of four pulley blocks supported by previously placed wire loops in the slab ceiling. These loops come through No. 20-gage circular plates 12 in. in diameter which cover holes in the ceiling panel, permitting the panels to fall when the double-headed nails are drawn. Notches are cut in the spacers so that a bar can be inserted to pry them out.

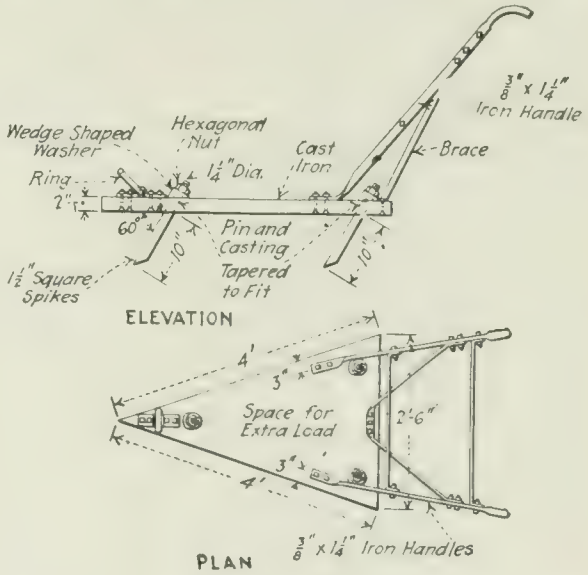
When the double-headed nails are drawn the entire form is free, except for the adhesion to the concrete. If the forms have been well oiled this will be small, and by shaking the forms they will generally fall the short distance to the support. When all the panels in the bay are down on the support, the entire form is lowered by the pulley blocks.

Instead of curved corner pieces, the angular piece shown in the alternative sketch is sometimes used. This is cheaper but has not as good an appearance as the curved corner. All of the corner pieces may be used many times, the only damage being due to too secure tacking.

Road Digger for Breaking Old Macadam Preparatory to Resurfacing

BREAKING up old macadam surfaces, preparatory to reshaping with a road machine and resurfacing, was accomplished in Niagara County, New York, with the device shown in the accompanying illustration. The old macadam had become very rough and full of pit holes and humps, due to frost action. Essentially, the tool is the same as a garden cultivator, except that it is built heavier and does not have as many teeth.

It consists of a V-shaped cast-iron plate 2 in. thick, with handles and three spikes projecting downward and forward. The flat top furnishes surface for piling



PLAN AND SIDE ELEVATION OF MACADAM DIGGER

extra weight. Alone it weighs 300 lb., and on the Niagara work it was loaded to double this amount. A kerosene tractor was used to haul it.

The above facts were taken from the *Concrete Highway Magazine* for July.

Other Articles in This Issue of Interest to Contractors

Chartered Summary of State Concrete-Road Specifications — Page 160

Backfilling Tunnel Through Holes Bored From Surface — Page 174

Large Concrete-Cased Steel Pipe Laid in One Piece — Page 176

Democracy or Partnership in Labor Management — Page 177

Dishpans Used for Light Reflectors

BY ALBERT S. FRY

Morgan Engineering Co., Memphis, Tenn.

ORDINARY tin dishpans are successfully used as reflectors for the electric lights which are placed on the booms of the walking dragline excavators, working in the Inter-River Drainage District of Missouri. The bright tin surface of the inside of the dishpan makes a good reflector, at a small cost. The lights themselves are run from a plant on the excavator.

NEWS OF THE WEEK

New York, July 24, 1919

Illinois Central Plans New Lakeside Terminal at Chicago

Electrification and a new terminal station for the Illinois Ceneral R.R., and a 1200-acre lake-front park development, with provision for harbor facilities, are the main features of a new ordinance passed by the Chicago City Council, July 21. This represents an important step following several years' debate and controversy between the city, the railway, the South Park Commission and the Federal Government. By the terms of the new ordinance the Illinois Ceneral R.R. will introduce electric traction on its suburban lines within seven years and on its main lines in from 12 to 15 years. There is to be an elaborate new station on 12th St., the site of the present station, which will be a terminal for main-line trains but a through station for suburban lines which will pass under and continue to a local terminal at Randolph St. Freight traffic will pass outside the station to yards on the Chicago River. The matter will now go to the War Department for approval.

The New York Port Commission Makes Preliminary Report

Study of the problems of developing the port of New York is being continued by the New York-New Jersey Port and Harbor Development Commission, according to the progress report of that body, just issued. As yet the commission is not ready to make a definite statement on any of the details which go to make up the port work, but hope to be able by next year to complete its work and make detailed recommendations. The report outlines, however, the studies which have been made into the present operation of commerce in the port. It is the opinion of the commission that coördinated action between the various Governmental bodies contributing to the port must be assured if the development of the harbor is to continue at its proper rate.

Engineer Training School at Camp A. A. Humphreys

Maj. Gen. William M. Black, chief of engineers, recently appeared before the military committee of the House of Representatives to ask for authority to complete temporary construction at Camp A. A. Humphreys, which is located on the Potomac River a short distance below Washington. This camp was started about a year ago as an engineer training camp for both officers and men, and was not put into actual service until just before the ending of the war. Since then it has been used as an engineer school.

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 233 Broadway, New York City.

It has been often reported that the Army would like to use Camp A. A. Humphreys as a permanent training school for engineers in the service, but General Black at this time is not asking for appropriations for this purpose. All he requires at present is about $400,000 to complete the temporary construction. He stated that it would cost about $3,000,000 to make the camp a permanent school.

Ask More Money for Alaska Railway

Bids have been introduced in both House and Senate authorizing the appropriation of an additional sum of $17,000,000 "to complete on or before Dec. 31, 1922, the construction and equipment of the railroad between Seward and Fairbanks, together with necessary sidings, spurs, and lateral branches." This amount is in addition to the $35,000,000 originally appropriated for the Government railway in Alaska, which sum has been nearly expended, though much of the work remains to be done. The excess of cost over estimate is largely due to the increased cost of construction. Hearings on the bills are to be held soon.

It is announced that the railway is available for freight or passengers from Seward north to Talkeetna, a distance of 227 miles.

Sues Cement Companies for Restraint of Trade

State of Kansas Asserts That Illegal Agreements Keep up Price of Portland Cement

Ouster suits against seven cement companies of Kansas have been filed in the State Supreme Court by the attorney general of the state. According to announcements, the suits follow extensive investigations made by the attorney general's office, based on charges that the cement companies have formed a trust, in violation of state laws, to fix cement prices. The petition prays that charters, franchises and business rights of the seven companies be forfeited, that restraining orders against continuing their combination be issued, that the property of all the companies be placed under the control of the court, that receivers be appointed, and finally that each company be fined not less than $100 for each day it has violated the anti-trust law.

The petition charges that the cement companies bound themselves not to sell, manufacture, dispose of or transport cement below a common standard figure which is termed excessive; that the companies have entered into a secret agreement to sell cement in Kansas at a uniform price, and add to said price and charge to the purchaser an amount equal to the railroad freight charges, not from the point of production to the point of delivery, but from the City of Iola, Kan., to the place of delivery, and that the companies agreed unlawfully to divide the territory of Kansas among themselves, to the end that in certain portions of the state certain companies have the exclusive right to fix the price of cement.

May Build 14-Mile Irrigation Tunnel in Washington

A tunnel some 14 miles in length, connecting the Methow and Okanogan drainage areas, is the main feature of the Methow-Okanogan irrigation project in Washington. The entire project embraces about 40,000 acres, from Chelan on the Columbia River to Riverside on the Okanogan. Of this area about 8000 acres are now irrigated under the Okanogan project of the United States Reclamation Service, and from other private sources of supply some 4000 acres are being watered. Unprecedented water shortage in this section led the districts concerned to ask the State Reclamation Service to make an investigation of the possible supply from the Methow drainage area. It was found by Elbert M. Chandler,

director and chief engineer of the Washington State Reclamation Service, that sufficient water could be obtained from the Methow River. Steps are now being taken to form a consolidated irrigation district, as provided for under recent amendments to the Washington irrigation district law. In addition, the lands are being classified, a soil survey is being completed and party is in the field making a preliminary survey of the proposed tunnel and canal line. If the project is found to be feasible and the necessary bonds are voted by the proposed consolidated irrigation district, it is thought likely, Mr. Chandler writes, that the State Reclamation Service will undertake the construction of the project and the purchase of the bonds, either jointly with the Federal Government or on its own account.

County Engineers Replace County Surveyors in California

Another state, California, has provided for county engineers to take over the work formerly done by county surveyors. By the passage of the Ream county engineer act, boards of supervisors are permitted to appoint county engineers to take complete charge of the management of county roads, and are compelled to make such appointment upon petition of 25% of the electors. While the boards of supervisors will hold general supervision over road matters, the engineer will be in complete charge of the design and construction of the roads, and will be constituted commissioner of each of the road districts in the county. In addition to performing the road work, he will take over all duties now performed by a county surveyor. As county road work has increased in importance, it has been found necessary in many places to replace the elected county surveyor, who often is not even an engineer and knows little, if anything, about modern road construction. In some cases this condition has been corrected by separating the offices of county surveyor and county road engineer. California has gone the whole way and given the county engineer the entire county engineering work.

Nevada May Have State Cement Mill

The Nevada state legislature has passed, and the Governor has approved, an act authorizing the Governor to appoint a commission of three to investigate the feasibility of the construction of a cement plant for the state. Section 3 of this act authorizes the State Board of Examiners to prepare and issue bonds in the sum of $100,000, the proceeds from the sale of which bonds are to be appropriated for the purpose of constructing and equipping such cement plant. This commission is to make a report of its findings to the 30th session of the state legislature, which will meet in 1921. There has been no report of the work of this commission.

War Factories To Be Sold

Manufacturing plants built for the war are about to be disposed of by the War Department. These consist of completed and partly finished manufacturing plants which were operated for, or under construction for, the use of all the different bureaus of the War Department. They include electrical, chemical, ammunition, gun, power and other plants, and are located in every part of the country.

It is provided in the contracts under which these plants were erected that they become the property of the United States Government at the end of the war, and in many instances it is stipulated that they be removed within a certain stated period after operation ceased. The Government, however, holds options on all the land, and it is possible to turn the entire plant over to a purchaser.

It is the policy of C. W. Hare, the director of sales, under whose direction these properties will be sold, to offer them first to the industries which have operated them for the Government during the war. If no sale can be effected through this means each plant will be sold by competitive bid.

Among the plants which will be offered for sale in the near future are the smokeless-powder plant at Charleston, W. Va., which cost the Government between $60,000,000 and $70,000,000. This plant, according to experts who are making appraisal, is adaptable for paper or chemical manufacturing. The picric-acid plant at Brunswick, Ga., which involved an expenditure of $6,000,000, will also be offered for sale shortly, as will also the picric-acid plant at Little Rock, Ark., which has only been in operation a short time. The picric-acid plants are said to be adaptable for use in manufacturing fertilizer.

The nitrate plant No. 4, at Cincinnati, Ohio, which was less than 50% completed, is also slated for early sale. This consists of completed steel buildings and structural steel on the ground.

W. G. Sloan, who served in France as a major in the 22nd Engineers, and who was formerly vice-president of McArthur Bros., contractors, of New York, is in charge of the disposal of plant facilities. He is assisted by B. L. G. Rees, formerly engineer executive of the McArthur company and who was a captain in the Engineer Corps during the war.

New York City To Build Piers on Staten Island

Fourteen new steamship piers on the east shore of Staten Island have been authorized by the Commissioners of the Sinking Fund of New York, this being the last step legally required before the Department of Docks may begin work. The piers are to be located just inside the Narrows, between Tompkinsville and Clifton. They will be each 125 ft. wide and will vary in length from 1000 to 1124 ft. and will be provided with one-story sheds. As at present designed, the piers are of the New York type; that is, with sheds occupying practically all of the pier so that freight handling has to be done from cargo masts. The total cost of the development will be about $15,000,000. Present titleholders of the property must vacate by September.

Commissioner Hulbert, of the Department of Docks, has also announced what is termed the "Hulbert Port Development Plan." This comprises the Staten Island development, the construction of the southerly five piers on the North River, reconstruction of scattered piers throughout the city, construction of three piers in South Brooklyn, an addition of one steamship pier to the present North River 48th St. group, "intensive study of the Jamaica Bay improvement," work for the straightening of the Harlem River, and study of the East River shores.

None of these projects can go forward without the financial aid which must be authorized by the Sinking Fund Commission, made up mainly of members of the city administration.

Buffalo Sells Its Garbage on Chicago Hog-Price Basis

After negotiations with several parties extending through several recent months, Buffalo has decided to let a five-year contract for garbage disposal by feeding to hogs. The contractor, Dr. T. B. Huff, offers to pay 50c. a ton as a minimum, with increases varying with (1) the price of live hogs on the Chicago market and (2) the quantity of separated garbage delivered yearly by the city. Regardless of yearly total, the contractor is to pay the city a price per ton of garbage six times the Chicago price of live hogs. If the yearly garbage total exceeds 30,000 tons, the multiple becomes seven, and if it exceeds 40,000 tons it will be eight. These multiples are to be based on average monthly prices and on corresponding monthly totals. The city agrees to employ two and, if need be, three inspectors; to carry on an education campaign for separation of garbage from other city refuse; to pass and enforce an ordinance prohibiting any collections except by the city; and to make daily deliveries to the feeding platforms, except on Sundays and holidays. The contractor agrees to be ready Oct. 1 to accept all garbage delivered by the city, and expects to accept some before that time. A tentative agreement has been made with the International Agricultural Corporation to continue to treat the garbage by reduction from the time of the expiration of its contract Aug. 1 until arrangements for feeding can be made, doing the work on the cost-plus basis A Baltimore contract for garbage disposal by feeding, at a price per ton of 3½ times the Chicago market price for live hogs, was described in *Engineering News-Record* of Feb. 6, 1919 p. 287.

Contributions From Engineers, Architects and Constructors' Conference on National Public Works

M. O. LEIGHTON, Chairman

PUBLISHER'S NOTE: *The space occupied under this caption is donated to serve as a means of frequent and intimate communication between the Engineers, Architects and Constructors' Conference on National Public Works and the members of the profession. The contributor takes full authority for the statements made.*

National Chaos in Our Rivers—Do We Need a National Department of Public Works?

The rivers of our country are the nation's greatest industrial plant. They furnish transportation, power, irrigation and domestic water-supply. They perpetuate swamps, define natural and political boundaries, and furnish sites for parks and places of recreation. They are the receptacles for city sewage. They rise in flood and destroy lives and property, and to compensate for this they harbor fish which constitute a not insignificant portion of our food supply. They are essential to placer mining, to numerous industrial processes, to fire protection and to some kinds of engineering construction.

Rivers are rivers. They are a unit from source to mouth. They all run down hill, discharge the same water, and invoke the same hydraulic principles. Each problem that they present merges with every other, and there can be no final and satisfactory solution of one that does not defer to the requirements of every other. One may as well try to separate the functions of a hand or a foot from those of the remainder of the body. If there be any Government function that requires a single authority and sane, consistent and coördinated management, it is the function relating to rivers.

Water-power development is under:

(1) The Department of War; Corps of Engineers;
(2) the Department of the Interior;
  (a) the Geological Survey;
  (b) the General Land Office and, in certain cases,
  (c) the Reclamation Service;
  (d) the National Park Service;
  (e) the Bureau of Indian Affairs;
(3) the Department of Agriculture; the Forest Service.

If these rivers rise in flood:

(1) The warnings are sounded by the Department of Agriculture; the Weather Bureau;
(2) the amount of water is measured by the Department of the Interior; the Geological Survey in most cases and the Reclamation Service in others;
(3) and certain *ex post facto* observations and conclusions are delivered by the Department of War; the Corps of Engineers.

If these rivers are to be used for irrigation:

(1) Any public lands involved must be subject to the action of the Department of the Interior; the General Land Office; except,
(2) if any lands in the national forests are involved there must be approval of or interference by the Department of Agriculture; the Forest Service; or
(3) if any of the project occupies land in an Indian reservation there must be approval of or interference by the Department of the Interior; the Office of Indian Affairs;
(4) furthermore, if the project be one of the Government's own then it is presided over by the Department of the Interior; the Reclamation Service.
(5) and then the whole thing may be subject to the consent of the Department of War; the Corps of Engineers, under the guise of interference with navigation and whether there be any actual navigation or not.

If it becomes necessary to make a river survey, that work may fall to any one of the following:

(1) The Department of War; the Corps of Engineers;
(2) the Department of State; the International Joint Boundary Commission;
(3) the Department of Commerce; the Coast and Geodetic Survey;
(4) the Department of Agriculture;
  (a) the Bureau of Roads and Rural Engineering;
  (b) the Forest Service;
  (c) the Bureau of Soils;
  (d) the Weather Bureau;
(5) the Department of the Interior;
  (a) the Geological Survey;
  (b) the General Land Office;
  (c) the Reclamation Service;
  (d) the Bureau of Indian Affairs;
  (e) the National Park Service.

If questions arise as to wet and overflowed lands the following departments find points of entrance:

(1) The Department of Agriculture; the Bureau of Roads and Rural Engineering;
(2) the Department of the Interior;
  (a) the Reclamation Service;
  (b) the Geological Survey;
(3) the Department of War; the Corps of Engineers.

If an issue arises as to the deposit of sewage or other foreign matter, one or more of the following is concerned:

(1) The Department of the Treasury; the Bureau of the Public Health Service;
(2) the Department of War; the Corps of Engineers and the California Débris Commission;
(3) the Department of Agriculture; the Bureau of Public Roads and Rural Engineering; also the Forest Service;
(4) the Department of the Interior;
  (a) the Reclamation Service;
  (b) the Geological Survey;
  (c) the National Park Service;
(5) the Department of State; the International Joint Boundary Commission.

All of these departments operate independently. Instances of mutual working agreement are so rare as to cause comment. Each department has its own regulations and rules of procedure, its own ideas, specifications, methods and specific objects. The race for departmental supremacy is often more prominent than the object to be attained by the official activities.

Then, think of the overheads, the duplications, the cross-purposes, the multiple accounting and the technical and clerical help; also the duplicated property and equipment, the duplicated traveling expenses. Think of it all, you men who are accustomed to manage a business, and finally decide whether we need a Department of Public Works.

Law to Curb Motor-Vehicle Thefts

Trafficking in stolen motor vehicles is very stringently regulated by a law passed by the legislature of Pennsylvania and recently signed by Governor Sproul. A fine not exceeding $5,000 and imprisonment for a period of not less than 10 years are provided for motor thieves. Special transfers containing a full description and history of a vehicle must be given to purchasers with every used car.

The bill, which is known as the Cox bill, contains the following provisions:

1. That the person conveying title to any used motor vehicle must furnish to the buyer a full description of vehicle in duplicate, containing the name of the manufacturer, the horsepower, the number under which it was last registered by the State Highway Department of Pennsylvania or of another state, with a full account of the numbers and marks identifying the vehicle. Also a statement in duplicate giving the name or names and residences of the previous owner or owners, with information as to where they may be found.

2. The purchaser must insist upon receiving the above description in duplicate. He must then within 10 days make a duplicate statement, giving his name and the complete facts, and send it with the other duplicate statement to the State Highway Department. No license may be given out by the State Highway Department until the law is complied with.

Various other sections pertain to the State Highway Department keeping a record of violations of the provisions against changing the trademarks, the manufacturing number, or other distinguishing marks on any motor vehicle, and requiring proprietors of public garages to keep a record of the names of all persons owning or having charge of vehicles stored or left for repairs or other purposes at the public garage, together with the make, manufacturer's number, name of the state of registration and the registration number.

Food Committee Recommends Rural Motor Express

Transportation of foodstuffs by motor trucks is recommended to Governor Smith of New York by the committee on food production and distribution of the New York Reconstruction Commission. Rural motor-express systems, to be owned by coöperative associations similar to the Farmers' Coöperative Co. of Harford County, Maryland, are suggested.

In advocating the establishment of such systems throughout the state, the committee sets forth the inability of farmers to deliver perishable produce quickly to market. This condition, it was stated, made them reluctant to plant such produce and greatly holds down production. The great advantage of the motor express in taking foodstuffs directly from the farms to the cities, thus saving the time which the farmer loses in hauling, was also brought out.

That routes such as are advocated are successful was shown by the citing of several examples distributed throughout the country. Much greater speed of delivery by truck than by railroad over distances from 180 to 200 miles was shown by actual tests. One test described the loading at 6 a.m. at Lancaster, Penn., of 18,000 eggs in crates and 1000 day-old chicks, to be delivered in New York, 180 miles away. At the same time a similar shipment was made by train. The truck arrived at the door of the consignee in New York 12 hours after leaving Lancaster, with nine eggs broken and four chicks dead. The train shipment was four days in reaching Jersey City, another day was lost in sending notice to the consignee, whereupon he was obliged to send his own truck to get the shipment. When it finally reached his door several thousand eggs were broken and half the chicks were dead.

It was the opinion of the committee that the establishment of such routes would greatly decrease the cost of foodstuffs and also help to increase the supply.

Civil Service Examinations

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Master computer, $2400 to $1800 per year, computer (Grade I) $1800 to $1400 and computer (Grade II) $1400 to $900, Ordnance Department. Applications will be received until further notice.

Electrical assistant, signal service at large, War Department, for duty at Manila, Philippine Islands, $1500 to $2000 per year. Applications must be filed before the close of business on Aug. 19.

Technical assistant, field of civil engineering, $3200 per year, and technical assistant, torpedo design, $3000 per year. Applications must be filed by Aug. 19.

Supervising draftsman, bureau of steam engineering, Navy Department, $12.80 to $13.60 per diem. Applications must be filed before August 19.

ENGINEERING SOCIETIES

Calendar

Annual Meeting

NEW ENGLAND WATER WORKS ASSOCIATION, Tremont Temple, Boston; Sept. 30, Oct. 1-3, Albany, N. Y.

The Southern California Association of Members of the American Society of Civil Engineers was addressed July 9 by C. E. Tait, senior irrigation engineer, Bureau of Public Roads, who read a paper on "Spreading as Related to Flood Control."

The Engineers' Club of San Francisco held a meeting July 10 at which Philip N. Moore, past president of the American Institute of Mining, and Metallurgical Engineers, spoke on the establishment of a national Department of Public Works.

The New York Chapter of the American Association of Engineers held a meeting July 23 at which Henry Stern, chief of the professional section of the United States Employment Service, and assistant Federal director, spoke on "Placing of Professional Men in Proper Positions."

The Charlotte, N. C., Chapter of the American Association of Engineers held its first regular meeting July 19. The following officers were elected: President, J. S. Lemond; vice-president, W. E. Vest; recording secretary, G. P. Ashbury; corresponding secretary, Alfred Greif; treasurer, Lacy Moore.

PERSONAL NOTES

L. L. HIDINGER, vice-president of the Morgan Engineering Co., Memphis, is now acting as chief engineer of the Little River Drainage District, Missouri, in addition to his other duties with the company.

C. J. WHITE, formerly resident engineer, Northern Pacific Ry., has resigned to become assistant highway engineer, State Highway Department of Minnesota, with headquarters at Pine River.

WALTER N. FRICKSTAD, engineer's office, Oakland, Calif., has been appointed a senior highway engineer, United States Bureau of Public Roads, with headquarters at Ogden, Utah.

LIEUT. COL. W. J. BARDEN, Corps of Engineers, U. S. A., has been appointed district engineer in charge of the United States Engineer's office at Jacksonville, Fla., succeeding MAJ. GLEN E. EDGERTON, Corps of Engineers. Colonel Barden recently returned from France, where he served as chief engineer, Ninth Corps of Engineers, with the rank of colonel.

CAPT. CHARLES CAULSON, Canadian Expeditionary Forces, has been appointed city engineer of Welland, Ont.

LIEUT. GERALD F. HEALEY, U. S. A., who was previously in the employ of the New York State Highway Department, has received his discharge from the service and has entered the Bureau of Public Roads, Washington, D. C.

FRED W. YOUNG and KENNETH T. YOUNG have become associated with their father under the firm name of CHARLES W. YOUNG AND SONS, of Boston, to engage in the management and operation of public utilities.

D. K. ORR, assistant chief engineer of the Monongahela R.R., has been appointed superintendent, with headquarters at Brownsville, Penn.

P. T. WILTSE, for the past year manager of the Doctor Shipbuilding & Drydock Co., Maury Island, Wash., has resumed his engineering practice in Seattle. He will continue his connection with the company.

LIEUT. COL. JOHN A. AMYOT, of Toronto, has been appointed deputy minister in the recently created Department of Health. Dr. Amyot served as sanitation officer with the Canadian Expeditionary Forces, and was made a Companion of the Order of St. Michael and St. George (C.M.G.). He is a graduate of St. Michael's College and the University of Toronto.

GEORGE H. WILLITS will not accept appointment as assistant county engineer of Dallas County, Texas, as noted in these columns July 3, p. 47. J. F. WITT resigned as county engineer, as noted in *Engineering News-Record* of June 26, p. 1285; Mr. Willits was to have been his assistant.

MAJ. FORREST S. HARVEY, Construction Division, U. S. A., assistant to the constructing quartermaster, Charleston port terminals, has been assigned as constructing quartermaster, Panama Canal Zone, with headquarters at Corozal.

MAJ. WILLIAM BOWIE, chief of the Division of Geodesy, United States Coast and Geodetic Survey, sailed recently for Brussels to attend a conference of the International Research Council, to be held July 18-Aug. 10.

DR. V. BUSH has been appointed associate professor of electrical engineering, Massachusetts Institute of

Technology. During the war Dr. Bush was associated with the researches of the United States Navy at New London for the detection of submarines.

CAPT. A. L. TRAUT, U. S. A., recently returned from France and will resume his engineering practice in Detroit.

C. F. KELLER, for the past 15 years assistant engineer, Department of Docks, New York City, has been appointed chief engineer succeeding C. W. STANIFORD, resigned.

MAJ. G. C. MUNOZ, Ordnance Department, U. S. A., has received his discharge from the service and has become associated with the American Pulley Co., Philadelphia.

BERNARD SNELL, Construction Division, U. S. A., has been relieved as engineer of railroads, Charleston port terminals, to become assistant to the constructing quartermaster, Corozal, C. Z.

CAPT. ADRIAN GROOT, 37th Engineers, A. E. F., has received his discharge from the service and will resume his work as head of the GROOT ENGINEERING CO., Rochester, N. Y.

COL. RALPH T. WARD, U. S. A., who recently returned from France, has been appointed district engineer in charge of improvements of the Missouri River.

O. J. EIDMAN, assistant bridge engineer, Kansas State Highway Commission, has resigned to become structural engineer, SOUTHWESTERN ENGINEERING CO., Hutchinson, Kan.

W. H. SCALES, previously with the Lackawanna Bridge Co., has become connected with W. E. Russ, architect, Indianapolis.

H. D. BRADSHAW, formerly of the United States Housing Corporation, has become associated with Wesley B. Porch, contractor, of Atlantic City, New Jersey.

OBITUARY

COL. JAMES KILBOURNE, president of the Kilbourne & Jacobs Mfg. Co., of Columbus, Ohio, died recently in that city. Colonel Kilbourne was known in the engineering field as the founder and builder of one of the largest contractors' equipment manufacturing plants in the Middle West. He was graduated from Kenyon Technical College, afterwards from Harvard, with the degree of LL.B., later receiving the degree of LL.D. from Kenyon College. After practicing law for a time he founded the company of which he was president and general manager at the time of his death.

GEORGE W. OAKES, head of the firm of George W. Oakes & Co., contractors, St. Paul, Minn., died in that city, July 16, at the age of 75. He was born in Ohio, and after serving in the Civil War went west, becoming one of the pioneer contractors of St. Paul. He had engaged in numerous railroad contracts and had built a large amount of the heavy foundation work done in the city.

HENRI VALENTA CARRERE, building contractor, New York City, died July 7. He had been successively associated with the Vreeland Contracting Co., the Schaeffer Construction Co. and Jacobs & Young.

New Device Indicates Proper Grade of Asphalt

A three-plate circular slide indicator for the proper grade of asphalt to use has been issued by the United States Asphalt Refining Co., of 90 West St., New York. Given the type of construction, the temperature range, and the degree of traffic, the device can be immediately set to show the grade number.



NEW ASPHALT INDICATOR SHOWS GRADE TO USE

The rings are made of celluloid, the entire instrument and its base being covered with this material. As set in the view herewith, it shows that with asphalt macadam (hot-mix), moderate temperatures and moderate traffic, grade No. 75 Aztec asphalt should be used. Instructions for the use of the instrument are given on the front, while on the back are given the various grade numbers with their range in penetration.

BUSINESS NOTES

THE SMITH-BOOTH-USHER CO., of Los Angeles, Calif., has opened offices at 433 Rialto Building, San Francisco. The company is the California, Nevada and Arizona agent for the following: Bessemer Gas Engine Co.; Foos Gas Engine Co.; Lakewood Engineering Co.; Clyde Iron Works; Barber-Greene Co.; Ohio Locomotive Crane Co.; J. D. Fate Co.; Cincinnati Iron & Steel Co.; Henry & Wright; C. & G. Cooper; Van Blerck Motor Co., and others.

THE WHEELER CONDENSER & ENGINEERING CO., of Carteret, N. J., has elected J. J. Brown, formerly vice-president and general manager, as president, succeeding Charles W. Wheeler, who died recently. H. S. Brown, of Boston, Mass., was elected vice-president. No other changes were made in the officers of the company at the recent election.

TRADE PUBLICATIONS

The following companies have issued trade publications:

THE SMITH ENGINEERING WORKS, manufacturers of rock, ore and gravel handling machinery, 32nd and Locust Streets, Milwaukee, Wis.; two catalogs, 7½ x 10¾ in., 15 pages and 35 pages, respectively; one describes gyratory crushing machinery, and the other mining, quarry and gravel pit machinery.

THE SPRAGUE ELECTRIC WORKS OF THE GENERAL ELECTRIC CO., of 527-531 W. 34th St., New York City; bulletin, 8 x 10½ in., 15 pages, illustrated; subject, the Sprague adjustable loop system of overhead material-handling machinery for terminal sheds.

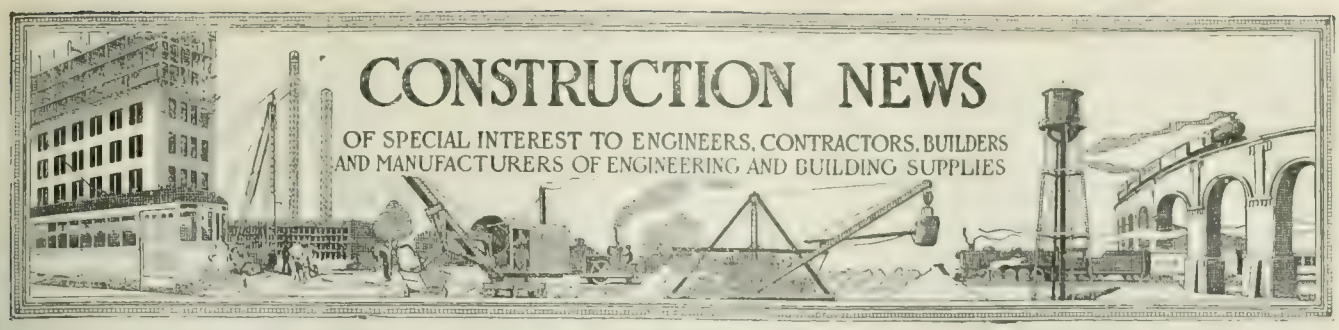
THE MCGRAW-HILL BOOK CO., INC., 239 W. 39th St., New York City; booklet, 8¾ x 11½ in., 12 pages, illustrated; entitled "Ten Years," being a history of the development of the company.

THE SPRAY ENGINEERING CO., of 93 Federal St., Boston; catalog, 8 x 11 in., 16 pages, illustrated; describes air-washing and cooling equipment especially applicable for steam turbine generators.

THE WELLMAN-SEAVER-MORGAN CO., engineers and manufacturers, of East 70th St. and Central Ave., Cleveland, Ohio; folder, 8½ x 11 in., 4 pages; contains three charts for reading shaft diameters, torsional stress, speed in revolutions per minute, and power when the necessary factors are known.

THE MCLEOD CO., of Bogen St., Cincinnati; catalog, 6 x 9 in., 28 pages, illustrated; contains descriptions of labor-saving devices for the use of city engineers, superintendents of streets, paving contractors, water-works superintendents, etc.

THE MASSEY CONCRETE PRODUCTS CORPORATION, of the Peoples' Gas Building, Chicago; catalog, 4½ x 7¾ in., 23 pages, illustrated; gives general information on Massey factory-made reinforced-concrete products.



PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
July 28	Montevideo, Minn.	July 17
July 29	Farmington, Minn.	July 24
July 30	Ottawa, Ont.	July 24
July 30	Dodge City, Kan.	July 24
July 31	Warsaw, N. C.	July 17
July 31	Wilkes-Barre, Pa. Adv. July 24.	July 24
Aug. 1	**Litchfield, Minn.**	**July 3**
Aug. 1	**Akron, O. Adv. July 17.**	**July 17**
Aug. 1	South Erie, Pa.	July 24
Aug. 2	Wadsworth, O. Adv. July 24.	July 24
Aug. 5	**Zebulon, N. C.**	**July 17**
Aug. 5	Sharon Springs, Kan.	July 24
Aug. 20	**Armour, S. D. Adv. July 24.**	**July 24**

SEWERS

July 26	Port Huron, Mich.	July 24
July 28	**New Bethlehem, Pa. Adv. July 17.**	**July 17**
July 28	St. Paul, Minn.	July 24
July 28	Waseca, Minn.	July 24
July 29	**Phœnix, Ariz.**	**July 17**
July 29	**Wamego, Kan.**	**July 17**
July 29	**Kings Park, N. Y.**	**July 17**
July 30	**Sibley, Ia. Adv. July 24.**	**July 24**
July 30	**Gregory, S. D.**	**July 24**
July 31	Ellwood City, Pa. Adv. July 24.	July 24
July 31	**Newton Mass**	**July 17**
Aug. 1	**Lake Preston, S. D.**	**July 24**
Aug. 2	Lincoln, Neb.	July 17
Aug. 2	Iroquois, S. D.	July 24
Aug. 4	**Idabel, Okla.**	**July 17**
Aug. 4	**Birmingham, Ala.**	**July 17**
Aug. 5	**Wakefield, Neb.**	**July 10**
Aug. 5	Caledonia, Minn.	July 24
Aug. 15	**South Charleston, W. Va. Adv. July 24.**	**July 24**
Aug. 18	Hackensack, N. J. Adv. July 24.	July 24
Aug. 19	**Kansas City, Mo. Adv. July 3 to 17.**	**July 3**

BRIDGES

July 29	**Jacksonville, Fla.**	**July 3**
Aug. 1	Apollo, Pa.	July 24
Aug. 4	**Little Rock, Ark.**	**July 3**
Aug. 4	Santa Barbara, Cal.	July 24
Aug. 5	Duluth, Minn.	July 24
Aug. 7	Marion, Ark	July 17
Aug. 19	**Statesboro, Ga.**	**July 3**
Aug. 20	**Swainsboro, Ga.**	**July 3**

STREETS AND ROADS

July 28	Junction City, Kan.	July 10
July 28	**Kalamazoo, Mich. Adv. July 17.**	**July 17**
July 28	Cleveland, Tenn.	July 24
July 28	St. Paul, Minn.	July 24
July 28	Welland, Ont.	July 24

Bids Close		See Eng. News-Record
July 28	St. George, S. I., N. Y. Adv. July 24.	July 24
July 29	Columbus, O.	July 17
July 29	Pennsylvania Adv. July 10 and 17.	July 10
July 29	New York Adv. July 10 and 17.	July 10
July 29	**Fayetteville, N. C. Adv. July 17.**	**July 17**
July 29	Tecumseh, Neb.	July 17
July 29	Baltimore, Md.	July 24
July 29	Martins Ferry, O.	July 24
July 29	Rankin, Ill. Adv. July 24.	July 24
July 29	Baltimore, Md.	July 24
July 30	Edgefield, S. C.	July 24
July 30	California	June 19
July 30	New York, N. Y.	July 24
July 30	Callitzen, Pa. Adv. July 17.	July 17
July 31	Connecticut Adv. July 24.	
July 31	Wyoming	July 24
July 31	Poughkeepsie, N. Y.	July 24
Aug. 1	Iowa City, Ia. Adv. July 24.	July 24
Aug. 1	Napoleon, N. D.	July 24
Aug. 1	Zumbrota, Minn.	July 24
Aug. 1	St. Malachie D'Ormstown Que.	July 24
Aug. 1	Salt Lake City, Utah	July 24
Aug. 1	Moroni, Utah	July 24
Aug. 4	Birmingham, Ala.	July 17
Aug. 4	Hyrum, Utah	July 24
Aug. 4	Seattle, Wash	July 24
Aug. 4	David City, Neb.	July 17
Aug. 4	Huntington, W. Va.	July 17
Aug. 4	Fremont, Neb.	July 17
Aug. 4	Seneca, Kan.	July 17
Aug. 4	Newton, N. J. Adv. July 24.	July 24
Aug. 4	Nashwauk, Minn.	
Aug. 4	Huntington, W. Va.	July 24
Aug. 5	Little Rock, Ark.	July 24
Aug. 5	Baltimore, Md.	July 24
Aug. 5	Little Falls, Minn.	
Aug. 5	Ohio	July 24
Aug. 5	Vermont Adv. July 24	July 24
Aug. 5	Salt Lake City, Utah	July 24
Aug. 5	**New York, N. Y. Adv. July 17.**	**July 17**
Aug. 5	**Lexington, N. C. Adv. July 17.**	**July 17**
Aug. 5	Lewisburg, W. Va.	July 24
Aug. 6	Ortonville, Minn.	July 24
Aug. 6	Freehold, N. J.	July 24
Aug. 6	Mt. Holly, N. J. Adv. July 24.	July 24
Aug. 6	New Jersey Adv. July 24.	July 24
Aug. 6	Burlington, N. J.	July 24
Aug. 6	Delaware. Adv. July 17.	July 17
Aug. 6	Arkansas. Adv. July 17.	July 17
Aug. 7	Pittsburgh, Pa.	July 24
Aug. 7	Marion, Ark.	July 24
Aug. 8	Minnewaukan, S. C.	July 24
Aug. 12	Charleston, W. Va.	July 24
Aug. 12	Meadville, Pa. Adv. July 17.	July 17
Aug. 12	Washington, N. C.	July 17
Aug. 12	Albany, N. Y. Adv. July 17.	July 17
Aug. 12	Beaufort, S. C.	
Aug. 13	Holtville, Cal.	July 24
Aug. 15	Farmington, Utah	July 17
Aug. 16	St. Albans, W. Va. Adv. July 17.	July 17
Aug. 18	Walnut Ridge, Ark. Adv. July 17	July 17
Aug. 21	De Queen, Ark	July 24
Aug. 24	Washington, D. C.	July 24
Aug. 24	Denver, Colo.	July 10
Sept. 1	Salt Lake City, Utah	July 24

EXCAVATION AND DREDGING

July 28	Alamosa, Colo.	July 17
July 30	New Westminster, B. C.	July 17
July 30	Brooklyn, N. Y.	July 24

Bids Close		See Eng. News-Record
Aug. 1	Salt Lake City, Utah	July 24
Aug. 5	Shippigan, N. B.	July 24
Aug. 6	Kenton, O.	July 3

INDUSTRIAL WORKS

July 28	Long Island City, N. Y.	July 24
July 31	Toronto, Ont	July 24
Aug. 1	Quebec	July 24
Aug. 1	Duluth, Minn.	July 24
Aug 1	Duluth, Minn.	June 26
Aug. 1	**Hastings, Minn.**	**May 15**

BUILDINGS

July 28	**Murray, Utah**	**July 10**
July 28	**Montreal, Que.**	**July 10**
July 28	**Shawenegan Falls, Que.**	**July 10**
July 28	**Woodstock, Ont.**	**July 10**
July 28	**Cap de la Madeleine, Que.**	**July 10**
July 28	Pelham, N. Y.	July 24
July 29	**Utica, N. Y. Adv. June 26 and July 3.**	**July 3**
July 29	Philadelphia, Pa.	July 24
July 29	**Aurora, Minn.**	**July 17**
July 29	Omaha, Neb.	July 10
July 30	**Austin, Minn.**	**June 26**
July 30	New Rochelle, N. Y.	July 24
July 30	**Two Rivers, Wis.**	**July 17**
July 30	Hibbing, Minn	July 24
July 31	Notre Dame de Grace, Que.	July 24
July 31	Mechanicsburg, O.	July 24
July 31	**Lincoln, Neb.**	**July 10**
July 31	New Philadelphia, O.	July 17
July 31	**Grand Rapids, Mich. Adv. July 17.**	**July 17**
Aug. 1	**Vinita, Okla.**	**July 17**
Aug. 1	Gilbert, Minn.	July 24
Aug. 1	**Gastonia, N. C.**	**June 26**
Aug. 1	Kenosha, Wis.	May 15
Aug. 1	**Duluth, Minn.**	**July 10**
Aug. 1	Virginia, Minn.	June 19
Aug. 1	**Duluth, Minn.**	**July 3**
Aug. 1	New Britain, Conn.	July 24
Aug. 4	Montreal, Que.	July 24
Aug. 5	Willmar, Minn.	July 3
Aug. 5	**Toms River, N. J.**	**July 17**
Aug. 6	St. Louis, Mo.	July 24
Aug. 9	Green, O.	July 24
Aug. 12	Indian Head, Sash.	July 24
Aug. 12	Morgantown, W. Va.	July 24
Aug. 15	Casper, Wyo	July 10
Aug. 15	New Bedford, Mass.	July 10
Aug. 15	**Omaha, Neb.**	**July 10**
Aug. 15	Provo, Utah	July 24
Aug. 15	Lehi, Utah	July 24
Aug. 15	Nopeming, N. Y.	July 24
Aug 18	Erie, Pa.	July 24
Aug. 21	St. Paul, Minn.	July 3
Sept. 1	Omaha, Neb.	July 17
Sept. 15	Pleasant Grove, Utah	July 24

FEDERAL GOVERNMENT WORK

July 28	Stone—Cincinnati, O. Adv. July 3 to 17.	July 3
July 28	Bridges—Las Vegas, N. M.	July 24
July 28	Dredging and Filling—San Juan, P. R. Adv. July 3 to 17.	July 3
July 29	Crib—Chicago, Ill. Adv. July 10 and 17.	July 10
July 30	Heating Apparatus — St. Augustine, Fla.	July 10
July 30	Dredging New York, N. Y. Adv. July 10 and 17.	July 10
July 30	Steel Sash—Spec 3914—South Charleston, W. Va. Adv. July 17.	July 17

Bids Close		See Eng News-Record
July 31	Boat House, Wharf and Boat Basin — Galveston, Tex.	July 10
July 31	Remodeling Elevator Providence, R. I. Adv. July 10.	July 10
July 31	Storehouse — Wilmington, Del. Adv. July 3.	July 3
July 31	Rubble Mound Protection, etc.—Buffalo, N. Y. Adv. July 10 and 17	July 10
July 31	Levee Work — Vicksburg, Miss. Adv. July 24	July 24
July 31	Grading — Washington, D. C. Adv. July 24	July 24
Aug. 1	Dredging, Wharf and Retaining Wall — Boston, Mass.	July 10
Aug. 1	Lock and Dam—Cincinnati, O. Adv. July 10 and 17.	July 10
Aug. 1	Material and Labor—San Francisco, Cal. Adv. July 17.	July 17
Aug. 2	Dredging and Rock Removal—Jacksonville, Fla. Adv. July 10 and 17	July 10
Aug. 4	Sewers -Washington, D. C. Adv July 10 and 17	July 10
Aug. 4	Post Office—Salem, Va.	July 17
Aug. 4	Sidewalks — Washington, D. C. Adv. July 24.	July 24
Aug. 4	Boiler — New Brunswick, N. J.	July 24
Aug. 6	Paving—Washington, D. C. Adv. July 17.	July 17
Aug. 7	Dredging and Rock Removal —New York, N. Y. Adv. July 10 and 17.	July 10
Aug. 8	Pumps, etc —Cairo, Ill. Adv. July 17.	July 17
Aug. 11	Dredging—Buffalo, N. Y. Adv. July 17	July 17
Aug. 11	Pass and Weir Horses, Props, etc.—Wheeling, W. Va.	July 17
Aug. 12	Paving — Washington, D. C. Adv. July 24.	July 24
Aug. 15	Torpedo Storage and Compressor Building — Spec. 3991—Mare Island, Cal.	July 24
Aug. 18	Removing Boulders—Newport, R. I. Adv. July 24	July 24
Aug. 19	Repairing Dike — Philadphia, Pa. Adv. July 17 and 24.	July 24
Aug. 20	Metal and Glass Work—Key West, Fla. Adv. July 17.	July 17
Aug. 26	Dredging—Honolulu, H. T Adv. June 26.	June 26
Aug. 29	Post Office—Fayette, Mo.	July 24
Sept. 2	Miscellaneous Equipment—Washington, D. C. Adv July 10 and 17	July 10
Sept. 2	Post Office—Kansas City, Mo.	July 24

MISCELLANEOUS

July 26	Paving Materials — New York, N. Y.	July 17
July 28	Fence, etc. — New York, N. Y.	July 24
July 29	Boilers, etc., Central Islip, N. Y. Adv. July 24.	July 24
July 30	Dam, San Francisco, Cal. Adv. July 17.	July 17
July 30	Garbage Incinerator — Monessen, Pa.	July 24
July 30	Sluices—Victoria, B. C.	July 24
July 30	Levee — Lake Providence, La.	July 24
July 31	Wharf—Powell River, B. C.	July 10
July 31	Harbor Improvement—Atlantic City, N. J. Adv. July 10.	July 10
July 31	Laundry, Float and Approaches—Port Essington, B. C.	July 17
Aug. 1	Cast Iron and Special Castings, Akron, O. Adv. July 1	July 17
Aug. 1	Pier — Swinburne Island, N. Y. Adv. July 24.	July 24
Aug. 1	Gasoline—New York, N. Y.	July 24
Aug. 2	Steam Road Roller — Sheboygan, Wis.	July 24
Aug. 4	Distribution System—Millville, Utah	July 24
Aug. 5	Wharf—Grosse Isle, Que.	July 24
Aug. 5	Wharf—Okanagan Center, B. C.	July 17
Aug. 5	Bulkhead — Philadelphia, Pa. Adv. July 24.	July 24
Aug. 5	Wharf—Port Elgin, Ont.	July 24
Aug. 5	Lighting Plant, etc. — Sutherland, Sask.	July 24
Aug. 5	Breakwaters — Shippigan Gulley, N. B.	July 24
Aug. 6	Pumps, Boilers, etc., — Sibley, Ia. Adv. July 24.	July 24
Aug. 6	Boilers and Generators—St. John, Kan.	July 24
Aug. 7	Wrecking and Removing—Chicago, Ill. Adv. July 24.	July 24
Aug. 15	Telephone Lines -Edmonton, Alta.	July 24
Aug. 19	Tracks—Philadelphia, Pa. Adv. July 24.	July 24
Aug. 20	Safety Cars — Saskatoon, Sask. Adv. July 24.	July 24
Aug. 28	Silo—Savannah, Ga.	July 24
Sept. 23	Turbines, etc.—Saskatoon, Sask Adv. July 24.	July 24

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Mass., Pittsfield—City plans to issue $41,000 bonds to build extensions to water mains.

Conn., Groton—Town having plans prepared by Bilderbeck & Langdon, engrs., 253 State St., New London, extending water system, involving 10,000 ft. 12 in. c. i. pipe.

Pa., Pittsburgh—City voted $1,401,000 bonds to improve and extend water supply system. N. S. Sprague, ch. engr. dept. pub. wks. **Noted Jan. 30** under "Streets and Roads."

O., Sydney—City retained W. J. Sherman Co., engrs., Toledo, to investigate and report, with recommendations on improved water supply.

O., West Carrollton—City retained W. J. Sherman Co., engrs., Toledo, to prepare plans and estimates of cost for improving waterworks system.

Kan., Elkhart—See "Industrial Works."

N. D., New Rockford—City plans to install water softening plant. About $20,000.

Mont., Townsend—City receives bids in August for improving waterworks system. Bonds for $30,000 voted for project. C. Widener, city engr.

Mo., Boonville—City plans to improve waterworks system. Bonds for $40,000 voted for project. Burns & McDonnell, Interstate Bldg., Kansas City, engrs.

Okla., Ada—City plans election to vote on $500,000 bonds to improve and extend waterworks and storm sewers. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Okla., Tonkawa—City plans election to vote on $117,000 bonds to improve waterworks and extend lighting system. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Utah, Orem (Provo P. O.)—City voted $110,0000 bonds to install waterworks system.

Wash., Reardan—Town plans to build waterworks system. About $40,000. C. F. Uhden, engr.

Wash., Seattle—Bd. Pub. Wks. rejected bids received June 27, building watermains in East 80th St. Work will be readvertised. Noted July 17.

Ore., Yamhill—City soon lets contract building gravity water system. Work involves 7.5 mi. cement, wood or galvanized iron pipe, concrete diversion dam across Turner Creek and concrete reservoir 3 mi. north of here. R. W. Jones, McMinnville, engr. Noted June 5.

Cal., North Berkeley—East Bay Water Co., Oakland, plans to build filtration plant, including filter and pumping plants. Basins now being excavated. G. H. Wilhelm, Oakland, engr. Hazen, Whipple & Fuller, 30 East 42nd St., New York City, archts.

N. B., St. John—City having surveys made for increasing water supply from 4,000,000 to 12,000,000 gal. daily capacity and building watermains to Spruce Lake. About $300,000.

BIDS DESIRED

Pa., Wilkes-Barre—Until July 31, by Morris Run Coal Mining Co., Miners' Bank Bldg., building reservoir on Morris Run, Hamilton Twp. Work involves 6200 cu.yd. embankment and 300 cu.yd. mass and rein.-con.; advertised in this issue.

N. C., Statesville—Until Aug. 5, by L. B. Bistol, mayor, building 1 clear water basin lined with concrete, 750,000 gal. capacity, and 2 filters, each to have 500,000 gal. daily capacity. R. L. Greenlee, city engr. Noted June 19.

O., Wadsworth—Until Aug. 2, by Village, building filtration plant. C. W. Courtney, 509 Leader-News Bldg., Cleveland, civil engr.; advertised in this issue.

Minn., Farmington—Until July 29, by E. H. Dosey, city recdr., laying 4800 ft. 6 in. water mains with valves, hydrants, etc. Druar & Smith, Globe Bldg., St. Paul, engrs.

Kan., Dodge City—Until July 30, by city, improving water works system, involving 500,000 gal. standpipe, 3000 ft. 4 in., 2000 ft. 6 in. and 1200 ft. 10 in. c.i. pipe, etc.

Kan., Sharon Springs—Until Aug. 5, by H. C. Wheeler, city clk., building 2 wells, 2 motor driven pumps; also brick power house, 1 or 2 oil engines with generators, 3000 ft. 4-6 in. c.i. pipe. Black & Veach, Interstate Bldg., Kansas City, Mo., engrs. Noted June 26.

S. D., Armour—Until Aug. 20, by city furnishing material and building one 80,000 gal. steel water tank and 110 ft. tower and furnishing material and laying 90 ft. 10 in., 1716 ft. 8 in., 60 ft. 6 in. and 40 ft. 4 in. c.i. water mains, 2550 ft. ¾ in. lead service pipe. J. E. Boot, mayor; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. J., Orange—See "Buildings."

★Pa., Phila.—Water Bur. let contract furnishing and delivering steel pump shaft at Torresdale Sta., to W. Cramp & Sons Ship & Engine Co., Richmond and Norris Sts., $1460; laying c.i. pipe lines, to M. and J. B. McHugh, 829 North Market St., $36,860.

★Mont., Polson—City let contract building water mains in various streets, to Nelson & Kordus, Eureka, $13,799. Noted Apr. 24.

★Cal., Oakland—East Bay Water Co., 9th St. and Bway., will build distribution reservoir on 39th Ave., involving 13,800 cu.yd. excav., 108,411 sq.ft. mass concrete, 102,131 sq.ft. roofing, etc. About $86,000. Work will be done by day labor. Noted May 29.

★Ont., Timmins—Town Council let contract extending and improving waterworks system, involving 8500 ft. 6-10 in. c. i. pipe; 20,000 ft. 6-18 in. vitr. pipe, hydrants, valves and boxes, to L. Masceoli, Timmins. About $116,000. Noted June 19.

★Ont., York—Town let contract building c. i. water mains on Eglington Ave., to Godson Contg. Co., Manning Chambers, Toronto. About $35,009.

Sewers

PROPOSED WORK

N. Y., Albany—Bd. Contr. & Supply received no bids July 14 building monolithic concrete sewer (part rein.-con.) in Maiden Lane. F. R. Lanagan, city engr. Noted July 17.

N. Y., Utica—J. Kemper, city engr., soon receives bids building sewer in North Genesee St., (double line) from Barge Canal to Riverside Dr., Trenton Rd., from Riverside Dr to Real's Creek, Walker Rd (double line) 432 ft. northerly from Herkimer Rd., Herkimer Rd from North Genesee St., 730 ft. easterly, and Auert Ave. from North Genesee St., 317 ft. easterly, all in 16th Ward. Cost between $60,000 and $70,000. Noted Mar. 27.

N. J., Bellville—City rejected bid received June 10, building 23,415 ft. sewer in Mill, Quarry, Terrace Sts., et al. Work will probably be readvertised. Noted June 26.

Pa., Forty Fort (Kingston P. O.)—H. C. Allen, boro. secy., soon lets contract building sewerage system. Work involves 500 cu.yd. wet excav. (addition price over and above dry excav.), 60,029 lin.ft. 8-24 in. vitr. pipe in place, 185 manholes 6 and 10 ft. deep, 1504 branches 8-24 in. pipe, 200 lin.ft. gravel or broken stone foundation, 75 cu.yd. concrete masonry, 50,000 ft. B.M. of sheeting and timber, 90 sq.yd. brick pavement on concrete base, 200 sq.ft. concrete side and cross walks, etc.

Pa., Lancaster—City retained Gannett, Seelye & Fleming, engrs., 204 Locust St., Harrisburg, to prepare designs and supervise construction of sewage disposal plant.

Pa., Pittsburgh—City voted $1,341,000 bonds to improve sewerage systems. N. S. Sprague, ch. engr. dept. pub. wks. Noted Jan. 30 under "Streets and Roads."

W. Va., Warwood—See "Streets and Roads."

N. C., Mt. Airy—City plans to build sewerage system. About $75,000. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, Ga., engrs.

Ky., Louisville—City plans election in fall to vote on $2,000,000 bonds to build sewers. R. Burk, asst. city engr.

O., Cincinnati—City plans to build Duck Creek interceptor sewer, cost $400,000; West Fork sewer, $150,000; Muddy Creek sewer, $65,000; Mill Creek trunk sewer, $400,000. Election Aug. 12 to vote on bonds for project.

Mich., Detroit—City soon lets contract building 5200 ft. brick, vitr. segmental block, rein.-con. or plain concrete sewer in Mack Ave., from Hamilton Ave. to Connor's Creek. C. W. Hubbell, city engr.

Mich., Port Huron—City had plans and estimate prepared for building, backfilling and finishing complete vitr. crock lateral sewers in alley between Minnie and Bancroft Sts., also alley between Bancroft and Cypress Sts. and 12th and 16th Sts., total length 3500 ft. About $14,000. E. R. Whitmore, city engr.

Ill., Danville—City plans to install sanitary sewerage system in ¾ sq.mi territory, using Imhoff tank disposal. About $52,000.

Minn., Duluth—See "Streets and Roads."

Kan., Russell—City having plans prepared building complete sewerage system and disposal plant. Black & Veach, Interstate Bldg., Kansas City, Mo., engrs.

Mo., Boonville—City plans to improve sewerage system. Bonds for $11,000 voted for project. Burns & McDonnell, Interstate Bldg., Kansas City, engrs.

Mo., Clayton—L. C. Diatzko, special sewer engr., Empire Bldg., Webster Groves, receives bids about Aug. 12, building sewers in Joint Sanitary Sewer Dist. No. 1, St. Louis Co. Former bids rejected. Noted July 3.

Utah, Salt Lake City—City Comrs. receive bids about Sept. 1 laying 5500 ft. 8 in. pipe in various streets in Gilmer Park, involving 5500 lin.ft. 6-15 in. earth trenching. About $25,000. S. Q. Cannon, city engr.

Ore., Portland—City Council adopted resolution to build vitr. or cement sewers in 42nd St., from 45th Ave. to Rhine St. About $10,607. O. Laurgaard, city engr.

Cal., Eldridge—State having plans prepared by State Eng. Dept., Sacramento, rebuilding sewage disposal plant at Sonoma State Hospital, here, also Imhoff tank and sprinkling filter. About $20,000.

Cal., Holtville—City rejected bids building 7000 ft. 12 in. vitr. pipe outfall sewer, involving 12 brick manholes. Plans will be revised and work readvertised. H. J. Burk, Holtville, engr. Noted June 5.

Cal., Oakland—City received no bids July 10, building sewers and drainage structures in 10th, Cedar, Goss and Bay Sts. and right of way adjacent to 7th St. Work involves 5568 ft. concrete, 250 ft. rein.-con. and 2398 ft. vitr. sewer pipe.

Cal., Waterman—State having plans prepared by State Eng. Dept., Sacramento, for sewage disposal plant at Preston School of Industry, including Imhoff tank and sprinkling filter. About $14,000.

Cal., Yountville—State having plans prepared by State Eng. Dept., Sacramento, for sewage disposal plant at Veterans Home, here, including Imhoff tank and sprinkling filter. About $10,000.

Ont., Belleville—Town soon lets contract laying 12,000 ft. vitr. tile sanitary sewers in Cedar, Yeomans, Isabella and Boswell Sts. About $35,000. Noted May 29.

Ont., Ottawa—City Council passed by-law authorizing expenditure of $6843 for sewer on Booth St. and $4558 for sewer on Echo St. H. H. Lett, city clk.

Ont., Ottawa—A. F. McCallum, comr. works, authorized expenditure of $38,000 to build drain across lands in Neufreau Twp. to outlet on Ottawa River.

BIDS DESIRED

N. J., Hackensack—Until Aug. 18, by Hackensack Impvt. Comn., building disposal works (otation basins, power house, power transmission lines, air lines, force mains, ejectors, ejector stations, etc., also for 101,450 lin.ft. pipe, together with manholes, catch basins, etc. F. J. Thompson, clk.; advertised in this issue.

Pa., Ellwood City—Until July 31, by C. C. Hall, boro. secy., building all or sections of sanitary sewer in 4th ward. J. J. Renner, boro. engr.; advertised in this issue.

Pa., South Erie (Erie P. O.)—Until Aug. 1, by City Council, building 5 sanitary tile sewerage systems. About $105,000.

W. Va., South Charleston—Until Aug. 15, by town clerk, building 50,000 ft. 8-36 in. or 42 in. sewers; advertised in this issue.

Mich., Port Huron—Until July 26, by city, trenching, laying and backfilling 1900 ft. sewer in Jenkinson St. from 7th to 10th Sts.; in 15th St. north of Baerd St. with lateral branches in alleys Nos. 2, 3 and 4 for Nernes Plat and Nos. 8, 9 and 10 of Petit Plat; in Garfield St. from 10th to 12th Aves.; lateral sewers west of 13th St. between Wall and Court Sts. in alleys Nos. 179, 206 and 223, lateral sewers from Howard to Pine Sts. in alleys Nos. 181, 204 and 225, laterals west of 13th St. between Court and Union Sts. in alleys Nos. 187, 207 and 222, between Pine and Wall Sts. in alleys Nos. 180, 205 and 224 between Union and Chestnut Sts. in alleys Nos. 177, 208 and 221 and between Chestnut and White Sts. in alleys Nos. 176, 209 and 220, all of White Plat. E. R. Whitmore, city engr.

Ia., Sibley—Until July 30, by town, building 16,220 ft. storm sewer. R. D. Stewart, city clk.; advertised in this issue.

Minn., Caledonia—Until Aug. 5, by R. V. Ryan, pres. Village Council, laying 2500 ft. 8-10 in. sewer in Dist. No. 3, 6-26 in. deep. About $12,000.

Minn., Little Falls—A. Johnson, city clk., receiving bids installing 7300 ft. sewers. About $28,000. C. L. Pillsbury Co., 813 Metropolitan Life Bldg., Minneapolis, engrs.

Minn., St. Paul—See "Streets and Roads."

Minn., St. Paul—Until July 28, by H. W. Austin, city purch. agt., City Hall, building storm water sewers in Como Ave. W. and Ross St. O. Claussen, city engr. Noted July 3.

Minn., Waseca—Until July 28, by J. Madigan, city clk., laying 14,894 ft. tiled drain. About $14,000.

S. D., Gregory—Until July 30, by city, building 6¾ mi. sanitary sewers. Dakota Eng. Co., Mitchell, engrs.

S. D., Iroquois—Until Aug. 2, by city, building 2¾ mi. sewers and 2¼ mi. water mains. Dakota Eng. Co., Mitchell, engrs.

S. D., Lake Preston—Until Aug. 1, by city, building 4 mi. sanitary sewers. Dakota Eng. Co., Mitchell, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—H. Bruckner, pres. Bronx Boro., received lowest 3 bids building storm water drain and appurtenances in East 233rd St., from J. O'Leary, $98,777, C. W. MacDonald, $120,000; P. J. Kearns, 2306 Creston Ave., $126,600.

N. J., Orange—See "Buildings."

★**Pa., Phila.**—Bureau of Surveys let contract building sewer in Chew St., to P. Ellis, Phila., $10,000.

★**Ga., Gainesville**—City let contract building sewer in Church St., to J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta. About $27,000.

★**Mich., Detroit**—City let contract building lateral sewers, to C. Melevin, Penobscot Bldg., No. 3131, $1895; Walker & Teetaert Co., 442 St. Clair St., Nos. 3140, $26,660, 3164, $24,125, 3068, $29,566, Charlevoix Ave. Sewer Arm, $11,880; Lemmane & McIlvenna, Book Bldg., Nos. 3153, $10,000, 3156, $8950; Western Constr. Co., 1208 Ford Bldg., Nos. 3160, $7429, 3161, $9217, 3167, $12,465, 3168, $8949, 3169, $8216. O'Rourke Eng. & Constr. Co., 17 Battery Pl., New York City, Joy Rd. Pub. Sewer, concrete, $988,218; Gawne Contg. Co., Cleveland, Linwood Ave. Pub. Sewer, Sect. 3, $135,506, Lynch Rd. Pub. Sewer, Sect. 5, $146,388; J. Winterbottom, 3274 West 25th St., Cleveland, Lynch Rd. Pub. Sewer, Sect. 6, concrete, $112,378. Noted July 3 and 17.

★**Kan., Marysville**—City let contract laying 60,000 lin.ft. 12-60 in. storm sewers, 12 manholes and 24 catch basins, to W. D. Boyle Constr. Co., Ry. Exch. Bldg., Kansas City, Mo. About $55,000.

★**Okla., Lindsay**—City let contract building sanitary sewers and sewage disposal plant, to Municipal Excavating Co., 200 East Main St., Oklahoma. About $52,000. Noted Apr. 10.

★**Cal., Eureka**—See "Streets and Roads."

Ont., Dundas—Town received bids building sewerage system, sewage disposal plant, etc., from Curran & Clement, Dundas, $152,031, Canadian Eng. & Constr. Co., Toronto, $216,583, Connolly-Agnew Co., Toronto, $228,222. Noted June 12.

★**Ont., St. Catherines**—City let contract building sewerage system in Facer St. Dist., involving 14,000 ft. 8 in. vitr. pipe, to McLaughlin Bros., Ottawa, $31,940; in Western Hill and Eastern Dists., 19,000 ft. 10 in. tile, to Mitchell & Mahan, London, $48,535. Noted June 26.

Bridges

PROPOSED WORK

Conn., Warehouse Point—Comrs. Hartford Co. (Hartford) appropriated $250,000 to build bridge over Connecticut River between here and Windsor Locks. Engineer not selected.

N. Y., Leroy—City election soon to vote on proposition to build bridge over Oatka River connecting Mill and Church Sts. About $28,000 for concrete arch bridge and $16,000 for steel girder. F. W. Leonard, Buffalo, engr. Noted May 22.

Pa., Pittsburgh—City voted $750,000 bonds to improve and change location of various bridges. N. S. Sprague, ch. engr. dept. pub. wks. Noted Jan. 30 under "Streets & Roads."

W. Va., Welch—Comrs. McDowell Co. plan to build concrete bridge over Negro Branch Creek. About $28,000. W. J. McClaren, Welch, engr.

N. C., Winston-Salem—City soon lets contract building 3 concrete bridges. J. Firth, supt. of pub. wks.

O., Cincinnati—See "Streets and Roads."

Ill., Danville—City plans to build 1140 ft. rein.-con. bridge on Gilbert St., 70 ft. high on 1½ per cent grade, to replace old steel bridge.

Bridges (continued)

Mont., Noxon—State Highway Comm., Helena, plans to build steel bridge over Clark's Fork of Columbia River, here. About $65,000. P. D. Pratt, state highway engr.

Mont., Park City—State Highway Comm., Helena, plans to build steel bridge over Yellowstone River near here. About $45,000. Federal Government asked to appropriate toward cost. P. D. Pratt, state highway engr.

Mont., Seips—State Highway Dept., Helena, plans to build bridge with steel span and approaches across Poplar River, near here. About $14,000. Federal Government asked to appropriate toward cost. P. D. Pratt, state highway engr.

Mo., Versailles—Morgan Co. election Aug. 26 to vote on $50,000 bonds to build bridges.

N. M., Santa Fe—Comrs. Santa Fe Co. plan to build 60 ft. concrete bridge over Arroyo Mesearros, 20 ft. wide. A. Lucero, clk.

Cal., Pasadena—City having plans prepared for rein.-con. bridge over Arroyo Seco. About $60,000. E. P. Dewey, asst. city engr.

Cal., Red Bluff—Bd. Supervs. Tehama Co. voted $521,000 bonds to build bridges. Noted June 26.

Cal., Willow—Bd. Supervs. Glenn Co. having plans prepared by Weeks & Day, engrs., Phelan Bldg., San Francisco, for concrete arch bridge to be known as Winslow Bridge. About $40,000.

Ont., Pickering—W. A. McLean, c/o Dept. Highways, Parliament Bldg., Toronto, soon lets contract building 655 ft. steel highway bridge over Rouge River, on Provincial Highway, 20 ft. wide, deck trusses up to 160 ft. long, supported on wood piling in clay soil. About $150,000. G. Hogarth, Parliament Bldg., Toronto, engr.

BIDS DESIRED

Pa., Apollo—Until Aug. 1, by Comrs. Armstrong Co., at office of J. S. Sell, controller Westmoreland Co., Greensburg, furnishing labor and material for wood block flooring; also painting and cleaning old steel floor system of joint county bridge over Kiskiminetas River here.

Ala., Birmingham—Until Aug. 15, by Bd. Revenue, Jefferson Co., building two 100 ft. rein.-con. arch bridges, one across Five Mile Creek at Lewisburg and other across Rock Creek on Taylor's Ferry Rd., about $10,000; also removing present steel bridge over Five Mile Creek and erecting same on Brookside cut off road. About $4000. S. R. Batson, co. engr.

Minn., Duluth—Until Aug. 5, by R. W. Acton, engr. St. Louis Co., building 36 rein.-con. and steel bridges in county varying in lengths from 10 to 300 ft., 18 ft. roadway between curbs. About $190,000.

Minn., Minneapolis—Comrs. Hennepin Co. receiving bids for 800 ft. rein.-con. steel bridge, 24 ft. wide, 100 ft. draw span and 500 ft. concrete span over Minnesota River on Lyndale Ave., cost $175,000; 850 ft. rein.-con. bridge, 20 ft. wide, over Minnesota River at Long Meadows, $100,000. E. E. Terrell, co. surv. Noted May 29.

Wyoming—See "Streets and Roads."

Ark., Marion—Until Aug. 7, by Bd. Comrs. of Rd Impvt. Dist. No. 9 building 2 steel bridges, 2 concrete viaducts and 4 concrete culverts. Morgan Eng. Co., 622 Goodwyn Institute Bldg., Memphis, Tenn., engrs.

Cal., Placerville—See "Streets and Roads."

Cal., Santa Barbara—Until Aug. 4, by Bd. Supervs. Santa Barbara Co., building rein.-con. bridge over Alamo Pintado Creek. C. A. Hunt, clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. J., Camden**—Comrs. Camden Co. let contract building rein.-con. arch bridge over Newton Creek on Nicholson Rd., to J. M. Kelly, 507 Federal St., $59,180. Noted July 17.

★**Md., Cumberland**—Baltimore & Ohio RR., Baltimore Bldg., Baltimore, let contract building foundation of 33rd St. bridge over Allegheny River, to Vang Constr. Co., 21-24 3rd Natl. Bank Bldg. About $500,000.

★**N. C., Long View**—Pender Co. (Burgaw) and Bladen Co. (Elizabethtown) let contract building bridge here, to Roanoke Bridge & Iron Co., Roanoke, Va. About $15,500.

★**N. C., Walnut Cove**—City let contract building 600 ft. bridge, 20 ft. roadway, 6 ft. sidewalk, consisting of 500 ft. steel trestle and 100 ft. span, involving 100 cu. yd. concrete and 120 tons steel, to Virginia Bridge & Iron Co., Roanoke, Va., $16,130.

★**Ga., Augusta**—Comrs. Richmond Co. let contract building 2 rein.-con. pile and slab bridges over Spirit and Little Spirit Creeks, to Twiggs & Sons, Herald Bldg., $21,466. Noted June 19.

★**Wis., Sheboygan**—Sheboygan Co. let contract building 750 ft. rein.-con. and steel bridge, 18 ft. wide, in Sherman Twp., to J. Theune, Main St., Cedar Grove, $12,480. Work involves 1790 cu.yd. concrete, 27,820 tons steel, 16 x 55 ft. truss spans with concrete flooring, pier and abutment.

★**Minn., Duluth**—J. A. Farrell, city comr., rejected bids received July 11 for 250 ft. triple span concrete bridge, 48 ft. wide, in Chester Park. About $37,653. Work will be done by day labor under supervision of E. K. Coe, city engr. Noted June 19.

★**Kan., Lawrence**—Douglas Co. let contract building Mud Creek Bridge, consisting of two 80 ft. span girders and 20 ft. concrete roadway, on Fort to Fort Rd., to C. Clark & Co., Topeka, $17,066. Noted June 19 under "Streets and Roads."

★**Oregon**—State Highway Comn., Portland, let contract building (a) wooden truss bridge over Cow Creek, consisting of six 70 ft. spans, near Glendale, Douglas Co.; (b) 3 wooden trestle bridges near Glendale; (c) 1 rein.-con. bridge, over Pass Creek near Comstock; (d) overhead crossing over Southern Pacific RR. near Comstock; (e) 7 rein.-con. box culverts and 2 cattle passes near Elgin on Elgin-Minam Sect. La Grande-Enterprise Highway, (State to furnish steel, cement and gravel); Union Co., (f) one 2 x 5 ft. rein.-con. culvert on Stage Rd. Pass, Douglas Co., to Union Bridge Co., Portland, (a) $18,487, (b) $3136, (f) $978; A. Anderson, Grants Pass, (c) $6931; C. Gardner, Portland, (d) $20,238; Rhymar & Dickie, Prairie City, (e) $4960. Noted July 17.

★**Oregon**—State Highway Comn., Portland, will build 6 rein.-con. bridges over Furnish Canal near Echo on Old Oregon Trail, Umatilla Co. Work will be done by day labor under supervision of Finnall & Howry, Baker, $15,100. Noted July 17.

Cal., Redwood City—Comrs. San Mateo Co. received bids building rein.-con. bridge over New Year's Creek, from A. Matson, San Bruno, $11,427; C. Miller, Redwood City, $13,500.

Cal., Reedley—See "Streets and Roads."

★**Cal., Yreka**—Bd. Supervs. Siskiyou Co. let contract building rein.-con. bridge over Sciad Creek, consisting of two 30 ft. spans, to E. K. Loosley, Montague, $60,745.

★**N. B., Sackville**—Canadian Natl Rys., Moncton, let contract building substructure of double-track bridge, with three 200 ft. spans, over Tantramar River, to Nova Scotia Constr. Co., Halifax, N. S., $162,200. Noted July 10.

★**Que., St. David**—Municipal Council let contract building steel bridge with concrete abutments, to La Cie de Constr., Nicolet, Que., $12,500.

★**Ont., Arnprior**—Comrs. Renfrew Co. let contract, to F. E. Fortin, Arnprior, building concrete bridge over Jamieson's Creek, cost, $1957, over Streasman's Creek, $4749, over Hennesey's Creek, $7866, over Beachburg Creek, $10,850.

Structural Steel

PROPOSED WORK

Mont., Park City—See "Bridges."

Mont., Seips—See "Bridges."

Ont., Pickering—See "Bridges."

Reinforced Concrete

PROPOSED WORK

Minn., Virginia—See "Buildings."

BIDS DESIRED

Ga., Savannah—See "Miscellaneous."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Yorkhaven**—See "Miscellaneous."

★**Ga., Augusta**—See "Bridges."

Minn., Duluth—See "Bridges."

★**Ore., Portland**—See "Bridges" under Oregon.

Cal., Redwood City—See "Bridges."

★**Que., Three Rivers**—See "Buildings."

Ont., Arnprior—See "Bridges."

★**B. C., Vancouver**—See "Buildings."

Streets and Roads

PROPOSED WORK

Mass., Great Barrington—City plans to pave Main St. from St. James Pl., south, concrete, cost $15,000; cement road from Belcher Sq., north, $16,000.

Mass., Winchendon—City soon receives bids resurfacing Central St., from Depot Sq. to Maple St.; also straightening and resurfacing Spruce St., asphalt. About $35,000.

N. Y., Herkimer—Village soon lets contract paving Folts, South Washington and East Smith Sts. About $26,000.

N. Y., New York—F. L. Dowling, pres. Manhattan Boro., rejected bids regulating and repaving with sheet asphalt on concrete base, roadway of Lenox Ave. Noted July 3.

N. J., Jersey—City Bd. Freeholders Hudson Co. soon receivers bids improving Paterson Plank Rd. from Central Ave. to Congress St., West Hoboken Twp., granite block. Cost to exceed $10,000. W. O'Mara, clk.

N. J., Jersey City—State Highway Comn., Broad St. Bank Bldg., Trenton, allotted $210,000 to improve following roads in Hudson Co.: Paterson Plank Rd. from Congress St. to Central Ave., Belleville Turnpike, Paterson Turnpike and Lincoln Highway.

N. J., Secaucus—Town Council plans to improve and repave Front St. About $10,000.

Pennsylvania—State Highway Dept., Harrisburg, rejected bids building roads in Clearfield and Westmoreland Counties. Noted July 17.

Pa., Ebensburg—Cambria Co. rejected only bid received rebuilding 17,490 ft. Carrolltown Twp. Rd., 17 ft. wide, vitr. brick on 5 in. concrete base. About $125,000. D. W. Dillman, 80-81 Altoona Trust Bldg., Altoona, engr. Noted July 10.

Pa., Ebensburg—Cambria Co. received no bids rebuilding 10¾ mi. Croyle Twp. Rd. and 1.205 ft. Conemaugh Boro. Rd., vitr. brick on concrete and cinder base. About $500,000. Noted July 3.

Pa., Pittsburgh—City voted $9,579,000 bonds to pave, reconstruct, widen and open various streets. N. S. Sprague, ch. engr. dept. pub. wks. Noted Jan. 30.

Pa., York—York Co. election Aug. 19 to vote on $2,500,000 bonds to construct highways.

W. Va., Berkeley Springs—Morgan Co. defeated $500,000 bonds to build roads. L. A. Rothrich, co. engr. Noted May 22.

W. Va., Clarksburg—Harrison Co. having plans prepared for improving streets, sewers and bridges; $900,000 bonds have been voted for project.

W. Va., Huntington—Cabell Co. plans to pave 1 mi. Huntington-Salt Rock Rd., 16 ft. wide, vitr. brick. About $34,144. A. B. Maupin, Huntington, engr.

W. Va., Point Pleasant—Mason Co. plans election soon to vote on $70,000 bonds to build roads in Wagner Dist., also $67,000 to build roads in Graham Dist. W. Steenbergen, Point Pleasant, engr.

W. Va., Ripley—Comrs. Jackson Co. plan to build .35 mile Ripley-Parkersburg Pike, surfacing 20 ft. and grading 26 ft. wide, involving 500 cu.yd. excav., 4100 sq.yd. cement concrete surface. About $13,000 Engineer not selected.

Streets and Roads (Continued)

W. Va., St. Mary's—Pleasants Co. plans to grade 5.4 mi. St. Marys-Bens Run Rd., 16 ft. wide. About $30,800. W. J. Alexander, Parkersburg, engr.

W. Va., Summerville—Comrs. Nicholas Co. plan to grade 2½ mi. road between Fenwick and Nettie. About $35,000.

W. Va., Warwood—City defeated $150,000 bond issue to improve streets and sewers. W. F. Bartels, recdr.

W. Va., Winfield—Comrs. Putnam Co. rejected bids received June 19, building 4 mi. Culloden-St. Albans Rd. About $40,000. Work will be readvertised. Noted June 5.

N. C., Jefferson—Comrs. Ashe Co. plan to build 80 mi. macadam roads, 14 ft. wide. W. E. Bright, Jefferson, engr.

S. C., Manning—City soon lets contract paving, curbing and draining 25,000 ft. Main St. About $75,000. Lee & Palmer, Sumpter, engrs.

Ga., Marietta—Cobb Co. election Aug. 15, to vote on $600,000 bonds to build and improve roads.

Ga., Quitman—Brooks Co. voted $500,000 bonds to build roads. Federal Government will appropriate like amount. Noted June 5.

Fla., Bunnell—Comrs. Flagler Co. plan to build 10 mi. of new roads. About $200,000.

Ala., Birmingham—Bd. Revenue Jefferson Co. soon receives bids building 8 mi. road from here to Bessemer. About $275,000. J. W. Gwin, pres. S. R. Batson, co. engr.

Ala., Florence—City soon lets contract paving 55,000 sq.yds. Tennessee, Mobile and Tombigbee Sts., concrete, bitulithic, asphalt, asphaltic concrete, bitoslag and vitr. brick. R. E. Meade, city engr.

Ky., Louisville—Jefferson Co. plans to build 4½ mi. Bardstown Pike from Balke's to Watterson Pike, 18 ft. wide, 3 ft. shoulders on each side, involving 47,520 sq.yd. concrete, 9 in. thick at center, 7 in. at sides, 15,840 sq.yd. 6 in. waterbound macadam, 21,500 cu.yd. earth and rock excav. and 3 small bridges and culverts. About $185,000. Cost to be borne by Jefferson Co., State and Federal Government.

O., Bowling Green—Wood Co. having plans prepared paving 6.75 mi Western Reserve Rd. from Perrysburgh Twp. to Sandusky Co. line, 16 ft. wide, bituminous bound, cost $148,000; 1.75 mi. Toledo-Elmore Rd., 18 ft. wide, asphaltic concrete on concrete base, $70,000. J. Gallier, Bowling Green, engr.

O., Cincinnati—City plans to pave with granite block, 6th St. from Elm St. to State Ave., $129,100; Baymille St., from 3rd to 7th Sts., $27,300; Mill St., from 5th to 2nd Sts., $27,250; Central Ave., from 3rd to Front Sts., $14,950; Plum St., from 4th to Front Sts., $27,200; Race St., from 4th to Pearl Sts., $12,800; Vine St., from 4th to Front Sts., $23,900; Walnut St., from 4th to Front Sts., $19,900; Main St., from 4th to Front Sts., $19,900; Bway., from 4th to Front Sts., $59,000; Pearl St., from Bway. to Plum St., $59,750; 2nd St., from Ludlow St. to Central Ave., $88,000; 3rd St., from Eggleston Ave. to Smith St., $129,200; widening and paving Liberty St., from Bway. to Highland St., $225,000; with asphalt, 8th St., from Elberon Ave. to St. Joseph's Cemetery, $32,200; Elberon Ave., from Bassett Rd. to Warsaw St., $48,800; 7th St., from Vine to Carr Sts., $99,200; 4th St., from Bway. to Smith St., $95,200; with granite and wood block, 5th St., from Pike to Freeman Sts., $163,800; Main St., from 4th to McMicken Sts., $80,100; Erie Ave., from Bramble to Wetzel Sts., wood block, $35,100; Wetzel Ave., from Madison to Bramble Sts., $51,800; Madison Rd., from Stewart Pl. to Plainville Pike, pavement undetermined, $70,300. Election Aug. 12, to vote on bonds for project. F. Krug, city engr.

O., Cincinnati—City plans to widen 5th St. from Main to Pike Sts. and build viaduct 2000 ft. long from 5th and Pike Sts., out 3rd St. to Gladstone St. to Kemper and Francis Lanes. This is part of the boulevard system.

O., Cincinnati—Hamilton Co. plans to pave Cincinnati-Louisville Pike from Cheviot to Cleves, cost $371,300; also section of Cincinnati-Louisville Pike west of Cleves, $105,000.

O., Cincinnati—Hamilton Co. rejected bids received paving Carthage-Hamilton Rd. from Hartwell to Wyoming. About $110,000. Work will be readvertised.

O., Columbus—Comrs. Franklin Co. rejected bids received July 8, grading, building bridges and culverts and paving with brick on 4.5 mi Harbor Rd., 26 ft. wide. About $342,213. Work will be readvertised. Noted June 26.

Mich., Detroit—Dept. Pub. Wks. soon lets contract paving following streets with asphaltic concrete on 6 in. concrete base, Berea, Medina or Amherst curbstone; Chapin Ave. from Seneca to Burns Aves., Clairpointe Ave. from Essex Ave. to point 520 ft. south Jefferson Ave., Garland Ave. from Canfield to Shoemaker Aves., Granger Ave. from Baldwin to Van Dyke Aves., Kirby Ave. from Baldwin to Van Dyke Aves., Louis Ave. from Holcomb to Belvidere Aves., Springle Ave. from Kercheval to Charlevoix Aves. and St. Clair Ave. from Warren to Shoemaker Aves., all 26 ft. wide, involving 21,575 cu.yd. excav., 24,446 lin. ft. curbstone, 35,803 sq.yd. paving and base and 678 cu.yd. concrete curb setting, etc. C. W. Hubbell, city engr.

Mich., Detroit—Dept. Pub. Wks. soon receives bids paving with asphaltic concrete on 6 in. concrete foundation, Berea, Amherst or Medina curbstone, Kanter St. from Elmwood to Moran Sts., cost $9600; Olivet St. from Distel to Woodmere Aves., $4070, Wilson Ave. from Hazelwood to Taylor Aves., $5100, all 26 ft. wide; with 1 course concrete, alley between Brush St., Oakland and Kenilworth Aves. and Leicester Ct., $4079, "T" alley between Russell, Riopelle and Theodore Sts. and Warren Ave., $3850, both 20 ft. wide. C. W. Hubbell, city engr.

Ill., Danville—City plans to build 1 mi. Perrysville Rd., 2600 lin.ft. Chandler St., 3500 lin.ft. Fairchild St., 2300 lin.ft. West Winter Ave., 2700 lin.ft. Sherman St., 550 lin.ft. Mann St., all 27 ft. wide on 4 in. concrete base. Also resurface ½ mi. 30 ft. Tarvia macadam pavement on Logan Ave.

Ill., Danville—City soon receives bids paving Cronkhite and Kentucky Aves., involving 4000 lin.ft. 27 ft. asphalt filled brick pavement with 4 in. concrete base and 1 in. sand cushion.

Wis., Brodhead—City soon lets contract grading 2.9 mi. Main St., 20 ft. wide, involving 11,357.2 sq.yd. rein.-con., 140 lin. ft. 12 in. vitr. pipe, 4 catch basins, etc. About $25,000. E. L. Edwards, c/o Green Co. Highway Comn., Monroe, engr.

Wis., Sheboygan—City plans to grade and pave 3 mi. North 3rd St. from Center to Bluff Aves., 20 ft. wide, involving 20,000 sq.yd. 2 course concrete with combined curb and gutter. About $45,000. C. U. Boley, city engr.

Minn., Albert Lea—Comrs. Freeborn Co. received no bids grading and graveling 11.5 mi Federal Aid Project No. 61, State Rd. No. 6, 24 ft. wide. About $60,000. E. V. H. Brown, Albert Lea, engr. Noted May 22.

Minn., Cambridge—Isanti Co. rejected bids received July 14, graveling road, 7000 yd. long, 24 ft. wide. About $25,000. P. M. Torell, Cambridge, engr.

Minn., Duluth—J. A. Farrell, city comr., soon lets contract paving 866 ft. Helen St. from 26th to 28th Aves., W., concrete. About $11,387. Work involves 1725 lin.ft. concrete curbing, 2420 sq.yd. concrete, and 972 cu.yd. excav. E. K. Cae, city engr.

Minn., Duluth—J. A. Farrell, city comr., soon lets contract laying 1 course concrete roadway and 6 ft. concrete sidewalk on 1150 ft. 64th Ave., W., from Grand Ave. to Roosevelt St., 24 ft. wide, involving 4175 sq.yd. concrete, 1150 lin.ft. concrete curbing, 6930 lin.ft. concrete sidewalk, 2645 cu.yd. earth excav., 1332 ft. 12-24 in. pipe, cost $22,408; brick roadway on 4906 ft. Railroad St. from 7th Ave., W., to Garfield Ave., 30 ft. wide, 15,800 sq.yd. vitr. brick, 9500 cu.yd. earth excav., 500 ft. 3 in. drain tile, 1200 ft. 12 in. sewer pipe, and 100 ft. 3 x 4 in. concrete culverts, $83,113.

Minn., Duluth—St. Louis Co. voted $7,500,000 bonds to build roads. W. H. Borgen, aud.

Minn., Duluth—Comrs. St. Louis Co. receive bids about Sept. 1, improving 54 mi Miller Trunk Highway from here to Eveleth, 18 ft. wide. About $2,000,000. Work involves grading and placing 1 course concrete surface on road to serve as trunk artery. A. W. Acton, co. engr. Bonds for $7,500,000 recently voted for road work throughout county.

Minn., Ivanhoe—Comrs. Lincoln Co. received no bids July 14, graveling 3½ mi Job. No. 1903, State Rd. No. 3, cost, $21,000 and 3 mi. Job No. 1902, State Rd. No. 5, $18,000. Work will be readvertised. E. Hangan, Ivanhoe, engr. Noted June 26.

Kan., Frankfort—City plans to improve 1600 ft. Kansas Ave. and 2nd St., involving 15,000 sq.yds. vertical fibre brick and 3000 lin.ft. concrete curbing. About $50,000. Shockley Eng. Co., 740 Reserve Bank Bldg., Kansas City, Mo., engrs.

Kan., Lawrence—Douglas Co. rejected bids received June 30, building Sects. E and F of Fort to Fort Rd., 18 ft. wide, vertical fibre paving and concrete curbing. Work will be readvertised. L. Duffie, co. engr. Noted June 19.

Kan., Leavenworth—City soon lets contract paving Delaware St., asphaltic concrete. F. Metschan, clk.

Montana—State Highway Comn., Helena, plans to pave streets in Whitehall, cost $40,000; 2540 ft. Main St., Lewistown, $30,000; .54 mi. Pike St. and 1st Ave., concrete, Columbus, 18 ft. wide, $18,000; .9 mi. Merrill Ave. and Bell St., Glendive, $95,000. Federal Government will be asked to appropriate towards cost. P. D. Pratt, state highway engr.

Montana—State Highway Comn., Helena, rejected bids received June 18, gravel surfacing 4 mi. Forsyth-Ashland Rd., Rosebud Co. P. D. Pratt, state highway engr. Noted June 12.

Montana—State Highway Comn., Helena, received no bids June 18, gravel surfacing 4 mi. Yellowstone Trail, 4 mi. Red Trail No. 2, and 5 mi. Red Trail No. 1. P. D. Pratt, state highway engr. Noted June 12.

Montana—State Highway Comn., Helena, plans to gravel surface 14.5 mi. Pine Creek-Emigrant Rd., cost $40,000, 12½ mi. Yellowstone Trail, $50,000; 8 mi. Carbella-Corwin-Yankee Jim Canyon Rd., $30,000, Park Co.; 45 mi. Great Falls-Monarch Rd., Cascade Co., $225,000; 6 mi. Emmet St.-Anaconda Rd., $120,000, 5 mi. Basin Creek Rd., $100,000, 4 mi. Elk Park Rd., $80,000, 10 mi. Nine Mile Rd., $200,000, Silver Bow Co. P. D. Pratt, state highway engr.

Montana—State Highway Comn., Helena, soon lets contract grading, draining and gravel surfacing 19 mi. Sun River Rd. between Great Falls and Sun River, Cascade Co., Federal Aid Project No. 10; also 3½ mi. Billings Cody Way, Carbon Co., involving river protection, consisting of 3000 ft. earth dyke with rock and brush rip-rap. Noted Jan. 23.

Mont., Baker—Fallon Co. election Sept. 2 to vote on $275,000 bonds to improve roads. Federal Government will appropriate toward cost. P. D. Pratt, c/o State Highway Dept., Helena, engr.

Mont., Bozeman—City soon receives bids paving 3rd Ave. from Main to Mendenhall Sts. and Mendenhall St., from 3rd to 5th Sts., bitulithic. About $10,000. C. Widener, city engr.

Mont., Helena—Lewis and Clark Co. election Sept. 2 to vote on $200,000 bonds to improve roads. Federal Government will appropriate toward cost. P. D. Pratt, c/o State Highway Dept., Helena, engr.

Mont., Hysham—Treasure Co. election Sept. 2 to vote on $160,000 bonds to improve roads. Federal Government will appropriate toward cost. P. D. Pratt, c/o State Highway Dept., Helena, engr.

Mont., Livingston—Park Co. voted $150,000 bonds to improve roads. C. T. Sackett, Livingston, engr. Noted Feb. 20.

Mo., Alton—Oregon Co. plans election to vote on $300,000 bonds to build roads. Address W. I. Cotham, Alton, presiding judge.

Mo., Chillicothe—Livingston Co. election Aug. 18 to vote on $1,200,000 bonds to improve roads. J. Broaddus, Chillicothe, engr.

Streets and Roads (Continued)

Mo., Clayton—Comrs. St. Louis Co. receive bids about Sept. 1, grading and paving 3½ mi. Clayton Rd. between St. Louis and Denny Rd., bituminous concrete. About $120,000. W. Elbring, co. engr. Noted June 5.

Mo., Galena—Stone Co. plans to build rock roads. About $100,000. W. T. McCulloch Galena, engr.

Mo., Hannibal—Marion Co. election Aug. 12, to vote on $1,500,000 bonds to build roads. A. V. Ely, Palmyra, engr.

Mo., Jefferson City—City Council voted to improve various streets, gravel and asphalt. C. P. Hardin, engr.

Mo., Jefferson City—Capitol Bldg. Comn., Jefferson City, soon receives bids grading State Capitol grounds; $25,000 appropriated for project.

Mo., Linneus—Linn Co. election Aug. 19 to vote on $1,000,000 bonds to build hard surfaced roads. D. E. Peery, Linneus, engr.

Mo., Mexico—Audrain Co. plans election soon to vote on $700,000 bonds to build roads. Address Co. Court, S. C. Groves, presiding judge.

Mo., Palmyra—Marion Co. election Aug. 12, to vote on $1,500,000 bonds to build roads. A. V. Ely, Palmyra, engr.

Mo., Paris—Monroe Co. election Aug. 2, to vote on $1,000,000 bonds to build hard surface roads. Address Co. Court, E. M. Lipp, presiding judge.

Mo., Troy—Lincoln Co. plans to build state roads from Old Trails Rd. through county. About $20,000. A. W. Graham, c/o State Highway Dept., Jefferson City engr.

Mo., Versailles—Morgan Co. election Aug. 26, to vote on $150,000 bonds to build roads. W. R. Stevenson, co. surv.

Mo., Webster Groves (St. Louis P. O.)—City receives bids about Sept. 1 paving 1¼ mi. Gray Ave., from Lockwood St. to Big Bend Rd., 30 ft. wide, rein.-con., concrete curbing. Cost to exceed, $10,000. J. Stecker, city engr.

Mo., Webster Groves (St. Louis P. O.)—City receives bids about Aug. 15, paving 2200 ft. Clark St. from Summit Ave. to Yeatman St., 25 ft. wide, rein.-con., concrete curbing. Cost to exceed $10,000. J. Stecker, city engr.

Tex., Austin—Travia Co. plans election soon to vote on $5,500,000 bonds to build 303.71 mi. bituminous topped macadam and 133.59 mi. graded and gravel surfaced roads and streets. O. E. Metcalfe, Austin Natl. Bank Bldg., engr.

Tex., Fredericksburg—Gillespie Co. plans to improve 17,617 mi. State Highway No. 9 from here to Mason Co. line, 16-24 ft. wide, involving building surfaced road with crushed rock, concrete dips and stone culverts and clearing and grubbing 64 acres. About $138,000. A. H. Kneese, co. judge.

Tex., Marble Falls—Burnet Co. voted $55,000 bonds to build roads. J. R. Smith co. judge. Engineer not selected. Noted July 3.

Okla., Stroud—City having plans prepared by Johnson & Benham, engrs., Firestone Bldg., Kansas City, Mo., for paving 20 blocks.

Idaho—State Highway Comn., Boise, plan to build 40 mi. Greer Rd. from Clearwater River to Pierce Rd. About $230,000. Federal Government will appropriate $130,000. D. Olson, state highway engr.

Idaho, Rupert—City soon lets contract paving 27,718 sq.yd. various streets, involving 4388 lin.ft. concrete curbing and 28,218 sq.yd. earth and rock excav. About $10,000. L. B. Redford, clk. L. C. Kelsey, 410 Selling Bldg., Portland, Ore., engr.

Wash., Wapato—City soon lets contract paving 20,000 sq.yd. streets, bitulithic, concrete or asphalt. C. A. Norton, clk.

Oregon—State Highway Comn., Portland, rejected bids paving 1.2 mi Salem-Brooks Sect., Pacific Highway, Marion Co., improving and grading 12.5 mi. Unit No. 2, Valades Ranch Rd., Grant Co., 11.5 mi. Unit No. 4, Service Creek-Vallades Ranch Rd., Wheeler Co., 7.9 mi. Yamhill-Gaston Rd., McMinnville Co. and 7.7 mi. Yoncalla Rd., Douglas Co. Work will be readvertised.

Ore., McMinnville—Yamhill Co. soon lets contract grading, building culverts and paving 2.9 mi. West Dayton Rd. to Yamhill River Bridge, Dayton, concrete. R. W. Jones, engr.

Ore., Portland—City soon lets contract paving Clatsop Ave., from East 13th to 17th Sts., asphaltic concrete No. 1 or No. 2 on crushed rock base or concrete Nos. 1 and 2; Linn Ave., from East 13th to 17th Sts., concrete Nos. 1 and 2 or asphaltic concrete on crushed rock base; building artificial stone or asphalt sidewalks, concrete foundation not less than 3 in. deep, on west side of East 12th St., from Emerson St. to point 150 ft. north; paving roadway Hawthorne Ave. to Sandy Blvd., between East Oak and East Pine Sts., with asphaltic concrete No. 1 or 2 on crushed rock base, balance to be paved with asphaltic concrete No. 1 or 2 redress except intersection of East Morrison St. between tracks, which is to be paved with concrete No. 1 or 2 with 2 in. ballast under rails of Light & Power Co., on 6 in. concrete foundation. O. Laurgaard, city engr.

Cal., Alturas—Bd. Supervs. Modoc Co. voted $400,000 bonds and Federal Government will appropriate like amount to build roads.

Cal., Oakland—City soon lets contract grading, curbing, guttering and paving 2000 ft. Fruitvale and Whittle Aves., 26 ft. wide, involving 9524 sq.yd. oil macadam, 6396 lin. ft. redwood curbing, 19,156 sq.ft. concrete gutter and 5870 sq.ft. cement sidewalk. About $35,000. W. Campbell, city engr.

Cal., Placerville—Marshall Blvd. Impvt. Dist., El Dorado Co., voted $150,000 bonds to cut down grades, widen curves and build bridges on 60 mi. roads between here and Auburn Co. line.

Cal., Red Bluff—Bd. Supervs. Tehama Co. voted $86,000 bonds to build highways. Noted June 26.

Cal., Selma—City plans to improve 3 mi. streets.

Que., Montreal—Dept. Rds., Parliament Bldg., Quebec, receives bids in August, macadamizing road from here to St. Anne de Bellevue, 30 ft. wide, 10 mi. with waterbound and 12 mi. with bituminous macadam. About $150,000. M. Henry, c/o Dept. Rds., engr.

Ont., Aurora—Town soon lets contract paving Yonge St., 24 ft. wide, involving 4000 sq.yd. bituminous bound macadam on 6 in. concrete base and 8600 lin.ft. concrete curb and gutter. About $75,000. E. A. James, 57 Adelaide St., E., Toronto, engr.

Ont., Bancroft—Dept. of Highway, Toronto, receives bids in August building 6 mi. bituminous macadam road from Madoc to Tudor, 25 ft. wide. About $30,000.

Ont., Ottawa—Bd. Control soon receives bids building asphalt pavement on Stanley Ave. from Sussex to Union Sts. About $12,000. A. J. McCallum, City Hall, Ottawa, engr.

Ont., Ottawa—City Council passed bylaw authorizing expenditures of $47,421 for concrete sidewalks, $8062 for pavement on Dalhousie St., and $40,438 for various other streets. N. H. H. Lett, clk.

Ont., Simcoe—Town having plans prepared and soon receives bids paving Townsend St., tarvia macadam, 24 and 30 ft. wide. About $20,000. G. R. Marston, town clk.

Alta., Edmonton—City Council passed bylaw to authorize expenditure of $200,000 to build sidewalks on Jasper Ave. and various streets.

B. C., New Westminster—Dept. Pub. Wks., Victoria, soon lets contract paving 3½ mi. Pacific Highway, 16 ft. wide. Alternative bids will be received on 1 course concrete, asphaltic concrete on concrete base and asphaltic concrete on macadam base.

B. C., Point Grey—W. B. Greig, engr., Municipal Hall, Kerrisdale, receives bids in about 3 weeks resurfacing 2000 ft. Highway St., from 16th to 21st Ave., 16 ft. wide, oil macadam or asphalt, for city. About $12,500.

BIDS DESIRED

Vermont—Until Aug. 5, by State Highway Comn., Montpelier, building 3.8 mi. gravel road in Williston and Irasburg Twps., 2.35 mi. bituminous macadam road, Fairlee Twp., 1.4 mi. concrete road, Colchester and Essex Twps. S. B. Bates, comr.; advertised in this issue.

Connecticut—Until July 31, by State Highway Comn., Capitol, Hartford, improving 4773 ft. Nichols Rd., bituminous macadam or bituminous concrete, Bridgeport Twp.; 4200 ft. Killingworth Rd., Chester Twp., 5205 ft. Westminster Rd., both native stone macadam, Canterbury Twp.; 4350 ft. Gildersleeve Rd., Portland Twp., 4625 ft. Canterbury Rd., both gravel, Plainfield Twp.; 4515 ft. Hawleyville Rd., graded with trap rock top, Newtown Twp.; 5400 ft. Eels Hill Rd., 3 in. bituminous macadam over stone base, Milford Twp.; 5029 ft. Orange Sta. Rd., 7 in. native stone macadam, Orange Twp.; also for substructure and grading approaches of steel drawbridge over Niantic River, East Lyme and Waterford Twps. C. J. Bennett, state highway comr.; advertised in this issue.

N. Y., New York—Until July 30, by F. L. Dowling, pres. Manhattan Boro., regulating and repaving with granite block pavement on concrete foundation, roadway of Brome St. from Bowery to Centre Sts., Walker St. from Centre to Baxter Sts., and Bleecker St. from Lafayette St. to Bway.

N. Y., Poughkeepsie—Until July 31, by Bd. Pub. Wks., Eastman Park Mansion, for 5000 lin.ft. new concrete curb and gutter in place. W. J. Davis, clk.; advertised in this issue.

N. Y., S. I., St. George—Until July 28, by C. D. Van Name, pres. Richmond Boro., repairing with wood block pavement roadway of Bay St. from Hannah to Thompson Sts.

New Jersey—Until Aug. 6, by State Highway Comn., Broad St. Bank Bldg., Trenton, building 2090 sq.yd. State Highway Route No. 4, Navesink River Sect., Monmouth Co., involving 2090 yd. concrete surface. A. L. Grover, ch. clk.; advertised in this issue.

N. J., Burlington—Until Aug. 6, by Comrs. Burlington Co., building 4059 sq.yd. concrete surface pavement from Florence Sta. to State Highway Route No. 2, 18 ft. wide. J. Logan, Mt. Holly, engr.

N. J., Freehold—Until Aug. 6, by Bd. Freeholders Monmouth Co., rebuilding Freehold-Adelphia Rd., Sect. 2, involving 11,734 sq.yd. surface pavement. W. M. Bergen, dir.; advertised in this issue.

N. J., Mt. Holly—Until Aug. 6, by Bd. Freeholders, Burlington Co., improving road from Florence Sta. to State Highway Route No. 2, involving 4059 sq.yd. concrete surface. H. Hawkins, Jr., clk.; advertised in this issue under "Florence."

N. J., Newton—Until Aug. 4, by Bd. Freeholders Sussex Co., improving Ogdensburg-Sparta Rd., Franklin and Ogdensburg Boroughs, Sparta Twp., bituminous macadam surface on macadam foundation, involving 46,790 sq.yd. surface pavement, 46,790 sq.yd. foundation and 45,501 cu.yd. excav. R. L. Slater, clk.; advertised in this issue.

Pennsylvania—Until Aug. 5, by State Highway Dept., Harrisburg, rebuilding roads in Beaver, Bedford, Cambria, Centre, Clearfield, Dauphin and Perry, Erie, Fayette, Indiana, Juniata and Snyder, Lackawanna, Lycoming, Northampton, Schuylkill, Venango and Westmoreland Counties. L. S. Sadler, state highway comr.; advertised in this issue.

Pa., Pittsburgh—Until Aug. 7, by J. P. Moore, Allegheny Co. controller, paving 15,100 ft. Ardmore Blvd., from Wilkinsburg boro. line to Electric Ave., North Braddock, 24 ft. wide, concrete; 15,840 ft. Imperial and Clinton Rds., Findlay Twp., 16 ft. wide, asphaltic concrete; widening 10,500 ft. Verona Rd. from Frankstown to Saltsburg Rds., Penn Twp., from 16 to 24 ft. wide, and surfacing with asphaltic concrete on concrete foundation.

Maryland—Until July 29, by State Roads Comn., 601 Garrett Bldg., Baltimore, building 2 mi. York Rd. from Parktown toward Pennsylvania State line, Baltimore Co., Contr. B-30, and 2 mi. Bucketstown Turnpike, 6 in. concrete and 3 ft. dirt shoulders, Frederick Co., Contr. F-31. Address F. H. Zouck, chn.; advertised in this issue.

Maryland—Until Aug. 5, by State Roads Comn., 601 Garrett Bldg., Baltimore, building .75 mi. Liberty Rd. from Gwynn Oak Jct. to Baltimore City limits, macadam Baltimore Co., Contr. BC-31; also

Streets and Roads (Continued)

grading and draining 2 mi Urbana Turnpike from Monocacy River Bridge to Hopeland, Frederick Co., Contr F-27 Address F. H. Zouck, chn.; advertised in this issue

W. Va., Charleston—Until Aug. 12, by Comrs. Kanawha Co., paving 3 mi. Sissonville Rd., 13 ft. wide between edging, asphaltic concrete. Topeka mix or similar pavement on concrete base. F. G Burdette, Charleston, engr.

W. Va., Huntington—Until Aug 4, by Comrs. Cabell Co., paving 1 mi. Huntington-Hamlin Rd., 16 ft. wide, brick, on concrete base. About $35,000. Oliver & Maupin, Huntington, engrs

W. Va., Lewisburg—Until Aug 5, by Comrs. Greenbrier Co., grading 6 mi Ft. Springs-Roncevert Rd., involving 43,000 cu.yd excav. About $15,000. F Rader, Lewisburg, engr. Noted July 10.

N. C., Beaufort—Until Aug. 12, by Comrs Beaufort Co., grading and paving highway, involving 270,000 sq.yd. paving, 150,000 cu.yd. grading, 5000 ft. storm drainage, 820 cu.yd. bridge concrete and 150,000 ft. reinforcing bars. About $500,000. G. C. White, Durham, engr.

N. C., Fayetteville—Until July 29, by City Council, paving and draining 21,000 sq.yd. various streets. About $70,000. E. C. Derby, Fayetteville, engr.

S. C., Edgefield—Until July 30, by Comrs. Edgefield Co., relocating, grading, draining and surfacing with top soil 8.42 mi Dixie Highway, from here to Turkey Creek, 30 ft. wide. About $35,000. J. R. Pennell, c/o State Highway Dept., Columbia, engr. Noted June 19

Ala., Birmingham—Until Aug 11, by Bd Revenue Jefferson Co., Court House, building and improving 5 mi Mt Pinson Rd., between here and Mt Pinson, Project No. 55, involving 1.5 acres clearing and grubbing, 7929.5 cu.yd excav., 83.6 cu.yd Class "B" concrete, 58,665 sq.yd pavement, pipe, etc.; 3.88 mi. Old Stouts Rd., between here and Fulton Springs, Project No 56, 1 acre clearing and grubbing, 15,938.9 cu.yd excav., 41.16 cu.yd. Class "A" and 126.88 cu.yd. Class "B" concrete, 3216 lb. rein steel, 44,837 sq.yd. pavement, pipe, etc.; 6 mi. South Bessemer Rd., between Birmingham and Bessemer, Project No. 57, 36,000 cu.yd. excav., 136 cu.yd. Class "A," 90 cu yd. Class "B" concrete, 15,000 lb. reinforcing steel, 70,398 sq.yd. pavement, pipe, etc.; 4.54 mi. Lovick and Leeds Rd., Project No 58, 19.2 acres clearing and grubbing, 32,188 cu.yd. excav., 113.5 cu.yd Class "B" concrete, pipe, etc; 5 mi Birmingham and Jasper Rd., between Pratt City and Adamsville, Project No 59, 40,000 cu.yd. excav., 100 cu yd Class "A" and 150 cu yd. Class "B" concrete, 12,000 lb. rein steel, 52,800 sq.yd. pavement, pipe, etc.; 6 mi. Birmingham-Montgomery Rd., Project No. 18, 24,725 cu.yd. excav., 21 cu yd Class "A," 45 cu.yd. Class "B," and 3 cu yd. Class "C" concrete, 2250 lb rein. steel, 47,520 sq.yd pavement, 1200 lin ft guard rail, 27 cu.yd cement stone masonry, pipe, etc Total cost, about $850,000 Federal government and State will appropriate one-half of cost S. R. Batson, co engr W S Keller, c/o State Highway Dept., engr

Ohio—Until Aug 5, by State Highway Comn., building roads in following counties:

Columbiana Co., Sect. "J" Salem-Alliance Rd., 4.12 mi., grading, constructing bridges and culverts and paving with brick, cost $146,408

Cuyahoga Co., Bedford Sect. Akron-Cleveland Rd., 61 mi., grading and paving with brick, $36,205.

Sects. "J," "G-1" and "G-2" Cleveland-Wooster Rd., 9.75 mi., grading, constructing bridges and culverts and paving with bituminous concrete, $163,350.

Darke Co., Sects. "B" and "C' Dayton-Greenville Rd., 1.34 mi., grading, constructing bridges and culverts and paving with concrete, $123,083.

Sect. "F," Celina-Greenville Rd., 4.61 mi. grading, constructing bridges and culverts and paving with concrete, $151,110.

Sect. "A," Versailles-Western Rd., 4.31 mi., grading, constructing bridges and culverts and paving with brick, $170,344

Fayette Co Sect "A" Columbus-Washington C. H Rd., 7.01 mi., grading, constructing bridges and culverts and paving with waterbound macadam or bituminous macadam, $113,534

Hamilton Co., Sect. "D" Cincinnati-Louisville Rd., 5.99 mi., grading, constructing bridges and culverts and paving with Warrenite, bitoslag, concrete or monolithic brick, $356,100

Sect. "A" Harrison Pike, 2.96 mi., grading, constructing bridges and culverts and paving with semi-monolithic brick, concrete, Warrenite or bitoslag, $165,153

Sect. "B" Harrison Pike, 3.66 mi., grading, constructing bridges and culverts and paving with semi-monolithic brick, concrete, Warrenite or bitoslag, $231,565.

Hardin Co., Sect "E" Findlay-Kenton Rd., 3.66 mi., grading, constructing bridges and culverts and paving with concrete or bituminous concrete, $70,440.

Knox Co., Sect "I" Columbus-Wooster Rd., 5.08 mi., grading, constructing bridges and culverts and paving with concrete, $193,842

Mercer Co., Sect. "G" St Mary's-Celina Rd., 5.49 mi., grading, constructing bridges and culverts and paving with concrete, $153,520

Celina Sect St Mary's-Celina Rd., 25 mi., grading and paving with concrete, $6652.

Montgomery Co., Sect. "M" Dayton-Indianapolis Rd., 3.10 mi., grading, constructing bridges and culverts and paving with rein.-con., $93,572.

Pickaway Co., Sect "B" Circleville-Adelphi Rd., 1.45 mi., grading, constructing bridges and culverts and surfacing with gravel, $19,236

Portage Co., Sect "U" Ravenna-Warren Rd., 2.97 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $85,939.

Sect. "V" Ravenna-Warren Rd., 3.14 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $79,747.

Sect. "W" Ravenna-Warren Rd., 2.37 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $53,557.

Shelby Co., Sect "F" Sidney-Wapakoneta Rd., 3.52 mi., grading, constructing bridges and culverts and paving with concrete or bituminous macadam, $95,361.

Sect. "B-2" Piqua-Mt. Mary's Rd., 1 mi., grading, constructing bridges and culverts and paving with rein.-con., $27,405

Sect. "A-2" Urbana-Sidney Rd., .95 mi., grading, constructing bridges and culverts, and paving with bituminous macadam, $28,531.

Sect "G" Piqua-Sidney Rd 3.07 mi., grading, constructing bridges and culverts, and paving with plain concrete, $89,576.

Trumbull Co., Sect. "N-1" Youngstown-Conneaut Rd., 1.93 mi., grading, constructing bridges and culverts, and paving with bituminous macadam, $40,346.

Sect. "B" Warren-Burton Rd., 3.51 mi., grading, constructing bridges and culverts, and paving with bituminous macadam, $110,331

Sect. "S" Warren-Burton Rd., 1.34 mi., grading, constructing bridges and culverts, and paving with brick, $32,848.

Wood Co., Sect "B-1" Toledo-Elmore Rd., 1.75 mi., grading, constructing bridges and culverts, and paving with bituminous concrete, $67,700

Sect. "F-1" Findlay-Bowling Green Rd., 3.03 mi., grading, constructing bridges and culverts, and paving with rein.-con or bituminous concrete, $92,600

Sect. "F-2" Findlay-Bowling Green Rd., 3.10 mi., grading, constructing bridges and culverts, and paving with rein.-con or bituminous concrete, $102,495

O., Martin's Ferry—Until July 29 by Dir. Pub. Serv., furnishing material (except paving block) for paving School St from Bway. to Pearl St.; Colerain Pike from 10th St. to corporation line; alley between Washington and Jefferson Sts., from Catawba St. to Euclid Ave A J Fallen clk

Ill., Rankin Until July 29, by village for 1¼ mi concrete pavement 16.50 ft wide. P. Henneberry, pres.; advertised in this issue.

Ia., Iowa City—Until Aug 1, by G Doher, city clk., for grading, paving and curbing Newton Rd involving 3600 cu.yd excav., 7300 sq.yd paving, and 1870 lin.ft. combined curb and gutter About $24,000. Advertised in this issue

Minn., Little Falls Until Aug 5, by Comrs Morrison Co., grading and graveling 12 mi Federal Aid Project No 24, Job No 2, State Rd No 2 involving 47,586 cu yd excav., 14,433 cu.yd gravel surfacing, 42,821 cu.yd overhaul, etc A J Fenn, Little Falls, engr Noted May 22

Minn., Nashwauk—Until Aug. 4, by H. A Olsen, village recdr., paving 3rd St. from Hawkins to Roberts Ave., crushed rock and tarvia

Minn., Ortonville Until Aug 6 by A V Randell, and Big Stone Co., building 10 mi Federal Aid Project No 66, State Rd No. 3, involving 65,000 cu.yd. excav., 12,000 cu.yd gravel surfacing material, culverts, etc About $60,000 L. P. Zimmerman, Ortonville, engr.

Minn., St. Paul—Until July 28, by H. W Austin, city purch. agt., City Hall, improving Locust St between 6th and 10th Sts., involving 2518 sq.yd vitr. clay brick paving blocks, 10,452 lbs filler, 562 bbls. Portland cement, 353 lin.ft. 12 in. sewer pipe, 3600 sewer bricks, etc. O. Claussen, city engr.

Minn., Zumbrota—Until Aug 1, by J. D Grover, village clk., paving 3 blocks with concrete, 60 ft. wide About $14,000. A E Rhame, Red Wing, consult. engr.

N. D., Minnewaukan—Until Aug. 8, by Comrs. Benson Co., building 24.2 mi. earth road from here to Church's Ferry, Federal Aid Project No 27 About $28,000 W. H Robinson, c/o State Highway Dept., Bismarck, engr.

N. D., Napoleon—Until Aug. 1, by Comrs Logan Co., building 22.4 mi. earth road, Federal Aid Project No 35, involving 780 cu.yd class "A" and 127,660 cu.yd class "B" excav., 280 cu.yd loose rock excav., 237 cu yd class "B" 1-2½-5 concrete, 336 lin.ft. 12 in and 360 lin ft 18 in concrete metal pipe, etc. About $34,210.

Wyoming -Until July 29, by State Highway Comn Cheyenne, building following Federal Aid projects

No 33 Albany Co., 2.16 mi Lincoln Highway from Laramine east, involving 8500 cu.yd excav and embankment, 20,700 sq.yd. macadam surfacing, one 24 ft I beam bridge, cost $26,153.

No. 37 Goshen Co., 9.195 mi. Platt River Highway Sect. 1, between Lingle and Torrington, 48,000 cu.yd excav and embankment, 10,800 cu.yd. gravel surfacing, 300 cu yd concrete in bridge and culverts, 10,000 lb steel in bridges and culverts, $40,980.

No 38 Hot Springs Co., 3.38 mi Yellowstone Highway, Thermopolis north, 20,000 cu.yd excav and embankment, 5400 cu.yd gravel surfacing, 5 concrete box culverts $30,000

No. 28. Sheridan Co., 4.16 mi. road from Sheridan to Dietz, 30,000 cu.yd. excav. and embankment, 6500 cu.yd. shale surfacing, 430 cu.yd. concrete, 41,000 lb. reinforcement, etc., $51,319.

No 19 Natrona Co., 3.18 mi. extension pavement on Casper-Salt Creek Rd. 29,850 sq.yd concrete surface

No 32 Fremont Co., 2 steel bridges 125 ft span over Wind River Lander-Du Bois Rd

Montana—State Highway Comn., Helena soon lets contract gravel surfacing 19 mi Sun River Rd., Cascade Co. P. D. Pratt, state highway engr. Noted Jan. 23.

Mo., Jefferson City—Until Aug. 11, by E W. Stephens, chn. State Capitol Comn., grading, building walks, drives, etc., on Capitol grounds. L. Landman, State Capitol, supt. grounds

Streets and Roads (Continued)

Arkansas—Until Aug. 5, by State Highway Comn., Little Rock, building 84.37 mi. road, asphaltic concrete on rolled stone base, warrenite on rolled stone base, asphaltic macadam, penetration method, waterbound macadam or clay gravel; advertised in this issue.

Arkansas—Until Aug. 21, by State Highway Dept., Little Rock, building 18.6 mi. gravel road from DeQueen through Lockesburg, to the Saline River, involving 24 acres clearing and grubbing, 197,900 cu. yds. earthwork, etc. Lund & Hill, Little Rock, engrs.

Ark., Walnut Ridge—Until Aug. 18, by Comrs. of Western Lawrence Co. Rd. Impvt. Dist., at office of State Highway Dept., Little Rock, building 4 systems of roads, involving 60 mi. grading, 56 acres clearing and grubbing, 137,700 cu.yds. earth and 4500 cu.yds. rock excav., 5736 ft. 15-30 in. metal culverts, 66,400 lb. rein. steel, etc. Pritchett & Hight, Walnut Ridge, engrs.; advertised in this issue under Imboden, Ark.

Utah, Hyrum—Until Aug. 4, by City Council improving 2900 lin.ft. curb and gutter, and 12,000 lin.ft. sidewalk, 4 ft. wide. T. H. Humpheries, Logan, engr.

Utah, Moroni—Until Aug. 1, by City Council building 11,500 lin.ft. sidewalk, 4 ft. wide, in sidewalk paving Dist. No. 2. J. L. Bench, Fairview, engr.

Utah, Salt Lake City—Until Aug. 1, by City Com. paving Mohrland Pl. involving 8000 sq.yd. 2 in. bituminous concrete on 6 in. concrete base. About $27,000. S. Q. Cannon, city engr.

Utah, Salt Lake City—Until Aug. 5, by City Com. paving 17th St. from State St. to 5th St., E., 2 in. bituminous concrete on 5 in. concrete base. About $47,000. S. Q. Cannon, city engr.

Utah, Salt Lake City—Until Sept. 1, by City Com. paving 15th St. E. from 13th to 17th Sts., involving 10,000 sq.yd. 2 in. bituminous concrete. About $46,000. S. Q. Cannon, city engr.

Utah, Salt Lake City—Until Sept. 1, by City Comn., paving various streets in Dist. 31, involving 11,000 sq.yd. of rein.-con. 7 in. thick, cost $45,000; also Denver St., from 9th St. to Harvard St., involving 5300 sq. yd. bituminous concrete, 2 in. thick, and 5300 sq.yd. concrete base, 4 in. thick, $23,-000. S. Q. Cannon, city engr.

Wash., Seattle—Until Aug. 4, by Comrs. King Co., laying either 1 course concrete or brick pavement on 3.19 mi. Sylvester Rd., 16 ft. wide. About $80,000. Work involves 29,675 sq.yd. concrete or brick and 4900 cu.yd. earth excav. S. J. Humes, engr.

Cal., Holtville—Until Aug. 13, by City Trustees, improving Dist. No. 1, comprising 5th, 6th, Olive, Palm, Holt Sts., et al, involving 252,000 sq.ft. 4 in. concrete paving with 1½ in. Warrenite surface, cement curbs, gutters, etc. H. J. Burk, Holtville, engr. Noted June 5.

Que., St. Malachie D'Ormstown—Until Aug. 1, by Dept. Highways, Quebec, building 5 mi. Provincial Highway, macadam. About $20,000.

Que., St. Scholastique—Town receiving bids macadamizing about 2½ mi. Bay de la cote de Anges Rd., 30 ft. wide. J. E. Quelette, St. Scholastique, engr.

Ont., St. Jacobs—Town receiving bids laying 40,760 sq.yd. 7 in. concrete pavement. L. S. Lichty, Kitchener, engr.

Ont., Welland—Until July 28, by Welland Co., building road between Ridgeway and Crystal Beach, waterbound macadam. About $22,000. A. Ridgeway, co. engr.

Ont., Wellesley—Town receiving bids laying 21,000 sq.ft. 8 in. concrete pavement. L. S. Lichty, Kitchener, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Whitinsville—City let contract surfacing Church St., trap rock and asphalt, Northbridge Twp., to R. H. Newell Co., South Main St., Uxbridge, $29,516.

★Rhode Island—State Highway Comn., State House, Providence, let contracts paving 3930 ft. Warwick Ave., Cranston Twp., to W. V. Polleys & Co., Turks Head Bldg., Providence, $18,672; 3170 ft. Centerville Rd., Warwick Twp., to Lane Constr. Co., 37 Colony St., Meriden, Conn., $50,459; 5200 ft. Farnum Pike, Smithfield Twp. and 11,080 ft. West Shore Rd., Warwick Twp., to A. D. Bridges & Son, Hazardville, Conn., $15,971 and $24,351 respectively. Noted July 17.

★Connecticut — State Highway Comn., Hartford, let contract to J. Arborio, 30 Park St., New Haven, paving 4700 ft. Chesterfield Rd., 7 in. native stone macadam, Montville Twp., cost $18,945; B. N. Beard, 464 Howe Ave., Shelton, 4050 ft. Oxford Rd., gravel, Southbury Twp., $8355; L. J. Wilcox, Norwichton, 4770 ft. Newent Rd., 7 in. native stone macadam, Liston Twp., $21,617; F. B. Hastings, 1200 Wood Ave., Bridgeport, grading 6965 ft. Pembroke Rd., Danbury Twp., $15,562. Noted July 11.

★Conn., East Hartford (Hartford P. O.) —City let contract building macadam roadway on Hillstown Rd., to F. A. Barone & Co., 16 Winchester St., Hartford, $1.48 per lin.ft. for 14 ft. macadam pavement, $1.00 for 10 in. tile, and $15 for catch basins. Noted July 17.

★Conn., Hartford—Bd. Contr. & Supply, Municipal Bldg., let contract paving 6175 ft. Wethersfield Ave., to Miller Sidewalk Co., Hartford. About $10,130. Noted June 19.

N. Y., Albany—Bd. Contr. & Supply received bids paving Western Ave., from Manning Blvd. to city line, from P. W. Mulderry, 5 St. Joseph St., $69,898; W. F. Campion, 372 Bway., $74,368. Noted July 17.

★N. Y., Geneva—Bd. Pub. Wks. let contract paving High, West and Brook Sts., brick, to Oatka Eng. & Constr. Co., Warsaw, $70,196. Noted July 3.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids July 14, regulating and repaving with sheet asphalt on (a) Edison Pl., (b) Trowbridge St., with asphalt, (c) Lotus Ave., (d) Silver St., (e) Summerfield St., regulating and laying sidewalks, (f) 109th St., (g) Queens Rd., regulating, grading and curbing, (h) Edison Pl., from Uvalde Asphalt Paving Co., 1 Bway., New York City, (a) $7471, (b) $7185, (c) $16,864, (d) $7675; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (a) $7658, (b) $7425, (c) $15,899, (d) $7818; C. A. Myers, (e) $46,150, (h) $1443; Scott & Kurth, West New Brighton, S. I., (f) $2293, (h) $2699; R. A. Hess, (f) $2291, (h) $3060; Grimm Constr. Co., 460 Herold Ave., Richmond Hill, (f) $2465; Welsh Bros., (g) $11,245; Peace Bros., 20 Main St., (f) $2835, (g) $12,489; Hastings Paving Co., 25 Broad St., New York City, (e) $41,795. Noted July 10.

★N. Y., New York—F. L. Dowling, pres. Manhattan Boro., let contract regulating and repaving with sheet asphalt on concrete base, roadway of Lexington Ave., to Sicilian Asphalt Paving Co., 41 Park Row, $55,000; 110th and 121st Sts. and railroad area, to Uvalde Asphalt Paving Co., 1 Bway., $27,099, $20,475 and $15,720 respectively; 119th St. and West Bway., to Davney Asphalt Paving Co., foot of Quinby Ave., $26,102 and $81,236 respectively; Moore St., to Asphalt Constr. Co., 2197 Madison Ave., $8128. Noted July 3.

★N. Y., New York—Park Bd., Municipal Bldg., let contract paving and repaving with asphaltic mastic, walks of Central and other parks in Manhattan Boro., to Sicilian Asphalt Paving Co., 41 Park Row, $12,265. Noted June 26.

N. Y., New York—F. L. Dowling, pres. Manhattan Boro., received bids July 14, regulating and repaving with granite blocks, (a) Front St., (b) Lexington Ave. from 95th to 97th St., with sheet asphalt, (c) Madison Ave., at intersection of 42nd St., from W. J. Fitzgerald, 547 West 45th St., (a) $3843; P. J. Kearns, (a) $4062, (b) $18,328; Burnside Constr. Co., 270 Burnside Ave., (b) $18,222; Asphalt Constr. Co., 2197 Madison Ave., (b) $18,536; Sicilian Asphalt Paving Co., 41 Park Row, (c) $4632; Uvalde Asphalt Paving Co., 41 Park Row, (c) $4632; Uvalde Asphalt Paving Co., 1 Bway., (c) $4876.

★N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., let contract repairing with bituminous concrete pavement roadways of Richmond Ave. and Old Stone Rd. from Blackford Ave. to Richmond Hill Rd. and Innis St. from Morningstar Rd. to John St., to J. Curren, $24,893. Noted July 10.

New Jersey—State Highway Comn., Broad St. Bank Bldg., Trenton, received bids building State Highway Route No. 8, Sect. 1, Riverdale to Pompton River, Morris Co., from Harrop & Shannon, Inc., 136 Passaic Ave., Westfield, $170,843; Union Bldg. & Constr. Co., Passaic, $192,997; O. G. Julian Eng. & Constr. Co., 20 Nassau St., New York City, $197,833. Noted June 26.

★N. J., Hoboken—City let contract improving Jackson, Jefferson, Grand and Clinton Sts., to W. T. S. Crichfield, 85 Washington St., about $117,000. Noted July 3.

N. J., Jersey City—City received lowest bid repaving roadway of Newark Ave., from Warren to Brunswick Sts., and from Summit to Palisade Aves., sheet asphalt on present concrete foundation, from W. T. S. Crichfield, 85 Washington St., Hoboken, 88 per cent of ($50,000) engineer's estimate. Noted June 19.

★N. J., Woodbridge—Town let contract improving Green St. from Rahway to Amboy Aves., to East Jersey Bridge Co., Inc., Perth Amboy, $21,180. Work involves 10,-232 sq.yd. 5 x 12 x 2 in. "Hastings" asphalt blocks.

★Pennsylvania—State Highway Dept., Harrisburg, let contracts building roads in following counties:

Lehigh Co., 30,121 lin.ft. rein.-con. and brick, Route No. 163, to J. F. Shanley, 605 Lincoln Bldg., Phila., $239,612;

Luzerne Co., 22,357 lin.ft. rein.-con. and brick, Route No. 177, to Hamilton-Kapnek Constr. Co., 1363 Ridge Ave., Phila., $163,-620;

Bradford Co., 45,051 lin.ft. rein.-con. or bituminous surface course, Routes Nos. 212 and 287, to Towanda Constr. Co., New Albany, $434,985;

Somerset Co., 10,554 lin.ft. rein.-con. and Hillside vitr. brick, Route No. 51, to B. J. Lynch Co., Meyersdale, $92,905;

York Co., 32,744 lin.ft. rein.-co.n and Hillside vitr. brick, Route No. 127, to W. H. Goll, trading as J. Goll & Co., 1539 Filbert St., Phila., $254,388. Noted July 17.

★Pa., Erie—Comrs. Erie Co. let contract building 2 mi. Meadville Rd., concrete, to J. Love & Son, Corry. About $77,000.

★Pa., Hastings—Boro. Council let contract paving 1125 ft. Fourth Ave. and Spangler St., to Susquehanna township line, brick on concrete base, to Lord & Clark, Hastings, $20,487.

★Pa., Parsons (Wilkes-Barre P. O.)—Town let contract paving 9800 sq.yd. Miner Rd., from George Ave. to Miners Mills line, with 5 x 12 x 2 in. "Hastings" asphalt blocks, to O'Brien Bros., Avoca, $22,834.

★Pa., Phila.—Dept. Pub. Wks. let contracts to I. K. Davis & Co., 20th and Spencer Sts., grading uncompleted portion of Front St. from Wingohocking St. to Nicetown Lane, including construction of retaining walls in Front St. and Hunting Park Ave., $98,799; to Estate R. P. Bennis, Chew and Price Sts., grading sections of Claridge, Northumberland, Vincent and Tabor Sts. and furnishing and placing 100 lin. ft. 15 in. vitr. clay pipe and 250 lin. ft. 12 in. c.i. pipe, etc., $7616; to Eastern Paving Co., Colonial Trust Bldg., paving with asphalt and vitr. block gutters 8th St. from Wyoming Ave., to Louden St., $5548 and 10th St. from Wyoming to Louden Sts., $5745; to Barber Asphalt Paving Co., 239 North 30th St., building footways on Parkway between 18th and 20th Sts., $7200; to A. A. Pastors, 6028 Greenway Ave., building drains on 64th St. and Dicks Ave., $1135 and to G. F. Dobbins, 4200 Chester Ave., for painting Baltimore Ave. Bridge over Cobbs Creek, $1080.

Streets and Roads (Continued)

Pa., Pittsburgh—Allegheny Co. received bids building (a) 2000 ft. Troy Hill Rd., Reserve Twp., Telford macadam, 16 ft. wide, involving 3500 sq.yd. pavement and 4000 cu.yd. earth excav.; (b) 2¼ mi. Elizabeth Rd., Forward Twp., rein.-con. or asphaltic concrete surface, 18 ft. wide, 24,000 sq.yd. asphaltic concrete, 2000 cu.yd. excav., 5500 sq.yd. concrete or Telford foundation, 19,150 sq.yd. scarified surface and 4000 ft. 6 in. vitr. pipe drain; (c) 5280 ft. Thompson Run Extension No. 2, Ross and McCandless Twps., bituminous macadam, 16 ft. wide, 11,050 sq.yd. bituminous macadam, 16,100 cu.yd. excav., 3800 ft. 6 in. tile drain from T. Cronin Co., South 17th and Muriel Sts., (a) $15,358, (c) $58,9[illegible], M. O'Herron Co., South 1st and McKean Sts., (a) $17,281, (c) $63,875; T. McNally Constr. Co., Oliver Bldg., (a) $17,907; Columbus Asphalt Paving Co., Pittsburgh, (b) $73,251; Booth & Flynn, Ltd., 1942 Forbes St., (b) $80,686; Hillside Stone Co., Farmers' Bank Bldg., (c) $65,698. Noted June 19 and July 10.

★**Pa., Pittsburgh**—Allegheny Co. let contract building 8000 ft. Bakerstown and Warrensdale Rds., Pine Twp., 18 ft. wide, rein.-con., to T. Cronin Co., South 17th and Muriel Sts., $84,163; also for 17,000 ft. Butler Pike Rd., Shaler and Hampton Twps., 20 ft. wide, asphaltic concrete and brick, to McDonald, McNeil Co., Pittsburgh, $161,857. Noted July 3.

★**Md., Baltimore**—Bd. Awards, City Hall, let contract grading, curbing and paving Gwynns Falls Parkway, Alameda Ave. and Garrison Blvd., involving 24,580 sq. yd. sheet asphalt, 13,940 lin.ft. concrete curb, 1050 sq.yd. vitr. brick gutter and 22,000 cu.yd. grading, to Baltimore Asphalt Block and Tile Co., Monroe and Lorman Sts., $95,295.

★**W. Va., Charleston**—Comrs. Kanawha Co. will surface 2 mi. Kanawha City Rd., 15 ft. wide, 2 in. asphaltic concrete. About $17,000. Work will be done by county forces.

★**W. Va., Clarksburg**—Harrison Co. let contract grading 1½ mi. Sycamordale Rd. (Class "A"), to J. N. Coaltrane, Haywood. About $16,000.

★**W. Va., Clarksburg**—Harrison Co. let contract grading 1½ mi. Haywood Rd., to Furgoson & Halbert, Shinnston, about $15,000.

★**W. Va., Fayetteville**—Fayette Co. let contract grading 3 mi. Fayette-Lansing Rd., 20 ft. wide, involving 45,000 cu.yd. excav., to Shipe & Thompson, St. Albans. About $36,000. Noted July 10.

★**W. Va., Harrisville**—Comrs. Ritchie Co. let contract paving 5 mi. Northwestern Pike, Federal Aid Project No. 29, to T. Pretio Co., Morgantown, $159,162. Noted June 19.

★**W. Va., Harrisville**—Ritchie Co. let contract building 5 mi. Ellenboro-Pennsboro Rd., 16 ft. wide, vitr. brick, to T. Pietro Co., Morgantown, $158,654.

★**W. Va., Hinton**—Comrs. Summers Co. Pipestem Dist. let contract building 5 mi. Tallery Mountain Rd. to T. Toroles, Princeton, $48,990. Work includes 65,000 cu.yd. excav., 130 cu.yd. Class "A" concrete, 100 cu.yd. Class "B" concrete, 100 cu.yd. cement rubble masonry, 100 cu.yd. dry rubble masonry, etc. Noted June 26.

★**W. Va., Kingwood**—Comrs. Preston Co. will grade and hard surface 2.56 mi. Morgantown-Kingwood Pike, 10 ft. wide. About $30,000. Work to be done by day labor. Noted May 8.

★**W. Va., Marlinton**—Comrs. Pocahontas Co. will build 2.25 mi. Marlinsbottom Turnpike, surfacing 16 ft., grading 26 ft. wide, involving 22,110 sq.yd. waterbound macadam (using local limestone). Work will be done by county forces. Noted May 22.

★**N. C., Durham**—Comrs. Durham Co let contract improving 1.8 mi. Durham-Roxboro Rd., 18 ft. wide, warrenite wearing surface on 5 in. concrete base, to R. G. Lassiter, Oxford. About $56,000.

★**N. C., Kinston**—Lenoir Co. let contract paving Central Highway, sheet asphalt, to West Constr. Co., Volunteer Life Bldg., Chattanooga, Tenn., $53,850. Noted June 19.

★**Ga., Douglas**—City let contract paving, curbing and building drainage structures on 22,000 sq.yd. various streets, to McDowell Constr. Co., Jacksonville, Fla. About $49,500. Noted June 26.

★**Ga., Macon**—Bibb Co. let contract paving and building drainage structures, etc., on 8.7 mi. Forsyth Rd., 18 ft. wide, to Brooks-Calloway Co., Healy Bldg., Atlanta, $307,536. Noted June 26.

★**Fla., Bunnell**—Comrs. Flagler Co. let contract grading, draining, hard surfacing and building bridges on 26 mi. road, in Shell Bluff Special Rd. and Bridge Dist., to C. A. Smith, Bunnell.

★**Ala., Athens**—Comrs. Limestone Co. let contract grading, draining and resurfacing with gravel 9.97 mi. Bee Line Highway, State Trunk Rd. No. 1, between Decatur and Tennessee State line, to S. H. Brown, Jasper, $53,185. Noted June 12.

Ohio—State Highway Comm., Columbus, received bids July 18, building roads in following counties:

Butler Co., Sect. "B" Oxford-Millville Rd., 4.05 mi., grading, constructing bridges and culverts and paving with brick, from B. F. Bolin, Columbus, $155,116; Andrews Asphalt Paving Co., Rentschler Bldg., Hamilton, bitoslag, $147,892, bituminous concrete, $135,588, sheet asphalt, $150,331.

Sect. "C-2" Oxford-Millville Rd., 3.60 mi., grading, constructing bridges and culverts, and paving with brick, B. F. Bolin, Columbus, $112,634; Andrews Asphalt Paving Co., Rentschler Bldg., Hamilton, bitoslag, $135,763, bituminous concrete, $125,074, sheet asphalt, $137,976.

Sect. "A" Hamilton-Middletown Rd., 1.36 mi., constructing gravel shoulders and paving bituminous macadam, J. L. Garver, Hamilton, $13,396; paving with bituminous concrete, Andrews Asphalt Paving Co., Rentschler Bldg., Hamilton, $23,827.

Coshocton Co., Sect. "C-2" Newark-Coshocton Rd., 2.04 mi., grading, constructing bridges and culverts and paving with brick, Dunsweiler Constr. Co., Zanesville, $76,585; paving with concrete, John Hall, Coshocton, $66,396.

Franklin Co., Sect. "M" Columbus-Sandusky Rd., .72 mi., grading and paving with brick on concrete base, A. W. Burns Co., 55 East State St., Columbus, $27,307; R. A. Shafer Co., Findlay, $29,060

Sect. "O" Columbus-Sandusky Rd., .76 mi., grading and paving with brick on concrete base, A. W. Burns Co., 55 East State St., Columbus, $28,390; R. A. Shafer Co., Findlay, $30,439.

Geauga Co., Sects. "T," "U" and "V-1" Chagrin Falls-Greenville Rd., 8.17 mi., grading, constructing bridges and culverts and paving with concrete, W. S. Newhall Co., Citizens' Bldg., Cleveland, $305,174.

Miami Co., Sect. "D" Dayton-Covington Rd., grading, constructing bridges and culverts and paving with rein.-con., Swank Engineering Co., Dayton, $96,509; C. L. Straw, Paulding & W. Huber, Tippecanoe City, each, $98,994.

Sect. "H" Piqua-Urbana Rd., .53 mi., grading, constructing bridges and culverts and paving with rein.-con., Burke Bros. Constr. Co., Anderson, Ind., $15,661. Noted July 10.

★**Ohio**—State Highway Comm., Columbus, let contract building roads in following counties:

Columbiana Co., Sect. "E" Cleveland-East Liverpool Rd., 3 mi., grading, constructing bridges and culverts and paving with waterbound macadam, to Campbell Bros., Stambaugh Bldg., Youngstown, $81,838.

Defiance Co. Sect. "F" Hicksville-Defiance Rd., 2.04 mi., grading, constructing bridges and culverts and paving with rein.-con., to Turritan & Figley, Evansport, $53,299.

Delaware Co., Sect. "L" Columbus-Sandusky Rd., 6.18 mi., grading, constructing bridges and culverts and paving with concrete to H. P. Streicher & Co., 319 Terminal Bldg., Toledo, $191,434.

Fayette Co., Sect. "B" Columbus-Washington C. H. Rd., 3.68 mi., grading, constructing bridges and culverts and paving with bituminous macadam, to Walter Huber, Tippecanoe City, $80,264

Sect. "C" Columbus-Washington C. H. Rd., 4.11 mi., grading, constructing bridges and culverts and paving with bituminous macadam, to Neff & Rader, Circleville, $94,512.

Guernsey Co., Sect. "I-1" Cambridge-Caldwell Rd., 1.26 mi., grading, constructing bridges and culverts and paving with concrete, to W. C. Peters, Marietta, $38,064.

Sect. "I-2" Cambridge-Caldwell Rd., 3.13 mi., grading, constructing bridges and culverts and paving with concrete, to W. C. Peters, Marietta, $114,233.

Hancock Co., Sect. "D" Lima-Sandusky Rd., 6.05 mi., grading, constructing bridges and culverts and paving with asphaltic concrete to Johnson Constr. Co., 38 South Dearborn St., Chicago, $193,896.

Lake Co., Sect. "J" Chardon-Madison Rd., 2.33 mi., grading, constructing bridges and culverts and paving with rein.-con., to Elias, Bates & Keiner, Madison, $58,514.

Logan Co., Sect. "C" Bellefontaine-Lima Rd., 1.27 mi., grading, constructing bridges and culverts and paving with rein.-con., to McHugh Bros., Springfield, $36,846.

Sect. "E" Bellefontaine-Wapakoneta Rd., 3.22 mi., grading, constructing bridges and culverts and paving with rein.-con., to Lewis & Copeland, Lima, $95,076.

Sect. "E" Bellefontaine-Wapakoneta Rd., 3.05 mi., grading, constructing bridges and culverts and paving with rein.-con., to Lewis & Copeland, Lima, $117,009.

Sect. "G" Bellefontaine-Wapakoneta Rd., 3.69 mi., grading, constructing bridges and culverts and paving with rein.-con., to C. F. Smith, Dayton, $113,267.

Madison Co., Sect. "D" National Rd., 2.47 mi., grading, constructing bridges and culverts and paving with bituminous macadam, to Billiter & Connell, Dayton, $47,517.

Sect. "A-2" Columbus-Cincinnati Rd., 5.92 mi., grading, constructing bridges and culverts and paving with bituminous macadam, to Billiter & Connell, Dayton, $146,856.

Montgomery Co., Sect. "N" Dayton-Indianapolis Rd., 2.67 mi., grading, constructing bridges and culverts and paving with rein.-con., to C. Hoolihan, Dayton, $92,572.

Sect. "N-2" Dayton-Indianapolis Rd., .38 mi., grading and paving with rein.-con., to C. Hoolihan, Dayton, $23,666.

Seneca Co., Sect. "Q" Lima-Sandusky Rd., 1.22 mi., grading, constructing bridges and culverts and paving with bituminous macadam, to Stone & Herl, Lima, $13,996. Noted July 17.

★**O., Columbus**—Franklin Co. let contract grading, building drainage structures and paving with macadam, 10.61 mi. Alkire Rd., 18 ft. wide, to Harness-Renick Co., Williamsport, $165,611.

★**Mich., Detroit**—City let contracts to Detroit Asphalt Paving Co., 20 McGraw Bldg., paving Kilick Ave., cost $20,000; Konkel Ave., $17,181; Kopernik Ave., $30,174; Canfield Ave., $6223; Fairview Ave., $25,091; Griffin Ave., $13,367; Gladstone Ave., $13,342; Hurlbut Ave., $35,330; Harper Ave., $25,955; Platt St., $6981. Noted July 17.

Mich., Detroit—City received only bid paving 10th St from Military to Water Sts., 30 ft. wide, rein.-con., from J. H. Baker & Sons, Port Huron, $81,448. Work involves 31,700 sq.yd. paving, at $1.95 per sq.yd. 15,850 cu.yd. excav., $0.50, 500 lin.ft. 8 in. sewer, $0.85, 300 lin.ft. new concrete curb, $0.65, 800 lin.ft. old curb to reset, $0.25, etc.

Mich., Detroit—City received bids from J. H. Baker & Sons, Port Huron, paving 22nd St. from Griswold to Railroad Sts., 28 ft. wide, and Railroad St., entire length, 24 ft. wide, concrete, $28,407; Griswold St. from Military St. to railroad tracks east of 4th St., 26 ft. wide, brick on concrete foundation, $6336; Stone St. from State to Garfield Sts., 30 ft. wide, concrete, $21,797; 10th Ave. from River St. to Pine Grove Ave., 30 ft. wide, concrete, $40,815; Park St. from Huron Ave. to Erie St., 30 ft. wide, concrete, $6849. Work involves 15,890 cu.yd. excav., 1250 lin.ft. 8 in. sewer, 5700 lin.ft. side drain, 6500 lin.ft. new curb, 35,945 sq.yd. paving and 27,080 sq.yd. reinforcing, etc.

Mich., Detroit—City received bids paving following alleys with 1 course concrete. (a) No. 1037, (b) No. 1038, (c) No 1039, (d) No. 1040, (e) No. 1041, (f) No 1042, (g) No. 1043, (h) No. 1044, (i) No. 1045, from T. E. Currie, 20 McGraw Bldg., (a) $7295; R. J. Powelson Co., 1577 Iriquois Ave., (a) $7752, (b) $5686, (c) $5193, (d) $3842, (e) $2157, (f) $5320, (g) $3479, (h) $3312, (i) $3057; Otis Cement Constr. Co., Hammond Bldg., (a) $7711, (b) $5686, (c) $5193, (d) $3912, (e) $2063, (f) $5287, (g) $3389, (h) $3220, (i) $2936; Lennane & McIlvenna, 1205 Book Bldg., (b) $5671, (c) $5043, (d) $4018, (f) $5539; Talbot Co., 400 Penobscot Bldg., (e) $2109, (g) $3563, (h) $3231, (i) $3222. Noted July 17.

Mich., Port Huron—City received bid grading, draining, curbing and paving Lapeer Ave. from 16th to 24th Sts., et al., 28 ft. wide, brick on concrete foundation, from J. H. Baker & Sons, on 6 in. concrete base, 5200 lin.ft. concrete curbing, 5200 lin. ft. side drain, 4000 cu.yd. excav. and 680 cu.yd. earth fill. Former contract rescinded. Noted Apr. 3.

★**Ill., Springfield**—Sangamon Co. let contract building 8 mi. concrete road, 18 ft. wide, to H. W. Horst Co., Horst Bldg., Rock Island. About $200,000.

★**Ill., Vandalia**—Fayette Co. let contract building 8 mi. concrete roads, 18 ft. wide, to H. W. Horst Co., Horst Bldg., Rock Island. About $225,000.

Streets and Roads (Continued)

★**Wisconsin**—State Highway Comn., Madison, let contracts to E. L. Peterson, 6014 Oakes Ave., Superior, grading Black River Rd., Superior Twp., Douglas Co., and removing dam at Black River Bridge, cost $10,818; H. Schroetter, Jim Falls, grading, Sand Creek Colfax Rd., Sand Creek Twp., $320, Wheeler-Prairie Farm Rd., Hay River Twp., $1590, Menominee-Colfax Rd., Red Cedar Twp., $916; Oftsie & Mulheron, Spring Valley, grading Menominee-Hudson Rd., Menominee Twp., $2650, Menominee-Hudson Rd., Lucas Twp., $1048; I. L. Harmon, Boyceville, grading Boyceville-Menominee Rd., Sherman Twp., $2262, Boyceville-Menominee Rd., Stanton Twp., $1289, Boyceville-Menominee Rd., Tiffany Twp., $2321; all in Dunn Co. Noted June 12.

★**Wisconsin**—State Highway Comn., Madison, let contract improving Grand Rapids-Plover Rd., Federal Aid Project No. 26, Wood Co., to F. Bossert, Grand Rapids, 7951 cu.yd. earth excav., $.50 per cu.yd., 180 cu.yd. borrow excav., $.50 cu.yd., 9387 sq.yd. concrete surfacing, $1.98 sq.yd., 60 cu.yd. concrete culverts, $20 cu.yd., etc., total cost, $59,232; Spooner-Rice Lake Rd., Federal Aid Project No. 90, Washburn Co., to A. E. Kennedy & Co., Shell Lake, .82 acres clearing and grubbing, $80 per acre, 40 cu.yd. earth excav., $.49 cu.yd., 47 cu.yd. borrow excav., $1 cu.yd., etc., total cost, $24,996.

★**Wis., Plymouth**—City let contract grading and paving 2 3 mi. Reed and Selma Sts., 18-20 ft. wide, to Murphy Constr. Co., 8th St., Manitowoc, $67,806. Noted July 3.

Wis., Racine—City received only bid paving 17th St., involving 10,700 sq.yd pavement and 5770 lin.ft. curb and gutter, from J. Cape & Sons Co., Water St., barr block, $3.44 per sq.yd., vertical fibre brick, $3.19 per sq.yd., curb and gutter, $.82 per lin.ft., total cost $40,000; Austin Ave., from Western Impvt. Co., Racine, 2000 sq.yd. asphaltic pavement, $2.50 per sq.yd. and 1250 ft. curb and gutter, $.85 per ft. Noted Feb. 20.

★**Minn., Duluth**—City let contracts paving 466 ft. 3rd St., involving 25,818 sq.yd. asphalt, 14,936 lin.ft. concrete curbing, 6830 cu.yd. earth excav. and 3156 ft. 12-19 in. sewer pipe, to D. H. Clough & Co., 914 East 1st St., $136,737; 2535 ft. House St., 2688 sq.yd. concrete, 2250 cu.yd. earth excav., 1535 cu.yd. tile pipe and 2738 ft. 3 in. drain tile, Hedberg & Olson, 313 21st Ave., W. Noted July 3.

★**Minn., North Mankato**– Village let contract building sanitary sewerage system, involving 2500 ft. mains, 2 pumping stations, etc., to F. A. Webster, St. Paul, about $51,000. Noted June 19.

★**Minn., Rochester**—Comrs. Olmstead Co. let contract building 7 mi. Job No. 1908, State Rd. No 2, 24 ft. wide, to A. Guthrie & Co., 366 Jackson St., St. Paul, $52,056. Noted July 3.

★**Minn., St. Paul**—City let contract paving Como Ave. between Rice St. and Great Northern Bridge, to Brooks Bros., 1923 University Ave., $80,734. Noted July 10.

★**Kan., Burlington**—City let contract paving various streets, involving 58,069 sq.yd. vertical fibre brick and asphaltic concrete, to J. K. Shinn, Burlington. About $225,000. Noted June 26

★**Kan., Ellsworth**—City let contract paving Douglas St., involving 13,885 sq.yd. 3 in. vertical fibre brick, to R. M. Ammerman, Salina, $54,509. Noted June 26.

★**Kan., Kansas City**—Wyandotte Co. let contract building 2½ mi. Fort to Fort Highway, 18 ft. wide, to A. Turner, Rosedale About $68,611.

★**Kan., Lawrence**—Douglas Co. let contract building Sect. A of Fort to Fort Rd., 18 ft. wide, vertical fibre paving and concrete curbing, to Cook-O'Brien Constr. Co., 308 Ry. Exch. Bldg., Kansas City, $117,051; Sect. G, to J. O. Patterson Co., 1008 Walnut St., Kansas City, $206,391. Noted June 19.

★**Kan., Marysville**—City let contract paving various streets, involving 70,000 sq.yds. vertical fibre brick, 28,700 lin.ft. curbing and guttering and 15,000 cu.yd. grading, to Metropolitan Paving Co., 114 South 5th St., St. Joseph, Mo. About $309,000. Noted June 26.

★**Neb., Kearney**—Comrs. Buffalo Co. let contract grading 20.4 mi. Kearney-Pleasanton Rd., Project No. 73, to A. S. Cook, Ottawa, Kan., $.37 per cu.yd.; total cost, $61,000. Noted June 12.

★**Montana**—State Highway Comn., Helena, let contract improving 6.13 mi. Grass Range-Roundup Rd., Sect. No. 1, to O'Neil & McIsaac, Lewistown, $18,881. Noted Jan. 23.

★**Mont., Bozeman**—City let contract to Warren Constr. Co., Journal Bldg., Portland, Ore., paving 5th and 7th Aves., $21,-299; College St. from 8th to 11th Aves., $12,902; Lindley Pl. and Olive St., $13,485; 6th Ave. from Story to College Sts., $15,-774; Koch St., from 3rd to 6th Sts., and 7th Ave. from Dickerson to College Sts., $17,418, all bitulithic pavement. Noted June 5 and 19 and July 10.

★**Mo., St. Louis**—City let contracts to Granite Bituminous Co., Ry. Exch. Bldg., paving 3490 ft. Arlington St., bituminous concrete, granite curbing, cost $51,229; 2300 ft. Emerson St., bitulithic, granite curbing, $40,093; 1170 lin.ft. Sherman Pl., bitulithic, concrete curbing, $11,081; 1325 lin.ft. Terry Ave., bitulithic, concrete curbing, $18,226; 1710 lin.ft. North and South Reber and Reber Pl., bitulithic, granite curbing, $33,460; 480 lin.ft. Portis Ave., bitulithic, granite curbing, $6815.

★**Mo., St. Louis**—City let contracts paving various alleys to T. C. Cavanaugh, 6426 Oakland Ave., cost $13,737; F. A. Stiers, 4512 Enright St., $12,107; J. F. McMahon Constr. Co., Title Guarantee Bldg., $9129; Eyermann Constr. Co., 1216 South Grand St., $23,777; J. E. Parkinson, $3135.

★**Tex., Fairfield**—Freestone Co. let contract gravel surfacing 10.04 mi. Highway No. 7 from Limestone Co. line to Teague, 15 ft. wide, to McElwrath & Rogers, Corsicana, $74,283. Noted July 17.

Tex., Montague—Montague Co received bids gravel surfacing 9.84 mi. Meridian Highway from Bowie to west county line, from Cobb & Kenkins, Dallas, $47,494, Harris & Alexander, Dallas, $53,797, Womack Constr. Co., Dallas, $54,746. Noted July 10.

★**Tex., Seymour**—Baylor Co. let contract grading 12.35 mi. Highway No. 30 from point 3 mi. southwest of Seymour to west county line, 24 ft. wide, to A. A. Harrison, Seymour, $13,997. Noted July 17.

★**Washington**—State Highway Bd., Olympia, let contracts paving with concrete 3 mi. Hoquiam Northwest Rd., to Grays Harbor Constr. Co., Hoquiam, $76,954; 3.3 mi. Camas-Ellisworth Rd., to Pacific Bridge Co. foot of Salmon St., Portland, Ore., $86,572; 3 mi. Parker-Donald Sect., Inland Empire Highway, Yakima Co., to A. L. Clarke & Co., Yakima, $95,889; 4 2 mi. Elma-Satsop Rd., to Aberdeen Paving Co., Aberdeen, $118,690. Noted July 3.

★**Washington** — State Highway Bd., Olympia, let contract building 6.4 mi. Sunset Highway, from Renton to Issaquah, King Co., to Kaiser Paving Co., 923 Joshua Green Bldg., Seattle, cost $181,175; 3.2 mi. Sunset Highway, from Waterville west, Douglas Co., to O. H. Mohr Constr. Co., Waterville, $19,737; 3.6 mi. Pacific Highway from Bellingham south, Whatcom Co., to J. W. Hoover & Co., Everett, $106,075. Noted June 26.

★**Wash., Asotin**—Anatone Highway Dist. let contract building 14 mi. highway beginning at Anatone and extending to top of Asotin grade, to G. L. Stickler, Tacoma, $7000 to $8000 per mi.

★**Wash., Centralia**—City let contract paving 17 blocks, to Allred, James & Hendricks, and Albers & Son, $36,747. Noted July 17.

★**Wash., Seattle**—Bd. Pub. Wks. let contract paving 3 mi. Thorndyke Ave. et al., 17 ft. wide, to Kaiser Paving Co., Green Bldg., $134,358. Work involves 25,050 sq. yd. concrete, 11,800 lin.ft. concrete curbing and guttering, 12,700 cu.yd. earth excav., 5900 cu.yd. subgrade and 3746 lin. ft. clay sewer pipe.

★**Wash., Aberdeen**—City Council let contract paving and building concrete walks on 7 blocks of Wishkah St. from K to Washington Sts., 48 ft. pavement and 8 ft. walks, to Aberdeen Paving Co., Aberdeen, $52,517. Noted June 12.

★**Oregon**—State Highway Comn., Portland, let contracts grading and draining ⅓ mi. Senfert Sect., Columbia River Highway, Wasco Co., to United Contg. Co., North West Bank Bldg., Portland, $19,355; also 13.1 mi. Salem-Dallas Sect., Pacific Highway, Polk Co., to O. Huber, Sherlock Bldg., Portland, $320,742. Noted July 10.

Oregon—State Highway Comn., Portland, received bids July 8, paving 10.5 mi. Westport-Clatskanie Sect., Columbia River Highway, from Warren Constr. Co., Journal Bldg., Portland, bitulithic and concrete pipe, $234,958, Pacific Bridge Co., foot of Salmon St., Portland, bithulithic and concrete pipe, $242,970; also grading 6.3 mi. Oregon City-Oswego Rd., Clackamas Co., from Palmer & Young, 143 West Park St., Portland, concrete pipe, $43,072, iron pipe, $43,090; Lyons & Son, concrete or iron pipe, $48,072; C. J. Cook, concrete pipe, $49,927; grading 12 mi. Unit No. 3, John Day Highway, Grant and Wheeler Counties, from O. Huber, Sherlock Bldg., Portland, $165,731. Noted July 10.

★**Oregon**—State Highway Comn., Portland, let contracts grading 13 mi. Unit No. 1, Fossil-Dayville Sect. John Day Highway, Wheeler Co., to Copenhagen Bros., Henry Bldg., $183,570; 16.7 mi. Burns-Lawen Sect. Central Oregon Highway, Harney Co., to Pacific Bridge Co., foot of Salmon St., Portland, $126,567; 4.4 mi. Canyon Sect., Baker-Cornucopia Highway, Baker Co., to Morrison-Knudson, Boise, Idaho, $52,785. Noted July 10.

Oregon—State Highway Comn., Portland, received bids paving with bitulithic (a) 6.1 mi. Unit No. 1 and (b) 6.1 mi. Unit No. 2, Eungene-Junction City Rd., section Pacific Highway, Lane Co., from Clarke & Henry, Portland, (a) $113,312, (b) $122,192; Warren Constr. Co., Journal Bldg., Portland, (a) $126,285, (b) $125,413, R. O. B. shoulders, $130,613, broken stone shoulders. Noted July 10.

Oregon—State Highway Comn., Portland, received bids July 8, paving (a) 9.5 mi. Rock Creek-Westport Sect., (b) 8 mi. Svensen-Rock Creek Sect., Columbia River Highway, Clatsop Co., from Pacific Bridge Co., foot of Salmon St., Portland, (a) $197,151 (b) $180,590. Warren Constr. Co., Journal Bldg., Portland. (a) $192,356, (b) $177,605. Noted July 10.

★**Oregon**—State Highway Comn., Portland, let contract grading and paving 3.4 mi. Canyon-Beaverton County Line Rd., Washington Co., to Warren Constr. Co., Journal Bldg., $103,099; 2.5 mi. Stage Rd. Pass Sect. Pacific Highway, to Joplin & Eldon, Portland, $16,425. Noted July 10.

Ore., Portland—City received bids paving (a) portions of Romona Ave., (b) 77th St., (c) East 61st St., (d) East 72nd St., (e) Sherman St., (f) East Madison St., (g) East 53rd St., from Warren Constr. Co., Journal Bldg., (a) $67,364, (c) $11,960, (e) $2054, (f) $1393, (g) $1951; Cochran Bros., Portland, (a) $74,324, (e) $1998, (g) $1019; Botrick & Cline, Portland, (b) $15,982; S. Brown, Portland, (d) $7173, (f) $1050; S. Simonsen, Portland, (d) $7399. Noted July 10.

★**California**—State Highway Comn., Forum Bldg., Sacramento, let contracts building 2.8 mi. road between Freshwater Lagoon and Orick, Sect. J, Route 1, Div. 1, Humboldt Co., to J. Wilmshurst, San Francisco; 7.9 mi. road between Last Chance Slide and Cushion Creek, Sect. B, Route 1, Div. 1, Del Norte Co., to Palmer & McBride, Hooker & Lent Bldg., San Francisco. Noted June 5.

★**Cal., Eureka**—City let contract curbing, paving and building sidewalks and sewers in Bway. and 4th St., to Federal Constr. Co., Call Bldg., San Francisco. $312,239. Work involves 16,361 lin.ft. each of concrete curbing and sidewalk, 685,593 sq.ft. 2 in. bitulithic pavement, 76,177 sq.yd. 5 in. concrete base, 6354 lin.ft. terra cotta and 151 lin.ft. concrete sewer and 75 lin.ft. 24 in. concrete pipe.

★**Cal., Exeter**—City let contract grading, paving, curbing, guttering and building sidewalks and catchbasins in 15 blocks F St., et al., to Federal Constr. Co., Call Bldg., San Francisco, $90,000. Work involves 5950 lin.ft. concrete curbing, 6500 lin.ft. concrete gutter, 11,725 sq.ft. concrete sidewalk, 1302 sq.yd. 1½ in. asphalt on 4 in. concrete base. Noted June 19.

Cal., Los Angeles—Bd. Pub. Wks. received bids building 4½ mi. highway from here to San Pedro Harbor, known as Municipal Impvt. Dist. No. 7, 20 ft. wide, from P. L. Ferry, 614 Acacia St., Glendale, $159,931; Tyron & Brain, Merchants Trust Bldg., $159,930. Noted Mar. 27.

Streets and Roads (Continued)

★**Cal., Martinez**—Bd. Supervs. Contra Costa Co. let contract paving extension of 3rd St., east from Pittsburgh, to G. Cushing, 2005 Roosevelt St., Richmond, $11,456.

★**Cal., Oxnard**—City let contract to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, for 8500 lin.ft. 4 in concrete paving, with 1½ in. asphalt concrete surface, 60 ft. wide; 9000 lin.ft. 4 in. bituminous base with 1½ in. asphalt concrete surface, 50 ft. wide; concrete curbs and gutters on both sides of streets and 7 corrugated iron and concrete culverts About $250,000.

★**Cal., Reedley**—City let contract grading, paving, curbing, guttering and building sidewalk on G and 11th Sts., et al., to Federal Constr. Co., Call Bldg., San Francisco, $204,300. Work involves 18,653 lin ft. each of concrete curb and gutter, 12,000 cu.yd excav., 3750 ft. arch culverts, 556,250 sq.ft 1½ in. bitulithic pavement, 123,000 sq.ft. shoulders, 61,805 sq.yd. 5 in. concrete base, and 27 ft. rein.-con. bridge and extensions to 3 bridgs. Noted June 12.

Cal., Riverside—Comrs Riverside Co. rejected bids improving Archibald Ave. and Cloverdale Rd., involving 543 cu.yd. grading, 3367 lin.ft. shaping roadbed, 831 cu.yd. concrete paving with alternate for 53,878 sq.ft. oil macadam paving; also improving Ontario Ave., 587 cu.yd. grading, 1700 lin. ft shaping, 419 cu.yd. concrete paving with alternate for 27,300 sq.ft. oil macadam paving. Work will be done by day labor.

★**Cal., Salinas**—City Council let contract to Granite Rock Co., Watsonville, paving Market St., $15,754, Soledad St., $10,999, Pajaro St., $8078 and Cayuga St. $7681, to W. A. Dontanville, Arroyo Grande, North Main St., $20,439, California St., $14,306; macadam pavement, concrete curbs and gutters.

★**Cal., San Diego**—A. H. Wright, city clk., let contract improving portions of India, Pierce, California and Taylor Sts., and San Diego Ave., 5194.31 lin.ft. in all, to Fairchild-Gilmore-Wilton Co., 25 14th St., $88,807. Noted July 3.

★**Cal., Sonora**—City Trustees let contract paving several streets, to A. Teichert & Son, Ochner Bldg., Sacramento, $33,846.

★**N. S., Halifax**—City let contract paving portions of 22 streets with bituminous concrete, to Canadian Bituminous Paving Co., Toronto, Ont. About $800,000. Noted July 3.

★**Que., Montreal**—City let contract improving Sherbrooke St., between Hampden and Mayfair Sts., bituminous macadam on concrete base, to Quinlan & Robertson, 260 St. James St. About $85,656.

Que., Ste. Rose—Dept Highways, Quebec, let contract building 5 mi. Provincial Highway, macadam, to O'Connors, Ltd., 204 St. James, Montreal. About $22,000. Noted Apr. 24.

★**Que., Val Jalbert** — Dept. Highways, Quebec, let contract building 2¾ mi. macadam road, here, to Provincial Eng. Co., 83 Craig St., W., Montreal. About $12,000.

★**Ont., Welland**—City let contract building 3 mi. Main and Ontario Rd., waterbound macadam, Crowland Twp., to Somerville & Delworth, $18,544.

★**B. C., Vancouver Island**—Dept. Pub. Wks., Victoria, let contract grading and paving 1 mi. Island Highway from Craigflower Bridge to Parsons Bridge, 16 ft. wide, with concrete, to Palmer Bros., 929 Main St., Vancouver. About $75,000. Noted June 5.

Railways

PROPOSED WORK

Michigan—Detroit, Bay City and Western Ry., Bay City, having surveys made for 40 mi. line to extend steam railway service to Marine City. W. Boyd, ch. engr.

Nova Scotia—Nova Scotia Tramways & Power Co., Halifax, received permission from Pub. Utilities Comn. to issue $2,000,000 gold coupon notes and plans to expend $1,000,000 this year to extend and improve tramway lines.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Nova Scotia** — Canadian Natl. Rys., Moncton, N. B., let contract grading 9.13 mi. double track line from Springhill Jct. to Maccan, to McLean & Wheaton, Halifax; 7.57 mi. additional main lines from Truro to Debert, to F. G. Jones, Sydney. Noted July 10.

★**New Brunswick**—Canadian Natl. Rys., Moncton, let contract grading 3.35 mi double track cut off at Moncton Yards, to McLean & Wheaton, Halifax, N. S. Noted July 10.

★**Quebec**—Canadian Natl. Rys., Moncton, N. B., let contract for 4 mi double track diversion between St. Rosalie and Charlotte, to O'Brien & Doheny, 211 McGill St., Montreal. About $57,000. Noted July 10.

Excavation and Dredging

PROPOSED WORK

Mass., Gloucester—Dredging—Harbor & Land Comn., Boston, soon lets contract building dolphin involving 37,000 cu.yd earth and 300 cu.yd. ledge excav. W. F. Williams, 473 State House, Boston, engr Noted May 29.

Fla., Miami—Drainage Comrs Dade Co having surveys made by C. E. Lee and C. H. Miller, Goulds, and H. R. Cone, Homestead, for draining 3000 acres east of Goulds.

Miss., Lake Cormorant—Drainage—Lake Cormorant D. D. receives bids in about 2 months for 92 mi. open drainage channels in Tunica and De Soto counties, 12 to 32 ft. base, 8 ft deep, involving 3,453,400 cu.yd. floating and dryland excav. About $600,000. Morgan Eng. Co., Goodwyn Institute Bldg., Memphis, Tenn., engrs.

Minn., Slayton—Ditches—Comrs. Murray Co. plan to build numerous drainage ditches. P. L. Minder, Slayton, engr.

Utah, Benjamin—Drainage—Benjamin D. D. having surveys made for drainage system of 5000 acres of alkali land. About $150,000. Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs.

Utah., Delta—Drainage—Millard D. D. No. 4 having surveys made for drainage system to comprise about 10,000 acres, involving 600,000 lin.ft. 6-20 in. tile and 175,000 lin.ft. open canal. About $300,000. Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs.

Utah, Hinckley—Drainage—Millard D. D. No. 1 having surveys made for drainage system to comprise about 5000 acres, involving 300,000 lin.ft. 6-18 in. tile, and 87,500 lin.ft. open canal. About $200,000. Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs.

Utah, Ogden—Drainage—Weber Co. D. D. No. 1 having surveys made laying tile and building open channels for draining 1500 acres. About $55,000. Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs.

Utah, Provo — Drainage—Lake Shore North D. D. having surveys made for drainage system to comprise about 1000 acres land. About $20,000. Caldwell & Richards, Salt Lake City, engrs.

Utah, Salt Lake City—Irrigation—Davis Co. Irrigation Co. plan to build pumping plant to irrigate 5000 acres. About $25,000.

Wash., Centralia—Irrigation Lewis Co election Aug. 4, to vote on $60,000 bonds to establish irrigation district on Ford and Waunch Prairies, comprising approximately 14,000 acres.

Cal., Oakland—Drainage—See "Sewers."

Cal., North Berkeley—Excavation See "Waterworks."

B. C., Summerland — Irrigation—Town Council soon receives bids building laterals and extensions to irrigation system. About $75,000. A. Fawkes, engr.

BIDS DESIRED

N. Y., Brooklyn—Dredging—Until July 30, by E. Riegelmann, boro pres., dredging Wallabout Canal from Hewes St. to point 1500 ft. north of Hewes St.

N. J., Newton—Excavation—See "Streets and Roads."

Minn., Virginia—A. C. Bickford, city clk., receiving bids building Tuebreak Ditch, 10 ft. across, 4 ft. deep, 1 mi. long.

Utah, Salt Lake City—Drainage—Until Aug. 1, by Brighten D. D., improving drainage system, involving 313,000 lin.ft. 6-15 in. tile. 313,000 lin.ft. trenching and backfilling, and 35,000 cu.yd. open drains. Caldwell & Richards, Vermont Bldg., engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ill., Morrisonville** — Excavation — Bd. Educ. let contract excavating and building concrete footings and brick foundation walls for school, to H. O. Hirsch, Wainwright Bldg., St. Louis, Mo., $34,095.

Minn., Duluth—See "Streets and Roads."

★**Utah, Fillmore** — Drainage — Millard Drainage Dist. No. 3, Delta, let contract furnishing and placing 2,803,860 lin ft 5-20 in. tile, involving 1,380,000 cu.yd open canal excav., and 2,800,000 lin.ft. trenching and backfilling, to B. A. Foley & Co., Aiken, Minn., $1,500,465.

★**Utah, Provo**—Drainage—Utah Co. D. D. No. 1 let contract furnishing and laying 159,250 lin.ft. 6-12 in. tile, involving 159,250 lin.ft. trenching and backfilling, and 73,000 cu.yd. open canal, to Heusser-Packard Co., Atlas Blk., Salt Lake City, $90,168.

Wash., Okanogan—Irrigation—State Irrigation Bd. received bids building irrigation project in Whitestone Dist., comprising 15,000 acres, from J. A. Morrison, Loomis, $161,800; Nettleton-Bruce-Esbach, Spokane, $170,000.

★**Wash., Vancouver** — Drainage — About 100 property owners of Clark Co. plan to reclaim 9000 acres by draining Shallow Pool and Vancouver Lake. Cost about $600,000, part of which will be borne by county. Work will be done under supervision of G. J. Posky, Kelso Bank Bldg. Kelso, co. drainage engr.

Industrial Works

PROPOSED WORK

Mass., Holyoke—G. P. B. Alderman & Co., archt., Alderman Bldg., soon receives bids building 2 story, 60 x 75 ft., brick and concrete, dairy plant, rein.-con. flooring, concrete foundation, on Beech and Sargent Sts., for Hall's Dairy, Inc., 11 Brooks Ave. About $30,000. Noted July 19.

Mass., Lynn—Davis Storage Battery Mfg. Co., 468 Chestnut St., plans to build addition to factory. About $150,000.

Mass., Millbury—Mayo Woolen Co. plans to alter and build addition to plant. About $60,000. J. R. Greenwood, agt. Architect not selected.

Mass., Pittsfield—G. E. Haynes, archt., 184 North St., preparing plans for 1 story, 75 x 150 ft. brick and concrete garage, rein.-con. flooring, concrete foundation, on South St. About $30,000. Owner's name withheld.

Mass., Springfield—Republican Co., Main St., plans to build modern fireproof printing plant on Cypress and Boylston Sts About $100,000. Architect not selected.

Mass., Worcester—J. W. Gumbleton, 512 Southbridge St., plans to build 2 story laundry. About $35,000. Architect not selected.

Mass., Worcester—Lockwood, Greene & Co., engrs., 93 Federal St., Boston, soon receive bids altering and building steel and concrete addition to plant of Crompton & Knowles Loom Wks., on Grand St. About $25,000.

Conn., Bridgeport—Fletcher, Thompson, Inc., engrs., 1089 Broad St., soon receive bids building 2 story, 20 x 150 ft. brick and mill construction addition to factory, on Iranistan Ave., for Bridgeport Hardware Mfg. Co., 461 Iranistan Ave.

Conn., Hartford—Ford, Buck & Sheldon, engrs., 60 Prospect St., soon let contract building 2 story, 50 x 200 ft., brick and steel addition to factory, concrete foundation, on Hawthorne St., for Arrow Electric Co., 99 Hawthorne St. About $40,000.

Conn., Hartford—Hartford Rubber Wks., Bartholomew Ave., plans to build two 6 story, 100 x 200 ft. rein.-con. additions. Lockwood, Greene & Co., 93 Federal St., Boston, engrs.

Conn., Rockville—J. Zaugg, 73 Talcott Ave., plans to build 1 story garage and showroom. About $25,000. Architect not selected.

Conn., South Norwalk—Nash Eng. Co., Wilson Rd., plans to build 3 story brick and mill construction addition to factory, rock foundation. About $30,000. Private plans.

N. Y., Batavia—Batavia Rubber Co., Robertson and Maple Sts., plans to build several brick and concrete additions to plant. About $60,000.

N. Y., Canandaigua—Common Council plans to build ice making plant About $60,000. Address Bd. Pub. Wks.

Industrial Works (Continued)

N. Y., Niagara Falls—Niagara Falls Gas & Electric Light Co., 306 Niagara Wks., Riverway, soon lets contract building gas plant on Buffalo Ave. and 22nd St., to include 7 buildings, concrete, brick and steel. About $200,000. A. H. Merritt, supt.

N. Y., Oswego—Kirk-Maher Co., 59 West Main St., Malone, ice cream manufacturers, purchased O'Keefe Bldg., here, and plans to remodel and build addition to same for its own use. Cost between $25,000 and $30,000

N. Y., Penn Yan—Nestle's Food Co., 130 William St., New York City, purchased milk station on Jacob St., here, and plans to rebuild same. About $45,000.

N. Y., Troy—Troy Boiler Wks., 7th Ave., plans to rebuild plant. Cost between $25,000 and $35,000 Address J. M. Kelley, 7th Ave. and North St.

N. J., Harrison—Driver-Harris Co., c/o Lockwood Greene Co., archts., 101 Park Ave., New York City, having plans prepared for 3 story, 50 x 100 ft., rein.-con., pared for 3 story, 50 x 100 ft., rein.-con., flooring, concrete foundation. About $50,000.

N. J., Newark—E. F. Hauser, archt. and engr., Union Bldg., soon receives bids for 4 story, 30 x 120 ft., brick and steel factory, at 282 Springfield Ave., for Bernstein Furniture Co., 279 Springfield Ave. Cost between $50,000 and $60,000.

N. J., Passaic—Genl. Silk Importing Co., c/o Lockwood Greene Co., archts., 101 Park Ave., New York City, having plans prepared for rein.-con. factory, rein.-con. flooring, concrete foundation, covering 100,000 sq.ft. floor space. About $200,000.

Pa., Hazleton—A. J. Corey, c/o Boston Shoe Store, having plans prepared by C. R. Rineheimer, archt., 10 Airy St., Wilkes-Barre, building 2 story, 50 x 150 ft., rein.-con., steel and brick garage, rein.-con flooring, concrete foundation, on Broad St. About $52,000.

Pa., Phila.—Tuttleman Bros., 406 Race St., soon receive bids for making interior alterations to factory, using brick, steel and concrete. About $60,000. H. B. Weldon, 10 South 18th St., archt.

Pa., Shickshinny—J. D. Woodworth Main St., plans to build 2 story, 70 x 140 ft. concrete, steel and brick garage, concrete foundation. About $65,000. Architect not selected.

Pa., Wilkes-Barre—Atlantic Refining Co., Keokuk, Ia., plans to build 30 x 90 ft. brick, concrete and stone service station, concrete foundation, on Carey Ave and Lockhart St., here. About $70,000. Architect not selected

Pa., Wilkes-Barre—A. Salem, Blackman St., having plans prepared by C. R. Rineheimer, archt., 10 Airy St., building 3 story, 30 x 80 ft., concrete, steel and brick warehouse, concrete foundation. About $50,000.

Md., Baltimore—See "Buildings."

Md., Baltimore—Shapiro & Roney, Pratt St. and Fremont Ave., plans to build 2 story, 75 x 178 ft., brick and rein.-con. warehouse, concrete foundation. About $65,000. E. G. Blanke, 213 N. Calvert St., archt.

W. Va., Huntington—A. Voegele & Dinning Co., 603-5 4th Ave., soon lets contract building 3 story, 80 x 150 ft., rein.-con. candy factory, rein.-con. foundation, on 7th Ave. and 7th St. About $50,000. S. L. Day, 1st Natl. Bank Bldg., archt.

Ky., Louisville—F. Avery & Sons, 7th St., having plans prepared by D. X. Murphy & Bros., archts., building 1 story, 100 x 330 ft. brick and steel, factory, brick and concrete foundation, cost $125,000; also 1 story, 100 x 150 ft. rein.-con. and steel addition to forge shop, concrete and brick foundation, $75,000.

Ky., Louisville—Mattingly-Hubbard Motor Co., plans to build 4 story, 150 x 200 ft. rein.-con steel and concrete garage, concrete foundation, to include shop, service department and sales room, etc., on 3rd St. between York and Breckinridge Sts. About $100,000.

O., Cleveland—Acme Fdry. Co., Sweeney Rd., plans to build 1 story, 75 x 100 ft., concrete, steel and brick addition to foundry, concrete foundation. About $100,000. Architect not selected.

O., Cleveland—Amer. Steel & Wire Co., Western Reserve Bldg., plans to build 1 story, 350 x 400 ft., rein.-con., steel and brick addition to factory, rein.-con. flooring, concrete foundation, on Harvard Ave. and Cuyahoga River (to be built on unit system). About $2,000,000. Private plans.

O., Cleveland—Central Ohio Paper Co., Bingham Bldg., purchased site on East 12th St. and Oregon Ave. and plans to build 5 story, 90 x 132 ft. rein.-con. steel and brick warehouse. About $75,000. Architect not selected.

O., Cleveland—O. Darst, archt., Brunson Bldg., Columbus, receives bids about Aug. 1, building 5 story, 90 x 132 ft., concrete warehouse and office building, on 12th St., here, for Central Ohio Paper Co., 212 North 5th St., Columbus. About $120,000.

O., Cleveland—B. T. and S. P. Day Co., 2394 Canal Rd., plans to build 5 story, 50 x 80 ft., concrete, steel and brick warehouse, rein.-con. flooring, concrete foundation, on Prospect Ave. and Canal Rd. About $75,000. Architect not selected.

O., Cleveland—Durable Tire & Rubber Co., 1115 Citizens Bldg., plans to build 3 story, 50 x 200 ft., concrete, steel and brick factory, on East 49th St. and Newburgh & South Shore Ry. About $500,000. Architect not selected.

O., Cleveland—Glidden Varnish Co., Madison Ave. and Berea Rd., plans to construct 4 story, 59 x 90 ft., brick, steel and rein.-con. grinding building, on Madison Ave. About $60,000. Architect not selected.

O., Cleveland—Hampton-Keller Co., Swetland Bldg., plans to remodel 4 story, 80 x 100 ft., brick and steel factory, on East 3rd and St. Clair Aves. About $60,000. Architect not selected.

O., Cleveland—Ideal Tire & Rubber Co., East 17th St. and Euclid Ave., having plans prepared by Osborne Eng. Co., archts. and engrs., 2848 Prospect Ave., for 3 story, 100 x 200 ft., concrete, steel and brick addition to factory on Warner Rd. About $125,000. Noted July 3.

O., Cleveland—Krause Battery Co., 3425 West 25th St., plans to build 3 story, 50 x 108 ft., rein.-con., steel and brick service station on West 25th St. and Scranton Rd. About $50,000. Architect not selected.

O., Cleveland—McElrath Tire & Rubber Co., 620 Union Bldg., plans to build 2 story, 60 x 200 ft., brick, steel and concrete factory and power plant, on East 131st St. About $80,000. Architect not selected.

O., Cleveland—Shuster Co., 2214 East 4th St., has acquired 6 story, 140 x 250 ft., brick and steel factory and plans to remodel same. About $100,000. Architect not selected.

O., Columbus—F. L. Packard, archt., Hayden Bldg., receives bids in about 3 weeks building 5 story, 93¾ x 187½ ft. wholesale grocery building, concrete, on Front St., for G. Bobbs & Sons Co., Main and Pearl Sts. About $200,000. Noted June 26.

O., Dayton—E. A. Brenneman, 42 Spirea Dr., organizing company to build factory for manufacture of tractors. About $100,000. including equipment.

O., Dayton—Dayton Standard Scale Co., 3103 West 3rd St., plans to build rein.-con. factory. About $40,000.

O., Dayton—Schwartz Estate, 5th and Ludlow Sts., plans to build 2 story, 120 x 190 ft., rein.-con. and brick garage and salesroom, rein.-con. flooring, concrete foundation, on West 4th St. About $100,000. Architect not selected.

O., Kent—Mason Tire & Rubber Co. having plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., Cleveland, for 60 x 90 ft. and 80 x 120 ft. addition to factory on Erie St. About $60,000.

O., Middletown—Amer. Rolling Mills Co. plans to build rein.-con., steel and brick mill. About $3,500,000, including equipment. Private plans.

O., Ravenna—Cascade Tire & Rubber Co. having plans prepared for 2 story, 175 x 300 ft. tire plant. About $65,000.

O., Troy—Cappel-Wayne Furniture Co., South Main St., Dayton, plans to build 2 or 3 story, 100 x 130 ft. warehouse, probably rein.-con., brick curtain walls, on Dayton Pike, here. Architect not selected.

O., Warren—D & M Cord Tire Co., Engrs. Bldg., Cleveland, plans to build 3 story, 80 x 120 ft., brick, steel and rein.-con. rubber plant, here. About $75,000. Architect not selected.

Mich., Detroit—Chevrolet Motor Co., 1244 Woodward Ave., soon lets contract for 1 story, 106 x 150 ft., rein.-con., brick and steel service station, rein.-con. flooring, concrete foundation, on York St., near Cass Ave. L. Kamper, 752 Book Bldg., archt.

Mich., Detroit—Fruehauf Trailer Co., 1371 Gratiot Ave., having plans prepared by Stahl & Kinsey, archts., McKerchey Bldg., for 1 and 2 story, 100 x 260 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Detroit Terminal R.R., near Deguinder St. About $100,000.

Mich., Detroit—Packard Motor Car Co., East Grand Blvd., soon lets contract for 3 story, 196 x 201 ft., rein.-con. and brick service station and garage, rein.-con. flooring, concrete foundation, on Antoine and Woodbridge Sts. A. Kahn, Marquette Bldg., archt.

Ill., Chicago—Brock & Rankin, 619 South La Salle St., plan to build 8 story, 106 x 140 ft. publishing plant on Sherman and Polk Sts. About $500,000. Architect not selected.

Ill., Chicago—Wartburg Publishing House, c/o Worthmann & Steinbeck, archts., 155 North Clark St., having plans prepared for 4 story, 68 x 130 ft. rein.-con. and brick plant, rein.-con. flooring, concrete foundation, at 2018 Calumet Ave. About $100,000.

Wis., Peshtigo—Peshtigo Pulp & Paper Co. plans to build 2 story, 70 x 178 ft., brick, rein.-con. and steel factory, brick foundation, on Main St. About $55,000. L. A. DeGuere, Grand Rapids, engr. and archt.

Wis., Sheboygan—By Wald Mfg. Co., 18th St. and Martin Ave., soon lets contract building 2 story, 80 x 194 ft. brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation on Martin Ave. Cost between $25,000 and $30,000. Private plans. Noted July 10.

Wis., Sheboygan—Chair City Broom Mfg. Co. plans to build 2 story, 90 x 110 ft. rein.-con. and brick factory, rock or concrete foundation, on 15th and Martin Sts. About $40,000. I. Perlman, pres. Architect not selected.

Ia., Council—Sinclair Refining Co., Conway Bldg., Chicago, having plans prepared building 1 story, 100 x 100 ft. warehouse and service station on Bway., between 13th and 14th St. About $30,000. W. T. Dinkins, Woodmen of World Bldg., Omaha, Neb., branch mgr.

Minn., Springfield—Co-operative Creamery Co. having plans prepared by A. Schippel, archt., Mankato, for 2 story, 52 x 66 ft., steel creamery. About $30,000.

Kan., Elkhart—City plans to improve electric light and water systems. Plans include razing of old power house and building new one. Bonds for $60,000 voted for project.

Kan., Wichita—O. J. Motor Co. rejected bids received July 8 building 5 story, 64 x 136 ft., rein.-con., steel and brick warehouse, rein.-con. flooring, concrete foundation. About $110,000. Noted July 3.

Neb., Lincoln—Henkle & Joyce Hardware Co. having plans prepared for 5 story, 50 x 100 ft. building with 2 story, 42 x 100 ft. addition, rein.-con. steel and brick, rein.-con. flooring and concrete foundation, on 8th and O Sts. About $100,000. E. Davis, Lincoln, engr.

Neb., Omaha—Nebraska Oldsmobile Co., 2559 Farnam St., receives bids about Aug. 1, building 3 story, 77 x 147 ft. automobile storage and sales building, rein.-con., brick facing and concrete foundation, on 18th and Howard Sts. About $200,000. J. McArthur, 401 Keeline Bldg., archt.

Mo., St. Louis—P. M. Adams, archt., c/o J. I. Case Threshing Machine Co., Mead St., Racine, Wis., soon receives bids building 192 x 400 ft. factory, on Forest Park Blvd. and Boyle Ave., here, for J. I. Case Threshing Machine Co., 700 South 17th St. Cost to exceed $100,000.

Mo., St. Louis—Gen. Motors Co., Flint, Mich., having plans prepared building two 3 story, 200 x 750 ft. factories, rein.-con., steel and brick, rein.-con. flooring and concrete foundation on Union St. near Natural Bridge. About $1,600,000. Buick Motors Co., archts., and W. H. Kilpatrick, engr., both of Flint, Mich.

Mo., St. Louis—St. Louis Mfg. Corp., Div. Gen. Motors Corp., 5401 Bulwer St., soon receives bids building two 3 story, 300 x 720 ft. rein.-con., steel and brick factories, rein.-con. flooring and concrete foundation at 3707-3911 Union Ave. About $808,800 each. W. H. Kilpatrick, engr., and Buick Motors Co., archt., both of Flint, Mich.

Ariz., Johnson—Keystone Copper Co., Newton, Kan., plans to build 100-ton mill, 6 mi. east of here, using flotation and concentration process at copper mines.

Industrial Works (Continued)

Wash., Seattle—Chanslor & Lyon Co., 914 East Pike St., plans to build 3 story, 120 x 121 ft. mill construction auto accessory plant, rein.-con. flooring, on 12th and Madison Sts. About $60,000. A. H. Bittman, Securities Bldg., engr.

Wash., Seattle—S. A. Hull, 2125 8th Ave., W., plans to build 4 story, 120 x 120 ft. timber warehouse, rein.-con. flooring, on Western and University Sts. About $125,000. J. Graham, L. C. Smith Bldg., archt.

Wash., Tacoma—City election Aug. 12 to vote on $300,000 bonds for purchasing site on Skokomish River and developing water power to have capacity of 75,000 h.p.

Wash., Vancouver—Clarke Co. Creamery Co. recently incorporated, with $100,000 capital stock, plans to build milk plant here, capacity, 10,000 cows. O. R. Lee, mgr. Architect not selected.

Ore., Portland—Company backed by M. Thelan, mgr. Illinois Farmers' Packing Co., and W. H. Hawthorne, both of Spring Valley, Ill., plans to build packing plant, here or near here. About $750,000. W. H. Crawford, c/o Dept. Industries, Chamber of Commerce, Portland, to investigate sites.

Ore., Portland—Franks Laundry & Dry Cleaning Co. plans to build 1 story, 100 x 100 ft., brick and tile laundry. Cost, $65,000, including equipment. H. S. Franks, mgr. L. R. Bailey, Northwestern Bank Bldg., archt.

Ore., Portland—See "Buildings."

Ore., Portland—Standard Oil Co., Astoria, having plans prepared for 1 story concrete warehouses on 100 x 100 ft. site on 5th St. and Spokane, Portland and Seattle R.R. right of way. About $50,000.

Cal., Fresno—See "Buildings."

Cal., Los Angeles—Layne & Bowler Corp., 900 Santa Fe Ave., purchased 9 acre site on 55th St. and Santa Fe Ave., and plans to build plant.

Cal., Sacramento—California Packing Corp., c/o P. Bush, engr., 101 California St., San Francisco, having plans prepared for 4 story, rein.-con. packing house on P. Q. 2nd and Front Sts. About $550,000.

Cal., Sacramento—Capitol Cracker & Candy Co., 810 2nd St., plans to build 5 story, rein.-con. and steel factory on 2nd and I Sts. About $250,000. G. Sherman, mgr.

Que., Red Mill—Canada Paint Co., 572 William St., Montreal, receives bids in August building 3 story, 40 x 60 ft., brick and steel factory, concrete foundation, here. About $42,000.

Ont., Ottawa—Grand Trunk Ry., McGill St., Montreal, Que., plans to build brick, concrete and steel storage plant here. About $70,000. H. R. Safford, Montreal, ch. engr.

BIDS DESIRED

Conn., New Britain—C. C. Palmer, archt., 272 Main St., receiving bids for 2 story, 60 x 100 ft., brick and concrete garage, rein.-con. flooring, concrete and rock foundation, for Swift & Ferguson, c/o archt. About $30,000.

N. Y., Long Island City—Until July 28, by Ballinger & Perrot, archts., 17th and Arch Sts., Phila., building 5 and 6 story, 200 x 600 ft., rein.-con. and brick factory at Degnal Terminal, for Amer. Chicle Co., 19 West 44th St., New York City. About $2,000,000.

N. Y., Long Island City—Until July 28, by C. Kreynborg, archt. and engr., 163rd St. and Park Ave., New York City, for 2 story, 200 x 300 ft. brick and steel factory, rein.-con. flooring, on Dale Rd., Washington and Union Hill Sts., for J. F. Tapley Co., Dale Rd., Jamaica.

N. J., Hackensack—See "Sewers."

Md., Baltimore—L. Rothchild, archt., 1225 Sansom St., Phila., receiving bids constructing 3 story, 40 x 110 ft. steel and stone service and sales building on North Ave. and Oak St., for Reinhardt Motor Co., here.

Mich., Detroit—A. Kahn, archt., Marquette Bldg., receiving bids for 3 story, 184 x 234 ft. rein.-con. and brick addition to factory, creosoted wood and rein.-con. flooring, and 2 story, 62 x 157 ft. rein.-con., steel and brick addition to office, rein.-con flooring, for Detroit Pressed Steel Co., Mt Elliott Ave.

Mich., Detroit—L. Kamper, archt., 752 Book Bldg., receiving bids for 2 story, 69 x 125 ft., rein.-con., steel and brick, dry kiln, rein.-con. flooring, concrete foundation, and 6 story, 144 x 236 ft. rein.-con. factory, rein.-con. flooring, concrete foundation, on Farnsworth and Riopelle Sts., for Fisher Body Co., Oakland and Piquette Aves.

Mich., Detroit—Smith, Hinchman & Grylls, archts., 710 Washington Arcade, receiving bids for 1 story, 80 x 198 ft., steel and cement stone factory, creosoted wood on concrete flooring, and concrete foundation, for Detroit Steel Products Co., East Grand Blvd.

Ill., Chicago—A. L. Alschuler, archt., 28 East Jackson St., is receiving bids for 4 story, 125 x 250 ft. brick and timber factory, concrete foundation, on Belmont and Hamlin Sts., for Florsheim Shoe Co., 541 West Adams St. About $275,000.

Minn., Duluth—Until Aug. 1, by A. Puck, archt. and engr., Tarrey Bldg., for 2 story, 75 x 280 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on 49th Ave., W., for Duluth Show Case Co., West Superior St. and 28th Ave. About $150,000.

Que., Quebec—Until Aug. 1, by E. Cormier, archt., New Birks Bldg., Montreal, building 4 story, 100 x 125 ft. concrete, steel and brick factory, concrete foundation, on St. Joseph St., for Marceau Oil Cloth Co., Quebec. About $500,000.

Ont., Toronto—Until July 31, by F. S. Saunders, archt., 672 Crawford St., building 3 story, 60 x 80 ft., concrete, steel and brick storehouse, rein.-con. flooring, concrete foundation, on Roncesvalles Ave., for S. Caufield & Son, 381 Roncesvalles Ave. About $50,000.

Ont., Walkerville—Grylls, Smith & Hinchman, archts., Washington Arcade, Detroit, Mich., receiving bids building 2 story, 60 x 337 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Walker Rd. and Seminole St., for Motor Products Co., Walker Rd., Walkerville.

Sask., Sutherland—Until Aug. 5, by R. C. Desrochers, secy. dept. pub. wks., Ottawa, Ont., for automatic lighting plant and electric wiring, etc., at Forest Nursery Sta., here.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

★**Mass., Fall River**—Keogh Storehouse Co., Darol St., will build 6 story brick and mill construction warehouse. About $100,000. Work will be done by day labor.

★**Mass., Holyoke**—Gowan Truck Co., Canal St., let contract building 2 story brick and mill construction addition to factory, concrete foundation, to Caspar Ranger Constr. Co., 20 Bond St. About $25,000.

★**Mass., Onset**—J. A. Milliken let contract building 1 and 2 story, 90 x 260 ft. and 40 x 80 ft., wood and steel canning factory, concrete foundation, to H. C. Vose, Wareham. About $125,000.

★**Mass., Springfield**—Package Machinery Co., 132 Birnie St., let contract building 2 story brick addition to factory, to F. T. Ley & Co., 499 Main St. About $28,000.

★**Mass., Turner Falls**—Esleeck Mfg. Co. let contract building 5 story, 60 x 120 ft., brick and mill construction addition to factory, concrete foundation, to Caspar Ranger Constr. Co., 20 Broad St., Holyoke. About $75,000. Noted July 10.

★**Mass., Worcester**—J. Smith & Son, 99 Hope Ave., let contract building 2 story, 60 x 212 ft. brick machine shop, concrete foundation, on Southbridge St., to E. J. Cross Co., 82 Foster St. About $38,000.

★**Mass., Worcester**—See "Buildings."

★**R. I., Woonsocket**—Barnai Worsted Co. will build 1 story, 35 x 130 ft. and 35 x 40 ft., brick and mill construction dyehouse, concrete foundation, on South Main St. About $25,000. Work will be done by day labor.

★**Conn., Bristol**—Amer. Silver Co., 2 Riverside Ave., let contract building 3 story, 32 x 190 ft. brick and mill construction addition to factory, concrete foundation, to Tracy Bros. Co., 52 Benedict St., Waterbury. About $50,000.

★**Conn., Danbury**—G. H. McLachlan Co., Thorpe St., let contract building 2 story, 36 x 72 ft. and 40 x 60 ft., brick and mill construction addition to factory, rock foundation, to L. Sweeney, 26 Montgomery St. About $25,000.

★**Conn., Hartford**—Older & Rosenberg, 1212 Main St., let contract building 4 story, 64 x 128 ft., brick, concrete and steel garage, rein.-con. flooring, concrete foundation, on Main St., to G. Cudemo, 327 Trumbull St. About $95,000.

★**Conn., Jewett City**—Ashland Cotton Co. will build 1 story 150 x 190 ft., brick and mill construction addition to mill, concrete foundation. About $65,000. Private plans. Work will be done by day labor.

★**Conn., New Haven**—Atlantic Refining Co., Turks Head Bldg., Providence, R. I., let contract building 2 story, 30 x 80 ft. warehouse and 1 story, 28 x 56 ft. garage brick and concrete, rein.-con. flooring, concrete foundation, on Albert St., to Metzger & Fisher Co., Otis Bldg., Phila. About $25,000.

★**Conn., Plainville**—Trumbull Electric Mfg. Co., Woodford Ave., let contract building 4 story, 50 x 106 ft., and 1 story, 60 x 100 ft., brick and mill factories, and 2 story, 50 x 150 ft. concrete factory, rein.-con. flooring, concrete foundation, to L. A. Miller, 22 Church St., Meriden. About $90,000.

★**N. Y., Brooklyn**—Koch & Wagner, archts., 42 Court St., let contract to Gibbons Co., 316 Columbia St., building 3 story 30 x 40 ft. rein.-con. and steel factory and storage plant, rein.-con. flooring, concrete foundation, on 19th St. and 3rd Ave., for R. H. Comey Co., 73 19th St. About $50,000. Noted June 19.

★**N. Y., Brooklyn**—B. Stephano Bros., 715 Lorimer St., will build 1 story, 50 x 100 ft. brick and steel garage, rein.-con. flooring, on Richardson and Lorimer Sts. About $25,000. Work will be done by day labor.

★**N. Y., Cohoes**—J. E. Gledhill, 541 West 34th St., New York City, let contract building 2 story, 100 x 400 ft. brick mill, here, to C. P. Boland Constr. Co., 30 4th St., Troy. About $250,000.

N. Y., Flushing—E. S. Walsh, supt. pub. wks., Capitol, Albany, received bids building barge canal terminal and timber freight house at Barge Canal Terminal, here. Contr. 43, from McHary-Barton Co., 171 Madison Ave., New York City, $151,340; Anderson & Weaver, Inc., West New Brighton, $162,341; Degnan Contg. Co., 51 East 42nd St., New York City, $165,138. Noted June 19.

★**N. Y., Middletown**—Dundee Textile Co., Clifton, N. J., let contract building 1 story, 25 x 30 and 120 x 130 ft., mill, to B. M. Higginson, Inc., Middletown. About $40,000. Noted June 19.

★**N. Y., New York**—C. Kreynborg, archt. and engr., 163rd St. and Park Ave., let contract, to I. Maifello, Williamsbridge, for 1 story, 100 x 200 ft. brick and steel factory, rein.-con. flooring, concrete foundation, on Bush and 177th St., for Finkel Umbrella Frame Co., 2534 East 137th St. About $75,000. Noted June 19.

★**N. Y., Syracuse**—United States Hoffman Co., Taylor St., let contract for 2 story, 80 x 200 ft. factory and 40 x 60 ft. power house, rein.-con. and brick, to Dawson Bros., Union Bldg., $100,000.

★**N. Y., Utica**—Foster Bros. Mfg. Co., 807 Broad St., let contract building 2 story, brick addition to plant, to Hopp & Down, about $40,000.

★**N. Y., Watertown**—L. Manfred, 126 Arsenal St., will build 1 story brick garage. About $25,000. Work will be done by day labor.

★**N. J., Hoboken**—R. Newman & Co. let contract building 2 story, 300 x 400 ft., concrete and steel addition to factory on Ferry and Willow Sts., to Rheinstein & Haas, 21 East 40th St., New York City. About $125,000.

★**Pa., Carlisle**—Lockwood, Greene Co., archts. and engrs., 101 Park Ave., New York City, let contract, to J. F. Rogers, Drexel Bldg., Phila., building 200 x 475 ft. rein.-con. and steel carpet factory, rein.-con. flooring, concrete foundation, here, for C. H. Masland & Sons, c/o archts. About $750,000. Noted June 26.

★**Pa., Phila.**—Rosenau Realty Co., 2545 North Broad St., let contract building 1 story, 125 x 151 ft., steel and brick factory, on 25th and Westmoreland Sts., to P. Hailbach Contg. Co., 1261 North 26th St. About $38,500.

Industrial Works (Continued)

★**Pa., Phila.**—Vigogne Mills, Adams Ave. and Wingohocking St., let contract building 3 story, 63 x 250 ft., brick and slow burning construction factory, on Unity and Oakland Sts., to M. W. Easly, 1420 Chestnut St. About $100,000. Noted June 19.

★**Pa., Wilkes-Barre**—Maloney Oil Co., Land Title Bldg., Phila., let contract building 2 story, 36 x 76 ft., concrete and brick warehouse and service station, concrete foundation, on Carey Ave., to H. Mailand, Barney St. About $51,000.

★**Md., Baltimore**—W. Fuld, 1228 North Central Ave., let contract building 2 story, 90 x 139 ft., brick and steel factory, rock foundation, to Consolidated Eng. Co., 243 Calvert Bldg. About $30,000.

★**Md., Canton** (Baltimore P. O.)—Eastern Rolling Mill Co., 503 Lexington St. Bldg., Baltimore, let contract erecting 1 story, 300 x 700 ft. factory, steel frame and sheet metal construction, concrete foundation, on 5th Ave., to Belmont Iron Wks., 32 Bway., New York City.

★**Md., Highlandtown** (Baltimore P. O.)—Jones & Lamb Co., Pennsylvania and Fulton Aves., let contract remodeling plant of Monumental Brewery Co., 7th and Lombard Sts. and constructing several rein.-con., steel and brick buildings, rein.-con. flooring, rein.-con. foundation, to Consolidated Eng. Co., 243 Calvert Bldg., Baltimore. About $500,000. Noted July 10.

★**W. Va., Huntington**—Sehon, Stevenson & Co., 11th St. and Chesapeake & Ohio R.R., will build 2 story, brick coffee roasting plant. About $25,000. Work will be done by day labor.

★**O., Cleveland**—Chester Realty Co., Williamson Bldg., let contract building 2 story, 55 x 120 ft., concrete, steel and brick garage, rein.-con. flooring, on East 65th St. and Carnegie Ave., to W. Stremple, 1029 Williamson Bldg. About $50,000. Noted July 17.

★**O., Cleveland**—Cleveland Metal Products Co., 1141 Ivanhoe Rd., let contracts to Craig Curtis Co., Guardian Bldg., for 3 story 72 x 266 ft. addition to machine shop, cost $75,000; 1 story, 120 x 300 ft. addition to foundry, $75,000; both rein.-con., steel and brick. Noted July 17.

★**O., Cleveland**—Sixth City Realty Co., Guardian Bldg., let contract building 4 story, 167 x 370 ft., concrete, steel and brick garage, on East 6th St. and St. Clair Ave., to C. A. Carson, 6408 Euclid Ave. About $1,300,000. Noted July 17.

★**O., Cleveland**—Union Garage Co., 517 Sloane Bldg., let contract building 2 story, 165 x 212 ft., concrete, steel and brick garage, on West St. Clair Ave., to C. A. Carson Co., 6408 Euclid Ave. About $400,000. Noted May 29.

★**O., Columbus**—D. L. Auld Co., 195 East Long St., let contract building 2 story, 45 x 390 ft. brick factory with 90 ft. wing on 5th St. and 5th Ave., to Franklinburg Constr. Co., Savings & Trust Bldg. About $55,000. Noted June 26.

★**O., Columbus**—Columbus Pharmacal Co., Oak and Columbus Sts., let contract building 3 story, 43 x 83 ft. brick warehouse, to E. Elford, 104 North 3rd St. About $60,000.

★**O., Dayton**—Air City Garage Co., 16 South Jefferson St., let contract building 3 story, 80 x 132 ft., rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on 5th and Perry Sts., to J. Lowes, Dayton. About $100,000. Noted June 5.

★**O., Dayton**—R. E. Gebhart, archt., 73 Callahan Bank Bldg., let contract to J. W. Bowen, Louis and Columbus Sts., building 3 story, 60 x 80 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Franklin St., for Custer Specialty Co., 26 North Ludlow St. About $30,000. Noted Apr. 17.

★**O., Springfield**—Springfield Baking Co., West Washington St., let contract building 2 story, 50 x 80 ft., rein.-con. and brick bakery, concrete foundation, to Cogswell Bldg. Co., Springfield. About $35,000.

★**Mich., Detroit** — Genl. Motors Corp., Boyer-Campbell Bldg., let contract for 6 story, 150 x 150 ft., rein.-con., brick and steel service and sales building, rein.-con. flooring, concrete foundation, to W. E. Wood Co., 1805 Ford Bldg. Noted June 12.

Mich., Detroit—A. Harvey Sons Mfg. Co., Woodbridge St., let contract building 6 story, 44 x 67 ft., rein.-con., brick and steel warehouse, rein.-con. flooring, piling and concrete foundation, on Woodbridge and 1st Sts., to Walbridge-Aldinger & Co., 2356 Penobscot Bldg. Noted June 26.

★**Ill., Chicago**—Straus & Schraus, 105 West 35th St., let contract building 2 story, 65 x 120 ft. mill construction warehouse, at 105 West 35th St., to E. W. Sproul Co., 2001 West 35th St. About $120,000.

★**Ill., Columbia**—Village let contract furnishing and constructing electric light and power plant to be divided in Sect. 1, building extension and machinery foundations, Sect. 2, 100 h.p. H. R. T. boiler and breeching, Sect. 3, 100 ft. x 4 in. concrete chimney, Sect. 4, 120 h.p. non-releasing Corlis or Unaflow Engine, Sect. 5, heater, boiler, feed pump, pipe work and covering, Sect. 6, direct connected A.C. generator, exciter, transformer and switchboard, to Baumes, McDevitt Machine Co., Ry. Exch. Bldg., St. Louis, Mo. About $100,000. Noted June 26.

★**Minn., Duluth**—Capitol Elevator Co., Board of Trade Bldg., let contract building 2 story, 75 x 120 ft., rein.-con., brick and steel addition to mill on Garfield Ave., to Barnett & Record Co., Lyceum Bldg. About $50,000.

★**Kan., Wichita**—A. J. Watson, 223 South Lawrence Ave., let contract building concrete warehouse, to Eberhart Constr. Co., Salina. About $115,000. Noted June 12.

★**Mo., Hermann**—Kilkenny Steel Wks. let contract building 1 story, 20 x 110 ft., rein.-con., steel and brick addition to forge shop, rein.-con. flooring, rock foundation, to Dings Constr. Co., Kansas City. About $80,000.

★**Mo., St. Louis**—Langenberg Bros. Grain Co., Chamber of Commerce Bldg., let contract building 35 x 45 ft. wharf house and 48 x 200 ft. mill, concrete, steel and brick, rein.-con. flooring, rock foundation, at 3921 North Wharf St., to Gamble Constr. Co., Gamble Bldg. About $48,000.

★**Mo., St. Louis**—Swift Packing Co., 800 Vandeventer Ave., let contract building 30 x 300 ft. addition to hoghouse, to Kellerman Contg. Co., International Life Bldg. About $41,000.

★**Wash., Seattle**—Jordan Terminal Co. let contract building 1st unit of warehouse terminal plant in industrial addition, consisting of 1 story building, covering 24,000 sq.ft. floor space, to J. A. McEachern Co., Bell St. Dock. About $50,000.

★**Ore., Portland**—U. S. Bakery Co., East 11th and Flanders Sts., let contract building 1 story, 100 x 200 ft., concrete and brick bakery, to W. Vaetz, 241½ 1st St. About $30,000.

★**Cal., San Jose**—R. Fry let contract building 3 story rein.-con. garage, rein.-con. flooring, concrete foundation, on 1st and San Carlos Sts., to Cahill-Vensano Co., French Bank Bldg., San Francisco. About $60,000. H. P. Smith, San Jose, lessee.

★**N. S., Sydney**—Dominion Government let contract for 250,000 tons ship plates and construction of large rolling plant here, to Dominion Steel Corp., 112 St. James St., Montreal, Que. About $5,000,000.

★**Ont., Fergus**—Beatty Bros. will build extension to factory, to consist of 3 wings, 45 x 100, 45 x 185 and 142 x 192 ft., concrete and brick. About $60,000. Work will be done by day labor.

★**Ont., Ford City**—Imperial Oil Co., 56 Church St., Toronto, let contract building brick oil refinery, here, to Westcott Contg. Co., Windsor. About $100,000.

★**Ont., London**—Murray Shoe Co., Richmond St., let contract building 3 story, 60 x 100 ft. steel and brick factory, to S. Wells, 765 Talbot St. About $80,000.

★**Ont., Oshawa**—General Motors Co. of Canada let contract building rein.-con. and brick factory, rein.-con. flooring, concrete foundation to include 40 x 80 ft. assembly, 80 x 200 ft. shipping, 80 x 800 ft. storage and 80 x 300 ft. enameling buildings, all 4 story, to Canadian Stewart Co., foot Cherry St., Toronto. About $1,000,000. Noted July 3.

Ont., Parry Sound—See "Miscellaneous."

Buildings

PROPOSED WORK

N. H., Exeter—Hospital—Phillips-Exeter Academy plans to build fireproof hospital on campus. About $200,000. Architect not selected.

Mass., Worcester—Ward—City plans to build ward building for infectious diseases at Belmont Hospital on Belmont St. About $160,000. Architect not selected.

R. I., Lonsdale (Pawtucket P. O.)—School—Lincoln Twp. plans to build school here. About $50,000. Address F. E. Fitzsimmons, Lonsdale. Architect not selected.

R. I., Pawtucket—Business—C. C. Hall, Broad St., receives bids in Septebmer, for 3 story brick and rein.-con., rein.-con. flooring, concrete foundation. About $150,000.

R. I., Providence—Business—J. Marcus & Bro., 210 North Main St., having plans prepared by W. G. Richards, archt., 17 Exchange St., for 3 story, 80 x 100 ft. brick and concrete, rein.-con flooring, concrete foundation. About $60,000.

R. I., Woonsocket—College—Church of Precious Blood receives bids in September for 3 story brick and rein.-con., rein.-con. flooring, concrete foundation. About $100,000. W. F. Fontaine, 285 Main St., archt.

Conn., Bridgeport—Police Station—City plans to build 3 story, brick, steel and concrete, on Barnum Ave. and Caroline St. About $75,000. W. J. Skinner, 1188 Main St., archt. Noted May 22.

Conn., Bridgeport—School—City plans to build addition to McKinley School on Kelsey St. About $150,000. F. A. Cooper, 1024 Main St., archt. Noted May 22.

Conn., Bristol—Community—Trowbridge & Ackerman, archts., 25 West 44th St., New York City, soon let contract building 2 story brick, steel and concrete, rein.-con. flooring, concrete foundation ,on Main St., for city. About $200,000. Noted Apr. 17.

Conn., Groton—School—Town soon lets contract building 1 story brick, wood flooring, concrete foundation. About $50,000. Bilderbeck & Langdon, Barrows Bldg., New London, archts. Noted July 17.

Conn., Hartford—School—City having plans prepared by W. F. Brooks, archt., Lewis and Gold Sts., for 3 story, 12 room addition to Brown School, on Talcott St. About $100,000. W. E. Cone, 89 Asylum St., chn.

Conn., Manchester—School—Town appropriated $150,000 bonds to build new school. Architect not selected.

Conn., Mansfield — School, etc. — State Training School had plans prepared by Cudworth & Thompson, archts., Thayer Bldg., Norwich, for 2 story, 35 x 80 ft., with 35 x 70 ft. ell, ward building, 1 story, 60 x 100 ft. dining hall, and 2 story, 60 x 100 ft. school and gymnasium, brick and concrete, rein.-con. flooring, rock and concrete foundation. About $250,000. Noted May 15.

Conn., Middletown — Houses — Russell Mfg. Co., South Farms, plans to build several 2 story workmens houses. About $50,000. Architect not selected.

Conn., New Britain—School—Bd. Educ. having plans prepared by C. C. Palmer, archt., 272 Main St. for brick concrete and steel addition to Northend School on Bassett St. About $200,000. Noted June 12.

Conn., New Haven — Hospital — New Haven Hospital, 330 Cedar St., having plans prepared by C. S. Palmer, archt., 191 Church St., for private room ward, children's building, service and nurses' home, on Cedar St. About $1,100,000. I. Ullman, chn. Noted June 5.

Conn., New Haven—Parish House—Trinity Church congregation plans to build parish house on George St. About $100,000 Address C. O. Scoville, 442 Temple St.

Conn., New London—High School—Bd. Educ. having plans prepared by D. S. Donnelly, archt., Plant Bldg., for junior high school. About $500,000. P. L. Harwood, pres. school bd. Noted Feb. 6.

Conn., Norwalk—Home—Davis & Dane, archts., 1024 Main St., Bridgeport, and Fairfield Co. Bd. (Bridgeport), soon receive bids building 3 story, 35 x 60 ft., brick and steel addition, rein.-con. flooring, concrete foundation, on Westport Ave., here. About $50,000. Noted Mar. 6.

Conn., Norwich—High School—City plans to build junior boys' high school. About $250,000. Architect not selected.

Buildings (Continued)

Conn., Shelton—High School City will appropriate $125,000 to build high school here. Architect not selected.

Conn., South Manchester—Business—J. W. Hall Co., 949 Main St., soon receives bids building 3 story brick and steel. About $50,000.

Conn., Stafford—Business—A. R. Sharpe, archt., 227 Lewiston Ave., Willimantic, soon receives bids for 3 story, 70 x 140 ft. brick, rein.-con. flooring, concrete foundation, to include assembly hall, theatre, post office and offices, for W. H. Hall, South Willington. About $60,000.

Conn., Waterbury—Office—Scovill Mfg. Co., 99 Mill St., having plans prepared by C. Gilbert, archt., 244 Madison Ave., New York City, for brick and rein.-con., rein.-con. flooring, concrete foundation, on Cole, Baldwin and Mill Sts. About $125,000. Noted July 10.

Conn., Willimantic— Dormitory - - State Normal Training School, Hartford, had plans prepared by W. H. Brooks, archt., Lewis and Gold Sts., Hartford, for 3 story, 46 x 114 ft., brick, steel and concrete, rein.-con. flooring, concrete and rock foundation, on Valley St., here. About $150,000. Noted Jan. 30.

N. Y., Buffalo—Store—J. W. Powell, 1136 Main St., plans to build 7 story, rein.-con. and brick, at 1140 Main St. About $100,000.

N. Y., Endicott—Club and Gymnasium—G. F. Johnson of Endicott Johnson Co., 753 Bleecker St., Utica, soon receives bids for rein.-con. and brick, on Main St. W. About $100,000.

N. Y., Johnson City—Theatre G. F. Johnson of Endicott Johnson Co., 753 Bleecker St., Utica, having plans prepared for moving picture theatre, here. About $200,000.

N. Y., New York—School—Bd. Educ. having plans prepared by C. B. J. Snyder, archt. and engr., Municipal Bldg., for P. S. 62, 5 story, 230 x 280 ft. brick and steel, brick foundation, on Liggett St., Southern Blvd. and Fox St. About $600,000.

N. Y., Troy— Laboratory — Ranssalaer Polytechnic Institute having plans prepared for 2 story addition to William Weightman Walker Laboratory. About $175,000. Address P. C. Ricketts, pres.

N. J., Collinswood—Rectory—St. John's congregation soon receives bids for 3 story, 30 x 70 ft., stone. F. F. Durang, 1220 Locust St., Phila., archt.

N. J., Maple Shade—School—Bd. Educ. soon receives bids for 2 story, 63 x 113 ft., brick. About $80,000. W. C. Furber, 418 Walnut St., Phila., archt

Pa., Bellwood — Church — St Joseph's Catholic congregation receives bids about Aug. 23 building 2 story, 43 x 96 ft brick, rock foundation. About $55,000. C. E. Haley, pastor. D. G. Puderbaugh, Hutchinson Bldg., Altoona, archt and engr

Pa., Carlisle — Church — Grace United Brethern Church plans to build 1 story, 87 x 117 ft. concrete, steel and brick, stone foundation, on Pomfret and West Sts. About $60,000. Markley & Starr, Harrisburg, archts.

Pa., Connellsville — Church — United Brethern congregation plans to build 60 x 100 ft. church. About $50,000. J. S. Ehowers, pastor and chn.

Pa., Pittsburgh—Fire and Police Stations, etc.—City voted $1,110,000 bonds to build fire, police and comfort stations and improve hospital facilities N. S. Sprague, ch. engr. dept pub wks Noted Jan. 30 under "Streets and Roads."

Pa., Saxton—School—School Bd. receives bids about Aug. 15 building 2 story, 55 x 100 ft., brick and stone school and community hall, rein.-con. flooring, concrete foundation, on Main St. About $50,000. F. A. Hersh and F. J. Shollar, Commerce Bldg., Altoona, archts

Pa., Waynesboro Bank—People's Natl Bank, having plans prepared by Wyatt & Nolting, archts., 1012 Keyser Bldg. Baltimore, Md., for bank. About $50,000

Pa., Wilkes-Barre—Club—Chopin Singing Society, Miners Bank Bldg., plans to build 5 story, 70 x 110 ft brick and timber, rock foundation, on South Washington St About $115,000. Architect not selected

Md., Baltimore—Dormitory—Morgan College, Hillen Rd. and Arlington Ave., plans to build 2½ story, 36 x 148 ft. dormitory and 1 story, 32 x 48 ft power house, stone and brick, stone foundation. About $75,000. E. L. Tilton and A. M. Githens, 52 Vanderbilt Ave., New York City, archts

S. C., Florence—School—School Bd. plans to build school here. About $100,000. Noted Apr. 10.

Tenn., Memphis—Auditorium and Market—City plans to build auditorium and market house to cover 1 block square on Main and Poplar Sts. About $750,000. C. O Pfeil, Union Planters Bank Bldg., archt Noted Feb. 27.

Ky., Ashland—Store and Office—Field Furniture Co. soon receives bids building 6 story, 30 x 145 ft., concrete and brick, on Main St. About $275,000 F. L. Packard Hayden Bldg., Colo., archt.

O., Canton—School—Bd. Educ having plans prepared by F. C. Warner, archt., Hippodrome Bldg., Cleveland, for 2 story, 114 x 200 ft., concrete, steel and brick, on 16th and Vine Sts. About $200,000. Noted June 17

O., Cincinnati—Sales—Cadillac Auto Co., 1038 Gilbert Ave., plans to build 75 x 200 ft., on Gilbert Ave., south of Elsinore St. About $100,000. G. W. Drach, 1701 Union Trust Bldg., archt. Engineer not selected

O., Cleveland — Commercial—J Babin, 13661 Euclid Ave., plans to build 4 story, 55 x 140 ft., rein.-con., steel and brick, concrete foundation, at 2226 Prospect Ave. About $75,000. Architect not selected.

O., Cleveland—Commercial—C H. Snearer Furniture Co., 72 Wymore Ave., plans to build 4 story, 270 x 780 ft. rein.-con., brick and steel, concrete foundation, at 10,022 Euclid Ave. About $150,000 Architect not selected.

O., Cleveland—Commercial G Whistler, Hollendan Hotel, East 6th and Superior Sts., plans to build 5 story, 100 x 150 ft., rein.-con., steel and brick, concrete foundation, on East 21st St. and Euclid Ave. About $100,000. Architect not selected.

O., Cleveland—Hotel—Euclid Fairmount Co., East 105th St. and Euclid Ave., plans to build 10 story, 100 x 200 ft., rein.-con., steel and brick, concrete foundation, on East 101st St. and Euclid Ave. About $500,000. Architect not selected.

O., Cleveland—School—Bd Educ East 6th and Superior Ave., soon receives bids building 1 story, 100 x 150 ft. rein.-con., brick, steel and stone addition, on Warner Rd. About $200,000. W. R. McCormack, East 6th and Superior Ave., archt

O., Cleveland—Theatre—Pauled Realty Co., Hippodrome Bldg., plans to build 5 story, 75 x 240 ft., rein.-con., steel and brick, on East 105th St. and Euclid Ave. About $400,000. Architect not selected.

O., Columbus—Business—M. H. Rieser, 66 East Main St., plans to build 3 story, 80 x 130 ft., brick, on Main and 3rd Sts. About $85,000. Stribling & Lum, 85 North High St., archts.

O., Columbus—Store—O. Darst, archt., Brunson Bldg., receives bids about August, razing old structure and building 4 story, 42 x 160 ft., concrete and brick, on South High St., for F. B. Chapman, 1117 East Broad St. About $85,000

O., Dayton—Club—Catholic Order of Foresters plans to build 2 story, 66 x 150 ft., rein.-con. and brick, concrete foundation, on 5th and High Sts About $50,000. Address R. M. Percival. Architect not selected.

O., East Cleveland (Cleveland P. O.)—School—Bd. Educ., Williamson Bldg., Cleveland, plans to build 2 story, 100 x 200 ft. rein.-con. steel, brick and stone, here. Bonds for $100,000 voted for project. Architect not selected.

O., Independence School—Bd. Educ having plans prepared by R H Hinsdale archt., Bangor Bldg Cleveland for 2 story, 80 x 100 ft brick, steel and stone, on Ryan Ave About $150,000

O., Massillon—Commercial — Hess-Snyder Co., Erie St., having preliminary plan prepared by W R Powell, archt., 705 Ross Bldg., for 8 story, 65 x 140 ft., steel and brick About $200,000.

O., Portsmouth—Theatre—S. Labold having plans prepared by C. C. Taylor, archt., 1st Natl Bank Bldg., for 2 story, 65 x 160 ft., rein.-con and brick, concrete foundation, on Gallia St. About $100,000

O., Rittman—Bank Rittman Savings Bank Co. having plans prepared by R H Hinsdale, archt., Bangor Bldg., Cleveland, for 2 story, 50 x 75 ft brick, steel and rein.-con., on Saywell Ave. About $50,000

O., Springfield—Home—Salvation Army plans to build home, to include club and hotel. About $90,000. Architect not selected.

O., Springfield—Office—R. C. Gotwald, archt., Gotwald Bldg., soon lets contract building 3 story, 52 x 150 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on West Columbia St., for Springfield Metallic Casket Co., Center St. About $60,000. Noted June 5.

O., Springfield—Office W. A Myers, Lagonda Ave. and Farlow St., having plans prepared by H. S. Kissell, archt., Gotwald Bldg., remodeling Gotwald Bldg. on Main and Limestone Sts. About $50,000.

O., Wheelersburg—Home—Comrs. Scioto Co. (Portsmouth) soon receive bids for 3 story, 130 x 160 ft. brick, home here, brick foundation. Plans include shops, playgrounds, etc. About $125,000. De Voss & Donaldson, Portsmouth, archts

Mich., Detroit—Chapel—Providence Hospital, West Grand Blvd. and 14th Ave., having plans prepared by L. Kamper, archt., Book Bldg., for 4 story, 40 x 140 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation.

Mich., Detroit—Church Nunde Methodist congregation, c/o W. E. N. Hunter, archt., 1306 Chamber of Commerce, having plans prepared for 1 story, 88 x 88 ft., rein.-con., brick and steel, wood and tile floor, concrete foundation on Grand River Ave. and Beverly Ct. About $100,000.

Mich., Detroit — Hotel—Detroit-Biltmore Hotel Co., c/o E. H. Johnes, 511 Moffat Blk., having plans prepared by Warren & Wetmore, archts., 16 East 47th St., New York City, for 23 story, 120 x 255 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Madison Ave. and Grand Circus Park. About $5,000,000. Noted June 19

Mich., Detroit—Hotel—Vinton Co., Vinton Bldg., soon lets contract for 3 story, 35 x 200 ft., brick and steel, wood flooring, concrete foundation, on Piquette Ave. About $100,000. R. H Marr, 1204 Kresge Bldg., archt.

Mich., Detroit—Mercantile—A Y. Malcolmson, 610 Congress Bldg., had plans prepared by W. C. Palmer, archt., 610 Congress Bldg., for 6 story, 100 x 200 ft., brick and steel, wood flooring, concrete foundation, at 187 Griswold St.

Mich., Negaunee—Church and Chapel—St. Paul's congregation having plans prepared by Van Leyen, Schilling & Keough, archts., 1115 Union Trust Bldg., Detroit, for 1 story, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $150,000.

Mich., Pontiac—School—Bd. Educ. having plans prepared by Perkins, Fellows & Hamilton, archts., 814 Tower Court, Chicago, for 1 story, rein.-con., brick and steel, concrete foundation, on West Huron St. About $80,000

Mich., St. Louis—School—Bd. Educ. having plans prepared by Cowels & Mutscheller, archts., Chase Bldg., Saginaw, for 2 story, rein.-con., brick and steel addition, concrete foundation. About $50,000.

Ill., Carlinville—High School—Bd. Educ plans to build high school. About $50,000 W. L. Mounts, pres. Architect not selected

Buildings (Continued)

Ill., Chicago—Hotel—Argonne Hotel Co., c/o R. C. Harris, archt., 190 North State St., having plans prepared for 10 story, 130 x 170 ft. rein.-con., rein.-con. flooring, concrete foundation, on Sheridan Rd. and Chase Ave. About $900,000.

Wis., Manitowoc—School—Bd. Educ., Dist. No. 3, plans to build 2 story, 70 x 90 ft. rein.-con. and brick, brick foundation. About $50,000. Architect not selected.

Minn., Kinney—Grade School and Gymnasium—Bd. Educ. receives bids about Aug. 9, for 2 story, 116 x 154 ft., rein.-con. and brick. About $175,000. A. W. Kerr Co., 5 Amer. Exch. Bldg., Virginia, archts.

Minn., Virginia—City Hall and Community Bldg.—A. E. Bickford, city clk., receives bids about Sept. 1, for 2 story, 190 x 275 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on 1st St., S. About $282,000. A. W. Kerr & Co., Virginia, archts. and engrs.

Minn., Virginia—Court House—Comrs. St. Louis Co., Duluth, having revised plans prepared by Croft & Boerner, archts. and engrs., Palace Bldg., Minneapolis, for 2 story, rein.-con. and brick, rein.-con. flooring, brick foundation. About $250,000. Noted June 19.

Minn., Rochester—Clinic—F. A. Bricker and G. J. Pattison, Fargo, and C. C. Fawcett, Rochester, plan to build 5 story, 46 x 142 ft., brick and concrete dental clinic, brick foundation. About $300,000. Architect not selected.

Kan., Atchison — Memorial Hall — City election July 29 to vote on $125,000 bonds to build memorial hall. Architect not selected.

Kan., Concordia — Hospital — Swedish Baptist Assn. of U. S., West 7th St., plans to build 40 x 65 ft., brick. About $50,000.

Kan., Marysville—Theatre—Turner Theatre Co. rejected only bid received building 2 story, 50 x 132 ft., brick and stone, rein.-con. flooring, concrete foundation. About $53,000. Noted July 3.

Kan., McLouth—High School—Bd. Educ. having plans prepared by W. Saylor & Co., archts., 300 Reliance Bldg., Kansas City, Mo., for 2 story, 64 x 92 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $52,000.

Neb., Chappell—High School and Dormitory—School Bd. plans to build 3 story high school and dormitory, here. About $100,000. R. A. Bradley, Hastings, archt.

Neb., Omaha—Store and Office—Hayden Bros., Brandeis Stores, Home Builders, and Nebraska Natl. Bank plan to build 16 story, 88 x 132 ft. steel, stone and brick, on 17th and Dodge Sts. About $1,750,000. Architect and engineer not selected.

S. D., Sioux Falls—School—Bd. Educ. soon lets contract building 1 and 2 story, 65 x 130 ft. brick and timber, concrete foundation. About $100,000. Holmes & Flinn, 8 South Dearborn St., Chicago, archts.

N. D., Fessenden—High School—School Bd soon lets contract building 3 story high school. About $60,000. A. Fraser, Minot, archt.

N. D., Minot—Bank and Office—Second Natl. Bank plans to construct 7 story bank and office building. About $50,000.

N. D., Wahpeton — Hospital—Lutheran Deaconess Hospital soon lets contract building 3 story hospital. About $50,000. Magney & Tusler, 450 Bldrs. Exch., Minneapolis, Minn., archts.

Mo., Galena—Court House—Stone Co. plans to build court house. About $50,000. J. S. Houser, presiding judge.

Mo., Jefferson City—Theatre—F. B. Miller, archt., Jefferson City, receiving bids building 57 x 198 ft., rein.-con., steel and brick, rein.-con. flooring, rock foundation, on High St., for W. H. Mueller. About $75,000.

Mo., Lindenwood (St. Louis P. O.)—Church—Congregational church plans to build 1 story, 100 x 150 ft., on Main and East Sts. About $50,000. G. Coman, pastor. Architect not selected.

HIGHWAY—CALIFORNIA

Bids were received by State Highway Comn. (lowest 3) Forum Bldg., Sacramento, building state highway in Lake Co., Div. 1, Route 16, Sect. A, from (A) A. J. Fairbanks, Willets; (B) Erickson & Peterson, Monadnock Bldg., San Francisco; (C) Grant, Smith & Co., Fernwell Bldg., Spokane, Wash. The unit bids were as follows:

	A	B	C
104,600 cu.yd. excavation without classification	$1.12	$1.15	$1.15
300 cu yd. Portland cement concrete (culverts and monuments), class "A"	24 00	25 00	35.00
3,104 lin.ft. 12-in. corrugated metal pipe	90	1 00	1.25
956 lin ft. 15-in corrugated metal pipe	1 00	1.20	1.35
830 lin ft 18-in corrugated metal pipe	1.25	1 50	1.50
64 lin.ft. 24-in. corrugated metal pipe	1.75	1.75	1.75
34 lin.ft. 30-in. corrugated metal pipe	1.50	2 00	2.00
4 mi. moving and resetting property fences	480.00	300.00	400.00
356 monuments	1 50	1.50	1.50
Extended totals	$131,790	$135,200	$139,520

RESERVOIR—BELLEVUE, OHIO

Bids were received by city, (lowest 3) building impounding reservoir, from (A) F. R. Jones Co., Wayside Rd., Cleveland; (B) Gist Bros., Bellevue; (C) Harrington Bros., 3959 Flad Ave., St. Louis, Mo. The unit bids were as follows:

	A	B	C
117,000 cu yd excavation on basis of embankment to El 138 0	$0 39	$0.495	$0.44
104,000 cu yd. excavation on basis of embankment to E 137 0	.39	.49	.44
91,000 cu.yd. excavation on basis of embankment to El 136.0	39	.485	.44
100,000 cu yd rolling embankments	.06	.04	.05
250 cu yd. core wall—concrete	21 30	17 50	33.00
2,000 cu.yd. core wall—earth	1.75	.90	.60
Seeding (lump sum)	242 00	450.00	100.00
Inlet and outlet pipes	3,790 56	4,415 00	3,970.00
Gate valves (lump sum)	1,448 53	1,785.00	1,350.00
Pumping station (lump sum)	6,347 00	5,650 00	6,150.00
500 cu yd excavation for deepening ditch	70	75	1.00
18-in. vitrified tile conduit, long line (lump sum)	17,869 65	13,750 00	15,200.00
14-in c.-i. conduit, long line (lump sum)	18,156.67	13,125 00	16,000.00
18-in vitrified tile conduit, short line (lump sum)	9,850 91	6,375.00	7,900.00
14-in. c.-i. pipe conduit, short (line (lump sum)	10,177 22	6,525.00	8,100.00
Extended totals	$105,159	$105,840	$108,000

Mo., St. Louis—Administration—St. Louis Mfg. Corp., Div. Genl. Motors Corp., 5401 Bulwer St. soon receives bids building 3 story, 40 x 120 ft. rein.-con. and steel, rein.-con. flooring, concrete foundation at 3809 Union Ave. About $57,600. W. H. K. Kilpatrick, Flint, Mich., engr.

Mo., St. Louis—Church—Chesed Shell Emeth. Society, 931 North 9th St., plans to build 115 x 150 ft. on Kings Highway and Minerva Ave. About $75,000.

Mo., St. Louis—Hospital—Bd. Pub. Serv. receives bids about Aug. 12, building 4 story, concrete, steel and brick, concrete foundation, on 11th and Market Sts. About $190,000. L. R. Brown, city engr.

Mo., St. Louis—Mercantile—E. J. Hess, archt., 3226 Magnolia Ave., soon receives bids building 5 story, 54 x 135 ft., concrete, rein.-con. flooring, concrete foundation, at 1409-11 Washington St., for G. D. Hall Real Estate Co., c/o Martin-Breitt Real Estate Co., Chemical Bldg. Cost to exceed $50,000

Mo., St. Louis—Theatre—Missouri Theatre Co., c/o Mercantile Trust Co., 8th and Locust Sts., plans to build 2 story, 129 x 130 ft., on Grand and Lucas Sts. About $60,000. Architect not selected.

Tex., Dallas—Office—C. L. Sanger, pres., Dallas Property Owners Ass'n., having plans prepared building 12 story, 100 x 100 ft., rein.-con. office building. About $1,000,000.

Tex., Rockdale—School—City plans to build school. About $75,000. C. H. Page & Bro., Austin Natl. Bank, Austin, archts.

Tex., Weatherford—Hotel—City plans to build 3 story, brick hotel. About $100,000. G. C. Poston, secy. bd. dirs.

Okla., Oklahoma — Auditorium — City plans election July 26 to vote on $750,000 bonds to build auditorium.

Colo., Greeley—School—Greeley School Dist. No. 6 voted $85,000 bonds to build school.

Colo., Hayden—School—School Dist. No. 2 plans election July 19, to vote on $60,000 bonds to build school. L. Kimsey, secy.

N. M., Albuquerque — Hospital — Children's Home Society of New Mexico plans to build orthopedic hospital here. About $200,000. J. S. Reynolds, pres.

Utah, Lehi—Memorial—City having plans prepared by Ware & Treganza, archts., Utah Savings and Trust Bldg., Salt Lake City, constructing 90 x 120 ft. memorial building. About $65,000.

Ariz., Jerome—Stores, etc.—United Verde Copper Co. having plans prepared by A. R. Kelly, archt., 1110 Story Bldg., Los Angeles, for about 100 buildings to consist of stores, residences, etc., rein.-con., to be erected on new townsite near here.

Ariz., Phoenix—Office—C. Korrick, 841 North 2nd Ave., having plans prepared by L. M. Fitzhugh, archt., 208 Noll Bldg., for 4 story office, 50 ft. on Washington St. and 137 ft. on 3rd Ave., also 3 story addition to building adjoining on east.

Ariz., Phoenix—Hotel—M. T. Grier, Jefferson Hotel, is head of syndicate, which is having plans prepared by Postle & Fischer, archts., 140 South Dearborn St., Chicago, for 9 story hotel, here. About $1,000,000.

Wash., Bremerton — Store and Hotel — Mutual Trading Co. plans to build 4 story, 60 x 103 ft., masonry construction and brick wall, rein.-con. flooring, concrete foundation. About $70,000. E. W. Houghton, Lumber Exch. Bldg., Seattle, archt.

Wash., Centralia—Temple—J. H. Wotleb, archt., Olympia, receives bids about August building 3 story, 60 x 120 ft., brick and mill construction, rein.-con flooring, on Pearl and Magnolia Sts., for B. P. O. E., No. 1083. About $60,000. Noted May 1.

Wash., Olympia—Club—J. H. Wohleb, archt., Capital Natl. Bank Bldg., soon lets contract building 3 story, 60 x 120 ft., concrete and brick, rein.-con. flooring, for B. P. O. E. Lodge. About $60,000.

Wash., Pasco—Hospital—Sisters of St. Joseph having plans prepared by Beezer Bros., archts., Walla Walla, for 4 story, brick, rock foundation.

Buildings (Continued)

Wash., Seattle—Hotel and Store—Essanay Investment Co. plans to build 10 story, probably concrete, stone or brick, on 1st Ave. and Pike St. About $400,000. S. W. Thurston, 116 29th St., pres. Architect not selected.

Wash., Seattle—Store and Office—G. O. Childs plans to build 2 story, 60 x 180 ft., terra cotta and brick, rein.-con. flooring, on 3rd Ave .and Pine St. About $55,000. A. H. Albertson, Henry Bldg., archt.

Wash., Spokane—Temple—B. P. O. E. of Spokane having plans prepared by K. Cutter and E. Baume, archts., Eiler Bldg., for 3 and 5 story, 100 x 142 ft., concrete, brick or tile, on Riverside Ave. Plans include gymnasium, swimming pool, shower baths, locker rooms, etc. About $200,000.

Wash., Tacoma—Office—W. R. Rust, 521 North Yakima St., plans to build 12 story, 65 x 100 ft., on 11th and Pacific Sts. About $750,000. A. Sutton, Tacoma, archt.

Ore., Haines—School—School Dist. No. 24, Union Co., soon lets contract building 2 story, 84 x 108 ft., masonry, concrete foundation. About $50,000.

Ore., Portland—Home—Knights of Columbus, Park and Taylor Sts., having preliminary plans prepared building 2 or 3 story, 60 x 100 ft., cement, brick or tile. About $75,000. Architect not selected.

Ore., Portland—Hospital—Comrs Multnomah Co. having plans prepared by Sutton & Whitney, archts., Lewis Bldg., for rein.-con., rein.-con. flooring, on grounds adjoining University of Oregon Medical School About $200,000. Noted Feb. 6.

Ore., Portland—Offices, etc.—Mitchell, Lewis & Staver Co., 346 East Morrison St., having plans prepared by Houghtaling & Dougan, archts., Henry Bldg., for 3 story, 100 x 139 ft. rein.-con. automobile business house, rein.-con. flooring, concrete foundation, on Bway. and Everett St., to include sales rooms, offices, service department, second hand department, shop, stock rooms, etc. About $80,000. Noted June 26.

Cal., Eureka — Theatre — Ackerman & Harris, c/o Hippodrome Theatre, San Francisco, having plans prepared by Reid Bros., archts., California-Pacific Bldg., San Francisco, for 2 story, 70 x 130 ft., rein.-con., on 4th and G Sts. About $75,000

Cal., Fresno—School—Bd. Educ. having plans prepared by Coates & Traver, archts., Rowell Bldg., for high school. About $750,000. R. F. Felchin, Rowell Bldg., engr. Noted June 26.

Cal., Fresno—School—Bd. Educ. having plans prepared by E. J. Kump, archt., Rowell Bldg., for 10 room school and shop building on Edison School site. About $78,000. Noted June 26.

Cal., Fresno—Schools—Bd. Educ. having plans prepared by Glass & Butner, archts., Cory Bldg., for 10 room school on John Muir School site, cost, $75,000; also 12 room addition to Jefferson School, $78,000. Noted June 26.

Cal., Fresno—Schools—Bd. Educ. having plans prepared by E. Matthewson, archt., Cory Bldg., for 2 room addition and shops to Washington School and addition to Lincoln School, cost, $25,000; R. B. Hotchkin, archt., Rowell Bldg., for 10 room school in Arlington Heights, $75,000 and kindergarten at Franklin School, $4000; Coates & Traver, archts., Rowell Bldg., for 6 room addition to Kirk School, $24,000. Noted June 26.

Cal., Fresno—Schools—Bd. Educ. having plans prepared by Swartz & Swartz, archts., Rowell Bldg., for 8 room addition to Longfellow School and 12 room addition and new heating system at Jefferson School, $78,000; also 12 room addition to Jackson School, $78,000.

Cal., Lindsay—Hotel—Lindsay Hotel Co. being incorporated with $250,000 capital stock and plans to build 138 room hotel. About $200,000. A. M. Robertson, secy. Architect not selected.

Cal., Los Angeles—Church—Train & Williams, archts., 225 Exch. Bldg., soon receive bids, for 2 story, 92 x 100 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Olivera and Marchesault Sts. for Methodist Episcopal congregation. Wright & Callender Bldg. About $150,000.

Cal., Red Bluff — Court House — Bd. Supervs. Tehama Co. voted $200,000 bonds to build courthouse. Noted June 26.

Cal., Salinas—High School—Trustees Salinas Union High School Dist. voted $250,000 bonds to build high school. R. Kyckhoff, Watsonville, archt.

Cal., San Francisco—Asylum—Pacific Orphanage Asylum plans to build asylum on Ocean Ave. About $500,000. A. H. Jacobs, 110 Sutter St., archt.

Cal., San Francisco—Hospital—A. I. Coffey, archt., Humboldt Bank Bldg., soon receives bids for 6 story, 35 x 100 ft., with wing 35 x 80 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Bush St., for St. Francis Hospital. About $250,000.

Cal., San Francisco—Library—San Francisco Library Trustees having plans prepared by G. A. Lansburgh archt., Gunst Bldg., for 2 story, concrete, brick and terra cotta, on Sacramento St. About $55,000.

N. S., Halifax—Post Office—R. C. Desrochers, secy. dept. pub. wks., Ottawa, Ont., soon lets contract altering post office here.

N. B., Fredericton — Station—Canadian Pacific Ry., Windsor St. Sta., Montreal, plans to build here. About $250,000. J. M. R. Fairbairn, asst. ch. engr.

Ont., Guelph—Dormitory and Piggery—H. F. McNaughton, c/o Dept. Pub. Wks., Parliament Bldgs., Toronto, soon lets contract building 1 and 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, here, for Dept. Agriculture, Parliament Bldgs., Toronto. About $150,000. F. R. Heakes, Parliament Bldgs., Toronto, engr.

Ont., Ingersoll—School—Bd. Educ. having plans prepared by W. G. Murray, archt., Dominion Savings Bldg., London, building 2 story, rein.-con., steel and brick. About $150,000.

Ont., Toronto—College—Bd. Educ. having plans prepared building 3 story, brick and steel, in Parkdale. About $300,000. G. W. Gouinlock, 796 Yonge St.

Sask., Moose Jaw—Office—Sask. Co-operative Stock Yard Co., Ltd., soon lets contract constructing 2 story, 35 x 60 ft. office building and 150 x 200 ft. stockyard, brick, concrete foundation. About $72,000

B. C., Point Grey—School—School Bd. receives bids in about four weeks building 3 story, rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on Granville St. and 25th Ave. Shaughnessy Dist. About $90,000. R. P. S. Twizell, 837 Hastings St., W., Vancouver, archt. Noted Feb. 20.

Alaska, Kethikan—Bank and Store—Lawton & Moldenhour, archts., Alaska Bldg., Seattle, Wash., preparing plans for 3 story, concrete, rock foundation, here. About $100,000. Owner's name withheld

BIDS DESIRED

Mass., Attleboro—School—Until July 28 by city, building 2 story, 57 x 106 ft. brick addition, concrete foundation. About $100,000. F. J. Cooper Corp., 33 Cornhill St., Boston, archts.

Conn., Hartford—Business—J. A. Allen, Jr., archt., 904 Main St., receiving bids altering 5 story building on High and Allyn Sts., for G. F. Heublein, 196 Trumbull St. About $50,000. Noted May 22

Conn., New Britain—School—Until Aug. 1, by Bd. Educ., building 2 story 64 x 110 ft. brick addition to Normal Training School, on Camp St., rein.-con. flooring, concrete foundation. About $160,000. W. F. Brooks, Lewis and Gold Sts., Hartford, archts. Noted Jan. 30

N. Y., New Rochelle—School—Until July 30, by Bd. Educ., building 62 x 180 ft., brick, on North Ave. About $200,000. F. G. Frost, 19 West 44th St., New York City, archt.

N. Y., Pelham—High School—Until July 28, by Tooker & Marsh, archts., 101 Park Ave., New York City, building 2 story, 168 x 171 ft., brick and steel, stone flooring, for Bd. Educ. About $115,000. Noted May 8

Pa., Erie—School—Until Aug. 18, by Bd. School Dirs., for general work, heating, plumbing, electric work, etc., for new East High School. R. S. Scobell, business mgr. school dirs., W. B. Ittner, Bd. Educ. Bldg., St. Louis, Mo., archt., advertised in this issue. Noted April 24, under "Miscellaneous."

Pa., Phila.—Club—W. F. Price, archt., 136 South 4th St., receiving bids building 1 and 2 story, 63 x 132 ft. and 26 x 36 ft. stone, on Germantown Lane and Main St., for Womens Club of Germantown. About $100,000

Pa., Phila.—Home—Until July 29, by C. I. Lovatt, archt., 418 Walnut St., repairing seven 3 story, concrete and brick buildings at St. Johns home on Wyalusing and 49th Sts., varying in size from 22 x 22 ft. to 40 x 300 ft.

W. Va., Morgantown—Home—Until Aug. 12, by Comrs. Monongalia Co., constructing 3 story, 16 x 103 ft. main building and two 2 story, 30 x 68 ft. wings, brick, terra cotta and steel, for Juvenile Detention Home. E. F. Jacobs, 701 Fleming Bldg., archt.

O., Cleveland — Library — O. Coltman archt., 1375 Euclid Ave., receiving bids building 1 story, 70 x 80 ft., concrete, steel and brick, on East 105th St. and Superior Ave., for Cleveland Public Library Assn., 1375 Euclid Ave. About $50,000.

O., Green (Celina P. O.)—Schools—Until Aug. 9, by Bd. Educ., Beuna Vista, building 2 schools here. About $50,000. F. S. Rusk, Brenson Bldg., Columbus, archt.

O., Mechanicsburg—Until July 31, by R. C. Gotwald, archt., Springfield, building 2 story, brick. About $90,000.

O., Perry—School—Bd. Educ. receiving bids for 1 story, 160 x 160 ft. brick, steel and concrete, on Wilson St. About $75,000. R. H. Hinsdale, Bangor Bldg., Cleveland, archt.

Mich., Detroit—Office—See "Industrial Works."

Minn., Buhl—High School—School Dist. No. 35, St. Louis Co., receiving bids for 3 story, rein.-con. and brick, on Chestnut St. About $250,000. A. W. Kerr Co., 5 Amer. Exch. Bldg., Virginia, archt. and engr. Noted Mar. 27.

Minn., Gilbert—Auditorium—Until Aug. 1, by E. H. Berg, archt. and engr., Eveleth, for 2 story, 100 x 110 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Main St., for Corporation of Gilbert. About $100,000.

Minn., Hibbing—Bank—Until July 30 by 1st Natl. Bank, for 2 story, 100 x 125 ft., brick and stone. About $150,000. A. Moorman & Co., 501 Minnesota St., St. Paul, archts. Noted June 19

Minn., Nopeming—Infirmary—Until Aug. 18, by A. L. Laird, secy. St. Louis Co. Tuberculosis Comn., building 3 story, 40 x 320 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $240,000. Holstead & Sullivan, Palladio Bldg., Duluth, archts. and engrs.

Minn., St. Paul—Theatre—Blue Mouse Theatre Co. receiving bids for 2 story, 50 x 150 ft. moving picture theatre on Hennepin Ave. between 7th and 8th Sts. About $70,000. H. Lowrie, Payton Blk., Omaha, Neb., archt.

Mo., St. Louis—Clinic—Until Aug. 12 by Bd. Pub. Serv., City Hall, building 4 story 50 x 125 ft. brick and rein.-con. concrete foundation, on 14th and Lafayette Sts. About $260,000. L. R. Bowen, 302 City Hall, engr. and archt.

Mo., St. Louis—Mercantile—Until Aug. 1, by W. R. Compton & Co., Merchants Laclede Bldg., altering building on 7th and Locust Sts. About $100,000. Plans include tearing out front and elevators, building vestibule and elevator shafts, and installing high power elevators. La Baume & Klein, Chemical Bldg., archts.

Utah, Lehi—High School—Until Aug. 15, by School Bd., building 2 story, 137 x 160 ft., brick school. About $100,000. Ware & Treganza, Utah Savings & Trust Bldg., Salt Lake City, archts. and engrs.

Buildings (Continued)

Utah, Pleasant Grove—High School—Until Sept 15, by School Bd building 2 story, 60 x 100 ft. addition About $50,000 Ware & Treganza, Utah Savings and Trust Bldgn, Salt Lake City, archts.

Utah, Provo—High School—Until Aug 15, by School Bd, building 2 story, 135 x 165 ft. on Provo Bench About $100,000 Ware & Treganza, Utah Savings & Trust Bldg, Salt Lake City, archts and engrs.

Que., Montreal—Office—Until Aug. 1, by Marice Trust Co., 179 St. James St., building 10 story, 50 x 66 ft, stone, terra cotta and steel About $350,000 Hogle & Davis, 70 St Francis Xavier St., archts.

Que., Notre Dame de Grace—Church—Until July 31, by St. Augustine Catholic congregation, Cote St. Antoine Rd., building stone and steel concrete foundation About $250,000. Audet & Charbonneau, 194 Cartier Park, Montreal, archts.

Sask., Indian Head—Office Until Aug 12, by R C Desrochers, secy dept pub. wks., Ottawa, Ont., building here.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Office—E. M. Hamlin & Co., 148 State St., let contract building 12 story, brick, steel and concrete, on P. O. Sq., to be known as Bankers' Bldg., to J. J. Prindiville Co., Framingham. About $400,000

★**Mass., Whitinsville**—Hotel and Houses—Whitin Machine Wks let contract building 2 story, 50 x 110 ft. hotel and four 2 story, 25 x 40 ft. frame and stucco workmen's houses, to E. J. Ward Co., 82 Foster St., Worcester About $80,000

★**Mass., West Warren**—Hotel—Warren Cotton Mills let contract building 3 story hotel for workmen on West Main St., to P H Provencal, 124 North St., Ware. About $50,000

★**Mass., Worcester**—Office, etc.—M. D Holmes & Sons Co., Salem Sq., let contract building 4 story, 56 x 108 ft., brick and mill construction office and warehouse, concrete foundation, on Portland and Myrtle Sts., to J. J. Roberts, 4 Wall St. About $100,000.

★**Conn., Hartford**—Bank—Mutual Bank & Trust Co., 18 Asylum St., let contract building 2 story brick and marble, rein.-con flooring, concrete foundation, on Pearl St., to Ellison Constr. Co., 96 Wellington Ave. About $100,000. Noted June 26.

★**Conn., Norwalk**—Business—S. Roodner, Ann St., South Norwalk, let contract building 2 story, 100 x 135 ft. brick, concrete and steel, on Wall St., to T. Robins, 23 Putnam Ave., South Norwalk. About $75,000. Noted Mar 27

★**Conn., Norwalk**—Hotel—G F Shepard, archt., 14 Kilby St., Boston, let contract to A. R. Malkan & Co., 3 Mechanic St., converting Royal James Hotel on Wall St into hotel and business building, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, for Norwalk Realty & Impvt. Co., Ann St., South Norwalk. About $125,000. Noted July 3.

★**N. Y., Brooklyn** School—Bd Educ let contract building brick and steel addition to P. S. 73, brick foundation, on McDougal St. and Rockway Ave., to P. Cleary, 115 Marion St. About $208,700. Noted July 17.

★**N. Y., Greensburg** School—Tooker & Marsh archts 101 Park Ave New York City, let contract, to Oscawana Bldg. Co., 101 Park Ave New York City, for 2 story brick and steel, brick foundation, for Bd Educ, here. About $90,000 Noted June 19

★**N. Y., Jamaica**—Hotel—Essemem Realty Corp., Fulton St., will build 5 story, brick, steel and stone, brick foundation. About $300,000 Work will be done by day labor.

★**N. Y., New York**—Church—Fifth Church of Christ Scientist, 42nd St., let contract building 20 story, 145 x 179 x 200 ft., brick, steel and stone, brick foundation, on Madison Ave., between 43rd and 44th Sts., to W J Taylor 7 East 42nd St About $3,000,000

★**N. Y., New York** Office—H Phipps Estate 737 5th Ave., let contract building 14 story, 60 x 105 ft., brick and steel, brick foundation, on 46th St and Madison Ave., to Cauldwell-Wingate Co 281 4th Ave. About $500,000 Noted July 17.

★**N. Y., New York**—Store, Lofts, etc.—Maynicke & Franke, archts., 25 East 26th St., let contract to J. A. Zimmerman, 18 East 41st St., for 15 story 50 x 85 ft brick and steel, brick foundation, at 119 West 41st St., for R. Wurlitzer Co., 113 West 40th St. About $500,000 Noted June 12

★**N. Y., Port Jervis**—School—Tooker & Marsh, archts., 101 Park Ave., New York City, let contract, to Oscawana Bldg. Co., 101 Park Ave., New York City, for 4 story, brick and steel, brick foundation, for Bd Educ, here About $85,000 Noted June 26

★**N. Y., Schenectady**—Church—St Luke's congregation let contract building brick church on State St., to M. E. Ryan, 1004 Albany St About $50,000.

★**N. J., Glassboro**—High School—Bd Educ, let contract building 2 story, 73 x 142 ft., stone, on Academy St., to Sherman & Sharp, Cape May, about $80,000 Noted June 26

★**N J., Hackettstown**—Church—Church of Assumption let contract building 2 story 50 x 100 ft., with 22 x 30 ft. wings, concrete and stone, to Gallo Bros., Netcong Noted July 3

N. J., Newark—School—Bd. Educ. received bid building 4 story, 113 x 223 ft., rein.-con. and steel on Sussex Ave., from F Kilgus, 13th St., $513,000 Noted June 12.

N. J., Orange—Sanatorium Bd Freeholders Essex Co. (Newark) received bids building concrete and steel in Orange Mts (general contract), from W G. Sharwell & Co., 377 North 5th St., Newark, $415,818; plumbing, Piper Bros., 112 Brunswick Ave., Trenton, $36,500; heating and piping, Gillis & Geoghehan, 537 West Bway., New York City, $59,500; electrical work, Jandous Electrical Equipment Co., 109 West 31st St., New York City, $34,100; water supply system, M. Averill, 31 Clinton St., Newark, $24,478; sewage disposal plant (in connection), M Averill, $90,000 Noted June 12

★**N. J., Plainfield** School—Bd Educ let contract building 2½ story, 55 x 150 ft., brick and steel, brick foundation, to Bandandi & Boerinder, Plainfield. About $140,000 Noted June 26

★**Pa., Coatesville**—Hotel, Theatre, Stores—W F Boogar let contract building 2 and 3 story, 150 x 200 ft., brick, steel and rein.-con on 1st and Main Sts., to Stuckert Co., 1420 Chestnut St., Philadelphia. About $150,000 Noted June 26

★**Pa., Eddystone**—School—A. Reid, secy bd. educ. let contract building 2 story, 70 x 80 ft. concrete, brick and timber, to H L Morris, Chester About $70,000 Noted July 10.

★**Pa., Miners Mills** (Wilkes-Barre P O)—School—Boro. let contract building 3 story, concrete, steel and brick, concrete foundation, on Main St., to F. Melan, Carey Ave Wilkes-Barre. About $56,000.

★**Pa., Phila.**—Bank—P A Davis, archt., 1713 Sansom St., let contract building 2 story, 80 x 110 ft brick, at 1645 North Broad St, for Tenth Natl Bank, to Melody & Keaving, 1322 Race St. Noted June 26.

★**Md., Frostburg**—Store—E B Prichard & Co let contract building 3 story, 30 x 165 ft, brick and steel rock foundation, to O Gerlach, Frostburg About $50,000

★**N. C., Rocky Mount**—Store—H E Brewer & Co. let contract building 3 story, to D G Rose Greensboro About $50,000

★**O., Cleveland** — Commercial — Altman Furniture Co., 2142 East 9th St., let contract building 4 story, 48 x 117 ft., concrete, steel and brick on East 152nd St. and St. Clair Ave., to W. I. Thompson Co., 6110 Euclid Ave About $75,000.

★**O., Springfield**—Bank and Store—Farmers' Natl Bank, 9 South Limestone St., let contract building 3 story, 85 x 100 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Limestone and High Sts., to Frank Hill Smith Co., East 3rd St., Dayton. About $200,000. Noted July 10.

★**O., Springfield**—School—Bd. Educ let contract building 3 story, rein.-con. and brick, rein.-con. flooring, concrete foundation to Ridgewood addition, to Cogswell Bldg. Co., Springfield. About $60,000. Noted July 3

Mich., Detroit School—C. A. Gadd, business mgr Bd Educ., received bids for 2 story, 125 x 130 ft., rein. con., brick and steel addition to A. L. Holmer School on Georgia and Crane Aves., masonry, from A J Smith Constr Co., Campau Bldg., $87,879; Corrick Bros., 507 Owen Bldg., $88,900; carpentry, H M Martins Co., 221 Moffat Bldg., $28,400; Harcus & Co., 774 Russell St., $27,769; E. Theide, 287 Berlin Ave., $27,212; heating ventilating and plumbing, Ernst Bros. Co., 35 Bagg St., $57,043; J. O'Connor, Penobscot Bldg., $57,988; J. W Partland, 51 Park Pl., $59,400 Noted July 10

★**Mich., Detroit**—Store and Restaurant—I O Rosenberg, Majestic Bldg., let contract building 2 story, 57 x 127 ft., rein.-con., brick and steel, concrete foundation on Woodward Ave., to P. H. Lorenze, Peoples Bank Bldg., Moline, Ill. About $100,000

Then and Now

One year ago there were 101 projects on which bids were wanted.

Today there are 220 such jobs.

How many will there be on Aug. 1?

Well, on Aug. 1, 1918, there were 129—an increase of 20% in two weeks.

Using the same rate for the same period of 1919, gives 282 as the number of jobs on which bids will be wanted on Aug. 1, 1919.

But, prophecy aside, here is a comparison of *Then* and *Now*:—

	July 18 1918	1919
Streets and Roads	29	64
Federal Government	25	41
Bridges	12	10
Buildings	11	47
Industrial Works	6	3
Sewers	5	16
Excavation and Dredging	4	8
Water Works	2	12
Miscellaneous	7	19

A 218% IMPROVEMENT

Buildings (Continued)

Mich., Detroit—Store and Roof Garden—Smith, Hinchman & Grylls, archts., 710 Washington Arcade, receiving bids for 2 story, 58 x 97 ft., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. and Stimson Pl., for A. S. Stanley and W. Brooks, c/o architects.

★**Mich., Ferndale (Oakland P. O.)**—School—Bd. Educ. let contract building 1 and 2 story, 138 x 143 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Woodward Ave. to W. H. Mueller, 1711 Ford Bldg., Detroit. About $100,000.

★**Mich., Port Huron**—Bank—First Natl. Exch. Bank let contract for 2 story, brick and steel, concrete foundation, on Huron Ave. and Quay St., to Hoggson Bros., 485 5th Ave., New York City. About $125,000.

★**Mich., Port Huron**—School—Bd. Educ. let contract building 2 story, rein.-con., brick and steel addition to Washington School, to A. W. Schultz, Port Huron, $52,500. Noted July 10.

★**Ill., Chicago**—Office—E. M. Willoughby & Co., 7 West Madison St., let contract improving and altering Unity Bldg. at 127 North Dearborn St., to Longacre Constr. Co., 180 North State St. About $250,000.

Wis., Eau Claire—Church—Holmes & Flinn, archts., 8 South Dearborn St., receiving bids building 1 story, 40 x 90 ft., brick, rein.-con. and stone, rein.-con. flooring, concrete foundation, on 3rd St. and Bway., for 1st Congregational Church. About $125,000. Noted May 22.

★**Minn., Cloquet**—High School—Bd. Educ. let contract building 3 story, 80 x 200 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Main St., to Genl. Constr. Co., Builders' Exch., Minneapolis, $161,450. Noted April 10.

★**Minn., Cloquet**—High School—Bd. Educ. let general contract building 3 story, 91 x 200 ft., on 6th St. and Caulton Ave., to Laurence Constr. Co., 544 Builders' Exch., Minneapolis, $169,500; plumbing and heating to H. Gazett, 522 Superior St., E. Duluth, $28,300.

★**Minn., Duluth**—Grade School—Bd. Educ. let contract building 2 story, 80 x 120 ft., rein.-con., brick and steel, brick foundation, on Franklin St., to H. Fawcett, Messabe Blk. About $85,000. Noted June 19.

★**Minn., Moorhead**—School—Bd. Educ. let contract building 2 story, to N. N. Malvey, Moorhead, $50,930. Noted June 19.

★**Ark., Russellville**—Mausoleum—H. B. Rockwell let contract building 1 story, 50 x 75 ft., rein.-con. and stone, to C. Bryan, East Walnut St., Pasadena, Cal. About $50,000, cost plus percentage basis.

★**Utah, Salt Lake City**—Chapel—Mormon Church, 34th Ward, let contract building chapel to Ashton Impvt. Co., South Temple St., $55,148.

★**Utah, Salt Lake City**—School—University of Utah let contract completing 3 story training school on 13th St., E., to Rudine & Chytraus, Salt Lake City, $51,674.

★**Wash., Snoqualmie**—Theatre—Sandel & Bennett having plans prepared by E. W. Houghton, archt., Lumber Exch. Bldg., Seattle, for 1 story, 72 x 80 ft., concrete. Work will be done by day labor. Cost to c., $50,000, including equipment.

★**Wash., Tacoma**—Office—W. R. Rust, 521 North Yakima St., let contract building 2 story, 65 x 100 ft., steel frame, wood rimmed exterior, to J. E. Bonnell, 311 South 9th St. About $750,000, cost plus percentage basis.

★**Cal., Los Angeles**—School—Bd. Educ. let contract building 2 story, 132 x 220 ft., brick and hollow tile, rein.-con. flooring, concrete foundation, on East 7th St., to J. V. McNeil, H. W. Hellman Bldg., $88,190. Noted July 3.

★**Cal., San Jose**—Assembly Hall—G. B. McDougall, state archt., Forum Bldg., Sacramento, let contract building 2 story, rein.-con., at State Normal School, here, to E. T. Leiter & Son, Call Post Bldg., San Francisco, $74,887. Noted July 17.

HIGHWAY—WASHINGTON

Bids were received by State Highway Comm. (lowest 3), Olympia, for constructing highway from Toledo to Forest, Lewis Co., from (A) T. M. Monsen, Auburn, (B) Kaiser Paving Co., 923 Joshua Green Bldg., Seattle, (C) G. A. Ferguson, Seattle. The unit bids were as follows:

	A	B	C
2.5 acres clearing	$150.00	$200.00	$200.00
1.2 acres grubbing	150.00	200.00	300.00
7,400 cu yd. common excavation	.70	.60	1.00
7,400 cu yd. loose rock excavation	1.25	2.00	1.50
200 cu yd. solid rock excavation	2.00	4.00	3.00
10,005 cu yd. subgrade excavation	.95	.60	1.00
10,920 cu yd. overhaul x 100 ft.	.05	.04	.06
80,817 sq yd. preparing subgrade	.07	.05	.05
80,817 sq yd. concrete pavement	2.05	2.23	2.25
12,250 sq ft. pavement reinforcing metal	.04	.03	.04
70 lin ft. pavement header	.60	.75	1.00
1,260 lin ft. concrete gutter	.50	1.00	1.00
2.4 cu yd. concrete, 1st class	30.00	25.00	36.00
15.0 cu yd. concrete, 2nd class	20.00	20.00	28.00
160 lb. steel reinforcing bars	.10	.10	.10
68 lin ft. reinforced concrete pipe, 12-in. dia.	1.00	1.50	2.00
64 lin ft. reinforced concrete pipe, 18-in. dia.	1.50	3.00	3.00
64 lin ft. reinforced concrete pipe, 24-in. dia.	3.50	5.00	6.00
64 lin ft. reinforced concrete pipe, 30-in. dia.	5.00	7.00	8.00
64 lin ft. tile drain, 6-in. dia.	.75	.50	1.00
630 lin ft. guard rail	.35	.60	1.00
Extended totals	$189,200	$199,411	$209,400

HIGHWAY—WASHINGTON

Bids were received by State Highway Comm. (lowest 3), Olympia, for constructing highway from Olympia to Tenino, Thurston Co., from (A) Alberson, Cornell & Simpson, Tacoma (awarded contract), (B) Kaiser Paving Co., 923 Joshua-Green Bldg., Seattle, (C) Puget Sound Bridge & Dredging Co., Seaboard Bldg., Seattle. The unit bids were as follows:

	A	B	C
7,250 cu yd. common excavation	$0.75	$0.50	$0.80
7,250 cu yd. loose rock excavation		2.00	2.00
9,940 cu yd. subgrade excavation	.80	.50	.80
420 cu yd. overhaul x 100 ft.	.06	.05	.05
79,700 sq yd. prep. of subgrade	.05	.05	.10
79,700 sq yd. one course conc. pavement	2.55	2.65	2.50
800 sq ft. pavement reinforcing metal	.05	.05	.05
300 lin ft. pavement header	1.00	1.00	.90
300 lin ft. reinforced concrete gutter	2.00	1.00	1.00
18.1 cu yd. concrete, 1st class	30.00	30.00	22.00
18.1 cu yd. concrete, 2d class	25.00	25.00	20.00
1,760 lb. steel reinforcing bars	.10	.10	.10
1,760 lin ft. plain concrete pipe, 12-in.	2.00	1.50	2.00
1,760 lin ft. reinforced concrete pipe, 18-in.	4.00	3.00	3.50
1,760 lin ft. tile drain, 6-in.	.75	.75	.75
Extended totals	$221,694	$224,865	$229,050

★**N. B., Moncton**—School—School Bd. let contract building concrete and brick, concrete foundation, to R. A. Corbett, 272 Douglas St., St. Johns. About $231,000. Noted Apr. 3.

★**Que., Three Rivers**—College—Dept. Pub. Wks., Quebec, let contract building 4 story, 80 x 100 ft., concrete, steel and brick, concrete foundation, on Notre Dame St., to Bellefeuil & Trepanier, St. John St., Quebec. About $150,000.

★**Que., Three Rivers**—Theatre—C. Laflland, archt., Three Rivers, let contract to T. Dugre, Three Rivers, building 50 x 100 ft. concrete, concrete foundation, on Notre Dame St., here, for T. Trow, Port Henry, N. Y. About $50,000. Noted June 26.

★**Ont., Barrie**—School—School Bd. let contract building 2 story, brick addition to West Ward School, to Ball Planing Mill Co., Barrie, $66,719. Noted June 26.

★**B. C., Point Grey**—School—School Bd. let contract building 3 story, rein.-con. and brick, concrete foundation, on Tupper and Ash Sts., Shaughnessy Dist., to Adkison & Dill, 707 Welton Bldg., Vancouver. About $73,300. Noted June 7.

★**B. C., Vancouver**—Bank and Office—Somerville & Putnam, archts., London Bldg., let contract to Hodgson, King & Marble, 608 London Bldg., building 3 story, 70 x 103 ft., rein.-con., rein.-con. flooring, concrete foundation, on Hastings and Seymour Sts., for Union Bank. About $300,000. Noted April 3.

Federal Government Work

PROPOSED WORK

Md., Annapolis—Laundry—Spec. 4006, Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build addition to laundry here. About $50,000.

Mich., Sault Ste. Marie—Revetment—U. S. Engr. Office, Sault Ste. Marie has plans prepared for rebuilding 12 mi. revetment at E. pier, St. Clair Flats ship canal, involving wooden piling 6 ft. on centers.

Wash., Puget Sound—Building—Spec. 4009, Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build extension to Building No. 178 here. About $30,000.

Oregon—Road Work—Bureau Pub. Roads, Portland, plans to survey Florence-Eugene Rd.

Cal., San Diego—Water and Sewer Systems and Fuel Oil Reservoir—Spec. 4007, Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $225,000.

H. T., Pearl Harbor—Torpedo Racks—Spec. 4008, Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build here. About $28,000.

BIDS DESIRED

R. I., Newport—Removing Boulders—Until Aug. 15, by U. S. Engr. Office, Newport, removing boulders, etc., from Point Judith Harbor of Refuge, advertised in this issue.

N. J., New Brunswick—Boiler—Until Aug. 4, by Treas. Dept., Wash., D. C., installing boiler, etc., in post office, here.

Pa., Phila.—Repair Dike—Until Aug. 19, by U. S. Engr. Office, Phila., repairing dike in Delaware River at Artificial Island, advertised in this issue.

D. C., Wash.—Grading—Until July 31, by Dist. Comrs., Dist. Bldg., grading and improving streets, roads and avenues; advertised in this issue.

Federal Government Work (Continued)

D. C., Wash.—Paving—Until Aug 12, by Dist. Comrs., Dist. Bldg., resurfacing asphalt pavements during year, involving 20,000 sq.yd. asphalt on 6 in. concrete base, 25,000 yd. asphalt surface, 2½ in. before compression, and 35,000 cu.ft. asphalt binder; advertised in this issue.

D. C., Wash.—Sidewalks—Until Aug 4, by Dist. Comrs., Dist. Bldg., laying 50,000 sq.yd. cement sidewalks; advertised in this issue.

Miss., Vicksburg—Levee Work—Until July 31, by Office of 3rd Mississippi River Dist., P. O. Box 404, building and enlarging levee; advertised in this issue.

Mo., Fayette—Post Office—Until Aug 29, by Treas. Dept., Wash., D. C., building, here. About $75,000.

Mo., Kansas City—Post Office Until Sept. 2, by Treas. Dept., Wash., D. C., building extension to post office, here. About $30,000.

N. M., Las Vegas—Bridges—Until July 28, by Bur. Pub. Rd., U. S. Dept. of Agricuture, 218 Luna-Strickler Bldg., Albuquerque, building four 75 ft. span timber bridges on Projects Nos. 2, 3 and 4, Glorietta-Panchuela Rd., involving 228 class "C" concrete, 100 cu.yd. excav. and 18,780 lb. bridge iron. J. S. Bright dist. engr.

Cal., Mare Island—Torpedo Storage and Compressor Building—Spec. 3991—Until Aug 15, by Bureau Yards & Docks, Navy Dept., building, here. About $60,000. Noted July 3.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—Cranes—Spec. 3933—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing cranes for Shipbuilding Ways No. 1, here, to Niles-Bement-Pond Co., 111 Broadway, New York City, $131,765 (150 days). Noted July 10.

★**N. Y., Stapleton**—Gas Mains—Treas. Dept., Wash., D. C., let contract installing gas mains in Marine Hospital, here, to Hickey Contg. Co., 841 Bway., New York City, $1200 (14 days). Noted July 10.

★**Va., Craddock**—School U. S. Housing Corp., 413 G St., N. W., Wash., D. C., let contract building a 2 story, 150 x 278 ft. brick grammar schol, here, to E. Linher Co., 831 Cherry St., Phila., Pa., $125,000. Noted Apr. 24.

★**W. Va., South Charleston**—Cranes—Bureau Yards & Docks, Navy Dept., let contract installing electric traveling cranes in open hearth, forge, furnace and machine shops and heat treatment building, here, to Cleveland Eng. & Crane Co., Wyckliffe, O., (9) and (13), 194,870; Manning, Maxwell & Moore, 119 West 40th St., New York City, (5), (6), (10) and (12), $245,201. Morgan Eng. Co., Alliance, O., (2), (3), (4), (7) and (8), $432,990. Noted May 29.

N. C., Wilmington—Officers' Quarters—Treas. Dept., Wash., D. C., received bids July 15, building medical officers' quarters, here, from Morton & Cox, 714 South 7th St., $8238; King Lumber Co., Charlotteville, Va., $9994. Noted June 26.

★**Fla., Pensacola**—Dry Dock—Emergency Fleet Corp. let contract building 5000 ton Crandall type dry dock, here, consisting of five 40 x 100 ft. floating pontoons, 10 ft. deep, to Aberthaw Constr. Co., 27 School St., Boston, Mass. About $450,000.

★**Ind., Evansville**—Water Mains—Treas. Dept., Wash., D. C., let contract installing water mains and repairing plumbing system at Post Office, here, to H. G. Newman Plumbing Co., 511 U 4th St., $7450, (90 days). Noted July 10.

S. D., Rapid City—School—C. Sells, comr. Indian Affairs, Wash., D. C., received bids July 16, building school, here, from W. D. Lovell, 1415 South East 8th St., Minneapolis, Minn., $57,700, (250 days); A. Motschmann Constr. Co., Security Bldg., Chicago, Ill., $57,900, (300 days). Noted June 26.

Mont., Bozeman—Road Work—Bureau Pub. Roads, Missoula, received bids June 30, grading and draining (1) 5.8 mi. West Gallatin National Forest Rd., 16 ft. wide, (2) 3.7 mi. West Gallatin-Squaw Creek National Forest Rd., 16 ft. wide, from Cliffton, Applegate & Toole, Anaconda (1) $19,467; N. Storey, Bozeman, (1) $20,052, (2) $18,472; P. O'Connor, Missoula, (1) $20,457; Lord Constr. Co., Hamilton, $18,995. Noted June 19.

Washington—Road Work—Bureau Pub. Roads, U. S. Dept. of Agriculture, 628 Post Office Bldg., Portland, Ore., received bids building McClellan Pass Rd., here, from H. Pederson, Alaska Bldg., Seattle, $303,816; Everett Constr. Co., Hewitt and Bond Sts., Everett, $423,760.

Miscellaneous

PROPOSED WORK

Coal Bin—Buffalo, N. Y.—Donner-Union Coke Co., Bell St., soon receives bids for concrete and steel coal bin. About $70,000.

Monument—Endicott, N. Y.—Endicott, Johnson & Co., 753 Bleeker St., Utica, plan to build monument, here. About $100,000. M. Rillo, chn. O. Ruotola, New York City, archt.

Park Improvements—Pittsburgh, Pa.—City voted $1,815,000 bonds to improve park and playground. Noted Jan. 30 under "Streets and Roads."

Subway—Pittsburgh, Pa.—City voted $6,000,000 bonds to build subway. N. S. Sprague, ch. engr. dept. pub. wks. Noted Feb. 20.

Sewer Pipe, etc.—Wilkes-Barre, Pa.—F. H. Gates, city clk., soon lets contract furnishing and delivering 2300 ft. 12 and 24 in. terra cotta pipe, 50 pieces 12 in. terra cotta bends, brick, sewer inlets and manhole castings, Portland cement and building sand. M. C. Murray, supt. streets and pub. impvts.

Water Pipe—Detroit, Mich.—J. A. Martin, Comr. Purchases and Supplies, Municipal Courts Bldg., soon lets contract furnishing 3115 tons 30 in. class "C" c.i. water pipe, f.o.b. cars Detroit. G. H. Fenkell, 232 Jefferson Ave., engr.

Harbor—Glace Bay, N. S.—Dept. Pub. Wks., Ottawa, soon receives bids improving harbor for Dominion Government. About $50,000. E. Lafleur, c/o Dept. Pub. Wks., Ottawa, engr.

Harbor Improvement—St. John, N. B.—Dept. Pub. Wks., Ottawa, Ont., receives bids about Aug. 1 improving harbor here. R. C. Desrochers, secy.

Harbor Improvements, Dry Dock—Champlain, Que.—Dept. Pub. Wks., Ottawa, Ont., receives bids about Aug. 1, improving harbor and building drydock here. About $55,800 and $207,000 respectively. R. C. Desrochers, secy.

Wharf—St. Francois du Sud, Que.—Dept. Pub. Wks., Ottawa, soon receives bids rebuilding wharf, for Dominion Government. About $30,000. E. Lafleur c/o Dept. Pub. Wks., Ottawa, engr.

Breakwater—Depot Harbor, Ont.—Dept. Pub. Wks., Ottawa, having plans prepared and soon receives bids reconstructing timber breakwater, here. About $34,000.

Harbor Improvements—Port Dover, Ont.—Dept. Pub. Wks., Ottawa, soon receives bids improving harbor, here. About $50,000. E. Lafleur, c/o Dept. Pub. Wks., engr. Noted Apr. 18, 1918.

Subway—Windsor, Ont.—City plans memorial subway under Detroit River. About $6,000,000. J. Brian, city engr.

Grand Stand, etc.—Regina, Sask.—Dept. Pub. Wks., Regina, soon receives bids building 75 x 90 ft. steel grand stand, rein.-con. flooring, concrete foundation, 190 x 240 ft. steel and concrete arena and 72 x 190 ft. brick stable, concrete foundation., on Exhibition Grounds. Total cost, $150,000.

Harbor Improvements—Vancouver, B. C.—Dept. Pub. Wks., Ottawa, Ont., receives bids about Aug. 1, improving harbor here. About $18,000. R. C. Desrochers, secy.

Harbor Improvements—Victoria, B. C.—Dept. Pub. Wks., Ottawa, Ont., receives bids about Aug. 1, improving harbor here. About $21,000. R. C. Desrochers, secy.

BIDS DESIRED

Fishway—Lawrence, Mass.—Comrs. Fisheries and Game, received bids July 14, building rein.-con. fishway, from G. T. Seabury, Inc., 44 Washington St., Providence, R. I., $18,549; S. C. Sperry Co., Inc., 300 Main St., Cambridge, $24,576; Collins Constr. Co., 22 Birch St., $24,981. Noted July 3.

Fire Alarm Cables—Hartford, Conn.—Until July 29, by Bd. Contr. & Supply, furnishing 750 ft. each of Nos. 15, 20, 30, 35, 40 and 50 wire cables and 3000 ft. of No. 25.

Boilers, etc.—Central Islip, N. Y.—Until July 29, by State Hospital Comn., Capitol, Albany, for one 600 h.p. boiler, 4 stokers, etc., for Central Islip State Hospital, here; advertised in this issue. Noted June 19.

Fence, etc.—New York, N. Y.—Until July 28, by C. B. Snyder, supt. school bldgs., Municipal Bldg., for new w.i. fence and gates at Evander Childs High School, 184th St., Morris and Crescent Aves., Bronx Boro.

Gasoline—New York, N. Y.—Until Aug. 1, by F. L. Dowling, pres. Manhattan Boro., furnishing and delivering 32,000 gal. gasoline.

Pier—Swinburne Island, N. Y.—Until Aug. 7, by L. E. Cofer, health officer, Port of New York, Rosebank, S. I., building and repairing Landing Pier, Quarantine Sta.; advertised in this issue.

Transmission Lines—Hackensack, N. J.—See "Sewers."

PESSIMISTS, ATTENTION!

Just one year ago we were grateful for the fact that 23 contracts, valued at $2,425,000, were let in a single week. Bids were wanted on only 9 projects. In the corresponding week of this year (1919), *Engineering News-Record* shows that 50 contracts were awarded, aggregating $10,442,000, while bids are asked on 44 projects.

These figures afford a certain comparison between the prosperity of war time and that of peace.

The destruction season is over; the construction season is here.

Miscellaneous (Continued)

Garbage Incinerator and Chimney—Monessen, Pa.—Until July 30, by J. E. Pittman, boro. secy., building garbage incinerator plant consisting of 2 units with 10 ton capacity to each unit. Chester & Fleming, Union Bank Bldg., Pittsburgh, engrs.

Bulkhead—Phila., Pa.—Until Aug. 4 by Dept. Wharves, Docks and Ferries, Bourse Bldg., constructing with appurtenant work of Schuylkill River Bulkhead, west side, south of Penrose Ferry Bridge. Norman & Stamm, Bourse Bldg., engrs.; advertised in this issue.

Trucks—Phila., Pa.—Until Aug. 19 by G. T. Atkinson, asst. dir. dept. city transit, 1211 Chestnut St., constructing tracks of Frankford Elevated Ry., on elevated structure on Front St., Kensington Ave. and Frankford Ave., between Callowhill and Harrison Sts., about 5 6-10 mi. long. Contr. No. 562; work includes furnishing and laying about 11,310 mi. single track, of which 38,900 lin. ft. will be laid in stone ballast and 20,800 lin. ft. will be laid with short ties bedded in concrete, advertised in this issue.

Silo—Savannah, Ga.—Until Aug. 28, by Comrs. Chatham Co., building rein.-con. silo, 200 ton capacity, on county farm.

Levee—Lake Providence, La.—Until July 30, by Bd. State Engrs. New Orleans Court Bldg., New Orleans, for enlarging (riverside) of Wilton-Goodrich Levee, East Carroll Parish, involving 225,000 cu.yd. levee work. F. M. Kerr, ch. state engr.

Wrecking and Removing—Chicago, Ill.—Until Aug. 7, by I. P. King, clk. sanitary dist., 910 South Michigan Ave., wrecking and renewing westerly portion of power house of Northwestern Elevated R.R. and adjoining tunnel and widening easterly side of south branch North 16th St., advertised in this issue.

Steam Road Roller—Sheboygan, Wis.—Until Aug. 2, by C. F. Boley, city engr., delivering steam road roller, 15-20 tons capacity, f.o.b. Sheboygan. Cost between $20,000 and $30,000. Noted July 3.

Pumps, Boilers, etc.—Sibley, Ia.—Until Aug. 6, by town, furnishing any or all of following equipment: One 250 h.p. Heine or Stirling water tube type boiler 180 lb. pressure, hand fired with shaker grates, 1 feed water heater, open, 500 h.p. series type to use with exhaust steam heating system, 1 feed water meter, wier type, maximum capacity 20,000 lb. water per hour; one 4 in. steam meter, to record amount of live steam let into exhaust heating system by automatic valve, 1 boiler feed water pump, steam driven, 7½ in. x 12 in. x 10 in., one 6 in. angle valve, one 6 in. gate valve, 6000 fire brick, 20,000 red brick, 4000 lb. fire clay. J. J. Shoemaker, supt.; advertised in this issue.

Boilers and Generators—St. John, Kan.—Until Aug. 6, by city clk., furnishing two 80-hp. boilers and two generators. Burns & McDonnell, 400 Interstate Bldg., Kansas City, Mo., engrs.

Electric Distributing System—Millville, Utah—Until Aug. 1 by Town Council building electric distribution system for heat, light and power. About $30,000.

Breakwater—Shippigan Gully, N. B.—Until Aug. 5, by R. C. Desrochers, secy. dept. pub. wks., Ottawa, Ont., repairing breakwater here.

Wharf—Grosse Isle, Que.—Until Aug. 5 by R. C. Desrochers, secy. dept. pub. wks., Ottawa, Ont., building extension to eastern wharf, here.

Water Meters—Ottawa, Ont.—Until July 30, by Bd. Control installing 351 water meters, varying in size from ⅝ in. to 8 in. About $40,000. A. F. McCallum, engr. Noted Feb. 13, under waterworks.

Wharf and Breakwater—Port Elgin, Ont.—Until Aug. 5, by R. C. Desrochers, secy. dept. pub. wks., Ottawa, Ont., repairing wharf and rebuilding portion of breakwater here.

Safety Cars—Saskatoon, Sask.—Until Aug. 20, by C. J. Yorath, city comr., delivering on or before Dec. 1, 5 fully equipped one-man safety cars here; advertised in this issue.

Turbines, Generators, etc.—Saskatoon, Sask.—Until Sept. 23, by C. J. Yorath city comr., for (1) steam turbine alternating current generator, switchgear equipment, (2) surface condensor and condensor auxiliaries; advertised in this issue.

Telephone Lines—Edmonton, Alta.—Until Aug. 15, by Dept. Railways, building 100 mi. telephone lines from Pembina to Ft. Assiniboine and from here to Clyde. About $60,000.

Sluices—Victoria, B. C.—Until July 30, by Inspector of Dykes, Victoria, building rein.-con. sluices with excavation back fill and crib work in Masqui Dyking Dist., for Provincial Government. About $12,000. Work involves 4400 cu.yd. earth excav., 3000 cu.yd. earth fill and 280 cu.yd. rein.-con. E. A. Wilmot, Victoria, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

Paving Blocks—Fall River, Mass.—City received bids furnishing 80,000 wood blocks, from Jennison Wright Co., 6 Beacon St., Boston, $83.25 per 1000, J. W. Hahn, 166 Devonshire St., $48.50 for 4 in. brick blocks and $44.50 for 3 in. brick blocks.

Freight-Handling Trailers and Trucks—New York, N. Y.—E. S. Walsh, supt. pub. wks., Capitol, Albany, received bids furnishing, delivering and testing freight handling trailers and stevedore freight handling trucks for Barge Canal Terminals, here. Contr. 112, from Mercury Mfg. Co., 1118 South Halsted St., Chicago, $6333; Lansing Co., 492 Broome St., New York City, $9250. Noted June 19.

Cast Iron Pipe—Jersey City, N. J.—City received lowest 3 bids furnishing and delivering c.i. water pipe, from J. Fox, 315½ Communipaw Ave., $47.25 per ton; Warren Fdry. Co., 11 Bway., New York City, $47.25; Camden Iron Wks., Line St. and Cooper's Creek, $47.75. Noted June 26.

★**Pipe—Phila., Pa.**—Water Bureau let contract furnishing c.i. pipe, to Donaldson Iron Co., Phila., $30,750.

★**Cap — Yorkhaven, Pa.** — Yorkhaven Water & Power Co. will build concrete cap to close low spillway in main dam, thus preventing water waste and slightly increasing operating head, involving 1000 cu. yd. concrete. About $30,000. Work will be done by day labor.

★**Wharves, Rocks, etc.—Savannah, Ga.**—Seaboard Air Line Ry., Royster Bldg., Norfolk, Va., let contract rebuilding portion of Hutchinson Island Terminal facilities, here, to G. E. Hillyer, Blum Bldg., Jacksonville, Fla. Work includes restoration of wharves, docks, sheds, etc.

★**Lakeshore Protection—Racine, Wis.**—Racine Co. let contract building 4400 lin.ft. double row wood pile lakeshore protection with stone filling, to Great Lakes Dredge & Dock Co., 1000-1004 South Michigan Ave., Chicago, $161,000. Noted July 3.

Boiler and Stoking Plant—Austin, Minn. State Bd. Control, Capitol, St. Paul, let contract installing boiler at electrical plant, here, to Babcock & Wilcox Co., 140 South Dearborn St., Chicago, $12,177; stoker, to Robinson, Carey & Sands, 4th and Wacouta Sts., St. Paul, $7440.

★**Road Oil, Vitrified Brick, etc.—St. Louis, Mo.**—Dept. Streets and Sewers, 317 City Hall, contracts furnishing 200,000 gal. light-grade No. .0432 road oil, to Standard Asphalt and Refining Co., 208 South La Salle St., Chicago, $24,000; 50,000 2¾ vitr. brick, to Hydraulic Press Brick Co., Central Natl. Bank Bldg., at $28.65, eighty-five 5½ and two hundred and twenty seven 3¾ square limestone, to Union Quarry & Construction Co., 4687 Natl. Bridge Rd., $7.00 and $7.94 respectively.

★**Dock — Seattle, Wash.** — Jordan Terminal Co. let contract building 80 x 400 ft., creosoted piling dock in industrial addition, to J. H. Dirkes Co., Henry Bldg. About $30,000.

★**Cotton Compress—Los Angeles, Cal.**—City Harbor Comn. let contract furnishing and installing high density cotton compress on city dock at San Pedro Harbor, to Southwark Fdry. & Machine Co., subsidiary of Baldwin Locomotive Wks., $79,973. Noted June 19.

★**Dam, etc.—St. Stephen, N. B.** Maritime Trust Co. let contract building concrete dam, power house and 2 wheel pits to L. Wheaton, 26 South Park St., Halifax, N. S. About $35,000 cost plus 10 per cent. basis. Work involves 700 cu.yd. rock and earth excav., 550 cu.yd. rein. and mass concrete, coffer dam, purchasing two 56 in. turbines and one generator.

★**Wharf—Ha Ha Bay, Que.**—Port Comn. of Chicoutimi let contract building concrete wharf to J. G. White & Co., 43 Exchange Pl., New York City. About $400,000.

★**Repairs to Pier—Ottawa, Ont.**—Dept. Pub. Wks., let contract repairing South Pier at Burlington Channel, to Ottawa Contractors, Ltd., Elgin St. About $27,940 (unit prices). Noted June 19.

★**Dam, etc.—Parry Sound, Ont.**—City let contract building dam, concrete power house and earth fill, in connection with municipal power plant, to W. M. Fletcher, 151 Bloor St., Toronto. About $64,000.

★**Breakwater—Port Arthur, Ont.**—Dept. Pub. Wks. let contract building breakwater at Bare Point, to Chambers McQuigg, Port Arthur, $150,000. Noted June 19.

★**Breakwater — Port Colborne, Ont.** — Dept. Pub. Wks., Ottawa, let contract repairing breakwater, to J. M. Hogan, Port Colborne, $31,325. Noted July 10.

★**Filling—Toronto, Ont.**—City will fill 64,000 cu.yds. Gerrard St., between Leslie St. and Greenwood Ave. Work will be done by City. Constr. Dept. About $53,000. R. C. Harris, city engr.

★**Aluminum—Portage La Prairie, Man.**—Dept. Pub. Wks., Winnipeg, let contract for aluminum for constructing transmission lines, to Northern Aluminum Co., $33,598.

★**Steel—Portlage La Prairie, Man.**—Dept. Pub. Wks., Winnipeg, let contract for steel for constructing transmission lines, to Canadian Bridge Co., 415 Paris Bldg., Winnipeg, $98,049.

Labor Restless in Chicago

Chicago, July 19, 1919.

The complicated strike situation in Chicago was intensified Friday, July 18th, when the Building Construction Employer's Association called a lock-out on all construction work in Chicago. The particular strike which caused this action was that of the Carpenters, for $1.00 an hour, their previous wage being 85c. and the compromise figure offered them but rejected being 92½c. As the past month has been one succession of tie-ups with laborers, bricklayers, lathers, structural iron workers, etc., this move seems to contemplate a fight to a finish.

It is expected that the Material Producers Association will cease all operation and delivery, thus making the tie-up complete. The immediate effect of the lock-out has been to throw over 100,000 men in the various trades out of work, and to stop work on at least $50,000,000 worth of work in progress, including the Michigan Boulevard improvement, the new Union Station, and all private work.

At the same time, 10,000 men are locked out at one of the International Harvester Co.'s plants, 7,000 are on strike at Crane Co.'s plant, and 16,000 traction employees, both surface and elevated, have just voted, almost unanimously, to strike at once unless granted a flat increase of 77%.

OFFICIAL PROPOSALS

OFFICIAL PROPOSALS

Bids: Aug. 12.

Canal Improvements

STATE OF NEW YORK
OFFICE OF SUPERINTENDENT
OF PUBLIC WORKS.
Albany, N. Y.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until 12 o'clock noon of Tuesday, August 12, 1919, at which place and hour they will be publicly opened and read, for improving the New York State canals pursuant to the provisions of Chapter 147 of the Laws of 1903, and of the acts amendatory thereof and supplementary thereto, and Chapter 570 of the Laws of 1915, as follows:

—1—

CONTRACT No. 144-A.
Erie Canal—Section 9.

For completing the construction of two concrete bridges over Red Creek in Genesee Valley Park, Rochester.

Sheets 1 to 10, inclusive.

—2—

CONTRACT No. 194.
Champlain Canal—Section 2.

For completing the excavation of the canal between Crocker's Reef and Fort Edward.

Sheets 1 to 7, inclusive.

—3—

CONTRACT No. 198
Erie Canal—Section 8

For constructing the substructure, superstructure and approaches of a highway bridge across the barge canal below Lock 28-A, Lyons, N. Y.

Sheets 1 to 6, inclusive.

Plans may be seen and detailed specifications, engineer's estimates of quantities, proposal blanks, form of contract and bond required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y.; at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y.; at the office of the Assistant Superintendent of Public Works for the Western Division, at Rochester, N. Y., and at the canal office, Spaulding's Exchange, Buffalo, N. Y.

Copies of detailed plans or drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or state bank in good credit within the state and payable at sight to the Superintendent of Public Works for five percentum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent) of the amount of the estimated cost of the work, according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds, co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the state for doing the work and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the reular manner if, in the judgment of the undersigned the interests of the state will be enhanced thereby.

EDWARD S. WALSH.
Superintendent of Public Works

Special price for Official Proposals, $3.60 an inch — Copy for Official Proposals can be received until Wednesday, 10 a.m., for issue out the next morning.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

OFFICIAL PROPOSALS

Bids: July 31.

Construction of Reservoir

THE MORRIS RUN COAL MINING COMPANY
Wilkes-Barre, Pa

Sealed proposals will be received by the undersigned at their office in Wilkes-Barre, Pa., until twelve o'clock noon of July 31 at which place and hour they will be publicly opened and read, for the construction of a reservoir on Morris Run, Hamilton Township, Tioga County, for The Morris Run Coal Mining Company.

The construction will involve about 6200 cu.yds. of embankment and about 300 cu.yds. of concrete, mass and reinforced.

Proposals must cover the entire construction, and the necessary labor and materials for same.

The right is reserved to reject any or all proposals and to readvertise and award the contract in the regular manner.

Plans and specifications may be obtained at the office of The Morris Run Coal Mining Company, Miners Bank Bldg., Wilkes-Barre, Pa., on payment of $2.00, which will be refunded upon return of plans and specifications in good condition.

Every proposal must be accompanied by a money deposit in the form of a draft or certified check, payable to The Morris Run Coal Mining Company, for $500.00.

The successful bidder will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them, or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the draft or certified check will be returned to the bidder.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The amount of security required for faithful performance of the work will be 40 per cent of the amount of the estimated cost of the work according to the contract prices.

THE MORRIS RUN COAL MINING CO.

Bids: Aug. 6.

Flood Protection and Drainage Work

Kenton, Ohio.

Sealed proposals will be received at the office of The Upper Scioto Drainage and Conservancy District, until 12 o'clock, noon, Aug. 6, 1919, for the construction of a system of drainage and flood control involving approximately the following principal quantities:

Earth excavation	2,036,400 cu.yd.
Rock excavation	6,290 cu.yd.
Leveling waste bank..	13,713 cu.yd.
Removing waste bank.	12,736 cu.yd.

Drawings, profiles, cross sections, specifications, proposal blanks, and other information may be obtained on application to the Morgan Engineering Company, Dayton, Ohio, or the Secretary, The Upper Scioto Drainage and Conservancy District, Kenton, Ohio, at whose office drawings and other data may be inspected.

S. K. YOUNG.
Secretary

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—James H. McGraw, President

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, Editor — Charles Whiting Baker, Consulting Editor

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Will the Shipping Board Explain?

SOMETHING more than the brief announcement of the proposed construction of 1000-ft. steamships, noted in the news pages of this issue, should be made by the Shipping Board. The mammoth and ornate passenger liner costs a lot of money, some of which in the past has been written off as advertising for the line which builds it. Who is going to operate these new Government ships after they are built? What is their advantage to the American merchant marine over the three or four passenger steamers of moderate size which the cost of each represents? These are questions the Government should answer before going further in the project. As for the Montauk Point terminal scheme, it seems that it must come before the public about every so often. Today, as nearly thirty years ago when it was first proposed, it needs much defending. Obviously, it is not cheaper to carry freight by rail down Long Island than by steamer alongside Long Island, and if passenger and mail speed is the thing desired, why not Boston as a fast-line terminal? If cheaper freight handling is wanted, why not better terminals in New York harbor, where there is still room to dock a number of 1000-ft. vessels with no interference and to put the transatlantic passenger down directly where he wants to be—that is, in New York City?

Oriental Oils and Pacific Ports

TRADE in oriental vegetable oils is new in this country. A few years ago it was comparatively unknown; last year the port of Seattle alone handled 90,000,000 gal., and an article on another page makes it clear that every Pacific port is considering increased provision to take care of the new commodity. The highest form of engineering is here involved. Not only must the actual designing and building of a new type of port facility be carried out expeditiously, but port authorities must be led to see the great importance of the new import trade, which has virtues for the port an export business does not possess. Vegetable oils are used in the manufacture of soap, food products, explosives, paint oils and varnishes. In building up a trade in such oils there is necessarily built up an attraction to those industries which use them as a raw material. Thus, contrary to such an example as Galveston, with its export cotton trade which attracts no business to speak of, the import oil business may serve to build up the cities' industrial development. Furthermore, oil-unloading facilities may attract other freight. Most cargoes can be unloaded at any well equipped wharf, but if only certain locations have the facilities which the oil trade requires that trade is naturally diverted in that direction, taking with it perhaps even a greater tonnage of general freight. Engineers on the Pacific Coast have made a signal success of the oil-port business in the past two years. They should continue to press the advantage which that success has given them.

Indirect Income from Good Roads

WHILE the value of good roads to the public is very generally admitted, it is doubtful whether many people comprehend the magnitude of the benefits. The direct benefits due to greater ease of communication are understood by all, but the value in dollars and cents of the total saving in transportation costs on so comparatively small a unit as the ton-mile, is seldom realized. This saving is discussed in an article on p. 214, by John C. Veenhuyzen of Los Angeles, who calls it "operative income," and bases it upon the difference in transportation cost per ton-mile over improved and unimproved roads. Mr. Veenhuyzen's method of computation may be questioned, because he has used the total traffic on the improved road to figure his saving, while such an amount of traffic on the unimproved roads with which comparison is made would be impossible. However, when a road is improved, produce comes to market which otherwise never would have come, and a saving in transportation reacts to the benefit of the consumer in lower prices for farm and other products. That is, in every business investment—and roads should be classed as such—income develops only as the investment becomes effective. Furthermore, in this case, as in every other, it is necessary to ask, Will the business—the traffic—warrant the expenditure? On the basis of the figures presented it would seem that no community where a fair traffic can be expected can afford to leave its highways unimproved; in fact, with one-tenth the traffic, the roads described could be paid for in a four-year period. Such conditions indicate that the highest quality of surfacing ordinarily employed would be amply justified when its cost is balanced against a yearly income estimated in the form of saving to the community.

Engineers' Salaries and Small Dollars

ONE explanation of the present unrest among engineers is found in the diagrams on p. 182 of our last week's issue, illustrating the shrinkage in the purchasing power of the dollar. They show that an engineer in Washington who had a salary of $70 a month from 1895 to 1897 could buy as much with it as he could at the end of 1918 with $170 a month, and that an engineer now drawing $100 a month can buy only 57% as much with it as he could in 1910. Changed conditions have brought enough more dollars to trade-union men and to unskilled workers to make up much if not all of the shrinkage of the dollar in value, but the great majority of engineers who live on salaries are struggling to make both ends meet with about the same number of dollars

as before—or, to put it another way, with smaller dollars and few, if any, more of them. This does not come from intention to be unjust to the engineer. It comes from ignorance—or from ignoring what has taken place in the value of the dollar, and the extent to which this represents a condition of more or less permanence. In most industries salaries cut so small a figure compared with the cost of labor and materials that the salaried worker might readily be given the square deal in increase of pay. For instance, if the standard allowance for engineering and incidentals on large construction work, say 10% of the total of all the other elements of cost, will still be allowed today when the total cost may be nearly double what it would have been five years ago, the amount available for compensation of engineers will be ample to represent fully the changed value of the dollar.

Holding the Migratory Workman

THE migratory workman is the pest of the construction manager. He drifts into camp, and after a week or a month "rolls his blankets and moves on"—and unit labor costs go up another notch. Cost data and job analyses generally fail to record this item of expense, but it counts in the bidding prices, and no contractor professes to have any very clear idea how it can be eliminated. The "floater" shows only resentment toward obvious "welfare" service, and anything which smacks of paternalism arouses him to rage and radical utterance. Great interest, therefore, lies in the article on p. 213 in which W. C. Ruegnitz explains one of the methods by which he has been able to put at least a dragging anchor on the "floater" of the logging camps.

As Mr. Ruegnitz describes it, his task appears to have been very simple. What was done and how it was done are, however, only a part of the story; the manner of doing what was done is the other and greater part. Men were not coerced into acceptance of bed service; acceptance was not urged. Instead the attitude was, "Here is the service, with bath, beds, pillows, sheets, blankets all complete; if you didn't bring your blanket roll you might try it." One or two men did try it, and they told others braggingly of their better lodging. Others tried it, until now in this camp 90% of the workmen pay for bed service, and labor turnover has been greatly reduced. Briefly, the men were not educated but were led in a subtle way to educate themselves. In this method is the secret of success in stabilizing the migratory workman.

Naturally, bed service might not be expected to solve completely the problem of eliminating the floater. However, giving the men good beds might—and, as events proved, did—induce many of the floaters to stay on the job long enough for a start to be made in their further self-education. Now another step is being taken. The men are being encouraged to form clubs to manage their own bed and bunkhouse service, with the idea that they may develop interest in the camp and become permanent employees. By bringing in the family man and giving him a detached house the camp has been given an atmosphere of a permanent living place instead of that of a temporary lodging. Other methods are enumerated in the article. They are operating successfully. Mr. Ruegnitz would, we imagine, be the last to claim that he has by these methods eliminated the floater from his camp, but he may justly claim that in his camp the floater less often breaks his moorings and drifts away. And, what is extremely interesting, this has been accomplished with a reduction in cost of bunkhouse service to the employer.

Further Tests of Steel Columns

INTERRUPTED by the onset of war, investigation of column strength is likely to be resumed in the very near future. At the American Railway Engineering Association's meeting four months ago it was announced that a new series of tests of steel columns would probably be initiated during the current year. This announcement recalls not only the earlier tests of the association, a rather limited series, but also the great and costly set of tests carried out for a committee of the American Society of Civil Engineers.

New tests, it is obvious, should be planned from the vantage point of the best existing knowledge of column strength. It would be unfair to the intricacy and importance of the subject were further costly and tedious experimental work undertaken otherwise than with the aid of the information yielded by previous work. However, the data of the Civil Engineers' tests have not yet been subjected to critical scrutiny and analysis. In the hundreds of test sheets containing these data, much may lie concealed that would help in planning the new tests: Facts on column behavior as well as cautions with regard to methods of testing or preparing for tests. It would seem wise and prudent, therefore, to defer the inauguration of the proposed tests until the study and analysis now lacking can be made.

For the same reason, it is desirable that the data of the Civil Engineers' tests should without delay be placed in the hands of trained laboratory investigators for study. Moreover, a peculiar obligation rests on the engineering profession in this matter, as was pointed out in these columns two years ago. It arises from the fact that the cost of the tests was defrayed by the Government. The tests were extremely costly, and thus it happens that a large fund was virtually placed in trust with the engineering profession, to the end that construction might be made safer and more economical, for the good of the people. This trust will not be discharged until full study has been applied to the test data, and the work done has thereby been crystallized into fundamental engineering fact. Few engineers believe that the report of the Civil Engineers' committee contains the full net result of the test series. The committee's conclusions commanded so little confidence, in fact, that the representatives of the American Railway Engineering Association, in deciding upon working stresses for bridge members, declined to accept them and instead set up a quite different set of recommendations. The specific comments that have been made concerning the Civil Engineers' column-test report need not be repeated at this time, but those comments amply demonstrated that the report was not based on detail analysis of the test figures. If this be the case, even those who see great value in the report will concede that such analysis should be undertaken.

A serious difficulty in the matter is that professional engineering organization is not well prepared to furnish the tools and funds for the required study. Laboratory training and engineering skill jointly must be applied to the problem. Months of time will be required, which means money to finance the work. It is estimated by men skilled in research that twice as much time is re-

quired for studying and working up test data as for making the tests, and on this basis the several thousand hours consumed in testing the columns of the Civil Engineers' series must be followed by many months of painstaking study. With respect to both skill and funds, it is not easy to see how the conditions are to be met. But there is no doubt that methods will be found, or will be created, once the need for doing the work is clearly recognized.

For full appreciation of the case, it is to be remembered that the tests in question constitute one of the great engineering laboratory investigations in the records of the art. The work was carried on with great precision and in patient detail. But as the behavior of different grades of metal and of various kinds of column structure were involved, and such testing is highly delicate work at best, the gross results cannot be accepted as final without critical questioning. Are all the figures reliable? Have they such character that they can be directly compared? What is the relative significance of the readings of compression, set and lateral deflection? Did the tests produce any figures of value other than the gross ultimate-strength and yield-point data? Generally, what facts are disclosed by the tens of thousands of readings that were taken? Are special features of column behavior, such as the rotary buckling exhibited by certain of the members, important phases of the problem? Is the value of the group of results vitiated by the variation of the test-column material? There is no dearth of essential questions in the problem presented. And many, if not all of them, are likely to have bearing on the tests which the American Railway Engineering Association is preparing to undertake.

Thus, engineers of high prominence in the structural field assert, on the basis of what the Civil Engineers' test indicate, that it is not possible to secure steel uniform enough for consistent results in a long series of column tests. If this be true, and if present acceptance methods cannot be modified so as to assure test-material capable of giving more uniform results, there is no prospect that new tests would be other than a waste of effort.

But there can be no doubt that the proposed tests represent a sound and progressive purpose. They aim at the most important unsettled point in column practice; namely, safe and efficient details. The underlying idea thus is very different from that of the Civil Engineers' tests, which were concerned with solid columns and only solid columns abutting against flat bearings.

It is doubtful whether there has been any large uncertainty in recent years concerning the safety or economy of solid-section steel columns. The working stresses of current practice were known to be safe, yet at the same time high enough to leave little room for increase. Some engineers saw an opportunity for arriving at a better balance of safety as between long and short columns; that is, determining a better formula for working stresses, and the tests were undertaken with this in view. But the purpose failed, for the tests when completed were declared inadequate as a basis for a new column formula; the matter was compromised by using the tests for tentative conclusions as to columns of moderate length, and applying general engineering experience to longer columns. Inasmuch as the other question presented by solid columns, that of proper design of end connections, was elminated from the Civil Engineers' test series by using only square abutment ends, in all cases carefully dressed true, the tests were not adapted to give much aid to practice. Solid-section columns loaded by square abutments are rare; perhaps still more rare are columns loaded centrally and free from lateral forces. Very different is the case of the proposed A. R. E. A. tests. These, dealing with open-webbed or latticed columns, have immediate relation to the important subject of bridge members. They will throw light on serious questions concerning the most efficient way of joining the several parts of a column and of connecting it to its abutments.

The proposed tests therefore promise to increase our ability to utilize structural materials efficiently. Engineers will welcome the promise of securing further data on steel columns, tending toward maximum efficiency of construction. But if the new tests are begun before a thorough study of the prior series is carried out, an opportunity and an obligation will have been neglected.

Highway Engineering as a Science

HIGHWAY engineering has reached a stage where it should be developed as an exact science. The custom of laying out a road for line and grade, and then arbitrarily setting a slab thickness for its entire length without reference to the soil conditions is not logical. When loads were so light that to design for them would have given a crust so thin that it would not resist the climatic and other external forces acting on the road, such a procedure was permissible. With the advent of the motor truck, road slabs must be made heavier, and there is now an opportunity for scientific engineering ability in the design of a road.

True engineering includes not only making a structure strong enough, but also giving due regard to economy in the use of material. Many roads throughout the country have unnecessarily heavy sections, when the underlying soil conditions are considered, even taking into account the greatly increased weight of traffic. Other roads are too thin, at least in places, as is evidenced by breaking up under the increased weight of traffic. Where drainage is good, heavy motor traffic has been carried, during the past two years, over what are considered very cheaply constructed roads, such as water-bound and bituminous macadam. In places these went to pieces, but in long stretches they were adequate, showing practically no strain.

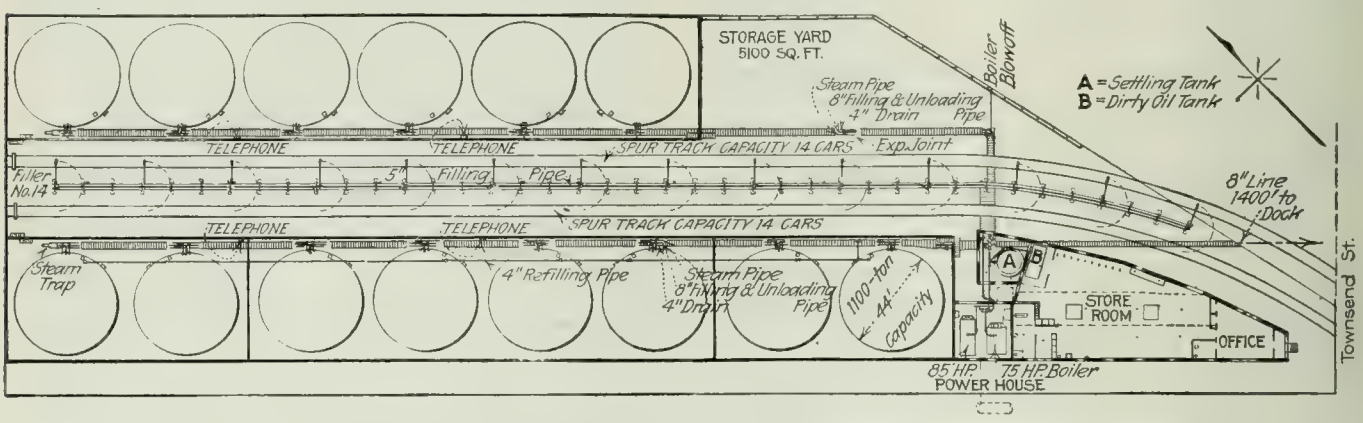
It should be possible to make so extensive a soil survey over a line that a variation in thickness corresponding to variation in conditions could be computed. Railroad bridges are not all designed of the same strength regardless of span length, nor does a hydraulic engineer design all dams of the same section regardless of height. Until highway engineering is reduced to a basis of accurate design for the special conditions met, it will still be considered guesswork, requiring judgment but not a high grade of technical engineering ability.

It is true that more exact highway design requires new data, such as the bearing power of soils, slab reactions, etc., now little developed. From this viewpoint the tests completed and proposed by the Bureau of Public Roads, described on p. 234 of this issue, are of special interest. It is to be hoped that this open field for investigation will be entered, and the experiments pressed to the utmost.

Handling Vegetable Oils at Pacific Coast Port Terminals

Traffic Has Developed Rapidly—Puget Sound Transshipped 90,000,000 Gallons Last Year and the Oil Terminal Question Is Receiving Attention Along Entire Coast

VEGETABLE oils imported from the Orient have increased in quantity very rapidly within the past year or two, and extensive provision for handling them has been made at several Pacific ports. The heaviest traffic has naturally sprung up with ports of the northwest because the northern route from the Orient to our Eastern centers is the shortest. Moreover, Seattle had recently undertaken a progressive scheme of port improvement and was in a position to add to its freight-handling facilities equipment specially for the convenience of oil shippers. Other ports of the Puget Sound district, particularly Tacoma and Everett, have also profited by trade in the new commodity. At San Francisco existing facilities have been developed wholly by private enterprise, but the State Harbor Commission has under way a survey of the need for vegetable oil equipment. The Port of Los Angeles likewise expects to spent for a vegetable oil terminal such part of a recent harbor improvement bond issue as the growth of the traffic may seem to warrant.



LAYOUT OF PHILIPPINE VEGETABLE OIL COMPANY'S TERMINAL AT SAN FRANCISCO

An idea of the extent to which shipments of vegetable oils have increased is conveyed by the recent statement of George F. Nicholson, chief engineer of the port of Seattle, that approximately 90,000,000 gal. of vegetable oils were handled through Puget Sound ports in 1918. Of this total, 60,000,000 gal. was handled through the port of Seattle and the remainder in smaller cities nearby.

In both figures quoted, soy bean oil made up 50 per cent. of the total, the remainder including oils made from the castor bean, cocoanut, peanut, rapeseed, wood, cottonseed, hempseed, perilla, sesame, and also from a few other sources. Tank storage capacity for vegetable oils totaling about 15,000,000 gal. has been developed in the port of Seattle and open storage for cased oil totaling about 25,000,000 gal. is available. There have been times in the past year when this capacity has been taxed.

The soy bean oil as received at Seattle is shipped from the Orient almost exclusively in 5-gal. cans, two cans being packed in a wooden box, this being called a case of oil. Shipping oil in this manner always involves leakage, which has been found to average about 2%. With the oil worth 15 cents per pound this amounts to a considerable financial loss. Another disadvantage is that before the oil can be transshipped it has to be emptied from the cases, as in this country it is practically always transported in tank cars.

There are several reasons, however, why port authorities expect oil to continue to come across the Pacific in cans. Primarily, the great majority of bean growers of the Orient own only a few acres which they harvest themselves, extracting the oil by means of a small press resembling the old cider press. Oil so extracted in the Orient goes by barge down the rivers to one of the chief seaports where it is loaded on a vessel whose cargo consists of probably 300 or 400 small consignments. Eventually a large company will doubtless erect big presses at the chief seaports and the oil can then be expected in bulk shipments. This is not so simple as it might seem, however, because the laws of China prevent the shipment of beans from one province to another, and even after the present shortage of tank steamers is remedied, it must be remembered that the chief exports from this country to the Orient are iron, steel and lumber, which cannot go in tank steamers without great loss of cargo space. Thus, the provision which has developed in Puget Sound ports, at least, has been for receiving cased oil, emptying the cans and pumping the oil into storage from which it can be conveniently delivered to tank cars.



CASED SOY OIL AT SEATTLE WAITING TO BE BULKED FOR TANK CAR SHIPMENT

A large part of the vegetable oil handled at Seattle is unloaded at the Smith Cove dock, which can accommodate 5,000,000 gal. of cased oil on the open dock and 800,000 gal. in concrete tanks beneath floor level. There is a 6-in. pipe line extending to a 2,500,000-gal. tank near the dock owned by a private company and the Port Commission is now building a 500,000-gal. steel tank for increasing the dock storage. Besides the pumps and pipe systems there are also steam-heating rooms for the liquefying of cocoanut oil, which have a capacity of about six tank cars per day. The railway trackage at this dock is sufficient for a total of 40 tank cars.



TABLES WHERE OIL IS BULKED BY HAND AND PUMPED FROM A SUMP

The largest private company handling vegetable oil at Seattle is the Rogers Brown Co., which has an oil terminal on Harbor Island. Here storage for 8,240,000 gal. is provided in 27 steel tanks ranging from 30,000- to 500,000-gal. capacity and in 30 wood tanks from 5000- to 50,000-gal. capacity. They also have outside storage space for 5,000,000 gal. of cased oil. The equipment on Harbor Island includes a $25,000 heating plant, a system for cleaning pipe lines and tanks by compressed air, and a series of eight dumping tables at each of which 50,000 gal. per day can be dumped from cans and pumped to tanks or tank cars. Railroad trackage is provided for the simultaneous loading of 55 tank cars.

The problem of mechanical equipment for the economical handling of vegetable oil under present conditions has been the subject of much experimenting. In Seattle both the Rogers Brown Co. and the Port Commission are now operating machines for opening and emptying the 5-gal. cans. At least six different types of machine have been previously tried out on this work, none of which was successful enough to be retained in service. The latest type has been in use only a short time, but thus far seems very satisfactory. It takes the cans from a conveyor and, with the can on its side, releases the oil by cutting both heads. A plunger then flattens the can, forcing out any oil that remains, and the flattened tin is delivered to a press resembling a hay baler.

Previous to the development of this machine, and in the interim between experiments with its predecessors, the cans were cut open by hand on the oil tables where they were overturned to drain into a pump sump. The empty cans were heaped in great piles on shore where coolie labor cut in the two heads, the headless can being then collapsed by hand and pressed into bales in a hydraulic press. The bales go back to the Orient, where the metal is recast.

At San Francisco conditions differ radically from those at Seattle. Most of the oil handled at San Francisco comes from the Philippines and the Dutch East Indies and is handled in bulk. Moreover, cocoanut oil predominates, the quantity of soy bean oil being almost negligible. Of the 34,000,000 gal. of vegetable oil handled at San Francisco during 1918 about 32,000,000 gal. was cocoanut oil, the remainder being an assortment of the varieties previously mentioned.

Because of facilities furnished at the shipping points in the South Seas and on San Francisco Bay, the cocoanut oil is handled in bulk. Nearly all cargo steamers on this run have tanks of capacity from a few hundred tons up to 1000 or 2000 tons in which cocoanut oil can be carried. These tanks are filled by hose while the general cargo is being loaded, and are emptied in the same manner. Several San Francisco piers have pipe lines to storage tanks nearby and the oil is pumped without interfering with the handling of the general cargo. The quantity of oil shipped has been rapidly increasing and of late there have been occasional full cargoes aggregating 10,000 to 12,000 tons of cocoanut oil shipped in bulk.

Although existing facilities at San Francisco are all privately owned, the California Board of State Harbor Commissioners is planning to make special provisions for handling vegetable oil. The first move will be the construction of an oil terminal where bulk, case and barrel oil can be stored and reshipped. The initial installation will be for 1,500,000-gal. bulk storage, 3,500,000-gal. case storage, with space for extensions as required. The case-storage area will have a tight floor so that leakage may be caught and drained into sumps. The plant will be provided with the necessary heating and pumping equipment, pipe systems and railway trackage.

As an adjunct to this plant a barge is now being equipped for taking oil from vessels while general cargo is being discharged. This barge will meet the condition of a general cargo steamer carrying a small consignment of cocoanut oil and being unwilling to move to an oil terminal dock specially to unload the oil. The barge will be equipped with steam-heating plant, pumps, flex-



PREPARING TINS BY HAND FOR RESHIPMENT OF OIL TO THE ORIENT

ible pipe, etc., so that oil can be transferred from the oceangoing vessel to its own storage tanks and later delivered to the desired oil terminal. The barge will have a tank capacity of about 190,000 gallons.

Despite the lack of municipal provision for accommodating a vegetable-oil trade at San Francisco it has nevertheless built up rapidly. The total storage capacity for bulk oil now aggregates about 14,000,000 gal. and for case and barrel oil about 3,000,000 gal. Seven San Francisco companies carry on an extensive business in vegetable oils and of these five have steel storage tanks ranging from 275,000 to 1,450,000 gal. Two companies have dumping tables where oil is taken from barrels or cans and transferred to tank cars.

The largest individual plant at San Francisco is that of the Philippine Vegetable Oil Co., which has fourteen 1100-ton steel tanks served by a 1400-ft. pipe between dock and storage yard. The tanks are in a double row between which run two railway tracks with space for 28 cars. Fourteen can be loaded simultaneously. This plant has a boiler capacity of 160 hp. and has been designed for the maximum of economy and safety in handling vegetable oil. The fire-insurance rate, which was at first set at 67c., has been reduced to 27c. since the plant has been in operation. This company, one of the pioneers in the industry, owns 235 tank cars, and four motor ships which carry about 12,000 tons per month from the Manila plant to San Francisco or European ports. It also operates an oil terminal at Tacoma which has five storage tanks ranging in capacity from 333 to 3000 long tons. Cocoanut oil freezes at 68 deg. F., and at this northern terminal it was thought best to have the storage tank housed in and to keep the temperature in the building at about 80 deg. This keeps the oil in fluid state. At this terminal oil is unloaded from vessels by means of portable steam pumps which are put down in the hold after the oil has been heated to about 110 deg. Each of these pumps, with an 8-in. suction, can handle about 400 tons per hour. They are usually served by steam from the vessel's own engine room, but flexible steam connections from shore are provided when necessary. The steamers delivering to this terminal each have an oil-tank capacity of 1000 tons. This is ordinarily emptied overnight. The tanks have to be emptied, "steamed down," washed with hot salt water and equipment cleared away between 5 p.m. and 8 a.m., to avoid interference with stevedores. A fleet of about 10 steamers averages three deliveries per month at the Tacoma plant.

The pipe from wharf to tanks is 1000 ft. long and 8 in. in diameter. It is housed in a wooden box with a $2\frac{1}{2}$ x $2\frac{1}{2}$-ft. space inside and is heated by a steam line to keep the oil in fluid condition. From the storage tanks the oil is delivered to 110-gal. steel drums or to tank cars. Spur trackage sufficient for 30 cars is provided. When this plant was being erected the fire-insurance rate quoted was $2.55 per hundred. This has since been reduced to 60 cents per hundred.

The fire marshal at San Francisco requires that all oil-storage yards shall be provided with concrete walls that in case of failure of all the tanks the storage capacity within the wall would be sufficient to hold all of the oil, and this provision is observed at all of the vegetable-oil terminals. In commenting on the fire hazard of vegetable oils in general, the fire marshal in another coast city recently said: "Besides special handling equipment, another provision that the port engineer must not overlook in planning for the oil trade, is fire protection. The vegetable oils are not likely to originate a fire *per se*, except as oily fabrics might start spontaneous ignition. But, oil-soaked wooden containers and wharves have been found to ignite



OIL TERMINAL OF PHILIPPINE VEGETABLE OIL COMPANY AT SAN FRANCISCO

Concrete walls provide emergency containers equaling tank capacity. Note distance from docks in background.

readily and burn with an intense heat, and large quantities of the oil itself have developed a fire that 3- and 4-in. streams from fireboats have been unable to extinguish. Last year in a Pacific port about 1100 gal. burned with terrific heat in the mass of wood and tin containers or poured in a flame from the open wooden wharf down to the water. The blazing oil on the water spread rapidly over a large area and the flames rose

to great height. Fortunately, a light wind drifted it away from other valuable property.

"The difficulty of guarding against such hazards depends largely upon whether there is solid earth under the surface upon which the oil is stored; in any case, there must be walls or curbs to prevent the overflow of the oil and ample fire walls to protect buildings. If the dock is on open piling the floors must be so protected by concrete, sand or similar material, that they will not give way in from four to six hours of intense heat. If these safeguards can be provided the conditions will then be advantageous for a liberal installation of an approved foam extinguisher. This seems to be the best method of controlling such a fire if the foam be in sufficient volume and properly distributed. If the burning oil is allowed to reach the water the safety of adjoining property will depend upon wind and tide."

Malaria Caused by Nondrainage of Irrigated Lands

Wet Areas Due to Seepage From Irrigation Canals Result in Loss of Health and Lowering of Property Values

ECONOMIC loss due to malaria in an irrigation district in California, in 1918, averaged $31.70 per family for medicine, medical service and labor loss, with a range from $1.86 to $75.10 in different parts of the district. This is the conclusion of Harold F. Gray, state district health officer, in a report to the California State Board of Health, printed in the *Journal* of the American Medical Association of May 24, 1919.

The report relates to the Anderson - Cottonwood irrigation district of about 32,000 acres along the Sacramento River, having a population of about 1300, half living on farms and the remainder in two towns. This district was organized in 1914 and the irrigation system—supplied from the river—was able to serve the northern part of the district early in 1918, while some water reached the southern part late in the season. As the soil varies from loam to gravelly loam and the main canal is on a side hill, the seepage from the canal and laterals has increased existing wet areas and caused new pools and marshes, bringing about ideal conditions for the breeding of anopheline mosquitoes. In fact, this is the dominant species. Except for unusual years, mosquitoes did not prove troublesome until the introduction of irrigation in 1918, but in that year they were the cause of universal complaint in the irrigated sections, while Dr. Gray states that in many places they seem to have made life nearly unendurable.

In view of the probable effect of irrigation in increasing malaria, already endemic in this district, Dr. Gray made his studies in order to determine the facts as a basis for recommendations as to its control. Special attention was given to the economic loss, since a tax for malaria control in addition to the heavy tax burden already existing would need evident justification in order to receive the support of the people. Practically every house was visited and data were obtained from 80% of the families, care being taken to underestimate rather than overestimate the probable cost of malaria to the family, and large items being checked by corroborative evidence where possible.

Medicine included quinine, calomel, prescriptions and "patent medicines" purchased by the patients. Medical service included physicians' fees, nurses' wages, hospital expense and medicine given by the attending physician. Labor loss included only that of the head of the household, or other wage-earning members of the family, charged at the local scale of $4 per day. These three items were selected because they could be ascertained with some degree of certainty. Of 1081 persons, 590, or 54.5%, had malaria symptoms. The cost per family for the year, as stated above, was $5.70 for medicine, $7.10 for medical services and $18.90 for labor loss, making a total of $31.70. With families averaging 4.16 persons, the cost was $7.66 per capita or $14.05 for each sick person.

Other costs are listed for which no accurate figures were obtainable. Thus, the six deaths averaged probably not less than $100 per funeral besides the economic value of the lives lost. Loss by inability to handle crops at proper time, owing to malaria attacks, amounted to $120 in one case. Nine families intended to leave the district on account of malaria, with probable loss on forced sale of property, while there was further loss due to families being deterred from buying land and settling. There was loss in much property being vacant on account of malaria, and in 20 such cases the annual rental was about $200. Loss due to families removing from the district in summer on this account will average about $50 per family, and there is, besides, the economic loss to the community. Depreciation of property value due to the presence of malaria and mosquitoes is taken as $5 to $10 per acre.

Drainage and mosquito-control work is estimated to cost $22,400 in the first year, $5000 in the second year and then $3800 annually. Of the first year's expense, $12,000 is allowed for agricultural drainage and correction of interference with natural drainage which would be required regardless of malaria. Estimating a reduction in malaria of 50%, 75%, 90% and 95% for the first four years, this work should eliminate, in savings, the malaria cost due to medicine, medical service and labor loss, while it should show a considerable profit in other items, particularly in appreciation of property values. Dr. Gray states that experience in California shows that the above reduction percentages are readily obtainable. The organization of a mosquito-abatement district, under the California law, has been advised as the first step in measures for control of malaria.

Canada's Electric Generating Plants

Canada has 565 electric generating plants supplying current for sale, according to an extensive descriptive report and summary by L. G. Dennis, just published by the Canadian Conservation Commission, Ottawa, Ont. These plants, which have an aggregate capacity of 2,107,743 hp., give service in 973 places, through 752 distributing systems. There are 270 hydro-electric plants, with a total of 1,806,618 hp.; 201 steam-driven, with 282,202 hp.; 49 gas plants, with 8157 hp.; and 45 oil- or gasoline-engine plants, with 4766 hp. Municipally owned plants number 207 and have 452,508 hp. altogether. There are 358 privately owned plants with a total of 1,655,235 hp. The Niagara system of the Ontario Hydro-Electric Commission (public) has a total load of 210,000 hp. and supplies some 120 municipalities. The Shawinigan Water & Power Co., of Quebec, has a load of 205,000 hp. and supplies, directly or indirectly, about 75 places.

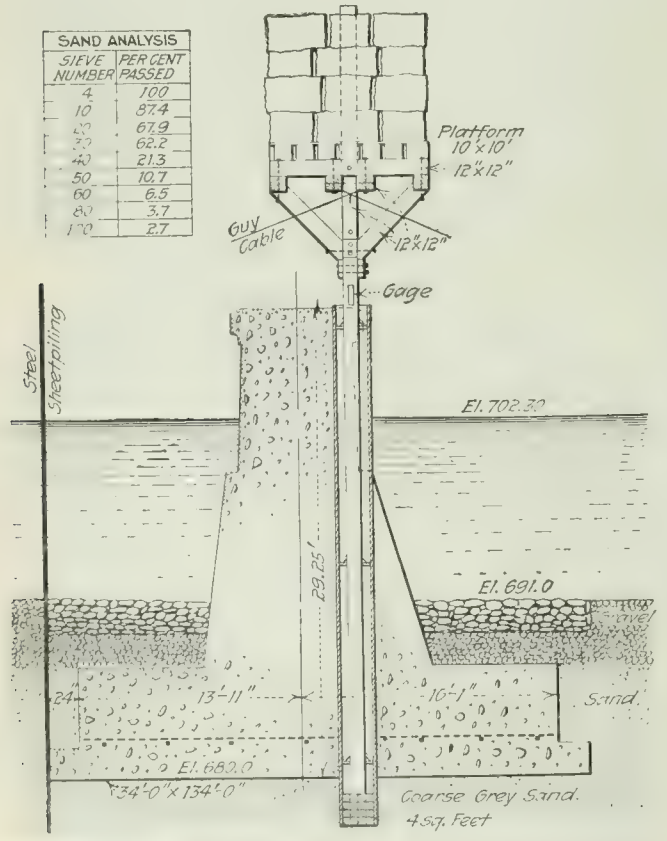
Test of Sandy Foundations at Arch Bridge Pier

Settlement Measured by Gage at Top of Timber Mast Passing Through Completed Concrete Base—Stone Blocks for Load

By Arthur Richards
Deputy County Engineer, Columbus, Ohio

A UNIQUE foundation soil test was made at one of the piers of the Broad Street bridge, Columbus, Ohio, in order to determine the bearing power and settlement under load of the sandy material below the pier. This test was conducted after the pier had been completed up to the springing line of the main arches, so that the sand was in a normal loaded condition and confined to preclude any upward movement adjacent to the bearing block. Large stone taken from an old abutment was used for the load, and applied on a platform at the top of a long mast extending through the pier. This platform was loaded rapidly up to about 11,500 lb. per square foot and finally to 18,350 lb. without any special consideration as to time of application; the object was to determine the action under long periods of load.

The test shaft was placed near the center line of the bridge in a sump opening through the pier which had been used to keep the cofferdam unwatered as the concrete construction proceeded. The bottom of the sump was dug out about 3 ft. lower than the footing of the pier, and it was this lower elevation at which the test shaft was begun. The first section of the shaft box was 10 ft. long. In the lower end was inserted a built-up block of wood 24 x 24 x 24 in. which was nailed to the shaft box to prevent upward movement,



DETAILS OF TEST APPARATUS AND RESULTS OBTAINED

RESULTS OF SOIL TEST AT ARCH BRIDGE PIER

Time	Time Interval Hr.	Min.	Lbs. per Sq.Ft.	Total Settlement, Ft.	Time	Time Interval Hr.	Min.	Lbs. per Sq.Ft.	Total Settlement, Ft.
3-27-19					2.30 p.m.	0	5	11,520	0 05
10.00 a.m.			1,275	0.00	3.00 p.m.	0	30	11,520	0.06
3-28-19					3-29-19				
1.37 p.m.			1,936	0 00	10.00 a.m.	19	0	11,520	0.06
1.40 p.m	0	3	2,780	0 00	10.20 a.m.	0	20	12,275	0.06
1.44 p.m.	0	4	3,742	0 00	10.25 a.m.	0	5	13,125	0.08
1.50 p.m.	0	6	4,456	0.00	10.30 a.m.	0	5	13,980	0.10
1.53 p.m.	0	3	5,210	0 00	10.40 a.m.	0	10	14,705	0.11
1.56 p.m.	0	3	6,215	0 01	10.45 a.m.	0	5	15,699	0.12
2.00 p.m.	0	4	7,165	0 02	10.50 a.m.	0	5	16,599	0 13
2.05 p.m.	0	5	8,036	0.03	10.55 a.m.	0	5	17,250	0.14
2.10 p.m	0	5	8,897	0 05	11.00 a.m.	0	5	18,350	0.15
2.15 p.m.	0	5	9,832	0 05	3-31-19				
2.20 p.m.	0	5	10,488	0 05	8.00 a.m.	45	0	18,350	0 15

but which could be displaced downward when a few hundred pounds of weight was placed upon it. The sump was filled with excavated sand up to the level of the bottom of the pier footing, and the concrete placed in this sump opening was carried up around the shaft box. This box was 2 x 2 ft. in cross-section and was carried vertically up to the elevation of the springing line.

Shortly after the pier was completed a 10-ft. flood occurred in the Scioto River, which delayed the beginning of the test for two weeks. Just prior to the placing of the test mast in the shaft, about 2 ft. of silt and sand which had been deposited therein during the flood was blown out of the shaft with a steam jet. The elevation of the water during the test period within the shaft and about the pier was 702, as illustrated in the drawing.

A 12 x 12-in. fir derrick boom was used as the loading mast, with guards to keep it vertical during the test and prevent deflection. The test platform, as illustrated in the photograph and drawing, was built up of 12 x 12-in. timbers. Some of the bolt washers, because of excessive weight on one side to balance the platform, were indented into the timber not more than $\frac{3}{16}$ in. during full loading, and the lower 12 x 12-in. brace on one side had a deflection of several inches. The large stone used for loading the mast varied in size, shape and weight, so that it was difficult to keep the load properly balanced at all times. Guy cables were therefore used to hold the mast in position during unequal loading, but for the test periods of 19 hours and 45 hours the platform was evenly balanced. The rope shown in the photograph extending over the top of the platform was the life line to be used by the workmen in the event of the failure of the platform.

The large stones used in the test were taken from the west abutment of the old bridge and were placed on the platform by a derrick; each stone was numbered and measured and its weight was computed. This stone was red and yellow sandstone and its weight per cubic foot was obtained by taking various samples, about 20 lb. each, and finding their displacement in water. The weight per cubic foot used in calculating the platform loading was 130 pounds.

The platform was constructed and attached to the mast before the latter was placed in the shaft. The entire weight of mast and platform was dropped clear of the last foot in order that the block at the bottom of the shaft would be loosened from the shaft box. A gage divided into hundredths of a foot was placed on the mast near the top, the indicator was adjusted, and the loading was begun the next day.

All the piers of the bridge rest upon coarse gray

sand which extends below the footings about 40 ft. and overlies about 20 ft. of blue hardpan on limestone bedrock. The total maximum toe pressure which will exist at any pier is computed to be about 8000 lb. per square foot, and the foundation soil test was made primarily to determine whether any undue settlement would take place. The time interval in loading therefore received no special consideration, as it was desired to see what action took place under a load over a long period of time. The platform was therefore loaded rapidly until a load of 11,520 lb. per square foot was obtained. As indicated in the table of results, it is seen that there was a total settlement of 0.06 ft. shortly after the first full load was applied, and that this remained constant for a period of over 19 hours. Additional weight was then applied until a pressure of 18,350 lb. per square foot was obtained, with a total settlement of 0.15 ft., which remained constant for a period of 45 hours.

It is evident that as the pier was being constructed up to the springing line, a small settlement had taken place, and that as the arches and the fill over the arches are placed there will be additional small settlements. From the test results it would appear that in this case after settlement had occurred for a specific load there would be no additional settlement in the future under the same load. With a pressure of 8000 lb. per square foot a total settlement of 0.04 ft. can be assumed; and as probably half of this will occur before the arches and superimposed loads are placed, it will only be necessary to provide for 0.02 ft. settlement when considering the placing of the arches. This is considered negligible.



LOADING THE TESTING PLATFORM FOR SOIL TEST

During the construction of the next pier it is intended to embed a vertical steel rod in the footing, and then make note of the settlement which takes place during the remainder of the construction of the bridge.

As the load was removed from the platform the gage was observed; after all the stone had been removed there was no change in the reading. The lower end of the mast was examined, and one end was found to be slightly crushed, although the general appearance indicated that the load had been evenly distributed. Improvements in the test apparatus would result if a steel plate on top of the bearing block and another at the bottom of the mast were used, and also by framing around the mast at the gage in order to prevent sidewise motion.

The cost of the test was as follows:

Test shaft, labor and material	$176
Platform, labor and material	172
Placing and loading platform	135
Dismantling platform	65
Extra, concreting test shaft	37
State liability insurance	32
	$617

The Broad St. bridge is a reinforced-concrete structure consisting of seven arch spans, and is being built by the Carmichael-Cryder Co., of St. Louis, at a cost of $650,000. The work is being done for Franklin County, Ohio, under the supervision of John Dun, county engineer.

Bonding New to Old Concrete

SMALL-SIZE tests on mortar and concrete specimens in direct tension, shear and cross-bending have led W. E. Rosengarten of the United States Bureau of Public Roads to the following conclusions (reported in the official paper of the Bureau, *Public Roads*, for June, 1919) regarding the practice in bonding old to new concrete:

By careful treatment new concrete can be made to adhere to old with a strength equal to 60% of monolithic concrete. If a greater bond than this is desired it will be necessary to resort to dowels drilled into the old concrete.

If no special treatment is given the old concrete other than cleaning off foreign substances before adding the fresh concrete, a bond of but 20% of the monolithic concrete is developed.

The surface of the old concrete can be roughened or treated with a 1:10 dilute solution of hydrochloric acid which will increase the bond by 20% of the strength of the monolithic concrete.

A bonding medium of a thin layer of neat cement butter spread over the surface of the old concrete will increase the bond 20% the strength of the monolithic concrete.

Tamping the fresh concrete hard against the old concrete, forcing the cement into the pores, increases the bond 5% of the strength of the monolithic concrete.

The above conclusions refer to a rich concrete—namely, 1:⅝:1½—and for leaner mixes the percentages very likely would be increased.

The shearing strength of a joint is greatly increased by a treatment of the surface of the old concrete, and although it may slightly increase the cost of the work, the added effect would certainly seem desirable. The results of this series show that there is no danger of leakage at a joint made in concrete of a mixture as rich as 1:⅝:1½, under pressures up to 40 lb. per square inch; when the surface of the old concrete has been treated.

Substructure of Michigan Avenue Bascule Bridge, Chicago

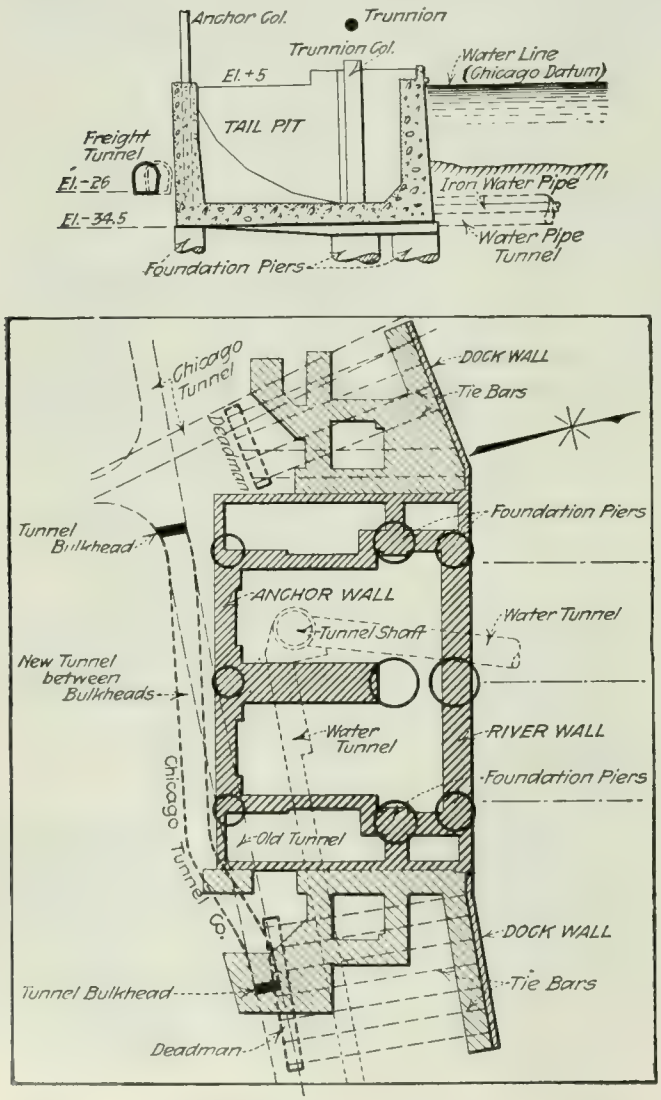
Cylinder Piers Sunk to Rock and Hardpan Carry Large Concrete Tailpits for Double-Deck Bridge—Steel Columns Embedded In the Walls Support Girders for Trunnions and Uplift Anchorage

By Hugh E. Young and William A. Mulcahey
Engineer of Bridge Design, City of Chicago
Engineer of Construction City of Chicago

REINFORCED-CONCRETE boxes or tailpits about 95 x 67 ft. in plan over all and 40 ft. deep, with their floors 34½ ft. below water and supported on concrete cylinder piers, form the principal parts of the substructure for the 254-ft. double-deck bascule bridge across the Chicago River at Michigan Ave. Braced cofferdams about 75 x 100 ft. were required, one of these being in 22 ft. of water. Open wells for the piers were sunk after the excavation had been carried down to the floor of the tailpit. Tunnels for water-supply and freight traffic were encountered, and a break in one of these caused the flooding of a cofferdam.

This bridge will be a double-leaf four-truss structure of the trunnion type, with a span of 254 ft. between trunnions and a clear width of 220 ft. between masonry piers. It is a part of the Michigan Ave. improvement to form a new link between the boulevard systems of the north and south sides of the city.

Each pit is a monolithic structure, 52 x 66 ft., inside at the floor level. Its front wall or river pier and its rear wall or anchor pier are each supported on three cylinder piers. In the rear wall are embedded the steel anchor columns carrying girders or floor-beams which serve to take the upward reaction at the bumper blocks due to the live load on the river arm of the bascule leaf.



PLAN OF SUBSTRUCTURE FOR SOUTH PIER SHOWS INTERFERENCE WITH TUNNELS

Transverse beams at the bases of these columns distribute the uplift to the concrete wall. The side walls are supported at their ends by the river and anchor walls and at intermediate points by cylinder piers carrying the girders for the trunnion bearings. At the ends of the side walls are brackets supporting cantilever shelves which form horizontal girders to reinforce the sides against lateral loads. These cantilevers also carry the masonry of the inclosure walls and columns supporting the sidewalks of the two decks on the fixed portion of the bridge.

To carry the trunnion bearings there is a heavy steel cross-girder behind the river wall, its ends resting on the side walls directly above the cylinder piers under these walls. At the center of the girder, where are located the bearings of the two middle trusses, it is supported by a heavy steel column seated on an independent cylinder pier beneath the floor of the pit. This column is braced longitudinally by a steel A-frame which has its toe in the river wall and is incased in concrete.

Of the 18 cylinder piers, nine to each pit, varying from 7½ to 12 ft. in diameter, one is carried to bedrock at a depth of 108 ft. below water line or city datum. This pier is formed with a shallow taper footing. The other piers are carried only to the hardpan, at depths of 80 to 90 ft. below datum. In these the bottoms are belled out for about 6 ft. in height to give a base diameter equal to 1½ times the diameter of the body of the pier. The maximum load per square foot allowed on the base of the footings is 25 tons on rock and eight tons on hardpan.

Owing to the great depth to which the tailpit is carried, its base being 34½ ft. below the water line, it was necessary to provide a heavy floor to withstand the upward pressure. This floor is 5 ft. 3 in. thick, including a 6-in. waterproofing course near the middle of its depth. At the center a rib or beam on the underside of the floor-slab is provided to carry part of the floor loads and the reactions developed from lateral loads on the anchor pier.

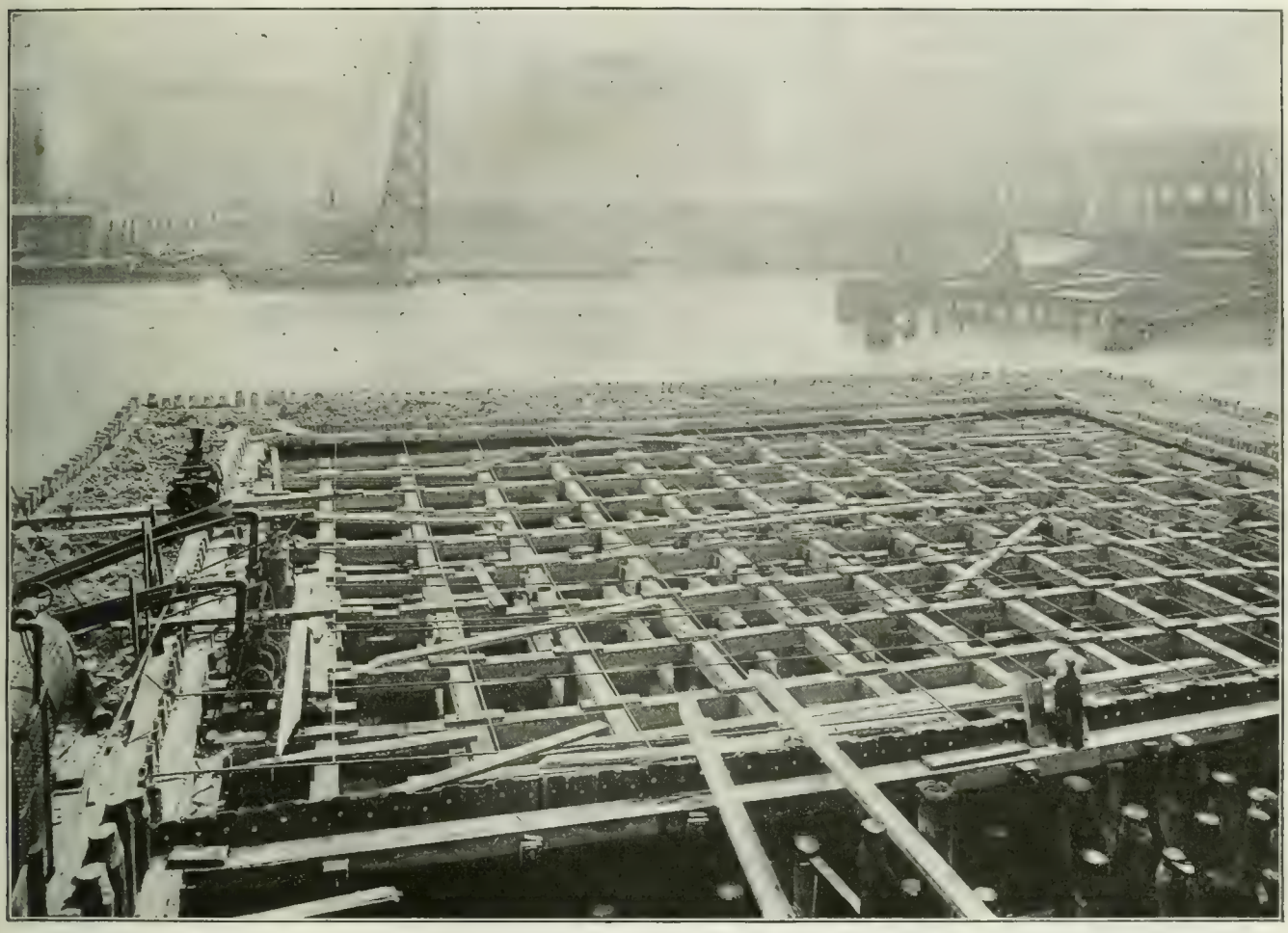
To provide supports for the rails of the emergency brake system, having toggle-joint brakes which act on the curved heels of the trusses, four concrete walls are built in the pit in line with the ends of the trusses. These are stepped at the top to permit of a good bond with the concrete and grout which will be placed when the brake rails are installed.

A stone concrete of 1:3:5 mix is used throughout, and to all the concrete of the tailpits was added hydrated lime in the proportion of 10 lb. of lime to 94 lb. of cement.

For waterproofing, a 6-in. layer of 1:2 mortar, made of portland cement and fine aggregate, is placed in the

floor and on the outside faces of the walls, the thickness being reduced to 4 in. in the upper portion of the latter. This was carried up with the concrete, a 12-in. plate with angles on the inside being placed against the form to insure a uniform thickness of the facing.

The 45-ft. steel column supporting the middle of the trunnion girder is about 51½ x 22½ in. in section, with



COFFERDAM, 75 X 105 FEET INSIDE, FOR NORTH PIER OF MICHIGAN AVENUE BRIDGE, CHICAGO RIVER

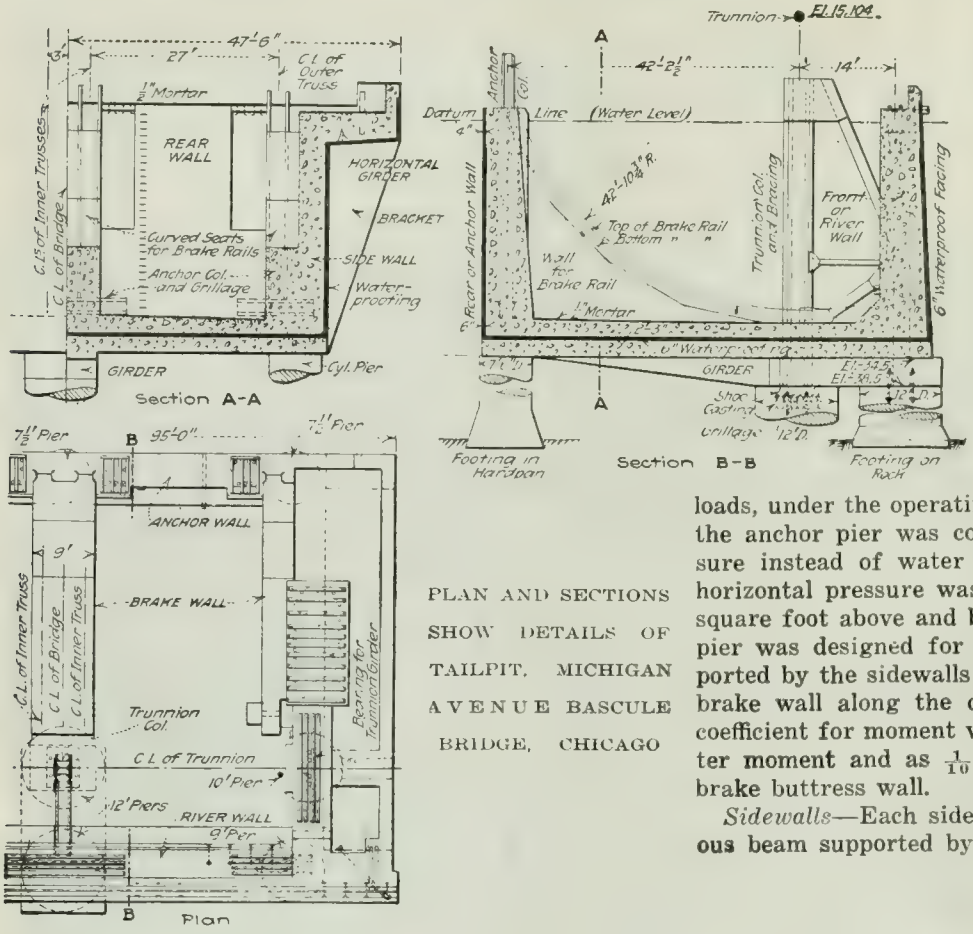
three 22-in. webs between the 50-in. side plates, as shown in the drawing. This shows also the A-frame brace. Provision is made for placing shim plates at all bearing points of the girder, in order to permit of adjustments in case of any difference in deformation of the sidewalls and the steel column under the dead load of the bridge. As the anchor columns are for tension loads, they are of relatively light construction. Each has two built-up sides of channel section connected by batten plates and lacing. These columns are 60½ ft. long, weighing 10 tons; they were erected complete, requiring a long spliced boom on a floating derrick to lower them vertically through the pockets formed by the bracing of the cofferdam. Between these columns are framed the 52½-in. floor-beams.

Concrete slab foundations on timber piles having a penetration of 18 to 20 ft. are used for the four operating towers, the spaces between the piles, behind the dock walls, being filled to the level of the base of the buildings. The dock walls are of concrete, supported on a double row of oak piles with a single line of triple-lap wood sheet piling between them. These walls are anchored or tied in place by horizontal bars extending back to concrete stringers or deadmen embedded in the fill. As the tower and dock wall foundations are independent of the bridge substructure, they are not affected by the bridge loads and vibrations.

Each concrete box pier or tailpit is designed to carry its own dead weight, water pressure from without and —to a certain extent—water pressure from within. This latter condition is brought about with the pit filled with water when the final hydrostatic tests are made before the cofferdam is removed. The effect of buoyancy due to the displacement of the pit walls and floor was considered, but the displacement of the pit as a whole was not taken into account either as lessening the dead loads of these parts or as reducing the loads in the subpiers. The loading conditions assumed in the design of the tailpits are given below.

Pit Floor—Two conditions were covered. For the operating condition the pit was assumed to be empty, with water pressure on the under side of the floor equal to 1410 lb. per square foot. For the construction condition the pit was assumed to be 25% filled with water, with the soil offering no support to the floor and pressure taken at 1410 lb. per square foot.

The floor was designed as a slab—reinforced longitudinally and transversely—supported by the sidewalls and pier walls and continuous over the girder along the center line of the bridge for both upward and downward pressures of 1410 lb. per square foot. This load was distributed to the longitudinal and transverse spans in inverse proportion to the fourth power of their span lengths. For the longitudinal span the coefficient for



PLAN AND SECTIONS SHOW DETAILS OF TAILPIT, MICHIGAN AVENUE BASCULE BRIDGE, CHICAGO

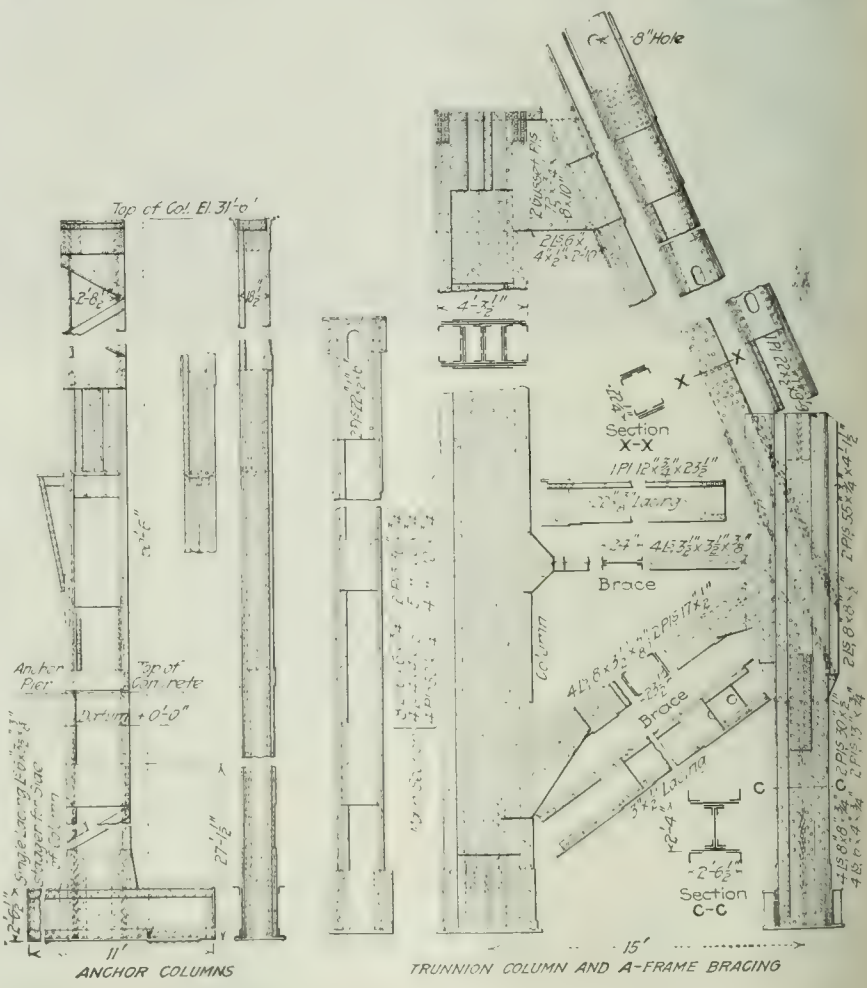
moment was taken as $\frac{1}{10}$ and provision is also made for bending moment in the floor slab induced by the cantilever moment in the river pier. For the transverse span the coefficient for moment was taken as $\frac{1}{12}$ for positive center moment and $\frac{1}{12}$ for negative ment was taken as $\frac{1}{12}$ for positive line of the bridge.

River Pier—For the operating condition the pit was assumed to be empty and the river wall or pier subject to the vertical loads of the bridge superstructure. For the construction condition the pit was assumed to be 25% filled with water and having a proportional part of this load on the floor carried by the river pier. The loads for these conditions are as follows: Pit empty; dead load of superstructure; 75% live load of superstructure; concrete in pier above datum at 150 lb. per cubic foot; concrete in pier below datum at 90 lb. per cubic foot. Pit 25% full; no superstructure loads; concrete in pier at 150 lb. per cubic foot.

For vertical loads this pier was designed as a beam continuous over the three cylindrical subpiers as supports. For horizontal loads, under the operating condition, the pit was assumed to be empty and the river pier subject to water pressure on the outside, while for the construction condition the pit was assumed to be filled with water to datum (for testing the pit for leaks) with the cofferdam in place and, therefore, no external pressure. The method used in the design of the river pier for horizontal loads is similar to that applied to retaining walls subject to bending moment due to the horizontal loads and direct stress due to the weight of the masonry.

Anchor Pier—The conditions and loads were practically the same as above, except that as to horizontal loads, under the operating condition with the pit empty, the anchor pier was considered subject to earth pressure instead of water pressure on the outside. This horizontal pressure was taken at 28 lb. and 60 lb. per square foot above and below datum, respectively. This pier was designed for horizontal loads as a slab supported by the sidewalls and the buttress formed by the brake wall along the center line of the bridge. The coefficient for moment was taken as $\frac{1}{10}$ for positive center moment and as $\frac{1}{10}$ for negative moment over the brake buttress wall.

Sidewalls—Each sidewall was designed as a continuous beam supported by the river pier, the anchor pier



STEEL COLUMNS IN PIERS SUPPORT GIRDERS FOR TRUNNION BEARINGS AND UPLIFT ANCHORAGE

and the cylindrical subpier for the trunnion. For horizontal loads, under normal operating conditions the pit was assumed to be empty and the wall subject to earth pressure on the outside. For the construction condition the pit was assumed to be filled with water to datum, with the cofferdam in place and, therefore, no external loads.

Cylinder Piers—In the design of the cylindrical subpiers the operating condition produced the maximum loads, which were as follows: Dead load of superstructure, 50% live load of superstructure, concrete of wall at 150 pounds and 90 pounds per cubic foot above and below datum and 150 pounds per cubic foot in the subpiers.

This project is being carried out by the Board of Local Improvements, of which C. D. Hill is chief engineer, but the plans and specifications were prepared in the bridge-designing section of the bureau of engineering, Department of Public Works: Hugh E. Young, engineer of bridge design; Thomas G. Pihlfeldt, engineer of bridges, and John Ericson, city engineer. The Great Lakes Dredge & Dock Co. is doing the substructure work for the bridge and its south approach under three contracts which aggregate $2,350,000. Capt. William Murphy is general superintendent for the company.

Camp Beds and Bedding Service Lower Labor Turnover

Bed Service by Big Lumbering Company Reduces Cost and Retains Men—Old Floaters Rent Beds and Forget To "Roll Up and Move On"

By W. C. Ruegnitz
Bridal Veil Lumbering Co., Portland, Ore.

MEN will cheerfully pay a dollar a week rent for bed and bedding service, and a camp which houses a hundred men for a ten-months' operation can make a profit on the service. Moreover, it is found that the men will stay longer on the job and will work more energetically.

An experience extending over a period long enough to be conclusive has established the truth of these assertions. This experience was gained in a logging camp, but the same results should be as readily obtained in a mining camp or in a construction camp, where similar conditions prevail.

About two years ago an experiment in furnishing bedding was tried by the Bridal Veil Lumbering Co. at one of its logging camps where about one hundred men are employed. Two of the regular bunk houses were especially cleaned, and to the regular equipment of steel bunks and mattresses there were added sheets, pillows, pillow slips, blankets and comforters. All of the bedding was of a good quality and was warm. The beds in these houses were called "special service bunks," and a charge for their use was made at the rate of $1 per week, 25c. for each of the first four nights of each week.

Coupled with this bed service there was a shower-bath house and a drying room. Men coming in from work on wet days could leave their wet clothing in the drying room instead of bringing it into the bunk house. A laundry was established so that the men on coming in from work could have a clean change of clothing after taking their baths. No man was allowed to elect to use this special service unless he had two suits of underwear, a complete change of clothing. This was done to keep the place clean and to improve the sanitary conditions.

Applications for the use of this special service came in slowly at first. Men had been so in the habit of carrying their beds that they paid little attention to the new service; many old-timers sneered at the idea, and continued to "roll up and move on." It was difficult to get the coöperation of the foremen. Occasionally a man was hired who had no bedding. He had lost his roll or he had not worked in a camp before. He accepted the special service. Soon results were apparent. Men who had carried their beds compared the company's bedding with their own. The special-service bed was better; it was clean; it was made up daily, so that at night the men had as good a bed as the best hotel could offer, and it was actually inviting. There was no change in the building, but the environment was different.

Waiting List Soon Established for the Special Service

We soon had a waiting list of men who wanted to use the special service. The following year 50 special-service beds were put in camp. This year we have 75 special-service beds in a camp of 100 men, and a waiting list of 17 men shows the feeling the men have toward this class of service. Many have discarded their blankets, and the labor turnover in our camp has been materially reduced. The men who take the special service invariably stay longer in camp than the men who carry their bundles.

It may be interesting to know how this special service is handled. We do not use the old-fashioned "bull cook" to make the beds. A washing machine and drying room are established in one building. The linen is washed by a woman who has charge of the special-service beds. She not only takes care of the making of the beds, but sees that all the linen is clean and mended. She has as much assistance as may be necessary, according to the number of beds that are used. An enterprising woman in camp can easily work up trade among the men to do their personal laundry and mending. This personal service is one that is greatly appreciated by the men.

The following tabulation of costs will no doubt be quite surprising to many contractors or operators who have considered that it would be impossible to put in bed service with supplies of bedding. First, we will consider costs based on the old practice of supplying beds alone:

One iron bed and spring, first cost, $5, years of life, 5, annual depreciation, $1 One mattress, first cost, $5, years of life, 2, annual depreciation, $1 50 Stove and miscellaneous equipment, first cost, $3; years of life, 3; annual depreciation, $1 Totals, first cost, $11, years of life, 3, annual depreciation, $3 50

Assuming ten months' operation, the unit cost per man per month are:

Depreciation, $0 35; interest, $0 066; labor (actual costs), $1 00; rent, light, etc., $1.00; total, $2.416.

Since, according to logging-camp practice, nothing is charged for this service, this $2.416 represents the loss per man per month. Now, let us add bedding to the

service and charge the men 25c. per night for the first four nights of each week. The additional costs are as follows:

Item	First Cost	Years of Life	Annual Depreciation
1½ heavy blankets at $10	$15 00	5	$3 00
2 light blankets at $2	4 00	3	1.33
1 comforter at $2	2.00	3	.67
4 sheets at $1	4 00	2	2.00
2 pillow slips at 25c	.50	1	.50
Total	$25.50		$7.50

Based on ten months' operation, the cost per man per month would be:

Depreciation, $0 75; interest at 6%, $0 15; labor care of bedding, $1 00;, total, $1.90.

By reason of this additional expenditure there is realized a return of $4.50 per man per month or, if the beds are not all occupied, of, say, $3.50 per man per month. But beds and other equipment under special care will last longer than under the old system, so that a revised analysis of the cost of the equipment is justified, as follows:

Item	First Cost	Years' Life	An. Depr.
1 bed	$5 00	7½	$0 75
1 mattress	3 00	3	1 00
Stove and miscellaneous equipment	3 00	3	1 00
Bedding	25 00	Varies	7.25
Total	$36.00		$10.00

The cost per man per month for ten-months' operation would then be as follows:

Depreciation, $1.00; interest at 6%, $0.216; labor, $2.00; rent, light, etc., $1.00; total, $4.216.

If the beds are all filled, the returns would be $4.50 per man per month, which would give a net profit of 28c per man per month. Even if the beds are not all occupied and the return is only $3.50, the net loss per man per month is only 71.6c., as compared with $2.416. Besides the money economy, bed service produces better feeling, cleaner men.

Coupled with the special bed service, every attempt is made to induce the family man to come to camp by furnishing him with a semifurnished house that will enable him to take care of his family. The invitation to the family enables the contractor to have women in camp who can be called upon to do the work that is required by the special bed service. The two work hand in hand.

Commissary stores have received increased floor space, and tables, with reading matter on them, and pool tables, have been added. A charge is made for their use. There is no attempt at paternalism. In all cases the men pay for what they get. No varnished camps or expensive structures have been attempted. An experiment of two years along this line has demonstrated the practicability of the idea. In discussing the subject of service beds, employees have repeatedly come to us with this remark: "We have thrown our roll away, and if we can't find a camp where we can get a bed furnished we will not go to work in camp."

Home Rule Cities May Regulate Utility Rates

The Supreme Court of Colorado has decided by a 4 to 3 vote that cities of that state operating under home-rule charters may regulate the rates of public-service companies. The cities affected are Denver, Colorado Springs, Pueblo, Boulder, Grand Junction and Fort Collins.

Good Roads Pay for Themselves Twice Every Year

Statistics for Three Roads in Los Angeles County, California, Show Large Operative Income From Decreased Haulage Cost

By John C. Veenhuyzen
Superintendent, Los Angeles County, Road Department, Los Angeles, Calif.

COMPARISON of accurate traffic censuses with haulage contract prices over both improved and unimproved roads in Los Angeles County, California, shows highway improvement to be a great economic investment. According to the data available as to the saving in haulage per ton-mile, to date three of the main roads out of Los Angeles have paid for their original cost and maintenance about nine times during the past four years. While it is impossible to estimate some of the indirect saving and other advantages from such improvement, the actual saving in transportation amply justifies large expenditures for this purpose, and it is believed that if such figures as are here presented are made public, there will be no trouble in obtaining money for such construction.

Traffic necessarily requires good roads. On the other hand, good roads stimulate traffic, and it becomes a continuous battle to keep roads up to the condition required not only by the increased number, but also by the increased weight of vehicles. The better the road, the easier it becomes to haul heavy loads. Building good roads and maintaining them continuously in good condition is therefore expensive.

Public Does Not Realize Benefit

In general, the public is most interested in the original cost of such improvements, and although to a certain extent it is realized that they are a benefit to the community, still the public does not fully realize what the actual benefit is because there are no figures at hand to show this benefit in a form that can be grasped generally. Indeed, it is doubted whether the persons most interested in the subject—that is, those who create the traffic by the use of such roads for their daily work or pleasure—fully realize the economy which is the result of the improvement and to what extent they profit.

It will therefore not be out of place to give some detailed figures, the result of nearly five years of investigation, which express what might be called the "operative income" of good roads, i.e., roads which have been improved either by the application of a macadam or better surface. As an illustration, the discussion will be confined to three important roads, two connecting the City of Los Angeles with San Pedro and Long Beach harbors, and one connecting the Cities of Long Beach and Pomona. All of these roads are built of oiled macadam, and their cost of construction and maintenance, up to date, is given in the accompanying table.

The operative income on these roads was computed on the following basis: The cost of haul per ton-mile over unimproved roads, according to the records of the Los Angeles County road department, averages about 25c. The records also show that the average cost per ton-mile over roads improved as stated above is 10c. per ton-mile, and several contracts for hauling have been let on the latter basis. These figures are assumed to cover

INVESTMENT AND OPERATIVE INCOME FROM THREE ROADS IN LOS ANGELES COUNTY, CALIFORNIA

Harbor Boulevard (Built, 1912; length, 11.33 miles; cost, $231,185; upkeep, $133,249; total cost to date, $364,434.)

	Ton-Miles — Horse Traffic	Ton-Miles — Motor Truck Traffic	Operative Income at $0.15 per Ton-Mile	Miles Auto Traffic	Operative Income at $0.02 per Mile	Total Operative Income for Year
1915	2,278,634	2,689,771	$745,260.75	3,763,259	$75,265.18	$820,525.93
1916	628,588	2,832,765	517,703.00	5,231,354	104,627.08	622,330 08
1917	698,890	2,925,821	543,706.60	10,743,899	214,877.98	758,584.58
1918	326,675	3,421,086	562,164.10	14,647,763	292,955.26	855,119.36
Total						$3,056,559.95

Long Beach Boulevard (Built, 1911; length, 12.47 miles; cost, $183,151; up-keep, $241,231; total cost to date, $424,382.)

1915	791,959	1,376,843	$325,320.30	5,047,670	$100,953.40	$426,273.70
1916	223,026	2,344,030	385,058.40	7,419,026	148,380.52	533,438.92
1917	245,783	1,854,756	315,080.90	8,948,340	178,966.80	494,047.70
1918	300,505	3,038,159	500,799.60	15,853,045	317,060.90	817,859.50
Total						$2,271,619.82

El Monte-Pomona Road (Built, 1913; length, 19.39; cost, $256,465; up-keep, $146,863; total cost to date, $403,328.)

1915	3,036,183	3,414,821	$967,650.65	11,047,743	$220,954.86	$1,188,605.51
1916	4,090,718	3,556,368	1,147,062.98	13,227,567	264,551.34	1,411,614.32
1917	4,090,718	3,556,368	1,147,062.98	13,227,567	264,551.34	1,411,614.32
1918	820,972	5,891,893	1,006,929.96	18,585,121	371,702.42	1,378,632.38
Total						$5,390,466.53

only the actual hauling and not the cost of loading and unloading trucks at freight terminals. This shows an operative income of 15c. per ton-mile on improved roads for commercial hauling. Why these ton-mile charges are lower than those reported from other parts of the country is not known, but it is suggested that it is due to lower wages and practically a 100 per cent year—that is, it is possible to operate trucks every day in the year with no interference from snow and ice and little from rain. Naturally, under these conditions upkeep is very much reduced and there is little lost time. In arriving at the figures the operation cost of the county-owned trucks were taken into consideration, depreciation being allowed at 20% per year.

The foregoing figures for the saving in commercial haulage were obtained from the difference in actual contract prices, but the saving for passenger automobiles, while not so easy to determine can also be considered an income. This income is made up of many factors, such as saving in oil, gasoline, wear and tear, and time. The saving from this source was assumed for automobiles at 2c. per mile. On distances as shown for the three roads in the table a saving in time of one-half in coming and going computed at 50c. an hour will more than cover this assumed total saving in operative income.

Accurate traffic censuses which were used in computing the figures in the table were taken on the three roads as follows: The figures showing average daily tonnage and number of vehicles were computed from a census of seven consecutive days of 24 hours each, and are as complete and correct as they can be made. They were not picked at random but were taken in shifts by experienced men and in different months during the year. The standards accepted for weights are rather low, so as to obtain only conservative figures.

The figures given for operative income in the tables were computed on the assumption that the traffic of each year was constant, and neglecting the steady increase of traffic during the year. It will be seen that in the case of the Harbor Road the income for four years was about 8½ times the total cost plus the maintenance; for the Long Beach Boulevard the income was 5⅓ times the cost, while for the El Monte-Pomona Road the income exceeded the total cost about 13 times.

There was no way of measuring the local traffic between intermediate points on these roads, so that the figures only show the actual traffic coming from and going to the City of Los Angeles, and passing over the entire length of the roads. They are therefore conservative and show the great financial gain to the public resulting from road improvements. The benefits of these gains are not necessarily confined to those who are making use of the roads, but they react on the public in general, especially through improved marketing conditions for garden truck, fruit, and dairy products. Aside from this, there are the many advantages of pleasure, convenience and comfort which such roads give to the users.

Considering the fact that these roads were built from a bond issue of $3,500,000 and form only a small part of the Los Angeles County system which was built under the issue, the road improvements from a financial standpoint cannot be criticised.

Covered Wooden Highway Bridges Economical in Oregon

MANY timber highway bridges have been built by the bridge department of the Oregon State Highway Commission, as noted in the annual report of the latter for 1917-18, because the material for such structures is plentiful in that state, and the first cost and maintenance charges are sufficiently low to warrant their consideration from the standpoint of economy. Observation of existing structures leads to the conclusion that the life of uncovered bridges is about 10 to 15 years, and that when they are properly covered the increased life is from 30 to 40 years. The covering of a wooden truss span adds about 30% to the cost and over 50% to the life of the structure.

One of the main disadvantages of the covered wooden truss span—that is, the bad lighting conditions—has been overcome by introducing a pleasing design of cased window openings. These open windows, however, can only be used when the bridge floor is paved. Otherwise, the advantage of the covered type is lost, due to the fact that the rain blows in and reaches the structural members.

The foregoing information has been furnished by C. B. McCullough, bridge engineer of the Oregon State Highway Commission, Salem.

Australia Has New Large Irrigation Projects

Near Albury, N. S. W., there has just been started an irrigation project which will, when completed, have a reservoir capacity of 1,000,000 acre-feet and a reservoir area of 30,300 acres, which brings it up among the large irrigation projects of the world. The site of the main dam is on the Murray River, and the reservoir extends into Victoria. About $8,000,000 will be expended by the Governments of New South Wales, South Australia, Victoria and the Commonwealth of Australia. The main dam is 3601 ft. long, divided into a 2700-ft. earth section, a 740-ft. concrete spillway and a 1061-ft. outlet works. It is not very high, being only about 85 ft. at the deepest part of the river. The discharge over the dam will amount to about 100,000 cu.ft. per sec., and a portion of this is to be utilized for hydro-electric development. Other parts of the work comprise an irrigation canal, control of the Murray River by locks and dams, and future control of other nearby rivers.

Chicago's $140,000,000 Lake-Front Improvement Plans

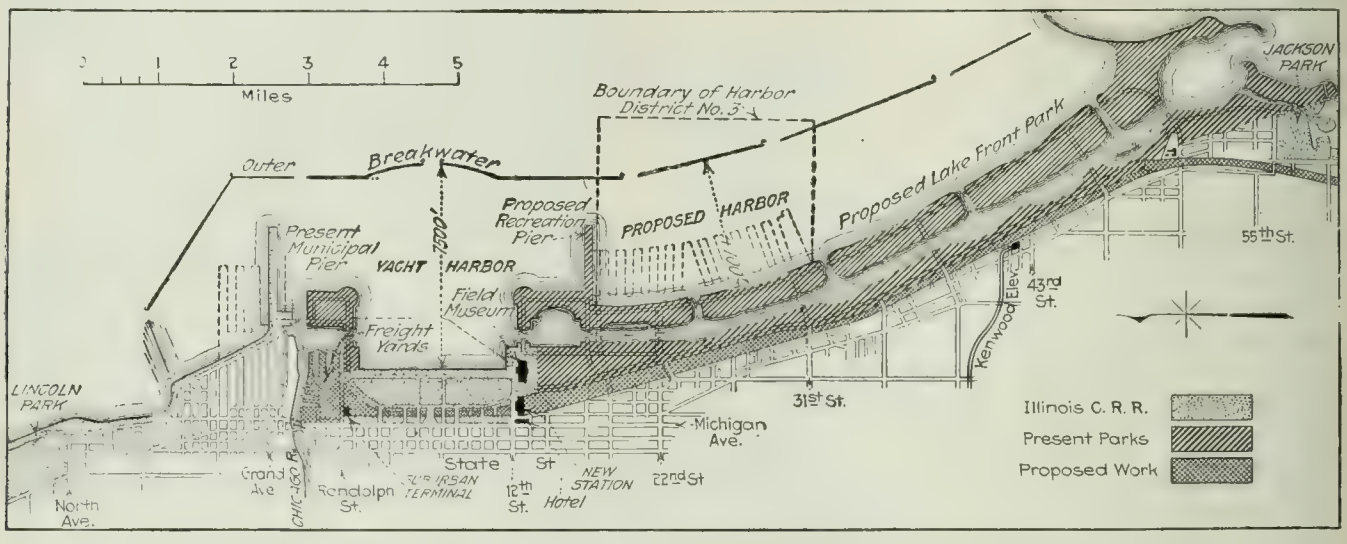
Railway Terminals, New Station, Electrification, Park, Harbor, Stadium and Other Large Developments Included

INTRODUCTION of electric traction on the Chicago terminal lines of the Illinois Central R. R., and reconstruction of the passenger terminal on a greatly enlarged scale, have been brought several steps nearer to attainment by the passage July 21, 1919, of a city ordinance covering this work and the general improvement of the lake front as a city park. The railway and park works are closely interlocked, owing to the fact that the railway occupies a part of the present shore line, beyond which it is proposed to establish a lake-front park by filling in along the shore, thus connecting Grant and Lincoln Parks on the north with Jackson Park on the south.

Complications of right-of-way, riparian rights, specific improvements, conflicting interests, encroachments on navigable waters and means of access across the railway to the park and harbor together with various allied matters of major or minor importance, have caused the negotiations to take the form of a four-sided debate between the city of Chicago, the South Park Commission (a state authority), the railway company and the United States Government (War Department). The filling on the lake front cannot be done without permission of the War Department. This it has refused to give until definite plans were presented, and it has also required that provision must be made for a lake-front harbor development within this park area. With these main elements and innumerable other matters to be harmonized and brought into a comprehensive but reasonable ordinance, the negotiations have progressed intermittently for over 15 years, but during the past few months they have been speeded up considerably. The ordinance, when approved by the mayor, will be submitted to the War Department.

Electrification of the Illinois Central Railroad lines within the city limits is one of the most important and interesting features of the improvement. This is to be applied to the suburban service within seven years, to the freight service with 10 and 15 years for different sections, and to the passenger service within 20 years. These provisions apply also to the Michigan Central R.R. and to some local lines of the Illinois Central Railroad.

The new passenger station is to front on 12th St., east of Indiana Ave., and its building is to be of a classic design, harmonizing with the new Field Museum, which is closely adjacent. This building will be 420x150 ft., with provision for extending it laterally in both directions as traffic develops. The main tracks will be elevated, but 12th St. will be raised also by an incline so as to be at the level of the main floor of the station. Beneath this level will be the baggage and express floor, approximately at normal street level, beneath which, again, will be the thorough suburban tracks. The plans provide for a future lower deck beneath the baggage-room level, thus doubling the track space. The station plans were presented some time ago (see *Engineering News* of Sept. 28, 1916, p. 624, and *Engineering Record* of Dec. 23, 1916, p. 783.)



MAP SHOWING LAKE-FRONT AND RAILWAY IMPROVEMENTS FOR CHICAGO

It will be a terminal station for main-line trains, with 12 stub tracks at the first-floor level, but there is ample room for increasing this number to 25 when required, independently of the lower-track deck already noted. Four suburban tracks will be depressed to pass under the station and continue north to the local terminal at Randolph St. Three freight tracks will pass outside the east end of the station and continue to the freight yards at the Chicago River. These suburban and freight tracks will extend through Grant Park, in the present open cut with concrete retaining walls, but at a lower level. Coach yards, a local freight yard and an engine terminal with rectangular engine houses are to be arranged south of the station. Improvements included in the park work are a stadium to seat 100,000 and a large aquarium. The cost is estimated at $88,500,000 for railway work and $53,000,000 for park work, the city's share of this latter being about $750,000.

Favors Municipal Ownership

Acting on a recommendation of its charter revision committee, the city council of Atlanta, Ga., has adopted a resolution asking the legislature to pass a charter amendment authorizing the city to acquire and operate any public utilities in Atlanta now owned by private corporations.

Some Tests on the Properties of Reinforced Concrete

Effect of Protecting Metal, Lapping Reinforcing Bars and of Reversing Stress in Beams as Well as the Action of Diagonally Placed Rods in Slab Spans Studied for Concrete Ship

By W. A. Slater

United States Bureau of Standards, With Emergency Fleet Corporation, Philadelphia, Penn.

Elaborate investigations of the availability of concrete for ships were necessarily a part of the program of the concrete ship section of the Emergency Fleet Corporation in preparation for its work during the war. The studies then made involved many kinds of laboratory tests which it may be impracticable to publish in full, but some of the results having most applicability to reinforced concrete in general are now being made public. Such results were the subject of a paper by W. A. Slater, who had charge of the investigations, in a paper entitled, "Structural Laboratory Investigations ip Reinforced Concrete Made by Concrete Ship Section, Emergency Fleet Corporation," and presented to the annual convention of the American Concrete Institute. An abstract of some of the data in that paper is given here.

Corrosion Tests

A CORROSION investigation was begun with the idea of determining the relative value of various kinds of coating which might be used for the purpose of protecting steel embedded in concrete from corroding due to the action of sea water and of sea air. Proprietary paints and bituminous coatings were used for the most part in this investigation. In addition, certain metallic coatings were used. Because the results were needed at the earliest possible date, the salt-spray accelerated test was applied. No way is apparent of converting the length of time which specimens stood up under this severe test into actual time which they would stand up under service conditions. However, the results may be expected to show something of the value, relatively to each other, of various means of reducing corrosion. The various specimens consisted of 4 x 4-in. pieces of black iron of No. 16 gage coated with the material to be used as a protective covering. In the case of paints and bituminous coatings the specimens were allowed to harden as much as they would without long-continued exposure. This generally required from 5 to 15 days.

As a result of the salt-spray tests it was found that any one of several different kinds of paints or bituminous coatings furnished a high degree of protection against corrosion. Their suitability for use depends on the practicability of applying a coating, of placing a coated bar of this kind in position without damaging the protective coating, and upon the fact that in all cases the bond resistance is seriously affected by such a coating.

Galvanizing and sherardizing protected the steel against corrosion, but a decomposition of the zinc itself took place. This raised the question of whether the salt which forms in this decomposition would have the same effect in splitting the concrete away from the bar as occurs when the unprotected bars are used. Electrolytic tests, in which both galvanized and unprotected bars were used, showed that the galvanized bars split due to corrosion within a shorter time than did the unprotected bars. There was uncertainty, however, as to whether the same action would occur in corrosion which was not due to electrolysis.

A proprietary method of protecting steel from corrosion which involves a chemical action of a phosphorus compound on the steel was tried. This gave poorer resistance to corrosion than any of the paint or bituminous coatings. However, when compared with unprotected steel there was sufficient retardation of corrosion to indicate that this method of protection may have decided value for treatment of steel which is embedded in concrete, since it caused no apparent loss in bond resistance.

The results of the tests made were not sufficiently conclusive to warrant the adoption of any anti-corrosion treatment for the reinforcement in the concrete ships which are under way.

Leakage of Water Through Cracks

Early in the investigation of shearing strength of reinforced-concrete beams it was found that cracks were likely to form when shearing stresses were considerably lower than those which it seemed necessary to use in the design of concrete ships; yet it was not known whether these cracks were such as would permit leakage of water through them or not. Tests were made in which hollow beams were loaded in such a way as to cause diagonal tension cracks in the side walls at the same time that the beam was filled with water which was maintained under pressure varying in head from 15 to 30 ft. These tests indicated that the smallest crack which could be detected, say 0.001 in. or less, in width, would permit the passage of enough water to cause a moist surface on the outside around the crack. As the crack width increased, the leakage increased rapidly, provided that time was not given for the closing up of cracks by the deposit of sediment of any kind. When the crack was 0.01 in. wide, water spurted clear of the outer surface of the beam.

When the beam was allowed to stand over night with the pressure head and the load maintained, the leakage was decreased markedly. This was probably due to the deposit of a substance which helped to fill up the cracks. Further indication of this was shown by the appearance of efflorescence on the surface of the beam in the neighborhood of the cracks.

If the cracks had been very small at the time of their formation and had developed very slowly, it is possible that the silting would have kept up with the opening of the cracks, and that leakage would not have occurred. Apparently, this is what has happened with some of the concrete ships and barges which are afloat. An inspection made by the writer on a concrete ship which had been in the water about a year showed the presence of cracks which were large enough to cause leakage under the conditions to which these test beams were subjected. However, there was no leakage, although the cracks were below the water line, and apparently there had been none. There was efflorescence apparent at cracks on the inside of the hull, indicating that the process of silting had been taking place. To the writer this seems more nearly a conclusive demonstration of the ability of the concrete ship to stand up under the conditions of

service than would be the case if there were no cracks, and if the possibility of cracks yet forming were present, together with uncertainty as to whether they would close up due to formation of silt.

Bond Tests of Coated Bars

Bond tests were made to determine the effect of the various anticorrosion treatments on the bond resistance of a bar. These were pull-out tests in which the specimens consisted of 6 x 6-in. concrete cylinders with ½-in. square bars, both plain and deformed, embedded axially in the cylinder. The amount of slip was measured accurately. The results of these tests indicate that in general all protective treatments used, except the phosphate treatment, reduced the bond resistance materially. This statement is true, regardless of whether plain bars or deformed were used, and regardless of the amount of slip which is to be taken as the basis for comparison.

Bond Tests with Lapped Bars

Beams were made in which a ½-in. bar was lapped over a distance of 40 in. at the center of the span. In one beam no other bars were present. In all others six additional bars varying in size from ½ in. to ¾ in. were used. Measurements of stress were taken at various points along the lapped bar as well as along the through bars, as shown in Fig. 1. Bond resistance was probably slightly decreased by the notches which were required to expose the bars for measurement.

In judging of proper working stresses in bond, an end slip of 0.01 in. in pull-out tests has sometimes been used

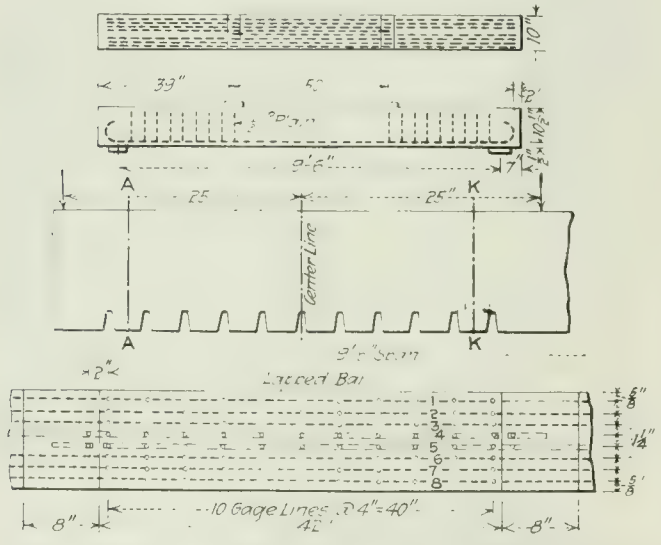


FIG. 1. TEST BEAM TO DETERMINE LENGTH OF LAP OF REINFORCING BARS

as the criterion. For pull-out tests using a concrete not less strong than that in these tests the bond resistance for uncoated bars at 0.01 in. end slip was 600 lb. per sq.in. The results of this test indicate that the factor of safety for unanchored bars is less than would appear if the working bond stress is based upon the resistance when the end slip is 0.01 in.

Fig. 2 shows the load-stress graphs for all the bars of beam 8AAB1 at sections A and K. Bars 4 and 5 were lapped with bar 5 ending near section A, and 4 ending near K. At section A, bar No. 5 was of little use in resisting the bending moment but it increased in effectiveness from section to section until at section K it

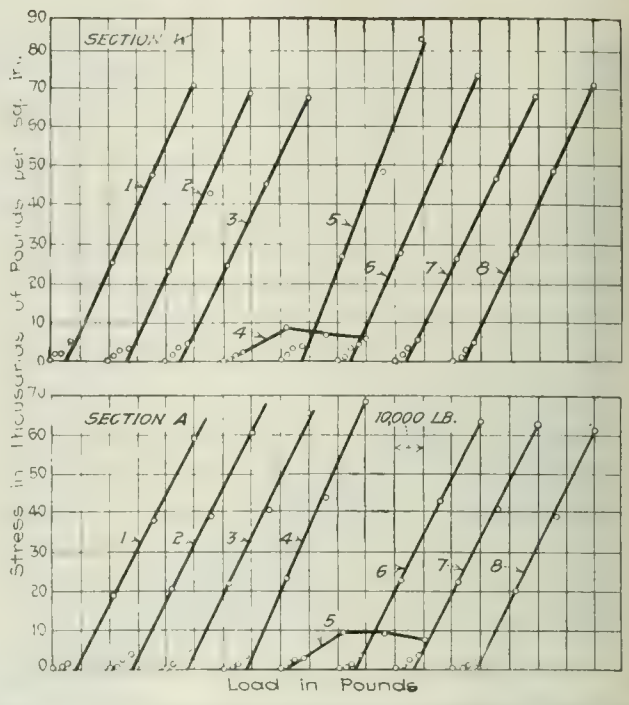


FIG. 2. LOAD-STRESS GRAPHS AT EXTREME ENDS OF ONE OF THE TEST BEAMS SHOWN IN FIG. 1

was fully as effective as any bar in the beam. Likewise, bar No. 4 was ineffective at section K, but at section A was fully effective.

The distribution of the stresses along the bar is shown in Fig. 3 for beam 8AAB1. The solid lines show the stresses in the lapped bars and the dotted lines

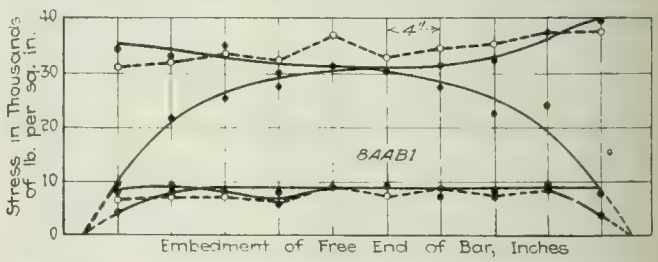


FIG. 3. DISTRIBUTION OF TENSILE STRESS ALONG RODS FOR TWO LOADS

Solid lines = stresses in lapped bars; dotted lines = stresses in through-bars

show the average for all other bars in the beam. The curves are given for two different loads for each beam. These loads are those which will give computed tensile stresses of 16,000 and 40,000 lb. per sq.in. in the reinforcement. From the slopes of these curves the bond stresses may be determined. These are shown in Fig. 4 for beam 8AAB1 for loads of 22,000 and 36,000 lb. The distribution of points on curves for Figs. 3 and 4 is somewhat erratic, due to the formation of cracks which will cause tensile stresses and bond stresses to be set up which are not in accordance with the assumption of perfect bond resistance. The amount of slip for beam 8AAB1 at various points along the reinforcing bars is shown in Fig. 5 for loads of 22,000 and 36,000 lb. The greater regularity for these points is due to the fact that they represent the summation of deformations along a bar. By this process of summation the irregularities due to cracks are removed to a great extent.

To serve as a working basis it may be assumed that for any given tensile stress the safe length of lap is

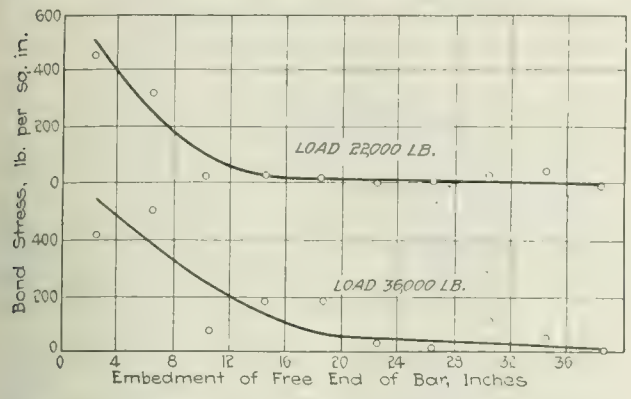


FIG. 4. DISTRIBUTION OF BOND STRESS ALONG BARS OF BEAM

the distance from the free end of the bar to the point where the tensile stress in the lapped bar becomes constant and equal to the stress in an adjacent through-bar. Analysis shows that if the lap furnished is less

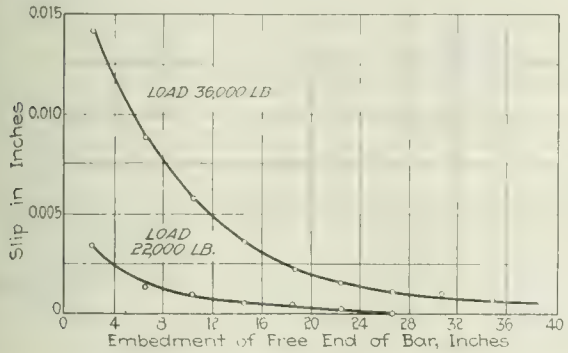


FIG. 5. SLIP AT SUCCESSIVE POINTS ALONG BARS OF BEAM

than this the tensile stresses in the through-bars at the ends of the lap will be greater than the value computed by the equation:

$$f_s = M/A_s jd$$

This is based on the assumption that the entire lap lies within a region of constant bending moment.

With this assumption as a basis, Fig. 6 has been prepared. The data for the beam without any through-bars were not used in this figure. The amount of reinforcement for this beam was very small; consequently, the concrete took a large portion of the stress, and the stress curves for the steel were too erratic for use in this way. The ordinates of the points given represent the distance from the ends of the lapped bars at which the measured stresses shown as abscissas were developed. A straight line represents fairly well the mean of the values shown by the points. The equation of this line is:

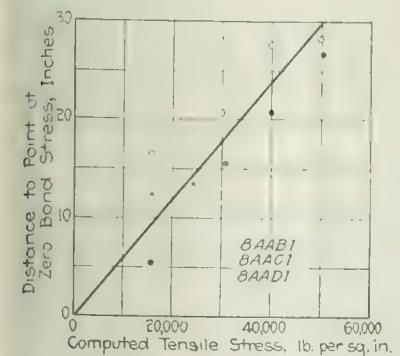


FIG. 6. RELATION OF TENSILE STRESS IN REINFORCEMENT TO LENGTH OF LAP REQUIRED

$$s = .00059\, f_s \text{ where} \quad (1)$$

s = distance in inches from end of lapped bar to point where bond stress becomes zero, and

f_s = the tensile unit stress under consideration.

It is apparent that the total tensile stress in a lapped bar at the section where the bond stress becomes zero is:

$$\frac{\pi a^2 f}{4} = \pi a u s, \text{ where} \quad (2)$$

a = diameter of bar, and

u = average bond stress in distance s.

From this equation

$$f = \frac{4us}{a} \quad (3)$$

Substituting in equation (1)

$$.00059 \frac{4us}{a} \quad (4)$$

$$u = \frac{a}{4 \times .00059} = 210 \text{ lb. per sq. in.} \quad (5)$$

This indicates that the value of the average bond stress was independent of the tensile stress developed. The adoption of this form of equation is equivalent to concluding that the average bond stress over the length s was the same at all stages of the test, but that the length s increased as the tensile stress increased. Reference to the beam in Fig. 4 shows that the distance s from the end of the bar at which the bond stress becomes zero was greater for the load of 36,000 lb. than for the load of 22,000 lb. but that the average bond stress was not far from 210 lb. per sq.in. in both cases. For the other beams the average bond stress was less than this. It probably is not exactly true that the average bond stress developed at the ends of lapped bars is independent of the tensile stress developed, but as a basis for design this assumption is probably exact enough.

It is generally assumed that the length of embedment required to develop the tensile strength of the bar is directly proportional to the diameter of the bar. In this investigation it was not feasible to test a sufficient number of beams with lapped bars to check this, but it seems a logical assumption to make. In these tests ½-in. bars were used. That is

$$a = \tfrac{1}{2} \quad (6)$$

Dividing equation (1) by equation (6) gives an equation for the number of diameters of lap required to develop the stress f_s.

$$\frac{s}{a} = \frac{.00059\, f_s}{\frac{1}{2}} = .00118\, f \quad (7)$$

The stress in the lapped bar just outside the lap is the f_s of this equation. If this is less than the average stress at this section calculated by the equation

$$f_s = \frac{M}{A_s jd}$$

the stress in the through-bars must be greater. Consequently, in using this equation to state the safe length of lap, the value of f_s should be the yield-point stress. Otherwise, the yield-point stress will be passed in the through-bars before reaching it in the lapped bars. Putting the yield-point stress at 40,000 lb. per sq.in.

$$\frac{s}{a} = 0.00118 \times 40{,}000 \quad (8)$$

$$s = 47.2a \quad (9)$$

The concrete in these beams had a compressive strength (determined from cylinder tests) of about 5,000 lb. per. sq.in. and for leaner concrete it is to be expected that a greater lap would be required.

This may seem a large requirement for the lap, in view of the fact that an embedment of 40 diameters is generally supposed to be sufficient to develop the full strength of a bar even with a leaner concrete than that used here. However, it must be remembered that this opinion is based generally upon pull-out tests of specimens which have no tension in the concrete surrounding the bar. In a region of high tensile stress considerable cracking of the concrete may occur. This tends to destroy bond resistance and a greater length of embedment would be expected to be necessary.

Furthermore, as pointed out in a previous paragraph, there were indications that in beam 8AAD1 there was some slip over the entire length of the bars, although the bond stress developed was only 270 lb. per sq.in.

Reversal of Stress

One of the earliest questions to arise in connection with design of reinforced-concrete ships was that of the deterioration of concrete due to a grinding and abrasion of the fractured surface of concrete on the tension side of a structure subjected to reversal of stress. Tests were made on concrete beams of a 1:2 mix to ascertain how serious this action might prove to be. The beams were 6 in. wide, 8 in. deep, and 8 ft. long, reinforced longitudinally in the top and in the bottom. They were subjected to reversal of loading at the rate of about seventeen cycles (17 loads up and 17 loads down) of loading per minute. At the present time, only four specimens have been tested to failure. Of these all have failed by tension in the reinforcement at a much smaller number of applications of load than is generally expected for tests of steel. There are a number of features of the test which may be considered partial explanations of the failure but none of them are entirely satisfactory.

In one beam, which had 1¼-in. bars without mechanical anchorage, less than 0.001 in. slip could be detected within the first 7200 applications of load. At this point slipping began and increased in amount until at 400,000 applications the slip was more than 0.06 inch.

One of the beams was made I-shaped in cross-section in order to introduce high shearing stresses. This beam proved to be very tough. The web reinforcement consisted of vertical stirrups spaced 2 in. apart welded to the reinforcing bars at the top and at the bottom.

The grinding of the fractured surfaces of the concrete was found to be negligible within the range of tests completed. In one of the beams after about 600,000 applications of stresses of 1550 lb. per sq.in. in compression in the concrete and 20,000 lb. per sq.in. tension in the steel, there was a slight indication of grinding and abrasion of the fractured surface, but other circumstances connected with the test indicated that this condition was only at the surface of the beam and did not extend to its interior. The stress observations indicated that throughout the test the beam was acting normally and that abrasion of the fractured surfaces did not affect in any way the amount of resistance afforded by the concrete to the compressive stresses in the beam.

For a beam subjected to 2,000,000 applications of a load which caused measured deformations corresponding to tensile stress in the reinforcement of 11,000 lb. per sq.in. and a compressive stress in the concrete of about 1450 lb. per sq.in., the largest crack measured 0.003 in. For this beam no indication is present of any grinding action between the fractured surfaces of the concrete and there is nothing to indicate that the beam is approaching failure.

These tests have developed failures which are difficult to explain but which point out the importance of careful inspection of reinforcement for a structure which has to undergo frequent repetition of stress.

Effect of Direction of Slab Bars on Stresses

In the design of reinforced-concrete slabs it has generally been assumed that where the reinforcing bars make an angle with the direction of span the stress developed in the bar is equal to the product of the stress, which would be developed if the bars were in the direction of the span, and the secant of the angle which they make with the span. The writer knows of no previous tests which give information on this subject.

Slabs were designed in which the reinforcing bars made an angle of 45° with the direction of the span, and for comparison with them slabs were made with the reinforcing bars placed in the direction of the span. The results indicated a stress in the slabs with bars at 45° about 20 to 25 per cent greater than in the case where the bars were parallel with the direction of span. With the number of tests available it seems best to interpret the results as meaning that the ordinary method of design is satisfactory though conservative, rather than that standards may be changed to permit greater advantage to the bars placed in the diagonal direction than is now accorded them.

In this investigation specimens reinforced with expanded metal were also included. These slabs show measured stresses in the reinforcement slightly less than the stresses in the slab in which the same weight of steel was used in the form of bars placed in the direction of the span. Although this would indicate that expanded metal is more effective in resisting tension than the same amount of metal would be if used in the form of bars extending in the direction of the stresses to be resisted, the tests have not been extensive enough to warrant so sweeping a conclusion. The showing is favorable to expanded metal, so far as economy of material is concerned, but more tests using deeper slabs should be made before this question is considered to be settled. The slabs used were so shallow that a small variation in depth would result in a relatively large variation in stress developed.

Swiss Railways To Extend Electrification

Extension of the electrified section of the Federal Rys. of Switzerland has been decided upon, and the board of direction has made an appropriation of 43,500,000 francs to provide for 141 km. of improvement. As reported in the *Schweizerische Bauzeitung* of May 10, 1919, the sections of railway involved are from Erstfeld to Luzern, from Arth to Zürich, from Luzern to Zug, and from Immensee to Rothkreuz. Extension from Rothkreuz to Olten will be considered in the near future. An additional sum of 37,500,000 francs has been appropriated for a hydraulic power-plant at Barberine, which is to furnish power to the western section of the railway network.

Computation of Lengths of Elliptic Arcs

By George Paaswell
New York City

IN THE design and computation of circular shafts, tunnels, pipes, etc., involving sections taken at an angle with the right section, it becomes necessary to determine the lengths of elliptic arcs. The addition of small miscellaneous structures to such shafts, such as pump chambers, manholes, inspection galleries and the like, requires special concrete and steel detailing, and also often makes it necessary to find the length of some elliptic arc. Again, a shaft may be given a true elliptic periphery for special reasons; for example, a vertical shaft of circular interior carried two steel columns supporting a steel structure, and in order to increase the supporting width the outside periphery of the shaft was made elliptical, the columns lying on the line of the major axis.

The following analysis simplifies the work of computing elliptic arcs, and tables are given to aid in the application of the equations derived.

The length of the elliptic arc, unlike that of the circular arc, cannot be expressed in terms of the elementary transcendental functions. The equation of the ellipse, in rectilinear coördinates, referred to its center as origin, is,

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \qquad (1)$$

in which a and b are the semi-major and semi-minor axes, respectively.

The length of the arc between any two abscissas, x_1 and x_2, is

$$s = \int_{x_1}^{x_2} \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx \qquad (2)$$

If in (1) $y = b \cos \phi$; $x = a \sin \phi$ and the eccentricity of the ellipse, i. e., $a^2 - b^2/a$ is placed equal to k, the length of the arc becomes

$$s = a \int_{\phi_1}^{\phi_2} \sqrt{1 - k^2 \sin^2 \phi}\, d\phi \qquad (3)$$

placing the integral $\int_0^{\phi} \sqrt{1 - k^2 \sin^2 \phi}\, d\phi = E(\phi)$

The integral in (3) becomes the difference of two arcs and the expression may be written

$$s = a[E(\phi_2) - E(\phi_1)] \qquad (4)$$

Table I gives a series of values of $E(\phi)$ for the several values of the ratio b/a, and of the ratio x/a.

To use the table to determine the length of any arc of a given ellipse, the ratio b/a is first found. Then entering the proper column corresponding to this value (interpolating if necessary) and using the values of x/a and x_1/a the proper values of $E(\phi)$ for Eq. 4 are found, whence that equation gives the required length.

The length of an elliptic quadrant is given by

$$s = a \int_0^{\frac{\pi}{2}} \sqrt{1 - k^2 \sin^2 \phi}\, d\phi$$

and if this integral is replaced by F, the complete perimeter of the ellipse is

$$s = 4\,a\,F$$

Table II gives the values of F for several values of the ratio b/a, and intermediate values can be obtained by interpolation.

TABLE I VALUES OF $E(\phi)$

ϕ	b/a = 0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0.95	1.0
0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.1	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
0.2	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.201
0.3	0.300	0.300	0.300	0.300	0.301	0.301	0.302	0.303	0.303	0.304	0.304	0.305
0.4	0.400	0.400	0.400	0.401	0.402	0.403	0.404	0.406	0.408	0.409	0.410	0.412
0.5	0.500	0.500	0.501	0.502	0.504	0.506	0.509	0.512	0.515	0.519	0.522	0.524
0.6	0.600	0.601	0.603	0.605	0.608	0.612	0.618	0.624	0.629	0.637	0.640	0.644
0.7	0.700	0.701	0.704	0.708	0.713	0.721	0.730	0.740	0.749	0.763	0.769	0.775
0.8	0.800	0.801	0.807	0.814	0.822	0.836	0.850	0.867	0.886	0.906	0.917	0.927
0.9	0.900	0.903	0.912	0.925	0.943	0.965	0.990	1.020	1.052	1.085	1.105	1.120
0.95	0.950	0.954	0.970	0.987	1.014	1.044	1.081	1.118	1.159	1.205	1.230	1.253
1.0	1.000	1.016	1.050	1.097	1.150	1.211	1.276	1.346	1.418	1.492	1.532	1.571

TABLE II VALUES OF F

b/a	F	b/a	F
0.00	1.000	0.55	1.242
0.05	1.005	0.60	1.276
0.10	1.016	0.65	1.310
0.15	1.032	0.70	1.346
0.20	1.050	0.75	1.380
0.25	1.073	0.80	1.418
0.30	1.097	0.85	1.455
0.35	1.123	0.90	1.492
0.40	1.150	0.95	1.532
0.45	1.176	1.00	1.571
0.50	1.211		

Narrow Gage Recommended for Local Railways in France

LOCAL or light traffic railways built and rebuilt in France after the war, particularly those in the devastated regions, should have meter-gage tracks but with ample provision of special cars for carrying standard-gage freight cars in order to avoid transfer of freight. These are the general conclusions presented in a paper on "Local Railways After the War," by M. Claise, in the *Annales des Ponts et Chaussées*, Paris, January-February, 1919. Exceptions might be made for short lines of easy construction connecting two standard-gage lines and carrying a considerable traffic of fully loaded cars.

In his opinion the cost of construction of standard-gage railways will be relatively very high at the prices that will prevail during the next few years, while operating costs also will be high. Furthermore, such lines require rails of 50 lb. per yard, as against 40 lb. for meter-gage lines, while cross-ties aggregate nearly twice the cubic contents of those for the latter lines. Reconstruction of the ruined narrow-gage railways as standard-gage lines would involve considerable additional earthwork in widening the roadbed and easing the curves, while such work would delay putting the lines in operation.

Transfer of freight at points of break of gage would be a serious inconvenience, but can be eliminated readily by the use of transporter cars to carry the standard-gage equipment. In both new construction and reconstruction of the meter-gage lines, therefore, it is suggested that care should be taken to provide ample clearance for main-line or standard-gage cars. In the system used on the Lake Brienz Railway, the transporters are double-truck cars having steel channel sills outside of the wheels, with their tops only 22 in. above the rails. These form a track for the wheels of a standard-gage car. At the transfer point, the standard-gage and narrow-gage lines have stub ends on the same center line, but with the latter track at a lower level so that the sills of the transporter are level with the rails of the standard-gage line.

Handling Materials in Construction of New York Hotels

New Type of Hoisting Bucket Used During Erection Prevents Excessive Vibration of Steel Frame—Comparison of Costs

SAVING both in labor and time is reported by the building superintendents of construction on the Hotels Commodore and Pennsylvania, New York City, through the use of a new hoisting bucket for mixed concrete and concrete materials. The advantage of the bucket over the old platform hoist using wheelbarrows is estimated in terms of costs. Being centrally loaded and having a bottom dumping arrangement, the bucket causes no vibrations to unriveted steel structures such as caused trouble with the older top dumping type. During the past season, when labor was scarce, this hoist was of especial value on account of its speed, and it was possible to eliminate many hoisting outfits on these buildings.

The general arrangements for handling material were about the same as usual for structures of this size. Sand, crushed stone and cinders were delivered at the ground level by motor trucks and dumped into concrete-mixing pits below the ground-floor level. The towers for the hoist guides were carried from the sub-basement up through the courts or outside of the buildings, to make unnecesssary the usual openings in the floors. The mixed concrete was dumped and chuted into the buildings through the windows. Arrangements were made so that the concrete aggregates could be run by gravity into the concrete mixer and from the concrete mixer into a supply hopper which was used to fill the hoist buckets. Electric motors of 50 hp. were used for operating the hoists. Steel cable of $\frac{5}{8}$-in. diameter and double-line, running over a 16-in. single sheave on the tower, was used to raise the 1-cu.yd.-capacity bucket.

One of the features of this new hoisting apparatus is that smaller towers may be used, and very little bracing or guying is necessary. This is due to the fact that the load is always centrally suspended, and the bucket is bottom dumped instead of being tipped by means of throw-out guide rails at fixed points on the tower. When the top dumping type of bucket is tipped there is necessarily considerable vibration in the tower. With the arrangement described, it is possible to run a tower as high as 50 ft. without using guys to steady it.

Material may be chuted to several floors at the same time, without the necessity of changing throw-out guides from one to the other. Fig. 1 shows a tower with several dumping chutes projecting through the windows. In cases where it is inconvenient to chute directly into a floor, materials may be chuted to the floor above, through an opening into another hopper, as shown. A special hopper is used for this work; it will be described later.

A close-up view of the hoisting bucket, known as the Gardner hoist, is shown in Fig. 2. The method of operation will be readily seen. It is equipped with a skip, 3, which is thrown forward to bridge the clearance space between the bucket and the chutes. The normal position of the levers for a closed bucket in hoisting is for both to be thrown forward toward the dumping side. In the view the skip is thrown forward ready for dumping. Lever 1 is pulled back as shown to throw the skip forward, while lever 2 releases the side of the bucket, which is hinged at 4. When the bucket arrives at the dumping point the attendant first throws the skip forward and then releases the hinged door, which is forced open by the weight of the material, allowing the concrete to slide out into the chute.

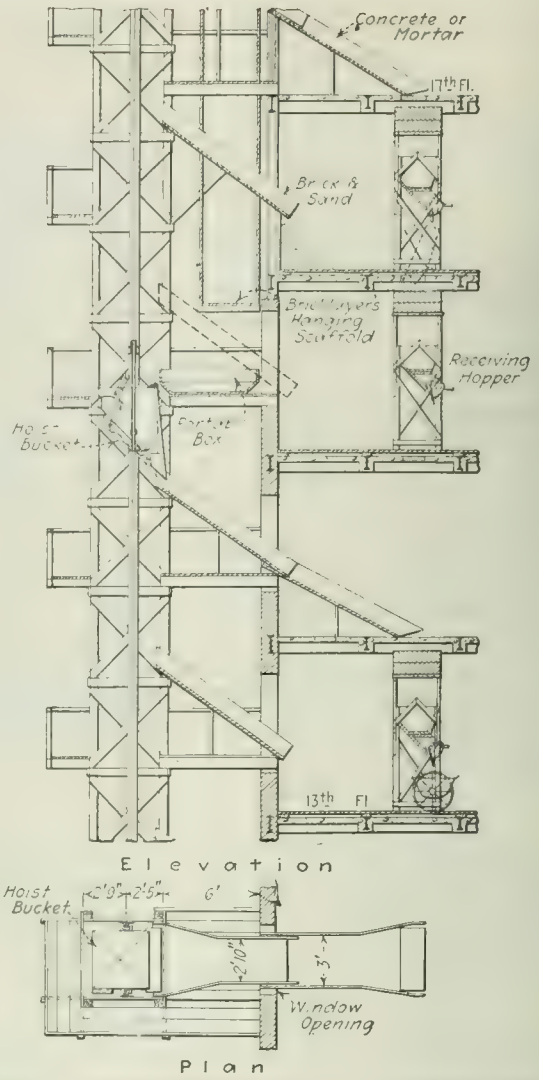


FIG. 1. ARRANGEMENT OF TOWER, BUCKET AND HOPPERS

In connection with this bucket, a receiving hopper, as shown in Fig. 3, is generally used. This allows for continuous operation of the bucket, the hopper having enough capacity to take care of the fluctuations in carrying to place. It is arranged to handle all the consistencies of mixtures ordinarily used in building-construction work, and has a special device to overcome binding of the gate by material. To operate, handle 1 is first raised, revolving an eccentric and throwing the gate forward and free from contact with the material. When handle 1 hits handle 2 a continuous

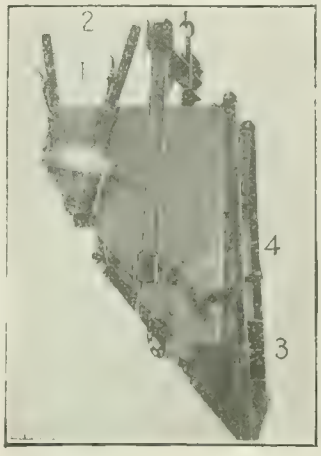


FIG. 2. SPECIAL BUCKET

movement occurs, raising the gate and allowing the material to flow out. There are two wings at 3 in the outlet which restrict it to about half the outside diameter shown.

The tower and the guides for this hoisting outfit are so arranged that it may be readily replaced with a platform hoist for any special purpose. To make the shift, it is only necessary to lower the bucket to the bottom of the shaft, take out a section of the guide rail, slip in the platform hoist and rebolt the guide. This change can be made in about 20 minutes.

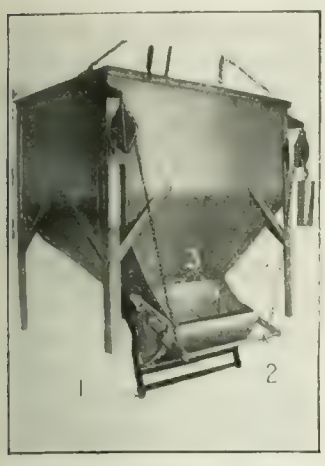


FIG. 3. DETAILS OF SPECIAL HOPPER

Not only will the bucket handle concreting materials, but dry material such as rubbish may be removed from the various floors and chuted into a rubbish bin to be carried away. Economical handling of rubbish is considered one of its main features.

Another large saving is in the lumber used. Not only are fewer towers required, but there is much less lumber in each tower, particularly because the platforms at each floor of the platform type of hoist must go entirely around the tower.

In elevating materials with a platform hoist as now employed in building construction about New York, two wheelbarrows are carried at each trip. Each barrow holds 2 cu.ft. of wet materials or 3 cu.ft. of dry or cinder concrete, making 4 or 6 cu.ft. to each lift. This system requires five men each at the top and bottom of the tower, two men to put on loaded and empty barrows, two men removing loaded and empty barrows, and one bell ringer, or ten men to load on and carry off. These men are standing waiting much of the time. With the new bucket two men are required for the operation of hoisting—one man to dump materials in the receiving hopper by operating the levers as described above, and one man to load the pushcarts or wheelbarrows at the upper-floor receiving hopper. With the 1-yd. bucket, two men can hoist 30 cu.ft. to a lift.

Comparing the relative economy of using Gardner buckets and platform hoists, the following information was obtained from Robert E. Carrick, secretary-treasurer of the Fireproof Contractors' Corporation of New York City, which put the fireproofing into the Hotel Commodore.

With a regular gang using the platform type of hoist it is possible to hoist about 100 cu.yd. per day of eight hours, or enough to cover 5500 sq.ft. of floor, including slabs with beams and girders incased. The hoisting charges for this work would be from $19 to $19.50, or about $0.0035 per square foot. With a self-tipping ½-cu.yd. bucket, an average day's work would be about 150 cu.yd. of concrete, or 8,000 sq.ft. of floor area, including casing of beams and girders. The cost of this bucket is about $25 per day, or a hoisting cost of $0.003, to which cost must be added a few more men as wheelers and spreaders, which would probably raise it to $0.0045.

Using the Gardner buckets, of which one was installed on the Hotel Commodore for use while fireproofing, as high as 13,000 sq.ft. of floor was laid per day for several days in succession, and as high as 70,000 sq.ft. was laid per week of six full days. In July, 1918, 253,680 sq.ft. of floor slabs, including casing of beams and girders, were placed, and in August, 265,421 sq.ft. were laid. This is believed to be a creditable record, considering the labor conditions, and the fact that the hoist was one-quarter of the way from one side of the H-shaped building, necessitating extra wheeling on the runways from the far corners of the building, this distance being over 300 feet.

On this work the bucket, including the rental of the motor hoist, electric current and pay of engineer, together with that of three extra men on wheeling, cost $31 per day. An average run was 12,000 sq.ft., or at the rate of $0.0026 per square foot. This represents a saving of about 25% in hoisting, over the platform type. The saving over the tipping bucket is about 42 per cent.

Two of the characteristics of this hoisting device are the speed with which it works and the large amount of material it carries. The towers in the Hotel Commodore extended 309 ft. above the sidewalk and 351 ft. from the sub-basement to the top of the pent-house. The round-trip time for the bucket averaged 2½ min. To supply the fireproofing gang, two continuous mixers at the bottom were dumping continuously into a hopper, which, in turn, fed the Gardner bucket.

While bricklaying was in progress the contractors used one hoist and one mixer to supply mortar to 500 bricklayers. In doing this, deliveries were made at five different floors at the same time with one hoist, an operation that could not be performed with the tipping bucket.

The contractor for the Hotels Pennsylvania and Commodore was the George A. Fuller Co., of New York. Thomas Smith was superintendent on the Hotel Pennsylvania and B. L. Norris was superintendent on the Hotel Commodore. The buckets were furnished on a rental basis by H. F. Gardner, of Newark, N. J.

Report of the Canadian Commission on Industrial Relations

The majority report of the Canadian Commission on Industrial Relations recommends: Legislation for a maximum work day of eight hours, with weekly rest of not less than twenty-four hours; a minimum wage, especially for women, girls, and unskilled labor; Government action to relieve unemployment through public works, to help the building of workers' homes, to restore fullest liberty of speech and press, and to establish a bureau for promoting industrial councils to improve the relations between employers and workers; immediate inquiry by experts into the system of proportional representation in parliamentary elections and into state insurance against unemployment, sickness, invalidity, and old age. Other general recommendations are: Collective bargaining; payment of a living wage; right of workers to organize; recognition of unions; steps toward establishment of joint plant and industrial councils; and extension to the poorest workers' children of opportunity to reach the highest educational institutions.

Topographical Surveying on Atacama Desert in Chile

Major Topography Obtained By Triangulation—Special Rod Designed For This Work—Climatic Conditions Give Difficulty

By B. L. G. Rees
Washington, D. C.

TOPOGRAPHICAL surveying on the desert and nitrate lands of Chili is attended with many difficulties, due to the nature of the country. On a recent survey of 150 square miles of the Atacama desert to determine the extent of the nitrate deposit, the magnitude of the project, the limited time allowed for the work, the small number of the engineers available, and the difficulty of making observations over the hot desert land, made it necessary to develop some modifications and several new applications of the usual methods employed for both the field and office work. Principal among these may be mentioned the method of taking the topography by triangulation over long distances by the use of a specially designed rod, computing the elevations and distances by means of the vertical and horizontal angles.

The property to be surveyed was on the Antofagasta pampa (desert nitrate lands) about 100 miles inland from the port of Antofagasta. It consisted of 80 pertinencias (claims), very irregularly covering about 100 square miles of rugged and rolling country. The problem was to locate sufficient detail for a topographical map on a scale of 1 in 20,000, showing 20-meter contours, locating the governing corners of each pertinencia, connecting the survey with existing railroad surveys, and showing the governing exterior topography. The total area covered by the survey was about 150 square miles.

Meteorological conditions are such in this territory that it is entirely rainless and totally devoid of vegetation. The tropical sun under cloudless skies produces an intense radiation, such that instrumental work is limited to short-distance sights most of the day. The wind blows nearly every day and is usually constant, but changes direction throughout the day. Due to violent boiling of the atmosphere above the desert surface, it was impossible to use a stadia rod for distances over 300 m., which was impracticable for so large a project and the limited time to finish the survey. The only solution was to have the instruments, for both the triangulation system and for taking major topography, high enough above the main pampa to avoid trouble due to this boiling atmospheric condition. This was accomplished by using triangulation stations located on the hills.

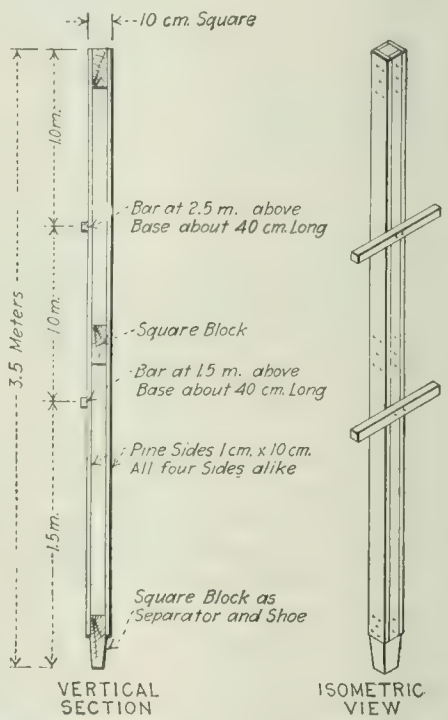
Triangulation System

More than 50 triangulation stations were used for the main triangulation system. The north and south length of the tract, which was roughly rectangular, was 30 km. (18.6 miles), and the width was 13.5 km. (8.3 miles). The elevation varied from 1745 m. (5725 ft.) to 2350 m. (7700 ft.). A base line of 1227.56 m. (4027 ft. was established east and west near the center of the property and was expanded by quadrilaterals to a developed base line of 5220.2 m., between two prominent peaks. Elevations above sea level were established by trigonometrical leveling from a railroad survey near the south end of the property.

Wood being unobtainable and rock abundant, the triangulation stations were made by piling rock around the flagpole marking the station. The top of the pole was set 1.5 m. above the ground (equal to the average height of the instrument) to establish a definite point for observation and to eliminate the correction for height of instrument. Precision was not attempted, but accuracy was required in the measurement of angles. With a transit reading to 30 seconds and a vertical circle to 1 minute, both horizontal and vertical angles were read once erect and once inverted, but were repeated if they did not check within the reading of the vernier. Magnetic bearings of all sights were noted to determine variation.

Topographical Field Work

After the triangulation was completed the major or exterior topography, which consisted of that which was not taken in the survey of each separate pertinencia, was started. On this work unusual features were developed to rush the field and office work, a special rod being used for the observations. The long-distance shots necessitated by placing the instrument above the boiling atmosphere of the desert made it impossible to read the ordinary stadia rod. A special rod was therefore



DETAILS OF SPECIAL TRIANGULATION ROD FOR TOPOGRAPHY

devised, which was 3.5 m. (11.5 ft.) long and with a cross-section 19 cm. (4 in.) square. It was made of thin pine and was hollow. The rod, which is shown, was painted with white enamel and was visible for a distance of 3 to 5 km. Major topography was taken by a party consisting of two observers, each having a native assistant, and a topographer accompanied by an assistant who carried the special rod, a signal flag and a pair of field glasses. The topographer decided the point to be located and noted a description of the topographical features governed by it while the rod held by the assistant was being located by the two observers.

The two best engineers in the party were selected as observers. Each of these had a transit, a shelter tent

to protect the instrument from the wind, a signal flag about 1 m. square, a wrist watch and a notebook. Accompanied by his assistant, each occupied a designated triangulation station. Stations were usually from 3 to 5 km. apart, plainly visible from each other and both controlling the section to be surveyed. These stations were usually occupied for the day, because they generally controlled all of the topography that could be surveyed in that time, and at least an hour was required for an observer to change stations. However, when it was necessary to change, this fact was indicated by flag signals from the topographer. Each observer set zero for angles on the other observer. During the day each observer made a topographical sketch of the hill on which his station was located.

Method of Taking and Recording Topography

When the topographer had taken up his position where the day's work was to start, his assistant set up the signal flag (1 m. square) to assist the observers in locating the starting point. When ready, the observers signalled, and the topographer's assistant placed the special rod on the point to be located and held his signal flag with the pole horizontal on the cross-bar of the special rod, 1.5 m. above the ground. The observers then set the horizontal cross-hair on this flagpole and split the rod with the vertical hair. These two settings finished the observations, and the observers signalled with their flags, which determined the time, to the minute, when the shot was taken. The observers recorded this time opposite the serial number of the shot in their notebooks, together with the horizontal and vertical angles. Shots were numbered serially in blocks of 10 and checked after each tenth shot by a signal from the topographer's assistant, thus avoiding any extensive error. The time record of each shot proved to be of great value. A special signal was given at exactly noon and at 3 p.m. by the topographer's watch, to correct watches.

A large square-ruled cross-section book was used by the topographer, who also carried a map, a Brunton pocket transit, which proved to be invaluable, and a wrist watch. After he had made notes describing the point, in the spaces opposite the serial number in his book, it was only necessary to note the time when the observer signalled. The complete topographer's notes, including later additions made in the office each evening in camp, are illustrated by the sample pages here reproduced. The notes were supplemented by topographical sketches when considered advisable.

Rapid, though accurate, observers were the factors determining the speed element of the work. The average day's work was 50 to 100 shots, covering a range of 10 to 15 km. Each point frequently governed a radius of ½ km. to 1 km. It seems to the writer that this method of surveying, with certain modifications, is readily applicable to many sections of the United States where speed and accuracy of stadia work are sufficient.

Interior Topography

For the purpose of sampling this property to determine the nitrate content, each pertinencia was divided into squares 100 m. on a side, and a sample hole 9 in. in diameter was drilled at all the corners. These sample holes were located by stadia survey parties, since greater accuracy was not required. By the use of diagonals to the squares, it was possible to locate 20 sample holes from one set-up. The chief of the party made a topographical sketch at each pertinencia as the sample holes were located, and kept a record of the stadia data used in locating the holes. This work was started at a property corner marker, which was located from the triangulation stations by the major topography party. These records formed a set of topographical notes complete for each pertinencia and was called the interior or stadia topography.

Computation of the triangulation system was the first work to be done in the office. The triangles were balanced and corrections were made for curvature and refraction to establish the elevations by trigonometrical leveling. Then the coördinates and azimuths were computed. For curvature and refraction corrections in meters, the formula was reduced to $\log C = 2 \log K + 2.8292647 - 10$, where C is the correction and K is the distance. A chart of this formula was used for topographical shots of over 4000 m. Elevations were kept to the nearest meter on topography.

In plotting the major topography two men worked together. One, the computor, had the topographer's field book which contained all angles as well as a description of each point. While the other was plotting, he computed, with a 20-in. slide-rule, the distance from the two triangulation stations to the located point, the difference in elevation for each, and the final elevation for the point. The second man did the plotting and by scale checked the computor. On a plot of 1 : 20,000, a distance of 20 m. in the field is represented by 1 mm. ($\frac{1}{25}$ in.) on the map, which makes slide-rule computations closer than plottings.

Reading vertical angles simultaneously from two stations to the same point was a very great advantage. In case one angle was missed or otherwise not available, there was always one vertical angle to determine the

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JULY 15 1917		INSTS. ΔB (JONES) & ΔC (SMITH) TOPO BY REES	INST. AT ΔB		INST. AT ΔC		B TO C 2016 M DIST. FROM		1712 1781 DIFF. ELEV. FROM			CHECKED
NO	TIME	DISCRIPTION	HOR A	VER A	HOR A	VER A	Δ B	Δ C	Δ B	Δ C	ELEVATION	
47	2:14	(+1) LIND "K" 37-F-80Z-NW-SE 12° CP TOP KNOLL SL 22° ALL WAYS	+52°47'	-3°10'	-78°14'	-3°40'	2130	2615	-118	-167	1594	✓
48	2:17	C.P PAMPA SL N+10°, S-5°, E & W 0°	+49°41'	-8°18'	-55°16'	-10°39'	1715	1590	-250	-299	1462	✓
49	2:19	C.P R.S. (10M) NO BANKS NW-SE 18° SL N15°, S-10°	+61°08'	-9°12'	-52°16'	-11°44'	1925	1740	-312	-360	1400	✓

SAMPLE OF TOPOGRAPHER'S NOTBOOK

Column 1 shows the serial number of the observation; column 2, time the shot was taken; column 3, complete description of the point as made on the ground; columns 4 and 5, field notes of one observer as copied from original in camp; columns 6 and 7, field notes of the second observer as copied from original in camp; column 8, at top is distance between stations, below is distance from first station to located point as scaled and computed by slide rule; column 9, same as column 8 for the other station; column 10, at top is elevation of station, below is differerence in elevation between station and located point; column 11, same as column 10, but for the other station; column 12, final established elevation of the point as checked from both stations.

elevation. Otherwise, the elevation would be indeterminate and the topographic value of the point lost. Also, in case one of the horizontal angles was missing, the two vertical angles made it possible to determine the position of the point close enough for plotting. The topographical details were worked out from the plotted governing points, together with the description of these points noted in the topographer's field book, and from the stadia-survey notes furnished by the parties locating the test holes.

Huntington Adams was in charge of this project, and under him the writer had charge of all surveys, maps and calculations, and later acted as his general assistant.

Moving Three Large Steel Tanks 150 Miles by Water

Due to Material and Labor Scarcity, It Was Cheaper To Move Storage Tanks Intact Than To Dismantle or Build Anew

By A. J. Taylor
The Taylor Engineering Co., Limited, Vancouver, B. C.

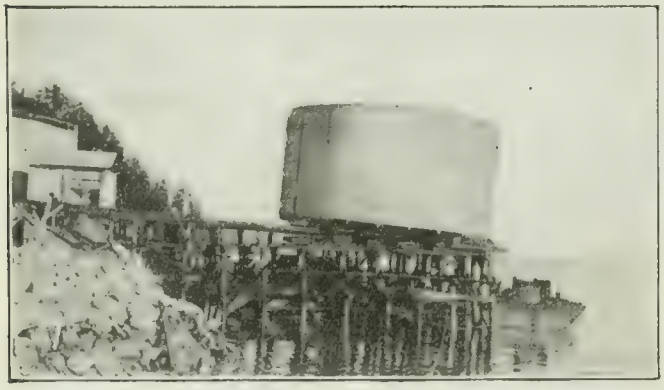
THREE large steel tanks, each 60 ft. in diameter and 30 ft. high, were moved during the war 150 miles by water because this action was found to be the cheapest method of supplying necessary storage. The Powell River Co., operating a very large paper mill at Powell River, B. C., resorted to this alternative early in 1918 to provide immediate additional fuel-oil storage capacity of 45,000 bbl., to accommodate the last cargo of fuel oil that they expected to be able to obtain from the California fields during the war.

Upon investigation, it was found that not only was the price of steel tank plate almost prohibitive, but it was impossible to obtain the necessary plates within the desired time. Concrete storage tanks were considered, and it was found that a tank with a capacity of 45,000 bbl. would have cost about $60,000, and would have been more or less of an experiment when completed.

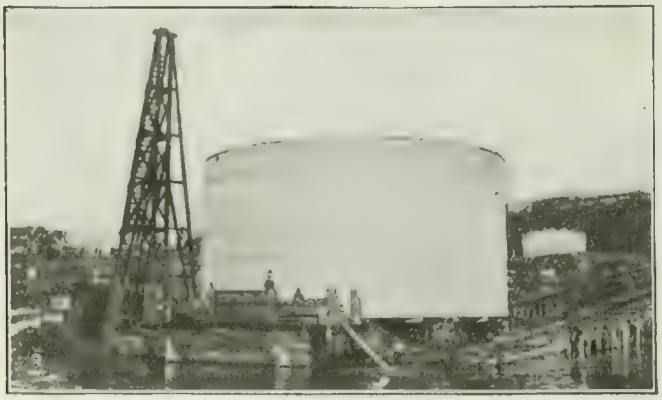
The situation appeared almost hopeless until it was discovered that the Associated Portland Cement Co. at Bamberton, B. C., 150 miles south, on the Strait of Georgia, had three 15,000-bbl. steel storage tanks that they were not using and were willing to sell. These were purchased on the foundations, as they stood at Bamberton, for approximately $24,000.

The question of transferring these tanks from Bamberton to Powell River was next tackled, and it was at first thought that the only way of doing this would be the usual method of cutting the tanks down and reërecting them. But on account of the large program of the Imperial Munitions Board for the construction of wooden and steel vessels in the neighborhood of Vancouver, there were only three or four boiler makers available, and only one of these had any experience in tank work. In other words, it was practically impossible to get an adequate supply of labor to cut down and reërect these tanks.

It was then determined to move each of the three tanks in one piece, after the calculations had been made to determine its stability when mounted on a 30 x 80-ft. scow. Two lines of piles were driven at Bamberton opposite the point at which the tanks were located. The tanks were lifted from their foundations by means of jacks, and set out over the water at a sufficient distance above the water so that the scow could be run in between the lines of piles at low tide, and, after the tide came up, each tank would settle on a scow and the scow and tank be pulled free of the trestles.









1 SCOW MOVING INTO POSITION UNDER TANK AT BAMBERTON; 2. FIRST TANK LOADED AND LEAVING BAMBERTON; 3. BLOCKING UP FIRST TANK AT POWELL RIVER, PREPARATORY TO MOVING SCOW; 4. PULLING TANK UP INCLINE TO FINAL LOCATION AT POWELL RIVER

To brace the tanks internally so as to eliminate as far as possible the strain that they would be subjected to in their journey a 2-in. hole was drilled in the center of the bottom of each tank, and in this hole a shackle was mounted from which was set up a series of turnbuckle guys from the top edge of the tank to the shackle. The structure of each tank was depended upon to prevent the sides being pulled in by the strain on the turnbuckles.

Each tank, after it was floated onto a scow, was towed to Powell River, at which point four lines of piles were driven, and a space was left between each pair of lines that would admit the scow. From the landing platform double tracks were extended up approximately 800 ft. to the final location for the tanks, these tracks being spaced so as to accommodate standard-gage trucks.

The scow was floated between the trestles, which were at such height that at high tide there was ample space between the bottom of the tank as it projected on each side of the scow to enable the railway trucks to be run underneath. As the tide lowered, it left each tank supported on the trucks. The tank was then hauled up the inclined runway to the foundation that had been prepared, by means of a 7 x 10-in. double-drum engine that was installed on the piledriver that had been used to drive the piles for the trestles.

The three tanks were unloaded and the job was completed within 30 days, at a total cost of $14,000, which was nearly $5,000 lower than the lowest tender received from local iron works for cutting down and reërecting the tanks. The total cost to the Powell River Co. of the three tanks complete was $38,650. The tanks were landed on their final foundations and tested were found to be absolutely free of leaks, evidence that they were not seriously strained in the moving operation.

All of the moving operations were carried out by the Taylor Engineering Co., Ltd., of Vancouver, B. C.

Haul Gravel With Caterpillar Tractor in Minnesota

Renville County Uses a 120-Horsepower Machine With a Train of Nine Wagons, the Load Being 30 Cubic Yards — Itemized Costs Given

HAULING gravel in trains drawn by a 120-hp. caterpillar tractor has been resorted to in Renville County, Minnesota, with what are considered excellent results. Cost per yard-mile ranging from 10 to 32c., according to length of haul, were given by F. M. Shepherd, county highway engineer, in a report dated Nov. 1, 1918. The trains consisted of the tractor and nine wagons, as shown in the illustration.

During 1916 the county used a 75-hp. caterpillar for hauling gravel with such success that the commissioners decided to purchase a larger machine for the 1917 work. Accordingly, a 120-hp. Holt machine was purchased, which could haul a longer wagon train, and the 75-hp. machine was assigned to grading work with a 12-ft. grader. The average costs of hauling gravel over a period of two seasons are given in the accompanying table. These costs include interest, depreciation, fuel, oil, salary of operator and helper, repairs, etc.

With a train of nine wagons the total capacity was 30 cu.yd. The maximum mileage was produced at hauls of 3, 4, 6 and 8 miles, when 12 miles per day with load could be realized. As will be seen from the table, the lowest loading cost per mile was on the three-mile haul. The lowest combined costs of loading and hauling, considering the length of haul, were on hauls of six and eight miles. At the five- and seven-mile hauls, the loss in trips per day, plus higher loading costs per yard, operated to increase the total cost proportionally, above that for the three- and four-mile hauls.

With the 120-hp. caterpillar the rate of travel, loaded, was 2.18 miles per hour at the normal engine speed of 550 r.p.m., and three miles per hour running light.



TRACTOR RETURNING WITH NINE EMPTY CARS

The track width of the caterpillar is 24 in. on each side, or 48 in. in all, and the length of contact with the ground is about 80 inches.

Printing Telegraph Valuable During War

During the five-year period 1912-1917 the printing telegraph came into extended use by telegraph companies, press associations, and railroads. It consists essentially of a sending instrument, equipped with a keyboard similar to that of a typewriter, electrically connected with a receiving instrument in such a manner that the latter automatically reproduces what is typewritten on the sending instrument. Without the printing telegraph it would have been difficult or impossible to handle the increased business during the war.

PERFORMANCE OF 120-HORSEPOWER CATERPILLAR TRACTOR IN HAULING GRAVEL FOR ROAD WORK IN RENVILLE COUNTY MINNESOTA

Haul, Miles	Average Performance: Number of Trips per Day	Load per Trip Cu.Yd.	Amount per Day Cu.Yd.	Yard-Miles per Day	Average Costs: Hauling: Cost per Day	Hauling: Cost per Cubic Yard Mile	Loading: Cost per Day	Loading: Cost per Cubic Yard	Cost of Loading and Hauling per Cubic Yard for Various Hauls
½	8	30	240	120	$38.00	$0.317	$36.00	$0.15	$0.31
1	6	30	180	180	38.00	.211	30.00	.17	.38
2	5	30	150	300	38.00	.127	24.00	.16	.41
3	4	30	120	360	38.00	.105	18.00	.15	.47
4	3	30	90	360	38.00	.105	18.00	.20	.62
5	2	30	60	300	38.00	.127	12.00	.20	.83
6	2	30	60	360	38.00	.105	12.00	.20	.83
7	1½	30	45	315	38.00	.121	12.00	.267	1.11
8	1½	30	45	360	38.00	.105	12.00	.267	1.11

Sewage and Dissolved Oxygen in New York Harbor

No Putrefaction in Main Channels Likely During Cold Months of Year—Increasing Reduction of Oxygen in Warm Months Points to Growing Need for Some Degree of Treatment

By Kenneth Allen
Sanitary Engineer, Board of Estimate and Apportionment, New York City

In 1909 the Metropolitan Sewerage Commission of New York took up the systematic study of the dissolved oxygen contents of New York harbor, as being the best general index of the degree of pollution existing at different points and of its change from year to year. Since the close of its observations in 1913 this work has been carried on by the Board of Estimate and Apportionment, of which Nelson P. Lewis is chief engineer, with results which confirm the earlier conclusions as to the steady and, in some locations, the rapid approach to a condition where nuisances from odor may be expected.

As is well known, the depletion of dissolved oxygen is due to bacterial activity brought about by the presence of organic wastes, such as sewage, and it has been recognized for a long time that the inhibiting effect of cold on such activity would result in an increased percentage of saturation in the water, but the importance of this fact has perhaps not received sufficient recognition. It was emphasized by Dr. D. D. Jackson in a report to the board submitted in May, 1914. Its significance is shown in Table I. It will be noted that with one exception (Willis Ave.) the April figures all show saturation of over 70 per cent.

TABLE I PER CENT. SATURATION OF DISSOLVED OXYGEN IN THE WATERS OF NEW YORK HARBOR

	Average for — April			June, July,		Aug. and Sept.
	1915	1916	1917	1915	1916	1917
Narrows			80.5	79	66	63
Upper Bay, Robbins Reef			84.5	72	64	50
Hudson River, Pier A	88		82.5	42	47	46
155th St	83		81.0	39	40	37
Spuyten Duyvil	93		81.5	46	51	
Harlem River, Morris Heights	82		73.5	25	25	25
Willis Ave.	65		78.5	22	15	13
East River, Pier 10	88.2		71.3	35	23	27
23rd St	79		79.8	34	31	35

The practical deduction to be drawn from these observations is that there need be no apprehension of a nuisance due to putrefactive odors from the main channels of the harbor in the colder months of the year, and that therefore it will probably not ever be necessary to provide costly methods of sewage treatment to maintain satisfactory conditions in this respect during the winter months, provided that any large volumes of putrescible effluents are discharged only at suitably located outlets and with provision for a rapid mixing with the harbor waters. Consequently, if it should ever be desirable to establish an activated-sludge plant at a given location there would be no necessity for operating it, except as a sedimentation plant (unless for the recovery of fertilizer) during perhaps half the year, thereby avoiding a considerable expense to the city.

If a residuum of dissolved oxygen were assured at every point in the harbor, no odors would be evolved by the water, but as channel saturations fall below 30 or 40% the danger of local nuisances near outlets and in the slips increases, especially where sludge deposits exist, belching forth gas in hot weather. So it is of great interest to follow the progressive *maximum* depletion of oxygen in warm weather at certain points, notably in the East and Harlem Rivers. This has been quite marked, as shown by Table II and Fig. 1.

TABLE II MINIMUM PERCENTAGE SATURATION OF DISSOLVED OXYGEN IN THE WATERS OF NEW YORK HARBOR

	1909	1911	1912	1913	1914	1915	1916	1917	1918*
Narrows (78% in 1906)	67	64	61	52	45	54	48	46	64
Upper Bay, Robbins Reef	64	64	53	38	70	58	51	42	53
Hudson River, Pier A	55	51	43	20	31	25	29	25	45
155th St					36	22	25	20	39
Spuyten Duyvil or Mt St. Vincent		74		60	44	35	28		36
Harlem River, Morris Hts	46	40	33	11	6	8	0	1	4
Willis Ave.	..	29	21	19	0	6	1	0	2
East River, Pier 10	69	51	25	13	19	22	17	19	18
23rd St	55	55		15	28	19	8	10	15
42nd St	57	51	29	53	26	24	4	10	
(95% in 1906)									

* The lower of a single series of top and bottom samples taken July 16-18. Lower results would undoubtedly have been obtained later, but work was prevented by war conditions

The observations indicate that since 1909 the general reduction in the oxygen content of the harbor water during the warm months has been as follows:

	In Percentages		
	From	To	Decrease
Narrows	83	63	24
Upper Bay	67	50	25
Hudson River	72	42	42
Harlem River	55	22	60
Upper East River	86	47	46
Lower East River	65	29	55

The samples from which the results shown in Table II were deduced were, in general, taken from near the surface in the main channels. To obtain information as to the variation in different parts of the stream, samples were analyzed from various cross-sections with the results shown in Fig. 2. Similar tests were made by the Metropolitan Sewerage Commission and described in Chap. VI, Sec. III, of its final report.

The conditions are in a state of continual change, but these tests appear to indicate that:

1. At the Narrows there is no great difference from side to side but that, due to the underrun of clean ocean water the saturations are higher near the bottom.

2. This also holds true as to the Hudson River, except that here the oxygen is somewhat less near each shore on account of the admission of sewage. But above Dyckman St. the effect of the sewage pollution is less, results are more uniform and the upper layers are often better supplied with oxygen than the lower.

3. In the East River there is a more thorough mixing, due to the currents; but here, too, the water near the bottom contains more oxygen, as the fresh sewage tends to rise on its discharge. Above Hell Gate the influence of the clean Sound water is more marked, and relatively high oxygen figures predominate near the bottom.

No more convincing proof of the effect of the increasing load of polluting matter discharged into the harbor without treatment is necessary than the above-mentioned table and diagrams. Already the Harlem River has become so foul that between the Willis Ave. and 155th St. bridges total depletion for short periods probably occur every year, and if this condition should be prolonged intolerable odors would result.

The proper solution of the whole problem of sewage-

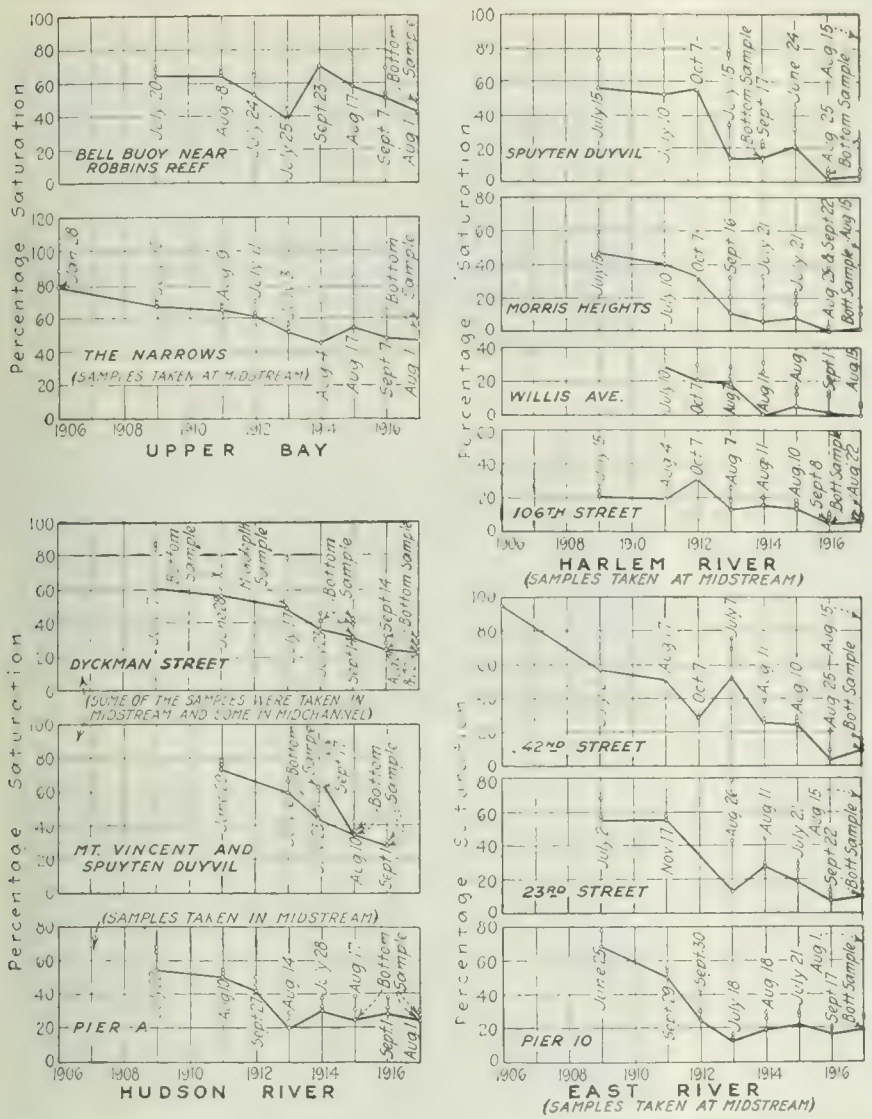


FIG. 1. OBSERVED PERCENTAGE OF DISSOLVED OXYGEN IN WATERS OF NEW YORK HARBOR, 1906-16

All samples were taken near the surface, except where noted. The diagrams are from the 1917 report of the Board of Estimate and Apportionment, New York City

disposal confronting New York City really depends upon the available dissolved oxygen in the harbor. Generally speaking, the excess above, say, 40% saturation can be utilized in purifying the filth poured into it. But the computation of this available supply is very difficult. The writer has attempted it several times, but with no confidence in the results. This is because so many and such variable factors have to be considered: The tidal flow, the fresh water discharge, the salinity, the temperature, the depletion of oxygen due to decomposing sludge deposits, reaëration from the atmosphere, etc., all of which are constantly changing, and the growth of the tributary population and the volume and character of industrial wastes for a long term of years.

If the visible solids are removed by screens or tanks, that measure, with the interception of sewage to certain strategically located points, will be the first and most obvious step in advance. This much can in many cases be done without further information, because topographical conditions and important centers of population are not subject to great change, so that lines of collection are pretty well prescribed; and this will alleviate certain local objectionable conditions. All development should be along predetermined general lines, but where any question as to future condition exists, plans should have sufficient elasticity to permit the adoption of more refined methods of treatment later if such action is found desirable.

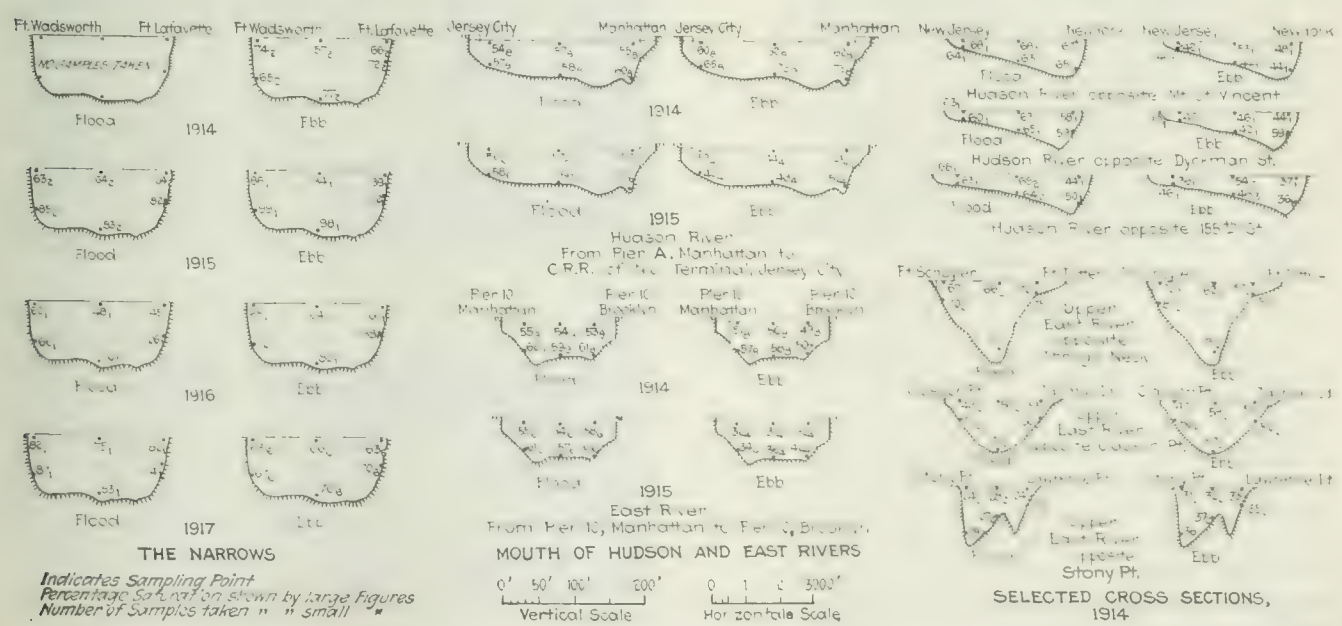


FIG. 2. AVERAGE PERCENTAGES OF DISSOLVED OXYGEN AT VARIOUS CROSS-SECTIONS, NEW YORK HARBOR

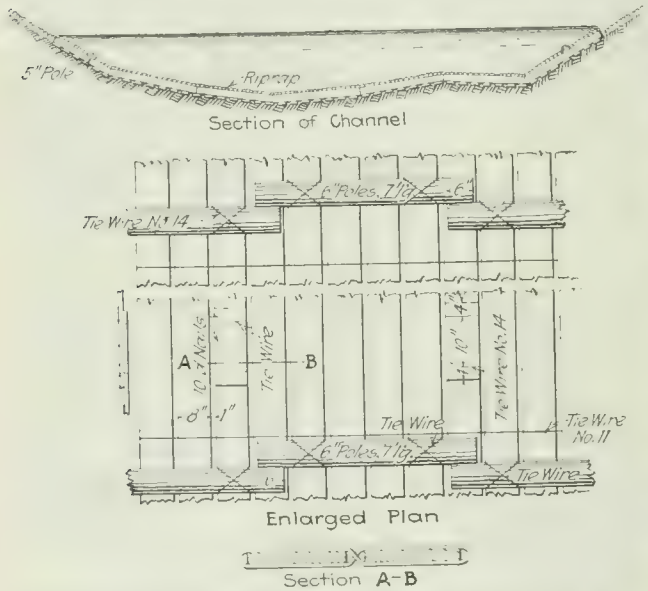
Sinking a Long Board Mattress in a Narrow Channel

Built Up in One Section 300 Feet Long, Suspended From Bank by Wires and Sunk by Force of Current

TO PREVENT scour through the contracted section of a drainage channel in the Little River Drainage District in Missouri, the expedient was adopted of sinking a long board mattress as a unit. The entire structure, 300 ft. long and 40 ft. wide, was built up suspended on wires attached to deadmen at the top of the channel slope and dropped into place while the water was going through the channel. Further protection was had by covering the wood mat with riprap.

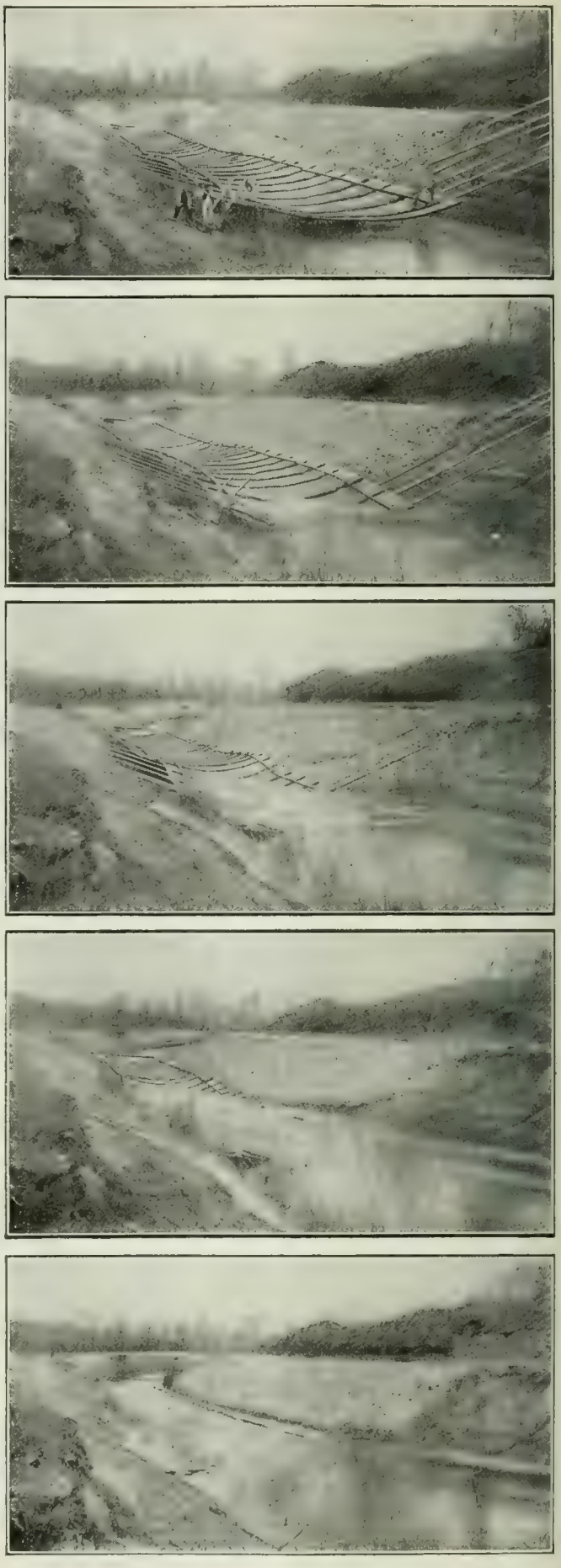
At the east end of the drainage district's headwater diversion system near Cape Girardeau, Mo., there is a contraction in the channel to control the outfall from the basin above. After the channel was excavated and before water was let into it, a considerable reach of the side slopes was protected from erosion by stone riprap, but at that time it did not appear necessary to protect the bottom of the channel. Later developments showed that such protection was necessary for a stretch at the end of the channel, mainly on account of the high velocity, which reaches approximately 7 ft. per second at low stage. This velocity was the main reason for the method adopted, that of lowering the mattress into place.

The top width of the channel is 90 ft., and the width at the water line is approximately 35 ft. As shown in the drawing, the mattress was built up on No. 4 steel



SECTION THROUGH CHANNEL AND PART PLAN OF BOARD MATTRESS

wire suspended across the channel from deadmen at the top of the bank. These boards, in 12-, 14- and 16-ft. lengths, were spliced and lapped to form lengths about 50 ft. long in the direction of the thread of the channel, and these strips were then wired transversely to form the 40-ft.-wide mat. When five or six boards were nailed together in the 50-ft. lengths, they were pushed off the bank onto the suspended wires, and workmen got out on the boards and laced them together to form the mattress shown. As soon as the boards were wired or



PROGRESS IN SINKING 300-FOOT BOARD MATTRESS IN DRAINAGE CHANNEL

laced into the mat a ⅞-in. cable was securely fastened to the upstream end and to a deadman on top of each bank, to hold the mat in place in the channel when it was launched. Cross-poles were then attached to the plank for the purpose of keeping the riprap in place after the mat was sunk, and a line of longitudinal poles was placed at each side to hold the side slope riprap.

When the whole structure was completed, the upstream end of the mat was weighted with a sufficient number of stones to pull it down into the water, and the rapid current then rushing over the mattress pushed it down into the water for the whole length. As soon as the water commenced to run up the mat the suspension wires let down from the weight of water. While but one of them broke, all were stretched considerably and were easily broken by a sharp tap with a hammer. Once the mattress was submerged the final weighting with riprap was accomplished by dumping from a suspension bridge across the channel.

The work was done under the direction of L. L. Hidinger, chief engineer of the Board of Engineers of the Little River Drainage District, and under the immediate supervision of H. W. English, resident engineer.

Wider Powers for Wisconsin State Board of Health

Controls Design and Operation of Water and Sewer Systems and Disposal Plants, With Power to Order Changes

CONTROL of the construction and operation of water-supply and sewerage systems and sewage and refuse disposal plants in Wisconsin is conferred upon the State Board of Health by a law passed recently by the legistature and signed by the Governor.

The board is given control of the surface and subsurface waters of the state so far as their sanitary and physical condition affects public health or comfort. This includes making rules and ordering changes to prevent pollution. It is to investigate all sources of water and ice supply, all water and sewerage systems and sewage or refuse disposal plants, keeping records of all such investigations. Furthermore, it is given power to compel the operation of these systems and plants in such a manner as to protect public health and comfort, or to order their alteration, extension or replacement.

On request the board will advise any owner (local authority, firm or individual) as to sources of water-supply and methods of providing for their purity and also as to methods of sewage and refuse disposal. For this work it may conduct investigations and experiments and hold public meetings, but no owner is required to bear the expense of such consultation, advice or experiment. It is provided specifically that the advice must only outline the best course to be pursued and that the board shall not be required to prepare plans. All prospective owners must file complete plans of projected water-supply and sewerage systems and disposal plants, and the board may require the filing of plans of old works as well.

As to efficient operation, the law provides that when the board finds any such system or plant is a menace to health or comfort or creates a nuisance it may require certain operating results to be secured within a certain time. If this is not done, the board may require changes to be made that will permit of the desired results being obtained.

If an owner objects to an order by the board the dispute may be submitted to three referee engineers, two appointed by the owner and board respectively and the third by these two. Their decision must be rendered within 30 days, unless the time is extended by agreement. The owner is to pay 66% of the fees and expenses of these engineers, the balance being paid by the State Board of Health. An owner may also bring suit to vacate any order of the board. If an owner fails to comply with an order within the time specified he will be held as creating a nuisance which may be enjoined and he is liable to a fine of $10 to $5000 per day.

Lake-Water Diversion and Sewage Treatment at Chicago

Sanitary District Plans Compensating Works To Hold Lake Levels—Sewage Treatment To Supplement Dilution

THE question of the diversion of water from Lake Michigan for the Chicago Drainage Canal has been revived recently by a letter from Col. W. V. Judson, Corps of Engineers, U. S. A., to the Sanitary District of Chicago, intimating that unless steps are now taken to begin the purification of sewage there will be necessary a continual increase of the draft of water from the lake. He suggested also that if the district should be permitted to withdraw—either temporarily or permanently—more than the 4167 sec.-ft. now authorized by the War Department, then the district should be required to advance to the United States Government sufficient funds for works for regulating the levels of Lakes Michigan, Huron, Erie and Ontario.

In its reply, the district referred to its ordinance passed in January, 1918, offering to compromise the litigation over water diversion by paying to the United States Government the money necessary to build compensating works in the St. Clair and Niagara Rivers, as recommended by a board of engineers in 1914. In return, it was expected that the Government would fix the maximum withdrawal of water at Chicago at 12,000 sec.-ft. The cost was estimated by the board at $475,000, but in view of increased prices due to war conditions the district appropriated $600,000 and now stands ready to provide the money.

After a bill for this purpose had been introduced in Congress, it was referred to the Chief of Engineers of the United States Army, who stated—in February, 1918—that it could not be approved, principally because Canada objected on the ground of alleged lowering of water level at Montreal. The Sanitary District then took up this objection with the Montreal harbor board and others, and a plan was suggested for controlling the outlet of Lake Ontario by means of a dam in the upper St. Lawrence. In this way water could be stored for nine months and delivered during September-November in amount considerably larger than the normal flow of the river. This would more than compensate for the alleged lowering of level due to the Chicago diversion. The works as planned are feasible and will accomplish their purpose, according to a report made to the Sanitary District by Francis C. Shenehon, consulting engineer.

On the question of sewage treatment, supplementary

to dilution, the district points out that it has provided for the treatment of sewage in excess of the amount that could be diluted properly by the maximum flow in the rock section of the main channel, as well as for the treatment of trade wastes and the treatment of sewage in various localities where it is impracticable to deliver the requisite amount of dilution water. Some of these works are built or under construction, and land has been secured for others. In addition, for several years the Sanitary District of Chicago has carried on extensive experiments in the treatment of sewage and of trade wastes.

With reference to the hydro-electric plant at Lockport, the end of the canal, it is stated that during the 12 years of operation no additional water has been withdrawn from Lake Michigan for power purposes, this plant simply utilizing the power incidental to the operation of the Drainage Canal.

War Prices Subject of Bulletin

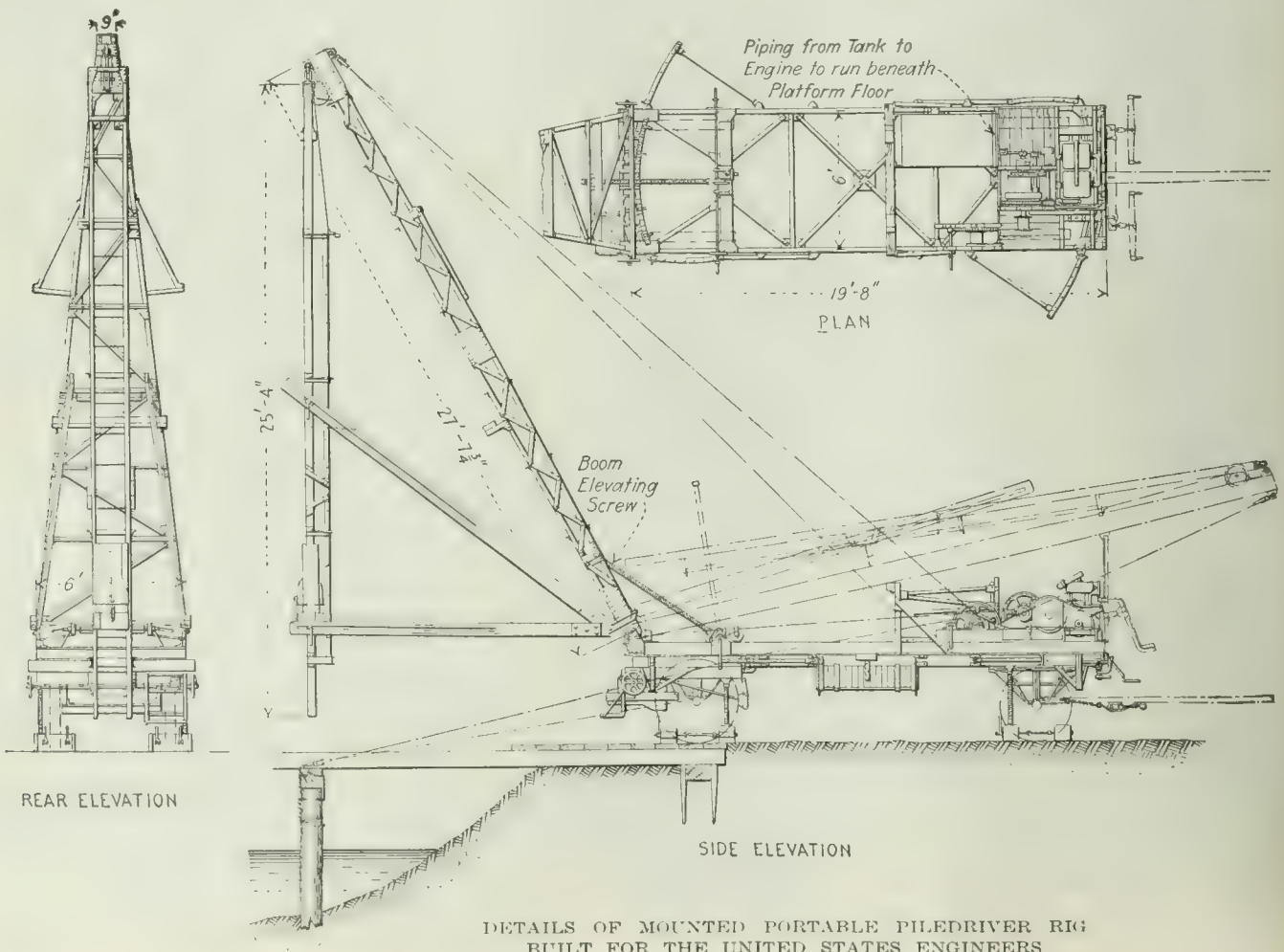
Prices of all commodities during the war were subject to considerable fluctuation and a gradual increasing rise toward the end. The United States War Industries Board was greatly concerned with these matters and has now for purposes of reference prepared bulletins on all of the various commodities subject to its direct or indirect control. Fifty-seven such bulletins will be issued, covering the general headings: Foods, clothing, metals, fuels, building materials and chemicals. The bulletin on cement contains a price chart from 1913 to 1918.

Mounted Piledriver Rig Developed by United States Army

Complete Outfit Is Readily Transported on Its Own Wheels and Can Be Used as Derrick, Shovel or Drill Rig

PILEDRIVERS mounted on trucks which could be readily pulled by motor trucks or horses were an obvious necessity for the engineer troops during the war. On this account the Corps of Engineers designed and developed a combination portable mounted piledriver to be used as a part of the engineer pontoon park for the engineer troops. The machine is mounted on a four-wheel truck and has the gross weight of 8200 lb. The main feature is the piledriving equipment, which permits of the driving of piles with a 950-lb. hammer in 25-ft. leads, but by slight rearrangement the rig can also be used for a drill with which to dig holes for telegraph posts, for a derrick, or for a steam shovel. The machine was designed by Capt. Alexander M. Bellony, Engineers, U. S. A., while he was in the General Engineer Depot as designing and purchasing officer of machines of special design. The first machine was built by the Clyde Iron Works, Duluth, Minn., and tested under actual working conditions on the St. Marys River at Duluth and on the Potomac River at Camp A. A. Humphreys, Virginia. There have been built, in all, 32 of the machines for the Army, 21 by the Flour City Ornamental Iron Works, Minneapolis, Minn., and 12 by the Clyde Iron Works, Duluth, Minn.

The machine consists of a four-wheel truck carrying

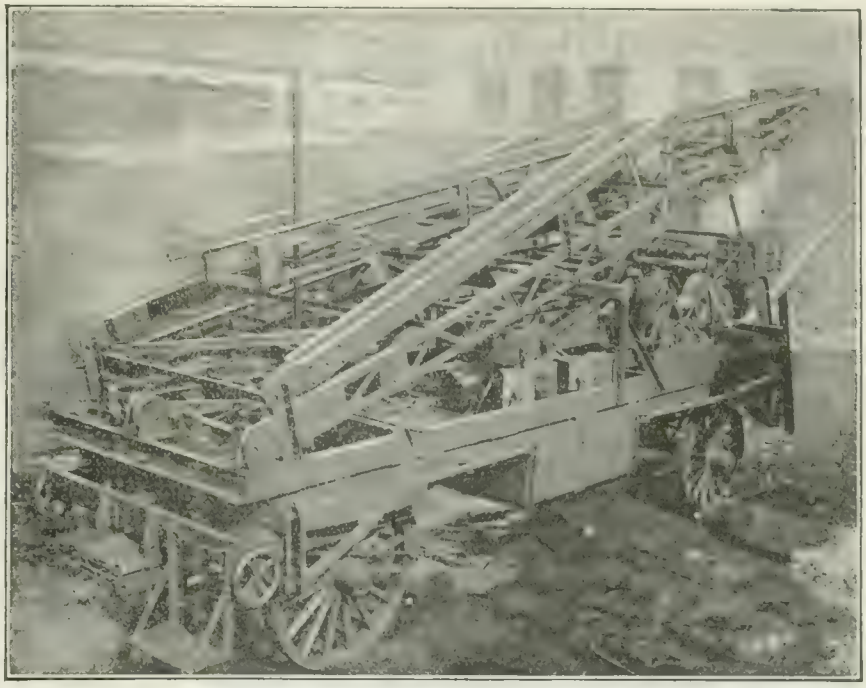


DETAILS OF MOUNTED PORTABLE PILEDRIVER RIG BUILT FOR THE UNITED STATES ENGINEERS

a main stationary frame and a superposed frame movable in the horizontal plane, which upper frame, in turn, carries at its forward end the A-frame boom and hanging leads and at the rear the engine and hoist. The leads and boom are folded down when the machine is being transported, the center of the folded portion resting on a timber cushion, which is supported and fixed on the upper frame. For this purpose the front end of the boom is provided with two legs bolted to the upper frame, which swing down to act as supports and also carry a seat for the operating crew.

The A-frame boom at its bottom end is pivoted to the longitudinal sides of the upper frame. The upper end is provided with two sheaves, one for the hammer and one for the pile line. The leads are 25 ft. long and have a 17-in. spread. The extreme height from the bottom of the wheel to the top of the leads is 32 ft., taking a pile about 30 ft. in height above the wheel base. If the penetration point is below this base, the length of the pile can, of course, be increased. The leads are connected to the boom by means of a locking hanging device assuring a suitable connection arrangement. Near the upper end of the leads, buffer blocks are provided to prevent the overpull of the hammer.

The leads are stiffened by sway braces, and the inner ends of both the lower and diagonal sway braces are pivoted near the foot of the boom. The other ends of the braces are provided with long, suitable slots, permitting the sliding of the leads in any desired position. To the leads are fixed the sway-brace supports and plates



ARMY PILEDRIVER READY FOR TRANSPORTATION IN THE FIELD

arranged with handle knots for fastening up braces to the leads, thereby stabling the leads under the operation of driving piles. In addition to this, the stabling of the leads is assisted by a lead cable-stiffening device which consists of two hand winches, one bolted to each side of the upper frame, and cables reaching from the winch to the leads. The cables travel through spools placed on the ends of the extension track.

The front and rear ends of the lower frame have a circular track, extending beyond the sides. When the machine is under transportation the extended parts of the track fall flat to the sides of the lower frame. Each end of the upper frame is provided with five rollers and also with a pinion on the front end traveling on a rack located on the lower frame. The center of the frame is provided with a pivot pin constituting the rotatable axis. By the operation of the pinion on the front end, the upper frame can be rotated in any desired position, and by adjusting the boom with the boom cable winch the leads can be placed over any point of the chord, so that a straight line of piles can be driven in a length of 25 ft. with an extreme reach of the leads of 16 ft. This operation permits the driving of piles from one position without any movement of the machine other than the turning of the upper frame and the adjusting of leads and boom, which can be accomplished within a comparatively short time.

The hammer provided is a drop hammer weighing about 950 lb., although power hammers could be used. When the outfit is under transportation the hammer is placed, as shown in the view of the demounted machine, in a suitable hammer housing pivoted on the rear end of the lower frame, turned up into a horizontal position, and thereby the space between the rear wheels to the height of the axle is cleared. The engine furnishing the power for the operation of the rig is a 30-hp., 600-r.p.m. gas engine, located on the front end of the upper frame. To the engine is connected the hoist which operates the drop hammer, which can be utilized for any desired attachment with which the machine may be used.



SHOWING HOW THE MOUNTED PILEDRIVER CAN BE USED IN DRIVING PILES IN WATER

The machine is transported on its own wheels with the boom lying back flat on the upper frame. When it reaches the place where it is to be used, the wheels are first blocked with a blocking and jacking device, in order to prevent undesired motion. The blocks, fast-



DRIVING PILES WITH ARMY ENGINEERS' NEW PORTABLE PILEDRIVER

ened by screw shafts, provided on one end with a ratchet handle, fit the outer surface of the wheels. A jackscrew is housed in the blocks and takes part of the strain off the axle. A clamping device for stationing the two frames under operation and transportation will prevent the moving of the upper frame, and assure stability under any condition. The truck being fixed, the boom is then raised with a special screw device. This mechanism connects the boom and frame with an endless screw shaft, and can be operated by hand or by power. After the boom has been raised and passes the vertical position, the pins connecting the screw block to the boom are taken out, and the boom is operated with the boom guide cable and winch placed on one side of the upper frame.

X-Ray Examination for Blow-Holes

Application of commercial X-ray apparatus to the detection of blow-holes in castings is described by E. Schneider in *Engineering* of May 9, 1919. Since the work was inaugurated at the laboratories of the Schneider-Le Creusot company researches have been made into segregation and blow-holes, and the influence of aluminum and of tungsten on steels. Examination of compound metals has been made. Castings up to 40 or 45-mm. (1.57- to 1.76-in.) thickness can be examined for blow-holes and internal defects. An example of the discovery of blow-holes forming in cast-steel brackets due to a defective method of casting is cited; by the changing of the casting process these blow-holes were eliminated. M. Schneider suggests the need for increasing the penetrative power of the apparatus to increase the scope of X-ray examination of metals to greater thicknesses.

Thickness of Concrete Slabs for Highway Surfaces

Maximum Loads, Condition of Subsoils, and Impact Are All Factors—Experiments Indicate the Latter Is Very Important

FROM extensive investigations of brick roads and tests for pressure upon the subgrade, engineers of the Bureau of Public Roads at Washington have concluded that while concrete-slab foundations and surfacings for roads should be proportioned with regard to maximum load and condition of subsoil, impact is a most important factor. Tentative conclusions from pressure tests indicate that tensile stress due to the road would be unlikely to break a slab which rests upon the subgrade, but that loads combined with impact will probably dictate slab thickness in such cases. Where the surface is arched and unsupported from any cause, direct bending stresses become important.

In recent issues of *Public Roads* two articles have been published, one dealing with the construction of brick pavements in the Middle West, by A. T. Goldbeck and F. H. Jackson, and one by Mr. Goldbeck, describing tests of the pressure of concrete slabs on the subsoil both loaded and unloaded. The articles appeared in Vol. I, Nos. 10 and 12, respectively, and the following information is abstacted from them.

The basis for the article upon brick roads was an inspection of a large number of pavements throughout the Middle West, with the idea of studying the merits of semimonolithic and monolithic brick roads. Other points affecting the design, such as the required thickness of base, the effect of soil conditions upon thickness, and the type of brick and filler to be used, were also considered. Particular attention was given to analyzing failures to determine the cause, so that suggestions might be made to guard against similar failures.

Soil Conditions Important

According to the authors, the character of the soil seemed to play a very important part in influencing the number of longitudinal cracks and the breaking down of many sections of pavement which were examined. It was very evident that sticky, clay soils, which retain a large amount of moisture and heave considerably during freezing and thawing weather, were much more likely to produce longitudinal cracks than were the more porous sandy soils. An instance examined where the road had broken entirely through, due to superimposed loads over a subgrade softened by the presence of moisture, was the Cleveland-Akron road. The writer suggests that soils of this character could be improved very greatly in their bearing value by the use of a porous filling material such as cinders, broken stone, slag and gravel, or by correct methods of drainage. In discussing the importance of soil conditions they state:

It cannot be too strongly urged that a thorough study must be made of the underlying soil and the drainage conditions, before attempting to design a road for a particular locality. It should be noted, also, that certain kinds of soils are not susceptible of drainage by the methods ordinarily practiced, using tile drains and trench drains along the side of the road. It is apparent that capillarity plays a very strong part in influencing the retention of moisture by the subgrade, even though apparently good drainage facilities are provided. A thorough study of capillarity and methods of draining various kinds of soil would be of

great benefit. . . . The character and thickness of the base should be very largely governed by the local soil and traffic conditions. It should be emphasized very strongly that it cannot be considered good practice to make a standard design for a brick road and apply this design to all sections of the country, irrespective of these local conditions.

Thickness of Concrete Base

In considering the thickness of the concrete base under brick pavements, it is stated that a theoretical discussion is impossible, due to the lack of data regarding the reactions between the slab and the subsoil. The strength of the brick in the monolithic and semimonolithic slabs should be taken into consideration, as the entire slab acts as a beam. A perfect monolithic construction is desirable, and proper contact lugs and square edges on the brick, such as those of the wire-cut lug brick, are to be preferred. The results of the investigations show that the present-day heavy traffic can be carried safely on a 4-in. concrete base with 4-in. brick laid monolithic under favorable subgrade conditions. If a bituminous filler is used in the brick wearing surface, theoretically the concrete base should be thicker than in the case of a grouted surface. Absence of test data, however, makes it impossible to say how much thicker.

Conclusions

General conclusions were drawn by the authors as follows:

1. The type and thickness of base for any brick pavement should depend upon (a) the maximum weight of the loads to be carried, and (b) the bearing value, under all weather conditions, of the underlying soil.
2. In all cases where the traffic to be carried is likely to be heavy or where the underlying soil is of such a nature that its bearing value is not sufficient to support the pavement under all conditions, a concrete base of sufficient thickness to properly distribute the loads should be provided.
3. Where the maximum weight of the loads to be carried is not excessive and the subsoil is of a porous, well drained nature, the thickness of the concrete base may be decreased or under very favorable conditions, it may even be omitted altogether.
4. Other things being equal, a somewhat lighter construction may be permitted in the case of the monolithic and semimonolithic types than where the ordinary sand cushion type is provided, on account of the increased slab strength which these types appear to possess.
5. A concrete curb or edging is not necessary when monolithic or semimonolithic construction is used.
6. Paving brick with well formed contact lugs are to be preferred to brick without lugs.
7. Paving brick with square edges are to be preferred to brick with rounded edges.
8. Given the requisite care in construction, satisfactory results may be obtained with either cement grout or bituminous filler.
9. Vertical fiber lug brick with bituminous filler have given good service in those cities west of the Mississippi where they were inspected, possibly due to the protecting action of the asphalt mat which prevents wear from coming upon the brick direct.
10. Expansion joints in grout-filled pavements would seem advisable at street intersections and at points of tangency on curves, and longitudinal joints should be used against all rigid curbs or structures.

Tests For Soil Reactions Under Slabs

Further data upon the required thickness of concrete slabs are in process of determination as a result of experimentation by the Bureau of Public Roads, as mentioned above. The tests described by Mr. Goldbeck were made upon an 8-in. concrete wearing surface on the Camp A. A. Humphreys concrete road near Alexandria, Va.

Special pressure cells were designed for making the tests, and were placed as shown in Fig. 1. The cells were connected with a pressure gage at the side through a small pipe, and benchmarks were placed so that accurate measurements could be taken of the rise and fall of the slab under loading. The principle used in the device for measuring the pressure is that of (a) equilibrating the subgrade pressures against the exposed face of the measuring cells by means of air pressure within the cells; (b) detecting the instant that equilib-

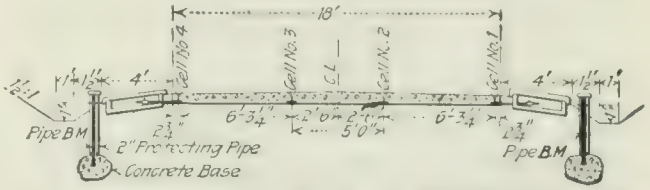


FIG. 1. CROSS-SECTION OF ROAD, SHOWING LOCATION OF PRESSURE CELLS AND APPARATUS

rium takes place, by the breaking of an electrical contact within the cell, and (c) reading the air pressure on a delicate pressure gage connected with the air pipe leading to the cell.

When taking pressure readings, an air hose leading from an air-pressure tank in the indicating box is connected with the $\frac{1}{8}$-in. pipe leading to the cells. Electrical connections are made, one with the pipe, and the other with insulated wire inside the pipe. When the circuit is thus completed, a small electric light in the indicating box is lighted. Air is then allowed to escape from the pressure tank into the cell, and the air pressure within the cell gradually increases. When the pressure within the cell is slightly greater than the subgrade pressure on the cell, the diaphragm is moved, the electric contact is broken, extinguishing the light, and the air pressure is instantly read.

All of the pressure readings taken up to date with zero loading are shown on the curves in Fig. 2, refer-

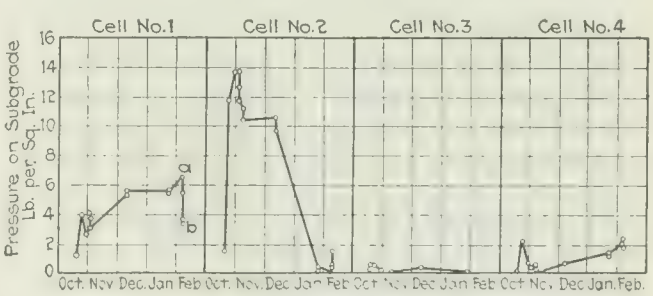


FIG. 2. CURVES OF PRESSURE READINGS AT ZERO LOADING

ence to which reveals the fact that under zero load on the slab the reaction pressures under the slab are not uniform and are far from constant, varying from day to day. Readings taken before and after the passage of a heavy load showed very appreciable changes in pressure.

In order to determine the distribution of pressure under heavy wheel concentrations, a class B standard Army truck was loaded with five tons of sand. The front wheels and rear wheels of the loaded truck were weighed separately, and the axle loads were found to be 5000 lb. and 17,000 lb., respectively. The truck was

backed, 1 ft. at a time, up to the central measuring cells Nos. 2 and 3, beginning from a position beyond that at which the readings of the cells began to increase on account of the heavy load. This backing and pressure reading was continued until the front wheels were over the cell. In a second test the truck was backed

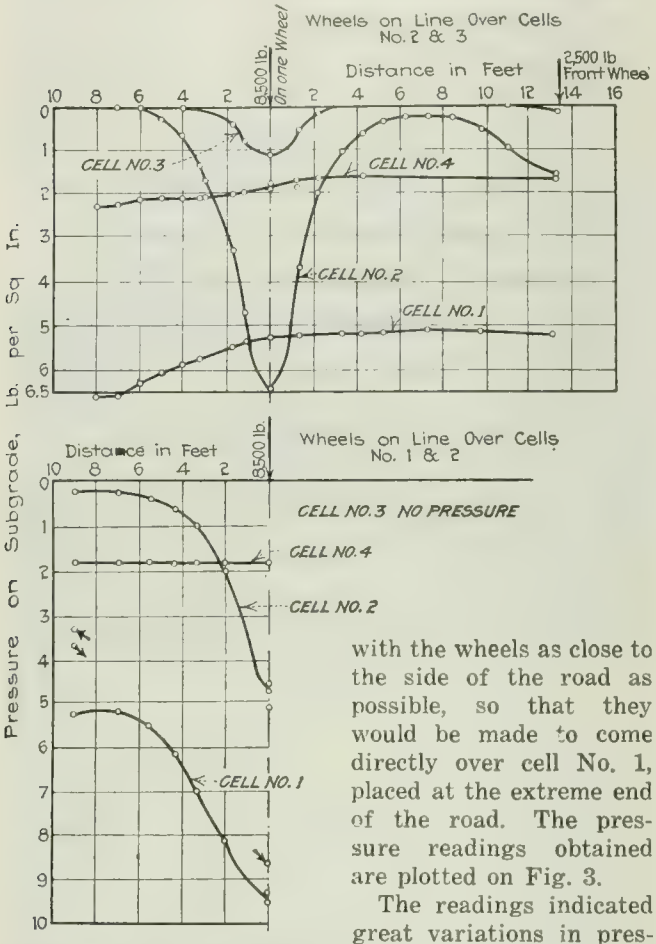


FIG. 3 CURVES SHOWING DISTRIBUTION OF PRESSURES DUE TO WHEEL LOADS

with the wheels as close to the side of the road as possible, so that they would be made to come directly over cell No. 1, placed at the extreme end of the road. The pressure readings obtained are plotted on Fig. 3.

The readings indicated great variations in pressure. The greatest intensity is seen to be directly under the load, and decreases rapidly as the distance increases from the load. Cell No. 3 did not receive as much load as cell No. 2, owing to the arching of the concrete over the subgrade at this point. A considerable load was required to deflect the slab enough to bring it in contact with the subgrade. When the load was removed from this point of the slab it sprang back into shape away from the subgrade, so that no electrical contact was made in cell No. 3, thus showing that the subgrade was exerting no pressure at that point. It may be noted from Fig. 2 that, at the beginning of the test Feb. 5, the concrete slab was supported largely at its side, as indicated by the comparatively high readings on cells Nos. 1 and 4 and the zero readings on cells Nos. 2 and 3.

From the curves in Fig. 3 it is seen that a very close approximation to the actual intensities of the subgrade pressure may be made by considering them in the form of a cone of about 4-ft. radius, which approximates the curve for cell No. 2. Distributing the load over the base of a cone of this radius, considered as a plate, the pressures as figured by the author for a uniformly supported 8-in. slab showed little likelihood that the slab would be stressed excessively in bending due to static loads, as the pressure under an 8,500-lb. wheel load would not exceed 34 lb. per square inch.

Judging from the results obtained, the probability is that the tensile stress produced directly under the load will never influence the design of a road slab which rests on a fairly homogenous subgrade. If, however, conditions arise so that the slab is left entirely without support under the load, excessive tension can be developed. Upon the latter basis it was figured that for the most extreme cases, as in the case of cells Nos. 3 and 4, in order that a slab might be safe from cracking under a wheel load of 8500 lb. about a 12-in. thickness of concrete would be required. There was evidence that an arched condition might occur, from the fact that the subgrade would not react after deflection to the same extent as the slab, thus eliminating support.

The author emphasized the fact that in the present tests only static loads were considered, and that it is hard to believe that the many failures in slabs could have occurred under simple loading. It seems that impact must have a distinct effect in causing them.

Experimental Study of Side Launching by Fleet Corporation

MEASUREMENTS of side-launching phenomena will be made this week at Jacksonville by technical representatives of the Emergency Fleet Corporation. A 6000-ton steel ship will be launched on Aug. 2, 1919, at the Merrill-Stevens Co. yard, and it was desired to obtain from this launching data bearing on the water depth needed alongside the building berths. Immersion depth and degree of tipping are the primary data to be obtained, but precision observations of speed and acceleration during the time the ship is on the ways, and of water pressure after it leaves the ways, will also be carried out. The concrete ship section of the corporation, under jurisdiction of the Ship Construction Division, devised the instrumental equipment and will carry out the work.

It is planned to place four pressure recorders at either of two cross-sections of the ship (two on the forward bilge, one near the center keel, and the fourth on the rear bilge). Tipping will be measured by roll-recorders, checked by kinematographic exposures of a vertical scale attached to the vessel. Speed and acceleration data will be furnished by a combined time and travel record made by a modified "strainagraph" set on the deck and connected with a fixed point on land by a wire.

High Traffic Record on New Jersey Road

A traffic census taken during the past year on the Lincoln Highway near its crossing with the Passaic River in New Jersey showed, according to the annual report of the county engineer of Essex County, an average of about 5000 vehicles per day between 8 a.m. and 6 p.m., or one every 7 sec. Forty-five per cent. or 2250 of these were commercial cars. An average of 15,000 tons passed over the road daily; 80% of this was confined to a 40-ft. width of surfacing. This is equal to a loading of 300 tons per day per foot of driving width. In connection with this traffic, the great loss of time due to drawspans was brought out. The drawspan over the Passaic River was swung 9172 times, accumulating a traffic holdup of 39 days during the year. At the bridge over the Hackensack River, which is nearby, the draw was swung 3803 times, causing a loss in the utilization of the bridge of approximately 13 days.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

New Engineering Council or American Association of Engineers?

Sir—The suggestions of Dr. Charles Warren Hunt with reference to the membership and functions of local engineering associations, as quoted in *Engineering News-Record* of July 10, 1919, p. 87, are of considerable significance. Of particular interest is the statement that the existing national engineering societies should not be interfered with or hampered by being forced to undertake matters concerning the welfare of the profession, and that for that reason the problem arises as to how the engineers of the country may be organized to handle such matters.

Dr. Hunt's solution of the problem has so many points of similarity with the existing plan of the American Association of Engineers that one may rightly ask why Dr. Hunt does not rather advocate that the solution of the problem is for engineers to join the American Association of Engineers.

A brief comparison of Dr. Hunt's plan and the plan of the American Association of Engineers will be of value in determining the proper solution. The cardinal features of Dr. Hunt's plan are as follows:

1. That in each center of population there be formed a local engineering association to be known by some distinctive sectional name.

2. That the voting membership of each of these associations be limited to the members in any grade of any national society of engineers residing in the territory covered by the association—such membership not to be restricted to the four founder societies only.

3. That these associations (a) act upon all local matters and (b) elect their proportionate representation on a National Engineering Council and contribute in similar proportion to the support of that council.

In the plan actually in operation in the American Association of Engineers, the outstanding features are as follows:

1. In each center of population there already has been formed or is about to be formed a local chapter of the association—each chapter being known by a distinctive sectional name.

2. The voting membership of each of these chapters is open to all engineers possessing the necessary qualifications who reside in the territory covered by the chapter, and such membership is open to the members of the four founder societies and of any other engineering society who possess the requisite qualifications.

3. These chapters (a) act upon all local matters and (b) have a voice in the election of the national board of directors and contribute a definite proportion of their receipts to the support of the national headquarters of the association.

When the two plans are thus compared point for point, one is impressed by the striking similarity between them. It follows that the question which in reality presents itself to the minds of engineers for decision is whether their strength should be thrown in on the side of an existing successful organization or whether their strength should be used to set up in competition a new organization.

In my mind, the answer should be: (1) The national technical societies for the theoretical, scientific and educational questions. (2) The American Association of Engineers for all matters concerning the economic and social welfare of the profession.

KAY B. KNUDSEN,
Secretary, New York Chapter, A. A. E.
New York City.

Corps of Engineers and the Auxiliary Engineer Corps

Sir—Engineers will appreciate the frank statement of the Chief of Engineers, U. S. A., published in your issue of July 17, 1919, p. 141, concerning his attitude toward the bill designated S. 1376, Sixty-sixth Congress, First Session, providing for an Auxiliary Engineer Corps. His assurance that the Corps of Engineers has not interested itself in that bill is cordially accepted. So complete has been the cohesion of the Corps of Engineers and so loyal have its members been to the specifications of the organization, that it was but natural in the case of S. 1376 to assume that the old order had not changed, and that the attitude of certain engineer officers was, as in the past, the attitude of the organization. If such be not the case in this instance, we shall look forward with interest to the report that the War Department will make to the Senate concerning the measure in question.

The Chief of Engineers regards the bulletin of this conference, published in your issue of June 19, 1919, p. 1232, as an attack on the probity of the Corps of Engineers. No question of probity is involved. If the dictionary be correct, probity means honesty of purpose. If the Corps of Engineers, in its support of a legislative measure in its own interest, should inaugurate its campaign through the civilian employees in its district offices, there would be no dishonesty of purpose therein. Neither can an opponent's statement which purports to expose the genesis of such a campaign be called an attack on probity. If such were the case, practically every political campaign that the country has passed through would lack probity.

We recognize that this may be an appropriate time to interpret very frankly the attitude of the Conference on National Public Works toward the Corps of Engineers, as expressed in the writings and statements of thousands of civilian engineers throughout the country. This conference has entered on a campaign for the creation of a Department of Public Works. The Corps of Engineers now, as in the past, opposes this national reform because, as repeatedly and frankly stated by engineer officers, it involves the removal of our rivers and harbors work from military control This conference accepts the issue on that basis and will deal with it in a frank and open manner, undeterred by the familiar and oft-used plea of the Corps of Engineers that disagreement with it must constitute an attack on its probity. For more than forty years the civilian engineers of the country have listened to that sort of plea, rendered in so plausible, persuasive and courteous a way that civilian engineers have been

persuaded to turn from their effort, with the result that the Corps of Engineers has always triumphed.

We recognize that we have a strong, well organized antagonist in the Corps of Engineers, which is probably more potent in its hold on the national legislature than any other Federal organization. We also recognize that the opposition of the Corps of Engineers is a matter of self-preservation as opposed to the public welfare. While we expect success, it is obvious that we may be defeated. If defeated we shall rise again. Sooner or later the public interest will prevail, just as it has prevailed, in the matter of public-works administration, in all the other important countries of the world.

It will be the endeavor of this conference to avoid controversy concerning the fitness of the Corps of Engineers in civil work, and its performances in the past; but if said corps forces that issue upon us, we will reply as judicially and effectively as we can, dealing with facts—documentary evidence which occupies a large section of our file. We recognize the peculiar excellence of the Corps of Engineers in certain lines of its work, and many of its members excite our profound admiration. But such considerations are irrelevant. The administration of our Federal public works is now a veritable hodge-podge, the correction of which transcends all considerations of personal affection or of obeisance to an established organization, however ancient and honorable. M. O. LEIGHTON,

Chairman, Engineers, Architects and Contractors' Conference on National Public Works.

Washington, D. C.

Regulate Engineering Profession by Law

Sir—I note the letter by F. N. Harris, of Olympia, Wash., which appeared in your issue of July 17, 1919, p. 141. I agree with Mr. Harris that the engineering profession needs a "closed season," but do not think there is any immediate danger of an oversupply of engineers from the engineering schools. I have been out of school since 1904, and in that time have met at least five hundred engineers, ranging from chainmen to chief engineers, and of that number not more than thirty or forty were graduates of an engineering school. Most of them were not graduates of a high school and some had studied only "the three R's."

What the engineering profession needs is regulation by law, the same as the medical, legal and other professions; then the profession and the individual members could command the respect of the public.

Coraopolis, Penn. F. E. CHESLEY.

Illinois Specifications for Monolithic Brick Roads

Sir—In view of the gross injustice that may ensue from the apparent misinterpretation of the results of tests on monolithic-brick slabs made at the University of Illinois, it seems necessary to restate a few of the fundamental principles enunciated as a result of these experiments. I refer particularly to the article by Clifford Older on new Illinois designs for rigid pavements, in *Engineering News-Record* of May 8, 1919, p. 905.

Mr. Older says that in a report of tests of monolithic slabs at the University of Illinois (see *Engineering News-Record* of Nov. 1, 1917, p. 802) Prof. C. C. Wiley states, in effect, that "the modulus of rupture of the concrete *base* of monolithic-brick slabs is approximately the same as that of plain concrete of the same quality, and that such slabs are fully equal in strength to concrete slabs of the same thickness."

But at no place in this article does Professor Wiley make the statement quoted. If by the last "same" is meant the concrete base, Mr. Wiley does say that, "these tests show that such a compound slab is fully equal in strength to a concrete road slab of the same thickness." Also, "with this type of construction it seems therefore entirely logical to reduce the total thickness of the slab, either by reducing the thickness of the base or by using thinner bricks, provided a sufficient gross thickness is retained to furnish strength enough to carry the probable loads, and this necessary gross thickness can be determined on the basis as the thickness of a concrete road."

Nor can it be said that these tests show that the concrete base of the monolithic slab must be of the same quality of concrete as in the all-concrete slab. The tests seem to show, for example, that a monolithic slab with a 1:3:5 concrete base is equal in strength to an all-concrete slab of a 1:2:3 mix.

Mr. Older's method of computing the required thicknesses for other mixes of concrete roads and other types of construction seems to be entirely justifiable. The question arises, Why should a designer go back for experimental data to a source which is over 15 years old? Later experiments give somewhat different results, and seem to fit more nearly the actual construction conditions as found today on the roads. It is quite probable that the experiments by William B. Fuller, referred to in Taylor and Thompson's book, were made on specimens of a much wetter consistency than the concrete which is to be used on the Illinois roads. The drier mixes, as shown by the experiments at the University of Illinois, and by the very elaborate and careful investigations of Prof. Duff A. Abrams, of Lewis Institute, give a much higher modulus of rupture for the leaner proportions.

After calculating the required thickness of a brick slab on the original basis of equivalent flexural strength, the designer proceeds to require the addition of 12½%, of material on the basis that, "If the total thickness is maintained the base would be so thin as to require a finer aggregate and more care in construction." What is the objection to the use of a finer aggregate? It is often cheaper, as it seems to be a size for which there is comparatively little demand. As to "more care required in construction," past experience seems to indicate that this is contrary to the facts; an example of which is to be found in the same issue of *Engineering News-Record* which is referred to above (Nov. 1, 1917, p. 830).

The specifications, as they now stand, require the brick pavement to contain 12½% more material by volume than the standard concrete pavement. This increased amount of material, together with the fact that the bricks are higher priced per unit volume than the concrete slab made of such materials as are readily available in the greater part of Illinois, results in a cost of construction which makes competition impossible. It should be remembered that the original premise was equal flexural strength. The addition of 12½% of

material adds more than 12½% to the flexural strength, as the variation in the first case is straight-line while in the latter it is parabolic.

The resulting brick pavement not only has greater strength, but greater wearing quality. There cannot be much ground for argument about this fact, in view of the statement that the limestone of the state is so soft that it is not fit for use in macadam roads. Such stone cannot become hard enough when mixed with a little cement to compare in wearing quality with vitrified brick.

Considering that a brick pavement has certain points of superiority which might justify its use in specific cases, even at considerable cost, it would seem that the proper policy would be to designate at once the type to be used, and call for bids on this only; rather than to call for competitive bids on two different types which obviously are not comparable on the basis of cost. As they are now written, the Illinois specifications have the effect, if not the appearance, of being discriminatory.

C. H. PIERSON.

Chicago, Ill.

[The foregoing letter was referred to Mr. Older, and his comment follows.—EDITOR.]

Sir—I believe Mr. Pierson will find, upon carefully reading Professor Wiley's article, contained in *Engineering News-Record* of Nov. 1, 1917, that Professor Wiley did say, *in effect*, "that the modulus of rupture of the concrete base of monolithic-brick slabs is approximately the same as that of plain concrete of the same quality." Professor Wiley's exact words were as follows:

"Comparison of the results given in the accompanying tabulation will show that when the concrete side of the slab is in tension the direction of the brick courses has little effect on the strength and that the modulus of rupture is approximately that of plain concrete of the same quality." [Page 821.]

I am unable to see how I misinterpreted this statement of Professor Wiley.

Mr. Pierson states that "the drier mixes, as shown by the experiments at the University of Illinois, and by the very elaborate and careful investigations of Prof. Duff A. Abrams, of Lewis Institute, give a much higher modulus of rupture for the leaner proportions." I am unfamiliar with any such tests, although I have a file of all of the Engineering Experiment Station bulletins, and referred to them, and also inquired personally of Professor Abrams for these data, previous to the preparation of my article. I would be glad if Mr. Pierson would refer me to the data in question.

I cannot agree that the brick pavement specified by Illinois has more flexural strength than the concrete slab specified. In the first place, only the 4-in. brick pavement has a greater thickness than the concrete slab. The 3-in. brick pavement specified has the same thickness and the same volume of materials.

Until sufficient tests are made to determine positively that the cross breaking strength of monolithic-brick slabs, having thicknesses of base equal at least to the thickness of the brick, and concrete of various proportions, is not the same as that of concrete slabs having the same thickness and the same proportions and quality of concrete, I can see no reasons for changing the designs selected.

A properly constructed brick pavement may present greater wear resistance than a concrete road having soft limestone aggregate. However, a concrete road built in Illinois, now six years old, constructed of aggregate showing a wearing coefficient of 6, exhibits such slight wear as to be negligible, although perhaps 75% of the traffic, which is moderately heavy, is steel-tired horse-drawn wagons.

As to the Illinois specifications being discriminatory, I cannot agree with Mr. Pierson except that they discriminate against inferior pavements of all types.

CLIFFORD OLDER,
Chief Highway Engineer, Department of Public
Springfield, Ill. Works and Buildings.

Appreciates Kindness of American Engineers

Sir—May I express through the columns of your valuable journal my keen appreciation of the kindness shown to me by brother engineers throughout the United States and Canada? During a tour of over three months, in which I have been studying some of the engineering problems of the cities of this continent, my daily contact with the members of the engineering profession has convinced me of their great value to the communities which they serve, and I have learned how closely are the ties that bind engineers of one country to another.

W. E. BUSH,
New York City. City Engineer, Auckland, N. Z.

A Plea for Making Watersheds and Administrative Areas Coincide

Sir—The plan and section of political administrative areas are of vital interest to the engineer. It is difficult to find any general principle underlying the present bewildering variety. The boundaries of all existing administrative areas—towns, counties, provinces, states, whole countries—bear all the marks of having been laid out from a map instead of on the ground. In new and unsurveyed country, the present system seems to be to take two parallels of latitude and two of longitude. This gives a neat and compact area, and, by analogous methods, you can, in a surprisingly short time, get a whole continent divided up into tidy and symmetrical parcels which will look extremely well on the office map. Whether they are likely to have any relation to flow of traffic or congruity of needs and occupations is a different matter. In well surveyed country, our boundary makers seem to have taken a river, a road and a canal—all of which are nicely marked on the map and on the ground. When the area looked big enough, they drew a straight line to close the polygon. From the scientific point of view both methods seem on a level.

In either case, after a lapse of time, many things happen in the usual course of nature. The merchant finds he cannot move his goods up river, down river or across the river. The farmer finds his crops are being ruined by floods or killed for lack of irrigation. The fisherman finds that factory waste is killing the fry. The manufacturer is starving for power. The man in the street wants to keep the dust down, drink pure water, and get rid of his sewage. Finally, when they get together and decide that something must be done, they find that, instead of having to get one public

authority to lay out a policy, pass the necessary ordinances, coerce obstructionists, and provide funds, they have to deal with four or five. And it is well known that the inertia of public bodies in the face of urgent public works increases as the *n*th power of the number of bodies involved.

The spectacle of two public authorities facing each other across a river, each waiting to see whether he can bluff the other fellow into paying for the essential bridge, is the lamentable but inevitable result of human nature under dual control. Nowadays, as a result of agitation and compromise, you find along any river a couple of irrigation boards, three or four drainage boards, a fishery conservation board, several water-supply and sewerage commissioners, and a couple of hydro-electric power companies. Each works in portions of several administrative areas. Their methods of collecting costs are cumbrous and expensive because duplicated by the areas. Their relations with each other and with the various authorities in whose areas they work are marked by veiled suspicion. This condition entails, in the aggregate, an inordinate amount of costly and intricate cross-account-keeping. And there is no coördinating power over this except the supreme power of the state, which is generally much too busy with matters of interest to all its constituents to worry over things which should be settled by the elected representatives of the people directly concerned.

Topographically, the ideal administrative area would be such that all matters affecting it arising from natural causes should be directly under its own undivided control. Among the most common and most costly of such matters are water-supply, sewerage, sewage discanalization, fisheries, river crossings—bridges, ferries, tunnels—navigation laws and ports. All these depend entirely upon the shape of the earth. All experience goes to show that when more than one authority is concerned with one of these matters, essential work is either not done, or is done after needless and ruinous delays. It seems obvious that the natural administrative area is the drainage area of a river, and its natural boundary a water parting.

All great cultures have grown up in river valleys—the Nile, the Euphrates, the Ganges. A river, far from being an obstacle, is generally an aid to communication. A mountain is always an obstacle. Even in war we know that, with proper engineering preparation and a good staff plan, a river crossing may cost some lives, but rarely loses much time; but you cannot make miles of road over a mountain in a night. In general, the inhabitants of a valley have a certain congruity of occupations, needs and interests.

If you can imagine people living on an ordinary pitch roof, you will see that the great mass live down near the gutter, and only a few daring spirits will climb up over the ridge to see what is in the other gutter. The direction of the great mass of traffic will be along the gutter, with perhaps one main route over the ridge to the other gutter. The people who live on the southern side, whose chief need is shade from the sun and extermination of the nesting swallows, will have no interest in the life of the northern inhabitants, who want warmth and shelter from the wind and rain. Our present system of taking rivers as boundaries and leaving a protruding backbone of watershed in the center of our areas to keep people apart results in a very similar state of things.

A system by which the complete drainage area of every river running into the sea would be administered by a single authority through sub-authorities in charge of the tributaries has much to recommend it. The electors who would have to vote on funds and policies would all be directly interested in them; for the rain falls on the just and the unjust alike, and then prefers to run downhill. The hordes of artificial and overlapping boards would disappear. Their boundaries would become coincident with those of the administrative area. The cost of their complicated accountancy would be saved. Their functions would be carried out with much greater efficiency and freer initiative by the area's public-works commission. Concerted action in matters of public interest would become much easier. The electors interested in any improvement would only have to tell their representatives to get on with it; there would be no other authority to worry.

The allotment of costs would be greatly simplified. The administrative authority could map out the lines of its internal traffic for the highest degree of efficiency, spot accurately the transfer points for external traffic, and fix and plan its port to handle all the imports and exports of the valley. It could coördinate its drainage, its irrigation, and its power. It could make its water-supply, its sewerage and its fishery live in amity. It could do all these because they were all of direct interest to all its constituents, and of no interest whatsoever to any one else.

C. G. LYNAM,
Major, Royal Engineers, British Expeditionary Force.

Using Planimeter to Compute Earthwork

Sir—I have read with interest the letter by Prof. J. H. Dorroh of the University of Mississippi in your issue of July 3, 1919, p. 39, concerning advantages claimed for the use of a special cross-section paper in computing earthwork. The paper used by Professor Dorroh was to the scale of 1 in. = $\sqrt{27}$ ft. = 5.196, so that 1 in. would equal 27 sq.ft. and it was claimed that "the use of this paper saves the time ordinarily spent in reducing square inches to square feet and cubic feet to cubic yards, as required with other cross-section papers."

The writer has been employed in several engineering offices where it is customary to obtain all areas by the planimeter in square inches and then reduce to square feet or some other unit. The work of reduction from one unit to another can usually be avoided.

It is a simple matter to compute a setting of the tracer arm of the planimeter for any paper or scale of plotting which will give results in feet or in any other unit desired. Where much of this work has to be done, valuable time can be saved by having on hand a list of settings for various scales and units. I have found this method especially valuable in the case of maps where areas can be obtained directly in acres or square miles instead of in square inches or square feet.

It is not always possible to plot all cross-sections to the same scale or to multiples of that scale. All paper, especially blueprint paper, is subject to distortion which varies with different conditions of temperature and moisture and which should be taken into consideration with areas of more than a few square inches. By a slight adjustment of the planimeter it is usually possible to correct these errors.

L. C. CRAIG,
Edmund T. Perkins Engineering Company.
Chicago, Ill.

Erecting a 331-Foot Suspension Bridge With Unskilled Labor

Sir—The article by William G. Grove in *Engineering News-Record* of July 3, 1919, p. 4, describing a 540-ft. suspension bridge, recalls a somewhat similar but smaller structure built at Brilliant, B. C., in 1913. This was for the Doukhobor society, composed of Russian peasants of a religious sect, living under a system of community ownership, so that the organization customary on construction work did not exist. Very few of them could talk any English, and I knew nothing of their language till I learned it on the job.

The bridge has a span of 331 ft. between centers of towers, with a 16-ft. roadway. The trusses are of steel, 9 ft. deep; the floor-beams are pairs of channels with hanger rods between and a kneebrace at each end. The towers are 50 ft. high above the piers and are of reinforced concrete. Each cable consists of four plow-steel wire ropes 2 in. in diameter, with about 37-ft. sag, this arrangement being adopted in order to use cables which the Doukhobors had bought before engaging engineers. Each rope socket is attached to two 2¼-in. rods which pass through a steel anchor bedded in concrete in the solid granite. At the towers, the cables rest on saddles, under which are rollers. The cables are cradled in planes with a batter of 1 to 12 and there are 1⅜-in. guy cables on each side, attached to floor-beams.

As the men were not accustomed to working high in the air, considerable difficulty was experienced in getting them to try some of the operations. On the north side of the river a 95-ft. tower was needed for hoisting concrete. Only three men were willing to build it, and even they would not take it down afterward, so it was pulled over and smashed on the rocks.

The cables were pulled across the river supported on a trolley cable, and after being swung free were adjusted to length. For placing clamps and hanger rods, a trolley cable was used on each side of the road; on these were hung boxes in which the men worked. For entering the lower ends of hanger rods through the floor-beams, suspended chairs were used. All of the men working on steel erection wore safety belts, such as are used by telephone linemen. On one side of the river the steel was lifted by a small single-drum engine; on the other side hand tackle was used.



SUSPENSION BRIDGE AT BRILLIANT, B. C.

After the clamps were on the cables the method used was as follows: Hanger rods were put up for three panels; then three floor-beams with kneebraces attached were hung, after which the trusses in the three panel sections were put on. A couple of holes in the top chord splice were then caught, the bottom chords pulled together, and the diagonal put in. Then after the laterals were put in place the deck was extended. Bolts were used for field connections.



PLACING A THREE-PANEL SECTION OF SUSPENSION BRIDGE

The bridge was built by the Doukhobor society, assisted financially by the provincial Government of British Columbia. It was designed by John R. Grant, of Cartwright, Matheson & Co., of Vancouver, B. C.; the writer was in charge of construction for the same firm.

A. M. TRUESDELL,
American Bridge Co.
Gary, Ind.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Bottom Form Carries Ginpole to Erect Top Form

ERECTION of the top panels of end forms for a retaining wall at Columbus, Ohio, is facilitated by using as a ginpole a vertical timber which serves to bind together and stiffen the two panels when erected. The wall is some 7 ft. thick at the base, 2 ft. thick under the coping and 25 ft. high, and is being concreted in 30-ft. sections. Frequent erection of the end forms is necessary, due to the construction in sections, and, because of the height of the wall and of the design of the panels for repeated use, they are heavy. The bottom panel and the vertical stiffener are first erected; then, using the vertical stiffener as a ginpole, the top panel is erected. D. W. McGrath & Sons, Columbus, Ohio, are the contractors and W. A. Jones is their superintendent.

Steel Sheeting Bridges Trench

FOR carrying streets and roads across trenches where steel sheet piling is used, an arrangement which requires but little depth consists in the use of some of the spare sheeting to form the roadway. Piles laid across the trench support a platform composed of piles parallel with the trench, this platform being covered with a few inches of earth. For light traffic a single layer of sheeting across the trench may suffice.

This construction is said to be superior to the ordinary plank platform or roadway, the planks of which wear and split under traffic, while the sheeting remains practically uninjured and may be used many times. It was devised by A. J. Penote, contractor, Cleveland, Ohio.

Raising a 140-Foot Concreting Tower Into Place in One Piece

BY S. S. HAMMEL
Assistant District Manager The Foundation Co., Pittsburgh, Penn.

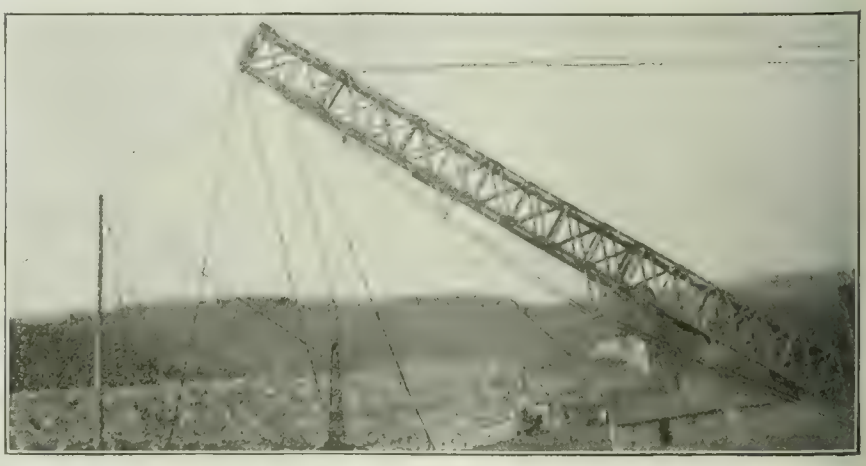
POSSIBLE interference of guy lines with the excavating and piledriving operations in the construction of a marine way for the Carnegie Steel Co. at Coal valley, Penn., forced the contractor to raise complete in one piece the 140-ft. wooden concreting tower which was required in subsequent concreting work. The tower-raising operation is shown in the accompanying view.

A permanent foundation for the tower was built in its proper place, made up mainly of two long timbers laid on the ground and anchored firmly with a spacing equal to the width of the tower. Two more timbers were laid across these and bolted to the first two to serve as the horizontal legs which were used in the tower in place of guys. The tower was then built up horizontally and laid along a line normal to the shore line, with its base tight against the foundation timbers, which were used also as a heel of the raising. To stiffen the tower in the raising operation steel cables were trussed as shown in the view along the lower side.

A heavy ginpole 50 ft. high was then set up at the shore end of the tower, and lines were rigged with block and fall to the top of the tower. When the time came for raising, two derrick boats with 75-ft. booms were set at the shore line, and boomed up as high as possible.

The fall lines from these derricks were made fast to a timber that was placed near the top of the tower so as to distribute the strain. The tower was first raised by means of the ginpole until it had made an angle of about 20° with the horizontal, when the derrick boats took the strain. Block and falls from the ginpole were then cut loose, and the tower was raised to its vertical position by the derrick boats. During the raising, the guys which had been made fast to the top of the tower while lying down were paid out from snubbing posts and kept tight enough to hold the tower in line in the line of the derricks. Exactly 35 min. elapsed from the time when the tower left its horizontal position until it was erect in place.

The work was done from the Pittsburgh office of the Foundation Co., of which H. B. Kelsey is district manager.



140-FOOT WOODEN CONCRETING TOWER BEING LIFTED INTACT INTO POSITION

Other Articles in This Issue of Interest to Contractors:

Substructure of Michigan Avenue Bascule Bridge, Chicago Page 210
Camp Beds and Bedding Service Reduce Labor Turnover Page 213
Chicago's $140,000,000 Lake-Front Improvement Plans Page 216
Haul Gravel With Caterpillar Tractor in Minnesota Page 227
Mounted Piledriver Rig Developed by United States Army Page 232

NEWS OF THE WEEK

New York, July 31, 1919

Massachusetts Water-Supply Problems To Be Studied

An investigation of the water-supply needs and resources of Massachusetts is to be made jointly by the State Department of Health and the Metropolitan Water and Sewerage Board, under a recent act of the legislature. (Chap. 49, Laws of 1919.) The investigation is to include "all questions relating to the quantity of water to be obtained from available sources, its quality, the best methods of protecting the purity of the water, the construction, operation and maintenance of works for storing, conveying and purifying the water, the cost of the same, the damages to property, and all matters pertaining to the subject."

A report is to be made to the legislature by the first Wednesday in January, 1921. A general organization for the study has been effected. *Engineering News-Record* is informed by X. H. Goodnough, chief engineer of the State Department of Health, that besides the needs of Boston and vicinity for more water, before many years consideration must be given to the water-supply problems of cities in southeastern Massachusetts, in the Merrimack and the Ipswich Valleys and in other thickly populated areas to the west and south of the present Metropolitan district.

Illinois Architects' License Law

Registration and licensing of architects in Illinois are provided by a new state law amending previous laws and specifically permitting licensed architects to enter into partnership with licensed structural engineers. A company engaged in architectural work may not be licensed, but must have a registered architect at its head.

This law does not affect draftsmen and superintendents acting under the supervision of registered architects, but persons registered under this law are exempt from the provisions of laws regulating the practice of structural engineering. It does not apply to residential or farm structures outside of corporate limits or to structures costing not over $7500 within such limits.

Examinations for license will cover design and construction, sanitation and ventilation, strength of building materials, and the ability of the applicant. The law describes a "building" as follows: "A building is any structure consisting of foundations, floors, walls, columns, girders, beams and roof, or a combination of any number of these parts, with or without other parts."

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago. Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 505 Pearl St.,

New York Wants Full Control of Barge Canal Rates

Governor Smith of New York has written to the New York members of Congress asking them to assist in defeating an attempt now before Congress to amend the Interstate Commerce Law by giving the Interstate Commerce Commission regulation and control of canal transportation rates. The Governor contends that the ratemaking power should remain with the carriers, and that if the bill now under consideration became law the Interstate Commerce Commission could order the publication of rates via a water route on an equality with rail routes from interior points or establish water rates at such a small differential under the rail rate that the traffic would be diverted from the water route. In this manner, he says, the competitive influence of the waterway might be nullified, and the expenditure of over $150,000,000 go for naught.

Garbage Disposal at St. Louis

Hearings on garbage disposal, preliminary to drafting specifications for bids, are being held by the Board of Public Service of St. Louis, Mo. The present temporary contract for disposal by feeding to hogs will expire in May, 1920. Alternative bids on feeding and on reduction may be invited.

United States May Build Largest Ocean Steamers

Announcement has been made by the United States Shipping Board that it is planning to build, as speedily as possible, two mammoth ocean liners, the largest and fastest in the world, for the transatlantic trade, and that it is considering recommending the revival of the Montauk Point terminal scheme for a landing place for these steamers.

Chairman Hurley of the Shipping Board has asked the Navy Department to supervise the building of these vessels, under the direction of a joint committee composed of Admiral D. W. Taylor, chief of the Bureau of Construction of the Navy, as chairman, and the presidents of several of the largest shipbuilding companies. According to the announcement, each of the ships will be 1000 ft. long and have 102 ft. beam, with a draft of 35 ft., a gross tonnage of 55,000 and an engine power of 110,000 hp., capable of giving a 30-knot speed. The vessels are to be passenger liners purely, with accommodations for 1000 saloon passengers, 800 second cabin, and 1200 steerage passengers. As planned, they will be somewhat larger than the "Leviathan," the former German liner "Vaterland," which is 950 ft. long, with 100 ft. beam. The new vessels will be oil-burning and have an oil-carrying capacity giving them a steaming radius of 7000 miles, so that they would be able to make a rapid turnaround at the other side.

The Montauk Point terminal scheme was suggested nearly 30 years ago by Austin Corbin, then president of the Long Island R.R. It contemplates the building of large terminal and docking facilities at Fort Pond, at the extreme eastern end of Long Island, and the double-tracking of the Long Island R.R. clear to New York. This line is about 120 miles long, and would reduce the steamship passage to Europe by that distance. It is expected that with the new vessels the time from the end of Long Island to Plymouth would be reduced to four days.

Permanent Housing Bureau Proposed

A bill has been introduced into the House of Representatives by Mr. Tinkham, of Massachusetts, to create a bureau of housing and living conditions in the United States Department of Labor. This bill proposes that this new bureau should be charged with the duty of investigating the housing and living conditions of the industrial population, conducting research and experimentation looking toward the provision

and publication of such information as will make economically practicable the elimination of slums, etc.; assisting communities during the present housing shortage; making available to the utmost all existing housing facilities, and serving as a clearing house of information on housing and living conditions.

It is further provided that the bureau shall inherit the collections of plans, books, pamphlets, etc., gathered by the United States Housing Corporation and by the housing and transportation division of the Emergency Fleet Corporation. A director is provided at a compensation of $6000 a year, and an annual appropriation of $250,000 is made. The bill has been referred to the Committee on Public Buildings and Grounds.

Going Ahead With Water Filters for Sacramento

Bonds for $1,800,000 for a 30,000,000-gal. mechanical water filtration plant for Sacramento, Calif., are about to be issued, following authorization by popular vote in June, 1919. Charles Gilman Hyde, professor of sanitary engineering, University of California, Berkeley, Calif., has been engaged as consulting engineer.

New York Council of Federal Highway Council Organized

New York State representatives of the Federal Highway Council met in the United Engineering Societies Building, New York City, July 18, 1919, and organized a New York State Council. The object of forming the council is to obtain the enactment by Congress of Federal legislation embodying the principles set forth in the Townsend bill providing for the creation of a Federal Highway Commission and the construction and control by the United States Government of a system of national highways. To assist in accomplishing this object, there will be appointed county representatives of the council throughout the State of New York. They will be instructed to obtain support of the Townsend bill by local organizations. The following officers were elected:

Chairman, Arthur H. Blanchard, president of the American Roadbuilders' Association and National Highway Traffic Association; vice-chairmen, D. C. Fenner, past-president of the Motor Truck Association of America; George M. Graham, manager of the Pierce-Arrow Motor Car Company; the Hon. Frederick S. Greene, New York State commissioner of highways; Edward J. Mehren, editor of *Engineering News-Record*, and Lt. Col. Theodore Roosevelt; secretary and treasurer, H. W. Perry, manager of the Trailer Manufacturers' Association of America.

New Hetch Hetchy Dam To Be One of Highest in World

Bids are now being asked by the Department of Public Works of San Francisco, Calif., through M. M. O'Shaughnessy, city engineer, for the construction of the Hetch Hetchy dam for the new city water-supply. When completed this will be one of the large masonry dams of the world. From the crest of the dam to the lowest estimate excavation is 311 ft., with a height above stream level of 212 ft., and an average excavation of 72 ft. Provision is made, however, for future enlargement. It will be a straight cyclopean masonry gravity-section dam 600 ft. long, with either a siphon spillway or an overflow section provided with Tainter gates, as later to be determined. Figures given in the advertisement for bids are as follows: Excavation below stream level, 77,000 cu.yd.; excavation above stream level, 60,500 cu.yd.; cyclopean masonry, 298,800 cu.yd., other concrete, 66,850 cu.yd.

The dam site is on the Tuolumne River about 150 miles east of San Francisco, and some 3600 ft. higher.

Highway Financing Status Throughout the United States

A compilation of the amounts of highway bond issues voted, to be voted, and contemplated in the United States is shown in the table herewith. Various sources of information have been utilized in preparing this table, principally data received from the Portland Cement Association.

In rating moneys voted in states not utilizing bond issues, the funds made available have in several cases been substituted and added to the bond issues. Under "election pending," elections by vote of legislators, commissioners and the people direct have all been included. No account has been taken of the large appopriations made by the Government for Federal aid.

This list is changing daily as various places vote upon the propositions, and a summary made later in the year will show quite different results. However, it is felt that the large figures recorded show the strong trend toward intensive road construction throughout the country.

FUNDS PROVIDED, TO BE VOTED UPON AND CONTEMPLATED FOR HIGHWAY CONSTRUCTION IN UNITED STATES

State	State Highway Funds			County Highway Funds				Totals			
	Voted	Election Pending	Contemplated	No.	Voted	Election Pending	Contemplated	Voted	Election Pending	Contemplated	Grand Total
Alabama				1		$5,000,000			$5,000,000		$5,000,000
Arizona				4	4,200,000	1,200,000	500,000	4,200,000	1,200,000	500,000	5,900,000
Arkansas			15,000,000	?	50,000,000			50,000,000		15,000,000	65,000,000
California	40,000,000			5	7,690,000	3,500,000		47,690,000	3,500,000		51,190,000
Colorado		5,000,000							5,000,000		5,000,000
Delaware				2		890,000			890,000		890,000
Georgia			40,000,000	46	7,088,000	9,323,000	1,440,000	7,088,000	9,323,000	41,440,000	57,851,000
Idaho				15	2,400,000	1,930,000		2,400,000	1,930,000		4,330,000
Illinois	60,000,000			7	1,095,800		600,000	61,095,800		600,000	61,695,800
Iowa				4	3,500,000	4,750,000		3,500,000	4,750,000		8,250,000
Kansas			60,000,000							60,000,000	60,000,000
Louisiana					1,805,000	4,190,000		1,805,000	4,190,000		5,995,000
Maine		8,000,000							8,000,000		8,000,000
Maryland	3,000,000							3,000,000			3,000,000
Michigan	50,000,000				1,400,000			51,400,000			51,400,000
Minnesota		100,000,000				7,500,000			107,500,000		107,500,000
Mississippi			20,000,000		5,650,000	3,030,000		5,650,000	3,030,000	20,000,000	28,680,000
Missouri		60,000,000			2,504,000	625,000	2,100,000	2,504,000	60,625,000	2,100,000	65,229,000
Montana		15,000,000			400,000	150,000	250,000	400,000	15,150,000	250,000	15,800,000
Nebraska				1			3,000,000			3,000,000	3,000,000
Nevada	1,000,000							1,000,000			1,000,000
New Jersey	5,000,000			1			605,000	5,000,000		605,000	5,605,000
New Mexico	500,000		5,500,000					500,000		5,500,000	6,000,000
New York		20,000,000							20,000,000		20,000,000
North Carolina	1,250,000		25,000,000	7	3,180,000	500,000	2,000,000	4,430,000	500,000	27,000,000	31,930,000
North Dakota			50,000,000							50,000,000	50,000,000
Oklahoma				2	150,000	60,000		158,000	60,000		218,000
Oregon	12,500,000			22	6,095,000	794,000		18,595,000	794,000		19,389,000
Pennsylvania	50,000,000			17	5,950,000	1,650,000	9,000,000	55,950,000	1,650,000	9,000,000	66,600,000
South Carolina			25,000,000	4	2,625,000	2,060,000		2,625,000	2,060,000	25,000,000	29,685,000
South Dakota				2		2,500,000	2,000,000		2,500,000	2,000,000	4,500,000
Tennessee			50,000,000							50,000,000	50,000,000
Texas		75,000,000		61	35,680,000	14,180,000	15,750,000	35,680,000	89,180,000	15,750,000	140,610,000
Utah		4,000,000		2	1,500,000	850,000		1,500,000	4,850,000		6,350,000
Virginia	3,100,000			1		114,000		3,100,000	114,000		3,214,000
Washington		30,000,000		7	8,540,000	250,000	3,200,000	8,540,000	30,250,000	3,200,000	41,990,000
West Virginia		50,000,000		23	2,200,000	2,935,000	8,936,000	2,200,000	52,935,000	8,936,000	64,071,000
Wisconsin	10,210,000		50,000,000	7	1,952,000	5,850,000	6,000,000	12,162,000	5,850,000	56,000,000	74,012,000
Wyoming	2,900,000							2,900,000			2,900,000
Totals	239,460,000	367,000,000	340,500,000		155,612,800	73,831,000	55,381,000	395,072,800	440,831,000	395,881,000	1,231,784,800

Motor Vehicle and Material Allotments

Department of Agriculture Reports to Congress on Distribution of Large Quantities

Large amounts of equipment and materials from the surplus of war supplies not needed by the War Department have been and are being distributed by the Department of Agriculture through the Bureau of Public Roads, according to a report made to Congress by the Department of Agriculture. This equipment and material is included under general heads as follows: Motor trucks and motor cars; construction and operating equipment; construction materials; field and office equipment; camp, mess and kitchen equipment; general supplies, machine tools, woodworking tools and miscellaneous outfits, and animals.

Aggregate Value Very Large

The aggregate value of the items under these heads is very large, the value of the motor-truck equipment alone being estimated at more than $70,000,000. The equipment and supplies are being distributed under an act of Congress which instructed the Secretary of War to deliver surplus war materials to the Department of Agriculture to be used in the construction and maintenance of roads constructed in part or in whole by Federal aid. This material is allotted to the states on the same basis as Federal aid and represents an addition to the Federal aid given by the various Federal-aid appropriations.

Allotments of motor vehicles are now reported by the Secretary of Agriculture to be complete; these allotments to the various states are given in the table printed herewith. Large numbers of these trucks and other motor vehicles have already been shipped to the states concerned.

ALLOTMENTS OF MOTOR VEHICLES FOR FEDERAL-AID ROAD WORK BY BUREAU OF PUBLIC ROADS

	Trucks	Fords	Autos
Alabama	432	21	11
Arizona	282	14	6
Arkansas	343	17	8
California	622	30	15
Colorado	358	17	9
Connecticut	124	6	4
Delaware	34	2	1
Florida	236	11	6
Georgia	553	27	4
Idaho	251	12	6
Illinois	898	44	22
Indiana	556	27	14
Iowa	595	29	15
Kansas	593	29	15
Kentucky	400	19	10
Louisiana	280	14	7
Maine	196	10	5
Maryland	181	9	4
Massachusetts	303	15	7
Michigan	596	29	15
Minnesota	584	28	14
Mississippi	366	18	9
Missouri	697	34	17
Montana	413	20	10
Nebraska	440	21	11
Nevada	265	13	7
New Hampshire	83	4	2
New Jersey	245	12	6
New Mexico	321	16	8
New York	1,021	50	25
North Carolina	470	23	12
North Dakota	319	15	8
Ohio	761	37	19
Oklahoma	476	23	12
Oregon	326	16	8
Pennsylvania	942	46	23
Rhode Island	48	2	1
South Carolina	296	14	8
South Dakota	333	16	9
Tennessee	462	22	11
Texas	1,199	58	30
Utah	237	11	6
Vermont	95	5	3
Virginia	406	20	10
Washington	298	14	7
West Virginia	217	11	5
Wisconsin	557	25	13
Wyoming	252	12	7
Forestry	118	32	...
Public Roads	506	75	55
Totals	20,586	1,075	550

Other Materials Being Delivered to Agriculture Department

Construction and Operating Equipment—The materials under the other headings are being delivered to the Department of Agriculture as rapidly as possible, and an attempt is to be made by the Secretary of War to cover the estimated needs of the various state highway departments as given to him by the Secretary of Agriculture. The estimate of construction and operating equipment includes such items as road rollers, 400; concrete mixers, 700; road graders, 600; elevating graders, 400; sprinkling wagons, 400; road oilers, 200; trailers and tractors, 3600; dump wagons, 6500; industrial railway dump cars, 3500, and 1000 miles of industrial-railway track. The total number of items included under this heading is 52.

Construction Material—Under the head of construction materials there are such items as the following: Bituminous binder, 550,000 barrels; lineal feet of prepared joint filler, 50,000; bags of portland cement, 2,110,000; tons of gravel and crushed stone, each, 1,000,000; lineal feet of steel forms, 40,000; industrial-railroad ties, 674,000; lineal feet of cast-iron culvert pipe, from 12 to 36 in. in diameter, 56,025, and 10,000,000 lb. of TNT (trinitrotoluene). Under this heading 31 items appear.

Field and Office Equipment—Listed as field and office equipment are 40 items, among which are engineers' transits, 1000; engineers' levels, 1146; Abney's levels, 1188; Universal drafting machines, 228; planimeters, 592, and 366 adding machines.

Camp Mess and Kitchen Equipment—Under the head of camp mess and kitchen equipment 11 items occur, such as tents, 17,000; Army blankets, 25,100; square feet of tarpaulin, 316,000, and 460 complete outfits of mess and kitchen equipment for units of various sizes, averaging 40 men.

As general supplies there are 40 items, one of which is 63,000 shovels, and under machine tools, woodworking tools and miscellaneous outfits there are 18 items, among which are complete machine outfits, 15; complete sets of carpenters' tools and chests, 306, and 552 complete sets of blacksmiths' outfits with forges, drills and other accessories.

Contributions From Engineers, Architects and Constructors' Conference on National Public Works

M. O. Leighton, Chairman

Publisher's Note.—The space occupied under this caption is donated to serve as a means of prompt and intimate communication between the Engineers, Architects and Constructors' Conference on National Public Works and the members of the profession. The contributor takes full authority for the statements made.

Public Works Departments in Other Countries

Those who urge the creation of a national Department of Public Works in the United States are merely contending that our affairs should be managed in the way which practically all the modern world, except this country, has found necessary. Without going into details concerning the various laws of foreign countries, it will be of interest to mention their names and the general characteristics of their public-works departments.

Canada—A Ministry of Public Works presiding over the Department of Public Works, with a suitable staff of deputies, engineers, architects, etc., has control over rivers, harbors, and all hydraulic works, roads, bridges, public buildings, telegraph lines, and surveys.

Australia—A parliamentary committee of nine constitutes a standing committee of public works.

New Zealand—Has the most comprehensive public-works code in existence, presided over by a Minister of Public Works whose jurisdiction includes lands, and eminent domain concerning the same; roads, surveys, bridges, ferries, rivers, railways, drainage, water-supply, mining, water power and irrigation.

France—A Ministry of Public Works covering roads and traffic regulations, river and maritime navigation, water power, drainage, irrigation, railroads, mines, public buildings and public monuments.

Spain—A Ministry of Public Works covering roads, railways, waters, rivers, canals, ports, mining and forestry.

Italy—A Ministry of Public Works, with jurisdiction over postoffices, railways, public buildings, bridges, monuments, prisons, fuel, storehouses, telegraphs, internal navigation, water storage, irrigation, drainage, floods, lighthouses, water power and climatology.

Denmark.—A Department of Public Works having jurisdiction over buildings, roads, rivers, harbors, water power, drainage, dikes, ferries, railroads, telegraphs and telephones, postal affairs and transportation. It is of interest to note that this Department of Public Works was, by royal decree of Apr. 27, 1900, set up by a division of the Department of the Interior in much the same way as is now proposed for the United States by the Engineers, Architects' and Constructors' Conference on National Public Works.

Norway—A Department of Public Works, made by division from the De-

partment of the Interior, with jurisdiction over highways, rivers, railroads, fire insurance, harbors, postal affairs, technical schools and surveys.

Prussia—A Ministry of Public Works with jurisdiction over coasts, harbors, lighthouses, merchant marine, waterways, public buildings, railroads, highways, monuments, postal service, telegraphs and telephones, rivers, lakes, canals, drainage and hydraulic works.

Argentina—A Department of Public Works embracing all enterprise and works concerning means of communication, hydraulic works, all construction—either of architectural or other nature—including public buildings, monuments, churches, prisons, barracks, arsenals, forts, shipyards, lighthouses, roads and bridges, and all hydraulic and sanitary matters.

Brazil—A Department of Communication and Public Works having jurisdiction over railroads, highways, interior navigation, ports, rivers and canals, water-supply, water power and surveys.

Chili—A Department of Industry and Public Works having jurisdiction over all communications by land, river and sea, the utilization and distribution of waters, public buildings, mines, surveys and mappings.

Peru — A Department of Public Works, formerly a part of the Ministry of the Interior, having jurisdiction over irrigation, hygiene, mines, schools, patents and trademarks, waterways and state railways.

England — The Commissioners of Works and Public Buildings have control over the lands and buildings of all kinds belonging to the Government, while rivers and harbors and their appurtenances are under the jurisdiction of the Board of Trade. This is the only modern government of any size, except the United States, in which all government activities of this kind are not concentrated under one jurisdiction.

Detailed information concerning the public-works laws of any of the countries above mentioned can be obtained on application to the Washington office of this conference.

Minnesota To Correlate Schools of Chemistry and Engineering

Lauder W. Jones, dean of the school of chemistry, has been elected to the deanship of the college of engineering at the University of Minnesota to fill the vacancy created when Dean John R. Allen resigned July 1. According to President M. L. Burton, the plan of the university is to correlate all the work in the engineering field, although the school of chemistry and the college of engineering and architecture, despite the unified administration, will continue their separate existence.

Dean Jones went to the University of Minnesota last year from the University of Cincinnati, where for 11 years he was head of the department of chemical engineering and director of the work in metallurgical engineering.

Imhoff Tanks and Percolating Filters for Worcester

Plans for extensive additions to the sewage-works of Worcester, Mass., are being made under the direction of F. A. McClure, city engineer. It is expected that the work will be done by the day, under the direction of Matthew Gault, superintendent of sewers. Under the provisions of Chapter 171, Massachusetts Laws, 1919, which were agreed to by the officials of the City of Worcester, by representatives of the towns in the Blackstone Valley, below the Worcester sewage-works, and by the State Department of Health, the city must begin construction of the proposed additions by Oct. 1, in accordance with plans to be approved by the department, and must complete the additions by April 1, 1924. By April 1, 1920, the city must have spent at least $100,000 on this work, and thereafter it must spend at least $200,000 yearly until the new plant is completed. The works must be of such a character as to remove from the sewage of the city, "before its discharge into the Blackstone River, the offensive and polluting properties and substances therein, so that after" the discharge of the sewage into the river "it shall not create a nuisance or endanger the public health."

The plans as now being made by Mr. McClure are designed to care for the sewage of the city at least until 1934. They provide for a minimum night flow of 14,000,000 gal. and a maximum flow of 60,000,000 gal. for short periods. The first installation will probably consist of 20 Imhoff tanks, 6 pairs of dosing tanks, 14 acres of stone percolating or trickling filters, and a final settling tank. These works will be located about a mile below the present plant, necessitating a sewer outfall extension of that length, and the lowering of the bed of the Blackstone River for about one-fourth mile.

It is expected that the existing 16 chemical precipitation tanks and 77 acres of sand filters will be used for treating storm water.

The decision to use Imhoff tanks follows after a long series of tests of various methods of disposal, including the activated-sludge process.

Civil Service Examinations

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Master computer, $2400 to $1800 per year, computer (Grade I) $1800 to $1400 and computer (Grade II) $1400 to $900, Ordnance Department. Applications will be received until further notice.

Electrical assistant, signal service at large, War Department, for duty at Manila, Philippine Islands, $1500 to $2000 per year. Applications must be filed before the close of business on Aug. 19.

Technical assistant, field of civil engineering, $3200 per year, and technical assistant, torpedo design, $3000 per year. Applications must be filed by Aug. 19.

Supervising draftsman, bureau of steam engineering, Navy Department, $12.80 to $13.60 per diem. Applications must be filed before August 19.

Patent investigator, patents section, War Department, $1200 to $1800 per year. File application before August 26.

Expert patent investigator, patents section, War Department, $1800 to $2400 per year. File applications before Aug. 26.

ENGINEERING SOCIETIES

Calendar

Annual Meeting

NEW ENGLAND WATER WORKS ASSOCIATION Tremont Temple, Boston, Sept. 30, Oct. 1-3, Albany, N. Y.

AMERICAN PUBLIC HEALTH ASSOCIATION; 169 Massachusetts Ave., Boston; Oct. 27-30, New Orleans.

The San Francisco Engineers' Club on July 18 held a meeting of welcome to Lieut. Col. Charles B. Wing, who has returned from France with the 23d Engineers. Colonel Wing described the conditions under which the work of engineer troops was carried on at the front.

The Nickel Plate Section of the American Association of Engineers held a special meeting July 24, to adopt a constitution and by-laws. The following officers were elected: President, G. H. Tinker; vice-president, W. H. Burrage; secretary, Ernest R. Taylor; treasurer, C. R. Wright.

PERSONAL NOTES

R. L. MORRISON, professor of highway engineering, Agricultural and Mechanical College of Texas, has resigned to become associated with the Pittsburgh Testing Laboratory, as engineer of tests, department of roads and pavements, with office in Birmingham, Ala.

J. H. CONZELMAN, engineer of tests, Pittsburgh Testing Laboratory, Birmingham, Ala., has been appointed district manager of the newly established laboratory at Little Rock, Ark.

RAYMOND ROBB MARSDEN has been appointed professor of civil engineering in the Thayer School, Dart-

mouth College. Professor Marsden has been successively connected with the H. S. Ferguson Co., the Laurentide Co., Grand Mere, Que., the Riordan Pulp & Paper Co., Hawkesbury, Ont., and the Atlas Powder Co., Wilmington, Del.

LAWRENCE B. CHAPMAN, of the technical staff of the Electric Boat Co., New London, Conn., has been appointed associate professor in the new course of ship construction and marine transportation instituted last year at Lehigh University. Professor Chapman is a graduate of the Massachusetts Institute of Technology.

LIEUT. WILLIAM L. STANTON, formerly of the 304th Engineers, U. S. A., has resigned from the city engineer's staff, Flint, Mich., to become associated with the Whitehead & Kales Iron Works, Detroit.

CAPT. DONALD MACISAAC, 11th Engineers, U. S. A., has received his discharge from the service and has become associated with Smith, Hauser & MacIsaac, Inc., contractors, New York City.

W. STUART TAIT, operating vice-president, Tait Engineering Co., has resigned to become manager of engineering, Hydraulic Steel Co., Cleveland.

C. E. HOFF has been appointed county engineer, Bexar County, Texas. Mr. Hoff is a graduate of the University of Illinois.

J. G. PALMER has been appointed city engineer of Kewanee, Ill. He was previously assistant engineer, Department of State Engineer and Surveyor of New York, and United States junior engineer, Corps of Engineers, United States Army.

L. R. ASH, city manager, Wichita, Kan., has resigned to reëstablish his connection with HARRINGTON, HOWARD & ASH, Kansas City. The resignation is to take effect not later than October 1.

A. L. GOLDENSTAR has become associated with MORGAN PARK CO., Morgan Park, Duluth, Minn., as office engineer. Mr. Goldenstar was formerly connected with MORRELL & NICHOLS, architects and engineers, Minneapolis, Minn.

FAY, SPOFFORD & THORNDIKE, consulting engineers, Boston, have removed their offices to 15 Beacon St., that city.

WALLACE L. CALDWELL, district manager, Pittsburgh Testing Laboratory, Birmingham, Ala., has been appointed director of the department of roads and pavements, with headquarters at Birmingham.

G. H. NICKERSON, superintendent and engineer of the Oakdale Irrigation District, has resigned to undertake surveys for a reservoir for hydroelectric power on the Merced River, California.

F. G. EASON, senior drainage engineer of the Bureau of Public Roads, United States Department of Agriculture, has resigned to become associated with MCCRADY BROS. & CHEVES, civil engineers, Charleston, S. C. Mr. Eason will have charge of the drainage and road department.

COL. H. R. LORDLY, of Montreal, has returned from overseas, where he served with the Canadian Expeditionary Forces, and will resume his practice as consulting engineer. Colonel Lordly has been elected a Fellow of the Society of Engineers, London. He is a graduate of Cornell University and holder of the Fuertes medal.

JOHN R. FORDYCE and W. TERRY FIELD have formed a partnership under the firm name of FORDYCE & FIELD, consulting and constructing engineers, Little Rock, Ark. Major Fordyce was constructing quartermaster at Camp Pike, Arkansas. Mr. Field had been connected with the American Car & Foundry Co., Detroit, as constructing engineer.

MAJ. W. W. BURDEN, 12th Engineers, U. S. A., has been discharged from the service and will resume his former connection with the engineering corps of the City of St. Louis.

H. H. LOTTER has been appointed by the Bureau of Public Roads resident engineer of Missouri, with office in Jefferson City.

J. M. LEAMY has been appointed provincial power commissioner, Winnipeg, Man., under the act providing municipalities with electric power.

COL. HORACE S. BAKER, 111th Engineers, U. S. A., who recently returned from France, has received his discharge from the service and is now associated with FRANK D. CHASE, INC., in charge of the work for the General Motors Corporation, Janesville, Wis. Colonel Baker was graduated from Northwestern University and from the Massachusetts Institute of Technology. He was assistant city engineer of Chicago for six years.

CAPT. BEN S. MORROW has returned from overseas, where he was in charge of developing the water system at Brest. On receiving his discharge he will resume his former connection with the water bureau, Portland, Ore., taking charge of the development at Bull Run Lake.

THOMPSON & BINGER, INC., engineers and contractors, New York City and Syracuse, N. Y., specialists in the design and construction of reinforced concrete, have recently opened an office in Cleveland, Ohio, in the Citizens' Building. The Cleveland office will be in charge of J. E. GILMORE, who will have a full organization of engineering and construction experts to handle the industrial work, bridge work, and heavy construction.

LIEUT. GUY BROWN, 314th Engineers, U. S. A., has received his discharge from the service and has resumed his connection with the engineering corps of the City of St. Louis.

BRENNECKE & FAY, consulting engineers, St. Louis, have dissolved partnership. The business will be carried on in the future by E. B. FAY. Mr. Brennecke has entered a manufacturing business.

JOSEPH W. PETERS, secretary of the Engineers' Club of St. Louis, has resigned to become associated with Reeves & Skinner Machinery Co., St. Louis, as sales engineer.

CLAUDE K. SHEDD has been appointed professor of agricultural engineering and engineer in charge of tractor tests at the University of Nebraska. Professor Shedd was formerly associate professor of agricultural engineering at Iowa State College; he made brake tests at the national tractor demonstration at Cedar Rapids, Iowa, and Salina, Kan.

GEORGE F. DEWEY and F. C. DWIGGINS have formed a partnership under the firm name of DEWEY & DWIGGINS, consulting engineers, Ohio Bldg., Cairo, Ill. Mr. Dewey has been city engineer of Cairo for several years.

LLOYD W. WEED, who during the war was in charge of the cost records of the concrete ship section of the Emergency Fleet Corporation, has returned to his former position with the Turner Construction Co., New York City.

CHARLES C. HOPKINS and ARTHUR M. FIELD have become associated under the firm name of HOPKINS & FIELD, consulting engineers, Cutler Bldg., Rochester, N. Y. Mr. Hopkins was previously a consulting engineer in Rochester. Mr. Field has been city manager of Winchester, Va.

CAPT. ERNEST G. RAYNOR, 141st Engineers, U. S. A., has received his discharge from the service, and has been appointed assistant division engineer, State Engineering Department, Nebraska, with headquarters at Lincoln.

E. G. BRIGGS, sidewalk engineer Department of Public Works, St. Paul, Minn., has resigned to become associated with GAYNOR & GAYNOR, consulting engineers, Grain Exchange, Sioux City, Iowa.

OBITUARY

JOHN C. RODGERS died in New York City, July 26, at the age of 75. Mr. Rodgers had been engaged in the contracting business for forty years in New York; he built parts of Riverside Drive, the old subway, the West Shore and Pennsylvania Railroads, and the Niagara power tunnel.

FREDERICK SARGENT, electrical and mechanical engineer, died in Chicago, July 27. Mr. Sargent was educated at the Anderson University in Glasgow and came to the United States in 1883. He was one of the first to advocate the use of the steam turbine in electric power houses.

Demountable Truck Body for Handling Piled Material

A demountable truck body for handling piled material in such manner as to place it where needed, without rehandling, is shown in the accompanying illustration. The material being handled is paving brick, but the body can be used in the transportation of boxed goods or anything that will stay piled after the truck body is removed. It is manufactured to fit any truck. Details of the apparatus are shown at the left. It consists of an underframe with two bracket-hooks at the forward end, arranged to engage a crossbar at the upper end of the box. When the hooks have been backed under the bar, and the frame comes in contact with the box, the hoist drum just back of the driver's seat tips the box and draws it forward into the position shown in the center cut. Upon arrival at the piling point seen at right, the box is stood on end, the bottom pallet, which is left under the pile, is disconnected and the box is removed. With two or more bodies in use, so that one can be loaded while transportation is being effected with the other or others, a large saving in the time of the truck is effected.

The manufacturer of this body is the American Truck Body Co., Inc., of Martinsville, Va.



DEMOUNTABLE BODY AND UNDERFRAME FOR HANDLING PILED MATERIAL

Exports for June Break All Records

A jump in exports during June brought the total for the fiscal year which ended July 1, 1919, to more than $7,000,000,000, a new record, according to a statement by the Bureau of Foreign and Domestic Commerce. The June exports are put at $918,000,000, which exceeds the previous high records established in April of this year by more than $200,000,000. The exports for June of last year were valued at $484,000,000.

Imports for June were valued at $293,000,000, a falling off from the total of $329,000,000 recorded for May, but an increase over the $260,000,000 for June of the previous year. The total imports for the fiscal year just closed were placed at $3,096,000,000 as against $2,946,000,000 for the year of 1918.

Business Notes

THE CAMDEN FORGE CO., Camden, N. J., has established a New York district sales office at 2 Rector St., New York City. Samuel W. Hilt has been placed in charge as manager of the new office.

THE SULLIVAN MACHINERY CO. announces the following changes in its personnel: Phillips F. Jarvis has resigned his position as sales manager for the territory controlled from the St. Louis office; Marion C. Mitchell has been appointed sales manager for the territory in Indiana and Illinois previously controlled from the St. Louis office, with temporary headquarters at Room 2006, Railway Exchange, St. Louis; Don M. Sutter, formerly manager of the El Paso office, has been appointed sales manager for the territory of western Kentucky, western Tennessee, Missouri, Arkansas, Oklahoma and Kansas, with the same address as noted above; Daniel H. Hunter has been appointed sales manager for Louisiana, Texas and the oil fields of Oklahoma and Kansas, with headquarters at Dallas, Texas.

THE ROSSENDALE - REDDAWAY BELTING & HOSE CO., Newark, N. J., has appointed E. O. Floyd as its general sales manager, to take effect Aug. 1.

THE EASTERN PAVING BRICK MANUFACTURERS' ASSOCIATION, William C. Perkins, chief engineer, has opened offices at 1019 Lincoln Bldg., Philadelphia, Penn. The formation of this association was noted in these columns some time ago.

THE CHICAGO PNEUMATIC TOOL CO., Fisher Bldg., Chicago, Ill., has appointed N. S. Thulin as special railroad representative on the staff of S. C. Sprague, manager of Western railroad sales.

Trade Publications

The following companies have issued trade publications:

THE MERCHANT & EVANS CO., manufacturers of fire doors and shutters, Philadelphia, Penn.; catalog, 8½ x 10¾ in., 24 pages, illustrated; describes fire doors, shutters and ventilators.

THE ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.; catalog, 8 x 10½ in., 18 pages, illustrated; describes the making of large forgings.

THE McKIERNAN - TERRY DRILL CO., builders of rock drills, apparatus, pile hammers and atlas jacks, 15 Park Row, New York City; bulletin No. 25, 6 x 9 in., 19 pages, illustrated; subject of booklet is hammer drills.

THE ALLIED MACHINERY COMPANY OF AMERICA, New York City; catalog, 8½ x 11 in., 32 pages, illustrated; describes plain and universal types of machines for grinding cylindrical and conical surfaces by the use of various types of grinding machines; also, a booklet of the same size, 15 pages, illustrated, which describes the development of machine-tool production in the United States.

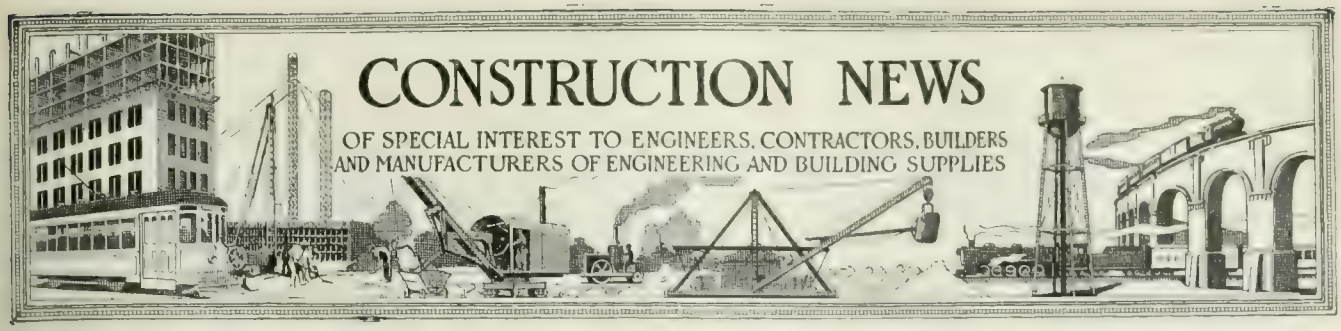
THE H. H. ROBERTSON CO., Pittsburgh, Penn.; engineering data booklet, 3½ x 5¼ in., loose-leaf leather binding, 20 pages of data and a memorandum section; contains data with regard to paving, of value to engineers. Additional pages will be supplied as soon as they are compiled.

THE LEGARE TEMPLET CO., 1201 Main St., Columbia, S. C.; folder, 8½ x 11 in., four pages, illustrated; describes the use of the Legare adjustable templet for highway construction.

THE CONVEYING WEIGHER CO., 90 West St., New York City; catalog, 6 x 9 in., 36 pages, illustrated; describes the use of the "Trump" measuring and mixing machine.

THE ECONOMY BODY SALES CO., distributors of "Economy" steel dump bodies, 405 Lexington Ave., New York City; folder, 8 x 11 in., four pages, illustrated; describes "Economy" steel dump and express bodies having capacities ranging from 35 to 54 cubic feet.

THE SULLIVAN MACHINERY CO., 122 S. Michigan Ave., Chicago; booklet, 5¼ x 3¾ in., 32 pages, illustrated; tells of the construction and use of Sullivan drills.



PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Aug. 4	Lewiston, Utah	July 31
Aug. 4	Boston, Mass.	July 31
Aug. 4	Cameron, Mo.	July 31
Aug. 5	York, Ont.	July 31
Aug. 5	Zebulon, N. C.	July 17
Aug. 5	Sharon Springs, Kan.	July 24
Aug. 8	Caldwell, Kan.	July 31
Aug. 11	New Prague, Minn.	July 31
Aug. 20	Armour, S. D. Adv. July 24.	July 24

SEWERS

Aug. 4	Idabel, Okla.	July 17
Aug. 4	Birmingham, Ala.	July 17
Aug. 4	Syracuse, N. Y.	July 31
Aug. 4	Marshalltown, Ia. Adv July 31.	July 31
Aug. 5	Wakefield, Neb.	July 10
Aug. 5	Caledonia, Minn.	July 24
Aug. 5	Corning, N. Y.	July 31
Aug. 6	Milan, Mo.	July 31
Aug. 7	Creston, Ia.	July 31
Aug. 8	Ferndale, Pa.	July 31
Aug. 8	Slayton, Minn.	July 31
Aug. 8	Erie, Pa.	July 31
Aug. 11	Scobey, Mont.	July 31
Aug. 12	Clayton, Mo.	July 31
Aug. 12	Erie, Pa.	July 31
Aug. 12	West Bend, Wis.	July 31
Aug. 12	Chicago, Ill.	July 31
Aug. 15	South Charleston, W. Va. Adv. July 24.	July 24
Aug. 18	Hackensack, N. J. Adv. July 24.	July 24
Aug. 18	Huntington, Pa.	July 31
Aug. 19	Kansas City, Mo. Adv. July 3 to 17.	July 3

BRIDGES

Aug. 4	Little Rock, Ark.	July 3
Aug. 4	Santa Barbara, Cal.	July 24
Aug. 4	Logan, Utah	July 31
Aug. 5	Duluth, Minn.	July 24
Aug. 6	San Diego, Cal.	July 31
Aug. 7	Marion, Ark	July 17
Aug. 11	Duluth, Minn.	July 31
Aug. 11	Eureka, Cal.	July 31
Aug. 12	Duluth, Minn.	July 31
Aug. 19	Statesboro, Ga.	July 3
Aug. 20	Swainsboro, Ga.	July 3

STREETS AND ROADS

Aug. 4	Birmingham, Ala.	July 17
Aug. 4	Hyrum, Utah	July 24
Aug. 4	Seattle, Wash.	July 24
Aug. 4	David City, Neb.	July 17
Aug. 4	Huntington, W. Va.	July 17
Aug. 4	Fremont, Neb.	July 17
Aug. 4	Seneca, Kan.	July 17
Aug. 4	Newton, N. J. Adv. July 24.	July 24
Aug. 4	Nashwauk, Minn.	July 24
Aug. 4	Huntington, W. Va.	July 24
Aug. 4	Providence, Utah	July 31
Aug. 4	California	July 31
Aug. 4	St. Paul, Minn.	July 31
Aug. 4	Wayne, W. Va.	July 31
Aug. 4	Belvidere, Ill.	July 31
Aug. 4	New Bedford, Mass.	July 31
Aug. 4	Edwardsville, Ill.	July 31
Aug. 4	Seymour, Tex.	July 31
Aug. 4	Chicago, Ill.	July 31
Aug. 4	Tacoma, Wash.	July 31
Aug. 4	St. George, S. I., N. Y.	July 31
Aug. 4	Irvington, N. J.	July 31
Aug. 5	Oregon	July 31
Aug. 5	Jersey City, N. J.	July 31
Aug. 5	Wisconsin	July 31
Aug. 5	Columbus, O.	July 31
Aug. 5	Toledo, O.	July 31
Aug. 5	Michigan	July 31
Aug. 5	Bickley, W. Va.	July 31
Aug. 5	Oakwood, Ill.	July 31
Aug. 5	Lewisburg, W. Va.	July 31
Aug. 5	River Rouge, Mich.	July 31
Aug. 5	Little Rock, Ark.	July 24
Aug. 5	Baltimore, Md.	July 24
Aug. 5	Little Falls, Minn.	
Aug. 5	Ohio	July 24
Aug. 5	**Vermont** Adv. July 24.	July 24
Aug. 5	Salt Lake City, Utah.	July 24
Aug. 5	New York, N. Y. Adv. July 17.	July 17
Aug. 5	Lexington, N. C. Adv. July 17.	July 17
Aug. 5	Lewisburg, W. Va.	July 24
Aug. 6	Ortonville, Minn.	July 24
Aug. 6	Freehold, N. J.	July 24
Aug. 6	Mt. Holly, N. J. Adv. July 24.	July 24
Aug. 6	St. George, S. I., N. Y.,	July 31
Aug. 6	New Jersey Adv. July 24.	July 24
Aug. 6	Burlington, N. J.	July 24
Aug. 6	Delaware. Adv. July 17.	July 17
Aug. 6	Arkansas. Adv. July 17.	July 17
Aug. 7	Pittsburgh, Pa.	July 24
Aug. 7	Marion, Ark.	July 24
Aug. 7	Santa Barbara, Cal.	July 31
Aug. 8	Minnewaukan, S. C.	July 24
Aug. 9	Bay City, Mich.	July 31
Aug. 9	Duke, N. C.	July 31
Aug. 11	Buckhannon, W. Va.	July 31
Aug. 11	Mt. Union, Pa.	July 31
Aug. 11	Monroe, N. C.	July 31
Aug. 11	Las Cruces, N. M.	July 31
Aug. 11	Buckhannon, W. Va. Adv. July 31.	July 31
Aug. 12	Logan, W. Va.	July 31
Aug. 12	Charleston, W. Va.	July 24
Aug. 12	Meadville, Pa. Adv. July 17.	July 17
Aug. 12	Washington, N. C.	July 17
Aug. 12	Albany, N. Y. Adv. July 17.	July 17
Aug. 12	Beaufort, S. C.	
Aug. 12	Omaha, Neb.	July 31
Aug. 12	Beaver, City, Neb.	July 31
Aug. 13	Holtville, Cal.	July 24
Aug. 13	Connellsville, Pa.	July 31
Aug. 13	McCook, Neb.	July 31
Aug. 13	Trenton, N. J.	July 31
Aug. 14	Jersey City, N. J.	July 31
Aug. 15	Farmington, Utah.	July 17
Aug. 15	Ripley, W. Va.	July 31
Aug. 15	Oxford, O.	July 31
Aug. 15	Williamsburg, Pa.	July 31
Aug. 15	Ripley, W. Va.	July 31
Aug. 16	Abilene, Tex.	July 31
Aug. 16	St. Albans, W. Va. Adv. July 17.	July 17
Aug. 18	Walnut Ridge, Ark. Adv. July 17.	July 17
Aug. 19	Michigan	July 31
Aug. 19	Georgetown, Del.	July 31
Aug. 19	Faribault, Minn.	July 31
Aug. 19	Harrisburg, Pa.	July 31
Aug. 21	De Queen, Ark	July 24
Aug. 23	Brainerd, Minn.	July 31
Aug. 24	Washington, D. C.	July 24
Aug. 24	Denver, Colo.	July 10
Aug. 26	Guntersville, Ala.	July 31
Sept. 1	Salt Lake City, Utah.	July 24

EXCAVATION AND DREDGING

Aug. 4	Duluth, Minn.	July 31
Aug. 5	Shippigan, N. B.	July 24
Aug. 6	Kenton, O.	July 3
Aug. 7	Philadelphia, Pa.	July 31

INDUSTRIAL WORKS

Aug. 6	Brooklyn, N. Y.	July 31
Aug. 8	Strathrop, Ont.	July 31
Aug. 10	Duluth, Minn.	July 31
Aug. 15	Duluth, Minn.	July 31
Aug. 25	Syracuse, N. Y.	July 31

BUILDINGS

Aug. 4	Montreal, Que.	July 24
Aug. 4	Providence, R. I.	July 31
Aug. 5	Willmar, Minn.	July 3
Aug. 5	Toms River, N. J.	July 17
Aug. 5	Grange Hall, Ala.	July 31
Aug. 5	Cloversdale, Ala.	July 31
Aug. 5	Ft. Dodge, Kan.	July 31
Aug. 5	Bemidji, Minn.	July 31
Aug. 6	St. Louis, Mo.	July 24
Aug. 9	Green, O.	July 24
Aug. 11	Biwabik, Minn.	July 31
Aug. 11	Morrisonville, Minn.	July 31
Aug. 11	Ottawa, Ont.	July 31
Aug. 11	London, Ont	July 13
Aug. 12	St. Louis, Mo.	July 31
Aug. 12	Indian Head, Sask.	July 24
Aug. 12	Morgantown, W. Va.	July 24
Aug. 14	New York, N. Y.	July 31
Aug. 15	Casper, Wyo.	July 10
Aug. 15	Winnebago, Neb.	July 31
Aug. 15	New Bedford, Mass.	July 10
Aug. 15	Omaha, Neb.	July 10
Aug. 15	Provo, Utah	July 24
Aug. 15	Lehi, Utah	July 24
Aug. 15	Nopeming, N. Y.	July 24
Aug. 18	Erie, Pa.	July 24
Aug. 21	Richmond, Utah.	July 31
Aug. 24	St. Paul, Minn.	July 3
Sept. 1	Omaha, Neb.	July 17
Sept. 4	Bayonne, N. J.	July 31
Sept. 15	Pleasant Grove, Utah.	July 24

FEDERAL GOVERNMENT WORK

Aug. 4	Sewers—Washington, D. C. Adv. July 10 and 17.	July 10
Aug. 4	Post Office—Salem, Va.	July 17
Aug. 4	Sidewalks — Washington, D. C. Adv. July 24.	July 24
Aug. 4	Boiler — New Brunswick, N. J.	July 24
Aug. 6	Paving—Washington, D. C. Adv. July 17	July 17
Aug. 6	Hangar — Spec. 4001 — Lakehurst, N. J.	July 31
Aug. 7	Dredging and Rock Removal —New York, N. Y. Adv. July 10 and 17	July 10
Aug. 8	Pumps, etc.—Cairo, Ill. Adv. July 17.	July 17
Aug. 9	Wharf—Boston, Mass. Adv. July 31.	July 31
Aug. 11	Dredging—Buffalo, N. Y. Adv. July 17.	July 17
Aug. 11	Pass and Weir Horses, Props, etc.—Wheeling, W. Va.	July 17
Aug. 11	Timber and Cement—Detroit, Mich. Adv. July 31.	July 31
Aug. 12	Paving — Washington, D. C. Adv. July 24	July 24
Aug. 13	Groins — Spec. 4004 — Great Lakes, Ill.	July 31
Aug. 13	Road Work — Flagstaff, Ariz	July 31
Aug. 14	Rip Rap—Memphis, Tenn.	July 31
Aug. 15	Torpedo Storage and Compressor Building — Spec 3991—Mare Island, Cal.	July 24
Aug. 18	Removing Boulders—Newport, R. I. Adv. July 24.	July 24
Aug. 18	Dredging—Norfolk, Va. Adv. July 31.	July 31

Bids Close		See Eng News-Record
Aug. 19	Repairing Dike — Philadelphia, Pa. Adv. July 17 and 24.	July 24
Aug. 19	Water Pipe—Washington, D. C.	July 31
Aug. 19	Canal Wall—Washington, D. C. Adv. July 31.	July 31
Aug. 20	Metal and Glass Work—Key West, Fla. Adv. July 17.	July 17
Aug. 20	Roofing — Spec. 4005 — Norfolk, Va.	July 31
Aug. 25	Post Office—Mystic, Conn.	July 31
Aug. 26	Dredging—Honolulu, H. T. Adv. June 26.	June 26
Aug. 27	Sea Wall — New York, N. Y. Adv. July 31.	July 31
Aug. 27	Dredging—Norfolk, Va. Adv. July 31.	July 31
Aug. 27	Lock and Abutment — Louisville, Ky. Adv. July 31.	July 31
Aug. 29	Post Office—Fayette, Mo.	July 24
Aug. 29	Dredging — New York, N. Y.	July 31
Sept. 2	Miscellaneous Equipment—Washington, D. C. Adv. July 10 and 17.	July 10
Sept. 2	Post Office—Kansas City, Mo.	July 24
Sept. 10	Post Office—Douglas, Ga.	July 31

MISCELLANEOUS

Aug. 4	Distribution System—Millville, Utah	July 24
Aug. 4	Levee — Bridge Junction, Ark.	July 31
Aug. 5	Wharf—Grosse Isle, Que.	July 24
Aug. 5	Wharf—Okanagan Center, B. C.	July 17
Aug. 5	Bulkhead — Philadelphia, Pa. Adv. July 24.	July 24
Aug. 5	Wharf—Port Elgin, Ont.	July 24
Aug. 5	Lighting Plant, etc. — Sutherland, Sask.	July 24
Aug. 5	Breakwaters — Shippigan Gulley, N. B.	July 24
Aug. 6	Pumps, Boilers, etc., — Sibley, Ia. Adv. July 24.	July 24
Aug. 6	Boilers and Generators—St. John, Kan.	July 24
Aug. 6	Pumps, Engines, etc.—Detroit, Mich.	July 31
Aug. 6	Paving Materials — St. George, S. I., N. Y.	July 31
Aug. 7	Wrecking and Removing—Chicago, Ill. Adv. July 24.	July 24
Aug. 8	Pier and Approach—Jamaico Bay, N. Y.	July 31
Aug 9	Refuse Destruction—Newport, Ky. Adv. July 31.	July 31
Aug. 14	Wire—Detroit, Mich.	July 31
Aug. 14	Wharf — Anse Aux., Gascons, Que.	July 31
Aug. 15	Telephone Lines—Edmonton, Alta.	July 24
Aug. 18	Mechanical Loader—Hastings, Minn.	July 31
Aug. 19	Tracks—Philadelphia, Pa. Adv. July 24.	July 24
Aug. 19	Channel — Prince Edwards Island	July 31
Aug. 20	Safety Cars — Saskatoon, Sask. Adv. July 24.	July 24
Aug. 20	Wharf—Stewart, B. C.	July 31
Aug. 28	Silo—Savannah, Ga.	July 24
Sept. 23	Turbines, etc.—Saskatoon, Sask. Adv. July 24.	July 24

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. J., Pittman—City having plans prepared by Remington & Vosbury, engrs., 601 Market St., Camden, building stand pipes, drumming stations and mains for distribution

W. Va., Clarksburg—City voted $300,000 bonds to build water works system and power plant. S. G. Highland, secy. and genl. mgr. water bd.

S. C., Lake City—City Council receives bids about Aug. 20, building waterworks system (deep well type), including furnishing and installing mains, hydrants and valves, steel tank and tower, deep well pumping machinery, boiler, etc. About $90,000. Tomlinson Eng. Co., Loan & Exch. Bank, Columbia, engrs.

O., Toledo—Comrs. Lucas Co. passed resolution to build Water Line No. 12, involving 5680 ft. 6 in. and 1510 ft. 8 in. c. i. pipe. About $14,500. L. A. Boulay, Courthouse, engr.

Kan., Harper—City having plans prepared by W. B. Rollins & Co., engrs., 209 Ry. Exch., Kansas City, Mo., improving waterworks system, including installation of pumping equipment, engine, generator and pipe lines. About $35,000.

Neb., Lincoln — City received no bids building 2,100,000 gal. rein.-con. reservoir. About $33,000. G. W. Bates, city engr. Noted July 10.

S. D., Centerville—City voted $16,000 bonds to extend water mains.

Wyo., Sheridan—City plans to build storage reservoir to increase water supply. About $15,000. H. M. Huntington, Sheridan, engr.

Okla., Ada—City plans election to vote on $500,000 bonds to extend waterworks system and build storm sewers.

Okla., Chelsea—City voted $30,000 bonds to improve waterworks system. Engineer not selected.

Okla., Tishomengo—City plans election to vote on $117,000 bonds to extend waterworks system.

Idaho—Boise—U. S. Recl. Serv. appropriated $463,000 for King Hill and $325,000 for Okanogan irrigation projects.

Idaho, Iona—City soon lets contract furnishing materials and building waterworks system, involving 13,300 ft. 4-8 in. wood pipes and 25,000 gal. concrete tank. Cotton & Wilson, Idaho Falls, engrs.

Wash., Spokane—See "Miscellaneous."

Que., St. Honore—Municipal Council soon lets contract building waterworks system. About $45,000. J. F. Brenow, Chicoutimi, engr.

Ont., Kitchener—Town plans to build new water supply and fire protection systems. Cost between $500,000 and $1,000,000. M. Fraser, City Hall, engr.

Ont., Toronto—Bd. Control soon lets contract laying and supplying 1200 ft. 20 in. c.i. water pipe, valves, etc., on section of St. Clair Ave. About $25,000. R. C. Harris, City Hall, engr.

Sask., Moose Jaw—City plans to extend waterworks system from Saskatchewan River to Moose Jaw, involving 70 mi. 24 in. wood pipe and 2,000,000 gal. reservoir. About $1,630,000. G. D. Mackie, Moose Jaw, engr.

BIDS DESIRED

Mass., Boston—Until Aug. 4, by Metropolitan Water and Sewerage Bd., 1 Ashburton Pl., building 2100 ft. 12 in. c.i. water pipe, here; 5000 ft. 16 in. c.i. in Arlington; 1700 ft. 36 in. c.i. in Chelsea. W. E. Foss, ch. engr.

Minn., Moose Lake—I. A. Jacobson, village clk., receiving bids laying 4350 ft. 6 in. and 3240 ft. 4 in. water mains, seven 6 in. and three 4 in. gate valves, 12,735 ft. 6-12 in. sewer and 17 manholes. About $7000.

Minn., New Prague—Until Aug. 11, by J. T. Rynda, supt. waterworks system, building 60,000 gal. wooden water tank and 80 ft. steel tower. About $6500.

Minn., St. Cloud—A. W. Buckman, city clk., receiving bids furnishing and laying 17,600 ft. 6-12 in. water mains.

Kan., Caldwell—Until Aug 8, by H. W Baker, city clk., laying 5 mi. 10 in. c. i. pipe. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., engrs.

Mont., Scobey—Until Aug. 11, by city, completing waterworks system, including 100,000 gal. steel tank on 80 ft. tower, fire hydrants, 4-6-8 in. mains, pumping station, intake well, etc. About $85,000. W. B. Saunders, Helena, engr. Noted June 19.

Mo., Cameron—Until Aug. 4, by City Clerk, laying 6000 ft. 4-6 in. pipe, 10 hydrants, 23 valves, including mechanical equipment, etc. E. E. Harper, 2408 East 30th St., Kansas City, engrs.

Utah, Lewiston—Until Aug. 4, by city, furnishing materials and building waterworks system, involving 5400 ft. 4 in. and 1346 ft. 2½ in. steel pipe. T. H. Humphries, Logan, engr.

Ont., York—Until Aug. 5, by F. Barber, engr., 40 Jarvis St., Toronto, building 29,635 ft. 6 in. c.i. water mains, in Atlas Ave., N., Miller Ave., Hanson Rd., etc., for York Co. About $175,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Garnerville**—See "Sewers."

★**N. J., Jersey City**—City let contract duplicating existing syphons between Passaic River at Lyndhurst and Summit Ave. reservoir, here, Sect. 2 of pipe line between Boonton Reservoir and here, to P. McGovern, 50 East 42nd St., New York City, $2,036,619. Noted June 5.

★**Ind., Whiting**—City let contract building 4,000,000 gal. capacity filtration plant, including two 3,000,000 gal. and two 5,000,000 gal. centrifugal pumps, to C. W. Secord, West Pullman, Ill. About $180,000. Noted May 22.

★**Ill., Salem**—City let contract building rein.-con., brick and steel filtration plant, to W. C. Johnson Constr. Co., South High St., Belleville. About $12,000. Noted June 19.

★**Minn., Frazee**—City let contract laying water mains and building standpipe for tank to have 100,000 gal. capacity, to Pastoret Constr. Co., 510 Lyceum Bldg., Duluth, $29,798. Work involves 600 lin. ft. 18 in. steel pipe.

★**Mo., Mt. Vernon**—Bd. Mgrs. Missouri State Sanitorium let contract building water system, to Urbauer-Atwood Heating Co., 115 South 11th St., St. Louis, $12,975. Noted July 17.

★**Utah, Price**—City let contract furnishing labor for laying 24.5 mi. pipe line from here to Calton, to Staes-Zeese & Raikes. Price, $71,595. Noted July 3.

★**B. C., Vancouver**—L. D. Pattullo, minister of lands, let contract building ditches, laterals and flumes to irrigate 3000 acres, near Vancouver, to A. E. Griffen, Vancouver, Wash. About $60,000.

Sewers

PROPOSED WORK

Mass., Pittsfield—City voted $36,000 bonds to build sewers in various streets.

R. I., Cumberland (Manville P. O.)—City plans to build new sewerage system. About $150,000. O. P. Sarle, 146 Westminster St., Providence, engr.

N. Y., Syracuse—City plans to build storm and sanitary sewers in 3 sections of Glenwood Ave., 1400 ft. long. About $10,000. H. C. Allen, city engr.

N. J., Paulsboro—Town soon receives bids building 11 mi. terra cotta sewer. About $150,000. Remington & Vosbury, 601 Market St., Camden, engrs.

Pa., Jeanette—See "Streets and Roads."

W. Va., Clarksburg—See "Streets and Roads."

N. C., Burlington—City will build 5 mi. sewer, together with disposal plant, also double its present water supply by building dam across Stone Creek, and piping 7 mi. to city. E. B. Horner, mayor. Engineer not selected; advertised in this issue.

S. C., Barnwell—City plans election soon to vote on $50,000 bonds to build sewerage system. Tomlinson Eng. Co., 1003 Loan & Exch. Bank Bldg., Columbia, engrs.

S. C., Lake City—City Council receives bids about Aug. 20, installing gravity type sewerage system, septic tank and disposal plant. About $60,000. Tomlinson Eng. Co., Loan & Exch. Bank Bldg., Columbia, engrs.

O., Toledo—City receives bids about Sept. 1 building Sewer No. 1363, involving 4752 ft. 8 in. vitr. pipe, 16 manholes. About $10,286. H. C. McClure, city engr.

Sewers (Continued)

O., Toledo—Comrs. Lucas Co. passed resolution for laying 730 ft. 12 in. and 1400 ft. 10 in. vitr. sewer, in Forest and Hickory Sts., about $10,200; 1366 ft. 10 in. and 2890 ft. 8 in. vitr. sewer in Ottawa Hills Subdivision, $13,000; 157 ft. 24 in., 1349 ft. 18 in., 1130 ft. 15 in., 960 ft. 12 in. and 4360 ft. 8 in. vitr. sewer in Dist. No. 1361, $23,037. H. C. McClure, 229 Valentine Bldg., engr.

Mich., Detroit—City soon receives bids building 1920 ft. 4 ft. brick, concrete or segmental block sewer in Virginia Park from Wilson Ave. to 14th St., cost $42,000; 4380 ft. sewer in Bates and Randolph Sts., from Bway. to river, with arm in Bway., involving 310 ft. outlet section, 2860 ft. 12 ft. 9 in. sewer and 1710 ft. sewer arm, concrete or brick, $508,000. C. W. Hubbell, city engr.

Mich., Detroit—City having estimates prepared building 8180 ft. sewer in Lonyo St., sewer arm in Atkinson Ave., from Linwood to Woodward Aves., with branch in 3rd St. from Atkinson Ave. to Highland Park line, brick or concrete, $825,000; also for sewer in Brush St. sewer system from Bway. north in Brush St. to Highland Park line, with branches reaching east to Greeley and Russell Sts. and 1 branch west to Wilson Ave., to be 12 ft. 9 in. in diameter at end and decreasing in size to Highland Park end, $2,092,000. C. W. Hubbell, city engr.

Ill., Chicago—See "Streets and Roads."

Ill., Clearing (Chicago P. O.)—Chicago Clearing & Transfer R. R., c/o Alvord & Burdick, engrs., 8 South Dearborn St., Chicago, having plans prepared for installing 3 mi. 12-39 in. sewers. About $100,000.

Minn., Austin—F. R. Smith, city recdr., soon lets contract laying sewers in Hope, Ash and Clark Sts. Work involves 1512 lin.ft. 10-24 in. terra cotta pipe, 340 lin.ft. 30 in. corrugated iron pipe, 16 inlets, 1095 cu.yd. excav., etc.; also in Collins and Ash Sts., to Bridge St., 310 lin.ft. 10 in. and 498 lin.ft. 15 in. terra cotta pipe, 302 cu.yd. excav., 3 manholes and 8 inlets; in Mill St., 443 lin.ft. 10 in. and 660 lin.ft. 15 in. terra cotta pipe, 15 cu.yd. plain concrete, 55 cu. yd. excav. and 3 manholes.

Neb., Alliance—City plans to build sewers and pave various streets. About $50,000. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs. Noted July 17.

Neb., Harvard—City having plans prepared installing sanitary sewers and building sewage disposal plant. About $50,000. Grant, Fulton & Letton, 505 Bankers Life, Lincoln, engrs.

Okla., Ada—See "Waterworks."

N. M., Santa Fe—City plans to lay 13,800 ft. 6 and 8 in. vitr. sanitary and storm water sewers, in Palace, Grant and Lincoln Aves. and Johnson and Don Gasper Sts., involving 5800 cu.yd. excav. W. G. Turnley, city engr. bout $13,000.

Wash., Seattle—City soon receives bids laying 6792 lin.ft. 8-15 in. clay sewer pipes in 50th Ave. S. Former bids rejected. About $21,239. A. H. Dimock, city engr.

Ore., Portland—City Council plans to build trunk sewerage system in East 57th St. from Klickitat to East 60th Sts., south to center Hancock St., Hancock St. to East 62nd St. to center of Halsey St., east to East 63rd St. to connect with sewer in East 63rd and Willow St. About $180,780. O. Laurgaard, city engr.

Ore., Portland—City Council plans to build sewers in Ogden Ave., from 41st St. S. E. to East Moreland, cost $3070; Ellis Ave. from East 24th to East 22nd Sts., $850; East 71st and East Taylor Sts., $8687; Glenwood Ave. from East 14th to Milwaukee Sts.; East 16th St. from Bybee Ave. to Glenwood Ave., $1717; Bybee St., from 41st St. S. E., to Bizbee Ave., $2948; Klickitat St. from East 65th to East 60th Sts., East 65th, East 64th, East 63rd, East 62nd and East 61st Sts., $24,376; also building 52nd St. and Foster Rd. Sewerage System, $19,876; 52nd St. S. E. from 39th Ave. S. E. to 52nd St.; 36th Ave. S. E. from 54th to 52nd Sts., East 37th Ave. from 54th St. to County Rd.; 52nd St. from 36th Ave. S. E. to 38th Ave. S. E.; Foster Rd. from 41st Ave. to 38th Ave. S. E.; 41st Ave. S. E., total cost $19,876, all vitr. or cement pipe. G. R. Funk, city aud.

Cal., Willows—City voted $40,000 bonds to build sanitary sewerage system.

Ont., Burlington—J. S. Allen, town clk., soon lets contract building sanitary sewers in sections of Guelph Rd., Caroline, Clark, Locust, Greeen, St. Paul, New, Caroline and Ontario Sts., involving 23,000 ft. 8 in. vitr. pipe. About $150,000. Chipman & Power, Mail Bldg., Toronto, engrs.

Ont., Newmarket — City having plans prepared by E. A. James, engr., 57 Adelaide St., Toronto, installing sewers in various streets. About $22,000.

Ont., Oshawa—W. G. Worden, engr., Oshawa, soon lets contract furnishing and laying 7200 ft. 15 in. vitr. tile sewer for town. About $20,000.

BIDS DESIRED

N. Y., Corning—Until Aug. 5, by Bd. Pub. Wks., building 13,000 ft. sanitary and storm sewers. W. C. Drake, supt.; advertised in this issue.

N. Y., Syracuse—Until Aug. 4, by Bd. Contr. & Supply, building Sect. D, 17th Ward Sewer. Former bids rejected.

N. J., Irvington—See "Streets and Roads."

Pa., Erie—Until Aug. 8, by city engr., extending outlet of Canal Sewer, cost, $10,000; completing Holland St. sewer, $6000 and building 6 in. storm sewer known as Cold Spring Run Flood Control Project, $47,000.

Pa., Erie—Until Aug. 12, by City Council, completing Sect. 2 and 3 of Garrison Run Impvt. F. C. Lynch, city engr.; advertised in this issue.

Pa., Ferndale—Until Aug. 8, by Common Council and Owen & Plummer, engrs., Otto Bldg., Johnstown, building sewers and paving Glenwood, Vickroy and Summitt Aves. and Ogle St., involving 3300 ft. 6-12 in. terra cotta pipe, 10,000 sq.yd. rein.-con. or vitr. block paving, etc. About $75,000.

Ia., Creston—Until Aug. 7, by C. Davenport, city clk., building sanitary sewers in Dist. Nos. 41 to 53, inclusive, involving 1350 ft. 10 in. and 9800 ft. 8 in. pipe. P. K. De Voe, city engr.

Ia., Marshalltown—Until Aug. 4, by O. A. Rosengren, city clk., for construction of 810 lin.ft. 36 in. segmental block or vitr., 440 lin.ft. 30 in. 410 lin.ft. 18 in. and 194 lin.ft. 15 in. vitr. sewer pipe, 22 catch basins, 6 manholes, 1 concrete bulkhead; advertised in this issue.

Minn., Moose Lake—See "Waterworks."

Minn., St. Cloud—A. W. Buckman, city clk., receiving bids building 36 in. double ring segmental block sewer in 5 blocks.

Minn., Slayton—Until Aug. 8, by village, laying 5800 ft. 8 in. tile, 7652 ft. 6-8 in. tile, sixty 6 in. and sixty 8 in. y's, 2 auto flush tanks and 5 manholes. E. G. Minder, village engr.

Mont., Scobey—Until Aug. 11, by City Council, installing 20,000 lin. ft. 8-18 in. vitr. pipe sewers, manholes, settling tank and sludge beds, in main streets. About $45,000. W. B. Saunders, Helena, engr. Noted June 10.

Mo., Clayton—Until Aug. 12, by St. Louis Sewer Comn. at office of County Clerk, building joint district sewers in Dist. No. 1, W. Elbring, Clayton, engr. Noted July 24.

Mo., Milan—Until Aug. 6, by City Clerk, building complete sanitary sewerage system and sewage disposal plant. About $40,000. Archer & Stevens, New England Bldg., Kansas City, engrs.

Okla., Paul's Valley—See "Streets and Roads."

Cal., Santa Barbara—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Conn., Portland—Sewer Com. received bids building sewers in Central Sect., from S. Mazzotta, $45,590; A. Brazon, $48,890; F. Arrigoni, $50,970. Contractors all of Middletown.

★N. Y., Garnerville—Garners Pipe Wks. let contract building sewage disposal plant and water filtration plant, to Linde & Griffith Co., foot of 4th Ave., Newark, N. J. About $45,000.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids July 21, building sanitary and storm water sewers and appurtenances in 32nd and Lawrence Aves., Willets Point Blvd. and Linden St., from Porter & DeWitt, $659,218; Kenmere Contg. Co., $724,000; Peace Bros., 20 Main St., Flushing, $867,000. Noted July 17.

★N. J., Pleasantville—City let contract building 10 mi. sanitary sewerage system, to E. G. Britz, 1759 Park Ave., New York City, $86,310.

N. J., Westmont (Camden P. O.)—City received bids building (a) 9 mi. sanitary sewerage system involving 126 manholes and 18 flush tanks, (b) disposal plant and pumping station, from Penn Eng. & Constr. Co., 1119 North Howard St., Phila., (a) $72,597, (b) $30,500; W. P. Corson, 1141 Sycamore St., Camden, (a) $68,416, (b) $26,284; R. F. Relly, Easton, Pa., (a) $69,131; B. Prizzimenpi, (b) $26,500. Noted July 17.

★Pa., Erie—City Council let contract for completion of Sects. 3 and 4 of Mill Creek Flood Control Project, to Folwell-Ahlskog, 24th and State Sts. About $703,830 and $539,288 respectively. They are not the lowest bidders, but on the condition that they receive both sections, this company deducted 5 per cent, which brought them $14,000 lower than any other contractor.

★N. C., Goldsboro—City let contract for labor for building several miles 8-15 in. terra cotta out-fall sewer pipe, to Sullivan, Long and Hagerty, Bessemer, Ala., $53,000; pipe, to Chattanooga Sewer Pipe Co., Chattanooga, Tenn.

O., Springfield—City received bids laying 2945 ft. 30 in. sewer pipe in alley west of Fountain Ave., from McCreight to College Sts., (a) rein.-con. segmental block, (b) vitr. tile, from C. Simmons, (a) $13,500, (b) $13,000; P. Hounker, (a) and (b) $18,510; J. J. Donnelly, (a) $22,630. Contractors all of Springfield. Noted June 19.

★Mich., Alpha—City will spend $50,000 to build sewers. S. A. Greeley, 39 West Adams St., Chicago, engr. Work will be done by day labor.

★Mich., Dearborn—City let contract building complete system storm laterals, involving 40,000 ft. 12-18 in. vitr. pipe, to G. R. Cooke, 1013 Ford Bldg., Detroit, $71,120. Noted July 17.

★Mich., Detroit—City let contract building vitr. crock sewer with manholes and special T and Y connections in Lateral Sewer No. 3070 in block between Yellowstone, Yosemite, Joy and Elmherst Aves., to Lennane & McIlvenna, Book Bldg., $10,500. Work involves 2500 ft. 8-12 in. vitr. pipe.

Mich., Muskegon—City received only bid building Highland Park Sewerage System, involving 144 ft. 20 in. and 6588 ft. 8 in. sewer, manholes and connections, from G. W. Clark, Muskegon, $28,860. Bid does not include sand and gravel used in filling. (Same to be furnished at cost plus 10 per cent.)

Ill., Chicago—Bd. Local Impvts. received bids July 18, building sewers in South Crawford Ave., West 59th and West 63rd Sts., from Ryan Co., 4500 West Division St., $964,440; M. Pontarelli, West 79th St. and South Kedzie Ave., $968,380; C. Roberts, 6921 South Laflin St., $1,030,261. Work involves 1 concrete bulkhead and siphon, 10,370 ft. 3-6 ft. 2R brick, 3560 ft. 10.5 ft. 4R brick, 18,720 ft. 7.5-10 ft. 3R brick, 2680 ft. 2-18 ft. D. S. sewer pipes, 1030 ft. 1.25-12 ft. wing sewers, 800 cu.yd. macadam pavement, 2500 sq.yd. 2.5 in. asphaltic top, 7000 sq.ft. 5 in. concrete and 2000 lin.ft. cinder sidewalks, 20,000 cu.yd. surplus excav., etc.

★Wis., Janesville—Bd. Pub. Wks. let contract building sewers in Dists. No. 3, 4, 5, 10, 11, 12, 14, 15 and 16, to G. W. Mulholland, Rockford, Ill., $31,375. Noted July 10.

★Minn., St. Cloud—City let contract building 30 blocks 48 in. and 10 blocks 72 in double ring or 2 piece vitr. segmental block sewer, to Gedney & Murphy, Minneapolis, $376,063. Noted July 10.

★Tex., Dallas—City let contract laying 4000 ft. 33-39 in. concrete and 18-21 in. tile sewers, in Parry Ave. Dist., to W. H. Nichols, 116 West 12th St., $22,223.

★N. B., Moncton—City let contract building trunk sewer, to J. E. Kane, St. John, $18,391.

★Ont., Kingston — Dept. Pub. Wks., Ottawa, let contract installing sewerage system and disposal plant at Sydenham Military Hospital here, to W. H. Harvey, Kingston, $10,403. Noted June 26.

Bridges

PROPOSED WORK

Conn., Warehouse Point (Hartford)—Comrs. Hartford Co. retained G. H. Sage, of Berlin Bridge Co., to act as consult. engr. and work in conjunction with C. J. Bennett, comr. state highway, Capitol, Hartford, to prepare plans for bridge spanning Connecticut River from here to Windsor Locks. About $350,000. Noted July 24.

N. J., Hackensack—Bd. Supervs. Bergen and Hudson Counties soon let contract repairing structural steel on Paterson Plank Rd. Bridge over Hackensack River. About $10,000. R. McClure, Courthouse, engr. Noted June 5.

N. J., Hoboken—Delaware, Lackawanna & Western R. R., 90 West St., New York City, plans to build viaduct over tracks on Newark Turnpike, here. About $125,000. G. J. Ray, ch. engr.

Pa., Wilkes-Barre—Luzerne Co. plans to build 60 ft. rein.-con. bridge, 15 ft. wide, Buck Twp. and 74 ft. steel bridge, 20 ft. wide, Black Creek Twp. About $16,000 and $20,000 respectively. J. J. Boyle, Court House, engr.

W. Va., Clarksburg—See "Streets and Roads."

Minn., Duluth—Comrs. St. Louis Co. receive bids about Sept. 1, building 74 rein.-con. bridges in 6th Dist. About $385,000. R. W. Acton, co. engr.

Wash., Asotin—City having preliminary plans prepared for memorial bridge over Asotin Creek on west end of Main St. About $15,000.

Ore., The Dalles—City voted $14,500 bonds to build concrete bridge over Mill Creek on West 6th St. R. A. Garrow, city engr.

Cal., Capay—Bd. Supervs. Yolo Co. (Woodland) plans to build 170 ft. bridge over Cache Creek near here. About $30,000. Address M. H. Stitt, superv.

Cal., Eureka—Bd. Supervs. Humboldt Co. soon receives bids building steel bridge over Mattole River, consisting of two 195 ft. spans. H. J. Brunnier, Sharon Bldg., San Francisco, engr.

Cal., Woodland—Bd. Supervs. Yolo Co. plans to build 90 ft. steel bascule bridge over Sycamore Slough, cost $20,000; also bridge at Davis. $5000. Address F. B. Edson, superv.

Ont., Trenton—Dept. Pub. Wks., Ottawa, soon receives bids replacing bridge at Canadian Northern R. R. crossing over Murray Canal, here. About $35,000. E. Lafleur, Dept. Pub. Wks., Ottawa, engr.

BIDS DESIRED

Pennsylvania—Until Aug. 18, by State Highway Dept., Harrisburg, building 66 bridges, 6-36 ft. spans, in Armstrong, Berks, Cameron, Clarion, Clearfield, Columbia, Crawford, Erie, Fayette, Indiana, Jefferson, Lehigh, Monroe, Montgomery, Pike, Schuylkill, Sullivan, Susquehanna, Venango, Warren, Wayne and Wyoming Counties. L. S. Sadler, state highway comr.; advertised in this issue.

Pa., East Brady—See "Streets and Roads."

Pa., Huntington—Until Aug. 18, by Comrs. Huntington Co. building 2 rein.-con. bridges, 50 ft. span, about 1 mi. south of Mapleburg. J. M. Africa Co., Huntington, engrs.

Ill., Chicago—Until Aug. 12, by C. R. Francis, comr. pub. wks., building substructure of double leaf trunnion bascule bridge over south branch of Chicago River on Madison St., involving 8000 cu.yd. excav. and 5000 cu.yd. concrete in walls and abutments. About $300,000. T. G. Pihlfeldt, br. engr.

Wis., West Bend—Until Aug. 12, by Parsons & Orbert, engrs., 627 M. & M. Bank, Milwaukee, building 120 ft., rein.-con. and steel bridge here, with two 40 ft. girder spans, 30 ft. roadway 6 ft. sidewalks and earth approach and fill. About $30,000.

Minn., Duluth—Until Aug. 11, by Comrs. St. Louis Co., building 26 rein.-con. bridges. R. W. Acton, co. engr.

Minn., Duluth—Until Aug. 12, by Comrs. St. Louis Co., building 8 bridges. W. H. Borgen, aud.

Minn., Faribault—See "Streets and Roads."

Utah, Logan—Until Aug. 4, by Comrs. Cache Co., building 5 rein.-con. bridges, involving 5000 lbs. steel and 200 cu.yd. rein.-con., also three steel span bridges, two 100 ft. span bridges, and one 70 ft. span bridge. T. H. Humpheries, co. engr.

Cal., Eureka—Until Aug. 11, by Bd. Supervs. Humboldt Co., building 145 ft. rein.-con. arch bridge over Little Van Dusen Creek, near Dismores. H. J. Brunnier, Sharon Bldg., San Francisco, engr.

Cal., San Diego—Until Aug. 6, by Bd. Supervs. San Diego Co., building 200 ft. girder type rein.-con. bridge at La Costa, consisting of five 40 ft. spans, and involving 998 cu.yd. excav., 579 cu.yd. Class "A" and 177 cu.yd. Class "B" concrete and 40 tons reinforcing steel. J. B. McLees, clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. J., Jersey City—Comrs. Essex Co. let contract painting part of Passaic Bridge and all of Hackensack Bridge on Lincoln Highway, to J. J. Haas, Montgomery St., $14,480 and $4080 respectively. Noted July 17.

★Pa., Du Bois—City let contract building 104 ft. bridge, 46 ft. wide, on Brady St., to Farris Eng. Co., Empire Bldg., Pittsburgh, $26,850. Noted July 10.

★Pa., Punxsutawney — Jefferson Co. (Brookville) let contract building 48 x 148 ft., rein.-con. bridge, here, to Whittaker & Diehl, Union Trust Bldg., Harrisburg, $38,715. Noted July 10.

★Mich., Gladwin City—State Highway Dept., Lansing, let contract building 100 ft. bridge over Cedar River, 23 ft. wide, Gladwin Co., to Ross & Williams, Beaverton, $18,372. Work involves 522 cu.yd. rein.-con., 220 cu.yd. concrete and 18 tons steel.

Mich., Port Huron—See "Streets and Roads."

★Mich., St. Ignace—State Highway Dept., Lansing, let contract building 60 ft. bridge over Carp River, 18 ft. wide, Mackinac Co., to A. S. Decker & Co., 1608 Beech St., Flint, $28,556. Work involves 350 cu.yd. rein.-con., 600 cu.yd. concrete and 7 tons steel.

★Ill., Chicago—Forest Preserve Dist. of Cook Co., Cook Co. Bldg., let contract building bridge over Des Plaines River on Washington Blvd., to Standish & Allen, 220 South State St., $58,985. Work involves 1690 cu.yd. concrete, 78,000 lb. reinforcing steel, 2000 cu.yd. dry and 2500 cu.yd. wet excav., 904 sq.yd. paving, 7500 brick in hand rail, etc.

★Ia., Cedar Rapids—City let contract building 600 ft. rein.-con. bridge on 1st Ave., to Koss Constr. Co., 2818 5th St., Des Moines, $418,999.

★Neb., Lincoln—Comrs. Lancaster Co. let contract building 100 ft., rein.-con. cantilever bridge over Oak Creek, on 14th St., involving 455 cu.yd. rein.-con. and 15.5 tons steel, to Martin Constr. Co., Lincoln, $18,250. Noted July 17.

★Okla., Tulsa—Comrs. Tulsa Co. let contract building 260 ft. steel bridge over Caney River, to have 120 ft. span and four 35 ft. spans, to Concrete, Steel & Constr. Co., 214-223 W. 3rd St., Joplin, Mo., $28,250.

★Cal., Redwood City—Comrs. San Mateo Co. let contract building rein.-con. bridge over New Year's Creek on Santa Cruz Rd., to A. Mattson, San Bruno, $11,427. Noted July 24.

★Ont., Grand Valley—Town Council let contract building 40 ft. span rein.-con. bridge on River Rd., to J. Tilker, Post Office St., Harrison. About $21,000.

Reinforced Concrete

PROPOSED WORK

Ala., Birmingham—See "Railways under Alabama."

O., Carthage—See "Industrial Works."

Minn., Duluth—See "Bridges."

BIDS DESIRED

Cal., San Diego—See "Bridges."

Streets and Roads

PROPOSED WORK

Mass., Leominster—City plans to pave 4600 ft. Main St., 18 ft. wide, involving 15,363 sq.yd. concrete, cost $50,000; 5645 ft. Lancaster St., 18 ft. wide, 11,290 sq.yd. concrete, $35,000. C. L. Ray, city engr.

Mass., Southbridge—City plans to macadamize South St., cost, $2500, Mechanic St., $1800, and repair permanent roadways, $6000.

Mass., Westboro—City appropriated $20,000 bonds for asphalt work on various streets.

Conn., Bloomfield—Town appropriated $20,000 to improve various roads. C. J. Bennett, c/o State Highway Dept., Hartford, engr.

N. Y., Albion—City election Aug. 7, to vote on $28,000 bonds to pave Clinton St. from West Bank to West Ave., concrete with Medina sandstone curb.

N. Y., Buffalo—City plans to pave Kensington Ave. from Main St. to Humbolt Parkway, 30 ft. wide, Manitoba St. from Gilbert St. to Baitz Ave., 26 ft. wide, Grove St. from Hertel Ave. to Race St., 26 ft. wide, asphalt, spec. "B" Medina sandstone curbs; repave Hampshire St. from Niagara St. to Normal Ave., 30 ft. wide, South Park Ave. from Cumberland Ave. to Triangle St., 32 ft. wide; also new paving on Wex Ave. to point 146 ft. south of Walden Ave., 24 ft. wide, Meriden St. from Abbott Rd. to point 1100 ft. northeasterly, 26 ft. wide. G. H. Norton, city engr.

N. Y., Utica—Common Council issued $70,000 bonds and soon receives bids resurfacing Claremont Terrace, Bradford, Butterfield and Downer Aves., Van Vorst, York, Catharine and 3rd Sts. J. Kemper, city engr.

N. J., North Bergen—Town soon lets contract improving Hamilton Ave., bituminous surface. About $20,000. P. Brady, clk.

Pennsylvania — State Highway Dept., Harrisburg, rejected bids received July 8 building 71,063 lin.ft. rein.-con. or bituminous surface course, in Lackawanna and Wyoming Counties and 16,218 lin.ft. rein.-con., Lehigh Co. Work will be readvertised at once. Noted July 17.

Pa., Erie—City soon lets contract grading various streets, involving 36,000 cu.yd. excav.

Pa., Jeanette—Borough plans to issue $150,000 bonds to pave and improve various streets and build sewers.

Pa., Juniata—Boro. Council receives bids about Aug. 15 paving and cement curbing, 4500 ft. 3rd St., rein.-con., cost $40,000; 1350 ft. 4th Ave. from 17th to 20th Sts., Hillside vitr. brick on 5 in. concrete base. H. Linton, 1717-13th St., Altoona, engr.

Va., Charlottesville—City soon lets contract paving, curbing 1300 ft. West Main St., 35½ ft. wide. About $20,000. S. A. Hecker, city engr.

W. Va., Clarksburg—City voted $600,000 bonds to pave streets and build sewerage system, also build bridge on West Pike St. over West Fork River connecting Adamston and Point Comfort, cost $80,000; on East Main St., over Elk Creek, $30,000; on East Pike St., over Elk Creek, $20,000; on Hartland Ave., over right of way of Monongahela Valley Traction Co., $8000; on Sycamore St. across Elk Creek, $20,000. Noted Oct. 3.

W. Va., Hinton—Summers Co. soon receives bids grading 2.7 mi. Hinton-Talcott Rd., 16 ft. wide, cost $34,000; 4.5 mi. Pence Springs-Griffiths Creek Rd., 16 ft. wide, $26,000.

W. Va., Martinsburg—Comrs. Berkley Co. soon receive bids resurfacing Winchester Pike, 16 ft. wide, bituminous macadam. About $100,000. J. W. Sperow, Martinsburg, engr.

W. Va., New Martinsville—Wetzel Co., Clay Dist., voted $105,000 bonds to improve 4 mi. Hundred-Littleton Rd. G. W. Comstock, New Martinsville, engr.

W. Va., Ripley—Comrs. Jackson Co. soon receive bids paving .35 mi. Ripley St., 13 ft. wide, vitr. brick. About $13,000. J. S. Chase, co. engr.

W. Va., Wheeling—City having plans prepared paving streets. About $110,000 available for project. H. Conrad, city engr.

W. Va., Winfield—Putnam Co. soon lets contract grading and draining 4 mi. Huntington-Charleston Rd., 26 ft. wide, involving 45,000 cu.yd. excav. About $50,000. G. H. Davis, Charleston, engr.

N. C., Dodson—Comrs. Surrey Co. plan to gravel 11 mi. road from Elkin to Doughton. About $20,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

Streets and Roads (Continued)

N. C., Elizabethtown—Comrs. Bladen Co. plan to build 35 mi. road from here to Cumberland Co. line and from here to Robeson Co. line, probably gravel. About $100,000. W. S. Fallis, c/o State Highway Dept. Raleigh, engr.

N. C., Fayetteville—City soon lets contract paving various streets. Plans include new pavements, surfacing old macadam on gravel bases and resurfacing old asphalt streets. Cost between $75,000 and $150,000. E. C. Derley, Fayetteville, engr.

N. C., Gastonia—Gaston Co. election Aug. 19 to vote on $500,000 bonds to improve roads.

N. C., Goldsboro—City retained Ludlow Engineers, Winston-Salem, to prepare plans and supervise construction of street paving. About $300,000.

N. C., Greenville—Comrs. Pitt Co. plan to gravel surface 10 mi. Greenville-Kinston Rd. About $30,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Brevard—Comrs. Transylvania Co. plan to gravel surface 1 mi. Hendersonville-Brevard Rd. About $35,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Jefferson—Comrs. Ashe Co. plan to gravel 18 mi. road from here to county line. About $60,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Lillington—Comrs. Harnett Co. plan to gravel 4 mi. road from Dunn to Sampson Co. line. About $10,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Lillington—Comrs. Harnett Co. plan to gravel 28 mi. roads. About $90,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Louisburg—Comrs. Franklin Co. plan to gravel surface 4 mi. Raleigh-Rocky Mt. Rd. About $12,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Louisberg—Comrs. Franklin Co. plan to build 20 mi. various roads, probably gravel. About $65,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Lumberton—Robeson Co. voted $750,000 bonds to build roads. State and Federal Government will be asked to appropriate $250,000 toward project.

N. C., Marion—Comrs. McDowell Co. plan to grade and gravel surface 28 mi. Morganton-Marion-Asheville Rd. About $280,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Marshall—Comrs. Madison Co. plan to gravel 9.5 mi. road from Walnut Gap to Laurel River and from Mars Hill to Yancey Co. line. About $30,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Nashville—Comrs. Nash Co. plan to gravel surface 12 mi. Rocky Mt.-Halifax Rd., cost, $40,000; 4 mi. Raleigh-Rocky Mt. Rd., $12,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Raeford—Comrs. Hoke Co. plan to surface 10 mi. Raeford-Fayetteville Rd. About $30,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Rutherfordton—Comrs. Rutherford Co. plan to gravel surface 38 mi. Charlotte-Asheville Highway. About $120,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Sparta—Comrs. Allegheny Co. plan to gravel 12 mi. road from here to Roaring Gap and from here to Ashe Co. line. About $36,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Wilson—Comrs. Wilson Co. receive bids in fall graveling 20 mi. various roads. About $60,000.

N. C., Vanceyville—Comrs. Caswell Co. plan to build 18 mi. road from here to Alamance Co. line, probably gravel. About $50,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

S. C., Barwell—City plans election soon to vote on $60,000 bonds to extend street paving in business section. Tomlinson Eng. Co., 1003 Loan and Exch. Bank Bldg., Columbia, engrs.

Fla., Bunnell—Flagler Co. voted $250,000 bonds to build 36 mi. road.

Fla., Jacksonville—City Council plans to issue $50,000 bonds to build sidewalks

Miss., Poplarville—Pearl River Co. voted $450,000 bonds to build hard surfaced roads. Federal Government will appropriate $150,000 toward project.

Miss., Walthall — Webster Co. issued $250,000 bonds to build roads.

La., Alexandria—Rapides Parish voted $2,000,000 bonds to build roads. Noted April 10.

La., Colfax—Grant Co. election Aug. 19 to vote on $210,000 bonds to build and complete 110 mi. roads.

La., New Orleans—City plans to pave following streets during 1920: St. Ann and St. Peter Sts from Rampart to Decatur Sts., Orleans St. from Rampart to Royal St., Barracks St. from Rampart to North Peters St., Birch St. from Carrolton Ave. to Eagle St., Leonidas St. from Birch to Spruce Sts., Claiborne Ave. from Elysian Fields to St. Roch St., Treret St. from Calliope to Melpomene Sts., Erato and Cho Sts from Magnolia to Claiborne Sts., Ester, Irma and Felicia Sts. from Bway. to Walnut Sts., Burdette St. from Plum to Jeanette Sts. and from Hickory to Spruce Sts., Elm St. from Adams to Lowerline Sts., Hampson St. from Fern to Lowerline Sts., Plum St. from Audubon to Lowerline Sts., Hagan Ave. from De Soto to Orleans Sts., Manrepas St. from Gentilly to Esplanade Sts., Constana St. from Louisiana Ave. to St. Mary St., Dufossat St., from Laurel St. to Dock Board Roadway, Baronne St. from Howard Ave. to Melfomene St., Girod St. from Camp to Rampart Sts., Hickory St. from Audubon Blvd. to Carrolton Ave., gravel, bitulithic or sheet asphalt. T. L. Willis, city engr.

La., New Orleans—City plans to pave, drain and curb 3000 lin.ft. St. Joseph St. from Camp to Delta Sts., 40 ft. wide, involving 9850 sq.yd. granite or wood block, 1640 sq.yd. concrete on 6 in. concrete base, 3850 lin.ft. stone curbing, 1200 sq yd. Shillinger sidewalk, 4240 cu.yd. excav., cost $69,396; 2050 ft. Julia St. from Magazine to Delta Sts., 40 ft. wide, 9025 sq.yd granite or wood block, 1510 sq.yd. concrete on 6 in concrete base, 2750 lin.ft. stone curbing, 500 sq yd. Shillinger sidewalk, 750 cu.yd. excav., $47,163; 1600 ft. Girod St. from Camp to Water Sts., 29 ft. wide, 2500 sq.yd. granite or wood block, 420 sq.yd. concrete on 6 in. concrete base, 1170 lin.ft. stone curbing, 700 sq.yd. Shillinger sidewalk, 110 cu. yd. excav., $33,060; 1600 ft. Notre Dame St., from Magazine to Delta Sts., 22 ft. wide, 1380 sq.yd. granite or wood block, 1100 sq.yd. granite block relaid, 230 sq.yd. concrete on 6 in. concrete base, 550 lin.ft. stone curbing, 150 sq.yd. Shillinger sidewalk, 2460 cu.yd. excav., $35,086; 500 ft. Lafayette St. from Front to St. Peters Sts., 22 ft. wide, 1380 sq.yd. granite or wood block, 230 sq.yd. concrete on 6 in concrete base, 650 lin.ft stone curbing, 550 sq yd Shillinger sidewalk, 2460 cu yd. excav., 1100 cu.yd. small granite block relaid, installing 6-24 vitr. pipe, $19,438; 400 ft. Howard Ave. from Front to St. Peters Sts., 28 ft. wide, 1440 sq yd granite or wood block, 220 sq.yd concrete on 6 in concrete base, 700 lin.ft. stone curbing, 600 sq.yd. Shillinger sidewalk, 600 cu.yd. excav., $12,000; 760 ft. Natchez St. from Bank Pl. to Tchoupitoulas St., 12 ft. wide, 1610 sq.yd. granite or wood block, 20 sq.yd. asphalt relaid, 270 sq yd. concrete on 6 in. concrete base, 700 lin.ft. stone curbing, 950 lin.ft. small granite block gutter, 500 sq.yd. Shillinger sidewalk, 510 cu.yd. excav., installing 6-18 in. vitr. pipe, $10,780; Common St from Magazine to Front St., 2480 sq.yd granite or wood block, 40 sq.yd. asphalt relaid, 415 sq.yd. concrete on 6 in. concrete base, 300 lin.ft. stone curbing, 800 lin.ft. small granite block gutter, 900 sq.yd. Shillinger sidewalk, $14,419. T. L. Willis, city engr. Noted June 12.

Ohio—State Highway Comm., Columbus, rejected bids received July 11, building roads in following counties:

Crawford Co., Sect. "M-1", Bucyrus-Galion Rd., 1.74 mi., grading, constructing bridges and culverts and paving with either bituminous macadam or semi-monolithic brick.

Sect. "M-2", Bucyrus-Galion Rd., 2.75 mi., grading, constructing bridges and culverts and paving with either bituminous macadam or semi-monolithic brick.

Fayette Co., Sect. "A", Columbus-Washington C. H. Rd., 5.01 mi., grading, constructing bridges and culverts and paving with either waterbound macadam or bituminous macadam

Morgan Co., Sect. H, McConnellsville-New Lexington Rd., 2.26 mi., grading, constructing bridges and culverts and paving with waterbound macadam. New bids will be received. Noted July 17

O., Cincinnati—City plans to widen roadway of McMillan St. from Peebles Corner to Almas Pl., by 4 ft., also repave same. About $50,000. F. Krug, city engr.

O., Leipsic—City receives bids about Sept. 15, paving ½ mi. Mathias St., 20 ft. wide. About $20,000. G. Champe, 610 Nasby Bldg., Toledo, engr.

O., Springfield—City received no bids paving 4563 ft. Limestone St., Sect. 1, from Washington to Clark Sts., wood or granite block, Sect. 2 from Clark to Rice Sts., sheet asphalt, bitulithic or brick, 45 ft. wide, involving 14,400 sq.yd. paving and 9100 ft. concrete curbing. O. E. Carr, city engr. Noted June 26.

Mich., Detroit—Dept. Pub. Wks. soon receives bids paving with 1 course concrete 1st Alley west of and parellel with 4th Ave. from Noble to Stimson Pl., cost $1160; North and South Alley, between McClellan, Park View, Jefferson and Agnes Sts., $2235; Alley between Beaubien, St. Antoine, Palmer and Hendrie Sts., $2242; Alley between Beaubien, Oakland, Hague and Alger Sts.; $5516; Alley between John R. Brush, Harmon and Rosedale Sts., $5180; Alley between Bewick, Garland, Waterloo and Charlevoix Sts., $4455; North and South Alley between Melrose, Cameron, East Grand Blvd. and Custer Sts., $2610; Alley between 3rd, 2nd, Milwaukee Sts. and West Grand Blvd., $4216; "L" Alley between Hamilton, 3rd, Glynn and Calvert Sts., $4380; Alley first east of and parallel to Dexter St. from Lothrop to Northwestern Sts., $1350; Alley between Joseph Campau, Mitchell, Warren and Theodore Sts., $1645; North and South Alley between Chene, Naples, Harper and Piquette Sts., $2140; Alley between St. Clair, Hamilton, Waterloo and Charlevoix Sts., $6500; Alley between Avery, Commonwealth, Lysander and Forest Sts., $2480; Alley between Vinewood, McKinley, Sylvan and Warren Sts., $2630; Alley between Joseph Campau, Mitchell, Palmer and Hendrie Sts., $2830; East and West Alley between 2nd, Woodward, Glynn and Calvert Sts., $3680; North and South Alley between Woodward, John R, Hancock and Warren Sts., $3020, 12-24 ft. wide. C. W. Hubbell, city engr.

Mich., Detroit—Dept. Pub. Wks. soon receives bids paving with asphaltic concrete on 6 in. concrete base, Berea, Medina or other curbstone, Hancock Ave. from Joseph Campau to Mt. Elliott Aves., cost, $45,790, Newberry Ave. from Junction to Cavalry Aves., $16,100, Ferry Ave. from Baldwin to Van Dyke Aves., $8370, Canfield Ave. from McClellan to Pennsylvania Aves., $10,809, Craig Ave. from Trombly to Milwaukee Aves., $7490, Highland Ave. from 12th St. to Wabash Ave., $9700, Lakeview Ave. from Kercheval to Waterloo Aves., $9650, Naples St. from Harper to Piquette Aves., $7640, Indiandale Ave. from 12th St. to Ellen Ave., $7150, Holmur Ave. from Joy to Collingwood Aves., $39,070, all 26 ft. wide, Fullerton Ave. from Oakman Ave. to Wabash Ave., $36,000, Clements Ave. from Herman Ave. to 12th St., $16,220, both 24 ft. wide. C. W. Hubbell, city engr.

Mich., Port Huron—Comrs. St. Clair Co. having plans prepared grading, draining, furnishing material and surfacing 5½ mi. Avoca-Beard Rd., 9 ft. wide, Kenockee and Clyde Twps.

Ill., Chicago—Bd. Local Impvts. soon lets contract paving alley between Montrose, Cullom, Ashland and Paulina Aves., involving 1180 ft. concrete curbing, 580 cu.yd. excav., 1180 sq.yd. vitr. brick on 6 in. concrete base, 260 ft. 10 in. tile sewer, etc., cost, $5000;

Alley between East 63rd and East 64th Sts., Langley and Champlain Aves., 416 cu.yd. excav., 1260 sq.yd. 7 in. concrete pavement, $1300;

Alley between Addison St., Cornelia Aves., Halsted St. and Reta Ave., 357 cu.yd. excav., 1050 sq.yd. asphalt on 7 in. concrete, 200 ft. 10 in. tile sewer, etc., $5300;

Alley between West 65th Pl., West 66th St., Stewart and Normal Aves., 196 cu.yd. excav., 1220 sq.yd. asphalt on 7 in. concrete, $3900;

Alley between Sunnyside, Galt, Clarendon and Hazel Aves., 612 cu.yd. excav., 1240 sq.yd. asphalt on 7 in. concrete, $4800;

Streets and Roads (Continued)

Alley between Harrison and Flournoy Sts., Spaulding and Homan Aves., 1190 ft. concrete curbing, 501 cu.yd. excav., 940 sq.yd. vitr. brick on 6 in. concrete, $3777.

Alley between Granville and Hood Aves., Bway. and Lakewood Ave., 410 cu.yd. excav., 1250 sq.yd. asphalt on 7 in. concrete, 75 ft. 10 in. sewer tile, etc., $4800;

Alley between Van Buren and Congress Sts., Washtenaw and California Aves., 2028 ft. concrete curbing, 609 cu.yd. excav., 1780 sq.yd.. vitr. brick on 6 in. concrete, $6100;

Alley between Menomonee and Eugenie Sts., Cleveland Ave. and Mohawk St., 387 cu.yd. excav., 1190 sq.yd. asphalt on 7 in. concrete, $4200;

Alley between Fillmore and 12th Sts., Francisco Ave. and Richmond St., 1408 ft. concrete curbing, 486 cu.yd. excav., 1110 sq.yd. vitr. brick on 6 in. concrete, $4300;

Alley between Sunnyside, Galt and Hazel Aves. and Sheridan Rd., 537 cu.yd. excav., 1190 sq.yd. asphalt pavement on 7 in. concrete, $4500;

Alley between Huron, Erie and Leavitt Sts. and Oakley Blvd., 1220 ft. concrete curbing, 805 cu.yd. excav., 1080 sq.yd. vitr. brick on 6 in. concrete, $6300;

Alley between East 63rd and East 64th Sts., Ingleside and Drexel Aves., 200 cu.yd. excav., 1100 sq.yd. asphalt on 7 in. concrete, $3700;

Alley between Blackhawk and Division Sts., Holt and Dickson Aves., 2690 ft. concrete curbing, 1300 cu.yd. excav., 2330 sq.yd. vitr. brick on 6 in. concrete, 375 ft. 10 in. tile sewer, etc., $10,457;

Alley between Washington Blvd., Madison, Ada and Sheldon Sts., 1550 ft. concrete curbing, 1115 cu.yd. excav., 1600 sq.yd. vitr. brick on 6 in. concrete, $9600;

Alley between Chicago Aves., Superior St., Hoyne Ave. and Leavitt St., 1204 ft. concrete curbing, 680 cu.yd. excav., 1070 sq.yd. vitr. brick pavement on 6 in. concrete, $4191;

Alley between Fillmore and 12th Sts., Sacramento Blvd. and Richmond St., 301 cu.yd. excav., 1190 sq.yd. asphalt on 7 in. concrete, $2800;

1st alley west of Racine Ave. from Congress to Harrison Sts., 658 ft. concrete curbing, 252 cu.yd. excav., 520 sq.yd. vitr. brick on 6 in. concrete, $2800;

Alley between West 72nd, West 73rd Sts., Union and Emerald Aves., 372 cu.yd. excav., 1020 sq.yd. asphalt on 7 in. concrete, $2700;

Alley between Grenshaw and 12th Sts., Kedzie and Spaulding Aves., 546 cu.yd. excav., 1240 sq.yd. asphalt on 7 in. concrete, $3150;

Alley between Harrison and Flournoy Sts., Homan and St. Louis Aves., 1200 ft. concrete curbing, 482 cu.yd. excav., 935 sq.yd. vitr. brick on 6 in. concrete, $3400;

Clyde Ave. from East 73rd to East 75th Sts., 2500 ft. concrete curbing, 1500 cu.yd. excav., 3600 sq.yd. asphalt on 6 in. concrete, etc., $15,000;

Clyde Ave. from East 92nd to East 93rd Sts., 1250 ft. concrete curbing, 800 cu.yd. excav., 1790 sq.yd. asphalt on 6 in. concrete, etc., $7,500;

Shields Ave. from 35th St. to point 631 ft. south, 500 ft. concrete curbing, 100 cu. yd. excav., 2760 sq yd. vitr. brick on 6 in. concrete, 205 ft. 12 in. tile sewer, etc., $13,500;

East 72nd St. from South Shore Dr. to East 71st St. and East 71st St. from South Shore Dr. to point 122 ft. east, 1490 ft. concrete curbing, 2200 cu.yd. excav., 2410 sq.yd. asphalt on 7 in. concrete, etc., $11,000;

South Hoyne Ave. from West 107th to West 111th Sts., 108th Pl. from Hoyne Ave. to point 160 ft. east, West 110th St. from Longwood Dr. to Hoyne Ave., 8000 ft. concrete curbing, 4500 cu.yd. excav., 13,000 sq.yd. asphalt on 6 in. concrete, etc., $49,500. C. D. Hill, city engr.

Wisconsin—State Highway Comn., Div. No. 4, Grand Rapids, soon lets contract improving 10.19 mi. Wautoma-Redgranite Rd., Waushara Co., Federal Aid Project No. 46, involving 8.6 acres clearing and grubbing, 40,958 cu.yd. earth excav., 247 cu.yd. Class "A" concrete, 52,599 sq.yd. sand clay surfacing, etc.; 6.4 mi. Stevens Point-Waupace Rd., Portage Co., Federal Aid Project No. 76, 1 acre clearing and grubbing, 19,257 cu.yd. earth excav., 8 cu. yd. Class "A" concrete, 60,112 sq yd. gravel surfacing, etc.

Wisconsin—State Highway Comn., Div. No. 2, Stephenson Bldg., Milwaukee, soon lets contract improving 1.04 Brown Deer Bridge and Road, Milwaukee Co., Federal Aid Project No. 95, involving 10,692 cu.yd. earth excav., 1283 cu.yd. Class "A" and 303 cu.yd. Class "B" concrete, 920 sq.yd. concrete surfacing, etc.

Wis., Sheboygan—City plans to grade and pave 2.1 mi. Michigan Ave. from 17th St. to city limits, 18 ft. wide, involving 15,000 sq.yd. 2 course concrete and concrete curbs and gutters. About $25,000. C. U. Boley, city engr.

Wis., Superior—City having plans prepared for widening 16th St. and extending Lamborn Ave. or building alley between 16th St. and Grand Ave. About $15,211. M. G. Beckley, clk.

Minn., Aitkin—Comrs. Aitkin Co. authorized $250,000 bond issue to build highways. H. O. Beecher, co. aud.

Minn., Anoka—Comrs. Anoka Co. authorized $250,000 bond issue to build highways. A. A. Caswell, co. aud.

Minn., Austin—Comrs. Mower Co. authorized $65,000 bond issue to build highways. O. J. Simmons, co. aud.

Minn., Brainerd—Comrs. Crow Wing Co. authorized $200,000 bond issue to build roads. C. W. Mahlum, co. aud.

Minn., Elk River—Comrs. Sherburne Co. authorized $125,000 bond issue to build highways. C. S. Wheaton, co. aud.

Minn., Faribault—Comrs. Co. authorized $250,000 bond issue to build highways. F. M. Kaisersatt, co. aud.

Minn., Foley—Comrs. Benton Co. authorized $250,000 bond issue to build roads. J. E. Kasner, co. aud.

Minn., Grand Marais—Comrs. Cook Co. authorized $50,000 bond issue to build highways. T. I. Caster, co. aud.

Minn., Grand Rapids—Itasca Co. election Aug. 18 to vote on $2,000,000 bonds to build roads. R. W. Acton, Duluth, engr.

Minn., Mahnomen—Comrs. Mahnomen Co. authorized $100,000 bond issue to build highways. F. D. Johnson, co. aud.

Minn., Orontonville—Comrs. Bigstone Co. authorized $50,000 bond issue to build highways. A. M. Randall, co. aud.

Minn., Park Rapids—Comrs. Hubbard Co. authorized $50,000 bond issue to build highways. F. Heisel, co. aud.

Minn., Rochester—Comrs. Olmsted Co. authorized $50 000 bond issue to build highways. L. J. Fiegal, co. aud.

Minn., St. James—Comrs. Watonwan Co. authorized $250,000 bond issue to build roads. A. G. Countryman, co. aud.

Minn., Slayton—Comrs. Murray Co. authorized $100,000 bond issue to build highways. E. V. O'Brien, co. aud.

Kan., Cimarron—Gray Co. having plans prepared building 25 mi. gravel roads. W. Barton, co. engr.

Neb., Alliance—See "Sewers."

Neb., Ashland—City plans to pave 16 blocks with asphalt or brick. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

Neb., Fairmount—City having plans prepared paving 10 blocks, vertical fibre or concrete. About $60,000. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

Neb., Lincoln—City plans to pave 5600 ft. Farm Ave., 6th, D, 33rd and Maple Sts., 25-30 ft. wide, involving 17,000 sq.yd. asphaltic concrete on 4 in. concrete base, and 12,000 lin.ft. concrete curbing and guttering. About $60,000. G. W. Bates, city engr.

Neb., Red Cloud—City plans to pave 40 blocks with sheet asphalt, asphaltic concrete or brick. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

Montana—State Highway Comn., Helena, plans to gravel surface 29 mi. Yellowstone-Glacier Bee Line Rd., Park Co., cost $100,000; 12 mi. Sun River-Chateau Rd., Cascade Co., $48,000. Federal Government asked to appropriate toward cost. P. D. Pratt, state highway engr.

Mont., Ekalaka—Carter Co. election Sept. 2 to vote on $35,000 bonds to build roads. Federal Government will appropriate toward cost. P. D. Pratt, Helena, state highway engr.

Mont., Glendive—Dawson Co. election Sept. 2 to vote on $200,000 bonds to build roads. B. W. Adams, Glendive, engr. Noted May 1.

Mont., Helena—City plans to pave various streets with concrete or bitulithic. About $150,000. J. McLeod, city engr.

Mo., Centralia—Town plans to pave six blocks various streets. About $60,000. Engineer not selected.

Mo., Charleston—Comrs. Mississippi Co. soon receive bids paving, grading, draining and building culverts and bridges on 12½ mi. road, 16 ft. wide, 2 course concrete, earth shoulders. C. E. Swank, Charleston, engr.

Mo., Fornfelt—City soon lets contract paving, grading, curbing and guttering Ruth St. from Main to 5th Sts., involving 4270 sq.yd. asphalt, 3114 lin.ft. granitoid curbing and guttering, 6544 cu.yds. earth excav. About $10,000. J. E. Kinkead, city engr.

Mo., Glendale (St. Louis P. O.)—L. C. Dziatzko, engr., 200 Empire Bldg., Webster Groves, receives bids about Aug. 10, paving 1400 ft. Sappington Rd. from Big Bend to Etta, 25 ft. wide, rein.-con. with concrete curbing, for city. About $10,000.

Mo., Platte City—Comrs. Platte Co. plan to pave and grade 38 mi. roads. Leslie-Barns Eng. Co., Amer. Natl. Bank Bldg., St. Joseph, engrs.

Tex., Baird—J. R. Black, judge, Callahan Co., rejected only bid received July 14, surfacing 34.85 mi. Highway No. 1, 16 ft. wide. About $6000 per mi. Noted July 10.

Tex., Boston—Bowie Co. plans to grade and build concrete drainage structures on 4.77 mi. Highway I-A, known as Cass Co. Rd., 24 ft. wide. About $12,500. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Tex., Comanche—Comanche Co. voted $750,000 bonds to build roads. W. E. Dickerson, Comanche, engr.

Tex., Cuero—Dewitt Co. election Aug. 9 to vote on $1,635,000 bonds to build roads. J. W. Benjamin, Cuero, engr.

Tex., Dallas—City having plans prepared paving Gilbert Ave. from Herschell to Throckmorton Sts., Bowser St. from Knight to Herschell Sts., Ruskin St. from Oak Lawn to Knight Sts., Holland Ave. from Throckmorton to Herschell Sts., bitulithic or 4 in. wood block; Browder St. from Pocahontas to Santa Fe Sts., Willomette St. from 12th to 7th Sts., 4 in. wood block or Uvalde rock asphalt. G. D. Fairtrace, city engr.

Tex., Gainesville—Cooke Co. election Aug. 11 to vote on $225,000 bonds to build Era and Valley View Rds. Engineer not selected. H. S. Holman, co. judge.

Tex., Waxahachie—Ellis Co. Rd. Dist. No. 1, election Aug. 23, to vote on $1,500,000 bonds to build hard surfaced roads. Engineer not selected. F. L. Wilson, co. judge.

Okla., Madill—City having plans prepared paving, curbing and guttering 40 blocks. Johnson & Benham, Kansas City, Mo., engrs.

Okla., Ponca City—Kay Co. election Aug. 5 to vote on $1,500,000 bonds to build 130 mi. hard surfaced roads. Total cost, $2,000,000. Federal Government will appropriate $500,000 toward cost.

Idaho—State Highway Comn., Boise, rejected only bids received grading 3.5 mi. Panhandle Highway. About $10,000. Work may be done by day labor.

Idaho, Boise—Ada Co. plans election soon to vote on $1,000,000 bonds to build, improve and hard surface various roads.

Idaho, St. Maries—City soon receives bids building 116,409 sq.ft. cement sidewalks, 5 and 12 ft. wide. About $27,290. M. S. Parker, St. Maries, engr.

Washington — State Highway Comn., Olympia, rejected bids received July 14, paving 4 mi. Walla Walla-Buroka Rd., Walla Walla Co.; grading 7 mi. Olympia Highway, West. Noted July 3.

Wash., Spokane—Spokane Co. voted $2,250,000 bonds to pave roads. A. D. Butler, Spokane, engr. Noted May 15.

Oregon—State plans to build 2.4 mi. Grants Pass-Crescent City Rd., cost $52,500; 10.4 mi. Ochoco Canyon Rd., $188,000; 22.2 mi. Medford-Klamath Falls Sect. of Crater Lake Rd, $246,000; 53.8 mi. McKenzie Pass Highway, $356,000 Federal Government will bear part of cost. H. Nunn. Salem, state highway engr.

Streets and Roads (Continued)

Ore., Roseburg—Douglas Co. soon lets contract grading and graveling 1.57 mi. road, 16 ft. wide. About $10,000. E. H. Lenox, clk.

Ore., Milton—Town of Milton and Freewater having plans prepared paving streets in section of Pendleton-Walla Walla Highway, concrete or asphaltic concrete. B. Breithaupt, Milton, engr. Cost to exceed $10,000.

Ore., Roseburg—Douglas Co. and Federal Government plan to build Tiller-Crater Lake Rd., 18 ft. wide. About $63,000. C. H. Purcell, c/o Bur. Pub. Rd., 628 Post Office Bldg., Portland, engr.

Ore., Sheridan—City soon lets contract paving and resurfacing 10,987 sq.yd. of various streets, involving 3000 sq.yd. macadam, 5237 sq.yd. new macadam, and 2750 sq yd. asphaltic concrete. About $10,000. E. F. Dack, comr. R. W. Jones, McMinnville, engr.

Ore., Sutherlin—Douglas Co. (Roseburg) soon lets contract regrading and graveling 1 mi. Stephens Schoolhouse, City of Sutherlin Rd., 16 ft. wide. About $10,000. E. H. Lenox, co. clk.

Ore., The Dalles—City voted bonds to pave Upper Union and West 9th Sts., cost $12,000; link from east end of 2nd St. to city limits, $35,000. R. A. Garrow, city engr.

Cal., Bakersfield—City Council soon receives bids for 325,000 sq.ft. asphalt-concrete paving with Warrenite surface, 20,000 sq.ft. concrete gutters, 6000 lin.ft. cement curbs, and 1500 lin.ft. culverts, etc. R. H. Hubbard, city engr.

Cal., Martinez—City trustees soon receive bids paving Escobar St., 24 in. concrete base, wire mesh reinforcement, bitulithic surface, concrete curbs, cement walks, 30 in. c.l. and concrete culverts, etc. About $25,000. P. Farley, city engr.

Cal., Oakland—City soon lets contract improving 87th Ave. Former bids rejected. P. F. Brown, city engr. Noted July 17.

Cal., Petaluma—City Council having plans prepared by W. C. Howe, engr., San Francisco, paving Main and 3rd Sts. About $80,000.

Cal., San Diego—Bd. Supervs. San Diego Co. appointed E. Fletcher, S. Wheaton and F. M. White, all of San Diego, to investigate and report on system of paved highways. About $2,500,000.

Cal., Santa Barbara—City Council receives bids about Sept. 1, improving Figuerva, Anapamu and Castillo Sts. Work involves 4 in. concrete paving with 1½ in. Warrenite surface, cement curbs and concrete gutters. A. B. Cook, city engr.

Cal., Visalia—City having plans prepared paving 2½ mi. streets, concrete with Topeka wearing surface. L. H. Gadsby, city engr.

Cal., Woodland—Yolo Co. election Aug. 26 to vote on $1,000,000 bonds to grade and pave 100 mi. county highways.

Ont., Belleville—City plans to expend $34,392 to build concrete sidewalks J. W. Holmes, clk.

Ont., Iroquois Falls—City plans to expend $26,600 for curbing and $35,640 for tarvia pavements. J. Hodgson, Iroquois Falls, engr.

Ont., Listowel — City voted $18,000 bonds to build 5 mi. macadam roads.

Ont., Oakville—City plans to build 5 pavements. About $18,000. J. A. Bell & Co., St. Thomas, engrs.

Ont., Pembroke—Renfrew Co. plans election to vote on $225,000 by-law to build macadam roads. W. A. Moore, Pembroke, engr.

Ont., Toronto—City plans to lay 3700 ft. asphalt pavements on Herman, Kennelworth and Oakvale Aves., 24 ft. wide. Work involves 9800 sq.yd. asphalt and 7400 lin.ft. concrete curbing. About $37,000. R. C. Harris, City Hall, engr.

Ont., Toronto—Comr. of Wks. recommended that 2 sections of St. Clair Ave. be paved with brick and section of Logan Ave. with asphalt. About $102,000. Work involves 15,000 sq.yd. vitr. brick and 10,000 sq.yd. asphalt on concrete base. R. C Harris, City Hall, engr.

BIDS DESIRED

Mass., New Bedford—Until Aug. 4, by city, paving School, 2nd, Brigham, Rotch and Kenyon Sts., 11,622 sq.yd. total length, granite blocks, asphalt, Hassam blocks or Endurite. Cost $25,000.

N. Y., S. I. St. George—Until Aug. 4, by C. D. Van Name, pres. Richmond Boro., repairing with wood block pavement, roadway of Jersey St. from Cleveland St. to Castleton Ave.

N. Y., S. I. St. George—Until Aug 6, by C. D. Van Name, pres. Richmond Boro., constructing concrete curb with steel guard and laying vitr. brick gutter on concrete foundation, where not already done, on Tompkins Ave. from Broad St. to Simonson Ave.; repaving with sheet asphalt and second-hand napped granite block on concrete foundation, roadway of Manor Rd. from Richmond Turnpike to Willow Brook Rd.; also constructing concrete curb with steel guard and laying wood block gutter on concrete foundation, on north side of Richmond Terrace from York to Clinton Aves. and repairing sidewalk in front of 78 Broad St.

N. J., Irvington—Until Aug. 4, by Town Council, paving and curbing Park Pl., involving 7850 sq.yd. paving, 4470 lin.ft. concrete curb, sixty 4 in. sewer connections, 76 lin.ft. radius curb. Bids will be received on asphalt block, bitulithic, concrete, national and asphaltic concrete; also for laying 500 lin.ft. 8 in. sanitary sewer in Lincoln Pl., involving 2 manholes and 1 flush tank.

N. J., Jersey City—Until Aug. 14, by Bd. Freeholders Hudson Co., repairing Paterson Plank Rd., between Central Ave. and Congress St., granite block. About $85,000. T. J. Wasser, Courthouse, engr. Noted July 24.

N. J., Jersey City—Until Aug. 5, by city, improving Stegman St. from Ocean to Garfield Aves., sheet asphalt on concrete base. About $10,000.

N. J., Trenton—Until Aug. 13, by Bd. Freeholders Mercer and Monmouth Counties, Weaver's Hotel, Allentown, improving 41,460 sq.yd. Old York Rd. at Upper Freehold, East Windsor and Millstone Twps., Mercer and Monmouth Counties, gravel surface, 20 ft. wide. About $28,000. G. D. Cooper, Red Bank, and H. Harris, Trenton, engrs.

Pennsylvania—Until Aug. 19, by State Highway Dept., Harrisburg, building roads in Allegheny, Armstrong, Bedford, Bucks, Cambria, Carbon, Chester, Delaware, Fayette, Lackawanna, Wyoming, Lehigh, Luzerne, Lycoming, Mercer, Northampton, Washington and Westmoreland Counties. L. S. Sadler, state highway comr.; advertised in this issue.

Pa., Connellsville—Until Aug. 13, by H. Kisinger, controller Fayette Co., building 7335 ft. concrete road, 18 ft. wide, 1927 ft. concrete foundation and curb with brick wearing surface, to be known as McClellandtown Rd.

Pa., East Brady—T. M. James, clk. city council, receiving bids grading, paving and curbing 3rd St. from Broad to High Sts., High St. from 4th Ave. to Clarion Rd., Clarion Rd. from High to Grant Sts., High St. Extension from Clarion Road to Ferry St., Broad St. from Brady St. to Clarion Rd., Clarion St. from Water to Broad Sts. and Brady St. from Broad St. to rear of Bank Bldg.; also building rein.-con. floor on 2nd St. bridge. Work involves 7700 sq. yd. vitr. brick on 4 in. concrete base, 5600 lin.ft. plain concrete curbing, 3500 cu.yd. earth excav., 450 sq.yd. rein.-con. flooring for bridge, 390 ft. 12 in., 620 ft. 18 in., and 270 ft. 15 in. T. C. pipe and 9 special catch basins. Douglass & McKnight, Columbia Bank Bldg., Poughkeepsie, engrs.

Pa., Mt. Union—Until Aug. 11, by W. F. Eberman, pres. town council, 106 Pennsylvania Ave., paving Pennsylvania, North and South Jefferson, East and West Water, North and South Division, East and West Market and Small Sts., involving 21,400 sq.yd. -vitr. brick on concrete base or 2 course rein.-con. Paving 6000 yd. excav. and 15,000 lin.ft. cement curbing. D. W. Dillman, 80-81 Altoona Trust Bldg., Altoona, engr.

Pa., Williamsburg—Until Aug. 15, by Boro. Council paving and curbing 1 mi. High, 1st and 2nd Sts., vitr. brick or 7 in. 2 course concrete, on concrete foundation. About $40,000. J. Ludenhenry, 528 Walnut St. Hallidaysburg, Pa., engr.

Del., Georgetown—Until Aug. 19, by Sussex Co. Highway Impvt. Comm., building various roads in county C. M. Upham, c/o State Highway Dept., Dover, engr.; advertised in this issue.

W. Va., Beckley—Until Aug. 5, by Comrs. Raleigh Co. grading and draining 25.4 mi. Town Trap Hill, Shady Springs and Slab Ford Dist., 9 ft. wide. About $200,000. C. L. Scott, Jr., Beckley, engr.

W. Va., Beckley—Until Aug. 5, by Comrs. Raleigh Co. paving 8.5 mi Giles, Fayette and Kanawha Turnpike, 9 ft. wide, penetration macadam with a 3 ft. broken stone shoulder. County will furnish asphalt. About $90,000. C. L. Scott, Jr., Beckley, engr.

W. Va., Buckhannon—Until Aug. 11, by Comrs. Upshur Co. paving 13 mi. vitr. brick roads, 16 ft. wide, in Buckhannon Dist. About $240,000 W. C. West, Buckhannon, engr.

W. Va., Buckhannon—Until Aug. 11 by Comrs. Upshur Co. building 10.42 mi. 16 ft. cement concrete pavement on certain streets of Buckhannon and 4 main roads radiating from city, involving 97,800 sq.yd. 6-8 in. pavement, 38,000 cu.yd grading, maximum haul from R.R. siding 1.5 mi., widening street to 28 ft. is contemplated, involving 19,310 sq.yd. additional paving. W. C. West, co. rd. engr., advertised in this issue. Noted Apr. 17.

W. Va., Lewisburg—Until Aug. 5, by Comrs. Greenbrier Co., grading and draining 7 mi. Ft. Springs-Ronceverte Rd., 20 ft. wide. About $70,000 F. K. Rader, Lewisburg, engr.

W. Va., Logan—Until Aug. 12, by Comrs. Logan Co. laying 1.3 mi. Main Rd., 16 ft. wide, concrete. About $25,000. J. W. McClared, Logan, engr.

W. Va., Parsons—Until Aug. 6, by Comrs. Tucker Co. grading 9 mi. Preston County Rd., 20 ft. wide, Davis Dist. also laying cement concrete surface on 2 mi. road. About $50,000. J. J. Taney, Thomas, engr.

W. Va., Ripley—Until Aug. 15, by Comrs. Jackson Co. surfacing 1.06 mi. streets in Ravenswood Twp., 20 ft. wide, involving 3500 cu.yd. excav. and 12,500 sq.yd. cement concrete surfacing, sewers, drains and curbs to be provided by town. About $35,000. T. A. Bragonier, Ripley, engr. Noted July 17.

W. Va., Ripley—Until Aug. 15, by Comrs. Jackson Co. building 5 mi. Ripley-Parkersburg Pike, 20 ft. wide, involving 4100 sq yd. concrete surface and 500 cu.yd. excav. About $13,000. T. A. Bragonier, Ripley, engr. Noted July 24.

W. Va., Wayne—Until Aug. 4, by Comrs. Wayne Co. grading and draining 4 mi. Armilda-Echo Rd., 20 ft. wide. About $25,000. H. A. Levering, Ceredo, engr.

N. C., Duke—Until Aug. 9, by F. M. McKay, secy. Harnett Co., building 18 mi. gravel roads. About $50,000. W. T. Smith, Duke, engr.

N. C., Monroe—Until Aug. 11, by Comrs. Union Co. gravel surfacing 4.2 mi. Wilmington-Asheville Highway, Marshville Twp. and 10 mi. in Vance Twp. Cost $12,000 and $30,000. N. A. Mullis, Monroe, engr.

Ala., Birmingham—Until Aug. 11, by Bd Jefferson Co. building 5 mi. Mt. Pinson Rd. Project No. 55, between here and Mt Pinson; 3.88 mi. Old Stouts Rd. Project No. 56, between Birmingham and Fulton Springs; 6 mi. South Bessemer Rd. Project No. 57, between here and Bessemer; 4.54 mi. Lovick and Leeds Rd. Project No. 58; 5 mi. Birmingham and Jasper Rd., Project No. 59, between Pratt City and Adamsville; and 6 mi. Birmingham-Montgomery Rd Project No. 18, between Birmingham and Shelby county line. W. S. Keller, c/o State Highway Dept., Birmingham, engr.; advertised in this issue.

Ala., Guntersville—Until Aug. 26, by Comrs. Marshall Co., grading, draining and surfacing with macadam 5.6 mi. Guntersville-Huntsville Rd., State Trunk Rd. No. 5, between here and New Hope. Work involves 3 acres clearing and grubbing, 1968 cu.yd. rock excav., 8600 cu.yd. stone surfacing, 4466 lbs. steel reinforcing, 481 cu yd. stone masonry in culverts, 250 sq.yd rip-rap, 27,500 ft. B. M. lumber, and 649 lin.ft. piling. W. S. Keller, c/o State Highway Dept., Montgomery, engr.

Streets and Roads (Continued)

O., Columbus—Until Aug. 5, by G. A. Borden, dir. pub. serv., grading, draining, curbing and paving 980 ft. Stanley Ave. from Heyl Ave. to 22nd St., 26 ft. wide, involving 2220 sq.yd. asphalt, 3100 sq.yd. brick block and 880 ft. gutter, about $19,166; 109 ft. Hood Alley from Sparrow Alley to Parsons Ave., 20 ft. wide, 5225 sq. yd. asphalt, 7650 sq.yd. brick block and 2425 sq.yd. gutter, $3520; 7650 ft. Grant Ave. from 5th to 11th Aves., 24 ft. wide, 5225 sq.yd. asphalt, 7650 sq.yd. brick block and 2425 sq.yd. brick gutter, $42,358; also grading, draining, curbing and repaving 2000 ft. 3rd St. from Livingston to Reinhard Aves., 46½ ft. wide, 13,600 sq.yd. asphalt, 4600 sq.yd. gutter and 700 sq.yd. intersections, $64,560; 940 ft. Monroe Ave. from Broad to Long Sts., 30 ft. wide, 2210 sq.yd. asphalt and 1050 yd. gutter, $11,789; 2860 ft. St. Clair Ave. from Mt. Vernon Ave. to South end of grading, 30 ft. wide, $28,655.

O., Oxford—Until Aug. 15, by village, paving and curbing ½ mi. High St., 33 ft. wide, involving 10,000 sq.yd. vitr. brick and 5200 lin.ft. curbing. About $50,000. L. A. Boulay Co., 1250 Nicholas Bldg., Toledo, engrs. Noted April 3.

O., Toledo—Until Aug. 15, by Comrs. Lucas Co. grading, draining and paving 2.56 mi. Obee Rd. 10 ft. wide, involving 14,900 sq.yd. waterbound macadam, 11,854 cu.yd. excav., cost $21,457; 2.96 mi. Midway Rd., 10 ft. wide, 17,240 sq.yd waterbound macadam, 14,641 cu.yd. excav., $30,298; 1.02 mi. Bury Rd., 16 ft. wide, 9500 waterbound macadam, 3411 cu.yd. excav., $17,752; 1.44 mi. Suder Ave. 16 ft. wide, 13,590 plain concrete, 4437 cu.yd. excav., $34,379; 2.01 mi. Seaman St., 16 ft. wide, 18,910 waterbound macadam, 3400 cu.yd. excav., $35,440. C. L. Rood, co. engr.

O., Toledo—Until Aug. 5, by D. H. Goodwillie, serv. dir., paving 7610 ft. Fairmont Park and Ottawa Park additions, 24 ft. wide, involving 17,980 sq.yd. bituminous concrete, 14,990 lin.ft. curbing and guttering, 3161 cu.yd. excav. Bids will be received on sheet asphalt 1 in. binder, 2 in. asphaltic block 1½ in. top and 2½ in. asphaltic concrete. About $90,000. H. C. McClure, city engr.

Michigan—Until Aug. 19, by State Highway Dept., Lansing, grading, surfacing and building drainage structures on 4.014 mi. road, 12 ft. wide, involving 28,257 sq.yd. gravel surface, cost, $33,648, 2.003 mi. road, 12 ft. wide, 14,309 sq.yd. gravel, Isabella Co., $16,302; 5.061 mi. road, 12 ft. wide, 39,579 sq.yd. gravel surface, $53,280, 3.085 mi. road, 12 ft. wide, 21,718 sq. yd. gravel surface, $29,168, Clare Co. F. F. Rogers, comr.

Michigan—Until Aug. 5, by State Highway Comn., Lansing, improving 1 mi. Main St., 16-20 ft. wide, Whittemore Twp. About $20,000. Work includes grading, building drainage structures, surfacing ½ mi. with concrete, and ½ mi. with gravel and involves 4683 sq.yd. gravel and 1155 cu.yd. concrete. F. F. Rogers, comr.

Mich., Bay City—Until Aug. 9, by C. L. Fox, clk. Bay Co., County Bldg., shaping, grading, draining and building culverts on 5 mi. Quanicasse Rd., 5 mi. Midland Rd. and 6 mi. AuSable Rd., 18 ft. wide.

Mich., River Rouge — Until Aug. 5, by R. J. Peters, village clk., 9 South Dearborn Ave., grading and paving with 1 course rein.-con., 6 in. thick with armor plate expansion joints. Henry and Great Lakes Ave., Maple and Pine Sts., 26-30 ft. wide. About $100,000. Noted July 17.

Ill., Belvedere—Until Aug. 4 by Bd. Local Impvts. paving East Madison and Gardner Sts. involving 11,000 sq.yd. 1 course rein.-con. pavement and 6488 ft. curbing.

Ill., Chicago—Until Aug. 4, by Cook Co. Supt. Pub. Serv., paving following highways: State Aid Rd. Work, Niles Twp., Sect. 59-15d, Route No. 1-A, Crawford Ave. beginning at north city limits and extending north to point 2275 ft., 7 in. concrete, 18 ft. roadway with 4 ft. earth shoulders, cost $15,303; Bloom and Rich Twps., Sects. 60-15d and 60-A, Route No. 30, Flossmoor Rd. at intersection with Dixie Highway and extending west to point 3702 ft., 7 in. concrete, 18 ft. roadway with 3½ ft. earth shoulders, $21,622; Norwood Park Twp., Sect. 61-15d, Route No. 9C, Canfield Rd. beginning at south city limits and extending south to point 4512 ft., 7 in. concrete, 18 ft. roadway, 6 ft. earth shoulders, $26,737.

Ill., Edwardsville—Until Aug. 4 by A. O'Leary, engr., City Hall, building Alton Rd. and completing boulevard system throughout city and resurfacing St. Louis Ave. between Collinsville and Southern Belt R. R. tracks, vitr. brick and asphalt. About $186,000.

Ill., North Chicago—Until Aug. 2, by Bd. Local Impvts. paving 14th, South Victoria and South Lincoln Sts., involving 26,000 sq.yd. 2 course rein.-con. pavement and grading and installing drains and manholes.

Ill., Oakwood—Until Aug. 5, by town, building 12,463 ft. concrete or brick road, 10 ft. wide, with 3 ft. rock or gravel shoulder on each side, to include side and lateral ditches, tile drains or other drains, culverts, etc. C. M. Powell, dist. engr.

Wisconsin—Until Aug. 5, by State Highway Comn., Div. No. 8, Spooner, improving Barron-St. Croix Falls Rd., Polk Co., Federal Aid Project No. 22; Hurley-Ashland Rd., Ashland Co., Federal Aid Project No. 45; Spooner-Cumberland Rd., Washburn Co., Federal Aid Project No. 98; Gordon-Minong Rd., Washburn and Douglas Counties, Federal Aid Project No. 99. Noted June 19.

Minn., Appleton—H. Steele, city clk., receiving bids for 21,987 sq.yd. paving, 18 ft. wide. J. W. Shaffer & Co., New York Life Bldg., Minneapolis, engrs.

Minn., Brainerd—Until Aug. 23, by C. W. Mahlum, aud. Crow Wing Co., improving 7.1 mi. Div. C, State Rd. No. 2, Federal Aid Project No. 51, 24 ft. wide, involving 39 acres clearing and grubbing, 46,339 cu.yd. grading, 4950 cu.yd. overhaul, 2200 cu.yd. gravel, etc., cost, $40,000; 3.7 mi. Federal Aid Project No. 73, State Rd. No. 2. 24 ft. wide, 3 acres clearing and grubbing, 19,000 cu.yd. grading, 39,400 sq.yd. concrete paving, 13,000 cu.yd. overhaul, 600 cu.yd. hand ditch, culverts, etc., $90,000. C. L. Molt, Brainerd, engr.

Minn., Duluth—City receiving bids paving Winona St. from Woodland to Allandale Aves. About $11,000. J. A. Farrell, comr.

Minn., Faribault—Until Aug. 19, by F. M. Kaisersatt, aud. Rice Co., improving 5.5 mi. Federal Aid Project No. 77, 24 ft. wide, involving 48,732 cu.yd. excav., 6650 cu.yd. gravel surfacing, culverts, etc., cost, $30,000; 4.3 mi. Federal Aid Project No. 69, 24 ft. wide, 16,823 cu.yd. excav., 5157 cu.yd. gravel surfacing, culverts, etc., $22,000; 4.6 mi. Federal Aid Project No. 68, 24 ft. wide, 33,484 cu.yd. excav., 5600 cu.yd. gravel surfacing, culverts, etc., $25,000. W. P. Chapman, Faribault, engr.

Minn., St. Paul—Until Aug. 4, by H. W. Austin, city purch. agt., grading Juliet, Palace and James Sts., between Underwood and Snelling Aves., Macalester Ave., between Randolph St. and Jefferson Ave., and Carroll St., between Syndicate Ave. and Griggs St. O. Claussen, city engr.

Neb., Beaver City—Until Aug. 12, by M. Disbrow, clk. Furnas Co., grading and building culverts on 19 mi. road from here to Arapahoe Rd., 24 ft. wide, involving 1575 sq.yd. concrete and 148,000 cu.yd. earth excav., etc. About $80,000. G. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., Hastings—Until Aug. 14, by J. A. Cates, clk. Adams Co., grading, paving and building culverts on 11 mi. road from here to Ayr Rd., 24 ft. wide, involving 815 sq.yd. concrete, 88,000 cu.yd. earth excav., cost $55,000; 27 mi. road from Red Cloud to Ayr Rd., 24 ft. wide, involving 223,000 cu. yd. earth excav., $125,000. G. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., McCook—Until Aug. 13, by B. Hafer, clk. Red Willow Co., grading and building culverts on 17 mi. road from here to Bartley Rd., 24 ft. wide, involving 3617 sq.yd. concrete and 139,000 cu.yd. earth excav. About $90,000. G. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., Omaha — Until Aug. 12, by City Council paving Leavenworth St. from 48th to 60th Sts., 30 ft. wide, involving 18,000 sq.yd. brick, asphalt, concrete, asphaltic concrete or creosoted wood block on 6 in. concrete base and 3000 cu.yd. grading. About $70,000. J. A. Bruce, city engr.

Tex., Abilene—Until Aug. 16, by Taylor Co., gravel surfacing and building concrete drainage structures, on 4.69 mi. Highway No. 1, State Aid Project No. 80, involving 18,187 lin.ft. grading, 107 cu.yd. concrete and 14,799 lbs. steel. About $17,525. H. E. Elrod, 505 Interurban Bldg., Dallas, engr.

Tex., Seymour—Until Aug. 4, by Baylor Co., surfacing with caliche or clay and building concrete drainage structures on 4.31 mi. Highway No. 30, east and west of Seymour, 16 ft. wide. About $21,400. C. E. Cocke, Seymour, engr. Noted May 22.

Okla., Paul's Valley—City receiving bids paving North Ash St., Charles, Paul and Bert Aves., involving 34,306 sq.yd. concrete, 21,073 lin.ft. curbing, 1930 cu.yd. earth excav., 3320 ft., 15 in. and 4810 ft. 12 in. vitr. sewer pipe, and 40 cu.yd. concrete storm sewers, etc. W. E. Moore, Oklahoma City, engr.

N. M., Las Cruces—Until Aug. 11, by E. R. Korf, town clk., for 15,000 yd. concrete, rein.-con., or bithulithic pavement.

Utah, Providence—Until Aug. 4, by city, building 30,000 lin.ft. concrete sidewalks, 5 ft. wide, and 3000 lin.ft. concrete crossings, 5 ft. wide. T. H. Humphries, Logan, engr.

Wash., Tacoma—Until Aug. 4, by Comrs. Pierce Co, clearing, grubbing and grading Eatonville Highway and Gig Harbor, Longbranch and Purdy Highway.

Oregon—Until Aug. 5, by State Highway Comn., Salem, paving roads in following counties:

Baker Co., Baker-Haines Sect. of Old Oregon Trail, 9.7 mi., 20,000 cu.yd. gravel or waterbound macadam, 31,000 cu.yd. mixed excav.

Benton Co., Corvallis & South Section of West Side Highway, 8 mi., paving with concrete or asphaltic concrete; concrete paver or railroad asphalt plant to be furnished by State Highway Comn.

Clatsop Co., Seaside-Astoria Sect. of Columbia River Highway, 14.8 mi., grading and paving with concrete or asphaltic concrete, 10,000 cu.yd. common excav.

Columbia Co., Rainier City Sect. of Columbia River Highway, 14.8 mi., grading and paving, 33,000 cu.yd. barrow, 8000 cu. yd. excav.

Deschutes Co., Jefferson County Line-Bend Sect. of The Dalles-California Highway, 23.9 mi., 61,000 cu.yd. excav.

Douglas Co., Yoncalla Sect. of Pacific Highway, 8.5 mi., 17,700 cu.yd. gravel or waterbound macadam, 10,000 cu.yd. common excav.

Wilbur-Roseburg Sect., Pacific Highway, 5.3 mi., 11,000 cu.yd. macadam.

Myrtle Creek-Canyonville Sect. of Pacific Highway, 9.8 mi., 78,000 cu.yd. common excav.

Galesville-Canyonville Sect. of Pacific Highway, 11.1 mi., 18,000 cu.yd. macadam.

Josephine Co., Wolf Creek and Stage Pass Sect. of Pacific Highway, 4.5 mi., 9500 cu yd. macadam.

Lane Co., Cottage Grove-Walker Rd., 3 mi., 6300 cu.yd. gravel or waterbound macadam.

Douglas Co. Line-Divide Sect. of Pacific Highway, 1.4 mi., 2800 cu.yd. gravel macadam.

Marion Co., Salem-Brooks Sect. of Pacific Highway, 4 2 mi., paving with concrete; concrete paver furnished by State Highway Comn.

Umatilla Co., Milton-Athena Sect. of Oregon-Washington Highway, 11.8 mi., paving with concrete.

Union Co., Lone Pine-Hot Lake Sect. of Old Oregon Trail, 3.9 mi., 8000 cu.yd. gravel or waterbound macadam.

Wasco Co., Three Mile—The Dalles Sect. of The Dalles—California Highway, 2 mi. paving with concrete or asphaltic concrete.

Wheeler Co., Butte Creek Sect. of John Day Highway, 9.5 mi., 40,000 yd. common excav.

Yamhill Co., Gaston-Yamhill Sect. of Forest Grove—McMinnville Highway, 7.9 mi., 16,500 cu.yd. macadam, 29,000 cu.yd. common excav.

State will furnish 3½ ton trucks on these projects, at $3.50 per hour, including driver. H. Nunn, state highway eng.

Streets and Roads (Continued)

California—Until Aug. 4, by State Highway Comn., Sacramento, building 9.4 mi. road between westerly boundary Lake Co. and Lakeport, involving 104,600 cu.yd. excav., 300 cu.yd. class "A" Portland cement, etc. A. B. Fletcher, state highway engr.

Cal., Santa Barbara—Until Aug. 7, by City Council, improving Quarantina St. between Victoria and Sola Sts. Work involves grading, 5 in. concrete paving, cement curbs, concrete gutters and 6 in. vitr. pipe sewer connections. A. B. Cook, city engr. Noted Jan. 16.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

New York—State Highway Comn., Capitol, Albany, received bids July 22, improving roads in following counties: (a) Cattaraugus Co., 4.6 mi. Bradford-Carrolton, Part 1, Rd. No. 8007;

(b1) Chenango Co., 4.78 mi. Rockwell Mills-South New Berlin, Rd. No. 1497, (b2) 5.57 mi. Greene-Oxford, Part 1, Rd. No. 8001, (b3) 5.87 mi. Greene-Oxford, Part 2, Rd. No. 8002;

(c) Onondago Co., .27 mi. Solvay-State Fair-Syracuse, Rd. No. 1353A;

(d) Suffolk Co., 3.85 mi. Smithtown-Fort Salonga, Part 1, Rd. No. 1048A; completing roads in following counties: (e) Cayuga Co., 8 mi. Auburn-Weedsport, Rd. No. 1317;

(f) Chautauqua Co., 3.9 mi. Fredonia-South Dayton, Part 3, Rd. No. 1381;

(g) Chenango Co., 7.09 mi. Norwich-South New Berlin, Part 2 and South New Berlin-New Berlin, Part 1, Rd. No. 1394;

(h) Franklin Co., 10.36 mi. Malone-Chateaugay, Rd. No. 5613;

(i) Niagara Co., 7.79 mi. Youngstown-Lockport, Part 1, Rd. No. 800;

(j) Oswego Co., 6.36 mi. Sandy Creek-Smartville, Rd. No. 1428;

(k1) Saratoga Co., 6.1 mi. Rexford Flats-Wait Corners-Groom Corners, Rd. No. 1117,

(k2) 5.74 mi. Mechanicsville-Clifton Park, Rd. No. 1345;

(l) Seneca Co., 4.89 mi. Waterloo-Burns Corners, Rd. No. 1400; repairing roads in following counties: (m) Alleghany, Schuyler and Steuben Counties, Repair No. 1231;

(n) Oswego Co., Rd. Nos. 5251 and 5276, Repair No. 1215;

(o) Suffolk Co., Rd. No. 743, Repair No. 1210; also completing repair roads in following counties: (p) Chenango Co., Rd. No. 664, Repair No. 1024;

(q) Cortland Co., Rd. Nos. 380 and 381, Repair No. 1037, from

L. H. Gipp, 787 Richmond Ave., Buffalo, (a) $154,358;

Fure & Cote, Olean, (a) $158,953;

J. F. Stabell Co., 1127 Niagara St., Buffalo, (a) $161,647, (b2) $202,146, (b3) $213,905;

Morrison & Quinn, Inc., Cutler Bldg., Rochester, (a) $161,704, (b2) $202,717, (b3) $216,295;

Paddleford & King, Sherburne, (b1) $120,594, (g) $104,189;

Newport Constr. Co., 200 North Main St., Herkimer, (b1) $143,483;

J. J. Guinan Contg. Co., 2314 Gravesend Ave., Brooklyn, (b2) $205,327;

Brown & Lowe Co. & Low Bros., Foster Ave., Schenectady, (b2) $245,920, (b3) $252,571;

J. D. Burt, Buffalo, (c) $19,417;

Munde Constr. Co., Inc., Syracuse, (c) $20,245;

Universal Steel Export Co., Inc., 26 Court St., New York City, (d) $82,067;

J. J. McDermott, Port Washington, (d) $85,124;

E. F. Monahan, Manhattan Beach, (d) $88,261;

Brayer Bros., North St., Auburn, (e) $6303;

Rosoff Eng. Co., 15 Park Row, New York City, (f) $87,111;

M. Dolan, Jamestown, (f) $87,747;

Greenfield Constr. Co., 89 Main St., Hornell, (f) $89,266, (q) $20,597;

W. T. Thayer & Co., East Main St., Chateaugay, (h) $65,446;

F. J. Mumm Contg. Co., Inc., 176 Best St., Buffalo, (i) $214,515;

W. O Rich, Youngstown, (i) $207,311;

Pub. Serv. Contg. Co., Niagara Falls, (i) $213,365;

A. J. Rockwood, 51 Rutgers St., Rochester, (j) $86,222;

J. B. Dower, Ballston Spa, (k1) $88,299;

Harradine Bros., Inc., Spencerport, (k2) $33,231;

H. A. Schaup, Inc., Albany, (k2) $33,948;

E. W. Foley Contg. Corp., New York City, (l) $118,266 and $123,358;

M. E. Soper, Seneca Falls, (l) $125,351;

H. A. Murphy, Albany, (m) $29,251;

J. J. Crouch, Rochester, (m) $30,152;

Lane Constr. Corp., 37 Colony St., Meriden, Conn., (n) $40,304, (q) $21,290;

L. D. Sullivan, 17 Scott St., Utica, (n) $41,457;

Fleming, O'Brien & McIntegart, Inc., 401 West 59th St., New York City, (o) $82,343;

C. D. Schlemmer, Islip, (o) $83,055;

Clements Contg. Co., 1195 Spofford St., New York City, (o) $87,001;

F. D. Griffin, 18 Pleasant St., Norwich, (p) $30,353;

N. E. Young, Union, (p) $30,986;

T. F. Murray, Leroy, (p) $31,458;

McGreevy, McGuigan & Baum Constr. Co., Robinson Bldg., Elmire, (q) $18,964;

Pearl Investing Co., Inc., Albany, (q) $21,046. Noted July 10.

N. Y., Brooklyn—E. Riegelmann, boro. pres., received bids July 16, regulating and grading (a) 39th St., (b) West 11th St., (c) 87th St., regulating and repaving (d) 39th St., (e) President St., (f) Snediker Ave., (g) Woodbine St., (h) Washington St., regulating and restoring, (i) Ocean Ave., from C. A. Myers, (a) $2040, (h) $50,082; (i) $8329; Grimm Constr. Co., 460 Herald Ave., Richmond Hill, (a) $2140; C. Gallagher, (a) $2610; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (d) $8071, (e) $20,803, (f) $8548, (g) $9782; Uvalde Asphalt Paving Co., 1 Bway., New York City, (d) $8264, (e) $21,194, (f) $8749, (g) $10,026; Cranford Co., 52 9th St., (d) $8641, (e) $22,042, (f) $8799, (g) $10,079; Brooklyn Alcatraz Paving Co., 407 Hamburg Ave., (d) $8520, (e) $21,782, (f) $8760, (g) $10,084; Annarock Eng. Co., (b) $2695; B. Turacamo, (b) $4274; L. Mangerie, (b) $4382, (c) $3331; M. A. Caponi, 1320 65th St., (c) $3442; M. Sanzo, (c) $4046; J. Ryan, (i) $5225; Scott & Kurth, (i) $6684; Leonard Paving Co., 233 Bway., New York City, (h) $48,597; F. J. Gallagher, (h) $49,722; M. J. O'Hara, (h) $49,989. Noted July 10.

N. Y., Buffalo—City received bids repaving (a) 4957 sq.yd. River St., 42 ft. wide; (b) 6935 sq.yd. Lathrop St., 30 ft. wide; (c) 1114 sq.yd. Pennsylvania Ave., 32 ft. wide; (d) 2639 sq.yd. Ross Ave., 24 ft. wide; (e) 2027 sq.yd. Stevens St., 26 ft. wide; (f) 2556 sq.yd. Poultney St., 26 ft. wide; (g) 3504 sq.yd. Fay St., 26 ft. wide; (h) 734 ft. Armin Pl., 26 ft. wide; (i) 2756 sq.yd. Crescent Ave., 26 ft. wide, all on concrete base, (1) Medina block (2) asphalt, (3) brick, from H. P. Burgard Co., 1968 Fillmore Ave., (a1) $32,220, (a2) $24,685, (b2) $32,870, (c2) $6350, (d2) $15,165, (e2) $11,235, (f2) $14,415, (g2) $17,320, (h2) $11,140; Rock Asphalt & Constr. Co., Morgan Bldg., (a2) $23,694, (b1) $45,562, (c2) $6235, (d2) $14,575, (e2) $10,954, (f2) $14,089, (g2) $17,972, (h2) $10,867, (i2) $25,440; Erie Contg. Co., Morgan Bldg., (b3) $35,000, (d3) $14,300, (e3) $10,790, (f3) $13,875, (g3) $18,975, (h3) $10,990, (i3, $28,700). Noted June 12,

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contract regulating and repaving 13th and Main Sts., to Feace Bros., 20 Main St., Flushing, $37,652 and $21,681 respectively, Jackson Ave. from Bridge Plaza to Thompson Ave., Jackson Ave., from Bridge Plaza to 2nd Ave. and Jackson Ave. from 2nd Ave. to Old Newton Rd., to F. J. Mason, $20,700, $17,860 and $60,040 respectively. Noted July 3.

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contract regulating, grading, curbing and laying sidewalks on 93rd Ave., to R. A. Hess, Inc., $2247; Olmstead Pl., to Scott & Kurth, $3309; 16th Ave. and Hancock St., to Sicilian Asphalt Paving Co., 41 Park Row, $5783 and $4955 respectively. Noted July 10.

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contracts regulating and repaving with sheet asphalt, Edison Pl., Trowbridge and Silver Sts., to Uvalde Asphalt Paving Co., 1 Bway., New York City, $7471, $7185 and $7675 respectively, Lotus Ave., to Sicilian Asphalt Paving Co., 41 Park Row, New York City $15,895; Summerfield St., to Hastings Paving Co., 25 Broad St., New York City, $11,795; 109th St., to R. A. Hess, $2291, Queens Rd., to Welsch Bros., $11,245; Edison Pl., to C. A. Myers, $1113. Noted July 24.

N. Y., New York—F. L. Dowling, pres. Manhattan Boro., received bids July 21, regulating and repaving with granite block on concrete foundation, roadway of Mail St., from M. I. Sachs, $15,072; Asphalt Constr. Co., 2197 Madison Ave., $15,258, P. J. Kearns, 2306 Creston Ave., $15,971. Noted July 17.

★**N. Y., Rome**—Bd. Pub. Wks. let contract to Warren Bros. Co., paving Bloomfield St., $8261; Jay St., $7735; William St., $7735; Court St. from Kossuth to Expense Sts., $3141, and Court St. from Kossuth to Bridge Sts., $3307; Ridge St., $6973; Elm St., $11,164. Noted July 17.

★**N. Y., St. Johnsville**—Village let contract paving Hough and South Division Sts., to Roberts & Co., Utica. About $16,400. Noted April 24.

★**N. Y., Salamanca**—Common Council let contract paving Kent and Front Aves., High, Washington and Linden Sts., to Morgan & Bock, Olean. About $90,000. Noted June 19.

★**N. Y., Seneca Falls**—Village will pave Clinton St. and several others, concrete. About $56,000. Work will be done by day labor. Noted April 10.

★**N. J. Elizabeth**—City let contract paving Elizabeth Ave. from 7th to Front Sts., to Newark Paving Co., 133 1st St., Newark, $211,378.

★**N. J., Hackensack**—Bd. Freeholders Bergen Co. let contract improving 4.63 mi. Paterson Plank Rd., to J. E. Doudon, New York City. About $150,000. Noted June 12.

★**N. J., Jersey City**—City let contract paving Jackson Ave., asphalt, to W. T. S. Crichfield, Washington St., Hoboken. About $10,000, cost plus percentage basis.

N. J., Jersey City—Comrs. Essex Co. received lowest bid repairing Lincoln Highway, from R. Enner, 190 Nesbit St., Weehawken, $10,000. Noted July 3.

N. J., Jersey City—Hudson Co. Blvd Comn. received bids repairing Hudson Co. Blvd. between Paterson Plank Rd. and Hackensack Plank Rd., from Clinton Contg Co., West Hoboken, 88 per cent. engineers' estimate, or $132,000; W. T. S. Crichfield, Washington St., Hoboken, 89½ per cent.; Curtin Bros., Guttenberg 98 per cent. Engineers estimate $150,000. Noted July 10.

★**N. J., North Bergen**—Town let contract improving Hill St., to E. Hornung, West Hoboken, $11,000. Noted Jan. 9.

N. J., Trenton—Comrs. Mercer Co received only bid paving 4100 sq.yd. Sullivan Way, Bridge St. and Riverside Ave., asphalt, from J. J. Barrett, 147 Lafayette Ave., $28,716.

★**Pennsylvania**—State Highway Dept., Harrisburg, let contract building 30,335 lin. ft. rein.-con. roadway, in North Milford and Bridgewater Twps., Susquehanna Co., to M. Stipp & Son, 435 Moir Court, Scranton, $223,673. Noted July 17.

Pa., Harrisburg—City received bid laying 16,334 sq.yd. asphalt pavement and 11,017 lin.ft. granite curbing, from Central Constr. Corp., Commonwealth Trust Bldg., $54,569 and $17,352 respectively.

★**Pa., Palmerton**—Boro. let contract improving Delaware Ave. with rein.-con. and slag sub-base, to S. L. Cyphers, South Bethlehem, $109,153. Noted July 17.

Pa., Pittsburgh—Allegheny Co. received bids paving between tracks 2540 ft. Glass and West Run Rds., in Homestead and Hays Boros., 14 ft. wide, involving 4900 sq.yd. Ligonier block stone, from McCrady Bros., Braddock, $31,966; Booth & Flynn, 1942 Forbes St., $31,703; T. Cronin Co., South 17th and Muriel Sts., brick, $34,288 asphaltic concrete, $30,125.

Pa., Pittsburgh—Allegheny Co. received bids paving 2800 ft. Bower Hill Rd. in Mt. Lebanon Twp., involving 5500 sq.yd. asphaltic concrete surface, 1950 sq.yd. Hillside vitr. brick or 7500 sq.yd. vitr. brick, 3850 sq.yd. integral raised curb, and 2000 cu.yd. earth excav., (1) brick, (2) asphaltic concrete, from T. Cronin Co., South 17th and Muriel Sts., (1) $34,288; (2) $30,125;

Streets and Roads (Continued)

J. B. Reed Co., 550 Bway., (1) $35,279, (2) $39,014; S. Gamble Co., Oliver Bldg., (1) $39,858, (2) $33,002; M. O'Herron Co., 1st and McKean Sts., (1) $36,977, (2) $32,-288; Columbus Asphalt Paving Co., (1) $28,670, (2) $30,590; McDonough & O'Toole, (1) $41,755; F. Donatelli, 334 South Lang St., (1) $35,352, (2) $34,244; also building 15,350 ft. Meridian and Gibsonia Rd. in Richland and McCandless Twps., involving 20,700 sq.yd. rein.-con., 5900 sq.yd. concrete foundation and shoulder, 9650 lin.ft. 6 in. underdrain, 23,500 cu. yd. earth excav., and 11,000 cu.yd. fill, from McLaughlin Constr. Co., Germania Bank Bldg., $128,812; M. O'Herron Co., $132,236; D. W. Challis & Sons, 420 Centennial St., Sewickley, $134,104.

★**W. Va., Benwood**—City let contract for ½ mi. vitr. brick pavement on concrete base, to P. J. Gilligan, Wheeling, $2.40 per sq.yd. About $10,000.

W. Va., Lewisburg—Comrs. Greenbrier Co. will lay 19,200 sq.yd. penetration macadam on James River and Kanawha Turnpike, 16 ft. wide. About $30,000. Work will be done by day labor. Noted May 22.

★**W. Va., Lewisburg**—Greenbrier Co. let contract surfacing 2 mi. road in Lewisburg Dist. to Doughner & Johnson, Ronceverte, $1.46 per sq.yd.

★**W. Va., Princeton**—Comrs. Mercer Co. will resurface 4.7 mi. Princeton-Athens and Princeton-Bluefield Rds., 16 ft. wide. About $28,000. Work will be done by day labor. Noted July 17.

★**N. C., Morganton**—City let contract paving Sterling, Greene, White and East Union Sts., Buckemmet and Valdese Aves., to Prudden & Co., 1907 2nd Natl. Bank Bldg., Toledo, $77,765.

★**Ga., Brunswick**—City let contract for 53,000 yd. brick pavement, to Georgia Eng. Co., Montgomery Bldg., Augusta, $2.53 per yd.; 52,000 yd. asphaltic concrete pavement, to Atlantic Bitulithic Co., Virginia Ry. & Power Bldg., Richmond, Va., $2.54 per yd. Noted June 12.

★**Ga., Brunswick**—Glynn Co. received bids paving 4.4 mi. Federal aid highway from city line to picric acid plant, from Smith Constr. Co., Forsyth Bldg., Atlanta, $95,000, Atlantic Bitulithic Co., Virginia Ry. & Power Bldg., Richmond, Va., $112,-000. Noted June 12.

★**Ohio**—State Highway Comn., Columbus, let contract building roads in following counties:

Coshocton Co., Sect. "C-2", Newark-Coshocton Rd., 2.04 mi., grading, constructing bridges and culverts and paving with brick, to Dunsweiler Constr. Co., Zanesville, $76,585.

Franklin Co., Sect. "M", Columbus-Sandusky Rd., 0.72 mi., grading and paving with brick on concrete base to A. W. Burns, 55 East State St., Columbus, $27,-307.

Sect. "O', Columbus-Sandusky Rd., 0.76 mi., grading and paving with brick on concrete base to A. W. Burns, 55 East State St., Columbus, $28,390.

Geauga Co., Sects. "T", "U", and "V-1", Chagrin Falls-Greenville Rd., 8.17 mi., grading, constructing bridges and culverts and paving with concrete to W. S. Newhall Co., Citizens Bldg., Cleveland, $305,174.

Miami Co., Sect. "D", Dayton-Covington Rd., 3.59 mi., grading, constructing bridges and culverts and paving with rein.-con. to Swank Engineering Co., Dayton, $96,509.

Sect. "H", Piqua-Urbana Rd., 0 53 mi., grading, constructing drainage structures and paving with rein-con. to Burke Bros. Constr. Co., Anderson, Ind., $15,661. Noted July 24.

★**Ohio** — State Highway Comn., Columbus, let contract building roads in following counties:

Henry Co., Sect. "A", Ottawa-Napoleon Rd., 3.01 mi., grading, constructing bridges and culverts and paving with waterbound macadam, to P. G. Watson, Malinta, O., $66,382.

Trumbull Co., Sect. "C", Warren-Burton Rd., 2.21 mi., grading, constructing bridges and culverts and paving with bituminous macadam, to Seiple & Wolf Co., Youngstown, $73,771.

Sect. "D", Warren-Burton Rd., 3 mi., grading, constructing bridges and culverts and paving with bituminous macadam to Seiple & Wolf Co., Youngstown, O., $111,-317. Noted July 17.

★**O., Brookville**—City let contract paving 8100 sq.yd. Pyrmont St., sheet asphalt, on 5 in. concrete base, to V. Wroe, 606 Union Bank Bldg., Dayton. About $27,995.

★**O., Toledo**—City let contract repaving 1625 ft. Bancroft St., from Vermont to Cherry Sts., 36 ft. wide, to Russell & Jennison Co., 2463 Bway., $32,768. Noted May 29.

★**O., Toledo**—City let contract asphalt paving 4190 ft. Hudson St., from Lagrange to Stickrey Sts., 24 ft. wide, involving 7172 cu.yd. excav., to H. P. Streicher Co., 319 Terminal Bldg., $63,173.

★**Mich., Orion** — City let contract grading, widening and paving with concrete 1 mi. Orion Rd., 18-31 ft. wide, to P. M. Lau, Pontiac, $81,000.

★**Mich., Pontiac**—Comrs. Oakland Co. let contract grading and surfacing with gravel 2 mi. Addison-Oakland Townline, 9 ft. wide, to P. C. Raymond, Pontiac, $17,787.

Mich., Port Huron—Comrs. St. Clair Co. received bids building 4.5 mi. Harris Rd. from Jeddo to Lake Shore Rd., Assessment Rd. Dist. No. 5, gravel, from E. Wilton, Port Huron, roads, culverts and bridges complete, $81,507, road only, less bridge and culverts, $72,978, road only, less gravel (to be furnished by county), $46,-080; 6⅜ mi. Lynn-Mussey Rd., Assessment Dist. Rd. No. 22, 9 ft. gravel with 2 bridges, culverts, etc., from H. Campbell, Goodells, road only, less bridges, culverts and gravel, $70,585; J. H. Baer, Port Huron, Bridge No. 1, $17,674, Bridge No. 2, $13,619, both rein.-con., culverts complete, $35,716; 2½ mi. gravel road in Lynn Twp., involving culverts, etc., from W. Burns, Port Huron, $25,600, Campbell & Teetbel, Goodells, $26,-221, Welsh & Williams, Port Huron, $27,-185.

★**Ill., Chicago**—Forest Preserve Dist., Cook Co., Cook Co. Bldg., let contract paving Carpenter Rd., Niles Twp., to A. Jaicks, River Forest, $25,774. Work involves 9250 sq.yd. 7 in. concrete, 18 ft. roadway, 5140 sq.yd. earth shoulders, 3518 cu.yd. excav., etc. Noted July 10.

Ill., Chicago—See "Sewers."

Wis., Sheboygan—City received only bid grading and paving 2.7 mi. Martin Ave. from North 15th St. to Calumet Dr., 20 ft. wide, from Pestien & Nauman, North 15th St., $2.31 yd. Work involves 8500 sq.yd. concrete, 4400 lin.ft. concrete curb and gutter. Noted July 17.

Wis., Sheboygan—City received only bid grading and paving 1.8 mi. St. Clair Ave., 20 ft. wide, from Pestien & Nauman, North 15th St., $2.18 per yd., total $21,980. Work involves 7000 sq.yd. 2 course concrete, 2480 lin.ft. concrete curb and gutter. Noted July 3.

★**Minn., Mantorville**—G. L. Taylor, aud. Dodge Co., let contract grading and graveling 12 mi. Federal Aid Project No. 66, State Rd. No. 1, Job No. 1802, 24 ft. wide, to Fulton & Nelson, Minneapolis. About $85,000. Noted July 3.

★**Minn., Pipestone**—Comrs. Pipestone Co. let contract graveling 5 mi. Job. No. 1905, State Rd. No. 4, to J. P. Pedersen, Ruthton, $6850; grading and graveling Job No. 1904, State Rd. No. 6, to Rodgers & Curtis, Globe Bldg., Minneapolis, $40,000. Noted June 19.

★**Minn., Virginia**—City let contract improving 14th, 15th and 16th Sts., 7th, 8th and 9th Aves., to Lawrence-McCann Co., Eveleth, $42,503.

★**Neb., Lincoln**—City let contract paving 16th, 19th and Park Sts., to Abel Constr. Co., 318-19 Terminal Bldg., $29,892; 24th, 31st, N. and Dudley Sts., to Burke Cochrane Co., 522 1st National Bank Bldg., $28,584. Noted July 10.

★**Mo., St. Louis**—City let contract building parkway, curb and granitoid cross walks on King's Highway from Natural Bridge to Penrose Park northeast to West Florrisant Ave., to R. G. Mincke, 4059 McRee Ave. About $10,064.

★**N. M., Albuquerque**—City let contract to El Paso Bitulithic Co., Alameda and Texas Ave., El Paso, paving 60 streets involving 25,990 sq.yd. bitulithic on 5 in. concrete base at $2.65 per sq.yd., paving 13 alleys with 6 in. concrete, $2.50 per sq.yd. Noted May 29.

★**N. M., Gallup**—City let contract for 15,000 sq.yd. concrete pavement, to S. P. Gillis Constr. Co., Arizona. About $68,400.

★**Utah, Brigham**—City let contract for 15,000 lin.ft. 2 in. bitulithic pavement on 4 in. crushed rock base, to Gibbons & Reed Co., Kearns Bldg., Salt Lake City, $131,300.

★**Ariz., Tombstone**—City let contract grading and graveling 3 mi. road across Willcox Lake, to J. Rock and J. S. Chamberts, Tombstone, $1.90 per cu.yd. About $15,000.

★**Washington** — State Highway Comn., Olympia, let contracts paving 4.3 mi. Vancouver-Fischers Rd., involving 56,048 sq.-yd. concrete, to Pacific Bridge Co., foot of Salmon St., Portland, $128,913; 5.3 mi. Granger-Sunnyside Rd., Yakima Co., to Savage & Cornell, Yakima, $143,965. Noted July 3.

Wash., Seattle—City received bids July 18, paving Harbor Ave., S. W., involving 14,600 sq.yd. 7 in. concrete, 17,000 cu.yd. earthwork and grading, from Independent Asphalt Paving Co., Seaboard Bldg., $76,-615; J. L. Smith, Seattle, $78,856; Fiorito Bros., Seattle, $79,813.

Wash., Seattle—Comrs. King Co. received bids July 14, building 3.27 mi. Bellevue-Newport Rd., 24 ft. wide, from Hanson & Hauge, $76,800; J. W. Hoover Co., $89,047; H. Pederson, $89,250. All contractors from Seattle. Noted July 3.

★**Wash., Sedro Woolley**—City Council let contract laying concrete sidewalks, to J. H. Steele, Sedro Woolley, $19,563.

Wash., Vancouver—City received bids paving (a) 4th Plain Ave., (b) Daniels St., concrete, from Warren Constr. Co., Journal Bldg., Portland, (a) $25,236, (b) $3763; United Contg. Co., Northwestern Bank Bldg., Portland, (a) $24,986, (b) $3657.

★**Ore., North Bend**—City let contract paving Sherman St., asphaltic concrete, concrete curbing, concrete sidewalk, to Scandie Contg. Co., North Bend, $17,987. Noted June 5.

Ore., Portland—City received bids July 16, paving (a) Clatsop Ave., (b) Linn Ave., (c) East 20th St., (d) 72nd St., (1) asphaltic concrete No. 1 on crushed rock base, (2) 2 in. crushed rock base, (3) concrete No. 1 on crushed rock macadam, from Warren Constr. Co., Journal Bldg., (a1) $1.34 per sq-yd., (a2) $0.64, total cost, $13,640, (b1) $1.34, (b2) $0.64, $14,589, (c) $30,578; Cochran Bros., Portland, (a1) $2.07, $13,644, (b1) $2.07, $14,520, (d3) $2.25 per sq.yd., $51,084. Noted July 24.

Cal., Newport Beach—City trustees received bids paving 28th, 30th and 31st Sts., involving 67,450 sq.ft. 5 in. concrete, from E. Scheilling, 4318 Figueroa St., Los Angeles, $14,839; Rogers Bros., Hibernian Bldg., Los Angeles, $17,402.

★**Cal., Oakland**—City let contract improving 86th Ave., to P. A. Belser, 625 Market St., San Francisco, $14,980. Noted July 17.

★**Cal., Oakland**—City let contract improving Hoplins, East 37th, Kingsley and Emerson Sts., to Bates & Borland, Bway. and 12th St., $12,538. Noted June 26.

★**Cal., San Bernardino**—Bd. Supervs. San Bernardino Co. let contract grading, curbing and paving with 4 in. concrete 2¼ mi. Hermosa Ave., et al, Impvt. Dist. No. 7, to R. T. Shea & Co., Riverside, $54,740.

★**Cal., Stockton**—Bd. Supervs. San Joaquin Co. let contract building 8 mi. Germinous Rd., 4 mi. waterbound and 4 mi. oil macadam, to C. Moreing, Commercial & Savings Bank Bldg., $69,400.

★**Sask., Saskatoon**—City let contract paving 1902 ft. Saskatchewan Crescent from Traffic Bridge to existing pavement on Saskatchewan Crescent, South, at Lorne Ave., to Bitulithic Co., Ltd., Saskatoon, pavement, $4.10 per sq.yd., concrete gutter, $.45 per sq.ft., concrete curb and gutter, $1.10. Noted June 12.

Railways

PROPOSED WORK

West Virginia—D. E. Hewitt, 1st Natl. Bank Bldg., Huntington, and others, soon receive bids building 1½ mi. standard gage railway from man to timber operations. Engineer not selected.

Railways (Continued)

Alabama—Southern Ry., 18th and Powell Sts., Birmingham, plans to build railroad yard in Birmingham, extending from 32nd St. to 51st St. and from 1st Ave. to Seaboard Air Line tracks. Plans include rein.-con. roundhouse capable of accommodating 100 engines and construction of subway at 41st or Spring Sts. About $4,000,000. R. W. Williams, dist. engr.

Michigan—See "Miscellaneous" under Detroit.

California—H. N. Savage, city hydraulic engr., of San Diego, has arranged with San Diego & Arizona Ry., Spreckles Bldg., San Diego, to build long spur track to Barrett dam site near San Diego. E. J. Kallright, ch. engr.

California—Western Pacific R. R., Mills Bldg., San Francisco, having survey made for branch line from Turlock to Madera, about 50 mi. T. J. Wyche, ch. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Kentucky—Big Sandy & Eastern Kentucky Ry., Ashland, received bid building and grading 7 mi. line, including 740 ft. tunnel, from N. K Sneed, 418 1st Natl. Bank Bldg., Huntington.

Excavation and Dredging

PROPOSED WORK

Minn., Moorhead—Ditches—Comrs. Clay Co. having plans prepared by E. Martinson, engr., Moorhead, digging Co. Ditch No. 42 and repairing Co. Ditch No. 30. About $25,000.

Mont., Columbus — Drainage—Stillwater Co. rejected bids received July 20, building lake drain. Work will soon be readvertised. H. C. Rothwell, Columbus, engr. Noted July 10.

Utah, American Fork—Irrigation—Lehi Irrigation Co. and cities of American Fork and Pleasant Grove having plans prepared for dam and division wier to be used to divide water for the municipalities from here, to Pleasant Grove. About $10,000 Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs.

Utah, Salt Lake City—Irrigation Dam—Bates Reservoir Co. having preliminary plans prepared for multiple arch dam, 75 ft. high, to impound 20,000 acre ft. water. About $200,000.

Ore., Klamath Falls—Irrigation—Walker Basin Irrigation Co. and State Desert Land Bd. having plans prepared irrigating and draining 17,000 acres in Klamath and Deschutes Counties. About $50,000. Address F. Tomes, La Pine.

Ore., Vale—Irrigation — Warm Springs Irrigation Co. plans to sell $400,000 bonds Aug. 5 to complete irrigation system. Work includes building 10 canals, laterals and flumes for irrigation of 29,000 acres in Malheur Co., concrete arched dam, 100 ft. high across middle fork Malheur River, 6 mi. above Riverside, and reservoir 170,000 acre ft. capacity or sufficient to irrigate 40,000 acres. J. Lewis, Vale, engr.

BIDS DESIRED

Pa., Phila.—Dredging—Until Aug. 7, by city, dredging high spots in Schuylkill River near Fairmount Park. About $25,000. A. Corson, Room 127, City Hall, engr.

Mich., Lansing—Drainage—See "Streets & Roads" under Michigan.

Minn., Faribault—See "Streets and Roads."

Minn., Tower—Dredging—Until Aug. 5, by W. H. Borgen, aud. St. Louis Co., (Duluth) dredging 500 lin. ft. channel to depth of 8 ft. below water line, 5000 lin. ft. pipe protection and 27,911 cu.yd. excav., near East Two Rivers. R. W. Acton, co. engr.

Cal., Sacramento — See "Streets and Roads" under Sacramento.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ia., Marshalltown**—Excavation—Comrs. Marshall Co. let contract straightening 14 mi. Iowa River, involving 1,400,000 yd. floating dredgework, to Pollard & Campbell. 348 Brandeis Theatre Bldg., Omaha, Neb., $11.5 per yd.; total cost, $161,000.

Wash., Seattle—Drainage—Comrs. King Co. let contract building Impvt. D. D. No. 7. including main ditch and laterals, to Chamberlain Constr. Co., Seattle, $18,436. Work involves 42,650 cu.yd. earth excav.

★**Ore., Echo**—Irrigation—Teel Irrigation Co. let general contract building irrigation project, to include reservoir, storage capacity to water 20,000 acres, canals, laterals and building sawmill for flume lumber, 75,000 ft. daily capacity, to Warren Constr. Co., Journal Bldg., Portland; also building 12,341 ft. tunnel, concrete where it does not go through solid rock, 8 ft. wide, 7 ft. high, to Rajoite, Fobert & Winters, Ziegler Bldg., Spokane. Total cost of project, $930,000. Noted Apr. 3.

Industrial Work

PROPOSED WORK

Mass., Chicopee Falls—Chicopee Mfg. Co., West Main St., soon receives bids building weave shed addition to plant. About $100,000. Private plans.

Mass., East Springfield (Springfield P. O.) —Springfield Tool Co., Inc., 125 Dwight St., Springfield, soon lets contract building 1 and 2 story, 90 x 200 ft., brick and mill construction factory and office, rein.-con. flooring, concrete foundation, here. About $55,000. Private plans.

Mass., Mittineague — Strathmore Paper Co. having plans prepared for factory. About $100,000.

Mass., Springfield—A. D. Potter, Greenfield, soon lets contract building 1 story, 100 x 290 ft. warehouse and 100 ft. grain elevator, timber, concrete flooring, concrete foundation on Page Blvd. and St. James Circle. About $100,000. Private plans.

Mass., Worcester—E. J. Cross, archt., 82 Foster St., preparing plans for 8 story, 84 x 143 ft., concrete and steel manufacturing plant, concrete foundation, on Franklin St. About $250,000. M. L Feeney, 808 State Mutual Bldg., agt. Owner's name withheld. Engineer not selected.

Mass., Worcester—G. B Cutting, archt., 4 Walnut St., preparing plans for 8 story, 98 x 133 ft., concrete and steel manufacturing plant, on Hygeia St. About $250,000. M. L. Feeney, 808 State Mutual Bldg., agt. Owner's name withheld. Engineer not selected.

Mass., Worcester—B. L. Handelman soon receives bids building 2 story, 150 x 200 ft. brick garage, rein.-con. flooring, concrete foundation, on Mechanic St. About $100,000. C. R. Hoyle, 1038 Slater Bldg., archt. Engineer not selected.

Mass., Worcester—S. H. Pitcher Co., engrs., 44 Front St., soon receives bids building 2 story, 60 x 150 ft., brick and concrete garage, rein.-con. flooring, concrete foundation, on Austin St. and Houchin Ave., for Worcester Paper Box Co., 68 High St. About $45,000.

R. I., Providence—Genl. Baking Co., 207 Brook St., plans to build brick and concrete addition to bakery on John and William Sts. About $150,000.

Conn., New Haven—Brown & Von Beren, archts. and engrs., 185 Church St., soon receive bids building 2 story, 83 x 100 ft. brick and mill construction factory, concrete foundation, on Greene and Olive Sts., for Alper, Krall & Co., 44 Crown St. About $40,000

N. Y., Falconer—Merriam Cabinet Co plans to remodel Chatauqua Planing Mills. About $25,000.

N. Y., Little Falls—Barnet Leather Co., 598 East Mill St., plans to build 3 story brick addition to plant. About $35,000. Address E. L. White, supt.

N. Y., New York—T G Cowan, 125 West 53rd St., having plans prepared by W. J. Russell, archt., 73 West 46th St., for 5 story, 40 x 200 ft., brick and steel garage, rein.-con. flooring, at 127-129 West 53rd St. About $25,000.

N. Y., New York—Cudahy Packing Co. 454 West 14th St., receives bids about Aug. 8, altering and building 2 story, rein.-con. and steel addition to packing plant, rein.-con. flooring, concrete foundation, at 611 West 34th St. About $50,000. Private plans. Noted July 3.

N. Y., New York—A. Lobo, 1133 Bway. soon lets contract building 2 story, 40 x 75 ft., brick and steel warehouse, rein.-con. flooring, brick foundation, at 401 403 Canal St About $30,000. J. M. Felson, 1133 Bway., archt. and engr.

N. Y., New York—Realty Corp., West 26th St., had plans prepared by W. Higginson, archt and engr., 18 East 41st St., altering 8 story rein.-con., brick and steel factory, rein.-con. flooring, at 518-534 West 26th St. About $155,000.

N. Y., New York—Swift & Co., 32 10th Ave., had plans prepared for 10 story, rein.-con. and steel refrigerating plant, rein.-con. flooring, concrete foundation, on West 14th St. About $1,000,000 . Private plans.

N. Y., New York—United Dressed Beef Co., 32 10th Ave., had plans prepared for 7 story irregular shaped packing plant and 5 story, 75 x 103 ft. pen for cattle, rein.-con. and steel, rein.-con. flooring, concrete foundation, on 1st Ave. and 44th St Cost $175,000 each. Private plans.

N. Y., Nunda—Peck & Pratt, Inc., purchased site and plans to build rein.-con condensed milk plant. Cost, including equipment, between $35,000 and $50,000.

N. Y., Syracuse—Brown, Lipe, Chapin Co., 110 Seneca St., plans to build 5 story, 70 x 78 ft. and 2 story, 50 x 50 ft. factories, on Ontario and West Fayette Sts., both rein.-con. About $125,000 and $75,000 respectively. G. L. Noble, Union Bldg., archt. and engr.

N. Y., Syracuse—A. E. Nettleton Co., 302 Pearl St., plans to build factory on East Willow and Pearl Sts. About $100,000. H. W. Cook, vice. pres.

N. Y., Theresa—Borden Milk Co., 63 Vesey St., New York City, plans to rebuild plant and station here which was recently destroyed by fire. Estimate lost, $25,000 A. Ackerman, Theresa, mgr.

N. J., Trenton—Thermoid Rubber Co., Whitehead Rd., having preliminary plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., Cleveland, for 3 story, 100 x 270 ft., rein.-con., brick and steel plant. About $150,000.

Pa., Archbald—Clemons Silk Co. plans to build 2 story, 75 x 100 ft. concrete and brick weaving plant, rock foundation, on John St. About $72,000. G. N. Edson, Connell Bldg., Scranton, archt.

Pa., Duryea—Universal Industrial Corp. plans to build 1 story, 52 x 130 ft. concrete, steel and brick mill, concrete foundation, with 30 x 40 ft. wing. About $60,000. E. H. Davis and G. M. D. Lewis, Union Bank Bldg., Scranton, archts.

Pa., Erie—Continental Rubber Co., 19th and Liberty Sts., having preliminary plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., Cleveland, for 2 story, 78 x 130 ft., steel and brick power plant. About $75,000.

Pa., Phila.—Sears Roebuck & Co., Arthington and Homan Aves., Chicago, having preliminary plans prepared by G. C. Nimmons & Co., archts., 122 South Michigan Ave., Chicago, for 9 story, mail-order warehouse, here. About $1,000,000.

Pa., Pittsburgh—United Eng. Co., Farm Bank Bldg., having preliminary sketches made by Hunting-Davis Co., archts., Century Bldg., for 1 and 2 story, 100 x 440 ft. and 45 x 100 ft. brick and steel foundry on 54th St. including office, dining room, etc.

Pa., Scranton—T. W. Bentley plans to build 3 story, 50 x 110 ft. concrete and brick mill on Wyoming Ave. About 100,000. L. Hancock, Mears Bldg., archt.

Pa., Scranton—Heath Silk Co. plans to build 3 story, 50 x 100 ft., concrete and brick mill, concrete foundation, on Wyoming Ave. About $66,000. G. N. Edson, Connell Bldg., archt.

Pa., Scranton—J. W. Howell, Mears Bldg., plans to build 3 story, 30 x 90 ft. concrete and brick warehouse, rein.-con. flooring, concrete foundation, on Lackawanna Ave. About $50,000. L. Hancock, Mears Bldg., archt.

Industrial Works (Continued)

Pa., Scranton—Maccar Truck Co., Cliff St., plans to build 1 story, 45 x 70 ft. brick, concrete and steel power plant, rein.-con. flooring, rock foundation, on Mulberry Ave. About $60,000. Davis & Lewis, Union Bank Bldg., archts.

W. Va., Clarksburg — See "Water Works."

W. Va., Huntington—Standard Ultramarine Co., 5th Ave. and 25th St., plans to build 3 story, 80 x 100 ft., concrete, steel and brick laboratory, on 24th St. About $25,000.

N. C., Cherryville — Rhyne-Houser Mfg. Co. plans to build 2 story, 79 x 220 ft brick and cement mortar factory, concrete foundation, near Seaboard Air Line Ry. About $25,000. J. H. Mayes, Realty Bldg., Charlotte, engr.

N. C., Gastonia—Meyers Mills plans to build 1 story, 133 x 420 ft. rein.-con. and brick mill, concrete foundation, also three 1 story, 50 x 100 ft., rein.-con. and brick warehouses, concrete foundation. Robert & Co., Candler Bldg., Atlanta, Ga., engrs. and archts.

N. C., Kannapolis — Cabarrus Cotton Mills, Pickers Bldg., plans to build two 3 story mills, 100 x 150 ft., and 104 x 380 ft., mill construction. Robert & Co., Candler Bldg., Atlanta, Ga., engrs. and archts.

N. C., Kannapolis—Cannon Mfg. Co. plans to construct 4 story, 100 x 200 ft. mill, 4 story, 100 x 275 ft cotton mill, and four 1 story, 50 x 100 ft. warehouses, all mill construction. Robert & Co., Candler Bldg., Atlanta, Ga., engrs. and archts.

Ga., Columbus—Bibb Mfg. Co., 32nd St., plans to build 6 story, 130 x 600 ft. mill and 1 story, 200 x 500 ft. weave shed, both rein.-con. and brick, rein.-con. flooring, concrete foundations. Robert & Co., Candler Bldg., Atlanta, engrs.

Ga., Macon—Payne Mills plans to build two 1 story, 50 x 100 ft. warehouses, and 1 story, 75 x 435 ft. heavy mill construction plant. Robert & Co., Candler Bldg., Atlanta, engrs.

Ga., Thomaston—Peerless Cotton Mills plan to build 2 story, 132 x 480 ft., rein.-con. and brick mill and four 1 story, 50 x 100 ft. brick warehouses, concrete foundation. Robert & Co., Candler Bldg., Atlanta, archts. and engrs

Fla., Orlando—Dickerson Ives Co., Mercantile Ave., having plans prepared for 4 story, concrete and steel factory, to cover 33,000 ft. floor space. About $125,000.

Fla., Palmetto—D. M. and J. C. Courtney having plans prepared for a 2 also 1 story addition to packing plant.

Ala., Birmingham—Alabama Packing Co., 3031 21st Ave. N., plans to build addition to plant. R. E. Lewis, representative. About $200,000.

Ala., Montgomery — Alabama-Georgia Syrup Co., Jones St., plans to build 2 story, 95 x 170 ft., rein.-con. and brick factory, concrete foundation, on North Court St. About $50,000. Okel & Cooper, Vandiver Bldg., archts.

O., Ashland—Ashland Tire & Rubber Co. having plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., Cleveland, for 2 story, 75 x 125 ft., rein.-con., steel and brick plant. About $90,000.

O., Ashland—Faultless Rubber Co. having plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., Cleveland, building 3 story, 80 x 160 ft., rein.-con., steel and brick addition to factory. About $75,000

O., Carthage—Lunkenheimer Co., Beekman and Tremont St., Cincinnati, plans to build concrete factory and clubhouse here. About $1,500,000.

O., Cleveland—Chandler Motor Co., East 131st St. and St. Clair Ave., plans to build 3 story, 80 x 400 ft., rein.-con., steel and brick machine shop addition About $200,000 Architect not selected.

O., Cleveland—Cleveland Automobile Co., 300 East 131st St., plans to build 4 story, 80 x 400 ft., rein.-con., steel and brick factory addition, on Euclid Ave. and London Rd. About $750,000. Architect not selected.

O., Cleveland—Cleveland Worsted Mills Co., 6300 Bway Ave., acquired site at 5442 Blanche Ave and plans to build 10 story, 89 x 105 ft. rein.-con., stone, steel and brick warehouse. About $400,000. Architect not selected.

O., Cleveland—Crescent Brass Mfg. Co., 8410 Lake Ave., plans to rebuild 3 story, 80 x 120 ft., rein.-con., steel and brick factory, recently destroyed by fire. About $50,000. Architect not selected.

O., Cleveland—P. A. Gear Co., 5112 St. Clair Ave., having plans prepared by Christian, Swatzenberg & Gaede, archts., 1900 Euclid Bldg., for 2 story, 60 x 200 ft. rein.-con., steel and brick machine shop, at 534 East 105th St. About $75,000.

O., Cleveland — Glidden Varnish Co., Madison Ave. and Berea Rd. having plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave. building 4 story, 59 x 90 ft. rein.-con., steel and brick grinding mill, on Madison Ave. About $60,000.

O., Cleveland — Jordan Motor Car Co., 1057 East 152nd St., plans to build 2 story, 97 x 167 ft. rein.-con., steel and brick factory addition. About $75,000. Architect not selected.

O., Cleveland—B. Moore & Co., 1314 Marquette Ave., plans to build 4 story, 60 x 100 ft., rein.-con., steel and brick factory, concrete foundation, on East 71st St. and Grant Ave. About $60,000. Architect not selected.

O., Cleveland—Natl. Malleable Castings Co., 7706 Platte Ave., having plans prepared for 3 story, 49 x 62 ft., rein.-con., steel and brick research laboratory, at 10509 Quincy Ave. About $50,000.

O., Cleveland—Sommer Adams Co., 2934 East 55th St., plans to build 2 story, 60 x 100 ft., rein.-con., steel and brick power house and factory, concrete foundation. About $75,000. Architect not selected.

O., Cleveland—E. A. Weinberger, Society for Savings Bank Bldg., plans to remodel 4 story, 52 x 140 ft. rein.-con., brick and steel factory, on Ontario and St. Clair Aves. About $30,000. Architect not selected.

O., Dayton—Dayton Reliance Tool & Mfg. Co., 818 East Monument St., plans to build rein.-con. and brick factory, rein.-con. flooring, concrete foundation. About $75,000.

O., Norwood—Dalton Adding Machine Co. having plans prepared for 4 story, 60 x 125 ft. factory on Beech St. About $75,000.

O., Warren—D. & M. Cord Tire Co., Engineers Bldg., having plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., building 3 story, 83 x 120 ft., rein.-con., steel and brick plant. About $75,000.

Mich., Allegan—Overton Creamery Co. having plans prepared by McCormich Co., archts. and engrs., Century Bldg., Pittsburgh, for creamery and dairy to include 40 x 50 ft. power house, rein.-con. and steel, rein.-con. flooring, concrete foundation, About $100,000.

Mich., Detroit — Belle Isle East Side Creamery Co., 1020 Forest Ave., E., having plans prepared by Williams Bros., archts., 1111 Kresge Bldg., for 2 story, 45 x 100 ft. rein.-con., brick and steel addition to creamery, rein.-con. flooring concrete foundation. About $40,000.

Mich., Detroit — A. Harvey's Sons Mfg. Co., 1st St., had plans prepared by Smith, Hinchman & Grylls, archts., Washington Arcade, for 2 story, 60 x 100 ft., rein.-con. and brick foundry, rein.-con. flooring, concrete foundation, on Bellevue Ave. and Michigan Central Ry.

Mich., Detroit—J. Wynne, Jr., 721 Ford Bldg., having plans prepared by G. W. Graves, archt., 43 John R St., for 2 story, 60 x 140 ft., brick and steel garage, concrete foundation, on Grand River Ave. About $55,000.

Mich., Marysville — Wills & Lee, Book Bldg., Detroit, having plans prepared by Smith, Hinchman & Grylls, archts., and engrs., 710 Washington Arcade, Detroit, for 1st unit of factory, to consist of power plant and 2 manufacturing units, rein.-con., brick and steel, concrete foundation, along St. Clair River.

Ill., Chicago—Century Rubber Wks., 1346 Rawson St., having plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., Cleveland, for 3 story, 200 x 350 ft., brick and steel factory, on La Salle St. About $200,000.

Ill., Chicago—See "Buildings."

Wis., Appleton—Fox River Tractor Co. plans to build plant. About $200,000.

Wis., Appleton—Interlake Pulp & Paper Co., John St., plans to build tower and install machinery About $125,000.

Wis., Black River Falls—City plans to improve hydro-electric plant, including vertical type waterwheel and 400 h.p. umbrella type generator. About $25,000.

Wis., Cedarburg—Cedarburg Creamery Co. plans to build 2 story, 50 x 80 ft. tile addition, concrete foundation. W. F. Hilgen, archt.

Wis., Manitowoc—Madson Seed Co., 718 Commercial St., plans to build 1 story, 50 x 60 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 8th St. About $25,000. Juul & Smith, Imig Bldg., Sheboygan, archts.

Wis., Marshfield—S. Miller Fruit Co. had plans prepared by Carpenter & Waldron, archts., Stock Exch. Bldg., Chicago, Ill., for 3 story, 42 x 136 ft., brick, rein.-con. and steel warehouse with refrigerating plant. About $60,000.

Wis., Peshtigo—T. A. Pomeperion having plans prepared for brick, concrete and steel paper mill. About $40,000. L. A. De Guere, Grand Rapids, engr.

Wis., Sheboygan—Northern Furniture Co., South Water and North Jersey Sts., plans to build 4-5 story, 65 x 190 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on New Jersey St. About $65,000. Architect not selected.

Minn., Duluth—Winkle Bros. Candy Co., 2115 West Michigan St., having plans prepared by E. F. Bromhall, archt., Alworth Bldg., for 2 story, concrete and brick factory, rock foundation, on London Rd. About $62,000.

Kan., Manhattan—Rocky Ford Milling Co. having plans prepared building 2 story plant. About $500,000. Private plans.

Mont., Great Falls—State Terminal Elevator, Ulm St., plans to build elevator on west side of Missouri River on "Old Stucco Mill." About $250,000.

Mont., Great Falls—M. Walls Hardware Co. plans to build warehouse. About $30,000. G. H. Shanley, 511 1st Natl. Bank Bldg., archt.

Mo., St. Louis—Natl. Metal Die Mold Co., 1627 Locust St., plan to build metal working plant and machine shop, at 207 North Bway. About $50,000. O. G. Stark, 1627 Locust St., pres. Architect not selected.

Tex., Ft. Worth—Oil House Supply Co. having plans prepared by Clarkson & Gaines, archts., Ft. Worth, building 2 story, 78 x 135 ft., rein.-con. and brick warehouse. Van Unworth & Byrd, Kansas City, Mo., engrs.

Tex., McKinney — McKinney Compress Co. plans to build additional shed and improve existing plant. About $40,000.

Utah, Salt Lake City—Headlund & Kent, engrs, Dooly Bldg., soon let contract building oil distilling plant for Rainbow Petroleum Oil Products Co. About $25,000.

Wash., Spokane—Spokane Drug Co., 707 Railroad Ave., plans to build 5 story, 116 x 142 ft. concrete and steel drug house, concrete foundation, on Wall St. About $200,000. A. L. Hawes, vice- pres. Architect not selected.

Cal., Chico—City Trustees having preliminary survey and estimate made for power plant in Chico Creek, to develop 3000 hp. F. S. Robinson, city engr.

Cal., Covina—Covina Citrus Assn. having plans prepared by Shepherd & Hamm, engrs., 315 Central Bldg., Pasadena, for 2 story, 150 x 175 ft., concrete, steel and hollow tile packing house, concrete foundation. About $70,000. Noted May 8.

Industrial Works (Continued)

Cal., Los Angeles — Goodyear Tire & Rubber Co., Market St., Akron, O., preparing plans for large tire and cotton fabric factory here. About $20,000,000. Noted July 10.

Que., Quebec—Terreau & Racine, 196 St. Paul St., plan to build 5 story, 75 x 150 ft., concrete factory. About $500,000. Architect not selected.

Ont., Kitchener—Canadian Consolidated Rubber Co., 137 King St., W., plans to build 4 story, rein.-con. addition to factory, rein.-con. flooring, concrete foundation, at 149 Strange St. About $1,000,000

Ont., London—H. C. McBride, archt., Molsons Bank Bldg., soon lets contract building 5 story, 150 x 300 ft., rein.-con. and brick tannery, on St. George St., for C. S. Hyman Co., Ltd., Richmond St. About $300,000.

Ont., Sault Ste. Marie—Algoma Steel Co plans to build 1 story, brick and steel extension to plant, concrete foundation. About $300,000. Private plans.

Ont., Windsor—C. H. Smith Co., Pitt St., having plans prepared by A. H. McPhail, archt., Bd. Trade Bldg., for 6 story, 30 x 120 ft., brick, rein.-con. and steel factory, rein.-con flooring, concrete foundation, on Ouellette Ave. About $100,000.

BIDS DESIRED

R. I., Westerly—Until Aug. 2, by Bilderbeck & Langdon, archts., Barrows Bldg., New London, Conn., building 1 story, 123 x 300 ft. brick and mill construction mill, concrete foundation, for New England Silk Co., Westerly. About $90,000.

N. Y., Antwerp—D. D. Kieff, archt., Flower Bldg., Watertown, receiving bids for rein.-con. and brick warehouse, for F. X. Baumert Milk Co., Antwerp. Cost including equipment between $50,000-$60,000.

N. Y., Brooklyn—Until Aug. 6, by H. J. Nurick, archt. and engr., 957 Bway., building 1 story, 100 x 185 ft. brick and steel warehouse, garage and workshop, rein.-con. flooring, concrete foundation, on Jefferson St., Wykoff and Flushing Aves., for Magid, Katzman & Strober, 58 Boerum St. About $120,000. Noted May 29.

N. Y., Syracuse—Until Aug. 25, by M. L. King, archt. and engr., Snow Bldg., for 1 story brick and steel foundry, concrete foundation, on Water St., for M. L. Oberdorfer Brass Co., 804 East Water St. About $40,000.

Pa., McKees Rocks—Hankey Baking Co. receiving bids building 2 story, 60 x 100 ft. steel and brick bakery. About $30,000. McCormick Co., Century Bldg., Pittsburgh, engrs. and archts.

Pa., Phila.—Bernstein Mfg. Co., Amer. and Allegheny Sts., receiving bids for 3 story, 52 x 152 ft. addition to factory. A. J. Sauer & Co., Denckla Bldg., archts.

Pa., Pittsburgh—Pittsburgh Gage & Supply Co., 30th and Liberty Sts. receiving bids building 6 story, 98 x 130 ft. rein.-con., steel and brick addition to factory, rein.-con. flooring, concrete foundation. W. G. Wilkins Co., Westinghouse Bldg., engrs. and archts.

O., Cleveland — City receiving bids constructing 1 story, 80 x 160 ft. concrete, steel and brick storage building, concrete foundation, on Division Av. About $50,000. F. H. Betz, 604 City Hall Bldg., archt.

O., Cleveland—T. Knight, Arcade Bldg., receiving bids for 1 story, 70 x 210 ft., concrete, steel and brick factory, on Scranton and Fairchild Aves. About $50,000.

O., Marion—Amer. Malleable Castings Co. receiving bids building 1 story, 70 x 75 and 60 x 70 ft., rein.-con., steel and brick foundry addition. About $50,000.

Mich., Detroit — Raseman & Freer, archts., 1302 Penobscot Bldg., receiving bids for 1 story, 240 x 140 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Conant Ave., for Swedish Crucible Steel Co., Butler St. and Grand Trunk Ry. Noted July 10.

Minn., Duluth—Until Aug. 15, by Marshall, Wells Co., Lake Ave., S., building 5 story, 115 x 250 ft., rein.-con., brick and steel warehouse and office, rein.-con. flooring, concrete foundation. About $250,000. German & Jenssen, Exch Bldg., archts and engrs.

Minn., Duluth—Until Aug. 10, by A. M. McDougall, mgr. McDougall Duluth Co., Riverside St., for 2 story, 90 x 100 ft. foundry and 1 story, 40 x 10 x 60 ft. pattern storage building on Polk St., both rein.-con., rein.-con. flooring, concrete foundation. About $50,000. A. Hanford, Lonsdale Bldg., archt. and engr.

Mo., Kansas City — C. S. Rider Co., archts., 612 Century Bldg., Cleveland, receiving bids building 3 story, 120 x 137 ft. rein.-con., concrete, steel and brick warehouse, on Darwin Ave., here, for Cleveland Metal Products Co., Ivanhoe Rd., Cleveland. About $100,000

Que., Donnacona—Donnacona Paper Co., Room 40, Toronto Stock Exch. Bldg., receiving bids building 150-ton capacity pulp and paper mill and fully equipped power plant to develop 5000 h.p. on Jaques Cartier River. Noted April 3.

Ont., Strathroy Until Aug. 8, by Dominion Canners, Aylmer, building rein.-con. and brick factory, rein.-con. flooring, concrete foundation, here. About $75,000. T. Wooster, Aylmer, archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Fall River** Weetamoe Mills will build brick and steel addition to factory. About $25,000. Work will be done by day labor.

★**Mass., New Bedford** — Continental Wood Screw Co., Mt. Pleasant St., let contract building brick and mill construction addition to factory, to Eastern Constr. Co., 660 Winter St., Woonsocket, R. I. About $50,000

★**Mass., Provincetown**—East Harbor Fertilizer Co., 293 Bridge St., Springfield, will build 2 story, 70 x 75 ft. brick and rein.-con. fertilizer plant, rein.-con. flooring, concrete foundation. About $30,000. Work will be done by day labor.

★**Mass., West Warren**—Warren Cotton Mills let contract building 3 story, 80 x 135 ft. addition, 2 story, 130 x 335 ft. card room, 1 story, 107 x 125 ft. picker house, rein.-con., steel and brick, rein.-con. flooring, concrete foundation, to Caspar Ranger Co., 12 Bond St., Holyoke. About $350,000. Noted July 10.

★**Mass., Willimansett** (Holyoke P. O.)—Paper Makers' Chemical Co., 529 Main St., Holyoke, let contract building 1 story, 66 x 206 ft. factory, 1 story, 26 x 36 ft. office and 1 story, 26 x 36 ft. garage, concrete and brick., rein.-con. flooring, concrete foundation, on Grattan St., here, to P. J. Kennedy & Co., Inc., 464 Maple St., Holyoke. About $75,000.

★**R. I., Cranston** (Providence P. O.)—Kenney Mfg. Co., 154 Greenwood St., Auburn, let contract building 1 story, 60 x 145 ft. and 20 x 60 ft. brick and mill construction addition to factory, concrete foundation, on Wellington St., here, to J. F. Cole, 81 Niagara St., Providence. About $25,000.

★**R. I., Cranston** (Providence P. O.)—United Wire & Supply Co., Auburn, let contract building 2 story, 100 x 120 ft. and 50 x 250 ft. brick and mill construction addition to factory in Auburn, concrete foundation, to W. H. Hamlyn & Son, 35 Greenwich St., Providence. About $125,000. Noted July 17.

★**R. I., Crompton**—Crompton Co. let contract building 2 story, 110 x 200 brick addition to mill, rein.-con. flooring, concrete foundation, to J. F. McCusher, Phenix. About $125,000.

★**R. I., Pawtucket**—Halliwell Co., Blackstone Ave., let contract building 2 story, 60 x 105 ft. brick and mill construction addition to bleachery, concrete foundation, to Cruise & Smiley Constr. Co., 188 Main St. About $40,000.

★**R. I., Pawtucket**—J. W. Little Co., 190 Exchange St., let contract building 2 story, 50 x 200 ft. brick and mill construction printing plant, concrete foundation, to F. G. Rowley Co., 260 Central Ave. About $40,000.

★**R. I., Pawtucket**—Nicholson-Thackray Co., Newall Ave., let contract building 1 story, 68 x 190 ft. brick warehouse, concrete foundation, to F. G. Rowley Co., Inc., 260 Central Ave. About $38,000

★**R. I., Providence**—Apco Mfg. Co., 702 Eddy St., let contract building 1 story, 80 x 200 ft. brick and mill construction addition to factory, concrete foundation, to C. I. Bigney Constr. Co., Inc., 898 Westminster St. About $30,000.

★**R. I., Providence**—W. R. Walker & Son, archts., 17 Custom House, let contract, to Interstate Constr. Co., 29 Weybosset St., for 2 story, 50 x 100 ft. brick and rein.-con. garage, rein.-con. flooring, concrete foundation, on Friendship St., for P. H. Quinn, 1411 Turks Head Bldg. About $25,000. Noted May 15.

★**R. I., Woonsocket**—French Worsted Co., Hamlet Aves., let contract building 40 x 60 ft. brick and mill construction addition to boiler house, rein.-con. flooring, concrete foundation, also 150,000 gal. rein.-con. feul oil tank, to W. Aubin, 1103 Diamond Hill Rd. About $25,000.

★**Conn., New Britain**—Hart & Hutchinson Co., Corbin Ave., let contract building 1 story, 77 x 340 ft. brick and steel addition to factory, concrete foundation, to J. H. Grozier Co., 756 Main St., Hartford About $70,000. Noted July 17.

★**Conn., New Haven**—Amer. Radiator Co., 820 South Michigan Ave., Chicago, let contract building brick and concrete warehouse, concrete foundation, brick and concrete superstructure, on South Front St. here, to Larkin-Carey Co., 166 Brewery St. About $150,000.

★**Conn., New Haven**—R. W. Foote archt., 185 Church St., let contract, to Larkin-Carey Co., 166 Brewery St., for 1 story, 60 x 220 ft. brick and steel garage, show room and service station, rein.-con. flooring, concrete foundation, on Bway. for N. B. Whitfield, 296 Elm St. About $50,000 Noted July 3

★**Conn., New Haven**—I. Weinstein archt., 6 Church St., let contract, to I. Alpert, 42 Elliott St., for 2 story, 80 x 100 ft. brick and concrete bakery, rein.-con flooring, concrete foundation, on Broad and Commerce Sts., for A. M. Levine, c/o archt About $50,000. Noted May 1.

★**Conn., New Haven**—S. D. Woodruff & Sons, Orange, let contract building 1 story 80 x 140 ft. garage with 40 x 80 ft. wing concrete and brick, rein.-con. flooring, concrete foundation, on Whalley Ave., to C. W. Murdock, 185 Church St. About $55,000. Noted July 10.

★**Conn., Putnam**—Manhasset Mfg. Co., Turks Head Bldg., Providence, let contract building 2 story, 100 x 100 ft. brick and mill construction mill, concrete foundation to Torrington Bldg. Co., 197 Water St., Torrington. About $125,000. Noted July 17.

★**Conn., Sound Beach**—Dalton Mfg. Co., 1915 Park Ave., New York City, let contract building 1 story, 100 x 400 ft. brick and steel plant, also power house, garage, office and locker building, here, to R. Deeves & Son, 309 Bway., New York City About $200,000.

★**N. Y., Brooklyn**—J. B. Camerdella, 215 Montague St., will build 1 story, 100 x 125 ft., brick and steel garage, rein.-con. flooring, brick foundation, on 4th Ave. and 65th St. About $30,000 Work will be done by day labor.

★**N. Y., Brooklyn**—Coyne & Delaney, 832 Kent Ave., will build 3 story, 50 x 120 ft., brick and steel factory, rein.-con. flooring concrete foundation, on Flushing and Mt. Olivet Aves. About $70,000. Work will be done by day labor.

★**N. Y., Brooklyn**—French Builders, 142 East 43rd St., will build 1 story, 105 x 133 ft., brick and steel garage, brick foundation, on Christopher and East New York Aves. About $35,000 Work will be done by day labor.

★**N. Y., Brooklyn**—P. Glickman 44 Court St., will build 1 story, 100 x 160 ft., brick and steel garage, rein.-con. flooring, brick foundation, on President St. and Franklin Ave. About $40,000. Work will be done by day labor.

★**N. Y., Brooklyn**—L. Gold, 44 Court St., will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, brick foundation, on Ave. Q and East 10th St. About $25,000. Work will be done by day labor

Industrial Works (Continued)

★**N. Y., Brooklyn**—E. Greenfield & Son, 95 Lorimer St., let contract building 6 story, 40 x 100 ft., brick and rein.-con. factory, rein.-con. flooring, concrete foundation, on Lorimer St. and Marcy Ave., to Turner Constr. Co., 242 Madison Ave., New York City. About $80,000. Cost plus percentage basis.

★**N. Y., Brooklyn**—L. Nodica, 250 Troutman St., will build 1 story, 50 x 90 ft., brick and steel factory, on Troutman St. and Knickerbocker Ave. About $35,000. Work will be done by day labor.

★**N. Y., Brooklyn**—D. Norton, 301 Douglas St., will build 1 story, 60 x 100 ft., brick and steel garage, rein.-con. flooring, brick foundation, at 357 Douglas St. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—J. B. Silman, 1511 Emmons Ave., will build 1 story, 110 x 125 ft. brick and steel garage, rein.-con. flooring, concrete fonudation, on Bridge St. and Willoughby Ave. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Weingold Realty & Constr. Co., 122 Dumont St., will build 1 story, 100 x 110 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Pacific St. and Washington Ave. About $25,000. Work will be done by day labor.

★**N. Y., Kingston**—Standard Oil Co., 26 Bway., New York City, let contract building 60 x 80 ft. warehouse, 32 x 52 ft. garage, 24 x 50 ft. filling shed, 22 x 24 ft. wagon house, all 1 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to H. D. Best, 949 Bway., New York City. Cost plus percentage basis.

★**N. Y., Lockport** — Upson Co., Upson Point, let contract building rein.-con. mill, to include beater room, machine, engine, boiler and roll paper stock rooms, to Abertaw Constr. Co., 27 School St., Boston. Cost between $250,000 and $300,000.

★**N. Y., Long Island City**—H. Balcom, archt. and engr., 10 East 47th St., New York City, let contract to Levering & Garrigue, 552 West 23rd St., New York City, for 6 story, 132 x 200 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Nott, Manby, Anable and Mount Sts., here, for S. Blickman, 199 Lafayette St., New York City. About $400,000. Noted July 3.

★**N. Y., Long Island City**—Tidewater Oil Co., 11 Bway., New York City, let contract building 2 story, 30 x 140 ft. garage and 3 story, 51 x 60 ft. warehouse, rein.-con. and brick, concrete foundation, on Greenpoint Ave. and Newtown Creek, to H. D. Best, 949 Bway., New York City. Cost plus percentage basis.

★**N. Y., New York**—H. S. Coffin, 44 Pine St., will build 2 story, 99 x 188 ft., brick and steel garage, rein.-con. flooring, brick foundation, at 388-394 11th Ave. About $100,000. Work will be done by day labor under supervision of G. M. McCabe, archt., 96 5th Ave. Noted July 3.

★**N. Y., New York**—R. T. Crane, Jr., 1550 Lake Shore Dr., Chicago, let contract building 4 story, rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, at 1996-2010 Park Ave., here, to White Constr. Co., 95 Madison Ave. About $175,000. Noted June 5.

★**N. Y., New York**—D Meenan, 1966 Bway., let contract building 6 story, 87 x 100 ft., brick and steel garage, rein.-con. flooring, brick foundation, to Standard Concrete Steel Co., 105 West 40th St. About $200,000. Noted June 19.

★**N. Y., New York**—Peerless Towel Supply Co., 29 Lafayette St., let contract building 4 story, 75 x 100 ft., rein.-con and steel assembling and distributing plant, rein.-con. flooring, concrete foundation, at 372-376 Gold St., to Austin Co., 217 Bway. About $120,000.

★**N. Y., Pierrepont Manor** — Northern New York Milk Producers' Assn. let contract building milk handling station and condensery, to O. D. Greene, Adams. About $200,000. Cost plus percentage basis. Noted June 12.

★**N. J., Jersey City**—Eastern States Refrigerating Co., 147 16th St., let contract building 7 story, concrete and brick plant on Provost St., to L. Green, Springfield, Mass. About $150,000. Noted June 26.

★**Pa., Phila**—Dodge Steel Co., Tacony St., let contract for 1 story, 116 x 800 ft., steel foundry, to Austin Co., Bulletin Bldg.

★**Pa., Phila.**—Sherritt & Stoer, Finance Bldg., let contract for 3 story, 35 x 160 ft. warehouse at 2006 Market St., to W. Steel & Sons Co., 16th and Arch Sts. About $60,000.

★**Pa., Pittsburgh**—Singer Nimick Plant of Crucible Steel Co., West Carson St., let contract altering and building addition to plant, to Toupet, Beil & Conley, 5814-16 Ellsworth Ave., E. E. About $150,000, percentage basis.

★**Pa., Pittsburgh**—Wolverine Supply & Mfg. Co., Page and Fontella Sts., North Side, let contract building 5 story, 70 x 100 ft. rein.-con. and steel factory, on Page St., to H. Shank Co., 132 7th St. About $125,000. Noted July 10.

★**Pa., Retreat**—Retreat Poor House let contract building 1 story, 46 x 300 ft. timber hog barn, concrete foundation, to A. Hilbrandt, 91 Wood St., Wilkes-Barre. About $52,000.

★**Md., Baltimore**—W. Schluderberg & Son, 4th and Bank Sts., let contract building 5 story brick and concrete packing plant, rein.-con flooring, concrete foundation, on East Baltimore St., to Consolidated Eng. Co., 243 Calvert Bldg. About $250,000. Noted July 10.

★**W. Va., Wheeling**—J. E. Moss Iron Wks., 28th and Chapline Sts., will build 1 story, 125 x 250 ft. plant, on 29th St. About $60,000. Work will be done by day labor.

★**N. C., Fayetteville**—Jackson Bros. Co., Salisbury, Md, let contract building 2 story, brick and timber, planing mill and box shook factory, here, to Irwin & Leighton, 126 North 12th St., Phila.

★**N. C., Shelby**—Shelby Cotton Mills will build 2 story addition to mill. Cost between $75,000 and $100,000. Work will be done by day labor.

★**Fla., Sarasota**—City let contract building 47 x 68 ft. power and water plant, concrete and Dennison inter locking tile stucco, to Southern Constr. Co., St. Petersburg.

★**Ala., Birmingham**—H. B. Odell, agt. Packard Motor Co., 541 Peachtree St., Atlanta, Ga., will build mill construction garage on Magnolia Ave. and Sycamore St., here. About $60,000. Work will be done by day labor under supervision of I. Adler, Birmingham.

★**O., Cleveland**—Bamberger-Reinthal Co., 2621 East 9th St., let contract building 3 story, 70 x 180 ft. rein.-con., steel and brick factory, on Grand Ave., to Bolton & Pratt, 801 Columbia Bldg. About $100,000.

★**O., Cleveland**—Natl. Lamp Co., Nela Park, let contract building 3 story, 80 x 110 ft., rein.-con., steel and brick factory, to S. W. Emerson Co., 1900 Euclid Ave. About $200,000.

★**O., Cleveland**—J. M. and L. A Osborn Co., Superior Viaduct, let contract building 2 story, 130 x 150 ft., rein.con., steel and brick warehouse, on East 39th St. and Superior Ave., to S. W. Emerson Co., 1900 Euclid Ave. About $300,000. Noted June 5.

★**O., Columbus**—Columbus Tire & Rubber Co., Hayden Bldg., let contract building 2 story, 75 x 300 ft. factory, with two 25 x 60 ft. wings, on west bank of Olentangy River, to Cummins & Blan Co., Cleveland.

★**O., Dayton**—M. Weber Co., 218 North St. Clair St., let contract building 4 story, 60 x 100 ft. repair shop and garage, rein.-con. and brick, rein.-con. flooring, concrete foundation, at 218-28 North St. Clair St., to H. R. Blagg., 1[illegible] East 3rd St. About $85,000.

★**O., Middleton**—Amer. Rolling Mills Co. let contract building rein.-con. and steel extension to sheet and jobbing mill plant, concrete foundation, to Westinghouse, Church & Kerr, 37 Wall St., New York City. About $2,000,000.

★**Mich., Detroit**—Commerce Motor Car Co., Solvay and Mackie Aves., let contract building 1 story, 120 x 240 ft. factory and 2 story, 30 x 90 ft. office, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to L. W. Zander, 708 14th St.

★**Mich., Detroit**—M. Standish, 39 Pengree Ave., let contract for 3 story, 60 x 150 ft., rein.-con. and brick garage, rein.-con. flooring, concrete foundation on Woodward and Hancock Ave., to J. Finn & Son, 2375 Woodward Ave. About $65,000.

★**Mich., Mt. Clemens**—Natl. Candy Co., New Natl. Bank of Commerce Bldg., let contract for steel plant to consist of 3 buildings, one 40 x 60 ft., one 60 x 160 ft. and other 200 x 400 ft., to Austin Co., 16112 Euclid Ave., Cleveland, $155,000.

★**Ill., Chicago**—Cleveland Metal Products Co., Platt Ave., Cleveland, let contract building 3 story, 90 x 200 ft. rein.-con. warehouse, rein.-con. flooring, concrete foundation, on West 43rd St. and Western Ave., here, to Austin Co., 208 South La Salle St. About $150,000.

★**Ill., Chicago**—A. Woltersdorf, archt., 138 North La Salle St., let contract to J. Rodatz, 209 South La Salle St., for 1 story, 65 x 162 ft., 2 story, 49 x 168 ft. and 3 story, 89 x 94 ft. bakery plants, mill construction, concrete foundation, at 5324 Federal St. also 1 story, 57 x 140 ft. stable, at 5407 Federal St., for Gordon-Pagel Co., 461 Chene St., Detroit, Mich., About $225,000. Noted May 29.

★**Ill., East St. Louis**—Natl. Stock Yards let contract building 3 story, 155 x 1000 ft., brick house for hogs, concrete flooring, rock foundation, to Natl. Stock Yards Constr. Co., East St. Louis. About $150,000.

★**Wis., Ripon**—Barlow-Seelig Mfg. Co. let contract building 1 story, 50 x 120 ft., brick and concrete factory, to Immel Constr. Co., 200 North Main St., Fond du Lac. About $25,000.

★**Wis., Sheboygan**—Haack Motor Co., c/o C. Haack, Jr., let contract building 2 story, 63 x 120 ft., brick, rein.-con. and steel garage, rein.-con. flooring, concrete foundation, on 12th St. and Indinana Ave., to C. Haack, Sheboygan, $61,050. Noted July 10.

★**Mo., St. Louis** — Columbia Transfer Co., Bway and Spruce Sts., let contract building 2 story, 82 x 228 ft. rein.-con., steel and brick freight depot, at Clark, Spruce and 6th Sts., to Fruin Colnan Contg. Co., Merchants Laclede Bldg, About $63,000.

★**Tex., Strawn**—Palo Pinto Oil Co., 61 Bway., New York City, let contract building rein.-con. and steel plant, here, to Westinghouse, Church, Kerr, 37 Wall St., New York City. About $50,000.

★**Utah, Salt Lake City**—McDonald Chocolate Co. let contract building rein.-con. and steel factory on West Bway., to Campbell Bldg. Co., 71 South Main St., $81,250.

★**Wash., Seattle**—Libby, McNeil & Libby, 33 South Dearborn St., Chicago, let contract building 2 story, 73 x 135 ft. concrete packing house, rein.-con. flooring, here, to F. J. Leonard, Lewis Bldg., Portland.

★**Wash., Seattle**—Paragon Tool Co., Manufacturers Exch. Bldg., let contract building 2 story, 50 x 110 ft., brick and concrete tool plant, rein.-con. flooring, on Pine and Boylston Sts., to McRae Bros., Amer. Bank Bldg. About $55,000.

★**Ore., Vale**—Vale Milling & Elevator Co., United States Natl. Bank Bldg., let general contract building 3½ story concrete and timber mill to Glasser Constr. Co., Hutton Bldg., Spokane, Wash.; lumber to Boise-Payeter Lumber Co.; plumbing and hardware materials, to Vale Trading Co. About $50,000.

★**Cal., Burbank** — Mcreland Truck Co., North Main St., Los Angeles, let contract building three 1 story, 160 x 320 ft. factories, and 2 story, 80 x 170 ft. office, rein.-con., brick and steel, concrete foundation, to C. J. Kubach Co., 701 Merchants Natl. Bank Bldg., Los Angeles. About $500,000.

★**Cal., Los Angeles**—Ponet Estate, City Natl. Bank Bldg., let contract building 4 story, 100 x 155 ft., rein.-con. garage, rein.-con. flooring, concrete foundation, on 12th and Hope Sts., to Winter Constr. Co., 2141 Sacramento St., $125,000. Chevrolet Motor Co., lessee.

★**Cal., Rivera**—El Ranchito Citrus Assn. will build 2 story, 80 x 150 ft., concrete, steel and hollow tile packing plant, concrete foundation. About $30,000. Work will be done by day labor under supervision of Shepherd & Hamm, engrs., 315 Central Bldg., Pasadena.

★**Cal., San Francisco**—Joshua Hendy Iron Wks., 75 Fremont St., let contract building plant on 47,000 sq.ft. site on Kearny and Fracisco Sts., to J. R. Cahill, 110 Sutter St. About $450,000.

Industrial Works (Continued)

★**Ont., London**—McClary Mfg. Co., 333 Wellington St., let contract building 5 story, 72 x 125 ft., rein.-con. and brick factory, concrete foundation, to J. Putherbough, 272 Regent St. About $60,000.

Buildings

PROPOSED WORK

Mass., Amherst—Memorial—Massachusetts Agricultural College plans to construct memorial building on campus. About $150,000. Architect not selected.

Mass., Chicopee—Theatre—P. P. Starzyk, 32 Center St., soon receives bids altering Old Wells Opera House, on Exchange and Center Sts., concrete and steel. About $50,000. Private plans.

Mass., East Springfield (Springfield P. O.)—See "Industrial Works."

Mass., South Hadley—Science and Dormitory—Mt. Holyoke College plans to build science hall and dormitory group. on campus. About $500,000. Brainerd & Leeds, 89 Franklin St., Boston, archts., for dormitory group.

Mass., Three Rivers—School—French Catholic Church plans to build brick and steel school. About $60,000. L. Geoffroy, pastor. Architect not selected.

Mass., Worcester—Hospital—City plans to build 2 story, 149 x 33 ft. brick, on Belmont St. About $160,000. Fuller & Delano, 44 Front St., archts. Engineer not selected.

Conn., Bridgeport—Office and Bank—Hincks Bros. & Co., 207 State St., having plans prepared by W. J. Skinner, archt., 1188 Main St., for 3 story, 38 x 120 ft., brick, terra cotta and marble, rein.-con. flooring, concrete foundation, on Main St. About $60,000. Noted July 10.

Conn., Forrestville—School—Bd. Educ., Bristol, plans to build 2 story brick and steel addition to school, in Dist. 13, here About $60,000. W. P. Crabtree, 272 Main St., New Britain, archt.

Conn., Milford—Hotel—P. M. Rosengarten, 335 Willow St., Waterbury, plans to build new hotel on Merwin St., here. About $50,000. Engineer not selected.

Conn., South Manchester—School—St James Roman Catholic Society, 896 Main St. having plans prepared by Whiton & McMahon, archts., 36 Pearl St., Hartford, for brick school. About $60,000. W. J. McGuirk, pastor.

Conn., Stamford—School—Bd. Educ. having plans prepared by Emmens & Abbott, engrs., Washington Bldg., for 24 room school on State and South Sts., brick, concrete and steel, concrete foundation, concrete flooring. About $225,000. Noted Mar. 20.

Conn., Waterbury—Hospital—Bd. Health soon receives bids building 2 story brick and rein.-con. isolation hospital, rein.-con. flooring, concrete foundation. About $200,000. Cross & Cross, 681 5th Ave., New York City, archts.

N. Y., Arcade—High School—City voted $100,000 bonds to build combined grammar and high school.

N. Y., Brooklyn—Hospital—New York Congregation Home for Aged, 123 Linden Ave., having plans prepared by Parfitt Bros., archts. and engrs., 26 Court St., for 3 story, 38 x 65 ft., brick, steel and stone addition, stone foundation. About $65,000.

N. Y., Brooklyn—Office—Home Title Insurance Co., Jay and Pearl Sts., having plans prepared by Slee & Bryson, archts., 154 Montgomery St., for 3 story, 65 x 90 ft. brick and steel, brick foundation, on Jay St. and Willoughby Ave. About $100,000.

N. Y., Flushing—School—Bd. Educ., 500 Park Ave., New York City, having plans prepared by C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City, building 3 story, brick and steel, brick foundation, on Jamaica Rd., here, and altering school adjoining same. About $300,000.

N. Y., Geneva—Club House—Geneva Council Knights of Columbus plans to build club house. Cost between $80,000 and $100,000. Address R. J. Wyatt, Geneva Architect or engineer not selected

N. Y., Hartsdale—Club House—Hartsdale Country Club having plans prepared by W. H. Gompert, archt. and engr., 171 Madison Ave., New York City, for brick, steel and stone, brick foundation. About $750,000.

N. Y., Hornell—School—City election Aug. 5, to vote on proposition to appropriate between $200,000 and $250,000 to build new school.

N. Y., Syracuse—School—Bd. Educ., Onondaga Valley, plans to build 2 story, 150 x 200 ft., brick, rein.-con. and steel, concrete foundation, here About $350,000. Ford, Buck & Sheldon, 60 Prospect St., Hartford, Conn., engrs. M. L. King, Snow Bldg., archt.

N. Y., Syracuse—School—City plans to build 2 story, brick and rein.-con., on Alvord St. About $300,000. M. L. King, Snow Bldg., archt. H. C. Allen, City Hall, engr.

N. Y., Syracuse—School—St. Anthony of Padrea Church, Colvin St. and Midland Ave., plans to build 2 story, 75 x 140 ft. rein.-con. and steel parochial school, rein.-con. flooring, concrete foundation. About $85,000. A. R. Acheson, 852 Ostrom Ave., engr. M. L. King, Snow Bldg., archt.

N. Y., Tonawanda—School—Bd. Educ soon receives bids building 2 story, brick and concrete on Highland Ave. About $60,000.

N. J., Plainfield—School—Bd. Educ soon lets contract building 2½ story, 55 x 150 ft., brick and steel, brick foundation on Emerson Ave. About $140,000. Incorrectly noted in our issue of July 24.

Pa., Chester—Club House—Chester Club soon lets contract building 4 story, 65 x 110 ft., marble, brick and terra cotta. About $140,000. C. Brazer, Crozer Bldg., archt.

Pa., Dorrancetown—Hall—Boro. plans to build 2 story, 48 x 68 ft. town hall. About $52,000. J. S. Petton, 2nd Natl. Bank Bldg., Wilkes-Barre, archt.

Pa., Jeanette—High School—Boro plans election in September to vote on $250,000 bonds to build high school on 4th St.

Pa., Nanticoke—Bank—Polish Bank Assn having plans prepared by A. Reilly, archt., Bennett Bldg., Wilkes-Barre, building 1 story, 25 x 100 ft. marble, brick and terra cotta bank. About $50,000.

Pa., Nanticoke—School—Borough having plans prepared by A. Reilly, archt., Bennett Bldg., Wilkes-Barre, building 2 story, 25 x 40 ft. and 2 story, 30 x 50 ft. brick, timber and stone schools, rock foundation. About $70,000 and $80,000 respectively.

Pa., Olyphant—Office—Scranton Gas & Water Co. plans to build 1 story, 25 x 50 ft., rein.-con., steel and brick, concrete foundation. About $50,000. E. Davis and G. M. Lewis, Union Trust Bldg., Scranton, archts.

Pa., Phila.—Bank and Office—Fidelity Trust Co., Broad and Chestnut Sts., had plans prepared by J. T. Windrem, archt., Commonwealth Trust Bldg., for 32 story, brick, steel and stone, 6 stories 27 x 127 ft., and 26 stories 175 x 229½ ft., on Broad and Walnut Sts. About $8,000,000.

Pa., Phila.—House of Correction—City having plans prepared by C. E. Oelschlager, archt., 1615 Walnut St., making interior alterations to 2 and 3 story house of correction on Helmerburg St. Rd. About $50,000.

Pa., Phila.—School—Protestant Episcopal Divinity School, 42nd and Spruce Sts., plan to build school. Cost to exceed $50,000. Zantinger, Borie & Medary, 16th and Sansom Sts., archts.

Pa., Pittsburgh—Office—See "Industrial Works."

Pa., Plymouth—Church—St. Leo Polish Catholic congregation plans to build 2 story, 50 x 133 ft., rein.-con., steel and brick, concrete foundation. About $90,000. Morris & McHale, Burr Bldg., Scranton, archts

Pa., Scranton—Toilet—Maccar Truck Co., Cliff St., plans to build 1 story, 40 x 60 ft., concrete and brick rein.-con. flooring, concrete foundation, on Mulberry St. About $51,000 Davis & Lewis Union Bank Bldg., archts.

Del., Selborne Farms (Wilmington P. O.)—Houses—M. Fielding, archt., 520 Walnut St. preparing plans for ten 2½ story, 36 x 58 ft. concrete, stone and frame farm buildings. Owner's name withheld

N. C., Gastonia—Cottages—Meyers Mills plans to build forty 1 story, 4 room cottages. Robert & Co., Candler Bldg., Atlanta, Ga., engrs. and archts.

N. C., Highpoint—Exposition—Southern Furniture Exposition Bldg. Co plan to build 10 story, 100 x 200 ft. rein.-con. and steel, rein.-con. flooring and concrete foundation on Main St. Cost between $400,000 and $500,000.

N. C., High Point—Hospital—W. L. Jackson, chn., Sanitarium, Inc., receives bids about Sept. 1 building 3 story, tile and brick, on Johnson St. About $60,000. H. Barton, Greensboro, archt.

N. C., Kannapolis—Cottages—Cabarrus Cotton Mills plan to build one hundred 1 story, 4 room cottages. Robert & Co. Candler Bldg., Atlanta, Ga., engrs. and archts.

N. C., Monroe—School—School Bd soon receives bids building 2 story, brick, on West Lancaster St. About $50,000. Architect not selected

N. C., Roxboro—Court House and Jail—Comrs. Person Co. plan to build courthouse and jail. About $200,000.

N. C., Shelby—Hotel—Cleveland Springs Co. plans to build hotel here About $300,000. Architect not selected.

N. C., Wake Forest—Hotel—Wake Forest Hotel Co. soon lets contract building 4 story, brick. About $50,000. F. B. Simpson, Raleigh, archt.

Ga., Thomaston—Cottages—Peerless Cotton Mills plan to build seventy-two 1 story, four room cottages, including drainage system and auxiliary buildings. Robert & Co., Candler Bldg., Atlanta, archts. and engrs.

Ala., Birmingham—Schools—Jefferson Co. election Sept. 1, to vote on $125,000 bonds to build 3 brick or tile high schools. 2 schools to cost $50,000 each and other $25,000.

Ala., Montgomery—Hospital—Sisters of Mercy having plans prepared by F. Ausfeld, archt., Montgomery, building 3 story, brick addition, rein.-con. flooring, concrete foundation. About $100,000.

O., Carthage—Clubhouse—See "Industrial Works."

O., Cleveland — Church — Hellanic Orthodox Community acquired site at 2167 West 14th St., and plans to build 2 story, 16 x 85 ft. stone, steel and brick. About $75,000. Architect not selected.

O., Cleveland — Commercial — English Woolen Mills Co., 232 Superior Ave., N. E., acquired site at 1712 Euclid Ave. and plans to build 4 story, 66 x 190 ft., rein.-con., steel, terra cotta and brick. About $150,000. Architect not selected.

O., Cleveland—Commercial—Frey-Fisher Furniture Co., Marshall Bldg., purchased site on East 125th St. and St. Clair Ave and plans to build 4 story, 80 x 100 ft. concrete, steel and brick About $100,000. Architect not selected.

O., Cleveland—Hospital—Mt Sinai Hospital Assn., East 105th St. and Hough Ave., acquired site on East 105th St. and Ansel Rd and plans to build 3 story, 100 x 250 ft. rein.-con., steel and brick addition, concrete foundation. About $100,000. Architect not selected.

O., Cleveland — Hotel — Terminal Bldg. Co., Marshall Bldg., plans to build 1 story, 136 x 136 ft rein.-con., steel and brick addition, at 204 West Superior Ave About $50,000. Architect not selected.

O., Cleveland—Office—Cleveland Osborne Mfg. Co., 5401 Hamilton Ave., plans to build 1 story, 49 x 128 ft., rein.-con., brick and steel office addition. About $50,000. Architect not selected

Buildings (Continued)

O., Cleveland—Office—Colburn Machine Tool Co., 1040 Ivanhoe Rd. plans to build 1 story, 44 x 78 ft. rein.-con., steel and brick. About $80,000. Architect not selected.

O., Cleveland — Office—B. Moore Paint Co., 1314 Marquette Ave., acquired site on East 71st St. and Grant Ave. and plans to build 3 story, 50 x 50 ft., rein.-con., steel and brick. About $60,000. Architect not selected.

O., Cleveland—Office—Parish & Bingham Co. acquired site at 10601 Madison Ave. and plans to build 2 story, 39 x 123 ft., rein.-con., steel and brick addition. About $75,000. Architect not selected.

O., Cleveland—Temple—Masonic Temple Assn., East 6th St. and Superior Ave., acquired site at 3515 Euclid Ave. and plans to build 6 story, 45 x 101 ft., rein.-con., steel, terra cotta and brick. About $500,000. Architect not selected.

O., Cleveland—Theatre and Office—Allen Theatre Enterprises, Richmond St., E, Toronto, Ont., having plans prepared by C. H. Crane and E. G. Kiehler, archts., 2325 Dime Bank Bldg., Detroit, Mich., for 2 story theatre, 6 story office and 2 story garage, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Euclid Ave., here. About $1,000,000.

O., Cleveland—Theatre—D. R. Hanna, 511 Leader-News Bldg., having plans prepared by C. A. Platt, archt., 101 Park Ave., New York City, for 11 story, 100 x 192 ft. rein.-con., steel and brick, on East 14th St. and Prospect Ave. About $750,000.

O., Cleveland—Theatre—Hoffman Bros., Electric Bldg., acquired site at 10210 Euclid Ave., and plans to build 4 story, 101 x 164 ft. rein.-con., terra cotta, steel and brick. About $250,000. Architect not selected.

O., Cleveland — Theatre and Office — J. Laronge Co., acquired site on East 17th St. and Euclid Ave. and plans to build 12 story, 225 x 230 ft. rein.-con., steel and brick. About $2,500,000. Architect not selected.

O., Cleveland—Theatre—Pauled Realty Co., Hippodrome Bldg., having plans prepared by Rapp & Rapp, archts., 69 West Washington St., Chicago, building 5 story, 75 x 240 ft. rein.-con., terra cotta, steel and brick, on East 105th St. and Euclid Ave. About $400,000.

O., Dayton—Stores and Offices—F. and J. Steffen, 44 East 4th St., plan to build 4 story, 60 x 120 ft., rein.-con. and brick, concrete foundation, at 5th and Main Sts. About $100,000. Architect not selected.

Ind., Whiting—Club—Owl Club having plans prepared by Zimmerman, Saxe & Zimmerman, archts., 64 East Van Buren St., Chicago, building 5 story, 45 x 65 ft., brick and timber, brick foundation. About $65,000.

Mich., Detroit—Commercial and Hall—B. C. Wetzel & Co., archt., 2317 Dime Bank Bldg., preparing plans for 2 story, 95 x 200 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. and Watson St. About $150,000. Owner's name withheld.

Mich., Detroit — Market — J. Loporovsky, Oakland Ave., having plans prepared by R. Finn, archt., 1144 David Whitney Bldg., for 2 story, 60 x 100 ft., brick and timber, wood flooring, concrete foundation. About $50,000.

Mich., Detroit — Mercantile — Moore Realty Co., 512 Holden Bldg., had plans prepared by R. A. Bailey, archt., 54 Lafayette Ave., for 2 story, 75 x 100 ft., rein-con., brick and steel, concrete foundation, on Grand River Ave. near Vinewood St. About $100,000.

Mich Detroit—Temple—Ionic Lodge F. & A. M., Lawton and Grand River Aves., having plans prepared by G. W. Graves, archt., 43 John St., for 3 story, 90 x 100 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Grand River Ave. About $130,000.

Mich., Detroit—Theatre and Stores—Allen Theatre Enterprise, 2325 Richmond St., E, Toronto, Ont., having plans prepared by C. H. Crane and E. G. Kiehler, archts., 2325 Dime Bank Bldg., for 2 story, 133 x 200 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. and Watson St., here. About $600,000.

Mich., Detroit — Theatre, Bank and Stores—Zemon & Wetsman, 1020 Chamber of Commerce, had plans prepared by G. V. Pottle, archt., 1401 David Whitney Bldg., for 2 story, rein.-con., brick and steel, concrete foundation on Linwood Ave. and Virginia Park. About $150,000.

Mich., Ecorse — School — St. Francis congregation having plans prepared by G. W. Graves, archt., 43 John R St., for 2 story, 80 x 150 ft., rein.-con., brick and steel, wood and mastic flooring, concrete foundation, on State and Webster Sts. About $150,000.

Mich., Flint—Church—Van Leyen, Schilling & Keough, archts., 1115 Union Trust Bldg., Detroit, receives bids about Aug. 8, building 1 story, 80 x 140 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Beach St., here, for St. Matthew's congregation. About $150,000. Noted July 3.

Mich., Holly—Temple and Stores—Holly Lodge F. & A. M. having plans prepared by G. W. Graves, archt., 43 John R St., Detroit, for 3 story, 63 x 108 ft., brick and steel concrete foundation, on Main St. About $100,000.

Mich., Houghton—Home—Maas Bros., archts., 400 Penobscot Bldg., Detroit, soon lets contract for 2 story, 83 x 134 ft., brick and steel, concrete foundation, for Good Will Farm. About $100,000.

Mich., Negaunee—Church, School and Parish House—Van Leyen, Schilling & Keough, archts., 1115 Union Trust Bldg., Detroit, receives bids about Aug. 8, building 2 story, 60 x 120 ft. church, 40 x 60 ft. parish house and 40 x 60 ft. school, rein.-con., brick and steel, rein.-con. flooring. concrete foundation, here, for St. Paul's congregation. About $150,000. Noted July 24.

Mich., Oakwood—School—Van Leyen, Schilling & Keough, archts., 1115 Union Bldg., Detroit, receives bids about Aug. 8, building 2 story, 85 x 200 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, for village. About $230,000.

Mich., Wyandotte— Temple — Wyandotte Lodge F. & A. M., having plans prepared by G. W. Graves, archt., 43 John R St., Detroit, for 3 story, 75 x 120 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Biddle Ave. About $115,000.

Ill., Belleville—Bank—St. Clair Natl. Bank, Freeburg, plans to build bank here. About $150,000. Address W. Reichert, Freeburg.

Ill., Chicago—Library and Office—John Crerar Library, Marshall Field Bldg., having revised plans prepared by Holabird & Roche, archts., 104 South Michigan Ave., for library and office, on Randolph St. and Michigan Blvd. Bids will soon be received. Noted June 12.

Ill., Chicago—Offices, etc.—Hall & Ellis, 37 West Van Buren St., having plans prepared by Puckey & Jenkins, archts., 6 North Michigan Ave., for 3 story, 145 x 170 ft., rein.-con. and brick offices and auto service building, rein.-con. flooring, concrete foundation, on Michigan Ave. and 29th St. About $150,000.

Ill., Chicago—Theatre—Lubiner & Trinz, 25 East Jackson Blvd., having plans prepared by W. W. Ahlschlager, archt., 111 West Washington St., for 2 story, 125 x 215 ft., brick, steel and rein.-con., rein-con. flooring, concrete foundation, on Kedzie and Madison Sts. About $500,000.

Ill., Springfield—Memorial—State Dept. Pub. Wks. & Bldgs., soon receives bids building 4 story, 190 x 277 ft. rein.-con. centennial memorial, on ground adjacent to State Capitol Bldg. About $1,000,000. E. Martin, 104 South Michigan Ave., Chicago, superv. archt.

Wis., Bloomington—High School—Bd Educ. plans to build 4 story, 90 x 150 ft. on Main St. About $75,000. Architect not selected.

Wis., Cudahy—Bank—Cudahy State Bank plans to build 2 story, 70 x 150 ft. rein.-con. and brick, brick foundation on Main and Center Sts. About $75,000. J. D. Buil, pres. Architect not selected.

Wis., Madison—University—Bd. Educ. having plans prepared by A. R. Peabody, archt., Capitol Bldg., improving University of Wisconsin. Plans include remodelling college of engineering, cost $62,500, North Hall, $8000, music hall, $35,000, men's gymnasium, $5000, coal bunkers, $55,000, etc., total cost, $147,087.

Wis., Neenah—Bank—First Natl. Bank, 100 West Wisconsin Ave., having plans prepared by Childs & Smith, archts., 64 East Van Buren St., Chicago building 1 story, 41 x 84 ft. rein.-con. and stone, concrete foundation. About $100,000.

Wis., West Bend—School—Bd. Educ., c/o J. W. Gehl, plans to build 60 x 110 ft., brick, rein.-con. and steel, brick foundation, on Main St. About $50,000. Architect not selected.

Ia., Newton—Hospital—Skiff Hospital plans to build 3 story, 88 x 118 ft. fireproof hospital. About $125,000. Cervin & Horn, 310 Safety Bldg., Rock Island, Ill., archts.

Minn., Albert Lea—School—School Bd. soon lets contract remodeling and building 2 story addition to school. About $[illegible]0,000. F. Tustison, Auditorium Bldg., Minneapolis, engr. Jaconson & Jaconson, Owatonna, archts.

Minn., Chisholm — Recreation — Village plans to build 2 story, 100 x 175 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Main St. Plans include swimming pool and large auditorium. About $200,000. W. E. Bates, pres. chamber commerce. Architect not selected.

Minn., Duluth—Hospital—A. W. Ryan, pres. St. Luke's Hospital Assn., receives bids about Sept. 15, for 5 story, 125 x 150 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 10th Ave., E. and 1st St. About $350,000. McKim, Mead & White, 101 Park Ave., New York City, archts. and engrs. Noted Jan. 30.

Minn., Duluth—School—Bd. Educ. rejected bids received July 11 for 2 story, 64 x 180 ft., brick addition to Riverside School. About $95,000. Work will be readvertised. Croft & Boerner, Palace Bldg., Minneapolis, archts. and engrs. Noted June 19.

Minn., Hibbing—Recreation—Town plans to build 2 story, 140 x 260 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 3rd Ave. About $250,000. Holstead & Sullivan, Palladio Bldg., Duluth, archts. and engrs.

Minn., Mankato — Office — Free Press Printing Co. had preliminary plans prepared by Kees & Colburn, archts., Plymouth Bldg., Minneapolis, for 5 story, 52 x 140 ft., rein.-con. and brick. About $225,000.

Kan., Marion—Court House—Marion Co. having plans prepared for 3 story, 96 x 124 ft. rein.-con, steel ad brick, rein.-con. flooring, concrete foundation. About $300,000. Tonini & Bramblett, 417 Terminal Bldg., Oklahoma City, Okla., archts.

Neb., Beatrice—Club—Beatrice Lodge of Masons plan to build club on 5th and Elk Sts. Cost between $50,000 and $60,000.

Wyo., Douglas—School—School Dist. soon receives bids building 3 story school. About $60,000. $80 000 bonds voted for project. T. J. Brownfield, secy. bd. educ.

Mont., Helena—Temple—Algeria Patrol Shrine receives bids in about 30 days, building 1 story on Neill and Benton Aves. About $200,000. C. S. Haire and G. H. Carsley, Power Bldg., archts.

Mont., Williston — Theatre—W. Snyder having plans prepared by R. A. Frentz, archt., Wolf Point, for 75 x 140 ft. theatre.

Buildings (Continued)

Mo., Rolla — Church — Hohenschild & Pearce, archts., Odd Fellows Bldg., St. Louis, soon receive bids building 3 story, 40 x 60 ft. rock, stone and brick, rock foundation, for Rolla Methodist Episcopal congregation. About $50,000.

Mo., St. Louis — Church — Grace Holy Cross congregation plans to build church, at 2601 North 11th St. About $50,000. C. R. Taylor, pastor. Architect not selected.

Tex., Donna—School—Trustees Donna Independent School Dist. soon receive bids building 1 story school. Cost between $50,000 and $60,000. H. F. Kuehne, 826 Littlefield Bldg., Austin, archt

Wash., Aberdeen—Theatre and Office—Pantages Amusement Co. plans to build 4 story, brick and concrete, (2000 seating capacity) on 1 and Wishkah Sts. About $175,000. Architect not selected.

Wash., Elma—Store—Minard & Co. plans to build 2 story, 99 x 127 ft. brick and concrete, concrete foundation. About $50,000. Architect not selected.

Wash., Hoquiam — Business — Boening, Merril & Endresen plan to build 1 story, 50 x 75 ft. concrete and brick. About $50,000. Beeb & Gould, Seattle, archts.

Wash., Spokane—Hotel—A. A. Morse, 217 3rd St., plans to build 3 or 4 story brick or concrete. About $100,000. Architect not selected.

Ore., Astoria—Theatre—Jensen & Von Herberg, Liberty Theatre, Portland, plan to build 2 or 3 story, 100 x 166 ft., brick or concrete, here. About $100,000. Architect not selected.

Ore., Marshfield—Business—A. H. Powers purchased 100 x 140 ft. site on Powers tract and plans to build 2 or 3 story concrete business block. About $50,000. Architect not selected.

Cal., Los Angeles—Sales—Albertson Motor Car Co., 1101 South Hope St., having plans prepared by L. A. Smith, archt., 621 Investment Bldg., for 2 story, 155 x 160 ft., rein.-con., concrete foundation, on 16th and Figuerva Sts.

Cal., Madera — Hospital — Bd. Supervs. Madera Co. having plans prepared by E. Mathewson, archts., Cory Bldg., Fresno, for 1 and 2 story, concrete, granite and tile. About $100,000.

Cal., Monrovia — Church — Presbyterian congregation having plans prepared by H. M. Patterson, archt., 356 South Bway., Los Angeles, for 125 x 130 ft., brick, concrete foundation, on White Oak St. and Myrtle Ave. About $60,000.

Cal., Oakland—Hospital—Comrs. Alameda Co. soon receive bids building hospital on 14th Ave. and Vallecito Pl. About $500,000.

Cal., Salinas—High School—City voted $250,000 bonds to build high school.

N. B., St. John—Housing—St. John Co. plans to raise $400,000 bonds to build 60 houses.

Que., Montreal — Theatre — Allen Theatre Co., Richmond St. E., plans to build 45 x 69 ft. rein.-con. and brick on McGill and Cathcart Sts. About $250,000. Architect not selected.

Ont., London—Post Office and Custom House—Dominion Government, Ottawa, having plans prepared by Dept. Pub. Wks., Ottawa, for 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, here. About $400,000.

Ont., Niagara Falls — School — Bd. School Comn. soon lets contract building 3 story, stone, brick and steel. About $90,000. C. M. Borler, 102 Main St., archt. Noted July 10.

Ont., Ottawa—Theatre and Hotel—Canadian United Theatres, Montreal, Que., soon receive bids remodeling and enlarging Dominion Theatre and Hotel Cecil, Sparks St., rein-con. and brick, concrete foundation. About $250,000. D. J. Spence, 246 Beaver Hall Bldg., Montreal, Que., archt

Ont., Preston—Bank—Bank of Toronto, 55 King St., W., plans to build 2 story, steel and brick, concrete foundation, on King and Wellington Sts. About $60,000. J. M. Lyle, Avondale Rd., Toronto, archt.

Ont., Sandwich—School—Bd. Educ. plans election to vote on $60,000 by-law to build 2 story, concrete and brick, concrete foundation. Address R. S. Agnelly, chn

Ont., Sandwich—School—Van Leyen, Schilling & Keough, archts., 1115 Union Trust Bldg., Detroit, Mich., soon let contract building 2 story, 60 x 85 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, on Wyandotte St., for Bd. Educ. About $60,000.

Ont., St. Thomas—Hospital—City and Elgin Co. plan to build memorial hospital, on Elgin St. About $225,000. N. R. Darrach, 3 Drake St., archt.

Ont., St. Thomas—Schools—City receives bids about Aug. 9, building two 2 story, six room brick school, concrete foundation. About $100,000. N. R. Darrach, 3 Drake St., archt.

Ont., Toronto—Stations, etc.—A. F. Stewart, ch. engr. Canadian Natl. Rys., 27 Wellington St., E., soon lets contract building 2 stations and 3 section houses, frame, concrete foundation; also 5 frame coal and oil houses and 21 bunk houses.

B. C., Penticton—School—Bd. Trustees plan to build 3 story, 10 room, brick and timber addition to Ellis School, concrete foundation. About $50,000. Architect not selected.

B. C., Vancouver—School—Bd. School Trustees had preliminary plans prepared by A. A. Bows, archt., School Bd. Offices, building 3 story, 24 room, brick, rein.-con. and tile, concrete foundation, on Central School site. Cost including equipment, $250,000. P. P. Brown, 410 London Bldg., engr. Noted Dec. 12.

BIDS DESIRED

R. I., Providence—Office—Until Aug. 4, by Jackson, Robertson & Adams, archts., Turks Head Bldg., for 4 story, 58 x 123 ft. and 63 x 113 ft. brick, rein.-con. flooring, concrete foundation, on West Exchange St., for General Fire Extinguisher Co., Providence. About $150,000.

N. Y., Astoria—Theatre—Until Aug. 2, by T. W. Lamb, archt., 644 8th Ave., New York City, for 2 story brick and steel, brick foundation, on Grand and Steinway Aves., here, for Glynne & Ward, Alhambra Theatre, Knickerbocker Ave. and Halsey St., Brooklyn. About $400,000. Noted May 8.

N. Y., New York—Nurses' Home—Until Aug. 14, by C. P. H. Gilbert, archt. and engr., 1123 Bway., for 5 story, 50 x 50 x 100 ft., brick and steel, at 407 West 34th St., for St. Marys Free Hospital. About $75,000. Noted July 3.

N. Y., New York—Store and Loft—Until Aug. 7, by A. Lexingson, archt. and engr., 405 Lexington Ave., for 3 story, 60 x 100 ft., brick and steel, brick foundation, at 42-46 West 33rd St., for St. Regis Lunch Co., c/o architect. About $80,000. Noted July 10.

N. J., Bayonne—School—Until Sept. 4, by Bd. Educ., building P. S. No. 1, on Ave. C, 4 story, brick. About $200,000. D. Anderson, 424 Ave. E., engr

N. J., Bayonne—School—Until Sept. 4, by Bd. Educ. building P. S. No. 1 on East 5th St., 4 story brick. About $200,000. D. Anderson, 424 Ave. E., engr

Pa., Midland — Office — Pittsburgh Crucible Steel Co., Empire Bldg., Pittsburgh, receiving bids building 5 story, 50 x 180 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation on Railroad Lane and 7th St. here. F. I. Merrick, Empire Bldg., archt. Noted Sept. 5.

Pa., Pittsburgh — Church — Hazelwood Presbyterian congregation receiving bids building 1 story, 70 x 150 ft. stone, in Hazelwood Dist. About $50,000. O. M. Topp, Jenkins Arcade, archt.

Pa., Pittsburgh—High School—Bd. Educ. receiving bids building 3 story, 225 x 250 ft. steel, brick and terra cotta, concrete foundation, in Homewood Dist. About $1,300,000. G. S. Orth & Co., Jenkins Arcade, engrs.

N. C., Nashville—Court House—Until Aug. 20, by Comrs. Nash Co. building 2 story, brick, on Washington St. About $75,000. J. C. Stout, Nashville, archt. Noted July 3.

Ala., Cloverdale—School—Until Aug. 5, by Supt. Bd. Educ., Montgomery Co., (Montgomery) building 1 story, brick, concrete foundation, covering 15,200 sq.ft. floor space. About $60,000. F. Lockwood, 119 Adams St., Montgomery archt.

Ala., Grange Hall—School—Until Aug. 5, by Dept. Educ., building 1 story, brick, rein.-con. flooring, concrete foundation, covering 16,450 sq.ft. floor space, for Montgomery Co. (Montgomery). About $80,000. F. Ausfeld, Montgomery, archt.

Ala., Hope Hull—School—Until Aug. 5, by Montgomery Co. School Bd., (Montgomery), building 1 story, brick, concrete foundation, covering 15,150 sq.ft. floor space. About $60,000. F. Ausfeld, Montgomery, archt.

Ala., Pine Level—High School—Until Aug. 5, by Montgomery Co. Bd. Educ., (Montgomery) building 1 story, brick, concrete foundation, covering 15,150 sq.ft. floor space. About $75,000. F. Ausfeld, Montgomery, archt.

O., Lodi—Church—Methodist Episcopal congregation and W. H. Nicklas, archt., 1900 Euclid Ave., Cleveland, receiving bids for 1 story, 73 x 125 ft., rein.-con., steel and brick. About $60,000.

Mich., Detroit — Theatre — C. H. Crane and E. G. Kiehler, archts., 2325 Dime Bank Bldg., receiving bids for 2 story, 50 x 200 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Michigan Ave. and Chopin St., for A. G. Grzezinski, 1518 Michigan Ave. About $50,000

Ill., Chicago—Hotel—Holabird & Roche, archts., 104 South Michigan Ave., receiving bids for 9 story, 55 x 190 ft. rein.-con. and steel, rein.-con. flooring, concrete foundation at 177 West Madison St., for Blackhawk Hotel Co., c/o archts. About $1,250,000

Minn., Bemidji—School—Until Aug. 5, by Bd. Educ., building 5 story, 38 x 58 ft., tile with tile foundation, in Dist. No. 48. About $70,000. Roberts & Funk, 1st Natl. Bank Bldg., archts. Noted July 17.

Minn., Biwabik—Recreation—Until Aug. 10, by L. R. Christensen, chn bd. educ., building 1 story, 100 x 110 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $75,000. C. E. Nystrom, Palladio Bldg., Duluth, archt. and engr.

Kan., Ft. Dodge—Home—Until Aug. 5, by R. S. Gamble, state archt., Topeka, building 1 and 2 story, 67 x 166 ft. and 40 x 51 ft. soldiers' home, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $75,000. Noted July 17.

Neb., Winnebago—School—Until Aug. 15, by Bd. Educ., Sioux Falls, S. D., building 1 and 2 story, 65 x 130 ft. brick and timber, concrete foundation. About $100,000. Holmes & Flinn, 8 South Dearborn St. Chicago, archts.

Mo., Morrisonville—School—Until Aug. 11, by H. G. Clymer archt., 620 Wainwright Bldg., St. Louis, or C. W. Morris, clk. bd. educ., building 2 story, 63 x 110 ft., concrete, brick and steel. About $50,000.

Mo., St. Louis — Hospital — Until Aug. 12, by Bd. Pub. Serv., building 4 story, concrete, steel and brick, rein.-con. flooring, rock foundation, on St. Ange and Caroline Sts. About $190,000. L. R. Bowen, city engr.

Buildings (Continued)

Utah, Richmond—High School — Until Aug. 21, by Cache Co. School Bd. (Logan), building brick school on Main St. About $75,000. F. W. Hodgson, Commercial Bldg., Logan, archt. Noted April 3.

Ont., London—Theatre—Until Aug. 11, by T. W. Lamb, archt., 644 8th Ave., New York City, building 1 story, 100 x 125 ft., steel and brick, brick foundation, for M. Loew, 1492 Bway., New York City. About $200,000. Noted May 30.

Ont., Ottawa—Store—A. W. Horwood, archt., Castle Bldg., receiving bids building 3 story, 60 x 100 ft. rein.-con. and brick, rein.-con. flooring, on George St., for A. J. Freiman, Rideau St. About $80,000.

Ont., Ottawa—Theatre—Until Aug. 11, by T. W. Lamb, archt., 644 8th Ave., New York City, building 2 story, 100 x 175 ft., steel and brick, brick foundation, for Loew Theatres, 1492 Bway., New York City. About $300,000. Noted May 22.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Clinton**—Houses—Bigelow-Hartford Carpet Co. let contract building several brick and timber houses for workmen on School St., to Gen. Bldg. Co., Clinton. About $50,000, cost plus percentage basis.

★**R. I., Saylesville** (Pawtucket P. O.)—Housing—Saylesville Bleacheries let contract building 12 brick and timber houses for workmen, to Central Constr. Co., Slater Trust Bldg., Pawtucket. About $80,000.

★**Conn., Hartford**—Sales, etc.—M. J. Unkelbach, archts., 162 Main St., New Britain, let contract to Ellison Constr. Co., Wellington Ave., for 3 story, 64 x 306 ft. auto sales and service building, rein.-con. flooring, concrete foundation, on Washington St., for A. C. Hine Co., 314 Pearl St. About $75,000. Noted June 19.

★**Conn., Thompsonville**—Housing—Bigelow Hartford Carpet Co., 58 Main St., let contract building ten 1 and 2 story timber houses for workmen, brick and concrete foundation, on Alden Ave., to T. Savage & Sons., Washington Ave. About $50,000.

★**N. Y., Albany**—Theatre—M. Spiegel, Strand Theatre, New York City, let contract building 2 story, 75 x 175 ft., brick and steel, brick foundation, on Monroe St., here, to Jardin Constr. Co., 507 5th Ave., New York City. About $150,000. Noted May 1.

★**N. Y., Binghamton**—Theatre—Kodeco Co. let contract building 62 x 133 ft. rein.-con. and brick, at 29 Chenango St., to A. E. Badgely, Binghamton. About $100,000.

★**N. Y., Brooklyn**—Church—Zion Norwegian Lutheran congregation, 6301 5th Ave., let contract building 1 story, 50 x 100 ft., brick, steel and stone, brick foundation, on 63rd St. and 4th Ave., to T. Drysdale, 250 Baltic St. About $50,000.

★**N. Y., Brooklyn**—Exchange—McKenzie, Voorhees & Gmelin, archts. and engrs., 1123 Bway., New York City, let contract to Cauldwell-Wingate Co., 381 4th Ave., New York City, for 4 story, 60 x 125 ft., brick and steel, on 14th Ave., here, for New York Telephone Co., 15 Dey St., New York City. About $200,000. Noted July 3.

★**N. Y., Broklyn**—Theatre—I. Miller, 166 Union St., will build 2 story, 100 x 140 ft., brick and steel, brick foundation, on St. Johns Pl. and Utica Ave. About $150,000. Work will be done by day labor. Noted June 26.

★**N. Y., Johnson City**—Church—Baptist Church will build brick and concrete church. About $75,000. Work will be done by day labor under supervision of Conrad & Tiffanys, archts., Binghamton.

★**N. Y., New York**—Office—Kerr Steamship Co., 8 South William St., let contract building 12 story, 25 x 100 ft., brick and limestone, brick foundation, at 38-46 Beaver St., to G. A. Fuller, 949 Bway. Cost plus percentage basis.

★**N. Y., New York** — Store and Office — Krim Realty Co., 426 West 14th St., will build 3 story, 25 x 100 ft., brick and steel, at 143 West 33rd St. About $100,000. Work will be done by day labor. Noted July 10.

★**N. Y., Waverly**—Community—Waverly Community Assn. let contract building 2 story, 30 x 70 ft. brick and concrete, rock foundation, to S. Sykes & Son, Waverly. About $60,000.

N. J., Camden—Bank—Central Trust Co., 4th and Federal Sts., let contract building 1 story, 58 x 58 ft., concrete, marble and steel addition, to G. Bachman, 19 North 30th St. About $100,000. Noted July 17.

★**N. J., Camden**—Schools—Bd. Educ. let contract building 4 story, 80 x 168 ft., brick and stone, in Yorkship Village, to W. Linker Co., 831 Cherry St., Phila., $152,000; 2 story, 126 x 172 ft., brick and stone, to Standard Constr. Co., 1713 Sansom St., Phila., $146,500. Noted June 12.

★**N. J., Jersey City**—Schools—Bd. Educ. let contract building School No. 23, to M. T. Connolly, 238 17th St., $719,000; School No. 6, on Central Ave., to W. R. Robinson & Son, 15 Exch. Pl., $643,000. Noted June 26.

★**N. J., Newark**—Theatre—M. Spiegel, Strand Theatre Bldg., New York City, let contract for 1 story, brick and steel, brick foundation, on Broad St., to Jarden Co., 507 5th Ave., New York City. About $100,000. Noted June 19.

★**Pa., Phila.** — Bank — Second Natl. Bank, 4356 Frankfort Ave., let contract for 1 story, 72 x 100 ft., concrete, stone, brick and steel, to R. A. Raff Co., Richmond and Norris Sts. About $160,000. Noted July 3.

★**Pa., Phila.** — Restaurant — Boothby Hotel Co., 116 South 3rd St., let contract building 3 story, 56 x 66 ft., brick, to H. P. Schneider, 7326 Elmwood St.

★**Pa., Vandling**—High School—Boro. let contract building 2 story, 30 x 30 ft., brick, stone, concrete and steel, concrete foundation, on 7th St., to J. Nolan, Carbondale. About $50,150. Noted May 29.

★**O., Cleveland**—Office—Cleveland Osborne Mfg. Co., 5401 Hamilton Ave., let contract building 1 story, 49 x 128 ft., rein.-con., brick and steel office addition here, to J. R. Gloyd Co., 1816 East 33rd St. About $50,000.

★**O., Cleveland**—Office — Lakewood Eng. Co., West 117th St. and Berea Rd., let contract for 1 story, 87 x 150 ft., concrete, steel and brick addition, to J. R. Gloyd Constr. Co., 1816 East 33rd St. About $75,000. Noted July 10.

★**O., Dayton**—Bank and Business—Gem City Bldg. & Loan Co., 3rd and Jefferson Sts., let contract building 1 story, 37 x 120 ft. stone and steel, concrete foundation, at 6 North Main St., to Davis-Hunt Constr. Co., Cleveland, O.; about $80,000.

O., Euclid—High School—Euclid Heights Bd. Educ. let contract building 2 story, 75 x 100 ft. concrete, stone, steel and brick, to Kelley-Demarest Const. Co., Amer. Trust Bldg., Cleveland. About $100,000. Noted June 26.

★**O., Middletown**—Business—W. Sebald Realty Co., 301 Castell Bldg., let contract building 4 story, 52 x 120 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to J. Lowes, 906 Schwind Bldg., Dayton. About $80,000.

★**O., Springfield**—Theatre—G. Sun, Main and Limestone Sts., let contract building 3 story, 60 x 200 ft., rein.-con., steel and brick, concrete foundation, on Limestone St., to C. E. Shehan Co., 207 Holliday St., Indianapolis, Ind. About $200,000. Noted June 19.

★**O., Steubenville** — Hotel — Steubenville Hotel Co., c/o W. R. Johnson, 4th and Main Sts., let contract building 9 story, 64 x 181 ft., rein.-con. steel and brick, on 4th and Main Sts., to F. Webber, archt. and engr., Morris Bldg., Phila., Pa. Noted June 19.

★**O., West Park**—School—Bd. Educ. let contract building 2 story, 36 x 80 ft., rein.-con., steel and brick on Longmead Ave., to C. Peterson, Engineers Bldg., Cleveland. About $50,000. Noted July 17.

★**Mich., Detroit** — Hospital — St. Mary's Hospital, St. Antoine St., let contract for 1 story, 150 x 400 ft., rein.-con. and brick addition, rein.-con. flooring, on St. Antoine and Mullet Sts., to J. Finn & Son, 2375 Woodward Ave. About $90,000.

★**Mich., Detroit** — Mausoleum — J. Couzens, Dime Bank Bldg., let contract building 1 story, 29 x 41 ft., granite, concrete foundation, at Woodlawn Cemetery, to Harrison Granite Co., 702 Kresge Bldg. About $100,000.

★**Mich., Detroit**—Office — See "Industrial Works."

★**Mich., Redford** — School — St. Mary's congregation let contract for 2 story, 80 x 160 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to J. Finn & Son, 2375 Woodward Ave., Detroit. About $150,000.

★**Ill., Chicago** — Bank and Offices — I. Viehe-Naess, archt., 64 East Van Buren St., let masonry contract, to Mueller Constr. Co., 179 West Washington St., for 2 story, 90 x 160 ft. brick and timber, concrete foundation, on Clark St. and Belmont Ave., for Lake View State Bank, 3160 North Clark St. About $150,000. Noted May 29.

★**Ill., Chicago**—School—St. Phillip Benici Catholic Parish, Oak and Cambridge Sts., let masonry contract for 2 story, 60 x 105 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, to F. Burke, 35 South Dearborn St. About $75,000.

★**Ill., Oak Park**—Bank—Puckey & Jenkins, archts., 6 North Michigan Ave., Chicago, let masonry contract to S. N. Nielsen & Co., 1853 North Kedzie Ave., Chicago, for 1 story, 60 x 140 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Oak Park Ave. and North Blvd., for Avenue State Bank, 126 North Oak Park Ave. About $100,000. Noted June 5.

★**Minn., Brainerd**—Court House—Comrs. Crow Wing Co. let contract building 3 story, 90 x 130 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation, to J. and W. A. Elliott Co., 906 Lumber Exch., Minneapolis, $175,000. Noted June 26.

★**Minn., Duluth** — High School — Sacred Heart congregation let contract building 3 story, 30 x 120 ft., rein.-con., brick and steel addition, rein.-con. flooring, concrete foundation, on West 4th St., to Pfeffer Constr. Co., 412 Tarney Bldg. About $60,000.

★**Minn., Ivanhoe**—Court House—Comrs. Lincoln Co. let contract building 2 story, 60 x 109 ft., brick and stone, to Madsen & Peterson, 646 Builders' Exch., Minneapolis, $143,000. Noted July 3.

★**Kan., Topeka**—Church—Walnut Grove Methodist Episcopal congregation let contract building 2 story, 70 x 100 ft. rein.-con., steel and brick, concrete foundation, to J. Cuthbert & Sons, 18th and Topeka Aves. About $50,000.

★**Neb., Omaha**—Hotel—J. W. and L. Hill, Blackstone Bank Bldg., let general contract building 13 story, 66 x 66 ft., concrete, steel frame, hollow tile and concrete flooring, steel and concrete foundation, on 16th and Howard Sts., to Vaughn Constr. Co., 522 Bee Bldg. About $278,000. Noted June 19.

★**Mo., Butler** — Bank — Farmers Bank of Bates Co., Farmers Bank Bldg., let contract building 2 story, 75 x 130 ft. concrete, steel, brick and Carthage stone, rock foundation, on Public Sq., to W. F. Duvall, Butler. About $50,000.

★**Ariz., Mesa**—High School—Trustees High School let contract building 2 story brick addition, concrete foundation, to Edwards & Wildey Co., 515 Black Bldg., Los Angeles, $77,500. Noted June 5.

★**Ariz., Phoenix**—Schools—City let contract building two 60 x 143 ft. schools, to Eagan Constr. Co., 206 Noll Bldg., $31,800 each.

★**Ariz., Phoenix**—School—School Trustees let contract building 2 story, 80 x 210 ft., containing manual training dept., etc., to Edwards & Wildey, 515 Black Bldg. About $190,000. Noted June 19.

★**Wash., Seattle** — Business — Chanslor, Lyon Co., 914 East Pie St., let contract building 3 story, 120 x 121 ft., concrete, to H. D. Stewart, Amer. Bank Bldg. About $91,000.

Buildings (Continued)

★**Ore., Mt. Angel**—Parish School—Mt. Angel Parish School will build 1 story, 166 x 198 ft., brick and masonry addition to school, to include class rooms, auditorium and dining room. About $50,000. Work will be done by day labor.

★**Cal., Burbank**—Office—See "Industrial Works."

★**Cal., Covina**—School—Trustees Grammar School Dist. let general contract building 1 story, 300 x 300 ft., rein.-con., rein.-con. flooring, concrete foundation, to Wopschall Bros., 100 East Colorado St., Pasadena, $107,000.

★**Cal., Pasadena**—Store—Model Grocery Co. let contract building 3 story, 75 x 200 ft., brick, concrete foundation, at 248 East Colorado St., to W. T. Loesch, 109 North Chester St., $83,363.

★**Ont., Ottawa**—Theatre, Stores and Office—Loew's Theatres, Ltd., let contract building 4 story, 150 x 200 ft. terra cotta, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Bank and Queen Sts., to Bate & McMahon, Central Chambers, Elgin St. About $450,000.

★**Alta., Edmonton**—School—City let contract building agricultural school, to Smith Bros. & Wilson, Lethbridge, $144,010.

Federal Government Work

PROPOSED WORK

N. Y., New York—Repairing Dry Dock—Spec. 4014—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to repair dry dock No. 4, here. Estimated cost, $100,000.

N. Y., Stapleton—Kitchen and Mess Hall—Treas. Dept., Wash., D. C., received no bids building kitchen and mess hall at Marine Hospital, here. J. A. Wetmore, superv. archt. Noted July 10.

Pa., Phila.—Boat and Storage Building—Spec. 4012—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build here.

Pa., Phila.—Cranes—Spec. 4013—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install in boat and general storage building, here.

S. C., Charleston—Mechanical Stokers—Spec. 4010—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install in Central Power Plant, here. About $11,000.

S. C., Charleston—Turbo-Alternator—Spec. 4011—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install in Central Power Plant, here. About $50,000.

Ore., Benham Falls—Reservoir and Dam—U. S. Recl. Serv. having plans prepared for reservoir and dam with capacity to irrigate 100,000 acres. Adress F. E. Weymouth.

Cal., San Diego—Marine Brigade Post—N. F. Smith, pub. wks. officer, 12th Naval Dist., Timken Bldg., Los Angeles, receives bids in September, building marine brigade post including administration building, power house, additional barracks, storage houses, sewer, water and lighting systems, etc., on "Dutch Flats."

BIDS DESIRED

Mass., Boston—Wharf Until Aug. 9, by U. S. Engr. Office, building pile wharf at Hog Island; advertised in this issue.

Conn., Mystic—Post Office—Until Aug. 25, by Treas. Dept., Wash., D. C., building post office, here. J. A. Wetmore, superv. archt.

N. Y., Buffalo—Dredging—Until Aug. 29, by U. S. Engr. Office, 540 Federal Bldg., dredging in outer harbor, here; advertised in this issue.

N. Y., New York—Dredging—Until Aug. 29, by U. S. Engr., 39 Whitehall St., dredging in Newtown Creek; advertised in this issue.

N. Y., New York—Sea Wall—Until Aug. 27, by U. S. Engr. Office, 39 Whitehall St., repairing and enlarging sea wall near southern boundary of Sandy Hook Reservation, N. J.; advertised in this issue.

N. J., Lakehurst—Hangar—Spec. 4001—Until Aug. 6, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 1 dirigible hangar, here. Estimated cost, $1,500,000. Noted July 17.

D. C., Wash.—Canal Wall—Until Aug. 19, by Dist. Comrs., Dist. Bldg., reconstructing portion of canal wall west of Aqueduct Bridge; advertised in this issue.

D. C., Wash.—Water Pipe—Until Aug. 19, by Dist. Comrs., Dist. Bldg., furnishing and delivering 342 tons 8 in. c.i. water pipe and 32 tons special water pipe.

Va., Norfolk—Dredging—Until Aug. 18, by U. S. Engr. Office, Custom House, dredging in 40 ft. channel between Hampton Roads and Belt Line Railway Bridge in Southern Branch of Elizabeth River; advertised in this issue.

Va., Norfolk—Dredging—Until Aug. 27, by U. S. Engr. Office, Custom House, dredging in waterway from Norfolk to Sounds of North Carolina; advertised in this issue.

Va., Norfolk—Roofing—Spec. 4005—Until Aug. 20, by Bureau Yards & Docks, Navy Dept., Wash., D. C., roofing hospital buildings, here. Estimated cost, $20,000. Noted July 17.

Ga., Douglas—Post Office—Until Sept. 10, by Treas. Dept., Wash., D. C., building post office, here. J. A. Wetmore, superv. archt.

Tenn., Memphis—Rip Rap—Until Aug. 14, by Mississippi River Comn., 1st and 2nd Dists., Custom House, furnishing 40,000 tons rip rap, f.o.b. cars at contractor's quarry.

Ky., Louisville—Lock and Abutment—Until Aug. 27, by U. S. Engr. Office, Louisville, building lock and abutment for Dam No. 45, Ohio River, at Addison. Noted June 26; advertised in this issue.

Mich., Detroit—Timber and Cement—Until Aug. 11, by Lighthouse Supt., 341 Post Office Bldg., furnishing 11,000 B. M. white oak timbers, 6 x 12 in. and 8 x 10 in. and 800 bbls. Portland cement, for use in constructing new concrete wharf at Detroit Lighthouse Depot; advertised in this issue.

Ill., Great Lakes—Groins—Spec. 4004—Until Aug. 13, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building groins for shore protection, here. Estimated cost, $125,000. Noted July 17.

Ariz., Flagstaff—Road Work—Until Aug. 13, by Bureau Pub. Rds., U. S. Dept. of Agriculture, Albuquerque, N. M., improving 4.8 mi. Oak Creek Cutoff Project located within Coconino Natl. Forest, Coconino Co. J. S. Bright, c/o Bureau Pub. Rds., 218 Luna-Strickler Bldg., Albuquerque, dist. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Stapleton—Mechanical Equipment—Treas. Dept., Wash., D. C., received bid furnishing mechanical equipment for kitchen and mess hall, at Marine Hospital, here, from G. E. Engr. Co., 22 Laight St., New York City, $86,550. Noted July 10.

★**N. J., Barnegat**—Stone Jetties—Bureau of Lighthouses, Wash., D. C., let contract building 2 stone jetties, here, involving 880 tons stone and 60 tons brush, to L. J. Seiling, Red Bank, $17,040.

Pa., Phila.—Dredging—U. S. Engr. Office, Phila., received bids July 25, dredging in Schuylkill River, (a) Sect. 1, involving 537,300 cu.yd. scow or 488,455 cu.yd. in place; (b) Sect. 2, 542,900 cu.yd. scow or 493,545 cu.yd. in place; (c) Sect. 3, 463,000 cu.yd. scow; (d) Sect. 4, 394,700 cu.yd. scow or 358 818 cu.yd. in place; (e) Sect. 5, 290,500 cu.yd. scow, from Great Lakes Dredge & Dock Co., Beach and East Susquehanna Sts., (d) and (e) $835 scow, $572,420; Amer. Dredging Co., Marine & Mercahnts Bldg., (a) $.238 scow, $127,877, (b) $.226 in place, $11,541, (c) $.298 scow, $137,974, (d) $.375 scow, $148,013, (e) $.64 scow, $185,920, alternate (a), (b), (c) and (d) $.269 scow, $520,295; Maryland Dredging & Constr. Co., Finance Bldg., (a) $.22 in place, $107,460, (d) $.29 in place, $104,057, (e) $.45 scow, $130,725, alternate bid (d) and (e) $.325 scow, $243,246. Noted June 26.

★**Pa., Pittsburgh**—Locks and Dams—U. S. Engr. Office, Pittsburgh, let contract building locks and fixed dams in Ohio River near Emsworth, to Dravo Contg. Co., Diamond Bank Bldg., $2,300,000. Noted June 12.

Md., Baltimore—Dredging—U. S. Engr. Office, Custom House, received bids July 21, dredging in channel to Curtis Bay, involving 950,000 cu.yd. scow measurement with over-depth dredging of 174,000 cu.yd., from Sanford & Brooks Co., Commerce St., $.27 per cu.yd.; Maryland Dredging & Contg. Co., 1515 Fidelity Bldg., $.28 per cu.yd.; F. E. Jones, 1002 Bank of Commerce Bldg., Norfolk, $.29 per cu.yd. Noted June 26.

W. Va., Charleston—Cranes—Spec. 3677—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids July 23, furnishing and installing two 150 ton electric traveling cranes, from Morgan Eng. Co., Alliance, O., $46,775, alternate $42,275 and $65,685, (190 days each); Cleveland Crane & Eng. Co., Wycliffe, Cleveland, O., $136,320 (240 days); Niles-Bement-Pond Co., 111 Broadway, New York City, $146,000, (300 days); Manning, Maxwell & Moore, 119 West 40th St., New York City, $98,876, (210 days); Alliance Machine Co., South Mahoning Ave., Alliance, O., $131,400, (200 days).

Ga., Dawson—Post Office—Treas. Dept., Wash., D. C., received bids building here, from P. H. Wall Contg. Co., St. Louis, Mo., $27,318; Unkefer Constr. Co., Minerva, O., $38,375. Noted July 10.

Ala., Andalusia — Post Office — Treas. Dept., Wash., D. C., received bids July 22, building here, from A. Blair, Montgomery, Ala., $47,890; King Lumber Co., Charlottesville, Va., $59,800. Noted June 26.

★**Ala., Florence**—Derricks—U. S. Eng. Office, Florence, let contract furnishing derricks, to E. F. Terry Mfg. Co., Grand Central Terminal, New York City, $159,589. Noted Apr. 24.

★**Mich., Detroit**—Pumps and Water Piping—Treas. Dept., Wash., D. C., let contract installing pumps and water piping in Post Office and Court House, here, to Drake-Avery Co., 40 State St., $6693 (120 days).

★**Ia., Fairport**—Laboratory—Comr. Fisheries, Dept. Commerce, Wash., D. C., let contract building laboratory at Biological Sta., here, to Walsh Constr. Co., 114½ West 3rd St., Davenport, $82,500. Noted June 5.

Idaho, Sorrento—Cottage—C. Sells, comr. Indian Affairs, Wash., D. C., received bids July 23, building physician's cottage at Cœur d'Alene School, here, from W. D. Lovell, 1415 South East 8th St., Minneapolis, Minn., $8815, (120 days); D. W. Parks, Bonners Ferry, $5876, (75 days); W. Pearce, 39 Cortlandt St., New York City, $5670, (75 days). Noted June 26.

Ariz., Leupp—Bridges—C. Sells, comr. Indian Affairs, received bids July 23, building 2 steel highway bridges, (1) bridge "E," (2) bridge "D," from J. J. Burke & Co., Kearns Bldg., Salt Lake City, Utah, (1) cost plus $4000, (150 days), (2) cost plus $8000, (180 days); Monarch Eng. Co., West Colfax Ave. and Larimer St., Denver, Colo., (1) $15,277, (210 days), (2) $36,439, (210 days); Omaha Structural Steel Co., 420 Bee Bldg., Omaha, Neb., (1) $15,800, (240 days), (2) $31,000, (240 days). Noted June 26.

Ore., Bend—Road Work—Bureau Pub. Rds., U. S. Dept. of Agriculture, 628 Post Office Bldg., Portland, received bids July 11, building and improving 15.51 mi. McKenzie River, National Forest Rd., Deschutes National Forest, Deschutes Co., from Sims & Carlson, Spokane, Wash., $224,474; Pacific Bridge Co., foot of Salmon St., Portland, $252,453; A. Giebisch, Portland, $278,872. Noted July 10.

Cal., Los Angeles—Silt Diversion Works—U. S. Engr. Office, 725 Central Bldg., received bids July 18 building here, involving 6 mi. channel, 500 ft. wide, levees and stone revetments from F. C. Franks Contg. Co., Amer. Natl. Bank Bldg., San Francisco, for all work in Sects. A and B, involving 1,030,000 cu.yd. earth work and 180,000 tons stone revetment, $716,350; Los Angeles Dredging Co., 1,300,000 cu.yd. excav. in Sect. C, $299,000; Rogers Bros. Co., 350 Merrick St., 40,000 tons stone revetment and 5000 tons stone jetties in Sect. C, $220,500. Total combination, $1,235,800. Noted June 19.

Miscellaneous

PROPOSED WORK

Coal Pocket—Fall River, Mass.—Staples Coal Co., 20 Bedford St., soon receives bids building rein.-con. coal pocket on Davol St. About $42,000. Private engineer.

Miscellaneous (Continued)

Scenic Railway—Hartford, Conn.—S. A. de Waltoff, 67 California St., plans to build scenic railway at Capitol Park, on Wethersfield Ave. About $30,000. Berenson & Moses, 1026 Main St., West Haven, engrs.

Swimming Pool—Hartford Conn.—S. A. de Waltoff, 67 California S.., West Haven, plans to build concrete swimming pool at Capitol Park on Wethersfield Ave. About $60,000. Engineer not selected.

Transmission Line—Watertown, N. Y.—Northern New York Utilities, Inc., Light & Power Bldg., having plans prepared for steel tower high tension transmission line from here to Black River, 7 mi. long. Cost between $80,000 and $100,000. Address H. G. Davis, ch. engr. Noted May 1.

Grandstand and Stadium—Phila., Pa.—J. H. Schumaker, 4819 Frankford Ave., had plans prepared by W. F. Gray, archt., 10 South 18th St., building 460 ft., concrete and steel grandstand and stadium, 7 rows high. About $150,000.

Subway—Detroit, Mich.—City had plans prepared building subway system in congested section of city comprising Fort St., Woodward, Monroe, Michigan, Grand River and Jefferson Aves. All stations to be underground. About $6,000,000. H. H. Esselstyn, ch. engr.

Park—Oshkosh, Wis.—City plans to build park in West Algona addition. About $15,000. D. Witzel, city clk.

Swimming Pool—Chisholm, Minn.—See "Buildings."

Transmission Line—Hudson, Kan.—City having plans prepared building transmission line for electric plant. About $15,000. W. B. Rollins & Co., 209 Ry. Exch., Kansas City, Mo., engrs.

Park Improvements, etc.—Boonville, Mo.—City issued $14,000 bonds for park improvements and buildings. W. E. Harris, Boonville, engr.

Park, etc.—St. Louis, Mo.—Bd. Pub. Serv. soon receives bids tearing down buildings and building playground at 11th, 12th, Benton and Montgomery Sts. About $15,000. N. Cunliff, City Hall, engr.

Speedway—Dalworth, Tex.—City of Dallas plans to build speedway here, midway between Dallas and Ft. Worth. Road to be built on 65 acres site on interurban and Dallas-Ft. Worth Pike. About $150,000.

Electric—Tishomengo, Okla.—City having plans prepared for electric improvements. Bonds for $60,000 voted for project.

Oil Tanks, etc.—Spokane, Wash.—Shell Oil Co. of California, North 111 Green St., plans to build 10 steel and concrete oil tanks, 100 bbl. capacity each, and reservoir. About $100,000.

Park and Natatorium—Baker, Ore.—City plans to establish park and having preliminary plans prepared for 2 story tile and brick natatorium, to include swimming pool, dancing pavilion and tourists camps. About $130,000. L. Gardner, mayor, Architect not selected.

Tunnel — Hook, Ore. — State Highway Comn., Salem, having plans and estimates made for 270 ft. tunnel, near here, on Columbia River Highway. About $30,000. H. Nunn, state highway engr.

Tunnel—Quinton, Ore.—State Highway Comn., Salem, having plans prepared for 560 ft. tunnel, near here, on Columbia River Highway. About $50,000. H. Nunn, state highway engr.

Swimming Pool — Colusa, Cal. — City trustees soon receive bids building concrete swimming pool. About $20,000. E. Symmes, 1700 Pearl St., Oakland, engr.

Equipment—Terra Bella, Cal. — Terra Bella Irrigation Dist. plans to spend $20,000 for equipment, etc., to irrigate 320 acres land, recently acquired. Noted April 3 under "Excavation and Dredging."

Dam—San Diego, Cal.—City directed H. N. Savage, city hydraulic engr., to prepare plans for single arch. rein.-con. dam for Barrett dam site. About $800,000. A. H. Wright, clk. Noted Jan. 30.

Transmission Line—San Diego, Cal.—H. N. Savage, city hydraulic engr., has arranged with San Diego Consolidated Gas & Electric Co., 935 6th St., to build transmission line to Barrett dam site near here.

Tank and Tower—Woodland, Cal.—City having plans prepared for 125,000 gal. water tank and tower. A. Proctor, city engr.

Wharf—Nova Scotia—Dept. Pub. Wks., Ottawa, Ont., soon lets contract building wharf on Bass River for Dominion Government, Ottawa. About $21,000. E. Lafleur, Ottawa, engr.

Wharf—Quaco, N. B.—Dept. Pub. Wks., Ottawa, Ont., soon receives bids rebuilding wharf here. About $22,000. E. Lafleur, c/o Dept. Pub. Wks., Ottawa, engr.

Harbor Improvements—Quebec, Que.—Dept. Pub. Wks., Ottawa, soon receives bids improving St. Charles River, Quebec Harbor. About $56,000. E. Lafleur, c/o Dept. Pub. Wks., Ottawa, engr.

Breakwater — Collingwood, Ont.—Dept. Pub. Wks., Ottawa, soon lets contract building breakwater here. About $34,000. R. C. Desrochers, secy.

Harbor Improvements—Ft. William, Ont. Dept. Pub. Wks., Ottawa, soon lets contract improving harbor here. About $200,000. R. C. Desrochers, secy.

Hydro Electric System—Victoria, Ont.—Town Council appointed committee to obtain estimates on hydro electric power and lighting system for Charlotteville Twp.

River Improvement—Steveston, B. C.—Dept. Pub. Wks., Ottawa, Ont., soon receives bids improving Fraser River at Nicomen Island, here. About $110,000. E. Lafleur, c/o Dept. Pub. Wks., engr.

BIDS DESIRED

Pier and Approach—Brooklyn, N. Y.—Until Aug. 8, by M. Hurlburt, comr. docks, Pier A, North River, New York City, furnishing all labor and materials for building pier and approach north of Barren Island, Jamaica Bay, Contr. No. 1609.

Paving Materials—St. George, S. I., N. Y.—Until Aug. 6, by C. D. Van Name, pres. Richmond Boro., furnishing and delivering asphalt mixing plant without boiler and wagon, steam roller and tools.

Piling—Hoboken, N. J.—Delaware, Lackawanna & Western R.R., 90 West St., New York City, receiving bids for piling for foundation for concrete viaduct over tracks on Newark Turnpike, here. G. J. Ray, ch. engr.

Structural Steel—Pittsburgh, Pa.—Amer. Window Glass Co., Farmers' Bank Bldg., receiving bids furnishing 200 tons structural steel to cover requirements for 4 months.

Refuse Destruction Plant—Newport, Ky. Until Aug. 9, by Bd. City Comrs., building refuse destruction plant of 2 units, 20-25 ton capacity each. J. G. Herman, city engr.; advertised in this issue.

Pumps, Engines, Etc.—Detroit, Mich.—Until Aug. 6, by J. A. Martin, comr. Dept. Purchases & Supplies, Municipal Courts Bldg., furnishing 4 gasoline driven double diaphram trench pumps with 3 in. suction and discharge hose mounted on wheels also 4 trench backfillers equipped with 1 man scraper, gasoline engines, caterpillar traction.

Wire—Detroit, Mich.—Until Aug. 14, by J. A. Martin, comr. purchases and supplies, Municipal Courts Bldg., furnishing 50 mi. No. 10 B. & S. gauge, 3 braid weatherproof hard drawn copper wire, freight paid to Detroit.

Mechanical Loader—Hastings, Minn.,—Until Aug. 18, by R. W. Downs, aud. Dakota Co., furnishing mechanical loader, suitable to load gravel from pits into auto trucks; advertised in this issue.

Reinforced Bars and Portland Cement—St. Paul, Minn.—H. W. Austin, city purch. agt., receiving bids furnishing 25 tons steel reinforced bars and 800 bbl. Portland cement.

Levee — Bridge Junction, Ark. — Until Aug. 4, by H. D. Tomlinson, pres., and J. R. West, secy., St. Francis Levee Dist., Bridge Junction, building levee at St. Francis Levee Dist. About $200,000.

Channel—Prince Edward Island—Until Aug. 19, by Dept. Pub. Wks., Ottawa, Ont., building channel protection works on either side of new opening from Gulf of St. Lawrence into North Lake (Kings Co.), work involves 1600 piles, stone filling, T-shaped protection works, 20 x 80 x 300 ft. wide, 12 ft. high. About $30,000. E. Lafleur, Ottawa, Ont., engr.

Wharf—Anse aux Gascons, Que.—Until Aug. 14, by Dept. Pub. Wks., Ottawa, building 400 ft. wharf, 30 ft. wide, 26 ft. high, involving 350 cu.yd. earth filling. About $36,000. E. Lafleur, c/o Dept. Pub. Wks., Ottawa, engr. Noted April 10.

Wharf—Cornwall, Ont.—Until Aug. 12, by Dept. Rys. and Canals, Ottawa, rebuilding and extending wharf, Lock 17-18, Cornwall Canal. About $30,000. N. A. Bowden, Ottawa, Ont., engr.

Wharf—Stewart, B. C.—Until Aug. 20, by Dept. Pub. Wks., Ottawa, Ont., building timber wharf in Skeena Dist., here. About $34,000. E. Lafleur, c/o Dept. Pub. Wks., Ottawa, engr.

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★Coal Pocket—Brooklyn, N. Y.—Lehigh & Scranton Coal Co., 5th and Berry Sts., let contract building rein.-con. coal pockets, to Linde & Griffith, foot of 4th Ave., Newark, N. J. About $75,000.

★Coal and Ash Handling Equipment—Central Islip, N. Y.—State Hospital Comn., Capitol, Albany, let contract for coal and ash handling equipment for hospital, here, to Guarantee Constr. Co., 140 Cedar St., New York City, $59,350. Noted July 10.

Sand—New York, N. Y.—F. L. Dowling, pres. Manhattan Boro., received only bid July 21, furnishing and delivering 11,000 cu.yd. asphalt wearing surface sand, Grade "B," from C. W. Crane, $13,200. Noted July 17.

★Electrical Equipment—Jersey City, N. J.—Bd. Educ. let contract installing exhaust fan and electrical equipment in Lincoln High School, to W. Coleman, Willow Court. About $10,000.

★Covers, Frames, etc.—Detroit, Mich.—City let contract to Stuart Fdry. Co., 207 Junction Ave., furnishing 550 manhole covers at $16, total $8800, 25 manhole frames, $10, $250, 25 manhole covers, $6, $150, 60 manhole covers, $6.75, $405, 900 Duplex complete, $16.50, $14,850, 50 Duplex frames, $6.20, $310, 50 Duplex covers $5.35, $268, 400 pool gates complete, $12.50, $5000, 25 pool gate frames, $6.75, $168.75, 25 pool gate covers, $4.50, $112.50, 50 circular curb boxes, $3.10, $155, total, $30,439.

★Transformer Stations — Chicago, Ill. — Holabird & Roche, archts., 104 South Michigan Ave., let contract to Black Constr. Co., 20 West Jackson St., for 2 story, 40 x 84 ft., brick and rein.-con. transformer stations, one at 6909 Throop St. and another at 2644 Irving Park Blvd., for Commonwealth Edison Co., 72 West Adams St. Total cost $175,000.

Pontoon—Portland, Ore.—Port of Portland received bids building pontoon No. 6, for St. John's drydock, from R. Wakefield, Worcester Bldg., $129,262, (5 mos.); coast Shipbuilding Co., Lewis Bldg., $132,500 (110 days); Northwestern Constr. Co., Portland, $132,544, (160 days).

Engine and Generating Unit—Palo Alto, Cal.—Bd. Pub. Wks. received bids furnishing and installing Deisel engine at power plant, from McIntosh-Seymour Corp., 461 Market St., $48,900; electric generating unit, from Genl. Electric Co., Rialto Bldg., $5680, contractors both of San Francisco. Bonds for $72,000 voted for project. Noted June 19.

★Dam—San Francisco, Cal.—Pacific Gas & Electric Co., 445 Sutter St., let contract enlarging dam in Lake Spaulding, rising height from 260 to 275 ft., to Duncanson Harrelson Co., Chronicle Bldg. About $400,000.

★Train Shed—Halifax, N. S.—C. B. Brown, engr., Moncton, N. B., let contract to Shearer Constr. Co., 225 St. Patrick St., Montreal, Que., building train shed at new South Station ocean terminals, for Canadian Natl. Rys., Moncton, N. B. About $80,000. Noted July 3.

★Hydro-Electric System — Teeswater, Ont.—Town Council having plans prepared installing hydro power and lighting system. About $15,000. Work will be done by day labor under supervision of Ontario Hydro Comn., University Ave., Toronto, engrs. Noted July 3.

★Park Improvement — Toronto, Ont. — City will improve and extend Ramsden, Riverdale, Withrow, Monark Parks and Allen Gardens. About $125,000. Work will be done by day labor

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—James H. McGraw, *President*

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, *Editor* — Charles Whiting Baker, *Consulting Editor*

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The Brotherhood's Railway Plan

OVERSHADOWING all other great public questions of the day except the high cost of living—of which it is a part—is, "What shall be done with the railways?" Plan after plan has been proposed, commented on by a larger of smaller number of proponents and opponents and all but forgotten except by a comparatively few. Among these plans will probably be classed before long the one formulated by a committee of the Chamber of Commerce of the United States and approved as to 9 of its 10 points by a "referendum vote" of business organizations, as announced in detail on p. 292. But the plan that surpasses all others in the general interest it has created and the discussion it seems likely to cause among the people at large is the one announced by the four large railway brotherhoods in the Sunday papers, Aug. 3. Formulated in more or less detail some time ago and indorsed since by the American Federation of Labor, the Plumb plan is now before Congress. An outline of its provisions appears on p. 290. The chief of these are Federal ownership of the railways, and their lease for operation to a corporation with directors representing equally the public, the railway officers and the railway employees. Profits from operation would be divided equally between (1) the public and (2) the officers and the wage earners. The plan has taken on greatly added significance because of the circumstances of its announcement, which tied it and the railway wage problem so skillfully into the high cost of living. Put forward in this way and as a virtual demand of two million railway employees for Government ownership of railways, the Plumb plan should be given close study to determine the effect of its adoption upon the railways, their employees and, last but not least, upon the public at large.

Helping City Planning Along

WIDESPREAD progress in city planning is the order of the day. Scores of cities have commissions devoted exclusively to this subject. Many of these commissions, probably most of them, have little more than advisory powers and very few have funds sufficient to enable them to gather the data and secure the expert assistance necessary to enable them to give good advice to the city authorities or to the general electorate who control he city purse and policies. At the best much general educational work is required to convince city councils and taxpayers that city planning pays. In a few of our progressive cities there have been promising attempts to secure coöperation by various civic and commercial organizations. A recent example is afforded at Dallas, Tex., where the Chamber of Commerce and the City-Planning Commission, working through the Metropolitan Development Association, are attempting to unite "all the Dallas business and civic organizations to meet properly the demands" of the rapid growth of that city "by undertaking a comprehensive, far-sighted program of practical city planning accomplishments," for which purpose an effort is being made to raise $35,000 yearly to maintain "a permanent office" and employ "experienced city-planning experts." This is commendable but ultimately the city itself should establish and finance city-planning studies, coördinating them and the execution of the plans with other city activities. Otherwise the best of plans are likely to remain where so many such now are—on paper, accumulating dust in pigeon holes. Few of our cities have yet learned that city planning is a function that they should assume without further procrastination. Coöperative action like this at Dallas will hasten the day.

Coöperation of Engineers and Contractors

COÖPERATION of engineers and contractors on highway work—and, in fact, upon all work—is essential to the best results. A tendency on either side to bulldoze the other is always a detriment to the job. In a visit to a highway office recently, the remark was made to the editor, "If a contractor comes into the office and says something good about an inspector, we 'fire' the inspector." While this was probably said in jest, still it represents a feeling which took that form of expression. If the engineer is overbearing, it creates in the contractor a desire to get even, which will generally be accomplished in spite of the engineer. A characteristic of all contract work should be a spirit of coöperation between the contractor who performs the work and the engineer who supervises it. Only by such harmony, fostered by a spirit of give-and-take, can the best results be obtained.

Care in Foundation Work Spells Safety

A COFFERDAM accident noted on p. 268 illustrates the fact that care and caution in foundation work are necessary for the proper prosecution of the work as well as for the stability of the future structure, which latter point was discussed in *Engineering News-Record* of May 29, 1919, p. 1043. In this present case a tunnel was known to exist beneath the site, but instead of careful preliminary investigation and bulkheading it seems to have been assumed that the tunnel was not an element of danger, and a chance was taken in letting it fill with water. The result was that the water, under high head, forced its way out through the surrounding ground and flooded a cofferdam in which foundation work was in progress. No lives were lost and no great damage was done, but the delay of ten weeks was a serious interruption to progress.

Public Improvement Programs Hampered By Local Authorities

THROUGH a weak point in the municipal government system of many cities, it happens too frequently that well considered plans for public improvements, prepared by competent men, may be seriously changed to meet the whims of inexpert local officials. This has been illustrated forcibly in the recent council discussions of the Chicago lake-front improvement ordinance, involving an expenditure of approximately $140,000,000.

After several years of debate, an ordinance was drafted that had the approval of all the conflicting interests, including a council committee, and was further indorsed by a special railway terminal commission. No sooner was this ordinance introduced in the city council than it became the target for attacks which took the form mainly of innumerable amendments imposing additional requirements upon the railway whose terminals are to be rebuilt. There was little regard for the relation of these amendments to the project as a whole, and they were carried so far that acceptance of the ordinance by the railway company was endangered.

The trouble comes in part from the ward system of representation. To the average alderman the interest of his ward comes first and that of the city comes second, while one of his main aims is to "get something" for his ward in order to prove to his constituents that he is actively representing them. Should the interests of the city require something adverse to his ward, he would try to defeat the proposed measure.

In part, also, there was the assumption that a railway company was a fair object of attack and might be loaded with any and every additional work and expense. In fact, there seemed to be an idea that the railway was asking a favor and therefore should shoulder any such additional work. Its representatives finally had to insist there were limits to the conditions under which it could accept the ordinance.

This experience brings to mind the tendency of the people to set themselves up as experts or judges in technical matters ("mobexpertocracy") discussed in our issues of June 14, 1917, p. 563, and June 5, 1919, p. 1091, and the habit on the part of public officials of making decisions on technical matters without asking or heeding technical advice, as commented on July 10, 1919, p. 49. True, it cannot be denied that a city ordinance is put through its various council stages to give opportunity for decision and amendment; and that representative government implies consideration of the interests of all classes of those represented; and that in many if not all cases the chosen representatives means well. But all this does not alter the fact that the interests of the city as a whole should come before those of a ward or class. Some think the remedy lies in election at large instead of ward representation. Others pin their faith on proportional representation. Each plan has its merits, but they are not sufficient in either case, for something more fundamental than the basis of representation or any other element in the framework of government is needed. The public must be educated to elect and to trust representatives of higher caliber and broader judgment, who will not only legislate more wisely and impartially but will also select specially trained men for executive positions, and put more confidence in their judgment in engineering and allied matters.

Cost Engineering as a Science

COSTS are of the essence of engineering. An appreciation of their importance, and the ability to control them, distinguish the successful engineer from his less fortunate brother—assuming always a proper grounding in the technique of design and construction. And yet, in spite of the wide acceptance of this statement as a fact, the science of cost keeping has not kept progress with the technique of the profession. The contractor of necessity ought to know his costs, and the engineer-designer and construction supervisor has to follow those costs in order to perform properly his part of the work, but, except among the large contractors whose business is on an extremely sound basis, costs are too loosely kept and too frequently misinterpreted.

War, with its vast accompaniment of construction, laid the basis for a more intensive study of the science of cost keeping. In the first place, practically all the contracts were let on a cost-plus basis, which of necessity led to the most detailed of cost records. But, besides this, the work had all to be done at record speed, which meant that the layout of prospective work must be most definite and the adherence of performance to expectation be close. No better measure of progress could be found than the record of cost—or at least, progress could be best recorded as a part of the cost-keeping procedure.

Thus it came about that all of the construction branches of the Government began the development of cost-recording methods on a scale never before attempted. It is a fair indication of the state of the science that practically every one embarked on his own scheme from the beginning, independent of the past or of the others engaged in the same study, and each, now that his system is developed, is willing to defend it as the best and most workable ever proposed.

One of the most elaborate of these systems is that used by the United States Housing Corporation, to which a number of pages of this issue are devoted. Although the work of this bureau was of a special type—that is, an aggregation of small operations, duplicated many times at many different places—the cost and progress records exhibit in admirable form the fundamental requirements of any such system. Large expenditures of money and effort are subdivided into minute details, which in themselves can be observed and recorded without much complication or difficulty. These details, however, are so recorded as to permit of ready accumulation into composite units which present to the executive a picture of the whole, but which at the same time may be traced back to their source if occasion demands. A record of progress at any instant is available by observation; costs, for whatever purpose, are readily obtainable.

The Housing Corporation's scheme, too, exhibits the apparent defects common to all cost and progress records on so large a scale. The details of observation and record seem innumerable and the multitude of results confusing. Actually, however, in such systems most of the operations soon become routine and are as easily performed as the results to which they lead are understood and applied.

Dr. Mann in his famous report emphasized the importance of cost study in the new engineering education. Here, then, is a part of a new course in, say, engineering accounting, made to hand. In their

elements such systems are bookkeeping of a higher sort, and may be left, as too often they have been in the past, to bookkeepers, but really they require much more than mere accounting skill. They run back to the bases of engineering knowledge and should, therefore, be a part of every engineer's equipment. In fact, Messrs. Prior and Green point out that in their work they found that engineers made the best material for their cost men, not only because of the technical fundamentals of the work but because of their adaptability and their direct pursuit of the fact to its source. Engineering cannot ever be merely building cheaply and quickly, but the best engineering in the world falls short of what it should be unless it is completed at the lowest possible cost and at the greatest possible speed. Any method of study which will encourage young engineers to develop this cost and speed sense will add much to the practice of engineering.

Traffic Control on Feeder Highways

MORE than a year ago, when the agitation for the regulation of motor-truck weights, sizes and speeds was just starting, we called attention to the various phases of the problem (*Engineering News-Record*, May 16, 1918, p. 939). One matter discussed was the liberty to be allowed the heavy truck on the inadequately improved cross-roads. The question was stated as follows: "What shall be done with the side roads? Shall all roads be built the same, so that the concentrated load of the occasional heavy truck which happens to go on the side road shall not destroy it, or shall a system of licensing, with prescribed zones, in which certain weights of trucks may operate, be employed?" The first alternative is not debatable, as it is manifestly impossible, financially, to comply with the conditions. The second, however, warrants attention.

At the present time a maximum load of 28,000 lb., including the weight of the truck and its burden, has been tentatively agreed upon by truck manufacturers, truck owners and highway engineers, and this standard will be pressed in all the state legislatures. It becomes a matter of grave concern as to whether this truck shall be allowed on feeder roads. It is of concern to the public to protect its investment in the type of road which composes the greater portion of its highways; it is of concern to the engineer who must provide, as best he can, for the ever-increasing maintenance charges due to traffic conditions, and it is of concern to the truck operator, who wants to know whether he can buy a uniform weight of truck of the maximum size, or whether he is to be held up with certain portions of his business at the side roads, being compelled to transfer to a lighter truck to complete the transportation. In his case it might be advisable to use the light truck for the entire movement.

Since it is evident that our highways cannot all be made to bear 28,000-lb. loads the year round, it seems necessary that some means for protecting lighter construction be considered at once, and before great damage is done to our more common roads at the expense of general ill-feeling against the destructive agent.

In considering what loads and speeds may be allowed, various factors enter the problem. In the types of construction most generally found on the cross-road, beam action is practically absent from the road crust, and the load-bearing power of the subsoil is the detail that must be considered. This bearing power is not only dependent upon the quality of the soil, but also upon its condition as regards moisture content. Many earth roads will safely carry a heavy motor truck in seasons when they are perfectly dry, and if it is possible to operate over them at all in wet weather, the damage is easily repaired. Not so with the light macadam construction which is practically broken up by the heavy motor truck when a soft subgrade exists, and can only be repaired at heavy cost.

Again, the crushing strength of the aggregate in the macadam road, affecting the internal wear under heavy motor-truck concentrations, would possibly exclude the 28,000-lb. truck, even in the dry season. Another factor which enters the problem is the light construction of the bridges on many of the side roads, which were built before motor-truck transportation was contemplated. What shall be the maximum loads allowed in the wet season? And what in the dry season? Shall maximum loads be different for different seasons of the year and different types of road and bridge construction?

Aside from maximum load, the speed of vehicles must also be considered, and this, instead of showing a maximum destructive effect in the wet season, will be more damaging in the dry season. The load impact and the consequent internal wear in the macadam road will be greatly affected by the speed of the vehicle. Again, the effect of rubber tires, particularly pneumatic, upon macadam roads is well known, and it often occurs that a light automobile will do more damage to a dry macadam road than a heavy, slow-moving truck. The speed maximum for macadam should therefore be established with reference to the dry- and not the wet-season wear.

When once a set of regulations has been promulgated, taking into consideration the type of road, the condition of the bridges, the weight and speed for different seasons of the year, etc., how shall these regulations be enforced? It is common knowledge that many regulations of motor trucks are continually disregarded by operators. The first consideration in the enforcement of such a set of regulations would seem to be the posting at each road intersection of either printed signs or easily distinguished symbols, to inform the driver what regulations apply to the road which he is about to traverse. There are many cases, no doubt, where adjacent cross-roads would call for entirely different traffic regulations.

Any system of signs that might be used would have to be such as to be quickly distinguished, so that a large loss of time might not occur in determining the conditions. On the main roads, licensing would solve the problem of weights and dimensions. On the feeder roads, should separate licenses be required, with special license tags which might easily be checked up by citizens living on the road, or should police supervision, which would be expensive in the country districts, be depended upon to enforce the rules?

Enough has been said to show the intricate character of the problem. It is in order for those interested to institute studies for its solution, and as it would seem logical and preferable to press before the legislatures a single statute covering both the main and feeder roads, it is hoped that those who have suggested the solution for the main road will now bend their energies to the solution of the feeder-road problem.

Keeping the Costs of Building the Government Houses

System of Reporting Progress and Cost Used by the United States Housing Corporation—Methods Devised and Operated by Engineers Applicable to One Building or to Complete Towns

By John C. Prior and Herbert P Green

Chief Cost Engineer and Assistant Chief Cost Engineer, United States Housing Corporation, Washington, D. C.

EXPERIENCE has demonstrated that the keeping of progress and cost records is an indispensable adjunct to the successful supervision of construction on a vast scale, and that in actual dollars and cents such reports pay for the cost of their preparation many times. In the construction of the many housing projects for the Government during the war, the United States Housing Corporation, which had an appropriation of $100,000,000 for war housing, developed a system of producing and keeping such records which served admirably to present a running picture of the status of the work on each project but which also preserved for future use the exact costs to the finest detail. Such a system is equally well adapted to a small undertaking as to the large ones for which it was devised.

Fundamental Principles

In designing reports for a busy executive, one paramount consideration is to have important features stand out so prominently that they may be seen at a glance. Details may be taken up afterward in the order of their importance.

Applying this principle to progress and cost reports on housing developments means that the reports should show standing out foremost a single figure to indicate *progress* to date, and another single figure to indicate the efficiency of the project as expressed by its *cost*. These single figures may include the construction of hundreds of houses of various types and sizes, stores, schools and other public buildings, a complete system of streets, sewers, water mains and other utilities, as well as the beautification of the grounds.

These single figures should be instantly comparable with the time schedule and the cost estimates, as well as with past performances, so that improvement or retrogression may be apparent.

Should the officials find these figures normal, the report is passed with no loss of time. On the other hand, if the figures are found to be unsatisfactory, the cause is immediately sought. Therefore, the report next analyzes the figures into their components, which are similar figures for buildings and for utilities.

The field is thus somewhat narrowed, but further subdivision is necessary. Hence, the next step is to divide buildings into groups, each group containing all buildings of the same general character, and to divide the utilities into the principal branches, such as streets, sewers, water lines, etc. After the difficulty has been traced to certain groups, the next step separates these groups into the various trades or operations, and in some cases these must be again subdivided into the minor operations. By following unsatisfactory components through to the smallest subdivision, the trouble is thus traced quickly to the very trade or operation which is delaying the work or running up the cost.

But to get the single index figures, which are the peak of a pyramid, we have to reverse the process and build up from the foundation. We have to begin with the details and proceed logically to the peak—the final answer sought. In the description of a report, hereinafter, we use this method.

The adoption of a unit cost system with units selected for detail and for breadth, amply met all requirements. In order that costs may always be comparable with estimates, it is necessary to use unit costs as well as total costs.

Standardization, with sufficient flexibility to take care of features peculiar to the individual developments, is a prime requisite for any system of progress and cost reporting which is used on many scattered projects.

As far as practical the system should automatically emphasize items which have the greatest effect on ultimate cost and on time of completion. The operation of the Housing Corporation is such that the cost of *materials* is almost a fixed unit. But the cost of *labor* used for incorporating materials into the finished structure is almost entirely dependent upon the efficiency of field supervision. Speed of erection also depends upon field supervision. Hence, much more time and care should be devoted to compiling labor reports than material reports. Also, some individual items in house construction consume a larger proportion of the whole cost and time than do other items. Thus, "Rough Carpentry" and "Masonry" are larger items and should have more thorough attention than "Sheet-Metal Work" or "Installation of Lighting Fixtures."

Construction Organization of Corporation

The policy of the Corporation was to organize itself on a combination of the line and staff systems. This is the best method to give responsibility to a man and to hold him responsible for the results.

It would have been a difficult matter to build up rapidly a hundred or more construction organizations, each complete and smoothly running. Hence, it was deemed advisable to absorb into the Corporation as many organizations as possible, and to make the Corporation organization a controlling one. Contractors had organizations, and each had his own method of enlarging them more quickly than the Corporation could create new organizations of the same size.

But while it was the policy of the Corporation to hold the contractor responsible for his organization and its accomplishments he could not be left to himself. Especially during war construction he could not get results as quickly nor as economically as he could if the Government were back of him. Hence, the Corporation did get back of him. It placed with him, to coöperate with him, certain representatives who were specialists in accomplishing the desired results. These men were a works superintendent, inspectors, engineers, an auditor and a cost engineer. While acting with the contractor, these men remained definitely a part of the Government organization, assigned not only to assist the contractor, but also to see that he performed his contract.

In order to follow the working of this principle, it is necessary to consider the form of contract evolved. This form is known as a "cost-plus-a-fixed-fee" contract.

This means that the Corporation pays for the actual cost of labor and material entering into the construction, and for the overhead cost of the project. The con-

tractor is paid a definite sum, agreed upon beforehand, for the use of his nucleus of an organization, his plant, equipment, supervision and personal attention, and for his constructive efforts in building up a large organization to accomplish the purpose of the contract.

But if the contractor has a contract in which the owner pays all bills and he gets a definite profit regardless of what the work costs or how long he takes to do it, the human tendency might be not to accomplish as much as possible. It was therefore deemed advisable to have bonus and penalty clauses in the contracts which would give two additional incentives to perform the work expeditiously and economically.

Most of the contracts allowed a bonus of twenty-five per cent of the saving, in case the contractor by reason of skill in executive management and organizing ability reduced the total cost of the work below his estimate, and exacted a penalty of twenty-five per cent of the loss, if the total cost exceeded his estimate, both the bonus and the penalty being limited to fifty per cent of the fee.

The bonus was further modified by a clause which required that to collect it the contractor must complete his work within the time he estimated.

The contracts of course allowed an equitable revision of both the money and time estimates to cover changes made by the Corporation, and for certain other contingencies beyond the control of the contractor.

As these clauses are personal matters to the contractor they are found to loom very large in his eyes. Hence he watches very closely the two items that the Corporation wishes him to watch—progress and cost.

The contractors are determined by a competitive bid, but this competition is not limited to dollars and cents. Some contractors might underfigure others, but not be able to carry the contract to completion. Hence, the form of bid contains in addition to the estimate of the probable cost of the work a statement of the contractor's past accomplishments, what composes the nucleus of his organization, what equipment and plant he has available, what capital he can command if necessary, what time he will take to do the work, and the fixed fee he will accept for his services.

All of these items are considered in making the award. The contract contains a restatement of the essence of each of these items. Not the least item is the estimate of the probable cost of the work. When the contractor reecives a contract and the estimate is reduced to the documentary form required by the Corporation, this estimate is known as the "Official Estimate."

The responsibility of living up to this official estimate is entirely upon the contractor. He has studied the plans of the work, has analyzed the component elements, has studied the labor and material situation, and has reached certain conclusions. He has combined his past experience with these new-given conditions into a comprehensive statement of *quantities* of work, *units* of cost, and *total* cost.

After being awarded a contract, the contractor is required to rewrite his estimate on forms prepared by the Cost Engineering Section. Complete instructions in regard to compiling these sheets are printed thereon, so that a competent estimator for the contractor can easily transform the contractor's own form of estimate into the standard form. The items into which the estimates are subdivided are units of standard construction with which all builders are familiar. Examples of these subdivisions are given in the detailed problem worked out hereafter.

Making the Official Estimate

The Official Estimate consists of three printed forms. Each form adopts given standard units of measurement.

The estimates are made by inserting the estimated number of these units required and the estimated cost of each unit, and by obtaining the products of these assumptions.

The first form includes all buildings. It is designed to show the quantities required for each type of building, and for each trade or operation. It shows the unit costs for labor and for material. It shows the total costs for labor and for material, and the totals to complete each trade or operation. The total cost is shown for one building of each type, as well as for all the buildings of each type.

The number of sheets required for buildings depends upon the number of types involved. This form is very flexible and makes possible the combination of such house groups as is deemed advisable.

The second form is used for the utilities estimate. On this form the estimate is first broken down into the principal groups, streets, sewers, water mains, etc., and these are again subdivided into their principal items. For example, sewers are classified by sizes. The size for each sewer is given, as is also the number of lineal feet required, the average cut, the unit cost for excavation and backfill, the unit cost for laying, the unit cost for hauling, the total unit cost for labor, the unit cost for material, the total cost for labor and for material, and the total cost for that particular size of sewer. Similar treatment is accorded all other items making up the various groups, standard units being used wherever possible.

The third form summarizes the preceding two. In addition it shows in detail the estimated cost of overhead, the cost for plant rental, and the fee for the contractor's services. The total of this third form equals the total amount stated in the contract, and these documents are made a part of the contract. The forms themselves are too voluminous for reproduction in this article.

The contractor proceeds with his contract on the agreement that he will work to accomplish the estimated results. This Official Estimate is the standard which enables the Corporation to compare what he does with what he said he would do.

In reporting progress and cost the corporation is able to judge performance better from records which are made by itself than from records which the contractor might make. Contractors' methods vary greatly—hence they must be standardized. It is the duty of the Cost Engineering Section to standardize these methods and to keep the records constantly up to date.

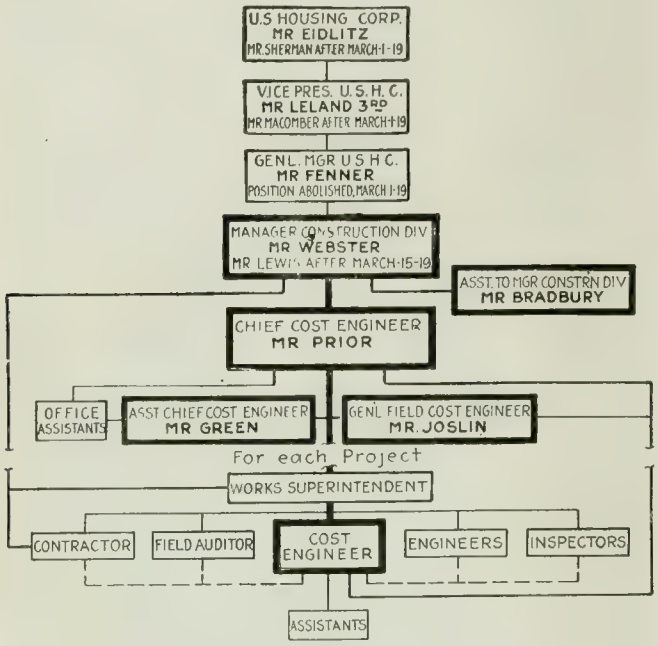
It would be difficult to keep reports momentarily up to date, hence definite periods have to be adopted for the ends of reports. An interval of two weeks between reports was adopted after considering, on the one hand, the desirability of having the reports as nearly up to date as possible, and, on the other hand, the amount of time necessary for their preparation and the fluctuations in unit costs for very short periods.

Cost engineering, as developed by the Housing Cor-

poration, performs two functions: First, compiling complete, immediate and accurate comparative records of *progress* and *cost* of work performed, and second, utilizing this information to improve the existing conditions.

The organization which the Housing Corporation established for these purposes is shown in Fig. 1.

The first function, that of compiling comparative records, is primarily the duty of the Cost Engineering Section. However, this section has the periodic assistance of other divisions in gathering the necessary information, for it is the policy of the Corporation to



FUNCTIONS OF PRINCIPAL ELEMENTS

ASST TO MGR CON DIV	ASST CHIEF COST ENGR	CHIEF COST ENGINEER	GENL FIELD COST ENGR	COST ENGINEER
Analyze reports for information and work with contractor and works superintendent to devise means whereby cost may be reduced and progress accelerated	Systematize and standardize operation and information Work to general efficiency of the organization, supplement work of chief cost engineer	Formulate policies, organize departments. Correlate activities.	Co-ordinate field activities, obtain official estimates, educate field assistants, act as field representative of chief cost engineer	Prepare cost reports, progress reports, special reports

FIG. 1. ORGANIZATION CHART OF COST ENGINEERING SECTION OF UNITED STATES HOUSING CORPORATION

keep the field force reduced to a minimum to avoid overlapping of duties.

The Fiscal Division, represented on the chart by the Field Auditor, acting in connection with the contractor's field force, performs all routine bookkeeping and auditing matters, and distributes the costs to certain accounts, as required by the Cost Engineering Section.

The quantity of production is obtained by actual measurements made on the job as the work progresses. The cost engineer is responsible for obtaining the measurements of production, but is aided by the inspectors and the utility engineer.

The Cost Engineering Section takes the information thus gathered and puts it into a permanent and understandable form.

The second function, namely, that of improving conditions, is vested in the general manager of the Construction Division. He appoints as his assistant a man who is eespecially diplomatic and forceful, and conversant with contractors' methods. His particular duty is to take from the Cost and Progress Reports the vital information therein, and to work with the contractor and with the works superintendent, to the end that cost may be reduced and progress accelerated.

The system adopted may be divided broadly into field and office methods. Because of many considerations, it was determined to make the field do all the work possible, leaving only the planning, systematizing, directing, coördinating and gleaning to be done at headquarters. The principal advantage of doing it this way, rather than by concentrating the work at Washington, was that it made the system so flexible that it could be applied to one building only or to a thousand towns with very little difference in the headquarters force. To do this, resident cost engineers had to be intensively trained in the Washington office, in order that they might be sent to the field thoroughly conversant with the duties required.

The men themselves are the most important part of the system. If we could not have secured good men, we could not have worked the system. As the system had to be flexible though standardized it was necessary to employ men who were themselves flexible though standardized. Of all classes of men, those with an engineering training seem to possess this quality of adjusting themselves to conditions as they find them, better than any other class. This is because they are taught to take what they find and create out of it what they want. Their training enables them to see broadly the purpose back of their routine work and thus to grasp the important and to disregard the irrelevant. In short, they should be what the word "engineer" really means—trained and *ingenious* men.

But even the most ingenious man cannot do full justice to his work, unless he knows precisely what is wanted, and in what form it should be presented. Hence, it was necessary for the central office to prepare a Manual of Instructions in advance of construction, setting forth in a clear and concise way the duties of a resident cost engineer and his relation to the other members of the field force. The Manual included in addition a complete set of cost engineering forms for a hypothetical example.

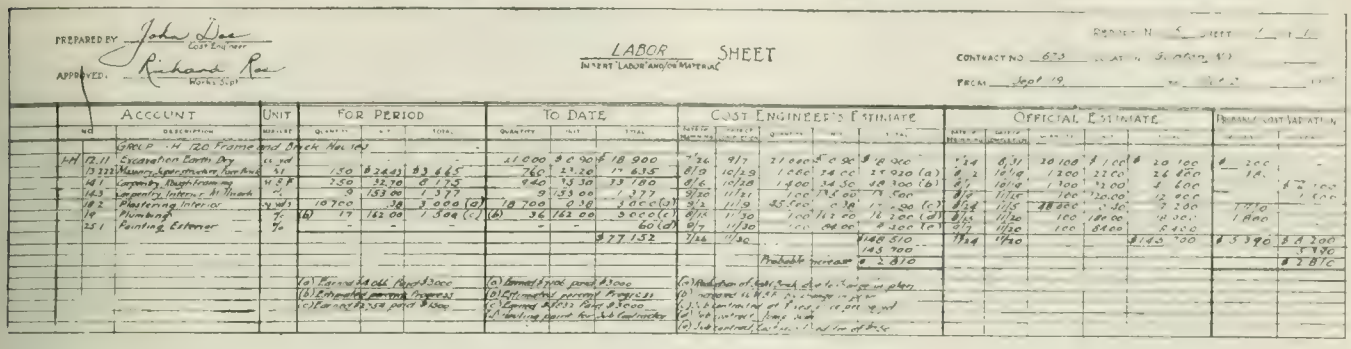
Among the ordinary printed forms in use by the Corporation may be mentioned several which are important for the cost engineer, but as they are not unique they will be only mentioned. These are the Foremen's Daily Work Reports, the time-keeping and checking forms, the weekly payrolls, the material requisitions, the invoice tracers, and the expense register. These are all brought together into a comprehensive scheme in the Construction Record, and it is from the Construction Record that the bulk of the cost engineer's figures as to expenditures are taken. This information is complemented by information he gains at first hand from various sources, and is checked by his personal examination into a certain proportion of the detail, so that he can satisfy himself of its correctness in principles and its approximate correctness in facts.

The tables given herewith, illustrating standard documents developed by us, are not intended to be a duplication of the *shape* of the forms used, but are intended to indicate the principles of computation adopted. Nor do the values used indicate any particular relation to any actual project.

Table I indicates the tabular form into which the cost engineer first gathers the information coming to him.

TABLE I. COMPARISON BETWEEN A CONTRACTOR'S ESTIMATE AND HIS PERFORMANCE

The information given is taken from records made by the contractor, audited by the field auditor, and supplemented and elucidated by the cost engineer. Progress and cost are shown *For Period* of time covered by the report, and for all time, *To Date* from beginning of the work. *The Cost Engineer's Estimate* of what he believes will be the total is given, as well as the Contractor's *Official Estimate* of what he thought would be the total.



A report generally includes many such tables, one for labor and one for material for each Main Group, one for Overhead, and one for the Project as a Whole. Material sheets are not included until the fourth report, and thereafter are included in even-numbered reports only.

For the purpose of illustration, a hypothetical project is assumed. It will include two groups of houses served by streets, sewers and water mains. Calculations and illustrations of forms will be given for one group of houses only. In this group, all but a few of the necessary trades or operations will be eliminated. To make the illustration include most of the conditions met in actual progress and cost reporting, it is further assumed that the project will require some twenty weeks for its completion, and that the construction has been under way for about ten weeks. This brings the project to the point where the fifth Biweekly Report is made.

The Main Group given in the hypothetical example herewith is known as 1 H and contains the labor for seven subdivisions or trades. All others have been eliminated for brevity, but the ones included are sufficient to illustrate the general principle involved. A complete Main Group for Houses generally includes about twenty to twenty-five subdivisions, and a Main Group for Utilities about five or six. The Main Groups adopted are as follows:

Houses, Group 1	1 H	Sewage-disposal plant	S D
Houses, Group 2	2 H	Sewage-pumping plant	S P
Houses, Group 25, etc	25 H	Sewers	S R
Bridges and culverts	B C	Street railways	R
Docks	D	Streets	S T
Electric lines and plants	E	Telephone lines	T
Garbage-disposal plant	G D	Water mains	W
Gas mains	G	Water-pumping plant	W P
General	G E	Water-purification plant	W F
Heating plant	H P	Water towers	W T

The preparation of reports is greatly simplified by reducing the number of house groups to a minimum. Hence, the buildings are divided into groups only when their character is distinctly different or where the development includes several sites.

There are thirty-three sets of subdivisions, generally by trades, and to each is assigned a whole number, beginning with ten. Each set is divided by decimals into parts which are different in nearly every trade. The subdivisions may be a part of any Main Group to which it is desired to assign them. One set of subdivisions is here given:

12. EXCAVATION
.1 Earth
.11 Dry
.12 Wet
.2 Rock
.21 Solid
.22 Loose
.3 Cofferdam
.4 Sheet piling
.5 Bracing and shoring
.6 Borrowed earth
.7 Back fill

Referring again to Table I, the first column (No.) shows a Main Group and its subdivisions in standard symbols.

The second column ("Description") gives popular descriptions of the operations, so that persons not familiar with the classification numbers may know the operations without referring to the Manual.

The third column gives the units of measure for the different classes of work. Such items as are difficult to reduce to cubic, square or linear units are appraised on a percentage basis, but reporting in percentage is discouraged because it is not as accurate as measuring in definite units. Plumbing, heating, lighting, millwork, painting, landscaping and cleaning up may be reported in per cent.

It will be noticed that the portion of the table to the right of the third column is divided into five main columns: 1. "For Period," 2. "To Date," 3. "Cost Engineer's Estimate," 4. "Official Estimate," and 5. "Probable Cost Variation."

Each of the first four of these columns contains the quantity of work, the unit of cost, and the total cost for each subdivision

The "For Period" is for the period of time shown at the top of the sheet.

The "To Date" column includes all the work completed since the project began

The "Cost Engineer's Estimate" contains figures which he and the works superintendent anticipate will be nearly correct at the completion of the project. The column is revised from time to time by the cost engineer, with the approval of the works superintendent, as new information is obtained indicating new conditions not foreseen at the time of the last revision of the "Cost Engineer's Estimate."

As the Official Estimate is the *base* of all computations, it is intended that it shall not be changed. A comparison between the other three columns and this column gives the measure of efficiency of the project as compared with the standard at first adopted. If the standard at first adopted is not met, it is reflected immediately by the difference between the other columns and this one. The dollar variation between the Cost Engineer's Estimate and the Official Estimate is shown in the last column, "Probable Cost Variation."

Both the "Cost Engineer's Estimate" column and the "Official Estimate" column contain dates for the beginning and for the completion of subdivisions of the work, and for the whole group.

In studying Table I, the following is some of the in-

formation which may be gathered from the first line taken in connection with the headings and notes. Item 12.11, "Labor on Excavation, Earth, Dry," has been completed with 900 more cu.yd. than estimated, but at 10c. per cubic yard less than estimated, making a total of $1200 decrease in cost. The fact that it is completed is shown by the quantity and unit totals in the "To Date" column being the same as the corresponding items in the "Cost Engineer's Estimate" column. It is also learned that the work was originally intended to be started on July 24 and completed on August 31, but that it was not started until two days later and was not completed until seven days later than planned, i.e., on

TABLE II. PROGRESS AND COST EACH EXPRESSED IN A SINGLE FIGURE FOR AN ENTIRE PROJECT—OR FOR AN ENTIRE GROUP OF HOUSES WITH INDIVIDUAL HOUSES IN MANY STAGES OF COMPLETION

By inserting in this form certain figures from Table I the cost engineer is enabled to compute the progress which has been made and the efficiency of the labor.

	% PROGRESS TO DATE Based on Cost Engineer's Estimate					% UNIT COST TO DATE Based on Official Estimate				
CLASS NO.	QUANTITY TO DATE	QUANTITY COST ENGRS EST	% COMPLETE	WEIGHT	WEIGHT × %	UNIT COST TO DATE	UNIT COST OFF EST	% UNIT COST	WEIGHT	WEIGHT × %
1-H										
12.11	21 000	21 000	100	12.7	1270	0.90	100	90	13.8	1242
13.222	760	1 080	70	17.5	1225	23.20	22.00	105	18.1	1900
14.1	940	1 400	67	32.5	2178	35.30	32.00	110	28.6	3146
14.3	9	100	9	9.1	82	153.00	120.00	127	8.2	1041
18.2	18 700	45 500	41	11.7	479	0.38	.40	95	13.2	1254
19.	36	100	36	10.9	392	162.00	180.00	90	12.3	1107
25.1	0	100	0	5.6	0	-	-	-	5.8	-
				100.0	5626				100.0	9690
	5626/100 = 56.3% PROGRESS					9690/942 = 102.9% UNIT COST				
PROJECT AS A WHOLE										
1-H			56.3	40.	2252			102.9	39.	4013
2-H			38.	30.	1140			93	31.	2883
ST			8.	15.	120			96	14.	1344
W			100	6.	600			95	6.	570
SR			42.	9.	378			124	10.	1240
				100.	4490				100.	10050
	4490/100 = 44.9% PROGRESS					10050/100 = 100.5% UNIT COST				

July 26 and September 7, respectively. As these dates are prior to the period of the report, no work is included in "For Period" column.

In the same way, other lines may be analyzed. In "Face Brick Work" there is a reduced quantity expected, a part of the reduction being caused by a change in plan. The reduction in quantity will cause a net decrease in dollars in spite of an expected increase in unit cost. The unit cost to date is not as great as the Cost Engineer's Unit Estimate, which shows that he expects the last part of the work to cost more than the work up to this time. If the period is indicative of the future, the unit cost for the period bears out his assumption. This work began three days ahead of schedule but probably will be ten days late in finishing.

"Rough Carpentry," according to the Cost Engineer's Estimate, was originally underestimated as to quantity, but more than half of the increase has been caused by a change in plan. The same estimate shows that labor for erection will cost more per thousand board feet than at first expected. The work done to date has cost even a higher rate, but the unit cost for period is showing improvement. Increased unit cost, faulty quantity estimating, and changes in plan, have all contributed to a considerable probable increase in total cost. This item was late in starting and probably will be relatively still later in finishing.

For "Carpentry, Interior Millwork," the "To Date" and "For Period" columns are alike, indicating that this item was started during the current period. The unit cost is considerably above the official estimate. As most of the work is yet to be done, the cost engineer estimates that the unit cost will be reduced and the excess cost absorbed somewhat, but that the unit cost cannot reach the originally estimated rate for all of the work. An overrun in total cost probably will result.

Interior plastering has been subcontracted at a fixed price per square yard two cents less than the Official Estimate. The quantity to be placed will probably be less than the estimate. Note that the quantities "For Period" and "To Date" multiplied by the unit costs do not equal the dollars in the total columns. This is due to the fact that actual payments to the subcontractor lag behind his production. In fact, the payments are based on previous reports.

The cost engineer should explain items involving special conditions by placing notes at the bottom of the sheet as shown, and he may discuss them more fully in the letter of transmittal.

Analysis on a Percentage Basis

For the purpose of further analysis of Progress and Cost to Date, another statement is compiled giving the results on a percentage basis. This form is recast for our example herein as Table II

The same classification numbers given in Table I are inserted in the first column. The left half of the rest of the sheet refers to Progress and the right half to Cost.

It will be noticed that "Progress to Date" is based on the Cost Engineer's Estimate, for this estimate is a statement of the best knowledge of what 100% of the work will be. Progress of each item is given in per cent of the Cost Engineer's Estimate. Items not started are of course reported as zero per cent complete.

When it is noted that the first item is 100% complete the second 70%, the third 67%, the fourth 9%, etc., the first question that arises is, "What progress has been made on the whole group?"

A correct answer to this query cannot be obtained by merely averaging the percentages, because some items require much more labor than others. Hence a column marked "Weight" is added. In this column figures are given which represent the relative importance of each item to the whole group of which each is a part. The group is taken as 100. The product of the per cent complete for each item and its weight is then carried to the next column. The sum of this column divided by 100 gives the per cent progress of the group. In the example this figure is 56.3 per cent.

In a similar manner the groups which compose a project are combined to obtain the progress for the project as a whole. For progress the weights should express the relative production each item will contribute to the whole group compared with all other items in the group.

On the assumption that labor is paid in proportion to what it produces, weights are based on labor costs. This method of fixing weights is simple to apply and leads

TABLE III. PROBABLE TOTAL COST OF PROJECT WITH AN ANALYSIS OF VARIATIONS FROM OFFICIAL ESTIMATE

COMPARISON BETWEEN COST ENGINEER'S AND OFFICIAL ESTIMATE

CONTRACT #675 Gunton, N Y FROM Sept 19 TO Oct 2, 1918

		PROBABLE COST VARIATION DECREASE	PROBABLE COST VARIATION INCREASE
DIRECT LABOR			
OVERRUN DUE TO INCREASED QUANTITIES	$ 2 308		
UNDERRUN DUE TO DECREASED QUANTITIES	2 540		
NET CHANGE DUE TO QUANTITIES		$ 232	
OVERRUN DUE TO INCREASED UNIT COSTS	$ 7 120		
UNDERRUN DUE TO DECREASED UNIT COSTS	4 810		
NET CHANGE DUE TO UNIT COSTS			$ 2 310
OVERRUN DUE TO CHANGES IN PLAN	$ 1 932		
UNDERRUN DUE TO CHANGES IN PLAN	1 200		
NET CHANGE DUE TO CHANGES IN PLAN			732
TOTAL		$ 232	$ 3 042
NET			232
			$ 2 810
PERMANENT MATERIAL			
OVERRUN DUE TO INCREASED QUANTITIES	$ 1 760		
UNDERRUN DUE TO DECREASED QUANTITIES	2 470		
NET CHANGE DUE TO QUANTITIES		$ 710	
OVERRUN DUE TO INCREASED UNIT COSTS	$ 5 360		
UNDERRUN DUE TO DECREASED UNIT COSTS	6 870		
NET CHANGE DUE TO UNIT COSTS		1 490	
OVERRUN DUE TO CHANGES IN PLAN	2 240		
UNDERRUN DUE TO CHANGES IN PLAN	1 050		
NET CHANGE DUE TO CHANGES IN PLAN			$ 1 190
TOTAL		$ 2 200	$ 1 190
		1 190	
NET		$ 1 010	
SUMMARY			
LABOR			$ 2 810
MATERIAL		$ 1 010	
OVERHEAD			1 250
TOTAL		$ 1 010	4 060
NET TOTAL CHANGE			1 010
OFFICIAL ESTIMATE			3 050
PROBABLE TOTAL COST OF PROJECT			$ 300 000
			$ 303 050

to uniformity on all projects. The weights for Progress are computed from the "Total" column in the "Cost Engineer's Estimate" of Table I.

The "Per Cent Cost To Date" is next computed by practically the same mathematical process as described for "Progress." The unit cost to date of each item is given in per cent of the unit cost of that item as set up in the Official Estimate. The weights are obtained by use of the total column in the "Official Estimate" of Table I instead of the "Cost Engineer's Estimate." Items which are not yet started are left blank, for we do not know if the cost will be greater or less than estimated. Hence, to obtain the per cent unit cost of the group, the sum of the products of the per cent unit cost times weight is divided by the sum of the weights of only those items which have been started. In our example 94.2 is the divisor and the unit cost for the group is 102.9%. The groups are combined to get a similar figure for the project as a whole.

The "Per Cent Unit Cost" thus obtained does not indicate that this group will cost in total dollars 102.9% of the total dollars given in the Official Estimate, because in obtaining it quantities are disregarded except as affecting weights. This figure is not intended to show total costs at all, as other forms are used for this purpose. But it is intended to be an indicator of the labor efficiency on the group and on the whole project. The titles "Per Cent Cost to Date" or "Per Cent Unit Cost" were used because they describe the procedure rather than the result. Other terms which suggest themselves for this figure are "Cost Index," "Unit Cost Index," and "Efficiency Index."

Similarly, figures might be computed for *material* costs, but where the Government is buying and furnishing most of the material to the contractor, such figures would serve no practical purpose.

Analyzing Cost Variation

After completing the computations described in Table II, the figures in the last two columns of Table I are analyzed by means of two other forms recast herein as Tables III and IV. These consider the causes underlying the Probable Cost Variation and obtain the amounts due to the different causes instead of considering them by trades or operations.

Table III also shows the total variation between the Official Estimate and the Cost Engineer's Estimate for all other parts of the work in addition to the group shown as 1 H. It gives the probable total cost of the project and enables the directors of the Corporation to plan accordingly.

The figures used in our hypothetical example for labor are carried through to this form without considering groups other than 1 H, so that the reader may easily follow the necessary computations.

The upper portion of Table II shows the result of this analysis of Table I. In this portion of Table III the same total overrun or underrun appears as in Table I, but the amounts which make the totals are different. The amounts are set up so as to show increases or decreases due to increased or decreased quantities, increased or decreased unit costs, and changes in plan.

The figures in the central and lower portion of Table III referring to material and to overhead are assumed herein as coming from other sheets of the report which are not shown in this example. The method of obtaining these figures is practically the same as herein described for labor. The totals also disregard all other groups in order to keep the example consistent.

Table IV shows the process of obtaining the figures for labor in Table III. The first column contains the

TABLE IV. AN ANALYSIS OF PROBABLE COST VARIATION TO DETERMINE THE CAUSES FOR THE VARIATION AND THE AMOUNTS DUE TO EACH CAUSE

This sheet is the intermediate between Tables I and III. It enables the cost engineer to compute almost automatically the six cardinal variations between the Contract or *Official Estimate of Cost* and the *Actual Cost*—Underrun (1) and Overrun (2) due to the corporation's changes are clearly separated from the four variations due to causes over which the contractor has control; viz., underrun (3) and overrun (4) due to incorrectly estimated quantities, and underrun (5) and overrun (6) due to decreased or increased unit costs.

Acct No.	Variation due to CHANGES IN PLAN by Corporation: A Quantity Decrease	D Quantity Increase	C Unit Cost $	D·A=C Product Underrun $	E·B=C Product Overrun $	Variation due to incorrectly estimated QUANTITIES by Contractor: F Quantity Off Est	G Quantity Cost End Est Excluding Changes in Plan	H·F-G Difference Decrease	J·G-F Difference Increase	K Official Estimate Unit Cost $	L·K=M Product Underrun $	M·J=K Product Overrun $	Var. at Cn due to decreased or increased UNIT COSTS by Contractor: N Unit Costs Off Est $	P·L=N Unit Costs Cost End Est $	Q-N=O Difference Decrease $	R Difference Increase $	S Quant. to Cost End Est Excluding Changes in Plan	T·Q=R Product Underrun $	T·Q=R Product Overrun $	TOTALS Underrun $	TOTALS Overrun $	NET TOTALS Underrun $	NET TOTALS Overrun $
1-H																							
13.11						20 100	21 000		900	1 00		900	1 00	0 90	0 10		21 000	2 100		2 100	900	1 200	
13.32	30		24 00	1 200		1 200	1 130	70		22 00	1 540		22 00	24 00		2 00	130		3260	2 740	2 260	480	
14.1		36	34 50		1 932	1 300	1 344		44	32 00		1 408	32 00	34 50		2 50	1 344		3 360	-	4 700	-	4 700
14.3													120 00	135 00		13 00	100		1 500		1 500	-	1 500
18.2						40 000	45 500	3 500		0 40	1 000		0 40	0 38	0 02		45 500	910		1 910	-	1 910	-
19.													180 00	163 00	18 00		100	1 800		1 800	-	1 800	-
25.1																				-	-	-	-
			TOTAL	1 200	1 932					TOTAL	2 540	2 308					TOTAL	4 810	1 120	8 550	11 360	5 390	8 200
					1 200						2 308								4 810		8 550		5 390
			NET		732					NET	232						NET		2 310		2 810		2 810

same classification numbers as are shown in the first column in Table I. The popular description column and the unit of measure column are not required on this sheet, as by referring to the same classification number on Table I, bound next to this sheet, this information may be found.

The first item to be separated from probable cost variation is the variation due to "Changes in Plan" which the Corporation makes. The dollars not chargeable to this cause are chargeable to causes over which the contractor has control, namely, incorrectly estimated "Quantities" and increased or decreased "Unit Costs."

In compiling Table IV, details which control additions or deductions due to changes in plan are obtained by an examination of the records concerning the contract and change orders. The amount of the decrease or increase in quantity is then inserted in either column A or B

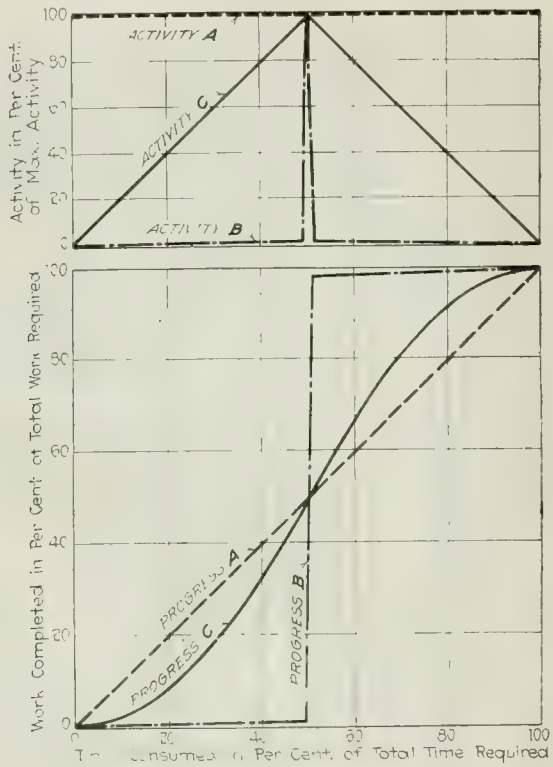


FIG. 2. RELATION BETWEEN ACTIVITY AND PROGRESS ON CONTRACT

as the case may require. In column C is inserted the unit cost. The product of the increased or decreased quantity by the unit cost is then inserted in either column D or E as required. It may be that the change order mentions no quantity or unit cost. In this case columns A, B and C are ignored and the total amount of dollars in the change order is inserted directly in column D or E.

After deducting all changes in plan, the cost engineer proceeds with the computations in the other columns *F* to *X*, inclusive. The figures to be inserted in columns F, G, K, N, O and R are obtained from Table I. Columns G and R may be modified by the figures in columns A to E.

After inserting the proper figures, the cost engineer performs the operations indicated by the headings of the columns. If he makes no mistakes in computations the net totals of columns U and W, or V and X, must be the same amounts as the total "Probable Variation" column in Table I. This provides an automatic check on the mathematical result. The totals are then transferred to the proper spaces in Table III.

This completes the mathematical analysis of progress and cost for the report.

Uniform Progress Not Expected

When progress is reported in per cent of actual production, it should be remembered that the per cent of production need not correspond with the per cent of time elapsed at the date of the report. In fact, on housing work exactly the contrary may be expected at all times except at one intermediate point and at the end of the work. This is especially true for main groups and for a whole project.

It is axiomatic among engineers that construction is slow in starting and slow in finishing. If this means that daily production in per cent of the whole is less at the beginning and at the end of the time required for construction than the daily production near the middle of this time, it is logical that it should be true. On most buildings the excavating must be well under way before the foundations can be started. There is a period at the beginning when no trade but excavators may be worked. When the foundations are started there are two operations or trades being worked. As the construction proceeds other trades are started in an orderly way, such as framing, superstructure masonry, plumbing, wiring, etc. Ultimately there are many trades working simultaneously, but some of them have to be nearly finished before others can begin. Thus, there is a period when a maximum number of trades may be worked simultaneously. This may be termed the period of maximum activity. This period is generally near the middle of the time required for the whole work, and ordinarily the rate of production at this time also becomes a maximum. From this point forward the activity diminishes until finally production is confined to completing certain odds and ends, and to final cleaning up.

Referring to Fig. 2, activity is represented on the upper part of the diagram and progress on the lower portion. Activity may be measured by the number of men working daily, or, better, by daily payrolls. Again, assuming that men are paid in proportion to what they produce, it follows that activity may be translated into progress based on production. One extreme assumption for activity is that the work starts with the maximum number of men possible and continues with this force until the work is complete. Such activity is represented by the activity curve A. The resulting progress is indicated by the straight line marked progress A and may be termed uniform progress. This condition cannot occur on an extensive building operation, but some of the individual trades will approximate it. The other extreme is represented by the activity curve B. In this case a very small force is used on preparatory work, producing very little for a long period. This force is suddenly expanded to a maximum for a very brief period, during which time nearly all the work is done. Then follows a long period of small activity and small production. Such a condition will probably never occur in extensive construction operations. A mean between these extremes is represented by the activity curve C. In this case construction is started with a minimum force which is uniformly built up to the maximum at the middle of the construction period and is then uniformly reduced to zero at the end of the

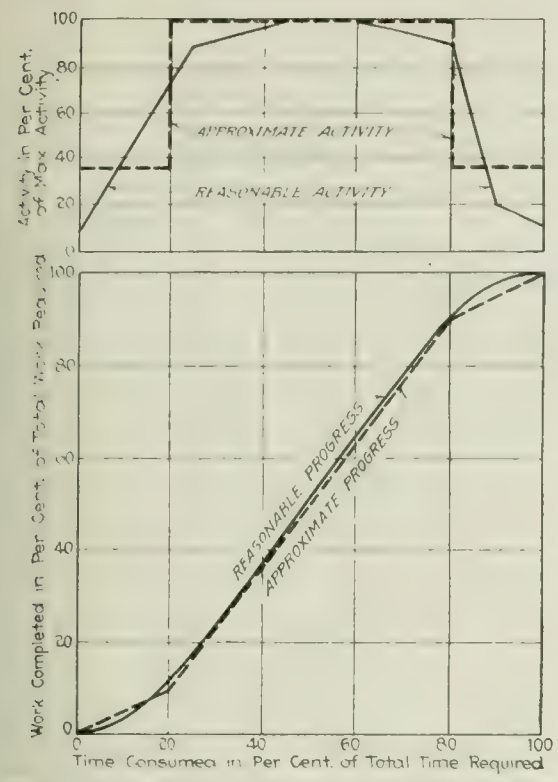


FIG. 3. DIAGRAM SHOWING ACTIVITY AND THE PROGRESS EXPECTED

working time. The resulting progress is a reverse curve as shown. The two C curves represent actual conditions on large building operations more nearly than either of the others, but such an activity curve is not altogether rational.

Because there must be some force employed at the very start as well as at the end of the working period, the activity curve cannot actually start or stop at zero. Activity is generally maintained for some length of time at nearly the maximum rate instead of culminating in a distinct peak. Maximum activity will ordinarily occur near the center of the construction period, but in special cases it may be near the beginning or near the end. These curves serve to give a good idea of the progress that should be expected on various operations requiring different organization methods.

In a general way, on housing projects it is deemed reasonable to expect that the working force should be built up from a nucleus of about ten per cent of the whole at the beginning to nearly the maximum force when twenty-five per cent. of the allowable time has expired, and that the maximum should occur during the period from forty-five to sixty per cent., but nearly the maximum should be maintained until eighty per cent. of the allowable time is gone. The force is then reduced rapidly to the size required for completing odds and ends and for cleaning up.

The curves for this force are shown on Fig. 3 and marked "Reasonable Activity" and "Reasonable Progress." Referring to the progress curve, it will be noted that when twenty per cent. of the working period has expired, about ten per cent. of the work, measured by actual production in place, should be completed, and that when eighty per cent. of the time is gone, ninety per cent. of the work should be completed. Hence, the curve is fairly closely approximated by the line labeled "Approximate Progress."

Each project should be studied—by establishing whether the houses are all to be carried forward simultaneously or in a series of groups; by estimating the sequence in which the various trades will take up their work, and by estimating the effect the utility construction will have on the whole undertaking—to fix a reasonable progress curve to use as a target. But in the absence of such a study, the approximate curve just mentioned serves fairly well for housing projects.

Individual trades or operations exhibit to some extent the same tendencies as do combined operations in that they have their getting-ready and finishing-up periods. Considerable experience is required to fix properly target progress curves for individual trades. The straight line of uniform progress is quite satisfactory for most trades if it is remembered that some lagging behind during the early stages is not a matter of great concern, but that in order to complete on time, production must be well ahead of the uniform progress during the late stages.

Visualizing the Tabular Records

For the purpose of making the more important information contained as tabular matter in the reports available with a minimum of mental effort, suitable diagrams are employed. A few of these charts containing worthy features will be described.

The method of visualizing progress and costs of various trades is illustrated in Fig. 4. This specific chart is made for face brickwork in our example. The diagram reads horizontally in months and days, and vertically in number of brick, per cent., and dollars. This

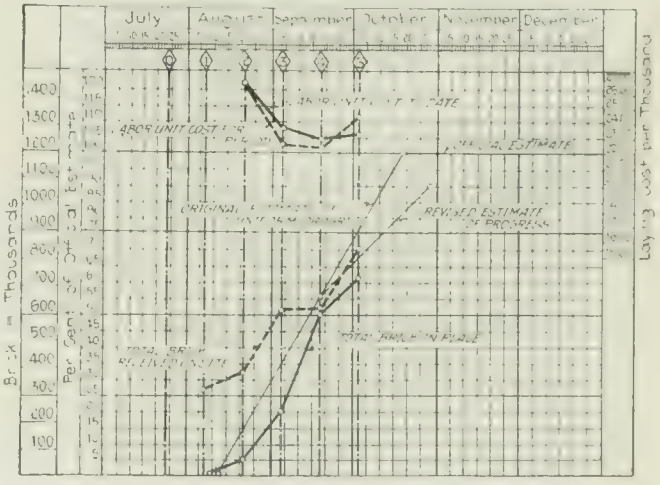


FIG. 4. TRADE PROGRESS CHART SHOWING LABOR UNIT COSTS FOR PERIOD AND TO DATE

Also shows quantities and percentages of material (brick in the case of this diagram) received on site and in place

diagram is computed from the information contained on the second line of Table I and the same line of previous reports. The date of beginning of the project is indicated by the verticle line with the 0 in the diamond at the top. As each report is made, the date of the report is indicated by a similar vertical line, with the report number at the top. It will be noted that the number of brick in place and the number of brick received both read in per cent. of the number estimated and in the actual quantity. The costs for laying also read in per cent. of the estimated cost and in actual dollars per thousand.

It is desirable for progress of trades to watch receipt

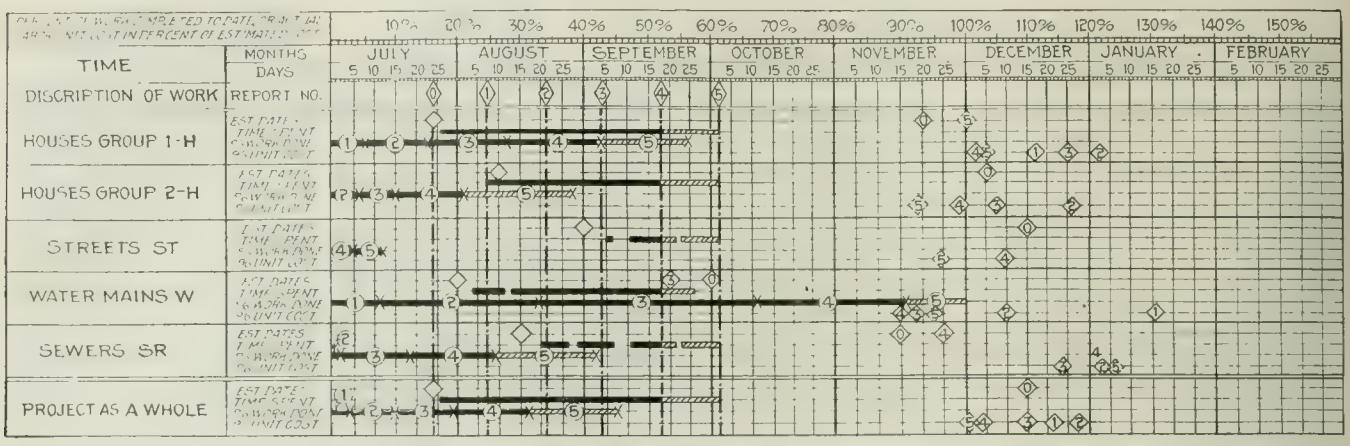


FIG. 5. GENERAL PROGRESS AND LABOR COST CHART

The information on this chart is a visualization of the general information contained in the report. Progress and cost are given for the main groups of the work as well as for the whole project. All reports to date are shown separately and collectively, and the future is predicted

of materials as well as the rate of incorporating them into the structure. In the example a delay in receipt of brick due to faulty shipments has caused a revision of schedule and is adversely affecting the laying costs. When the cost engineer advanced the time schedule on the chart, he also incorporated the estimated savings in quantity of brick required. The line labeled "Revised Estimate of Progress" indicates the resident cost engineer's expectations at the time the fourth report was made, and as no further revision is given for the fifth report, it must be assumed that he still expects to fulfill the new schedule. It will be noticed by studying the line of "Total Brick in Place" that the supply on hand will be quickly exhausted and that unless more brick is received another delay will result. Also, it will be noted that unless progress is speeded up the work will not be done on time even for the revised estimate. The chart therefore clearly shows that delay in receipt of brick upset all calculations.

Similar charts are made for the very important items and for those which, on account of unsatisfactory progress or cost, need detailed analysis. For field use they are kept up to date at more frequent intervals than once in two weeks. The tracing is kept at the field office and blueprints forwarded to Washington with each report.

Fig. 5 is a graphic resumé of the report.

A vertical dot and dash line is drawn through the date of the report and the report number is shown in the diamond at the top. Progress and cost of each item are indicated on the four horizontal lines which run to the right from the item. On the first and second lines the quantities are read in months and days and on the third and fourth lines in per cent.

On the first line the original estimate and the revised estimates of dates of beginning and completion are shown. A blank diamond indicates original estimate of date of beginning and a diamond with 0 in it indicates original estimate of date of completion. The numbers in the other diamonds indicate the report number on which the revised estimates were made.

On the second line the actual time spent on the work is shown by a very heavy line. Interruptions are shown by breaks.

On the third line the percentage of work completed on the date of the report is shown. The percentage completed at the end of all previous report periods is indicated by crosses. The report numbers are given in the circles.

On the fourth line the labor unit cost to date in per cent. of estimated unit cost is shown. The numbers in the diamonds are report numbers.

To add to the ease of reading, the chart, the lines or marks for the latest report are colored red. In Fig. 4 the cross-hatching and the diamonds with corners only represent red.

The chart shows in compact form the status of all the main groups and of the project as a whole, from the beginning of construction to the date of the current report. Whether progress is getting better or worse and whether labor unit costs are improving or retrograding is apparent at a glance.

Fig. 6 is a chart showing progress and cost of the project as a whole. The information given is practically the same as that shown for the last item of Fig. 4, but is in a form more familiar to the average reader.

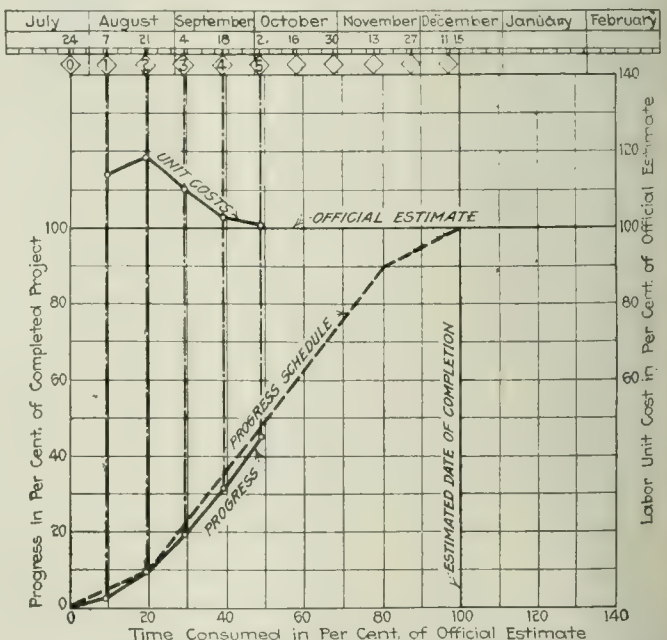


FIG. 6. DIAGRAM ILLUSTRATING PROGRESS OF WORK AND COSTS OF LABOR UNITS EXPRESSED IN TERMS OF CONTRACT

A collection of these charts provides, in compact form, a series of terse statements of the progressive physical conditions and costs of all projects. These charts may be termed the indices of the performances of the contracts.

A collection of these charts, one for each project, is kept on the desks of all persons interested in following progress and costs. The curves are compiled for labor only.

A plat of the entire property with various stages of completion of all buildings and utilities, indicated by means of cross-hatching and coloring familiar to all engineers, is included with the report.

After all sheets have been checked, the cost engineer studies them from the point of view of the man in the office perhaps three thousand miles away. He then dictates the letter of transmittal. This is a terse statement explaining everything the cost engineer deems the Corporation should know in connection with the report. High or low costs, speed or lack of it, shortage of labor or material, the weather, the personnel of the organization, and many other items require consideration in analyzing reports. The cost engineer is the one person whose duty it is to watch, record, analyze and report performance, so that those at headquarters may know

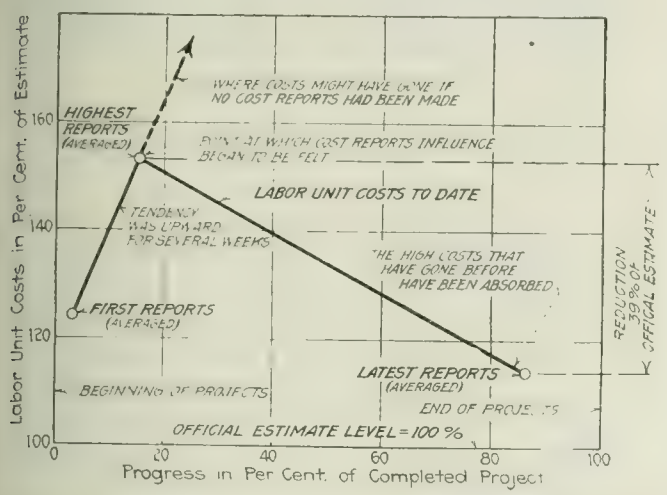


FIG. 7. DIAGRAM ILLUSTRATING REDUCTION IN LABOR UNIT COSTS

the accomplishments almost as well as if personally present.

All sheets composing a report are bound in a prescribed order into manila letter-size vertical file folders. Standardized information is given on the face of the cover.

The proof of the usefulness of any cost-reporting system can be found only by an examination of its actual operation.

Fig. 7 shows in a general way how labor unit costs compared with estimates have progressed on all the projects averaged into a composite. The reduction of thirty-nine per cent. is further analyzed in the following paragraph.

An examination of the cost curves similar to the upper curve on Fig. 6, for all projects, shows that the projects, as far as labor unit costs are concerned, group themselves into four general classes: (1) Those in which the course of costs is upward for some weeks, followed by a long period of improvement; (2) those which have shown a steady improvement from the very beginning; (3) those on which the costs have run about horizontally, showing neither improvement nor retrogression, and (4) those in which the costs have grown steadily worse. The majority are in the first class and the next largest number are in the second class. Only a very few are in class 4. The sum of the savings represented by the reductions in costs for Classes 1 and 2 is several million dollars, which is many times the cost of maintaining the cost engineering section. This reduction was effected without reducing labor wages and in many cases was made in spite of increased wages.

It should be understood that the cost engineering section did not actually install improvements in the construction organization, as this was done by the manager of the construction division, but the cost reports have been an *index* to the specific parts of operations that required attention and action. They have enabled those responsible for the construction to concentrate on the items which reflect unhealthy conditions and to pass with a word of commendation over those which were proceeding normally. The progress and cost reports may be regarded as the diagnosis of a project which permits the manager and his works superintendents as the physicians to apply proper medical measures immediately. Without a reliable and prompt diagnosis the patient's condition might become serious while the doctors are experimenting with the various remedies.

It may be argued that the costs would have come down even if no records had been kept. We are free to admit that some of them probably would have done so. But against this argument, we are sure any person familiar with war-time construction will say that if no check is kept on construction costs, the chances of the costs going upward are greater than of their coming downward.

It is a significant feature that in a majority of the projects unit costs went upwards for a few weeks and then reversed, since which time they have come steadily downward. This is explained by the fact that it took a short time to have the cost reports coming in properly and to set the necessary machinery in motion for correcting the difficulties.

The argument that unit costs at the start are always the highest is refuted by this class of curves, for they show that the costs continued to mount until corrective steps were taken. The few projects in Class 4 where costs have continued to go up from the beginning, as well as those in Class 4, were the costs continued horizontally, also contradict this argument.

In addition to the other objects for which the reports were designed, it was intended that the data gathered by the cost engineering section should serve as the foundation for future estimating. This use was never realized, due to the early ending of the war. This suggests the fact that many contractors regard acquirement of bidding data as the only purpose of their cost-keeping system. Hence, their costs for the most part are compiled after the job has been completed. The expense of gathering cost data is scarcely justifiable unless the information is compiled promptly enough to point the way to immediate savings as the work progresses.

While the system just described was designed as a war measure to meet special conditions surrounding construction on a large scale, the principles are no less applicable to peace-time construction. With only minor modifications this system may be made to fit a great variety of building and industrial operations. It is difficult to see how any large undertaking can be successfully managed without some means of determining reliable progress and costs as the work proceeds. Because of prevailing high prices of material and labor, it is now of greater importance than ever before to inaugurate *efficient management.*

Concrete Used in Boiler-House Structure and Fittings

War Scarcity of Metal Led to Wide Application of Concrete in Brooklyn Navy Supply Base Heating Plant

By George S. Nobles
Turner Construction Company, New York City

COAL hoppers, forced-draft air duct, and boiler breeching, at the boiler plant of the Navy supply base, Brooklyn, N. Y., were constructed of concrete because of the difficulty in obtaining the customary metal during the war period in which the buildings were erected. The structures themselves were also of reinforced concrete, but were not of exceptional design, except that for the height of the first-story columns, 24 ft., and the 46-ft. height of the boiler room, which required scaffolding all the way up for the purpose of erecting and stripping forms.

The power house is a complete heating plant. In brief, there are six 500-hp. boilers of the horizontal water-tube type. The feed water, which is taken from a 4-in. cold-water line, is passed through three pumping



MONITOR OVER COAL HOPPERS ALL BUILT OF CONCRETE

engines and forced by them to the fuel economizers, which are located about 36 ft. above the boiler-room floor and in back of the boilers. From there the water returns to the direct feed into the boilers. Since there is very little exhaust steam in a straight boiler heating plant, and also because the little that is there is largely utilized for the operation of turbines for forced draft, feed pumps, automatic stoker, conveyors, etc., it was not possible to operate the number of hot-water feed tanks which would be customary with 3000-hp. installation of boilers. Therefore, a hot-water feed tank of only about one-sixth this capacity was installed, and piping was so arranged as to provide for a bypass, so that only a portion of the feed water would pass through this tank.

As indicated above, the plant is also equipped with a forced-draft system operated by three 2200-r.p.m. turbine direct-driven blowers. The coal, which is delivered through a hopper and a crusher outside the building, is carried to the storage bins above by an elevator and a conveyor, whence it is automatically discharged into weighing scales and thence through chutes into automatic stokers. The question of disposal of ashes



SIDE VIEW OF FIRST BATTERY OF BOILERS COMPLETED

is solved by the equipment of the stokers with automatic steam dumps which lead the ashes into bunkers below the boiler-room floor, whence they are discharged into a hand-dump car and carried to the ashpit. From this pit an ash elevator carries them to a bunker above at the coal-hopper level. Discharge from this bunker is effected by a chute into freight cars outside.

There are several special features of the building which present possibly greater interest even than did the mechanical equipment. The duct in the basement for the forced-air draft system is constructed of concrete, with connections to the fireboxes made of plaster laid on metal lath, the only portion of this duct made of sheet metal being that section directly adjoining the blowers, where, since it is necessary to include a damper, the metal is essential. The coal hoppers, about 22 ft. wide at the top and 45 ft. deep, with a capacity of 2000 tons of coal, are also constructed completely of



FUEL ECONOMIZER AND CONCRETE BREECHING ADJOINING

concrete. They are of the typical trapezoidal hopper section. In the lower portion, where, it was anticipated, the grinding effect of the coal would be more pronounced, a little metallic hardener was used in the con-

crete. The ash bunkers in the basement were likewise made of concrete.

The section of the building in which the use of concrete is more or less of a novelty is the boiler breeching, which is usually constructed of sheet metal. Here concrete is used throughout. The breeching is about 36 ft. high; the wall thickness is 4 in., increasing to 6 in. at some points, and it was built in six separate expansion sections. Sheet-metal expansion joints are placed between the metal faces of the economizers and the adjoining concrete walls. Where the heated gases of combustion enter the breeching through smoke hoods from boilers, the concrete ceiling has been plastered with about a 1-in. thickness of a special retort cement, and at all other places, bottom and sides, it is lined with tile. A very neat and thoroughly workmanlike job results, and there is every reason to believe that this concrete breeching wall will serve the purpose for which it is intended as well or even better than would one of a sheet steel. The work was done in the summer of 1917 and 1918 by the Turner Construction Co., of New York City, under the direction of the United States Navy Department.



END VIEW OF FORCED-DRAFT DUCT BUILT OF CONCRETE

The three openings are for connection to turbine blowers; at the right the plaster-on-lath air feed to firebox of first battery of boilers.

Water-Power Studies in India

As a start toward a hydrographic survey of India a Government study of the water-power possibilities of the country is being made. G. T. Barlow, chief engineer for irrigation, and John W. Mears, electrical adviser to the Indian Government, Simla, are inspecting possible power sites for the purpose of selecting those that are considered worthy of detailed investigation by the Government.

Longest Suspension Bridge in New Zealand

By O. Johnson
Donnevirke, New Zealand

TO BE used mainly for the purpose of transporting flax-carrying trucks, the longest suspension bridge in New Zealand, 473 ft. over all, was completed under war conditions in about one year at a cost below £6 per running foot of bridge, including all engineering expenses. It is located about nine miles from Palmerston North, on the Foxton line, and crosses the Manawatu River. The cables are of the best plow steel, 16 in number on each side. The total length of each cable is 750 ft.; the cables are carried over the tops of the towers on saddles resting on 24 wheels, and each cable has a breaking strain of 60 tons. They are fastened to the anchorages by 2-in. rods about 30 ft. long and steel channels.



ROADWAY OF NEW ZEALAND SUSPENSION BRIDGE

The suspender rods are double, of $\frac{5}{8}$-in. diameter, and fixed to the cables with strong clips. The length of these rods varies from 48 ft. to 8 ft. The stiffening truss is $4\frac{1}{2}$ ft. deep with 7 x 5 in. and 5 x 5 in. chords, all timber being black birch. Vertical rods, each $3\frac{1}{2}$



SUSPENSION BRIDGE AT LOW COST BUILT OVER MANAWATU RIVER, NEW ZEALAND

ft. long by 1¾ in. in diameter are used, with ⅝-in. diagonal rods for the web members. About 30,000 ft. board measure of timber was required; the floor joists are 9 x 4 in. and 9 x 3 in., and the decking is 8 x 2½ inches.

The anchors and towers are reinforced concrete, the height of the towers from foundations to top of saddles being 68 ft. As illustrated in the photograph, the two towers at each side of the river are connected by three horizontal reinforced-concrete struts of arched outline. The anchorages contain about 20 cu.yd. of concrete each, in which the 2-in. anchor rods are embedded.

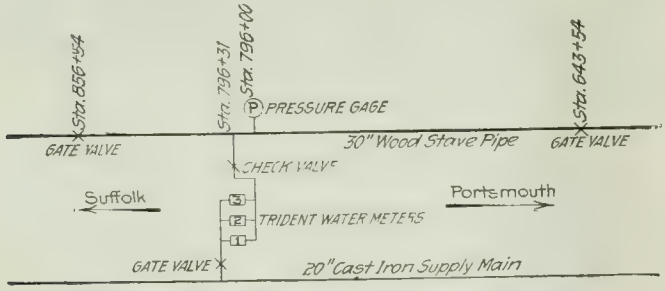
This bridge was built for the Tane Hemp Co. by Joseph Dawson of Pahiatua, New Zealand.

Leakage Test of Wood-Stave Pipe Line

By Victor M. Crown

Civil Engineer, Portsmouth Water Development, Quartermaster Corps, United States Army, Suffolk, Va.

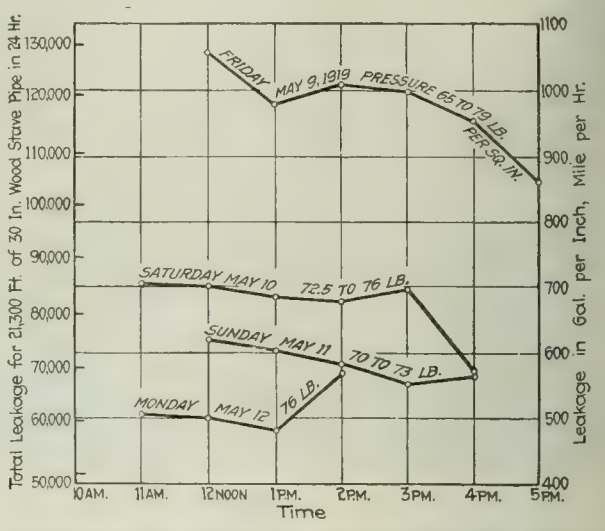
TEST data on leakage in a 30-in. continuous wood-stave pipe are shown in the accompanying table and diagram. The pipe is part of a supply main installed between Suffolk and Portsmouth. Fortunately, a supply of water for the test was near at hand in a



SKETCH MAP SHOWING CONNECTIONS FOR TEST

20-in. cast-iron main that paralleled the wood pipe.

The following description of the test will be made clearer by reference to the sketch map. By means of gate valves the wood-stave pipe line was closed between Sta. 643 + 54 and 856 + 54, a distance of 21,300 ft. Water was supplied at Sta. 796 + 31 from the 20-in. cast-iron main and measured by three disk meters arranged in parallel. Simultaneous readings were taken of the meters and pressure gage on four successive days, at intervals of one hour. Readings were reduced to a unit basis so as to be applicable to a pipe of any length and diameter, and the result was noted in column 9 on the data sheet. Leaks were being



LEAKAGE CURVES IN WOOD-STAVE PIPE TEST

repaired during the test, which accounts for the decrease from 1070 to approximately 500 gal. per inch-mile in 24 hours.

At this latter figure no further leaks were discernible and the pipe was accepted by the constructing quartermaster.

Government Wireless Stations

The United States Government has erected wireless plants at various points along the Atlantic and Pacific coasts and at Pearl Harbor, Hawaii, and at Cavite, in the Philippines. Government shore stations, according to the reports of the Bureau of Navigation, numbered 135, on June 30, 1918, of which 88 were in the continental United States, 20 in Alaska, 19 in the Philippine Islands, 3 in the Canal Zone, 2 in Hawaii, and 1 each in Porto Rico, Guam and Samoa. The Government ship stations totaled 470.

DATA OBTAINED IN LEAKAGE TEST OF WOOD-STAVE PIPE

Time	P Pressure in Pounds per Square Inch	$h = 2.3\,P$ Equivalent Water Head in Feet	Meter No. 1 Cu.Ft.	Meter No. 2 Cu.Ft.	Meter No. 3 Cu.Ft.	Leakage Cu.Ft.	Leakage Gal.	I Gallons per Inch-Mile per 24 Hours	L_{24} Total Leakage in 24 Hours, Gallons
Friday, May 9, 1919									
Start 11:00 a.m.	65	150	2,872	237	2,622				
12:00 noon	78	180	3,122	466	2,863	720	5,380	1,070	129,000
1:00 p.m.	78	180	3,352	673	3,084	658	4,930	980	118,000
2:00	79	183	3,586	892	3,308	677	5,070	1,010	122,000
3:00	78	180	3,816	1,109	3,531	670	4,940	1,000	118,000
4:00	78	180	4,037	1,317	3,744	642	4,800	955	115,000
5:00	75	173	4,239	1,505	3,934	580	4,340	863	104,000
Saturday, May 10, 1919									
10:00 a.m.	74	171	7,478	4,545	7,045				
11:00	72.5	167	7,642	4,699	7,201	474	3,540	705	85,000
12:00 noon	73	169	7,812	4,840	7,360	470	3,520	700	84,500
1:00 p.m.	74	171	7,980	4,996	7,498	462	3,460	685	83,000
2:00	76	175	8,146	5,151	7,635	458	3,360	680	80,500
3:00	75	173	8,298	5,297	7,803	466	3,500	695	84,000
4:00	72.5	167	8,438	5,427	7,917	384	2,880	570	69,000
Sunday, May 11, 1919									
11:00 a.m.	73	169	11,289	8,125	10,698				
12:00 noon	72	166	11,435	8,257	10,836	416	3,120	620	75,000
1:00 p.m.	72	166	11,577	8,387	10,972	408	3,060	606	73,500
2:00	71	164	11,711	8,513	11,104	392	2,940	583	70,600
3:00	70	161	11,841	8,633	11,226	372	2,780	553	66,800
4:00	72	166	11,971	8,757	11,354	382	2,860	568	68,600
Monday, May 12, 1919									
10:00 a.m.	76	175	14,161	10,780	13,423				
11:00	76	175	14,278	10,893	13,537	344	2,580	512	62,000
12:00 noon	76	175	14,392	11,005	13,649	338	2,530	503	60,800
1:00 p.m.	76	175	14,496	11,125	13,759	324	2,430	482	58,500
2:00 p.m.	76	175	14,626	11,249	13,887	382	2,869	568	68,600

Track Elevation on the Indianapolis Union Railroad

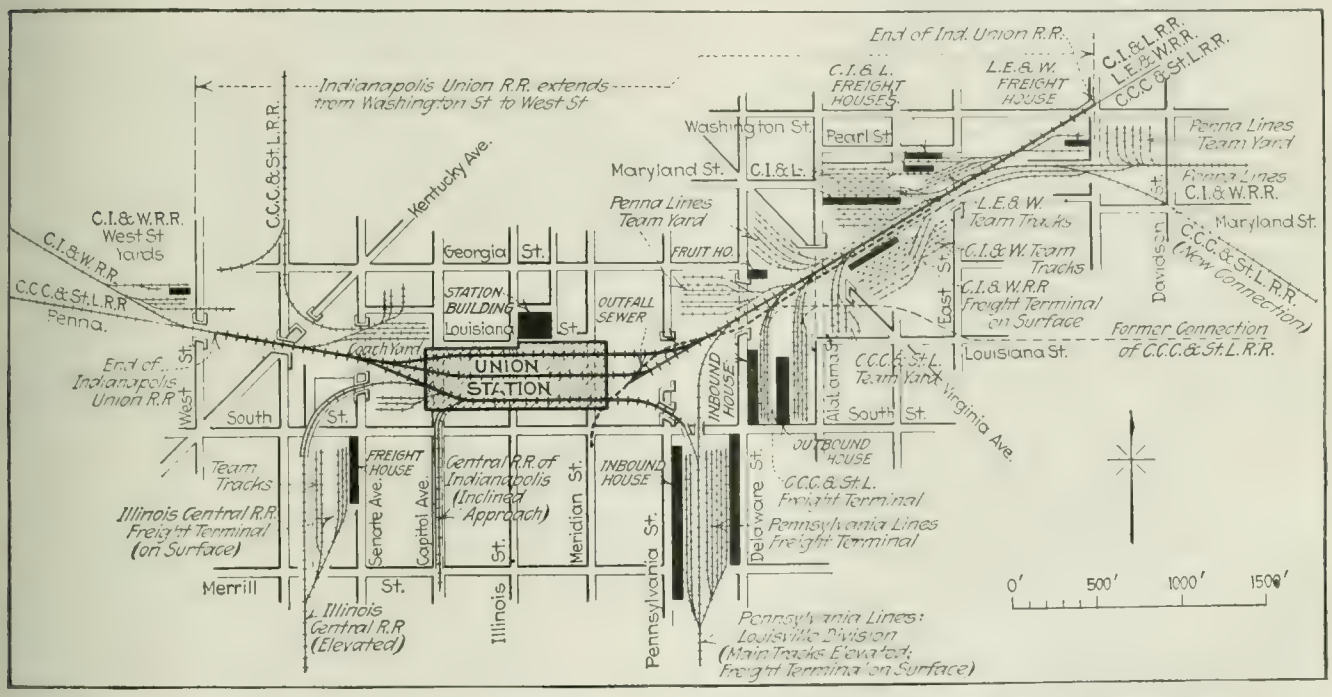
Traffic of 165 Trains Daily Necessitates Piecemeal Methods of Track Elevation on Line Through Union Station and Connecting Two Groups of Railways—Tracks Raised 18 Feet—Large Outfall Sewer Rebuilt

TRACK elevation for the elimination of grade crossings at Indianapolis, Ind., is an $18,000,000 project extending over several years and involving main lines, a connecting line across the business section of the city, a busy union station and a group of freight terminals, together with street and sewer alterations and other auxiliary works.

The most serious part of the problem, involving 50% of the total cost, is the elevation of the Indianapolis Union R.R., a 1¼-mile line which carries all passenger traffic through the city and on which the union station is located. The solution was aided by the widening of the line and the station yard, so that some beginning could be made before there was interference with existing facilities, but all work had to be under heavy traffic. Bridges replace 11 grade crossings, four of which were near the station and extended over a series of tracks in continual use. Elevation and revision of several freight yards located along the line form an important accessory to the improvement, but this work was done by the trunk lines which own the terminals. The reconstruction of the union station was described in *Engineering News-Record* of July 10, 1919, page 84.

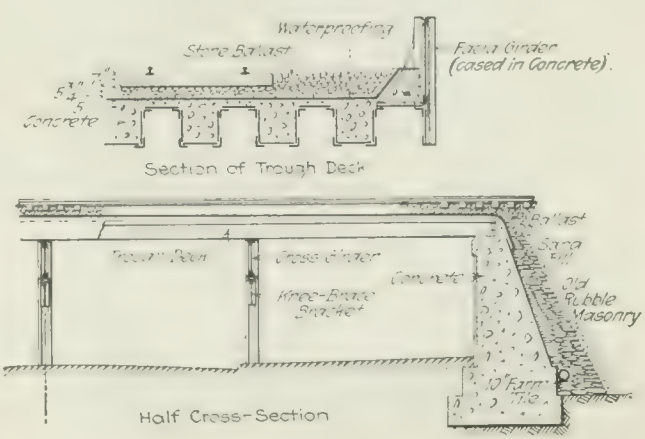
Indianapolis is a great railway center, and is peculiar in that the numerous railways converge upon the ends of the 1¼-mile line noted above, as shown by the accompanying map. Four railways have nine divisions connecting with the west end, while five railways have eight lines connecting with the east end. Two junctions are just outside the station. Traffic, therefore, is not only very heavy, but is complicated by numerous switching movements at the station and at the freight terminals. An average of 165 passenger trains daily are handled at the station, besides about 60 freight movements. These latter are mainly for industry connections, as regular freight trains are passed around the city by the 14-mile belt line of the Indianapolis Union R.R., which provides interchange between the railways and their main yards and also serves a number of outlying industries.

Full elevation of tracks was adopted in place of the compromise method of partial elevation combined with street depression. There is very little lowering of the streets, and their approach grades will not exced 3%. The tracks are elevated about 18 ft., so as to give a minimum headway of 12 and 14 ft. where there are no car tracks and 15 ft. 9 in. where clearance must be provided for cars of electric interurban railways.



TRACK ELEVATION THROUGH INDIANAPOLIS INVOLVES UNION STATION AND FREIGHT TERMINALS

Steel bridges over the streets are of the trough-floor type, carrying a concrete deck for the ballast and supported by steel bents at the curbs and in the roadway. For the long subway at Meridian St., just outside the station, deck girders will span the roadway and carry a buckle-plate floor with concrete slab. Concrete casing is applied to the facia girders of all bridges. Owing to the restriction on steel supply during the war, timber



TYPICAL CONSTRUCTION OF SUBWAY BRIDGES

trestles were erected in some places to connect with the first elevated tracks of the station and so permit their being put in service. Retaining walls and abutments are of plain concrete, as described in the earlier article on the station work.

The placing of the fill is a difficult part of the work, on account of the almost continual traffic, the numerous junctions and yard connections and the switching movements for passenger and freight service. Work trains increase the congestion from the fact that certain running tracks must be given up to them temporarily while material is being dumped and track raised on the fill. Some of the elevation on the main line beyond the station is done by successive small shifts; material is dumped, the train is moved away and the track is jacked up to have the material shoveled under it in readiness for the next lift.

On the more open part of the line the widening for two additional tracks was done in advance of interference with the two original tracks. But near the station, with its complicated approaches, the work had to be done piecemeal in short sections and as tracks could be given up to the construction force. No definite program could be made for any long period, as the necessity for handling late trains or unexpected movements was likely to interrupt the program. The location of work and the selection of tracks was planned by cooperation of the engineer in charge and the train dispatcher.

Filling Done by Railway Force

Owing to these traffic conditions, the filling was done by the railway. Gravel trains of 20 dump cars of 12-yd. capacity were brought to a point near the work, beyond which only a few cars at a time could be handled on account of lack of room and the short time during which tracks could be given up for the work trains. Contractors' dump cars were employed for most of the work, owing to the embargo on the use of gondola cars. For the same reason, some filling on the track elevation of the connecting main lines was done with 20-yd. and 28-yd. dump cars owned by these roads.

Progress has been hampered by war conditions, labor shortage, car embargoes and restrictions on supply of material. At the end of 1917, the United States Railroad Administration proposed to suspend the work, but a special representative sent to study the situation recommended that it be continued, in view of the serious interference with street and railway traffic consequent upon the incomplete conditions. Eight elevated tracks at the station will soon be ready and connected with the approaches. Work for 1919 includes elevating the remainder of the station tracks and a double-track approach at the east.

In the final layout the Union R.R. and both station approaches will have four tracks. Train movements will be controlled from three interlocking plants, two of which will be at the ends of the station. The third will be further east, serving the junction with the trunk lines and the connections to the freight yards. All tracks will be laid with 100-lb. rails.

Street traffic has been interrupted seriously during the work. The union station crosses three streets, one of which, Illinois St., has been closed to vehicle traffic since June, 1916, so that this traffic has had to use the long and busy grade crossing at Meridian St. or an inconvenient crossing at Capitol Ave. Formerly a low-level subway carried Illinois St. and its car line beneath the station, but this year the street is to be reopened at normal grade, passing under the elevated station.

An open storm-water channel and sewer outfall 40 ft. wide, known as Pogue's Run, was a troublesome factor, as it paralleled the main line and passed under the station. It was spanned at some points by girders carrying signal towers and cabins for watchmen at crossings. This has been replaced by the city with a double-barrel reinforced-concrete sewer having two compartments 18 ft. wide and 8 ft. high. At the station this is carried under Meridian St. instead of through the adjacent block, the abandoned section being filled up. As the new sewer passed under six streets crossed by the elevated tracks, steel bents were installed at these points to form supports for the abutments and columns of the subway structures. These bents straddle the sewer and have footings below its invert level. This sewer was described in *Engineering News* of Nov. 15, 1914, p. 935, and in *Engineering Record* of May 1, 1915, p. 560. Its cost was $1,079,853, of which the city paid $732,805, this being applied on its share of the track-elevation expense.

Total Cost Will Be $9,000,000

Work on this line was commenced in 1915. Its total cost, including reconstruction of the station, was estimated at $6,000,000, but with the war increase in price of material and labor it is expected to reach $9,000,000. The expenditures up to the end of 1918 had been about $4,000,000.

The Indianapolis Union R.R. is owned jointly by the Pennsylvania Lines and the Cleveland, Cincinnati, Chicago & St. Louis R.R., but its charter provides that any railway is entitled to use this line and the union station on payment of a share of the operating expenses. On account of this ownership, all improvement plans are passed upon by a board of engineers composed of W. C. Cushing, chief engineer of maintenance of way of the Pennsylvania Lines; C. A. Paquette, chief engineer of the C., C., C. & St. L. R.R., and P. J. Landers, superintendent (and formerly engineer) of the Indianapolis Union R.R. Construction work is in charge of T R. Ratcliffe, engineer of maintenance of way.

Grade-Crossing Elimination at Indianapolis

History Reviewed—Elevated Tracks Replace Street Viaducts—Freight Terminals Affected —Total Cost $18,000,000

GRADE separation in Indianapolis, as in several other cities, began with viaducts to carry streets over the tracks, but it was soon evident that these would afforded only partial relief. The only one remaining when track elevation was commenced was that at Virginia Ave. This was built in 1891 and was 500 ft. long. For several years it was in bad condition, but it was shored up for temporary service, as it carried an important street-car line across a series of tracks. It was demolished in 1919 to make way for the new Virginia Ave. subway.

Track-elevation history began in 1898, when the city engineer, Mr. Jeup, was directed by the council to pre-

pare plans. Then came a period of controversy. Acting on the basis of these plans, the city, in 1899, passed an ordinance declaring all steam tracks at grade to be nuisances and requiring the railway to elevate them. The city was divided into districts, with dates set for the completion of work in each. In April, 1900, the railways were directed to remove or elevate their tracks in the first district by September, 1901. As they refused to do this or to recognize the authority of the city, suit was brought against them, but the decision was against the city and was sustained by the Supreme Court in February, 1903.

In 1905 the Indiana legislature passed a law permitting cities of over 100,000 population to require railways to eliminate grade crossings. This apportioned 75% of the cost to the railway, 17% to the city and 8% to the county. Where street-car lines were involved the city was to pay 14%, the county 6% and the company 5%. In this case the company's share is figured on the cost of elevating 200 ft. each side of the center line of the street. The law provided that the cost to the city should not exceed $400,000 in any year, but this limit was removed by the repeal of the provision in 1911. All the track elevation at Indianapolis has been done under this law.

In 1905 the city passed an ordinance for the elevation of all tracks west from the union station property at Capitol Ave. to West St., about 2000 ft. This work was completed in 1909, the tracks coming down on a 1% grade to connect with the surface tracks at Capitol Ave. The railways at the east side do not come so near the station, and are elevated only at their connections with the Union R.R., beyond which they run down to grade. An exception is the Louisville division of the Pennsylvania Lines, which is elevated for about a mile south from the union station. In 1907 an ordinance was passed for the elevation of all tracks in the central district east of Senate Ave. This was supplemented in 1912 by an ordinance covering the territory from Senate Ave. east to Delaware St. and including the union station, while a later ordinance of 1912 extended this along the Indianapolis Union Railroad to the main-line junctions at Washington Street and Noble Street.

Main Lines and Freight Terminals

The largest proportion of the work and cost is for the Indianapolis Union R.R., which connects the several railways entering the city, as described in the preceding part of this article. Track elevation on these railways, beyond their junctions with the Union R.R., presents few significant features. Each line does its own work and employs its own designs and construction methods. To secure better street crossings, the Cleveland, Cincinnati, Chicago & St. Louis R.R. will in 1919 abandon its east-end junction at Delaware St. and will connect with the elevated tracks of the Pennsylvania Lines at Noble St., as shown on the map. In general, all this work consists of solid fills, with concrete retaining walls in the populated sections and with concrete abutments for steel and concrete bridges.

An exception to this class of work is that of the Illinois Central R.R. which has a single-track viaduct 2075 ft. long, with 75-ft. plate-girder spans. The station connection is made by a 430-ft. viaduct on a 16° curve, with girders supported on concrete four-post bents and carrying a concrete slab deck for ballasted track. This was completed in 1917. Its entire cost was paid by the railroad under an agreement made in 1915, when the line entered Indianapolis. Another 16° junction curve occurs at the middle of the station, but this is on the freight tracks, as it is for an industry line known as the Central R.R. of Indianapolis. A single-track viaduct 1000 ft. long, having a grade of 2.6%, forms the connection with the elevated station tracks. It occupies the center of Capitol Ave. and has plate girders on steel bents except for a short fill betwen retaining walls at the lower end. This was built in 1917-18.

Freight terminals of the trunk lines extend along both sides of the Union R.R., as shown by the map. Most of these remain at street level, inclined approach tracks being preferred to inclined driveways, but in several cases they have been altered to fit the new conditions. The Pennsylvania team yard between Pennsylvania and Virginia Aves. is elevated and will be completed in 1919, while a surface team yard at Noble St. will be completed in 1920. The C., C., C. & St. L. R.R. will elevate its terminals along South St. The Lake Erie & Western R.R. will build a freight house at the street level and its elevated team tracks will come to that level at Alabama Street.

Cost of the Work

The total cost of the track elevation will be about $18,000,000, the largest item being the work on the 1¼-mile line of the Indianapolis Union R.R., including the reconstruction of the union station. This will amount to about $9,000,000. For the elevation and reconstruction of freight terminals along this line, of which the city pays no part, the cost will be about $6,000,000. On the several trunk railways up to the end of 1918 there had been elevated 3¼ miles of main line, with 6¼ miles of track, exclusive of yard tracks, at a cost of $1,750,000. The remaining work includes 1½ miles of line with 3¼ miles of main track at an estimated cost of $1,300,000. Thus, about six miles of line are covered by the improvement.

Plans and reconstruction for all the grade-crossing work are subject to the approval of the city, represented for several years by B. L. T. Jeup, as city engineer. He was succeeded in 1918 by the present city engineer, F. C. Lingenfelter, who was formerly engineer of track elevation for the city.

Sewer Interconnections Made Compulsory in Wisconsin

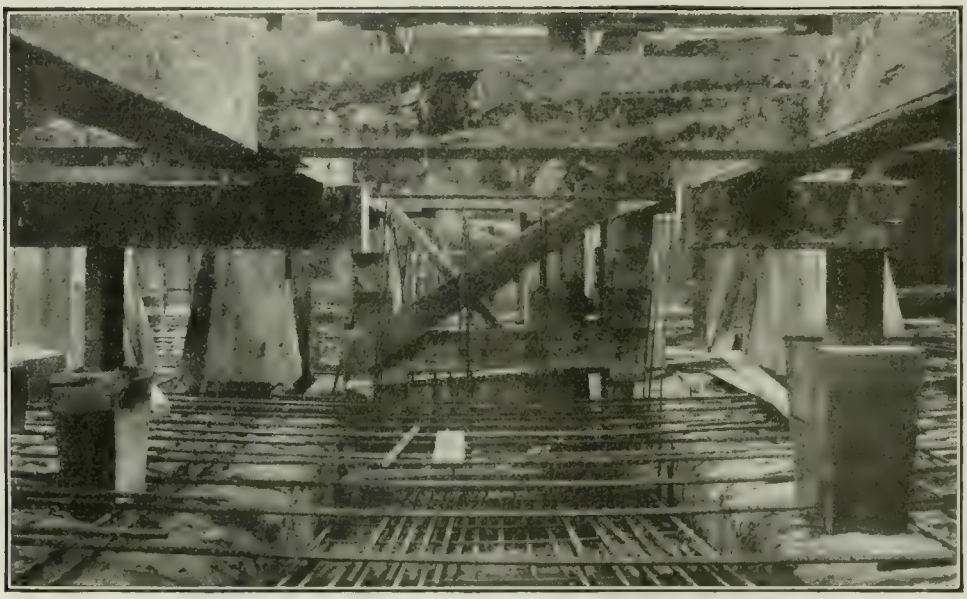
Under a Wisconsin statute which recently became a law the State Board of Health may require any sewerage system or sewage or refuse disposal plant to be so planned and constructed that it may be connected with any other similar system or plant, in order that the water-supply and health of any community in the same general drainage district may be protected. The sewerage commission or other body in control of the system rendering service is to determine annually the compensation, and the municipality receiving service must raise this amount by tax. Objections to the charge may be submitted to the arbitration of three referee engineers, whose majority vote will give the decision or action may be entered in the county court.

Cofferdam Experience at a Bridge in Chicago River

Flooding Due to Inaccurate Record of Old Tunnel—Movement of Wall in Deep Water Leads To Heavier Construction

By Hugh E. Young and William A. Mulcahy
Engineer of Bridge Design, City of Chicago
Engineer of Construction, City of Chicago

SEVERAL unusual experiences marked the construction of the combined piers and tailpits for the Michigan Ave. bascule bridge, described in *Engineering News-Record* of July 31, 1919, p. 210. Work on one pier was delayed 10 weeks by flooding of the cofferdam through an old tunnel. Bulging of cofferdam sheeting gave serious trouble, and heavy reinforcement was applied in order to hold the bulging wall until its bracing was in place. The piers, 52 x 66 ft. at the base, are large reinforced-concrete boxes supported on cylinder piers. The base of each box is 34½ ft. below water level. Flooding of the north cofferdam after its completion resulted from inflow of water through an old 6-ft. brick tunnel which passed under both cofferdams. This tunnel, carrying a 24-in. water main, was built about 50 years ago. No reliable plans or records were available, but the invert elevation was supposed to be 34.4 ft. below water level, and it was intended that the 45-ft. cofferdam sheeting would pass through it and form a seal. As the invert actually is at 66½ ft., the tunnel was not sealed. The shaft of the tunnel came within the south cofferdam, and its upper portion was found to be in excellent condition, built of two rows of brick in cement mortar. It was assumed that the tunnel brickwork was equally good and would sustain the interior pressure due to connecting it with the river. The shaft was therefore knocked away while the cofferdam site was dredged to a depth of 20 ft. to permit of placing the interior bracing. This permitted water from the river to enter the shaft and fill the tunnel.

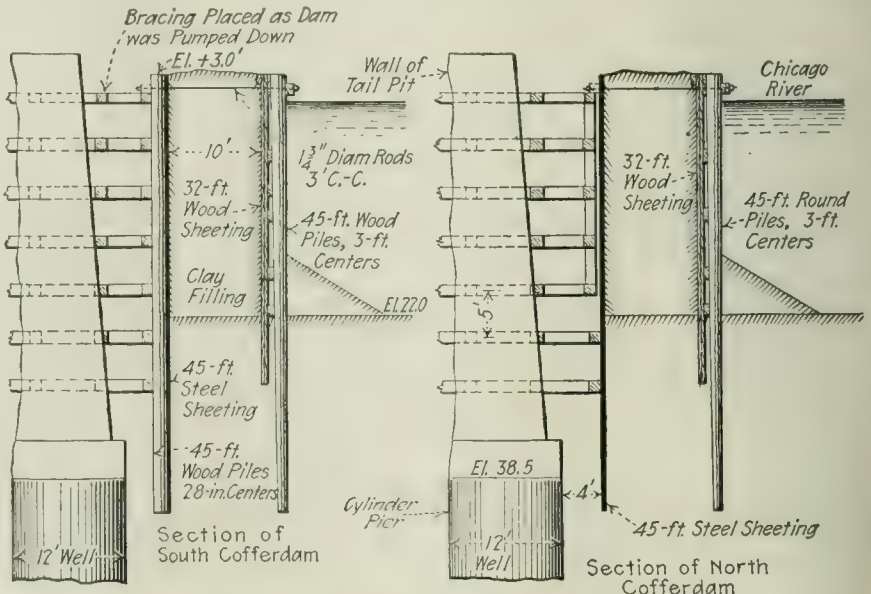


PILES AND CAPS SUPPORT BRACING IN COFFERDAM—BOXING KEEPS CONCRETE CLEAR OF PILES

Before this cofferdam was completed and pumped out, the sinking of the open wells for the cylinder piers was started in the north cofferdam, and had reached a depth of 60 ft. when a leak developed in a well which was within 3 ft. of the old tunnel. Bailing was tried, but in a short time the men had to be hoisted out of the well to save them from drowning and the cofferdam was gradually flooded to the river level. It appeared that the water in the tunnel, under 60-ft. head, had forced its way through the mortar joints and the surrounding clay. This mishap caused a delay of 10 weeks at the north pier, as work could not be resumed until after the south cofferdam had been completed and pumped out.

As wells for two 12-ft. cylinder piers in the south cofferdam had to pass through the old tunnel and extend to a considerably greater depth, a 5-ft. brick bulkhead was built within it to prevent any possibility of flooding these foundation wells. The 24-in cast-iron water main in the tunnel was in service up to the time of starting the bridge work, when it was shut off by a valve at the north end and the pipe drained by a tap at the south end. Two lengths of pipe were removed to clear the subpiers. This pipe line will be renewed when the new shaft and bypass connection to the tunnel are completed.

Interference of another tunnel further complicated the pier work. A concrete tunnel of the Chicago Tunnel Co. passed through the rear of the south cofferdam,



CONSTRUCTION DIFFERS IN TWO COFFERDAMS FOR MICHIGAN AVENUE BASCULE BRIDGE, CHICAGO

with its invert 26 ft. below water level. It was necessary to isolate a length of this by bulkheads outside the line of the cofferdam, so as to avoid flooding the extensive system of tunnels for handling freight and other materials in the business district. Traffic was diverted temporarily, and a tunnel diversion will be constructed after the pier is completed.

Very large cofferdams, about 75 x 105 ft. inside, were required for the construction of the piers. They differ somewhat in their wall and bracing details, as shown by the accompanying drawing, this being due to the fact that one was wholly in deep water and the other partly in shallow water.

For the north cofferdam, which was the first one built, there was an inner row of 45-ft. steel sheeting and an outer row of 32-ft. wood sheeting, the latter driven behind a row of 45-ft. round piles. This cofferdam was in water 16 to 22 ft. deep. Five sets of interior bracing were completely framed and submerged before the cofferdam was pumped out, the heaviest set resting on the bed of the river. This bracing was held down by skips loaded with loose rock.

A clearance of 6 to 9 in. was provided between the bracing and the sheeting, in order to permit of sinking the former to place. With this bracing completed, the puddle walls were built up with clay, as noted above. By the time the filling had reached the top of the cofferdam, 4 ft. above water level, the clearance had been eliminated and the steel sheeting was bearing firmly against the bracing. In other words, it had bulged inwards, due to the weight of the mass of clay in the puddle wall.

In the south cofferdam a different method of bracing had to be adopted, since only one-third of its area was in the river and it was impossible therefore to frame and submerge all the bracing in advance. One set of bracing was placed, but when the water was being lowered 5 ft. to allow of placing the second set the pressure of the clay fill caused the inner line of steel sheeting to bulge inward. A second row of 45-ft. round piles was placed on the inside to keep the sheeting vertical or prevent bulging. It was necessary to drive a row of 12 x 12-in. wood sheeting 50 ft. long in the front puddle wall, just outside the steel sheeting, in order to retain the clay and prevent further bulging.

A central row of piles at the bottom of each cofferdam supported the bracing and formed what is called the "backbone." This is general practice on large cofferdams, serving to keep the bracing from sagging as the water is pumped out. At all intersections of the bracing were placed the usual vertical shores or separators of 12 x 12-in. timbers. In addition, ¾-in. vertical tie-rods connected each two sets, being staggered on opposite sides of the separators.

At the bottom of the cofferdam, the piles were inclosed by boxing to keep them clear of the concrete. After the tailpits are finished and the piles are withdrawn, this boxing will be removed. This will leave square tapering holes in the 5-ft. concrete slab, which will be filled with rich concrete so as to make the floor water-tight.

The Great Lakes Dredge & Dock Co. has the contract for the substructure. The bridge is being built under the direction of the Board of Local Improvements, of which C. D. Hill is chief engineer. It was designed in the bureau of engineering, Department of Public Works. Hugh E. Young is engineer of bridge design, Thomas G. Pilhfeldt is engineer of bridges and John Ericson is city engineer. William A. Mulcahy is chief engineer in charge of construction.

Hollow Concrete Posts Packed With Sand

Belgian Engineers Devise a New System Which Permits Settlement—To Be Used Mainly in Mine Timbering

CONCRETE mine timbers which will permit some settlement if the support is overburdened have been designed by M. Muzak, a Belgian Government engineer. The device is described in *Le Génie Civil* of June 21, 1919, but it is not stated there whether it has actually been used or not. Information from other sources, however, indicates that some posts have been built and put into service.

The essential element in this new scheme is the use of a hollow reinforced-concrete column, which is filled with sand or other slightly compressible material through which the load is transmitted. A typical installation is shown in the accompanying cut. In Fig.

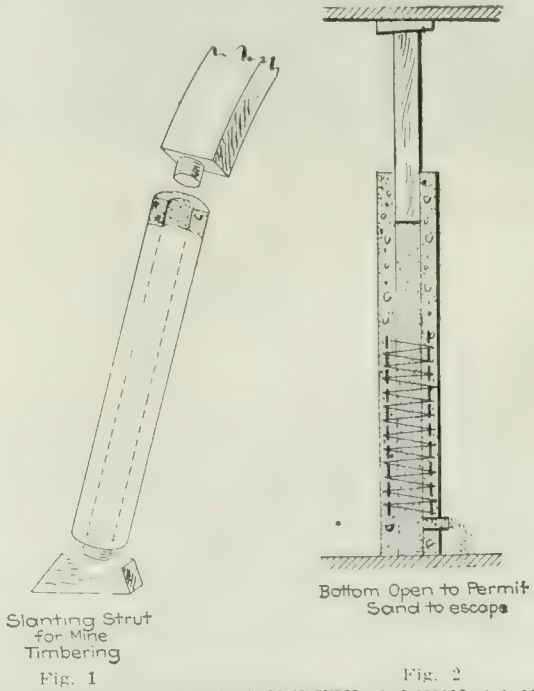


Fig. 1 Fig. 2

SAND-PACKED HOLLOW CONCRETE COLUMN AS USED IN MINE TIMBERING

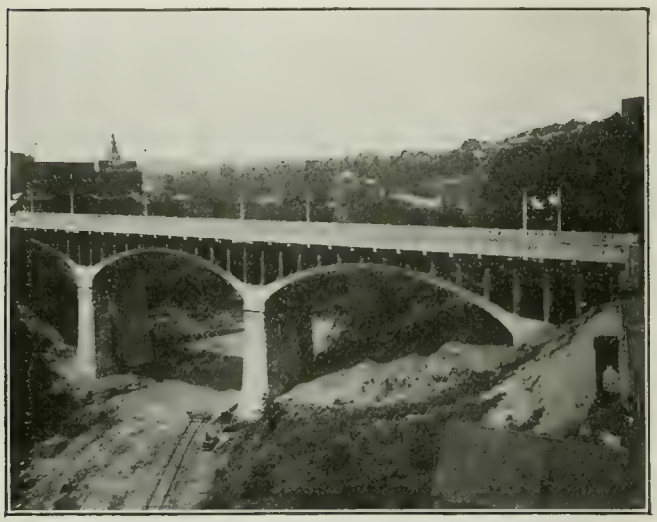
1 there is a mine frame in three parts. The arch for the roof is of precast concrete and is provided with a tenon which fits into the opening of the hollow post, which at its bottom fits also into the tenon on the base block. The post is spirally reinforced, and has to resist at the beginning of loading the radial compression of the sand which fills the hollow and which is compressed under load on the frame. If the roof settles, the sand will compress a certain amount, and if this amount is beyond the length of the tenon the post commences to take compression.

Fig. 2 illustrates another type of the support in which the roof is supported by a direct wooden post penetrating into the top of the opening in the hollow concrete column. If the roof settles, in this type the movement is taken care of by the ejection of the sand through an opening at the bottom.

Flat Arches on High Piers, South Side Bridge, Fairmont

More Economical of Two Alternate Designs Is Adopted—Special Falsework Used for Salvage—Costs Affected by War Conditions

TWO complete alternate designs were made for the South Side bridge over Coal Run in Fairmont, W. Va., one consisting of a single 160-ft. main arch span, with one 60-ft. semicircular arch on the south end and two similar arches on the north side, and the other of three equal 116-ft. flat-arch spans on high piers. The latter design was adopted because of its symmetrical proportions and relative simplicity of design, which resulted in lower cost, the estimated approximate contractors' figures showing a difference of $28,700 in favor of this design.

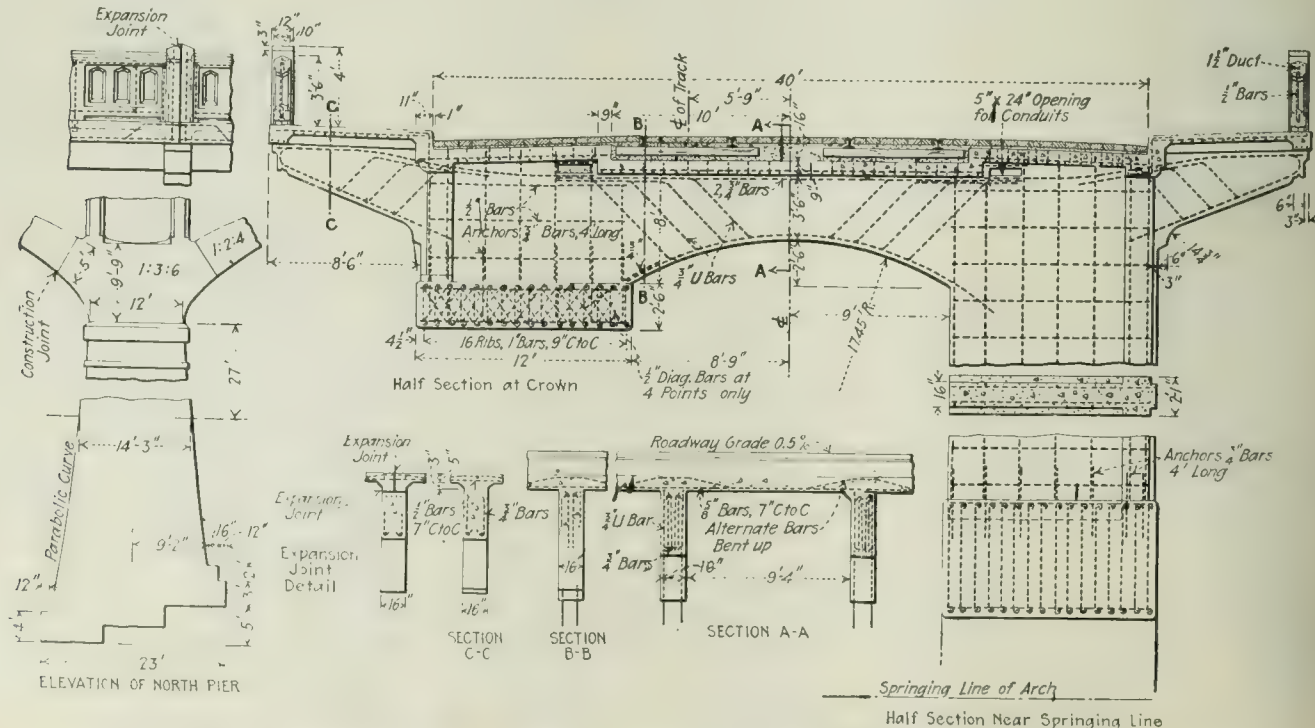


COMPLETED SOUTH SIDE BRIDGE—FLAT ARCHES ON HIGH CONCRETE PIERS OF EFFECTIVE OUTLINES

The new arch bridge replaced a steel viaduct highway bridge practically on the same center line. In order to maintain traffic as long as possible, the steel structure was continued in use, until it was absolutely necessary to remove it, requiring special and extraordinary solutions of the construction problem. Thus, the new piers were cast around the steel columns and bracing of the existing towers. The various structural steel members so incased were cut off 6 in. back of the face of the piers, and the square recesses left for this purpose were filled with mortar and neatly finished to the surrounding surfaces.

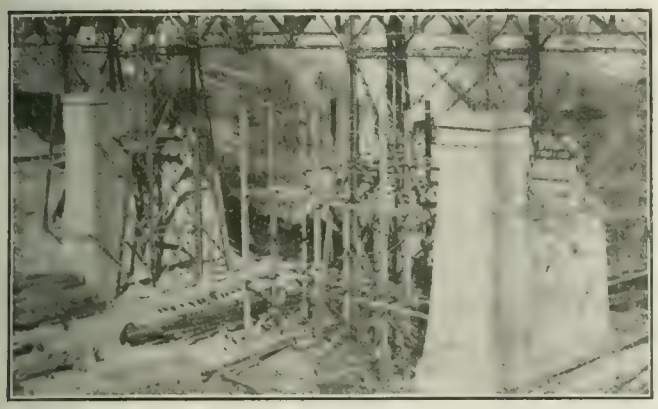
The contract was let on a cost-plus-fixed-sum basis, as lump-sum bidding entailed so much risk to the bidders as to make their bids excessive. In view of the unusually difficult labor and material conditions due to the war, the work was completed at a cost and within a time limit which agreed remarkably well with the estimated amounts. One element of economy lay in the special design of falsework for the arch centering, the long timbers of which were chosen because they could be utilized in the superstructure construction of walls and girders, as well as in the main pier cofferdams for the Monongahela River bridge now under construction by the same contractor.

General Dimensions—The new South Side bridge connects Adams Street with Fairmont Ave., Fairmont, W. Va., crossing a deep ravine about 535 ft. across and 100 ft. deep on a 0.5% grade. It consists of three equal 116-ft. arch spans on high piers. These spans are comparatively flat arches on piers about 62 and 55 ft. high, respectively. The concrete specified for the piers and abutments consisted of 1:3:6 mix, with large aggregate which would pass a 3-in. ring. The curtain and transverse walls up to the bottoms of the girders are of 1:3:6 mix, using large aggregate passing a 2-in. ring. The main arch ribs, the brackets, girders and floor slabs are of 1:2:4 concrete, with a coarse aggregate passing a 1½-in. ring.



CROSS-SECTIONS OF 116-FOOT ARCH SPANS OF SOUTH SIDE BRIDGE—PIER AND RAILING DIMENSIONS

The arch span adopted had a rise of 22 ft., the intrados consisting of a seven-centered curve, the ribs having a thickness of 2.5 ft. at the curve and 5 ft. at the springing line. As shown in the cross-section herewith, the bridge is 58 ft. wide, with two 12-ft. ribs carried by four solid independent piers and four abutments. The length of the structure between the faces of the abutments is 372 ft. The spacing of the transverse walls is uniformly 10 ft. 8 in. The structure carries a wood-block pavement, 40 ft. wide curb to



MASSIVE CONCRETE PIERS INCLOSE STEEL OF OLD TOWERS, FAIRMONT BRIDGE

curb, two 8-ft. sidewalks, and two trolley tracks 11½ ft. center to center.

The arch ribs were designed for a moving live load consisting of 50-ton electric cars, 150 lb. per square foot on the roadway outside of the car tracks, and 80 lb. per square foot on the sidewalk. The analysis was made by the use of influence lines, based upon the usual elastic theory. The total maximum dead- and live-load stresses at the crown are within 500 lb. per square inch in the concrete, based upon the assumption of fixed-ended arch ribs.

In order to estimate the effect of the deflection of high piers, an analysis was made, assuming fixed outer ends for the outside arch ribs and fixed bases at the piers. This analysis was based upon the movement of piers assumed as vertical fixed-ended beams, in connection with the working equations obtained to indicate the effect of movement of end abutments in the elastic arch analysis. The total maximum combined stress thus obtained occurred at the crown of the center arch under full live load in that arch, and amounted to about 600 lb. per square inch in the concrete.

Foundations—The geological conditions at Coal Run are typical of this coal-mining country; that is, there are alternate layers of sedimentary deposits. At the bridge site was a bed of relatively hard shale about 48 ft. thick overlying a bed of solid sandstone. On top of the shale was a similar solid bed of sandstone about 35 ft. thick. The south pier was founded on solid sandstone, while the north pier rests upon the overlying shale at an elevation about 6 ft. higher. The abutments for the end spans were carried into the upper layer of solid sandstone which outcrops on each side of the ravine.

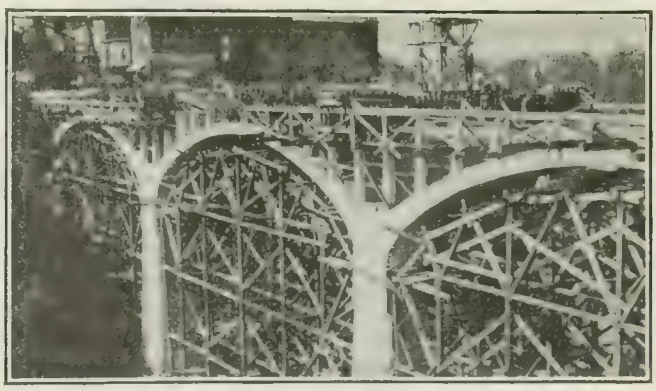
Both piers are 12 ft. square at the springing lines of the arches, and because of the flatness of the arch and the great height of these piers it was necessary to spread the pier footings to keep the foundation pressures within safe limits. To aid in developing this desired width and improve the appearance of the piers, the faces were battered to a point 27 ft. below the springing line, and then given the form of a parabola.

In order to economize in the cost of these massive piers, cyclopean masonry consisting of large stones bedded approximately horizontally with vertical joints filled around with the concrete, was used. Not more than 25% of the entire mass was occupied by these stones, cyclopean concrete being permitted up to the level of the springing lines of the arches.

The north pier was just inside one of the steel tower bents of the old bridge. It was concreted up to the springing line around the struts and diagonal braces of the latter, which were afterwards cut off 6 in. back of the face with an oxyacetylene flame, and the holes in the concrete were filled and finished. At the south pier, one of the column bents was concreted into the pier, and all projecting members were cut off at the time of the removal of the steel superstructure. The contractor was thus able to complete the piers and erect the arch centering before beginning to dismantle the old bridge. As this old bridge carried the main-line traffic of the Monongahela Valley Traction Co. between Clarksburg and Fairmont, and as its removal required a detour of four or five miles, it was essential to postpone the interruption to traffic as long as possible. A foot-bridge 5 ft. wide was maintained for pedestrian traffic.

The old structure, which consisted of five wrought-iron spans on towers, with steel trusses and towers erected later to carry the electric railway, was removed by burning around the main joints with the oxyacetylene torch, beginning at the south end. The cableway was used in removing the members, and the dismantling operation was facilitated by cantilevering the trusses over the supporting towers.

Construction Methods—The contract for this bridge was awarded July 30, 1917, and on the following day



ERECTION FALSEWORK—VARIOUS STAGES OF CONCRETING

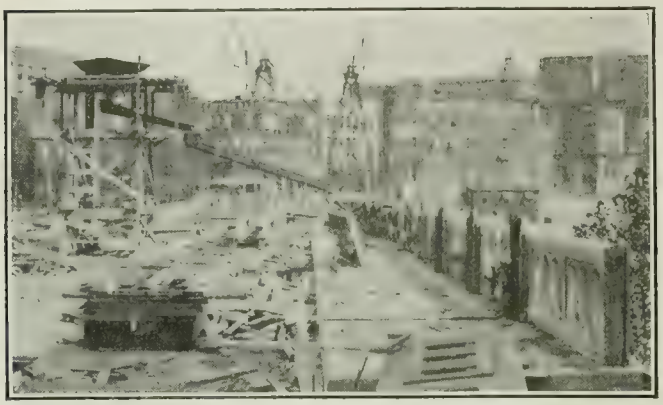
the first material for the new bridge was ordered by closing an option on the steel required for the structure. The next four weeks were used in assembling and shipping the contractor's plant; and for the four months beginning in September the excavation and foundations for piers proceeded. Pier shafts were carried up to the arch springing line, and the arch centering plans were developed.

One cableway, just clearing the outside easterly line of the bridge and the old steel structure, was used in the pier work. An additional cableway was erected on the center line of the new structure for the balance

of the construction work, which was actively begun on the main arch in April, 1918.

The old bridge was left in place to accommodate traffic until June 3, during which months practically all materials were assembled and stored on the job, to avoid risk of delay due to lack of materials. From this time up to Thanksgiving Day, Nov. 28, 1918, when the structure was formally opened to public travel, the progress was fairly continuous, considering the difficult labor conditions.

The mixing plant was located about at the center



MOVABLE HOPPER FRAME—TWO CABLEWAYS USED

of the middle span near a railroad siding, to reduce to a minimum the handling of materials. The two cableways were of 540-ft. span, with 10-ton capacity, and were used to deposit buckets of concrete in the hoppers placed on a movable frame near the center line of the bridge.

Erection Falsework—The erection falsework for the arch ribs was specially designed by the contractor to make possible the greatest amount of salvage of timber for use in the construction of the Monongahela River bridge. For example, the long timber posts were later used in the cofferdams of this bridge. They are 40 x 80 ft. in size, and the transverse timbers, 60 ft. long, used to tie the arch centering together, was later utilized for the transverse wall forms. (See cut, opposite column.)

The railing forms were designed of cypress to eliminate warping, and were used over and over, the complete railing on both sides being placed within three weeks. The last floor panel was cast at the opening left in the center for the cableway hoist on Nov. 14, and two weeks later, on Thanksgiving Day, the traffic passed over. The arch centers were lowered about one month after the final concrete was poured, the operation being carried out by beginning at the crown and working each way with wedges, as indicated by the drawing.

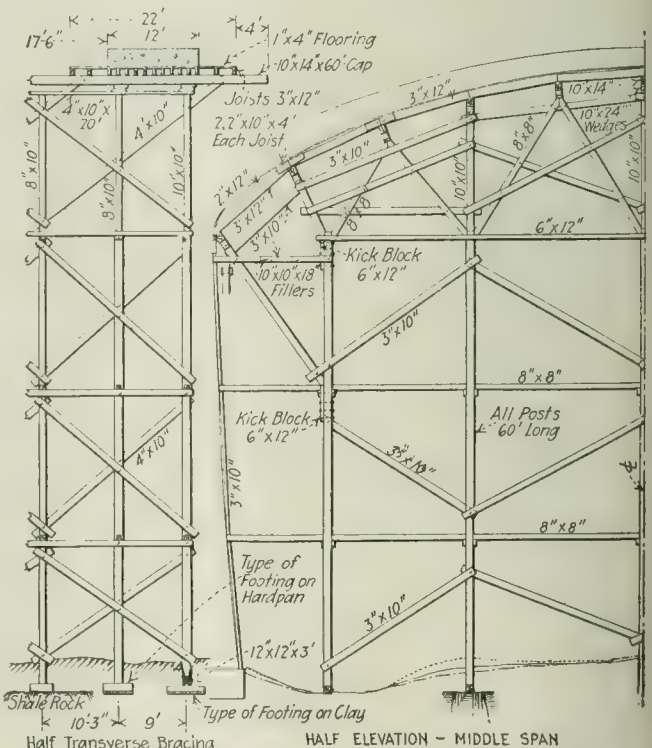
The plant employed by the contractor consisted of one motor-driven concrete mixer, with fixed batch hopper, fed by gravity from overhead bins of about 50-cu.yd. capacity. The bins were in turn kept filled with sand and gravel by a clamshell on a 78-ft.-boom guy derrick handling materials from stock piles. The derrick was operated by a three-drum engine equipped with a 60-hp. boiler, which furnished steam also for an air compressor. The latter supplied air for the operation of wood-boring machines used in the form erection. A saw mill with rip, cut-off and band saws was operated in connection with the form work. The concrete was handled from the mixer in 1-cu.yd. buckets on the cableways, which were also used in the demolition of the old bridge and the handling of forms, etc.



COMBINATION LIGHT AND TROLLEY POLE

The final total quantities of concrete were 3400 cu.yd. of 1:3:6 mix, 2400 cu.yd. of 1:2:4 mix, with 195,000 lb. of steel bars. The final cost to the City of Fairmont was a little over $174,000. The total cost of the bridge, however, was $192,300, including the contractor's compensation, fixed at $15,600. The old bridge steel was sold as scrap for about $20 per ton. Common labor varied from 30c. in 1917 to 50c. in 1918, and mechanics and carpenters from 60c. to 80c. per hour. During the summer a decided scarcity of labor developed, and willing high-school boys and young men filled up the gaps in the gangs quite efficiently.

Both alternate designs were made by the Concrete-Steel Engineering Co., William Mueser, chief engineer. E. H. Harden for a few months, and Charles F. Bornefeld for the major part of the work, were resident engineers for this company at Fairmont. The John F. Casey Co., of Pittsburgh, Penn., was the contractor, with Samuel L. Fuller as superintendent on the work, and E. J. Gass designing engineer. The structure was erected under the administration of the Board of Affairs of the City of Fairmont, W. Va.; Albert L. Lehman, commissioner of bridges and streets, and Shrewsbury B. Miller, city engineer.



DETAILS OF ERECTION FALSEWORK FOR ARCH CENTERING

Some Problems in the Design of Concrete Ships

Special Details of the Structural Design as Developed by the Experience on the Government Concrete Ships

By J. Glaettli, Jr.
Concrete Ship Section, Emergency Fleet Corporation, Philadelphia, Penn.

The following section of Mr. Glaettli's paper before the recent convention of the American Concrete Institute relates to the specialties of structural design in concrete ships. The remainder of the paper was devoted to questions of naval architecture, ships' fittings and stress determination, and are more general in their nature.—Editor.

WHILE the solution of the problems involved in the design of the concrete members for the Government concrete ships has been no easy matter, the number of problems involved has been comparatively small, and experience alone will demonstrate whether they have been correctly solved. Successive designs have in general shown a decided improvement over those that have gone before, and unquestionably the latest designs are far better than the earlier ones. The individual problems that arose are discussed in detail in the following paragraphs.

Continuous Beams and Compression Reinforcement—In order to reduce the weight of beams, frames and slabs to a minimum, all members whose cross-section was largely determined by the intensity of the moment to be resisted were designed as continuous beams wherever the construction was such as to enable this condition to be realized. In many instances, compressive reinforcement was added in order to reduce the gross cross-section of members but in the usual case reinforcement was used on both faces to provide reinforcement for negative moment over the supports.

Percentage of Steel—At the very beginning of the work of design, it became evident that larger percentages of steel would be required in the design of concrete members than had hitherto been used in common practice. It also became evident that the resistance to shear or diagonal tension would have to be increased by using more steel or by using it in a different arrangement. Higher unit stresses in the concrete have also been found desirable to a limited extent. The use of the working stresses adopted has been fully justified by the experimental work done.

The amount of steel used in the various designs ranges from 3 to 4 per cent. of tensile steel and from 1 to 4 per cent. of compressive steel. If web reinforcement be included, the total amount of reinforcing steel in concrete ships thus far designed by the Concrete Ship Section ranges from 5 to 9 per cent. by volume or from 22 to 40 per cent. by weight, assuming concrete weighing 110 pounds per cubic foot.

Unit Stresses in Flexure—There seems to be a well-established opinion among those not familiar with concrete ship design that the unit stresses in a concrete ship are materially greater than are those in land structures. This, however, is not the case and it can be said that with few exceptions the stresses are as conservative, if not more so, than the stresses used in land structures. In a great many cases members are subjected to reversing moments, a condition which requires steel on both faces of the member. If these moments are equal in magnitude, the amounts of steel on each face must be nearly equal, and the compressive strength of the concrete is then of no exceptional advantage, the tensile steel on one face being sufficient to carry the compressive stresses when the moment is reversed. However, to keep the structure intact, a safe working stress of from 1000 to 1500 lb. per square inch must be permitted in the concrete. In view of the fact that in certain parts of a ship the steel stresses must be kept low to prevent leakage, we find numerous instances where the stresses are more conservative than usually supposed. In very few instances have the unit stresses in the steel for ordinary service conditions been increased above 16,000 lb. per square inch.

Unit Stresses in Shear—The usual method of designing shear members on land structures has been to assume that a large proportion, say 75%, of the shear, is carried by steel stirrups at a unit stress of about 75% of the usual tensile working stress in the steel. In the design of concrete ship members, except the shell, it has been the practice to assume that all of the shear is carried by steel stirrups at 16,000 lb. per sq.in.; this method giving the same results as obtained in common practice. It has been assumed that the webs of beams could be reinforced to the extent of permitting a maximum working shearing unit stress of 500 lb. per sq.in., and then assuming that all of the shear or diagonal tension is carried by stirrups. For this item alone can it be said that radical departures have been made from common practice. The results of tests justify the use of such large percentages of web steel.

Reinforcing the Shell for Shear—The side shell of a ship is subjected to shearing stresses of a reversing character, and the best arrangement of steel to resist such shearing stresses is not easily determined. It is generally conceded that diagonal rods are more effective than vertical rods for resisting diagonal tension, especially before the concrete has cracked. If the shears are reversible two sets of diagonals must be provided at right angles to each other, while only a single set of vertical rods is needed.

Using the same unit tensile stresses in the vertical as in the diagonal bars as was done in the first ship designed by the Concrete Ship Section, the amount of vertical steel required is only half as great as the amount of diagonal steel needed. However, with the use of vertical rods to resist shear, it becomes necessary to add horizontal rods to tie the structure together, and the apparent advantage of the vertical steel is somewhat reduced. In addition, the disadvantage of having horizontal rods in thin vertical slabs at the time of pouring must be considered.

It can be demonstrated analytically that vertical shear reinforcement takes little or no stress as long as the concrete remains intact, and laboratory experiments bear this out. It is to be expected, then, that diagonal reinforcement is the more effective in preventing cracks from forming and in keeping the width of the cracks down once they do form. The work of the investigation branch of the Concrete Ship Section indicates that lower working stresses should be used in vertical rods rather than in diagonal rods in order to keep the size of cracks down to a minimum.

When using a materially reduced working stress for vertical bars, in the design of the side shell of a ship, it is found that the amount of vertical steel required

is about 90 per cent. of the amount of the total steel in both sets of diagonals. The use of horizontal rods in conjunction with the vertical rods eliminates even this saving of 10 per cent., and less steel is required if placed in a diagonal direction.

It does not follow, necessarily, the diagonal steel reinforcement should be used in preference to vertical. The problem is invariably complicated by the conditions of local bending that must be provided for. Diagonal steel is generally not as effective for carrying local bending as are rods which span the panel in the direction of the shortest dimension. It is probable that a combination of vertical and diagonal steel is as efficient and economical as can be expected. What proportion of shell steel should be placed vertically and what amount diagonally depends on the thickness of the slab, the direction in which local bending is carried, the sizes of rods to be used in the shell, the maximum and minimum spacing of rods, and other features.

Kind and Size of Rods—Nearly one-half of the steel in a concrete vessel is in the deck and bottom, where the bond stress is exceedingly low, and where deformed bars have no advantage over plain rods. This feature and the difficulties which have arisen in the field with deformed rods have led the Concrete Ship Section to specify plain round rods for all vessels.

While large-diameter rods have been used in certain designs with a view to reducing the number of pieces to be handled, the difficulties encountered in bending the steel have demonstrated that the rods should be as small as can be conveniently placed in beams and slabs. In slab design particularly should small rods be used. The use of small steel rods (less than $\frac{3}{4}$ in. diameter) in the shell is especially encouraged because their use eliminates all previous bending of the steel for the turn of the bilge. The size of rod best suited for a particular location depends on the thickness of the member, the number of bends, etc., as well as on the requirements of design.

Thickness of Cover Over Rods—A simple calculation will show that if the upper deck and shell of a 7500-ton ship can be reduced in thickness $\frac{1}{8}$ in., there will result a net saving of roughly 30 tons in the hull weight and a corresponding increase in dead-weight carrying capacity. It is therefore of prime importance that the cover of slab steel be reduced to the minimum required for the protection of the steel. Foreign practice seems to consider 1 cm. sufficient, a figure which compares favorably with the $\frac{3}{8}$-in. cover used by the Concrete Ship Section. The above figures can be applied to illustrate how important it is to build forms exactly to size and to hold them rigidly in place. The inner and outer bottoms, decks and other slabs built without forms should also provide no more than the cover called for on the plans.

Screeding Easements of Banked Highway Curves

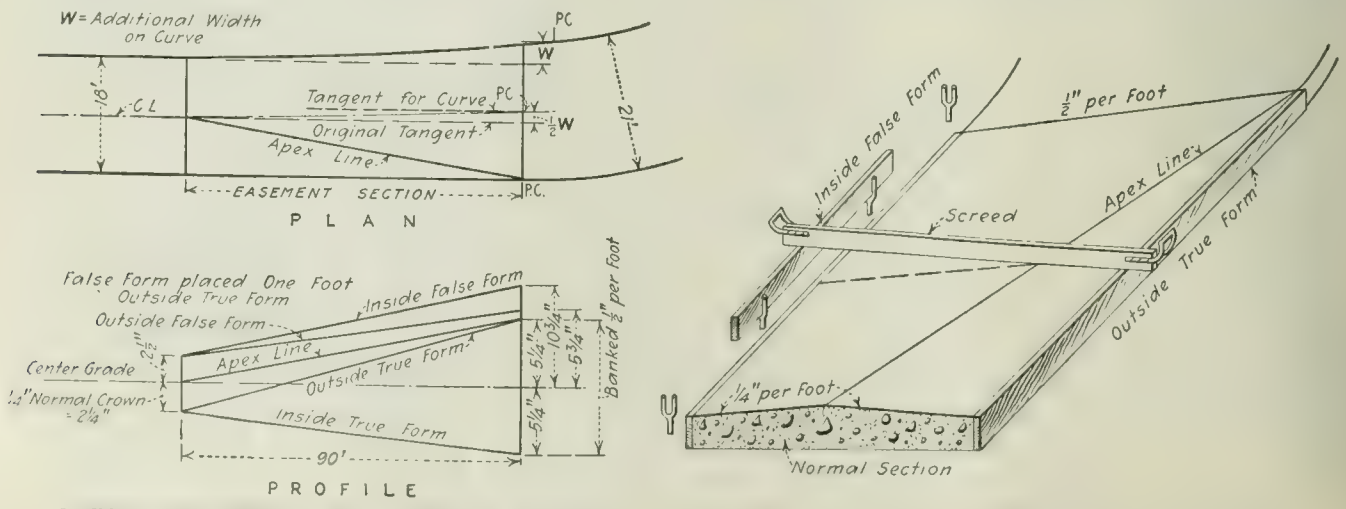
Method of Setting True and False Forms for Templet to Ride—Transition Cannot Be Seen After Construction

By George A. Curtis
District Engineer, Massachusetts Highway Commission, Springfield

SCREEDING the transitions from the normal or crowned sections to the banked sections of concrete-road curves is difficult, on account of the warped surfaces which result from changing from double to single slope sections. It may be accomplished, however, by setting auxiliary sets of false forms to be used with the true forms and drawing the templet twice. While this produces a diagonal ridge or apex along the transition or easement, it cannot be seen after the construction is completed. With other types than concrete pavement, the apex line must be staked out.

The length of the easement naturally depends on the amount of change in pitch from the normal to the banked section. This varies from about $\frac{1}{2}$ to $1\frac{1}{4}$ in., according to the radius of the curve. The maximum change is on the outside of the curve, where the pitch from the center of the road must change from a minus at the beginning of the easement to a plus at full banked section. Thus, in changing from a $\frac{1}{4}$-in. crowned section to a $\frac{1}{4}$-in. banked section, this pitch has been changed $\frac{1}{2}$ in. Thirty feet of easement should be allowed for each $\frac{1}{4}$-in. change in pitch. The full bank should extend from the P. C. to the P. T. of the curve, the easement section extending back on the tangent for a length as determined above.

As it is customary to widen the road at curves from 3 to 6 ft., the center line should be moved parallel to the original and a distance toward the center of the curve equal to $\frac{1}{2}$ the additional width. This is done in order to give a good alignment to the outside of the



LAYOUT AND METHOD OF SCREEDING EASEMENT—ALIGNMENT AND GRADES OF TRUE AND FALSE FORMS

easement and curve, as well as to throw all the widening toward the center. The apex of the cross-sections is continued practically in a straight line from the center of the roadway at the beginning of the easement to the extreme outer edge at the P. C. This apex line divides the easement into two sections, designated as the inside or outside of the easement, according to whether the section is toward the inside or the outside of the curve. The normal pitch is maintained on the outside of the easement until the latter runs out at the P. C. This gives to each cross-section a pitch at least as great as that on the normal section, thus allowing for proper drainage.

The easement section for concrete-road curves is mechanically obtained by means of a set of auxiliary forms called "false forms," placed 1 ft. outside the true concrete forms. A straight screed is used, as also on the full banked section. In screeding, one end is rested on the true form at one side, and the other end on the false forms at the opposite side, and vice versa. All grades given for the true as well as for the false forms should be referred to the corresponding profile grade. The grades for each set of forms and for the apex line vary uniformly from the beginning of the easement to the P. C. To illustrate, assume a normal crowned section 18 ft. wide with a $\frac{1}{4}$-in. pitch, and a full banked section 21 ft. wide with a $\frac{1}{2}$-in. pitch. The $\frac{1}{4}$-in. pitch of the normal section is continued on the outside of the easement, until the latter runs out at the P. C. The inside of the easement increases uniformly from a $\frac{1}{4}$-in. pitch at the beginning to a $\frac{1}{2}$-in. pitch at the point of curve.

Determining Grades of True and False Forms

Grade for the inside true and false forms, the outside true and false forms and the apex line—all referred to the center grade—are shown in the profile. From this, the relative heights of the true and false forms for any point on the easement may be scaled directly. The isometric view (scale greatly exaggerated) illustrates the method of screeding. The inside false form has been omitted for clearness. For the false forms, Y-brackets, 10 ft. apart, are driven to such depth that the upper edge of a 2 x 6-in. board, 12 ft. long, resting in them, will be at the required grade. This piece may be moved along as required or taken out of the way when screeding on the other set of forms. A view of completed easement is shown, the transition starting at the expansion joint in the foreground.

Easements for other than concrete surfaces are obtained by first staking out the side lines, using the grades shown for inside and outside true forms, and then staking out the apex line to grade. In cases where the pitch of the bank is the same as that of the normal section, the apex line will be straight. When the banked section has a greater pitch than that of the crowned section, it will be found that the apex line bows outward somewhat. In the case above mentioned, the bow amounts to only about 0.7 ft. For practical purposes, therefore, it may be assumed to be straight. It is recommended that construction stakes on this line be sawed off to grade and that corresponding reference stakes be placed just outside the work.

Reverse curves should be avoided if possible, and an attempt made to obtain sufficient tangent length between to allow for the transition. The transition from



COMPLETED EASEMENT DOES NOT SHOW TRANSITION FROM NORMAL TO BANKED SECTION

full bank to reverse full bank is done by pivoting the straight-line cross-section about the center grade. Assuming each full bank is of $\frac{1}{2}$-in. pitch, the total change in pitch would be 1 in. and, according to the rule, would require 120 ft. of tangent. While the above represents the ideal, the transition may be made in a shorter tangent length, by extending some of the transition back on the curves. When dealing with actual reverse curves, care should be taken not to make the transition too abrupt, and to keep in mind the rule requiring 30 ft. in which to make a $\frac{1}{4}$-in. change in pitch.

It sometimes happens that nearby curves both in the same direction are separated by a short tangent. When this tangent does not exceed $1\frac{1}{2}$ times the figured easement length ($1\frac{1}{2}$ E), the full bank and full width should be maintained throughout. When the tangent length exceeds this, the regular easement sections should be started from the adjacent points of curvature and continued toward each other until within a distance of $1\frac{1}{2}$ E. The cross-section then arrived at should be maintained for this intervening distance. It will thus be seen that in order to return to normal section between nearby curves in the same direction, the tangent between would have to be at least $3\frac{1}{2}$ times the figured easement length.

High Prices for Engineering Materials in France

Representative retail prices of building material, tools, hardware, etc., in France, which are the bases of settlement on which many of the claims filed with the Department of Rents, Requisitions and Claims are being settled, indicate a higher scale than exists in this country. Only for sand, gravel and crushed stone, with which France is well supplied almost everywhere, does the price approach levels in the United States. The prices have been converted into American units, with exchange assumed at 5.70 francs to the dollar.

REPRESENTATIVE PRICES FOR ENGINEERING MATERIALS IN FRANCE

Lumber and construction timber, pine and fir	per thousand	$120 00
Oak flooring	per thousand	250 00
Red brick, common	per thousand	38 00
Fire-brick	per thousand	79 00
Roofing tile	per thousand	67 00
Pitch	per 100 lb	14 00
Cement tile, 6-in. diameter	per linear foot	15
Nails and spikes	per pound	27
Bridge augers	each	$1 00
Small stone hammers	each	90
Window glass, double strength	per square foot	57
House paint	per 100 lb	45 00
Sand, at pit	per cubic yard	.55
Gravel, at pit	per cubic yard	.80
Crushed stone, at quarry	per cubic yard	1 20
Electric light wire	per linear foot	023
Electric lamp cord	per linear foot	054
Leather belting, 5½ in. wide	per linear foot	1 30
Leather belting, 8 in. wide	per linear foot	1 95
Castings, malled, weight 10 lb. each	per pound	16
Brass bushings	per pound	87

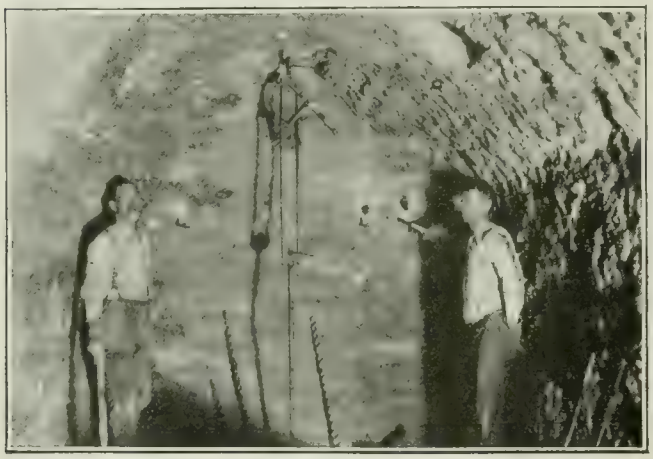
Reconstruction of the Naches-Selah Irrigation Canal

Parts of Old Sidehill Canal in Disrepair Replaced, Under War Conditions, by Concrete-Lined Tunnels, Reinforced-Concrete Flumes, and Canal With Wire-Reinforced Concrete

By Elbert M. Chandler
Chief Engineer, Naches-Selah Irrigation District, Yakima, Wash.

DURING the most difficult year for construction work ever experienced in this country, the Naches-Selah Irrigation District carried out some interesting reconstruction work on its canal system. This involved tunnel, flume and canal work in concrete. The following notes describe the work, with particular reference to construction details, but the more notable features of design are also brought out. Tunnel cost figures are included.

The district comprises some 10,500 acres of highly developed orchard lands in the Yakima Valley, Washington. The water is diverted from the Naches River about a mile above the mouth of the Tieton River and some 20 miles upstream from the City of Yakima. The diversion dates from 1888. The original length of



TUNNEL FACE SHOWING USE OF COAL AUGERS

the main canal was 19 miles, terminating at a division point where three main laterals start to distribute the water. The entire length of the main canal is made up of steep sidehill construction, originally of the usual pioneer type—earth canal and wooden flumes.

In the summer of 1917 the canal reached such a state of disrepair that several serious breaks occurred, resulting in interruptions to the water service aggregating over 30 days and a loss in the apple crop estimated to be not less than $500,000. The writer was engaged at that time to make a study of the situation and prepare a plan for the permanent reconstruction of the entire system.

For the main canal, the general plan contemplated abandonment of the first seven miles whenever the proposed Government high-line canal, which would parallel and lie above the Selah canal, was constructed, provided that an arrangement could be made with the Government to share in the cost of construction and operation jointly of the new canal. From the point where the high-line canal would leave the Selah canal, a plan was worked out whereby the remaining 12 miles would be ultimately shortened 5.3 miles in length, and of the 6.7 miles to be reconstructed, less than three miles would follow the original location. The outstanding feature of this program of reconstruction was the use of 16 tunnels, aggregating 21,000 ft. in length, the tunnels to be connected by reinforced-concrete flumes and by canals lined with reinforced concrete.

It was decided in February, 1918, to issue $375,000 of bonds to carry out as much of this plan as was urgently necessary. Accordingly, since May 1, 1918, the district has constructed eight tunnels, totaling 8718 ft. in length, 3100 ft. of reinforced-concrete canal lining, and 1200 ft. of reinforced-concrete flume, all of which was completed and carrying a head of water at the opening of the irrigation season on Apr. 1, 1919. During the winter of 1917-18, before the bond issue was voted, one tunnel 600 ft. in length, and 2600 ft. of canal lining, that had to be ready before the 1918 irrigation season, were completed. The balance of the improvement will be carried out more slowly, as required.

All of the tunnels are 7 ft. wide in the clear, with flat bottoms, side walls from 4 to 5½ ft. high to the spring line of a segmental arch having a 2-ft. rise. All lining, except in timbered sections, is 6 in. thick, except that in rock a floor thickness of 4 in. was used.

A uniform net width of 7 ft. was adopted (1) so that standard forms for lining the roof could be used interchangeably between tunnels, and (2) because that was about the minimum width for working advantageously on the face and for mules, which were used in hauling out the muck, to turn around. The height of walls depended upon the grade available, which varied with the amount of old canal eliminated. All recaptured grade was placed in the tunnels. To obtain the necessary water-sectional area, the grade was dropped below the old grade line wherever required.

The tunnels were all driven by station men. In the early stages of the work five tunnels were being driven, double-ended and double-shifted at one time, with a maximum aggregate daily progress of 140 ft. In all cases but one, the drilling was done with coal augers, as the material encountered was either sand rock or shale, relatively soft and dry in all cases.

The tunnel lining was performed in an unusual manner. The floor was first laid like a sidewalk, with 2 x 6-in. ribbons on each side for forms set accurately to grade, and the concrete was filled in between, leaving a space at each side for the thickness of the walls.

Ordinary forms, in sections, were used for the side walls and carried forward and used again and again. They were braced both at the bottom and top to the opposite side to prevent bulging. After the forms for the side walls were removed, the concrete was placed in the roof by shoveling into the end of collapsible forms, male and female, 4 ft. long, hinged at the key of the arch, carried on both sides by wooden supports accurately adjusted to grade by wooden wedges, with the concrete rammed back into place by wooden poles. Four men in the tunnel, two taking turns shoveling overhead, and two, one on each side, tamping back into place, would ordinarily put in 60 ft. of roof in eight hours, the maximum record being 76 ft. in one day. A relatively dry mix was most satisfactory for the roof,

while a wet mix was best adapted to the floor and sides. A 1:2:4 mix was used for the floor and sides for water-tightness, while 1:3:5 mix was used for the roof.

The costs of driving and lining are given in the accompanying table. It must be noted that this work was carried out during the stress of war; that common labor was paid from $3.60 to $4.50, most of the time

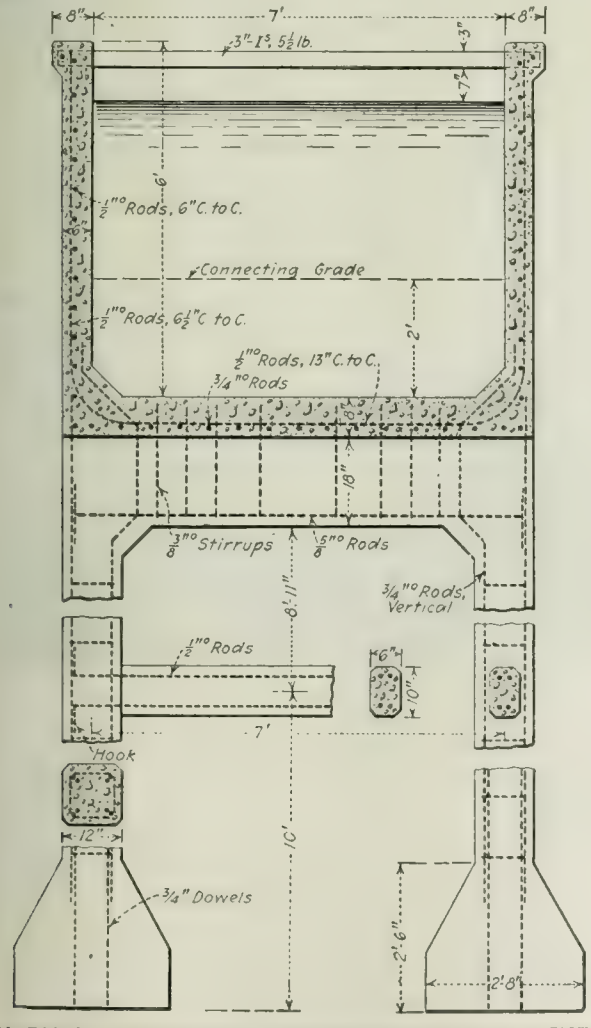
COST OF DRIVING AND LINING EIGHT TUNNELS FOR NACHES-SELAH IRRIGATION DISTRICT, YAKIMA VALLEY, WASHINGTON

Tunnel No.	Length, Ft.	Cost Total	Cost Per Lin.Ft.	Excavation Cost Total	Excavation Cost Per Cu.Yd.	Lining Cost Total	Lining Cost Lining per Cu Yd	Material Excavated
1	1920.0	$40,695	$21 20	$18,173	$4 10	$22,522	$22.20	Sandstone of varying hardness and irregular fracture
2	782.5	18,949	24 20	9,353	5 20	9,596	22 80	Cemented gravel and large boulders Could not use augars or machine drills Much overbreak
9	1363.0	27,357	20.00	10,437	3.33	16,920	23.40	Soft sandstone Concrete run in from one end only.
10	1080.5	21,293	19.70	8,445	3.39	12,848	22 30	Soft sandstone
11	883.0	16,294	18 20	6,973	3.89	9,321	21.00	Soft shale with considerable gravel intermixed
12	893.0	16,047	18.00	6,285	3.51	9,762	22 00	Soft shale Lined in winter Water hauled several miles under bad conditions
13	651.0	12,204	18 70	4,645	3.32	7,559	22.40	Soft shale Concrete material hauled 5 7 miles
14	1145.0	22,468	19.60	7,162	3.13	15,306	27 20	Soft shale with considerable overbreak Concrete material hauled 6 miles and water 3 miles in winter over almost impassable roads
Total,	8718.0	$175,307	$20.10	$71,473	$3.73	$103,834	$23 00	Estimated cost, made in 1917, was $4 for excavation and $20 for lining

the latter; and that workmen were very scarce and mostly old men. The costs include everything except engineering, legal expense and contractor's compensation.

The reinforced-concrete flumes connecting the tunnels are 7 ft. wide and 6 ft. deep. The width was chosen to match the width of the tunnels and make the elimination of transitions possible. The depth, with 1-ft. freeboard, was selected to carry 135 sec.-ft., Kutter's n as 0.016, a high but safe assumption.

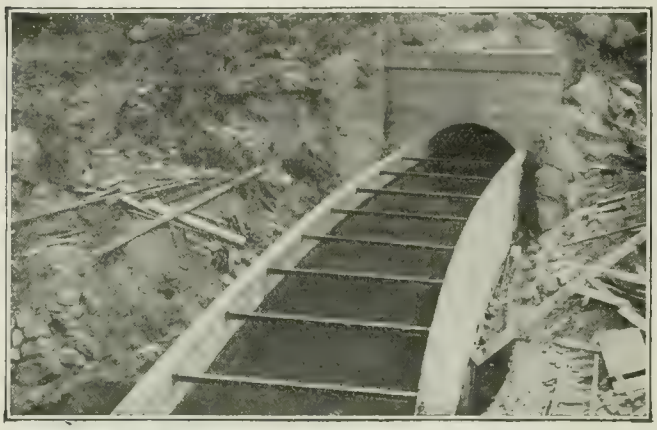
The flume box is designed to be supported entirely by the floor between bents spaced 10 ft. apart. The walls are tied together every 6 ft. by a 3-in. I-beam embedded in the concrete, the ends of which serve as points of reaction for a concrete-steel beam between I-beams, the beam in turn serving as a line of reaction for the upper side of the sidewalls, themselves acting as steel-concrete beams. The lower edge of the sidewalls is supported by steel ties into the floor. No contraction joints were used, but 0.4% of the concrete volume in temperature steel was added, extending well into the tunnels as anchors at each end. Round steel was used, in preference to deformed bars, to facilitate movement of concrete material, and a very wet mix was used, as there was little opportunity for spading. Concrete was poured continuously for each flume until finished. On one of these flumes, it was necessary to make a rock cut of 30 ft. to grade and follow it immediately by an overhead flume supported by a 60-ft. reinforced-concrete arch. The arch was necessary because of unsatisfactory foundation conditions.



NORMAL SECTION OF IRRIGATION FLUME ON BENTS

For the connection between Tunnel No. 10 and the trapezoidal section of the canal lining, a design of reinforced-concrete flume was worked out upon different principles. Here there was no reason why the economic hydraulic cross-section should not be used (the width equal to half the water depth) and a width of 8½ ft., with a gross depth of 5 ft., was selected. As before, the floor is designed to carry the flume between bents spaced 10 ft. apart, but there are no ties across the flume, and the walls are designed as cantilever beams to withstand water pressure only. The location is such that the walls will not be required to withstand pressure from without, as might be the case with the steel-concrete flume heretofore described. As before, there are no contraction joints, but there has been added 0.4% temperature steel. The flume is 600 ft. long, was poured in cold weather (temperature about 35° F.) continuously. Where it joins the trapezoidal lining, by a warped surface transition, an anchor wall has been provided and the longitudinal steel extended into that. The steel at the other end extends for 10 ft. into the tunnel. Shortly after the flume was poured, zero weather was experienced for a prolonged spell of ten days, and during that time two or three contraction cracks were noticeable. When the temperature went back to 30° F., or above, the cracks were closed up and not visible to the naked eye. Since then the temperature has been up to 85° F., with water in the flume and no leaks from cracks.

In places where the reconstructed canal followed the original location, the old canal was lined with concrete. The shape of the old canal was very irregular, with much vertical timber side-lining on the outer bank, and the grade in many places was high. A section was chosen for the most common grade with a base width of 12 ft., side slopes of 1½ to 1 and a depth of 4 ft. In addition, a dip was given the floor, from each side, of 6 in. to the center, and a 4-in. tile drain was laid



REINFORCED-CONCRETE FLUME BETWEEN TUNNELS

under the center, with outlets about every 600 ft. A coping of 7 in. on each side was provided. No. 11 electric-welded 12 x 12-in. mesh wire was embedded in the concrete. Construction joints every 5 ft. were weakened by a screed so as to concentrate all contraction cracks in definite lines. Concreting was continued in the coldest weather possible without injury from freezing.

In most cases, the lining was through adobe soil or soil very retentive of moisture. Previous neighborhood experience with lining had been very unsatisfactory; this was due to frost action. Consequently, unusual precautions were taken. The lining was run in cold weather, so that any cracks due to temperature changes would be made tight by expansion during the irrigation season, and thus leakage to the subgrade would be prevented. In case any leakage should occur, the floor of the lining was dipped to the center, to facilitate rapid flow to the drain and give the floor more resistance to heaving from frost. The drain is surrounded by coarse gravel and will quickly take away any surplus water. The steel mesh was added to give additional strength to the concrete in tension and to prevent any cracks arising from uneven settlement of the subgrade, although all fills were carefully hand-tamped moist. The mesh will not be sufficient to prevent cracks due to temperature contraction in cold weather, but the canal is empty then, and the cracks will be concentrated at 5-ft. intervals so as not to be large or located irregularly between construction joints. The coping at the top is provided to prevent surface moisture getting under the lining sides and causing disintegration by heaving. All lining is 3 in. thick, of 1 : 2 : 4 mix, and n was assumed at 0.016. The 1½ to 1 side slope was selected in preference to any steeper slope, because it is about as steep as a wet mix can be plastered on a slope of that width. The mesh was purchased in rolls of sufficient widths to require two on the bottom and one on each side. It was easily placed by rolling out down the canal and tied together crossways by small projections of wire provided on the side of the mesh.

The cheapest labor on the lining was $4.50 per day and quite inefficient. The finishers were paid $6 per day and were only handy laborers. The preparation of the subgrade was of such character as to be practically all handwork and very expensive. For the lining, completed, the cost was $8.45 per linear foot, exclusive of engineering and of contractor's compensation. Of this amount, the preparation of the subgrade, including the drain, cost $2.66 per linear foot (and, as it happens, also per square yard), leaving $5.79 per linear foot for concrete lining, including the mesh, or $23.16 per cubic yard. All tunnels and the cantilever were connected with the canal lining by reinforced-concrete warped surface transitions.

It was necessary to build about 10 miles of wagon road on the entire work, and to have, at different times, a total of five camps. Excellent meals were furnished at 40c. each, at a loss, and the bunk houses were equipped with steel bunks, mattresses, electric lights, coal stoves with free fuel, and running water. While all this was costly, it was well invested, because the district was able to obtain the best help available, and, what was more important, keep it on the job.

One of the interesting construction features was the sand and gravel plant. The best available material for concrete was in the bed of the Naches River. A suitable bar was found as close to all the work as possible, and here was erected a movable plant, as the bar was long and narrow. The bunkers were of the usual three-bin type, for sand, gravel and crushed rock. A rotary screen, driven by a 10-hp. motor, was mounted on the top of the bin and was fed from a hopper covered with railroad rails spaced 4 in. in the clear, which acted as a grizzly. By means of a 1½-yd. bucket operated as a dragline by a steam-driven stiff-leg derrick with 60-ft. boom, material from the bar was dumped on the rails. Two men were stationed there with poles to push off the very large rocks, which fell into a chute and rolled into a pile back of the bunkers. The other material entered the screen, where the sand



SAND AND GRAVEL PLANT ON RIVER BAR

and gravel were extracted by ⅜-in. and 2½-in. holes, respectively. The tailings dropped into a jaw crusher, operated by a 50-hp. motor, and finally found their way into the third bin. Water was supplied by a 10-hp. motor operating a 2-in. centrifugal pump to keep the sand wet enough to work through the mesh and to facilitate loading the trucks. The bunkers were mounted on rollers and were pulled forward by means of a deadman, wire rope and blocks, with power furnished by the derrick engine. The derrick was backed up as required on greased skids, by its own power. Moving

required about two hours, and was necessary every other day. The plant was operated 12 hours a day by a single shift of five men and kept from eight to twelve 3½-ton trucks busy from 16 to 20 hours per day hauling away material. The hauling was contracted at 40c. per yard-mile, most of it being uphill over earth roads of our own construction and maintenance. It was found that the roads could be kept in fine condition for this heavy hauling by occasional dragging and by daily sprinkling. One man and team were able to do this.

While all kinds of concrete-mixing plants were used to meet the varying conditions, one of unusual interest was a plant built on a steep sidehill at the end of a road so that the trucks were obliged to back onto the material bins and dump in order to turn back on the road. The sand and gravel was fed to a two-bag-batch steam-driven mixer by one man operating control gates, and the concrete was discharged into an open spout which carried it 150 ft. below into a hopper in an inaccessible cañon from which it was loaded into cars by gravity and hauled to place.

Owing to the existing conditions of labor and material, it was impossible to contract this work at reasonable unit prices, and so it was done on a cost-plus fixed-sum basis—under the direct control in all particulars of the chief engineer of the district—by the Nettleton Bruce Eschbach Co. The arrangement proved to be very satisfactory. The general program and designs were worked out by the writer, who was assisted by O. J. Bergoust as field engineer and R. S. Calland as office engineer. Before construction was undertaken, the general program and principal designs were reviewed and approved by D. C. Henny, consulting engineer, Portland, Oregon.

Motor-Vehicle License Fees and Speeds in Iowa

Iowa's new motor-vehicle law, which is designed to supply from $5,000,000 to $6,000,000 annually for highway purposes, prescribes the fees and speeds for the various capacities of trucks, as shown in the accompanying table. The pleasure vehicles are taxed 1% of the factory cost plus 40c. per hundredweight; the tax is payable annually. The speed limit is 30 miles per hour for pneumatic tires and 25 miles per hour for solid rubber tires. Commercial-car schedules are shown in the table. A noticeable feature of the new law is that which requires that in the sale of a second-hand car both seller and purchaser must jointly make application for transfer, and all details, including the new registration, must be complete before the law recognizes the change in ownership as complete.

SCHEDULE OF FEES FOR MOTOR TRUCKS IN IOWA

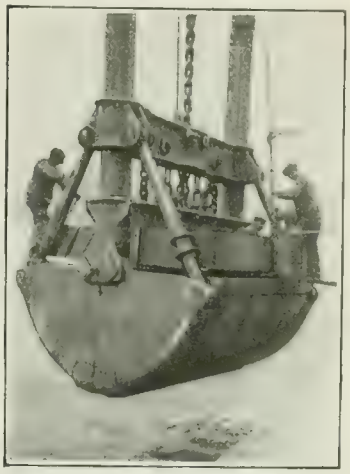
For—	Pneumatic Tires per Annum	Maximum Speed, Miles	Solid Rubber Tires per Annum	Maximum Speed, Miles	Iron, Steel or Hard Tires	Maximum Speed, Miles
1-ton or less capacity	$15 00	30	$15.00	25	$40 00	10
1½-ton capacity	22.50		22.50		50 00	
2-ton capacity	30 00		30 00		No license issued for heavier load capacities	
2½-ton capacity	45 00		55 00			
3-ton capacity	65 00		75 00			
3½-ton capacity	90 00		100 00			
4-ton capacity	105 00	25	115 00	20		
4½-ton capacity	120 00		130 00			
5-ton capacity	135 00		145 00			
6-ton capacity	165 00	16	175.00	12		
Fees for trailers:						
½-ton capacity		..		..	$3 00	
1-ton or less capacity	10 00	..	10 00	..	15 00	
2-ton capacity	15 00	..	15 00	..	30 00	
3-ton capacity	25 00	..	35 00	..		
4-ton capacity	40 00	..	50 00	..		
5-ton capacity	50 00	..	60 00	..		
6-ton capacity	60 00	..	70.00	..		

Clamshell Bucket Digs Thirty Cubic Yards per Dip

Largest Bucket of This Type Ever Built — Has Record of 24,000 Cubic Yards of Material in Twenty Hours

WHAT is said to be the largest clamshell bucket ever constructed was used in dredging the approaches to a dry dock at Sparrow's Point, Md., for the Bethlehem Steel Co. The bucket, which is shown in the illustration, has a capacity when working in solid mud of 30 cu.yd. per bite. The jaws themselves have a wet capacity of 15 cu.yd. This bucket is said to have a record of 24,000 cu.yd. in two 10-hour shifts.

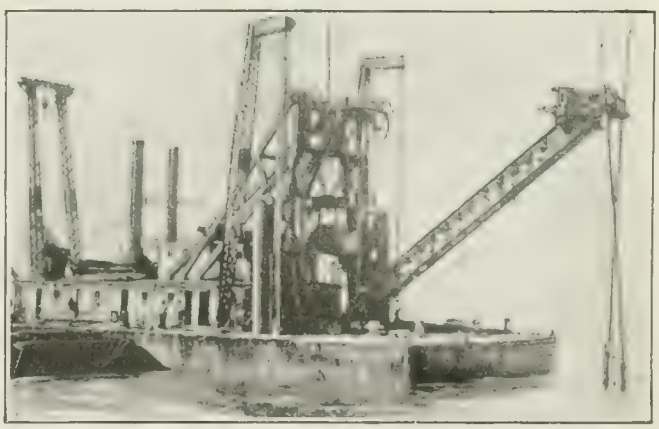
The general dimensions of the bucket may be seen from the size of the men working upon it. The pipe sleeves into which the 90-ft. hickory poles are set, to keep the bucket from twisting, are 16 in. in diameter. The poles pass through ring spreaders upon the mast and keep the bucket in line. Sideboards about 2 ft. high are placed above the jaws, so that when they close they will hold the extra material which rises above the top.



THE SIZE OF THE MEN SHOWS SIZE OF BUCKET

Without the poles the bucket alone weighs 40,000 lb. and in operation it remains open by its own weight. When lowered for a bite the large chain, working through four 30-in. sheaves, closes the jaws. Then the chain and the wire cable, seen attached to the crosshead, work together in hoisting. After the bucket reaches dumping position the chain is released and the jaws open. This chain extends only a short distance above the bucket, where it is attached to another wire cable.

Specially designed scows are required to attend the large dredge shown in the view, since ordinary scows are soon destroyed by the effect of shock in dumping such heavy loads. When the bucket is operating, three



LARGE BUCKETS MAKE SPECIAL SCOWS NECESSARY

1400- and two 1800-cu.yd. scows are in constant attendance. These are of the bottom-dump type.

The bucket was built by the Morris & Cumings Dredging Co., New York City, of which George Leary is president and Fred H. Schomburg is vice-president and secretary.

Powder Magazines Made To Look Like Cedar Trees

Sandy Hook Buildings Had to Be Concealed by Camouflage To Deceive Possible German Submarine Raiders

By G. C. Muñoz

Major, United States Army, Chief of Construction Section, Supply Division, Ordnance Department, Washington, D. C.

CAMOUFLAGED ships were familiar to every one who was near an American seaport during the war, but buildings concealed by the new art were rarely seen except by those who got to the war areas. In New York harbor, however, there was a clever example of the camoufleur's skill applied to structures, which it is now permitted to describe.



CAMOUFLAGED POWDER MAGAZINE AT SANDY HOOK—TWO MORE MAY BE DIMLY MADE OUT IN THE BACKGROUND.

Early in the year 1918 a storage depot for high explosives was established at Sandy Hook, just outside New York harbor. The area selected was about one and one-half miles long, bordering on the Atlantic Ocean, and in this area a number of magazines 26 x 42 ft. each were built in two groups and spaced approximately 400 ft., one from the other. The two groups were separated by a space of about 2,000 ft. This portion of Sandy Hook is a sand bar with low vegetation in the southern half and woods and sand dunes growing heavier toward the northern portion. The trees are mostly cedar.

The magazines were built of corrugated asbestos, making the buildings white in color and rendering them exceedingly conspicuous from the ocean. On account of the danger from fire due to combustible underbrush and trees, all vegetation was cleared from around the magazines for a distance of 100 ft. and this clearing, although necessary from a fire-protection point of view, rendered the buildings much more conspicuous from the ocean. As soon as it was established that German submarines could operate along our Atlantic seaboard, it was deemed advisable to render these magazines less conspicuous in order to minimize the danger from bombardment by submarines, and a request was therefore made of the Engineer Corps to send a camoufleur to Sandy Hook to study the problem of camouflaging these magazines and to give instructions to the construction forces as to the best methods of carrying out this work.

After a study of the problem made from a boat, it was decided to camouflage the buildings by making them resemble groups of cedar trees, which was the type of tree found most generally scattered through the depot. This was accomplished by painting vertical blotches of bronze green, light green and mauve with a few horizontal streaks in the lower portion of the building painted light green and sand color. The design in each instance was carried out to resemble so far as possible the immediate background of each magazine and the square lines of the magazines were broken by erection of artificial tree silhouettes built of fire-resisting material and cut and fitted to continue the trees painted on the buildings.

The accompanying view shows very clearly the nature of the surrounding land and the method of camouflaging the buildings in order to make them resemble the surrounding trees. The results obtained were excellent and a man in a boat half a mile from shore cannot detect the presence of these buildings.

Increase in the Use of Motor Vehicles in Chicago

Figures recently made public by the City of Chicago from the records of licenses issued for vehicles under the wheel tax law show that during the last four fiscal years, which ended Apr. 30, 1919, the number of horse-drawn vehicles that were licensed decreased from 49,582 to 32,489, or 34¼. In the same period the automobiles and motor trucks licensed increased from 43,229 to 77,332, or 77¾%. At the end of April there were two and one-half times as many motor vehicles as horse-drawn in the city. The highest percentage of increase during the four years was in motor trucks, buses and coaches of more than one-ton capacity, which increased 164%, while motor delivery wagons increased 104.4 per cent.

Compares Strength of Long-Used and Freshly-Cut Douglas Fir

USING large-sized Douglas fir timbers from the frame of the former city hall of Oakland, Calif., which was dismantled in 1913 after standing for 36 years, a series of 1200 tests was made in the civil engineering testing laboratory of the University of California to determine the strength, elastic properties and moisture content of such timber after long use in a typical frame building.

The original pieces were tested first as beams, using the longest possible span consistent with the sectional dimensions; in general, span length was equal to 10 times the depth of the beam. Broken pieces from the beam tests were sawed into specimens for compression tests, both parallel and perpendicular to the grain, for longitudinal shearing tests and for other beam tests to investigate resistance to impact.

The results of these tests and a comparison between them and tests of freshly-cut Douglas fir are given in extensive tables. Among the conclusions of the author, Arthur C. Alvarez, published in Bulletin 2, Volume 2, of the University of California publications in engineering, it is stated:

For compression parallel to the grain, comparing results of 2 x 2-in. specimens free of defects, all reduced to 12% moisture, the elastic limit of the long-used timber is about 85% of that of the freshly-cut material, but the maximum crushing strength of the former is 3½% greater than that of the latter.

Long-Used Timber Is Stronger

The modulus of elasticity of long-used timber in one case is twice as great as that of freshly-cut Douglas fir. In the other case, when the reduction to 12% moisture is made, the moduli of elasticity are equal. The ultimate strength of the 2 x 2-in. specimens shows that the long-used timber surpasses the freshly-cut timber by about 360 lb. per square inch, or 9%, at the elastic limit, and by 1640 lb. per square inch, or 33%, at the maximum crushing load. A similar comparison for the largest sizes shows that the former are stronger by 300 lb. per square inch, or 9%, at elastic limit, and by 940 lb. per square inch, or 22%, at the maximum crushing load. This comparison shows that the static compressive strength parallel to the grain of air-seasoned timber may increase in time during use under favorable conditions.

The results for longitudinal shear on 2 x 3-in. or 1½ x 3-in. areas show that the long-used timber is stronger than the freshly-cut material by 698 lb. per square inch, or 85%. This shows how greatly the longitudinal shearing resistance of small sections of Douglas fir wood fiber may increase with age, provided defects such as checks, shakes and knots are absent.

The results for compression perpendicular to the grain for the largest size of long-used timber exceeded that for corresponding sizes of air-dry specimens by 243 lb. per square inch, or about 38%. This may be due to difference in moisture content.

The results of the static bending tests on large beams indicate that the static strength in longitudinal shear due to increased seasoning kept pace with the deterioration due to increased checking. Under favorable conditions, Douglas fir of large structural size with ordinary defects does not deteriorate in use when exposed to bending under static loading, but maintains the strength it had in the beginning. Age does not seem to intensify the weakness due to defects.

Impact tests in beams of clear material indicate that Douglas fir after long use is only about 86% as strong at the elastic limit as freshly-cut material of the same moisture content, but is 95% as strong as freshly-cut Douglas fir containing 20% of moisture, a condition which approximates "air-seasoned" on the market. Long use renders Douglas fir fiber slightly less resistant to loading suddenly applied.

Working stresses for longitudinal shear should be based on the results of tests of specimens similar in character to the details of the timber structure to be designed.

Depressed Cross-Walk Connections Are Convenient for Pedestrians

By C. C. Wiley
Associate in Civil Engineering, College of Civil Engineering, University of Illinois, Urbana

CROSS-WALK connections depressed to eliminate both the step-down type and the crowned cross-walk combine the convenience of the pedestrian with non-interference with vehicular traffic. The accompanying photograph shows the new type of sidewalk-apron crossing which has been adopted as standard on all new work in residence districts in the City of Champaign, Ill.

With a combined concrete curb and gutter, the notch is made in the same way as in private drive entrances. The radius of the curb return is about 1 ft., and sufficient back slope is given to the gutter flag to make a satisfactory water channel. With other types of curbs, the curb can be returned on any convenient radius and the walk made to meet the pavement, with



SIDEWALK APRON AT CROSS-WALK CONNECTION

a somewhat steeper slope for the last foot or so to provide a gutter. The depressed walk is provided with curbs 3 in. wide, built as extensions to the pavement curb returns. The construction as shown costs from $2 to $4 more than the ordinary "jump-down" type.

These approaches are very neat and pleasing in appearance. They provide adequate waterway for ordinary rains, and are no worse in times of unusually heavy rainfall than any of the other types. They offer no obstruction whatever to street traffic, while the full height of the curb at the corner prevents vehicles from encroaching on the parking. At the same time the inconvenient and often dangerous step-down is eliminated, and a smooth, easy approach from either the street or the sidewalk is provided; this is highly ap-

preciated by all pedestrians and especially by women with baby carriages. This crossing was designed by F. C. Lohman, city engineer, of Champaign.

Graphical Method for Estimating Storm-Water Run-Off

By Ralph W. Horner
With Fay, Spofford & Thorndike, Consulting Engineers, Boston, Mass.

THE problem of estimating the quantity of storm-water which may be expected to run off from a given surface area is one which requires considerable experience and good judgment on the part of the engineer. The amount of run-off from a given area is directly dependent on both the amount of rainfall and the imperviousness of the surface over which it flows. At the present time, the rational method of estimating run-off is in quite common use. For its proper application to a given problem the following factors must be known:

1. The area of the surface from which the run-off is to be estimated; (2) the time required for the water to flow over the surface, from the most remote part of the area and through the drainage system to the particular point of concentration under consideration; (3) the intensity of rainfall corresponding to the time of concentration, determined under (1). (This intensity should be obtained from a rainfall curve which is characteristic of the locality being studied.); (4) the run-off coefficient, which is dependent upon the imperviousness of the surface and several other factors.

For use with the rational method, the above factors are combined in the following formula:

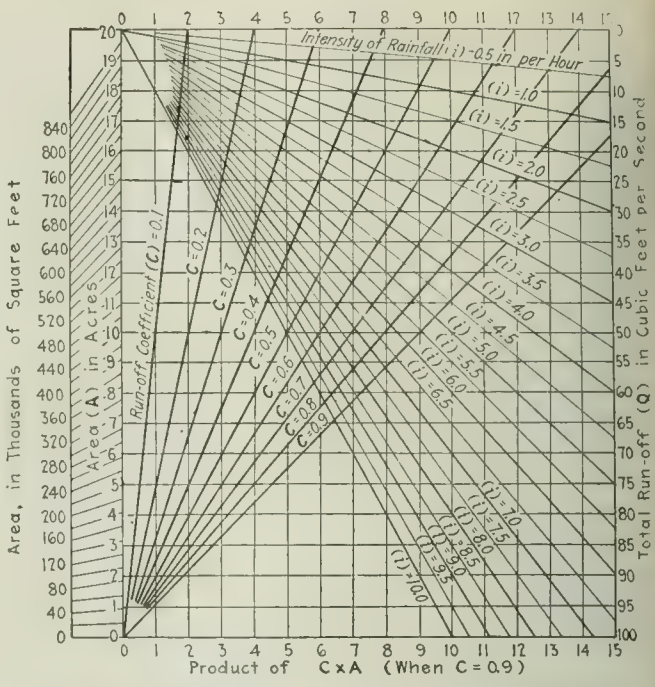
$$Q = c \times i \times A$$

in which Q = the total run-off in cubic feet per second.
c = the run-off coefficient of the area.
i = the intensity of rainfall in cubic feet per second per acre (or approximately the rate of rainfall in inches per hour).
A = the drainage area in acres.

Although this formula is of quite simple solution, the accompanying diagram will be found to be a time-saver in estimating the run-off from a considerable number of areas or from an area which is composed of numerous subareas having different run-off coefficients.

The solution of the following example will serve to explain the use of the diagram: Required the amount of run-off from an area embracing the following parts (a) 350,000 sq. ft. of roof area with a run-off coefficient of $c = 0.9$; (b) 100,000 sq.ft. of sidewalk area with $c = 0.75$; (c) 250,000 sq.ft. of cobble pavement with $c = 0.5$; and (d) 500,00 sq.ft. of filled area, unimproved, with $c = 0.2$. Assume that the time of concentration at a hypothetical point in the drainage system is 15 min. and that the corresponding intensity of rainfall is 3.35 in. per hour.

Enter the diagram on the left-hand side at an area of 350,000 sq.ft., as given under (a); follow diagonally across to the graduations representing area in acres, thus reducing the area in square feet to the corresponding number of acres; follow horizontally toward the right to the diagonal representing $c = 0.9$ and read at the bottom of the diagram the corresponding value of $(c \times A)$ which for (a) equals about 0.7. In the same manner $(c \times A)$ for (b) equals about 1.7; $(c \times A)$ for (c) equals about 2.9; $(c \times A)$ for (d) is equal to about 2.3; and the total is equal to about 7.6.



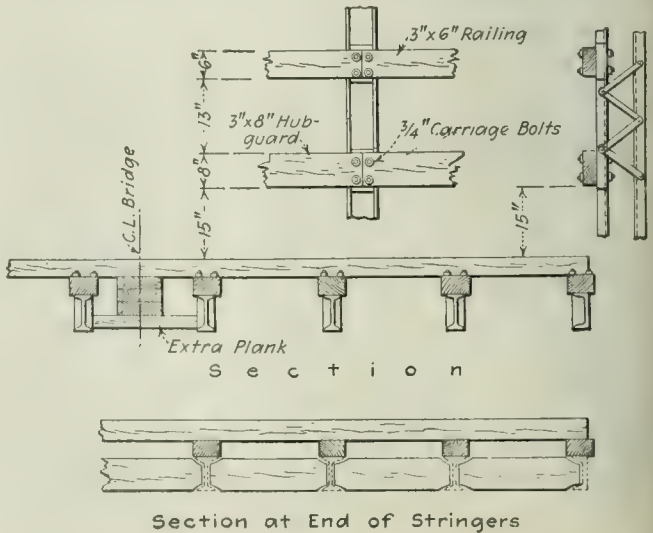
STORM-WATER RUN-OFF DIAGRAM FOR USE WITH RATIONAL METHOD

Enter the diagram again at the bottom, where the value of $(c \times A)$ equals 7.6; follow vertically upward to the point where i is equal to 3.35, and from there horizontally across to the right-hand edge of the diagram where the corresponding value of Q is found to be 25.5 cu.ft. per second.

In solving a problem dealing with areas larger than those covered by the diagram, it is only necessary to enter it at the same sequence of figures as those in the given area, and by moving the decimal point the proper number of places to obtain the correct value of Q.

Wheel Guards on Highway Bridges

TO KEEP vehicles clear of trusses of highway bridges, hub guards as part of the railings are preferable to curb timbers on the floor, as the plank floors then keep clean and last longer. This opinion was expressed by C. W. Dewart, bridge engineer, in the 1918 report of the State Highway Commission of Michigan. The construction is shown in the accompanying draw-



ing. Provision is made in these standard bridge plans for extra planks for repairs to be stowed beneath the floor. In reflooring old bridges, heavy strips are bolted to the stringers, and the planks are nailed to these at every intersection. It is explained in the report that this materially reduces the vibration and sway of the trusses and also enables the stringers to carry a much heavier load.

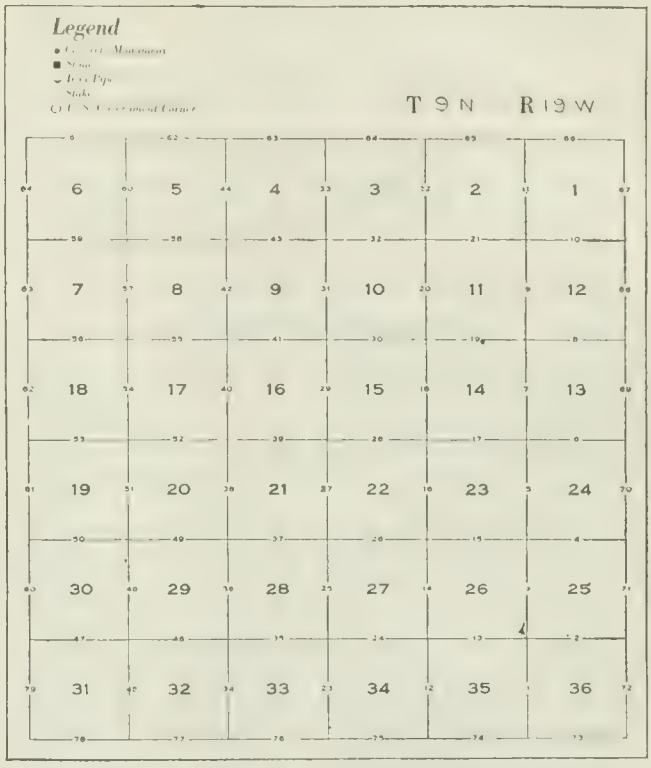
Land-Survey Indexing Plan for County Surveyors

Reference Plat With Loose-Leaf Record Sheets Similarly Numbered Makes Location of Survey Data Easy

By K. Q. Volk
Los Angeles, Calif.

A LOOSE-LEAF indexing system has been developed and found very convenient in making records of land surveys by A. E. Stegman, county surveyor of Kern County, California. The county has an area approximately equal to that of Massachusetts, and each township of 36 square miles has two index sheets as shown, for recording the survey data pertaining to it, the key to the system being the numbered township plat on the back of the sheets.

Referring to the plat and index sheets, it will be seen that the two sets of numbering on the former correspond to that in the left-hand columns of the latter. The sections are numbered from 1 to 36, and the boundary lines of the sections from 1 to 84. The first series of numbers is used to index surveys entirely within the sections, while the second is to index surveys pertaining to the boundary lines of the sections.



TOWNSHIP PLAT WITH INDEX NUMBERS AND MONUMENT LEGEND
Actual size of plat, 8 x 8 inches, printed on back of record sheet

By this means it is easy to locate all surveys which have been made in any section. A record is also kept of the surveyor and of the book which contains the notes.

T 9 N R 19 W.

SEC.	NAME	DRAWER	NO	SURVEYOR	DATE OF SURVEY	NAME	DRAWER	NO	SURVEYOR	DATE OF SURVEY
1										
2										
3										
35										
36										

T 9 N R 19 W

LINE	DRAWER	NO.	SURVEYOR	DRAWER	NO.	SURVEYOR	DRAWER	NO	SURVEYOR	BOOK	PAGE	SURVEYOR	DATE OF SURVEY	GOV NOTES
1														
2														
3														
82														
83														
84														

RECORD FORMS FOR INTERIOR AND BOUNDARY-LINE SURVEYS (Actual size, 10½ by 6 inches)

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

California State Council of Engineers in Process of Formation

Lack of a central engineering agency for the different sections of California, when an effort was made during the last session of the legislature to reach an agreement on an engineers' license law, has served to crystallize action on the formation of a Joint Council of Engineering Societies of California, to further "the common interest of members of the engineering professions and for the rendering of public service as opportunity offers." A joint committee of seven Los Angeles societies and a joint council of five San Francisco societies already exist and have been functioning. For state problems, however, they soon found their organizations were insufficient, and the San Francisco council proceeded to formulate plans for a state-wide council built practically on the same basis as the two local organizations. The proposal, well worked out in general and ready for the final details, has been sent out for comment and criticism by N. A. Bowers, secretary of the joint council, to nine societies in San Francisco, six in Los Angeles, one in Sacramento and one in San Diego.

The keynote is in the statement of the formulating committee, consisting of C. D. Marx, Edward Higgins, B. S. Drake, C. E. Rogers and E. C. Hutchinson, to the effect that "if engineers are to use their influence to advantage through a state joint council, that body must be representative and it must have some authority." In the proposal it is suggested that representation be restricted to professional organizations, excluding those formed for social purposes; that each society have one representative for each 100 members, with votes equal to the number of active members; that five officers elected at the one annual meeting constitute an executive committee; that an expression of opinion by mail from the membership of each society as a whole on all important questions is to be obtained whenever feasible, representatives being expected to vote the sentiment of their constituency except on minor matters; that expenses of the council, including traveling expenses, are to be apportioned among all societies on the basis of their active membership. Rather than work out representation at large the societies are urged to enroll engineers belonging to no local.

The San Francisco joint council does not consider itself or the Los Angeles joint committee eligible, but it is simply setting the stage and providing the medium until the first organization meeting. In this respect the plan is at slight variance with that proposed by the development committee of the American Society of Civil Engineers, which suggests that the state councils be composed of representatives from the local affiliations, the affiliations to be made up of branches of the national technical societies and the local technical societies. No provision seems to have been made for state societies either in the California proposal or in the development committee plan, whereas in Illinois, the Middle West and West the state societies have followed legislation much more consistently year in and year out than the local organizations. California has made a long step forward toward the consummation of the development committee's plan. It is apparent that it will soon have the machinery to be democratically represented in a national council.

Colorado Engineering Council Working

Under the name of Colorado Engineering Council, eight state and local technical societies have organized to coördinate their work, to promote the welfare and professional standing of their members and to foster a more general recognition of the engineer in civic matters. Each organization has one delegate and an alternate. Two years is the term of office. A representative failing to attend three successive meetings without being excused by the president forfeits his seat. Regular sessions are scheduled at least once a month. The dues are $5 per year for each organization.

One of the first pieces of work was an examination of the license law which was passed by the last legislature, largely through the efforts of the Colorado Society of Engineers, an organization of about 250 members having business and welfare aims. The council was organized too late to do anything with the bill before it became a law, although some of the mining engineers objected quite strenuously to it. Examination by the council into the details, however, disclosed that the law is not bad, and it was decided that, for the time being at least, no opposition to it should be launched.

The officers of the council are as follows: President, Arthur Ridgway; vice-president, L. G. Carpenter; secretary-treasurer, Robert J. Grant, Interstate Trust Building, Denver, Colo.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Large Construction Firms Shun Roadwork

Sir—Just a few added remarks to those of "Practical Engineer" in *Engineering News-Record* of July 3, 1919, p. 38, as to why large contractors shun roadwork. In the capacity of engineer and also of contractor, I have seen the methods of several highway departments.

There are three main items to any engineering project: First, the designing, which naturally falls to the lot of the engineer; second, the building of the project; third, the paying for it. Most anybody (even the Romans) could design and build a structure, but what places the modern designer in the status of an engineer is not his ability to design a structure but, having been given the conditions, to design the structure which will make the investor's dollar accomplish the most.

The writer believes there is a general lack of coordination of the first two items by engineers on highway work. Many highway plans are prepared without a thought of how the work is to be done, what equipment will be used, what equipment is available, the labor situation, the contractors, what equipment should

be used and how the plans can be made to conform to these conditions in order to lower cost and obtain a low bid.

These and many other important features are never considered even by some of our largest engineering departments. We find engineers doing the same things they did twenty years ago. They stick to the old methods of pick and shovel, mule and scraper, and generally make the work a losing game even for these ancient implements.

The work should be designed not only to make a good highway but also to enable a contractor to get the most economical use of his equipment, which will not only result in more competitive bids and more good will but a lower price.

This policy would inevitably result in a better and more substantial road at less or no greater cost. When the plans "chop up" the work and make it a losing proposition for any kind of equipment, an experienced contractor will let the work alone, and the inexperienced one will get the job and lose money or go broke, which is a detriment both to the community paying for the work and the engineer of the project, because a contractor in preparing a bid considers first the reputation of the community, then that of the engineer and his methods and the possibilities of obtaining justice and fair treatment.

A farmer who is a Western state highway commissioner recently remarked at a meeting that what we need in roadwork is less white collars and shirts and more practical men in overalls. I believe he is right, to a certain extent. My Army experience in France and England convinces me that we Americans are too quick to establish large, intricate systems and methods—, where, true enough, everybody is busy and things work in a clocklike manner, but we sometimes make the mistake of calling it efficiency.

Suffice it to say that too often the cost of highway engineering work has exceeded the cost of construction or has been too large an item of expense. There is a limit to engineering expenditure, especially in highway work, and the proper judgment of the engineer should tell him when to stop. Taking all into consideration, one good practical highway engineer of a $250 per month status will accomplish as much satisfactory work as a half-dozen inexperienced men at $125 per month, which latter salary seems to be about all some districts expect to pay. Contractors will not bid on highway work until we have highway engineers, and we cannot get highway engineers at present salaries.

Lincoln, Neb. WILBER J. HOSKYN.

Government Specifications Should Not Misplace Responsibility

Sir—Referring to the letter of E. D. Buel and your added comment in your issue of July 17, 1919, p. 144, with respect to the custom of municipal, state and Federal specifications misplacing responsibility, at least one department of the City of Philadelphia is endeavoring, through its contract specifications, and even through its advertisements for bidders, to assume, as much as possible, the uncertainty of a few of the items which are ordinarily shouldered by the bidders and contractors.

I refer to the Department of City Transit, which, since its creation in 1913, has maintained that bidders and contractors are entitled to whatever information it is possible to accumulate, in order to lessen the element of uncertainty and its attending responsibility, and, furthermore, to obtain the financial benefits to be thus derived.

A few quotations from the publications of this department are self-explanatory and need no enlargement. A specification for the construction of a portion of the Broad Street subway, issued in 1916, contains the following:

> The plans show existing underground structures in accordance with the best information accessible, and should any of such data prove to be so inaccurate or incomplete as to be misleading and involve work not contemplated in the contract, *equitable allowance and compensation will be made therefor.*

In a specification for the construction of column foundations for the Frankford elevated railway, issued in 1915, we find:

> Should any gas or water mains with their chambers or electrical conduits with their manholes, whether shown and noted on the plans or not, or any structure not shown on the plans, require to be moved and relocated in order to clear a pier, such work will be done by the city in the case of city-owned structures, or by the owners in the case of privately owned structures, *without expense to the contractor;* or, if so ordered, the contractor shall do the work as extra under the items in the proposal applicable to the work done. Should the contractor desire to change the location of structures to facilitate his work, such changes shall be subject to approval, and shall be made at the contractor's expense either by the owners or under the owner's supervision.

A third quotation is from an advertisement for station buildings for the Frankford elevated railway, dated April 15, 1919:

> In order to relieve intending bidders of the expense and time involved in taking off the quantities from the plans, a statement of the quantities of material and work as required and covered by the price bid will be issued with the plans and specifications to all bidders. In order that bidders may be assured of the accuracy of the quantities, the statement will be made a part of the contract, and the contractor *will be compensated for any additional work or material that may be required in excess of the statement.*

Philadelphia, Penn. SAMUEL W. BARAKAT.

The Reaction in Engineering Education

Sir—The editorial entitled "Developing the Engineering Mind," in *Engineering News-Record* of July 24, 1919, p. 155, touched on several points in connection with engineering education which have always appeared to be very important to the writer, although he does not agree with all the ideas advanced.

To begin with, it hardly seems possible that the idea of training a student to think can be a "new development" in engineering education. Strange as it may seem, however, it appears that many teachers are just awaking to the fact that the main function of an engineering school is not to fill up a student's mind with a selection from the immense collection of engineering technique which has been accumulated in the last fifty years, but to make him think. As Mr. Allen points out, in the same issue, "with a treatise or textbook as a basis it is natural for a student to depend upon memory." Furthermore, it is undoubtedly true that too many instructors in engineering have looked upon themselves as "drill masters" and have thought that their greatest efficiency was reached when they had so carefully explained some mathematical problem that the students

were letter-perfect in their recitation on it. This has been due to some extent to the survival of ancient teaching methods of the "school of the rod," but the exponents of this method have been aided and abetted by the wave of vocational training which has swept over the country. This mania for problem and laboratory work and for what have been described as "sugar-coated pill" courses has at last produced a reaction, as is indicated by the general tone of the editorials and letters appearing in *Enginering News-Record* during the past year.

From the student standpoint, courses are very popular in which the matter is carefully arranged and is presented by lecture in a very simple way, with interesting applications. Such courses involve little brain work on the part of the student and the instructor is put down as "O. K." On the other hand, the instructor who makes the student "dig it out" for himself, who patiently leads the student to think and reason—who, in short, subordinates himself to the end that thinking and reasoning may be substituted for memorizing—is not always popular, but knows he has done a day's work when he closes his office door at night.

Again, no engineering instructor who has really been "on the job" has entirely neglected the so-called "case system" now advanced as a new departure. Too often an instructor has used practical examples as purely mathematical problems and has neglected entirely the discussions of the "primary assumptions" and other features involved. These things have been dismissed as being settled by that mysterious power known as "engineering judgment," back of which we must not attempt to go. Few students have been brought to realize that real engineering ability does not entirely consist in accurately and rapidly manipulating a slide rule, but in possessing and being able to exercise engineering judgment—knowing how to analyze and weigh the pros and cons of a question and give a scientific opinion of value. Mark Twain once said that "an honest difference of opinion was the thing that made politics interesting." The same is true in engineering, and there is no sense in leading a student to believe that every engineering problem is solved by mathematics and will always have but one answer. The case system is good in moderation, just as "practical problems" are good in moderation, but the minute the problem or case, rather than the fundamental principles involved, becomes the main feature, the instruction degenerates to a form eminently suitable for instructing draftsmen and detailers but not calculated to develop engineers.

Many courses in mathematics and mechanics have been taught with this same tendency, with the result that students can integrate the most involved expression or work out the stresses in a railroad bridge, but the minute a new problem is advanced and they have to analyze the situation and formulate the principles before integrating they are lost. Their grasp of the principles involved is lacking; they are machines for the rapid and exact solution of formulated problems, but they cannot get the data in shape to operate.

It would probably be a very good thing if the engineering schools recognized that at least two kinds of young men were needed in the profession: First, honest, careful, conscientious plodders who will be satisfied to spend their lives as draftsmen and detailers and who have never been educated above their jobs. For such men a vocational type of instruction, such as can be found in most engineering schools, is probably well suited. This is also the type that many narrow-minded practical engineers desire to employ. Second, there is needed the type which broad-minded engineers and educators look to as an ideal—thinking, reasoning beings of power and judgment. Every student who goes to college cannot hope to enter this class, nor can he be educated to it. The qualities required can be developed but not made—they must be present in the raw material.

Thorough and intensive training is essential in the coming "war of efficiency," but the big men of the future must also be broad-minded. The man who goes through life knowing only his own narrow professional field will never raise the status of the engineering profession and is only half living. Economics, business, art, literature and even music, as *Engineering News-Record* suggests, are important. These subjects and even the "principles of architecture" are not entirely "ignored" in all colleges. In at least one institution a brief course in architecture has been given to civil engineering students and has been found to be a valuable feature of the curriculum that may bear fruit in the future.

The space which *Engineering News-Record* has recently given to engineering education and the discussion which has been brought out by this effort cannot fail to lead to important results, and it deserves the thanks of both practicing engineers and the teaching profession.

J. K. FINCH,
Associate Professor of Civil Engineering,
New York City. Columbia University.

Asks Information on Organization of Engineers to Increase Pay

Sir—The Engineers' Club of Columbus, Ohio, has a special committee at work investigating the increasing tendency of the engineering profession to organize in an effort to obtain just compensation for services rendered. This committee asks assistance in the endeavor to obtain such information as may be available pertaining to those organizations that have been completed or are in the process of organizing.

The committee is especially interested in organizations that have not become affiliated with the American Federation of Labor, but which nevertheless have felt it advisable to act collectively.

If possible, we should like to have the name, location and strength of such organizations and the schedule of salaries that each of these bodies recommends, if any recommendation has been made.

Any other information along these lines will be greatly appreciated.

DALE T. WADSWORTH,
Chairman, Committee to Investigate Compensation of Engineers.
117 W. Frambes Ave., Columbus, Ohio.

Accident-Prevention Highway Spurs at Railroad Grade Crossings

Sir—In your issue of July 10, 1919, p. 94, Albert L. Wyman makes three suggestions looking to the prevention of railroad grade-crossing accidents: First, that highway spurs should be built parallel to the track to enable drivers of automobiles approaching a crossing

to turn from the main highway to avoid an oncoming train; second, that a signal to indicate approaching trains should be placed 150 ft. from the track, and, third, that red light signals should be installed at all crossings.

As assistant chief engineer of the California Railroad Commission, the writer had charge of the grade-crossing work of the commission for about three years, during which time every important grade-crossing accident was investigated. An examination was made of every protective device in use or suggested, and nearly all the grade crossings in the state were surveyed. As a result of these investigations, several thousand recommendations, ranging all the way from clearing brush to separating grades, were made to the railroads. Most of them were carried out or were being carried out when the work was discontinued on account of the war.

From this experience the writer is convinced that, except for busy city crossings where gates and watchmen are necessary, the best type of grade-crossing protection is the audible-visible signal, and the first two of Mr, Wyman's suggestions are fundamentally wrong.

Based on their reactions to the grade crossing, there are three types of automobile drivers: The careful and cautious drivers who are always on the alert, the drivers who are willfully careless and deliberately take chances, and, in between, the drivers who are careless through ignorance or thoughtlessness. A grade crossing can never be made safe for a driver of the second class, and a driver of the first class will be amply protected by any device which will protect the drivers of the third class, who are responsible for the greater portion of the crossing accidents that disgrace the country, because they are in an overwhelming majority. The way to reach and protect a driver of this kind is to educate him to the danger of the grade crossing, give him every possible chance to know when he is approaching a crossing, and then to compel him to exercise care whether he wants to or not, because when he gets into trouble he takes, on an average, two others with him.

The highway spur banked to divert safely from the main highway an automobile traveling at 30 miles per hour is an invitation to take a chance which would induce the taking of chances. A driver who knowingly approaches a railroad grade crossing at a speed of 30 miles per hour, or at any speed so high that he is unable to stop after he reaches a point where he can obtain a clear view of the track in both directions, is guilty of nothing less than criminal carelessness. Why go to an enormous expense to aid and abet him? It would be an enormous expense, because 600 miles of highway spurs would be required in California alone to carry out such a plan. The trouble is not that automobile drivers have no chance to escape, but that they place themselves in situations where it is necessary to escape. If all carelessness at grade crossings resulted inevitably in accidents, the number of crossing accidents would be immediately reduced. It is because so many people are careless and "get away with it" that the cautious driver is in a decided minority. A railroad crossing is as dangerous as a drawbridge. Surely the proper way to protect a drawbridge is to require caution when approaching it, and not attempt in any way to make it safe for caution to be thrown to the winds.

In 1916 the grade-crossing committee of the National Association of Railway Commissioners recommended that every grade crossing should be protected by an approach warning signal of a specified type, and California and other states have since passed laws requiring the cities and counties to install such signs at all crossings within their boundaries. Their purpose is not the same as the advance signal advocated by Mr. Wyman, which would indicate the approach of a train, but to notify the automobile driver that he is approaching a spot where there may be danger and that he should govern himself accordingly. The first signal costs $10 per crossing, the second would cost not far from $1000.

The grade-crossing problem is like the problem of squaring the circle—it is impossible of solution. There will be accidents on grade crossings as long as there are grade crossings. The writer's program would be: First, unceasing "safety-first" campaigns by the railroads, the public utility commissions and any civic organization that could be enlisted; second, a crossing sign and approach warning sign at every crossing, the removal of obstructions at the intersections of rail and road, the installation of automatic flagmen, *in the center of the highway* at the more dangerous crossings, and crossing gates and watchmen where they are needed; third, a law, which should be enforced, making it illegal to approach or pass over crossings at a speed exceeding 15 miles per hour.

It is illegal in California to approach a grade crossing at a greater speed than 15 miles per hour when the operator's view is obstructed and to approach a crossing at a speed exceeding 10 miles per hour where the driver's view of the crossing or of the railway traffic within 400 ft. of the crossing is obstructed. This was the program followed by the California Railroad Commission, and the results speak for themselves: Number of persons killed and injured in grade-crossing accidents in California for the year which ended June 30, 1916, 524; June 30, 1917, 384; June 30, 1918, 231.

During 1917 and 1918 motor-vehicle registrations in the state, exclusive of motorcycles, increased 57%, and as most grade-crossing accidents are motor-vehicle accidents it is not unfair to assume that the results were even more beneficial than these figures indicate.

When the program outlined above has been followed, then and not until then should suggestions such as Mr. Wyman's be carried out, and even then it should be borne in mind that when a grade crossing becomes so dangerous that elaborate and expensive means must be taken to protect it, the money can probably be spent to much better advantage by separating grades and abolishing it altogether.

H. G. BUTLER.

San Francisco, Calif.

Design of Swimming Tank

Sir—I was much interested in the article on the design of a swimming tank, by L. R. Viterbo, in *Engineering News-Record* of July 17, p. 135. My attention was particularly attracted to his assumption of 100 lb. per square foot for superimposed live load on the bottom of the tank. I should like to know how much of the 100 lb. was due to the waterproofing and tile, and how much was due to the swimmers in the tank.

New York City. J. S.

[In reply to an inquiry, Mr. Viterbo states that 30 lb. was for the tile and the waterproofing and 70 lb. for swimmers in the tank.—EDITOR.]

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Overcoming Difficulties in Laying Concrete in Cramped Alleys

BY W. W. HORNER
Chief of Division of Sewers and Paving, St. Louis, Mo.

CONCRETE alleys are being constructed in St. Louis this season for the first time. The adoption of this type of pavement has been deferred for several years on account of the difficulty expected in handling and finishing the concrete in cramped locations, with fences, sheds and telephone poles on either side. It was also stated freely that it would be impossible to manipulate it in such close quarters, and that the inverted alley with the center 4 in. lower than the sides, as called for in the St. Louis design, could not be belt-finished. Engineers and contractors, however, have found little difficulty in overcoming these obstacles.

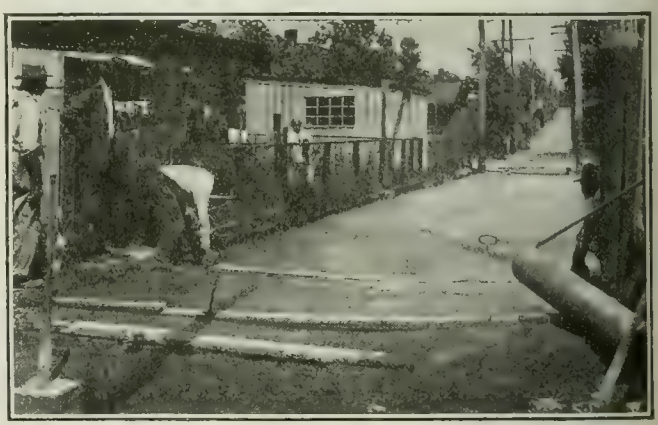
On account of certain soft ledges in St. Louis limestone, it was decided that it would be unsafe to use quarry-run stone in the wearing surface of the alleys.

There is much good stone for this purpose under St. Louis, practically all of the ledges for which the French coefficient of wear will run from 10 to 11. These ledges, however, will alternate with certain soft ledges giving a coefficient of from 4 to 6, and, as handled commercially, these grades are mixed in the crusher.

With the idea of using this local stone as far as possible, the specifications permit its use in a bottom course having a thickness of 4 in. and the use of gravel in the top course having a thickness of 2 in. The lower course is a 1:2¼:4 mix, and the upper course must be a 1:1½:3 mix. The option is given to the contractor of putting in all of the concrete in one course of the richer mix, but all have preferred to use the two-course work and consider the saving in cement as more than offsetting the additional cost of the two-course organization.

On account of the impossibility of turning the teams in a 15-ft. alley, all materials must be delivered and placed on the subgrade before concreting is started. It has been found rather difficult to distribute properly a limestone aggregate for one course and a gravel aggregate for the other with proportional amounts of sand, and, to the present time, only one contractor has used the limestone in the base.

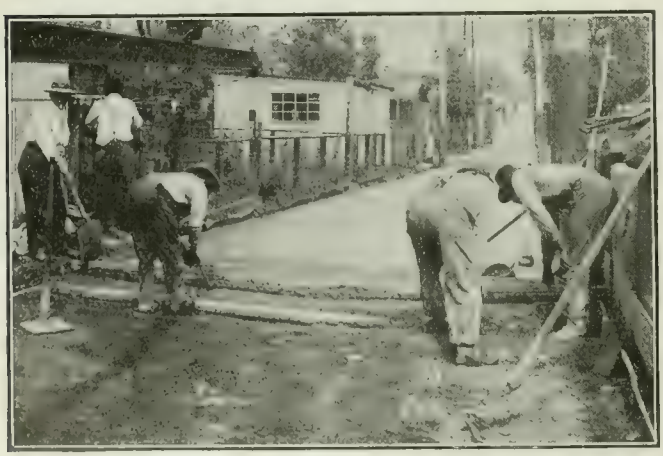
Considerable difficulty was anticipated in the placing of proper forms at the sides of the alleys, on account of the irregular line of fences and sheds, many of which will vary 6 in. on or off the alley; but this difficulty was overcome by the use of the bar-iron guides, shown in one of the views. These are made of ¾- x 1½-in. strap iron on edge, with the two ends turned over for about a foot and sharpened for driving.



FINISHING CONCRETE SURFACE OF ST. LOUIS ALLEY WITH BELT

The irons are 6 to 8 ft. long, and are set sufficiently in the alley to avoid interference with existing structures. They are driven to grade along a line stretched between grade stakes. By slight allowance for the slope of the alley, they may be set as much as 12 or 18 in. out in the pavement.

The concrete for the lower course is deposited for a distance of about 15 ft., or the reach of the ordinary boom-and-bucket mixer. It is brought to grade, tamped



STRIKING SURFACE (NOTE IRON GUIDES AT RIGHT)

Other Articles in This Issue of Interest to Contractors:

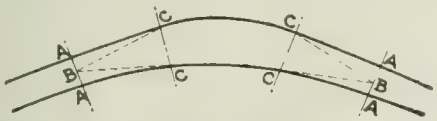
Keeping the Costs of Building the Government Houses — Page 252
Track Elevation on the Indianapolis Union Railroad — Page 265
Reconstruction of the Naches-Selah Irrigation Canal — Page 276
Large Construction Firms Shun Roadwork (Letter) — Page 284
Government Specifications Should Not Misplace Responsibility (Letter) — Page 285

lightly and covered with the top mixture, which is struck off with a templet sliding on the iron guides. The guides are set approximately ½ in. high to allow for compacting the concrete by rolling. As soon as the concrete has been struck off, the iron guides are pulled out and the space is filled with wet mortar. A piece of 1-in. plank is laid on top of the conrete on each side of the alley, as a working platform for the roller-man and the belt finishers.

It is found that after the belt becomes wet and the cement coated, it adheres closely to the concrete surface and can be pulled easily from side to side without lifting in the center. On completion of the belt finishing, the side planks are removed, and this strip is finished with a hand float. Nine of these alleys have been completed with very satisfactory results. The average cost of this pavement is about $2 per square yard.

Method of Striking Off Superelevated Highway Curves

WIDENED superelevated curves consist, as indicated by the diagram, of a plane surface CC and two warped surfaces, AC and CA, which connect the plane section with the normal surface of the road approaching the curve. At the two transition sections



METHOD OF STRIKING OFF CONCRETE ON SUPERELEVATED CURVES

the normal line of the crown of the road diverges into two lines, BC. This gives for each section three triangular parts, one, BCC, a plane surface and two others, ACB, which are curved similarly to the normal crown of the road.

To strike off the concrete, drive stakes along the lines BC and on them set to elevation 4-in. channels, flanges down. With these channels as guides, strike off the triangles BCC with a straight-edge. With one channel and the adjacent side form as guides, and using a templet curved to the normal road crown, strike off each of the triangles, ACB. The roller-and-belt finishing operation will round off the ridges along the lines BC and give a warped surface very close to the theoretical elevations.

This method of striking off highway curves is described by William F. Long in the *Concrete Highway Magazine*.

New Device Scoops Up and Loads Asphalt Pavement in One Operation

By Robert H. Moulton
Board of Trade, Chicago

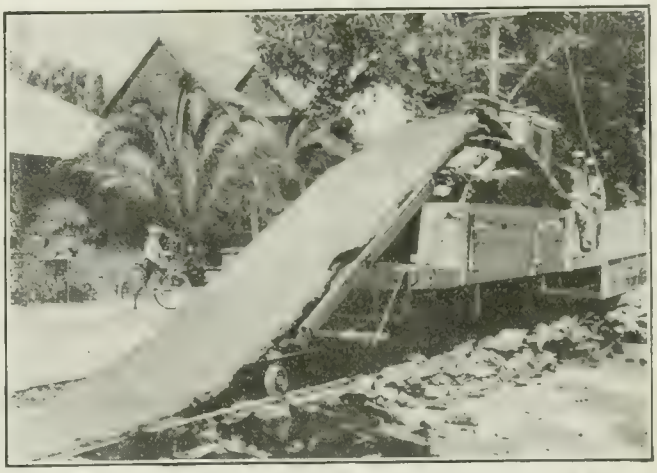
ONE of the most difficult and tedious jobs with which the engineers of street-railway companies have had to contend has been the tearing up and removal of asphalt pavements, especially the strips lying between the car tracks. There was nothing to do but attack the pavement with picks and axes, and then, when the asphalt had been broken up, load the pieces into wagons or cars with shovels. All of this meant much extra labor, delay and expense in doing the work.



SCOOP COUPLED UP WITH WORK CAR—NOTE DETAILS OF BLADE

Now, however, by means of an apparatus designed by the chief engineer of the United Railroads of San Francisco, the two operations of tearing up and loading the pavements have been combined into one, and the whole thing is accomplished almost with as much ease and speed as peeling a banana.

The new machine is very simple. First, there is a 75-lb. T-rail, which couples with an ordinary work-car. On the T-rail is mounted a scoop or shovel, 34



ASPHALT STRIP REMOVED FROM PAVEMENT SLIDES UP SCOOP IN CONTINUOUS RIBBON

in. wide and 63 in. long, having a sharp, turned-up edge, as shown in one of the views. From the shovel an inclined platform 4 ft. wide and 15 ft. long extends to the car on which the torn-up pavement is to be loaded.

When in operation, the point of the scoop is forced under the asphalt to start it. The car is then started ahead, moving under trolley power, and the strip of asphalt between the tracks is raised up the incline and over the edge of the platform into the body of the car, as seen in the second of the accompanying views. When the car is full it is uncoupled from the scoop and hauled away, another empty car comes up to take its place, and the operation is repeated. By this method great speed in removal of paving is attained.

NEWS OF THE WEEK

New York, August 7, 1919

Tomlin Returns to Editorial Duties

Robert K. Tomlin, Jr., who was captain of Engineers in charge of the Historical-Technical Section, Office of Chief Engineer, A. E. F., has been discharged from the Army and has resumed his duties as managing editor of *Engineering News-Record.*

Captain Tomlin was sent to France as war correspondent for *Engineering News-Record* in the autumn of 1917, his mission being to gather information first-hand of the engineering activities of the A. E. F. and to report them for the benefit of American engineers. He served in that capacity for nearly a year, during which time he covered all of the major engineering activities of our troops back of the front line, his articles, which appeared regularly in *Engineering News-Record,* carrying the only authoritative and complete information on these activities which had at that time come to this country. Just before the Germans started their spring drive of 1918 he covered part of the British front also, preparing as a result of his experience a most comprehensive article on the use of light railways at the front.

In September, 1 18, feeling that the need for officers was great, he asked for release from the staff of *Engineering News-Record* and applied for a commission. He was promptly made a captain and placed in charge of the writing of the history of the American engineering operations in France. That work being completed, he was ordered home in June, and after discharge and a rest of a month resumed his former editorial duties Aug. 1.

Road-Building Materials in Texas

The Texas Highway Department reports that there is a constant inquiry from practically every part of the United States concerning the opportunities for developing road-building materials in the state. These letters are being held until the department can arrange a bureau to oversee the development of road-building deposits in various portions of the state which, the commissioners say, local capital has overlooked.

The need for new sources of material is considered so urgent that the legislature which has just adjourned authorized the Prison Commission to install factories to manufacture road-building materials, with convict labor, if it becomes satisfied that the plan is feasible. Texas is plentifully supplied with raw material for this work, and the deposits are fairly well scattered over the state, it is asserted. In an effort to defeat the high price of cement several counties are contemplating attempts to manufacture this material for the roads they build. It is estimated that the Texas Highway Department will have supervison of approximately $75,000,000 worth of road construction during the next two years.

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago. Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 505 Pearl St.,

Wires Returned to Owners

On July 31, 1919, after just a year of Government operation, the telegraph and telephone systems of the United States were returned by Postmaster General Burleson to the companies owning them.

Daylight Saving Repeal Again Up

The Senate this week by a vote of 41 to 12 passed the bill (H.R. 3854) repealing the daylight saving law. The House passed the bill June 18, but action upon it in the Senate was suspended until this week. Meanwhile, the President vetoed the rider in the agricultural bill and the House was unable to enact it over the veto. The repeal bill differs from the rider in that it does not do away with the provisions regulating standard time. It is expected that the President will veto the bill now before him, as his former veto advanced his reasons for his failure to approve the measure.

Railway Brotherhoods' Plan for Railways

Government Ownership With Voice in Management and Profit Sharing for Employees and Officers

By the action of the railway labor organizations a new element has been injected into the current discussion of the railway problem now before Congress for solution. The heads of the organization have served notice on the Federal Railroad Administration that unless some measures are taken to reduce the cost of living, railway labor all along the line must have a further wage increase sufficient to raise the operating expenses of the railways some $800,000,000 a year. Railway repair-shop workmen have already begun strike for increased wages. The net income of the railways under Federal control during the first six months of 1919 was only $157,000,000. Hence, increased freight rates or huge appropriations from the Federal treasury are the only means by which such large increases of wages could be granted.

Oppose Return to Owners

At the same time, the railway labor leaders have announced their opposition to the return of the roads to the companies, and demand the adoption of the plan for reorganization of the railways prepared by Glenn E. Plumb, counsel to the railway brotherhoods. In a public statement issued Aug. 2 the heads of the brotherhoods say, "the railroad employees are in no mood to brook the return of the lines to their former owners, since all the plans suggested for this settlement of the problem leave labor essentially where it has stood and where it is determined not to stand."

The Plumb plan, which is now before Congress in a bill introduced by Congressman Sims, provides for the taking over by the Government of the entire railway system at a valuation to be fixed by the courts. The Government would lease the entire property for operation to a corporation with 15 directors, five to be appointed by the President, five elected by the railway officers and five by the railway employees. This corporation would have no capital and the directors would really be a board of trustees.

The corporation would pay from its earnings the operating expenses and the fixed charges on the purchase price paid by the Government. The balance remaining would be divided equally between the Government and the corporation, and the corporation would use it to pay a profit-sharing dividend to the officers and employees.

Rates would be fixed by the Interstate Commerce Commission and whenever the corporation's share of net earnings exceeded 5% of the gross operating revenue in any year the commission would reduce the rates. The cost of extensions would be met in whole or part by assessment on the property benefited.

In a published statement by Mr. Plumb he says that an essential feature in the success of this plan is the correct interpretation of valuation. He says: "It is the contention of the organized railway employees that the only basis for valuation is the amount of money the railways have actually invested in the public service. This principle eliminates fictitious securities and improvements paid for out of surplus. This would probably decrease the assumed valuation of the railroads from approximately $18,000,000,000 by at least one-third."

In order to force the Plumb bill through Congress, the railway brotherhoods have effected an organization of which Warren S. Stone, chief of the Brotherhood of Locomotive Engineers, is the head. It is declared that organizations representing over 6,000,000 voters, including the American Federation of Labor, have already indorsed the Plumb plan, and that branch organizations in every Congressional district will bring pressure to bear upon individual Congressmen to induce them to vote for its adoption.

Mondell Soldier Settlement Bill Reported in House

A National Soldier Settlement Fund of $500,000,000, "to provide employment and rural homes" for soldiers and sailors who served in the late war, will be created if the Mondell bill (H. R. 487), favorably reported to the House Aug. 2 passes Congress and is approved by the President. The bill embodies Secretary Lane's project for farms for soldiers and sailors, which has been before the country for months past. It authorizes the Secretary of the Interior to acquire and reclaim or develop land for the purpose indicated, going so far as to make the land ready for cultivation, "including the building of essential public roads." So far as possible, soldiers and sailors will be used for the necessary reclamation work. The farms will be sold to soldiers and sailors for 5% cash, the balance to be paid within 40 years, with interest at 4%. Loans up to $1,500 for farm improvements and $12,000 for livestock and equipment are authorized. Any state coöperating with the United States in providing these rural homes, and furnishing 25% of the necessary funds, will be permitted to carry out the improvements and aid, subject to the supervision of the Secretary of the Interior. The Mondell bill, as outlined above, is one of some twenty before Congress for the same general purpose, but interest has seemed to center in it.

First Government Designed 3500-Ton Concrete Ship Launched

On July 31, 1919, the first of the 3500-ton concrete ships designed by the concrete ship section of the Emergency Fleet Corporation was launched at the yard at Wilmington, N. C. As shown in the accompanying view of the boat on the ways, it was launched sideways and slipped into the water without difficulty. As described in *Engineering News-Record* of July 4, 1918, this ship, which was christened the "Cape Fear," is 282 ft. long, has 46 ft. beam and 28 ft. 3 in. molded depth, and has a dead-weight carrying capacity of 3500 long tons. The following data regarding the launching are reported by the shipbuilding company:

Average pressure on the grease immediately before the launching, approximately 5 long tons per square foot.

Maximum pressure during the launching, which occurs as the vessel pivots on the ways, about 13 tons per square foot.

Inclination of the ways, 1¼ in. per foot.

Distance from center line of ship to end of ways, 35 feet.

The ship was built by the Liberty Shipbuilding Co., Lewis R. Ferguson, general manager, as superintendent for the United States Shipping Board, Emergency Fleet Corporation.



3500-TON CONCRETE SHIP "CAPE FEAR" JUST BEFORE LAUNCHING

Five States Memorialize Congress For Greater Federal Aid

Governors of five states, Kansas, Texas, Oklahoma, Nebraska and Iowa, have memorialized Congress for increased Federal aid. The memorial was unanimously adopted at a meeting held in Kansas City July 31 by representatives of the highway departments of the states named.

The meeting was called at the suggestion of Gov. Henry J. Allen, of Kansas, who acted as chairman and stated the necessity for obtaining additional Federal aid. He supported his claim by the fact that Kansas counties now have appropriations for such aid amounting to $16,000,000, less than $8,000,000 of which is available, because it was appropriated with the stipulation that the Federal Government should supply one-half the amount used. It developed at the meeting that each of the other states represented was in a similar situation. Texas, in particular, has voted more than $60,000,000 in county road bonds with the understanding that an equal amount of Federal aid would be available, yet only $10,000,000 of this aid is now available. Arkansas and Missouri, while not represented at the meeting, sent telegrams, through their state highway departments, indorsing the action of the other states. The memorial requested that additional funds to the amount of $400,000,000 be available for hard roads in the next five years.

The representatives of the states at the meeting were as follows: Kansas, Gov. Henry J. Allen, chairman of the State Highway Commission; A. C. Blair, commissioner; W. C. Markham, secretary to the commission, and M. W. Watson, state highway engineer; Texas, C. S. Fowler and R. M. Hubbard, commissioners, and R. J. Windrow, highway engineer; Oklahoma, State Senator Colobie, representing the Governor; Henry Wood, commissioner, and E. W. Foster, representing the commission; Nebraska, George E. Johnson, highway engineer; Iowa, J. W. Holden and William Collinson, commissioners, and F. R. White, state highway engineer. The last-named acted as secretary.

Roads in the National Forests

Through provisions in the Federal-aid road act and the postoffice act, the forest service of the Department of Agriculture has at its disposal a sum of $13,500,000 which will be spent this year on survey, improvements and construction of 3368 miles of road in the national forests. About 270 projects in road maintenance and construction are now under way, approximately 75 of which are major projects in the Northwestern states. The building of new roads in the national forests will open up natural resources which have heretofore been inaccessible, it is stated In addition, some necessary links in transcontinental highways will be provided. It is estimated by experts of the forest service that $100,000,000 is needed to construct and maintain adequate roads in the 153 national forests.

Referendum Vote on Return of Railways to Owners

Nine of ten recommendations involving the return of the railroads to their owners by the Federal Government, and other questions of railway policy, submitted to a referendum vote by the Chamber of Commerce of the United States, were carried by the necessary two-thirds majority, according to an announcement made July 28. These recommendations were framed by a committee of the chamber's committee on railroads after a conference with more than twenty men chosen by the committee as representatives of various interests affected by railway transportation. Among the eleven committeemen who signed the report were Charles Lee, consulting engineer, New York City; Walter S. Dickey, manufacturer, St. Louis, Mo.; Emory R. Johnson, professor of transportation and commerce, University of Pennsylvania, and George A. Post, New York City, formerly president of the Railway Business Men's Association, who was chairman of the committee. Over 1100 commercial and industrial organizations, distributed through 48 states, took part in the vote. The 10 questions submitted, with the votes, follow:

1. Adherence to the policy of corporate ownership and operation, with comprehensive regulation, 1439 to 12.

2. Return of roads to corporate operation as soon as remedial legislation can be enacted, 1439 to 12.

3. Adherence to the period of Federal control as now fixed unless and until the impossibility of remedial legislation in this period clearly appears, 1329 to 109.

4. Permission for consolidation in the public interest, with prior approval by Government authority, in a limited number of strong competing systems, 1293½ to 123½.

5. Requirement that railroad companies engaging in interstate commerce become Federal corporations, with rights of taxation and police regulations reserved for states, 1215 to 184.

6. Exclusive Federal regulation of capital expenditures and security issues of railroads engaged in interstate commerce, with provision for notice and hearing by state authorities, 1321½ to 85½.

7. Federal regulation in intrastate rates affecting interstate commerce, 1314 to 114.

8. A statutory rule providing that rates in each traffic section shall yield an adequate return to a fair value of the property as determined by public authority, 1206½ to 208½.

9. [Not carried.] Payment into a fund of a share of the excess earned by any railroad system, under application of the above statutory rule, over an equitable minimum return upon the fair value of the property, this fund to be used as Congress directs for strengthening general railroad credit and increasing general railroad efficiency, 850 to 540.

10. A Federal transportation board to promote development of a national system of rail, water and highway transportation and articulation of all transportation facilities.

Pennsylvania Adopts a System of Rewards for Roadwork

A law instituting a system of rewards to townships for the construction and improvement of township roads and for the erection and construction of township bridges in townships of the second class has been signed by Governor W. C. Sproul of Pennsylvania. An appropriation of $1,000,000 has been made available for this purpose by the new law, which takes the place of that which provided for bonuses of 50% of the amount expended by townships on the work.

By the terms of the new law the State Highway Department will pay rewards when the work has been completed by the township. Rewards will be granted by the township for improvements of the following nature covering a distance of ½ mile of road: (1) Grading and draining; (2) graveling or cindering a graded and drained road; (3) macadamizing or constructing telford road; (4) constructing a concrete, brick or bituminous road surface; (5) erection and construction of bridges 3 ft. or more in span, of concrete or stone or combinations of concrete and stone; (6) constructing steel bridges with a floor approved by the State Highway Department; (7) purchase and installation of culvert and drain pipes.

The rewards are to equal 33⅓% of the cost of the proposed improvement, the basis of reward being roads 16 ft. in width.

Highway Bill Calls for Extension of Federal Aid

A bill introduced in Congress, H. R. 4377, calls for the continuation of Federal aid for roads, with amendments, and appropriates $100,000,000 to be available June 30, 1920, and $300,000,000 each for 1921, 1922 and 1923, making a total appropriation of $1,000,000,000. A Senate bill, S. 1037, provides for the granting to the State of Colorado of public lands to aid in the construction and maintenance of public roads and in the study of forestry. This bill grants to the state all unreserved nonmineral public lands within the state, the proceeds of sales to be used as follows:

One-fourth to go to the construction and maintenance of public wagon roads and bridges, one-fourth to the State University to encourage and promote the study and solution of the problems of forestry, one-fourth to the agricultural college to promote the study of horticulture, and one-fourth to be used by the State Normal School to promote vocational education, train teachers, etc. It is provided that none of the land shall be sold for less than $2.50 per acre.

Five-Million Dollar Contract for Hetch Hetchy Dam

Bids for the construction of the large Hetch Hetchy dam for the San Francisco water-supply, described in *Engineering News-Record* of July 31, 1919, p. 244, were opened on July 31, 1919. Only two bidders submitted figures. R. C. Storrie & Co. submitted a total bid of $5,431,010 for the overflow spillway type and $5,475,910 for the siphon spillway design, in both cases the contractor to furnish the cement. On these same propositions the Utah Construction Co. submitted bids of $5,370,808.50 for the overflow spillway and $5,447,792.50 for the siphon spillway. The latter company also made a bid without the cement.

The contract was awarded to the Utah Construction Co. for the siphon spillway design.

There was great interest manifested in the opening of the bids, over 100 contractors being present.

Concrete Barge Sinks at Dock

One of the Railroad Administration's concrete barges operating on the New York Barge Canal sank at the dock at Tonawanda July 29, carrying down 15,000 bushels of wheat. Reports of the occurrence are vague, but it appears that the barge came in contact with a bridge pier just before docking, which may have punched a hole in the shell. Investigations of the accident are under way.

Higher Pay for Chicago Engineers

In the large salary increase included in the new budget of the City of Chicago, the engineers appear to have received substantial recognition. Owing to the activities of the local branch of the engineers' union, all engineers up to Grade 3 (division engineer) were granted rates according to a schedule adopted by the union. This union has not yet included the higher grades, but the engineers in those grades have received an increase of approximately 10 per cent.

Motor Trucks Are Earning Large Wages in Texas Oil Fields

One hundred dollars for a haul of 42½ miles would be considered a large wage for motor-truck drivers in the north, but it is just an ordinary day's return in the newly opened oil field in northern Texas, according to reports.

However, the trucks have to operate over a very difficult territory, which is practically prairie, and it is doubtful whether the rates which are now in force will be lowered in the near future. For instance, the route lying between Moran, Tex., and Park Field is traversed by trucks carrying loads averaging 12,000 lb. each over trails and roads in what can be considered little less than unbroken country. In addition to the capacity load of the trucks themselves, practically all trucks take

trailers. With these trailers the trucks carry the long oil-well casings so necessary to the well drillers of the oil region. Many of these trucks and trailers are now being equipped with collapsible bodies which will be used to haul grain on the return trip, thus adding materially to the profits of the truck drivers, as well as moving part of the present crop of wheat.

Railway Engineers Get Higher Pay

Consideration of the request for higher pay for engineers in railway service was transferred some time ago by the United States Railroad Administration from the Wage Board to the regional directors, and R. H. Aishton, of the Northwestern region, has authorized the increase specified in the schedule submitted, for all grades below chief draftsman and assistant engineer. Other regional directors have the matter under consideration.

Licensing Engineers in Idaho

Enforcement of regulations governing the practice of surveying and civil engineering in Idaho now comes under the commissioner of law enforcement, R. O. Jones, Boise, under a state law regulating the practice of civil engineering, which appears to include all branches of engineering except mining and metallurgy. An examination for civil engineers will be held Sept. 9, and that for surveyors Sept. 2. Since June, 1903, no land survey or plan has been legal in Idaho unless made by a licensed surveyor.

More Water Filters for Cleveland

A start is being made on plans for the proposed new east side water-filtration plant for Cleveland. The plant will be of the mechanical filtration type and will be built adjoining the site of the Baldwin reservoir. Excavation for the latter will be completed this year, which will permit the starting of the filtration plant construction early next year, it is expected. J. T. Martin is water commissioner and A. V. Ruggles is engineer of construction and surveys, Division of Water.

Civil Service Examinations

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Master computer, $2400 to $1800 per year, computer (Grade I) $1800 to $1400 and computer (Grade II) $1400 to $900, Ordnance Department. Applications will be received until further notice.

Electrical assistant, signal service at large, War Department, for duty at Manila, Philippine Islands, $1500 to $2000 per year. File applications before the close of business on Aug. 19.

Technical assistant, field of civil engineering, $3200 per year, and technical assistant, torpedo design, $3000 per year. File applications by Aug. 19.

Supervising draftsman, bureau of steam engineering, Navy Department, $12.80 to $13.60 per diem. Applications must be filed before August 19.

Patent investigator, patents section, War Department, $1200 to $1800 per year. File applications before August 26.

Expert patent investigator, patents section, War Department, $1800 to $2400 per year. File applications before Aug. 26.

Chief metallurgist, $4,500 to $5,000 per year; assistant chief metallurgist, $3,600 to $4,500 per year, Ordnance Department. Applications must be filed before Sept. 16.

Electrical engineer, $2,400 to $3,600 per year; assistant electrical engineer, $1,800 to $2,400 per year, Signal Service. File application before Sept. 16.

Specification engineer, $2,400 per year; Chief Signal Officer's Office, War Department. File application before Sept. 9.

Research engineer, $2,800 to $3,200 per year, Ordnance Department. File application before Sept. 2.

Plant superintendent, $2,000 to $2,400 per year, Ordnance Department. File application before Sept. 2.

Electrical engineer, $2,800 to $3,300 per year, Bureau of Standards, Department of Commerce. File application before Sept. 2.

Research physicist, $2,700 to $3,200 per year, Ordnance Department. File application before Sept. 2.

Radio engineer, $3,000 to $4,800 per year; assistant radio engineer, $2,000 to $3,000 per year; radio laboratory assistant, $800 to $2,000 per year, Signal Service, War Department. File application before Sept. 2.

Mathematics and dynamics experts, Grade I, $2,500 to $4,000 per year; Grade II, $4,000 to $5,000 per year, Ordnance Department. File application before Sept. 2.

New York State

Inspector of engineering work, county service, $960 per year. File applications before Aug. 20; Sanitary engineering inspector, State Department of Health, $1,260 per year. Applications must be filed not later than Aug. 20. Statistician, Bureau of Statistics and Information, State Industrial Commission, $1,500 to $1,800 per year. Applications must be filed before Aug. 20; Albany, N. Y.

Engineering Societies

The Engineers' Club of Minneapolis was addressed July 26 by Theodore Wirth, superintendent of parks, Minneapolis, who spoke on the improvement of city parks. The club adopted a resolution to support the campaign to create a department of public works.

The Engineers' Society of St. Paul held a special meeting July 31, to discuss the bill now before Congress, creating a department of public works, and passed a resolution approving the bill.

The New York Chapter of the American Association of Engineers has established permanent headquarters in the St. James Bldg., 1133 Broadway, New York City.

The American Chemical Society will hold an autumn meeting Sept. 2-6, at the Bellevue-Stratford Hotel, Philadelphia, Penn.

The Utah Chapter of the American Association of Engineers is in process of organization, Prof. F. H. Newell, president of the association, having gone to Salt Lake City at the end of July to complete the organization.

The American Institute of Mining and Metallurgical Engineers will hold its annual meeting at Chicago, Sept. 22-26. The progress that has been recently made in technical lines will be fully discussed. Among the subjects that will receive particular attention will be the iron and steel industry, which has reached such importance in Chicago and its vicinity. It is planned that the institute will make an excursion to Gary, Ind., during the meeting. Arrangements are being made to charter a steamer which will convey the members and guests across the south end of Lake Michigan directly to the steel works. Technical discussions on metallurgy will be held on the boat. The banquet has been scheduled for the evening of Sept. 24, at the Congress Hotel.

Calendar

Annual Meeting

NEW ENGLAND WATER WORKS ASSOCIATION Tremont Temple, Boston, Sept. 30, Oct. 1-3, Albany, N. Y.

AMERICAN PUBLIC HEALTH ASSOCIATION; 169 Massachusetts Ave., Boston; Oct. 27-30, New Orleans.

Personal Notes

PREVOST HUBBARD has resigned as chief of the division of tests and research, United States Bureau of Public Roads, to become associated with the Asphalt Association, New York City, as chemical engineer, with headquarters at 15 Maiden Lane, New York City.

CHARLES B. SPENCER, who has just returned from France, where he served a year with the American Expeditionary Forces, has become a member of the new firm of SPENCER, WHITE & PRENTIS, INC., engineers and con-

tractors, of New York City. Mr. Spencer for eight years was in the employ of the Underpinning and Foundation Co., of New York City, in which capacity he had charge of many large construction operations.

LAZARUS WHITE, who was recently released from war work, mainly in the Construction Division of the Army, has become a member of the new firm of SPENCER, WHITE & PRENTIS, INC., engineers and contractors. Mr. White was engaged on the Catskill Aqueduct during the entire course of its construction, and since 1914 was connected with Smith, Hauser & MacIsaac, Inc. For them he carried to successful completion on William St. one of the most difficult of the New York subway sections.

EDMUND A. PRENTIS, JR., recently released from active duty in the Navy, has joined the new firm of SPENCER, WHITE & PRENTIS, INC., engineers and contractors, of New York City. Mr. Prentis was a mining engineer in South America and Mexico until 1912, when he entered contracting in New York. He was superintendent of the underpinning of buildings along two Broadway sections of the New York City subway for the Underpinning and Foundation Co., and later for Smith, Hauser & MacIsaac, Inc., he designed and installed difficult underpinning along the William St. section.

W. S. BURNETT, district engineer, Springfield, Ohio, has resumed his duties as engineer maintenance of way on the Cleveland-Sandusky division of the Cleveland, Cincinnati, Chicago & St. Louis Ry., with office in Springfield, Ohio.

CAPT. JOHN B. NORRIS, JR., 51st Engineers, U. S. A., has returned from France after 27 months' service, and has received his discharge. Captain Norris will become associated with the Ellicott Machine Corporation, builders of hydraulic presses, Baltimore, Md.

EDMUND MORTIMER BLAKE has been appointed production engineer, Charles R. McCormick & Co., Fife Bldg., San Francisco, Calif. Mr. Blake is a graduate of Amherst College and of Lawrence Scientific School of Harvard University; during the war he was engaged in shipyard construction as supervisor of subcontracts on the Victory destroyer plant at Squantum, Mass., and later as assistant manager of the Liberty shipyards, at Alameda, Calif.

MCLEAN & WHEATON, contractors, have enlarged the firm by admitting GEORGE DEEKS into partnership, the new firm being known as the DOMINION CONSTRUCTION CO. & WHEATON, with headquarters at Moncton, N. B. Mr. Deeks was previously connected with Deeks & Hinds, Toronto, and the Toronto Construction Company.

CAPT. R. FRASER ARMSTRONG, Canadian Expeditionary Forces, has been appointed town manager, Woodstock, N. B. Captain Armstrong is a graduate of the University of New Brunswick and a postgraduate of McGill University. He was awarded the M.C. during the allied drive of 1918.

J. E. KISSEL, acting engineer maintenance of way, Cleveland and Indianapolis division, has resumed his duties as engineer maintenance of way, Cairo division, Cleveland, Cincinnati, Chicago & St. Louis Ry., at Mount Carmel, Ill.

W. J. PARSONS has formed a new company, of which he is president, to be known as the W. J. Parsons Housing Co., specialists in housing problems, 1616 E. Monadnock Bldg., Chicago. Mr. Parsons has had long experience in housing problems for industrial companies, having built the houses for the American Bridge Co., Gary, Ind. He also had charge of some of the heaviest construction work on the Hell Gate bridge. Since then he has been associated with the Foundation Co., as assistant local manager, Pittsburgh; with the Koppers Co., Chicago, as resident engineer, and with the Southeastern Housing Corporation as chief engineer.

O. C. TENNYSEN, general foreman in charge of steel structure, Chester Shipyards, has formed a company under the firm name of the Tide Contracting Co., 2016 Lippincott St., Philadelphia, Penn.

C. F. HINCHMAN has received his discharge from the service and has resumed his work as engineer maintenance of way, Indianapolis Terminal division of the Cleveland, Cincinnati, Chicago & St. Louis Ry., with office in Indianapolis, Ind.

CAPT. CHARLES E. ELLICOTT, JR., 105th Engineers, U. S. A., has returned from France after two years' service. Captain Ellicott will become associated with the Ellicott Machine Corporation, builders of hydraulic dredges, Baltimore, Md.

L. B. ELLIOTT, formerly engineer maintenance of way, has been appointed acting engineer maintenance of way, Peoria & Eastern division of the Cleveland, Cincinnati, Chicago & St. Louis Ry., with office in Indianapolis.

FRANCIS L. BENNETT has become associated with the Boldt Construction Co., general building contractors, Cleveland, Ohio, as estimator.

FRED W. FISCH has been appointed assistant sanitary engineer, Flint, Mich.

ARTHUR G. GEHRIG, structural engineer, Western Electric Co., Chicago, has been appointed associate professor of civil engineering, in charge of structural engineering, at the University of Nebraska. Professor Gehrig was formerly connected with the American Bridge Co. at the Panama Canal on the construction of the Balboa shops, emergency dams, and the Navy coaling station.

W. C. KEGLER, previously district engineer, Cleveland, Cincinnati, Chicago & St. Louis Ry., has been appointed engineer maintenance of way, Cleveland and Indianapolis division, with office in Galion, Ohio.

HARVEY SNOOK, recently returned from France, has been reappointed county engineer of Sussex County, New Jersey.

F. E. POWERS, J. E. SCHLOTTMAN, and W. B. MCCOOL, having returned from France and received their discharge from the Engineers, United States Army, with rank of captain, have become associated under the firm name Ajax Contracting Co., Pottsville, Penn., and will engage in general contracting work.

H. W. HOUGHTON has resigned from the engineering department of the Kansas City Ry., at Pittsburg, Kan., to become associated with the Nebraska state highway engineering Department, as designer, at Lincoln.

GEORGE S. HUBBEL, chief engineer, PRUDENTIAL ENGINEERING CORPORATION, will take charge of the New York office of this company, which will be located at 131 W. 39th Street.

HERBERT M. HALE, consulting engineer, has opened an office at 7 E. 42nd St., New York City. Mr. Hale will engage in general engineering, examination and reports, and general contract work.

MAJ. H. A. MCPHERSON, of the 11th Battalion Canadian Engineers, has been appointed advisory engineer to the Canadian Government. Major McPherson, besides being advisory engineer to the Bureau of Public Health, will also act as advisory engineer to the Local Government Board. He served for three years at the front with the Canadian Engineers.

OBITUARY

ALFRED FARRAND, city engineer of Ventnor City, N. J., died Aug. 4. Mr. Farrand had been city engineer of Ventnor City for five years, and prior to that he was city engineer of Atlantic City for 15 years.

LA VERNE W. NOYES died in Chicago, July 24, at the age of 70. He was graduated from Iowa State College in 1872, and later received the honorary degree of doctor of engineering from that institution. Mr. Noyes had been president of the Aërmotor Co., and the Illinois Manufacturers' Association. He was interested in farm machinery, and perfected and patented the tilting towers for windmills. Later he formed the Aërmotor Co. Mr. Noyes made an endowment to the University of Chicago of over $2,000,000 to be devoted to the education of soldiers, sailors and their families.

Motor Truck Wrecker Has Wide Range of Utility

A large motor truck wrecker used by the Boston Fire Department has a wide range of usefulness aside from its business of picking up wrecked fire apparatus. In fact, the big machine, which weighs approximately seven tons, is equipped with all kinds of jacks, bars, shovels, chains, ropes and repair tools, making it in reality a traveling machine and repair shop. It has a power winch and derrick that lifts 10 tons.

Among the services which it has performed, as enumerated in the records of the Fire Department, are: lifting out horses which have fallen through floors, into trenches or manholes, etc., and moving of large steel columns, as shown in the accompanying illustration, besides taking care of the usual fire apparatus wrecking about the city. As constructed by the International Motor Co. of New York, it can travel at 40 to 45 miles per hour. It requires a squad of six men, three of whom are kept busy both night and day.



BOSTON FIRE DEPARTMENT'S MOTOR TRUCK WRECKER

Its ordinary duties, besides towing wrecked apparatus, include delivering tools and pulling down walls at fire ruins. During the past three years it has been called upon in several hundred accidents, and it averages a dozen calls per week.

Business Notes

THE W. S. BARSTOW MANUFACTURING ASSOCIATION has appointed Robert N. Hodgson sales manager. Mr. Hodgson has resigned as general manager of the Binghamton Light, Heat & Power Co., which, with 22 similar companies, is owned by the Barstow Manufacturing Association. Mr. Hodgson's headquarters will be in New York City.

A new firm of engineers and contractors, to be known as SPENCER, WHITE & PRENTIS, INC., has just been organized with offices at 47 W. 42d St., New York City. The firm is equipped to do construction work of all kinds, specializing in difficult foundation work, underpinning, piledriving of all types, shafts, tunnels, bridges, piers, etc. It is made up of Lazarus White, president, Charles B. Spencer, vice-president, and Edmund A. Prentis, Jr., secretary and chief engineer. All three members of the firm were released recently from war work. Before that, Mr. Spencer was connected with the Underpinning and Foundation Co. and Messrs. White and Prentis with Smith, Hauser & MacIsaac, Incorporated.

THE SMITH-BOOTH-USHER CO., which represents the Lakewood Engineering Co. in Los Angeles and San Francisco, announces that J. A. Kinkead, formerly New York representative of the Parkersburg Iron & Steel Co., has joined its staff. His office will be in the Rialto Bldg., in San Francisco.

THE TRAYLOR ENGINEERING & MANUFACTURING CO., maker of mining, milling, crushing and smelting equipment, Allentown, Penn., announces the return of R. R. Shafter to its sales organization after an absence of two years as general superintendent of the shipyard of the Traylor Shipbuilding Corporation.

THE OSHKOSH MANUFACTURING CO., Oshkosh, Wis., has completed the organization of its new service plan, consisting of a chain of service stations throughout the United States. J. W. Wooley, general sales manager, announces that these stations will carry a complete line of repair parts for all Oshkosh machines and maintain fully equipped shops for the repairing or complete rebuilding of the machinery. An engine and machinery expert is to be in attendance at each repair shop. Besides the equipped service stations a number of substations will be established. This service is thought to be rather an innovation in the contracting field, and complete information regarding it can be obtained by addressing the firm.

THE BLAW-KNOX CO., Pittsburgh, Penn., has appointed Frank O. Leitzell engineer-salesman in the sheet and tin mill specialties department. Mr. Leitzell was formerly with the H. K. Porter Co., of Pittsburgh, as assistant to the general manager.

THE CHAIN BELT CO., Milwaukee, Wis., has appointed Clifford F. Messinger, formerly manager of the mixer sales, as assistant to the vice-president, and Barney F. Devine, formerly assistant manager of mixer sales, to become manager. Russell E. Dean, formerly of the mixer sales department, becomes Eastern manager of mixer sales, and will have offices in New York City.

THE OHIO LOCOMOTIVE CRANE CO., Bucyrus, Ohio, has appointed H. A. Wolcott district manager for its Chicago territory, with offices at Suite 1417 to 1419, in the Lytton Building.

Trade Publications

The following companies have issued trade publications:

THE BLAW-KNOX CO., Pittsburgh, Penn.; catalog, 6 x 9 in., 24 pages, illustrated; explains the construction and use of the various types of Blaw forms.

THE THEW AUTOMATIC SHOVEL CO., Lorain, Ohio; bulletin No. 30, 8½ x 11 in., 20 pages, illustrated; the subject is highway construction, with text and illustrations of steam shovels on highway work; also catalog No. 11, 8½ x 11 in., 12 pages, illustrated, describing products of the company and full-circle swing shovels and cranes, operated by steam, gasoline or electricity.

THE AUSTIN MANUFACTURING CO., Chicago, Ill.; catalog, 9 x 12 in., 12 pages, illustrated; describes the Austin motor sweeper.

THE UNITED STATES CRANE CO., Chicago; catalog No. 190, 6 x 9 in., six pages; covers the installation and operation of 20- and 30-ton locomotive cranes.

THE LEHIGH PORTLAND CEMENT CO., Allentown, Penn., Chicago and Spokane, Wash.; folder, 7¼ x 10¼ in., six pages; subject, "History Repeats."

THE HASTINGS PAVEMENT CO., 25 Broad St., New York City; folder, 6¼ x 6¾ in., four pages, illustrated; describes the use of asphalt blocks for shop floors and the methods of attaching light and heavy machinery to the floors.

THE SMITH ENGINEERING WORKS, manufacturers of rock, ore and gravel handling machinery, 32nd and Locust Sts., Milwaukee, Wis.; catalog, 7½ x 10¾ in., 15 pages, illustrated; subject, jaw crushers.

THE WEBBER CHIMNEY CO., designers and builders of reinforced-concrete chimneys, 1452 McCormick

Bldg., Chicago, Ill.; catalog No. 19, 5 x 8 in., 56 pages, illustrated; describes the design, construction and proportioning of reinforced-concrete steel chimneys for steam boilers.

THE PELTON WATER WHEEL CO., San Francisco and New York; bulletin No. 11, 8 x 10½ in., 12 pages, illustrated, catalogues centrifugal pumps for irrigation and general use.

THE FEDERAL CEMENT TILE CO., 110 S. Dearborn St., Chicago; folder, 9 x 12 in., four pages; describes cement tiling for roofs.

Lumber Prices High and Advancing

Market Is Uncertain and Highly Speculative, Due to Extraordinary Demand and Subnormal Supply

BY ALDEN W. WELCH

It is beginning to look as if there need be no limit to the price of lumber, that buyers will gratefully accept any price, begging only that their orders be accepted. The natural result is that the lumber market has become extremely uncertain; that is, while everybody knows that prices will not fall, nobody is able to predict how much higher per month they will go. Hence, contractors are chary about estimating on work more than a month ahead, and when they can be induced to *guess*, rather than estimate, a future price, it is natural to suppose that the figure will be generous. This is a most unhealthy condition, the uncertainty of which even the lumbermen deplore. It is a condition that eventually will have the effect of slowing up construction, which is now moving forward so satisfactorily.

The immediate reason for this chaos in the lumber market is the unprecedented demand and the wholly inadequate supply. The most conservative estimate is that production is 19% below normal, with the volume of orders 15% above present production. In certain parts of the country production is 50% of capacity—this in spite of the huge and rapidly growing demand both at home and abroad.

REASONS FOR HIGH PRICES

Labor is scarce, expensive and inefficient, freights are high, buyers are insistent and are bidding against one another; these are some of the obvious reasons why prices are high. However, we are less concerned with merely high prices than with the exorbitant prices which a continuation of the present shortage promises. That word "shortage" explains the whole situation, for it is clear that if prices were based upon cost of production instead of upon insufficient supply they would not be exorbitant, however high they might be.

The scarcity is not confined to one or two localities, but may be said to be general. A large dealer in Baltimore asserts that "supplies of lumber in the United States are only 50% of normal," stating furthermore that there is a present shortage of 250,000,000 ft. in world production.

The labor shortage is attributed partly to the fact that this is the farming season, and that many mills depend upon farming labor exclusively. It is doubtful, however, whether labor shortage can be considered as seriously affecting total production. On the other hand, labor certainly does its bit toward boosting the price, inasmuch as wages at the mill are three times the pre-war rate.

During the war, numerous mills which formerly catered only to the export trade were forced by shipping conditions to enter the domestic market. With the return of export facilities—and the high export-price incentive—these mills have resumed exporting, thereby causing an important change in the stock offered on the home market.

ON THE PACIFIC COAST

Although the price of lumber at Los Angeles is nearly double pre-war prices, indications point toward a further advance. Mills in the Northwest are 250,000,000 ft. behind in filling orders, the extraordinary foreign demand being assigned as the principal reason. Shipments from the mills have exceeded production for some time. So many unfilled orders have accumulated at the mills that producers are refusing further requests. The inadequate supply is explained by the eight-hour day now in effect (10 hours during the war), an insufficiency of efficient labor, and wet weather.

The situation on the Pacific coast is further elaborated upon in a report from San Francisco. At the time when it was made known that the Government would order no more wooden vessels (some existing contracts were canceled), the mills tried to induce trade by putting a price on lumber which netted them about $22 per thousand base. At present writing the base is $31.50 for cargo lots (50,000 ft. or over). The rise was occasioned by orders for Eastern export and the home trade.

The mill owner's claim that prices are high all along the line will be readily admitted. For instance, No. 2 fir logs are selling for $17 to $18, delivered at the mill. To this must be added the manufacturing cost, the high ocean freight and the profit.

Again, during the war the Government, through the air service, cut a great many cedar logs out of which a very small percentage of timber was satisfactory for use in Army airplanes. As a result, when production was discontinued, there was stacked up some 30,000,000 ft. of lumber. This stock has at last been disposed of, mostly for foreign account and ship construction. A stiffening of prices has, naturally, resulted.

TAXES LARGELY TO BLAME FOR SHORTAGE

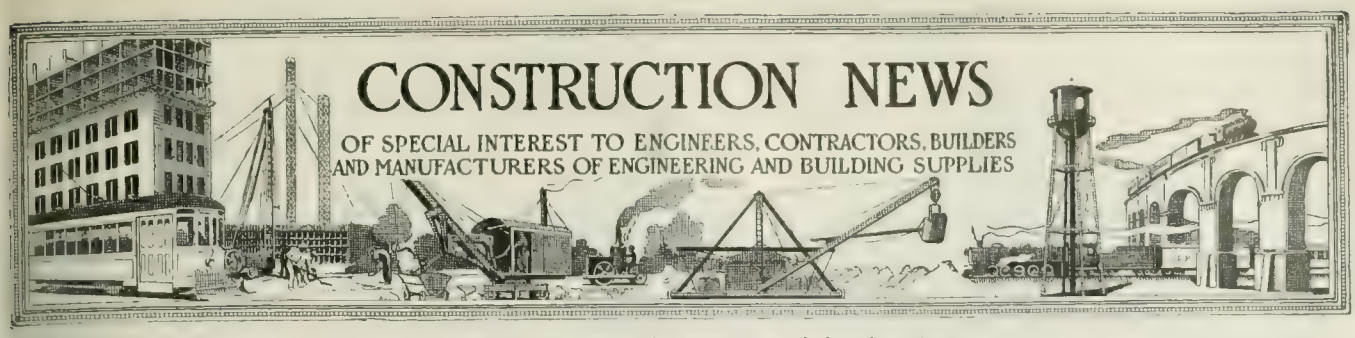
In the foregoing the reasons why lumber is expensive are clear and sufficient, but the serious shortage of supply was not adequately explained. Indications point toward a voluntary curtailment of production on the part of the manufacturers. The reason—the stumpage basis tax and the excess profits tax. It is asserted that a plant having capacity to cut 50,000,000 ft. a year can cut 25,000,000 ft. and make a fair profit, whereas if this amount were exceeded the big end of the profit would go to the Government. The larger operators estimate that their share is $16,000 out of net profits of $100,000. Rather than face these taxes they prefer to conserve their timber. An instance is cited of a lumberman who normally cut 300,000,000 ft. annually, whereas this year he will cut only 100,000,000 ft. Another company, which under normal conditions has a 10-year cut ahead of it, will curtail production rather than pay 80% to the Government, for the ensuing three or four years.

STABILIZE THE MARKET BY ANNOUNCING MONTHLY PRICE SCHEDULES

It must not be overlooked that the extraordinary domestic demand indicates that the country as a whole is prosperous and able to pay high prices for its needs. In the seven days prior to July 24 contracts were let on 50 non-industrial building projects valued at $10,442,000, in addition to the vast amount of residence construction. Nevertheless, there is a limit to the patience and the pocket of the public. Unless a concerted effort is made to stabilize the lumber market, building operations in which lumber is an important factor will be curtailed. It is quite likely that such an undesired condition would be prevented if the large lumber companies would announce monthly schedules of prices which they guaranteed to maintain unchanged throughout the month. Contractors complain less of high prices than of unstable prices. Under the present intolerable conditions they are unable to estimate ahead on work involving large amounts of lumber.

That only the speculators should object to stabilizing the market by announcing monthly price schedules is fairly established by the fact that the Long-Bell Lumber Co., of Kansas City, Mo., has embraced this policy. Its president says, in a bulletin to the trade: "This is to announce that our prices on our yellow-pine lumber, until Aug. 15, will be no higher than now. It shall be our policy to endeavor to protect our trade by stable prices on yellow-pine lumber, if humanly possible."

And this should be the endeavor of all lumber manufacturers and dealers.



Price advances are indicated by heavy type; declines by *italics*

PIG IRON—

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$30.35	$30.35
Northern Basic	27.55	27.55
Southern Ohio No. 2	28.55	28.25
NEW YORK, tidewater delivery		
2X Virginia (silicon 2.25 to 2.75)	32.40	31.90
Southern No. 2 (silicon 2.25 to 2.75)	35.20	33.95
BIRMINGHAM		
No. 2 Foundry	28.00	26.25
PHILADELPHIA		
Eastern Pa.	30.65*	30.65
Virginia No. 2	32.10–34.10†	30.85
Basic	30.90*	30.90
Grey Forge	29.90*	30.90
CHICAGO		
No. 2 Foundry Local	26.75	26.75
No. 2 Foundry Southern	*28.00*	31.75
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	28.15	28.15
Basic	27.15	27.15
Bessemer	29.35	29.35

* F. o. b. furnace. † Delivered.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	$45.00	$55.00	$45.00	$65.00
Standard openhearth rails	47.00	57.00	47.00	67.00
Light rails, 8 to 10 lb.	2.58½*	3.13*	2.83½*	3.13½*
Light rails, 12 to 14 lb.	2.54*	3.09*	2.79*	3.09*
Light rails, 25 to 45 lb.	2.45*	3.00	2.70*	3.00*

*Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				San
	Current	One Year Ago	Chicago	St. Louis	Francisco
Standard spikes, ⅝-in. and larger	$3.35	$3.90	$4.27	$4.44	$5.65
Track bolts	4.35	4.90	5.17	Premium	6.65
Standard section angle bars	3.00	3.25	4.22	Premium	4.60

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

		7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In by 8 Ft.
Chicago	Plain	$1.48	$1.33
San Francisco	Douglas Fir—Green	1.42	1.00
San Francisco	Douglas Fir—Creosoted	*2.12*	*2.00*

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak (No. 4)	$0.80	No. 5	.87

Note.—Add 36c. each for treatment.

PIPE

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
¼ to 3 in. butt welded	47%	57.5%	45%
2½ to 6 in. lap welded	42%	53.5%	41½%

	Galvanized		
	New York	Chicago	St. Louis
¼ to 3 in. butt welded	31%	44%	30½%
2½ to 6 in. lap welded	27%	41%	27½%

Malleable fittings, Class B and C, from New York stock sell at +12½% list prices. Cast iron, standard sizes, 10% off.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York						
	Current	One Month Ago	One Year Ago	Chicago	St Louis	San Francisco	Dallas
4 in.	$55.30	$53.00	$64.75	$56.80	$50.00	$77.55	$65.00
6 in. and over	52.30	50.00	61.75	53.80	47.00	74.55	62.00

Gas pipe and 16-ft. lengths are $1 per ton extra.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh: basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	50½%	24%	½ to 1¼	39½%	23½%
½	54½%	40%			
¾ to 3	57½%	44%			

LAP WELD

2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 6	34½%	21½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	46½%	29%	½ to 1¼	39½%	24½%
½	51½%	39%			
¾ to 1¼	55½%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2½ to 4	35½%	23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Malleable fittings. Class B and C, banded from New York stock sell at list 2% off. Cast iron, standard sizes, 20% off.

CLAY DRAIN TILE—The following prices are per 1000 lin.ft..

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35.00	$35.00	$22.50	$30.00	..	$33.44
4	51.00	51.00	27.00	40.00	$45.00	50.16
5	65.00	65.00	45.00	50.00	65.00	62.70
6	90.00	90.00	55.00	60.00	90.00	83.60
8	130.00	130.00	100.00	80.80	150.00	133.76

SEWER PIPE—The following prices are in cents per foot for carload lots

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$0.081	$0.126	.....	$0.09	$0.09	$0.132
4	.081	.126	.....	.09	.15	.132
5	.1215	.189	.....	.135	.1875	.207
6	.1215	.189	$0.16	.135	.225	.207
8	.189	.294	.21	.21	.3475	.2875
10	.283	.441	.29	.315	.45	.4025
12	.365	.567	.37	.405	.60	.5175
15	.480	.766	.56	.54	.9375	.7475
18	.675	1.05	.91	.875	1.275	.9775
20	.81	1.26	1.14	1.05	1.71	1.15
22	1.08	1.68	1.46	1.40	.....	1.495
24	1.215	1.935	1.56	1.80	2.125	1.725
27	2.015	2.795	1.90	2.75	.....	2.5875
30	2.232	3.096	2.57	3.45	.....	3.1625
33	2.79	4.05	3.09	4.00	.....	4.025
36	3.18	4.6125	3.37	4.35	.....	4.60

	3	5	8	12	24	36
Boston	*$0.078*	*$0.117*	*$0.182*	*$0.351*	*$1.17*	*$3.28*
St. Paul	.12	.18	.28	.45	2.00	4.75
Denver	.105	.16	.25	.425	1.575	.....
Seattle	.15	.....	.3375	.64	2.00	.....
Kansas City	.12	.18	.25	.50	1.80	4.60
Los Angeles	.0825†	.1375†	.2475	.44	1.50†	.....
New Orleans			50 per cent. off			
Cincinnati	.08	.12	.19	.36½	1.21½	2.76½
Atlanta	....	....	.34	.55	2.00	....
Montreal			40 per cent. off			
Winnipeg	.09	.16	.30	.50	2.00	.....
Detroit	.081	.1215	.189	.3645	1.215	2.7675
Baltimore	.114	.171	.266	.513	1.71	.....

†4-in., 6-in., 30-in. respectively.

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices per gallon in tank cars 8000 gal minimum f.o.b. place named:

	Current	One Month Ago
New York, 45-65% asphalt	*$0.04¼*	$0.04¾
New York, liquid asphalt	.06	.06
New York, binder	.06¼	.06½
New York, flux	.04¼	.04¾
St. Louis, 40% asphalt	.06	.06
Chicago, 15-20% asphalt	10	.10
Chicago, 100% dust layer	11	.11
Dallas, 40-50% asphalt	.07	.07
Dallas, 60-70% asphalt	.08	.08
Dallas, 75-90% asphalt	.10	.10
San Francisco, 75-95% asphalt, per bbl.	2.10	2.10

ASPHALTUM—Price per ton in packages and bulk in carload lots:

	Brand	Package	Bulk
New York	Texaco	*$18.00*	*$14 00*
Chicago	Mexican	33.00	31 00
San Francisco	California	17.00	13.75
Dallas	Texaco and Mexican	32.00	30.00
Seattle	D grade	23 50	.....
Denver	Trinidad	45 00	.....
Denver	California	38.00	.....
St. Paul	Mexican	21.00	.....
Kansas City	Mexican	28.00	26.00
Atlanta	Standard	24.00	19.80
New Orleans	.....	16.50	.....
St. Louis	Stanolind	24.90	18.40
Detroit	.....	48.00	.....
Baltimore		23.50	.....

PAVING STONE—

Chicago	About 4x8x4 dressed	$2.45	sq.yd.
	About 4x8x4 common	2.20	sq.yd.
San Francisco	Basalt block 4x7x8	57.75	per M
Kansas City	Granite	2.75	sq.yd.
Boston	5-in. granite	110.00	per M
St. Paul	Sandstone	1.75	sq.yd.
Atlanta	Granite	1.85	sq.yd.
Detroit	Granite, small	2.75	sq.yd.
Baltimore	Common	2 52	sq.yd.

FLAGGING—

New York	Bronx	$0.21	sq.ft.
	Manhattan	.22	sq.ft.
	Queens, 5 ft. square	.21	sq.ft.
	5x20-in. cross-walk	.75	lin.ft.
Chicago	18 in. wide	.70	lin.ft.

WOOD BLOCK PAVING—

	Size of Block	Treatment	Per Sq.Yd.
New York	3½	16	$3.25
New York	4	16	3 50
Chicago	4	16	3.10
Chicago	3½	16	2 95
Chicago	City specifications		3.10
St. Louis	3½	16	2.45
St. Louis	4	16	2.70
Seattle	4	16	2.55
Kansas City	4	16	3.00
St. Paul	3½	..	3.13
Atlanta	3½	16	2.25
Dallas	3½	18	3.17
Dallas	4	18	3.56
Baltimore	4 in.		3.60

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd.:

	Gravel 1½ In. Current	Gravel 1½ In. One Yr. Ago	Gravel ¾ In. Current	Gravel ¾ In. One Yr. Ago	Sand Current	Sand One Yr. Ago
New York	$2 00	$2.00	$2.00	$2.00	$1.25	$1.25
Denver	1.60	1.55	1.60	1.55	1.25	1.10
Chicago	1.35	1.45	1.35	1.45	1.35	1.00
Kansas City	2.50	2.15	3.00	2.25	1.00†	.80
St. Louis*	1.78	1.35	1.82	1.08	1.68	1.45
Seattle	1.25	1.00	1.25	.75	1.25	1.00
Dallas	2.50	2.00	2 50	1.50	2.25	1.40
St. Paul	1.25	1.25	1.35	1.40	.60	.60
San Francisco	1.15	1.00	1.00	1.00	1.15	1.00
Boston	1.60	2.00	1.60	1.60	1.00	1.50
New Orleans	2.50	.....	....	.....	1.20	.....
Cincinnati	.....	1.35	....	.....	.....	1.35
Atlanta	2.00‡	....	....	....	1.10‡	....
Detroit	2.00	....	2.00	....	2.00	....
Baltimore	1.10	....	1.30	.....	.50	.....

*Fine white sand, Pacific and Ottawa per ton, $6. †Kaw River sand is $1.50 per yd. ‡ per ton

CRUSHED STONE—Price for cago or carload lots is as follows, per cu.yd.:

	1½ In. Current	1½ In. One Year Ago	¾ In. Current	¾ In. One Year Ago
New York	$1.65-1.75	$1.60	$1.75-1.85	$1.85
Chicago	1.30	1.20	1.30	1.20
St. Louis	1.40	1.08	1.40	1.08
Dallas	2.70	1.51	2.70	1.55
San Francisco	1.15	1.00	1.15	1.00
Boston	3.00*(del)	1.50	3.00*(del)	1.75
St. Paul (lime)	1.15†	1.15	1.25	1.40
Denver	....	1.55	1.60	1.55
Kansas City	1.90	1.70	2.00	1.80
Seattle	1.50	1.10	1.50	1.10
Atlanta	2.15*	....	*2.25**	....
Cincinnati	.....	1.50	.....	1.50
Los Angeles	1.20	1.05	1.20	1.05
Detroit	2.00	....	2.00	....
Baltimore	1.25	....	1.50	....

*Per ton. †Limestone; traprock, $1.60 and $1.80 per ton for 1½ and ¾-in., respectfvely.

LIME—Warehouse prices:

	Hydrated per Ton Finished	Hydrated per Ton Common	Lump per 200-Lb. Barrel Finished	Lump per 200-Lb. Barrel Common
New York	$17.50	$14.50	$2.90*	$2.65*
Kansas City	22.00	21.00	2.30	2.20
Chicago	18.00	17.50	1.80	1.10
St. Louis	18.00	.....	.....	.....
Boston	22.75	18.25	3.75*	3.40*
Dallas	30.00	.....	2.75	.....
San Francisco	19.00	.....	.....	2.00
St Paul	23.00	20.00	1.60	1.50
New Orleans	.....	10.00	.....	11.00‡
Atlanta	.....	1.90	1.75	1.90
Detroit	20.00	20.00	3.00*	2.85*
Seattle	30.00	.....	.....	2.75†
Los Angeles	.....	.....	3.05†	2.80†
Baltimore	19.00	14.00	.....	.....

* 300-lb. barrels. † Per 180-lb. barrel. ‡ Per ton.
NOTE—Refund of 10c. per barrel.

NATURAL CEMENT—Price to dealers for 500 bbl. or over, f.o.b., exclusive of bags:

St. Paul (Austin)	$1.45
Kansas City (Ft. Scott)	1.40
New Orleans	2.52

PORTLAND CEMENT—Current prices are for barrels in carload lots, without bags, to contractors.

	Current	One Month Ago Without Bags	One Year Ago With Bags
New York	$2 30	$2.30	$2.59
Jersey City	2 27	2.27	2.50
Boston	2 42	2.42	2.81
Chicago	2.00	2.00	2.90
Pittsburgh	2.05	2.05	2.45
Cleveland	2.32	2.32	2.15
Detroit	2.08	2.08	2.32
Indianapolis	2 27	2.27	2.62
Toledo	2 12	2.12	2.62
Milwaukee	2 11	2.11	2.56
Duluth	2 10	2.10	2.60
Peoria	2 12	2.12	2.56
Cedar Rapids	2.18	2.18	2.68
Davenport	2.14	2.14	2.64
St. Louis	2.20	2.20	2.70
San Francisco	2 43	2.40	2.88
New Orleans	2.36	2.36	....
St. Paul	2.20	2.20	2.78
Denver	2.67	2.67	3.07
Kansas City	2.26	2.26	2.67
Seattle	2.53	2.53	3.33
Dallas	2 03	2.03	2 60
Atlanta	2.50	2 60	.....
Cincinnati	2.90	....	2.80

NOTE—Bag charge is generally 15c. each.

TRIANGLE MESH—Price per 100 sq.ft. in carload lots:

Style Number	Sectional Area Square Inches per Ft.	Width	Pitts-burgh	New York	Chicago	St. Louis	Dallas	San Fran-cisco
PLAIN 4-INCH x 4-INCH MESH								
032	0.032		$0.92	$1.16	$0.98	$0.99	$1.13	$1 32
049	0.049		1.18	1.48	1.26	1.26	1.43	1 67
068	0 068		1.44	1.86	1.53	1.56	1.79	2.06
093	0.093		1.85	2.39	1.97	2.00	2.41	2.65
126	0.126		2.28	3.02	2.43	2.47	2.92	3.28
153	0.153		2.72	3.59	2.90	2.95	3.48	3.93
180	0.180		3.12	4.13	3.33	3.39	3.99	....
245	0.245		4.12	5.44	4.40	4.47	5.27	....
287	0.287		4.76	6.29	5.08	5.16	6.10	6.86
336	0.336		5.52	7.30	5.89	5.99	7.06	.....
395	0.395		6.40	8.45	6.83	6.94	8.19	.....
PAVING								
036P	0 036		$0.71	$0.92	$0.76	$1.77	$0.80	.....
053P	0 053		1.00	1.28	1.06	1.08	1.12	.....
072P	0 072		1.26	1.66	1.34	1.37	1.46	.....
097P	0.097		1.62	2.12	1.73	1.76	1.88	.....
049R	0.049		1.00	1.28	1.06	1.08	1.12	.....
067R	0.067		1.26	1.65	1.34	1.37	*1.46*	.....
089R	0.089		1.62	3.11	1.73	1.76	1.88	.....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths. Galvanized is about 10% higher.

EXPANDED METAL LATH—Prices in carload lots per 100 yd. for painted are as follows:

Gage	Weight	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
27	233	$29.10	$34.07	$29.00	$29.00	*$34.00*	*$32.75*
26	250	30.45	35.23	30.50	30.00	35.00	*34.50*
25	300	31.90	36.51	32.00	.....	37.00	*36.75*
24	340	33.50	37.73	33.00	33.00	40.25	*39.25*
22	450	36.60	40.48	.....	.....	.....	43.30

About 10% additional for smaller quantities.

BARS, CONCRETE REINFORCING—Following quotations are per 100 lb.:

ROLLED FROM BILLETS

In.	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Year Ago	Chicago	St. Louis	Dallas	San Francisco
¾ and larger	$2.35	$3.37	$4.14½	$3.37	$3.68	$4.75	$4.60
⅝	2.40	3.42	4.19½	3.42	3.74	4.80	4.65
½	2.45	3.47	4.24½	3.47	3.79	4.95	4.70
⅜	2.60	3.62	4.39½	3.62	4.04	5.00	4.85
¼	2.85	3.87	4.64½	4.87	4.19	5.05	5.10

Twisted bars cut to length take extra of 27½c. per 100 lb. Extra on deformed bars, uncut, 7½c.

ROLLED FROM RAILS

	Chicago	St. Louis	Dallas		Chicago	St. Louis	Dallas
¾ in. and larger	$3.45	$2.45	$4.25	⅝	$3.70	$2.70	....
⅝	3.50	2.50	4.30	¼	3.95	.....	....
½	3.55	2.55	....				

BRICK—To contractors price per 1000 in cargo or carload lots is as follows:

	Common Current	Common One Month Ago	Common One Year Ago	Paving Brick	Paving Block
New York	$15.00	$15 00	$14.00	No Quotations	
Chicago	12.00	12.00	11.00	.....	.....
St. Louis, selected	16.00*	16.00	16.00	$26.00	.....
St. Louis, salmon	10.00	10.00	10.00	.....	.....
Denver	13.00†	12.00	10.00	.....	.....
Dallas	18.00	18. 0	0.50	26.50	.....
San Francisco	12.50	12.50	12.00	.....	.....
Boston	18.00	18.00	16.50	30.00	45.50
New Orleans	17.50	17.50	.....	18.50	18.50
St. Paul	13.00	10.25	9.40	30.00	36.50
Kansas City	15.00	15.00	12.00	42.50	.....
Seattle	15.00	15.00	15.00	36.00	.....
Cincinnati	16.00	16.00	13.00	.....	.....
Atlanta	15.00	15.00	.....	40.00	.....
Los Angeles	12.50	12.50	7.00	.....	.....
Montreal	15.00	14.50	.....	80.00	.....
Detroit	19.00	.. .	.....	36.00	40.00
Baltimore (del)	18.00	.....	....	22.00	45.00

† Salmon is $12 in Denver.* Hard brick, $14.

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12	$0.11475*	$0.10125	0.08	$0 08	$0.1125	$0 1088	.....
6x12x12	.153*	.13500	.112	.105	.15	.09	$0.1512
8x12x12	.204*	.....	.144	.15	.....	115	.1944
10x12x12	.....	.....	.168	.173	.....	2546	.2268
12x12x12	.....	.....	.208	.208	.....	.3082	.2916

*Delivered below 72nd St.

	4x12x12	8x12x12	12x12x12
Boston	$0 10	$0 22	$0.30
St. Paul	.065	.135	.185
Cincinnati	.0645	12075	.1777
Kansas City	.0786	.15	.205
Denver	.1250	.18	.25
Seattle	.09	.175	.30
Atlanta	.105	.135	.22
Los Angeles	.082	.154	.236
New Orleans	.165	.22	.325
Detroit	.0842	.1579	.2264

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh, together with quotations per 100 lb. from warehouses at places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$2.45	$3.47	$4.24½	$3.54	$3.47	$4 45	$4 50
Channels, 3 to 15 in.	2.45	3.47	4.24½	3.54	3.47	4.45	4 50
Angles, 3 to 6 in., ¼ in. thick	2 45	3.47	4.24½	3.54	3.47	4 45	4 50
Tees, 3 in. and larger	2 45	3.52	4.24½	3.54	3.47	4 45	4 50
Plates	2.66	3.67	4 49½	3.54	3.67	4 90	4 70

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	New York Current	New York One Yr. Ago	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger	$4.20	$4.72	$5.65	$4.72	$4.79	$6.05	$5.90

CONE HEAD BOILER

¾ in. and larger	4.30	6.84	5 75	4.82	4 89	6 15	6.00
⅝ and 11/16	4 45	4 97	5.90	4.97	5.04	6 30	6.15
½ and 9/16	4.70	5.22	6.25	5.32	5.29	6.65	6.50

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2in. take an extra of 25c.

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.
No. 1 grade	$1 50	$1.75	$1.90	$2 15	$2 30	$2 55
No. 2 grade	1 35	1.60	1.70	1 95	2.05	2.30

Asbestos asphalt-saturated Felt (14 lb. per square) costs $156 per ton.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.25 per roll in carload lots and $2.50 for smaller quantities.

Shingles, red and green slate finish, cost $6.00 per square in carloads; $6 25 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (4 lb. per square of 100 sq ft)	$70.00	$70.00	$71.00	$71.00
Tar pitch (in 400-lb. bbl)	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels)	34.00	34.00	37.50	37.50
Asphalt felt	68.00	68.00	72.50	72 50

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill.

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	3 55	4 64	4 57	5 80	4.57	5.495
No. 12	3 60	4 69	4 62	5 75	4.62	5.545
No. 14	3.65	4.74	4.67	5.90	4.67	5.595
Black						
*Nos. 18 and 20	4.15	5 24	5 17	6.75	5 30	6.295
*Nos. 22 and 24	4.20	5.29	5.22	6.80	5.35	6.345
*No 26	4 25	5 34	5 27	6.95	5 40	6 395
*No. 28	4.35	5.44	5.37	7.05	5.50	6.595
Galvanized						
No 10	4 70	5 79	5 97	.	6 20	6 845
No. 12	4 80	5 89	6 07	7.30	6 25	6 945
No 14	4 80	5 89	6 07	7.30	6 30	6.945
Nos 18 and 20	5.20	6 19	6 37	7.60	6 60	7 245
Nos 22 and 24	5.25	6 34	6 52	7.75	6 75	7.295
*No 26	5.40	6 04	6 67	7.90	6 90	7.445
*No 28	5.70	6 79	6.97	8.20	7 20	7.745

*For painted corrugated sheets add 30c per 1000 lb for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel	$2.15	$1 61	$2.00	$2 00	$2 48	$1.66
5-gal. cans	2.28	1 71	2.25	2 15	2 68	1.86

WHITE AND RED LEAD—Base price per pound.

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Yr Ago Dry and In Oil
100-lb keg	13.00	14.50	11 25	11 00	13 00	10 50
25 and 50-lb. kegs	13.25	14.75	11.50	11 25	13 25	10 75
12½-lb. keg	13.50	15.00	11.75	11 50	13 50	11 00
5-lb cans	15.00	16.50	13 25	13 00	15 00	13 00
1-lb. cans	16.00	17.50	13.25	13 00	16 00	13.00

500 lb. lots less 10% discount; 2000 lb. lots less 10-2½% discount

LUMBER

San Francisco—Prices of rough Douglas fir No. 1 common, in more than carload lots:

	Lumber Prices in Yards at San Francisco 6-8-12 and 14 Ft.	10-16-18 and 20 Ft.	22 and 24	25 to 32 Ft.
3x3 and 4	$33 00	$33 50	$34 50	$36 50
3x6 and 8	34 00	34 50	35 50	37 50
4x4-6 and 8	34 50	35 50	36 50	38 50
3x10 and 12	34.50	35 50	36.50	38 50
3x14	35.00	36 00	37 00	39 00
4x10 and 12	34.50	35 50	36 50	38 50
4x14	35.50	36 50	37 50	39.50

	24 Ft. and Under	25 to 32 Ft.	33 to 40 Ft.
6x10	$34 00	$36 00	$37 00
6x14	35 50	37 50	38 50
8x10	34 00	36 00	37 00
8x14	35 50	37 50	

New York, Chicago and St. Louis

	Southern Pine New York* 20 Ft. and Under	Southern Pine New York* 22-24 Ft.	Southern Pine Chicago 20 Ft. and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft. and Under	Yellow Pine St. Louis 22-24 Ft.
3x 4 to 8x 8	$46.00	$47.00	$51 00	$52.00	$40 00	$42 00
3x10 to 10x10	49.00	50 00	55 00	56.00	43 50	45 00
3x12 to 12x12	54 00	55.00	57 00	58 00	45.00	46 00
3x14 to 14x14	57 00	58.00	62 00	63 00	50 00	52 00
3x16 to 16x16	66 00	67.00	65.00	66.00	53.00	55 00
3x18 to 18x18	76 00	77.00	69.00	70.00	57.00	58.00
4x20 to 20x20	86 00	87.00	.....	.....	.....	.....

*Prices from Lumbermen's Bureau

Over 24 ft. Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x12 add $2. For merchantable add $4 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In x 20-Ft. and Under P.	8 x 8-In x 20-Ft. and Under Fir	8 x 8-In x 20-Ft. and Under Hemlock	8 x 8-In x 20-Ft. and Under Spruce	12 x 12-In 20 Ft. and Under P	12 x 12-In 20 Ft. and Under Fir
Boston	$50.00	$49.00	$48.00	$48.00	$50.00	$50.00
Kansas City	45.50	50.25	50.25	50.25	52.50	51.25
Seattle	.....	.....	.....	.....	.....	30 00
New Orleans	45.00	.....	.....	.....	48 00	.
St. Paul	60.00	61.00	60 00	46.00	62 00	63 00
Denver		42 00	42 00	42 00		43 00
Atlanta	55 50	57 50	58 00	68 00	68 50	70 50
Baltimore	48.00				60.00	

	1-In. Rough, 10 In and Under x 16 Ft. P.	1-In. Rough, 10 In and Under x 16 Ft. Fir	1-In. Rough, 10 In and Under x 16 Ft. Hemlock	2-In. T and Gr. 10 In x 16 Ft. P	2-In. T and Gr. 10 In x 16 Ft. Fir
Boston	$50.00	$50.00	$48.00	$50 00	$50 00
Kansas City	64 50	72 75	72.75	67 25	79 00
Seattle				21 50	30 50
New Orleans	55 00			50 00	
St. Paul	58 00	55 00	54 00	63 00	56 00
Denver		43 50	43 50		40 00
Atlanta	80 00	85 00		65 00	67 50
Los Angeles		41.00*	41 00*		
Baltimore	43.00			40 00	

Montreal—Hemlock 2x10x16, 2x12x14, both $44; rough pine, 1x10 and 2x10, $60 No. 1 flooring, 64; British Columbia Fir, 10x12 to 16x16, 32 ft. long, $65.

*Base price

Dallas—Yellow pine. Price per M:

2x4 to 2x12—12, 14 and 16	$51 25
2x4 to 2x12—10, 11 and 20	52 50
2x4 to 2x12—22 and 24	56 75
4x4, 4x6, 6x6, 8x8 and 3x8	54 75
8x10, 10x10 and 3x10	60 00
12x12 and 3x12	63.75

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Chicago	San Francisco	Dall
Wire	$3.25	$3.90	$3 90	$5.00	$5.00
Cut	4.25	5.40	5.50	6.65	6.40

FREIGHT RATES

On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	$0.30	New Orleans	$0 38½
Buffalo	.17	New York	.27
Chicago	.27	Pacific Coast (all rail)	1.25*
Cincinnati	.23	Philadelphia	.24½
Cleveland	.17	St. Louis	.24
Denver	.99	St. Paul	.49½
Kansas City	.59	Detroit	.33
		Baltimore	.33

Note—Add 3% transportation tax. * Minimum carload, 80,000 lb.

Contractors' Miscellaneous Supplies

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55	$2.55	$4

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+12½%
Galvanized cast steel rigging	7½%
Bright plow steel	35%
Bright cast steel	22½%
Bright iron and iron tiller	5

San Francisco: Galvanized, less 5%, bright, less 25% off.
Chicago, +5 on galvanized, 30–2½ off on bright.

MANILA ROPE—For rope smaller than ⅜-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅜-in., 8 ft., ½-in., 6; ⅝-in., 4½; ¾-in., 3½; 1-in., 2½; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ⅜-in. and larger, in 1200-ft coils:

Boston	$0.25	Kansas City	$0.28½
New York	.27	New Orleans	.27½
Chicago	.26½	Los Angeles	.26
St. Paul	.28	Seattle	.27½
San Francisco	.26	St. Louis	.26½
Atlanta	.29½	Montreal	.27½
Denver	.29½	Detroit	.28

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder.

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York		$0.27	$0.30		$2.40
Boston	$.2225	.2425	.2675	$.3100	*2.20*
Kansas City	.19	.2375	.2625	.30	2.25
New Orleans	.22½	*.2375*	*.2475*	.30½	

Seattle	$0.1425	$0.185	$0.21	$0.315	$1.90
Chicago	.1875	.2125	.2550	.2975	2.15
St. Paul	.19	.2375	.2625		2.45
St. Louis	.19	.2325	.2575	3000	2.40
Denver	.1775	.22	.245	2875	2.25
Dallas			.288	.342	2.75
Los Angeles	.1895	.232	2.57		2.55
Atlanta	.20	.225	.245		2.45
Baltimore	.19	.23½	.28½	.30	2.35

POLES—Price of Western red cedar poles is as follows:

	New York Current	New York One Year Ago	Chicago	St. Louis	Denver
6-in. x 30-ft	$5.82	$5.66	$5.17	$4.55	$5.17
7-in. x 30-ft	7.65	7.45	6.85	6.10	6.85
7-in. x 35-ft	11.10	10.80	10.00	8.95	10.00
8-in. x 30-ft	12.65	12.30	11.35	10.10	11.35
7-in. x 40-ft	12.85	12.50	11.50	10.20	11.50
8-in. x 45-ft	18 90	18.40	16.90	15.00	16.90
8-in. x 50-ft	22 65	22.05	20.30	18.00	20.30

10c. higher freight rates on account of double loads.

For plain pine poles, delivered New York, the price is as follows:

10-in. butts, 5-in. tops, length 20-30 ft	$9.00
12-in. butts, 6-in. tops, length 30-40 ft	11.50
12-in. butts, 6-in. tops, length 41-50 ft	12.50
14-in. butts, 6-in. tops, length 51-60 ft	21.00
14-in. butts, 6-in. tops, length 61-71 ft	23.50

Note—At the present time it is almost impossible to give accurate prices on poles. The above are only nominal.

	Dallas
6-in. x 20-ft	$4.60
6-in. x 30-ft	7.10
8-in. x 30-ft	8.45
8-in. x 35-ft	10.38

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges.

	New Yor'	Chicago	St. Louis
No. 1 railroad wrought	$22.00	$17.50	$19.50
Stove plate	17.00	18.25	21.50
No. 1 machinery cast	23.00	22.00	23.50
Machine shop turnings	10.00	8.75	11.50
Cast borings	10.00	11.00	11.50
Railroad malleable cast	15.00	18.50	18.50

SHIP SPIKES—Current prices per 100 lb.

In.	San Francisco Galv.	San Francisco Black	Seattle Black
¼	*$9.20*	*$8.50*	$8.55
⅜	*8.75*	*6.75*	8.25
½	*8.60*	*6.60*	8.30

Pittsburgh base, $3.85 per 100 lb.

LABOR RATES AND CONDITIONS THROUGHOUT THE COUNTRY

S means scarce; E, enough; P, plentiful

Cities	Bricklayers	Carpenters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor	Remarks
Atlanta	$0.90S	$0.70	$0.40	$0.45	$0.50	$0.72½	$0.35	Atlanta—Union scale 90c., but some contractors are paying $1.25.
Baltimore	1.00E	0.80E	0.87½	0.46 to 0.54E	0.74E	0.87½E	0.35 to 0.40E	Baltimore—Carpenters are asking 90c.; structural iron workers, $1. Common labor is paid 45c. on government work, 46c. in shipyards.
Boston	.60-.70P	.80-.90P	.80-1.00P	.60-.70P	80P	.80-1.00P	.52½- .62½P	
Cincinnati			.70		.50			
Dallas	1.00S	.87½S	.87½S	.40S		.75E	.35S	
Denver	1.00E	.87½E	.93¾E	.59¾E		.87½E	.40-.50	
Detroit	1.00E	.80S	.90E	.60E	.90E		.55S	
Kansas City	1.00	.85	.90	.68¾	.77½	.90	.30-.50	
Los Angeles	.87½E	.75E	75P	.56¼-.75S	.75P	.75P	.50-.62½P	Los Angeles—No strikes. Non-union bricklayers and carpenters receive $6 and $5, respectively, against the union scales of $8 and $7.
Montreal	.70	.65S	.55	.40-.45	.55	.45-.50S	.30-.40	Montreal—Fifty per cent. of carpenters are on strike; 75 per cent. of structural iron workers are striking for 60c.
New Orleans	.75S	.60	.80S	.45	.80-.90	.80	.35	
New York	.87½	.81¼	.87½	.57½	.81¼	.87½	.50	New York—Shortage of common labor
Pittsburgh	1.00	.90	.90	.60	.60	1.00	.40-.45S	
St. Louis	1.00	.87½	1.00	.70	.80-.92½	.90	.40-.45	
St. Paul	.87½	.75	.80	.62½	.85	.85	.45-.50	St. Paul—No strikes. Sewer diggers and paving-block layers are paid 50c.
San Francisco	1.25	1.00	1.00	.87½				San Francisco—No strikes. Building is improving in the San Francisco Bay District.
Seattle	1.12	.92½	.94	.75-.80	.90	1.00	.75S	Seattle—Common labor scarce owing to harvest season.

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Aug. 11	New Prague, Minn.	July 31
Aug. 16	Hettinger, N. D.	Aug. 7
Aug. 18	Garber, Okla.	Aug. 7
Aug. 20	Armour, S. D. Adv. July 24.	July 24
Aug. 30	Clarksburg, W. Va. Adv. Aug. 7.	Aug. 7

SEWERS

Aug. 11	Scobey, Mont.	July 31
Aug. 11	New York, N. Y.	Aug. 7
Aug. 12	Clayton, Mo.	July 31
Aug. 12	Erie, Pa.	July 31
Aug. 12	West Bend, Wis.	July 31
Aug. 12	Chicago, Ill.	July 31
Aug. 15	South Charleston, W. Va. Adv. July 24.	July 24
Aug. 16	Hettinger, N. D.	Aug. 7
Aug. 18	Hackensack, N. J. Adv. July 24.	July 24
Aug. 18	Huntington, Pa.	July 31
Aug. 18	Crisfield, Md.	Aug. 7
Aug. 18	Paulsboro, N. J. Adv. Aug. 7.	Aug. 7
Aug. 18	Towson, Md.	Aug. 7
Aug. 19	Kansas City, Mo. Adv. July 3 to 17.	July 3
Aug. 20	Cartersville, Ga.	Aug. 7
Aug. 21	Mandan, N. D.	Aug. 7
Aug. 25	Walnut Grove, Minn.	Aug. 7
Aug. 25	Lima, O. Adv. Aug. 7.	Aug. 7

BRIDGES

Aug. 11	Duluth, Minn.	July 31
Aug. 11	Eureka, Cal.	July 31
Aug. 12	Duluth, Minn.	July 31
Aug. 14	Wilkes-Barre, Pa.	Aug. 7
Aug. 18	Harrisburg, Pa.	Aug. 7
Aug. 18	Pritchard, B. C.	Aug. 7
Aug. 19	Statesboro, Ga.	July 3
Aug. 20	Swainsboro, Ga.	July 3
Aug. 20	New Jersey Adv. Aug. 7.	Aug. 7
Aug. 25	Willougby, O.	Aug. 7
Aug. 25	Great Falls, Mont.	Aug. 7

STREETS AND ROADS

Aug. 10	Outremont, Que.	Aug. 7
Aug. 11	Buckhannon, W. Va.	July 31
Aug. 11	Mt. Union, Pa.	July 31
Aug. 11	Monroe, N. C.	July 31
Aug. 11	Las Cruces, N. M.	July 31
Aug. 11	Buckhannon, W. Va. Adv. July 31.	July 31
Aug. 11	Natchitoches, La.	Aug. 7
Aug. 11	Salem, N. J.	Aug. 7
Aug. 11	San Diego, Cal.	Aug. 7
Aug. 11	Iola, Kan.	Aug. 7
Aug. 11	St. Paul, Minn.	Aug. 7
Aug. 11	Sacramento, Cal.	Aug. 7
Aug. 12	Wisconsin	Aug. 7
Aug. 12	Roby, Tex.	Aug. 7
Aug. 12	Frederick, Md.	Aug. 7
Aug. 12	Omaha, Neb.	Aug. 7
Aug. 12	Duluth, Minn.	Aug. 7
Aug. 12	Newark, N. J.	Aug. 7
Aug. 12	Hoboken, N. J.	Aug. 7
Aug. 12	Logan, W. Va.	July 31
Aug. 12	Charleston, W. Va.	July 24
Aug. 12	Meadville, Pa. Adv. July 17.	July 17
Aug. 12	Washington, N. C.	July 17
Aug. 12	Albany, N. Y. Adv. July 17.	July 17
Aug. 12	Beaufort, S. C.	
Aug. 12	Omaha, Neb.	July 31
Aug. 12	Beaver City, Neb.	July 31
Aug. 12	Charleston, S. C.	Aug. 7
Aug. 12	Helena, Ark.	Aug. 7
Aug. 13	Illinois Adv. Aug. 7.	Aug. 7
Aug. 13	Holtville, Cal.	July 24
Aug. 13	Connellsville, Pa.	July 31
Aug. 13	McCook, Neb.	July 31
Aug. 13	Trenton, N. J.	July 31
Aug. 13	Lockhart, Tex.	Aug. 7
Aug. 14	St. Roch, Que.	Aug. 7
Aug. 14	Chicago, Ill.	Aug. 7
Aug. 14	Jersey City, N. J.	July 31
Aug. 14	Bentonville, Ark.	Aug. 7
Aug. 14	Excelsior Springs, Mo.	Aug. 7
Aug. 14	Wisconsin	Aug. 7
Aug. 15	Farmington, Utah.	July 17
Aug. 15	Ripley, W. Va.	July 31
Aug. 15	Warren, Minn.	Aug. 7
Aug. 15	Alliance, Neb.	Aug. 7
Aug. 15	Fenelton Falls, Ont.	Aug. 7
Aug. 15	St. Romuald, Que.	Aug. 7
Aug. 15	Lindsay, Ont.	Aug. 7
Aug. 15	Montague, Tex.	Aug. 7
Aug. 15	Long Island City, N. Y.	Aug. 7
Aug. 15	Oxford, O.	July 31
Aug. 15	Williamsburg, Pa.	July 31
Aug. 15	Ripley, W. Va.	July 31
Aug. 16	Abilene, Tex.	July 31
Aug. 16	St. Albans, W. Va. Adv. July 17.	July 17
Aug. 16	Fairmont, W. Va.	Aug. 7
Aug. 18	Walnut Ridge, Ark. Adv. July 17.	July 17
Aug. 18	Trenton, Ont.	Aug. 7
Aug. 18	Beamsville, Ont.	Aug. 7
Aug. 18	London, Ont.	Aug. 7
Aug. 18	Brantford, Ont.	Aug. 7
Aug. 18	Kingston, Ont.	Aug. 7
Aug. 18	Brockville, Ont.	Aug. 7
Aug. 19	Michigan	July 31
Aug. 19	Michigan	Aug. 7
Aug. 19	Farmington, Minn.	Aug. 7
Aug. 19	Georgetown, Del.	July 31
Aug. 19	Faribault, Minn.	July 31
Aug. 19	Harrisburg, Pa.	July 31
Aug. 21	De Queen, Ark.	July 24
Aug. 21	Oil City, Pa.	Aug. 7
Aug. 23	Brainerd, Minn.	July 31
Aug. 24	Washington, D. C.	July 24
Aug. 24	Denver, Colo.	July 10
Aug. 25	Ebensburg, Pa.	Aug. 7
Aug. 26	New York, N. Y.	Aug. 7
Aug. 26	Guntersville, Ala.	July 31
Aug. 27	Peru, Neb.	Aug. 7
Sept. 1	Arcadia, Fla.	Aug. 7
Sept. 1	Salt Lake City, Utah	July 24
Sept. 2	Independence, Mo.	Aug. 7

EXCAVATION AND DREDGING

Aug. 15	West Point, Miss.	Aug. 7
Aug. 20	Carrollton, Miss.	Aug. 7
Aug. 28	Granite Falls, Minn.	Aug. 7

INDUSTRIAL WORKS

Aug. 15	Duluth, Minn.	July 31
Aug. 15	Hartford, Conn.	Aug. 7
Aug. 16	London, Ont.	Aug. 7
Aug. 16	Bridgeport, Conn.	Aug. 7
Aug. 25	Syracuse, N. Y.	July 31

BUILDINGS

Aug. 9	New York, N. Y.	Aug. 7
Aug. 11	Biwabik, Minn.	July 31
Aug. 11	Grand Island, Neb.	Aug. 7
Aug. 11	Morrisonville, Minn.	July 31
Aug. 11	Jamestown, N. D.	Aug. 7
Aug. 11	Ottawa, Ont.	July 31
Aug. 11	London, Ont.	July 13
Aug. 11	Hatboro, Pa.	Aug. 7
Aug. 11	Pelham, N. Y.	Aug. 7
Aug. 12	St. Louis, Mo.	July 31
Aug. 12	Indian Head, Sask.	July 24
Aug. 12	Morgantown, W. Va.	July 24
Aug. 12	Philadelphia, Pa.	Aug. 7
Aug. 12	Eugene, Ore.	Aug. 7
Aug. 14	New York, N. Y.	July 31
Aug. 15	Casper, Wyo.	July 10
Aug. 15	Winnebago, Neb.	July 31
Aug. 15	New Bedford, Mass.	July 10
Aug. 15	Omaha, Neb.	July 10
Aug. 15	Provo, Utah	July 24
Aug. 15	Lehi, Utah	July 24
Aug. 15	Oakwood, Mich.	Aug. 7
Aug. 15	Arden, Man.	Aug. 7
Aug. 15	Edmonton, Alta.	Aug. 7
Aug. 15	Eldorado, Kan.	Aug. 7
Aug. 15	Pleasanton, Kan.	Aug. 7
Aug. 16	Pilot Rock, Ore.	Aug. 7
Aug. 18	Erie, Pa.	July 24
Aug. 18	Ottawa, Kan.	Aug. 7
Aug. 19	Spring City, Pa.	Aug. 7
Aug. 19	Fairmont, Neb.	Aug. 7
Aug. 20	Hamilton, Ont.	Aug. 7
Aug. 20	Austin, Minn.	Aug. 7
Aug. 21	Springfield, Ill.	Aug. 7
Aug. 21	Valparaiso, Neb.	Aug. 7
Aug. 21	Richmond, Utah	July 31
Aug. 24	St. Paul, Minn.	July 3
Aug. 25	Elizabeth, N. J.	Aug. 7
Aug. 25	Bayard, Neb.	Aug. 7
Aug. 25	Chicago, Ill.	Aug. 7
Aug. 26	Weyburn, Sask.	Aug. 7
Aug. 27	Stoutsville, O.	Aug. 7
Aug. 30	New Aberdeen, N. S.	Aug. 7
Sept. 1	Omaha, Neb.	July 17
Sept. 4	Bayonne, N. J.	July 31
Sept. 15	Pleasant Grove, Utah	July 24

FEDERAL GOVERNMENT WORK

Aug. 11	Dredging—Buffalo, N. Y. Adv. July 17.	July 17
Aug. 11	Pass and Weir Horses, Props, etc.—Wheeling, W. Va.	July 17
Aug. 11	Timber and Cement Detroit, Mich. Adv. July 31.	July 31
Aug. 12	Paving — Washington, D. C. Adv. July 24.	July 24
Aug. 12	Gunnery Emplacements, etc. —Aberdeen, Mo. Adv. Aug. 7.	Aug. 7
Aug. 13	Groins — Spec. 4004 — Great Lakes, Ill.	July 31
Aug. 13	Road Work — Flagstaff, Ariz.	July 31
Aug. 13	Pipes, Valves, etc.—Washington, D. C. Adv. Aug. 7.	Aug. 7
Aug. 14	Rip Rap—Memphis, Tenn	July 31
Aug. 15	Torpedo Storage and Compressor Building — Spec. 3991—Mare Island, Cal.	July 24
Aug. 18	Removing Boulders—Newport, R. I. Adv. July 24.	July 24
Aug. 18	Dredging—Norfolk, Va Adv. July 31.	July 31
Aug. 19	Repairing Dike — Philadelphia, Pa. Adv. July 17 and 24.	July 24
Aug. 19	Water Pipe—Washington, D. C.	July 31
Aug. 19	Canal Wall—Washington, D. C. Adv. July 31.	July 31
Aug. 19	Water Supply — Stapleton, N. Y.	Aug. 7
Aug. 19	Repairing Wharf—Washington, D. C. Adv. Aug. 7.	Aug. 7
Aug. 20	Metal and Glass Work—Key West, Fla. Adv. July 17.	July 17
Aug. 20	Roofing — Spec. 4005 — Norfolk, Va.	July 31
Aug. 20	Torpedo Racks—Spec. 4008 —Pearl Harbor, H. T.	Aug. 7
Aug. 25	Post Office—Mystic, Conn	July 31
Aug. 26	Dredging—Honolulu, H. T Adv. June 26.	June 26
Aug. 27	Sea Wall — New York, N. Y. Adv. July 31.	July 31
Aug. 27	Dredging—Norfolk, Va Adv. July 31.	July 31
Aug. 27	Lock and Abutment — Louisville, Ky. Adv. July 31.	July 31
Aug. 29	Post Office—Fayette, Mo	July 24
Aug. 29	Dredging — New York, N. Y. Adv. July 31.	July 31
Aug. 29	Breakwater—Chicago, Ill. Adv. Aug. 7.	Aug. 7
Sept. 2	Towboat—Memphis, Tenn	Aug. 7
Sept. 2	Miscellaneous Equipment—Washington, D. C. Adv. July 10 and 17	July 10
Sept. 2	Post Office—Kansas City, Mo.	July 24
Sept. 2	Dredging, New York, N. Y. Adv. Aug. 7.	Aug. 7
Sept 10	Post Office—Douglas, Ga	July 31

MISCELLANEOUS

Aug. 10	Electric Light Extension Conduits, Etc., Outremont, Que.	Aug. 7
Aug. 10	Garbage Destruction, Outremont, Que.	Aug. 7
Aug 14	Wire—Detroit, Mich.	July 31
Aug 15	Telephone Lines—Edmonton, Alta.	July 24
Aug 18	Mechanical Loader—Hastings, Minn.	July 31
Aug 19	Tracks—Philadelphia, Pa Adv. July 24.	July 24
Aug 19	Channel — Prince Edwards Island	July 31
Aug. 19	Wharf — Dauphin River, Man.	Aug. 7
Aug 20	Safety Cars — Saskatoon Sask. Adv. July 24.	July 24
Aug. 20	Wharf—Stewart, B. C	July 31
Aug. 20	Bulkhead, Boston, Mass. Adv. Aug. 7.	Aug. 7
Sept 23	Turbines, etc.—Saskatoon, Sask. Adv. July 24.	July 24
Aug 25	Railway Ties — Toronto, Ont.	Aug. 7
Aug 28	Silo—Savannah, Ga.	July 24

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Herkimer — City voted $750,000 bonds to build rein.-con. storage reservoir and dam, and install complete gravity system, near Gravesville, Russia Twp. C. L. Wood, city engr. Noted July 17.

O., Carrolton—City retained W J Sherman, engr., 613 Nasby Bldg., Toledo, to prepare plans and estimates for water supply system.

O., Mau[illegible]—City retained W J Sherman, engr., 613 Nasby Bldg., Toledo, to prepare plans for new water supply system, electric light and power plant.

O., Oxford—Village plans to improve waterworks, plans include new electric pumping equipment, new service mains, etc. About $35,000.

O., Toledo—City having plans prepared building 22 filters, 1,000,000 gal. capacity daily, 20 x 50 x 500 ft. settling basin, 11,250,000 gal. capacity, and several miles 30, 32 and 40 in. c. i. mains. Bonds for $850,000 voted for project. H. C. McClure, city engr.

Mich., Port Huron — City having plans and estimates prepared furnishing and installing about 6000 water meters in water system. About $50,000. E. R. Whitmore, city engr.

Mich., St. Clair Beach (St. Clair P. O.)—Village having plans prepared by R. A. Murdock, engr., 706 Free Press Bldg., Detroit, building system of watermains involving 7000 ft. 4-6 in. water pipe, 12 hydrants, valves, etc. About $10,000.

Minn., Foley—City having plans prepared by Chute & Bradley, engrs., St. Cloud, for waterworks and sewers to include 60,000 gal. steel tank pump, 1000 gal. per minute motor. About $40,000.

Mont., Judith Gap—City plans to build waterworks system, including 6 in. mains. About $15,000. Gerharz-Jaqueth Co., 514 1st Natl. Bank Bldg., engrs.

Mo., Cameron—City soon lets contract building filtration plant, installing mechanical equipment and 10 hydrants; also laying 6000 ft. c.i. pipe. E. E. Harper, 2408 East 30th St., Kansas City, engr. Noted July 19.

Tex., Cisco—City having plans prepared by H. Exall Elrod Co., engrs., Interurban Bldg., Dallas, for water-works distribution extensions and concrete dam, involving 240 tons steel, 8520 cu.yd. concrete, 25,000 cu. yd. earth and 1000 cu.yd. rock excav., 30,000 cu.yd. embankment and backfill and 1700 sq.yd. slope pavement; also sewer extensions and pavements throughout the city. Noted Feb. 6.

Idaho, Lewiston—City Water Dept soon lets contract furnishing materials and laying 500 ft. 6 in. converse joint pipe, 1 Mueller tapping machine for c.i. pipe, one 4 in. and one 12 in. and one 8 in. converse joint gate valve, 1790 ft. 6 in. universal joint c.i., one 6 in. converse by 6 in. universal coupling, 100 lb. pressure pipe, 123 in. Mueller corporation cocks for c.i. pipe with attached 16 in. lead goose necks, six 6 in. Universal joint gate valves, four 4 in., six 6 in., one 8 in. converse gate valves, 10 gate boxes to extend 4½ ft., three 4 in. Universal joint gate valves, one 8 x 4 x 8 in. converse cross one 8 x 4 x 8 x 6, one 6 x 6 x 4 x 4 in., one 12 x 12 x 6 x 6 in. converse joint crosses, 2290 ft. 6 in. converse joint, G. & D. pipe, one 6 in. 20 degree special converse joint bend, 600 lb. pig lead, three 4 in. Corey fire hydrants, with converse connections, three 6 x 6 x 4 in. and one 6 x 6 in. converse tees, one 6 x 6 in. converse by 2 in. standard screw tee, two 4 in. Cory fire hydrants with universal connections.

Idaho, Preston—City election Aug. 11, to vote on $35,000 bonds to improve and extend water system. W Chatterton, city clk.

Cal., Pasadena—S. B Morris, ch engr. city water dept., advocates building distributing system in San Rafael Heights, cost, $100,000, reservoir, $17,000 and installation of booster pump.

Cal., Sierra Madre—See "Streets and Roads."

Ont., Cochrane—Town having plans prepared extending waterworks system. Bonds for $25,000 voted for project. E. Casewell, Cochrane, engr.

Ont., St. Thomas—City plans to build concrete reservoir to increase water supply. About $80,000. W. Ferguson, city engr.

Ont., Windsor — City had plans prepared by F. W. Thorold, engr., Toronto, installing pumping station and filtration plant for cities bordering on Windsor. About $100,000.

BIDS DESIRED

W. Va., Clarksburg—Until Aug. 30, by Water Bd., furnishing and erecting complete with appurtenances, following pumping machinery, one 4 m.g.d. centrifugal pump, gear driven from gas engine for total lift 350 ft., one 4 m.g.d. centrifugal pump, gear driven from gas engine for total head 35 ft., one 6 m.g.d. centrifugal pump, gear driven from condensing steam turbine, complete with condensing apparatus for total head 350 ft. Fuller & McClintock, 170 Bway, New York City, engrs.; advertised in this issue. Noted July 31.

N. D., Hettinger—Until Aug. 16, by city, building water works system, involving 20,000 lin.ft. 4, 6 and 8 in. mains, and 50,000 gal. tank on 50 ft. tower. Black & Griffin, Mandan, engrs.

Okla., Garber—Until Aug. 18, by city clerk, laying 12,000 ft. 6 in and 10,380 ft. 8 in Class B c.i. pipe, twenty-three hydrants, etc. Black & Veach, Interstate Bldg., Kansas City, Mo., engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★W. Va., Parkersburg—City let contract installing crib system in city filtration plant, to Western Rivers Co., Point Pleasant, $20,545. City will furnish necessary c.i. pipes. Noted July 17.

★O., Bucyrus—Boro let contract to Rust Eng. Co., Farmers Bank Bldg., Pittsburgh, building dam and storage reservoir, and 500,000 gal. rein.-con. clear water basin. About $63,000.

★O., Springfield—City let contract building 2300 ft. 42 in. cement pipe to increase water supply, to Doyle & Hanahan, 935 Avondale Ave., $34,410. Noted June 12.

★Minn., Brainerd—City let general contract for improvements to waterworks system, to J. W. Hildred & Co., 33 East 3rd St., St. Paul, 13,275; reservoir to Circular Concrete Co., 846 Builders' Exch., Minneapolis, $15,490; flanged fittings, to U. S. Cast Iron Pipe & Fdry. Co., 122 South Michigan Ave., Chicago, $3775; valves, to J. B. Clow & Sons, 344 South Franklin St., Chicago, $2257. Noted June 26.

★Minn., St. Paul—See "Streets and Roads."

★Cal., Los Angeles—Bd. Pub. Serv Comrs. will drill 100 8 and 12 in. wells in Owens River Valley, Inyo Co. to augment supply to Los Angeles aqueduct; also install pumps and pipe lines. W. Mulholland, 645 South Olive St., ch. engr. Work will be done by day labor.

Sewers

PROPOSED WORK

Conn., Stamford—City plans to build sewerage disposal plant. About $225,000. Engineer not selected.

W. Va., Charleston—See "Buildings."

Mich., Detroit—City having plans prepared building 6 mi. Connors Creek Sewer system in Connors Rd. from Seven Mile Rd. to Kercheval Ave. and in Connors Creek from Kercheval Ave. to Detroit River, involving rein.-con. intercepting sewer, 4-barreled type, 2 storm-water barrels, sewage treatment plant, open channel about 20 x 80 ft., from Jefferson Ave. to outlet, to drain 39 sq.yd., discharge 5000 sq.ft., also treatment works to comprise battery of 40 Imhoff tanks. About $14,000,000. C. W. Hubbell, city engr.

Ill., Rock Island—City Council passed ordinance to build storm drain sewers in 46th St. and 16th Ave. Dist. About $75,000. W. Treichler, city engr.

Wis., Sheboygan—City plans to excavate and lay 1.18 mi. sewers in Franklin St. from Washington Ct. to Wisconsin Ave., involving 7000 ft. 8-10 in. vitr. pipe. Cost between $11,000 and $12,000. C. U. Boley, city engr.

Minn., Adrian—Village having survey made by Druar & Smith, engrs., Globe Bldg., St. Paul, for sewerage system and sewage disposal tank. About $40,000. M. E. Corrigan, clk.

Minn., Foley—See "Waterworks."

Minn., Lamberton—Village having plans prepared by Druar & Smith, engrs., Globe Bldg., St. Paul, for new sewers. About $30,000. F. A. Biersdorf, clk.

Neb., Geneva—City having plans prepared installing 28,000 ft. 8 in. sanitary sewers. About $40,000. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

Neb., Wilbur—City having plans prepared installing 30,000 ft. sanitary sewers. About $50,000. Grant, Fulton & Letton, 505 Bankers Bldg., Lincoln, engrs.

Mont., Judith Gap—City plans to build 1 mi. 6 in. sewer in various streets. About $20,000. Gerharz-Jacqueti. Eng. Co., 514 1st Natl. Bank Bldg., Great Falls, engrs.

Tex., Cisco—See "Waterworks."

Tex., San Antonio—See "Streets and Roads."

Okla., El Reno—City having plans prepared enlarging sewers and building Imhoff sewerage disposal plant. About $95,000. H. G. Powel, Box 204, engr.

Okla., Stroud—City having plans prepared for laying 28,500 ft. sewers and building Imhoff tank. About $95,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Idaho, Buhl—City plans to install vitr. or cement sewers in Dist. Nos. 3 and 4. About $87,000. G. B. Brazeau, clk.

Idaho, Salmon—City council plans to install sewers in Main and Shroup Sts. from Daisy to Terrace Sts., vitr. or cement. Cost to exceed $10,000.

Wash., Seattle—See "Streets and Roads."

Wash., Vancouver—City soon lets contract building 8 in. vitr. or cement sewers in various alleys. About $10,039. W. Schwarz, city engr.

Ore., Bend—City soon lets contract building 360 ft. 12 in. vitr. sewer, 2 catch basins, also paving, removing old walks, clearing and grubbing streets in Local Impvt. Dists. Nos. 10, 11, 12, 13, 14 and 16, involving 9504 cu.yd. earth and 1590 cu.yd. rock excav., 24 430 sq.ft. cement walks, 76,990 lin.ft. cement curb, 4940 cu. yd. cinder roadway, 3 culverts, etc. About $22,640. R. B. Gould, city engr.

Ore., Portland—City Council plans to build sewers in Powell Valley Rd., East 39th and 53rd Sts., Oakdale and Mistletoe Additions, Myrtle St., Cherry Park, Overton Park and 44th Ave., Hessemer Addition, Carol Park, Tremont Park, Germania, Yale, Brockton and Kelso Sts., Maplewood Additions, Gladstone and Francis Aves., Naples Heights, Cooper's Addition and Greenwod Ave., Waverly Heights. About $61,910. O. Laurgaard, city engr.

Ont., North Bay—City soon receives bids installing 3000 ft. 10-12 in. sanitary vitr. sewers in Cassells, McIntyre and Worthington Sts. About $27,000. H. J. McAuslan, North Bay, engr.

BIDS DESIRED

N. Y., New York—Until Aug. 11, by F. L. Dowling, pres. Manhattan Boro., reconstructing sewer in East 72nd St., from 1st to 2nd Aves., F St. and in continuation thereof, now known as Prescott Ave. from Dyckman St. to point 750 ft. north; also re-regulating, regrading and repaving with granite block pavement on concrete foundation, roadway of West 46th St. from 11th Ave. to west line of 12th Ave.

N. J., Paulsboro—Until Aug. 18, by Boro Council, Black Bldg., building sanitary sewerage system, involving 10.8 mi. 5, 6, 8, 10, 12, 15 and 18 in. terra cotta pipe, 107 manholes, 11 flushtanks, pumping station and disposal plant. D. D. Pote, clk.; advertised in this issue. Noted July 31.

Pa., Oil City—See "Streets and Roads."

Md., Crisfield—Until Aug. 18, by Mayor and City Council, building 8000 ft. 6-20 in. terra cotta sewers, including manholes, house connections, etc. About $25,000. Norton, Bird & Whitman, 606 Munsey Bldg., Baltimore, engrs.

Md., Towson—Until Aug. 18, by Comrs. Baltimore Co., building sewage disposal plant. Work involves Imhoff tanks, dosing chamber, trickling filters, sludge beds and 9 mi. 6-15 in. terra cotta sewer pipe. About $100,000. Norton, Bird & Whitman, 606 Munsey Bldg., Baltimore, engrs.

Ga., Cartersville—Until Aug. 20, by P. C. Flemister, mayor and Bd. Aldermen, at office of City Clerk, building 16 mi. 8-15 in sanitary sewers, with necessary appurtenances; advertised in this issue.

O., Lima — Until Aug. 28, by A. L. Methany, dir. pub. serv., building Collett St. Relief Sewer, Contr. No. 1, involving 16,430 ft. 42-84 in. circular and 78 x 127½ in. semi-circular monolithic concrete, segmental block, vitr. segmental block or rein.-

Sewers (Continued)

con. pipe, also outlet abutment at Ottawa River, overflow chamber, etc.; South Side Main Relief Sewers, Contr. No. 2, involving 12,220 ft. 24-72 in. circular and 60 x 80 in. semi-circular monolithic concrete, concrete segmental block, vitr. segmental block, rein.-con. or vitr. pipe, also weir chamber near Kibby St. and Central Ave., etc. V. C. Miller, city engr.; advertised in this issue.

Minn., Duluth—See "Streets and Roads."

Minn., St. Paul—See "Streets and Roads."

Minn., Walnut Grove—Until Aug. 25, by City Clerk, laying 26,000 ft. sewers. About $40,000. Druar & Smith, Globe Bldg., St. Paul, engrs.

Neb., Alliance—See "Streets and Roads."

Neb., Geneva—C. Underwood, city clk., receiving bids installing 28,000 ft. 8 in. pipe sewers. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

Neb., Red Cloud—See "Streets and Roads."

N. D., Hettinger—Until Aug. 16, by city building sewerage system, involving 21,000 lin.ft. 10-15 in. pipe and septic tank. Black & Griffin, Mandan, engrs.

N. D., Mandan—Until Aug. 21, by city, building sanitary sewerage system for South Side Dist., involving 14,000 lin.ft. 8-12 in. pipe, 36 manholes and lift station. Black & Griffin, Mandan, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Stratford** (Bridgeport P. O.)—Bd. Sewer Comrs. let contract building sewage disposal plant, chlorine treatment house and tidal basin and sludge bed, including piping and grading, etc., to Eastern Eng. & Constr. Co., 886 Main St., Bridgeport, $175,000. Noted May 15.

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contract building sanitary and storm water sewers and appurtenances in 32nd Ave., Lawrence Ave., Willets Point Blvd. and Linden St., to Porter & DeWitt, 6201-18th Ave., Brooklyn, $659,218. Noted July 31.

★**Pa., Phila.**—City let contract building Wingohocking Creek intercepting sewer, to J. J. McHugh, 1430 South Penn. Sq., cost $42,000; Knorr St. sewer from Knorr to Charles Sts., in Charles to Longshore St., in Longshore St. to Gilmore St., and in Gilmore St. to Tyson St., to J. Lombardi, 937 Carpenter St., $65,000; Cobbs Creek intercepting system in 69th St., to J. Perna, 362 North 65th St., $50,000. Noted Mar. 28.

Mich., Detroit—City received bids furnishing labor and material building 5200 ft. sewer in Mack Ave. from Hamilton Ave. to Connors Creek, from J. Porath, 34 McGraw Bldg., $118,914; J. A. Mercier, 216 Hammond Bldg., $140,000; Lennane & McIlvenna, 1205 Book Bldg., $149,000. Noted July 24.

★**Mich., Hamtramck**—See "Streets and Roads."

★**Mich., Oakland**—City let contract furnishing labor and building 8000 ft. 12-15 in. vitr. crock sewer in Dix, Zanger and Rouge Aves., involving eighteen 36 in. manholes, to Oakland Constr. Co., 165 Ft. Blvd. Detroit, $16,000.

Mich., Port Huron—City received bids building sewers in (a) Jenkinson St. with branches in 7th and 10th Sts., (b) alleys of blocks 181, 204 and 225 of White Plat, (c) alleys of blocks 180, 205, 224 of White Plat, (d) alleys of blocks 178, 207 and 222 of White Plat, (e) blocks 177, 209 and 221 of White Plat, (f) 15th St., (g) Garfield St., (h) blocks 179, 206 and 223 of White Plat, from C. Mugovero, Port Huron, (a) $11,622, (b) $2408, (c) $2612, (d) $4065, (e) $4128, (f) $14,915, (g) $4801, (h) $2668; J. Kaumeier, Port Huron, (a) $12,268, (b) $3543, (c) $3735, (d) $6005, (e) $5911, (f) $12,061, (g) $4531, (h) $4119. Noted July 24

★**Minn., St. Paul**—See "Streets and Roads."

★**Minn., St. Paul**—City let contract building storm water sewers, to O'Neil & Preston, 60 East 6th St., $88,400. Noted July 24.

★**Ore., Marshfield**—City let contract laying vitr. sewer pipe in South 6th and Elrod Sts. also paving Elrod St. with 1 course concrete, to Scandia Shipbuilding Co., Marshfield, $47,692.

★**Cal., Stockton**—City let contract building 6-10 in. lateral vitr. sewers in Fair Oaks Ave. and 11 other streets in Searchlight Tract, to E. A. Burns, Stockton, $16,806.

★**Ont., Dundas**—Municipal Council let contract laying 30 in. segmental block sewer to Toronto Potteries, Dominion Bank Bldg., Toronto, $10,175.

Bridges

PROPOSED WORK

Maine—State Highway Comm., Augusta, soon lets contract building 415 ft. concrete arch bridge, 20 ft. roadway, over Gilman Falls, to have three 105 ft. spans.

N. Y., Leroy—Town having estimates made (on basis of present prices), by J. P. Wells, engr., 249 Cutler Bldg., Rochester, for concrete arch or steel girder bridge over Oatka River connecting Mill and Church Sts. This item incorrectly noted in our issues of May 22 and July 24.

N. J., Perth Amboy—State Highway Comn., Trenton, having preliminary surveys made for relocating steel bridge over Raritan River, here. About $1,000,000. C. A. Mead, ch. engr. div. bridges and grade crossings of Pub. Utilities Comn.

Pa., Towanda—Comrs. Bradford Co. plans to build 20 x 780 ft. 8 in. rein.-con. approach to Tozer bridge over Chemung River.

Ga., Savannah—State Highway Comn., South Carolina and Georgia, and Federal Bureau Pub. Roads, having surveys made for steel draw bridge over Savannah River to connect this city and southwest section of South Carolina. About $250,000. J. R. Pennell, c/o State Highway Dept., Columbia, S. C., and H. C. Neal, c/o State Highway Dept., Atlanta, engrs.

O., Springfield—City having plans prepared for rein.-con. arch or girder type viaduct on North Limestone St. from North St. north. About $200,000. W. E. Lucas, city engr.

Mich., Ferrysburg — State Highway Comn., Lansing, soon lets contract building Bridge No. 217 over Spring Lake, near here, to have one 80 ft. single leaf bascule span with wood floor, and one 80 ft. low truss steel span, concrete floor, 20 ft. roadway with 5 ft. cantilever walk on each side, involving 1800 cu.yd. rein.-con. and 175 tons steel. F. F. Rogers, comr.

Tex., San Antonio—City voted $200,000 bonds to build bridges. H. Helland, city engr. Noted July 10.

Idaho, Lewiston—Comrs. Nez Perce Co. plan election to vote on $400,000 bonds to build concrete and steel bridges over Clearwater River at Arrow, Agatha, Myrtle and Spaulding Twps.

Idaho, Twin Falls—City retained R. M. Murray, engr., 214 Electric Bldg., Billings, Mont., to prepare plans and supervise construction of steel and concrete bridge over Rock Creek Canyon. Bonds for $250,000 voted for project.

Oregon—State Highway Comn., Portland, soon lets contract building bridge over Molalla River on Canby-Aurora Sect. of Pacific Highway, near Canby, Clackamas Co., to have three 80 ft. steel truss spans and two 30 ft., concrete spans, involving 266 lin.ft. wood trestle approach, 167,000 lb. structural steel, 45,000 lb. reinforcing steel, 325 cu.yd. Class A and 425 cu.yd. Class B concrete, 624 lin.ft trestle piling, 2100 lin.ft. foundation piling, 3 rein.-con. bridges over Neil Creek on Pacific Highway, near Ashland, 27,000 lb. reinforcing steel, 375 cu.yd. Class A concrete, 600 lin.ft. wooden piling, 200 lin.ft. concrete hand rail and 2 bridges over Birdseye Creek and Miller's Gulch, Jackson Co., 30,000 lb. reinforcing steel, 200 cu.yd. Class A concrete, 240 lin.ft. concrete hand rail, 450 lin.ft. wooden piling, 4 culverts and 3 bridges on Amity-Holmes Gap Sect. of West Side Highway, Polk and Yamhill Counties, 50,000 lb. reinforcing steel, 300 cu.yd. Class A concrete in bridges, 100 cu. yd. Class A concrete in culverts, 300 lin.ft. concrete hand rail, 600 lin.ft. wood piling, one 108 ft., one 90 ft and one 70 ft. wood truss span bridges near Spray, on John Day Highway, Wheeler Co., 75 cu.yd. Class A concrete in addition to 3 truss spans, 230 lin.ft. trestle approach. H Nunn, state highway engr.

Cal., Hanford—Bd. Supervs. King Co. directed R. Moye, co. surv., to prepare plans for 500 ft., rein.-con. bridge over Kings River, south of Kingsburg.

Cal., Yuba City—Bd. Supervs Sutter Co. soon receives bids building 1500 ft., rein.-con. trestle and 30 ft. concrete span bridge over Butte Slough, 16 ft. wide. About $45,000. E. Cope, co. engr

BIDS DESIRED

New Jersey—Until Aug. 29, by State Highway Comn., Broad St. Bank Bldg., Trenton, building Bridge No. 46, 10 ft span, 30 ft. wide, at Sta. 15-80, Route 3, Hamilton-Ancora Sect.; No. 172, 10 ft span, 30 ft. wide, at Sta. 121-40, Route 3, Hammonton-Ancora Sect.; No. 174, 15 ft span, 30 ft. wide, at Sta. 174-63, Route No 3, Ancora-Atco Sect.; No. 46, 13 ft. span, 30 ft. wide, at Sta. 415-80, Route No. 3, Ancora-Atco Sect., all rein.-con., in Camden Co. A. L. Grover, ch. clk.; advertised in this issue.

Pa., Harrisburg—Until Aug. 18, by State Highway Comm., building 2300 ft., rein.-con. and steel bridge, here, 30 ft wide. A. W. Brunner, 101 Park Ave., New York City, engr.

Pa., Shickshinny—Until Aug. 14, by Comrs. Luzerne Co., Wilkes-Barre, building 1600 ft., rein.-con. bridge, 35 ft. wide, over Susquehanna River, between here and Mocanqua. D. A. Keefe, Main St., Athens, engr. Noted April 17.

Ky., Newport—Campbell Co. receiving bids building ten 6-12 ft. concrete bridges over streams at points along Licking Pike. About $10,000.

O., Willoughby—Until Aug. 25, at office of Bd. Comrs. Lake Co., (Painesville), building rein.-con. viaduct and approaches over Chagrin River and Valley, here. W. J. Watson and W. P. Brown, 1101 Hippodrome Bldg., Cleveland, consult. engrs.

Mont., Great Falls—Until Aug. 25, by State Highway Comn., Helena, building 970 ft. concrete bridge, 42 ft. wide, on 1st Ave. and 1200 ft. concrete bridge, 44 ft. wide, on 10th St., both over Missouri River P. D. Pratt, c/o State Highway Dept., Helena, engr. Noted Mar. 7, 1918

Okla., Warwick—A. L. Mills, receiver, Ft. Smith & Western Ry., Ft. Smith, Ark., receiving bids building 120 ft steel bridge (Cooper's E-40 loading) over Deep Fork Drainage Canal, near here.

B. C., Pritchard — Until Aug. 18, by A. E. Foreman, engr., c/o Dept. Pub. Wks., Victoria, building 132 ft. timber bridge over Thompson River, here, 16 ft. wide, with 1000 ft. approach, involving 1600 lin.ft. wooden piling. About $30,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Springfield**—A. D. Potter, Greenfield, let contract building 1 story, 100 x 290 ft. brick, warehouse and 100 ft. grain elevator, timber, concrete flooring, concrete foundation, on Page Blvd. and St. James Circle, to E. F. Carlson Co., 310 Main St. and Cordner & Montague, 373 Bay St. About $100,000. Noted July 31.

N. Y., Watertown—City received bids July 18, building rein.-con. bridge over Black River on Pearl St., from Peckham Constr. Co., Niagara Life Bldg., Buffalo, $335,815; Walsh Constr. Co., Herald Bldg., Syracuse, $345,932; Scott Bros., Arlington Blk., Rome, $385,495. Noted July 10.

Pennsylvania — State Highway Dept. Harrisburg, received bids building triple span highway bridge, rein.-con. floor system, also for additions and repairs to present piers and abutments, in "Lackawanna Trail," Wyoming Co., from Anthracite Bridge Co., 310 Ganet St., Scranton, $56,538; W. S. Rae, 439 Oliver Bldg., Pittsburgh, $64,067; Whittaker & Diehl, Union Trust Bldg., Harrisburgh, $70,744; also building truss highway bridge, rein.-con floor system, also for additional repairs to abutments, Route No. 127, York Twp., York Co., G. A. and F. M. Wagman, Dallastown, $28,938; G. W. Ensign Co., Inc., Harrisburg Bank Bldg., Harrisburg, $35,205; Whittaker & Diehl, Union Trust Bldg., Harrisburg, $43,023.

★**Pa., Summerville**—Jefferson Co., Brookville, let contract building rein.-con. bridge, involving 929 cu.yd. rein.-con., 77 cu.yd masonry, 56½ tons steel and 457 cu.yd. dry, 37 cu.yd. wet and 64 cu.yd. rock excav., to Concrete Steel Co., Clarksburg, W. Va. About $39,000.

★**Mich., Mt. Clemens**—F. F. Rogers, state highway comr., Lansing, let contract building 230 ft. rein.-con. bridge over Clinton River on Gratiot Ave., 60 ft. wide, 75 ft. center span with two 70 ft approach spans, 45 ft. roadway with walks on each side, to T. E. Currie, 20 McGraw Bldg., Detroit, $90,000. Noted June 26.

★**Minn., Pine River**—Comrs. Cass Co. (Walker) let contract building bridge No. 3070 on Highway No. 24, 710 ft. long, to Gervais & Rockeford, 1924 Fremont Ave., N., Minneapolis. About $15,000. Noted July 10 under Walker.

Prnges (Continued)

Ariz., Florence—T. Maddock, state engr., Phoenix, received bids building 120 ft. rein.-con. span arch bridge over Queen Creek on Mesa-to-Superior Highway, from Topeka Bridge & Iron Co., Stormont Bldg., Topeka, Kan., $14,000; (180 days); J. C. Steele & Co., Phoenix, $18,606, (120 days); C. Hover, Phoenix, $19.968, (120 days). State furnishes 642 bbls. cement and 40,000 lbs. reinforcing steel.

★**Wash., Mataline Falls**—Comrs Pend Oreille Co., (Newport) let contract building steel bridge with concrete piers, here, to Union Bridge Co., Fenwick and Kenton Sts., Portland, Ore. About $64,000.

Ore., Newberg—Tamhill Co. (McMinnville) received bids July 21, building 580 ft. rein.-con. viaduct on Newberg Rd., near here, from J. W. Sadler, Albany, $19,040; L. O. Herrold, $54,638; R. Walkerfield, Worcester Bldg., Portland, $55,409. Noted July 10.

Cal., San Diego—Bd Supervs. San Diego Co. received lowest bid building 180 ft. rein.-con. girder type bridge near Cardiff, involving 700 cu.yd. excav., 3742 lin.ft. wood piling, 605 cu.yd. rein.-con. and 39 tons reinforcing steel, from Johnson & Gaston, San Diego, $26,900. Noted July 17.

★**Que., Yamichiche**—City let contract building 52 ft. steel and concrete bridge over River aux Glaises, 20 ft. wide, to E. Vaitlancourt, Yamichiche. About $15,000.

Structural Steel

PROPOSED WORK

Tex., Cisco—See Water-works."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mich., Detroit—See "Industrial Works."

Reinforced Concrete

PROPOSED WORK

Tex., Cisco—See Water-works."

Cal., Balboa—See "Miscellaneous"

Cal., Hanford—See "Bridges"

Cal., Santa Paula—See "Industrial. Works."

Cal., Yuba City—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mich., Detroit**—See "Industrial Works."

★**Ill., Chicago**—See "Industrial Works."

Ariz., Florence—See "Bridges."

★**Cal., Bishop**—See "Buildings."

Streets and Roads

PROPOSED WORK

Conn., Hartford—Bd Contr. & Supply soon lets contract paving 6175 ft. Wethersfield Ave., sheet asphalt on 6 in. concrete base. About $75,000. Incorrectly noted in our issue July 24. Contract let to Miller Sidewalk Co., was for resetting curbs and walks, preparatory to above paving.

Conn., Willington—Town appropriated $20,000 bonds to improve roads. C. J. Bennett, c/o State Highway Dept., Hartford, engr.

N. Y., Herkimer—Village soon receives bids paving and building sewers in Folts, Steuben, South Washington and Smith Sts. Former bids rejected. C. L. Wood, city engr. Noted July 24.

N. J., Bordentown—City plans to pave Burling, 2nd, Church, Mary and Spring Sts., about 1 mi., concrete. About $25,000. J. H. Eaton, City Hall, engr.

N. J., Highland Park (Mt. Ephriam P. O.)—Boro Council plans to grade, curb and pave Lincoln Ave. from Raritan to Lawrence Aves., cost, $20,000; South 1st Ave. from Raritan to Harper St., $35,000; South 3rd Ave. from Raritan to Valentine St., $50,000; North 3rd Ave. from Raritan to Lawrence Ave., $35,000; Park Pl., $6000.

N. J., North Bergen—City rejected bids improving Hamilton Ave., bituminous surface. About $20,000. Work will be readvertised about Aug. 8. Noted July 31.

N. J., North Bergen—Town Council plans to improve Anderson Pl., part of Willow Ave. Courtlandt Pl. and South St., bituminous. About $10,000 each. P. F. Daly, engr.

Pennsylvania—State Highway Dept., Harrisburg, received no bids building roads in counties as follows:

Chester Co., 21,619 ft. bituminous macadam surface course, penetration method, Franklin and New London Twps.; 10,509 ft. bituminous surface course, penetration method, East and West Marlboro Twps.

Crawford Co., 640 ft. rein.-con. and Hillside vitr. brick, Routes No. 89 and 18, East Mead Twp.

Erie Co., 7900 ft. bituminous surface on concrete foundation, or 1 course rein.-con., Route No. 304, Northeast Twp.

Pa., Pittsburgh—City passed ordinance to widen portions Brownsville and Pioneer Aves., between Templeton and West Liberty Ave.; also grade, pave and curb Bricelyn St., from Tokio St. to Wilkinsburg Ave., cost $33,000; McCandless Ave., from 53rd to 56th St., $41,000; Swope St. and Way, from Ravenna St. to Alder St., $14,000; Stadium St. from Stafford St. to Radcliffe St., $9000; and Sidney St., from South 24th St. to South 25th St., $13,000. T. Reed, city engr.

Pa., Pittsburgh—City passed ordinance to grade, pave and curb Melwood St., from Ridgeway to Denver Sts. About $90,000. M. S. Sprague, city engr.

Pa., Turtle Creek—City soon lets contract repaving 1200 ft. Pennsylvania Ave. from Union Railroad to Boro. line, 34 ft. wide, involving 1400 sq.yd. excav. and 3410 sq.yd. brick. Harrop & Hopkins, 801 Hometrust Bldg., Pittsburgh, engrs.

W. Va., Beckley—Raleigh Co., Marsh Fork Dist., plans election soon to vote on $195,000 bonds to improve roads. C. L. Scott, Jr., Beckley, engr.

W. Va., Berkeley Springs—Morgan Co. having plans prepared and soon receives bids building 2 mi. Berkeley Spring-Hancock Rd., surfacing 16 ft. wide and grading 24 ft. wide, involving 9000 cu.yd. excav. and 14,000 sq.yd. cement concrete surfacing. About $42,000. C. A. Rathrock, Berkeley Springs, engr.

W. Va., Charlestown—Comrs. Jefferson Co. had plans prepared resurfacing 7.37 mi. Harpers Ferry—Charlestown Pike, surfacing 16 ft. wide, grading 26 ft. wide, involving 11,000 cu.yd. excav. and 69,000 sq.yd. bituminous macadam. About $77,000. Federal Government asked to appropriate $38,000 toward cost. J. K. Hendricks, Charlestown, engr.

W. Va., Charleston See "Buildings"

W. Va., Elkins—Comrs. Randolph Co. rejected bids received improving 1.92 mi. Street Car Rd., 22 ft. wide, involving 18,000 cu.yd. excav. About $17,000. F. A. Parsons, Elkins, engr. Noted May 22.

W. Va., Hinton—Summers Co., Green Sulphur and Forest Hill Dists., plan to vote on $100,000 and $27,000 bonds to improve roads in respective district. J. D. French, Hinton, engr.

W. Va., Logan—Comrs. Logan Co. plan to pave 1.3 mi. Logan-Milton Rd., concrete. About $39,380. H. McCormack, Logan, engr.

W. Va., Madison—Boone Co., Sherman Dist., plans election soon to vote on $130,000 bonds to improve 22 mi. Jerrold's Valley-Racine Rd., 20 ft. wide. S. E. Bradley, Madison, engr.

W. Va., Moorefield—Comrs. Hardy Co. having plans prepared graveling, surfacing and draining 7.76 mi. Petersburg-Moorefield-Romney Rd., surfacing 16 ft. wide, grading 26 ft. wide, involving 12,000 cu.yd. excav. and 65,700 sq.yd. gravel surfacing. About $43,700. J. P. Stover, Moorefield, engr.

W. Va., West Union—Doddridge Co., McCellan Dist., plans election soon to vote on $250,000 bonds to improve roads. J. M. Martin, West Union, engr.

W. Va., Winfield—Putnam Co., Scott Dist., plans election soon to vote on $20,000 bonds to improve roads. G. H. Davis, Charleston, engr.

W. Va., Woodsdale—City plans to improve 35,000 sq.yd. of various streets. Bonds for $100,000 voted for project.

S. C., Columbia—Richland Co. election Aug. 18 to vote on $2,000,000 bonds to build 300 mi. hard surfaced roads. Engineer not selected.

S. C., Edgefield—Comrs. Edgefield Co. soon let contract relocating, grading, draining and surfacing with top soil 8.42 mi. Dixie Highway from here to Turkey Creek, 30 ft. wide. About $40,000. J. R. Pennell, c/o State Highway Dept., Columbia, engr. Noted July 24.

S. C., Greenville—Comrs. Greenville Co. soon let contract improving 3.03 mi. road from here to Travelers Rest, 30 ft. wide, involving 29,000 sq.yd. 2½ in. bituminous macadam and 2100 tons crushed stone for shoulders. About $35,000. J. R. Pennell, c/o State Highway Dept., Columbia, engr.

S. C., Winnsboro—Fairfield Co. election Aug. 26, to vote on $400,000 bonds to build 200 mi. road. Engineer not selected.

Miss., West Point—Clay Co. soon lets contract furnishing material and building macadam roads in Rd. Dists. Nos. 1 and 2 of Supervs. Dist. No. 5. About $70,000. L. J. Howard, clk.

Louisiana—State Highway Comn., New Orleans, rejected bids received July 24 gravel surfacing 8.35 mi. Shreveport-Arkansas Highway, from Myra to Arkansas Line, Caddo Parish. D. Buie, c/o State Highway Dept., New Orleans, engr. Noted July 17.

La., Alexandria—Comrs. Rapids Co. will sell $2,000,000 bonds Aug. 20, to build roads. I. W. Sylverter, superv. engr.

La., Gretna—Jefferson Parish soon lets contract paving Anson St. from Washington to Monroe Sts., Washington St. from Hamilton to Anson Sts., Monroe St. along street through the Brooklyn Pasture and Front St., Monroe St. from 2nd to Front St., 2nd St. from Corpernicus Ave. to Monroe St., Corpernicus Ave. from 4th to Front St., Monroe St., from Anson St. to Parish line of New Orleans, bitulithic concrete and vitr. brick on 6 in. concrete base, stone curbing. F. T. Payne, city engr.

La., New Orleans—City plans to pave Rampart St. from Calliope to Melpomene Sts., Dufossat St. from Constance St. to Dock Board Roadway, Baronne St. from Howard Ave. to Melpomene St., Girard St. from St. Charles to Rampart St., wood block, asphalt or concrete on 6 in. concrete base, stone curbing and Shillinger sidewalks; Sycamore St. from Lowerline St. to Bway., St. Ann St. from Decatur to North Rampart St., 2190 ft., cost $30,375; 1400 ft. Orlean St. from Royal to North Rampart Sts., 24 ft. wide, 2600 ft. Barracks St. from North Peters to North Rampart St., 22½ ft. wide, $32,625; 2190 ft. St. Peter St. from Decatur to North Rampart St., 22 ft. wide, wood block, asphalt, concrete or waterbound macadam on 6 in. concrete base, stone curbing and artificial stone sidewalks, $86,580. T. L. Willis, city engr.

La., New Orleans—City plans to subsurface, drain and pave 650 ft. Constance St. from Howard to Calliope Sts., 24 ft. wide, involving 1380 sq.yd. granite or wood block on 6 in. concrete base, 1050 lin.ft. stone curbing and 620 lin.ft. Shillinger sidewalk, cost $11,500; 770 ft. Calliope St., from Waters to South Peters Sts., 29 ft. wide, 1980 sq.yd. granite or wood blocks on 6 in. concrete base, 330 cu.yd. concrete, 1160 lin. ft. stone curbing, 500 sq.yd. Shillinger sidewalk and 300 cu.yd. earth excav., $18,480; 1650 ft. Poydras St., from Camp to Delta Sts., 50 ft. wide, 9650 sq.yd. granite or wood block on 6 in. concrete base, stone curbing, 3500 lin.ft. granite block gutter, $51,820; 1380 ft. Thalia St., from Tchoupitoulas St. to Dock Board Roadway, 25 ft. wide, 3000 sq.yd. granite block, 200 cu.yd. concrete on 6 in. concrete base, 2500 lin.ft. stone curbing, 450 sq.yd. Shillinger sidewalk and 1200 cu.yd. earth excav., $20,250; 2850 ft. Erato St., from Camp to Water Sts., 29 ft. wide, 9750 sq.yd. granite or wood block, 1625 cu.yd. concrete on 6 in. concrete base, 5250 lin.ft. stone curbing, 3400 sq.yd. Shillinger sidewalk and 3200 cu.yd. earth excav., $34,200; 2720 ft. Front St., from Canal to St. Joseph Sts., 36 ft. wide, 9080 sq.yd. granite or wood block on 6 in. concrete base, 3500 lin.ft. stone curbing, 1000 sq.yd. Shillinger sidewalk and 2600 cu.yd. earth excav., $43,520; 5200 ft. South Peters St., from Canal to Thalia Sts., 40 ft. wide, 18,120 sq.yd. granite or wood blocks, and 3020 cu.yd. concrete on 6 in. concrete base, 7700 lin.ft. stone curbing, 2620 cu.yd. earth excav., etc., $123,000; 1320 ft. Poeyfarre St., from Camp to Tahoupitoulas Sts., 27 ft. wide, 4365 sq.yd. granite or wood block, and 725 cu.yd. concrete on 6 in. concrete base, 2250 lin.ft. stone curbing, 1950 sq.yd. Shillinger and brick sidewalk, and 1500 cu.yd. earth excav., $30,000; 1660 ft. Annunciation St., from Howard Ave. to Thalia St., 40 ft. wide, 13,100 sq.yd. granite or wood block or 12,120 sq.yd. asphalt and 2180 cu.yd. concrete on 6 in. concrete base, 2950 lin.ft. stone curbing, 1350 sq.yd. Shillinger sidewalk and 1340 cu.yd. earth excav., $37,000; 514 ft. Constance St., from Julia to St. Joseph Sts., 24 ft. wide, 1380 sq.yd. granite or wood block, and 260 cu.yd. concrete on 6 in. concrete base, 1040 lin.ft. stone curbing and 360 sq.yd. Shillinger sidewalks, $5140; 3150 ft. Gaiennie St., from Camp St. to Dock Board Roadway, 28 ft. wide, 7750 sq.yd. granite or wood block and 1710 cu. yd. concrete on 6 in. concrete base, 5300 lin.ft. stone curbing, 1030 sq.yd. Shillinger

Streets and Roads (Continued)

sidewalk and 3360 cu.yd. earth excav.; 1560 ft. Gravier St., from Camp to Delta Sts., 28 ft. wide, involving 4850 sq.yd. granite or wood block, 7290 sq.yd. concrete on 6 in. concrete base, 2150 lin.ft. stone curbing, 2800 sq.ft. granite gutter and 1000 sq.yd brick and Shillinger sidewalk, $17,950; paving and resetting old granite block gutter and curb, on 900 ft Common St., from Magazine to Front Sts., 26 ft wide, involving 2480 sq.yd. granite or wood block and 415 cu.yd. concrete on 6 in concrete base, resetting 800 lin.ft., stone curbing and relaying 400 sq.yd. Shillinger sidewalk, $14,420. T. L. Willis, city engr

O., Dayton—City plans to pave 1750 ft. Pursell Ave from Wayne to Wyoming Sts., 30 ft. wide, involving 5850 sq.yd waterbound macadam, 3500 lin.ft. cement curbing and guttering and 3500 lin.ft cement sidewalk About $25,350. F O Eichelberger, city engr.

O., Dayton—J. Hertzram, 134 East 3rd St., has acquired 11 acre site between Euclid and Harvard Aves. and plans to build new sub-division, involving graveling streets, laying cement curbs and gutters, etc. About $15,000.

O., Hamilton—City passed ordinance to pave, curb and gutter Wayne Ave. from C to E Sts., Dick, Edgewood and Wiea Aves., also Virginia St. Work involves 5000 sq. yd. asphalt or tarvia macadam, 2500 lin.ft. cement curbing, and 2500 lin.ft. cement guttering. About $35,000 W Weaver, city engr.

O., New Lebanon—City plans to pave 1900 ft. Main St., 32 ft. wide, involving 6750 sq.yd. rein.-con. and 3800 ft. cement curbing and guttering. About $35,000. S. Sharts, Court House, Dayton, engr.

O., Oak Harbor—City receives bids about Oct. 1, paving Benton, Mill, Maple and Park Sts., 20 ft. wide. About $45,000. G. Champe, 610 Nasby Bldg., Toledo, engr.

O., Toledo—City receives bids about Sept. 1, paving 1100 ft. Thatcher Dr. and Lexington Ave., 22 ft. wide, involving 2340 sq.yd. vitr. brick, 2070 lin.ft. concrete curbing and guttering and 1608 cu.yd. earth excav., cost $13,647; 1346 ft. Starr Ave. from Dearborn St. to city line, 32 ft wide, 4350 sq.yd vitr. brick, 2555 lin.ft. stone curbing and 1794 cu.yd earth excav., $24,571; 2629 ft. Bennett Rd. from Sylvania Ave. to city line, 24 ft. wide, 7064 sq.yd. vitr. brick, 5262 lin.ft. curbing and 5114 cu.yd. earth excav., $40,000. H. C. McClure, city engr

O., Toledo—Lucas Co. having surveys made and plans prepared building 7700 ft. Perrysburg-Holland Rd. No. 57, 16 ft. wide, involving 13,940 sq.yd. concrete and 8351 cu.yd. earth excav., cost $40,000; 17,500 ft. Waterville-Swanton Rd. No. 59, 16 ft. wide, concrete. C. L. Rood, co engr.

O., Wauseon—City receives bids about October paving ½ mi. Chestnut St., 20 ft. wide. About $20,000. G. Champe, 610 Nasby Bldg., Toledo, engr

Michigan—F. F. Rogers, state highway comr., Lansing, soon lets contract grading, shaping, draining and building concrete culverts and bridges on 13.5 mi. Trunk Line Rd. in Scippo, Moscow and Somerset Twps., Hillsdale Co.

Michigan—State Highway Comn., Lansing, soon lets contract shaping sub-grade and surfacing with gravel 5.972 mi. road, 16 ft. wide. Alcona Co., involving 8771 cu.yd. gravel. F F Rogers, comr

Mich., Detroit—See "Miscellaneous."

Mich., Detroit—City soon lets contract paving following alleys with one course concrete, medina retaining stone:

No. 1046, between La Salle Blvd., 14th St., La Mothe and La Salle Gardens, S., involving 315 cu.yd. excav., 1430 sq.yd. pavement, 1267 lin.ft. retaining plank, etc.

No. 1047, between Lawton, Grand River and Kirby Aves., 20 ft wide, 202 cu.yd. excav., 620 sq.yd. pavement, 438 lin.ft. retaining plank, etc.

No. 1048, between Scatton Ave., Deming St. and Michigan Central Ry., 20 ft. wide, 162 cu.yd. excav., 473 sq.yd. pavement, 412 lin.ft. retaining stone, etc

No. 1049, between Lawton, Linwood, Montgomery and Columbus Aves., 20 ft. wide, 495 cu.yd. excav., 1779 sq.yd. pavement, 1610 lin.ft. retaining plank, etc.

No. 1050, between Russell, Riopelle, Warren and Theodore Sts., 19 ft. wide, 332 cu.yd. excav., 1097 sq.yd. pavement, 1019 lin.ft. retaining plank, etc.

No. 1051, between Dexter Blvd., Northwestern and Hagarth Ave., 18 ft. wide, 103 cu.yd. excav., 476 sq.yd. pavement, 387 lin.ft. retaining plank, etc.

No. 1052, between Hastings, Rivard, Catherine and Sherman Sts., 20 ft. wide, 602 cu.yd. excav., 1328 sq.yd. pavement, 680 lin. ft. retaining plank, etc.

No. 1053, between Lawton St., Ferry Park and West Grand Blvd., 20 ft. wide, 230 cu.yd. excav., 715 sq.yd. pavement, 593 lin. ft. retaining plank, etc.

No. 1054, between Tillman, Williams, Stanley and McGraw Aves., 20 ft wide, 145 cu.yd. excav., 429 sq.yd pavement, 385 lin.ft. retaining plank, etc.

No. 1055, between 15th and 16th Sts., Stanley and Antonette Aves., 20 ft. wide, 427 cu.yd. excav., 1213 sq.yd. pavement, 1034 lin.ft. retaining plank, etc.

No. 1056, between 15th, 16th Sts., Linden and Poplar Sts., 20 ft. wide, 312 cu.yd. excav., 978 sq.yd. pavement, 880 lin.ft. retaining plank, etc.

No. 1057, between Brush, Oakland, Leicaster and Kenilworth Aves., 20 ft. wide, 613 cu.yd. excav., 1850 sq.yd. pavement, 1665 lin.ft. retaining plank, etc. Total cost, about $34,300.

Mich., Flint—City having plans prepared by J. Shoecraft, engr., City Hall, building 1 mi. boulevard on north side of city, extending from Saginaw to Marquette Sts., 80 ft. wide. Plans include grading and terracing with ornamental fixtures in center with double driveway paved and curbed.

Wisconsin—State Highway Comn., Madison, Div. No. 1, received no bids improving Beloit-Janesville Rd., Rock Co., Federal Aid Project No. 95 and County Line Rd., Dodge and Jefferson Counties, Federal Aid Project No. 72. Noted July 17.

Wisconsin—State Highway Comn., La Crosse, Div. No. 5, rejected bids received improving Fountain City-Winona Rd., Buffalo Co., Federal Aid Project No. 87. Noted July 10.

Wis., Florence—Florence Co. voted $100,000 bonds to build roads.

Wis., Reedsburg—City soon lets contract grading and paving 2.5 mi. South Water, North Park, Locust and 3rd Sts., 18 ft. wide, involving 8950 sq.yd. vitr. brick and 5000 lin.ft. concrete curb and gutter About $35,000. A. F. Niebuhr, city engr.

Wis., Reedsburg—City having plans prepared by A. F. Niebuhr, engr., City Hall, grading and paving 1.8 mi. Main St., between East Oak St. and Dewey Ave., 20 ft. wide, involving 5900 sq.yd. vitr. brick. About $20,000.

Wis., Sheboygan—City plans to grade and pave 2.9 mi. North Water St. from Pennsylvania to Erie Aves., and from 13th St. to Michigan Ave., 20 ft. wide, involving 25,000 sq.yd. vitr. brick and 4000 lin.ft. concrete curb and gutter. About $35,000. C. U. Boley, city engr.

Wis., Superior—Dept. Pub Wks. receives bids about Aug. 15 concrete paving 6.74 mi. Oakes Ave. from Winter to 21st Sts., 347,800 ft., Tower Ave. 5200 ft. Tower Ave. from section 34 to 58th St., 4th St. from Tower to Grand Aves., Clough Ave. from 4th to 12th Sts., Lamborn Ave. from 3rd to Main Sts., Becker Ave. from West 6th to West 10th Sts., Banks Ave. from 21st to 28th Sts., Weeks Ave. from 18th to 21st to West 6th Sts., John Ave. from 24th to 28th Sts., L Ave. from West 5th to 7th Sts., 54th St. from Tower Ave. to Northern Pacific R.R. and Main St. to Interstreet bridge. Total cost $307,811. E. B. Banks, Engineers Office, City Hall.

Minn., Bemidji—Comrs. Beltrami Co. soon let contract grading and graveling 30 mi. Federal Aid Project No. 57, 24 ft. wide. About $180,000. S. D. Snyder, Bemidji, engr.

Minn., Duluth—J. A. Farrell, city comr., soon lets contract paving 54th Ave., E., from London Rd. to Glendale St., $33,595

Minn., Grand Rapids—Comrs. Itasca Co. rejected bids received July 14, grading and graveling 10 mi. Federal Aid Project No. 52, State Rd. No. 6, 24 ft. wide. About $50,000. Work will be readvertised. O. J. Lidberg, Jackson, engr Noted June 26.

Minn., Red Wing—Comrs. Goodhue Co. rejected bids received July 17, graveling 21.25 mi. Federal Aid Project No. 20, State Rds. Nos. 1 and 3, 24 ft. wide. Work will be advertised. J. A. Prior, Red Wing, engr. Noted July 3.

Kan., Fredonia—Wilson Co having plans prepared building 25 mi. gravel road. South Western Eng. Co., Hutchinson, engrs.

Neb., David City—City soon receives bids paving 39 blocks, 24 ft. wide. About $175,000. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

N. D., Fargo—City soon lets contract paving 7000 sq.yd. 3rd St., asphalt, bitulithic, bitumnous concrete, Portland cement, or vitr brick About $30,000. R T Jacobes, city engr.

Mo., Benton—Scott Co soon receives bids graveling 2 mi Kingshighway About $50,000 M S Murray, Benton, engr

Texas—State Highway Dept., Austin, soon lets contract surfacing with earth and gravel and building rein.-con. drainage structures on 10.849 mi Highway No. 30, 16 ft wide, between Abilene and Runnels Co. line, involving 14,600 lin.ft. machine grading, 42,223 cu.yd. earth excav., 491 cu. yd. concrete and 18,682 lb. reinforced steel etc., cost $28,599. 20.661 mi. Federal Aid Project, Highway No. 30, 16 ft. wide, running from Abilene toward Runnels Co. line, 76,742 cu.yd. earth excav., 46,720 lb. reinforced steel, etc., $58,803; 2.098 mi. Federal Aid Project No. 90, Highway No. 7, known as Tuscola View Rd., 16 ft wide, 14,534 cu.yd. earth excav., 145 cu.yd. concrete, etc., $13,618; 5.405 mi. Highway No. 7, 16 ft. wide, 32,855 cu.yd. earth and borrow excav., 5.5 acres clearing and grubbing, 105 cu.yd. concrete, $21,568, all in Taylor Co. H. E. Elrod, 505 Interurban Bldg., Dallas, engr.

Tex., Boston—Bowie Co. plans to gravel surface and build rein.-con. drainage structures on 2.965 mi. Highway No. 1, from point 6 mi. west of Texarkana to Red Water, 9 ft wide, involving 51 cu.yd. concrete, 29,319 cu.yd. earth excav. and 3107 lb. steel. About $20,000. Hess & Skinner, Southwestern Life Bldg., Dallas, engr.

Tex., Bryan—Brazos Co. election Aug. 19 to vote on $1,500,000 bonds to build roads. J. T. Maloney, co. judge.

Tex., Cisco—See "Waterworks."

Tex., Ft. Worth—Tarrant Co. voted $3,450,000 bonds to build roads. H. P. Hays, c/o Hess & Skinner, Southwestern Life Bldg., Dallas, engr. Noted July 10

Tex., Menard—Menard Co. election Aug. 23 to vote on $275,000 bonds to build State Highways Nos. 10 and 30 and main laterals J. D. Scruggs, co. judge.

Tex., San Antonio—City voted $950,000 bonds to widen and open streets, $900,000 to pave and install sewers in various streets, and $50,000 to build sidewalks H Helland, city engr. Noted July 10.

Tex., Seguin—Guadalupe Co. voted $100,000 bonds to improve roads along Galveston, Harrisburg and San Antonio R.R. from here to Bexar Co. line, connecting link of Houston-San Antonio Highway. Engineer not selected. J. B. Williams, co. judge.

Idaho, Boise—Ada Co. election Aug. 30, to vote on $1,000,000 bonds to build and improve highways.

Idaho, Lewiston—North Fork Highway Dist. plans to grade, gravel and surface 15 mi. Lewiston-Missoula Sect of Lewis and Clark Highway. About $100,000 A J Warren, Northfork, engr.

Idaho, Orofino—North Fork Highway Dist. plans to grade and hard surface new link between North and South Highways. Bonds for $140,000 sold for project.

Idaho, Preston—City election Aug 11, to vote on $25,000 bonds to pave streets and $18,000 bonds to macadamize 3 mi of suburban roads.

Ariz., Florence—Pinal Co. election Sept. 16, to vote on $1,000,000 bonds to build following roads: Florence to Superior, $150,000, Mt. Lemmon Rd., $15,000, Florence to Casa Grande, $178,500, Casa Grande to Maricopa, $3800, Oracle to Mammoth, $65,000, streets in Ray, $61,000 Toltec north, $1400, Casa Grande to Pima Co., $164,100, Riverside bridges, $5000, Florence to Price, $5000, Ray to Superior, $160,200, streets in Superior, $10,000, Ray to Kelvin, $95,000, Casa Grande to Sacaton, $26,000, Casa Grande South, $40,000 and Troy Rd., $10,000.

Wash., Anacortes—City Council rejected bids received July 15, paving 8396 ft 7th, 8th, 9th and K Aves., 16 ft. wide About $37,329 Forty-eight per cent property holders objected to improvement and it was sustained by city council. Noted July 10

Wash., Anacortes—City Council received no bids July 15 paving 35th St. from Commercial St. to V Ave., concrete or bituminous top on concrete base, and Fidalgo Rd from V Ave. to city limits, concrete, 16 ft. wide. About $33,014. Plans will be revised W B Short, city engr.

Wash., Camas—City Council soon lets contract grading and building concrete curbs and sidewalks on D St.; also macadamizing 24 ft. center strip and laying lateral sewers in Gracey and Spruce Sts. Cost, street work, $19,190, and sewer $4098. C. E. Farr, city clk

Streets and Roads (Continued)

Wash., Centralia—City plans to pave 4th, 5th and D Sts. and Towler Ave., concrete, bitulithic or asphaltic concrete. Cost to exceed $10,000.

Wash., Chehalis—City Comrs. received no bids July 18, paving Cascade Ave. from Main to Washington Sts., concrete. About $10,000. Work will be readvertised.

Wash., Colville—City Council adopted resolution to construct concrete sidewalks on Columbia and Birch Sts., from South Main St. to city limits, 1st St., from North Main St. to 5th Ave., 2nd St. and Oak St., from 6th Ave. to 1st, 4th and 3rd Sts., also portions of Maple, Cedar and Elm Sts. Cost will exceed $10,000.

Wash., Colville—City Council rejected bids received July 21, paving 5 blocks Main St., concrete. Owing to irregularity in publishing ordinance, bids were returned to bidders for later submission. Noted Aug. 7.

Wash., Kent—City plans to grade and gravel Winner Ave., also 1st St. from Winner St. to Sole Ave., Cloudy Ave. from 1st to 2nd Sts., and Cole Ave. from 1st to 2nd Sts. Cost to exceed $10,000. R. M. McHugh, city engr.

Wash., Seattle—Bd. Pub. Wks. received no bids July 18, paving Empire Way et al, involving 270 lin.ft. 24 in. clay pipe and 1000 lin.ft. 6 in. side sewers, etc. About $329,962. Work will be readvertised. A. H. Dimock, city engr.

Wash., Seattle—Bd. Pub. Wks. received no bids July 25, improving Bennett St., et al. from Empire Way to Renton Ave. Work involves 2700 cu.yd. earth excav., 910 sq.yd. concrete sidewalk and 11,000 ft wood curbing and guttering.

Wash., Tacoma—Comrs. Pierce Co. rejected bids paving 1 mi. Milton Ave., concrete. About $21,600. E. A. White, co. engr.

Wash., Waterville—Douglas Co. soon lets contract grading, draining and surfacing Local Impvt. Rd. No. 4, near Winthrow, gravel or crushed rock. About $10,000. R. L. Richards, co. engr.

Wash., Wenatchee—Chelan Co. plans to improve Chelan-Manson Rd., 9 ft. wide; Wenatchee-Leavenworth Rd., 18 ft. wide; State Rd. No. 10, from Ribbon Cliff to Sunnypole; road from Wenatchee south to County line; Entiat Valley Rd up river; Squillchuck Rd.; Malaga West Rd.; Church-Ingalls Creek Sect. of Blewett Pass Rd., all Portland cement concrete; building East Cashmere bridge, also bridges across Peshastin Creek and Entiat River, all concrete. Total expenditure, $1,127,000. About $830,000 of which is derived from bond issue, $297,000 from Permanent Highway fund, and balance from Federal Government.

Wash., Yakima—Comrs. Yakima Co. plan to issue $100,000 bonds to hardsurface and build connecting links between highways in county. W. C. Marion, Yakima, engr.

Oregon—State Highway Comn., Salem, having plans prepared grading and surfacing 15 mi. John Day River-Blalock Sect. Columbia River Highway. About $350,000. H. Nunn, state highway engr.

Ore., Baker—City having plans prepared grading, surfacing and building sidewalks in suburban sections. About $10,000. A. Mahan, comr.

Ore., Bend—See "Sewers."

Ore., Forest Grove—City soon lets contract hardsurfacing 3rd and 5th Aves., A and Main Sts., asphaltic concrete or bitulithic concrete; also laying vitr. or cement drain pipes, and building concrete curbs. About $10,000. W. P. Dyke, city recdr. Cost to exceed $10,000. Noted May 29.

Ore., Ontario—City voted $20,000 bonds to pave and improve streets. L. C. Kelsey, 410 Selling Bldg., Portland, engr.

Ore., Portland—City received no bids paving 46th Ave. from Kern Park to 67th St., S. E. O. Laurgaard, city engr.

Ore., Portland—City soon lets contract paving Marion Ave. from East 15th to East 17th Sts.; East 17th St. from Linn to Clatsop Aves.; Olin St. from Willamette Blvd. to Lombard St., cost $7280; 56th Ave. S. E. from 72nd to 77th Sts., S. E., $6472, artificial stone or asphaltic sidewalks on concrete foundation, not less than 3 in. in depth; Division St. from Grand Ave. to East 10th St., $17,397; East 47th St. from East Glisan St. to connect with pavement at south end regrade project, $14,488; Umatilla Ave. from East 19th to East 23rd Sts., $8532; Girard St. from Haven to Newman Sts., $8726; East 11th St. from Going to Alberta Sts., $6233; East Morrison St. from East 30th to East 32nd Sts., $1705; East Madison St. from East Water to East 1st Sts., $1157; East 9th St. from East Ash to East Burnside Sts., $2104; Klickitat St. from East 24th to East 33rd Sts., East 27th St. from Klickitat to Fremont Sts., $24,546; East 60th St. from East Glisan to Oregon Sts., excepting Portland Ry. Light & Power Co. right of way laying rails, pattern and weight to be approved by City Council, laying 12 in. foundation under track of crushed rock, laying concrete base between ties and paving with basalt stone block or brick block between rails extending 1 ft. outside of rails, $3460; East 16th St. from Marion to Spokane Ave., $17,909, all asphaltic concrete or concrete pavement Nos. 1 and 2 on crushed rock base; Tacoma Ave. from East 17th to East 21st St., 16 ft. wide, crushed rock macadam or gravel macadam, $7800. O. Laurgaard, city engr.

Ore., Portland—City soon lets contract paving and building sidewalks on Clatsop Ave., 46th Ave. S. E. from 67th St. S. E. to Kern Park, crushed rock or gravel macadam, East 10th St. from Killingsworth to Durham Aves., artificial stone or asphalt sidewalks on concrete foundation not less than 3 in. in depth, East Caruthers St. from East 37th St. to Almond Addition, Woodward Ave. from East 19th to East 21st Sts., Grand Ave. from Wyant to Alberta Sts., Clatsop Ave. from East 13th to East 17th Sts., asphaltic concrete Nos. 1 and 2 on crushed rock base or concrete Nos. 1 and 2. Cost to exceed $10,000. O. Laurgaard, city engr.

Cal., Clovis—City having preliminary plans prepared by A. M. Jensen, engr., Fresno, paving 10 blocks with concrete.

Cal., Glendale—City having plans prepared paving 7400 ft. Sycamore Canyon Rd., 50-56 ft. wide, 5 in. concrete paving with oil and rock screenings surface. H. A. Eddy, city engr.

Cal., Hanford—City Trustees receive bids in September, paving 1½ mi. Irwin and 7th Sts., 50 ft. wide, involving 4 in. bituminous base with 1½ in. bitulithic surface, cement curb, etc. B. Duffeld, Hanford and E. M. Lynch, Central Bldg., Los Angeles, engrs.

Cal., Pasadena—City plans to grade and surface 1.1 mi. road in Arroyo Seco Canyon. About $22,202. R. V. Orbison, city engr.

Cal., Sierra Madre—City election soon to vote on $100,000 bonds to improve streets and build extensions to water system.

N. S., Amherst — Dept. Pub. Wks., Ottawa, Ont., soon receives bids grading, paving and curbing Drill Hall grounds here. About $12,000. R. C. Wright, c/o Dept. Pub. Wks., Ottawa, Ont., engr.

Que., Charlesbourg—City soon lets contract building 3 mi. St. Joseph Rd., 18 ft. wide, concrete. About $12,000. C. M. Henry, c/o Dept. Rds., Parliament Bldg., Quebec, engr.

Que., Kenogami—City soon receives bids building 4 mi. concrete roads. J. F. Trenou, Kenogami, engr.

Ont., Milton—Halton Co. soon lets contract building 6 mi. Middle Rd., 20 ft. wide; 3¾ mi. bituminous macadam and 2¼ mi. waterbound macadam. About $130,000. Dept. Highways, Toronto, engrs.

British Columbia—Dept. Pub. Wks., Victoria, soon receives bids building 3 mi Marine Dr., 18 ft. wide, from Lonsdale to Vancouver, North and West Vancouver Twps. About $40,000. A. E Foreman, c/o Dept. Pub. Wks., Vancouver, engr.

B. C., North Vancouver—City soon lets contract building 23,200 sq.yd. 2 in. asphaltic concrete wearing surface on Marine Dr. About $35,000. A. M. West, city engr.

BIDS DESIRED

New York—Until Aug. 26, by State Highway Dept., Albany, improving roads in following counties: Montgomery Co., 2 highways, 3.7 and 3.63 mi.; Rensselaer Co., 1 highway, 1.27 mi.; Saratoga Co., 1 highway, 9.06 mi.; Suffolk Co., 1 highway, 5.86 mi. Also completing following roads: Cuyahoga Co., 2 highways, 6.06 and 5.45 mi.; Chautauqua Co., 1 highway, $.05 mi.; Franklin Co., 1 highway, 10.36 mi.; Livingston Co., 1 highway, 8.34 mi.; Madison Co., 2 highways, 6.54 and 5.65 mi.; Oswego Co., 1 highway, 6.36 mi.; Seneca Co., 1 highway, 2.13 mi.; Ulster Co., 1 highway, 10.24 mi.; Washington Co., 1 highway, 2.06 mi. Also completing cement concrete repair contract, Cortland Co.; advertised in this issue.

N. Y., Long Island City—Until Aug. 15, by M. E. Connolly, pres. Queens Boro., regulating, grading, curbing and laying sidewalks and paving with sheet asphalt on 6 in. concrete base, Anthon Ave. from Myrtle to Halleck Aves. 2nd Ward; Broad St. from Clinton Ave. to Grand St., 2nd Ward; 4th Av. from Bway to Jamaica Ave. 1st Ward; Freedom Ave. from Jamaica Ave. to Fenhurst Pl., 4th Ward; Gunther St. from 51st to Depeyster Sts., 2nd Ward; Hancock St. from Cypress to Myrtle Aves., 2nd Ward; Roosevelt Ave. from Alburtis to Woodside Aves., Skillman Ave. from Woodside Ave. to 5th St.; St. Felix Ave. from Walter St. to Charlotte Pl., 2nd Ward; Van Cortland Ave. from Buchman Ave to Fresh Pond Rd., 2nd. Ward; regulating and paving with asphalt block on concrete base, 18 ft. wide, centrally located, Boulevard from Bway. to Washington Ave., 1st Ward; with sheet asphalt on concrete base, Olmstead Pl. from Myrtle Ave. to Cypress Hills Cemetery, 2nd Ward; regulating, grading and laying gutters, Buckley St. from Hunterspoint to Thomson Aves. 1st Ward; Roosevelt Ave. from 51st St. to Tiemann Ave., 2nd Ward; Moore St. from Nelson to Hunterspoint Aves., 1st Ward; Woodside Ave. from 5th to 8th Sts.; 16th Ave. from Paterson Ave. to point 285 ft. southwest of Grand Ave., 1st Ward; regulating, recurbing and paving with old granite block on sand base, Hunterspoint Ave. from Viaduct over Long Island R.R. to Hayward St., with sheet asphalt on concrete base from Hayward to Creek Sts., regulating, setting curb and paving with sheet asphalt on 6 in. concrete base, Nurge St. from Emma to Martin Sts., 2nd Ward; resetting curb and recurbing with sheet asphalt on 6 in. concrete base, Roland St. from Potter to Woolsey Aves., 1st Ward; constructing ramps with gutters and drains extending from Roosevelt Ave. at legal grade for distances and laying and relaying sidewalks on ramps in 16th, 17th and 18th Sts.

N. J., Hoboken—Until Aug. 12, by city, grading, paving and improving with asphalt pavement Bloomfield St. from 5th to 14th Sts., 6th St. from Bloomfield to Garden Sts. from 7th St. from Bloomfield to Garden Sts., 8th, 9th and 10th Sts., from Washington to Clinton Sts., 12th and 13th Sts. from Washington St. to Willow Ave., Garden St. from 5th to 8th Sts. and Adams. About $75,000. J. O. Whittemore, city engr.

N. J., Newark—Until Aug. 12, by city paving Belgium St. from South 10th to South 11 Sts., involving 660 sq.yd. concrete pavement, 500 lin.ft. new 5 x 16 in. four cut bluestone curb, 24 lin.ft. 5 x 16 in. quarry cut bluestone header curb, 2220 sq.-yd. cement sidewalk, 20 sq.yd. new brick repaving on old concrete, 20 sq.yd. old brick paving and 1 basin complete. M. R Sherrard, city engr.

N. J., Salem—Until Aug. 11, by Bd. Freeholders Salem Co. building 1600 sq.yd. concrete roads, 18 ft. wide, in Elmer Twp. J. S. Sparks, Salem, engr.

Pa., Allegheny—Until Aug. 25, by Supervs. Allegheny Twp., c/o Cambria Co. Controller, (Ebensburg) reconstructing 17,-490 ft. Carroltown Rd., alternate bids will be received on (1) 4 in. vitr. clay paving block on concrete base; (2) 3 in. vitr. clay paving block on concrete base; (3) 1 course rein.-con. pavement. D. W. Dillman, twp. engr.; advertised in this isue.

Pa., Oil City—Until Aug. 21, by E. W. Egan, city controller, grading, paving and building sewers in various streets, invglving 1600 cu.yd. grading, 2800 lin.ft. concrete curbing, 2800 sq.yd. paving, 11,000 sq.ft. sidewalks and 2250 ft. 6-15 in. sewers. B. B. Weber, city engr.; advertised in this issue.

Md., Frederick—Until Aug. 12, by Comrs. Frederick Co., building 1.99 mi. Harmony Rd. between Middletown and Harmony, 16 ft. wide with 3 ft. dirt shoulders, 6 in. concrete. About $50,000. J. N. Mackall, 601 Garrett Bldg., Baltimore, engr. Noted Feb. 20.

W. Va., Fairmont—Until Aug. 16, by Bd. Affairs, paving 3000 ft. Morgantown Ave. concrete, 16 ft. wide. S. B. Miller, city engr.

W. Va., Morgantown—Until Aug. 23, by J. M. Cregg, clk. Monongolia Co., building 4.5 mi. Rosedale Rd., 16 ft wide, 1 course rein.-con. Noted May 22.

S. C., Charleston—Until Aug. 12, by Sanitary and Drainage Comn., Charleston Co., relocating, grading, draining and surfacing with concrete 4 mi. Charleston-Columbia Rd. from entrance of Navy Yard to Berkeley Co. line, 20 ft. wide, involving 46,933 sq.yd. concrete and 8000 cu.yd. rock excav. About $100,000. J. R. Pennell, c/o State Highway Dept., Columbia, engr.

Streets and Roads (Continued)

Ga., Jefferson—Until Aug. 9, by Comrs. Jackson Co., building 4.25 mi. Jefferson-Commerce Rd., involving 28 acres grubbing, 21,575 cu.yd. earth and 555 cu.yd. rock excav., 13,328 cu.yd. soil surface, 612 lin.ft. culverts, 493 cu.yd. concrete, etc. About $100,000. Mitcham & Wright, Atlanta, engrs.

Fla., Arcadia—Until Sept. 1, by Comrs. De Soto Co., paving 98,000 sq.yd roads in Moore Haven Rd. and Bridge Dist. Work involves 3700 cu.yd. grading, 17,400 cu.yd. sand cushion, 227 cu.yd. concrete in culverts, 24,000 lb. reinforcing steel and 2000 ft. lumber. E. V. Camp, Punta Gorda, engr. Noted Dec. 12.

La., Natchitoches—Until Aug. 11, by City Council, gravel surfacing and draining 17.89 mi. Natchitoches-Many Natchitoches, Calfax Highway. D. Buie, c/o State Highway Dept., New Orleans, engr.

Michigan—Until Aug. 19, by State Highway Comn., Lansing, shaping, surfacing with gravel and building drainage structures on 2.596 mi. road, 16 ft. wide, Project No. 47-1, Shiawassee Co., involving 24,364 sq.yd. gravel. F. F. Rogers, comr.

Illinois—Until Aug. 13, by Dept. Pub. Wks. & Buildings, Div of Highways, Springfield, building roads as follows: 9671 ft. Sect. K-15d, 24,125 ft. Sect. A, 18,465 ft. Sect. B, 26,575 ft. Sect. C and 21,655 ft. Sect. D, Chicago-Wisconsin Highway, 18 ft. wide, Lake and Cook Counties; 12,655 ft. Sect. N-15d and 7545 ft. Sect. B, Morris-Henry Highway, 18 ft. wide, La Salle Co.; 20,183 ft. Sect. P-15d and 11,426 ft. Sect. 32, National Highway, 18 ft. wide, Madison Co.; 19,270 ft. Sect. U, 14,518 ft. Sect. Q, 32,424 ft. Sect. X and 21,270 ft. Sect. Y, Springfield-East St. Louis Highway, 18 ft. wide, Madison Co.; 3099 ft. Sect. F, Peoria-Henry Highway, 18 ft. wide, Peoria Co.; 17,674 ft. Sect. 13 Lincoln Highway, 16 ft. wide, Lee Co. Alternate bids will be received on Portland cement concrete, 4 in. monolithic brick, 3 in monolithic brick, bituminous concrete with binder course (Spec. C1, C2, C3 or CT), bituminous concrete without binder course (Spec. C1, C2, C3 or CT). On Lincoln Highway, bids will only be received for bituminous macadam; advertised in this issue.

Ill., Chicago—Until Aug. 14, by Bd. Local Impvts., paving 15 alleys and 7 streets, involving 27,000 yd. excav., 14,000 yd. 7 in. concrete, 38,000 yd. asphalt on 6 in. concrete and 2700 yd. vitr. brick on 6 in. concrete base. About $210,000.

Wisconsin—Until Aug 12, by State Highway Comn., Grand Rapids, grading and paving 3.97 mi. Stevens Point-Wausau Rd., Marathon Co., Federal Aid Project No. 94, involving 8976 cu.yd. earth and 1060 cu.yd. borrow excav., 43 cu.yd. Class "A" concrete, 41,979 sq.yd. 18 in. concrete surfacing, etc.

Wisconsin—Until Aug. 14, by State Highway Comn., at office of Div. No. 2, 208 Stephenson Bldg., Milwaukee, grading and paving 2.31 mi. North Fond du Lac Rd., Waukesha Co., Federal Aid Project No. 102, involving 5973 cu.yd. earth and 72 cu.yd. borrow excav., 105 cu.yd. Class "A" concrete, 24,354 sq.yd. concrete surfacing, etc.; 1.50 mi. Whitefish-Brown Deer Rd., Milwaukee Co., Federal Aid Project No. 103, 6579 cu.yd. earth excav., 48 cu.yd. Class "A" concrete and 18,347 sq.yd. concrete surfacing.

Minn., Duluth—Until Aug. 12, by J. A. Farrell, city comr., improving 4000 ft. 54th Ave., E., from Landon Rd. to Glendale St., 24 ft wide, involving 100 ft. 3 in. drain tile, 2858 ft. 12-24 in. sewer pipe, 7145 lin. ft. concrete curbs and gutters, 5400 cu.yd. earth and 110 cu.yd. rock excav. About $33,495.

Minn., Farmington—Until Aug. 19, by Village Clerk, grading and paving 20 blocks, 18 ft. wide, involving 31,600 sq.yd. wood blocks, 1500 cu.yd. grading and 11,000 ft. curbing. About $90,000. Druar & Smith, Globe Bldg., St. Paul, engrs.

Minn., St. Paul—Until Aug. 11, by H. W. Austin, city purch. agt., paving Grove St. between Missisippi St. and LaFayette Ave. Work involves 6694 sq.yd vitr clay brick blocks, 80,328 lb. asphalt filler, 1450 bbl. Portland cement, 558 cu.yd. concrete sand, 930 cu.yd. stone or gravel, 277 cu.yd. sand, sewer connections, castings, etc. O. Claussen, city engr.

Minn., Warren—Until Aug. 15, by Comrs. Marshall Co., building Federal Aid Rd. No. 81, State Rd. No. 1, 24 ft. wide, involving unloading 5387 cu.yd. gravel at Warren, 11,619 cu.yd. at Argyle, 15,181 cu.yd. at Stephen and 2695 cu.yd at Donaldson, 138,732 lin.ft. road bed, 1700 cu.yd. excav., 12,000 cu.yd. overhaul, culverts, etc. About $160,000.

Kan., Iola—Until Aug. 11, by G. Seymore, clk., Allen Co., building 4½ mi. State St., Federal Aid Project No. 79, concrete. C. E. Stebbins, Iola, engr.

Neb., Alliance—Until Aug. 15 ,by G. H. Kennedy, city clk., paving Box Butte and Laramie Aves., 1st, 2nd, 3rd and 4th Sts., 40 and 72 ft. wide, involving 30,000 sq.yd. vertical fibre, asphalt or concrete, on 5 in. concrete base, 420 lin.ft. concrete curbing, 8800 lin.ft. concrete gutter and curb, and 100 cu.yd. earth excav., also building 6500 ft. of 12-36 in. storm sewers. About $170,000. Grant, Fulton and Letton, 505 Bankers Life Bldg., Lincoln, engrs.

Neb., Fairmont—Until Aug. 19, by C. L. Cox, city clk., paving 3500 ft., Lincoln St. and Fairmont Ave., 26 and 52 ft. wide, involving 14,500 sq.yd. vertical fibre, asphalt or concrete on 5 in. concrete base, 7200 lin. ft. concrete gutter and curb and 1800 cu.yd. earth excav. About $65,000. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs. Noted July 31.

Neb., Omaha—Until Aug. 12, by City Council, paving various streets in 39 districts. About $200,000. J. A. Bruce, city engr.

Neb., Peru—Until Aug. 27, by R. W. Kelly, city clk., paving 4700 ft. 5th St., 24 ft. wide, involving 11,654 sq.yd. vertical fibre on 5 in. concrete base, 1168 lin.ft. concrete curbing, 13,768 cu.yd. earth excav. and 527 cu.yd. gravel for drives. About $57,000. State will appropriate toward cost. G. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., Red Cloud—Until Aug. 25, by O. C. Teal, city clk. paving and building 12,000 ft. storm sewers in Cedar, Webster, Seward and Walnut Sts., 3rd, 4th, 5th, 6th, 7th and 9th Aves., 26, 30 and 54 ft. wide, involving 40,000 sq.yd. vertical fibre, asphalt or concrete, 27,000 lin.ft. gutter and curb, 150 cu.yd. earth excav. and 2350 lin.ft. 12-30 in. storm sewers. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

Neb., Red Cloud—Until Aug. 25, by City Council paving 40 blocks, in Dist. Nos. 2 and 3, involving 40,338 sq.yd. asphalt and 27,427 sq.yd. concrete. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs. Noted July 31.

Mo., Excelsior—Until Aug. 14, by city, resurfacing 1350 ft. Dunbar Ave., 30 ft. wide, bituminous macadam. About $10,000. C. A. Shockley, 740 Reserve Bldg., Kansas City, engr.

Mo., Independence—Until Sept. 2, by Jackson Co. Court, grading, surfacing with bituminous macadam, building earth shoulders, ditches and culverts, on 3.1 mi. Lone Jack East Rd. from Lone Jack to Jackson-Johnson Co. line, 16 ft. wide. O. C. Sheley, co. highway engr.; advertised in this issue.

Ark., Bentonville—Until Aug. 14, by E. C. Pickens, secy. Rd. Impvt. Dist. No. 3, building 45.5 mi. highway, local materials to be used for surface. Plans include one 100 ft. steel bridge and two 30 ft. I-beam bridges. W. L. Winters, Ft. Smith, engr.

Ark., Helena—Until Aug. 12, by Comrs Phillips Co., building 6.68 mi. highway, bituminous macadam or asphaltic concrete on 4 in. Warrenite base Monroe & Parmelee, c/o Business Mens League, Helena, engrs.

Tex., Lockhart—Until Aug. 13, by Caldwell Co., scarifying, gravel surfacing with bituminous surface treatment, building rein.-con. drainage structures on 6.67 mi Central Route Highway, 16 ft. wide, involving 12,500 ft. scarifying, 2232 cu.yd. earth excav., 13,468 lb. reinforced steel, 195 cu.yd. concrete and 62,611 sq.yd. bituminous surface. About $38,621. W. O. Washington, Lockhart, engr.

Tex., Montague—Until Aug. 15, by Montague Co., gravel surfacing and building rein.-con. bridges and culverts on 9.84 mi. Meridian Highway from Bowie to Wise Co. line, 16 ft. wide. Work involves 159 cu.yd. Class A, 86 cu.yd. Class B and 100 cu.yd. Class C concrete, 45,482 cu.yd. earth and 1129 cu.yd. rock excav.

Tex., Roby—Until Aug. 12, by W. C. Martin, Judge Fisher Co., building gravel surfaced road and rein.-con. drainage structures on 14.2 mi. State Highway No. 4, known as Rotan Rd., 15 ft. wide, involving 27,000 lin.ft. grading, 111,000 cu.yd. unclassified earth and 1000 cu.yd. solid rock excav., 52,000 lb. reinforcing steel, etc., Hess & Skinner, Southwestern Life Bldg., Dallas, engrs. Noted May 22.

Cal., Sacramento—Until Aug. 11, by Bd. Supervs. Sacramento Co., paving 6 mi. Jackson Rd. and Winding Way Rd., concrete.

Cal., San Diego—Until Aug. 11, by A. H. Wright, city clk., improving Morena Blvd. and Linda Ave., involving 8169 cu.yd. excav., 1901 cu.yd. embankment for main roadway; 4940 cu.yd. excav., 4122 cu.yd. embankment for berms; 343,424 sq.ft. bitulithic (warrenite) pavement, 1½ in thick on 4 in. concrete base, culverts, etc Noted May 8.

Que., Outremont—Until Aug. 10, by city, building sidewalks, cost $6061, grading, $2000, curbing, $8800, macadamizing, $65,000, concrete paving, $7000. I. Duchatel, engr. Noted May 11.

Que., St. Roch—Until Aug. 14, by city, macadamizing 3½ mi. Main St., 18 ft. wide. About $15,000. C. M. Henry, Dept. Rds., Parliament Bldg., Quebec, engr.

Que., St. Romuald—Until Aug. 15, by A. Pigeon, secy., building macadam road. Former bids rejected.

Ont., Beamsville—Until Aug. 18, by Dept. Pub. Highways, Toronto, building 3.25 mi. Provincial Highway, east of here, bituminous. About $10,000. G. Hogarth, c/o Dept. Highways, Toronto, engr.

Ont., Brantford—Until Aug. 18, by Dept. Pub. Highways, Toronto, building 15.62 mi. bituminous road east of here to Ancester village. About $35,000. G. Hogarth, c/o Dept. Highways, Toronto, engr.

Ont., Brockville—Until Aug. 18, by Dept. Pub. Highways, Toronto, building 10.46 mi. bituminous road easterly from here to westerly limit of Prescott. About $25,000. G. Hogarth, c/o Dept. Highways, Toronto, engr.

Ont., Fenelon Falls—Until Aug. 15, by Victoria Co., building 5 mi. Leddy Corners Rd., 18 ft. wide, macadam. About $22,000 Dept. Highways, Toronto, engr.

Ont., Kingston—Until Aug. 18, by Dept Pub. Highways, Toronto, building 7.72 mi bituminous road here. About $20,000. G Hogarth, c/o Dept. Highways, Toronto. engr.

Ont., Lindsay—Until Aug. 15, by Victoria Co., building 1 mi. Mariposa Rd., 20 ft. wide, bituminous macadam. Cost between $20,000 and $27,000. Dept. Highways, Toronto, engrs.

Ont., London—Until Aug. 18, by Dept. Pub. Highways, Toronto, building 15.93 mi. Provincial Highway from here to Ingersoll Twp., bituminous. About $45,000. G. Hogarth, c/o Dept. Highways, Toronto, engr.

Ont., Trenton—Until Aug. 18, by Dept. Pub. Highways, Toronto, building 9.13 mi. bituminous road from easterly limit of Trenton to westerly limit of Belleville. About $25,000. G. Hogarth, c/o Dept. Highways, Toronto, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Conn., Danbury—City received bids repaving roadway of Main and Rose Hill Sts., sheet asphalt on Portland cement concrete base; also regulating and repaving roadway of White, Elm, River and Rose Sts., from C. W. Blakeslee & Sons, 58 Waverly St., New Haven, $126,304; Asphalt Constr. Co., 137th St. and Madison Ave., New York City, $142,908; D. O'Connell's Sons, Holyoke, $175,183. Noted July 17.

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres., let contract regulating and grading 39th St., to C. A. Meyers, $2040; West 11th St., to Annarock Eng. Co., $2695; 87th St., to L. Mangerie, $3331; 39th, President and Woodbine Sts. and Snediker Ave., to Sicilian Asphalt Paving Co., 41 Park Row, New York City, $8071, $20,803, $9782 and $8548 respectively; Washington St., to Leonard Paving Co., 233 Bway., New York City, $48,597; Ocean Ave., to J. Ryan, $5225. Noted July 31.

★**N. Y., Gowanda**—Bd. Pub. Wks. will pave Chapel St. from Water to Jamestown Sts., concrete. Cost between $12,000 and $15,000. Work will be done by day labor. Noted July 17.

N. Y., New York—F. L. Dowling, pres. Manhattan Boro., received bids July 30, regulating and repaving with granite block pavement on concrete foundation, roadway of, (a) Brome St., (b) Walker St., (c) Bleecker St., from Regan Tower Co., (a) $27,151, (b) $4079, (c) $9134. P. J. Kearns, 2306 Creston Ave., (a) $27,885, (b) $4058, (c) $9628; Asphalt Paving Co., 2197 Madison Ave., (a) $28,187, (b) $4207, (c) $10,154; M. I. Sachs, (b) $4065, (c) $9745. Noted July 24.

Streets and Roads (Continued)

★**N. Y., New York**—F. L. Dowling, pres. Manhattan Boro., let contract regulating and repaving Mail St. with granite block on concrete foundation, to M. I. Sachs, $15,072. Noted July 31.

★**N. Y., Oneida**—Town let contract, to Fazio & Chapman, Oneida, paving Lyndon St., cost $7954. Pleasant Ave., $2270, Central Ave. from West to Warner Sts., $8712, concrete. Noted Apr. 17.

★**N. Y., Syracuse**—City let contract paving City Hall Sq. and contiguous streets, wood block, to G. B. Dickison, Union Bldg., $73,651.

★**N. J., North Bergen**—Town Council let contract repairing 34th and 35th Sts., granite block, to J. Devlin, 117 24th St., Guttenberg. About $100,000. Noted July 17.

N. J., Trenton—Bd. Freeholders Mercer Co. received bids building 1600 ft. Sect. 2-A River Rd., concrete, Hopewell Twp., from Gibbs & Morgan, 12 North Willow St., $43,920; A. Keys, Trenton, $46,080; Natl. Constr. Co., $46,080. Noted July 17.

Pennsylvania — State Highway Dept., Harrisburg, received bids building roads in counties as follows:

Adams Co., 246 ft. 1 course rein.-con. and Hillside vitr. brick, Routes No. 23 and 41, Butler Twp., from Winston & Co., 240 Fair St., Kingston, N. Y., $188,525; Mason & Hanger Co., Inc., Chambersburg, $192,519; 13,733 ft. 1 course rein.-con., Route No. 123, Tyrone and Strabane Twps., Winston & Co., Kingston N. Y., $154,716; M. Bennett & Sons, Indiana, $135,267.

Beaver Co., 14,481 ft. rein.-con., Eastvale Boro. and North Sewickley Twp., A. W. Falck, Leetsdale, $141,511; T. McNally & Son Co., 701 Oliver Bldg., Pittsburgh, $144,678; Aronberg & McDonald, 313 Citizens Bldg., Norfolk, Va., $138,432.

Bradford Co., 15,207 ft. vitr. brick on concrete foundation and bituminous surface course on concrete foundation, Athens, Sayre and South Waverly Boros., Routes No. 15 and 287, Warren Bros. Co., 142 Berkeley St., Boston, Mass., $188,060.

Chester and Delaware Counties, 46,815 ft. resurfacing, bituminous on prepared broken stone base, Tredyffrin, East-town and Radnor Twps., Class A, Union Paving Co., 30th and Locust Sts., Phila., $110,483; Eastern Paving Co., 401 Colonial Trust Bldg., Phila., $134,827; Class "B," R. H. Johnson Co., Wayne, $115,165; Cunningham Paving & Constr. Co., 1345 Arch St., Phila., $99,248.

Crawford Co., 619 ft. 1 course rein.-con and Hillside vitr. brick or 2 course concrete and Hillside vitr. brick, Routes 18 and 82, Vernon Twp., Atlanta Constr. Co., Atlanta, N. Y., $229,065; Aronberg & McDonald, 313 Citizens Bldg., Norfolk, Va., $213,440.

Erie Co., 400 ft. bituminous surface course on concrete foundation and Hillside vitr. brick or 1 course rein.-con. and Hillside vitr. brick, Routes 20 and 86, Girard and East Springfield Boros., Campbell Bros. Co., 609 Stambaugh Bldg., Youngstown, O., $340,976; Griff Constr. Co., 1117 State St., Erie, $192,005; Aronberg & McDonald, 313 Citizens Bldg., Norfolk, Va., $243,723; 21,120 ft. bituminous surface course on concrete foundation or 1 course rein.-con., Route 86, Mill Creek Twp., C. H. Fry Constr. Co., Cherry and 19th Sts., Erie, $122,607; Griff Constr. Co., 1117 State St., Erie, $127,634; Class "B," Gaylord International Eng. & Constr. Co., Inc., Orchard Ave. and Cedar St., Scranton, $125,865.

Fayette Co., 19,918 ft. vitr. brick on concrete foundation, Route 112, Menallen Twp., Brooke & Cornish, 620 Fayette Title & Trust Bldg., Uniontown, $167,016; Aronberg & McDonald, Norfolk, Va., $171,906.

Jefferson Co., 25,972 ft. 1 course rein.-con. and Hillside brick, Route 60, Pine Creek Twp., Aronberg & McDonald, Norfolk, Va., $237,516; Dale Eng. Co., 23 Mann Bldg., Utica, N. Y., $230,347.

Lawrence Co., 29,628 ft. 1 course rein.-con. and Hillside vitr. brick or 2 course rein.-con. and Hillside brick, Route No. 81, Union and Mahoning Twps., Burns Bros., 323 East Washington St., New Castle, $265,015; T. H. Gill Co., Security Mutual Bldg., Binghamton, N. Y., $263,570; Aronberg & McDonald, Norfolk, Va., $242,816.

Mifflin Co., 24,049 ft. bituminous surface on concrete foundation and Hillside vitr. brick or 1 course rein.-con. and Hillside vitr. brick, Route No. 29, Armaugh Twp., Mason & Hanger Co., Chambersburg, $153,860; Winston & Co., 240 Fair St., Kingston, N. Y., $258,169; Bennett & Randall, Lebanon, $271,546.

Montgomery Co., 5575 ft. bituminous surface on concrete foundation or 1 course rein.-con., Route No. 178, East Norriton Twp., Field, Barker & Underwood, Commercial Trust Bldg., Phila., $35,100; Union Paving Co., 30th and Locust Sts., Phila., $36,594; H. B. Tranger, National Park, N. J., $35,253; 723 ft. bituminous surface on concrete foundation and Hillside vitr. brick or 1 course rein.-con. and Hillside vitr. brick, Routes 37 and 153, Springfield, White Marsh, Upper Dublin, Lower Gwynedd Twps., Manwaring & Cummins, Inc., 5600 Germantown Ave., Phila., $242,302; Union Paving Co., 30th and Locust Sts., Phila., $243,905; J. McGraw Co., 1010 Commercial Trust Bldg., Phila., $242,819.

Montgomery and Bucks Counties, 15,898 ft. bituminous surface on concrete foundation or 1 course rein.-con., Route 178, Montgomery and New Britain Twps., H. E. Eaton, 1713 Sansom St., Phila., $126,334; Manwaring & Cummins, Inc., 5600 Germantown Ave., Phila., $140,768; J. McGraw Co., 1010 Commercial Trust Bldg., Phila., $132,707.

Northampton Co., 2565 ft. resurfacing, bituminous on broken stone base, Route No. 297, Bethlehem and Lower Nazareth Twps., R. S. Rathbun Contg. Co., 409 Vine St., Bethlehem, $70,239; F. J. Groman & Sons, Bethlehem, $67,959; Eastern Paving Co., 401 Colonial Trust Bldg., Phila., $67,503.

Susquehanna Co., 53,806 ft. bituminous surface on concrete foundation or 1 course rein.-con., Route No. 9, Hopbottom Boro., Lathrop, Lenox, Harford and New Milford Twps., Gaylord International Eng. & Constr. Co., Cedar and Orchard Sts., Scranton, $342,637; Winston & Co., Kingston, N. Y., $353,255; MacArthur Bros. Co., 120 Bway., New York City, $363,712.

Union Co., 11,484 ft. 1 course rein.-con., Route No. 17, Lewis Twp., T. L. Evans Sons, 344 Terry St., Danville, $67,366; Sutton Contg. Co., 640 Heed Bldg., Phila., $75,845; R. Hand, Wilkes-Barre, $74,099.

Washington Co., 1106 ft. vitr. brick, Route No. 108, Canansburg Boro., R. W. Wilson, South Central Ave., Canonsburg, $34,788; Hardy & Rankin, 40 Murdock St., Canonsburg, $18,416. (Total will be changed. The written figures were $1.20, others $1.25); 9480 ft. 1 course rein.-con. and Hillside vitr. brick, Route No. 268, East Bethlehem Twp., Brooke & Cornish, 620 Fayette Title & Trust Bldg., Uniontown, $74,191; Donora Constr. Co., Inc., Donora, $88,297; G. S. White Co., 7119 Jenkins Arcade Bldg., Pittsburgh, $83,571.

Westmoreland Co., 12,065 ft. 1 course rein.-con. and Hillside vitr. brick, Route 117, Hempfield Twp., Aronberg & McDonald, Norfolk, Va., $110,979; G. S. White Co., 7117 Jenkins Arcade Bldg., Pittsburgh, $119,461; Dawson Constr. Co., Inc., Connellsville, $107,856; 7484 ft. 1 course rein.-con. North Huntingdon Twp., T. L. Ryan, Ligonier, $114,961; M. O'Herron Co., 1st and McKean St., S. S., Pittsburgh, $112,835; Hillside Stone Co., Farmers' Bank Bldg., Pittsburgh, $111,966.

★**Pa., Pittsburgh**—Allegheny Co. let contracts building 2000 ft. Troy Hill Rd., Reserve Twp., Telford macadam, and 5280 ft. Thompson Run Extension Rd. No. 2, Ross and McCandless Twps., bituminous macadam, to T. Cronin Co., South 17th and Muriel Sts., Pittsburgh, $15,409 and $58,047 respectively; 15,350 ft. Meridian and Gibsonia Rds., Richland and McCandless Twps., rein.-con., to McLaughlin Constr. Co., Germania Bank Bldg., $128,812; 2½ mi. Elizabeth Rd., concrete, to M. O'Herron Co., 1st and McKean Sts., $69,117; also paving between tracks on 2540 ft. Glass and West Run Rds., Homestead and Hays Boros., brick block on concrete base, to McGrady Bros., Braddock, $31,066. Noted July 24.

★**Maryland**—State Rds. Comn., 601 Garrett Bldg., Baltimore, let contract building 2 mi. York Rd., from Parkton toward Pennsylvania State line, Contr. B-30, Baltimore Co., to T. Bresnan & Son, 2018 West North Ave., Baltimore, $66,337; 2 mi. Buckeystown Turnpike from Adamstown toward Montgomery Co. line, Contr. F-31, Frederick Co., to M. J. Grove Lime Co., Lime Kiln, $55,182; 2.12 mi. highway from Oakland toward Hutton, via Crellin, Contr. G-13, Garrett Co., to Claiborne, Johnston & Co., 910 Garrett Bldg., Baltimore, $73,338. Noted June 12 and July 24.

★**Md., Baltimore**—Bd. Awards let contract repairing streets in various sections of city, sheet asphalt, asphalt block, cement and Belgian Block, to P. Flanigan & Sons, Harford Rd. and Baltimore & Ohio R.R., $12,515

★**Md., Towson**—Comrs. Baltimore Co. let contract building 1 mi. Dulaney's Valley Rd., 16 ft. wide, slate, to G. Long, 13th St. and 1st Ave., Baltimore, $28,500.

★**W. Va., Glenville**—Comrs. Gilmer Co. will grade and drain 2 mi. Gilmer-Ripley and Ohio Turnpike. About $26,000. Work will be done by day labor. Noted June 26.

★**N. C., Elizabeth**—Comrs. Pasquotank Co. will hard surface 25 mi. road, 9-18 ft. wide. About $500,000. Work will be done by day labor. Noted July 10.

★**N. C., Raleigh**—Comrs. Wake Co. let contract hard surfacing 1 mi. Raleigh-Garner Rd., to R. J. Lassiter, Oxford. About $30,000.

★**Ga., Atlanta**—City let contract paving 31,000 sq.yd. Hemphill Ave., concrete, to Brooks-Calloway Co., Healey Bldg. About $89,900.

★**La., Tangipahoa**—City let contract improving 12.55 mi. Hammond-Mississippi State Line Rd., 30 ft. wide, to T. G. Womack, c/o State Highway Dept., New Orleans, $86,076.

★**O., Columbus**—City let contract grading, draining, curbing and repaving 1200 ft. Franklin Park W. from Broad St. to Franklin Park S., 30 ft. wide, to Franklin Asphalt Paving Co., Columbus, $16,884. Noted July 17.

★**O., Greenspring**—City let contract paving 4700 ft. Main St., to Lee Bros., Clyde. About $4200. Noted July 17.

★**O., Hamilton**—City let contract paving 900 ft. Lane, Frankfort and Minster Sts., 30 ft. wide, involving 4500 sq.yd. sheet asphalt, cement curbing and guttering, to Federal Asphalt Paving Co., 125 Main St., $23,857.

★**O., Upper Arlington**—City let contract paving 2 mi. Arlington Ave., Tremont, Bedford, Coventry, Devon, Waltham, Edhemont, Stanford, Fairfax and Guilford Rds., 20 to 36 ft. wide, sheet asphalt, to Andrews Asphalt Paving Co., Hamilton, $122,772.

★**Ind., Indianapolis**—City let contract resurfacing from Mexican asphalt, Merrill St. from Meridan to Union Sts., to Mansfield Eng. Co., 1011 Fletcher Savings & Trust Bldg., $2.96 per lin. ft. Noted June 19.

★**Ind., Noblesville**—City let contract paving 3 mi. Boulevard with bituminous concrete, to E. G. Grant, Greenfield. About $104,599.

Mich., Detroit—Dept. Pub. Wks. received bids paving (a) St. Clair Ave., (b) Chapin Ave., (c) Clairpointe Ave., (d) Garland Ave., (e) Granger Ave., (f) Kirby Ave., (g) Louis Ave., (h) Springle Ave., from Detroit Asphalt Paving Co., 20 McGraw Bldg., (a) $31,326, (b) $4440, (c) $39,548, (d) $56,201, (e) $7512, (f) $8522, (g) $3993, (h) $21,439.

Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a) $32,380, (b) $4586, (c) $41,151, (d) $58,047, (e) $7749, (f) $8788, (g) $4116, (h) $22,131.

W. B. Brady Constr. Co., 1972 Grand River Ave., (a) $32,939, (b) $4585, (c) $41,300, (d) $58,827, (e) $7728, (f) $8746, (g) $4095, (h) $22,297. Noted July 24.

★**Mich., Hamtramck**—Village let contract to Lennane Bros., 809 Union Trust Bldg., Detroit, improving Yemens Ave., involving 5841 sq.yd. concrete, 4209 lin.ft. concrete curbing, 2881 cu.yd. earth excav., 300 ft. 12 in. sewer, manholes, etc., cost, $26,865; Mitchell Ave., 1635 cu.yd. excav., 3421 lin.ft. curbing, 3256 sq.yd. concrete, 800 lin.ft. 12 in. sewer, etc., $17,432; Oliver Ave., 1300 cu.yd. excav., 1737 lin.ft. curbing, 2375 sq.yd. concrete, 650 ft. 12 in. sewer, etc., $12,407; Norwalk Ave., 1025 cu.yd. excav., 1933 lin.ft. curbing, 2646 sq yd. concrete, 450 lin.ft. 12 in. sewer, etc., $12,411. Noted June 26.

★**Mich., Port Huron**—City let contract to J. H. Baker & Sons, Port Huron, paving 10th St., $85,520; 10th Ave., $42,856; Stone St., $22,887; 22nd St., $29,828; Griswold St., $6653; Lapeer Ave., $41,133; Park St., $7191; alley from Water to Pine Sts., $2186. Noted July 24.

Ill., Chicago—Bd. Local Impvts. received bids July 23 paving following streets: (a) Archer Ave., (b) South Bishop St., (c) Brompton Ave., (d) Cambridge Ave., (e) Carmen Ave., (f) Carroll Ave., (g) West Congress St., (h) Fairoaks St., (i) Homer St., (j) Hutchinson St., (k) Keystone Ave., (l) North Meanard Ave., (m) Potomac Ave., (n) State St., from Madison to Randolph Sts., (o) State St. from Randolph to South Water Sts., (p) St. Louis Ave. from Carmen to Foster Aves., (q) Wabansia Ave., (r) West 42nd St., (s) North Latrobe, North Lockwood and North Long Aves., (t)

Streets and Roads (Continued)

North Fairfield Ave., (u) East 103rd Pl., East 104th St., East 104th Pl., East 105th St., East 105th Pl., East 106th St., East 107th St., Stephenson, Langley, Corliss and Erickson Aves., (v) Wrightwood, Dole and Pine Grove Aves., Hampton and Lehman Courts, from

Ready & Callaghan Coal Co., 133 West Washington St., (a) $67,021; (r) $25,555.

Ryan Co., 4500 West Division St., (a) $68,226; (n) $39,186; (o) $46,477; (r) $25,703.

Smith & Brown Co., 128 North La Salle St. (a) $69,153; (b) $8306; (p) $11,033

J. A. Sackley Co., 179 West Washington St., (b) $8210; (u) $172,004.

Contg. & Material Co., 10 South La Salle St., (b) $8299, (p) $11,362.

White Paving Co., 17 North La Salle St., (c) $9676; (d) $6050; (h) $7084; (i) $5696; (k) $16,588; (t) $74,971; (v) $64,766.

Amer. Asphalt Paving Co., 133 West Washington St., (c) $9803; (e) $7683; (g) $2731; (i) $5748; (j) $7042; (l) $19,704; (m) $6063; (q) $45,964; (s) $141,113; (v) $65,166.

R. F. Conway Co., 133 West Washington St., (c) $9899; (d) $6082; (e) $7605; (f) $6579; (g) $2735; (h) $7185; (j) $6962; (k) $16,299; (l) $20,063; (m) $6131; (s) $142,840; (t) $74,497.

F. P. McCormick Co., 133 West Washington St., (d) $6021; (e) $7742; (f) $6635; (h) $7353; (i) $5668; (j) $7144; (k) $16,641; (l) $20,016; (m) $6107; (q) $47,210; (s) $142,613; (t) $75,349; (v) $64,477.

Standard Paving Co., 29 South La Salle St., (f) $6487; (g) $2700; (q) $45,064.

Central Paving Co., 179 West Washington St., (p) $11,444; (r) $25,308.

J. A. McGarry Co., 189 West Madison St., (u) $169,056.

Farr Bros. Co., 356 West 111th St., (u) $171,290.

Wisconsin—State Highway Comn., Grand Rapids, received only bid improving Stevens Point-Waupaca Rd., Portage Co., Federal Aid Project No. 76 and Wautoma-Redgranite Rd., Waushara Co., Federal Aid Project No. 46, from A. Mews, Auburndale, $51,314 and $36,325 respectively. Noted July 31.

★**Wisconsin**—State Highway Comn., Madison, let contract improving Viroqua-Sparta Rd., Federal Aid Project No. 67, Monroe Co., to J. E. Young, Leon, $29,502; Portage-Stevens Point Rd., Federal Aid Project No. 93, Marquette Co., to A. Jones, c/o L. Jones, Endeavor, $23,984. Noted July 17.

★**Wisconsin**—State Highway Comn., Madison Div. No. 1, let contract improving Watertown Plank Rd., Jefferson Co., Federal Aid Project No. 59, to J. Finley, Janesville, 14,601 cu.yd. earth excav., $1.10 per cu.yd., 371 cu.yd. borrow excav., $1.00, 885 cu.yd. concrete in culverts, $23, 1224 lin.ft. 6 in. tile, $0.32, 852 lin.ft. 12 in. tile, $0.50, 178 lin.ft 12 in. vitr. pipe, $0.50, and 3 cleanout basins, $23. Noted July 17.

★**Wisconsin** — State Highway Comn., Madison, Div. No. 1, will improve Portage-Wyocena Rd., Columbia Co., Federal Aid Project No. 51. Work will be done by day labor. Noted July 17.

★**Wis., Sheboygan**—City let contract grading and paving 2.1 mi. Martin Ave. from North 15th St. to Calumet Dr., 18 ft. wide, and St. Clair Ave. from North 1st to North 14th Sts., 20 ft. wide, to Pestien & Nauman, North 15th St., $25,923, and $17,185, respectively. Noted July 31.

★**Minn., Albert Lea**—Comrs. Freeborn Co. rejected bids received July 8, grading and graveling 11.5 mi. Federal Aid Project No. 61, State Rd. No. 6, 24 ft. wide. About $60,000. Work will be done by day labor. Noted July 24.

★**Minn., Brainerd**—Comrs. Crow Wing Co. let contract grading and graveling 14 mi. Federal Aid Project No. 51, 24 ft. wide, to Franzen Bros. & E. Zoutele, Brainerd. About $80,000. Noted July 3.

★**Minn., Duluth**—J. A. Farrell, city comr., let contract paving and curbing with concrete 932 ft. Helem St., 24 ft. wide, to Olson & Johnson, c/o city engineer's office, $10,856. Noted July 24.

★**Minn., Faribault**—Comrs. Rice Co. let contract paving and grading 13 mi. Federal Aid Project No. 64, State Rd. No. 5, 18 ft. wide, to Siems, Helmers & Schaffner, 514 Guardian Life Bldg., St. Paul, $212,523. Noted July 3.

★**Minn., St. Paul**—City let contract for labor and materials paving Woodlawn Fairmont, and Princton Aves., St. Clair St. and Mt. Curve Blvd., to Fielding & Shepley, 216 University Ave., $83,200; sewer and water connections, to Thornton Bros. Co., 304 Scandinavian Amer. Bank Bldg., $15,000. Noted July 3.

★**Kan., Great Bend**—City let contract paving 10 blocks and repairing 5 blocks, brick and asphalt, to A. L. Cook, Ottawa, $66,938.

★**Neb., Grand Island**—City let contract paving Main St., to Watts Constr. Co., Concordia, Kan., at $2.54 per sq.yd. Work involves about 31,000 sq.yd. sheet asphalt

★**Neb., Laurel**—City let contract for 20,000 yd. vitr. brick block pavement on 5 in. concrete base, to Western States Constr. Co., 409 Brandeis Theatre Bldg., Omaha. About $82,000.

★**Neb., McCook**—City let contract paving various streets, to J. C. Braden, Denver, Colo., work involves 29,574 sq.yd. vitr. brick, 1806 ft. 5 in. curbing, 10,684 ft combined curbing and guttering, 28 manholes, 70 catchbasins and 4700 ft. 10-36 in. storm sewer. About $3.82 per sq.yd. Noted July 17.

★**Mo., St. Joseph**—Buchanan Co. let contract paving 2.2 mi. One Hundred and Two Rd., asphaltic concrete, to Metropolitan Paving Co., 114 South 5th St. About $32,949. Noted July 10.

★**Ark., Fayetteville**—Washington Co. Rd. Dist. No. 2 let contract building 52 mi. waterbound limestone and gravel macadam road and 2 mi. bituminous macadam road, to Crane Constr. Co., Springfield, Mo. About $385,000. Noted June 26

★**Ark., Marion**—Bd. Comrs. Rd. Impvt. Dist. No. 9, Crittenden Co., let contract building 11 mi. earth road embankment, to R. G. Hill & Co., 1st Natl. Bank Bldg., Birmingham, Ala., $69,300. Work involves 125,000 cu.yd. embankment, 20 acres clearing and grubbing, 80 cu.yd. plain concrete, 1200 ft. 18 and 24 in. corrugated metal, 1200 ft. 18 and 24 in. vitr. and 1200 ft. 18 and 24 in. rein.-con. pipe. Noted July 17.

★**Tex., Houston**—Harris Co. let contract scarifying and rescarifying 7.41 mi. Houston-Crosby Rd. No. 1, 24 ft. wide, to Miller & Johnson, Crosby, $16,112; building cement concrete pavement, etc., on 1.859 mi. Houston-Crosby Rd. No. 4, 16 ft. wide, to Houston Constr. Co., 518-18 Commercial Bank Bldg., $56,067. Noted July 17

★**Tex., Jasper**—Jasper Co. let contract gravel surfacing 4.23 mi Highway No. 7 from Angelina Co. line to Jasper, and 16.21 mi. Highway No. 7, from Jasper west, to Smith Bros., Crockett, $15,669 and $110,813 respectively. Noted July 17

Tex., Mt. Vernon—Franklin Co. received only bid graveling 11.13 mi. and building 1.24 mi. concrete road and concrete drainage structures on Highway No. 1 from Hopkins Co. to Titus Co. line, 9 ft. and 14 ft. wide, from Allhanes & Davis, Wills Point, $55,850. Noted July 17.

★**Okla., Pauls Valley**—City let contract paving North Ash St., Charles, Paul and Bert Aves., to R. S. Mitchell, Oklahoma, $123,791. Noted July 31.

★**Colo., Ft. Morgan**—City let contract paving ½ mi. road, to Colorado Bridge & Constr. Co., 306 Gas & Electric Bldg., Denver. About $10,000.

★**New Mexico**—State Highway Comn., Santa Fe, will build 21 mi. Federal Aid Project No. 4, from Armijo to Rio Puerco, Valencia Co., 20 ft. wide, involving 18,000 cu.yd. excav., 1100 yd. gravel, 8000 yd crushed rock sufacing, 8 wooden bridges etc. About $74,000. Work will be done by day labor.

★**Wash., Centralia**—City Council let contract paving 4 blocks Main St., concrete, to G. J. Albers & Son, Chehalis, $36,747

Wash., Colville—City received bids paving 3 blocks on Main St. and 5 blocks on parking business center (1) cash; (2) bonds, from J. W. Baylor, 704 Cleveland St., (2) $26,764; Alloway & Georg, Old Natl. Bank Bldg., (1) $23,668, (2) $24,497; Root & Joslin, (1) $24,145, (2) $25,021 All contractors of Spokane.

★**Wash., Mt. Vernon**—Comrs. Skagit Co. let contract paving 4.5 mi. road in Local Impvt. Dist. No. 9, Sect. No. 3, 16 ft. wide, involving 41,700 sq.yd. concrete and 16,000 cu.yd. earth excav., to C. L. La Plant, Sedro Woolley, $124,090; 1.75 mi. in Local Impvt. Dist. No. 6, Sects. 2 and 3, 16 ft. wide, 16,550 sq.yd. concrete and 3000 cu.yd. earth excav., to Kaiser Paving Co., Green Bldg., Seattle, $44,016.

★**Wash., Orting**—Comrs. Pierce Co., Tacoma, rejected bids paving 1 mi. Caligostoga Ave., here, 1 course concrete. About $21,000. Work will be done by day labor.

★**Wash., Seattle**—Bd. Pub. Wks. let contract paving Harbor Ave., S. W., et al., to Independent Asphalt Paving Co., Seaboard Bldg., $76,614. Eastern Ave., et al., involving 3740 sq.yd. 6 in. concrete, 2625 lin. ft. concrete curbing and guttering, and 1100 cu.yd. earth excav., to Fiorito Bros., Seattle, $14,496. Noted July 31

★**Wash., Seattle**—Bd. Pub. Wks. let contract paving Railroad Ave., et al., involving 200 sq.yd. brick block and 1960 sq.yd. 3 in. wood block, to S. A. Mocerri, 1515 West Barrett St., $13,163. Noted July 17.

★**Wash., Seattle**—Comrs. King Co. let contract building 3.27 mi. Newport-Bellevue Rd., 24 ft. wide, involving 500 cu.yd. gravel surfacing and 30,000 cu.yd. earth excav., also building 2500 ft. creosoted piling trestle, to Hanson & Hauge, Seattle, $76,800. Noted July 31

Wash., Spokane—City Comrs. received bids paving Monroe St., from River St. to Eklund Ave., concrete, from Grays Harbor Constr. Co., Hoquiam, $56,927; Haukeh-Hegg Co., Aberdeen, $57,552

★**Wash., Tacoma**—Comrs. Pierce Co. received no bids July 17 clearing, grubbing and grading Pioneer Way from Crocker to South Prairie. About $31,500. Work will be done by day labor.

★**Wash., Vancouver**—Comrs. Clarke Co. let contract building 7.5 mi. concrete road, to United Contg. Co., Northwest Bank Bldg., Portland, Ore., $158,419.

★**Ore., Astoria**—City let contract paving and building concrete and wooden sidewalks on 2nd St. and paving Floral Ave., to Miller & Bauer, Astoria, $7828 and $7287 respectively; 12th St., to J. Slotti, $5586; Grand Ave., to H. Makela, $6974; 31st St., to J. Woupie, $1700. Noted July 17.

★**Ore., Marshfield**—See "Sewers."

★**Ore., Marshfield**—City let contract paving South 6th St., rock asphalt, to Klockers & Webber, North Bend, $24,356 Noted June 10.

Ore., Portland—City Council received bids grading, paving and building sidewalks, (a) Woodward Ave. from East 19th to East 21st Sts., (b) district improvements in portions of East 25th St. and Woodward Ave., (c) Grand Ave. from Alberta to Wygant Sts., (d) East Caruthers St from Almond Addition to East 37th St., (1) asphaltic concrete No. 1 in roadway, 2 in. top, (2) No. 1 concrete in roadway, (3) No. 1 concrete in track, (4) asphaltic concrete No. 1, 2 in. top, (5) concrete in track, from Warren Constr. Co., Journal Bldg., (a1) $1.34 per yd., total cost, $4448, (b3) $2.00 per yd., (b4) $1.35 per yd., $16,339, (c) $1.34 per yd., $6199, (d4) $1.34 per yd., $4448; Cochran Bros., (a2) $2.05 per yd., $4546, (b5) $2.05 per yd., $16,723

★**Cal., Fresno**—City let contract paving F and N Sts., 4 in. concrete paving with 1½ in. bitulithic surface, to Thompson Bros., 1514 H St., $46,990

★**Cal., Hercules**—City let contract paving ¾ mi. Main St., concrete, to Bates & Borland, 592 Market St., San Francisco, $20,000.

Cal., Oakland—City received bids grading, curbing, guttering and paving 2000 ft. Fruitvale and Whittle Aves., from Bates & Borland, Bway. and 12th St., $35,166; Oakland Paving Co., 5000 Bway., $35,642; Hutchinson Co., 444 17th St., $36,612. Noted July 24.

★**Ont., Kitchener**—Waterloo Co. let contract building 3 mi Wellesley Rd., 14, 16 and 24 ft wide, involving 4000 sq.yd. asphalt on concrete base and 33,000 sq.yd. waterbound macadam, to Lichty Bros., Wellesley, $48,385.

★**Ont., Ottawa**—Bd. Control let contract asphalt paving Wilbrod St. from Nicholas to Charlotte Sts., to A. F. Macallum, city engr., Elgin St., $43,106; Slater St. from Bay to Bronson Aves. and Bessemer St. from Nicholas to Charlotte Sts., to O'Leary Bros., Rideau St., $8977 and $46,935 respectively. Noted July 17

★**Ont., Welland**—Welland Co. let contract to J. Person, Welland, building 10 mi. waterbound macadam road from Marshville to Port Colburne, cost $99,782, 2½ mi. Bethel Rd., waterbound macadam, $13,860; ½ mi. concrete highway in Ridgeway, $19,500. Noted July 10.

★**B. C., Esquimalt**—City let contract grading and paving 2¼ mi. Island Highway, 25 ft. wide, to Palmer Bros., 929 Main St., Vancouver. About $75,000.

★**B. C., New Westminster**—Dept. Pub. Wks., Victoria, let contract concrete paving and grading 3 mi. Pacific Highway

Streets and Roads (Continued)

from Westminster Bridge 3 mi. toward Blaine, to H. P. Peterson Constr. Co., Berks Bldg., Vancouver. About $90,000. Government will supply cement. Noted July 24.

Miss., West Point—Drainage—Until Aug. 15, by Comrs. Clay Co., building ditch, 16 ft. wide on bottom, 8 ft. deep, involving 600,000 cu.yd. excav. G. T. Ivy, West Point, attorney.

★**B. C., Vancouver**—City Council let contract paving Pacific St. from Granville to Broughton Sts., and various other streets, asphaltic concrete, to M. P. Cotton Co., Ltd., False Creek. About $50,000. Noted July 10.

Railways

PROPOSED WORK

Michigan—See "Miscellaneous" under St. Ignace.

Oklahoma—K. M. Ward, Richmond Va., O. E. Cope, Waynoka, M. M. Gibbons and D. Carter, Oklahoma City, are forming company and plan to build 53 mi. line between Waynoka and Buffalo, to connect with Atchison, Topeka & Santa Fe R.R. About $800,000. Engineer not selected.

Oregon—Portland & Southwestern Ry., Spalding Bldg., Portland, recently incorporated with $2,000,000 capital stock, plans to build railroad from Portland's southeastern boundary via Waldo Hills and Santiam to Bend. H. S. Huson, ch. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contracts)

★**Oregon**—Oregon Amer. Lumber Co. let contract building 35 mi. standard gauge railroad from Willsbridge via Veronia to Rock Creek, to Utah Constr. Co., Multnomah Hotel, Portland. About $1,500,000.

Excavation and Dredging

PROPOSED WORK

Mich., Detroit—Drainage—See "Sewers"

Wis., Manitowoc—Dredging—City soon lets contract dredging 30,000 cu.yd. in Manitowoc River from Upper Soo Line Bridge to Lower Soo Line Bridge. About $20,000. Bidders to state price for quantities measured in scows. A. H. Zander, city engr.

Ark., Osceola — Redredging — Comrs. Drainage Dist. No. 8, Mississippi Co. having plans prepared by Morgan Eng. Co., engrs., Goodwin Institute, Memphis, Tenn., redredging drainage channels and enlarging outlet.

Tex., Cisco — Excavation—See "Waterworks."

Ore., Bend—Irrigation—Squaw Creek Irrigation Dist. plans to improve irrigation system by building laterals, ditches, flumes and gates. About $15,000.

Cal., Madera—Irrigation—Property owners plan to organize irrigation district comprising 370,000 acres between Foothills, San Joaquin, and Chowhilla River, to build dam in San Joaquin River near Friant, also system of canals. About $15,000,000. L. Hill, Hollingsworth Bldg., Los Angeles, engr.

BIDS DESIRED

Miss., Carrollton—Excavation—Until Aug. 20, by Comrs. Potacowa D.D., Grenada, building channel 2 mi. long, 90 ft. base. Work involves levee 3.2 mi. long, 6 ft. top, 10 ft. average fill, 461,500 cu.yd. dragline excav. and 6 acres clearing. About $70,000. Morgan Eng. Co., Goodwyn Institute, Memphis, Tenn., engrs. Noted Feb. 13.

Mich., Lansing—Drainage—See "Streets and Roads" under Michigan.

Minn., Granite Falls—Ditch—Until Aug. 28, by G. H. Wilson, aud. Yellow Medicine Co., (Granite Falls), and H. O. Thompson, aud. Lac Qui Parle (Madison), building Judicial Ditch No. 2, involving 621,630 cu. yd. 8-24 ft. bottom, 92,008 cu.yd. 6 ft. bottom, 208,200 ft. 6-26 in. tile, 747,380 cu.yd. excav., etc. About $160,396.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Williamstown** — Excavation — Boston & Maine R.R., Boston, will divert Hoosic River between here and Pownal along railroad, involving 272,000 cu.yd. dry earth and rock excav. Work will do away with two railroad bridges. About $250,000. Work will be done by day labor.

N. Y., Brooklyn—Dredging—E. Riegelmann, boro. pres., received bids July 30, dredging Wallabout Canal from Hewes St. to point 1400 ft. north of Hewes St., from New Jersey Shipbuilding & Dredging Co., 66 Orchard St., $18,810. Noted July 24.

★**Ont., Kincardine**—Dredging—Dept. Pub. Wks., Ottawa, let contract for dredging, here, to C. S. Boone Dredging & Constr. Co., Ltd., Excelsior Life Bldg., Toronto. About $10,500.

★**B. C., Victoria**—Canal—Provincial Government let contract building canal for irrigation projects, to A. E. Griffin & Co., Vancouver. About $60,00. Noted July 10.

Industrial Works

PROPOSED WORK

Mass., Gardner—T. A. Dunn & Co. plans to build brick and mill construction addition to factory. About $40,000. Engineer not selected.

Mass., Charlemont—Douglas Packing Co., Rochester, N. Y., soon receives bids building evaporating plant, brick and timber, opposite Boston & Maine R.R. Sta. About $25,000.

Mass., Clinton—L. S. Gottleib, archt., 101 Park Ave., New York City, receives bids about Aug. 15, building 4 story, brick, steel and rein.-con. mill, rein.-con. flooring, brick foundation, for Roubaix Mills, 792 Main St. A. Braciner, 110 West 40th St., New York City, engr. Noted July 17.

Mass., Northampton—J. W. Riley, 132 Pleasant St., soon receives bids building 1 story, 55 x 173 ft. brick and concrete garage, concrete flooring, concrete foundation. About $30,000. Private plans.

Mass., West Upton—Upton Mfg. Co. plans to build 2 story brick and mill construction addition to factory on Williams and Grafton Sts. About $30,000. Private plans.

R. I., Providence—C. B. Bullock, 9 Seekonk St. ,soon receives bids building 1 story, 21 x 120 ft. garage with 1 story, 21 x 79 ft. ell, brick and concrete, concrete foundation. About $30,000. Private plans.

R. I., Providence—Estate of R. G. Davis, 236-240 Meeting St., soon receives bids building 3 story, 50 x 135 ft. concrete and steel garage and service station, concrete flooring and foundation. About $50,000.

R. I., Providence—H. H. Ford, Thurston St., soon receives bids building 1 story, 44 x 84 ft. concrete garage and service station, concrete flooring and foundation, on Thurston St. and Elmwood Ave. About $25,000.

R. I., Providence—T. F. and W. F. Hussey, 226 Williams St., soon receive bids building 1 story, 50 x 183 ft. brick garage, concrete flooring and foundation. About $35,000.

R. I., Providence—Jenks & Ballou, engrs., 1035 Grosvenor Bldg., soon receive bids building 2 story, 40 x 160 ft. brick and concrete warehouse, concrete flooring and foundation, on Canal St., for What-Cheer-Beef Co., 356 Canal St. About $30,000.

R. I., Providence—Page & Page, archts., 87 Weybosset St., soon receive bids building 2 story, 69 x 143 ft. garage and service station, brick, rein.-con. flooring, concrete foundation, on Benefit and Venckes Sts., for J. Goldman, c/o architects. About $50,000.

R. I., Providence—Page & Page, archts., 87 Weybosset St., soon receive bids building 1 story, 87 x 99 ft. cement concrete garage, concrete flooring and foundation, on Sheldon and Benefit Sts., for M. Kellman., 38 Wickenden St. About $30,000.

R. I., Providence—Weeden Land Co., Broad and Fenner Sts., soon receives bids building 1 story, 60 x 96 ft. garage, service and sales stations, brick, concrete and stone, concrete flooring and foundation. About $25,000. Private plans.

Conn., Bridgeport—Bridgeport Brass Co., Grand St., having plans prepared by H. M. Lane Co., engrs., 701 Owen Bldg., Detroit, for 1 story, 150 x 220 ft., brick, steel and concrete addition to casting shop, rein.-con. flooring, concrete foundation, on Grand St. About $150,000.

Conn., Hartford—C. W. Cramer, 217 Main St., plans to build brick and steel garage. About $35,000. Engineer not selected.

Conn., Hartford—United States Rubber Co., Bway. and 58th St., New York City, plans to build 6 story, 100 x 300 ft., brick and concrete addition to plant, on Bartholomew St., here.

Conn., Manchester — Orford Soap Co., Hilliard St., plans to build brick and mill construction factory and mill. About $40,000. Private plans.

Conn., New Haven—F. T. Cox, Railroad Ave. and New St., plans to convert Old Natl. Casket Co. plant into cold storage plant and building large rein.-con. addition. About $60,000. Engineer not selected.

Conn., Windsor Locks—Ford, Buck & Sheldon, Inc., engrs., 60 Prospect St., Hartford, soon receive bids building 2 story, 84 x 135 ft. addition to factory, and 1 story, 84 x 100 ft. cotton plant, rein.-con., rein.-con. flooring and foundation, here, for J. R. Montgomery Co., Windsor Locks. About $80,000.

N. Y., Albany — Crane Co., 836 South Michigan Ave., Chicago, having plans prepared by Fuller & Robinson, archts., 95 State St., for brick and concrete factory and assembly building, on North Bway, here. Cost betwen $150,000 and $200,000.

N. Y., Buffalo—Pierce-Arrow Motor Co., 1695 Elmwood Ave., plans to build 2 story brick and concrete addition to boiler house. About $100,000.

N. Y., Copenhagen—C. W. Pratt, of Island Paper Co., Tannery Island purchased High Falls hydro-electric development here and plans to double present 1000 hp. installation, by building rein.-con. addition to plant and new 1000 hp. generating unit. Estimated cost $25,000.

N. Y., Johnson City—Endicott-Johnson Co. soon receives bids building 6 story, 60 x 300 ft. rein.-con. factory on Lestershire Lumber & Box Co. site. About $300,000. Address G. F. Johnson, Johnson City.

N. Y., Long Island City—A. G. S. Fletcher, archt. and engr., 103 Park Ave., New York City, receives bids about Aug. 9, building 1 story, 200 x 285 ft., brick, rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation, on Borden Ave., School and Mount Sts., here, for Eggleston Bros., c/o architect.

N. Y., New York—Kelly-Springfield Tire Co., 200 West 57th St., soon lets contract building 4 story, 100 x 115 ft. warehouse and 1 story, 60 x 100 ft. service station, brick and steel, rein.-con. flooring, brick foundation, on 10th Ave. and 54th St. About $100,000. E. Necarsulmer, 507 5th Ave., archt. Noted June 5.

N. Y., New York—J. Pedersen, 148th St. and 3rd Ave., having plans prepared by Moore & Landseidel, archts., 148th St. and 3rd Ave., for 1 story, 65 x 155 ft. brick and steel garage, rein.-con. flooring, brick foundation, on West Farms Rd. and 176th St. About $30,000.

N. Y., New York—J. M. B. Realty Co., 30 East 42nd St., having plans prepared by Gronerberg & Leachtag, archts., 303 5th Ave., for 1 story, 100 x 200 ft., brick, steel and rein.-con. garage, rein.-con. flooring, brick foundation, on 158th St. and New York Central R.R. tracks. About $75,000.

N. Y., Ripley—Ripley Milk Products Co. plans to build cheese and butter plant and pasteurizing station. Cost between $60,000 and $75,000. C. B. Newbury, pres.

N. Y., Rochester—J. H. Smith Co., 247 North Goodman St., plans to build 3 story brick addition to factory . About $80,000.

N. Y., Syracuse—Amer. Agricultural Chemical Co., 92 State St., Boston, purchased site on Barge Canal and Hiawatha St. here, and plans to build 3 story, 180 x 340 ft. rein.-con. warehouse, 2 railroad sidings, concrete unloading pier with 1 overhead unloader, conveyor system and overhead trestle with electric hauling units. Cost between $300,000 and $500,000.

N. Y., Syracuse—H. B. Conkling, 411 Tallman St., purchased 4 story, 50 x 100 ft. warehouse at 115 Otisco St., from Drennan Hardware Co., for Syracuse Rug Co., 11 Tallman St., who plans to build mill construction addition. About $25,000.

N. Y., West Endicott (Endicott P. O.)—Endicott-Johnson Co., Johnson City, plans to build 3 story tannery and 4 story shoe factory, concrete, here. Total cost $350,000. Address G. F. Johnson, Johnson City.

Pa., Erie—Ball Engine Co., 12th and Cranberry Sts., plans to build 1 story, 115 x 185 ft. brick and steel addition to present shovel shop. About $65,000. Osborne Eng. Co., 2848 Prospect St., Cleveland, archts. and engrs.

Pa., Mifflinburg—A. P. Villa & Bro., Inc. 95 Madison Ave., New York City, having plans prepared by W. H. Lee, archt., 32 South 17th St., Phila., building 1 and 2 story, 50 x 151 ft. and 45 x 50 ft. factory, here.

Industrial Works (Continued)

Pa., Pittsburgh—Natl. Casket Co., Chateau and Reedsdale Sts., plans to build 5 story, 60 x 330 ft., rein.-con. factory and office, rein.-con. flooring, concrete foundation, on Reedsdale and Mumford Sts., N. S. About $199,000. W. G. Wilkins Co., Westinghouse Bldg., engr. and archt.

Pa., Turbotville—A. P. Villa & Bro., Inc., 96 Madison Ave., New York City, having plans prepared by W. H. Lee, archt., 32 South 17th St., Phila., building 1 story, 50 x 163 and 50 x 70 ft. factory, here.

Pa., Wilkes-Barre—J. Luksic having plans prepared by H. Maier, archt., Coal Exch. Bldg., for 2 story, 54 x 180 ft., rein.-con., steel and brick garage, rein.-con. flooring, rock foundation, on Washington St. About $50,000.

Md., Baltimore—Fenway Apartment Co., St. Paul and 34th Sts., plans to build 2 story, 54 x 108 ft., concrete and steel garage, cement flooring, concrete foundation. About $55,000. Parker, Thomas & Rice, 1109 Union Trust Bldg., archts.

Md., Baltimore—Hutzler Bros. Co., 212 North Howard St., having plans prepared by F. Baldwin, archt., 328 North Charles St., for 8 story, 60 x 60 x 154 ft., rein.-con. and brick warehouse, concrete foundation, on Saratoga and State Sts. About $85,000.

N. C., Albemarle—Albemarle Mfg. Co. plans to build mill. About $1,000,000. Architect not selected.

N. C., Salisburg—Rowan Cotton Mills Co. plans to build 1 story, 100 x 400 ft., brick factory on South Main St. Extension, to include main factory, storage buildings and 30-40 employees' cottages. R. C. Biberstein, 614 Elizabeth Ave., Charlotte, archt.

O., Akron—Akron Baking Co., 178 South Forge St., having plans prepared by McCormick Co., engrs. and archts., Century Bldg., Pittsburgh, Pa., for 2 story, 69 x 132 ft. rein.-con. and steel addition. About $80,000.

O., Akron—G. W. Albrecht having plans prepared by McCormick Co., archts. and engrs. Century Bldg., Pittsburgh, Pa. for 5 story, 45 x 75 x 150 ft. rein.-con., and steel plant, rein.-con. flooring, concrete foundation. About $150,000.

O., Cleveland—Cleveland Fruit Juice Co., 1390 West 9th St., acquired site on Euclid Ave. and London Rd., and plans to build 3 story, 100 x 140 ft., rein.-con., steel and brick factory. About $80,000. Architect not selected.

O., Cleveland—Colburn Machine Tool Co., 1041 Ivanhoe Rd., acquired site at 1040 Ivanhoe Rd., and plans to build 1 story, 192 x 238 ft., rein.-con., steel and brick factory. About $100,000. Architect not selected.

O., Cleveland—Corday & Gross Co., 113 St. Clair Ave., having plans prepared building 2 story, 135 x 200 ft. rein.-con. steel and brick factory and print shop, on East 24th St. and Chester Ave. About $300,000.

O., Cleveland—Crown Land Co., East 22nd St. and Superior Ave., acquired site on West 3rd St. and Lakeside Ave., and plans to build 6 story, 107 x 125 ft. rein.-con., steel and brick factory, concrete foundation. About $200,000. Architect not selected.

O., Cleveland—Dickey Grabler Mfg. Co., 10302 Madison Ave., plans to build 1 story, 69 x 220 ft. rein.-con. steel and brick machine shop. About $50,000.

O., Cleveland—W. S. Ferguson Co., archts. and engrs., 1900 Euclid Ave., soon receive bids building 2 story, 63 x 262 ft., rein.-con. steel and brick factory addition, on East 131st St. and Kirby Ave. About $75,000.

O., Cleveland—Fulton Fdry. Co., 1209 Marquette Rd., plans to build 1 story, 100 x 111 ft., rein.-con., steel and brick addition to foundry on East 75th St. and Morgan Rd. About $70,000. Architect not selected.

O., Cleveland—Grant Motor Car Co., East 131st St., and Kirby Ave., acquired site here and plans to build 2 story, 63 x 262 ft., rein.-con., steel and brick factory addition, concrete foundation. About $75,000. Architect not selected.

O., Cleveland—Natl. Lamp Wks., Nela Park, having plans prepared by F. E. Willis, archt. and engr., New York City, for 2 story, 64 x 139 ft., rein.-con., steel and brick service building, concrete foundation. About $150,000.

O., Cleveland—Ohio Carbon Co., 3620 Loraine Ave., having plans prepared building 1 story, 51 x 100 ft., rein.-con., steel and brick factory, concrete foundation, at 8219 Almira Ave. About $15,000.

O., Cleveland—A. Teachout Co., 321 Prospect Ave., N. W., acquired site on West 20th St. and Loram Ave., and plans to build 3 story, 100 x 160 ft., rein.-con., steel and brick lumber mill. About $80,000. Architect not selected.

O., Cleveland—Vichek Tool Co., 8711 Mt. Auburn Ave., acquired site and plans to build 1 story, 96 x 256 ft., rein.-con., steel and brick factory addition, concrete foundation. About $60,000. Architect not selected.

O., Cleveland—Willard Storage Battery Co., East 131st St., preparing plans for 2 story, 35 x 137 ft., rein.-con., steel and brick factory addition, concrete foundation, at 246 East 131st St. About $40,000.

O., Dayton—Dayton Wright Airplane Co. plans to build two 1 story, 60 x 300 ft. rein.-con. and brick factories, on Coleman and West 3rd Sts. About $30,000. Private plans.

O., Dayton—Market Realty & Storage Co., c/o F. W. Howell, 957 Reinbold Annex, plans to construct 10 story, 60 x 65 ft. rein.-con. storage building and loft, rein.-con. flooring, concrete foundation. About $250,000. F. J. Highes, Dayton, archt.

O., Madison—See "Waterworks."

O., Newark—Bodenstein & Surmann, archts., 2nd Natl. Bank Bldg., Cincinnati, soon receive bids building 2 story, 30 x 60 ft., rein.-con. and brick power house, rein.-con. flooring, concrete foundation, for W. S. Weld & Son, Newark. About $35,000.

O., Ravenna—New Cascade Tire & Rubber Co. having preliminary plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., Cleveland, for plant to include several 1 and 2 story buildings, rein.-con., steel and brick, concrete foundation. About $1,000,000.

O., Springfield—W. Baley Co., West North St., plans to build 2 story, 65 x 130 ft., rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation. About $85,000. Private plans.

O., Springfield—Thompson Grinder Co., Main and Murray Sts., plans to build 1 story, 50 x 200 ft., rein.-con. and brick factory and shop, also 1 story, 30 x 60 ft. stuccoed office, concrete foundation, on Main and Zischler Sts. About $65,000. Architect not selected.

Mich., St. Ignace—See "Miscellaneous."

Ill., Chicago—Creamery Package Co., 61 West Kinzie St., plans to build plant on Division St. and Kostner Ave. to consist of group of buildings, including office, warehouse, etc. About $250,000. Architect not announced.

Ill., Chicago—Economy Machine Products Co., 4755 London Ave., plans to build 160 x 200 ft. factory, on Lawrence and Lipps Aves. Cost over $100,000. Architect not selected.

Ill., Chicago—D. S. Klafter, archt., 64 West Randolph St., soon receives bids building 3 story, 75 x 100 ft. mill construction factory, concrete foundation, on Robey St. and Wilmot Ave., for Ozark Garment Mfg. Co., 1718 North Robey St. About $75,000.

Ill., Chicago—L. Lehle, archt., 38 South Dearborn St., soon receives bids building 1 and 2 story, 75 x 125 ft. and 50 x 125 ft. brick, steel and concrete factory, concrete foundation, on Seminary Ave. near Cornelia Ave., for Westerlin & Campbell Co., 26 North Clinton St.

Ill., Chicago—Wahl Co., 1800 North Roscoe St., soon receives bids building 5 story, 125 x 150 ft. rein.-con. factory, rein. con. flooring, concrete foundation, on Roscoe and Lincoln Sts. About $225,000. B. H. Prack, Keystone Bldg., Pittsburgh, Pa., archt.

Wis., Kohler—Kohler Co. plans to build 2 story, 180 x 260 ft. brick, rein.-con. and steel factory, brick foundation. About $60,000. Brust & Philipps, Free Press Bldg., Milwaukee, archts.

Minn., Minneapolis—Berman Bros., 227 North 1st St., having plans prepared by Long, Lamoreaux & Long, archts., 1028 Andrus Bldg., for 4 story, 84 x 105 ft., warehouse, rein.-con., on 9th Ave., S., and 3rd St. About $75,000.

Minn., Minneapolis—Northwestern Catalog Co., 800 Phœnix Bldg., rejected bids building 4 story, 100 x 100 ft., brick and tile warehouse, rein.-con. flooring. About $100,000. Long, Lamereaux & Long, archts., 1028 Andrus Bldg., will revise plans. Noted May 1.

Neb., Omaha—M. E. Smith & Co., 9th and Farnam Sts., plans to build 8 story, 100 x 132 ft. factory on 10th and Douglas Sts. About $400,000. F. S. Stott, 216 Kennedy Bldg., archt.

Mo., Booneville—Hamilton-Browne Shoe Co., 12th and Washington Sts., St. Louis, soon receives bids building rein.-con. and steel factory, rein.-con. flooring, here. About $50,000. F. C. Taxis, Chemical Bldg., St. Louis, engr.

Mo., Carthage—Platt-Porter Wholesale Grocery Co. having plans prepared building 2 story, 50 x 160 ft. concrete and stone warehouse, rein.-con. flooring, concrete foundation, on 6th and Main Sts. About $55,000. P. K. Simpson, Carthage, archt.

Mo., St. Joseph—Grant Motor Co., Frederick Ave., rejected bids building 2 story, 120 x 140 ft. garage, on 10th and Edmond Sts. About $55,000. R. Meier, 2526 Jule St., archt. Noted July 3.

Mo., St. Joseph—Western Tablet Co., 11th and Mitchell Sts., having plans prepared by R. Meier, archt., 2526 Jule St., for 6 story, 142 x 160 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation. About $250,000.

Tex., Dallas—Proctor & Gamble, Gwynn Bldg., Cincinnati, having plans prepared for refinery and factory, here. About $2,000,000.

Colo., Denver—T. Roberts, 1235 Bway., soon receives bids building 100 x 125 ft. rein.-con., steel and brick garage, concrete foundation, on 11th and Bannock Sts. About $90,000. J. J. Huddart, 409 Bank Bldg., archt.

Wash., Everett—City having preliminary plans prepared developing electric power water plant, 5000-6000 hp. Work involves enlarging present dam and building new one, and constructing tunnel through rock walls. Cost to exceed $10,000.

Wash., Spokane—Spokane Drug Co., 707 Railroad Ave., plans to build 5 story, 116 x 142 ft., steel and concrete factory, rein.-con. flooring, on Wall and Railroad Aves. About $200,000. Architect not selected.

Wash., Vancouver—Clarkes Lumber & Mfg. Co. has acquired 8 acre site and plans to build industrial plant including 1 story, 48 x 112 ft. warehouse and 22 x 104 ft. dry kiln. About $55,000.

Ore., Bend—Oregon Nitrate Co. plans to build crushing plant and install crystallization evaporating system to develop Stinking Lake and Sheep Mountain nitrate deposits. About $25,000. J. H. Morgan, pres.

Ore., Medford—Gagnon Lumber Co. plans to rebuild 1 story timber saw mill near here, to replace one recently destroyed by fire. About $25,000. Private plans.

Cal., Santa Paula—Mupu Citrus Assn. having plans prepared by Allison & Allison, archts., 1405 Hibernian Bldg., Los Angeles, building 2 story, 80 x 100 ft., rein.-con. packing house, concrete foundation.

Cal., Santa Paula—Santa Paula Citrus Assn. having plans prepared by Allison & Allison, archts., 1406 Hibernian Bldg., Los Angeles, for 2 story, 100 x 100 ft., hollow tile and concrete addition to packing house, concrete foundation.

Ont., Brantford—Cockshutt Plow Co. plans to build 1 and 4 story, 50 x 60 ft. and 100 x 145 ft., rein.-con. and brick factory, concrete foundation. About $100,000. Private plans.

Ont., Collingwood—Imperial Steel & Wire Co., Harbor St., plans to rebuild plants destroyed by fire. About $500,000. Private plans.

Ont., Hamilton—Carr Fastener Co., Boston, Mass., purchased 22 acre site here and plans to build factory. About $125,000. Private plans.

Ont., Hamilton—I. Spencer Taner & Co. purchased site and plans to build factory. About $250,000. Address W. S. Scott, 28 Mepleside Ave.

Ont., Sarnia—Wills-Lee Book Bldg., Detroit, Mich., purchased 250 acre site along St. Clair River south of here, and plan to build first unit of factory.

B. C., Merritt—Nicola Pine Mills, Ltd., purchased 250 acre site here and plans to build new mills. About $250,000. H. C. Mecker, mgr. Private plans.

BIDS DESIRED

Conn., Bridgeport—Until Aug. 16, by E. G. Southey, archt., 983 Broad St., for 2 story brick and concrete building, to include stables, garage and storage plant, at Seaside Park, for city. About $50,000. Noted July 3.

Industrial Works (Continued)

Conn., Hartford—Until Aug. 15, by E. A. Sellew, archt., 756 Main St., building 1 story, 90 x 100 ft. garage, with 30 x 30 ft. ell, and 2 story, 40 x 60 ft. office and showroom, brick and terra cotta, concrete flooring and foundation, on Washington St., for Hartford Buick Co., 51 Elm St. About $50,000.

Pa., Ephrata—W. E. S. Dyer, archt., Land Title Bldg., receiving bids building 4 story, 50 x 50 ft. brick and concrete factory, for H. Eby Shoe Co.

Pa., Phila.—J. Miller & Sons Co., 16th and Reed Sts., receiving bids for 3 and 5 story, 90 x 118 ft., rein.-con. and brick factory. F. E. Hahn, 1112 Chestnut St., archt.

Pa., Pittsburgh—Waverly Oil Co., 54th St and Allegheny Valley Street Ry., receiving bids constructing 6 story, 71 x 81 ft. oil storage building and office, rein.-con. flooring, concrete foundation. R. M. Trimble, Ferguson Bldg., archt.

Ill., Chicago—R. C. Harris, archt., 190 North State St., receiving bids for 2 story, 100 x 250 ft. rein.-con. factory, rein.-con. flooring, concrete foundation, on 30th St and Sawyer Ave., for Apex Appliance Co., 3231 West 30th St. About $250,000.

Ill., Wilmette—C. W. Westerlind, archt., 79 West Washington St., Chicago, receiving bids building 3 story, 50 x 125 ft. rein.-con. storage warehouse, rein.-con. flooring, concrete foundation, for Warble Furniture Co. Wilmette. About $65,000

Ont., London—Until Aug. 16, by Greene Swift Co., building 4 story, 40 x 100 ft., concrete and brick addition to factory, concrete foundation, on Talbot St. About $50,000. W. G. Murray, Dominion Savings Bldg., archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., East Springfield** (Springfield P. O.)—Springfield Tool Co., Inc., 125 Dwight St., Springfield, let contract building 1 and 2 story, 90 x 200 ft., brick and mill construction factory and office, rein.-con. flooring, concrete foundation, on Depot and 2nd Sts., to F. T. Ley Co., 499 Main St., Springfield. About $55,000. Noted July 31.

★**Mass., Watertown**—Aetna Mills let contract building 4 story, 75 x 160 ft. brick and mill construction addition to plant, concrete foundation, to H. Wales-Lines Co., 134 State St., Meriden, Conn. About $100,000.

★**Mass., Westfield**—Westfield Candy Co., 132 Elm St., let contract building 2 story brick and cement factory, rein.-con. flooring, concrete foundation, to H. A. Bosshart, 42 Noble St. About $40,000. Noted Apr. 17.

★**Mass., Willimansett** (Holyoke P. O.)—G. Haarmann & Co., Inc., Commerce St., Holyoke, will build 3 story, 60 x 250 ft., brick plant, here. Cost between $50,000 and $75,000. Work will be done by day labor. Noted June 26 under "Holyoke."

★**R. I., Providence**—K. B. Ely, Boston, let contract building 1 story, 50 x 85 ft garage, sales and service station, brick, steel and concrete, on Reservoir St., to E. H. Bigney, 17 Custom House St. About $30,000 Noted July 17

★**R. I., Providence**—S. Waldman, 129 Blackstone St., let contract building 3 story, 28 x 100 ft. brick and mill construction addition to factory, to C. I. Bigney Constr. Co., 898 Westminster St. About $28,000.

★**R. I., Woonsocket**—Barnai Worsted Co., South Main St., let contract building 1 story 35 x 130 ft. and 35 x 40 ft brick and mill construction dyehouse and boiler house, to J. H. Grozier Co., 756 Main St., Hartford. About $25,000. Incorrectly noted in our issue of July 24

★**Conn., Bridgeport**—J. W. Skinner, archt., 1188 Main St., let contract to T. J. Pardy Constr. Co., 15 Fairfield Ave., for 2 story, 45 x 85 and 38 x 70 ft factory, office and storage, brick, concrete foundation, on Water St., here, for J. D. Johnson Co., 54 Cliff St., New York City. About $35,000. Noted June 26.

★**Conn., Hartford**—Ford, Buck & Sheldon, archts. and engrs., 60 Prospect St., let contract to Portens-Walker Co., 13 Forrest St., building 2 story, 50 x 200 ft. rein.-con. addition to factory, rein.-con. flooring, concrete foundation, for Arrow Electric Co., 99 Hawthorne St. About $40,000. Noted July 24.

★**Conn., Middletown**—Russell Mfg. Co., South Farms, let contract building 1 story, 49 x 155 ft., brick and mill construction addition to factory, concrete flooring, concrete foundation, to D. O'Brien & Sons, Inc., 118 Asylum St., Hartford. About $28,000.

★**N. Y., Brooklyn**—S. Z. Ageloff, 126 Reid Ave., will build 1 story, 100 x 125 ft., brick and steel garage, rein.-con. flooring, brick foundation, on Bainbridge St. and Lewis Ave. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Adreff Constr. Co., 467 Hendrick St., will build 3 story, 90 x 140 ft., brick and steel machine shop, rein.-con. flooring, concrete foundation, on Liberty Ave. and Barbey St. About $80,000. Work will be done by day labor.

★**N. Y., Brooklyn**—M. Barslow, c/o A. Farber, archt., 1746 Pitkin Ave., will build 1 story, 100 x 120 ft., brick and steel laundry, brick foundation, on Neptune Ave., between 21st and 22nd Sts. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—M. Black Realty Co. will build 1 story, 85 x 120 ft. brick and steel garage, brick foundation, on Utica Ave. and Herkimer St. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—R. Foustin, 40 Myrtle Ave., will build 1 story brick and steel garage, rein.-con. flooring, brick foundation, on Myrtle and Lewis Aves. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—I. Levy, 17 Marcy Ave., will alter 2 story, 100 x 100 ft. brick and steel factory, rein.-con. flooring, on Metropolitan Ave., near Graham Ave. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—M. Segar, Passaic, N. J., will build 1 story, 105 x 135 ft. brick and steel garage, rein.-con. flooring, brick foundation, on Coney Island Ave. near Foster Ave., here. About $25,000. Work will be done by day labor.

★**N. Y., Lockport**—Harrison Radiator Co., Washburn St., let contract building 3 story, 163 x 397 ft., brick and rein.-con. warehouse, rein.-con. flooring, concrete foundation, to J. W. Cowper Co., Fidelity Bank Bldg., Buffalo. About $100,000.

★**N. Y., Long Island City**—L. Gold, 44 Court St., Brooklyn, will build 1 story, 100 x 150 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on Jamaica Ave. near 102nd St., here. Work will be done by day labor.

★**N. Y., Long Island City**—H. J. Houpert, Harris Ave. and Marion Pl., let contract altering and building 1 story, brick and steel addition to factory, rein.-con. flooring, concrete foundation, to J. O. Whitenack, 231 West 18th St., New York City. About $25,000.

★**N. Y., Long Island City**—Patterson-Sargent Co., 8 Jay St., New York City, will build 4 story, 40 x 110 ft., brick and steel factory, rein.-con. flooring, on Van Dam St. and Borden Ave., here. About $200,000. Work will be done by day labor under supervision of Ballinger & Perrott, archts. and engrs., 47 West 34th St., New York City. Noted June 10.

★**N. Y., Newburg**—Sweet Orr & Co., Inc., 15 Union Sq., New York City, let contract altering and building additions to plant here, to T. C. Desmond Co., 31 Nassau St., New York City. About $100,000.

★**N. Y., New York**—H. O. Chapman, archt., 334 5th Ave., let contract to Fountain & Choate, 110 East 23rd St., building 7 story, 50 x 100 ft., brick and steel publishing house, brick foundation, for Street & Smith, 161 West 15th St. About $125,000. Noted July 10.

★**N. Y., New York**—Hillman Co., 567 3rd Ave., will build 1 story, 99 x 120 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 237-245 East 41st St. About $25,000. Work will be done by day labor. Noted June 12.

★**N. Y., New York**—King Phillip Chocolate Co., 44 Whitehall St., let contract building 5 story rein.-con. and steel factory, rein.-con. flooring, concrete foundation, with 65,000 sq.ft. floor space, at 127 East 12th St., to J. O. Whitenack, 231 West 18th St. About $30,000.

★**N. Y., New York**—J. O'Flaherty, 371 West 148th St., let contract building 3 story, 75 x 101 ft., brick and steel printing plant, rein.-con. flooring, concrete foundation, on 48th St. and Cortlandt Ave., to G. H. McEntee, 1123 Bway. About $60,000.

★**N. Y., Oswego**—Oswego Candy Co., 275 West 1st St., let contract building 4 story brick, rein.-con. and steel factory, on Utica and 2nd Sts., to P. Raby Contg. Co., 23 West Cayuga St. About $50,000.

★**N. Y., Schenectady**—Le Valley, M'Leod-Kincaid Co. let contract constructing 3 story factory and store building, with 160 ft. frontage, brick and steel, on Van Guysling Ave., to Brown & Lowe, Foster Ave. About $75,000.

★**N. Y., Syracuse**—H. H. Franklin Mfg. Co., 302 South Geddes St., let contract building 7 story, 120 x 240 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on West Marcellus and Magnolia Sts., to W. J. Burns Co., Keith Theatre Bldg. About $400,000. Noted May 8.

★**N. Y., Syracuse**—Hammond Steel Co., 1400 Milton Ave., Solvay, let contracts building 80 x 260 ft. and 40 x 60 ft. concrete plant, here, to Levering & Carrigues Constr. Co., 552 West 23rd St., New York City, and Dawson Bros. Contg. Co., Union Bldg. About $250,000.

★**N. J., Camden**—Eavenson & Levering, 217 Atlantic St., let contract building 3 story, 80 x 132 ft. rein.-con., brick and steel addition to factory, to G. Kessler Constr. Co., Denckla Bldg., Phila. About $40,000.

★**N. J., Newark**—Cellulose Co., c/o Lockwood & Greene, archts. and engrs., 101 Park Ave., New York City, let contract building 1 story, 28 x 68 ft., rein.-con. and steel factory, concrete foundation, to J. W. Ferguson, Paterson. About $50,000.

★**Pa., Phila.**—Collins & Aikman, 4675 Nixon St., let contract building 4 story, 62 x 160 ft. rein.-con. factory, on 51st St. and Leidy Ave., to W. Steele & Sons Co., 16th and Arch Sts.

★**Pa., Phila.**—Drueding Bros. Co., 5th and Master Sts., let contract building 9 story, 91 x 100 ft. rein.-con. and brick factory, to W. Steele & Sons Co., 16th and Arch Sts.

★**Pa., Phila.**—Powers, Weightman & Rosengarten, 916 Parrish St., let contract building 5 story, 25 x 31 ft., 35 x 58 ft., 35 x 72 ft. and 35 x 80 ft., brick additions to factory on Brown and Hutchinson Sts., to R. C. Ballinger & Co., 218 North 13th St. About $45,000.

★**Pa., Phila.**—Rosenblum & Jaffe Bros., 419 South St., let contract building 5 story, 50 x 100 ft., brick and terra cotta warehouse at 521 South 4th St., to B. Bornstein, 1512 North Franklin St. About $50,000.

★**Pa., Pittsburgh**—Atlantic Refining Co., Chamber Commerce Bldg., will build 1 story, 45 x 125 ft., rein.-con. and brick boiler house, concrete foundation. About $25,000. Work will be done by day labor.

★**Pa., Pittsburgh**—Denny Estate, 4th Ave., let contract rebuilding 4 story, 100 x 120 ft., rein.-con. and brick storage building, rein.-con. flooring, concrete foundation, on 29th St. and Liberty Ave., to B. A. Groah Constr. Co., 847 West North St. About $50,000.

★**Pa., Pittsburgh**—Pittsburgh Rolls Corp., 41st and Willow Sts., let contract building brick and steel annealing furnace and coke ovens, rein.-con. foundation, to S. R. Smythe, House Bldg. About $26,000.

★**Pa., Reading**—Phila. & Reading R. R., Reading Terminal, Phila., let contract building 1 story, 38 x 50 ft. rein.-con. and brick power house, here, to R. E. Lamb, 841 North 19th St., Phila.

★**Pa., Shamokin**—Hewesco Silk Co. let contract building 2 or 3 story, 59 x 90 ft., rein.-con. and brick factory, to Shamokin Lumber & Mfg. Co., 37 South 5th St. Noted July 17.

★**Pa., Wyncote**—D. Wentz let contract building 1 story, 56 x 97 ft. stone and frame garage, to F. T. Mercer Co., 1706 De Lancy St., Phila. About $30,000.

★**Md., Baltimore**—Amer. Ice Co., 309 Calvert Bldg., let contract building 1 story, 28 x 160 ft., rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on Franklin St. near Pulaski St., to H. S. Rippel, 1929 West Baltimore St. About $50,000

★**Md., Baltimore**—Shapiro & Roney, Pratt St. and Fremont Ave., let contract building 2 story, 75 x 178 ft., rein.-con. and brick warehouse, concrete foundation, to Price Constr. Co., 210 Maryland Trust Bldg. About $65,000. Noted July 24.

★**N. C., Greenville**—Greenville Cotton Mills, Inc. will build 80 x 257 ft. brick factory. About $250,000. Work will be done by day labor.

★**Ala., Ensley**—Ensley Motor Co., Ave. H, Birmingham, let contract building 2 story, 75 x 140 ft. brick garage and repair shop, at Ave. E and 20th St., here, to P. E. Bostick, 1st Nat'l Bank Bldg., Birmingham. About $45,000

Industrial Works (Continued)

★**O., Cleveland**—Advertype Co., 1823 East 23rd St., let contract building 2 story, 80 x 115 ft., rein.-con., steel and brick publishing house, to W. Dunbar Co., 8201 Cedar Ave. About $50,000. Noted July 3.

★**O., Cleveland**—P. A. Gier Co., 5112 St. Clair Ave., let contract building 2 story, 60 x 200 ft., rein.-con., steel and brick machine shop, at 534 East 105th St., to Minnick & Gibbons, 5309 Prospect Ave. About $75,000. Noted July 31.

★**O., Cleveland**—Superior Fdry. Co., East 71st St., let contract altering and building 2 story, 75 x 200 ft., concrete, steel and brick addition to foundry, to Austin Co., 16112 Euclid Ave.

★**O., Dayton**—Ohio Mitchell Sales Co., 1st and St. Clair Sts., let contract building 2 story, 80 x 176 ft. rein.-con., garage and salesroom, rein.-con. flooring, concrete foundation, on Main and Riverdale Sts., to C. W. Bittner, 22 East Bittner St. About $35,000. Noted June 26.

★**O., Marion**—Amer. Malleable Castings Co. let contract building 1 story, 70 x 75 and 60 x 70 ft., rein.-con., steel and brick foundry addition, to J. Baldauf & Co., Marion. About $50,000. Noted July 31.

★**O., Springfield**—Superior Gas Engine Co., Sheridan Ave., let contract building 2 story, 60 x 150 ft., rein.-con. machine shop, concrete flooring; 1 story, 110 x 280 ft., steel foundry, rein.-con. flooring and foundation, and 1 story, 95 x 160 ft., rein.-con. storage house, to T. A. Graham, Sheridan Ave. About $125,000. Noted June 26.

★**Mich., Detroit**—Chevrolet Motor Co., 1244 Woodward Ave., let contract constructing 1 story, 106 x 150 ft., rein.-con., brick and steel service building, rein.-con. flooring, concrete foundation, on York and Cass Aves., to A. J. McLean Bldg. Co., 307 Stevens Bldg. Noted July 24.

★**Mich., Detroit**—Detroit Steel Products Co., East Grand Blvd., let contract building 1 story, 80 x 198 ft., sash factory, steel and cement stone, rein.-con. and creosoted wood block flooring, concrete foundation, to Cooper Widenmann Co., 854 Penobscot Bldg.

★**Mich., Detroit**—Fisher Body Corp., Piquette Ave., let contract building 6 story, 156 x 581 ft., rein.-con. and brick shop, rein.-con. flooring, concrete foundation, on Piquette Ave. and St. Antoine St., to H. G. Christman Co., 315 Stevens Bldg., $1,200,000. Noted July 17.

★**Mich., Detroit**—Ford Motor Co., Highland Park, let contract constructing 1 story, 100 x 313 ft., rein.-con. and tile, dry kiln building, rein.-con. flooring, concrete foundation, to H. G. Christman Co., 315 Stevens Bldg. About $100,000.

★**Ill., Chicago**—Chicago & Northwestern R.R., 226 West Jackson Blvd., let contract building rein.-con. grain elevator, 1,000,000 bushels capacity, to Witherspoon-Englar Co., 53 West Jackson Blvd. About $1,000,000.

★**Ill., Chicago**—Hoeft & Co., 400 North Ashland Ave., let contract building 1 and 2 story, 120 x 120 ft. brick and timber addition to factory, concrete foundation, on Kinzie St. near Paulina St., to Menke-Thielberg Co., 139 North Clark St. About $35,000. Noted July 17.

★**Ill., Chicago**—L. Melind Co., 183 West Madison St., let contract building 3 story, 50 x 125 ft. mill construction factory, concrete foundation, at 362-364 West Chicago Ave., to J. Hammond Co., 68 West Washington St. About $50,000

★**Ill., Chicago**—A. Pick & Co., 212 West Randolph St., let contract building 5 story irregular shaped, rein.-con. addition to warehouse, rein.-con. flooring, concrete foundation, to have 200,000 sq.ft. floor space, on 35th St. and Racine Ave., to E. W. Sproul Co., 2001 West 39th St. About $400,000.

★**Ill., East St. Louis**—Kellor Flour Mills, 430 South Front St., will build 4 story, 85 x 125 ft., concrete, brick and steel mill, rein.-con. flooring, rock foundation. About $60,000. Work will be done by day labor.

★**N. D., Fargo**—F. L. Berry, 311 1st Ave. N., let contract building 4 story, 55 x 150 ft., concrete and brick garage, to Meincke Johnson Constr. Co., Fargo. About $75,000.

★**Wyo., Cheyenne**—International Harvester Co. let contract building 3 story, 132 x 132 ft., concrete warehouse and office, to Midland Eng. Constr. Co., 332 South Michigan St., Chicago. About $100,000

★**Mont., Great Falls**—Great Falls Iron Wks., 13th St. and 8th Ave., N., let contract building 1 story, 100 x 150 ft. addition to foundry, to Thiesen Co., Great Falls. About $50,000.

★**Mo., St. Louis**—Johansen Bros. Shoe Co., 3645 Laclede Ave., let contract building 5 story 53 x 102 ft., steel and brick factory, rein.-con. flooring, concrete foundation, to Western Constr. Co., Century Bldg. About $50,000.

Cal., Los Banos—California Central Creameries Co., c/o H. J. Brunnier, engr., Sharon Bldg., San Francisco, received bids building 1, 2 and 3 story 150 x 150 ft., creamery, power house and 2 small warehouses, rein.-con., brick and steel, concrete foundation, from Lange & Bergstrom, Sharon Bldg., $66,600; G. W. Boxton, Hearst Bldg., $67,899; Duncan & Co., Sharon Bldg., $70,100. All contractors of San Francisco.

★**Cal., San Francisco**—E. C. Voorhies let contract building 4 story, 135 x 350 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Kearny and Francisco Sts., to Cahill & Vensano Co., French Bank Bldg. About $250,000. Address owner, c/o contractors.

★**Que., Montreal**—Letrault Shoe Mfg. Co., 331 De Montigny St. E., let contract building steel and brick factory, to A. Gratton, 142 5th Ave. About $85,000.

★**Ont., Brantford**—Brantford Smelting let contract building 1 story, 100 x 200 ft. concrete and brick plant, concrete foundation, to P. H. Secord, 133 Nelson St. About $50,000.

★**Ont., London**—H. C. McBride, archt., Molsons Bank Bldg., let contract building 5 story, 150 x 250 ft., rein.-con. and brick factory, concrete foundation, on St. George St., for C. S. Hyman & Co., Richmond St., to P. H. Secord & Sons, 133 Nelson St., Brantford. About $200,000. Noted July 31.

Buildings

PROPOSED WORK

Mass., Boston—Bank—First Natl. Bank, 70 Federal St., purchased Equitable Bldg. on Milk St. and properties immediately in rear, comprising an area of over 20,800 sq. ft. extending 108 ft. on Milk St. and 171 ft. each upon Devonshire and Federal Sts. and plans to erect bank building. About $2,000,000.

Mass., Chicopee—School—Bd. Educ. plans to build 6 room school on Chicopee St. About $50,000. Architect not selected.

Mass., Fall River—School—Bd. Educ. plans to build brick, steel and concrete school in Bower St. Sect. About $60,000. Engineer not selected.

Mass., Fall River—School—Bd. Educ. plans to build fireproof grammar school on New Boston Rd. Architect not selected.

Mass., Northampton—Memorial—City plans to reconstruct and convert Clarke Library into memorial building for soldiers and sailors. About $250,000. Engineer not selected.

Mass., Pittsfield—Church—First Church of Christ Scientist, 131 South St., purchased site on Wendall Ave. and plans to build brick church. About $50,000. Engineer not selected.

Mass., Shrewsbury—Church—Methodist congregation plans to build brick church. About $60,000. F. E. Smith, pastor. Engineer not selected.

Mass., Springfield—Hotel—D. H. Sievers & Co., Hillman St., plans to build 6 story addition to Highland Hotel. About $200,000. Engineer not selected.

Mass., Springfield—Temple—Masonic Order, Main and State Sts., plans to build fireproof temple on State and Myrtle Sts. About $500,000. Architect not selected.

Mass., Willimansett (Holyoke P. O.)—Housing—G. Haarmann & Co., Inc., Commerce St., Holyoke, plans to build group of 2 story brick and timber houses for workmen, concrete, rock and brick foundation, here. About $100,000

Mass., Winchendon—Memorial—N. D. and J. N. White, Jr., Winchendon Springs, plan to construct memorial building here, to late J. N. White, Sr., to include community, clubhouse and athletic field. About $100,000. Architect not selected.

R. I., Pawtucket—Synagogue—Marshak & Hickey, archts., 310 Strand Bldg., Providence, soon receive bids building 60 x 70 ft. brick and concrete, concrete and stone foundation, on Jackson St., for Congregation Ohave Sholan, Jackson and High Sts. About $50,000. Noted May 1.

Conn., Bridgeport—School, Convent, etc.—St. Cyril & Methodius Roman Catholic congregation, Church St., having plans prepared by B. Wozny, archt., 381 Main St., Springfield, Mass., for school house and assembly hall, cost $175,000; 16 room convent, $5000 and rectory, $25,000. J. Panik, pastor. Noted July 3.

Conn., Hartford—Theatre, etc.—See "Miscellaneous."

Conn., Meriden—Y. M. C. A. plans to erect new building on West Main St. About $60,000. Jallade, Lindsay & Warren, 37 Liberty St., New York City, archts.

Conn., New Britain—Home, etc.—Knights of Columbus, Daly Council, 434 Main St., plans to build home and club on Main St. About $200,000. Architects not selected.

Conn., Ridgefield—Bank—First Natl. Bank, Main St., having plans prepared by E. Greene, archt., 5 Beekman St., New York City, for 1 story, brick and marble. About $50,000.

Conn., Tariffville—School—Simsbury Twp., plans to build 6 room brick school on Winthrop St., here. About $50,000. Architect not selected.

Conn., Thompsonville—Housing—Bigelow-Hartford Carpet Co., 58 Main St., soon receives bids building thirty brick and timber houses for workmen, concrete and stone foundation. About $125,000. Private plans.

Conn., Windsor—School—Town plans to build school in Dist. No. 3. About $50,000. Engineer not selected.

N. Y., Albany—Hall—F. F. Proctor Co., 69 North Pearl St., plans to repair and alter Harmannus Bleecker Hall, 161 Washington St., brick and rein.-con. About $75,000.

N. Y., Buffalo—Office—Buffalo Enquirer Co., 250 Main St., having plans prepared by E. B. Green & Son, archts., 75 Niagara St., for 30 story, 86 x 100 ft., concrete and steel, concrete foundation. About $500,000.

N. Y., Buffalo—Office—Buffalo Fdry. & Machine Co., 1543 Fillmore Ave., plans to build 2 story, 70 x 90 ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on East Ferry St. About $70,000. North, Sheldgreen & Swift, Niagara Life Bldg., archts.

N. Y., Buffalo—Theatre—W. F. McDonald, Hertel Ave., plans to build brick and concrete on Hertel Ave., between Park and Norwalk Aves. About $200,000.

N. Y., Lockport—Theatre—Victoria Theatre Assn. plans to build brick, concrete and steel theatre on Main and Elm Sts. About $150,000. W. N. Cross, Lockport, chn. bldg. com.

N. Y., Mineola—Hospital—Nassau Hospital having preliminary plans prepared by Lord & Hewlet, archts., 343 5th Ave., New York City, for altering and building brick, stone and steel addition, brick foundation. About $300,000.

N. Y., New York—Office—Amer. Realty Co., 71 Bway., having plans prepared by A. C. Jani, archt. and engr., 71 Bway., for altering 16 story, brick and steel, at 32 Bway. About $100,000.

N. Y., New York—Restaurant and Store—New York Central R.R., 70 East 45th St., having plans prepared by Warren & Wetmore, archts. and engrs., 16 East 47th St., for alterations to brick and steel, at 3-11 Vanderbilt Ave. About $1,000,000

N. J., Asbury Park—High School—School Bd. plans to purchase 20 acre site west of Pine St. and build school. Cost to exceed $300,000. J. G. Coleman, comr. bd. educ.

N. J., Plainfield—School—Bd. Educ. soon lets contract building 2½ story, 55 x 150 ft., brick and steel, brick foundation on Emerson Ave. About $140,000. Incorrectly noted in our issue of July 24

N. J., Trenton—Hotel—Stacy-Trent Hotel Co., Broad St. Bank Bldg., soon receives bids building 10 story, rein.-con., brick and steel. About $1,000,000. W. A. Klemann, 1st Natl. Bank Bldg., archt. J. O. Hunt 144 North Montgomery St., engr.

Buildings (Continued)

Pa., Lansdale—Church—Methodist Episcopal congregation having plans prepared by G. E. Savage, archt., Witherspoon Bldg., Phila., for 1 story, 55 x 110 ft. stone. About $50,000.

Pa., Phila.—Hospital—Dept. Health and Charities soon receives bids altering and building 3 story, 40 x 62 ft. 40 x 50 ft. and 31 x 47 ft., brick and stone, for contagious diseases. About $300,000. P. H. Johnson, 1713 Sansom St., archt. and engr.

Pa., Pittsburgh—Office—See "Industrial Works."

Pa., Pittsburgh — High School — Bd. Educ., Fulton Bldg., having plans prepared by Alden & Harlow, archts., Farmers' Bank Bldg., building 4 story, steel and brick addition to South Hills High School, on Ruth St. About $911,200.

Pa., Pittsburgh—School—Bd. Educ., Fulton Bldg., plans to build 3 story, 65 x 125 ft., steel and brick addition to Gladstone Elementary School, concrete foundation. About $238,000. O. M. Topp, Jenkins Arcade, archt.

Pa., Pittsburgh—School—Bd. Educ., Fulton Bldg., having plans prepared by E. Stotz, archt., Monongahela Bldg., building 2 story, 64 x 158 ft., brick and steel addition, brick and concrete foundation, on South 9th and Carsons Sts. About $221,400.

Pa., Pittsburgh—School—Bd. Educ., Fulton Bldg., having plans prepared by Kiehnell & Elliott, archts., 245 4th Ave., for 3 story, 75 x 340 ft., with 65 ft. wing, steel and brick, rock foundation, on Greenfield Ave., to be known as Greenfield Elementary School. About $598,720.

Pa., Pittsburgh—School—Bd. Educ., Fulton Bldg., having plans prepared by P. C. Bowler, archt., Magee Bldg., for 3 story, 70 x 320 ft., with 40 ft. wing, brick and steel, concrete foundation, to be known as Beechwood Elementary School. About $553,040.

Pa., Pittsburgh—High School—Bd. Educ., Fulton Bldg., had plans prepared by McClure & Spahr, archts., Keystone Bldg., for 3 story, 170 x 303 ft., brick and steel, concrete foundation, in Sheridan Dist., to be known as Samuel P. Langley High School. About $664,500.

Pa., Pittsburgh—School—Bd. Educ., Fulton Bldg., having plans prepared by R. M. Trimble, archt., Ferguson Blk., for 3 story, 130 x 242 ft., steel and brick addition to Perry Elementary School, on Perrysville Ave. About $612,000.

Pa., Wilkes-Barre — Church — Syrian Greek Catholic congregation plans to build 2 story, 40 x 80 ft., brick, stone and steel, stone foundation, on Park Ave. About $80,000. C. R. Rinehimer, 10 Airy St., archt.

Md., Boomsboro—Mausoleum—City having plans prepared building 29 x 50 ft., rein.-con., granite and bronze community mausoleum.

Va., Pulaski—Theatre, Stores and Offices—S. Dalton had plans prepared by J. R. Forsythe, archt., 232 St. Paul St., Baltimore, Md., for 3 story, 76 x 180 ft., brick and rein.-con., concrete foundation. About $60,000.

W. Va., Charleston — Municipal — City election Aug. 20, to vote on $1,000,000 bonds to construct new city buildings, jail, central, and other fire stations, also pave and build sewers in various streets.

O., Centerville—School—Bd. Educ. Washington Twp. plans to build 2 story, 80 x 130 ft., rein.-con. and brick, concrete foundation. Bonds for $80,000 voted for project. A. Potter, supt.

O., Cincinnati—Lodge—Walnut Hills Masonic Lodge, Peebles Corner, plans to build lodge on Alms Pl. About $60,000.

O., Cleveland—Church—Third Reformed Church, 1531 East 36th St., acquired site on Eddy Rd. and plans to build 1 story, 72 x 100 ft., rein.-con., stone, steel and brick, concrete foundation. About $60,000. Architect not selected.

O., Cleveland — Commercial — Company, c/o Citizens Savings & Trust Co., Citizens Bldg., acquired site on East 30th St. and Euclid Ave. and plans to build 5 story, 270 x 280 ft. rein.-con., steel and brick, concrete foundation. About $300,000. Architect not selected.

O., Cleveland—Commercial—J. Laronge, 214 Williamson Bldg., acquired site on East 55th St. and Euclid Ave., and plans to build 6 story, 80 x 140 ft., rein.-con., steel and brick, concrete foundation. About $150,000. Architect not selected.

O., Cleveland—Commercial—H. O. Oster, 2052 East 105th St., acquired site on 105th St. and Euclid Ave., and plans to build 2 story, 42 x 280 ft. rein.-con., steel and brick. About $100,000. Architect not selected.

O., Cleveland—Commercial—L. A. Skeel, 1040 Forest Cliff Dr., acquired site at 2044 Euclid Ave., and plans to build 5 story, 50 x 189 ft. rein.-con., steel and brick. About $100,000. Architect not selected.

O., Cleveland—Office—Cleveland Ry. Co., Leader-News Bldg., plans to build 1 story, 75 x 80 ft., rein.-con., steel and brick, on Howard Ave. About $50,000. Architect not selected.

O., Cleveland—High School—Bd. Educ., East 6th St. and Rockwell Ave., receives bids in fall for 2 story, 80 x 120 ft., rein.-con., stone, steel and brick addition, concrete foundation, on East 55th St. and Scoville Ave. About $150,000. W. R. McCormack, East 6th St. and Rockwell Ave., archt.

O., Columbus—Hospital—Children's Hospital Assn., Fair Ave. and Franklin Park West, soon receives bids building 4 story, 40 x 200 ft., rein.-con., with 2 wings, 40 x 150 ft. and 25 x 60 ft., rein.-con flooring, concrete foundation, on 17th St. About $300,000. Richards, McCarty & Bulford, 584 East Broad St., Columbus, archts.

O., Dayton—Church and Library—Second Church of Christ Scientist, East 1st St., purchased site on Grand and Belmont Sts., and plans to build 100 x 250 ft., stone and brick. About $150,000. Architect not selected.

O., Dayton — Club House — Hollywood Club, 133 West 2nd St., plans to build 3 story, 60 x 130 ft. About $100,000. Architect not selected.

O., Dayton — Office and Store — A. Schwartz Estate, 5th and Ludlow Sts., plans to build 4 to 6 story, 58 x 100 ft., rein.-con. and brick, concrete foundation, on South Ludlow St. About $200,000. Architect not selected.

O., Dayton—Seminary, etc.—Bonebrake Theological Seminary having plans prepared by F. J. Hughes, archt., Dayton, building 2 to 4 story, rein.-con. and brick seminary, concrete foundation on 19½ acre site on Cornell Ave. Plans include main building, gymnasium and several smaller buildings. About $400,000.

O., Dayton—Store—Reed Furniture Co., East 3rd St., having plans prepared by Pretzinger & Musselman, archts., 1155 Reibold Bldg., for 3 story, 50 x 120 ft. rein.-con. and brick, concrete foundation on 5th St., near Main St. About $100,000.

O., East Cleveland (Cleveland P. O.)—School—Bd. Educ., Williamson Bldg., Cleveland, having plans prepared by W. Hirsch, archt. and engr., 1900 Euclid Ave., for 2 story, 100 x 200 ft., rein-con., steel, stone and brick, on Shaw Ave. About $100,000.

O., South Euclid—School — Bd. Educ. plans to build 1 story, 75 x 150 ft., rein.-con., stone, steel and brick. About $150,000. Architect not selected.

O., Tiffin—Bank—Tiffin Natl. Bank having plans prepared by Walker & Weeks, archts. and engrs., 1900 Euclid Ave., Cleveland, building 2 story, 50 x 100 ft., rein.-con., steel and brick, on Washington St. About $60,000.

Mich., Detroit — Club—Masonic Athletic Assn., c/o G. W. Graves, archt., 43 John R St., having plans prepared for 3 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on shore Lake St. Clair. About $100,000. W. F. Jordan, secy.

Mich., Detroit—Commercial and Hotel—H. Chalmers, 275 Iriquois Ave., having plans prepared by B. C. Wetzel & Co., story, 90 x 226 ft., rein.-con., brick and steel, concrete foundation, on Woodward and Parsons Sts. About $175,000.

Mich., Detroit—Hotel—W. J. Brown, 193 Woodward Ave., having preliminary plans prepared by S. E. Remet, archt., 1888 Beaubien St., for 4 story, rein.-con., stone and brick, rein.-con. flooring, concrete foundation, on Cass Ave. and West Columbia St. About $200,000.

Mich., Detroit—Store and Hotel—G. A. Lindke, Monroe and Farmer Sts., had plans prepared by Rogers, Bonnah & Chaffee, archts., 528 Forwell Bldg., for 3 story, 140 x 159 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. and Peterboro St. About $300,000.

Mich., Wahjamega — Hospitals — E. R. Dunlap, archt., 709 Hammond Bldg., Detroit, rejected bids received July 16, building 1 story, 43 x 265 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, for Michigan Colony for Epileptics, here. Revised plans being prepared and new bids will be received later. Noted July 10.

Ill., Chicago—Bank—Madison & Kedzie State Bank, 3131 West Madison St., having plans prepared by J. K. Cady, archt., 179 West Washington St., for 2 story, 100 x 125 ft., brick, concrete foundation, on Madison St. and Kedzi Ave. About $325,000.

Ill., Chicago—Bank—Security Bank of Chicago, 741 Milwaukee Ave., plans to build 3 story, 120 x 135 ft., on Milwaukee and Chicago Aves. About $150,000. Architect not announced.

Ill., Chicago—Community and Synagogue—Bnai Abraham Zion-Jewish congregation, 27 West Illinois St., plans to build community house and synagogue, on Washington Blvd. and Karlov Ave. About $200,000. Architect not selected.

Ill., Chicago—Office—A. S. Alschuler, archt., 28 East Jackson St., soon receives bids building 12 story, 75 x 125 ft., rein.-con. and tile, concrete foundation, on Wabash and Harrison Sts., for W. G. Shedd, c/o architect. About $1,300,000.

Wis., Spooner—Grade School—J. T. Murphy, chn. bd. educ., receives bids about Sept. 1, building 2 story, 85 x 100 ft., brick, rein.-con. flooring, rein.-con. foundation. About $75,000. Architect not selected.

Ia., Winterset—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., Hutchinson, Kan., for 2 story, 90 x 140 ft., rein.-con. and brick, rein.-con. flooring. About $150,000.

Minn., Fergus Falls—Station—Northern Pacific R.R., Railroad Bldg., St. Paul, having plans prepared by O. M. Rognan, archt., 1228 Railroad Bldg., St. Paul, for 2 story, rein.-con., brick and tile, here. About $60,000. H. E. Stevens, ch. engr.

Minn., Jordan — Sanitarium — Mudlavia Sanitarium having preliminary plans prepared by W. D. MacLeith, archt., 1220 Seminary Ave., St. Paul, for 200 room sanitarium. T. Shannon, mgr.

Minn., Minneapolis—School—Bd. Educ. receives bids about Aug. 25, building 8 room, rein.-con. and brick, brick foundation, on Nicollet Ave. and 58th St., to be known as Richfield Consolidated School. About $100,000. Architect not selected.

Minn., St. Paul—Fire Station—City having plans prepared for 2 story, 60 x 80 ft. on University and Van Daley Sts. About $50,00. C. A. Hausler, city archt.

Minn., Spooner—School—Bd. Educ. plans to build school to contain gymnasium, swimming pool, manual training department, assembly hall, locker rooms, etc. About $75,000. Architect not selected.

Minn., Virginia — Church—Presbyterian Society receives bids about Oct. 1 building 1½ story, 62 x 103 ft. About $75,000. Hewitt & Brown, 716 4th Ave., S., Minneapolis, archts.

Kan., Arkansas City—Hotel—Arkansas Hotel Co. plans to build 3 story, brick, rein.-con. flooring, concrete foundation. About $200,000. Shepard, Farrar & Wiser, 1202 R. A. Long Bldg., Kansas City, Mo., archts.

Kan., Atchison—School—Bd. Educ. receives bids about Oct. 1, building 2 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $75,000. W. Saylor & Co., Reliance Bldg., Kansas City, Mo., archts.

Kan., Hiawatha—Auditorium—City having plans prepared and soon receives bids building 2 story, 80 x 130 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $75,000. T. W. Williamson & Co., 418 Central Natl. Bank Bldg., Topeka, archt.

Kan., Holton—Court House—Jackson Co. plans to build 3 story, 85 x 100 ft., stone and brick, rein.-con. flooring, concrete foundation. About $140,000. T. W. Williamson & Co., 418 Central Natl. Bank Bldg., Topeka, archts.

Kan., Lakin—School—Bd. Educ. soon lets contract building 2 story, 54 x 90 ft., concrete and brick, rein.-con. flooring, concrete foundation. About $50,000. H. A. Noble, Reliance Bldg., Kansas City, Mo., engr. Mayn & Gerow, Hutchinson, archts.

Buildings (Continued)

Kan., Manhattan — Engineering — State Bd. Management, Capitol, Topeka, having plans prepared by R. E. Gamble, archt., 1415 Fillmore St., Topeka, building 3 story, 22 x 56 ft., and 2 story, 50 x 112 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation. About $190,000.

Kan., Wellington—Auditorium—City rejected bids building 2 story, 90 x 120 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $125,000. C. Boller & Bro., 506 Ridge Bldg., Kansas City, Mo., archts. Noted July 10.

Neb., Aurora—School—Bd. Educ. Consolidated Dist. No. 99, having plans prepared for 2 story, 70 x 122 ft., brick and stone, concrete foundation. About $60,000. R. A. Bradley & Co., Hastings, archts.

Neb., Columbus—Court House—Platte Co. election Sept. 9, to vote on $150,000 bonds to build 4 story, 70 x 106 ft., brick. C. W. Wurdeman, Columbus, archt.

Neb., Falls City—Court House—Richardson Co. voted $200,000 bonds to build 3 story courthouse. W. E. Hulse & Co., Hutchinson, Kan., archts. Noted June 19.

Neb., Grand Island—High School—Bd. Educ. plans to build 3 story, 86 x 136 ft. brick Junior High School. About $150,000. O. R. Kirschke and F. Crocker, Grand Island, archts.

Neb., Grand Island—High School—Bd. Educ. plans to build 3 story, 150 x 200 ft., brick. About $300,000. Kirschke & Crocker, Grand Island, archts.

Neb., Grand Island—Hospital—Sisters of St. Francis having plans prepared for 2 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $55,000. R. A. Bradley & Co., Hastings, archt.

Neb., Lincoln—School—Bd. Educ. having preliminary plans prepared by Fiske & Meginnis, archts., 533 Bankers Life Bldg., for 2 story, brick, rein.-con. flooring, concrete foundation, on 22nd and Lake Sts. About $450,000.

Neb., Mead—School—Bd. Educ. having plans prepared and soon receives bids building 2 story, 80 x 130 ft., brick, rein.-con. flooring, concrete foundation. About $130,000. E. Davis, 1809 South St., Lincoln, archt.

Neb., North Platte—Court House—Lincoln Co. voted $200,000 bonds to build new court house here.

Neb., Ord—Court House—Comrs. Valley Co. voted $100,000 bonds to build 3 story court house here. Architect not selected.

N. D., Fargo—Refectory—State Bldg. Comn., Bismarck, soon receives bids building 2 story, 59 x 160 ft. About $85,000. W. F. Kurke, Equity Bldg., archt.

Mont., Helena—Laboratory—State Bd. Examiners received no bids building laboratory for Bd. Health. About $50,000. Link & Haire, Power Bldg., archts. Work will be readvertised. Noted July 10.

Mo., St. Joseph — Infirmary — Buchanan Co. soon receives bids building 2 story, 42 x 230 ft., 40 x 133 ft., and 55 x 86 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $235,000. R. Meier and R. Arnold, 2526 Jule St., archts.

Mo., St. Joseph—Sunday School—First Presbyterian congregation having plans prepared by Eckel & Aldrich, archts., Corby Bldg., for 3 story, 50 x 60 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $60,000.

Tex., San Antonio — Auditorium — City voted $500,000 bonds to build auditorium. H. Helland, city engr. Noted July 10.

Tex., San Antonio—Market—City voted $200,000 bonds to build market. N. Helland, city engr. Noted July 10.

Okla., Guthrie—Consistory—Scottish Rite Consistory plans to construct consistory building here. About $500,000. Hawk & Parr, Oklahoma, archts.

Okla., Norman — Dormitory—Bd. Pub. Affairs, Oklahoma, plans to build dormitory, here. About $100,000. C. A. Popkins, 417 Berryhill Bldg., Sapulpa, archt.

Okla., Oklahoma—Office—Oklahoma Gas & Electric Co., Insurance Bldg., soon receives bids building 3 story, 50 x 140 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, on 1st St., near Bway. About $100,000. Parr & Hawk, 501 Security Bldg., archts.

N. M., Santa Fe—Home—Knights Columbus plan to build 2 or 4 story, 40 x 150 ft. concrete and brick, brick foundation, on Palace Ave. Cost to exceed $50,000. Architect not selected.

Idaho, Glenns Falls—Hotel—D. M. Gorby having plans prepared by Wayland & Fennell, archts., Idaho Bldg., Boise, building 2 story, 75 x 140 ft., brick, concrete foundation. About $50,000.

Nev., Reno — University — Bd. Regents, University of Nevada, having plans prepared by F. J. LeLongchamps, archt., 332 Gazette Bldg., for 2 story, 58 x 160 ft., brick and timber, concrete foundation, on campus.

Wash., Benton City — School — Benton City School Dist. plans to build 2 story, concrete or brick. City voted $52,000 bonds for project. Architect not selected.

Wash., Chehalis — Business — J. Denhof plans to build 2 or 3 story, 112 x 126 ft., brick, concrete foundation. About $50,000. Architect not selected.

Wash., Pasco—Hospital—Catholic Sisters plan to build 5 story, brick, rein.-con. flooring. About $80,000. Architects not selected.

Wash., Spokane—Auditorium—City plans to build 1 story, 100 x 155 ft., rein.-con. and brick, concrete foundation. About $160,000. F. W. Westcott, Spokane, archt.

Wash., Spokane—Hotel—T. C. Powers, Helena, Mont., plans to build 7 story, 71 x 135 ft., concrete or brick, on Post St. and Trent Ave., here. About $200,000. Architect not selected.

Wash., Spokane — Temple — Spokane Union Labor Temple Assn. recently incorporated, plans to build 3 or 4 story, brick or concrete. Cost, including site, $150,000. Address W. H. Pazen, East 108 Empire St. Architect not selected. Will be member of association.

Ore., Bend—Hospital—Sisters of St. Joseph having preliminary plans prepared for 3 or 4 story, brick, concrete foundation. Cost of 1st unit, $65,000.

Ore., Salem—Hall—Willamette University having plans prepared by F. A. Legg, archt., 263 South High St., for 2 or 3 story, brick or tile hall, on campus, to include gymnasium, parlors, shower baths, etc. for women. About $50,000.

Ore., Seaside — Hotel — Seaside Hotel Corp. having plans prepared by F. O. Johnson, archt., 693 Marshall St., Portland, for brick or concrete hotel, 300 ft. long, concrete foundation, on Pacific Beach, connecting with beach by concrete bulkhead and esplanade. About $50,000.

Ore., Seaside—Hotel—Seaside Hotel Corp. having plans prepared by Johnson & Parker, archts., United States Bank Bldg., Portland, for 4 story, 70 x 300 ft., brick and concrete, on beach. About $300,000.

Cal., Berkeley—Schools—City plans to build junior high school, cost, $250,000; also high school, $800,000. W. C. Hays, 1st Natl. Bank Bldg., San Francisco, archt.

Cal., Glendale—Schools—School Trustees having plans prepared by O. P. Dennis, archt., Hawthorne Ave., Los Angeles, for school on Bway., cost, $75,000 and 3 small kindergarten buildings on other sites, brick, concrete or hollow tile. Bonds for $100,000 voted for project. Noted July 17.

Cal., Hemet—School—Trustees Hemet Union High School Dist. having plans prepared by G. S. Wilson, archt., Virginia Bldg., Riverside, for 1 story, 125 x 175 ft., rein.-con., concrete foundation. About $70,000. Noted June 5.

Cal., Huntington Beach—Bath House, Hall, etc.,—See "Miscellaneous."

Cal., Los Angeles—Office and Store—L. Phillips et al, c/o Pacific Mutual Life Insurance Co., 6th and Olive Sts., had preliminary plans prepared by W. J. Dodd, archt., Brack-Shops Bldg., for 12 story, 100 x 120 ft., rein.-con., brick and terra cotta. About $1,500,000. W. Richards, Brack-Shops Bldg., engr.

Cal., Los Angeles—Store—Bullock's Dry Goods Store, 7th and Bway., having plans prepared by J. Parkinson, archt., 420 Title Insurance Bldg., for 7 story, 150 x 150 ft., brick, steel and frame addition, on 7th and Hill Sts., Noted July 17.

Cal., Napa — Theatre — Blumenfeld & Knox, Empire Theatre, having plans prepared by Reid Bros., archts., California-Pacific Bldg., San Francisco, for 2 story, 75 x 120 ft., concrete and timber, concrete foundation. About $50,000

Cal., Salinas — High School — School Trustees having plans prepared by R. Wyckoff, archt., Salinas, for group of rein.-con., brick or hollow tile school buildings. About $250,000. Noted July 31.

Cal., San Bernardino—Hotel—Chamber of Commerce appointed committee to promote erection of hotel. About $300,000. J. D. Gentry, chn.

Cal., San Francisco—Bank—F. H. Meyer, archt., Bankers Investment Bldg., soon receives bids building 6 story, steel and granite addition, on Market St. and Grant Ave., for Union Trust Co., c/o architect. About $200,000. Noted May 22.

Cal., San Francisco—Office and Loft—Wellman Estate Co., c/o J. Krafft & Sons, archts., Phelan Bldg., had revised plans prepared for 6 story, 40 x 60 ft., brick and steel, on Jackson St. Architect will receive bids soon. Noted May 22.

Cal., Santa Maria—Club—Business Men's Club having preliminary plans prepared by F. R. Spangler, archt., Jones Bldg., for brick and frame club. About $65,000.

Ont., Ottawa—Collegiate Institute Ottawa Collegiate Bd., Elgen St., will ask Corporation of Ottawa for authority to purchase land on 1st Ave. and build collegiate institute. About $250,000.

Ont., Toronto—Hospital, Home—Orange Grand Lodge soon receives bids building hospital and home. About $300,000. W. Fitzgerald, 30 Grange Ave., secy.

BIDS DESIRED

Conn., Hartford—Office—See "Industrial works."

N. Y., New York—Theatre—Until Aug. 9, by G. M. Pollard, archt., 347 5th Ave., building 1 story, 83 x 176 ft. brick and steel, brick foundation, at 4023 Bway., for A. Lewisohn, 61 Bway. About $120,000. Noted July 3.

N. Y., Pelham—School—Until Aug. 11, by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, building 2 story, 168 x 171 ft., brick and steel, stone flooring, for Bd. Educ. About $115,000. Former bids rejected. Noted July 24.

N. J., Collinswood—Rectory—St. John's congregation receiving bids for 3 story, 30 x 70 ft., stone. F. F. Durang, 1220 Locust St., Phila., archt. Former bids rejected. Noted July 24.

N. J., Elizabeth—Hospital—Until Aug. 25, by Crow, Lewis & Wickenhoefer, archts., 200 5th Ave., New York City, building 6 story, 33 x 75 ft., brick, steel and stone addition, brick foundation, on East Jersey St., for Elizabeth Gen'l Hospital here. About $500,000. Noted Feb. 20.

Pa., Hatboro—School—Until Aug. 11, by Heacock & Hohansen, archts., 1218 Chestnut St., Phila., building 2 story, 35 x 58 ft. stone addition here for Bd. Educ.

Pa., Phila.—Bank—Until Aug. 12, by Golove & Lewis, archts. and engrs., Real Estate Trust Bldg., building 2 story, 78 x 116 ft., brick and terra cotta, for Pub. Bank, 7th and Morris Sts. Cost to exceed $50,000.

Pa., Phila.—Dormitories—I. O. O. F., c/o R. Davis, Mt. Carmel, receiving bids building two 3 story, 13 x 58 ft., brick dormitories, here. About $75,000. W. H. Lee, 32 South 17th St., archt.

Pa., Spring City—Infirmary—Until Aug. 19, by East Pennsylvania State Institute for Feeble Minded, building 2 story, 28 x 170 ft., with two 40 x 80 ft. wings, brick and stone. P. H. Johnson, 1713 Sansom St., archt. and engr.

Fla., Miami—Hotel—Until Aug. 15, by Price & McLanahan, archts., 908 Bellevue Court, Phila., Pa., building Hotel Flamingo, 17 story, 110 x 488 ft., steel, stucco and concrete, for C. G. Fisher, 134 N. Capitol Ave., and J. J. Allison, Indianapolis. Noted June 19.

O., Bellevue — Commercial — Walker & Weeks, archts. and engrs., 1900 Euclid Ave., Cleveland, receiving bids building 100 x 150 ft., rein.-con., stone, steel and brick, on Market St., for Wright Banking Co. About $75,000.

O., Stoutsville—School—Until Aug. 27, by A. Barr., clk. bd. educ., and Glass & Austin, archts., 55 East State St., building 2 story, 60 x 102 ft., rein.-con. About $70,000.

Mich., Detroit—Office—A. Kahn, archt., Marquette Bldg., receiving bids for 2 story, 60 x 145 ft., brick and steel addition, for Detroit Evening News Co., Lafayette Blvd.

Buildings (Continued)

Mich., Oakwood (Oxford P. O.)—High School—Until Aug. 15, by Van Leyen, Schilling & Keough, archts., 1115 Union Trust Bldg., Detroit, for 2 story, 85 x 200 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, for Bd. Educ. About $230,000. Noted July 31.

Ill., Chicago—Hotel—Until Aug. 25, by R. C. Harris, archt., 190 North State St., building 10 story, 130 x 172 ft. rein.-con., brick and terra cotta, rein.-con. flooring, concrete foundation, on Sheridan Rd. and Chase Ave., for Argonne Hotel Co., c/o architect. About $950,000. Noted July 24.

Ill., Rockford—Church—S. M. Seator, archt., 35 North Dearborn St., Chicago, receiving bids for 1 and 2 story, 60 x 115 ft., brick, concrete foundation, on Court and Palm Sts., for First Baptist congregation, Church and Mulberry Sts. About $60,000.

Ill., Springfield—Memorial—Until Aug. 21, by Div. of Architecture, Capitol Bldg., for 4 story, 190 x 277 ft., rein.-con. centennial memorial, on ground adjacent to State Capitol Bldg. About $1,000,000. E. Martin, 104 South Michigan Ave., Chicago, supervg. archt. R. E. Schmidt and Garden & Garden, 104 South Michigan Ave., Chicago, assoc. archts. Noted July 31.

Minn., Austin—High School—Until Aug. 20 (change of date), by Bd. Educ., building 3 story, 180 x 220 ft., rein.-con., brick and steel, rein.-con flooring, concrete foundation. About $450,000. G. L. Lockhart, Endicott Bldg., St. Paul, archt. F. Tustison, 355 Auditorium Bldg., Minneapolis, engr. Noted June 26.

Minn., Duluth—Office—See "Miscellaneous."

Minn., Moose Lake—Grade School—Bd. Educ. receiving bids for 2 story, 53 x 62 ft., rein.-con. and brick addition. About $50,000. F. A. Schweiger, Moose Lake, archt. Noted July 17.

Kan., Eldorado—Memorial—Until Aug. 15, by R. E. Foley, city clk., building 2 story, 75 x 135 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $100,000. G. P. Washburn & Sons, Ottawa, archts.

Kan., Ottawa—Auditorium—Until Aug. 18, by E. M. Cusick, city clk., building 2 story, 75 x 135 ft., rein.con., steel and brick, rein.-con. flooring, concrete foundation. About $90,000. G. P. Washburn & Sons, Ottawa, archts. Noted Mar. 27.

Kan., Pleasantown—School—Until Aug. 15, by Bd. Educ., building 2 story, 72 x 84 ft., concrete, steel and brick, concrete foundation. About $53,000. H. R. Primmer, Nevada, Mo., archt. Noted July 17.

Neb., Bayard—School—Until Aug. 25, by Bd. Educ., building 2 story, rein.-con. steel and brick, rein.-con flooring, concrete foundation. About $100,000. R. A. Bradley, Hastings, archt.

Neb., Grand Island—School—Until Aug. 11, by Bd. Educ., building 2 story, 53 x 86 ft., rein-con., steel and brick, rein.-con. flooring, concrete foundation. About $55,000. Kirschke & Crocker, Grand Island, archts.

Neb., Valpariso—School—Until Aug. 21, by Bd. Educ., building 1 story, 85 x 155 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $75,000. E. Davis, 1809 South St., Lincoln, archt.

N. D., Jamestown—Hospital—Until Aug. 11, by Bd. Administration, Bismarck, building 4 story, 70 x 180 ft. concrete and brick, at State Hospital for Insane, here. About $150,000. W. F. Kurke, Fargo, archt. Noted May 8.

Utah, Salt Lake City—Hospital—Until Aug. 13, by Comrs. Salt Lake Co., building rein.-con. hospital on South State St. About $200,000. Pope & Burton, Newhouse Bldg., engrs. and archts. Noted July 10.

Ore., Eugene—Gymnasium, etc—Until Aug. 12, by Bd. Regents, University of Oregon, building 3 story, 86 x 276 ft. gymnasium and club building for women, brick foundation, on campus. About $200,000. P. Campbell, pres. Lawrence & Holford, Chamber of Commerce Bldg., Portland, archts. Noted June 26.

Ore., Pilot Rock—High School—Until Aug. 16, by C. W. Paulus, clk. Union High School Dist. No. 2, building 2 story, 42 x 64 ft., concrete or brick, concrete foundation. Cost to exceed $50,000. C. E. Troutman and C. A. Haynes, Aberdeen, Wash., archts.

N. S., New Aberdeen—Church—Until Aug. 30, by M. R. Chappell, archt., Brookland St., building 3 story, stone and steel, concrete foundation, on Main St., for Methodist congregation. About $50,000.

Ont., Hamilton—School—Until Aug. 20, by F. W. Warren, archt., Bank of Hamilton Bldg., building 3 story, rein.-con. and brick, concrete foundation, on King St., for Bd. Educ., c/o R. H. Foster, 18 Cottage Ave. About $80,000. Noted June 12.

Man., Arden—School—Until Aug. 15, by M. E. Broughton, archt., Landsdowne, building 3 story, 54 x 66 ft., brick and steel, concrete foundation, here, for Bd. Educ. About $60,000.

Sask., Weyburn—School—Until Aug. 26, by E. W. Clarke, secy. bd. educ., building 3 story, 50 x 50 ft., concrete and brick, concrete foundation, on Queen St., for School Bd. Trustees. About $65,000. Storey & Van Egmond, 7013 McCallum Hill Bldg., Regina, archts.

Alta., Edmonton—Hospital—Until Aug. 15, by R. P. Blakey, archt., Canadian Provincial Bldg., building fireproof addition to Civic Hospital, concrete foundation. About $150,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Chicopee**—Business—P. P. Starzyk, 32 Center St., let contract to B. Grabowski, 1600 Dwight St., Holyoke, converting Old Wells Opera House, on Exchange and Center Sts., into business building. About $50,000. Noted July 31.

★**Mass., Pittsfield**—Church—South Congregational Church, South St., let contract remodeling church, to include interior and exterior alterations, new ceiling, etc., brick and steel, to E. F. Roscoe, 100 Livingstone Ave. About $50,000.

★**Conn., Bridgeport**—Church and Rectory—St. Lukes Episcopal Society, 1161 Stratford Ave., let contract building 2 story, 42 x 96 ft. brick church, and 2 story, 30 x 40 ft. timber rectory, concrete foundation, on Strafford Ave., to Casey & Hurley, 120 Pequonnock St. About $50,000.

★**Conn., Bristol**—Hotel—New Departure Mfg. Co., 269 North Main St., let contract building 6 story, 75 x 157 ft. brick and concrete, concrete flooring, concrete foundation, on North Main St., to Ellison Constr. Co., 98 Wellington Ave., Hartford. About $200,000. Noted June 19.

★**Conn., Hartford**—Business—H. S Bond, 320 Asylum St., let contract altering and building 1 story addition, concrete flooring, concrete foundation, to J. C. Smith, 143 Adelaide St. About $50,000.

★**Conn., Middletown**—School—City let contract altering and repairing school, brick and timber, on College and Hamlin Sts., to D. O'Brien & Sons., Inc., 118 Asylum St., Hartford. About $50,000.

★**Conn., New Haven**—Business—Lenox Realty Co., c/o C. F. Townsend, archt., 185 Church St., let contract altering and building 2 story, brick and concrete addition, on Court and Orange Sts., to C. E. Auger Co., 549 Elm St. About $50,000.

★**Conn., Oakville**—School—Town let contract building 2 story, brick, concrete and steel, to J. F. Buttner, 227 Willow St., Waterbury. About $50,000. Noted July 3, under "Watertown."

★**Conn., Plainville**—Stores, etc.—M. J. Unkelbach, archt., 162 Main St., New Britain, let contract to A. Berti, 138 Oak St., New Britain, for 3 story, 60 x 124 ft., brick business building on Main St., to include stores, offices, hall and bowling alleys, for Neri Bros., 8 East Main St. About $100,000. Noted Feb. 20.

★**N. Y., Astoria**—Theatre—T. W. Lamb, archt., 644 8th Ave., New York City, let contract to H. Shapiro, 52 Vanderbilt Ave., New York City, building 2 story, brick and steel, brick foundation, on Grand and Steinway Aves., here, for Glynne & Ward, Alhambra Theatre, Knickerbocker Ave. and Halsey St., Brooklyn. About $400,000. Noted July 31.

★**N. Y., Brooklyn**—Synagogue—Congregation Sons of Jacob, 293 Vermont St., will build 2 story, 50 x 100 ft., brick and stone, brick foundation, on Pennsylvania Ave. About $70,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Synagogue—M. Whinston, archt., 63 Park Row, New York City, let contract to S. Sherusky, 493 Snedeker Ave., for 2 story, 50 x 92 ft., brick, stone and steel, brick foundation, on Vermont Ave., near Sutter Ave., for Congregation Sechoi Thoras Moses, 369 Vermont Ave. About $60,000. Noted June 26.

★**N. Y., Brooklyn**—Theatre—I. Birnbaum, 303 Oakland Ave., will build 1 story, 25 x 200 ft. brick and steel, on Manhattan and Norman Aves. About $65,000. Work will be done by day labor. Noted May 8.

★**N. Y., Brooklyn**—Theatre—Weber Realty Co., 520 St. Marks Ave., will build 1 story, 145 x 185 ft., brick and steel addition, brick foundation, on St. Johns Pl. and Kingston Ave. About $230,000. Work will be done by day labor.

★**N. Y., New York**—Office—Bway.-John St. Corp., 206 Bway., let contract building 6 and 7 story, 53 x 83 ft., brick and steel, brick foundation, at 19-23 Bridge St., through to 2-4 Stone St., to Fleischmann Constr. Co., 531 7th Ave. About $300,000.

★**N. Y. New York**—Office and Loft—Severence & Van Allens archts. and engrs., 4 West 37th St. let contract to C. L. Frazer, 103 Park Ave., for 9 story, 28 x 83 ft., brick and steel, brick foundatin, at 37 Water St., for Baker, Carver & Morrell, 39 Water St. Noted June 5.

★**N. Y., New York**—Synagogue—Institution of Synagogues, 37 West 116th St., let contract building brick, steel and stone, to G. R. Davis, 30 East 42nd St. About $250,000.

★**N. Y., New York**—Theatre—C. Hensle, 3879 10th Ave., will build 2 story, 100 x 315 ft., brick and steel, brick foundation, on Dykman St. About $300,000. Work will be done by day labor.

N. Y., Thiells—Cottage, etc.—F. A. Vanderlip, pres. bd. mgrs., Letchworth Village, 7 Wall St., New York City, received bids July 17, building eight 1 story, 34 x 150 ft. stel cottages, with 36 x 46 ft. wings, concrete foundation; 1 story, 40 x 80 ft. steel industrial building, concrete foundation; 1 story, 49 x 145 ft. service building, with 64 x 100 ft. wing, concrete foundation; underground tunnel and conduit, hot water and steam connections, distributing equipment, underground sewer, water connections and electric service, (general contract), from P. Keler Bldg. Co., 425 Orange St., Albany, $427,888; M. Kantrowitz, 20½ Market St., Albany, $520,000; heating, from J. C. Williams, Inc., 233 Bway., $163,741, Adams, Britz & Co., Inc., 1761 Park Ave., $167,000; Lord Constr. Co., 105 West 40th St., $168,500; sanitary work, from C. Nally, 710 Columbus Ave., $95,675, Kenny Moran Co., Inc., 33 Old Bway., $182,899, all contractors of New York City; electric work, from W. H. Straut Co., Haverstraw, $14,-100, Lord Electric Co., 105 West 40th St., New York City, $14,981, G. E. Eng. Co., Inc., 417 Canal St., New York City, $15,920. Noted July 3.

★**N. Y., Utica**—Hospital—Trustees of Masonic Home let contract building 4 story, 41 x 217 ft., Soldiers and Sailors Memorial Hospital, with two 33 x 91 ft. wings, brick, on Bleecker St. and Prospect Park, to J. F. Hughes Constr. Co., 211 Post St. About $300,000.

★**N. J., Absecon**—Club—Seaview Golf Club let contract building 3 story, 10 x 35 ft., 33 x 45 ft. and 45 x 92 ft., concrete, brick and hollow tile, to J. M. Yardley, 1716 Sansom St., Phila. About $100,000.

★**Pa., Bethlehem**—High School—Bd Educ. let contract building 4 story, 200 x 300 ft., concrete, steel and brick, to Cramp & Co., Denchla Bldg., Phila. About $1,-000,000.

★**Pa., Chester**—Club House—Chester Club let contract building 4 story, 65 x 110 ft., to Chester Constr. & Contg. Co., 8th and Parker Sts. About $131,000. Noted July 31.

★**Pa., Harrisburg**—Church—Grace Methodist Episcopal congregation let contract building brick, steel and stone, to Kelly & Kelly, 12th St., Long Island City. About $55,000.

★**Pa., Harrisburg**—Club House—Harrisburg Country Club let contract building 2 story, 100 x 100 ft. brick and steel, brick foundation, to Kelly & Kelly, 12th St., Long Island City. About $80,000.

★**Pa., Kittanning**—School—School Bd. let contract building 3 story rein.-con. and brick, rein.-con. flooring, concrete foundation, to H. Shaffer, Kittanning. About $135,000.

★**Pa., Phila.**—Bank—Industrial Trust Co., Front and Norris Sts., let contract altering 3 story, 32 x 80 ft., fireproof, to W. Steele & Sons Co., 16th and Arch Sts. About $150,000.

★**Pa., Phila.**—Sunday School—Bethany Temple Presbyterian congregation, 54th and Spruce Sts., let contract building 3 story, 84 x 120 ft., concrete, brick and stone, to A. R. Raff, Co., Richmond and Norris Sts. About $100,000. Noted July 3.

Buildings (Continued)

★**Pa., Phila.**—Y. W. C. A., 5020 Germantown Ave., let contract building 1 story, 32 x 60 ft. brick addition, on Germantown and Chelton Aves., to Doyle & Co., 1519 Sansom St. About $50,000.

★**Pa., Pittsburgh** — Retreat House—St. Paul's Monastery, Monastery St., let contract building 2 story, 75 x 100 ft., brick walls, to Duquesne Constr. Co., Bessemer Bldg. About $53,000.

★**Pa., Reading**—Theatre—Carr & Schad, 9th and Spring Sts., let contract building 1 story, 113 x 200 ft. concrete, steel and brick, to C. H. Schlagel, 23rd and Park Sts. About $80,000. Noted July 10.

★**Pa., Swarthmore**—Engineering—Swarthmore College let contract building 3 story, 52 x 124 ft. concrete and stone, to B. White, 1713 Sansom St., Phila. About $75,000.

★**Va., Fredericksburg** — School — City Council let contract building 3 story, 78 x 125 ft. brick, concrete foundation, on Potters Field, to E. G. Heflin, Fredericksburg, $85,267. Noted July 17.

★**N. C., Highpoint**—Exposition—Southern Furniture Exposition let contract building 10 story, 100 x 208 ft., rein.-con. or steel, to W. P. Rose, Goldsboro. About $450,000. Noted July 31.

★**O., Cleveland**—Theatre—D. R. Hannan, 511 Leader-News Bldg., let contract building 11 story, 100 x 192 ft., rein.-con., steel, limestone and brick, on East 14th St. and Prospect Ave., to J. Gill & Son, 1301 Citizens Bldg. About $750,000. Noted July 24.

★**O., Columbus**—Home — M. D. Fernknopp, archt., Columbus, let contract to Franklin Constr. Co., Columbus, building 2 story, 20 x 30 ft. and 42 x 100 ft., brick and stucco, on Rect and 11th Sts., for J. Schenthal, Southern Hotel Bldg. About $55,000.

★**O., Columbus**—Nurses' Home—Mt. Carmel Hospital, West State St., let contract building 1 story, 40 x 125 ft., with 40 x 75 ft. wing, brick and concrete, to D. W. McGrath, New 1st Natl. Bank Bldg. About $225,000. Cost plus percentage basis.

★**O., Dayton** — Bank — Merchants Natl. Bank, 3rd and Jefferson Aves., let contract remodeling 4 story, concrete, steel and brick to Dickey-Wood Bldg. Co., East 3rd St. About $75,000.

★**O., Dayton** — Business — Metropolitan Clothing Store, 4th and Ludlow Sts., let contract building 3 story, 78 x 105 ft., steel and brick addition, to H. R. Blagg Co., 1229 East 3rd St. About $60,000. Noted June 26.

★**O., Lorain**—Hotel—T. C. Metzer, Bway Ave., let contract building 5 story, 70 x 140 ft., rein.-con., terra cotta, steel and brick, to Crowell Lundoff Little Co., Meriam Bldg., Cleveland. About $300,000.

O., Mechanicsburg—School—R. C. Gotwald, archt., Gotwald Bldg., Springfield, received bids building 3 story, 60 x 120 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, for Bd. Educ., from L. B. Foltz, Columbus, $74,000; G. Hicks, South Charleston, $79,000; A. M. Fry, Piqua, $82,000. Noted July 3.

★**Ind., Indianapolis** — Lodge — West Indianapolis Masonic Temple Assn. let contract building 2 story, 94 x 100 ft., brick, at 1522 West Morris St., to Walter Brooks Co., Indianapolis.

★**Ind., Rushville** — Infirmary — Comrs. Rush Co. let contract building 2 story, 71 x 296 ft., brick and concrete, concrete foundation here, to L. Colvin, West Lafayette, $74,296.

★**Mich., Detroit**—Hospital—Pub. Welfare Comn., Macomb and St. Antoine Sts., let contract building 4 story, 87 x 218 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to G. A. Fuller Co., 540 Penobscot Bldg., $462,834. Noted July 10.

★**Mich., Detroit**—Schools—Bd. Educ. let contracts building (a) addition to Moore School on Alger and Cameron Ave., (b) addition to A. K. L. Holmes School on Georgia and Crane Aves., (c) addition to Dwyer School on Hawthorn and Caniff Aves., (1) masonry, (2) carpentry, (3) heating and ventilating, to M. A. Mahoney, Penobscot Bldg., (a1) $96,000; Ernst & Thiede, 287 Berlin St., (a1) $27,629, (a2) $27,212, (c2) $28,785; J. W. Partlan, 51 Park Pl., (a3) $56,661, (c3) $55,295; A. J. Smith Constr. Co., Campau Bldg., (b1) $87,879; Ernest Bros. Co., 35 Bagg St., (b3) $57,043; Derrick Bros., 508 Owen Bldg., (c1) $110,-923. Noted July 10 and 24.

★**Mich., Flint**—Bank and Office—Genesee Natl. Savings Bank let contract building 10 story, 44 x 120 ft., steel, stone and brick, brick foundation, on Saginaw and Kears Sts., to Hoggson Bros., 485 5th Ave., New York City. About $500,000. Noted July 17.

★**Ia., Vinton**—School—Bd. Educ., c/o W. E. Bickel, secy., let contract building 2 story, 88 x 110 ft., rein.-con., steel and brick, rein.-con. flooring, brick and concrete foundation, to M. N. Moenn, Mason City. About $113,000.

★**Minn., Gilbert** — Schools — Independent School Dist. No. 18, St. Louis Co., let contract building 1 and 2 story, 50 x 71 ft. and 44 x 57 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to J. Doulin, 1213 16th St., Superior, Wis., $51,588.

★**Minn., Hibbing** — Mercantile — Oliver Mining Co., Wolvin Bldg., Duluth, let contract building 2 story, 106 x 125 ft., rein.-con., brick and steel, rein.-con flooring, concrete foundation, on 1st Ave., here, to W. H. Hoy Co., 700 Metropolitan Bank Bldg., St. Paul, $130,000. Noted May 22.

★**Mo., St. Louis**—School—City let contract building 2 story, steel and brick, concrete foundation, on Manchester and Magnolia Sts., to E. C. Gerhard Bldg. Co., Post-Dispatch Bldg. About $209,000.

★**Okla., Idabell**—Court House and Jail—Comrs. McCurtin Co. let contract building 3 story, 80 x 96 ft., brick, rein.-con. flooring, concrete foundation, to Manhattan Constr. Co., 3rd and Fon du Lac Sts., Muskogee, $118,936. Noted June 12.

★**Colo., Englewood**—High School—Dir. Dist. No. 1, Arapahoe Co., let contract building 2 story, brick and steel, rein.-con. foundation, to A. Olson, 655 Vine St., Denver, $77,114. Noted June 12.

★**Ariz., Tucson**—Dormitory—Bd. Regents University of Arizona let contract building 2 story, concrete, on campus, to A. Campbell, Tucson, $67,829.

Wash., Spokane — School — Fern Hill School Dist. received bids for remodeling and building 2 story, 6 room, brick and concrete addition, concrete foundation, to include gymnasium and auditorium (general contract), from S. C. Erickson, Spokane, $126,570; heating and ventilating, from C. A. Richardson, Spokane, $29,397.

★**Cal., Bishop**—Hotel—G. Watterman let contract building 2 story, rein.-con., rein.-con. flooring, concrete foundation, to Edwards & Wildey Co., 515 Black Bldg., Los Angeles. About $60,000.

★**Cal., Redlands**—College—University of Redlands let contract building 2 story, 60 x 120 ft. science hall and 2 story, 40 x 136 ft. men's dormitory, rein.-con. and hollow tile, rein.-con. flooring, concrete foundation, to W. C. Crowell, 440 Chamber of Commerce Bldg., Pasadena. About $150,000.

★**Cal., San Marine**—Library—H. E. Huntington let contract building 2 and 1 story, 160 x 200 ft. library with three 50 x 100 ft. wings, rein.-con., rein.-con. flooring, concrete foundation, to W. C. Crowell, 440 Chamber of Commerce Bldg., Pasadena. About $175,000.

★**Que., Montreal**—Hotel—Queen's Hotel, Ltd., 1 Windsor St., let contract building 70 room brick and stone addition, to T. Wand, 1667 Clarke St. About $60,000.

★**Que., Montreal**—Synagogue—B. Goldenberg, archt., 83 Craig St., W., let contract to Sauvegeau & Co., 108 Stadacona St., building 50 x 90 ft. brick, stone and steel, stone foundation, on Esplanade St., for Beth B'Nae Jacobi congregation. About $100,000. Noted May 8.

★**B. C., Victoria**—Church—First Church Christian Science let contract building 1 story, stone and brick, concrete foundation, to P. McKechnie, 2358 Cadboro Bay Rd. About $50,000.

Federal Government Work

PROPOSED WORK

Va., Norfolk — Pattern Shop — Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $500,000.

Ala., Andalusia — Post Office — Treas. Dept., Wash., D. C., rejected bids received July 22, building, here. J. A. Wetmore, superv. archt. Noted July 31.

Ia., Vinton — Post Office — Treas. Dept., Wash., D. C., rejected bids received July 10, building, here. J. A. Wetmore, superv archt. Noted July 17.

Idaho, Grangeville—Road Work—Bureau Pub. Rds., U. S. Dept. of Agriculture, appropriated $135,000 to build and hardsurface 11 mi. Meadow Creek-Rocky Point Rd. Total cost, $185,000.

Wash., Yakima—Irrigation—U. S. Reel Serv. appropriated $25,000 for survey of arid lands in Walla Walla and Franklin Counties, also $353,000 for Yakima Irrigation Project, $325,000 for Okanogan Project, and $11,000 for maintenance of reservoirs furnishing water to Yakima Indian Reservation.

BIDS DESIRED

N. Y., New York Dredging—Until Sept. 2, by U. S. Engr. Office, 39 Whitehall St., dredging in Shrewbury River, N. J.; advertised in this issue.

N. Y., Stapleton—Water Supply Connections—Until Aug. 19, by Treas. Dept., Wash., D. C., for water supply connections at Marine Hospital, here. J. A. Wetmore, superv. archt.

Md., Aberdeen—Gunnery Emplacements, etc.—Until Aug. 12, by Constr. Officer, Aberdeen Proving Ground, building 4 concrete gun emplacements, 1 sand butt, 3 armor plate butts, 3000 ft. railroad, 6000 sq.yd. concrete roads, traverses, pavements, drains, etc., advertised in this issue.

D. C., Wash.—Pipe, Valves, etc.—Until Aug. 13, by Washington Suburban Sanitary Comn., 611 F St., N. W., furnishing contracts as follows: Contr. 2W, 50,000 ft. 6 in., 45,000 ft. 8 in. and 2200 ft. 12 in. c.i. water pipe and 65 tons special castings; Contr. 3W, one hundred seventy-five 6 in., seventy 8 in. and five 12 in. gate valves and 250 valve boxes; Contr. 4W, 10,000 ft. ¾ in., 5000 ft. 1 in. 1000 ft. 1¼ in., 500 ft. 1½ in. and 500 ft. 2 in. galvanized genuine w.i. pipe; Contr. No. 5W, seven hundred fifty ¾ in., five hundred 1 in., fifty 1¼ in. twenty-five 1½ in. and twenty-five 2 in. corporation cocks and goose necks; advertised in this issue.

D. C., Wash.—Repairing Wharf—Until Aug. 19, by Dist. Comrs., Dist Bldg., repairing sand wharf, on Water St., between 9th and 10th Sts., S. W.; advertised in this issue.

Tenn., Memphis—Towboat—Until Sept. 2, by Mississippi River Comn., 1st and 2nd Dists., Custom House, furnishing 1 stern wheel steel towboat; advertised in this issue.

Ill., Chicago—Breakwater—Until Aug. 29, by U. S. Engr. Office, 508 Federal Bldg., constructing rubble mound breakwater at Indiana Harbor, Ind.; advertised in this issue.

H. T., Pearl Harbor—Torpedo Racks—Spec. 4008—Until Aug. 20, by Bureau Yards & Docks, Navy Dept., Wash., D. C. building, here. About $28,000; $10 deposit required on plans and spec. Noted July 24.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Conn., New London—Distributing System—Spec. 3989—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids July 30, installing here, (1) work complete, from Lord Constr. Co., 105 West 40th St., New York City, (1) $248,319 (180 days), (2) $55,368, (3) $12,254, (4) $13,-126, (5) $3100; Carroll Electric Co., 714 12th St., Wash., D. C., (1) $305,000 (180 days), (2) $43,000, (3) $19,000, (4) $24,-000, (5) $2000; J. W. Danforth Co., 70 Ellicott St., Buffalo, N. Y., (1) $314,708 (180 days), (2) $56,821, (3) $20,149, (4) $21,500, (5) $4000. Noted July 3.

N. Y., New York—Garage—Spec. 3873—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids July 30, building at Field Medical Supply Depot, from Caye Constr. Co., 299 Bway., $61,200, (140 days), alternate $58,200 (140 days); Post & McCord, 101 Park Ave., $66,730 (150 days); Guarantee Constr. Co., 140 Cedar St., $68,-527 (150 days). Noted May 1.

N. J., New Brunswick—Boiler—Treas. Dept., Wash., D. C., received bids Aug. 4, installing boiler in post office, here, from McFadden Plumbing & Heating Co., New Brunswick, $1400, (36 days); W. Wilby, Selma, Ala., $1995 (Oct. 1st); Boston Heating Corp., New York City, $3425, (60 days) Noted July 24.

Md., Annapolis—Garage—Spec. 3988—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids July 30, building, here, (1) work complete, from King Lumber Co., Charlottesville, Va., (1) $28,358 (120 days), (2) $25,858, (3) $700, (4) $700; S. R. Harris, 710 14th St., Wash., D. C., (1) $29,932, (2) $27,637, (3) $412, (4) $930.

Federal Government Work (Continued)

Piel Constr. Co., 2519 Edmonson Ave., Baltimore, (1) $39,747, (100 days), (2) $36,747, (3) $700, (4) $875. Noted June 26.

D. C., Wash.—Flushing System—Dist. Comrs., Dist. Bldg., received bids installing flushing system in Fish Market, from Federal Heating Co., 827 14th Ave., N. W., $2738; Carroll Electric Co., 714 12th St., $2960; Casey Constr. Co., 3207 14th St., N. W., $3497.

D. C., Wash.—Generator—Bd. of Awards, Dept. of Agriculture, received bids July 25, furnishing and installing 1 compound, 3 wire, direct current generator, from Westinghouse Electric & Mfg. Co., Hibbs Bldg., $11,219; Moore Steam Turbine Co., Wellsville, N. Y., $11,685; Kerr Turbine Co., Stock Exchange, Phila., $12,590.

D. C., Wash.—Sewers—Dist. Comrs., Dist. Bldg., received bids Aug. 4, building sewers as follows: (A) Illinois Ave., (B) 12th St., S. E. Relief Sewer; (C) Minnesota Ave. Trunk Sewer, (D) Scaggs Branch Trunk Sewer, (E) 9th St., N. E. Relief Sewer, (F) Piney Branch Trunk Sewer. (1) excav., (2) concrete masonry "F", (3) vitr. brick masonry, (4) sewer brick masonry, from

W. F. Brenizer Co., 101 New York Ave., N. E., (A1) $2.25, (A2) $15, (A3) $37, (A4) $27; (B1) $2.25 (B2) $14, (B3) $37, (B4) $27; (C1) $3.25, (C2) $17, (C3) $40, (C4) $30; (D1) $2.50 (D2) $15, (D3) $40, (D4) $30; (E1) $2.50, (E2) $15, (E3) $39, (E4) $28; (F1) $2.40, (F2) $16, (F3) $40, (F4) $29.

G. Hyman, 2209 F St., N. W., (A1) $1.75, (A2) $15, (A3) $40, (A4) $30; (B1) $4, (B2) $17, (B3) $40, (B4) $30; (C1) $3.40, (C2) $12, (C3) $30, (C4) $25; (D1) $2.50, (D2) $15, (D3) $40, (D4) $30; (E1) $3.50, (E2) $18, (E3) $40, (E4) $30; (F1) $2.50, (F2) $15, (F3) $40, (F4) $30.

Ryan Constr. Co., Baltimore, Md., (A1) $2.10, (A2) $16, (A3) $40, (A4) $2[illegible].

W. F. Cush, 3rd and R St., (B1) $3.30, (B2) $14.60, (B3) $45, (B4) $25; (E1) $3.50, (E2) $14.60, (E3) $44, (E4) $25.

A. C. Moses Constr. Co., 916 New York Ave., N. W., (C1) $3.78, (C2) $18.73, (C3) $40, (C4) $30.

Becker & Chapman, Baltimore, Md., (D1) $2.65, (D2) $16, (D3) $44, (D4) $24.

Contenental Contg. Co., 66 Knickerbocker Bldg., Baltimore, Md., (F1) $2.50, (F2) $16, (F3) $40, (F4) $25. Noted July 10.

D. C., Wash.—Sidewalks—Dist. Comrs., Dist. Bldg., received bids Aug. 4, laying 50,000 sq.yd. cement sidewalks, from Hyde & Baxter, Wash., (a) $2.48, (b) $2.68; W. F. Brenizer, 101 New York Ave., N. E., (a) $2.29, (b) $2.49. Noted July 24.

W. Va., South Charleston—Steel Sash—Spec. 3914—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids July 20, installing steel sash in various buildings, from Detroit Steel Products Co., East Grand Blvd. and Griffin St., Detroit, $[illegible]24,929 (45 days); D. Lupton's Sons Co., Wilkins Bldg., Wash., D. C., $128,073 (75 days); Truscon Steel Co., Woodward Bldg., Wash., D. C., $129,800 (70 days). Noted July 17.

Tex., Galveston — Boathouse — Treas. Dept., Wash., D. C., received bid July 31, building boathouse at U. S. Quarantine Sta., here, from J. Jacobs, Galveston, $39,566. Noted July 10.

★Cal., Mare Island—Cranes—Spec. 3903—Bureau Yards & Docks, Navy Dept., Wash., let contract installing wall cranes in structural shop, here, to Cleveland Crane & Eng. Co., Wickliffe, O., A $103,000 (240 days); Manning, Maxwell & Moore, 119 West 40th St., New York City, B $94,876 (155 days). Noted July 10.

Miscellaneous

PROPOSED WORK

Park, etc.—Hartford, Conn.—A. W. Creedon, et al., 50 State St., plans to build amusement park to include swimming pool, dance pavilion, restaurant, theatre, etc., all fireproof, on Wethersfield Ave. About $400,000. Berenson & Moses, 1026 Main St., archts.

Swimming Pool—Hartford, Conn.—S. A. de Waltoff, 67 California St., West Haven, having plans prepared by Berenson & Moses, engrs. 1026 Main St., for rein.-con. swimming pool at Capitol Park on Wethersfield Ave. About $60,000. Noted July 31.

Garbage Incinerator—Syracuse, N. Y.—City plans to build garbage plant and incinerating plant, concrete and brick. About $50,000 each. H. C. Allen, city engr.

Tunnel—Detroit, Mich.—City and Dominion Govt. of Canada, c/o E. B. Winter, mayor, Windsor, Ont., had tentative plans prepared by W. H. Adams, engr., 1211 Vinton Bldg., Detroit, for double-barrel type highway tunnel under Detroit River, about 2600 ft. long with 6 vehicle elevators and 4 passenger elevators and memorial building entrance at each end. Proposed tunnel to be of 2 tube type with concrete lined tubes and raised foot walk in each tube at side of roadway.

Fire Protection System — Port Huron, Mich.—Holmes Fdry. Co., having plans prepared for fire protection system, involving installation of 1000 gal. per minute centrifugal pump, 100 lb. pressure with h.p. 200 volt direct current motor, automatic starter, compensator and all necessary wiring, 1 mi. extra heavy 10 in. c. i. pipe, 800 ft. 8 in. pipe, all laid on concrete base, pump house, intake, well and cribbing, at foot of Connor St. on St. Clair River. About $31,000.

Dock—St. Ignace, Mich.—Great Lakes Towing & Wrecking Co. plans to build rein.-con. dock, 80 x 100 ft. coal pocket, water filled pocket for timber storage warehouse, 50 x 75 ft. machine shop, marine railway supported by submerged concrete floor to be used in docking boats. Plans subject to approval of U. S. Government. A. J. Cunning, St. Ignace, engr.

Park Improvements — Wyandotte, Mich.—City having plans prepared by G. W. Graves, archt., 43 John R St., Detroit, for park covering 8 acres. Plans include filling with earth, grading paths and drives, concrete railings, lamp posts, retaining wall and walk, combined band stand, shelter and comfort station of rein.-con. M. L. Brown & Son, Chamber of Commerce, Detroit, engrs.

Pumping Machinery—Brainerd, Minn.—City rejected bids received July 8, for pumping machinery in connection with waterworks system. Work will be readvertised. L. P. Wolff, Guardian Life Bldg., St. Paul, engr. Noted June 26.

Shed—Smith Cove, Wash.—Port of Seattle, Seattle, soon lets contract building 118 x 1110 ft. concrete and timber transit shed at west end, here. Cost, including equipment, $200,000. G. H. Nicholson, Port of Seattle, Seattle, ch. port engr.

Dock, Etc.—Portland, Ore.—City plans to build dock, cost $5350, bunkers with 1050 cu.yd. capacity, $6200; also enlarge paving plant to 100,000 sq.yd. of pavement yearly, to include removing old plant to new location and building trackage, $5052, new equipment, $5000 and building new plant at foot of Jefferson St. O. Laurgaard, city engr.

Bulkhead—Seaside, Ore. — See "Buildings."

Pier—Balboa, Cal.—Chamber Commerce appointed committee to prepare preliminary plans and submit estimates for rein.-con. pleasure pier. About $50,000. H. B. Tudor, chn.

Pavilion—Huntington Beach, Cal.—City having plans prepared by J. C. Smith, archt., 325 H. W. Hellman Bldg., Los Angeles, for 1 story, 80 x 140 ft., rein.-con. and frame pavilion containing dance hall, concession booths, etc.; also rebuilding bathhouse, rein.-con. piling, concrete foundation. About $85,000.

Breakwater—Long Beach, Cal.—City having plans prepared for 1700 ft. rubble stone breakwater in front of seawall between Silver Spray pier and Golden Ave. F. Hoffman, city engr.

Breakwater — Margaree, N. S. — Dept. Pub. Wks., Ottawa, Ont., soon receives bids building breakwater here. About $20,000. E. Lafleur, Ottawa, engr.

Protection Works — Laprairie, Que. — Dept. Pub. Wks., Ottawa, Ont., soon receives bids completing protection works. About $82,000. E. Lafleur, Ottawa, Ont., engr.

Telephone and Telegraph Lines—British Columbia—Dept. Pub. Wks., Ottawa, Ont., appropriated $97,000 to build telephone and telegraph lines here.

Wharf—Cowichan Bay, B. C.—Dept. Pub. Wks., Ottawa, Ont., soon receives bids building wharf here. About $12,000. E. Lafleur, Ottawa, Ont., engr.

BIDS DESIRED

Bulkhead—Boston, Mass.—Until Aug. 20, by Comn. on Waterways & Pub. Lands, State House, building 1000 to 3700 lin.ft. timber bulkhead on Commonwealth Flats, East Boston. F. W. Hodgon, engr.; advertised in this issue.

Tracks—Brooklyn, N. Y.—Until Aug. 19, by J. H. Delaney, comr. transit constr., 49 Lafayette St., New York City, furnishing and installing tracks for portion of Culver Rapid Transit R.R. extending over and along Shell Rd. and West 6th St. from point near Ave. X to Sheepshead Bay Rd.

Bulkhead—New York, N. Y.—Until Aug. 15, by M. Hurlburt, comr. docks, Pier A, Battery Pl., North River, furnishing labor and material for building bulkhead platform between East 79th and East 80th Sts., East River, Manhattan Boro. and for depositing riprap thereat.

Water and Electric Light Equipment—Aitkin, Minn.—L. Hallem, city comr., receiving bids furnishing 1 purifier, 1 water filter, one 150 h.p. corliss type steam engine, 1 electric generator, 125 kw. current, 1 coal conveyor and 50,000 gal. steel or wood water tank.

Foundation—Duluth, Minn.—Fidelity Investment Co., Lake Ave., S., receiving bids for foundation for 4 story, 114 x 252 ft. office. Total cost, $75,000. German & Jenssen, 410 Amer. Exch. Bank Bldg., archts.

Electric Light Extensions, Conduits, Etc.—Outremont, Que.—Until Aug. 10, by city, building electric light extensions, cost $13,000, underground conduits, $7500, poles, etc., $5000, gullies, $1000, burying cables, $15,000. I. Duchatel, engr.

Garbage Destructor—Outremont, Que.—Until Aug. 10, by city, building garbage destructor. About $20,000. I. Duchatel, engr.

Railway Ties—Toronto, Ont.—Until Aug. 25, by E. Langham, genl. purch. agt., Canadian Natl. R.R., for 1,375,000 railway ties, to be delivered on Canadian Natl. lines, 1,000,000 between Port Arthur and Pembroek, 50,000 in Central Ontario, 25,000 between Ottawa and Quebec, 200,000 between O'Brien and Quebec and 100,000 in Lake St. John Dist.

Wharf—Dauphin, Man.—Until Aug. 19, by Dept. Pub Wks., Ottawa, Ont., building crib wharf in front of government fish hatchery, Dauphin River, Selkirk Co. About $11,000. E. Lafleur, Ottawa, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Suspension Line — Hartford, Conn. — Hartford Electric Light Co., 266 Pearl St., let contract placing high tension suspension line across Connecticut River, below Dutch Point, to F. T. Ley, 495 Main St., Springfield, Mass. About $50,000.

★Penstock—Potsdam, N. Y.—St. Lawrence Transmission Co., Colton, will rebuild 600 ft. 16 ft. wood penstock which recently collapsed, causing about $30,000 damage. Work will be done by day labor.

★Waterproofing — Utica, N. Y. — Bd. Supervs. Oneida Co. let contract waterproofing county court house here, to Obelisk Waterproofing Co., 1 Madison Ave., New York City. About $28,250.

★Subway Walls—Erie, Pa.—City let contract building Division St. subway walls, to W. Bancroft, Jr. About $10,525. Noted June 5.

★Ovens—Phillipsburg, Pa.—Hagerty Baking Co. let contract building ovens, to Gearhart Constr. Co., Phillipsburg. About $30,000.

★Cast Iron Pipe—Detroit, Mich.—Dept. Purchases & Supplies, Municipal Courts Bldg., let contract furnishing 3115 tons c. i. pipe, to Camden Iron Wks., Line St. and Coopers Creek, Camden, $50.60 per ton. Noted May 29.

★Pavilion — Spokane, Wash. — Spokane Union Stock Yards Co., Union Stock Yards, let contract building 1 story, concrete and frame pavilion, to Meyers & Telander, Hutton Bldg. About $50,000.

★Dam—San Francisco, Cal.—Bd. Pub. Wks. let contract building Hetch Hetchy Dam, siphon spillway type, to Utah Constr. Co., Eccles Bldg., Ogden, Utah, $5,447,800. Contractor to furnish cement. Noted July 17.

★Wharf—St. Michel de Bellechasse, Que.—Dept. Pub. Wks., Ottawa, Ont., let contract removing and rebuilding wharf, to J. B. Gallibois, St. Pierre, $32,422. Noted June 19.

★Pier—Port Hope, Ont.—Dept. Pub. Wks., Ottawa, let contract repairing pier here, to R. Brewder, Cobourg, $11,565.

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Andrew Carnegie

A PICTURESQUE figure in American industry has disappeared with the death of Andrew Carnegie. Rising in the day when business was untrammeled in its methods of competition, he stood out as the most venturesome and successful of the captains of industry. As an organizer and a developer of men he had no equal in his generation. Those rushing days, however, have been largely forgotten, for the Carnegie of recent years has been a public benefactor, a patron of science. The engineer has special reason for remembering him. He relied on engineers in building the steel industry, and he paid his tribute to them and rendered his thanks tangibly in the home he gave the national engineering societies in New York City. Carnegie Institute of Technology, in Pittsburgh, he endowed that young men might be educated in engineering; the Carnegie Institution of Washington he founded for research under the broadest possible charter. Whatever may be said of his fighting methods in the days of his power, he has left us a fine example of what grit and energy can do, and in his later years laid down a model that deserves emulation by those who have been plentifully blessed with this world's goods. In the days of his power, too, he was but playing the game that was being played against him.

Efficiency, in Theory

AGAIN may come from the railway brotherhoods' injection of soviet ideas into the current economic discussion, for they recognize in their advocacy of the Plumb plan that the sound means of lowering costs is to increase efficiency, since upon an increase in efficiency they would depend for profits. The mere admission of this fact, though, is but a beginning. We need results. To secure them, leadership, preferably by the President, as set forth in another column, is necessary, and the passing down of the doctrine from union heads in Washington to every local and to every individual. The individual must understand that labor is the largest element in production cost, and therefore in selling price. The brotherhoods have made a good start in enunciating theory. Will the American Federation of Labor build a program on that theory and help get results?

Mr. Hurley and Montauk

TWO weeks ago we asked the Shipping Board to explain why it contemplated the construction of two new mammoth Atlantic liners and why, as announced in some detail by the board itself, it was playing with the old Montauk Point pier and terminal scheme. The first of the two questions remains unanswered, but the second, Mr. Hurley, the chairman of the board, now answers with a denial. In a letter to the Dock Commissioner of New York City, he states that the question of developing terminal facilities at Montauk Point has never been seriously considered, and that obviously there is nothing to be gained by going there when the piers at Hoboken can take care of the 1000-ft. ships. This sounds sensible though belated, but evidently something is wrong with the publicity department of the board which circulated the original statement.

Orderly Progress Is Safe Progress

IT IS unfortunate for orderly progress in the settlement of our industrial difficulties that the railroad brotherhoods should have made such a tremendous leap in their demands upon Congress. We were rapidly coming to the time when employee boards and committees were general in industries where bad conditions had prevailed. Profit-sharing has, of course, become even more common than managerial participation. In fact, two of the plans proposed for settlement of the railroad problem—those of the Association of Railway Security Owners and of Director General Hines—provide for profit-sharing by the employees. Moreover, so far has the thinking of business men gone that in the referendum vote of the Boston Chamber of Commerce on the railroad situation, just completed, 446 voted in favor of giving employees representation on the directorates and only 157 against the proposal. Orderly progress is the only substantial progress, and orderly progress requires a gradual development of the employees' functioning in management.

New Methods for New Tasks

PROBLEMS lead to progress. The problem presented to the constructing engineers by the City Hall section of the Philadelphia subway was so formidable that existing methods would not suffice, and a remarkably original procedure of downward building resulted. Its effectiveness is proved by the successful way in which the task was executed, and it is clear that the resources of the art of subsurface construction have been notably increased by the development of the new method. Our description of the intricate operations involved in the enterprise is limited to a setting forth of the essentials of the method, but it is to be hoped that full details of the variations made necessary by local conditions will be placed on record later on. The abnormally high cost of the City Hall subway section is in itself enough to give the work prominence, the more so as in this case cost is a fair measure of difficulty and technical importance; only too often it defines mere size. All the elements of difficulty and cost will, of course, survive in the form of a permanent financial burden on the shoulders of the Philadelphia public. This, unfortunately, is a quite unnecessary burden in so far as a change in location of the subway

would have avoided the difficulties that are responsible for the great cost. Indeed, there is almost as much opportunity for studying the City Hall subway work from this standpoint as from that of the originality of construction method.

Old and New Compound Rails of the Same Type

HOW invention—like history—may repeat itself, and how methods impracticable at one time may become more practicable under later conditions, is illustrated by the letter on compound rails on p. 336. The wear of a rail is mainly on the head, but when this has reached its limit the entire rail must be removed. This condition has led naturally to designs of rails in which the wearing element or head is independent of the supporting element. The object may be to make the head renewable, as in many of the older types of street-railway track construction, or to apply a head of specially high resistance to wear. As to the steel-capped Canadian rail of 1871, shown in the illustration, the methods available at that time for applying the head or cap were inadequate, so that the head became loose and the rail defective or even unsafe. With a development of the same idea in 1906, or 35 years later, modern machinery was devised to clinch the head much more firmly, by powerful pressure. Whether the cost and difficulties in manufacture of the compound rail would offset any advantages is another question. An unfavorable answer is indicated by the very limited use attained by the modern cap-head rail.

Experience With Bolted Connections

FOR some time past, steel erectors have believed that field bolting of certain kinds of steel structure is as good as field riveting, or better. Among engineers, on the other hand, the tendency to specify field riveting and eliminate bolting has increased rather than decreased. It can hardly be said that lapse of time has brought to light a satisfactory amount of definite experience to decide between the two views.

From a study made for us by R. Fleming it appears that bolting shows up well in tests, and, in a very limited record of data, has given good account of itself in service. Besides revealing the dearth of tangible experience in the subject, the study suggests that the few available items of experience have not exerted much influence on engineers' specifications, so that field riveting is very widely specified for all types of steel structure, and the economy of bolting receives no consideration. Clearly, money is wasted when riveting is required where bolting would do. But, even more clearly, many additional data of experience are needed if conclusive evidence on the service value of bolting is to be had without unnecessary delay. We hope, therefore, that engineers possessed of practical data on the subject will contribute it as a supplement to Mr. Fleming's study.

That precedent plays so large a part and actual experience-data so small a part in this particular item of engineering practice is worth a moment's thought. Experience does not always accumulate, in spite of the common belief that it does. In respect to field bolting versus riveting, for example, five or six decades have yielded a record of definite experience that is all but negligible and is actually ignored; we still govern ourselves largely by copying prevailing practice—and what we like to consider "best" practice; namely, the costliest practice.

The fact is that in this subject, as in some others, what may properly be called "experience" develops through the piecing together of a multitude of small, scattered items of observation, very few of which can come under one man's eye. The separate bits of information are worthless if not assembled, yet they scatter so widely that they fail to come together unless deliberate effort is made to search them out and build them into a group. Mr. Fleming has begun this grouping with respect to the subject of bolts and rivets. The ultimate success of such work, however, is apt to depend on the willing coöperation of engineers working under many different conditions. Contribution of data from each man's experience to the common fund is one of the fundamental processes of engineering advance.

However, the current views unfavorable to bolting are based on something more than a passive ignoring of good service rendered by bolted structures. Uncertainty with regard to permanent tightness is a large factor. There are two points of question in regard to bolted joints in steelwork: The deficiency in bearing, as compared with rivets (which presumably expand so as to fill the rivet-holes), and the possible loosening of the nut. As to the former, static tests give a reassuring answer. On the nut question, however, tests are not satisfying, for everyone has daily opportunity to observe the uncertainty of tightness of a bolt. The prime need for information on the actual service of bolts in steel structures relates to this matter of loosening. And here again unfavorable evidence is bound to receive more weight than favorable; a hundred bolted buildings—or bridges—that stand for years with joints unimpaired in tightness will not hold up the one that loosens and fails.

Production and Patience

LAST week the President went before Congress to discuss the high cost of living. The specific methods he suggests may well be left to other papers for discussion, but two features of his address ring so true and have so great a bearing on the social problems of the minute that they must have emphasis. He insisted, first, on the need for increasing production, and, second, made it plain that he had no tolerance for those who by strikes or threats of strikes propose to take advantage of a serious situation and of the public.

In saying that we must increase production the President was not enunciating anything new. Throughout the war the slogan was, "Increase production and decrease consumption," while since the armistice the assurance has been constant that the high wages of the war period could and would be maintained only if the worker would increase his efficiency, would increase production. The President couples with his counsel, however, a new reason. Without us Europe is lost, and we shall go down in the wreckage. We saved her in a military sense; we must save her economically.

In actual fact, the sacrifices and sufferings of the war are not over; only the armed conflict is at an end. Not until normal conditions are restored everywhere shall we have the peace of 1913, and until we have such a peace nations and individuals must suffer for the destruction that has been wrought. This doctrine must be preached and accepted for years to come.

The chief preacher, for the country has selected him as leader, should be the President. Will he be equal to the occasion? Even his staunchest supporters must at times have a wish that the man who died recently at Oyster Bay could be handling the situation. Whatever Roosevelt's faults, he had the ability to popularize great issues. One can easily imagine the propaganda he would now set on foot to continue the sacrifices, the patience of the war, until the redemption was complete.

The other feature of the President's address to which reference has been made, his declaration against the use of force in this crisis, has had well-nigh universal acclamation. With his capitulation to the brotherhoods in the so-called eight-hour matter of 1916 in mind, there were fears that he would condone the action of those labor elements which have been threatening to strike. Instead, he stood up for law and order. He did not mince language. "There must be no threats. . . . The world has just destroyed the arbitrary force of a military junta. It will live under no other. All that is arbitrary and coercive is in the discard."

Then he enunciated what every sane thinker knows —that the great mass of the people will insist on orderly solution and will resist unreasonable demands. Well said were the words, "Those who seek to employ it [force] only prepare their own destruction."

Truly, these are times for sanity, for study of problems rather than hasty adoption of what a strong group desires. Only through patience, "through steadiness and self-possession and business sense," as the President said, can we arrive at a just and a workable plan.

Meanwhile, let every one with influence pound home in his own way the slogan of increased production.

Railway Operation by the Brotherhoods

SINCE the railway brotherhoods made their demands for turning over the railways to the employees there has been a great deal of discussion, with the result, in sum, that the plan is not received with enthusiasm by the country at large. The Plumb plan was proposed months ago, but the introduction of a bill embodying it, coupled with demands, virtually an alternative, of wage increases of $800,000,000, with further requests to come, dazed the country for a few days. Analysis succeeded surprise, the weakness and danger of the proposal became evident, while in the hearings before the committee of the House the brotherhoods have injured rather than strengthened their case. The impression made on the country may well be summarized in the retort of Representative Winslow to Glenn E. Plumb, the author of the plan: "The realm of business seems the only one with which you are not thoroughly familiar."

It was but natural that in a proposal so far-reaching the minutiæ should get no attention, but that discussion should be confined to the major issues. In fact, discussion so far has not been even on the advisability of public ownership as such, but rather on the wisdom of turning over the operation of the properties to the employees. In this the new radicalism lies. Public-ownership advocacy has long been with us, but it is a new thought that the Government, having bought the roads, should surrender them to small groups of citizens, retaining no other control than could be exercised by a minority of directors, themselves subject to political pressure from the dominant interest. This goes one step beyond sovietism, because the owner—the Government—would immediately give away its property and for one hundred years relinquish its control.

The plan is socialistic—or bolshevistic, if you will—but the true inwardness of the proposal can be put simply and convincingly without calling names. In brief, human experience from the dawn of history shows that no group can be trusted with uncontrolled powers that may affect other men, without certainty of abuse of those powers. Absolute monarchs, autocracies, long-standing political rings in state or city, large combinations of capital without effective control, all have shown the unfailing weakness of human beings to take advantage of their fellows. The absolute monarch had to be restrained by a constitution and by bills of rights, autocracies have had to bow to the introduction of a lower house, political rings have been chastised by the electorate, trusts have required restraining measures, managerial despotism has been met by the power of collective bargaining. The best results come from a system where strong power is restrained and where all groups at interest have sufficient strength to demand recognition of their rights. Our Federal Government is an excellent illustration of this restrained power—a system of checks and balances between the legislative, the executive and the judicial branches.

In the proposals by the brotherhoods there would be given them an unlimited power over properties valued at some $20,000,000,000. Theoretically there would be a check by the five Government and the five official directors; actually these men would be agreeable to the brotherhood control. If the brotherhoods could force the plan through, they could control the appointment of the Government directors and—if not at once, certainly in a few years—could weed out those officials and, consequently, official directors not responsive to their wishes. In such a situation the public's interest would get short shrift until public opinion could be aroused to repeal the law—if that were possible, a 100-year lease being involved—or otherwise rectify the bad bargain.

True, uncontrolled power wrecks itself and eventually is brought to book, but the destruction wrought in the meantime may impose terrific burdens. Germany's course, and the consequent world sufferings, furnish an exaggerated example of what it costs to let power go uncontrolled and what it costs to check it.

Without moralizing, as we have here done, the dangers involved in giving so much power to one group are appreciated by the country at large. On that score alone we do not believe that there is any likelihood of the acceptance of the plan.

Aside from that fundamental objection, there enter at the present time financing difficulties that appall any one with knowledge of finance, while there are always with us the sound objections to Government ownership.

This much, though, the brotherhoods' agitation has served to do—to throw into relief the importance of the railroad problem and to focus on it the attention of the country at large, of those who heretofore have taken no interest therein. The solution eventually proposed will need both a wide understanding and a wide sympathy.

New Construction Methods in Subway Work Under Philadelphia City Hall

Difficult and Costly Work Completed—Subway Built From Roof Downward by Continuous Underpinning—Method Determined by Poor Character of Foundation of Building

WITH the virtual completion of the City Hall section of the new Broad St. subway in Philadelphia, an enterprise unique in respect to difficulty and cost has been carried through successfully. It involved what is probably the largest single underpinning task ever carried out. Furthermore, this piece of subway is undoubtedly the most costly rapid-transit structure in existence, as the expenditure for construction exceeds $20,000,000 per mile. The problems presented in the work were so serious that it



FIG. 1. TYPICAL PIECE OF OLD CITY HALL FOUNDATION

was necessary to devise new methods for dealing with them; their success as well as their ingenious detail makes them most noteworthy.

A complete change in plan and construction method is involved in the history of the work. The first data on the underground conditions at the site were incomplete, and an imperfect conception of the undertaking resulted. When the true state of affairs was understood, after work had been in progress some months, the builders developed a new construction method, involving a fundamental change in the structural design of the subway. The success of the plans made for the work is now complete.

What this work includes may be described as the undermining of the Philadelphia City Hall on an area of more than an acre, and the construction of a four-track subway with station in this area and under the two branches of the Market St. subway south and north of the City Hall, the total area being about 700 x 100 ft. The City Hall as well as the old subways had to be supported without damage from settlement at all stages of the construction work and also had to be carried finally on the new structure. Settlement was, in fact, kept down to a negligible amount. The subway undercrossings, while requiring great care, were not out of the range of normal work; the undermining and construction work under the City Hall, however, was an operation of extreme difficulty. That the cost of the work is beyond all precedent is due to this part of it, and is chargeable entirely to the original location of the Broad St. subway.

When the city's new rapid-transit system, now under construction, was planned, prior to 1915, a four-track subway was laid out along Broad St., which is the city's central north-south artery. The City Hall interrupts Broad St., but, instead of providing for deflecting the subway around the City Hall, the plan carried it directly through under the building, with only enough divergence from a straight line to avoid the 550-ft. tower in the north front of the building, which is the city's distinguishing landmark. As there is an existing east-west subway in Market St., which loops around the building, the new subway also had to cross under both branches. To build the subway on this location necessarily involved supporting the City Hall temporarily, while taking out a core under the building 45 to 50 ft. below street level, 100 ft. wide and 500 ft. long, and later transferring the load to the roof of the new subway. This operation was rendered unusually delicate by the fact that the building is of brick and stone masonry construction without any steel framework, and is thus very heavy and greatly liable to damage by cracking or even partial collapse in case of serious disturbance of the old footings.

Early in 1916 W. S. Twining, director of the city's Department of City Transit, proposed a change of location of the subway, bypassing the City Hall, except for the extreme southwest corner. The people at a special election, however, rejected this proposal, and nothing was left but to build the subway as originally laid out. At this time the construction contract was already in force.

Because of the special difficulties concentrated in the work under the City Hall and the two undercrossings of the Market St. subway, the 700-ft. section which embraces these operations was made a single construction section, and in August, 1915, a contract for building it was let to the lowest bidder, the Keystone State Construction Co., which had associated with itself for this work the Underpinning and Foundation Co., of New York. At that time the plans for the work provided for a subway roof of steel transverse girders carried by steel longitudinal girders between the subway tracks, these longitudinals in turn resting on cylindrical piers sunk as open wells.

Work began with excavation at the northwest corner of the City Hall. When this exploration work showed that the footings of the building were so poor that if exposed they would probably crumble, it was decided that execution of the work according to the plans was impracticable, and that a new structural design and method of underpinning would have to be worked out. The new working scheme would have to provide for complete replacement of the rubble walls by substantial brick or concrete masonry, but a change of roof-construction method was also

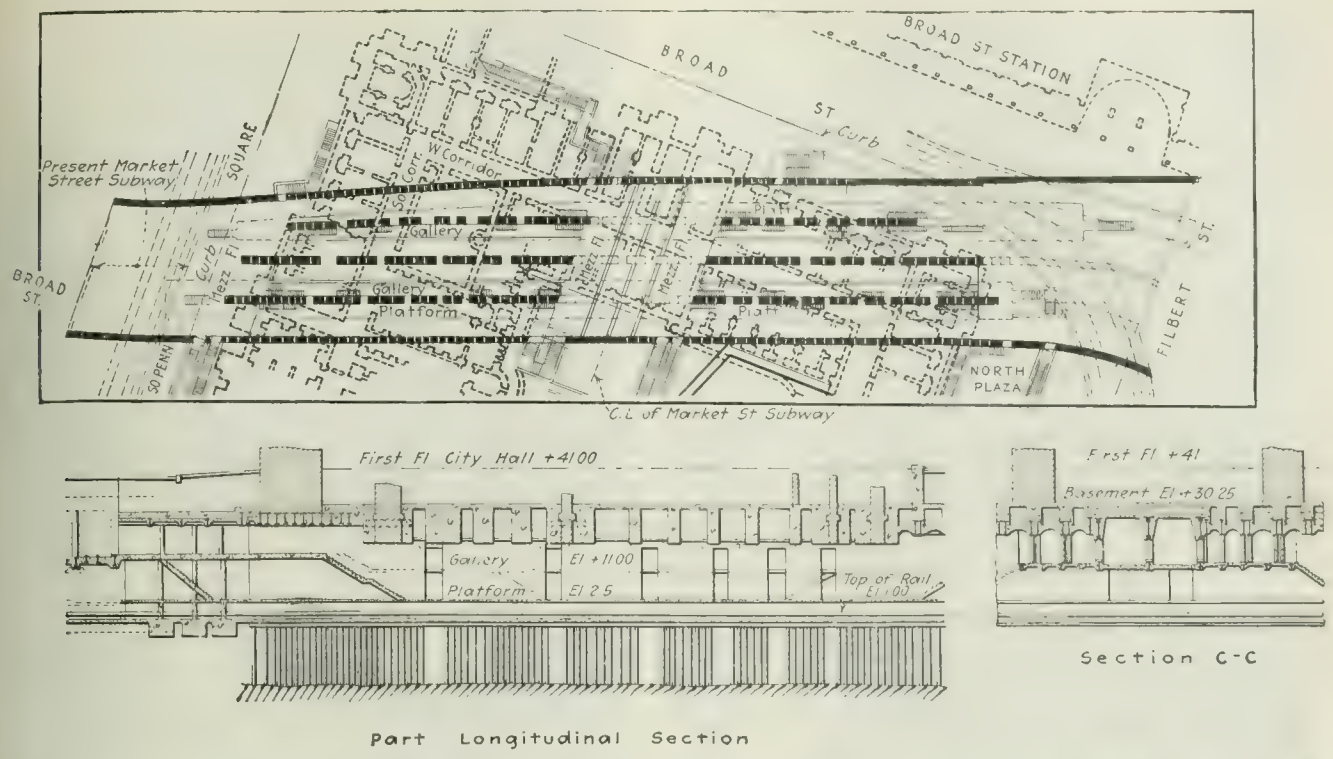
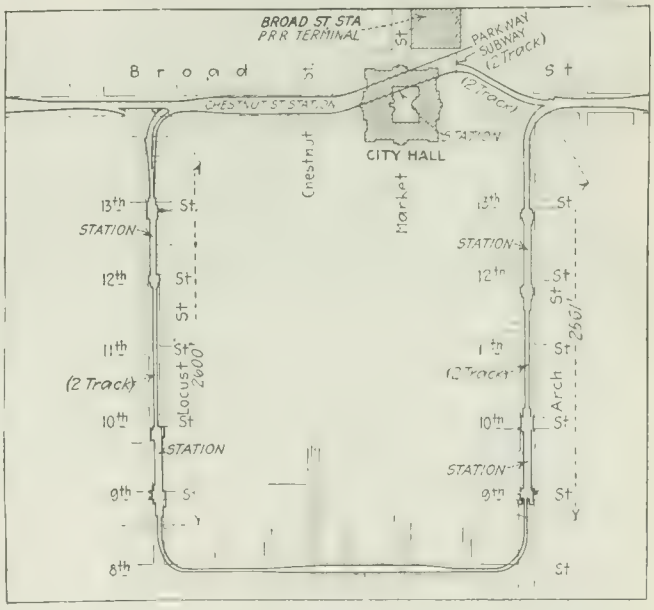


FIG. 2. BROAD STREET SUBWAY LAID OUT SO AS TO PASS DIRECTLY UNDER CITY HALL, AVOIDING THE 550-FOOT TOWER (IN CENTER OF NORTH FRONT)

necessary. Without it, since the preliminary foundation wall work would produce an initial disturbance of the building, and successive subsequent disturbances would be brought about by the insertion of steel transverse and longitudinal girders, destructive settlements were likely to occur even if the construction were so carried on as to eliminate all temporary or falsework support of the building and thereby avoid unsafe conditions.

The work thenceforward had to be developed as an underpinning enterprise, and the contractors had to formulate their construction plans accordingly. A method for rebuilding the foundation walls and a modified roof design were worked out which avoided the necessity for inserting steel girders under the foundation walls except in small parts of the area. The construction method and the changed roof design were necessarily interdependent. The Department of City Transit approved both, in the early part of 1916, and since that time work has progressed steadily and without accident, to its present completion. It was directed for the city by Frank R. Fisher, engineer of subway construction, and Dion Martinez, principal assistant engineer. The execution of the method, however, was carried out by the men who devised it, S. M. Swaab, of the Keystone State Construction Co., chief engineer, and William P. Parker, of the Underpinning and Foundation Co., construction engineer.

Stable support of the building on solid masonry and undisturbed earth foundation at all stages characterizes the method of working. Reconstruction of the old rubble footing walls was accompanied by the construction of reinforced-concrete girders or the placing of steel girders alongside of and integral with the foundation walls as a means for supporting their load



across the span between the future intertrack subway walls. Thus the entire subway roof, composed very largely of a close assemblage of girders, was constructed on the ground surface, through or adjoining the footing walls of the City Hall, forming for the time being the lowest course of the building.

It will be seen from the more detailed description that up to this stage the work was done without transferring the load of the building to shoring or falsework supports at any time. Some small amounts of shoring were used in the unit footing-wall pits in the first stage of these operations, but the stability or security of no part of the building at any time depended on this shoring, whose purpose was only to guard against any local disorganization of the masonry which would have been the starting point of cracking.

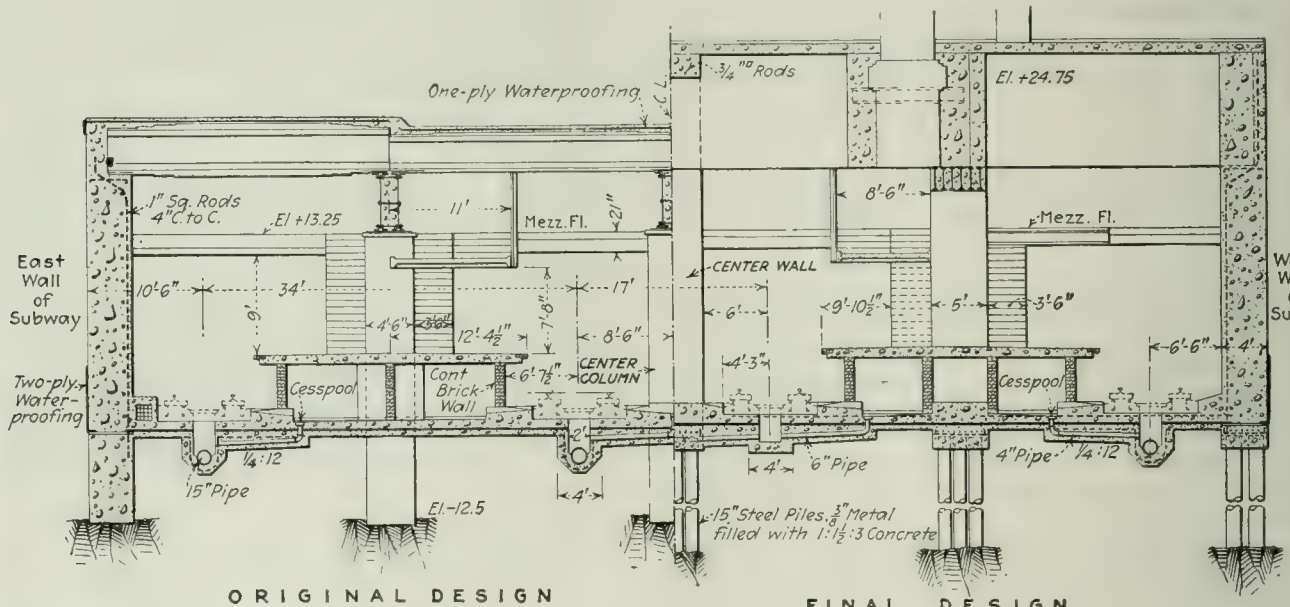
With the roof structure completed in this way, supporting piers were constructed under the ends of all

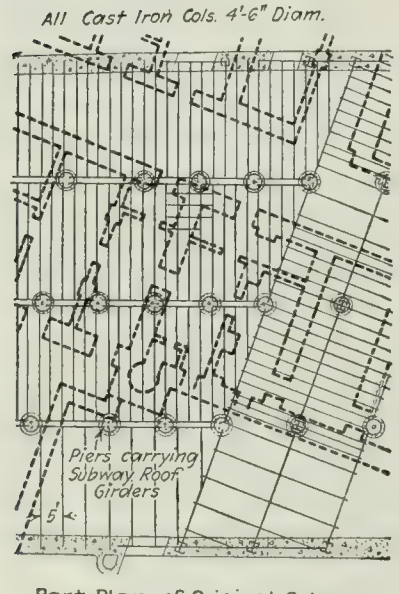
the girders by sinking sheeted pits to subgrade level, driving steel-pipe piles to bedrock in the bottom of these pits, and filling the pits with concrete to form piers. At the top these piers were finished against the girders usually by keying up with brick work, but in some instances by grouting; the building load, however, still passed from its bearing on its footings and the girders directly to the earth support, and the piers did not take load until a later stage of the work.

As may be seen from the plan in Fig. 3, the piers in question are set close side by side, and thus form continuous walls, which are the inclosing and intertrack walls of the subway, taking the place of the separate piers of the original design. By dovetailing adjoining piers together, the walls were made structurally integral, though no load transfer from one pier to the adjacent ones was counted upon in any instance. Thus, when the piers were completed the whole subway structure had been built, except for the details of floor and interior finish; only excavation of the core was needed to bring it into active service as a support of the City Hall.

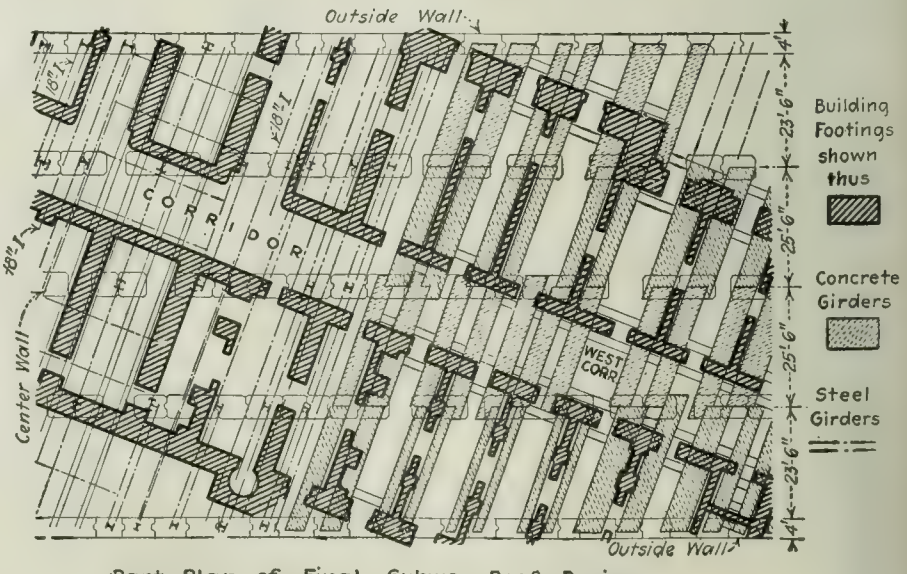
Foundation Wall and Girder Construction—The key to success in the entire method lay in arranging the work so that temporary support was only an incidental factor, and so that both settlement and the elastic deformation of the elements successively brought into action were minimized to the point of being negligible. Complete stability existed at every moment; transfers of load were made in very short sections, where the wall load could be transferred without appreciable elastic distortion; and the natural ground support remained in service until the last stage. The girders being unusually deep (11 ft. in the case of the concrete girders), the deflection at the last stage also was extremely minute.

The preceding describes only the general or typical method, from which there were a number of important variations. In its details this typical method is





Part Plan of Original Subway Roof Design



Part Plan of Final Subway Roof Design

FIG. 3 CITY HALL SUBWAY CROSS-SECTIONS, AND PART PLAN; IN THE WORK AS EXECUTED (RIGHT-HAND PLAN) THE STRUCTURE WAS COMPLETED BEFORE EXCAVATION OF THE EARTH CORE

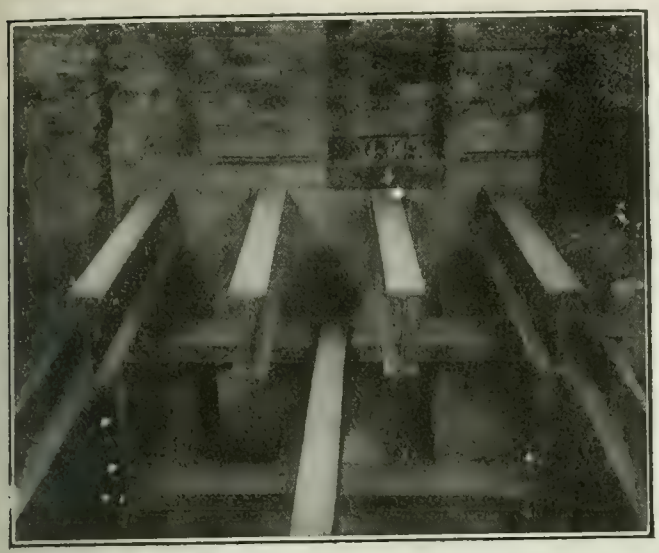


Fig. 4—Rebuilt section of City Hall footings; needle beams for ultimate support of wall

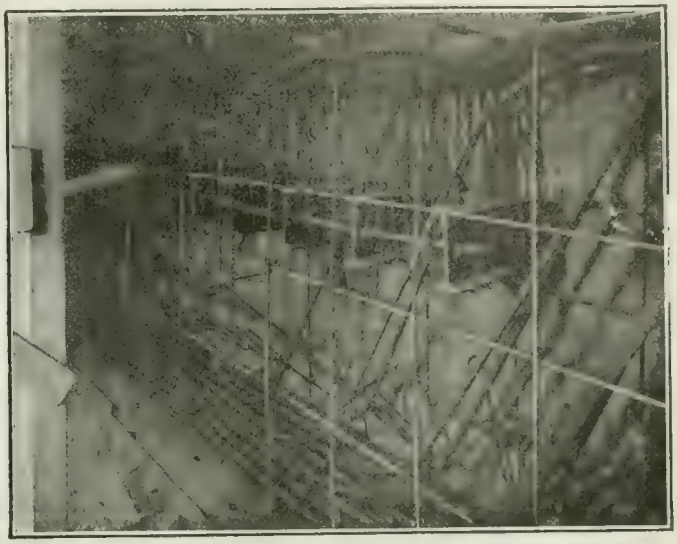


Fig. 5—One of a pair of wall girders to span one track of subway ready for concreting

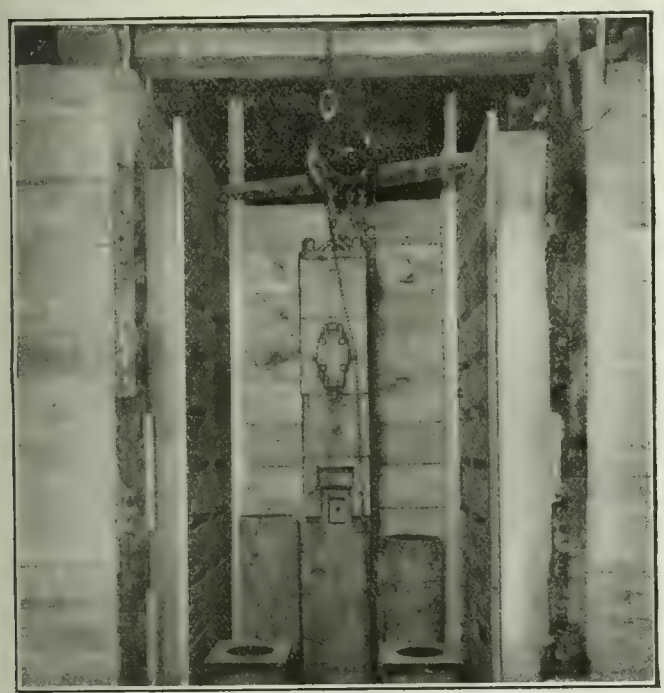


Fig. 6—Steel pile foundation for subway wall pier (pit specially arranged to illustrate the method)

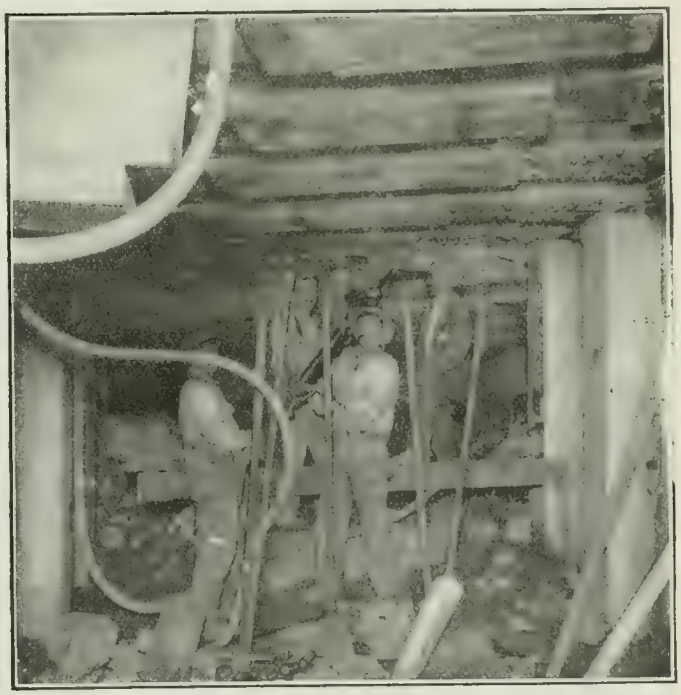


Fig. 7—Grillage and concrete under subway roof girders removed with first lift of core excavation

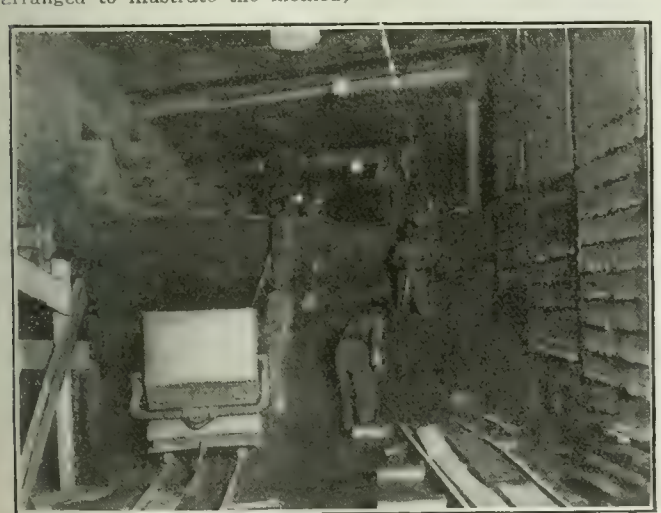


Fig. 8—Excavation finally exposed the roof girders and the multi-pier subway walls



Fig. 9—Waterproofed under-floor prepares subway for concrete roadbed structure

FIGS. 4 TO 9. STAGES IN SUBWAY CONSTRUCTION UNDER PHILADELPHIA CITY HALL

represented in the drawing Fig. 10. Pits were dug on either side of the wall at the point of attack, about 6 ft. long in the direction of the wall and 4 ft. wide transversely. Simultaneously, narrow slots were cut in the solid masonry above the footing wall and two pairs of 15-in. I-beams were inserted as needles, as indicated in the detail sketch A in Fig. 10. When the pits had reached the base level, 19 in. below the level of the subway roof, their floor was planked with a mattress of 4 x 8 plank and jacking drums were bedded on this, bearing against the ends of the needles. Four such posts per pit, each containing a

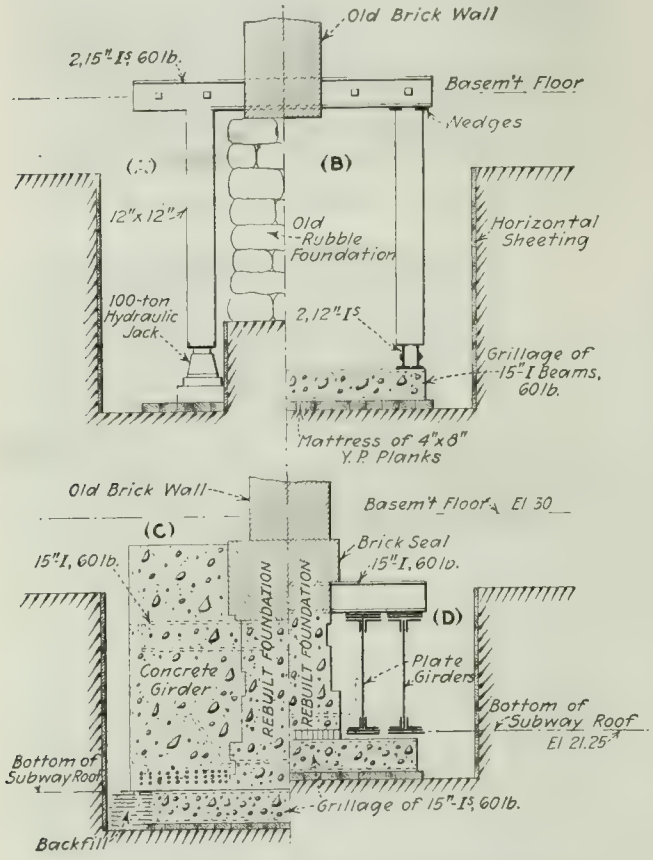


FIG. 10. DIFFERENT STAGES IN REBUILDING THE FOOTING WALLS

100-ton hydraulic jack, were used for picking up one-half the computed load on this wall section.

The old footing wall core between the pits was now removed, the plank mattress extended to make the closure, and a grillage of 15-in. I-beams laid on top of the plank mattress. The load was then transferred from the jack-posts to four other posts bearing on the grillage beams and wedged against the needle beams. Then the jack-posts could be slacked off and removed without any disturbance of the stress distribution in the wall. The 15-in. I-beam grillage was then concreted.

On the base so prepared the new foundation wall was constructed. In most instances this was built of concrete, but at some locations of brick. In either case, after the foundation wall was set up hard, the closure between old and new work was made usually with brick, the closing joint being carefully filled with mortar, shims being embedded in the mortar where necessary. Grouting was considered a less dependable method and was only used when conclusive proof of its effectiveness could be obtained. No definite transfer of load was attempted at this stage, but by the close masonry contact the new wall was enabled to take the load without appreciable deformation of any part of the structure, upon knocking out the posts under the needles. Thus the pit was brought into a condition intermediate between that of sketches B and C in Fig. 10. With the construction of the foundation wall, stirrups and projecting I-beams were concreted in, in those cases where reinforced-concrete clamping girders were to be built alongside the wall. In the case of steel girder supports, as shown by sketch D in Fig. 10, permanent needle beams were built into the new foundation wall under the temporary needles previously mentioned, to transfer the wall load to the girders.

Footing-wall reconstruction in short 6-ft. sections as described was carried on at widely different parts of the building simultaneously. When one piece of wall in a length to be carried by a single roof girder or pair of roof girders had been brought to this stage, another pit in the same length of wall was started, though this pit was not in general immediately adjacent to the first pit. In other words, work was kept scattered as much as possible, and the aim was not to disturb immediately adjacent parts either simultaneously or in immediate succession, so far as possible.

So soon as the whole length of a roof-girder section had been prepared by reconstructing the footing wall on the plank mat and grillage, the concreting or placing of the girders integral with this wall was taken in hand, as indicated in sketches C and D, Fig. 10.

As the axis of the subway makes an acute angle with the north-south axis of the City Hall, and the walls of the latter are aligned rectangularly, the roof-girder system of the subway was kept in the line of the east-west building walls, and thus is skewed at a uniform angle with the subway. The method of supporting the east-west footing walls of the building is typical, with respect to the girder arrangement, and this is illustrated in sketches C and D. In that part of the foundation where the roof girders are of concrete a pair of clamping girders is built along the foundation wall, being concreted directly against the wall and keyed to it both by offsets and by I-beam and rod-stirrup connections. Where steel girders form the roof, as occurs principally in the central section (on the axis of Market St.), these are set alongside in similar relation and bear against needle beams built into the reconstructed foundation walls, as in sketch D. These steel girders were in all cases incased in concrete and keyed to the walls in the same way as are the concrete girders. Thus the final support of the east-west walls followed immediately upon the completion of the reconstructed foundation wall, and resulted in forming the subway roof girders for the full span length (26 ft.) over one of the four cells of the subway.

For the north-south walls a generally similar method was used, these walls being in part carried on short north-south girders built between two east-west girders. This may be seen more fully and in a number of variations in the right-hand portion of the roof plan in Fig. 3. So soon as the short north-south pair of girders was completed, it enlarged the area of wall footing sufficiently to enable the space needed for constructing the main east-west girders through these walls to be cleared, and the concreting of these

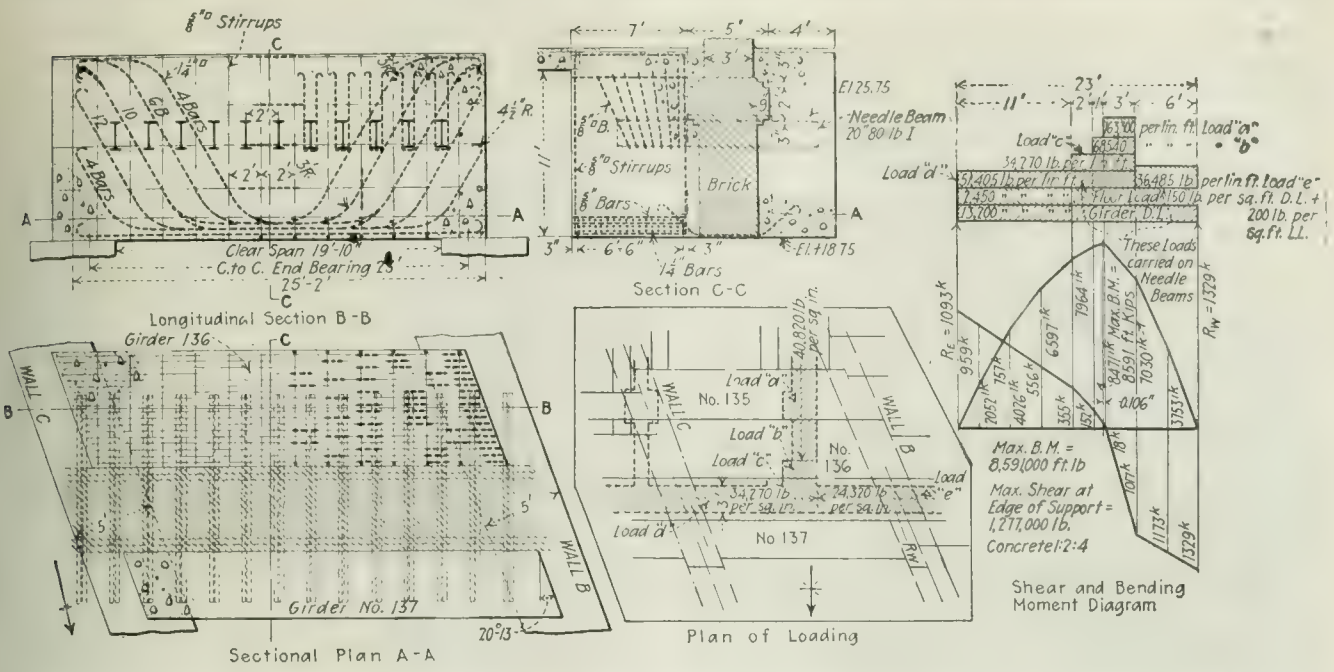


FIG. 11. HEAVY REINFORCED-CONCRETE GIRDERS CLAMP AND CARRY THE CITY HALL FOUNDATION WALLS

girders followed as the next and final step in the construction of the roof-girder system.

As already indicated, the foundation and roof-girder work was attacked at a number of points at a distance from each other. Its continuation followed the same principle and, generally speaking, the reconstruction of one piece of foundation was not followed immediately by work on adjoining sections. By wide distribution of the units of work, it was sought to avoid any local summing up of the small individual contributions to disturbance of the masonry that might be caused by slight yielding of the footings or even by the elastic distortion remaining in spite of the jacking and wedging done in transferring the load.

Very satisfactory success was achieved by these means in minimizing settlement. The average changes of level in the building due to this first set of operations, Mr. Fisher states, reached about ½ in., and the movement was in general uniform. Careful level surveys and examinations of walls for cracks were conducted from the very start. The extension of all existing cracks was carefully recorded, the original ends of the cracks having been marked. Many of the original wall cracks found in the building extended more or less, but very few new cracks developed. All indications of crack development and extension were of minor character. Perhaps most remarkable of all, a staircase that spirals around the interior of the square tower at the northwest corner of the building, formed of large granite slabs cantilevered from the tower wall, showed but two slight cracks and no opening of joints at any stage of the construction. The foundation work of this tower, however, was carried on by a modification of the typical method described, due to the nature of the footings and the concentrations to be carried, as will be noted further on.

Of course, there was no possibility of applying to this foundation and roof-girder work any systematic plan of large-scale working. Scattered operations meant small gangs and small units of material supply. Generally the footing construction was done by five-man gangs. Concrete for the foundation and girder pouring was supplied to them from ½-yd. mixers set up in some cases on the ground level and in other cases on the basement floor of the building, and was chuted to place by wooden troughs, often of intricately crooked alignment, especially for supply to the pier pits that formed the next stage of construction.

Underpinning the Subway Roof—The concrete piers which support the roof and building and which form the subway walls were constructed one by one in sheeted pits dug under the ends of the completed roof girders without any appreciable disturbance of the support of the building on the spread footing afforded by the concrete-and-steel grillage and the completed roof-girder system.

Short pits and drifts from the City Hall basement level or from the trenches in which the roof girders had been built gave access to the points where the pits were to be sunk. A four-man gang sheeted and dug out the pit, from 4 x 5 to 5 x 8 ft. in size, with shovels, and also hoisted out the dirt and dumped it on the basement floor, where wheelbarrows and ½ yd. narrow-gage dump cars took it to the shafts for hoisting to the dumping aprons. Pails and small sheet-iron barrels were the hoist buckets; a chain block supported by beams laid across the top of the pit was available for handling these buckets and subsequently the pile hammer. Sheeting was done by the louver-board method, in which successive horizontal planks, mortised at the corners to engage and brace each other in a square set, are placed at the bottom of the pit as excavation proceeds. Slots in the plank wall, formed by notches in the edges of the louver-boards, permit packing earth or cement mortar back of the sheeting to fill up voids which might start earth moving.

A new departure in the use of this method was made by carrying it below water level; previously it has been considered to be practicable only above groundwater. In this case the pits were generally sunk about 7 ft. below groundwater, but in some in-

stances a depth of 10 to 12 ft. below water level was required. The ground was a dense, gravelly soil with some clay admixture but not enough to make it tight; there was considerable inflow of water, but carrying practically no soil with it. The contractor therefore considered it possible to keep the pits dry by pumping and continue the louver-board method to the bottom. The conclusion was made good by carrying all the pit work through on this basis.

A small direct-acting steam pump lowered into a pit by a rope sling and operated by compressed air proved to be a very efficient tool for the pit drainage. Keeping the middle of the pit a foot or two below the level

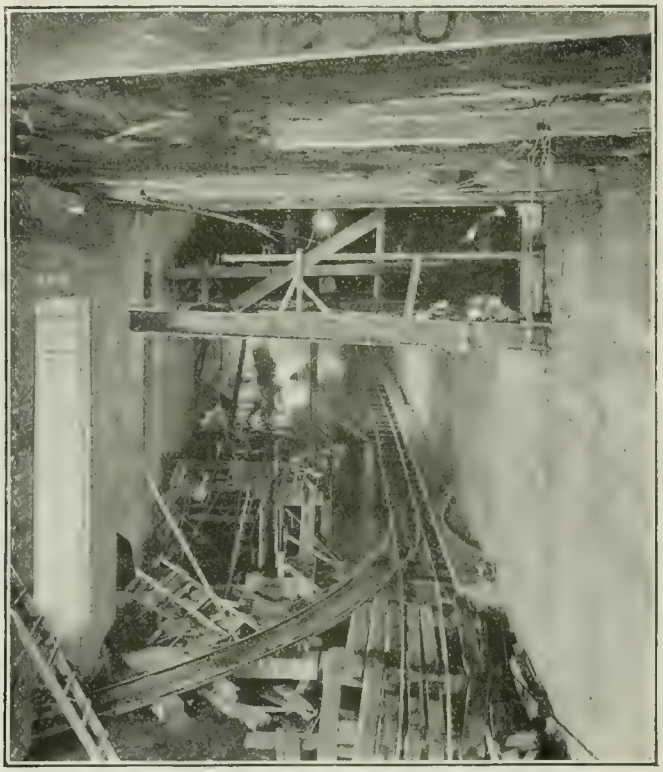


FIG. 12. BUILDING A STATION PLATFORM. NARROW-GAGE TRACK SYSTEM FOR EXCAVATION AND MATERIALS

of the outer edge made it possible to carry on excavation for the successive sheeting boards without undue movement of the ground. Clay packing back of the louver-boards was used in some cases, and in others cement-mortar packing was preferred; both gave satisfactory results.

At subgrade level the hard, gravelly clay and sand soil continued. The bearing power of this soil is high, but the loading is so great that pile foundations were necessary. Rock surface is 5 to 18 ft. below subgrade; it is overlain by several feet of disintegrated mica schist, into which the piles were driven.

The number of 15-in. steel-pipe piles in each pit varies from four (in the 4 x 5 pits) to a maximum of 15 (in the 5 x 8 pits). They were driven with a No. 5 McKiernan-Terry air-driven hammer suspended in the pit; after every 4 to 5 ft. of driving the muck inside the pipe was blown out. In this work the usual method was followed, filling 3 or 4 ft. of water into the pipe and then, with a 3-in. air pipe (supplied at 100-lb. pressure from a large receiver) lowered down on the earth in the pile, turning on the full pressure; the blast of air and water lifted out the contents of the pile, including even boulders up to clearance size. When driven to full depth the pipe was filled with concrete to an elevation slightly below that of the cap, the top of the pile was then burned off, and the cap was placed and grouted to bearing.

A loading of 90 tons was decided upon for these piles. Loading tests up to 116 tons showed no appreciable compression. Similar load tests on the soil itself, made by means of a 2-ft. square plunger and carried up to a loading of 12 tons per square foot, indicated a permanent settlement of $\frac{1}{16}$ in. per ton.

Application of waterproofing to the rear wall of the pit (in the case of the outside walls) and filling with concrete to slightly below the roof-girder level completed the pier. Close bearing contact between pier and girder was secured by keying up with brickwork or in some few instances by grouting.

All piers were dovetailed together by vertical grooves in their abutting faces. In addition, at intervals of 7 or 8 ft. in the height, horizontal keys of similar shape were provided. Transfer of load from one pier to the adjoining one was not counted upon, however, but each girder load was taken through its pier direct to the footing piles.

The same plan of scattered construction was applied to the pier work as to the roof-girder work, but the purpose in this case was not alone the avoidance of ground disturbance but also the convenient interleaving of the various items of work, the pier construction having to follow girder construction. Thus the subway walls grew piecemeal under ground. Each pit was located independently of the other, and the survey work necessarily had to be carried on with conscientious accuracy. The result is seen in the perfect alignment of the piers as they were revealed by the core excavation, shown in some of the accompanying views.

Core excavation started at the south end of the section when the roof-girder and pier construction there was complete. At this time a number of scattered piers in the north part of the section still remained to be constructed, but they were built by the time the excavation had progressed to them. Removal of the core deprived the roof-girder system and the foundations of the building of their earth support and transferred the load to the piers supporting the girders. In the aggregate the changes of level in the the City Hall due to this step in the construction work represented a general subsidence, rather smaller than $\frac{1}{4}$ in.; with this movement the total settlement of the structure due to the subway work reached a maximum of approximately $\frac{3}{4}$ in; the average subsidence was considerably below this and may be put down at $\frac{1}{2}$ in., according to Mr. Fisher.

The first lift of excavation was taken out as a shallow heading, only high enough to give working room, as the purpose here was to drive through and remove the temporary grillage footings in this operation. There was a tar-paper joint between the concrete of the grillage and the superincumbent girders and foundations, to make a separation; however, bull-point air hammers and later on, in some instances, light dynamite charges had to be used to bring the grillage down. A second lift was taken out in the full height from the first lift down to groundwater,

and this, generally speaking was the bulk of the excavation. The third and final lift took all the material from groundwater level down to subgrade.

Pick-and-shovel work was used for taking out this earth, in view of the moderate yardage and the impossibility of providing large muck cars. Small dump cars on a narrow-gage track led back from the working face to a derrick shaft at the south end. In the work below groundwater the drainage was led to a sump near this derrick shaft.

An interesting feature of the groundwater question was that early in the life of the contract a trial was made of pumping down the groundwater. Four sump wells carried below subgrade, at distant points of the site, were pumped down for a period of several months, lowering the water level by 4 or 5 ft., but in an erratic way. The result was not considered entirely satisfactory; the success of carrying the wall-pier pits to subgrade by using the louver-board method below water level with the aid of direct pumping was soon demonstrated, and the lowering of the groundwater reduced the cost of the pit excavation only slightly.

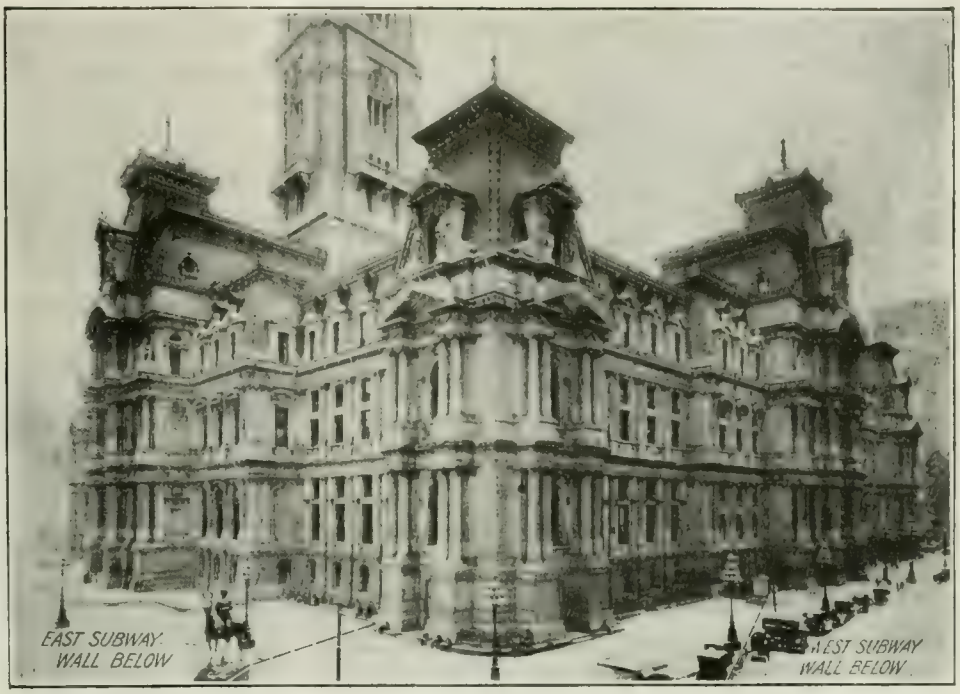


FIG. 13. AT THE NORTHWEST CORNER OF CITY HALL BEFORE WORK STARTED

The subway is waterproofed by a two-ply layer of asphalt-treated fabric waterproofing on the outside of the side walls, extending down to the base of the walls, and a similar two-ply layer between the 6-in. sub-base of the track floor and the 12-in. top floor, notched a few inches into the side walls but not connected to the waterproofing at the back of the wall.

Work at North and South Towers.—The specially large weight concentrations at the two towers of the building under which the subway passes (that near the center of the south front, and the northwest tower) made it necessary to resort to very pronounced modifications of the typical method described in the preceding. Steel-girder support directly under the walls had to be adopted on account of the thickness of these walls and the resulting impossibility of using the ordinary concrete clamping girder method within reasonable limits of dimensions.

At the south tower the method used was substantially as follows: A trench was excavated along the southerly side of the south wall, down to the ceiling level of the subway, in this case practically the same as the bottom of the tower footing masonry. This masonry was in good condition, strikingly in contrast with the condition of the rubble foundations elsewhere. In the trench was placed a steel plate girder, a member of the subway roof system, directly against the wall and in such position as to span across one cell of the subway. Above and around this girder was cast a concrete toe or buttress to the wall, bonded into the old masonry and intended to remain as a permanent addition to the wall. The footing of this buttress on the ground increased the base area of the wall by a sufficient amount so that a narrow drift could be cut through the wall just behind the girder and buttress for the admission of a second roof girder; the bearing area removed in cutting out this drift was made up by the footing area of the buttress, and so the soil pressure conditions under the tower were not altered. When the second girder was placed in the drift cut through the wall, and properly brought to bearing against the masonry above and bedded on a mat of concrete on the soil below, another drift, for a third girder, could be cut through, and so on until the series of seven or eight girders comprising the support of this wall and the north-south walls adjoining it had been placed. With the tower fully supported on its grillage of transverse girders, drifts were excavated under their ends for longitudinal grillage girders on the line of the future subway walls, and pits for the wall piers were sunk one by one under the longitudinals and concreted.

Steel columns were erected in three intermediate pits, resting on a base of grillage beams over the group of piles in the bottom of the pit, and these columns were wedged to bearing against the girders. The function of these columns, or steel cores, was to reinforce the supporting wall at the points of heaviest concentration of the tower load.

Special Work at Northwest Tower—At the northwest tower, where steel girder construction also was used on account of the great load to be carried, the foundation walls went down lower than elsewhere, and a variation of the typical method was used.

Through the north and principal wall of the base of the tower, by means of successive drifts, the transverse girder needles designed for its permanent support were inserted and solidly bricked in, resulting in the rubble foundation being replaced by a continu- not disturbed in this initial operation. A separation joint was provided in the new work at the elevation of the bottom flange of the girders to permit the sub-

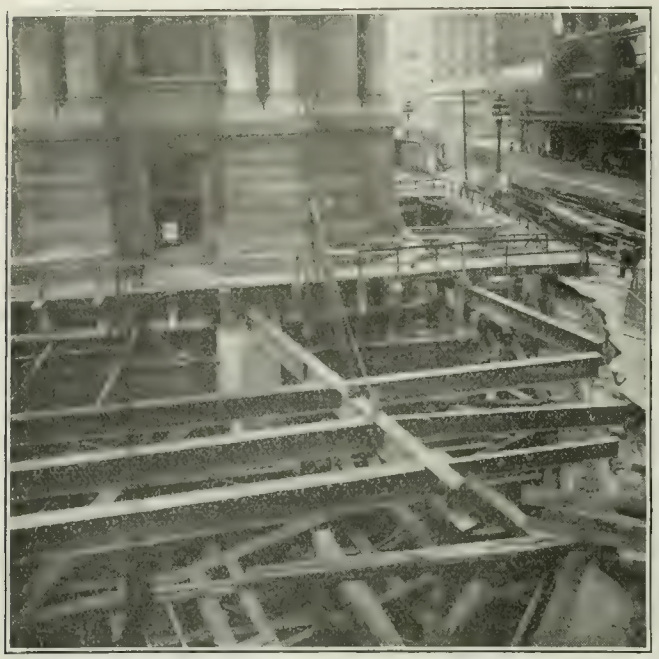


FIG. 11. NORTHWEST TOWER OF CITY HALL CARRIED ON STEEL GIRDERS

ous course or layer of brickwork extending from approximately 1 ft. above the top flange of the girder to about 6 in. below the bottom flange. This masonry, when carefully wedged and grouted against the old rubble above, transferred the entire tower load to the lower portion of the old foundation, which was not disturbed in this initial operation. A separation joint was provided in the new work at the elevation of the bottom flange of the girders to permit the subsequent dropping and removal of the masonry that extended below that level.

As three of the walls of the subway cut through the tower foundation, much pier construction work had to be carried out along and under the footing walls. Before any considerable amount of pit excavation was made beneath the foundations, the main roof girders, paralleling the north wall of the tower on either side, were placed in position and supported on the soil by brick piers and concrete slabs or mats. The projecting needle girders were then wedged to their support on the roof girders.

This method provided increased bearing area for the tower load, compensating for the loss thereof occurring during the operation of sinking the wall pits. The roof girders, with the needle girders supported thereon, were picked up by the subway walls as the work progressed. During the various stages of the construction in connection with the underpinning of the tower its bearing on the soil was maintained, and the load was not supported by the subway structure until it was subsequently transferred thereto automatically by the excavation of the core.

In general, restoration of the City Hall basement floor over the girders was carried through completely by placing a concrete slab either directly on the roof girders or on short footing walls erected over them. Furthermore, the space between girders (except where adjacent girders are in direct contact) was closed at the bottom by a thin ceiling slab set into notches formed (or in some cases cut) in the sides of the girders.

Tunneling under the south branch of the Market St. subway to construct the undercrossing had to be preceded by reconstruction of the concrete slab pavement constituting the old subway floor, in order to convert it into a bridge spanning the tracks of the new subway. As a preliminary step, drifts were carried through on the lines of the future subway wall, about 6 ft. high, directly under the floor of the old subway, and, these being timbered as they progressed, they were concreted solid (but between side forms) as soon as driven to the end. This procedure resulted

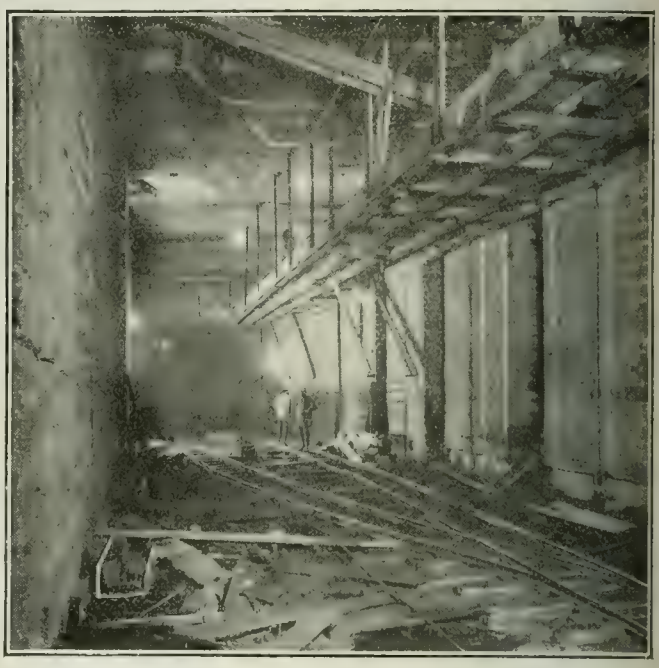


FIG. 15. PIERS SUNK SEPARATELY FORM WALLS IN TRUE ALIGNMENT

in placing a deep and rigid concrete girder under the old floor. Spanning across between these girders, the steel construction of the new floor could then be put in place, one track at a time, by night work, when traffic could be shut off or restricted to a single track. While this work was proceeding drifts were carried forward to the locations of individual piers under the party built new walls, and carried below subgrade

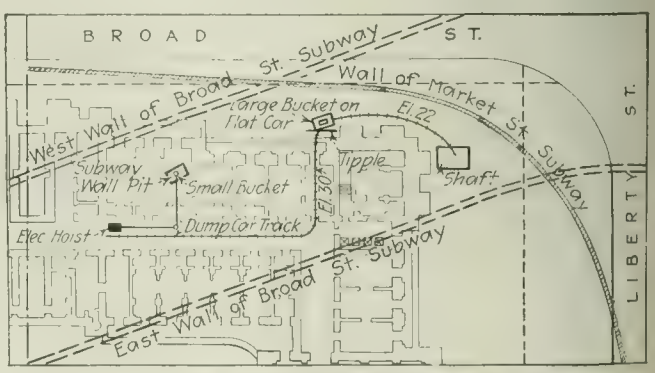


FIG. 16. HANDLING EARTH FROM PIER PIT

level. This was followed by core excavation and completion of the walls.

More complicated operations were required at the north undercrossing, partly on account of the skew of the intersection and the fact that the crossing is under the sharp right-angle curve of the north branch

and partly because an interchange station had to be constructed here. Much more extensive reconstruction work had to be done in connection with the old structure than in the case of the south undercrossing. The work was further affected by its contiguity to the complex work at the northwest tower.

A total cost of very close to $3,000,000 is involved in the work described; the final estimates have not yet been prepared, but the supervisory officials expect the figure to approach closely this amount. As the contract was taken and its subsequent revision agreed upon before the war rise of prices, and the contractor carried on his work throughout the war, the cost to him probably exceeds the contract total computed from the unit-price figures. About one-third of the total, or something over $900,000, was expended for the underpinning work or foundation wall reconstruction.

Of the municipal and construction engineers, other than those already mentioned as being in direct charge, J. H. Fisher was superintendent for the contractors. James Shute was division engineer in charge for the city, William M. Lanard assistant engineer, and O. L. Morgenstern, inspecting engineer.

Navy Concrete Barge Side-Launched

Combination Oil and Coal Carriers Being Built on Hackensack River Have Ways Reaching Into Water

CONCRETE oil and coal barges for the United States Navy are being built in three yards, one of which, at Verplanck, N. Y., was described in *Engineering News-Record* of May 29, 1919, p. 1056. Similar boats, designed under a general Government specification by the builder, are under construction by the Ambursen Construction Co., at Little Ferry, N. J., on the Hack-



NAVY CONCRETE BARGE ON BUTTER BOARDS AND CRADLES PREPARATORY TO LAUNCHING

ensack River, just above New York harbor. The Verplanck yard was designed for end-launching, but the Little Ferry barges are side-launched, as shown in the accompanying views. Two of the four barges contracted for have been built.

The Navy barge is 112 ft. long, 36 ft. wide and 12 ft. 3 in. deep, and is designed to carry oil in compartments and, with flashboards, a load of coal on deck. The barges are described as "500-ton coal and oil barges," but with both coal and oil aboard their capacity is nearer 750 tons. The general design of the Little Ferry barge is a 3-in. slab on frames 16 in. deep, spaced 3 ft. centers. This layout is the same on deck, sides and bottom. The bulkheads are also 3 in. in thickness and are stiffened with ribs on 3-ft. centers on both sides. Gussets at all intersections provide ample stiffness.

The yard has two sets of side-launching ways with a concreting tower midway of the two distributing to



NAVY CONCRETE OIL AND COAL BARGE SIDE-LAUNCHED

wheelbarrows on runways at the boats. For launching, the barge was held level on stringers parallel to the ways and blocked up on butter boards at the water side, as shown in one view, and on shoes or cradles at the shore side. The launching ways were stringers laid directly on the sand of the beach and descending into the water with no drop. Four of the carrying stringers extended shoreward beyond the ground ways and were blocked against the latter. Before the launching, the two middle stringers were sawed off inside the blocking, leaving the weight of the barge on the two end blocks. The stringers inside these blocks were sawed simultaneously, and the barge slid freely into the water.

The designs for the barges were made by the late Howard L. Coburn, for many years chief engineer of the Ambursen Construction Co., Inc. The construction and launching was under the supervision of L. A. Robb, vice-president of the company.

Chicago Bridge Replacement Problem

In planning the construction of a bascule bridge to replace the old center-pier swing bridge over the Chicago River at Madison St., the engineers had a serious problem in the necessity for insuring the minimum interference with traffic. This is one of the city's busiest streets, and two large railway stations are located within a block of the west end of the bridge. The method decided upon is to increase the proposed 180-ft. clear span of the bascule bridge to 188 ft. between abutments, which will allow the swing bridge to operate between the two leaves of the bascule as they are being erected in the upright position. In this way, traffic will be interrupted only during the first and final stages of work on the new bridge. It is expected that the construction will be commenced this year. This plan was devised by the city's engineers and has been approved by the War Department and the Sanitary District of Chicago.

Diagram for Locating Stirrups in Concrete Beams

Curves Facilitate Spacing of Vertical Stirrups in Uniformly Loaded Beam for Two Methods of Stress Distribution

By M. J. Lorente
Civil Engineer, Lynn, Mass.

WHEN the shear diagram of a reinforced-concrete beam has an irregular outline, it is impossible to locate the stirrups except by following some such method as that explained by the writer in *Engineering News* of Mar. 20, 1913, p. 570. When a beam is uniformly loaded, the shear diagram is a triangle, and the regularity of the outline ought to make it possible to devise a method for locating stirrups in a beam without much trouble.

The writer has worked out the accompanying set of curves, which give, in one operation, the almost mathematically accurate location of all the stirrups in a uniformly loaded reinforced-concrete beam. The figures from which the curves have been plotted were obtained from the following mathematical deduction:

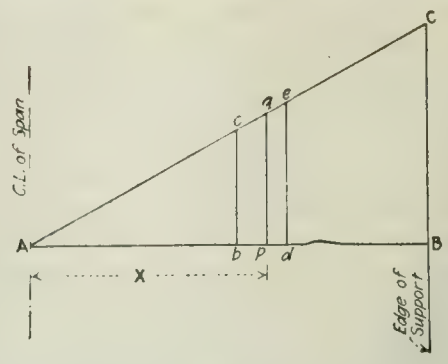


FIG. 1

In Fig. 1 let $A\ B\ C$ represent the shear diagram of one-half of a beam, and let w = load on beam per lineal foot. If the triangle $A\ b\ c$ represents the shear carried by $n - 1$ stirrups, and if the triangle $A\ d\ e$ represents the shear carried by n stirrups, then $c\ b\ d\ e$ represents the shear carried by the nth stirrup, and this stirrup should be located in a line passing through the centroid of $c\ b\ d\ e$.

To find the centroid of this trapezium would compli-

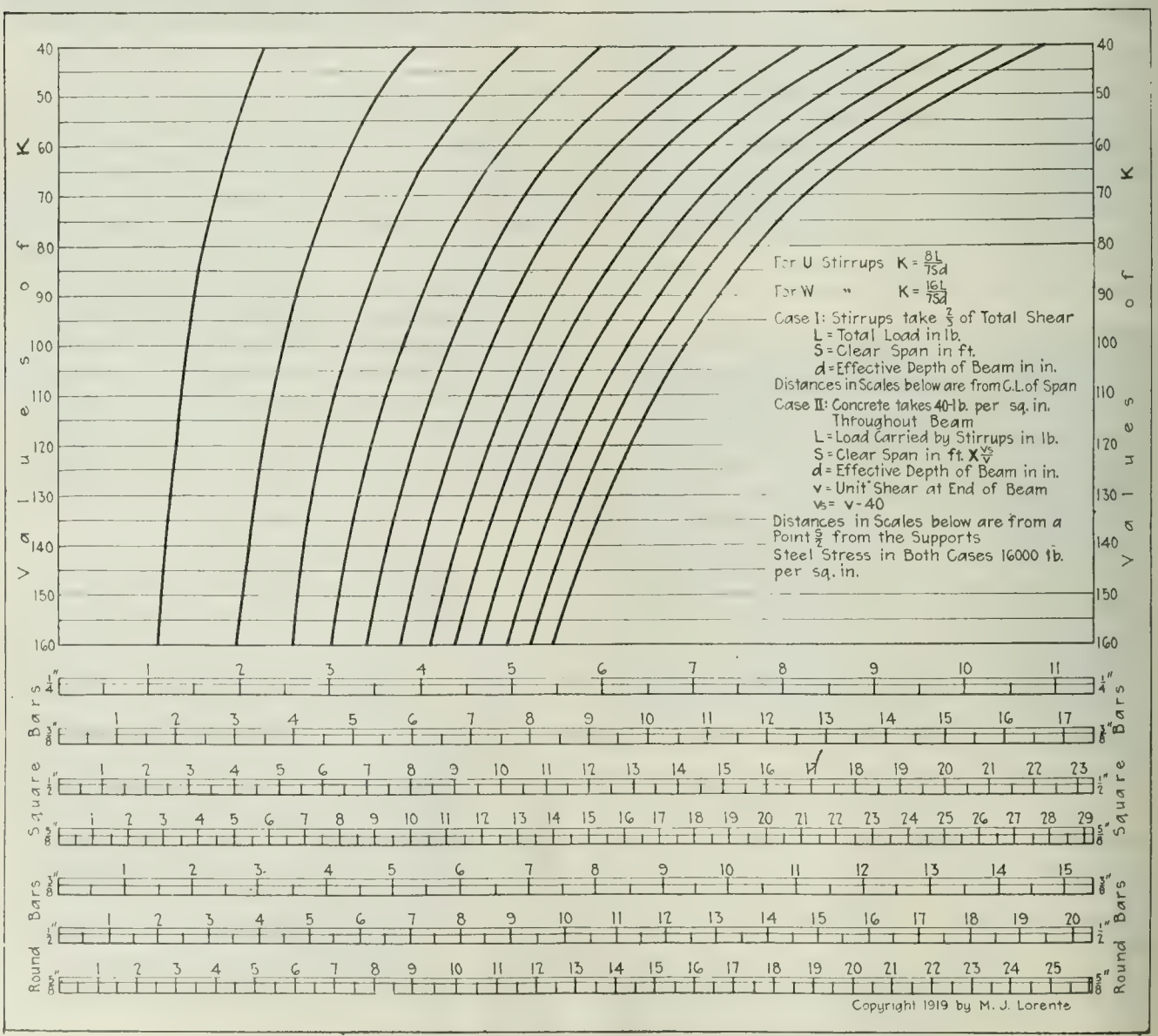


DIAGRAM FOR LOCATING STIRRUPS IN REINFORCED-CONCRETE BEAMS

cate matters so much that an approximation is justified. Accordingly, the stirrup is located in such a way that it lies in a line $p\ q$, dividing the area $c\ b\ d\ e$ into two equal parts. In practice, it will be found that the location thus obtained varies but little from the location in a line passing through the centroid of the area mentioned, and that the difference is negligible.

Therefore, the location of the nth stirrup is given by the side along the line $A\ B$ of a triangle representing the shear carried by $n - \frac{1}{2}$ stirrups.

Now, let the shear at p equal V

Then the unit shear at p equals $v = \frac{V}{jdb} = \frac{wx}{12\,jdb}$

where b = width of beam, in inches;
d = depth of tension steel from top of beam in inches;
jd = moment arm of section, in inches;
and x = distance, in inches, from center of span to nth stirrup.

The total shear up to the point p, taking $j = \frac{7}{8}$, will be

$$\frac{wx^2}{21\,d}$$

and this shear must be equal to $(n - \frac{1}{2})\ a_s f_s$,
where n = number of stirrups up to the point p;
a_s = cross-sectional area of each stirrup, in square inches;
f_s = stress allowed in stirrups, in pounds per square inch.

We then have the equation $\frac{wx^2}{21\,d} = (n - \frac{1}{2})\ a_s f_s$,

which, if we let $\frac{w}{d} = y$ becomes $\frac{x^2 y}{21} = (n - \frac{1}{2})\ a_s f_s$,

therefore,

$$x = \sqrt{\frac{21(n - \frac{1}{2})a_s f_s}{y}}$$

If we follow the recommendations of the Joint Committee and allow the stirrups to take two-thirds of the shear, then this equation becomes

$$x = \sqrt{\frac{63(n - \frac{1}{2})a_s f_s}{2y}}$$

If, on the other hand, we allow the concrete to take v_c lb. per square inch throughout the beam, then x will be the distance of the stirrup from a point $\frac{S}{2} \times \frac{v - v_c}{v}$ from each support, where S = clear span and v = unit shear of beam at supports.

The accompanying curves have been worked for both methods of distribution for a steel stress of 16,000 lb. per square inch. Similar curves could easily be worked out for other stresses.

The best way to use the curves is to mark off on a piece of paper the intersections of the curves with the horizontal line at the proper value of the constant K, then read these marks on the scale corresponding to the size of stirrups it is desirable to use.

Manganese Exports From Brazil

Manganese exports from Brazil during the first two months of 1919, according to a recent consular report, amounted to 59,270 metric tons, compared with 71,101 metric tons in the corresponding period of the year 1918.

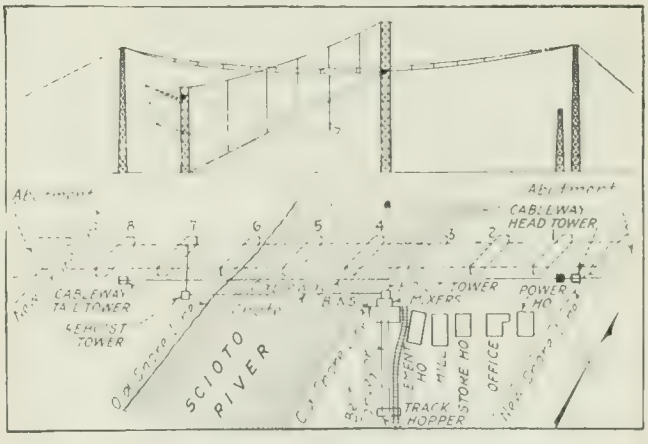
Electricity Cuts Construction-Plant Power Costs

Plant for Large Arch-Bridge Construction Motor-Operated—Motor Generator Permits Use of High-Tension Current

LOWER costs are being cut by electric operation of the construction plant for the nine-span concrete-arch bridge over the Scioto River at Columbus, Ohio. A motor generator, receiving alternating current at 4400 volts, generates 220-volt direct current for the machine motors. A 250-kw. generator supplies current for some 13 motors varying in size from 5 hp. for small machines to 65 hp. for the main cableway. Sawmill, belt conveyor, concrete mixers, derricks, pumps, piledriver, cableway and concrete-hoist towers are all electrically operated. Firemen and coal piles are eliminated except for one small boiler which supplies steam to a hammer for driving and pulling steel sheet piles for the cofferdams.

The bridge being constructed is located at Mound St. in Columbus, and is a portion of the work of widening the Scioto River to reduce the danger from floods. It is a heavily reinforced barrel-arch structure on two abutments and eight piers, and has the remarkable skew of 45°. There is 24,765 cu.yd. of concrete to be placed. When the channel is widened all nine arches will be waterway, but now the abutment and three piers at each end are on shore, although all have to be constructed in cofferdams.

All large units of the construction plant, as is shown by the sketch plan, are located on the east shore, on

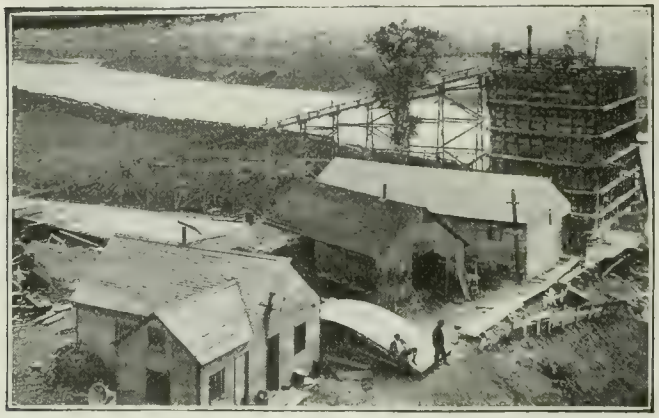


SYSTEM FOR HANDLING CONCRETE ELIMINATES DELAYS

ground which is finally to be removed. On the west shore are the tall tower of the cableway, the rehoist tower and derricks and pumps, and a mixer used on the west-shore abutment and piers. The derricks, piledriver, pumps, etc., are not indicated on the sketch, as their locations change as the work progresses. As indicated, two longitudinal conveying systems are provided. The first is an 800-ft. cableway which will handle and help erect form units and whose chief purpose is to shift from span to span the steel center ribs. Whenever necessary, the cableway can also handle concrete buckets from the central mixing plant. On most occasions, however, concrete will be distributed by the second of the two conveying systems, which is a main and a rehoist tower and chutes. The double means of

distributing concrete was a safeguard thought to be warranted by the requirement that the arches be poured in longitudinal sections. Two mixers are provided for the same reason; generally one will merely stand by, but it can be switched into operation at any time.

Sand and gravel are brought in cars on a switch track which extends to the cement house. Four cars can be stored on this switch between the track hopper and the cement house and, as the track is on a grade, can be dropped back by gravity and unloaded into the track hopper. In case the rail deliveries fail, materials can be delivered by truck to the track hopper. The hopper feeds into a 16-in. belt conveyor which ascends on a



BELT CONVEYOR ASCENDS FROM TRACK HOPPER TO GRAVEL BINS

trestle to the bin tops. The bins store 250 cu.yd. of sand and 500 cu.yd. of gravel, and chute by gravity into the mixers. A 15-hp. motor operates the conveyor. One mixer is a 1-cu.yd. machine with a 20-hp. motor and the other is a ¾-yd. with a 15-hp. motor. Either mixer can chute into the hoist bucket or to one side of the tower into the cableway bucket. The main tower will chute directly into the center and east shore spans. For the arches across the river, the main tower will chute to a rehoist tower and that in turn will deliver by swinging chute.

Steel centers and wood pier forms are employed. Centers for two half arches are provided, and when the right half of the arch is completed each half center is



CABLEWAY HANDLES CENTER AND PIER FORMS

rolled into position under the second half of the arch. When this is completed the centers are rolled out from under and are transferred ahead by the cableway to the next spans. A 65-hp. motor operates the cableway so that it can handle quite large form units and thus reduce dismantling to a mimimum. Wood forms are built on the job, there being a sawmill and a large assembling platform for framing the various units, with curved surfaces for umbrella piers and pier noses.

Reduction of power costs by using electricity is a matter of estimates. A power bill of $400 to $500 per month will, the contractor has figured, carry the work. The single boiler plant for the steam hammer which drives and pulls sheeting costs $10 per day for fuel and fireman. Separate steam plants would be required for all machines, owing to their wide separation, and each, it is calculated, would cost no less for fuel and attendance than does the pile-hammer outfit.

The plant layout was planned by the contractors, the Hickey Bros. Construction Co., of St. Louis, Mo.

State Control of Public Bathing Places

THE sanitary control of all swimming pools and public bath-houses in Florida, whether privately or municipally owned, is placed under the Florida State Board of Health by recent legislation (Florida laws, Chap. 7825, 1919). The law is based, in part, upon studies made by George W. Simons, Jr., chief sanitary engineer, state Board of Health, acting as chairman of the American Public Health Association's committee on swimming pool sanitation, but it is patterned after the law of California, which Mr. Simons says is, so far as he knows, the only other state which has such a law. Under the Florida statute no swimming pool, public bath-house, bathing or swimming place may be constructed, altered or operated without "an unrevoked permit" from the state Board of Health. Before such permit shall be granted, plans, specifications, and full operating details must be filed with the board. Information must be given as to the source of water-supply, its amount and quality, the proposed method of treating and heating the water and of providing for the cleanliness of bathers, the method of washing and storing bathing suits and towels, and any other data that the board may require. The board is authorized to inspect bathing and swimming places at any reasonable time, and in its discretion may publish the results of the inspections in its monthly bulletin. It may revoke or suspend permits for cause, and likewise may declare and bathing establishment a public nuisance, which nuisance may be abated or enjoined by either the state or local board of health. Violators of the act are subject to fines of $25 to $500, or to imprisonment in a county jail for not more than six months, or to both fine and imprisonment.

Motor Vehicles in Pennsylvania

Motor vehicles have increased greatly in Pennsylvania during the past five years, as is shown by registrations under the new motor-vehicle law. These show the following numbers for the year 1919:

Pneumatic-tire vehicles	402,797
Solid-tire vehicles	36,475
Tractors	2,619
Trailers	1,200
Motorcycles	23,021

The total receipts from all sources under the motor vehicle law in 1919 are $4,598,350.

Miami Flood Works Involve Radical Railway Changes

Railways Crossing Flood-Retarding Basins Shifted to High Ground—Levees Guard Stretches Crossing Low-lying Areas

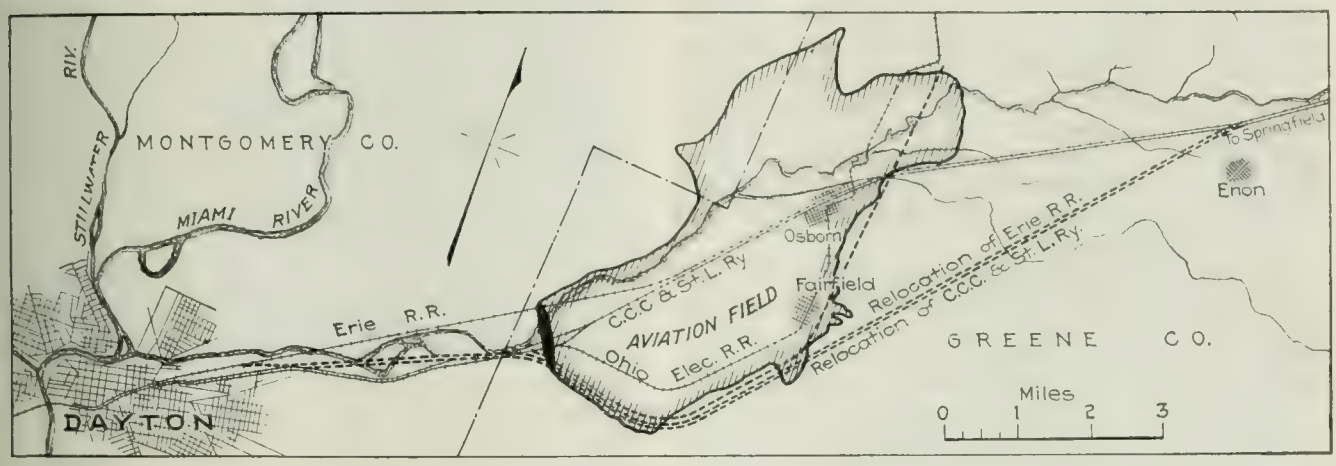
RAILWAY relocation is a large problem in the task of securing safety from floods for the towns of the Miami Valley in Ohio. Railways crossing the flood-retarding basins are being swung aside several miles and lifted above the reservoir flow lines. At places where complete clearance is impracticable, parallel levees embrace the roadbed and isolate it from the flood waters on both sides. Long culverts under levees and roadbed will keep the water level the same and equalize pressures.

Few railway construction operations now in progress are larger than those being conducted in connection with the Miami Valley flood-control works. At the two retarding basins where major railway changes are in progress some 55 miles of trackage are affected. The quantities are, in round numbers, 40 miles of new roadbed, over 100 culverts and bridges, 500,000 cu. yd. of levee, 1,500,000 cu. yd. of cut and 1,300,000 cu. yd. of fill. Including compensation of the railways for increased mileage and curvature and for changed grades, the construction cost will be about $4,000,000.

Only two of the five retarding basins greatly interfered with railway lines. The Erie R. R., the Cleveland, Cincinnati, Chicago & St. Louis Ry., and the Ohio Electric R. R., all running northeast out of Dayton, traversed the dam site and the retarding basin at Huffman. The Baltimore & Ohio R. R., from Dayton directly north, crossed the west end of the Taylorsville dam and skirted the west edge of the retarding basin just inside the flow line of maximum floods. At either Huffman or Taylorsville, to proceed far with the dam construction would require that the railways be removed. At Huffman a temporary local removal has already been affected.

Since the placing of the new lines and the design of their roadbeds and works must coördinate with the elevations and the locations of the flood-control structures proper, they were determined by the conservancy engineers. For similar reasons it was essential that these engineers should also regulate the time, place, and general methods of construction. So far as the design and construction method had no influence on the new lines as an integral part of a system of flood-control works, they were left to the railway engineers, subject to the approval of the conservancy engineers in matters of economics. As to the work of construction, the plan is to let the owning companies perform the work through their own engineers and through contractors, subject to the approval of the engineers of the district, which pays the total cost. This general plan is departed from in certain instances, where the district is doing this work with its own forces.

At Taylorsville the problem of the Baltimore & Ohio R. R. relocation was not unusual. The old line skirted the west edge of the reservoir a little within the flow line of maximum flood. Broadly speaking, relocation

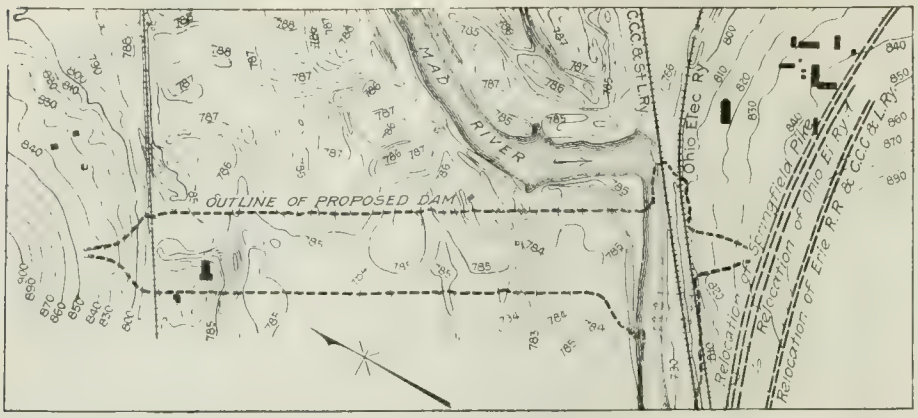


THREE RAILWAY LINES RELOCATED TO DETOUR HUFFMAN RETARDING BASIN

consisted of building a new line higher up the valley slope. The change in level at the reservoir ranged from 5 ft. to 35 ft. Rather heavy grading was involved in crossing a close succession of ridges and tributary valleys; there were in the 52,000 ft. (9.85 miles) of new line 850,000 cu. yd. of cut and 711,000 cu. yd. of fill, or about 85,000 cu. yd. of excavation per mile. At the dam the new line crossing a bulge of the flow line is protected by levees. The location standards followed were: Width of double-track roadbed, 34 to 42 ft.; side slopes, 1 on 1½; maximum grade, 0.2% compensated; maximum curve, two degrees.

The larger problem of relocation was at Huffman. Here three lines of railway traversed the basin, cutting squarely across both ends of the dam site which extends, as shown by the contour map, between the two valley slopes of Mad River. (See next page.) To pick the tracks out of the valley and set them on high ground above flood level necessitated new gradients and new alignments adjusted to maximum economy, considering both operation and construction cost.

The determining factors as to gradient were the elevation of railway yards at East Dayton and the elevation (850) of the top of the dam about five miles northeast (upstream). The ruling gradient made it necessary to adopt a location reaching El. 840 at the dam, so that the track is 10 ft. below the dam crest and must be protected by levees. These extend upstream from the dam about 3500 ft., where the railroad reaches higher ground. Downstream (toward Dayton) the alignment must be adjusted to fit the ruling gradient. These were the broad requirements of relocation.



CRITICAL POINT OF RAILWAY DETOUR AT SOUTH END OF HUFFMAN DAM

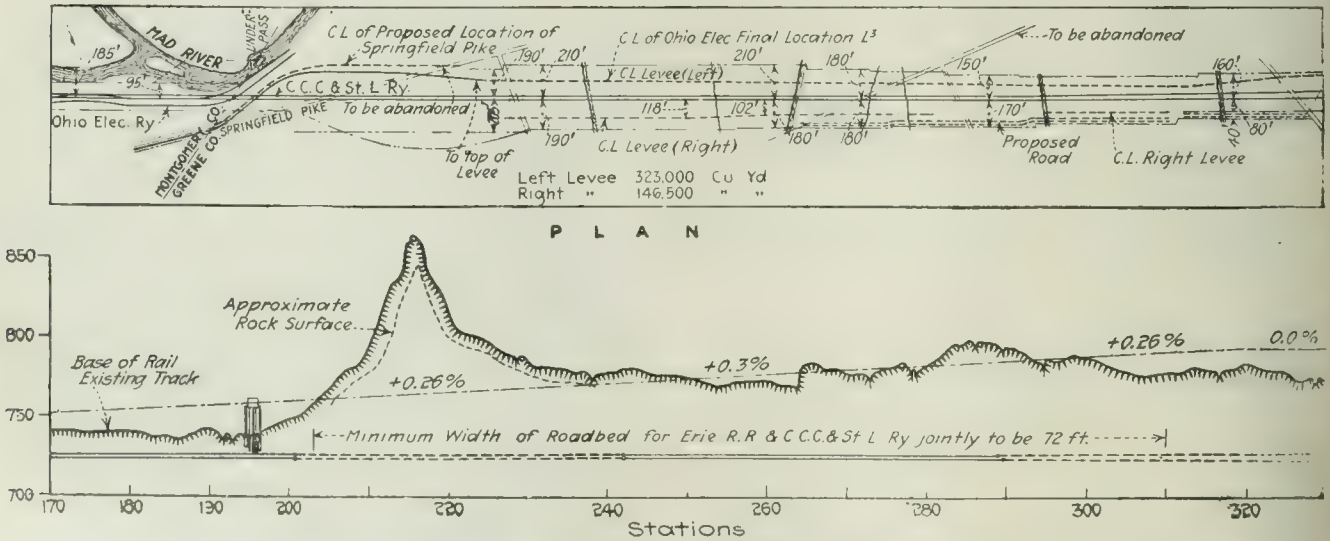
The original line locations are shown by the general map. Since the two steam lines had been for some time jointly operated as a double-track railway, it was possible, in planning their relocation, to consider them structurally as a double-track line on one roadbed. The logical detour was around the south end of the dam, that being the shortest, the least expensive in curves and gradients, and the one which best permitted the structures for all three roads to be bunched and thus reduce construction costs.

Some forty alternative alignments and profiles were compared before the final solution, giving maximum economy and safety from overflow, was reached. The problem was complex. A ruling grade of 0.3% could not be exceeded. Increases in milage and curvature, and grade changes beyond those of the original line, must be paid for. This was a very material factor, as is indicated by the fact that the 4000-ft. greater length and the 100° additional curvature, plus the grade changes, increased operating expenses by an amount which entitles the railways to $400,000 extra compensation. Above the dam for some distance the lines must come within the retarding basin and be protected by levees; the cost of earthwork in these levees, varying with changes in line and grade, introduced an additional factor in the normal problem of balancing cut and fill. Finally, there was the concentration of excavation in the heavy cut at the dam, of very nearly 75% of the total yardage of cut involved in the relocation, to be integrated with the factors of ruling grade and of safety from overflow of the line above the dam.

Beginning in the outskirts of Dayton, the Erie and the C., C. & St. L. lines are swung together as a double-track line on one roadbed and are carried at the grade of 0.3% to the hill at the dam. Here the Ohio Electric line is picked up, and for 2½ miles the three roads are kept together. The 4⅓-mile approach to the dam from Dayton is a continuous fill of 374,000 cu.yd., the grade of which strikes the hill at El. 810, which is 25 ft. below the elevation of the dam spillway and 40 ft. below its crest. Continuing the same grade, the line passes through the hill and between levees until El. 840 is reached. The profile shows in detail this critical section of the relocation. Throughout the 15 miles of new line the following standards are maintained: Width of single-track roadbed, 20 to 30 ft.; of double-track roadbed, 34 to 44 ft.; slopes, 1 on 1½ for earth, 1 on 1 for rock; maximum curve, 1°; maximum grade, 0.3%, compensated 0.04% on curves.

Both structurally and as a construction task, the striking portion of the new location lies between stations 200 and 310, a distance of slightly over two miles. To clear the dam, the steam-railway lines are swung about 400 ft. south of the new C., C. & St. L. Ry. location, into the hill, giving a cut about a mile long, with maximum depth of 119.8 ft.; the yardage is 680,000 cu. yd., of which about 80% is rock. From a point a few hundred feet above the dam, the cut is continued artificially in the form of parallel levees 200 ft. apart to station 310, where the grade on embankment between the levees has risen to El. 840. The crest elevation of the levees is 845, which gives a maximum depth of embankment at any point of about 35 ft. The northern levee, which also serves as a roadbed for the relocated line of the Ohio Electric R. R., is 20 ft. wide on top, the opposite levee 20 feet.

The excavation of the large cut is the governing operation in constructing the relocated lines. About 323,000 cu. yd. of the excavation is needed to construct



PROFILE OF TRIPLE-LINE PERMANENT WAY AT HUFFMAN DAM

the north levee, and the remainder for the south levee and the fills east and west of the cut. Steam shovels were put at work early in 1918, the shoveled material being hauled in dump-car trains onto the two embankments.

Much of the rock in the cut requires blasting to prepare it for the shovels. Much of it is shaky, and certain strata which are quite hard in the cut disintegrate on exposure, so that the rock forms a rather dense



ROCK CUT AT HUFFMAN DAM THREE-FOURTHS TOTAL EXCAVATION

embankment. To make sure that the north levee will be water-tight, however, it will be covered with a blanket of earth. At maximum progress the output has been between 30,000 and 40,000 cu. yd. per month. The general contractor, the Walsh Construction Co., of Davenport, Iowa, has handled the cut and the embankment formed from its spoil; the remainder of the grading it has let to subcontractors. On July 1 some 80% of the grading was finished. On the Baltimore & Ohio relocation at Taylorsville the general contractors, Grant Smith & Co., of St. Paul, Minn., and H. C. Kahl, of Davenport, Iowa, have sublet the team work and are doing the heavier grading themselves.

The structures on the new lines vary in size from pipe culverts to concrete arches and trestles up to 3500 cu. yd. They are all of heavy design, but present no particular features except in case of the long culverts under the roadbed between levees. These are more than 250 ft. long.

All railway relocating is under the direction of the Miami Conservancy District, Arthur E. Morgan, chief engineer; Charles H. Paul, assistant chief engineer, and C. H. Locher, construction manager. Albert Larsen, as division engineer, is in direct charge of all railway work.

Deliveries of Crude Domestic Petroleum

Deliveries to the trade of crude domestic petroleum in 1918, in barrels of 42 gal. each, totalled 380,242,153, according to reports prepared by A. B. Coons, under the supervision of E. Russell Lloyd, of the United States Geological Survey. Crude petroleum marketed in the United States amounted to 355,927,716 barrels.

License Surveyors in Texas

A BILL has been passed and signed by the Governor of Texas licensing land surveyors. The law becomes effective Oct. 21, 1919. The provisions of the law, as set forth by State Land Commissioner J. T. Robinson, are as follows:

"The surveyor's act creates a Board of Examiners of Land Surveyors to be composed of the Land Commissioner and two surveyors of 15 years' experience who shall be appointed by the Governor.

"The board will prepare questions pertaining to land surveying generally and the law of land boundaries. The examinations will be conducted by the county boards of examiners of applicants for teachers' certificates, but the surveyor's board will grade the answers and issue licenses. A surveyor's license will be good for life, unless revoked for improper conduct. Applicants will pay a fee of $10, of which $2 will be retained by the county board, and so much of the remainder as may be necessary will be used to defray the expenses of the surveyors' board.

"When a surveyor receives a license he will be authorized to do surveying work, public or private, anywhere in the state, and his work may be recorded and have the same authority as that of the county surveyors. This act does not in any respect affect county surveyors or their deputies, though a licensed surveyor may be elected county surveyor, but when so elected he may perform work outside his county.

"These licensed surveyors and county surveyors may charge a fee not to exceed $10 a day and expenses.

"Surveyors who have been actually engaged in the field for 15 years may, upon payment of a fee of $2, obtain a surveyor's license without examination."

At present the county surveyor's records are the only ones that are accepted for state and county records and in courts. The new law is expected to remove the monopoly held by county surveyors, for corporation men, if they have been licensed, may prepare records for court evidence. With the oil development of the state, there is considerable work of this nature.

Slag Concrete in England

Slag as an aggregate in concrete is just being developed in Gerat Britain. While there has been a great deal of very good concrete made from this aggregate, apparently there have been some difficulties which are recounted in a paper before the Cleveland Institution of Engineers by Dr. J. E. Stead. Dr. Stead said that poorly made concrete, when slag is used, is particularly dangerous below water because of the deleterious effect of water on the slag. He said, too, that often when the fines from old slag dumps are used they contain coal ashes and other deleterious substances, which ought to have been sieved off. In fact, he thinks that it is better to throw out all material passing a ½-in. mesh, or, better, a 1-in. mesh, for this will generally take care of the coal ashes, which contain sulphides of iron that produce acid solutions which react on the slag in the presence of air and water. This dissolves a portion of the alumina and lime in the cement, producing an aluminum calcium sulphate which may cause expansion. The investigator reports that such expansion has actually occurred where trouble has not been taken to remove the fine slag.

Bolts in Field Connections of Steel-Frame Buildings; a Study of Data and Experience

By R. Fleming
Engineer for American Bridge Company, New York City

Marked economy in construction may be realized through the substitution of bolting for the much more costly field riveting of steelwork; yet riveting is very commonly specified, because of doubts concerning the strength and permanent tightness of bolted connections. With a view to supplying data for more definitely grounded engineering practice, "Engineering News-Record" requested Mr. Fleming to collect and interpret the existing information and experience concerning field bolting. The results of this investigation are printed herewith. They tend to establish a far wider field for the use of bolts than present practice recognizes.—Editor.

RECENT specifications for steel-frame buildings commonly include a paragraph similar to: "Field connections shall be riveted throughout. No bolt shall be used in place of a rivet except by special permission of the engineer." The purpose of this article is to present a consideration of the subject of bolted field connections and to show that at times there are advantages in using them instead of connections that are riveted.

Bolted Mill Building 30 Years Old—The rolling mill of the Crucible Steel Co. at Harrison, N. J., now being torn down to give place to a larger structure (illustrated in *Engineering News-Record* of May 8, 1919, p. 898), was built in 1888-9. It is 190 ft. wide by 266 ft. 9 in. long, outside of brick walls. Roof trusses are from 12 to 15 ft. apart, 19 bays in all. The roof is of corrugated iron resting on angle purlins. A cross-section is shown in Fig. 1, and details of the field connections in the 75-ft. roof truss in Fig. 2.

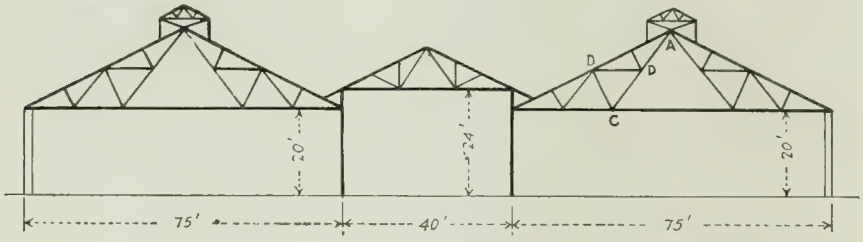


FIG. 1. CROSS-SECTION OF OLD ROLLING MILL OF CRUCIBLE STEEL CO. HARRISON, N. J.; FIELD CONNECTIONS BOLTED

Rivets are ⅝ in. and open holes 11/16 in. in diameter. Field connections were made with ⅝ in. buttonhead iron bolts. Not a field rivet was driven during the erection of the entire structure. Driftpins were used, evidently, to bring holes to match, as no reaming was done.

After 30 years' service the steel frame is apparently in as good condition as when erected. In this instance, then, nothing was lost in efficiency by having the field connections bolted throughout. It should be said that the trusses carry no shafting and are subject to but little vibration.

Bolts in a Railroad Viaduct—A striking use of bolts is in a railroad viaduct, the strengthening of which is the subject of an article in the *Journal of the Western Society of Engineers*, Dec., 1913. In 1888 the Chicago & Western Michigan R. R. built a wrought-iron single-track viaduct 1170 ft. long, designed for a loading practically equal to Cooper's E25. In 1912-1913 the structure was strengthened for E50 loading. The engineer of the work and writer of the article referred to, W. T. Curtis, tells the interesting story:

> The old structure was field-bolted (with the exception of buck and lateral bracing between the girders), a fact which was not discovered until after the field work of reconstruction had been begun. Careful investigation showed the old structure to be in perfect alignment, with none of the bolts loose in the slightest degree. As a matter of fact, many of the buck and lateral connections, which had been riveted originally, were found to be in bad shape on account of loose rivets. . . . While it was realized that the points which had been riveted in the old structure were points subject to more severe service than the points which had been bolted, the investigation satisfied all that participated in it that bolts are in reality much better than they are generally considered in ordinary practice.

It may be added that the bolts in the original structure were left undisturbed and are still in service.

Relative Costs—At the present time the cost of riveting is forming a larger proportion of the cost of erection than ever before. An average ratio of 2 to 1 is close to the relative cost of riveting and bolting in a steel-frame building. The ratio of cost of one rivet

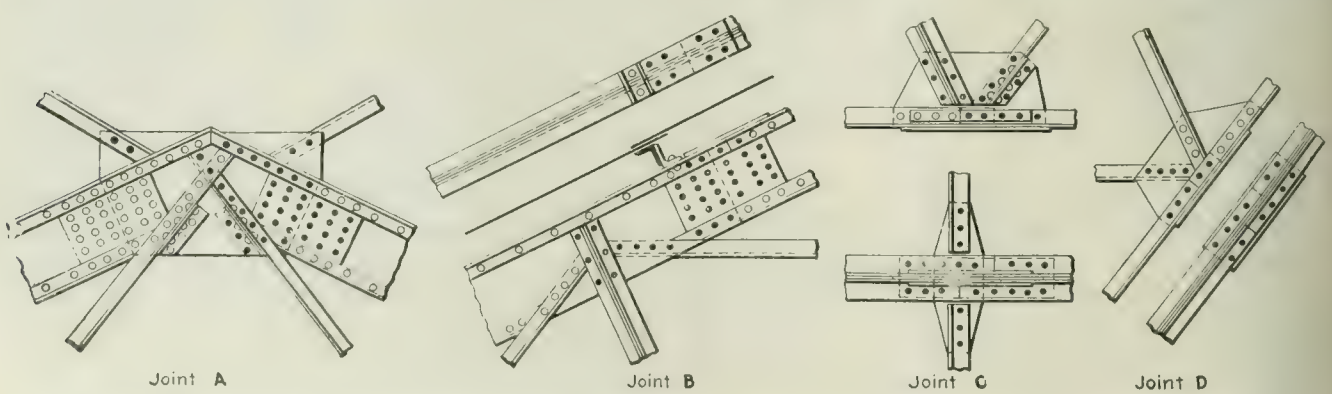


FIG. 2. DETAILS OF MAIN FIELD JOINTS IN 75-FOOT TRUSS OF OLD ROLLING-MILL ROOF TRUSSES

to one bolt at the intersection of angle bracing midway between trusses is about 8 to 1 for single-hole connections and 4 to 1 for three-hole connections. For attaching purlins to roof trusses, with a single hole at each end of purlin, the ratio of cost is about 5 to 1. Conditions vary so much that it is difficult to state actual costs, but the above ratios are given by the erection manager of one of the largest fabricating companies. The first cost of bolts above that of rivets need not be considered; it is soon absorbed in the lessened cost of erection.

In addition to lessening the cost of erection, the use of bolts saves time. This was recognized in the specifications for the three towers of the U. S. Government Radio Station at Darien. These towers are each 600 ft. high, and their tension as well as compression members are structural shapes. To facilitate erection the specifications allowed the bolting of all field connections, provided the members were assembled and reamed in the shop. The punching of holes not over $\frac{11}{16}$ in. was permitted, the reamed holes to be $\frac{13}{16} + \frac{1}{64} = 53/64$ in.; the use of turned bolts not less than 53/64 — 1/50 in. in diameter was required for field bolting. Such specifications, however, would practically prohibit the use of bolts for field connections in steel frames of ordinary buildings.

As to Turned Bolts—By "turned" bolt is usually meant a bolt turned to a desired diameter in a lathe. The necessity of using such bolts in reamed holes has been magnified. The result sought is that bolts should have a tight fit. When the ordinary commercial bolt will not answer, "cut" bolts can be used. These bolts are "cut" or turned by pushing an ordinary bolt into a series of revolving cutters set to the desired diameter. The relative costs of ordinary, "cut" and "turned" bolts are 3 to 7 to 10. A provision found in a former New York building code and in many present codes is:

> Turned bolts in reamed holes shall be deemed a substitute for field rivets.

The paragraph on bolted connections in Johnson, Bryan and Turneaure's "Modern Framed Structures, Part III, Design," 1916, says:

> Occasionally, permanent connections are made by the use of bolts, in which case the bolts are accurately finished to exact dimensions. The holes must also be drilled to an exact fit with the bolts. Such joints are more reliable in direct tension than riveted joints and it may be questioned whether they would not be in general more reliable for field connections where the rivets are very long.

The book quoted treats mainly of bridge design. The present writer takes exception to any statement that in building work turned bolts in reamed holes are necessary for bolted connections.

Bolts and Rivets in Tension—Many specifications prohibit rivets in tension. Some add:

> Where it is necessary that connections take tension turned bolts shall be used.

The writer does not think it always necessary to substitute bolts for rivets in tension—the kneebrace, for instance. Neither is it necessary to use turned bolts; ordinary bolts will answer. In telpher and monorail systems it is usually necessary to connect the top flange of an I-beam to the bottom flange of another I-beam or to the bottom chord of a truss by rivets or bolts in direct tension. The writer believes that in this and similar cases bolts should be used. He would apply to suspended trolley systems a paragraph of the specifications in Godfrey's "Steel Designing" by changing it to read:

> Tension in *bolts* will be allowed only when the connection is symmetrical and contains at least four *bolts*. The bending at the heel of the connection angle must be considered as well as the bending on the part to which the detail is attached. Additional *bolts* must be provided to take any shear coming upon the same connection.

Other requirements that should be added are that the bearing for head and nut be at right angles to axis of bolt and that the load be distributed over as great an extent of area as necessary to prevent bending of bearing surface. Both these results may be accomplished by cast-steel washers or clamps. When the flanges are beveled the clamps should be beveled to fit, and they should have a greater superficial area when the flanges are thin than when they are thick. A detail of bolts and clamps is shown in Fig. 3.

The interests involved are sufficient to warrant frequent inspection of the bolts. A few years ago the

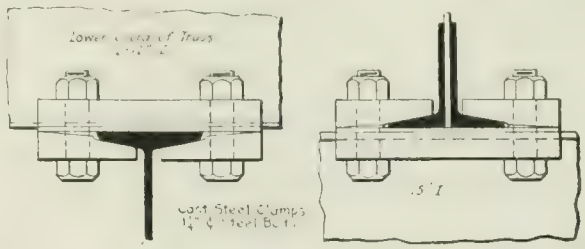


FIG. 3. CLAMPS ATTACHING MONORAIL BEAM TO TRUSS

A recommended example of practice. The monorail carries 3- and 5-ton loads; though the nuts are not locked they have required very little adjustment in five years' service

family of an operator who was killed by the failure of a telpher system from the bolts giving way recovered damages in the courts. (*Engineering News*, June 10, 1915, p. 1139.) It is interesting to note that before final failure of the faulty connection both rivets and bolts had been used. The rivets lasted a day or two, the bolts a week or two. While a comparison of the lasting qualities of bolts and rivets for this particular case is thus given, "the bolts undoubtedly gave way because they were highly overstressed, not alone by the direct load, but also by impact and the movement caused by the overhang of the end of the rail close to the switch joint."

The writer uses a working stress of 9000 lb. per sq.in. net section under the thread for bolt in tension. This stress is specified in the present New York building code. The previous code gave a value of 14,000 which was widely copied and unfortunately still remains the assigned value in many building codes.

Strength of Bolts—At the outset of any discussion of bolted joints it is important to know their strength. The amount of experimental data on bolted joints compared with that on riveted joints is small.

The *Cornell Civil Engineer*, May, 1915, contains a description of a series of tests on beam connections made in the College of Civil Engineering of Cornell University. The purpose of the tests was primarily to determine whether or not satisfactory beam connections could be made with fewer web rivets than were required by the standards then in use, but incidentally the outstanding legs of the connection angles were attached to the supports by machined bolts turned to make a driving fit in $\frac{13}{16}$-in. reamed holes.

Because of this the test was actually a test of bolted connections, the manner of final failure in most of the tests being by shearing of the bolts. This occurred at stresses of from 44,700 to 52,400 lb. per sq.in. of bolt section. But machined bolts turned to make a driving fit in reamed holes are seldom used in ordinary building work.

TABLE I. STRENGTH OF RIVETS AND BOLTS, WATERTOWN ARSENAL TESTS, 1896

Pieces Connected	Number of Rivets or Bolts	Steel Rivets Tension	Iron Rivets Tension	Steel Bolts Tension	Steel Bolts Shear	Iron Bolts Tension	Iron Bolts Shear
2 plates 3⅛x⅜	2—¾	26,990	26,120	21,110	45,030	18,690	39,660
2 plates 5⅛x⅜	3—¾	29,590	24,310	21,460	46,310	18,090	38,920
2 plates 7x½	4—¾	28,820	26,450	22,060	45,940	20,470	43,310
1 web 4x⅜ and 2 covers 4x⅜	2—¾	*29,540	29,670	20,050	35,780	18,000	32,440
1 web 6x⅜ and 2 covers 6x⅜	3—¾	31,040	28,520	25,010	44,920	17,720	31,260
1 web 8x⅜ and 2 covers 8x⅜	4—¾	*28,970	28,470	23,440	41,840	18,990	34,110
2 plates 6x⅜	12—⅝	.....	39,600	.....	.....	26,490	32,310
2 plates 6x½	6—⅝	.....	32,880	.....	.....	17,740	29,600
2 plates 7½x½	8—⅝	.....	*34,350	.....	.....	22,410	34,960
2 plates 9x½	10—⅝	.....	*35,940	.....	.....	19,000	28,770
2 plates 8x¼	6—⅝	.....	.....	.....	.....	32,700	38,110
2 plates 10x¼	8—⅝	.....	.....	.....	.....	34,840	37,220
1 web 9½x¼ and 2 covers 9½x¼	8—⅝	.....	36,300	.....	.....	23,390	34,370

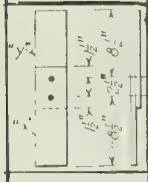
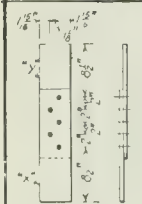
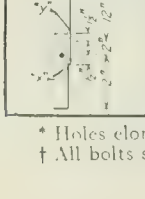
Under "Tension" is given the load applied (in lbs. per sq in. of gross section of plate) that produced failure.
Under "Shear" is given the shearing strength of bolts in lbs. per sq.in. of bolt section.
In all cases except those marked * failure occurred by the shearing of bolts or rivets.
* Plate fractured.

Watertown Tests—An extensive series of tests of riveted and bolted joints for the Berlin Iron Bridge Co., of East Berlin, Conn., was made in 1896 at the Watertown Arsenal. (*Tests of Metals*, 1896, pp. 277-339.) The tests were made to determine the shearing strength of rivets and bolts. The pieces connected were of steel; the holes were punched with a punch $\frac{1}{16}$ in. and die $\frac{1}{8}$ in. larger than the diameter of the rivet or bolt. Ordinary bolts with button heads and hexagonal nuts without washers were used. The results of the 24 tests of $\frac{3}{4}$-in. rivets and bolts and a dozen of the 27 tests of $\frac{5}{8}$-in. iron rivets and bolts are given in Table I herewith. All $\frac{3}{4}$-in. rivets and bolts and the twelve $\frac{5}{8}$-in. rivets and bolts in the 6 x $\frac{3}{4}$-in. plates were in a single row; the remaining rivets and bolts were in double rows. As so many of the tests were of iron rivets and bolts the table is of value at the present time mainly for comparative study. It will be seen that practically the same pull produced failure in both steel and iron rivets, while the pull producing failure in steel bolts was 20% greater than in iron bolts. The shearing value of the bolts, while somewhat erratic, is no more so than that of the rivets. It should be noted that although the number of bolts in a connection varied from 2 to 12, in no case was the shearing value such as to lead to apprehension concerning working stresses for bolted connections.

Bolts in Transmission Towers—Field connections of ordinary towers for high-tension transmission lines are almost invariably bolted. For crossings over railroads and navigable streams, specifications are not uniform. Some railroad engineers require that the towers supporting a span over tracks be riveted even when the material is galvanized, though riveting destroys the galvanizing around the heads of rivets, and gives a less efficient structure. In some of the U. S. Engineer districts riveting is required for crossings over navigable streams, while in other districts bolting is allowed. This emphasizes the vagueness of technical opinion regarding the value of bolted and riveted connections.

A series of tests was made in 1915 at the testing laboratory of the Carnegie Steel Co., Pittsburgh, by J. B. Leeper, manager of the tower department, American Bridge Co., to determine the strength of $\frac{1}{2}$-in. and $\frac{5}{8}$-in. bolts such as are used in transmission towers. (The writer is indebted to Mr. Leeper for a copy of his report on these tests). The purposes of the tests were to determine the ultimate bearing and shearing values of the bolts and to determine if the bolted connections showed any signs of stresses.

TABLE II. TESTS OF TRANSMISSION TOWER BOLTS

Make-up of Test Pieces	Test No.	Material End "X"	Material End "Y"	No. and Size of Bolts	Breaking Load (Lbs.) Total Load	Unit Bearing	Unit Shear
	A1	1 bar 4x⅛ x1'-0½"	2 bars 3x⅜x1'-0½"	2—⅝"φ	24,900	*145,500	20,300
	A2	1 bar 4x3/16x1'-0½"	2 bars 3x⅜x1'-0½"	2—⅝"φ	32,900	*142,100	26,800
	A3	1 bar 4x¼ x1'-0½"	2 bars 3x⅜x1'-0½"	2—⅝"φ	39,000	*124,800	31,800
	A4	1 bar 4x⅜ x1'-0½"	2 bars 3x⅜x1'-0½"	2—⅝"φ	48,100	62,000	†29,200
	A5	1 bar 4x⅛ x1'-0½"	2 bars 3x⅜x1'-0½"	2—½"φ	22,500	*170,500	28,600
	A6	1 bar 4x3/16x1'-0½"	2 bars 3x⅜x1'-0½"	2—½"φ	27,900	*155,000	†35,550
	A7	1 bar 4x¼ x1'-0½"	2 bars 3x⅜x1'-0½"	2—½"φ	27,600	*110,400	†35,200
	A8	1 bar 4x½ x1'-0½"	2 bars 3x⅜x1'-0½"	2—½"φ	27,100	53,600	†34,550
	B1	1 bar 4x⅛ x1'-0½"	1 bar 4x⅛x1' 0½"	2—⅝"φ	23,400	*138,700	†38,200
	B2	1 bar 4x3/16x1'-0½"	1 bar 4x⅛x1' 0½"	2—⅝"φ	22,900	*100,600	†37,300
	B3	1 bar 4x¼ x1'-0½"	1 bar 4x⅛x1'-0½"	2—⅝"φ	22,700	*71,100	†37,000
	B4	1 bar 4x5/16x1'-0½"	1 bar 4x⅛x1'-0½"	2—⅝"φ	24,270	61,500	†39,600
	B5	1 bar 4x⅜ x1'-0½"	1 bar 4x⅛x1'-0½"	2—½"φ	13,900	*107,000	†35,400
	B6	1 bar 4x3/16x1'-0½"	1 bar 4x⅛x1'-0½"	2—½"φ	13,350	*73,300	†34,000
	B7	1 bar 4x⅛ x1'-0½"	1 bar 4x⅛x1'-0½"	2—½"φ	13,100	52,400	†33,400
	C1	1 bar 5x⅛ x1'-6"	1 bar 5x7/16x1'-6"	3—⅝"φ	25,050	*111,300	27,250
	C2	1 bar 5x3/16x1'-6"	1 bar 5x7/16x1'-6"	3—⅝"φ	28,400	*94,600	30,850
	C3	1 bar 5x¼ x1'-6"	1 bar 5x7/16x1'-6"	3—⅝"φ	36,100	78,600	†39,200
	C4	1 bar 5x5/16x1'-6"	1 bar 5x7/16x1'-6"	4—⅝"φ	44,100	55,100	†35,900
	C5	1 bar 5x⅜ x1'-6"	1 bar 5x7/16x1'-6"	4—½"φ	26,900	*107,600	†34,200
	C6	1 bar 5x3/16x1'-6"	1 bar 5x7/16x1'-6"	5—½"φ	34,650	*81,500	†35,200
	C7	1 bar 5x¼ x1'-6"	1 bar 5x7/16x1'-6"	5—½"φ	35,600	58,100	†36,250
	D1	1L2x2x⅛ x1'-1½"	1 bar 4x½x10"	1—⅝"φ	9,050	*120,600	29,500
	D2	1L2x2x3/16x1'-1½"	1 bar 4x½x10"	1—⅝"φ	11,300	*93,600	†36,800
	D3	1L2x2x¼ x1'-1½"	1 bar 4x½x10"	1—⅝"φ	10,900	*69,800	†35,700
	D4	1L2x2x5/16x1'-1½"	1 bar 4x½x10"	1—⅝"φ	10,300	57,800	†33,600
	D5	1L2x2x⅜ x1'-1½"	1 bar 4x½x10"	1—½"φ	7,050	*117,500	†35,900
	D6	1L2x2x3/16x1'-1½"	1 bar 4x½x10"	1—½"φ	6,600	*71,400	†33,600
	D7	1L2x2x¼ x1'-1½"	1 bar 4x½x10"	1—½"φ	6,870	55,000	†35,000
	E1	1L2x2x¼ x1' 3½"	1L2x2x⅜ x1'-3½"	2—⅝"φ	19,120	*122,200	31,200
	E2	1L2x2x3/16x1'-3½"	1L2x2x3/16x1'-3½"	2—⅝"φ	21,700	*94,750	†35,400
	E3	1L2x2x⅛ x1'-3½"	1L2x2x¼ x1'-3½"	2—⅝"φ	21,850	*71,400	†35,600
	E5	1L2x2x⅛ x1'-3½"	1L2x2x⅛ x1'-3½"	2—½"φ	13,500	*112,500	†34,400
	E7	1L2x2x⅛ x1'-3½"	1L2x2x¼ x1'-3½"	2—½"φ	13,800	56,400	†35,200

* Holes elongated.
† All bolts sheared or were about to shear.

yielding when subjected to a pull corresponding to 20,000 lb. per sq.in. shearing and 40,000 per sq. in. bearing stress.

Usual shop practice was followed in punching the test-pieces, the holes being $\frac{1}{16}$ in. larger than the nominal diameter of the bolts. The plates had an ultimate tensile strength of 60,000 to 70,000 lb. per sq.in., the angles 55,000 to 65,000 lb. per sq.in.; the bolts, taken from stock, were made from openhearth steel with an ultimate tensile strength of 55,000 to 65,000 lb. per square inch.

The make-up of pieces and the breaking loads are shown in the accompanying Table II (see preceding page). The unit values were computed from actual dimensions.

Bearing values are best determined from those marked by an asterisk, denoting that the holes elongated. The average bearing value per bolt for 38 bolts in 18 test pieces (the values for A1, A2, A3, A5, A6 and A7 are not included, for the reason that the test pieces are held between two heavier pieces and do not give fair averages) is 95,048 lb. per sq.in. It will be seen that the unit bearing values for individual tests are erratic; the wide variation was caused by the piling up of metal under the bolt as the hole elongated.

The unit shear values marked by dagger are for those cases in which all the bolts failed by shearing or were "about to shear." The average shearing value per bolt for the 49 bolts in 22 test pieces in single shear is 35,853 lb. per sq.in. It may be noticed that the unit shearing values for one and two-bolt connections are about the same as for three- four-, and five-bolt connections.

In making the tests the loads were applied gradually and as uniformly as practicable, keeping the beam of the testing machine balanced. When the test load had reached the predetermined load equivalent to 20,000 lb. shear and 40,000 lb. bearing, the motor was stopped for about a quarter of a minute to make sure the yield-point had not been reached. On account of the element of time necessary to stop the motor, it was difficult to stop always on just the predetermined load; the average unit bearing stress of 53 bolts was 40,826 lb., and the average unit shearing stress of 41 bolts was 20,760 lb. The test pieces showed no signs of reaching the elastic limit at these loads.

The recommendations made by Mr. Leeper are followed by the American Bridge Co. in the detailing of transmission towers. His report is quoted:

We recommend that the following unit values of shear and bearing be considered as the so-called elastic limit of a bolted connection: Shear, 22,000 lb. per sq.in.; bearing, 44,000 lb. per sq.in. We also recommend that the nominal ultimate unit shearing and bearing values be considered: Shear, 35,000 lb. per sq.in.; bearing, 70,000 lb. per sq.in.

We further recommend that for tower connections the allowable unit shear for bolts be two-thirds the allowable unit tensional strain in the tension members and that the allowable unit bearing for bolts be double the allowable unit bolt shear. This recommendation is based on an elastic limit of 30,000 lb. per sq.in. for structural steel and 10/11 of the 22,000 lb. per sq.in. recommended elastic limit of bolt shear and 10/11 of the 44,000 lb. per sq.in. recommended elastic limit of bearing value of bolts. The reason for taking 10/11 of the so-called elastic limit values for bolted connections is to use values such that the bolted connections will be nominally 10% stronger than the members which they connect, up to the elastic limit.

On this basis bolt values will be as follows:

Allowable Tension, Lb. per Sq.In.	Bolt Shear, Lb. per Sq.In.	Bolt Bearing, Lb. per Sq.In.
30,000	20,000	40,000
25,000	16,700	33,400
20,000	13,500	27,000
18,000	12,000	24,000
16,000	10,700	21,400

Bolts in Buildings—Are the foregoing recommendations applicable to bolted connections in buildings? It is noted that the shearing values of bolts are based upon the allowable tension and that for the commonly specified tension of 16,000 lb. the bolt shear is 10,700 lb. From the different natures of the two classes of structures it seems reasonable that the bolt values used in transmission towers be assumed greater than those used in building work. Schneider, in his "General Specifications for Structural Work of Buildings," assigns values in pounds per square inch as follows:

Tension, net section, rolled steel	16,000
Shear on rivets and pins	12,000
Shear on bolts and field rivets	10,000
Bearing pressure on pins and rivets	24,000
Bearing pressure on bolts and field rivets	20,000

Elsewhere in the specifications is a paragraph:

Wherever bolts are used in place of rivets which transmit shear, such bolts must have a driving fit. A washer not less than ¼ in. thick shall be used under the nut.

When he wrote his specifications, Mr. Schneider has said in discussing this subject, he had in mind a bolt whose threaded portion was less in diameter than the unthreaded portion. Such a bolt could be driven without injuring the thread, but bolts of this kind are not listed in the trade catalogs of bolt manufacturers. They would have to be specially made at special prices.

Other specifications allow different values. Ketchum in his "General Specifications for Steel-Frame Buildings," 1916, also specifies for tension in main members 16,000 lb. per sq.in. net section and assigns a shearing value of 11,000 lb. and a bearing value of 22,000 lb. per sq.in. to shop rivets, two-thirds of these values to field rivets, and to field bolts, "when allowed," two-thirds the value of the field rivets. This gives a field bolt a shearing value of 4889 lb. and a bearing value of 9778 lb. per sq.in. (Rivets in lateral connections may have values increased 25%.) The bolt values of Ketchum are needlessly severe. It is doubtful if they are followed to any great extent.

The American Bridge Co. uses 9000 lb. per sq.in. shearing value and 18,000 lb. per sq.in. bearing value for bolts in building work. These values apply to ordinary commercial bolts, and holes punched $\frac{1}{16}$ larger than the diameter of the bolt. The writer considers these values well chosen.

Overtightening Bolts—Bolts of small diameter have sometimes broken off in screwing up the nut. "It is doubtful if the intensity of stress due to the initial load is fairly appreciated. The resultant load due to the combined action of the initial and external loads is one that is discussed periodically in technical journals with an invariable disagreement among the disputants as to conclusions." (From "The Stress on Bolts in Service," by John H. Barr, *Sibley Journal of Engineering*, Oct., 1902. See also "The Relation of Bolt Tension to Wrench Pull," *American Machinist*, Nov. 12, Dec. 17, Dec. 31, 1914). The matter is too academic for discussion in this article. Moreover. the best calculations may be

thrown into the scrap heap by a workman with a wrench.

It is possible to overstress a bolt in tension by turning the nut too tight, thus causing it to fail under apparently low unit stress. A practical method of limiting the initial stress is to limit the wrench handle to such a length as to make it impracticable to turn the nut too tight—say 9 in for $\frac{5}{8}$-in. bolts and 10 in. for $\frac{3}{4}$-in. bolts.

In comparing rivets with bolts it should be remembered that the initial stress in rivets may be greater than in bolts. Experiments made a few years ago showed tensile stresses of 31,000 lb. per sq. in. in ordinary rivets parallel to the shank after they had cooled subsequent to being driven by a hydraulic riveting machine. Rivet heads sometimes snap off in cooling, also in extremely cold weather.

Looseness of Bolted Joints—The important question now, arises, When is it permissible, and when not, to use bolts in field connections? It is not altogether a question of strength. Riveted connections and bolted connections can be made of equal strength by increasing the number of bolts. The usual objections to bolts are: They do not fill the holes, resulting in a looseness at the joints which is particularly objectionable where there are alternating stresses; and it is uncertain how nearly uniform is the distribution of stress where there are a large number of bolts. The stiffness of the structure is thus affected, it is claimed, when members have bolted connections. The determining factor therefore should be whether or not the stiffness of the structure would be impaired to such a degree by the use of bolts as to render them objectionable.

It is believed that bolted connections are permissible for the following:

Buildings of one story, not of great height and acting mainly as shelters. Such buildings carry no shafting or electric traveling cranes and unless exposed to unusual winds there is little reason why field connections may not be bolted throughout.

Buildings for temporary use.

Subordinate framing such as that required for stairs, doors, windows, partitions, ceilings, monitors, pent houses, curbs and railing. It is often desirable, if not necessary, to have framing around windows, doors, skylights and similar work bolted in order to secure proper adjustment for the work of other contractors.

Purlins and girts, except where they form an integral part of a system of bracing. There is little reason why the clips to which purlins and girts are attached should not be shop-bolted, instead of shop-riveted, to main members. The same is true of many connections for subordinate framing.

Platform and floor plates. If there are trucks moving on the floor, or there is shoveling of coal or material, countersunk-head bolts should be used. An indentation in the head is convenient to hold a bolt while the nut is being turned. In other cases bolts with button heads not over $\frac{1}{4}$ or $\frac{5}{16}$ in. high may be used.

Connections of beams to beams and beams to girders in floors that do not support machinery, shafting or rolling loads. This is an important item in a many-storied office building or hotel. If the connections of floor members to columns are riveted the structure is stiff transversely and longitudinally. Little is gained in stiffness and much is added to expense by riveting connections of filling-in members. Moreover, in fireproof construction the bolts are embedded in concrete, a fact which should assure any doubter that there is no chance of nuts becoming loose. The specification for a 12-story apartment house in New York City has the clause: "All connections within 3 ft. of the column centers must be riveted. All tank and sheave beam supports must be riveted. Other connections may be bolted." In this particular building the beams upon which some columns depend for lateral stiffness do not connect directly to the columns, but frame a foot or two away into other connecting beams. Is not this a commendable clause for similar cases?

Bracing connections not subject to direct stress. This refers particularly to the intersection of bracing angles midway between trusses and columns. An over-zealous inspector will sometimes insist upon specifications being carried out to the letter and that rivets be used. This necessitates riveting from a special rigging at a cost of a dollar or two per rivet. The cost would not be a valid objection provided anything were gained by it.

Connections not subject to shearing stress at points where members rest upon other members.

The foregoing list is a conservative minimum. In many cases it may be extended.

Bolts have been used to a greater extent than allowed in specifications, and seemingly without harm. One instance is a power house 52 ft. by 270 ft., 33 ft. high to bottom chord, containing a 20-ton electric traveling crane. The owners were in a great hurry for the building, and, on the representation of the erector that bolting instead of riveting would hasten completion, instructed that all connections be bolted. As the writer was especially interested in the building he protested to the erector against bolts being used in certain connections and was promised that they would be replaced with rivets. More than four years have passed and the bolts are still in place—and to all appearance rendering efficient service.

Recommended Clause for Field Bolting—It is obvious that there are many places in which bolts should not be used. Connections of members with large stresses, column splices, members subject to vibration, and most bracing, should be riveted. The writer has endeavored to embody the spirit that should govern the use of rivets and bolts in field connections, in his specifications:

(98) In general, field connections shall be riveted, but connections of the following classes may be bolted:

a. Light subordinate framing such as purlins, monitor and skylight framing, girts, platforms, stair framing, partitions, ceilings, pent houses.

b. Ordinary framing of beams to beams and beams to girders.

c. Connections not subject to direct shearing stress.

All connections, however, affected by loads that cause undue vibration shall be riveted.

One-story buildings not subjected to excessive wind pressure or not supporting heavy concentrated loads, shafting or moving loads may be bolted throughout.

Many specifications require that washers be used under heads of all nuts. The washer permits a variation in the length of thread, allowing it to be long enough to assure the nut being screwed tightly against a bearing surface but not so long that it bears against the metal connected. But where no direct shear is transmitted or the shear is small or the metal so thick that full bearing is not required, the bearing of the thread does no harm. With this in view the writer has added to the portion of his specifications previously quoted:

The threaded part of a bolt transmitting shearing stress shall not be so long that the bearing value of the unthreaded portion is reduced to less than the shearing value of the bolt.

Washers shall be used wherever needed.

An objection may be made to specifying that washers shall be used "wherever needed," on the ground that the choice is left to workmen at the site. This is not the case. The bolt list is sent from the drafting room to the erector in charge. The lengths of bolts, lengths of thread and grip, whether washers are wanted or not, are determined by the draftsman.

For the same reason that the good appearance of a drawing goes far to inspire confidence in its accuracy, the neat appearance of a bolted connection tends to create confidence in its strength. A like thought was probably in the mind of the writer of the following drafting-room instructions:

In bolts for exposed work, specify hex. heads and hex. nuts for both shop and field bolts. Specify a length of bolt that will not give an excessive projection beyond the nut. There are cases where it is necessary to specify on which side of the member the heads of the bolts are to be placed.

Locking Nuts—The matter of nuts becoming loose has received much attention. It is often specified that nuts must be locked. The *Index of Patents Issued* indicates that about 2350 patents for nut locks and nut locking devices have been issued since 1900. New devices are still being brought forward.

Many times when bolts are considered perfectly locked there develops a slight looseness. This is usually attributed to nuts working loose. But a writer (John B. Seymour, of the National Lock Washer Co., in an article "Permanent Security of Bolted-Up Construction," in *Electric Railway Journal*, Nov. 22, 1913, p. 1104) claims that this is not the case. He says, "Tests have been made on practically every variety of bolted construction which conclusively demonstrate that looseness may occur without nut movement." Stretch of bolt and corrosion are also eliminated by this writer as causes of nut movement. He states what he thinks is the real cause: "Movement of bolted parts on each other occurs from end thrust, since it is commercially impossible to make all bolt connections to a theoretical driving fit. Where movement of objects in surface contact occurs, frictional loss must take place, and after the loss has taken place conditions are prepared for nut movement, stretch of bolt and corrosion."

Some "vibration-proof" bolts and nuts when tested at the Watertown Arsenal (*Tests of Metals*, 1895, 1897) did not by any means prove true to name. Evidently the only certainty that nuts of bolts subject to considerable vibration are kept tight is by frequent inspection and screwing them up if found loose.

For ordinary vibration two nuts are often used, one as a jam or lock nut for the other. The lock nut is usually one-half as thick as the ordinary nut and is placed on the outside. A split nut-lock washer underneath the nut is also frequently used.

Sometimes the thread is jammed to keep the nut from turning. A similar method for preventing the turning of nuts in towers for transmission lines has been used and has given excellent satisfaction. A chisel with either a diamond or a square point is driven by a sharp blow into the thread of the bolt just above the nut (see photographs in Fig. 4). The indentation prevents the nut coming loose under vibration but will not prevent its being taken off if such necessity should arise.

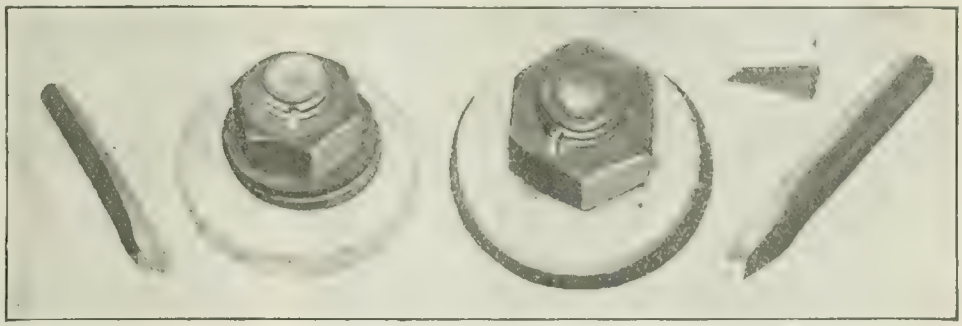


FIG. 4. NUTS LOCKED BY CHISEL CUT—STANDARD PRACTICE OF A LARGE BUILDER OF TRANSMISSION TOWERS

Two forms of chisel used, and their work (about one-half actual size.) The two forms are equally convenient and give equally secure locking. The field superintendent reports highly satisfactory results.

In conclusion: Bolted connections have a place in building construction. Each building should be considered by itself and advantage taken of the saving in time and cost by the use of bolted connections where they are unobjectionable and practicable.

Suggests Closing Chicago River to Navigation

Although the Chicago River is a link in the proposed waterway connecting the Great Lakes with the Mississippi River, its closure to navigation by substituting fixed bridges for drawbridges has been suggested by Col. W. V. Judson, Corps of Engineers, U. S. A., in charge of the Chicago district. Such a move would be accompanied by the establishment of a harbor on the lake front.

In a statement by Colonel Judson that was recently sent to public officials it is remarked that navigation on the river by lake vessels is declining and that the cost of drawbridges, with their maintenance and operation and delays to street traffic, is enormous and increasing. With regard to harbor facilities and the present ordinance for lake-front improvement, the statement implies that the Government may be more liberal in authorizing the creation of park lands by filling along the shore if the state agrees that certain of these park lands may revert to harbor purposes on demand of the Government. Reference is made to deep waterways connecting the Great Lakes and the sea (evidently meaning the Atlantic) and the possibility of Chicago becoming a seaport, but no reference is made to the westward waterway by way of the Chicago River and the Drainage Canal. The new lake-front ordinance does include a harbor reservation, but whether this is extensive enough to meet the ideas of the War Department cannot be determined until the ordinance is submitted to the department for its approval.

A somewhat similar idea expressed in regard to the Milwaukee River at Milwaukee, Wis., was described in *Engineering News-Record* of Sept. 27 and Oct. 18, 1917, pp. 608 and 722, but in that case the river is used only as a harbor and its possible development as a navigable waterway for through traffic was not a factor of the problem.

Concrete Fuel-Oil Tank Design and Construction

Precautions To Be Observed in Building Small Oil-Storage Reservoirs for Use in Industrial Plants

FUEL-OIL tanks of concrete became quite common during the war on account of the shortage of steel and the increase in liquid fuel to take the place of the coal which was hard to get. The following paper is an abstract of one on the subject of such tanks read by H. B. Andrews, consulting engineer, of Springfield, Mass., at the recent convention of the American Concrete Institute.

The reservoir should be located a safe distance from inflammable structures as far as possible consistent with pumping requirements, and should be covered with at least 18 in. of earth, if near buildings, to decrease fire hazards and also to minimize oil evaporation. If distant from buildings it should be at least half underground, and, if possible, the excavated material should be used in banking up around it.

The reservoir should be limited in size for two reasons: First, the necessity for not exceeding a day's working limit in operation of pouring concrete so that joints between operations may be eliminated, and second, so that in case of an accident or fire in any reservoir too much oil in storage will not be involved. This size limit should not be over 300,000 gal. under most conditions, and the majority of contractors have not the facilities to construct properly a reservoir of this capacity.

Reservoirs should be circular in shape, the better and more directly to take care of involved stresses and to avert danger of tensile or temperature cracks. They should be so proportioned and designed as to limit the number of pouring operations of concrete, in order to avoid joints between these operations.

Care should be taken to provide for all exterior stresses, such as hydrostatic pressure from groundwater, earth pressure on walls, and roof if reservoir is buried, and also to avoid as far as possible concentration of loads on walls or footings. Where joints are absolutely necessary they should be so protected that there will be no leakage through them. Regarding hydrostatic pressure, while engineers have found from tests that this pressure in soils is only about 50% of the full head of water, it is not safe to design for stresses less than the full head, as any deflection in the concrete admitting a film of water between the earth and the concrete will produce the full hydrostatic pressure.

Concrete surfaces must be temporarily or permanently protected so that oil will not come in immediate contact with them if the concrete is less than six weeks old.

Falsework must be designed to hold concrete temporarily in place so that it will not fail or be distorted while placing concrete. It is especially necessary to provide for the firm holding of wall forms, as the pressure of several feet of concrete poured quickly as a monolith is intense, and any "give" of the forms after the concrete has obtained its initial set breaks up the crystals already formed and allows expansion of the concrete mass, with resultant porosity and loss of strength.

Concrete must be so designed that it will resist all exterior stresses to which it is subjected and so that it will be oil-proof. One of the principal features of this design is to make the walls of circular reservoirs in tension sufficiently thick so that the ultimate strength of the concrete in tension will not be exceeded. It is not meant to leave out the steel reinforcement so that the stress will theoretically be borne by the concrete, but nevertheless it will be borne by it unless some unforeseen weakening of the concrete should throw it upon the steel.

An extended investigation, by the writer, on high circular concrete standpipes for water showed that if the concrete in the wall was stressed beyond its elastic limit, or ultimate strength, which is practically identical, vertical hair cracks will appear of sufficient width to admit water into the body of the concrete.

This ultimate tensile strength in a 1 : 1½ : 3 concrete from tests made for the writer at the Watertown Arsenal was 203 lb. per square inch. Where the concrete is in large sectional areas, and reinforced, this tensile strength will probably be somewhat higher. If a stress not exceeding 150 lb. per square inch is allowed in tension there will be no danger of these vertical cracks appearing.

Reinforcement must be so designed that it will take care of all interior and exterior stresses, and with fittings to hold it rigidly in place while the concrete is being poured. Steel in tension in walls should not be stressed over 10,000 lb. per square inch to conform with insurance company requirements. The writer does not think that it is necessary to figure the stress as low as this, under usual conditions, as he has satisfactorily constructed many reservoirs using a stress of 14,000 lb. But the lower stress is an additional safeguard against inferior workmanship by inexperienced contractors and against any decrease in bond strength due to oil penetration of concrete. It is probably unwise to depart radically from insurance company recommendations.

All reinforcing rods in concrete exposed to oil should be of a deformed section, for better bonding value.

For other parts of the reservoir the recommendations of the Joint Committee on Concrete and Reinforced Concrete should be followed.

The concrete should be no leaner than a mix composed of one part of cement, 1½ parts of sand and three parts broken stone or gravel. To this mix should be added a "densifier." Hydrated lime has been found economical and satisfactory for this purpose, using 10 lb. of dry lime to each bag of cement. The stone must be hard and clean, the best material being traprock, granite or gravel. The sand must be free from any deleterious matter, and should be well graded. Cement should be of an established quality.

The concrete should be deposited continuously in concentric layers not over 12 in. deep in any one place. No break in time over 30 min. is permissible in depositing concrete during any one operation, and if any delay occurs amounting to 30 min. or more the previous surface must be thoroughly chopped up with spades before the next layer of concrete is deposited.

The different operations in pouring are: (1) The pouring of the floor and footings; (2) the pouring of the entire wall; (3) the pouring of the roof. In small reservoirs the wall forms may be supported so that the footings, floor and wall may be poured in one continuous operation. An approved joint or dam must be made between the floor and the wall.

Concrete should be mixed by a mixing plant of sufficient size and power to carry out each separate prearranged operation without danger of delay during the process. The materials should be mixed at least 2 min. in the mixer, using just enough water to obtain a plastic mix without excess water coming to the surface after the concrete is deposited, and a measuring tank should be used so that the amount of water may be kept uniform.

The concrete when deposited in forms should be well spaded by at least four competent laborers who are not afraid to use their muscle in compacting the concrete thoroughly and working out the trapped air bubbles.

Reinforcement should be of round deformed medium steel bars. These bars should be bent or curved true to templets carefully placed in their predesigned location, and rigidly maintained there by mechanical means. No laps should be less than 40 diameters and no two laps of adjacent rods should be directly opposite each other.

The forms should be of a good material, strongly made and so braced, or held in place by circumferential bands, that no distortion allowing displacement of concrete during its initial set is possible.

The surface of the floor should be trowelled smooth as soon as it can be properly done. If all previously named precautions are taken, there should be no defects in the wall to correct.

Concrete designed and placed as recommended herein is practically oil-tight, but as oils are somewhat detrimental to fresh concrete it is advisable to put on an interior wash or coating to protect the fresh concrete from the action of the oil, for such a time as may be necessary for it to cure and harden sufficiently. Silicate of soda, while not a permanent coating, has been used satisfactorily for this purpose according to the following specification for oil-proofing:

"The surface of the floor and the interior surface of the wall are to be coated with silicate of soda of a consistency of 40° Beaumé, and applied as follows:

"*First Coat*—One part of silicate of soda and three parts water, applied with brush, and all excess liquid wiped off with cloth before drying.

"*Second Coat*—One part of silicate of soda and two parts water applied as above.

"*Third Coat*—One part silicate of soda and one part water, applied with brush and allowed to dry.

"*Fourth Coat*—Applied same as third."

Treatment of Boiler Water for Industrial Plants

Coal Economy Demands Scale Prevention—Method Must Be Adapted to the Water—Boiler Compounds Rarely Useful

TREATMENT of feed water for railway and industrial boilers, to prevent the formation of scale, has an important influence upon the efficiency of the boiler and the economy of its service, as is shown in a paper on "Present Tendencies in Water Purification," presented before the Missouri Association of Public Utilities by W. F. Monfort, consulting chemist, St. Louis, Mo. In too many cases steam users use raw water without consideration of its quality, or depend upon certain trade compounds, instead of having analyses made and the treatment problem studied with proper relation to the kind of water that is being used.

It is pointed out that the larger railway systems have found it advantageous to install water-treatment plants. Many industrial enterprises also use softeners regularly, and find economy in installations which take the strain off the boilers, save coal at war prices and maintain expensive plants at high efficiency when labor and material are at a premium, as well as under the old conditions. But a larger number of small and medium-sized water and light plants continue to use water without treatment.

"Recourse to boiler compounds," says Mr. Monfort, "is had sometimes intermittently, quite like that to patent medicines, and there is lack of serious consideration of effects immediately following the use of ill considered compounds devoid of merit. There are few safe remedies which can be applied in boilers. The adequate treatment of a boiler feed water should be based on a complete analysis of the water, should take place outside the boiler and should be tested by its results."

That the analysis should be thorough is indicated by the variety of troubles with feed waters due to silica, sulphates, calcium and magnesium, bicarbonates, sodium and potassium, nitrates, iron, manganese and chlorides. Silica in some waters causes an abundant hard scale. Its treatment calls for special methods. Sulphates in conjunction with calcium yield on evaporation a hard scale of calcium sulphate in some parts of the boiler. The common treatment is addition of soda ash. If this is added to the feed water there may be a high concentration of sodium compounds in the boiler, along with precipitated calcium carbonate, which combination is favorable to wet steam, waste of packing and gaskets, and other ills. Even with pretreatment, foaming may follow.

The treatment must be adapted to the individual supply, which is one reason for its neglect, but at present prices of coal the treatment of feed water is practically an economic necessity. With well supplies of practically constant composition, the maintenance of a softening plant offers little difficulty. With surface supplies, some additional supervision is required, but first cost and operating cost should be more than offset by boiler economies.

Conditions of three kinds of water before and after treatment are shown in the accompanying table. The first was high in calcium and sulphates, forming hard scale, but low in other constituents when treated. With soda ash and lime, the sodium content was increased and foaming resulted. When treated with lime, soda ash and a barium compound, it became a good, soft water, containing little more than 1 lb. of dissolved matter per 1000 gal. and causing neither hard scale nor foaming.

CHARACTER OF RAW AND TREATED WATER FOR BOILERS

	Dissolved Solids		Calcium	Magnesium	Sodium	Bicarbonate	Carbonate	Sulphate	Chloride
1	523	Raw	6 56	2 63	0 02	4 00	0 0	4 38	0 84
	401	Soda-lime	1 2	0 1	5 22	0 0	1 3	4 38	8 84
	99	Alternate	1 0	0 0	0 84	0 0	1 0	0 00	0 84
2	162	Raw	3 5	2 9	1 3	7 8	0 0	0 05	0 1
	121	Lime-acid	0 6	0 0	1 3	0 0	0 6	1 20	0 1
3	277	Raw	2 6	1 33	1 56	2 91	0 0	2 16	0 34
	222	Soda-lime	0 9	0 1	2 50	0 0	1 0	2 16	0 34
	158	Alternate	0 9	0 1	1 66	0 0	1 0	1 23	0 34

Calcium and magnesium in waters of high bicarbonate content yield a soft scale, abundant and wasteful of heat. It is difficult to prevent pitting and corrosion of rivets, seams and plates when the deposited soft scale interferes with the quick transmisssion of heat. Great economy results if this scale is precipitated and collected before the feed water is introduced into the boiler. Corrosion is promoted by the deposit of those magnesium salts which decompose with the liberation of acids (magnesium, chloride, sulphate, nitrate) and such excesses of carbonic acid as are frequent in many of our local waters.

Another type of water, common in parts of Illinois, is represented by No. 2 in the accompanying table, which shows the condition before and after treatment with lime and sulphuric acid. The softened water in actual practice is very desirable for boiler use, forming no scale and giving no cause for corrosion. The other water in the table, No. 3, is an average sample from the Missouri River, near its mouth. The results of two kinds of treatment are indicated.

The cost of treatment is given as follows: For water No. 1, soda-lime, 3.42c. per 1000 gal.; alternate, 15.38c.; for No. 2, lime-sulphuric acid, 1.09c.; for No. 3, soda lime, 0.89c.; alternate, 4.27c. The costs given are based on prices before the war. Present costs are uncertain, says Mr. Monfort, because of the downward tendency which should appear soon. Even allowing for lime at twice the former price, and with soda ash at the double price, and other reagents at current prices, the cost would not be more than doubled. There is still room for economy with the present prices for coal.

Proportion and Reasonable Economy in Rural Road Design

Correct Alignment, Grades, Surfacing, Foundations—Plans for 2000 Miles of Road Reviewed—Recent Practice a Marked Improvement Over Ten Years Ago

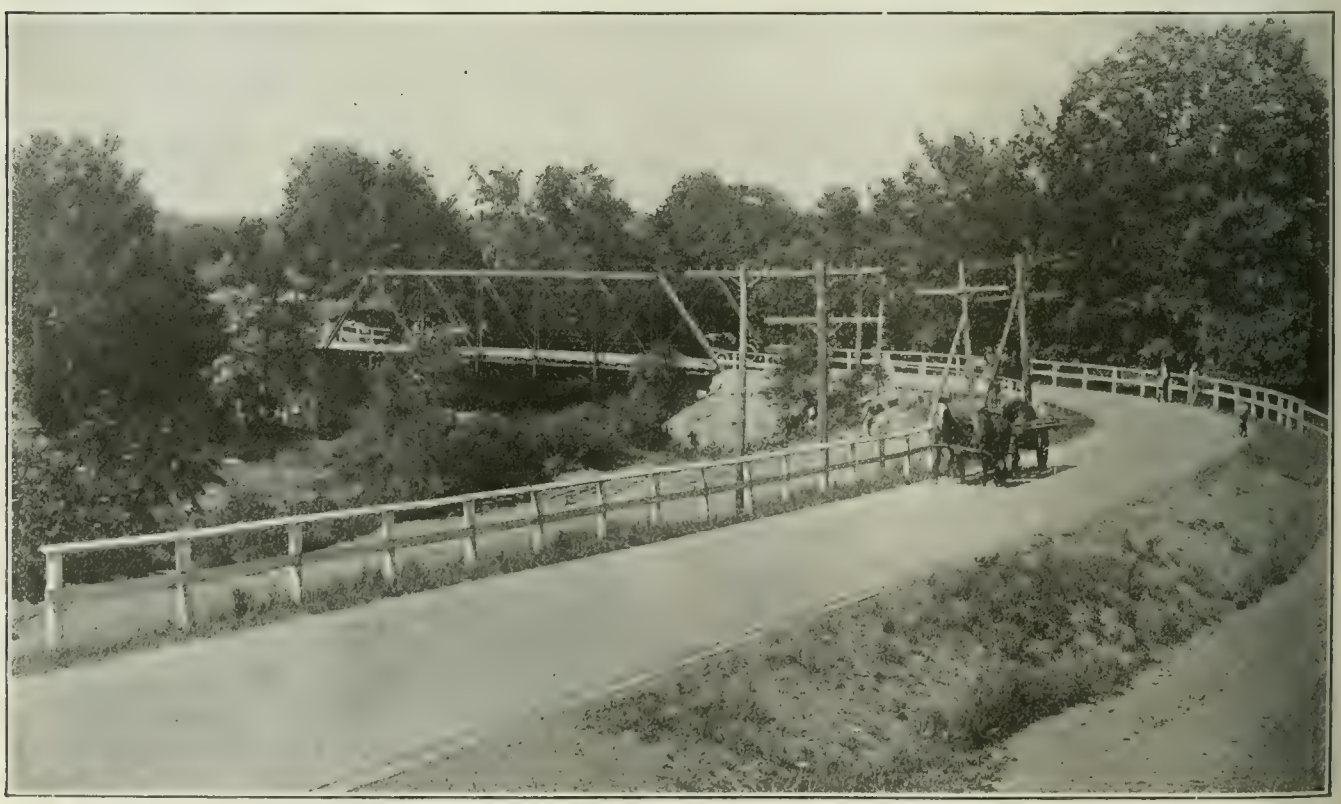
By W. G. Harger
Rochester, N. Y.

PROPORTION and economy in grading, foundations, widths, and courses are discussed in the following article, the data for which have been gathered during the past ten years in connection with the field inspection of improved roads over a rather widely scattered territory, and in the review of plans for some 2000 miles of proposed improvements. The reviews were made in considerable detail by the writer for his own information, with the idea of forming a reasonable conclusion as to the trend of highway design in this country and to see how closely current practice follows the well recognized principles of highway engineering.

The general impression produced was not favorable. The most encouraging feature lay in the fact that the practice of 1918 seemed a marked improvement over that of 1910 in the localities where state and Government aid are becoming active. Some very creditable work is being done, and if this article must deal largely with faults it is not with the intention of discrediting present practice, but rather to point out the lines of further improvement that seem reasonable.

As a rule, the plans and construction subject to local control reflect very closely the general standard of the community in which the work is done; there are some very excellent examples and some crude performances. The various state highway department plans are fairly well standardized, but the design methods are generally too mechanical. The construction cost is often needlessly high (for the results obtained) due to excessive standardization, machine-like design methods and disregard of limited supplies of local materials. The results, as far as actual traffic service is concerned, are usually excellent where enough money is available for the complete and finished design of a reasonable type of road for the existing traffic. Where the funds are inadequate for a completely satisfactory design the results too often show a lack of proportion. The illustration will perhaps show in a general way the point I have in mind. It shows a high-class pavement with dangerous alignment, dangerous section, flimsy guard rail and cheap bridging.

Most roadwork can be classed as a step in progressive improvement; the highway is gradually bettered from a trail to a high-class, modern, heavy-traffic thoroughfare as its use or prospective use warrants the expenditure. In the majority of cases the money at hand is not sufficient for the complete construction of all the features that are desirable even at the time when the improvement is made, and it is never sufficient to build a road that will completely fill the requirements of the future. Some features have to be omitted or slighted. It therefore seems well worth while to encourage first the construction of the fundamental elements which act as a basis for the final improvement, and then in logical order as many of the other desirable parts as can be built. To my mind, the neglect of this principle is the most noticeable fault of present design practice, and the lack of adequate maintenance and renewal provisions the most dangerous feature of present highway programs.



GOOD PAVEMENT WITH POOR ALIGNMENT, BRIDGING AND WIDTH

Road design ranges from the low-type earth roads of sparsely settled districts to the hard-surfaced pavements of densely populated sections. For these extreme conditions the issues are clear-cut; the first required the greatest possible mileage with limited funds, and the last the most suitable design for present conditions regardless of first cost. Intermediate cases are handled by merging the requirements of the extremes. A reasonable design for any case depends on the needs and resources of the local community, considered in connection with the importance of the improvement to the general transportation scheme of the country and the outside aid that will be granted on account of its general importance. In pioneer districts mileage is the only important consideration, and a sufficiently cheap type of construction must be adopted to obtain a line of communication to the point desired; an ordinary earth road is all that can be reasonably expected for the greater part of these districts. Scattered agricultural communities require primarily roads that are usable the year round and that will handle ordinary farm traffic; gravel or similar, fairly cheap constructions are the only reasonable solutions for the greater part of these districts. Densely populated districts with closely located cities require the highest, strongest type of rigid pavements for the main connecting routes and macadam and gravel constructions for the secondary and local roads.

The use of state and national funds is justified for all of these types of construction in their proper places, notwithstanding various resolutions passed by various organizations throughout the country advocating the expenditure of national funds only for the "so-called" permanent types of pavement. The expenditure of such funds is justified anywhere so long as their use actually improves fundamental road conditions. It is not justified for roads that are allowed to "go to pot" through inadequate maintenance—which is happening to most of our roads at the present time; it is not justified when applied to high-type pavements on excessive grades; it is not justified on roads whose usefulness is handicapped by weak bridges; it is not justified on isolated "pork barrel" improvements; and certainly it is not justified on extremely expensive, extra-wide roads of limited length suitable for the next generation, when the main need of this country is mileage of roads suitable for present conditions.

If this is so, it certainly pays to construct what is done so that it can be readily strengthened and widened as the future requires, without losing the benefit of previous work. The following tentative list illustrates an order of importance of design elements which probably applies to most cases, with some minor variations:

Design Features

First, selection of the best general route.
- (a) Best location for the development of the territory.
- (b) Longest open season.
- (c) Least rise and fall.
- (d) Length and cost.

Second, selection of the most natural engineering location following the desired general route.
- (a) Reasonable grades.
- (b) Exposure. Avoid north exposure and areas of deep snow.
- (c) Character of excavation. Avoid rock, slides, etc.
- (d) Drainage problems. Avoid flood areas, stream crossings, etc.
- (e) Avoid artificial restrictions such as section line locations, etc.

Third, detail requirements of design.
- (a) Reasonable maximum grade, considering future requirements.
- (b) Economical intermediate grades.
- (c) Safe and economical alignment, considering future requirements.
- (d) Width of roadway safe for traffic, eliminating dangerous ditches.
- (e) Width of roadway convenient for traffic.
- (f) Sufficient culverts and bridges to protect the roadway, considering the future.
- (g) Permanent construction of these culverts and bridges.
- (h) Sufficient width of clearing for sun to reach road.
- (i) Safety provisions. Protection for traffic at dangerous places.
- (j) Provision of liberal width of right-of-way, considering future widenings and development.

Fourth, improvement of the road surface.
- (a) By selective soil treatment.
- (b) By gravel, chert, etc.
- (c) By rigid pavements.

Fifth, improvements for the future.
- (a) A higher-grade surface.
- (b) A wider hard surface.
- (c) Provision of sidewalks for pedestrians.
- (d) Planting trees, etc.

An examination of the roads in almost any locality leaves the impression that a little more emphasis on and attention to the better construction of the fundamental features will add to the reasonable proportion of design and be a move in the right direction.

Reasonable Economy in Design

The mileage to be constructed in the near future is so great and the amount of money involved so impressive that it seems desirable to use all possible care to produce as many miles of road as can be done with the available funds. The results of the analysis of the road plans mentioned in the opening paragraph were, roughly, as follows: About 25% could be classed as first-class designs from an economical standpoint. Practically all the designs showed minor wastes, but for the plans classed as good, revisions would not result in any practical advantage. About 75% of the plans showed a material expenditure of money for which no adequate return was obtained, amounting to from 5% to 20% of the cost. On some of the roads which, as built, served the traffic well, this excess might better have been spent on other jobs. On some of the roads which, as built, were not up to the requirements of the traffic, the waste might better have been applied to their own improvement in fundamental features.

The general faults most noticeable were:

Too much spent on the reduction of intermediate grades.
Too much spent to obtain long straight grades.
Too much spent on sections with deep ditches.
Not enough spent on realignment at dangerous locations.
Not enough spent on long-span bridges.
Too much spent on width of macadam.
Not enough spent on depth of macadam.
Too much spent on imported materials where local materials were available in limited quantities.

An article of this nature cannot go into much detail as to the exact methods, but a summary can be given of a few of the well recognized, proved means of effecting economies without reducing the usefulness of the road. The probable savings from these expedients as given below are based on the experience of the writer and

his friends from their application on construction jobs for a number of years. The original plans on which the construction revisions were made were well up to the standard of the usual highway plan of today.

GRADING ECONOMIES

Use of the "rolling" grade line for intermediate grades.

Avoid long, straight, railroad rates of grade.

Avoid the reduction of easy grades naturally less than the improved ruling grade.

Avoid long, needlessly high bridge-approach fills level with high bridge floors.

Utilize the principle of the short maximum grade in connection with a long ruling grade.

Use of the minimum-width grading section with the shallowest ditches that will serve the purpose.

Use of a reasonable ratio of cut to fill, so that excavation is not wasted.

Balance with short hauls wherever possible.

These principles consistently applied have reduced the yardage of excavation by from 500 to 2500 cu.yd. per mile, the average saving amounting in money to about $500 to $600 per mile on the basis of excavation at 50c. per cubic yard. I have one extreme case in mind where excavation was reduced 30%; the original hauls were long wagon hauls; the final grade line reduced the work to such short hauls that it could be handled largely with wheeled scrapers and road machines; this materially cheapened the unit cost, which happened to be force account, and the quantity reduction plus the unit cost reduction reduced the total grading cost about 50 per cent.

Economies in Macadam Foundations—There is no economy in using a depth less than that required by the traffic and soil requirements. The following table indicates the depths that seem necessary for different conditions, as determined by the action of well built macadam roads in New York State subjected to modern traffic. It will be noted that the depths are greater than ordinarily used.

TOTAL CONSOLIDATED DEPTHS OF MACADAM

Subgrade Soil	Cut, Inches	Shallow Fills Less Than 1 Ft Deep, Inches	Intermediate Fills 1 to 3 Ft. Deep Inches	High Fills Above 3 Ft Deep Inches
Class I Traffic				
Large volume of ordinary vehicles and heavy auto trucks				
Coarse sand and fine gravel..	9	9	9	9
Clay loam	12 to 15	12 to 15	10 to 12	10
Heavy clay and quicksand..	20 to 24	20 to 24	12 to 18	10
Class II Traffic				
Large volume ordinary traffic. A few heavy trucks				
Sand and gravel	7 to 8	7 to 8	7 to 8	7 to 8
Loam	9 to 12	9 to 12	9	8
Clay and quicksand	15 to 22	15 to 22	12 to 15	9
Class III Traffic				
Moderate volume ordinary farm loads. Very few heavy trucks				
Sand and gravel	5 to 8	5 to 8	5 to 8	5 to 8
Loam	8 to 12	8 to 12	8	7 to 8
Clay and quicksand	15 to 22	15 to 22	10 to 15	9

Note.—Under Class III traffic it is better to use the same depth as recommended for Class II and reduce the width of metaling if economy is desired, as all improved roads are bound at times to be subjected to the extreme loading produced by heavy trucks.

Economical foundation design utilizes to the best advantage all local material, preferably uncrushed, to its full extent. Uniform designs that disregard limited amounts of suitable local materials often increase the cost from $500 to $1000 per mile.

Economies in Pavement Widths—In the writer's opinion, a 14-ft. width is more or less useless; it might better be cut to a 12- or even a 10-ft. or increased to 15 ft.; if the cut is feasible it saves on macadam construction from $1000 to $2000 per mile; similarly, a 16-ft. width might better be cut to 15 ft. or increased to 18 ft.; if the cut is feasible it saves from $600 to $700 per mile. No rigid pavements are advocated less than 18 ft. wide.

Economies in Top Courses—Where imported materials are used, the least depth of top that is feasible is often good practice. This applies to the smaller paving brick, stone block, vitrified clay cubes and the 2½-in. depth of penetration bituminous macadam, etc., which often save from $400 to $1000 per mile.

Total Saving—None of these economies is spectacular singly or for one job, but if consistently used the result is well worth the effort, considering the tremendous mileage to be built. A very conservative estimate of the average saving is from $1000 to $2000 per mile. Multiply this out and see what it means. Two features that are most worth emphasizing are the grading design and the effective use of limited supplies of local materials.

A Reviewing Department Well Worth While—The writer believes that every set of plans should be subjected to the review of the most experienced designer available, who applies a set of questions, say, as follows:

QUESTIONNAIRE

Is the alignment suitable for all requirements of the future?

Is the ruling grade suitable for all requirements of the future?

Is the section, ditch to ditch, safe and suitable for present traffic?

Is the right-of-way wide enough for future requirements?

Are there ample culverts for all requirements of the future?

Are the culverts proportioned properly as to size? considering run-off?

Are the culverts long enough to be safe and large enough to maintain?

Are the bridge superstructures strong enough for present traffic?

Have all permanent culverts and bridges been designed strong enough and wide enough for, say, 50 years?

Are the bridge abutments for new temporary superstructures solid enough for future permanent superstructures?

Are the ditches road ditches and not farm drainage ditches?

Are the safety provisions real safeguards or are they only warnings?

Is the road surface thick enough to handle present traffic without foundation failure, considering the subsoil conditions?

Is the road surface wide enough for present traffic and can it be widened to meet the demands of, say, 50 years without regrading the section?

Is the surface of the general type required by present traffic?

So Much for Proportion—Now for Economy:

Does the grade line conform with the principles of economical design?

Do the sections fluctuate to conform to economical design?

Has the selection of pavement type been based on the most economical use of local materials?

Has the design been varied to use limited supplies of local material with short hauls?

Is the width reasonable, and has it been varied on a road that has heavy traffic part of the distance and light traffic part of the way?

Has the depth of macadam been varied to meet the different requirements of the soils and kept to a reasonable minimum?

Have the culverts and bridges been designed for the most economical type for the span in question?

Have the types of culverts been varied to get the cheapest

SUMMARY SHOWING APPROXIMATE YEARLY COST PER MILE OF DIFFERENT KINDS OF ROADS

Type of Pavement	Width and Thickness Including Base: Width Feet	Width and Thickness Including Base: Thickness Inches	Class of Traffic	First Cost per Mile, Including Grading, Pavement, Drainage and All Incidentals	Four per Cent. Yearly Interest on First Cost	Approx. Yearly Maintenance, Including Oiling	Assumed Length of Life Years	Cost of Resurfacing, Distributed Over Probable Life of Road on Yearly Basis	Total Cost per Mile per Year
Stone block	18	13	I	$36,000	$1,440	$150	35	$700	$2,300
Asphalt block	18	9	I	28,000	1,120	150	25	800	2,100
Asphaltic concrete	18	8	I-IV	22,000	880	300	10	1,200	2,400
Brick	18	10	I	26,000	1,040	150	15	1,100	2,300
First-class cement concrete	18	8	I	20,000	800	150	12	1,100	2,050
First-class cement concrete	18	7	II-A-IV	18,000	720	100	15	800	1,600
Bituminous macadam	15	12	II-II-A-IV	14,000	560	350	10	550	1,450
Water macadam tarred	15	12	II	12,000	480	450	7	500	1,450
Water macadam oiled or treated with calcium chloride	14	9	III	9,000	360	350	10	400	1,110
Water macadam calcium and oiled	10	10	III	8,000	280	300	10	350	1,000
First-class cement concrete	10	6	III	12,600	4[illegible]	[illegible]	15	550	1,250

NOTE.—It can be seen that our experience indicates that the selection of type has very little effect on final cost and [illegible]
Class I Traffic (interest, maintenance and renewal is approximately $2200 per mile per year)
Class II Traffic (interest, maintenance and renewal is approximately $1600 per mile per year)
Class III Traffic (interest, maintenance and renewal is approximately $1100 per mile per year)

result, considering local materials, in comparison with market quotations and cost of long hauls on imported materials?

Are the specifications flexible enough to permit the reasonable use of local materials?

Does the testing laboratory make an effort to approve the reasonable use of local material, or is it inclined to hold arbitrarily to the highest standards, regardless of the relative importance of the job in hand?

So Much for the Designer—Now for a Few Questions to the State Highway Commissioner:

Does the improvement fit into a well balanced scheme of highway transportation for the state? (This can probably be answered in the affirmative.)

Is there sufficient provision made for maintaining and renewing the pavement on this road, as indicated in a general way in the accompanying tables?

It is not probable that the funds will be forthcoming until a number of roads in each locality have been ruined by neglect. This is the most forceful way of bringing the matter home, but rather expensive. It seems well worth while to do a little more talking and advertising—perhaps by public speakers, popular magazines, the "movies," etc., about the real cost of maintaining and renewing an improved road system. Public

APPROXIMATE YEARLY COST OF EARTH AND SAND-CLAY AND GRAVEL ROADS

Type	Approx. Cost per Mile	Four per Cent. Interest on First Cost	Approx. Yearly Maintenance and Renewal	Total Yearly Cost per Mile
Earth	$2,000	$80	$50	$130
Sand-clay	3,000	120	75	200
Gravel	4,000	160	240	400

officials naturally hesitate to ask for what they know is necessary, unless the real need of these large amounts is recognized in the proper quarters and tolerated by the voters.

The present tendency is to build high-priced pavements which require very little maintenance for a number of years; this relieves the immediate stress but cuts down needed mileage and merely postpones the day of reckoning. Take any set of plans that is handy and try out these questions. If more than 25% pass more than 75% of the list, you are among the leaders in highway design.

Oil Shale Resources of the United States

An investigation of the oil-shale resources of the United States is provided for in a bill introduced recently by Senator Henderson of Nevada. The bill carries an appropriation of $140,000 and specifies that the work is to be done by the Bureau of Mines.

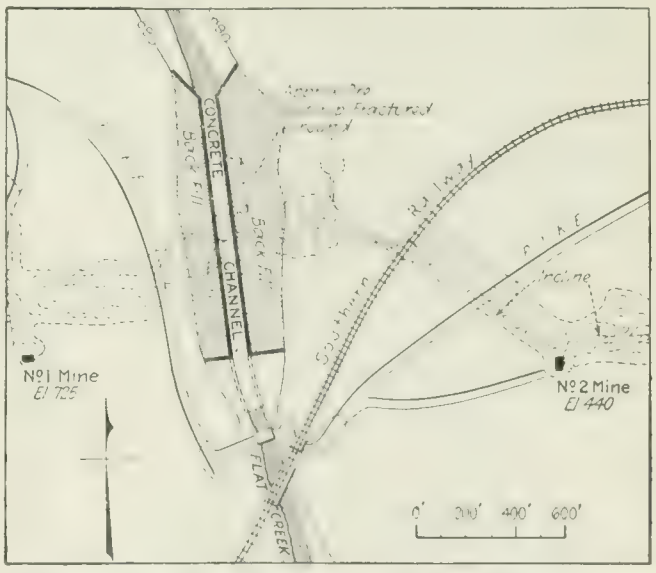
Concrete Channel for Stream Over Fractured Mine Outcrop

Flood Water Which Formerly Backed Up Creek and Seeped Through Into Mine Below Is Now Carried Past Broken Ground

By Harley A. Coy
Superintendent of Mines, American Zinc Co. of Tennessee, Mascot, Tenn.

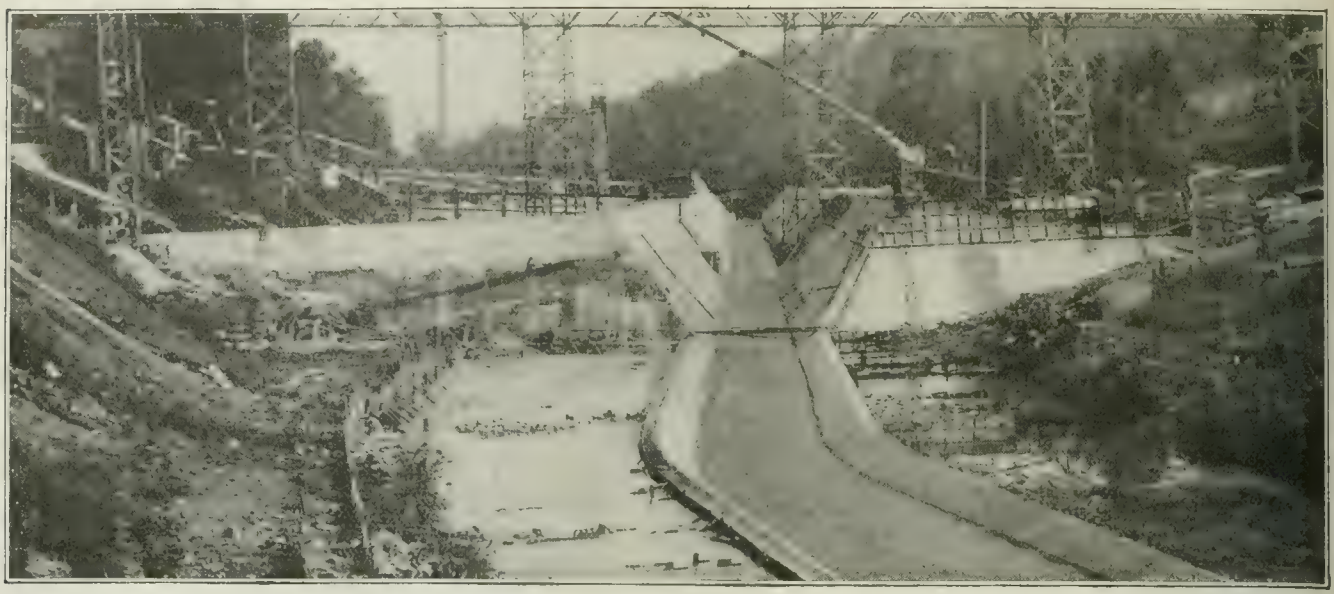
FLOODS due to the penetration of river water through broken ground at the ore outcrop caused an enormous amount of trouble in the mines of the American Zinc Co. of Tennessee at Mascot, Tenn., some years ago. The difficulty has now been removed by the construction of a concrete channel to carry the creek across the fractured area.

Flat Creek, shown in the map herewith, is a very small stream flowing south about halfway between No. 1 and No. 2 shafts of the mine and passing over the out-



CONCRETE CHANNEL PREVENTS CREEK WATER FROM FILTERING INTO MINE WORKINGS

crop of the ore body. In the earlier workings of the mine the water from the creek during high stages gave some trouble, which was taken care of by diverting the flow of water into a lower, worked-out portion of the mine, but as No. 1 workings advanced east additional crevices and openings were encountered, and each year, when floods occurred in the Holston River, into

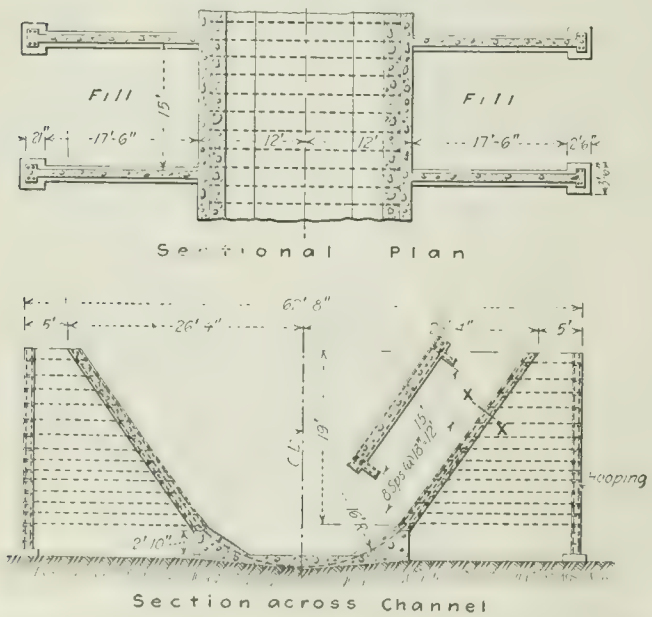


LOOKING UPSTREAM AT CONCRETE CHANNEL BUILT TO CARRY FLAT CREEK OVER ZINC MINES

which Flat Creek empties about 2800 ft. below the mine outcrop, the water backed up the creek and, filtering through the surface cracks, kept entering the mine in increasing quantity.

In January, 1916, the first high water from the river found its way into No. 1 mine through various crevices and completely filled it, reaching a height of 125 ft. above the main level. As near as it could be figured, the volume of water was over 90,000,000 gal. Special pumps were installed and the mine was emptied, but after this experience it was decided that something radical had to be done in the over-mine area. At first some steps were taken to concrete a number of crevices. The formation along the outcrop was found to be so broken that it seemed impossible to fill in with concrete all of the openings, so this work was discontinued. Various schemes considering the diversion of the creek were studied, but were abandoned, and finally the concrete channel shown herewith was built.

The structure comprises a trough-shaped reinforced-concrete channel about 1000 ft. long, supported at the invert on a solid, continuous bottom footing on the rock and held on the side by concrete-wall buttresses spaced 15 ft. c. to c. The area back of the channel proper was filled in up to the level of the top of the channel with slime from the nearby flotation mill. At either end of the structure, wing walls continue back to the fill contour so as to prevent water from getting into any of the fractured area.



DETAILS OF THE CONCRETE CHANNEL CARRYING CREEK OVER MINE WORKINGS

When this channel was built originally it was the intention to extend it about 200 ft. further south than the present south wing wall, and the invert of the channel was built as shown in the view. Before the completion of the work it was found unnecessary to extend the high portion so far beyond the outcrop, so the wing walls were extended to the bank, as shown in the drawing and views. The bottom of the concrete channel is approximately 150 ft. above that portion of the mine directly under the channel, but there are places on either side where the mine workings are within 75 ft. of the bottom of the channel.

There have been two floods since the work was completed. Both of them reached a higher stage than any before noted, but there has been only very slight increase in the flow of water underground during the flood stage.

Wagon Gages and Street-Railway Gages

Wagon wheel-gages are governed by the gage of street-railway track, according to R. C. Cram, of the Brooklyn Rapid Transit Co., in "Notes on the History and Development of Electric Railway Rails," in the *Electric Railway Journal* of July 19, 1919. In speaking of the modifications in rail section made to improve paving conditions and reduce the rut formation produced by heavy wagon traffic, Mr. Cram says: "Wagon makers are wiseacres. Originally, it is believed, the rail gage was made the standard gage of 4 ft. 8½ in. because it was wagon gage also, and wagons were first used on rails. However that may be, the writer has observed that in cities where the gage of the tracks is 5 ft. 2 in. the wagon gage is the same, and that in all cities the wagons generally will readily follow in the tracks whatever the gage may be."

Rondout Creek Bridge Design Condemned for Excessive Load on Batter Piles

State Highway Commissioner Considers Pier Foundation Dangerous and Superstructure Design Not Adapted to Site—Plan Supported by Engineers of Former Administration

SUBSTRUCTURE work for a large highway bridge over Rondout Creek, at Kingston, N. Y., was stopped recently by order of the new State Highway Commissioner, Frederick Stuart Greene. Commissioner Greene had occasion to examine the plans for the structure shortly after taking up the duties of the office; he concluded that the proposed foundation for the main pier was unsafe, and therefore canceled the contract. He found, furthermore, that in the opinion of several contractors the superstructure could not be built for the available money, and as he also considered the design unsuited to the location he withdrew the superstructure from bidding Apr. 22, two days before bids were to be opened. Work is now under way on the preparation of new designs, the bridge being required as part of the new state highway from Kingston to Port Ewen, a link in the main New York-Albany highway along the west bank of the Hudson River.

The crossing is about a mile from the mouth of the creek, where the valley is about 1200 ft. wide. At the sides of the valley, rock is near the surface, but in the middle it is at considerable depth. War Department requirements with respect to navigation, fixing a clearance height of 85 ft. on a width of 200 ft. over Rondout Creek, governed the design of the bridge.

Fig. 1 herewith gives an outline drawing of the condemned design. It was prepared under the supervision of the preceding administration of the Highway Department by William R. Davis, consulting engineer, of Albany, N. Y. The main part of the structure consists of two steel arch spans of 360 ft., with a rise of 110 ft. The piers carrying these arches are solid only up to the springing line, and above this are broken up into separate shafts to secure lightness without sacrificing architectural effect. The center pier rests on a pile foundation, the piles going 60 ft. below water. This foundation was the main object of criticism on the part of Commissioner Greene.

As shown by Fig. 2 (see illustration on next page), the foundation piles are driven inclined on a 1:5 batter, alternately a pile-row in one direction and a row in the other, with a view to giving stability against any unbalanced thrust developed by the two arches, whether due to live loads or to deck-renewal work or the like. On either side are two rows of vertical piles, but these are only a minor element of the foundation; of the 390 piles in the whole foundation, 338 are batter piles and 52 are plumb piles. The bearing-pile cluster is surrounded by an inclosing wall of concrete sheet piles, intended to serve as cofferdam during construction and subsequently as a bearing element for the outer part of the capping slab. This inclosure consists of individual piles 12 x 24 in. in section and 25 ft. long, with embedded metal interlock sections. A reinforced-concrete capping slab 13 ft. thick, 60 x 87 ft. in area, extends over the whole group of piles.

The foundation was to carry a gross load, dead plus live, of something over 9000 tons. Commissioner Greene considered that this would put a dangerously high load on the piles. He states his attitude as follows:

> After I had looked over the plans of the bridge as formerly designed, and especially noted the load that the piles were asked to carry, I did not consider the foundation safe. Upon inquiry as to why these piles were loaded so heavily, I was informed that they expected the reinforced-concrete cofferdam to take part of the load. As this cofferdam did not go down to the underlying strata of sand and boulders, but, in a way of speaking, was "hung up" in the filled ground, I did not and do not consider that it would have been safe to have figured on this cofferdam carrying any part of the load. I at once referred the matter to Daniel E. Moran, consulting engineer, New York City, who confirmed my opinion, and, as I did not purpose either to begin or end my administration by putting up a structure which I considered unsafe, I withdrew the bridge from the letting.
>
> As originally designed, this bridge consisted of two huge steel arches, the shore ends of each resting upon rock, but the center main foundation pier was designed as a pile foundation. The design was not, in my opinion, good in any respect, nor did it fit the ground.

Some additional facts are contained in the following passages of a statement from the Commissioner to the Governor:

> Upon taking office I was informed by my predecessor

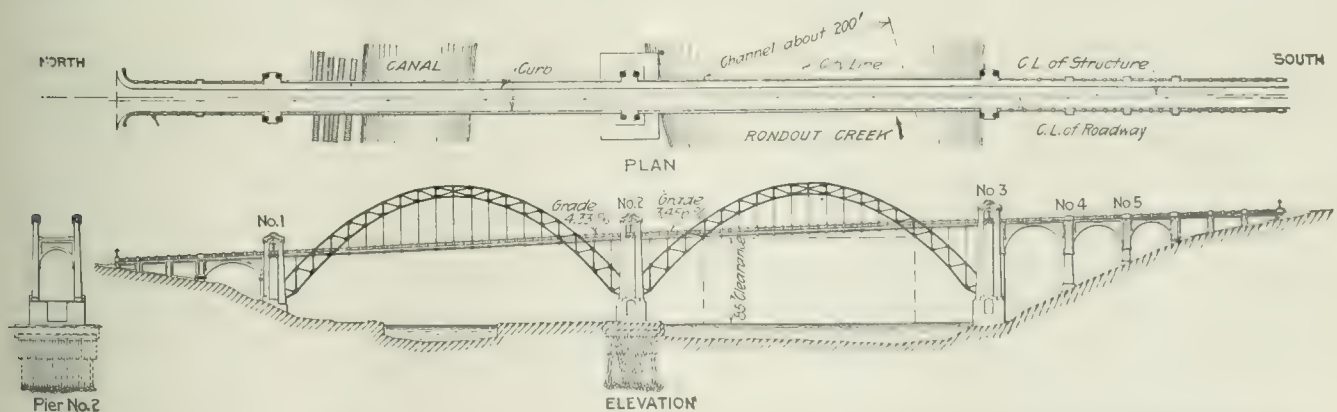


FIG. 1. RONDOUT CREEK BRIDGE DESIGN WHICH WAS RECENTLY ABANDONED; CENTER PIER FOUNDATION COMPOSED OF BATTER PILES CAPPED WITH REINFORCED-CONCRETE SLABS

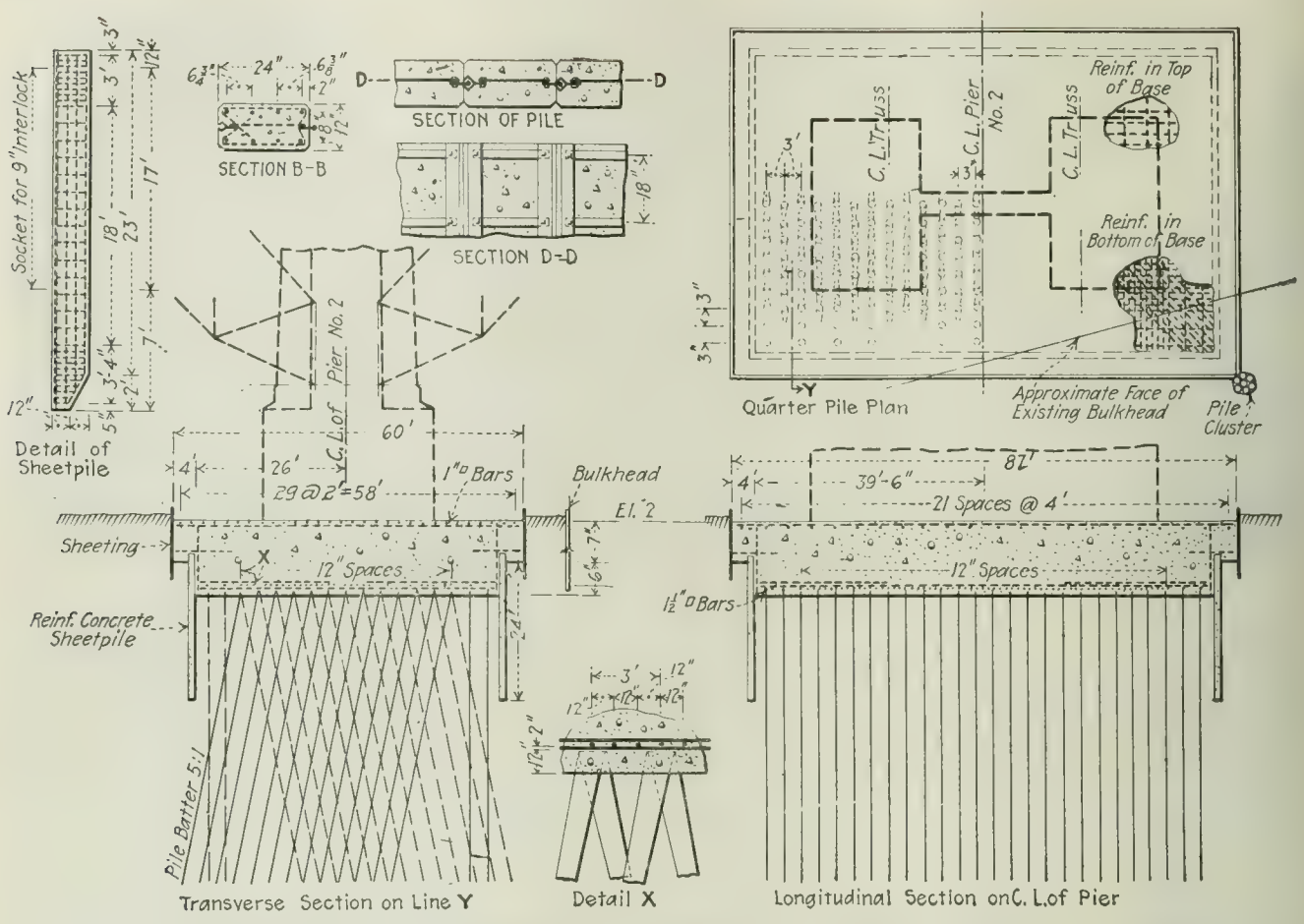


FIG. 2. DETAILS OF BATTER-PILE FOUNDATION OF CENTER PIER; CONCRETE SHEET-PILE COFFERDAM TO REMAIN AS PERMANENT INCLOSURE WALL OF FOUNDATION SOIL

that this bridge was an important project, and my attention was called to the early date that proposals were to be received. I at once sent for the plans, and upon my first eexamination of them was surprised to find that the piles for the main foundation were designed to be driven at an angle. To drive bearing piles off the perpendicular was in my opinion bad in theory, and so far as I know has never been done. The innovation seemed so far from sound engineering principles that I decided to make a thorough study of the plans. I found that these wooden piles, supporting the foundation upon which depended the safety of the entire bridge, were to carry a load of 25½ tons each. This was an alarming discovery. The foundation was located upon made ground, in what had once been the center of the stream, and the piles were driven through this filled-in material to an under stratum of sand and boulders. Under the conditions, I considered that a load of more than 15 tons per pile was dangerous. Realizing the state's responsibility in the construction of this important bridge, I sought the most expert advice that the engineering profession has to offer and withdrew the bridge from the letting.

After a further study of the plans, I became convinced that the bridge could not have been built within the engineer's estimate of $321,000, and several contractors who figured the job have informed us that the bridge, as designed, would have cost between $450,000 and $475,000. Aside from the faulty foundation, I have found other defects in design, which in my opinion would make it unwise, not to say unsafe, to construct the bridge as formerly planned.

I regret to inform you that part of the foundation work, let under a previous contract, has been done, and that the money so spent has been wasted. Through this faulty design the state has suffered a financial loss of $47,916.40. [Of this, $37,500.97 represents payments to contractors.—EDITOR].

It is my purpose to redesign this bridge; in fact, new plans are now under way, and the bridge will be constructed as speedily as possible, consistent with safety and good workmanship. In order to safeguard the state's interests I have retained Mr. Moran as engineer for the new designs. Mr. Moran has already submitted preliminary sketches of a bridge which will not only give us a safe structure, but one that will be a pride to the entire state. His plan, which is a massive concrete viaduct, with a concrete arch over the canal, and a steel truss spanning the stream, admirably fits the ground, and will be less expensive to construct and maintain than a bridge built after the former design, even had that design been safe. The former design called for two steel arches each 360 ft. long. To keep these arches in condition would have required repainting about every three years, which on arches of this length and height would have been a continual and heavy maintenance charge for the state to meet.

A sketch of the design now under consideration by the State Highway Department is reproduced as Fig. 3 herewith. A steel arch truss over the river is shown in the sketch, but in the final development of the design a truss of ordinary type may possibly be substituted. The crossing over the canal is made by a large concrete arch, and the rest of the structure is concrete arch viaduct.

Study of the site has led to the conclusion that it may be economy to use the concrete pier already completed on the south side of the creek. At present it is thought probable that this will be done.

Replying to Mr. Greene's strictures on the design and the work done on the foundations, statements have been made at the request of *Engineering News-Record* by

H. Eltinge Breed, deputy commissioner of highways under the last administration, and by W. R. Davis, designer of the bridge. Mr. Breed says:

The location of the bridge had already been decided by the Carlisle administration. We examined and approved it because it provided the quickest and most dignified entrance into the town, eliminated steep grades, was economical and met the situation from the engineering standpoint. It gave general satisfaction to the people of the city and the vicinity who were most familiar with the need of the bridge. We sought to secure the best possible design, both in strength and beauty, by calling to our assistance an expert in bridge construction. We asked William Russell Davis to design the bridge, because we considered that his training, experience and successful previous work peculiarly qualified him for the task.

Mr. Davis has designed and built bridges for 25 years. Not one of his structures has ever failed. As bridge engineer of the City of New York he designed and constructed the 151st St. viaduct and the Melrose Ave. viaduct. For 13 years he was chief bridge designer to the State Engineer and designed work amounting to $5,000,000. In his private practice he has designed the dock, bridge, and siphon spillway for the General Electric Co. of Schenectady. We have the highest regard for Mr. Davis as an engineer and a bridge expert, and we have every confidence in his design. Such objections as Mr. Greene makes do not seem to us valid in view of the obvious facts; he fails to sustain his assertion that the design does not "fit the ground."

Actual construction work, until the time it was stopped, progressed smoothly with every indication of complete success. About one-third of the piles were driven, a No. 2 steam hammer, weighing about 5500 lb., being used. The piles were driven until they brought up hard, the penetration for the last 20 blows being ¼ in. or less, and the entire penetration being such as to show no pockets of soft material. There was, and is, no doubt in our minds that the bridge was thoroughly adequate in design and construction to the loading it would be required to sustain. Anyone, however, who had wanted additional factors of safety could have secured them at comparatively slight increase of cost by spreading the foundation and driving additional piles. I can see no reason from an engineering standpoint for abandoning the entire project, or for the so-called "waste" of the $47,916.40.

The pier design is discussed in some detail by Mr. Davis, the author of the original design, who says:

It is contended by Commissioner Greene that each of the 390 bearing piles is loaded with 25½ tons, which, if his method of estimating is accepted, is approximately correct. In other words, the total weight at the top of the bearing piles, with total weight of sheet piles included, is nearly 9900 tons. In these figures no allowance is made for the fact that the bottom of the concrete foundation is 4.8 ft. below lowest low water as shown by the records of the United States Engineer Department.

The upward pressure of water to be properly deducted is 300 lb. per square foot, or a total of 616 tons. The weight of sheet piles (480 tons) should not be included. Thus, the total load per pile, if no allowance is made for the supporting resistance of the sheet piles or for the sand inclosed within the sheeting, is close to 22½ tons instead of 25½ tons, as claimed.

It is known that the reinforced-concrete sheet piling drove hard and that it has definite supporting power. It is also proper practice to allow the materials in which the piles are driven to carry some load when properly confined within a suitable inclosure. Such an inclosure was provided with tops of all sheet piles securely tied to the concrete foundation. Deducting the supporting power of 390 piles at 16 tons each leaves 2564 tons to be carried on the sand around the piles. The net area is 3718 sq.ft., giving 0.7 tons per square foot, which is to be considered satisfactory when allowance is made for the supporting power of the sheet piles.



FIG. 3. STUDY FOR NEW DESIGN, RONDOUT CREEK BRIDGE, KINGSTON, N. Y.

The bridge which carries the West Shore R.R. over Rondout Creek, a short distance above the site of Pier 2, is founded in like materials and subject to like conditions, except as to live-load impacts, which are much greater for a railroad bridge than for a highway bridge. The load on the piles under certain of the piers for the West Shore bridge is 20 tons per pile, and these piles have proven satisfactory over a long term of service. There is no question but that properly driven piles under Pier 2 can be safely loaded to 20 tons.

I quote from Commissioner Greene as follows: "To drive bearing piles off the perpendicular was, in my opinion, bad in theory and, so far as I know never has been done." It is well established that batter piles can be properly driven if suitable driving equipment is used by competent men, and that, if the batter does not exceed that used for Pier 2, the supporting power is substantially as great as for vertical piles. Batter piles have been successfully driven and relied upon to take the thrust on abutments of simple-span bridges, arches and elsewhere, and have proven to be dependable. That an arrangement of such piles which is possibly new was used for Pier 1 is not valid criticism. It is the duty of the engineer to use new arrangements of tried materials when good reasons warrant. The use of batter piles is so well established that it is not necessary to take space to cite examples.

Pier 2 supports two 360-ft. three-hinged arches. In order to take care of the possible unbalanced loads, it was thought best to drive about one-half of the piles with a batter in one direction and about one-half with a batter in the other direction. All engineers will readily understand how, with the top of each pile securely embedded in the concrete of the foundation, by resolution of forces the unbalanced hori-

zontal forces will positively transmit a certain proportion of the vertical loads from one set of batter piles to the other set without producing bending of piles or dependence upon other resistance to motion.

The division engineer in charge of construction was thoroughly familiar with the design, and would most certainly have reported the facts had it been discovered during construction that the plans were based on misinformation or wrong assumptions as to foundation conditions. No such report was ever made, and hence the writer is justified in contending that no good reason exists for condemning the design, which he is confident is entirely adequate.

It is stated by Commissioner Greene that in his opinion the bridge could not have been completed according to the design of the writer within the amount of money available. The Commissioner's predecessor in office had advertised for bids and it is known that at least several bids would have been submitted had Commissioner Greene not canceled the letting a day or two before the date set. The writer is of the opinion that there would probably have been at least one bid within the estimate. He regrets that the letting was canceled, thus leaving this question in doubt.

The Commissioner claims that the defective design has caused a loss of nearly $50,000 to the state. He has thrown away one pier foundation on rock which he does not criticise. If he is not satisfied with the foundation of Pier 2 and wishes to reduce the pile loads, which the writer considers unnecessary, the footings can be extended and additional piles driven as provided for by the writer in the specifications to cover any unforeseen condition that might arise.

In conclusion, the writer emphatically denies that the pier in question was not properly designed. From the information at hand he finds no justification for the condemnation of the pier or the abandonment of the entire design, for the choice of a new location or for the waste of moneys already expended.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Valuations for Rate Regulation

Sir—Just now would seem to be the time to stop, look and listen in the matter of valuations for rate regulation.

The more or less time-honored custom of valuing utility properties on the basis of cost of reproduction less depreciation, with prices as of the present time or even with prices averaged over a very few years last past, would seem to be likely to bring utilities into trouble at a later date. Assuming that there is to be a material drop in prices—possibly even a panic bringing a very large drop—and at any rate some drop, what is going to happen to the utility that is valued now on the basis of high prices and capitalizes that value, and is forced to reduce its rates within the next few years because of a lower valuation put upon it? If it be argued that capitalization will not follow a high valuation because of the high rates to be paid for money, is not this argument an admission that the valuation is too high?

Does not the situation at the present time, with the reasonable prospect ahead, add much of force to the argument that was presented by the writer in *Engineering News-Record* of Sept. 5, 1918, p. 451, to make cost of service the chief factor in rate regulation?

If, in a valuation of a growing property, the estimate of the physical items is based on the actual sacrifice to produce them—including, as it must, sacrifices at comparatively recent high rates—and if cost of operation, including maintenance, is estimated at prevailing prices and a proper profit is allowed on such cost of operation, it would seem that the utility would get all that it may be entitled to, and will not be put in the dangerous position of imagining that it has a large value which it can capitalize—only to find a part of that value destroyed within the next few years as prices drop.

Are not those on the defensive who have interpreted "present value" in the court decisions to mean cost of reproduction as of the present time less depreciation? That real monstrosity, cost of reproduction of a property, the wiping out of which and its reconstruction are both purely imaginary conceptions, impossible of realization, never has been and never will be a correct basis for the value of a long-lived public-utility property.

It is hoped that those who may reread the writer's article mentioned above, or may read it for the first time, will see by the application of the methods there suggested a way out of the present difficulties. Certainly, these are dangerous times in which to apply the theory of cost of reproduction at present prices less depreciation, in the valuation of a public-utility property—dangerous more to the utility itself than to the public concerned.

The language of the court in that old decision saying "fair return on the fair value of the property used in service" may voice a correct principle, but it seems to be almost certain that it has been productive of much difficulty, much greater than would have been caused by the establishment of another principle apparently equally sound—namely, a utility owner is entitled to a fair profit on the reasonable cost of the service rendered.

WILLIAM G. RAYMOND,
Dean, College of Applied Science, State University of Iowa.
Iowa City, Iowa.

Transit or Plane-Table for Topography

Sir—After several months of plane-table work, I can quite agree with Hargraves Wood of Martinsburg, W. Va., in his belief that the plane-table is superior to the transit for topographical surveying. [See *Engineering News-Record* of July 10, 1919, p. 95.]

In the first place, topographical surveying is the object of the plane-table and, consequently, it has been perfected to a high degree of accuracy for that purpose, while the transit has an unlimited number of uses of which topographical surveying is a side issue. With the plane-table you have the drawing paper and topography directly before you, and as a result can draw it just as it is. This cannot be done with a transit.

Contours can be chased and located exactly, provided the Beamen-arc style of alidade is used in the plane-table work. The old style alidade with a vertical-angle arc is far inferior to the Beamen arc, which enables the recorder to compute his notes while the instrument man is locating his next sight. The vertical angle on the transit requires a tabulated set of tables for the computations, which is not the case with the Beamen-arc alidade.

For orientation, the backsight and foresight method

of traversing is exceedingly accurate, as is the use of the magnetic needle, if it is well taken care of and damage is prevented. Orientation by the use of flags which were previously located by triangulation and plotted on the paper by coördinants is also very accurate, and most errors can be picked up by solving a three-point problem, which is not as difficult as some imagine.

The Gurley alidade of the Beamen-arc style was used exclusively by the 472nd Engineers, U. S. A., in their work of mapping a section of Virginia and the District of Columbia, to say nothing of the 180-square mile reservation at Fort Sill, Okla., prior to the contemplated shipment overseas of the Engineers.

The United States Geological Survey engineers assert that the plane-table is much more rapid than the transit in topographical surveying, fully as accurate as the result can be plotted, regardless of scale, far easier than the laborious transit method, and much more complete in its work. When you come in at night after using a plane-table with Beamen-arc alidade, the notes are all computed, the plotting is completed and a large area of ground has been covered, while with the transit method notes must be computed and the map plotted in the office, the latter map lacking the finer details obtained only when using a plane-table.

In my estimation it is a one-sided argument in favor of the plane-table to contrast the two methods of taking topography.

FRED VERNON.

Schenectady, N. Y.

Sir—In your journal for July 10, 1919, p. 95, the question of the plane-table versus the transit for topographical surveys is brought up by Hargraves Wood.

From considerable experience in the past in this line of work, I have come to the conclusion that each method has its particular sphere of usefulness.

The plane-table is particularly adapted to an open country, where considerable detail is desired on a map of fairly large scale, such as for parks, cemeteries and private estates. But it is cumbersome to carry about, and where large areas are to be covered, especially in hilly and wooded territory and where contours are not closer than 10-ft. intervals, the use of the transit with vertical arc and stadia and a small plotting table, as devised and used by Dr. Rudolph Hering in surveys for the water department, Philadelphia, in 1883-1886 (see *Engineering News* of Sept. 26, 1885, p. 302) is believed to be far superior. This system was also used with some modifications in a survey of the Connellsville coke region made by me in 1890-1892 (see *Engineering News* of Nov. 7, 1891, p. 446) and was found admirably adapted to the conditions there, being rapid, reliable and economical. The results of both of the surveys referred to have been incorporated in the standard United States Geological Survey sheets for the respective territories.

New York City. KENNETH ALLEN.

Sir—*Engineering News-Record* of July 10, 1919, p. 95, contained a letter from H. Wood raising the question why the plane-table was not used in taking topography for railroad location surveys. Since 1917 the subject of railroad location has been quite out of date. But as there is promise, in some quarters, of a revival of the art, a few remarks may not be out of place at this time.

Mr. Wood answers his own question when he states that considerable experience is needed to operate a plane-table efficiently. That is perhaps the reason why one never sees a plane-table in a railroad survey party—not that the railroads lack efficient men, but their work is not continuous enough to develop instrument men with sufficient experience to run a plane-table efficiently. It is more nearly the rule than the reverse, that railroad location parties are organized hurriedly for a limited amount of work. New men must be broken in to take topography, and naturally they must be taught the simplest methods first. This results in the method by transit lines, with cross-sections at more or less frequent intervals. Often quite ingenious methods are used, but the plane-table is conspicuous by its absence.

The writer would advocate keeping one plane-table in the equipment of every railroad survey party, and one man fully able to run it. The plane-table could be used in taking topography from the preliminary line. The existing practice of first running a preliminary line need not be abandoned in favor of plane-table work. Railroad surveys cover a comparatively long and narrow strip of ground, and the accuracy needed even for a "preliminary" line could not be secured with plane-table without a greater expense than the common method of running preliminary line. Also, there would be trouble in staking out a projected location from a map which contained no preliminary lines from which to make ties.

However, a plane-table will give accuracy greater than that obtained by common methods; its cost is less, its speed is greater, and it would prove invaluable for the many little odd jobs of any survey requiring detail, natural or artificial. The only objection which could be raised against it is the fact that plane-table work must be done on small sheets, and the work transferred to the larger map. But this objection is not valid, as the same thing applies to any method where contours are sketched in the field.

For transferring topography, taken on small sheets to a larger map, the writer prefers to trace the work directly by means of home-made copying paper, made by ordinary scratch paper and soft lead pencil. Marks made on a map from this kind of paper can be easily erased, which cannot be said of ordinary typewriting paper or carbon paper.

F. J. HOWES,
Resident Engineer, Northern Pacific Railway Co.
Emigrant, Mont.

Concrete for Railway Track Support

Sir—Referring to an article entitled "Concrete for Railway Track Support," in *Engineering News-Record* of July 24, 1919, p. 165: While the concrete slabs supporting the tracks of the Northern Pacific Ry. in the State of Washington are the most extensive use of this construction on main line, I beg to call your attention to a paper prepared by the writer entitled "Concrete Railway Track Support," which was read before the American Concrete Institute June 28, 1919, wherein were shown a considerable number of other examples of concrete slabs supporting railway track.

The article in the July 24 issue of *Engineering News-Record* says that this example of the Northern Pacific Ry. is the only example of such construction on the

open line. You are doubtless aware that the Pennsylvania Railroad Terminal in New York City has more than 14,000 ft. of slab concrete under its tracks and that 720 ft. of similar construction is in use near East River tunnels Nos. 1 and 2, where it is subjected to high-speed traffic.

There is on the Chicago Junction Ry. in Chicago approximately 500 ft. of solid concrete track support that has been in use since 1911. This stretch of track was selected purposely so as to subject it to the heaviest traffic conditions of any track on the Chicago Junction Ry. A majority of the stock trains going to the Chicago stockyards pass over this experimental track. The service derived from it, according to G. W. Hegel, chief engineer of the Chicago Junction Ry., has been entirely satisfactory.

You may not call these examples open-line service, but they do represent the two extremes of such service; namely, high-speed passenger traffic and comparatively low-speed heavy-freight traffic.

A. C. IRWIN,
Engineer, Structural Bureau, Portland Cement Association.
Chicago, Ill.

Further Criticism of Fineness-Modulus and Surface-Area Methods

Sir—The replies of Professor Abrams in *Engineering News-Record* of June 12, 1919, p. 1142, and Mr. Edwards in the issue of July 24, 1919, p. 191, to our article, "Tests of Two Recent Theories for Proportioning Concrete," published in the issue of June 12, 1919, p. 1142, seem to us to evade direct and definite reference to the fundamental errors in the two theories which it was the purpose of our article to point out. It is true that our criticism was more destructive than constructive, but justifiable on the ground that engineers and others, who are not in a position to test fully the new theories, may not be misled by faulty or incomplete evidence.

We have at this time no new theory of proportioning concrete to present. Any such offering should be thoroughly tested under all practical conditions with the widest variations in aggregates found in practice, and its limitations should be clearly known before offering it to the public.

We believe, however, that our article has constructive value in calling attention to the necessity for some adequate means of controlling the water content of concrete mixtures, which Professor Abrams himself regards as the most potent of the ingredients. In his laboratory work, however, Professor Abrams has thrown aside the all-important water control to such an extent that the concretes given in Table 2 of the above bulletin, which are said to have constant consistencies, really vary more than 25% in this respect; that is, the amount of water in the wettest of these mixes is more than 25% greater than that required to yield the consistency of the driest of these mixes.

The following is a reply to the detailed criticisms of our previous article, and statements of definite reasons for the failure of both theories are included.

The wide variations in grading of aggregates in our Tables I to III were included to show the effect of any additions of aggregate to a neat cement paste. It is well known that ordinary concrete is weaker than the aggregate of which it is composed, and that a concrete is also weaker than a neat cement paste which has the same consistency or flowability. For the sake of economy it is necessary to sacrifice strength, with the result that ordinary good-quality concretes have a fraction of the strengh of either the cement or the aggregate particles. To emphasize that the resulting function of any added aggregate is to lower strength, these series were included. It should be pointed out that if many of these mortars and concretes had been made so as to have equal flowability or consistency instead of equal water-cement ratios, much lower strengths would have been obtained, as compared with a neat cement paste of the same consistency. To pass over a series of tests with the statement that the aggregates are of freak gradings emphasizes the fact that "freak" gradings in one locality may be quite similar in many respects to aggregates in common use in another, and that an arbitrary decision as to "freakishness" does not alter the fact that something is wrong with any theory which ceases to function within any limits which may be encountered in practice, or which do not include concretes of better quality than that of the ordinary structural type. Even though the aggregate gradings for the ones which have been termed freakish are not those commonly met with, the mass is in all cases composed of similar particles which have the same compositions and physical characteristics as those aggregates labeled normal, and so long as they can be formed into a plastic, workable combination, the same laws, if correct, must govern them.

The following comments refer more specifically to the criticisms offered by Mr. Edwards:

Whether or not the area of large particles in a concrete mix is considered in proportioning the quantity of cement is of little moment, since the surface area of coarse aggregate per unit weight is only a fraction of that found for the same weight of sand. The aggregates included in our Table V all passed the $\frac{3}{8}$-in. screen, so they may be classed as sands. The area of the particles, per 100 grams retained on the No. 4 sieve in the case of aggregate 57, is 35 sq.in., and the total for the aggregate per 100 grams is 568 sq.in., so that the area of the portion above the usual sand size is negligible.

Mr. Edwards states that " . . . . the surface-area method is not comparable with the methods used in the tests described in Tables II, III, IV and VI," of our article. That these tables of results are of direct bearing upon the accuracy of the surface-area theory is shown by the following quotation from Mr. Edwards' article in the American Society for Testing Materials "Proceedings," Vol. XVIII, 1918, p. 235:

> The results obtained show that the strengths of mortars of uniform consistency containing sand aggregates of varying granulometric composition are directly proportional to the quantity of cement they contain in relation to the surface area of the aggregate.

With regard to our italicized statement that "the surface-area method after fixing a ratio of cement to surface area of aggregate arrives at the same final conclusion," etc., this is an accurate statement of fact verified by the mathematical demonstration which follows it, and by Table VII in Mr. Edwards' 1918 A. S. T. M. paper, p. 256. This table includes nine aggregates in the first group, all of which have the constant water-cement volume ratio (Abrams w/c), of

0.426, and also a constant ratio of water to cement by weight of 0.284, or 28.4 per cent.

Further reference to this table indicates that the proportions of cement to aggregate by weight varied from 1:1.12 to 1:3.11, and yet it is stated that this water formula which results in the constant w/c relation of 0.426 gives mortars of the same consistency. The absurdity of such a statement should require no proof to anyone who is familiar with testing of concrete. This table alone disproves the claims made for the surface-area method. In practice, lean mixes require a higher value of w/c than rich mixes for the same consistency or flowability, yet here it is stated that a 1:1.12 proportion had the same consistency as a 1:3.11 proportion.

We have checked the consistencies by duplicating the mortars made up of his aggregates C, E, and G, as specified in this table. We are at a loss to explain how anyone can put forth such data with the claim that equal consistencies or flows were obtained under the conditions. We found the water formula and the quantities of mixing water specified by Mr. Edwards to be entirely inadequate, thereby bearing out the statement in our June 12 article in which we showed that the formula would supply 7.42% for a 1:3 standard sand mixture, whereas the 10.3% called for in standard specifications is actually too little to furnish a good, working, plastic mix. *Not only did the formula supply too little water for all of the above three aggregates, but there was a wide difference in consistency very apparent to the eye and verified by the flow test.*

The tests on the Edwards aggregates E, C, and G may be summarized as follows:

MIXING WATER

	Specified by Edwards formula w/c constant		As used in our tests w/c constant			As used to obtain equal flows			
*	cc	w/c	cc	w/c	Relative Flow	cc	w/c	Relative flow	†
E	553	0.426	720	0.555	170	720	0.555	170	3855
C	343	0.426	447	0.555	125	497	0.616	168	3170
G	178	0.426	234	0.555	No flow not plastic	342	0.820	171	1810

* Aggregate
† Compressive Strength, Lb. per Sq. In., Age 7 Days

The above data show: (1) The water formula is inadequate to give good, working, plastic mixes; (2) with ratio of cement to surface area fixed it gives a constant water-cement ratio for all mortars; (3) instead of mortars of the same consistency, mortars of widely varying consistency result. Instead of constant w/c values which, it is claimed, give uniform flows, the water-cement ratios varied from 0.555 to 0.820.

We believe that the data given in Mr. Edwards' Table VII, together with the above, effectually disprove the claims made for the surface-area method of proportioning mortar and concrete.

The following refers more specifically to Professor Abrams' criticisms:

In reply to the statement that some of the mortars of Table II were too dry, we would state that these mixtures were all plastic, and that well formed test specimens were made in the usual manner. The seven-day strength results also indicate good quality mortar.

He states that aggregate 62 makes up the only normal mortar shown in the group (Table II) with constant w/c, and that the others are too dry. It is difficult to follow this reasoning, since the addition of more water resulted in lower strengths. It would be just as logical to state that the first group is too strong as well as too dry. It is not claimed that the w/c constant group had equal flows, but all were plastic and easily molded.

The aggregates used in the concretes of Table IV are criticized as being too coarse, probably due to the low strength results obtained in some cases with a constant w/c.

These low strengths are not due to coarseness, but to adherence to the Abrams water formula, which provides too much mixing water for coarse aggregates, resulting in concretes having unequal flows which are not comparable. It should be noted that these poor aggregates 2, 3, 7, and 8, when tested with flow constant, showed good strength increases which indicated them to be among the best aggregates in the group. It would seem that any standard of coarseness which would rule out such aggregates must be seriously in error. Aggregates 7 and 8 are criticised as being decidedly freakish in that all material is retained on the 28- or 48-mesh sieves. This same criticism can equally well be made of the Abrams aggregates 271 and 276, Table II, Lewis Institute Bulletin No. 1. However, tests show that all four of these aggregates are satisfactory from the standpoint of workability and compressive strength, when proper account is taken of flowability.

With respect to our Table VI, which is made up of aggregates included in the above Lewis Institute Bulletin, we feel that Professor Abrams has evaded the real issue, which is the lack of uniformity in workability found when concretes are proportioned by the fineness-modulus theory. We pointed out in text and diagram the wide range of workabilities found for his aggregates which, he states, results in concretes of the *same consistency*. As for the surface-area theory, the water formula which is supposed to give any desired workability or consistency for known conditions of cement and aggregate fails to function, and this failure, which disproves the fundamental and necessary assumption of the fineness-modulus theory, is not touched upon by its author in his discussion of our results.

The expression for quantity of mixing water is as follows:

$$x = R\left[3.2\,p - \left(\frac{0.30}{1.26^m} \cdot a - c\right) n\right]$$

It is stated that with m, fineness modulus, and n, proportion of cement to aggregate, constant, the same consistency will result, and the same strength will be obtained whatever the grading of the aggregate within rather wide limits.

As shown in Table 2, Lewis Institute Bulletin No. 1, with m constant there may be wide differences in grading with large differences in surface areas. For the aggregates shown in this table, the surfaces vary approximately 600%. It has been well established in concreting practice that for the same consistency a fine sand requires more mixing water than a coarse sand, that a sand similar to a beach sand requires more than a coarse, graded concrete sand, and that sands commonly used throughout the country may vary over several hundred per cent. in surface area.

In spite of this well understood condition, that a fine sand, one having a large surface area, will require more water than a coarser sand, it is claimed that the above water formula will result in the same consist-

ency for any group of aggregates having the other conditions constant. Although not expressed in so many words, *the Abrams water formula is equivalent to the statement that whatever the gradation, sands having the same fineness modulus, although varying as much as 600% in surface area, require the same quantity of mixing water for the same consistency.* That this is untrue is shown by the variation in the surface areas of the aggregates in his Table 2, all of which have the same fineness modulus, 6.04. The falsity of the water formula is further proved by the flowability tests which we made on eight of these aggregates and included in our Table VI, as well as the results of the previously quoted tests in which the Edwards aggregates C, E, and G were used.

To obtain constant flow among any such group of aggregates, it is necessary to vary the quantity of water for each, and as soon as this is done the constant water-cement ratio, the foundation upon which the fineness-modulus theory has been built, disappears.

Summarizing, both the surface-area theory and the fineness-modulus theory assume that known and equal consistencies can be obtained by the use of the water formulas which each provides, but both fail to accomplish this in practice.

It has been shown that the surface-area theory formula reduces to the constant w/c relation for any fixed relation of cement to surface area of aggregate, and that the important property of surface area does not enter into the determination of the quantity of mixing water, except in so far as it fixes the quantity of cement at the beginning. The formula is not only incorrect in theory, but is inadequate in practice, and results in mortars and concretes varying widely in workability which are in no sense comparable. That this is strictly true is proved by the data given in the proponent's own article, in the A. S. T. M. "Proceedings" for 1918.

The fineness theory assumes that equal consistencies and strengths are obtained by the use of a water formula which disregards the varying water requirements due to differences in number of particles or surface area of aggregate. Any factor which might be added to take account of this variable condition will result in different values of w/c for each aggregate, thereby losing the constant w/c relation which is claimed to be the criterion for equal strengths. The wide variations in gradations of aggregates given with the author's description of the theory disprove the assumption that any given consistency can be obtained for a group of aggregates by the use of his water formula.

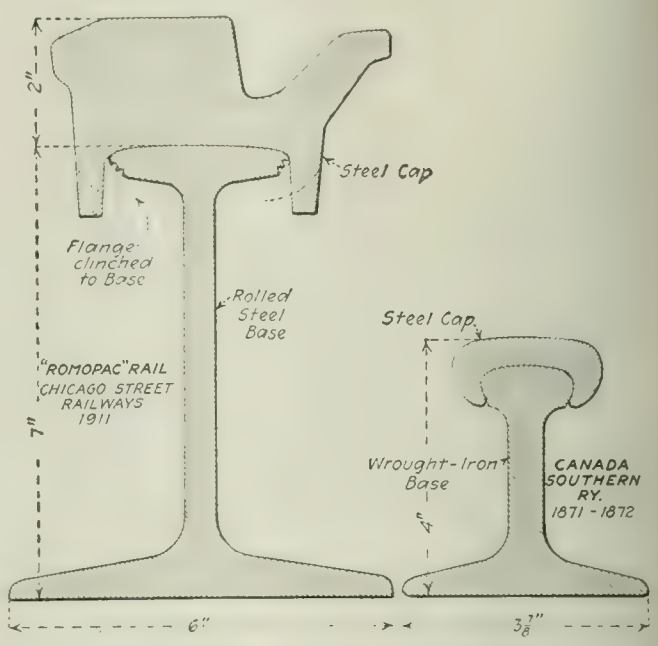
The test data which he includes clearly indicate that the fineness-modulus method of proportioning fails in practice.

No doubt, continued experiments by all interested in the testing of concretes and concrete materials will finally lead to some method which will aid in the proportioning of any given material to produce a concrete of known quality, but we cannot see how the above theories as now proposed are in any sense a final solution of the problem.

G. M. WILLIAMS,
WATSON DAVIS,
United States Bureau of Standards.
Washington, D. C.

Compound Rails With Separate Heads

Sir—I have noticed recently in *Engineering News-Record* sketches of several unusual old and odd rail sections. Inclosed is a tracing showing a "steel-cap" rail at one time in use on the St. Clair branch of the



TWO TYPES OF OLD COMPOUND RAILS

Canada Southern Ry. This rail consists of a wrought-iron base and web with a steel top. It was laid about 1871 or 1872 and failed after only a few years' use.

Bay City, Mich. S. D. WILLIAMS, JR.
Division Engineer, Michigan Central Railroad.

[Presumably the cap of this rail was rolled in place upon the bulb head, but with the rail-mill machinery of those days it is not likely that the contact surfaces were regular or that the grip of the cap was very secure. About 1906 a development of this idea was tried on the street railways of Leeds, England, and the Chicago street railways experimented with it in 1911. We have reproduced this section beside the Canada Southern rail. In this case the cap formed a grooved head and was of channel section. It was applied by means of a powerful bending machine which clinched the flanges of the channel under the bulb head of the base section. A curious feature was that the cap was applied after the substructure of the track had been completed, the clinching or crimping being done by a machine traveling on the track. For renewal, the same machine could cut and split off one flange, so that the cap could be removed. The cap and base were laid to break joint.

Some trouble with proper adjustment of the cap was experienced on the Chicago work, but was attributed to failure to roll the cap to the exact section desired. It was said that no such trouble was experienced on the English work. The system was not developed on a commercial basis in this country, however. For those who may wish to look up its records, we give the following references to articles in *Engineering News:* 1906, May 26, p. 571; 1911, Sept. 28, pp. 374 and 386; 1912, Feb. 1, p. 216, and Nov. 28, p. 1007; 1913, Jan. 23, p. 179, and March 13, p. 527.—EDITOR.]

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Improvised Hoisting Derrick Tilts Steel Stack Onto Base

A HOISTING rig improvised from spare timbers and two chain-blocks successfully up-ended a steel stack, approximately 75 ft. high and weighing 70 tons, for the copper-smelting works at Benson, Ariz. The operations and the equipment are indicated by the diagrams. Two timbers were fixed for deadmen, and two others, one on each side of the old concrete base, were placed as sills for the A-frame.

The feet of the A-frame were hinged to the sills by cutting slots in them. Strap-iron loops on the feet of the A-frame extending down into these slots with iron pins passing through timbers and loops, and into the concrete base for anchorage, completed the construction equipment.

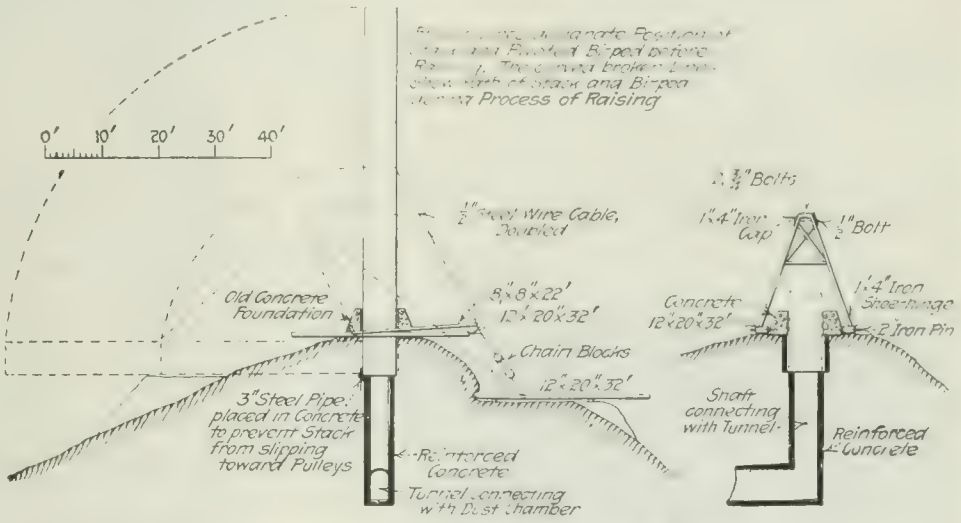
The chain-blocks were rigged to separate hitches so that one would hold the stack while the cables were being shortened on the other. The length of pull of the blocks was about 10 ft., and four changes of cable were necessary to up-end the stack. When pulling was commenced at a flat angle the stack was given a start with screw jacks, but afterward the two chain-blocks handled the stack readily.

The cost of the operation was $316 for labor and $54 for material. This description has been prepared from an article by Martin Fishback in *Engineering & Mining Journal* of July 19, 1919.

Other Articles in This Issue of Interest to Contractors:

New Construction Methods in Subway Work Under Philadelphia City Hall — Page 300

Electricity Cuts Construction-Plant Power Costs — Page 311

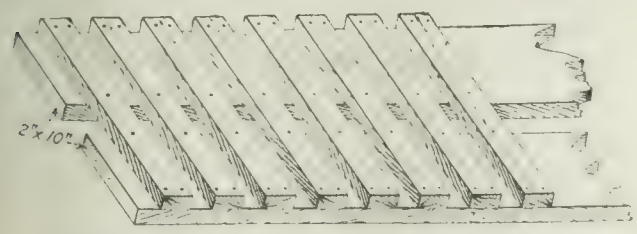


HOISTING RIG FOR UP-ENDING STEEL STACK

Motor-Truck Boardwalks for Muddy or Sandy Soil

A DEVICE that is being used in southern New Jersey to facilitate the operation of motor trucks is a boardwalk. On one contract 1500 feet of this boardwalk was in use recently to pass motor trucks over sandy soil or muddy subgrades.

The tracks are composed of two 2 x 10-in. 16-ft. planks, set 24 in. out to out and tied together with 2 x 4-in. material 3 in. apart in the clear, as shown in the illustration. When the subgrade has been properly crowned and graded, and it is not desired to cut it up with motor trucks, these boardwalks are laid lengthwise of the grade and at the proper gage. The spaces between the cross-treads not only give good traction but allow the trucks to proceed up the grade for distance equal to the length of the tracks, without injury to the grading. The tracks were in use on the work of H. Wilhelm Sons for the New Jersey State Highway Department, W. G. Thompson, state highway engineer.



DETAILS OF BOARDWALK FOR MOTOR TRUCKS

Six-Inch Steam Pipe Replaces Wood Rolls Under Dragline Excavator

By G. E. Wright
Bridgeport, Conn.

THE use of wooden rollers under a Bucyrus dragline excavator weighing about 60 tons caused considerable trouble and some delay, by the splitting or crushing of the rolls. It was decided to try 6-in. steam-pipe to replace the broken rolls. This worked so well that the wooden rolls were discarded altogether. The pipes were of such length that a man could handle them and pass them ahead. Three or four rolls were used under each of the four skids.

The work was being done on tidal flats, where the tide left the machine alternately high and dry and standing in 5 to 7 ft. of water. It was working on the



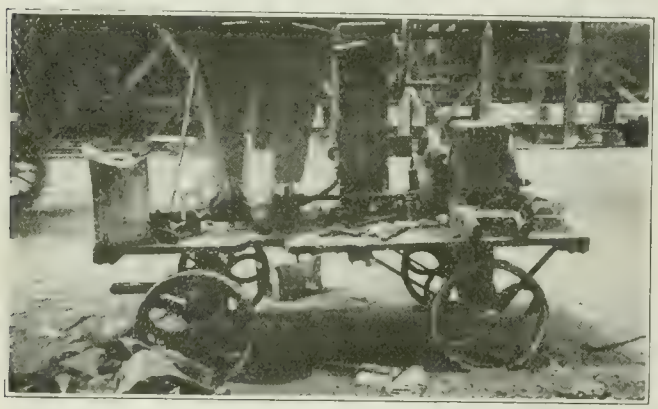
STEAM PIPE REPLACES WOODEN ROLLERS

seawall extension being constructed by the T. A. Scott Co., of New London, Conn., for the City of Bridgeport, Conn., making a fill back of the wall. The material was dipped directly from the sand flats in front of the wall by the machine, which was carried on wooden mats and hauled ahead by dipping the bucket in the sand and hauling in on the dragline. It was equipped with a bucket of two-yard capacity.

C. A. Calahan was superintendent for the contractor, A. H. Terry was consulting engineer for the city and J. A. McElroy is city engineer. The writer was engineer in charge of construction.

Handy Mechanical Device for Mixing Mastic Pavement Filler

MASTIC filler for granite-block pavement is being successfully mixed by a small mechanical device on contract work in New York City. Numerous hand mixing methods have been employed for this material, but it is difficult to obtain the proper agitation and thorough mixing which can be accomplished by mechanical means. The small mechanical plant shown in the view is giving a very thorough mix.



OUTFIT FOR MIXING HOT MASTIC FILLER FOR BLOCK PAVEMENTS

The device consists of an inverted conical drum which has paddles working on the inside through the cogs shown at the base. Power is furnished by a 10-hp. gasoline engine, while a hand pump is used to transfer the liquid bituminous material from the heating tank to the drum. The pump, shown between the engine and the drum, is arranged so that the correct amount of bituminous material is transferred at each pumping. The apparatus works with either tar or asphalt mastic. In the particular case illustrated asphalt mastic is being mixed.

When the device is operating, the bituminous material is first pumped into the drum, and then the proper amount of thoroughly dried sand is thrown in and agitated, until an even mixture is obtained. This is then allowed to flow out at the opening at the bottom, into wheelbarrows, from which it is dumped upon the pavement and squeegeed into the joints. The mixture is about 1 of sand to 1 of bituminous cement.

The work is being done, under the supervision of Robert MacGregor, assistant engineer of the Department of Public Works of the Borough of Manhattan, by the W. J. Fitzgerald Co., of New York City. M. H. Lynch is engineer for the contractor. It is stated that the complete outfit costs about $500.

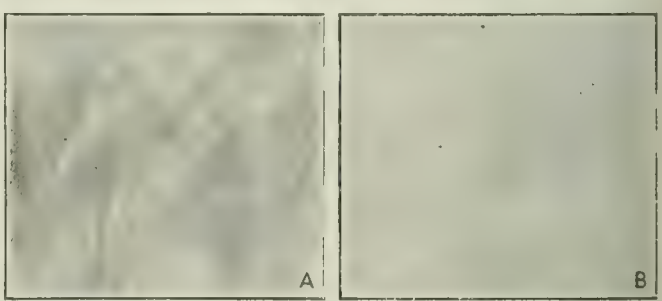


FILLING GRANITE BLOCK WITH ASPHALT MASTIC

Removing Diamond-Shaped Serrations From Belt-Finished Concrete Roads

WHEN a concrete road is finished by the belt method, diamond-shaped serrations are left as the belt travels crosswise of the road and slides lengthwise at the same time. These are due to movement of the larger particles of the sand grains.

While the serrations do not affect the life of the pavement, they give it a sort of wavy appearance, which is undesirable. This has been overcome in New Jersey by a method proposed by W. G. Thompson, state highway engineer, and the result is shown in the accompany illustration. A shows the straight belt-finished road, while B shows the surface after the serrations are removed.



SURFACE OF CONCRETE ROAD BEFORE AND AFTER FINAL BELTING

The operation is performed by passing the belt over the surface twice. The first time the usual method of zigzagging is employed, while the second time the belt is carried back and slightly raised at the forward edge and just dragged longitudinally over the surface of the pavement. This covers up all the zigzag marks in the surface and the process appears to make no new ones longitudinally.

NEWS OF THE WEEK

New York, August 14, 1919

War Labor Board Ends Existence

The National War Labor Board ended its existence Aug. 12, through announcement of the oint chairmen, William H. Taft and Basil M. Manly, issued after a meeting of that board in New York City which adopted resolutions to the effect that no new cases would be received.

The War Labor Board was created by an act of the President early in 1918. It was said that, though he had created the board, the President had no hand in the termination of its existence. The expenses of the board were paid out of a war emergency appropriation, and it was said that its end was brought about "more through lack of funds than anything else."

During the 15 months of its existence the board has handled and adjusted more than 1,200 labor disputes and has expended $750,000. In every case brought before it labor benefited by increased wages.

Another East River Tunnel Holed Through

Excavation work in the north tube of the 14th St. rapid-transit tunnel under the East River, New York City, was completed Aug. 7, when the last piece of rock between the tunnel headings between Brooklyn and Manhattan was shot away. The river section of the tunnel is 3437 ft. between shafts. The top of the tunnel is 97 ft. below mean high water at the lowest point, while the bottom is 115 ft. The maximum pressure used in driving the tunnel was 39 lb. The termini of the tunnel are East 14th St., Manhattan, and the foot of North 7th St., Williamsburg, Brooklyn.

One Hundred Engineers for Civilian Service

About 100 engineers will be released from Government service in the Western district, Interstate Commerce Commission, on or about Oct. 1. These men have been employed by the Government at salaries ranging from $725 to $3000 per annum, plus all expenses. Many of them have had extensive experience in the construction and maintenance of railways, and in general engineering.

John S. Worley, member of the Engineering Board, with headquarters at Interstate Building, Kansas City, Mo., will be glad to correspond with anyone with reference to the employment of any of these men. If interested persons will write to him the particular employment for which services are sought, and the range of salaries, he will be glad to give a complete statement of any one of the men whom he would recommend.

It is thought this may be of considerable interest to many of the readers of *Engineering News-Record*.

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago. Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 505 Pearl St.

Carnegie Dies in 84th Year

Andrew Carnegie died at his summer home in Lenox, Mass., Aug. 11, in his 84th year. He entered the steel business in 1863, having previously come to this country from Scotland, and having become a telegraph messenger at 14. He became a telegraph operator for the Pennsylvania R.R. and subsequently was made division superintendent. It is estimated that his fortune approximates $500,000,000.

Zoning for Washington, D. C.

A zoning commission for the District of Columbia is proposed by Senate bill 1369, introduced by Senator Calder of New York. The commission would be composed of the three commissioners of the District of Columbia, the officer in charge of public buildings and grounds of the District and the superintendent of the United States Capitol building and grounds. Within six months of the passage of the act the commission would divide the District of Columbia into height, area and use districts. The bill has the approval of the District commissioners.

Policies Stated by Highways Transport Committee

Rail and Water Facilities Declared Important — Effect of Transport on Public Health—Membership

At a recent meeting of the Highways Transport Committee, as newly organized, a policy was stated regarding the various means of transportation, such as rail, both steam and electric, and water. The effect of highway transport on the public health, as set forth by medical journals, was also made a matter of record. Emphasis was placed upon the necessity for developing highway transport to the utmost, and consideration was given to making such operation safer both as an investment and physically.

In stating its peace-time policy, the committee declared for greater highway transportation facilities to increase production and aid in distribution. However, it questions the value of such transportation when established parallel to and in direct competition with rail and water facilities. Rail and water transport should be fostered, and, at the same time, as stated in resolutions adopted, "the committee is becoming more and more convinced that the development of efficient rail, electric and water facilities is dependent upon the establishment of highway transportation facilities in territories such as will prove complementary to such rail, electric and waterways systems, instead of competing with them."

Good Roads and Health

In further advocacy of highway transport, an editorial published in *Modern Medicine*, entitled "Good Roads and Health," was introduced into the minutes of the meeting. This editorial set forth that rural health conditions, especially among babies and mothers, and contrary to general belief, are lower than city health conditions. This was attributed to poor highway facilities which hinder physicians. The proportion of young men unfit for service in the war was as great in country as in city districts, it was stated.

The committee is anxious to learn of locations where proper facilities are lacking, with a view to organizing rural motor-express routes, and return-load bureaus, which are necessary to make the routes a paying investment. The necessity of improving the locations of roads at corners, etc., to make them safer, was also emphasized by a report taken from the *Commercial Motor* of England. This extract advocated that powers be given to the proper authorities to regulate the clearances and

visibility at corners, by removing hedges, buildings and high fences.

The Highways Transport Committee as now constituted consists of the following representatives of Government departments:

War Department, Lieut. Col. J. M. Ritchie, Motor Transport Corps; Postoffice Department, James I. Blakslee, fourth assistant postmaster general; Interior Department, John W. Halowell, assistant to the secretary; Department of Agriculture, James H. Collins, of the Bureau of Markets, and Clifford Shoemaker, of the Bureau of Public Roads; and Department of Commerce, R. S. MacElwee, assistant director of the Bureau of Foreign and Domestic Commerce. The new members are Mr. Shoemaker, succeeding J. M. Goodell, who has retired from the Bureau of Public Roads, Mr. Halowell and Lieutenant Colonel Ritchie.

Shipping Board Reconstituted

Three new members of the United States Shipping Board took office last week, and the board thus again has a full quota of members. Judge John B. Payne, Commander Thomas A. Scott and H. M. Robinson are the new members, while Vice-Chairman Raymond B. Stevens and John A. Donald are the holdover members. Judge Payne has been elected chairman of the new board.

Highway Activities in New South Wales

Reports from Australia state that a good-roads movement is about to begin throughout the continent. The campaign is especially strong in New South Wales and Victoria. Legislation has already been passed facilitating the movement, and New South Wales, with its local government amendment act, has empowered shire councils to grant franchises for the development of roads, hydro-electric schemes and irrigation projects. Victoria has already its county roads commission.

Nearly 500,000 soldiers are returning home from countries where good roads are the rule rather than the exception. In each state of the Commonwealth many thousands are being settled on the land and they demand good roads.

An Anzac Highway, to extend around the Australian continent, after the plan of of the Lincoln Highway in America, has been approved by both Federal Houses of Parliament, but the work is proceeding slowly, owing to lack of labor and machinery.

English and continental machinery cannot continue to supply the Australian demand as before the war, as there are in Europe nearer markets and countries needing reconstruction. American motor cars and trucks have already appeared in the Australian market, and roads are essential for their further success and appreciation. It is also thought that American highway machinery and products will soon find a large market there.

Plumb Plan Arouses New Interest in Valuation

New interest in the physical valuation of the railroads has been aroused in Washington in view of the Plumb plan of the railway brotherhoods for the taking over of the railroads by the Government, since the sponsors of the plan have set the value of the properties a great deal lower than previous estimates. It has been noted that a certain amount of ignorance in regard to the progress of valuation work has been displayed by officials of the United States Railroad Administration. The Washington correspondent of *Engineering News-Record* reports, after an investigation in Washington, that the work of the valuation is, however, still continuing, as it has ever since 1913, when the law providing for it was passed, notwithstanding war conditions in the meantime.

At the office of Judge Prouty of the Interstate Commerce Commission's committee which has charge of the work, the statement is made that so far the cost of valuation has been $17,500,000, and that all of the field work has now been done. It is also stated that the Director of Valuation intends to release and discharge from the service, by Jan. 1, 1920, 150 engineers in each of the five districts. There are now in the employ of the Director of Valuation about 1200 men. Principally there remains only office and tabulation work to be done.

In 1913 Congress appropriated $250,000 for the work. An examination of the appropriation bills since then shows that up to May 31, 1917, $8,250,000 had been paid. In 1918 the appropriation bill carried $3,500,000, and in 1919 the same amount. The current appropriation bill, which became effective July 1, 1919, and which will expire on the same date next year, carries an appropriation of $2,500,000 for the work.

It is stated at the office of the director, as noted above, that, since the work began in 1913, seventeen odd millions of dollars have been spent, and that the division has succeeded in announcing the physical valuation of about 20 small railroads in the Southern and Southwestern sections of the United States.

Colonel Mears Chairman of Alaska Railroad Commission

Col. Frederick Mears, formerly of the 31st Engineers and in charge of the transportation of American forces in France, has been made chairman and chief engineer of the Alaskan Engineering Commission, in charge of building the Government railroad.

Colonel Mears left Washington Aug. 9 for Seattle, Wash., where he is expected to arrive Aug. 14. He will sail immediately for Alaska on an inspection tour of the Government railroad. With Colonel Mears will be John W. Halowell, assistant to the secretary of the Interior and in charge of the Alaskan Engineering Commission, and Col. George Slade, of the Northern Pacific Railway.

During the war William C. Edes was the chairman, and for some time the only member, of the commission. Colonel Mears resigned in January, 1918, to join the American forces in France, and Thomas Riggs, Jr., the other member, resigned in April, 1918, to become Governor of Alaska. Colonel Mears now remains the only member of the commission, and, owing to the fact that its funds are quite low, it is not likely that other members will be appointed this year.

William C. Edes, retiring chairman, has been appointed consulting engineer of the commission.

Court Rules Lower Otay Dam Failure Was "Act of God"

The Superior Court of California has rendered a decision in the case brought by the land owners of Otay Valley against the City of San Diego in an endeavor to collect for damages caused by the failure of the Lower Otay dam. This was an earth and rock-fill dam that failed Jan. 27, 1916. The failure was described in *Engineering News* of Feb. 3 and 17, 1916, pp. 236 and 334, and also in *Engineering Record* of Feb. 12, 1916, p. 225. The court held that the failure was caused by an "act of God" and that the city is not responsible.

Classification and Pay of State and Municipal Engineers

In furtherance of a plan to determine what changes should be made in the compensation of engineers working for salaries, the state and municipal section of Engineering Council's committee on the classification and compensation of engineers (29 W. 39th St., New York City) has prepared a tentative classification of engineering positions in state, county and municipal service. Copies of this classification, accompanied by a questionnaire as to compensation paid July 1, 1915, July 1, 1919, and compensation recommended, are being sent by the section committee named to all state engineers and state highway engineers and to all city engineers in places of 100,000 population and over—a total of 161. Recipients of the questionnaire are requested to vote yes or no as to concurrence in the classification proposed by the committee; to offer remarks upon the "present morale of the service reported on"; and to suggest "the course to be pursued in order to insure recognition of the results of this investigation." The section committee consists of Arthur S. Tuttle, deputy chief engineer, Board of Estimate and Apportionment, New York City; Frederick W. Cappelen, city engineer, Minneapolis, Minn., and M. M. O'Shaughnessy, city engineer, San Francisco.

Shipyards Consolidate

Formal merging of the Chester Shipbuilding Co. with the Merchant Shipbuilding Corporation under the name of the latter has just been announced. Both properties have been under the same ownership, with identical officers, and the present consolidation is essentially a reorganization of management. The Merchant yard, one of the three original Government agency yards, is located at Bristol, Penn., and has 12 building ways. The Chester yard, at Chester, Penn., is an expansion from the old yard of John Roach, the oldest steel shipyard in the country; it has been building ships on seven ways.

Contributions from Engineers, Architects and Constructors' Conference on National Public Works

M. O. LEIGHTON, Chairman

PUBLISHER'S NOTE *The space occupied under this caption is donated to serve as a means of frequent and intimate communication between the Engineers, Architects and Constructors' Conference on National Public Works, and the members of the profession. The contributor takes full authority for the statements made.*

UNITED STATES COAST AND GEODETIC SURVEY

The latest bulletin from the Engineers, Architects and Contractors' Conference on National Public Works deals with the work of the United States Coast and Geodetic Survey and other Government agencies engaged in mapmaking. An analysis of all the activities of the Survey, according to the bulletin, shows the work to be entirely technical and largely engineering in the strictest sense. It is contended that the entire activities of this bureau coud well be coördinated with those of the other mapmaking agencies of the Government thereby bringing about an improvement in the amount and character of the work done. The bulletin says, in part:

SHOULD CO-ORDINATE SURVEYS

The results of the Survey's work are made use of by commerce, by railways, by land owners of every kind and by all enterprises whose primary investigations require the use of maps. The putting of all of these surveys, whether by land or by sea, under the Bureau of Public Works would insure a comprehensive mapping plan and the use of consistent scales and legends on all maps, and would bring together a permanent corps of skilled surveyors who would be capable of mapping the interior of the United States with such exactitude as would make their results of unlimited value in time of peace, and in war their maps would be the basis of all war operations even as the French maps were recently.

Instead of 12 independent bureaus making surveys, each without liaison with the other 11, there would be one central department planning and conducting this work, weighing the comparative needs of different sections and so directing the efforts of the department that the greatest good to the greatest number would result

These maps, under a unified control, would be made with sufficient detail and exactness to cover the most particular needs. The information once gathered, it would be comparatively simple to adapt it for any special purpose, whether it be war, idustry or commerce.

There is no work that this Survey does that does not fit in well with the work planned for the Department of Public Works. It is essentially an engineering work and consequently belongs in the national Department of Public works, together with the other engineering activities of the Government.

Strengthening of Patent Office Legislation

The patents committee of Engineering Council has collaborated with the similar committee of the National Research Council in developing a scheme for the improvement of the method of dealing with patents in this country. The staff of the Patent Office is itself actively engaged in this effort. Out of the report prepared by the National Research Council, and approved and adopted by Engineering Council as the report also of its patents committee, remedial legislation has taken form. Three bills have been introduced, as follows: One, known as H.R. 5011, is a bill to make the Patent Office independent of the Department of the Interior or any other department, and to simplify the procedure of the courts with reference to assessment of damages or profits for infringement of patents; H.R. 5012 is a bill to establish a single court of patent appeals, and H.R. 7010 is a bill to increase the force and the salaries in the Patent Office. Chairman Charles A. Terry, of the patents committee of Engineering Council, requests that those interested write to their Congressmen, urging the passage of these bills.

American Chemical Society Will Meet September 2-6

The autumn meeting of the American Chemical Society will be held at the Bellevue-Stratford Hotel, Philadelphia, under the auspices of the Philadelphia section of the society, Sept. 2-6. Two new divisions of the society will hold their first meetings. One session will be addressed by Secretary of War Baker.

Civil Service Examinations

Canada—Junior engineer, Department of Public Works, Prince Rupert, B. C., $1680 per year. Application forms may be obtained from the offices of the Employment Service of Canada or the Secretary of the Civil Service Commission, Ottawa, and must be filed not later than Aug. 29.

New York—Inspector of engineering work, county service, $960 per year. File application before Aug. 20; Sanitary engineering inspector, State Department of Health, $1,260 per year. Applications must be filed not later than Aug. 20. Statistician, Bureau of Statistics and Information, State Industrial Commission, $1,500 to $1,800 per year. Applications must be filed before Aug. 20; Albany, N. Y.

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Patent investigator, patents section, War Department, $1200 to $1800 per year. File applications before August 26.

Expert patent investigator, patents section, War Department, $1800 to $2400 per year. File applications before Aug. 26.

Research engineer, $2,800 to $3,200 per year, Ordnance Department. File application before Sept. 2.

Plant superintendent, $2,000 to $2,400 per year, Ordnance Department. File application before Sept. 2.

Research physicist, $2,700 to $3,200 per year, Ordnance Department. File application before Sept. 2.

Radio engineer, $3,000 to $4,800 per year; assistant radio engineer, $2,000 to $3,000 per year; radio laboratory assistant, $800 to $2,000 per year, Signal Service, War Department. File application before Sept. 2.

Mathematics and dynamics experts, Grade I, $2,500 to $4,000 per year; Grade II, $4,000 to $5,000 per year, Ordnance Department. File application before Sept. 2.

Specification engineer, $2,400 per year; Chief Signal Officer's Office, War Department. File application before Sept. 9.

Chief metallurgist, $4,500 to $5,000 per year; assistant chief metallurgist, $3,600 to $4,500 per year, Ordnance Department. Applications must be filed before Sept. 16.

Junior highway bridge engineer, Office of Public Roads and Rural Engineering, Department of Agriculture, $1200 and $1600 per year, Sept. 17.

Computer, Ordnance, Navy Yard, Washington, D. C., $7.20 to $12 per diem, Sept. 17. File applications in time to arrange for examination at place selected by applicant.

Assistant examiner, Patent Office, Washington, D. C., $1500 to $1740 per year, Sept. 17 to 19 and Nov. 19 to 21. File applications in time to arrange for examination at place selected by applicant.

Engineer, $3000 per year; assistant engineer, $1800 to $2880 per year; junior engineer, $1200 to $1740 per year; engineering draftsman, $1200 to $3000 per year, Reclamation Service Applications will be received until further notice.

ENGINEERING SOCIETIES

Calendar

Annual Meeting

NEW ENGLAND WATER WORKS ASSOCIATION Tremont Temple, Boston. Sept. 30, Oct. 1-3.
Albany, N. Y.

AMERICAN SOCIETY OF NAVAL ENGINEERS; Sec. Lieut. Com. F. W. Sterling, U. S. N., Navy Department, Washington, D. C.; Oct. 7, Washington.

AMERICAN PUBLIC HEALTH ASSOCIATION. 169 Massachusetts Ave., Boston; Oct. 27-30, New Orleans.

The Duluth Engineers' Club, at its monthly meeting Aug. 4, adopted a report prepared by a committee composed of Frank Hutchinson, Dwight E. Woodbridge and W. H. Woodbury, recommending the construction at the earliest possible date of a channel from Lake Superior ports to Atlantic tidewater, to be of sufficient depth to provide for the passage of seagoing vessels drawing 21 ft. of water, and with provision to use the water-power that would be made available. The resolution commended the efforts of the Great Lakes Tidewater Commission, and urged upon the state's senators and representatives in Congress that they promote the project in every way possible. A resolution was adopted indorsing the bill to establish a national Department of Public Works. The following officers were elected: President, Col. F. A. Pope; vice-presidents, W. A. Clark and J. L. Pickles; treasurer, A. V. Shipman, and secretary W. H. Woodbury.

The Oregon Society of Engineers unanimously voted at its meeting July 24 to amalgamate with the American Association of Engineers.

The New York Chapter of the American Association of Engineers held a meeting in the Engineering Societies' building, Aug. 13.

The Colorado Society of Engineers held Aug. 1 its monthly meeting, which was devoted to a discussion of national engineering questions. Recommendations for the speedy completion of the topographic mapping of the country were approved, and the committee on national affairs reported favorable replies from all the state's Congressmen. Active support was promised by the Wyoming and Idaho state societies. Favorable action was taken on the soldiers' settlement bill, and sentiment was expressed in favor of the bill for a national Department of Public Works. Affiliation with a national organization, either the American Association of Engineers or some organization yet to be formed including all societies, was discussed, and the question was left in the hands of a committee consisting of Hugh Glen, V. B. Wagner and R. M. Hosea, to make a recommendation on which a letter ballot may be taken.

PERSONAL NOTES

WALTER JACKSON, for 17 years associated with the *Electric Railway Journal*, first as associate editor and then as business manager, has resigned in order to engage in consulting work on the application of zone fare systems to electric railways and the coördination of bus and electric-railway service. He recently completed a four-months' study in England of both of these subjects. He has written extensively on electric-railway matters and is co-author with Henry W. Blake of a book entitled "Electric Railway Transportation." Mr. Jackson's offices will be at 567 8th St., Brooklyn, N. Y.

HARRY N. JENKS has returned to this country from his position as sanitary engineer, Burma Mines, Ltd., Namtu, Burma, and has become assistant engineer under C. G. Gillespie, director, bureau of sanitary engineering, California State Board of Health, with headquarters at Berkeley. Mr. Jenks is the author of the article, "Sanitary Engineers Get Direct Results in East Indian Mining Camp," which appeared in *Engineering News-Record* of Jan. 23, 1919, p. 172.

ROBERT B. HOADLEY, formerly county assistant, New York State Highway Department, with headquarters at Binghamton, and JOHN A. GILES, formerly commissioner of public works and city engineer of Binghamton, have formed the firm of HOADLEY & GILES, Phelps Bldg., Binghamton, N. Y. They will conduct a general practice, specializing in municipal work, highways, subdivision and topographical surveys.

DELANO & ALDRICH, architects, and the firm of CHARLES H. HIGGINS, architects and engineers, have discontinued the business association they had during the war. Each firm will continue its practice, Delano & Aldrich at 126 E. 38th St., and Charles H. Higgins at 19 W. 44th St., New York City.

LIEUT. COL. HENRY S. SPACKMAN, Corps of Engineers, U. S. A., returned to this country July 18 and received his discharge from the service. He has resumed his work as president of the HENRY S. SPACKMAN ENGINEERING CO., engineers, chemists and inspectors, Philadelphia. He reported for active service in July, 1917, and was assigned to duty with the officer in charge of cantonment construction, later becoming constructing quartermaster at Camp Merritt, New Jersey. He left for France in September, 1917, and later served as chief of the cement section. Last January he was assigned to duty with the peace commission as technical adviser, Department of Finance and Economics, War Damages in Allied Countries, and was engaged in the determination of damages to France, Belgium, Italy, Serbia, Roumania and Greece. He has recently been attached to the Army Educational Commission in Paris as director of the bureau of institute organization and industrial problems.

CAPT. JACK J. HINMAN, JR., Sanitary Corps, U. S. A., who has been engaged in water-supply work in France, has received his discharge from the service and has returned to his work as water bacteriologist and chemist for the Iowa State Board of Health and assistant professor of epidemiology in the State University of Iowa, Iowa City.

ROBERT COLTMAN, JR., who was recently connected with BARCLAY PARSONS & KLAPP, consulting engineers, New York City, in the construction of the twin graving docks for the Emergency Fleet Corporation at Norfolk, Va., has become construction engineer for the American Mongolian Trading Co. at Kalgan, China.

GEORGE F. COTTERILL, chief engineer of the state highway department, Olympia, Wash., since 1916, has resigned. COMMISSIONER JAMES ALLEN will continue to exercise supervision over the engineering work that is directly administered by resident engineers in the various highway districts.

F. D. MESSENGER is now on inactive duty as assistant sanitary engineer, United States Public Health Service, and has become an engineer in the office of the state highway department, Lansing, Mich. While in the service he was in charge of antimalarial operations in the Camp Logan zone, Houston, Tex.

LIEUT. JACK T. NASH, Engineers, U. S. A., has received his discharge from the service and has resumed his connection with the HENRY EXALL ELROD CO., as chief office engineer, at Dallas, Tex.

ALFRED WALDRON SMITHERS, chairman of the board of directors of the Grand Trunk Railway System of Canada, has been granted knighthood by King George V.

T. DANTZIG, G. A. PFEIFFER, and J. F. RITT have become associated under the firm name of DANTZIG, PFEIFFER & RITT, consulting mathematicians, 500 W. 116th St., New York City, and will specialize in problems arising in industry for the solution of which the knowledge of mathematical specialists may be necessary. Dr. Dantzig is a graduate of the University of Paris and of the École Supérieure d'Aëronautique et de Construction Méchanique. He has taught at Indiana University and at Columbia University. During the war he was in charge of the mathematical work of the instrument section of the

United States Ordnance. Dr. Pfeiffer received the degree of mechanical engineer from Stevens Institute of Technology and the degree of doctor of philosophy from Columbia University He has taught mathematics at Harvard, Princeton and Columbia, and he is an associate editor of the *Annals of Mathematics*. Dr. Ritt took the degree of doctor of philosophy at Columbia University. He was for three years at the Naval Observatory and has since taught mathematics at Columbia; during the war he was one of the chief ballisticians in the United States Ordnance.

B. W. MATTESON, formerly in the city engineer's office, Los Angeles, Calif., is now connected with the Bureau of Public Roads, Department of Agriculture. His headquarters are at Enterprise, Utah.

CHARLES A. HASKINS, until recently captain in the Sanitary Corps, U. S. A., on duty in the office of the Surgeon General, has been appointed director of the division of water and sewage, Kansas State Board of Health.

ALLAN WATERS, for five years supervising architect for the British Columbia Government, and for the past 2½ years in overseas war service, has located for practice of his profession in Seattle, Wash.

J. C. TOWNLEY, formerly superintendent of public works, Ithaca, N. Y., who recently received his discharge from the 23rd Engineers, U. S. A., has been appointed assistant engineer with HUGH L. COOPER & CO, hydro-electric engineers, New York City, with headquarters at Massena, N. Y.

W. C. MAURICE, assistant engineer, New York Central R.R., has been temporarily assigned to special work in the engineering and maintenance section, division of operation, United States Railroad Administration, with office in Washington, D. C.

JOHN REVELL, who for the past year has been engaged as assistant engineer in the construction of Camp Knox, Kentucky, has been appointed chief draftsman, Kentucky Department of Public Roads, at Frankfort.

A. S. ADAMS has temporarily suspended his engineering practice in the Union National Bank Bldg., Houston, Tex., to become general superintendent of the refinery department, Humble Oil & Refining Co., Baytown, Tex.

COL. A. MCPHAIL, C.M.G., D.S.O., has returned from the Canadian forces overseas and resumed his former position as head of the department of civil engineering at Queens University, Kingston, Ont.

GILBERT K. COOPER and GEORGE B. MCCLARY have become associated under the firm name of COOPER & MCCLARY, civil engineers, 343 S. Dearborn St., Chicago, and will engage in general practice. Mr. Cooper was field engineer for the Chicago Union Station Co., and Mr. McClary has served as field engineer for the same company since receiving his discharge as captain of engineers, United States Army.

T. CANBELL, provincial government engineer, St. Boniface, Man., has been elected a member of the Royal Society of London.

W. F. DUGAY and G. A. PRINGLE, Seattle, have formed a partnership and opened offices as consulting engineers and contractors in steam and hot-water heating, at 201 Boston Building.

C. L. POST, vice-president of the CONDRON Co., engineers, Chicago, has taken charge of the newly-created branch of that company at Akron, Ohio.

CARL F. MEYER has resigned as chief engineer of the MORGAN PARK Co., Duluth, Minn., after six years' service with it and associated engineering firms.

BLAIR BOYLE, county engineer of Geary County, Kansas, has resigned to accept appointment as county engineer of Bourbon County, Kansas.

T. A. GARROW has resigned as city engineer of The Dalles, Oregon.

LIEUT. FRANK MITCHELL, engineers, U. S. A., who recently returned to this country and received his discharge from the service, has been appointed highway engineer of Thomas County, Georgia.

T. H JOHNSON has resigned as city engineer of Sioux City, Iowa, and A. M. SCHOTT has been named acting city engineer.

GEORGE H. HALEY, Watertown, N. Y., has become associated with the du Pont Construction Co., Wilmington, Del., as a construction engineer.

V. V. LONG has opened offices in the Colcord Bldg., Oklahoma City, Okla., under the firm name of V. V. LONG & Co., to conduct an engineering practice in municipal improvements.

OBITUARY

FREDERICK J. REMMERS, president, Frederick Remmers Construction Co., St. Louis, died recently in that city. At the age of 24 he organized the Remmers Construction Co., of which he was president for more than 55 years.

Common Brick Manufacturers' Association to Advertise

A national advertising campaign is proposed by the Common Brick Manufacturers' Association of America, which held its first annual convention in Chicago in February, 1919. At that time it was proposed to adopt a trademark to be molded in every brick manufactured by the members of the association, irrespective of the company. This measure has now been adopted, and the association proposes to enter upon a nation-wide campaign to keep the advantages of common building brick before the public.

In furtherance of this plan, the association has issued a pamphlet, 13 x 20 in., the subject of which is a national campaign to educate the public in the use of common brick and to build business. The pamphlet deals with the need for publicity in its various phases. The association has also issued some smaller booklets, descriptive of the association and its aims.

International Trade Conference To Be Held at Atlantic City

An international trade conference is announced for Atlantic City during the week of Sept. 29. Invitations have been extended by the Chamber of Commerce of the United States to Great Britain, France, Italy and Belgium for a joint commercial mission to visit this country in the autumn and attend the conference. It is intended that the mission shall tour the country after the conference, visiting the chief industrial and commercial centers.

The main purpose of the visit and of the international trade conference is to acquaint American business men with the situation abroad, and to bring about closer relations between this country and its European associates in the war. It is felt that unless the European countries can begin production on a large scale they are faced with a serious danger in that they may not be able to pay for food and clothing which they need, and meet other obligations.

At Atlantic City questions regarding financial and trade relations with foreign countries will be taken up and discussed. That the missions will have standing is evidenced by the fact that at least two will be headed by cabinet members, and each will be accompanied by a Government representative. Each will include five principals and a number of assistants and secretaries, making a party altogether of 50 or 60. It is estimated that the conference will be attended by at least a thousand leaders of American business.

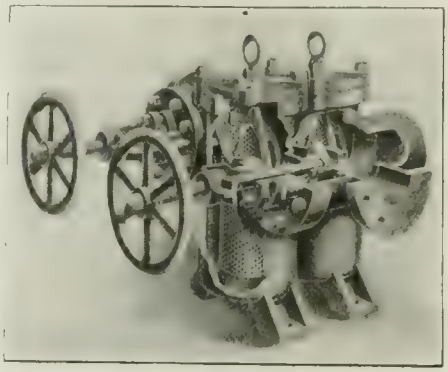
A. C. Bedford, chairman of the Standard Oil Co. of New Jersey, will act as chairman of both the general and the executive committees. Among the members of the executive committee will be Homer L. Ferguson, president of the United States Chamber of Commerce; Thomas W. Lamont, of J. P. Morgan & Co.; James A. Farrell, chairman of the National Foreign Trade Council; William F. Morgan, president of the Merchants' Association of New York. Further information may be obtained by addressing Elliott H. Goodwin, general secretary of the Chamber of Commerce of the United States, at Washington, D. C.

Duplex Strainer for Water or Oil

A duplex strainer, designed for installation in the suction of discharge lines of lubricating- or fuel-oil systems for the removal of solids in suspension, and suitable also for straining the water-supply from such sources as rivers and lakes to prevent the entrance of weeds, sticks, marine plants and small fish into the pipe lines, is shown in the accompanying illustration.

Such foreign material, if not removed from the oil, makes the lubrication inefficient, and may seriously damage the bearing surfaces. Similarly, sediment in fuel oil tends to clog the burners, reducing their capacity and necessitating frequent cleaning. The necessity of removing such solids from water is well understood.

The strainer consists of a cast-iron body containing two perforated steel or brass baskets. The valve arrangement permits the complete removal and cleaning of either basket while the other remains in service. In operation, the oil or other liquid enters the inlet connection of the strainer and passes into the basket that is in service, the solid matter remaining in the basket while the liquid passes through the perforations and thence out of the strainer. All the cast-iron sections are cylindrical, resulting in maximum strength. The valve mechanism is very simple



DUPLEX STRAINER OPENED TO SHOW BASKETS

and the valves are easily reground. The apparatus is manufactured by the Griscom Russell Co., 90 West St., New York City.

Business Notes

THE INDEPENDENT PNEUMATIC TOOL CO., 600 W. Jackson Boulevard, Chicago, announces that Sergeant Paul Mitchell has returned from service with the American Expeditionary Forces in France, and has resumed his duties as traveling representative for the company.

THE CHICAGO PNEUMATIC TOOL CO., Fischer Building, Chicago, has appointed J. L. Canby as district manager of sales at Chicago, succeeding Nelson B. Gatch, who has been transferred to New York as district manager of sales.

PAUL KIRCHER, sales engineer of the Massey Concrete Products Corporation in Chicago, has been transferred to New York and has become resident manager, reporting to Charles Gilman, vice-president, in charge of the Massey interests in the East.

THE AMERICAN STEAM CONVEYOR CORPORATION, engineering and contracting, Chicago, has appointed Thomas O. Morgan, until recently head of the service department of the New York office, sales engineer. He will handle the Long Island and Connecticut territory. H. S. Valentine has also been appointed sales engineer in charge of the Philadelphia territory, with offices in the North American Building. Mr. Valentine is a mechanical engineer and was connected with the Link Belt Co. of Philadelphia for 5½ years. He has also been associated with the Brown Hoisting Machine Co., the Yale & Towne Manufacturing Co. and the Badenhausen Company.

THE PETROLEUM REFINING CO., of Texas has changed its corporate name to the Galina-Signal Oil Co. Its offices are at 1504 Carter Bldg., Houston, Tex.

THE GREEN ENGINEERING CO., East Chicago, Ind., has appointed the firm of Bull & Livensparger as its sales representatives in Chicago and Northern Illinois territory. The latter firm will take charge of the Chicago sales office at 14 E. Jackson Boulevard. Messrs. Bull and Livensparger have been connected with the company for several years.

THE AUSTIN CO., industrial engineers and builders, Cleveland, Ohio, has appointed F. W. Mettler as director of purchases, to succeed F. B. Gerard, who has resigned to become general manager of Pilkington Bros. Co., Ltd., at Thorold, Ont.

THE YOUNGSTOWN STEEL CAR CO., Youngstown, Ohio, has appointed George J. Lynch sales manager, with headquarters at Youngstown.

THE FOUNDATION CO., Woolworth Bldg., New York City, announces that it has established offices at 16 Rue de La Pépinière, Paris, and is prepared to undertake operations in European countries. American corporations contemplating engineering or construction work abroad can arrange at the New York office of the Foundation Co. for the carrying out of the details of the project. The French organization, which operates under the name of "Fondations, Constructions, Travaux Publiques," includes engineers who have had years of experience with the Foundation Co. At a recent meeting of the board of directors Franklin Remington was elected chairman of the board, John W. Doty was elected president of the company, and Harry J. Deutschbein was elected first vice-president and general manager.

THE BLAW-KNOX CO., manufacturer of steel products, Pittsburgh, Penn., has recently completed a playground at its plant at Hoboken, Penn., to be used by the children of the employees. The center is complete in every detail, including a swimming pool, and is intended for employees as well as their children.

Trade Publications

The followng companies have issued trade publications:

THE BARBER ASPHALT PAVING CO., Land Title Building, Philadelphia, Penn.; bulletin No. 6, 8 x 10½ in., eight pages, illustrated; subject, Iroquois asphalt paving tools.

THE WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J.; booklet, 5 x 7 in., 16 pages, illustrated; tells of the effects of corrosion of condenser tubes, gives price list of seamless tubes, weight per lineal foot for various diameters, and other information.

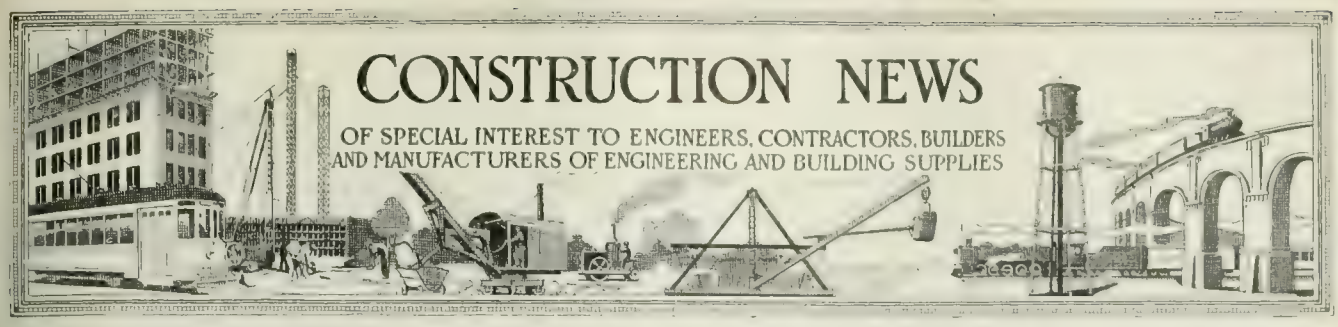
THE COMBUSTION ENGINEERING CORPORATION, of New York; bulletin No. G-1, 6 x 9¼ in., 20 pages, illustrated; the subject is grates for the promotion of combustion.

THE A. LIETZ CO., 61 Post St., San Francisco, Calif.; catalog, 6¼ x 9¼ in., 612 pages, illustrated; it lists the company's surveyors' and engineers' instruments and a large number of engineering books and publications. The company carries a stock of engineers' and surveyors' instruments.

THE BEDFORD FOUNDRY & MACHINE CO., Bedford, Ind., manufacturer of cranes and derricks; catalog, 8¾ x 11¼ in., 59 pages, illustrated; its subject is Bedford cranes and derricks.

THE GUARANTY TRUST CO., 140 Broadway, New York City; bulletin, 6¼ x 9¼ in., 28 pages, illustrated; subject, "Trading With Mexico Today."

THE UNITED AIRCRAFT ENGINEERING CORPORATION, of New York, has just issued an interesting booklet entitled "Commercial Aviation and Its Relation to the Community." It is the first of a series which will show in its true light the present status of commercial aviation and its future possibilities; the booklet is 4 x 9¼ in. and contains 18 pages. Among other subjects it has pages devoted to the types of aircraft, speed, endurance, landing, load, altitude, safety and cost of operation.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Aug. 18	Garber, Okla.	Aug. 7
Aug. 18	Ashland, Ky.	Aug. 14
Aug. 19	Philadelphia, Pa.	Aug. 14
Aug. 20	Armour, S. D. Adv. July 24.	July 24
Aug. 20	Hawthorne, N. J. Adv. Aug. 14.	Aug. 14
Aug. 25	Grey Bull, Wyo.	Aug. 14
Aug. 25	Royal Oak, Mich.	Aug. 14
Aug. 30	Berwick, N. S.	Aug. 14
Aug. 30	Clarksburg, W. Va. Adv. Aug. 7.	Aug. 7

SEWERS

Aug. 18	Hackensack, N. J. Adv. July 24.	July 24
Aug. 18	Huntington, Pa.	July 31
Aug. 18	St. Paul, Minn.	Aug. 14
Aug. 18	Harrisburg, Pa.	Aug. 14
Aug. 18	Detroit, Mich.	Aug. 14
Aug. 18	Crisfield, Md.	Aug. 7
Aug. 18	Paulsboro, N. J. Adv. Aug. 7.	Aug. 7
Aug. 18	Towson, Md.	Aug. 7
Aug. 19	Toledo, O.	Aug. 14
Aug. 19	Kansas City, Mo. Adv. July 3 to 17.	July 3
Aug. 20	Cartersville, Ga.	Aug. 7
Aug. 20	Philadelphia, Pa.	Aug. 14
Aug. 21	Mandan, N. D.	Aug. 7
Aug. 21	Senatobia, Miss. Adv. Aug. 14.	Aug. 14
Aug. 21	New Baltimore, Mich.	Aug. 14
Aug. 25	Walnut Grove, Minn.	Aug. 7
Aug. 25	Lima, O. Adv. Aug. 7.	Aug. 7
Aug. 25	Royal Oak, Mich.	Aug. 14
Aug. 25	Fairhaven, Mass. Adv. Aug. 14.	Aug. 14

BRIDGES

Aug. 18	Harrisburg, Pa.	Aug. 7
Aug. 18	Pritchard, B. C.	Aug. 7
Aug. 18	Pine City, Minn.	Aug. 14
Aug. 18	Harrisburg, Pa.	Aug. 14
Aug. 19	St George Island, Md.	Aug. 14
Aug. 19	Pickering, Ont.	Aug. 14
Aug. 19	Statesboro, Ga.	July 3
Aug. 19	Orangeville, Ont.	Aug. 14
Aug. 19	Port Hope, Ont.	Aug. 14
Aug. 20	Swainsboro, Ga.	July 3
Aug. 20	New Jersey Adv. Aug. 7.	Aug. 7
Aug. 20	Barrington, R. I.	Aug. 14
Aug. 20	Albany, Ore.	Aug. 14
Aug. 20	Michigan	Aug. 14
Aug. 25	Willougby, O.	Aug. 7
Aug. 25	Great Falls, Mont.	Aug. 7
Aug. 25	Underwood, Wash	Aug. 14
Aug. 26	Lockhart, S. C. Adv. Aug. 14.	Aug. 14
Sept. 1	Duluth, Minn.	Aug. 14
Sept. 2	Minneapolis, Minn.	Aug. 14
Sept. 3	Toledo, O.	Aug. 14
Sept. 9	Duluth, Minn	Aug. 14
Sept. 23	Harrisburg, Pa Adv Aug. 14.	Aug. 14

STREETS AND ROADS

Aug. 16	Michigan	Aug. 14
Aug. 16	Granite City, Ill. Adv. Aug. 14.	Aug. 14
Aug. 18	Walnut Ridge, Ark. Adv. July 17.	July 17
Aug. 18	Trenton, Ont.	Aug. 7
Aug. 18	Beamsville, Ont.	Aug. 7
Aug. 18	London, Ont.	Aug. 7
Aug. 18	Brantford, Ont.	Aug. 7
Aug. 18	Kingston, Ont.	Aug. 7
Aug. 18	Brockville, Ont.	Aug. 7
Aug. 18	California	Aug. 14
Aug. 18	Philadelphia Pa	Aug. 14
Aug. 18	Chester, Pa.	Aug. 14
Aug. 18	Toronto, Ont	Aug. 14
Aug. 19	Michigan	July 31
Aug. 19	Reedsburg Wis	Aug. 14
Aug. 19	Manitowoc, Wis.	Aug. 14
Aug. 19	Anoka, Minn	Aug. 14
Aug. 19	Columbus, O	Aug. 14
Aug. 19	Michigan	Aug. 7
Aug. 19	Farmington, Minn.	Aug. 7
Aug. 19	Georgetown, Del.	July 31
Aug. 19	Faribault, Minn.	July 31
Aug. 19	Harrisburg, Pa.	July 31
Aug. 19	Michigan	Aug. 14
Aug. 20	Alabama	Aug. 14
Aug. 20	Baltimore, Md.	Aug. 14
Aug. 20	Brooklyn, N. Y.	Aug. 14
Aug. 21	De Queen, Ark.	July 24
Aug. 21	Oil City, Pa.	Aug. 7
Aug. 21	Michigan	Aug. 14
Aug. 21	Newport News, Va.	Aug. 14
Aug. 21	Michigan	Aug. 14
Aug. 21	St. George, S. I., N. Y.	Aug. 14
Aug. 22	St. George, S. I., N. Y.	Aug. 14
Aug. 22	Boise, Idaho	Aug. 14
Aug. 23	Brainerd, Minn.	July 31
Aug. 23	Montana	Aug. 14
Aug. 23	Monesson, Pa.	Aug. 14
Aug. 23	Michigan	Aug. 14
Aug. 23	Morgantown, W. Va.	Aug. 14
Aug. 24	Washington, D. C.	July 24
Aug. 24	Denver, Colo.	July 10
Aug. 25	Ebensburg, Pa.	Aug. 7
Aug. 25	Indiana	Aug. 14
Aug. 25	Washington	Aug. 14
Aug. 25	California	Aug. 14
Aug. 26	Indiana	Aug. 14
Aug. 26	Maryland	Aug. 14
Aug. 26	Bordentown, N. J. Adv. Aug. 14.	Aug. 14
Aug. 26	Trenton, N. J. Adv. Aug. 14.	Aug. 14
Aug. 26	New York, N. Y.	Aug. 7
Aug. 26	Guntersville, Ala.	July 31
Aug. 27	Peru, Neb.	Aug. 7
Aug. 27	Welch, W. Va.	Aug. 14
Aug. 27	Middletown, Del	Aug. 14
Aug. 27	New Jersey Adv. Aug. 14.	Aug. 14
Aug. 28	Helena, Ark.	Aug. 14
Aug. 28	Martinsburg, W. Va	Aug. 14
Aug. 28	Camden, N. J Adv. Aug. 14.	Aug. 14
Aug. 29	Greenfield, Ind	Aug. 14
Aug. 30	St. Martine, Que.	Aug. 14
Sept. 1	Arcadia, Fla.	Aug. 7
Sept. 1	Salt Lake City, Utah	July 24
Sept. 2	Independence, Mo.	Aug. 7
Sept. 2	Minneapolis, Minn.	Aug. 14
Sept. 2	Washington, Ga.	Aug. 14
Sept. 2	Sylacauga, Ala	Aug. 14
Sept. 3	Toledo, O	Aug. 14
Sept. 3	Moultrie, Ga.	Aug. 14
Sept. 8	Indiana	Aug. 14
Oct. 10	Tacoma, Wash Adv. Aug. 14.	Aug. 14

EXCAVATION AND DREDGING

Aug. 19	Ottawa, Ont.	Aug. 14
Aug. 20	Brooklyn, N. Y.	Aug. 14
Aug. 20	Carrollton, Miss.	Aug. 7
Aug. 28	Granite Falls, Minn.	Aug. 7
Sept. 2	Sanford, Ala	Aug. 14

INDUSTRIAL WORKS

Aug. 16	Worcester, Mass.	Aug. 14
Aug. 20	Minneapolis, Minn.	Aug. 14
Aug. 20	Philadelphia, Pa.	Aug. 14
Aug. 22	Wilkes-Barre, Pa	Aug. 14

BUILDINGS

Aug. 16	Hazleton, Pa.	Aug. 14
Aug. 18	Erie, Pa.	July 24
Aug. 18	Ottawa, Kan.	Aug. 7
Aug. 18	Maple Shade, N. J.	Aug. 14
Aug. 18	Minneapolis, Minn.	Aug. 14
Aug. 19	Spring City, Pa.	Aug. 7
Aug. 19	Fairmont, Neb.	Aug. 7
Aug. 19	West Bethlehem, Pa	Aug. 14
Aug. 20	Hamilton, Ont.	Aug. 7
Aug. 20	Austin Minn	Aug. 7
Aug. 20	Watsontown, Pa	Aug. 14
Aug. 21	Springfield, Ill	Aug. 7
Aug. 21	Valparaiso, Neb	Aug. 7
Aug. 21	Richmond, Utah	July 31
Aug. 21	Storm Lake, Ia.	Aug. 14
Aug. 21	Detroit, Mich	Aug. 14
Aug. 22	Montevideo, Minn.	Aug. 14
Aug. 23	Thief River Falls, Minn	Aug. 14
Aug. 23	Hobart, N. Y.	Aug. 14
Aug. 24	St. Paul, Minn.	July 31
Aug. 25	Elizabeth, N. J.	Aug. 7
Aug. 25	Bayard, Neb	Aug. 7
Aug. 25	Chicago, Ill	Aug. 7
Aug. 26	Weyburn, Sask.	Aug. 7
Aug. 26	Manhattan, Kan.	Aug. 14
Aug. 27	East White Plains, N. Y.	Aug. 14
Aug. 27	Stoutsville, O	Aug. 7
Aug. 30	New Aberdeen, N. S.	Aug. 7
Aug. 30	Worcester, Mass.	Aug. 14
Aug. 30	Halifax, N. S.	Aug. 14
Sept. 1	Omaha, Neb	July 17
Sept. 1	Ft Worth Tex	Aug. 14
Sept. 1	Cameron, Tex	Aug. 14
Sept. 1	Miamisburg, O	Aug. 14
Sept. 1	Outremont, Que.	Aug. 14
Sept. 3	Trenton N. J	Aug. 14
Sept. 3	Victoria, Tex	Aug. 14
Sept. 4	Bayonne, N. J	July 31
Sept. 4	Peterborough, Ont.	Aug. 14
Sept. 6	Fairview, Pa	Aug. 14
Sept. 15	Pleasant Grove, Utah	July 24
Sept. 15	St. Paul, Minn.	Aug. 14

FEDERAL GOVERNMENT WORK

Aug. 18	Removing Boulders—Newport, R. I. Adv. July 24	July 24
Aug. 18	Dredging—Norfolk, Va. Adv. July 31	July 31
Aug. 19	Repairing Dike — Philadelphia, Pa Adv. July 17 and 24.	July 24
Aug. 19	Water Pipe—Washington, D. C.	July 31
Aug. 19	Canal Wall—Washington, D. C. Adv. July 31.	July 31
Aug. 19	Water Supply — Stapleton, N. Y.	Aug. 7
Aug. 19	Repairing Wharf—Washington, D. C. Adv. Aug. 7.	Aug. 7
Aug. 20	Metal and Glass Work—Key West, Fla. Adv. July 17	July 17
Aug. 20	Roofing — Spec. 4005 — Norfolk, Va	July 31
Aug. 20	Torpedo Racks—Spec. 1008 —Pearl Harbor, H. T.	Aug. 7
Aug. 20	Completing Structural Shop —Spec. 3719—Mare Island Cal.	Aug. 14
Aug. 20	ay Wall—Spec. 3773— Charleston, S. C.	Aug. 14
Aug. 25	Fuel Oil—Washington, D. C.	Aug. 14
Aug. 25	Post Office Mystic, Conn	July 31
Aug. 26	Dredging—Honolulu, H. T. Adv. June 26	June 26
Aug. 27	Sea Wall — New York N. Y. Adv. July 31	July 31
Aug. 27	Electric Lighting and Power System Spec 3982, Mare Island, Cal.	Aug. 14
Aug. 27	Dredging Norfolk, Va Adv. July 31	July 31
Aug. 27	Lock and Abutment — Louisville, Ky. Adv. July 31	July 31
Aug. 29	Post Office Fayette, Mo.	July 24
Aug. 29	Dredging — New York, N. Y. Adv. July 31	July 31
Aug. 29	Breakwater Chicago, Ill Adv. Aug. 7.	Aug. 7
Sept. 2	Towboat Memphis, Tenn	Aug. 7
Sept. 2	Miscellaneous Equipment—Washington, D. C. Adv. July 10 and 17	July 10
Sept. 2	Post Office—Kansas City, Mo.	July 24

Bids Close		See Eng. News-Record
Sept. 2	Dredging, New York, N. Y. Adv. Aug. 7.	Aug. 7
Sept. 5	Post Office — Montevideo, Minn.	Aug. 14
Sept. 8	Post Office—Carroll, Ia.	Aug. 14
Sept. 10	Post Office—Douglas, Ga.	July 31
Sept. 18	Post Office—North Taleda, Kan.	Aug. 14

MISCELLANEOUS

Aug. 18	Mechanical Loader—Hastings, Minn.	July 31
Aug. 18	Culverts, Piers—Grenville, Que.	Aug. 14
Aug. 18	Cast Iron Pipe, Detroit, Mich.	Aug. 14
Aug. 18	Water Tube Boiler, etc., Webster City, Pa.	Aug. 14
Aug. 18	Paving Bricks — Montreal, Que	Aug. 14
Aug. 19	Tracks—Philadelphia, Pa. Adv. July 24.	July 24
Aug. 19	Channel — Prince Edwards Island	July 31
Aug. 19	Wharf — Dauphin River, Man.	Aug. 7
Aug. 19	Ottawa, Ont.	Aug. 14
Aug. 19	Cement—New York, N. Y.	Aug. 14
Aug. 20	Brooklyn, N. Y.	Aug. 14
Aug. 20	Safety Cars — Saskatoon, Sask. Adv. July 24.	July 24
Aug. 20	Creosoted Wood Blocks, Baltimore, Md.	Aug. 14
Aug. 20	Wharf—Stewart, B. C.	July 31
Aug. 20	Bulkhead, Boston, Mass. Adv. Aug. 7.	Aug. 7
Aug. 20	Retaining Wall—St. John, N. B.	Aug. 14
Aug. 22	Heating, etc., Hudson, N. Y. Adv. Aug. 14.	Aug. 14
Aug. 23	Transit Shed — Halifax, N. S.	Aug. 14
Aug. 25	Railway Ties — Toronto, Ont.	Aug. 7
Aug. 26	Column Foundations—Philadelphia, Pa.	Aug. 14
Aug. 28	Silo—Savannah, Ga.	July 24
Aug. 28	Wharf—Sillery, Que.	Aug. 14
Sept. 12	Dam—Decatur, Ill.	Aug. 14
Sept. 15	Levee—Alexandria, La.	Aug. 14
Sept. 23	Turbines, etc.—Saskatoon, Sask. Adv. July 24.	July 24

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Geneva—Bd. Pub. Wks. plans to install new pumping unit for water supply, 1,000,000 gal. daily capacity. J. W. Brennan, city engr.

Md., Brunswick—City soon receives bids building 3,000,000 gal. concrete storage reservoir, involving 3000 ft. 10 in. c.i. pipe with valves, 3000 cu.yd. concrete and 10,000 cu.yd. earth excav. About $30,000. Address F. L. Spitzer, clk. Norton, Bird & Whitman, 616 Munsey Bldg., Baltimore engrs.

Md., Mt. Airy—City plans to build water storage and pipe system. Bonds for $18,000 voted for project. A. R. Molesworth, mayor.

Minn., St. Paul—Bd. Water Comrs. have completed program for improvements to cover 5 years; 1920 program includes preliminary work on impounding reservoir, cost, $202,500; meters, $1,500, reservoir on Snelling Ave., $160,000, dam, $50,000; total 5 year program includes conduit from Lake Vadnais to here having 65,000,000 gal. capacity every 24 hours, $440,000, low service main from Cayuga St. to congested district and new pumps, $300,000 and 10,000,000,000 gal. impounding reservoir, $525,000. J. C. Flanagan, secy.

Mont., Ryegate—City plans to improve waterworks system. About $25,000. T. R. Atkinson, Bismark, N. D., engr.

Mo., Marysville—A. D. Hewitt, city clk., soon receives bids building water filtration plant. About $50,000.

Mo., Weston—City having plans prepared extending pipe line, also building new well and concrete reservoir. About $20,000. W. H. Rollins & Co., 209 Ry. Exch. Bldg., Kansas City, engrs.

Okla., Ada—City retained Johnson & Benham, engrs., Firestone Bldg., Kansas City, Mo., to investigate feasibility of water supply. Probable source will be from spring 13 mi. from city, to be conducted to within 1 mi. of city by gravity line and then forced to reservoirs. Present expenditure, $400,000, probable future expenditure, $300,000.

Okla., Carnegie—City election soon to vote on $30,000 bonds to extend waterworks system. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma, engrs.

Okla., Hobart—City plans election soon to vote on $250,000 bonds to improve waterworks system. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma, engrs.

Wash., Pullman — City plans to lay 1000 ft. 4 in. and 1000 ft. 6 in. c. i. mains to replace present wooden pipe. Cost to exceed $5000. C. M. Hooper, Pullman, engr.

Wash., Valley—City plans to lay 2 mi. 12 in. pipe. About $10,000. Washington Surveying & Rating Bureau, Sherwood Bldg., Spokane, engrs.

Cal., Los Angeles—Municipal Impvt. Dist. No. 10 (Westgate annexed section) defeated $90,000 bond issue to build system to distribute water from aqueduct to Angeles Mesa Dist. Noted June 26.

BIDS DESIRED

N. Y., Hudson—See "Miscellaneous."

N. J., Hawthorne—Until Aug. 20, by Boro Comrs., furnishing, laying and placing 6000 ft. 6 in. c. i. pipe, 9 hydrants and 20 valves. J. A. Shea, clk. H. J. Harder, Paterson, engr.; advertised in this issue.

Pa., Phila.—Until Aug. 19, by Bureau Water Supply, 792 City Hall, building superstructures for pumping station, placing valve boxes and furnishing meters for pumping station No. 4, Lardners Point.

Ky., Ashland — Until Aug. 18, by Bd. Water Comrs., building pumping station and filtration plant. Alvord & Burdick, 8 South Dearborn St., Chicago, engrs. Noted July 10.

Mich., Royal Oak—Until Aug. 25, by C. W. Hubbell, engr., 2348 Penobscot Bldg., Detroit, furnishing labor and material laying 15,000 ft. 6-8 in. c.i. pipe water mains in Bronx Subdivision here, for Baker Land Co.

N. S., Berwick—Until Aug. 30, by B. C. Thompson, secy. water comrs., building concrete and timber dam, 1100 ft. high, 2 ft diameter, wood stave flume, power house and wheel pit. Work involves 3000 cu.yd. earth and 1700 cu.yd. rock excav., 800 cu. yd. mass concrete, 1100 ft. 2 ft. wood stave pipe, and 18,000 ft. B.M. timber. Total cost, $27,500. S. E. March, Berwick, engr.

PRICES AND CONTRACT AWARDED

(★Indicates award of contract)

★**R. I., North Smithfield** (Woonsocket P. O.)—Andrews Mills Co., Branch Village, will lay 2600 ft. c.i. waterpipe and build 40 x 40 ft. rein.-con. pump house and concrete power house with 250 h.p. wheel. Work will be done by day labor.

★**Minn., Montevideo** — E. O. Bonn, city clk., let contract extending waterworks system, Sect. 2, to Circular Concrete Co., 846 Builders Exch., Minneapolis, $16,625; Sects. 3 and 4, to W. D. Lovel, 2247 Hendon Ave., Minneapolis, $5,621 and $19,638 respectively. Noted July 17.

★**Kan., Caldwell**—City let contract furnishing 5 mi. 10 in. c.i. pipe to Nat'l Cast Iron Pipe Co., Commerce Bldg., Kansas City, Mo.; laying same to Y. C. Brooks & Son., Jackson, Mich., $14,700.

★**Ariz., Phoenix**—City let contract draining underground waters, system to have outlet into Gila River, to C. Fisher, 845 North 6th Ave., about $125,000. Work involves 49,500 ft. 18 in. tile pipe.

★**Ariz., Phoenix**—Union Oil Co. of Arizona, 15th and Santa Fe Sts., will build distributing plant to consist of warehouse, office, pump house, garage, storage tanks, etc. About $100,000. Work will be done by day labor.

Sewers

PROPOSED WORK

Fla., Jacksonville—City voted $200,000 bonds to improve and build sewers. F. M Edwards, city engr.

Fla., Seabreeze—City soon lets contract building drainage system, involving 2½ mi. vitr. pipe, 100 catch basins and 25 manholes. C. M. Rogers, Daytona, engr.

Mich., Royal Oak—M. L. Brown & Son, engrs., 821 Chamber of Commerce Bldg., Detroit, soon lets contract furnishing labor and material for laying 2200 ft. 8-12 in. vitr. pipe sewer, in Vinsetta Park Subdivision, for Vinsetta Land Co. Work includes Imhoff tank, ejector station and sprinkling filter. About $25,000.

Minn., Duluth—See "Streets and Roads."

Minn., Litchfield—F. O. Holm, village clk., soon lets contract laying 7880 lin.ft. 8 in. and 2235 lin.ft. 10 in. sewer pipe in Dists. Nos. 11, 12 and 20.

S. D., Elk Point — City election Sept. 1, to vote on bonds to build sewerage system.

N. D., Fairmont—City having plans prepared by W. C. Buck, engr., 1245 West Minehaha Parkway, Minneapolis, for sewerage system.

Wyo., Cheyenne—City voted $30,000 bonds to build storm sewers. E. W. Glafcke, city engr. Noted July 21.

Mont., Sidney—City election Aug. 26 to vote on $30,000 bonds to build 11,000 ft. 18 in. pipe sewer extensions. H. A. Thomas, Sidney, engr.

Idaho, Soda Springs—Town Council soon lets contract furnishing materials and building Sewer Dist. No. 2, involving 3218 ft. 12 in., 8500 ft. 8 in. and 6500 ft. 6 in. vitr. pipe and 5500 cu.yd. excav. A. Meyer, clk.

Ore., Portland—City soon lets contract building vitr. or cement sewers in East 37th and Raymond Ave., East 77th St., north from Oregon to Halsey Sts., Harold Ave. and 55th Ave., S. E., East 76th St. from East Burnside to East Glisan Sts. About $10,000. O. Laurgaard, city engr.

Ore., Portland—City Council adopted resolution to build vitr. or cement sewer in Glisan St. from point 100 ft. west of 10th St. to Willamette River. About $37,366. O. Laurgaard, city engr.

Ore., Portland—City Council soon lets contract building vitr. or cement pipe sewers in East 76th and East 29th Sts., and paving with asphaltic concrete No. 1 on crushed rock base or concrete Nos. 1 and 2, East 61st St. and district improvement in Farragut St. et al. About $10,000. O. Laurgaard, city engr. Noted July 10.

BIDS DESIRED

Mass., Fairhaven—Until Aug. 25, by Bd. Sewer Comrs., building 1200 lin. ft. 15 in. and 465 lin.ft. 10 in. sanitary sewers with manholes and appurtenances. Address F. M. Metcalf, 25 Merchants Bank Bldg., New Bedford; advertised in this issue.

Pa., Harrisburg—Until Aug. 18, by Supt. Streets & Pub. Impvts., Room 30, Commonwealth Trust Co. Bldg., building sewer in Penn St., from Seneca to Schuylkill Sts., and in Berkley Pl., 28 ft. east of Reservoir Park.

Pa., Phila.—Until Aug. 20, by Dept. Pub. Wks., Room 412, City Hall, building branch sewers in various streets. A. Allen, city engr.

Pa., Pittsburgh — City receiving bids building 6, 15 and 18 in. sewers in Sebring, Fallowfield, Pioneer and McConnell Aves., Veronica, Sundehan, Berthoud, Wallace and Esplanade Sts. N. S. Sprague, City County Bldg., engr.

Miss., Senatobia — Until Aug. 21, by Town, constructing system of house sewers. Work involves 8 mi. 6-12 in. pipe sewers, manholes, flush tanks, etc. H. I. Gill, clk.; advertised in this issue.

O., Toledo—Until Aug. 19, by D. H. Goodwillie, serv. dir., building Sewer No. 1363, involving 4752 ft. 8 in. vitr. pipe, 16 manholes, etc. About $10,286. H. C. McClure, city engr. Noted July 31.

Mich., Detroit—Until Aug. 18, by C. W. Hubbell, engr., 2348 Penobscot Bldg., furnishing labor and materials for trenching, backfilling and laying 4000 ft. 12-24 in. vitr. pipe sewer and 13 brick manholes in Seven Mile Rd., for Lincolnshire Land Co., c/o Engineer. About $15,000.

Mich., New Baltimore—Until Aug. 21, by C. Gibbons, city clk., laying and backfilling complete vitr. crock storm sewerage system in Main, Maria and Alfred Sts., involving 8 and 12 in. pipe. About $14,000.

Mich., Royal Oak—Until Aug. 25, by C. W. Hubbell, engr., 2348 Penobscot Bldg., Detroit, furnishing labor and material laying 15,000 ft. 8-12 in. vitr. pipe sewer, disposal plant, tanks, sand filter and pumping station, in Bronx Subdivision, for Baker Land Co. About $15,000.

Sewer (Continued)

Ia., Hartley—Until Aug. 20, by H. F. Broders, town clk., for construction of 1542 ft. rein.con. rectangular sewer, ranging in size from 5 ft. x 5 ft. to 3 ft. 6 in. x 3 ft., 386 ft. 36 in. circular sewer, vitr. or segmental block, 1340 ft. 33 in. circular sewer, vitr. or segmental block, 2679 ft. 8-24 in. vitr. sewer pipe, etc. H. R. Green, 197 North 2nd St., Cedar Rapids, engr.

Ia., Strawberry Point—Until Aug. 18, by G. Scofield, town clk., for construction of 3000 ft. 8 in. tile sewer, 1400 ft. 6 in. tile sewer, septic tank, dosing chamber, sand filter bed and sludge basin. H. R. Green, 107 North 2nd St., Cedar Rapids, engr.

Minn., St. Paul—Until Aug. 18, by H. W. Austin, city purch. agt., City Hall, building sewers in Cleveland Ave. between University, Myrtle and Wabash Aves., 360 ft. south; James and Juliet Sts. between Underwood Ave. and 185 ft. west of Snelling Ave.; Macalester Ave. between Jefferson Ave., 75 ft. north Juliet Ave. from Juliet St. to point 75 ft. north Palace St.; from Palace St. to point 75 ft. north James St.; James St. to point 75 ft. north Randolph St. O. Claussen, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Providence**—City let contract building vitr. sewers in Magnolia St., Freeman Parkway and Laurel Ave., to M. A. Gamino Constr. Co., 428 Grosvenor Bldg.; Delaine St., to N. W. Colgrove, Providence. Total cost, $75,000. Noted July 10.

★**Conn., Portland**—City let contract building vitr. tile sewer in Ocean St., to G. Dascanio. Portland, $10,753.

★**N. Y., Syracuse**—Bd. Contr. & Supply let contract building Sect. D., 17th Ward sewer, to Mondo Constr. Co., Kirk Bldg., $80,507. Noted July 31.

★**N. J., Westmont**—City let contract to W. P. Corson, 1141 Sycamore St., Camden, building 9 mi. sanitary sewerage system, $62,691; disposal plant and pumping station, $26,284. Noted July 31.

★**Pa., Hamarville**—Consumers' Mining Co. let contract building sewage disposal plant, to Pihl & Miller, Wabash Bldg., Pittsburgh. Cost to exceed $10,000.

★**Pa., Pittsburgh**—City let contracts building sewers in Stafford Ave. between Cherry and Chestnut Sts., and Poplar St. between 21st and 26th Sts., to Mayer Bros. Constr. Co., Commerce Bldg., $11,697 and $15,528, respectively; 4th St., between East and Dunn Sts., to J. F. M. Doyle, $7666.

★**N. C., Goldsboro**—City let contract for labor for installing 53,000 ft. 8-12 in. tile sewer pipes in all unsewered streets, to Sullivan, Long & Hagerty, Bessemer, Ala., $53,000; pipe, to Chattanooga Sewer Pipe Co., Ft. Gpie, Chattanooga, Tenn., $11,000. Noted July 10.

★**N. C., Tarboro**—City let contract for labor, for installing 14,400 ft. 6, 8 and 12 in. vitr. sanitary sewers, to F. G. McGuire, 601 Paul-Gale-Greenwood Bldg., Norfolk, Va., $19,135; pipes, to Chattanooga Pipe Wks., Ft. Gpie, Chattanooga, Tenn. $3,025.

Mich., Detroit—City received bids building Virginia Park Relief Sewer from Wilson to 14th Aves., involving 1920 ft. 4 ft. brick or concrete sewer, from W. Blanck & Co., 330 Longfellow Ave., $34,-887; Jeynes & Affeld, 1208 Ford Bldg., $37,422; J. Winterbottom, 3274 West 25th St., Cleveland, $39,900.

★**Mich., Detroit**—City let contract building 5200 ft. sewer in Mack Ave. Pub. Sewer, to J. Porath, 34 McGraw Bldg., $118,914. Noted Aug. 7.

★**Ia., Marshallton** — City let contract building sewers in Dist. No. 5, to Anderson & Emple, Marshallton. About $10,000.

★**Minn., Austin**—City let contract building sewers in Hope, Ash and Clark Sts., to De Graff Wolff, 985 Schaffer St., St. Paul, $12,366. Noted July 31.

★**Neb., Lincoln**—City rejected bids received Aug. 2, building 14,800 ft. sanitary sewers. Work will be done by day labor. C. W. Bates, city engr. Noted July 17.

★**Mo., Milan**—City let contract building complete sanitary sewers and sewage disposal plant, to J. O'Neil, Leavenworth, Kan. About $29,000.

★**Okla., Idabell**—City let contract building main sewers and a sewage disposal plant, to Empire Constr. Co., Kansas City, Mo., $65,000 and $54,800 respectively. Noted July 17.

★**Wash., Seattle** — See "Streets and Roads."

Ore., Portland — City Council received bids building sewerage system in East 38th and Knight Sts., from J. Keating, Portland, $12,704, Jacobsen-Jensen Co., 407 Stanton St., $12,585, Azar & Co., Portland, $12,439.

Bridges

PROPOSED WORK

Fla., Jacksonville—City voted $200,000 to improve and build bridges. F. M. Edwards, city engr.

Minn., Fergus Falls—City soon receives bids building 2 concrete bridges, 90 ft. span, 52 ft. wide. About $16,000. A. C. Eschweiler, 720 Goldsmith Bldg., Milwaukee., Wis., engr.

Neb., Henry—Scotts Bluff Co. (Gering) having plans prepared and soon receives bids building rein.-con. arch bridge here, to have twelve 50 ft. spans and 16 ft. roadway. About $70,000. State will appropriate $35,000 toward cost. F. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., Minatare—Scotts Bluff Co. (Gering) having plans prepared and soon receives bids building rein.-con. arch bridge, here, to have twelve 50 ft. spans and 16 ft. roadway. About $70,000. State will appropriate $35,000 toward cost. F. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., Morrill—Scotts Bluff Co. (Gering) having plans prepared and soon receives bids building rein.-con. arch bridge here, to have twelve 50 ft. spans and 16 ft. roadway. About $70,000. State will appropriate $35,000 toward cost. F. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., Scottsbluff—Scotts Bluff Co. (Gering) having plans prepared and soon receives bids building rein.-con. arch bridge here, to have twelve 50 ft. spans, 24 ft. roadway and 4 ft. walks. About $100,000 Federal Government will appropriate toward cost. F. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Tex., Rockwall—See "Streets and Roads."

Cal., Blythe—See "Railways" under California.

Cal., San Bernardino—City election soon to vote on $50,000 bonds to build bridge over Lytle Creek and $10,000 bonds for bridge over Warm Creek. W. L. Brown, city engr.

Cal., Vasalia—See "Streets and Roads."

Ont., Windsor—City and Dominion Government plan to build 2500 ft suspension type bridge, 90 ft. wide, across Detroit River from Ouelette St., here, to Bates St., Detroit, Mich. J. A. Waddell & Son, 800 Graphic Arts Bldg., Kansas City, Mo., engrs

BIDS DESIRED

R. I., Barrington—Until Aug. 20, by State Bd. Pub. Rds., State House, Providence, building state bridges Nos. 72,106,108 and 122, known as Coventry Center Bridge, Coventry, Oak Valley and Branch River Bridge, Burrillville and Nyatt Bridge, here. Address A. L. Atwood, State Bd. Pub. Rds., Providence; advertised in this issue.

Pa., Harrisburg—Until Aug. 18, by Comrs. Dauphin Co., building 40 ft rein.-con. bridge over Paxton Creek on Shaonix St., 36 ft. wide; 30 ft rein.-con. bridge over Paxton Creek on Sycamore St., 43 ft. wide; also 76 ft rein.-con. single span bridge over Flushing Creek, 18 ft. wide. C. M. Hershey, First Natl. Bank Bldg., engr.

Pa., Harrisburg—Until Sept. 23, by T. W. Templeton, supt. pub. grounds and bldgs., Commonwealth of Pennsylvania, constructing Soldiers' and Sailors' Memorial Bridge along Park Extension and State St. J. E. Greiner & Co., Fidelity Bldg., Baltimore, engrs. A. W. Brunner, 101 Park Ave., New York City, archt.; advertised in this issue.

Md., St. George Island—Until Aug. 19, by State Rds Comn., 601 Garrett Bldg., Baltimore, building 984 ft. creosoted wooden pile and timber bridge, 14 ft. wide, 10 ft. clear roadway, over Potamac River from here to mainland. About $10,000. J. N. Mackall, state engr. Noted June 12; advertised in this issue.

S. C., Lockhart—Until Aug. 26, at office of Lockhart Mills, Lockhart, building steel highway bridge over Broad River, here; Advertised in this issue.

O., Toledo—See "Streets and Roads."

O., Toledo—Until Sept. 3, by D. H. Goodwille, serv. dir., building 40 ft., through bascule bridge, single leaf, 80 ft. wide, over Swan Creek, cost $65,000; also 80 ft deck bascule bridge, single or double leaf, 80 ft. wide, on Summit St., $165,000 Builder to submit own plans and specifications. H. C. McClure, city engr

Michigan—Until Aug. 20, by State Highway Comr., Lansing, building 200 ft. rein.-con. arch bridge, 24 ft. wide, over Thornapple Creek near Grand Rapids, consisting of one 70 ft and two 65 ft spans and 20 ft. roadway, involving 598 cu.yd rein.-con. and 882 cu.yd plain concrete, State Trunk Line Bridge No. 93, Kent Co.; 50 ft. span truss bridge over Sturgeon River near Sturgeon, two 10 ft. abutments and 20 ft. concrete flooring, 178 cu.yd concrete, No. 291, Delta Co.; bridge over Prairie River near Bronson with two 35 ft girders, 20 ft. roadway, two 8 ft abutments and one 8 ft. pier, 126 cu.yd plain and 132 cu.yd rein.con., No. 295, Branch Co.; one 35 ft. girder bridge, 20 ft. wide, over Pine River near Standish, two 10 ft abutments, 183 cu.yd. concrete, No. 257, Arenac Co.; bridge over Bird Creek, Port Austin, two 35 ft. girders and two 12 ft. abutments, 167 cu.yd. plain and 60.8 cu.yd. rein.-con., No. 315, Huron Co.; 40 ft rein.-con girder bridge over Hedge Creek at Crystal Falls, 20 ft. roadway, and two 8 ft. abutments, 85 cu.yd. plain and 94 cu.yd rein.-con., No. 287, Iron Co.; bridge over Hog Creek at Quincy Twp., two 35 ft. rein.-con girders, 20 ft roadway, two 7 ft abutments and one 7 ft. pier, 238 cu.yd rein.-con., No. 203, Branch Co.

Minn., Duluth—Until Sept. 1, by Comrs St. Louis Co., building 74 rein.-con. bridge in 6 districts About $385,000. R. W. Acton, co. engr. Noted July 31.

Minn., Duluth—Until Sept. 9, by W. H. Bargen, treas. St. Louis Co., building 30 rein.-con. and steel bridges in 4th, 5th 6th and 7th Dists., 18 ft. wide, length varying from 20 to 200 ft. About $200,000 R. W. Acton, co. engr.

Minn., Minneapolis — Until Sept. 2, by Comrs. Hennepin Co., building 840 ft. bridge, 20 ft. wide, on Cedar Ave. to have 5 spans and rein.-con flooring, cost, $160,000; 800 ft. rein.-con. and steel bridge, 24 ft. wide, on Lyndale Ave., to have 100 ft draw span, $170,000. E. E. Terrell, co. surv. Noted May 15 and July 24.

Minn., Pine City—Until Aug. 18, by A. P. Edin, aud. Pine Co., building Bridge No. 3128 between Sects. Nos. 28 and 29; No. 3125 between Sects. Nos. 25 and 26; No. 3128, 18 ft. rein.-con. slab span; No. 3126, 50 ft. rein.-con. deck girder span; No. 3125, 2 rein.-con. abutments, 36 ft. steel truss, hauled 9 mi. W. J. Buckley, Pine City, engr.

Ark., Marshall—See "Streets and Roads."

Wash., Underwood—Until Aug. 25, by State Highway Comn., Olympia, building 190 ft., steel bridge over White Salmon River, here. Skamania Co. About $10,000. J. Allen, state highway engr.

Ore., Albany—Until Aug. 20, by W. R. Bilyeu, judge Linn Co., building 4 rein.-con. bridges on Pacific Highway, Albany Tangeut Sect., involving 30,000 lb. reinforcing steel, 450 cu.yd. Class "A" concrete, 324 lin.ft. concrete handrail, etc. About $10,000. D. H. Pierce, co. comr.

Ont., Orangeville—Until Aug. 19, by Wheelock & Christie, engrs., Orangeville building one 4 ft., four 6 ft., one 8 ft. seven 10 ft., two 12 ft., one 14 ft. one 16 ft., one 20 ft., one 22 ft. and three 24 ft. rein. con. bridges and culverts for Dufferin Co. About $60,000.

Ont., Pickering—Until Aug. 19, by W. A. McLean, deputy minister highways Toronto, building concrete abutments, concrete roadway and sidewalk floors with other necessary work in connection with construction of bridge on Provincial Highway, and over Duffins Creek here. About $65,000. G. Hogarth, Parliament Bldgs., Toronto, engr.

Ont., Port Hope—Until Aug. 19, by W. A. McLean, deputy minister highways, Toronto, building four 30 ft. concrete culverts, abutments, etc., on Provincial Highway, from here to Coburg. About $60,000. G. Hogarth, Parliament Bldg., Toronto, engr

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Maine**—State Highway Comn., Augusta let contract building concrete arch bridge over Gilman Falls, 20 ft. wide, to have three 105 ft. spans and two 25 ft spans to Cyr Bros., Waterville, $45,925. Work involves 1000 cu.yd. rein.-con., 800 cu.yd concrete, 53 ton steel, 150 cu.yd. rock and 750 cu.yd earth excav., etc. Noted Aug. 7.

Bridges (Continued)

Conn., East Lyme—State Highway Dept., Hartford, received lowest bid building concrete and steel drawbridge over Niantic River, from T. A. Scott Co., 292 Pequot Ave., New London, $48,081.

N. Y., Elmira—Bd. Pub. Wks. received bids July 7, building 830 ft. concrete bridge, 80 ft. high, consisting of 8 arches, over Chemung River on Main St., from Walsh Constr. Co., Herald Bldg., Syracuse, (a and b), $315,000, (Jan. 1, 1921); Concrete Steel Bridge Co., Clarksburg, W. Va., (b) $397,800, (July 31, 1921); T. L. Eyre, Commercial Trust Bldg., Phila., (a) $414,032, (b) $378,425, (Apr. 30, 1921); Amer. Bridge Co., 5 steel spans, new piers, $384,900, 5 steel spans, old piers, $356,430, 8 steel spans, 8 new piers, $367,530. Noted June 19.

★**N. J., Hackensack**—Bd. Supervs. Bergen and Hudson Counties let contract rebuilding steel work on Paterson Plank Rd. Bridge over Hackensack River, to Selbach-Meyer Co., 605 22nd St., West New York, $19,900. Noted July 31.

★**Fla., Jacksonville**—Duval Co. let contract furnishing material and building superstruction for steel bridge across St. John River here, to Bethlehem Bridge Corp., City Reality Bldg., Bethlehem, Pa., $534,180; foundations and approaches, to Missouri Valley Bridge & Iron Co., Pennsylvania Ave., Leavenworth, Kan., $374,447. Noted July 3.

★**Mont., Huntley**—State Highway Comn., Helena, let contract building 950 ft. bridge, 16 ft. wide, over Yellowstone River, near here, consisting of five 190 ft. spans, to Security Bridge Co., 502 North 32nd St., Billings, $163,341. Noted July 10.

Mont., Livingston—State Highway Comn., Helena, received bids building 270 ft. bridge, near here, Park Co., from B. M. Crenshaw, Glendive, $37,187; Nelson-Rich, $43,349; L. T. Lawler, Butte, $46,311. Work involves 1000 cu.yd. concrete and 90,000 lb. reinforced steel. Noted July 10.

★**Mont., Toston**—State Highway Comn., Helena, let contract building 529 ft. bridge, 16 ft. wide, over Missouri River near here, to Security Bridge Co., 502 North 32nd St., Billings, $55,334. Noted July 10.

Mont., Victor—Ravalli Co. received bid building 224 ft. bridge, 16 ft. wide, over Bitterroot River, near here, from Buell Bridge Co., Missoula, $17,719; Lord Constr. Co., Hamilton, $17,936. Noted July 17.

★**Ark., Marion**—Comrs. Rd. Impvt. Dist. No. 9 let contract building two 50 ft. steel girder spans and 308 lin.ft. concrete slab bridge, etc., near here, to Kansas City Bridge Co., 510 Orear-Leslie Bldg., Kansas City, Mo. Work involves 400 cu.yd. excav., $3.15 per cu.yd., 180 cu.yd. plain concrete, $25,625 cu.yd. rein.-con. $31.50, 100 lin.ft. steel girder spans, $54, etc., total cost, $38,205. Noted July 17.

Reinforced Concrete

PROPOSED WORK

Minn., Fergus Falls—See "Bridges."

BIDS DESIRED

O., Toledo—See "Streets and Roads."

Michigan—See "Bridges."

Minn., Duluth—See "Bridges."

Minn., Minneapolis—See "Bridges."

Ont., Orangeville—See "Bridges."

Ont., Pickering—See "Bridges."

Ont., Port Hope—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Cal., Los Angeles—See "Industrial Works."

Streets and Roads

PROPOSED WORK

Pa., Emsworth (Pittsburgh P. O.)—Boro plans to grade, pave and curb Locust St., vitr. brick pavement and stone curbing. About $15,000. P. H. Martin, 331 4th Ave., Pittsburgh, engr.

Pa., Pittsburgh—City passed ordinance to grade, curb and gutter Webster Ave. from Orion St. to Alpena Way. About $57,000. T. Reed, city engr.

Pa., Turtle Creek—Boro. election soon to vote $200,000 bonds to improve streets.

Pa., Turtle Creek—City rejected bids receiving Pennsylvania Ave. Work will be readvertised. Noted Aug. 7.

Pa., Turtle Creek—City having plans prepared by Harrop & Hopkins, archts., Home Trust Bldg., Pittsburgh, grading, paving and curbing 600 ft. Greensburg Ave., 30 ft. wide, involving 1800 sq.yd. vitr. brick on granite slag base and 1200 lin.ft. concrete curbing and guttering. Cost to exceed $10,000.

Md., Baltimore—See "Industrial Works."

W. Va., Huntington—Comrs. Cabell Co. rejected bids paving 1 mi. Huntington-Hamlin Rd., 16 ft. wide, involving 9300 sq.yd. vitr. brick on 4 in. cement concrete base. About $35,000. Oliver & Maupin, Huntintgon, engrs. Noted July 24.

W. Va., Morgantown—Monongalia Co., Union Dist., election Sept. 6, to vote on $150,000 bonds to build roads. L. M. Cox, co. engr.

Fla., Jacksonville—City voted $200,000 bonds to improve and build streets. F. N. Edwards, city engr.

Ohio—State Highway Comn., Columbus, rejected bids received Aug. 5, grading, building bridges and culverts and paving 5.49 mi. Sect. G, St. Mary's Celina Rd., plain concrete, Mercer Co.; 3.52 mi. Sect. F. Sidley-Wapakoneta Rd., plain concrete or bituminous macadam, Shelby Co.; 4.0009 mi. Sect. A, 3.831 mi. Sect. B, 3.579 mi. Sect. C, 2.653 mi. Sect. D, and 2.617 mi. Sect. E, Akron-Cleveland Rd., rein.-con., Summit Co. Noted July 24.

O., Springfield—City plans to repave Fountain Square, involving 2500 sqyd. vitr. brick on concrete base. About $11,500. O. E. Carr, City mgr.

Michigan—F. F. Rogers, State Highway Comr., Lansing, soon lets contract furnishing labor and material for grading, shaping, draining, gravel surfacing, etc., 3.289 mi. State Trunk Line Rd. No. 24-1, 16 ft. wide, Austin and Colfax Twps., Mecosta Co.; 3.780 mi. State Trunk Line Rd. No. 12-1, 16 ft. wide, St. Ignace Twp., Mackinaw Co.; 7.083 mi. State Trunk Line Rd. No. 25-3, 16 ft. wide, Lakefield Twp., Luce Co., all gravel; 1.236 mi. State Trunk Line Rd. No. 11-3, 16 ft. wide, Olive Twp., Ottawa Co.; 3.155 mi. State Trunk Line Rd. No. 50-1, Ridgeway Twp., Lenawee Co., both bituminous concrete or concrete surface.

Michigan—State Highway Dept., Lansing, plans to grade, drain and surface with concrete or bituminous concrete, 1.236 mi. Trunk Line Rd., No. 11-3, 16 ft. wide, Ottawa Co., involving 6421 cu.yd. excav., 11,602 sq.yd. bituminous concrete or 2363 cu.yd. concrete.

Mich., Detroit—City soon lets contract paving Fenkell Ave. from 12th to Livernois Sts., 26 ft. wide, sheet asphalt; Colfax Ave. from Warren to Milford Sts., Clements Ave. from Herman to 12th Sts., Florida Ave. from Michigan to Radcliffe Sts., Fullerton Ave. from Oakman Blvd. to Wabash Ave., Northfield Ave. from Warren to Tireman Sts., Otsego Ave. from Joy to Graham Sts., Olivet St. from Distel to Woodmere Sts., Pingree Ave. from Linwood St. to Dexter Blvd., Schroeder Ave. from West Jefferson to South Sts., Sylvan St. from McKinley to Vincent Sts., Wilson Ave. from Hazelwood to Taylor Sts., 24-26 ft. wide, asphaltic concrete on 6 in. concrete foundation, berea, medina or amherst curbstone. Work involves 42,378 cu.yd. excav., 46,277 lin.ft. curbstone and 71,132 sq.yd. paving, etc. C. W. Hubbell, city engr.

Ill., Chicago—Bd. Local Impvts. rejected bids received July 23, paving North State St. from Madison to Randolph Sts., and from Randolph to South Water Sts. C. D. Hill, ch. engr. Noted Aug. 7.

Wis., Sheboygan—City plans to grade and pave 1.3 mi. Georgia Ave., from 6th to 17th Sts. and city limits, 18 ft. and 20 ft. wide, involving 7500 sq.yd. concrete and 2900 lin.ft. concrete curb and gutter. Cost between $17,000 and $20,000. C. U. Boley, city engr.

Minn., Duluth—J. A. Farrell, city comr., soon lets contract improving 3262 ft. 22nd Ave., W., from Superior to 7th Sts., 24 ft. wide, involving 3708 sq.yd. vitr. brick, 4790 sq.yd. concrete, 4967 lin.ft. concrete curbing, 13,080 sq.ft. retaining wall and 1643 ft. 12-18 in. sewer pipe. About $57,043. E. K. Cae, city engineer's office, engr.

Minn., Little Falls—Comrs. Morrison Co. rejected bids received Aug. 5, grading and graveling 24 mi. Federal Aid Project No. 24, 18 ft. wide. About $120,000. Work may be readvertised. Noted July 24.

Kan., Minneapolis—Comrs. Ottawa Co. plan to hard surface 25 mi. Meridian Rd., from Cloud Co. line to Minneapolis, to Bennington and to Saline Co. line. J. H. Boyle, co. engr.

Montana—State Highway Comn., Helena, rejected bids received July 25, gravel surfacing 18 mi. Sun River Rd., Cascade Co., and 3 mi. Billings-Cody Way, Carbon Co., Federal Aid Project No. 4. P. D. Pratt, state highway engr. Noted July 24.

Mo., Bethany—Harrison Co. rejected bids received July 23, grading, paving with concrete, laying macadam shoulders, etc., on 9.4 mi. State Rd. No. 8, 9 ft. wide. M. G. Hall, Centerville, Ia., engr. Noted July 10.

Mo., Carthage—Jasper Co. election Sept. 19, to vote $700,000 bonds to build hard surface roads.

Mo., Clinton—Henry Co. election Sept. 9 to vote on $150,000 bonds to build hard surface roads.

Mo., Grant City—Worth Co. election soon to vote $500,000 bonds to build hard surface roads.

Mo., Houston—Texas Co. voted $225,000 bonds to build Ozark Highway. C. L. Johnson, presiding judge.

Mo., Poplar Bluff—Comrs. Butler Co. soon receives bids building 50 mi. St. Louis-Poplar Bluff Rd. and Jefferson City-Poplar Rd., through Arcadia Valley, concrete. About $1,100,000. E. C. Nickey, Poplar Bluff, co. highway engr.

Mo., Shelbyville—Shelby Co. election soon to vote $1,000,000 bonds to build hard surface roads.

Mo., Springfield—Green Co. election Sept. 15, to vote $2,000,000 bonds to build hard surface roads.

Tex., Corpus Christi—Comrs. Neuces Co. voted $2,000,000 bonds to build roads. Engineer not selected. Noted July 3.

Tex., Eastland—Eastland Co., plans election to vote on $3,000,000 bonds to improve 100 mi. highway.

Tex., Falfurrias—Brooks Co. soon lets contract excavating, grading, sub-grading, caliche surfacing, excavating and building concrete drainage structures on 10.75 mi. State Highway No. 12 from Encino to south line Brooks Co., 16 ft. wide. Work involves 10.358 mi. machine grading, 14,025 cu.yd. unclassified earth excav., 1293 lb. reinforced steel, etc. About $37,701. H. S. Bedell, Falfurrias, engr.

Tex., Granbury—Hood Co. soon lets contract building 6 mi. waterbound macadam road with bituminous surface and concrete drainage structures on State Highway No. 10 from Erath Co. line to Tolar, 16 ft. wide. About $85,000. G. Tarrant, co. judge. Burks, Firmin & Hart, Granbury, engrs. Noted June 19.

Tex., Oakville—Live Oak Co. voted $60,000 bonds to build lateral roads and State Highways Nos. 9 and 12B. Engineer not selected. T. H. Miller, co. judge.

Tex., Rockwall—Rockwall Co. plans to build 13.36 mi. Highway No. 1 from Dallas Co. line to Collin Co. line, 18 ft. wide, 1 course plain and 1 course rein.-con. pavement, involving rein.-con. drainage structures, concrete trestle, 1200 ft. bridge across levee of Trinity River, 140,000 sq.yd. concrete pavement and 410,000 lb. steel. About $544,816. J. Montgomery, Rockwall, engr.

Okla., Ada—City having plans prepared paving 50 blocks. About $500,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Okla., Stroud—City having plans prepared paving 5 blocks. About $40,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Idaho, Fairfield—Town soon lets contract building and furnishing 20,650 lin.ft. 4 in. sidewalks, and 5960 lin.ft. 6 in. crossings. S. Stinton, clk.

Idaho, Malad—Oneida Co. voted $250,000 bonds to improve highways. J. H. Giles, Pocatello, engr.

Idaho, Payette—Payette Co. voted $200,000 bonds to build roads. J. Smith, co. clk.

Idaho, Rupert—City plans to pave, curb and gutter various streets. About $118,500.

Idaho, Sandpoint—Bonner Co. plans to grade and drain 7 mi. Bottle Bay Rd. About $20,000. C. W. Wilson, Sand Point, engr.

Idaho, Soda Springs—Town Council soon lets contract building 80,096 sq.ft. 4 in. sidewalks, 11,200 sq.ft. 6 in. crossings and 1500 cu.yd. excav. A. Meyers, clk.

Utah—State Highway Comn., Salt Lake City, soon lets contract paving 2.1 mi. state road from Ray to present city limits, and 4 mi. from North Ogden to Utah Hot Springs, involving (a) 6-8 in. monolithic concrete, (b) 2 in. bitulithic top on 6 in.

Streets and Roads (Continued)

concrete base, (c) 2 in. bitulithic top on 4 in. block base, (d) 2 in. bitulithic top on 4 in. crushed rock base, (e) 2 in. bitulithic top on present tarvia base. I. R. Browning, c/o State Highway Dept., Salt Lake City, engr.

Utah—State Highway Comm., Salt Lake City, election Aug. 29, to vote on $65,000 bonds to hard surface state road from St. George to state line. I. R. Browning, state highway engr.

Utah, Fairview—City soon lets contract laying 7000 lin.ft. sidewalk, 4 in. thick, 5 ft. wide. J. Bench, Fairview, engr.

Wash., Aberdeen—City election Aug. 26, to vote on $125,000 bonds to replace east end trestle with permanent highway. P. F. Clark, city engr.

Wash., Colville—City plans to grade, gravel and build concrete sidewalks on Astor Ave. from Hofstetter to Oak Sts. Cost to exceed $10,000.

Wash., Wenatchee—Chelan Co. plans election in September to vote on $830,000 bonds to improve roads.

Ore., Astoria—City Council soon lets contract improving, removing old walks, paving, laying drainage pipes and building curbs on 3rd and 42nd Sts., involving 4770 lin.ft. concrete curbing, 516 lin.ft. concrete sidewalks, 3280 cu.yd. common excav., 96,269 ft. 4 x 12 in. planking, 425 ft. 10 x 10 in. splicers, 6830 lin.ft. railing, 1270 ft. vitr. pipes, etc. About $10,000. G. T. McClean, city engr.

Ore., La Grande—Union Co. plans election to vote on $1,500,000 bonds to build permanent highways.

Ore., Oregon City—Moody Investment Co. having surveys made for platting tract of land having about 50,000 ft. water frontage on Williamette River between suspension bridge and river, involving laying out streets, cross streets, alleys and subdividing into about 1000 lots. About $10,000. S. O. Dillman, 8th and Main Sts., mgr.

Ore., Portland—City soon lets contract paving with concrete Nos. 1 and 2, or asphaltic concrete Nos. 1 and 2, on crushed rock base, East 13th St. from Humboldt to Alberta Sts., East 30th St. from Ainsworth Ave. to Holman St., East 68th St. from Sandy Blvd. to Siskiyou St., East 12th St. from Going to Alberta Sts., Leo Ave. from East 13th to Milwaukee Sts., Emerson St. from Delaware to Denver Aves., East Market St. from East 29th to East 30th Sts., Linn Ave. from East 9th to East 11th Sts., including laying of rails (weight and pattern approved by City Council), concrete base between ties, 2 in. ballast under ties and planking tracks on East 9th St., cost to exceed $10,000; also Stockton St. from Oberlin to Lombard Sts., East 72nd St. from Thorburn Ave. to East Glisan St., East 33rd St. from Fremont Ave. to Shaver St., East 6th St. from Jarrett St. to Ainsworth Ave., Jarrett St. from Union Ave. to East 9th St., East 33rd St. from Kelly to Tibbetts Sts., Tibbetts St. from East 31st to East 35th Sts., Killingsworth Ave. from East 30th to East 42nd Sts., 46th Ave. from 67th Ave. to Kern Park, East 6th St. from Umatilla to Spokane Aves., Tacoma Ave. from East 6th to East 15th Sts., Smith Ave. from Fessenden to Bristol Sts., 5th Ave. from Taylor's Ferry Rd. to Nevada St., Webster St. from Gay St. to Denver Ave., East Carruthers St. from East 26th St. to Brush's 2nd Addition, $25,000. O. Laurgaard, city engr.

Ore., Portland—See "Sewers."

California—Until Aug. 18, by State Highway Comm., 515 Forum Bldg., Sacramento, paving 10.7 mi. road between southerly boundary Kern Co. and 2.3 mi. south Rose Sta., involving 10,000 cu.yd. excav. and 14,600 cu.yd. Class "A" Portland cement concrete pavement; 1.9 mi. road between Santa Clara River and Williams Ranch, Los Angeles Co., 21,000 cu.yd. excav., 2500 cu.yd. Class "A" Portland cement concrete pavement, etc. A. G. Fletcher, state highway engr.

Cal., Tulare—City had estimates prepared paving 3 streets, probably concrete. About $31,000. A. P. Bosworth, city engr.

Cal., Visalia—Bd. Supervs. Tulare Co., U. S. Forest Serv. and Southern California Edison Co., Edison Bldg., Los Angeles, plan to jointly build 16 mi. road from Springville to Camp Nelson. Each will contribute $27,000. Work involves grading and building timber bridges and culverts, etc.

Ont., Ottawa—Bd. Control soon receives bids asphalt paving Queen St. from Bay St. to Bronson Ave., cost $10,800; King Edward Ave. from Laurier Ave. to Rideau St., $25,000; Bessemer St. from Charlotte St. to east limit of lot 58, $10,900. A. E. Macallum, city engr.

BIDS DESIRED

N. Y., Brooklyn—Until Aug. 20, by E. Riegelmann, boro. pres., regulating and repaving with permanent asphalt and Grade 1 granite on 6 in. concrete base, central portion of roadway, Atlantic Ave. from Washington to Classon Aves., Atlantic Ave. from Classon to Bedford Aves., Bedford Ave. from Grant to South 2nd Sts., Classon Ave. from Hewes St. to Flushing Ave., East 18th St. from Ave. O to Ave. P, Sprague Alley from Fulton to Liberty Sts., 83rd St. from 19th to 20th Aves., also regulating, grading, curbing and laying sidewalks on East 18th St. from Ave. O to Ave. P, Vermont Ave. from Highland Blvd. to Bulwer Pl., excludng sidewalks on westerly side along Evergreen Cemetery.

N. Y., S. I., St. George—Until Aug. 21, by C. D. Van Name, pres. Richmond Boro., repaving Richmond Terrace from Western Ave., to Elizabethport Ferry, bituminous macadam, Richmond Terrace from Treadwell Ave. to Harbor Rd., napped granite rock on concrete foundation and wood block on present foundation, repairing Castleton Ave. from Clove Rd. to Caroline St. and from State St. to Bway., wood block Brook St. from Richmond Turnpike to Jersey St., asphaltic block and wood block, Castleton Ave. from Bard to North Burgher Aves., asphalt block, Richmond Terrace from Davis to Campbell Aves., Wadsworth Ave. from Bay St. to Tompkins Ave., macadam, Bay St. from Bayview to Wadsworth Aves., bituminous concrete.

New Jersey—Until Aug. 27, by State Highway Comm., Broad St. Bank Bldg., Trenton resurfacing Brown's Mills-Lakehurst Rd., Burlington Co., involving 13,170 cu.yd. gravel surfacing. A. L. Grover, ch. clk.; advertised in this issue.

N. J., Bordentown—Until Aug. 26, by City Comrs., paving various streets involving 7000 cu.yd. concrete and 1750 cu.yd. excav. J. R. Malone, clk.; advertised in this issue.

N. J., Camden—Until Aug. 28, by C. F. Wise, chn. Stone Rd. Com., improving portion King's Highway, Haddonfield Twp., Camden Co., involving 7715 sq.yd. bituminous surface on concrete foundation. F. W. George, clk.; advertised in this issue.

N. J., Trenton—Until Aug. 26, by Bd. Freeholders Mercer Co., building 1600 ft. Sect. 2-A River Rd., Hopewell Twp., involving 16,000 cu.yd. fill for heavy embankment, sodding slopes of same and building 4300 su.yd. macadam road to be utilized as future foundation for bituminous pavement, which bituminous pavement will not be part of present work. Former bids rejected. W. C. Fowler, clk.; advertised in this issue. Noted Aug. 7.

Pennsylvania—Until Sept. 2, by State Highway Dept., Harrisburg, building roads in Adams, Butler, Carbon, Centre, Chester, Clarion, Clearfield, Clinton, Crawford, Erie, Indiana, McKean, Mifflin, Potter, Snyder, Susquehanna, Tioga, Warren and York Counties. L. S. Sadler, state highway comr.; advertised in this issue.

Pa., Chester—Until Aug. 18, by D. Newsome, city clk., for following Schedule A-1150 sq.yd. granite block paving, 11,900 sq. yd. asphalt or bituminous paving (assessment work), 500 ft. straight and 30 ft. curved 6 in. granite curb, Schedule B 15,720 sq.yd. asphalt or bituminous paving (assessment work), Schedule C, 8565 sq.yd. concrete or bituminous paving (assessment work). C. G. Worrilow, supt. streets and pub. impvts.

Pa., Monesson—Until Aug. 23, by city, grading, paving and curbing various streets. About $90,000. A. W. Johns, Monesson, engr.

Pa., Phila.—Until Aug. 18, by Dept. Pub. Wks., City Hall, gradings sections of Cheltenham, Michener, Williams, Dorcas, Jackson, Osceola and Oxford Sts. Schedule "A," paving with asphalt (assessment work) sections of Hutchinson, Warrington, Windsor, Winghocking, 6th, 7th, 16th and 26th Sts., Schedule "B," paving with bituminous macadam section of Benezet St.; Schedule "C," repaving sections of Emerald, Norris, Ridge and Susquehanna Sts.; Schedule "D," repaving with redressed granite block sections of Front, Kensington and Germantown Sts.; Schedule "E," with wood block section of Columbia Ave., Schedule "F", improving 8th St., Schedule "G" furnishing and placing granite curb on Fairmount St.; Schedule "H," painting and repairing bridges on Belmont and Girard Aves., Germantown Ave., 6th St. and Allegheny Ave., and 57th St., Schedule "I," G. E. Datesman, dir.

Pa., Pittsburgh—City receiving bids grading, paving and curbing Fellowfield Avenue, Singer, Exeter, Archenez, Jean, Veronica, Cowan and Stadium Sts., regrading, repaving and recurbing Stafford St. and Sebring Ave. N. S. Sprague, City County Bldg., engr.

Del., Middletown—Until Aug. 27, by Town Council, paving Broad and Main Sts., involving 4000 cu.yd. excav., 5100 lin.ft. curbing, 1200 sq.yd. guttering and 13,000 sq.yd. sheet. Alternate bids for concrete, broken stone base with sheet asphalt or penetration macadam surface. C. M. Upham, c/o State Highway Dept., Dover, ch. engr.; advertised in this issue.

Maryland—Until Aug. 26, by State Rds. Comm., 601 Garrett Bldg., Baltimore, building 1 mi. road from Benfield toward Seven Cross Rds., concrete, Federal Aid Project No. 36, Contr. AA-16, Anne Arundel Co.; 2 mi. road from Boonsboro to Keedysville, concrete Federal Aid Project No. 35, Contr. W-17, Washington Co. F. H. Zouck, chn. advertised in this issue.

Md., Baltimore—Until Aug. 20, by Bd. Awards, c/o City Register, furnishing materials and flushing surface of Edmondson Forest, Forest Park, Rogers and Greenspring Aves. G. H. Weighardt, highway engr.; advertised in this issue.

Va., Newport News—Until Aug. 21, by city, grading and paving 60,000 sq.yd. various streets, concrete. T. E. Pearse, city engr.

W. Va., Martinsburg—Until Aug. 28, by E. A. Hobbs, clk. Berkeley Co., building 8 mi. Martinsburg-Winchester Rd., bituminous macadam 16 ft. wide. Noted July 31.

W. Va., Welch—Until Aug. 27, by Comrs. McDowell Co. building and grading 6 mi. Top Mountain Rd., waterbound macadam, also road from Simmons to McDowell, 18 ft. wide. W. J. McClaren, co. engr.

N. C., Elizabethtown—Comrs. Bladen Co. receiving bids improving 65 mi. roads White Creek Twp. About $30,000. Engineer not selected.

Ga., Moultrie—Until Sept. 3, by Comrs. Colquit Co., paving 4.5 mi. Moultrie-Camilla Rd., 9 ft. wide, with necessary draining, grading, etc. About $100,000. O. H. Lang, Moultrie, engr.

Ga., Washington—Until Sept. 2, by Comrs. Wilkes Co., paving 3.327 mi. Athens and Augusta Highway, 18 ft. wide, with necessary draining, grading, etc. About $125,000. H. S. Jandon Eng. Co., Elberton, engrs.

Alabama—Until Aug. 20, by State Highway Dept., Montgomery, resurfacing 7.1 mi. highway on Telegraph Rd., from Axis to Mt. Vernon, clay gravel. W. S. Keller, state highway engr.

Ala., Sylacauga—Until Sept. 2, by City Council, laying 29,000 ft. 5 ft. sidewalk and 2800 ft. curb and gutter. E. S. Howard, city clk.

O., Columbus—Until Aug. 19, by G. A. Borden, dir. pub. serv., grading, draining, curbing, laying water mains and paving 10,096 ft. 5th Ave. from Perry St. to alley west of Parker St., 30 and 36 ft. wide, involving 25,700 yd. asphalt, cost $127,407. 448 ft. Findlay Ave. from Olentangy St. to north terminus, 24 ft. wide, 1300 yd. asphalt or brick, $8,300; also grading, draining, curbing, laying water mains and repaving 1112 ft. Dennison Ave. from 5th to King Aves., 30 ft. wide, 4120 yd. asphalt on present brick surface. $11,600. H. A. Maetzel, city engr.

O., Toledo—Until Sept. 3, by D. H. Goodwillie, serv. dir., extending Summit St., by building 750 ft. timber revetment, cost $20,000, 150 ft. rein.-con. viaduct, $50,000 400 ft. rein.-con. retaining wall, $70,000, involving 90,000 cu.yd. earth excav., 5000 cu.yd. mass and rein.-con. and 70 tons reinforcing steel. H. C. McClure, city mgr.

O., Toledo—Until Aug. 19, by D. H. Goodwillie, serv. dir., paving 2629 ft. Bennett Rd. from Sylvania Ave. to city limits, 24 ft. wide, involving 7064 sq.yd. vitr. brick, 7262 lin.ft. curbing and 5114 cu.yd. earth excav., cost $40,000; 1640 ft. Nevada St. from Spring Grove Ave to city limits, 26 ft. wide, 5141 sq.yd. vitr. brick, 3360 lin.ft. stone curbing, 2620 cu.yd. earth excav., $28,998. H. C. McClure, city engr. Noted Apr. 17 and Aug. 7.

O., Westerville—Until Aug. 23, by R. W. Orebaugh, city mgr., paving East Park St., bituminous macadam, and East and West Main St., rock, advertised in this issue.

Streets and Roads (Continued)

Indiana—Bd. Co. Comrs. building roads in following counties:

Aug. 25, Lake Co., Crown Point, building gravel road, Calumet Twp., known as H. M. McCraken road; gravel road in Hobart Twp., known as L. E. Barnes Rd. G. M. Foland, co. aud.

Vanderburgh Co., Evansville, rock and gravel road, Knight Twp., known as Green River Rd. W. Copeland, co aud.

Aug. 26, Madison Co., Anderson, concrete road, Adams Twp., known as J. Starr et al road, 44,132 ft., in length. E. T. Flahavin, co. aud.

Sept. 8, Lake Co., Crown Point, gravel road, Ross Twp., known as J. Kaiser Rd.; gravel road, St. John Twp., known as J. Backe road; gravel road, in Cedar Creek Twp., known as H. M. Walls et al Rd. G. M. Foland, co. aud.

Ind., Greenfield—Until Aug. 29, by Comrs. Hancock Co., grading, draining, culverting, bridging and paving with gravel waterbound macadam and concrete, 4 roads in 3 townships. C. Boone, co. engr.

Michigan—Until Aug. 19, by State Highway Comr., Lansing, building 2.596 mi. gravel road north of Owasso, 16 ft. wide, Rush and New Haven Twps., Shiwasse Co.; bids will also be received for this section at office of Co. Rd. Comn., Corunna.

Michigan—Until Aug. 16, by State Highway Dept., Lansing, grading, surfacing with concrete or bituminous concrete and building drainage structures on 3.155 mi. State Trunk Line Rd. No. 50-1, 18 ft. wide, Lenawee Co., involving 4954 cu.yd. excav. Alternate bids will be received on 6941 cu.yd. concrete and 33,317 sq.yd. bituminous concrete on 6 in. concrete base.

Michigan—Until Aug. 21, by State Highway Dept., Lansing, grading, surfacing with concrete and macadam and building drainage structures on 7.661 mi. road, 16 ft. wide, Lenawee and Monroe Counties, involving 2249 cu.yd. concrete, 60,875 sq.yd. waterbound macadam and 18,825 cu.yd. excav. About $138,000. F. F. Rogers, comr.

Michigan—Until Aug. 23, by State Highway Dept., Lansing, grading, surfacing with gravel and building drainage structures on 5.026 mi. State Trunk Line Rd. No. 72-1, 15 ft. wide, Alcona Co., involving 44,229 sq.yd. gravel and 23,978 cu.yd. earth excav.

Ill., Granite City—Until Aug. 16, by Bd. Local Impvts., improving B St. from 19th to 25th Sts. and North 24th St. from B to C Sts., known as "B St Paving Dist. No. 2", involving 14,100 sq.yd. rein.-con. pavement, 16,100 sq.yd. earth excav., 9500 lin.ft. concrete curb and gutter, 850 lin.-ft. 8-12 in. sewers, etc. B. E. Hodges, pres.; advertised in this issue.

Wis., Manitowoc—Until Aug. 19, by A. H. Zande, city engr., grading, paving, curbing and guttering 1.7 mi. South 16th St. from North 21st to South 25th Sts., 18 ft. wide, involving 10,500 sq.yd. concrete, etc. About $18,000.

Wis., Reedsburg—Until Aug. 19, by City Clk., grading and paving 2.8 mi. East Main St., between East Oak St. and Dewey Ave., 18 ft. wide. Work involves 35,000 sq.yd. vitr. brick and 5500 lin.ft. concrete curb and gutter. About $40,000. A. F. Niebuhr, city engr. Noted Aug. 7.

Minn., Anoka—Until Aug. 19, by A. A. Caswell, aud. Anoka Co., improving State Rd. No. 3, Job No. 1805, involving 4 acres clearing and grubbing, 5273 cu.yd. excav., concrete culverts, etc. H. H. Thursten, Anoka, engr.

Minn., Minneapolis—Until Sept. 2, by Comrs. Hennepin Co., grading and gravel-ing 1¼ mi. approaches to Cedar Ave. Bridge, 24 ft. wide. About $56,000. E. E. Terrell, co. surv.

Neb., Stockville—Until Aug. 25, by A. G. Williams, clk., Frontier Co., grading 12 mi. Curtis-Stockville Rd., 24 ft. wide. About $40,000. G. E. Johnson, c/o State Highway Dept., Lincoln, engr.

N. D., Grafton—Until Sept. 2, by city, paving Impvt. Dist. No. 1, involving 6850 sq.yd. street paving and guttering, 3743 lin.ft. concrete curbing and 1333 sq.yd. concrete alley pavement.

Montana—Until Aug. 23, by State Highway Comn., Helena, gravel surfacing 5 mi. Manhattan-No. 1 Ranch Rd., Gallatin Co., involving 13,000 cu.yd. excav. and 47,000 sq.yd. gravel surface. P. D. Pratt, Helena, state highway engr. Noted Jan. 23, under "Bozeman."

Ark., Helena—Until Aug. 28, by E. P. Molitor, pres. Bd. Comrs., building 34.83 mi. West Helena-Marvell Rd., 16 ft. wide. C. H. Purvis, Helena, engr.; advertised in this issue.

Ark., Helena—Until Aug. 28, by Comrs. of Helena and Old Town Rd. Impvt. Dist., at office of S. Adams, Solomon Bldg., building 15 mi. road. Bids will be received for (1) gravel, asphaltic, macadam (penetration method); (2) asphaltic, macadam or Warrenite on concrete or gravel base; (3) Portland cement concrete on course road. J. M. Quarles, Helena, engr.; advertised in this issue.

Ark., Marshall—Comrs. Searcy Co. receiving bids improving 90 mi. roadway, involving 1600 lin.ft. steel bridges, 100 ft. long. Winn Eng. Co., Little Rock, engrs.

Idaho, Boise—Until Aug. 22, by Comrs. Pub. Wks., grading and graveling 30.5 mi. road from New Meadows to Whitebird, 12 ft. wide. Cost will exceed $100,000. D. P. Olson, c/o State Highway Dept., Boise, engr.

★**Washington**—Until Aug. 25, by State Highway Bd., Olympia, clearing, grading and draining 5.5 mi. Pacific Highway from Blanchard to Allen, Skagit Co.; 1.9 mi. Pacific Highway from Marysville to Silvana, Snohomish Co., clearing, grading, draining, and surfacing 6.7 mi. Pacific Highway from Castle Rock north, gravel, Cowlitz Co.; 4 mi. North Bank Highway from Camas west, concrete, Clarke Co.; 6.5 mi. Olympic Highway, Post Rd. Project No. 29, gravel, Jefferson Co.; 6 mi. Olympic Highway from Lake Quinault northwest, Project No. 29, gravel or plank, Grays Harbor and Jefferson Counties; 5.6 mi. Olympic Highway Post Rd. Project No. 29, gravel or plank, Grays Harbor Co.; 5.5 mi. Olympic Highway from Lake Quinalt (west side). Natl. Forest Rd. Project, gravel, Grays Harbor Co.; 21.9 mi. Inland Empire Highway from Colfax to Central Ferry, crushed rock, Whitman Co.; 7.8 mi. Tyler-Cheney Sect., Central Washington Highway, 16 ft. wide, crushed rock, Spokane Co., $50.000. J. Allen, state highway engr.

Wash., Tacoma—Until Oct. 10, by Bd. Comrs., Pierce Co., clearing, grubbing, grading and paving 95 mi. roads. Bonds for project voted May 31. E. A. White, co. engr.; advertised in this issue.

California—Until Aug. 25 by State Highway Comn., Sacramento, grading 9.4 mi. road between westerly boundary and Lakeport, Lake Co., involving 104,600 cu.yd. excav., 300 cu.yd. Class A Portland cement, etc.; paving 3.6 mi. road, between Divide and Orcutt, Santa Barbara Co., 12,500 cu. yd. excav., 3600 cu.yd. Class A Portland cement, etc.; 5.2 mi. road between southerly boundary and Conejo Grade, Ventura Co., 1500 cu.yd. excav. and 7000 cu.yd. Class A Portland cement; 5.2 mi. road between Lankershim Blvd. and South Sherman Way, Los Angeles Co., 1730 cu.yd. Class A Portland cement, 48,100 sq.yd. asphalt surface, etc.; 1.3 mi. road between Russell Ranch and westerly boundary, Los Angeles Co., 1600 cu.yd. Class A Portland cement. A. B. Fletcher, state highway engr. Noted July 31.

Que., St. Martine—Until Aug. 30, by N. Mallette, secy.-treas. municipality, building 5 mi. bituminous macadam road including bridges.

Ont., Toronto—Until Aug. 18, by W. A. McLean, deputy minister highways, grading and paving with bituminous macadam Sect. 1, 15.93 mi. from easterly limit of London, to westerly limit of Town of Ingersoll, Sect. 2, 15.62 mi. from easterly limit of Brandtford to Village of Lancaster, Sect. 3, 3.25 mi. from easterly limit of Village of Beamsville, Sect. 4, 913. mi. easterly limit of Town of Trenton to westerly limit of Belleville, Sect. 5, 7.72 mi. westerly limit of Kingston to westerly limit of Kingston Twp., Sect., 6, 10.46 mi. easterly limit of Brockville to westerly limit of Town of Prescott; all located on Provincial Highway and 20 ft. wide. Total cost, $200,000. G. Hogarth, Parliament Bldg., engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Vermont**—State Highway Comn., Montpelier, let contract building 25,000 ft. state road, Marlboro Twp., gravel, to P. Ricci, Rutland. Noted July 3.

★**R. I., Providence**—City let contract paving Delaine St., Union Pocasset and Kinsley Aves., asphalt, to Narragansett Impvt. Co., Providence. About $70,000. Noted July 10.

New York—F. S. Greene, State Highway Comr., Albany, received bids Aug. 5, improving roads in following counties:

(a) Warren Co., 4.59 mi. Chestertown-Hague Rd. No. 1501, Part 4; also completing roads in following counties: (b) Franklin Co., 11.41 mi. Santa Clara-Lake Meacham Rd. No. 1251, (c 1) Genesee Co., 2.62 mi. Alabama-Batavia Rd. No. 1402-A, Part 2, (c 2) 7.94 mi. Alabama-Batavia Rd. No. 1403, Part 1, (d) Rensselaer Co., 2.97 mi. Melrose-Schaghticoke Hill Rd. No. 1425-A, (e) St. Lawrence Co., 11.16 mi. De Peyster-Ogdensburg Rd. No. 1388, (f) Wyoming Co., 4.73 mi. Varysburg-Warsaw Rd. No. 1349-A, Part 2, from F. W. Hamilton, Rochester.

(a) $141,249; E. J. Anderson & Co., Albany, (a) $141, 822; M. J. Bruce & Co., Tupper Lake, (b) $121,239; T. F. Murray, Leroy, (c 1) $51,355; A. J. Rockwood, 51 Rutgers St., Rochester, (c 1) $53,-608, (c 2) $109,021; Roco Co., Inc., Rochester, (c 1) $54,718; Wing & Munger, Holley, (c 2) $103,964; M. H. Ripton, Livingston Bldg., Rochester, (c 2) $104,325; J. A. Jova, Inc., Roseton, (d) $31,506; H. A Schaupp, Inc., Albany, (d) $32,272; Spellman-Oliver Co., Lake St., Chauteaugay, (e) $95,363; A. A. Howard, Fairport, (f) $48,-816; Greenfield Constr. Co., 89 Main St., Hornell, (f) $52,161; F. J. Mumm Contg. Co., Inc., 176 Best St., Buffalo, (f) $54,030. Noted July 17.

New York—State Highway Comn., Albany, received bids July 29, improving roads in following counties:

(a) Chautauqua Co., 4.64 mi. Brockton-Fredenia Rd. No. 8008.

(b) Jefferson Co., 6.78 mi. Gunn Corners-Fishers Landing Rd. No. 1397, Part 2; also completing roads in following counties: (c) Allegany Co., 9.07 mi. Belfast-Caneadea Rd. No. 5615,

(d) Cattaraugus Co., 6.98 mi. Hinsdale-Franklinville Rd. No. 5543, Part 1,

(e1) Cayuga Co., 3.89 mi. Port Byron-Weedsport Rd. No. 5609, (e 2) 4.39 mi. Montezuma-Port Byron Rd. No. 5610,

(f 1) Duchess Co., 6.97 mi. Amenia-Pine Plains Rd. No. 5580, Part 1, (f 2) 6.79 mi. Amenia-Pine Plains Rd. No. 5628, Part 2,

(g) Franklin Co., 1.99 mi. Malone Village, Main and Elm Sts., Rd. No. 5602.

(h 1) Jefferson Co., 14.05 mi. Cape Vincent-Clayton Rd. No. 1255, (h 2) 7.76 mi. Gunn Corners-Fishers Landing Rd. No. 1256, Part 1,

(i) Livingston Co., 7.69 mi. Caledonia-Mt. Morris Rd. No. 5593-A, Part 1,

(j 1) Monroe Co., 2.92 mi. Chili-Coldwater Rd. No. 1390, (j 2) 7.93 mi. Sweden-Walker Rd. No. 1391, (j 3) 5.27 mi. Scottsville-Rush Rd. No. 1393-A, (j 4) 6.33 mi Churchville-Adams Basin Rd. No. 1466, (j 5) 4.56 mi. Scottsville-West Henrietta Rd. No. 1499-A,

(k) Oneida Co., 5.34 mi. Utica-Poland Rd. No. 5597, Part 3,

(l) Onondaga Co., 3.06 mi. Syracuse-Bridgeport Rd. No. 1072, Part 2,

(m) Orange Co., 4.03 mi. Cornwall-West Point (Storm King Highway) Rd. No. 5498, Parts 1 and 2,

(n) Schuyler Co., 6.03 mi. Townsend-Watkins Rd. No. 5557,

(o) Wayne Co., 2.25 mi. Wolcott-Savannah Rd. No. 1058-A, Part 3, from E. J. Bailey, Brocton, (a) $131,555.

H. P. Burgard Co., 1968 Fillmore Ave., Buffalo, (b) $127,710, (h 1) $181,598, (h 2) $121,576;

McCarthy & Rock, Winthrop, (b) $132,-739;

W. J. Fox, Oramel, (c) $180,622;

J. A. Hughes, Wellman Bldg., Jamestown, (c) $196,452;

F. J. Foote Co., Inc., Nunda, (c) $221,420, (i) $185,291, (j 3) $195,100;

L. H. Gipp, 787 Richmond Ave., Buffalo, (d) $137,588;

Fure & Fote, Olean, (d) $147,110;

Mosier & Summers, Inc., 1266 Summers St., Buffalo, (d) $151,294;

Kennedy Contg. Co., Albany, (e 1) $28,-712;

Knox, Shaw & Drake, Auburn, (e 1) $29,103;

Scott Bros., Arlington Blk., Rome, (e 2) $153,343;

Cayuga Co., Auburn, (e 2) $155,573;

C. D. Schlemmer, Islip, (e 2) $154,193;

S. B. Van Wagenen, Inc., Rondout, (f 1) $108,280;

R. J. Garafano, Amenia, (f 1) $114,729;

De Graff & Hogeboom, Inc., Kingston, (f 1) $115,855;

S. Beskin, Beacon, (f 2) $150,008;

A. D. Bridges' Sons, Inc., Hazardsville, Conn., (f 2) $153,714;

J. A. Jova, Inc., Roseton, (f 2) $157,396;

A. F. McConville, Ogdensburg, (g) $27,-428;

Streets and Roads (Continued)

F. H. Rhody, Albion, (h 1) $179,686; Dale Eng. Co., Mann Bldg., Buffalo, (h 2) $122,908, (k) $174,771; Atlanta Constr. Co., Atlanta, (i) $186,022; H. C. Schroeder, Mercantile Bldg., Rochester, (i) $189,067, (j 2) $166,356, (j 3) $192,368; I. M. Ludington Sons., Inc., Powers Bldg., Rochester, (j 1) $36,239; Greenfield Constr. Co., 89 Main St., Hornell, (j 1) $35,317, (j 2) $164,852; G. W. Chambers, Powers Bldg., Rochester, (j 1) $36,323; A. J. Rockwood, 51 Rutgers St., Rochester, (j 2) $171,853; R. T. Ford Co., 206 South Ave., Rochester, (j 3) $191,957; J. Petrossi Co., Livingston Bldg., Rochester, (j 3) $194,180, (j 5) $128,061; Ribstein-Holter Co., Inc., 16 State St., Rochester, (j 4) $71,786; Wing & Munger, Holley, (j 1) $73,589, (j 5) $131,202; Morison & Quinn, Inc., Cutler Bldg., Rochester, (e2) $155,269, (j 3) $194,888, (j 5) $130,242; P. H. Murray, Cutler Bldg., Rochester, (k) $169,095; C. H. Van Auken, Fulton Chain, (k) $178,841; L. D. Sullivan, Co., Inc., 17 Scott St., Utica, (1) $59,526; F. W. Hamilton, Rochester, (1) $65,689; J. L. Hayes Constr Co., Inc., Yonkers, (m) $453,584; Rosoff Eng. Co., 15 Park Row, New York City, (m) $159,346; W. L. Frost, Watkins, (n) $89,245; Hendrickson-McCabe Constr. Co., Inc., Syracuse, (o) $39,226; F. H. Wells, Savannah, (o) $39,194. Noted July 17.

★**N. Y., New York** — F. L. Dowling, pres. Manhattan Boro., let contract regulating and repaving with granite block on concrete foundation Broome and Bleecker Sts to Regan Tower Co., $27,151 and $9134 respectively, Walker St., to M. I. Sachs, $4065. Noted Aug. 7.

★**N. Y., Rochester**—City let contract paving Weisner Rd., bituminous macadam and Ryan Alley, asphalt, to T. Holahan, 164 Lewis St., $18,145 and $7301 respectively, Fairview Ave., asphalt, to Ribstein-Holter Co., 16 State St., $22,464. Noted June 12.

N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., received bids Aug. 6 building concrete curb with steel guard rail, etc., (a) Tompkins Ave., (b) Richmond Terrace, (c) Manor Rd., from J. Curran, Stapleton, (a) $2797, (c) $59,437; Kraemer-Leedecke, 114 East 56th St., New York City, (a) $2951, (b) $1338; J. E. Donovan, Port Richmond, (a) $3844, (b) $1683; J. Johnson Sons, Port Richmond, (a) $4131, (b) $1543; Uvalde Asphalt Co., 1 Bway., New York City, (c) $66,825; Sicilian Asphalt Paving Co., 41 Park Row, New York City, $70,870. Noted June 31.

★**N. Y., Watertown**—Bd. Pub. Wks. let contract paving Hewitt and Walden Sts., concrete, to Reed & Colwell, Watertown, $23,313. Noted June 19.

★**N. Y., Watertown**—City will pave Pearl and South Massey Sts., concrete. About $9706 and $17,323 respectively. Work will be done by day labor. Noted June 19.

New Jersey — State Highway Comn., Broad St. Bank Bldg., Trenton, received bids building 2090 sq.yd. State Highway Route No. 4, Navesink River Sect., Monmouth Co., from Miles & Dennston, Asbury Park, $19,956; C. H. Winans Co., Elizabeth, $22,663; L. J. Sieling, 150 Nassau St., New York City, $22,771.

★**N. J., Mt. Holly**—Bd. Freeholders Burlington Co. let contract improving road from Florence Sta. to State Highway Route No. 2, to Model Concrete Co., Medford, $17,383. Noted June 24.

Pennsylvania — State Highway Dept., Harrisburg, received bids building roads in counties as follows:

Beaver Co., 6788 ft. 1 course rein.-con., Pulaski and Daugherty Twps., from S. B. Markley, 299 Adams St., Rochester, $65,038; E. W. Falck, Leetsdale, $66,159; J. H. DeCarpentier & Sons, 521 Falls Ave., Youngstown, O., $66,692.

Bedford Co., 2414 ft. 1 course rein.-con., Woodbury Boro., Detwiler & Detwiler, New Enterprise, $22,239.

Cambria Co., 6634 ft. 1 course rein.-con. and Hillside vitr. brick, Route No. 276, Crovle Twp., Croyle Township Supervs. of Cambria Co., R. D. No. 2, Wilmore, $127,217; Portage Concrete Constr. Co., Portage, $141,120.

Clearfield Co., 17,977 ft. 1 course rein.-con., Route No. 59, Lawrence and Pike Twps., Dowler & Anderson, Clearfield, $195,585; J. Boyce, Clearfield, $199,498; 8118 ft. 1 course rein.-con and Hillside vitr. brick, Route No. 59, Brady Twp., G. Minns, Jr., 601 First St., DuBois, $68,179; G. I. Thompson & Co., Clearfield, $73,302; 4333 ft. 1 course rein.-con., Route No. 57, Chester Hill Boro., G. I. Thompson & Co., Clearfield, $42,887; Gifford & Pritchard, Phillipsburg, $47,672; 13,027 ft. 1 course rein.-con. and Hillside vitr. brick, Route No. 60 Sandy Twp., Dale Eng. Co., Inc., 23 Mann Bldg., Utica, N. Y., $136,991.

Erie Co., 18,421 ft. bituminous surface concrete on concrete base or 1 course rein.-con., Northeast Twp., Gridd Constr. Co., 1117 State St., Erie, $137,612.

Fayette Co., 5950 ft. 1 course rein.-con. and Hillside vitr. brick, Route No. 247, Dunbar Twp., G. S. White Co., Jenkins Arcade, Pittsburgh, $65,403; R. D. Thomas & Co., 6 Boundary St., Pittsburgh, $65,659.

Indiana Co., 8188 ft. 1 course rein.-con., Route No. 54-63-67, Indiana Boro., M. Bennett & Sons, Indiana, $73,959; McCrady Bros. Co., 308 6th St., Braddock, $84,031.

Lackawanna Co., 7538 ft. bituminous surface on concrete foundation, Route No. 108, Elmhurst Boro., H. B. Sproul Constr. Co., Inc., 218 Adams Ave., Scranton, $56,507; Holt Lumber Co., 61 North Main St., Carbondale, $59,435; O'Brien, Rees & Ruthven, 212 Carter Bldg., Scranton, $63,109.

Lycoming Co., 24,201 ft. bituminous surface course on concrete foundation or 1 course rein.-con., Route No. 240-19, Muncy Creek and Wolf Twps., Muncy and Hughesville Boro., Winston & Co., 240 Fair St., Kingston, N. Y., $198,042; 14,284 ft. bituminous surface on concrete foundation or 1 course rein.-con., Route No. 23, Piatt & Perter Twps and Jersey Shore Boro., W. J. Gephart, 2033 5th St., Pittsburgh, $126,272; Winston & Co., 240 Fair St., Kingston, N. Y., $162,862.

Northampton Co., 29,182 ft. 1 course rein.-con., Route No. 166, Plainfield Twp., E. P. Arbogast, 10 North 7th St., Stroudsburg, $217,812; J. McGraw Co., 1010 Commercial Trust Bldg., Phila., $223,773; R. T. and C. D. Stewart Contg. Co., 14 South 3rd St., Easton, $230,311.

Perry & Dauphin Co., 11,753 ft. bituminous surface on concrete foundation or 1 course rein.-con., Route No. 195, Buffalo and North Buffalo Boros, and Watts and Reed Twps., Winston & Co., 240 Fair St., Kingston, N. Y., $439,676.

Schuylkill Co., 22,435 ft. 1 course rein.-con., Route No. 161, New Castle, Blythe, Ryan and West Mahoning Twps., E. J. Corcoran, Plains, $325,120.

Snyder and Juniata Co., 25,737 ft. bituminous surface on concrete foundation or 1 course rein.-con., Route No. 195-229, Susquehanna and Chapman Twps., R. C. Fiss, Shamokin Dam, $267,972.

Venango Co., 14,000 ft. 1 course rein.-con., Route No. 91, Sugar Creek Twp., C. F. Hamilton, Inc., 423 Trust Company Bldg., Franklin, $131,698; Ritchey, Cramer & Snow, Franklin, $132,553.

Westmoreland Co., 32,047 ft. 1 course rein.-con., Route No. 68, Derry Twp., McCrady Bros. Co., 308 6th St., Braddock, $389,580; Booth & Flinn, Ltd., 1942 Forbes St., Pittsburgh, $394,336.

★**Pa., Gallitzen**—Boro Council let contract building 6000 sq.yd. brick paving, 2000 cu.yd. excav. and 175 lin.ft. stone curbing, to Loomis & King, Central Trust Bldg., Altoona. About $36,000. Noted June 17.

★**Pa., Greensburg**—Comrs, Westmoreland Co let contract building Sect. 1 Harrison City Export Rd., 2.7 mi. long, to R. H. Cunningham, Turtle Creek. About $137,240.

Pa., Pittsburgh—Comrs. Allegheny Co. received bids rebuilding (a) 15,100 ft. Ardmore Blvd., 24 ft. wide with (1) concrete, (2) asphalt, (3) brick, involving 40,550 sq.yd. rein.-con. or 36,600 sq.yd. asphaltic concrete, 40,900 sq.yd. concrete foundation and integral raised curb, or 36,600 sq.yd. brick block, 41,350 sq.yd. concrete foundation and integral raised curb, 15,100 ft. 6 in. vitr pipe underdrain, 1450 cu.yd. rein.-con. retaining wall and 110,000 reinforcing rods; (b) 15,840 ft. Imperial and Clinton Rd., Finley Twp., 16 ft. wide, 28,500 sq.yd. asphaltic concrete, 4000 tons ballast and screenings, 28,500 sq.yd. scarified and trued surface, 32,000 ft. concrete shoulder, 16,000 ft 6 in. vitr. tile drain and 3000 cu.yd. excav.; (c) widening 10,500 ft. Verona Rd. from Frankstown to Saltsburg Rds., 24 ft. wide, 16,350 sq.yd. asphaltic concrete, 16,100 sq.yd. concrete foundation shoulder and integral curb, 8000 ft. 6 in vitr pipe underdrain and 3500 cu.yd. excav., from Booth & Flynn, 1942 Forbes St., (a1) $288,567, (a2) $235,975, (a3) $279,045, (b) $126,188; T. Cronin, South 17th and Muriel Sts., (a2) $245,130, (a3) $286,810, (b) $115,330, (c) $79,832; T. McNally, Oliver Bldg., (a1) $274,561, (a3) $329,404; Columbus Asphalt & Paving Co., Pittsburgh, (b) $106,481, (c) $86,173, M. O'Herron & Co., South 1st and McKean Sts., (c) $64,792. Noted July 24.

★**Maryland**—State Rds. Comn., 601 Garrett Bldg., Baltimore, let contract resurfacing 0.75 mi Liberty Rd. from Gwynn Oak Jct. to Baltimore city limits, macadam, Contr. BC-31, Baltimore Co., to D. C. McAleer, 405 Phoenix Bldg., Baltimore, $9918. Noted July 24.

★**Va., Charlotte**—City let contract (a) paving 1300 ft. West Main St., concrete, (b) building concrete sidewalk and curb, (c) laying concrete foundation for car tracks, to Lightnor & Co., Richmond, (a) $3.15 per sq.yd., (b) $2.10 per sq.yd., (c) $12.00 per cu.yd. Noted July 31.

★**W. Va., Huntington**—Comrs. Cabell Co rejected bids received building 1 mi. Huntington-Hamlin Rd., 16 ft. wide, involving 9300 sq.yd. vitr. brick paving on 4 in. cement concrete base. About $35,000. Work will be done by day labor. Noted July 17.

W. Va., Lewisburg—Comrs. Greenbrier Co. received bids grading and draining 6.5 mi. Ft Springs Rd., 20 ft. wide, from Blodgett-Carola Co., Newark, O., $43,230; Kanawha Constr. Co., Clarksburg, $63,000. Pipe to be furnished by county. Noted July 24.

W. Va., Wayne—Comrs. Wayne Co. received bids grading and draining 3.2 mi. Armilda-Echo Rd., 26 ft. wide, from Shipe & Wentz, Barboursville, $41,103; Hoad Constr. Co., Maysville, $45,131; Clay & Doyle, Huntington, $45,523. Noted July 31.

★**N. C., Fayetteville**—City let contract to Amer Constr Co., Moultrie, Ga., paving 5240 ft. Person St., 40 ft. wide, involving 24,000 sq.yd. 3 in. asphalt on 5 in. concrete base, 400 lin.ft. granite curbing, 1000 sq.yd. concrete gutter, and 3000 sq.yd. concrete sidewalks. About $81,000. Noted July 17.

★**N. C., Winston-Salem**—Comrs. Forsyth Co. will grade, drain and pave 1.87 mi. road with concrete. Work will be done by day labor. About $63,000.

★**Ala., Birmingham**—Bd. Revenue, Jefferson Co., let contract to P. Wallace, Tuscaloosa, cherting 4 mi. road from Alliance School to Marine, cost $10,400; 4 mi. Oak Grove Rd., $14,508; also grading 2 mi. Gilmore and Alliance Rds., $8600; 7 mi. Oak Grove and Lock 17 Rd., $52,120; 5½ mi Taylors Ferry Rd., $19,095; J and I Parsons, Bessemer, grading and cherting 3½ mi. McCalla and Buckville Rds., $25,489; Acton & Self, Trussville, cherting 7 mi. Gintown, Flat Top and Bessie Rds., $26,500; to W. H. and J. B. Rylant, McCalla, grading 1 mi. road, Edgewater to Mack's Chapel, $8045.

★**Ala., Birmingham**—City let contract paving 2240 sq.yd. 46th St. from Clairmont to 8th Aves., involving 2240 sq.yd. asphalt and 3500 cu.yd. grading, to H. N. Bowdry, Empire Bldg., $11,413.

★**Ky., Paris**—City let contract to R. W. Parke Co., Realty Bldg., Center and Jefferson Sts., Louisville, paving 1600 ft. Main St. from 10th to 14th Sts., 30 ft. wide, involving 5800 sq.yd. concrete, 3000 lin.ft. concrete curbing and 1140 cu.yd. earth excav., cost $12,300, also 4000 ft., Pleasant St., 30 ft. wide, 14,500 sq.yd. concrete, 7500 lin.ft. concrete curbing, and 2850 cu.yd. earth excav., $30,700.

★**Ohio**—State Highway Comn., Columbus, let contracts to Andrews Paving Co., Hamilton, grading, building bridges and culverts, and paving 4.05 mi. Sect "B," Oxford-Millville Rd., sheet asphalt, cost $150,331; 3.66 mi. Sect. "C-2," Oxford-Millville Rd., sheet asphalt, $137,976; building gravel shoulders and paving 1.36 mi. Sect. "A," Hamilton-Middletown Rd., bituminous concrete, $22,827; all in Butler Co. Noted July 10.

★**Ohio**—State Highway Comn., Columbus, let contract grading, building bridges and culverts and paving 3.21 mi. Sect. E, Hicksville-Defiance Rd., rein.-con., Defiance Co., to Turritan & Figley, Evansport, $84,489; 2.15 mi. Sect. P, Unity-Salem Rd., brick, Mahoning and Columbiana Counties, to J. D. Paxson, Salem, $93,510; 4.28 mi. Sects. G and A-1, Upper Sandusky-Tiffin Rd., brick, to Modern Constr. Co., Fremont, $163,842; 1.16 mi. Sect. A, Warren-Burton Rd., bituminous macadam, to Gray Bros., Youngstown, $30,423. Noted July 3.

Ohio—State Highway Comn., Columbus, received bids Aug. 5, resurfacing Sects. "J", "G-1" and "G-2," Cleveland-Wooster Rd., bituminous concrete, Cuyahoga Co., from W. B. McAllister Co., 2163 East 31st St., Cleveland, cost $156,268; Highway Constr. Co., Elyria, $159,498. Noted July 24.

(Continued)

Streets and Roads

★**Ohio**—State Hig[hway Com.], Columbus, let contracts building [concrete roads in following counties:

Columbiana and Mah[oning Counties, pave]ing, Sect. J, Salem-Alli[ance Rd., brick to] J. D. Parson, Salem, $[46,406.

Crawford Co., Sects. M[and M-2 Bucy]rus-Galion Rd., brick, L[. R. McMichael, Bucyrus, $67,239 and $110,[13 respectively

Clarke Co., Sects. B [d C. Dayton-Xenia Rd., plain concrete, [, Dull & Dull, Greenville Rd., plain concrete, [82; Sect. F, Arcanum, $86,541 and $3[concrete. Celina-Greenville Rd., plain [0,707; Sect. Celina, Alexander Bros., North Star, $15[k on con-A, Versailles-Western Rd., brick[le, $168,- crete base, Manix Bros., Greenv[Washington, 654.

Fayette Co., Sect. A, Columbus-[P. D. Washington C. H. Rd., bituminous macadam, Van Camp, Camp Dennison, $106,42[

Hamilton Co., Sect. D, Cincinnati-[Colerain Rd., Warrenite, Henkel & Sullivan, 105 Bell Blk., Cincinnati, $355,520; Sect. A, Harrison Pike, bitoslag, Migent & Hine, Harrison, $154,664; Sect. B, Harrison Pike, bitoslag, Scully Bros., Cincinnati, $222,416.

Knox Co., Sect. P, Columbus-Wooster Rd., plain concrete, Highway Constr. Co., Elyria, $189,989.

Montgomery Co., Sect. M, Dayton-Indianapolis Rd., rein.-con., C. Hoolihan, Dayton, $91,474.

Pickaway Co., Sect. B, Circleville-Adelphi Rd., gravel, O. M. Junk, Chillicothe, $18,888.

Shelby Co., Sect. B-2, Piqua-St. Mary's Rd., rein.-con., Putnam & Shindledecker, Sidney Rd., bituminous macadam, Stone & Hile, Lima, $26,875.

Trumbull Co., Sect. N-1, Youngstown-Conneaut Rd., bituminous macadam Seiple-Wolfe Co., Youngstown, $39,983; Sect. B, Warren-Burton Rd., bituminous macadam, Russell & Russell, West Austintown, $107,442.

Wood Co., Sect. B-1, Toledo-Elmore Rd., bituminous concrete, Johnston, Van Wagoner & Johnson, Tontogany, $67,660; Sects. F-1 and F-2, Findlay-Bowling Green Rd., rein.-con., C. L. Straw, Paulding, $90,601 and $101,206. Noted July 24.

O., Columbus—G. A. Borden, dir pub. serv., received bids grading, draining, laying water mains and paving with (1) brick, (2) asphalt, (3) sheet asphalt, No. 1 process, (4) sheet asphalt, No. 2 process, (5) sheet asphalt No. 3 process, (a) Grant Ave. from 5th to 11th Aves., (b) Monroe Ave. from Broad to Long Sts., (c) Stanley Ave. from Heyl Ave to 22nd St., (d) St. Clair Ave. from Mt. Vernon Ave. to south end of viaduct, (e) 3rd St. from Livingston to Reinhard Aves., from R. J. Dienst, 2515 West Broad St., (a 1) $38,529, (c 1) $17,473; A. G. Pugh, Columbus, (a 1) $10,651, (a-2) $40,201, (b 2) $10,528, (d 3) $35,732, (d 4) $39,920, (d 5) $41,277, (e 2) $59,365; Franklin Asphalt Paving Co., Columbus, (a 2) $38,858, (c 2) $17,023, (d 3) $37,959, (e 2) $54,511; Cleveland Trinidad Paving Co., The Arcade, Cleveland, (a2) $39,629, (c2) $17,457, (d 3)$37,245, (d 4) $34,715, (d 5) $41,798; Andrews Paving Co., Hamilton, (e 2) $63,972. Noted July 31.

★**O., Hamilton**—City let contracts to Andrews Paving Co., Hamilton, paving with sheet asphalt and building cement curbs and gutters on Middletown Pike from Milliken St. to corporation line, $22,827; Milliken St. from D to G Sts., $17,718; Bellaire Ave. from Laurel and Benninghofen Aves., $66,549.

★**Indiana**—State Highway Comm., Indianapolis, let contract building 8.85 mi. road between Hancock and Marion Co. lines, to M. Kirkpatrick, Greenfield, cost $230,063; 5.76 mi. road from Broad Ripple to Carmel, Marion and Hamilton counties, to J. E. McNamarra, Indianapolis, $205,971; 7.35 mi. road from Seeley to Brazil, Vigo and Clay Counties, to Carpenter Constr. Co., Terra Haute, $265,777; 6.22 mi road from Seymour to Bartholomew Co. line, Jackson Co., to Davis Constr. Co., Seymour, $210,378; 8.39 mi. road from Plymouth to St. Joseph Co. line, Marshall Co., to Becker, Bryant Co., Plymouth, $274,520; 8.12 mi road from Stilesville to Mt. Meridian Hendricks and Putnam Counties, to F. Cunningham, Indianapolis, $339,105; 3.5 mi. road from Osceola to Elkhart, St. Joseph and Elkhart Counties, to Northern Constr. Co., Elkhart, $117,088; 6.35 mi. road, Elkhart Co., to K. Riley Co., Goshen, $248,874; all concrete.

★**Ind., Rushville**—City let contract paving Sexsquaus and 3rd Sts., 40 ft. wide, involving 10,800 sq.yd. Brazil brick block on 5 in. concrete base, to G. G. Miller, Lebanon. About $48,600.

★**Ind., Rushville**—Rush Co. let contract to pave 3 mi. New Salem Pike, 36 ft. wide, 6 in. concrete, to G. G. Miller, Lebanon, $33,396.

★**Mich., Detroit**—Bd. Pub. Wks. let contract to Detroit Paving Co., 20 McGraw Bldg., paving with asphaltic concrete on 6 in. concrete foundation, Amherst curbing set in concrete, St. Clair Ave., $31,326; Chapin Ave., $4440; Clairpointe Ave., $39,548; Garland Ave., $56,202; Granger Ave., $7712; Kirby Ave., $852; Louis Ave., $3993; Springle Ave., $21,439. Noted Aug. 7.

★**Mich., Detroit**—City let contract paving following alleys with 1 course concrete, No. 1037, to T. E. Currie, 20 McGraw Bldg., $7,295; Nos. 1038, 1039, to Lennane & McIlvenna, 1205 Book Bldg., $5671 and $5043 respectively; No. 1040, to R. J. Powelson, 1577 Iroquois Ave., $3842; Nos. 1041, 1042, 1043, 1044, 1045, to Otis Cement Constr. Co., Hammond Bldg., $2063, $5287, $3389, $3220 and $2936 respectively.

Mich., Detroit—City received bids paving following alleys with 1 course concrete, (a) No. 1046, (b) No. 1047, (c) No. 1048, (d) No. 1049, (e) No. 1050, (f) No. 1051, (g) No. 1052, (h) No. 1053, (i) No. 1064, (j) No. 1055, (k) No. 1056, (l) No. 1057, from R. J. Powelson Co., 1577 Iriquois Ave., (a) $3860, (c) $1665, (d) $4901, (e) $2567, (g) $5013, (h) $2272, (i) $1423, (j) $3117, (k) $3901, (l) $5555; J. Porath, 34 McGraw Bldg., (a) $3817, (b) $1908, (c) $1451, (d) $4916, (f) $1312, (h) $1119, (i) $1300, (j) $2926, (k) $3755; Otis Cement Constr. Co., 806 Hammond Bldg., (a) $5855, (c) $1784, (d) $4040, (e) $3567, (g) $1863, (h) $2401, (i) $1445, (l) $5555; Talbot Co., 400 Penobscot Bldg., (b) $1964, (e) $3501, (f) $1334, (g) $4742, (l) $5792; Lennane & McIlvenna, 1205 Book Bldg., (b) $1955, (j) $3052, (k) $3380; E. R. Meredith Co., 145 Harper Ave., (f) $1316. Noted Aug. 7.

★**Ill., Chicago**—Bd. Local Impvts. let contracts to Standard Paving Co., 29 South La Salle St., paving Carrol Ave., from St. Johns Court to Ashland Ave., $6487, West Congress St. from Talman Ave. to Washtenaw St., $2700; to White Paving Co., 17

Streets and Roads (Continued)

★**Mo., Kansas City**—City let contract paving Grand St., asphalt, to E. D. Tyner Constr. Co., Kansas City, at $42,755.

★**Mo., St. Joseph**—Buchanan Co. let contract paving 3.7 mi. Saxon Rd., 18 ft. wide, asphalt macadam, to Land & Skilbred Constr. Co., Ballinger Bldg., $43,385.

★**Ark., Fayetteville**—Bd. Comrs. Washington Co. let contract building 52 mi. limestone macadam road in Rd. Dist. No. 2, 18 ft. wide, to Crane Constr. Co., Springfield. About $385,000. Noted June 5.

★**Okla., Tulsa**—City let contract paving, grading, curbing, guttering and draining 69,000 yd. various streets, to F. P. McCormick, c/o Parker-Washington Constr. Co., Reeder Bldg., $333,429.

★**Idaho, Bonners Ferry** — City let contract paving 4050 sq.yd. Main, Bonner and Kootenai Sts., to J. C. Broad, Jamieson Bldg., Spokane, Wash., $27,465.

★**Idaho, Lewiston**—City Council let contract grading, curbing and building concrete sidewalks on D St. extension, to F. A. Dole, Lewiston, $11,331.

Idaho, St. Marie—City received bids building 116,409 sq.ft. cement sidewalks, 5-12 ft. wide, from W. L. Geist, St. Marie, $26,920; Two Miracle Co., 437 Ford Bldg., Great Falls, Mont., $28,229. Noted July 31.

Arizona—State Highway Comm., Phoenix, received bids improving 2 mi. Prescott-Jerome Highway, from Miller Constr. Co., San Francisco, $1.34 cu.yd. excav., total, $102,403; H. Balbaith, Jerome, $1.55 per cu.yd.; Twohy Bros., North West Bank Bldg., Portland, Ore., $1.89 per cu.yd. Work involves 58,200 cu.yd. excav., 2600 cu.yd. dry rubble masonry in retaining walls, etc.

★**Washington** — State Highway Comm., Olympia, will grade and gravel 7 mi. Olympic Highway west from Olympia. About $99,996. Work will be done by day labor. Noted July 31.

★**Wash., Seattle**—Bd. Pub. Wks. let contract improving 30th Ave. S., et al. involving 95,000 lin.ft. wooden curbing and guttering, 7990 lin.ft. concrete sidewalk, 22,200 cu.yd. earth excav. and 1555 ft. 8 in. concrete sewer pipe, to Bishop Constr. Co., Seattle, $55,119.

★**Wash., Vancouver**—City let contract paving with bitulithic and building concrete sidewalks on 22nd St. from Reserve to Main Sts., to Warren Constr. Co., Journal Bldg., Portland, Ore., $29,617. Noted July 10.

Ore., Portland—City received bids July 3rd improving (a) East 47th St. from East Glisan St. to connection with pavement at railroad south and regrade project, (b) East 16th St. from Spokane to Marion Aves., (c) Umatilla Ave. from East 23rd to East 19th Sts., (d) East 27th and Klickitat Sts., (e) East 9th St. from East Burnside to East Ash Sts., (f) East 60th St. from East Glisan to Oregon Sts., (g) Division St. from East 10th St. to Grand Ave., (h) Girard St. from Newman to Haven Sts., (i) Marion Ave. and East 16th St., (j) East Madison St. from East 1st to East Water Sts., (k) Tacoma Ave. from East 17th to East 21st Sts., (l) 56th Ave. S. E. from 77th St. S. E. to 72nd St., S. E., (m) East Morrison St. from East 32nd to East 13th Sts., (n) East 11th St. from Alberta to Going Sts., (o) Olin St. from Lombard St. to Willamette Blvd., (1) asphaltic concrete, (2) asphaltic concrete No. 1 in roadway, (3) concrete No. 1 in roadway, (4) asphaltic concrete redress, (5) concrete No. 1 in track, (6) concrete in roadway, (7) asphaltic concrete repairs, (8) asphaltic concrete No. 1 redress, (9) macadam in roadway, from Warren Constr. Co., Journal Bldg., (a1) $1.42 per yd., total cost, $15,234, (b2) $1.43 per sq.yd., $18,747, (c2) $1.43 per yd., $9808, (d2) $1.37 per yd., $25,040, (e4) $1.39 per sq.yd., $2417, (f5) $2.00 per sq.yd., (f1) $1.53 per sq.yd., $4115, (g5) $2.10 per sq.yd., (g2) $1.28 per sq.yd., $16,132, (h1) $1.63 per sq.yd., $10,022, (j8) $1.39 per yd., (m2) $1.30 per sq.yd., $6477, (n2) $1.40 per sq.yd., $6660; J. Keating, (e3) $2.30 per sq.yd., $9001, (k9) $5.50 per sq.yd., $10,008, (o) $8161; S. Simonsen, (d3) $1.98 per sq.yd., $24,200, (f7) $4036, (l) $6491, (o) $7892; Municipal Paving Plant, (e4) $1.00 per sq.yd., $1757, (j1) $1.00 per sq.yd., $1009; Cochran Bros., (g3) $2.05 per sq.yd., (g5) $2.05 per sq.yd., $17,296, (h6) $2.25 per sq.yd., $9775, (m3) $2.10 per yd., $5041, (n3) $2.10 per sq.yd., $6477. Noted Aug. 7.

★**Cal., Martinez**—Comrs. Contra Costa Co. let contract grading and paving with 4 in. concrete 6.84 mi. Div. 11, west from Pittsburg, 18 ft. wide, to O'Brien Bros., Martinez, $13.75 per cu.yd. concrete paving and $0.70 per cu.yd. excav.; 2 mi. Div. 12, west from Pittsburg, 18 ft. wide, Blanchard, Crocker & Howell, Oakland, $13.49 per cu.yd. concrete paving and $0.93 per cu.yd. excav.

★**Cal., Oakland**—City let contract curbing, guttering, paving and building sidewalks on 2000 ft. Fruitvale and Whittle Aves., to Bates & Borland, Bway. and 12th St., $35,166. Noted Aug. 7.

Cal., Oakland—City received bids improving (a) 87th Ave., (b) 37th Ave., from Bates & Borland, Bway. and 12th St., (a) $13,223, (b) $18,318; P. A. Belser, 625 Market St., San Francisco, (a) $14,301; Hutchinson Co., 444 17th St., (a) $15,124, (b) $17,632; Oakland Paving Co., 5000 Bway., (b) $18,455. Noted July 31.

★**Ont., Owen Sound**—D. H. Fleming, city engr., let contract paving 16 blocks, 6th, 8th and 10th Sts., 20, 24 and 28 ft. wide, bitulithic to Warren Paving Co., McKinnon Bldg., Toronto, $75,000; curbing, guttering and catch basins, to Curran Clement Co., Orillia, $15,000. Noted July 10.

Railways

PROPOSED WORK

Maryland—See "Industrial Works" under Baltimore.

Maryland—Maryland, Delaware & Virginia R.R., and Philadelphia, Baltimore & Washington R.R., having survey made for connecting lines near Queen Anne. Cost between $75,000 and $100,000. Address E. Lee, Broad St. Sta., Phil., Federal mgr.

Florida—St. Augustine Pub. Ser. Corp. plans to build electric car line from Jacksonville to St. Augustine. T. R. Osmond, St. Augustine, promoter.

Missouri—City of St. Louis plans to build electric railway belt line to connect Municipal and McKinley Bridges. Appropriation of $1,920,000 has been made and plans prepared by J. A. Hook, dir. and C. S. Butts, engr., both of Bd. Pub. Utilities, for laying 63 mi. track of United Ry. Co., extending Natural Bridge line 1¾ mi. to Pine Lawn, thence to Florrisant Ave. north, also extending Tower Grove line 1½ mi. to Lindenwood, Taylor line 3¾ mi. south to Gravois Ave., Lee line 2 mi. west and short ning Cherokee line between 18th St. 12th St. and Geyer Ave. Plans also include connection of Terminal R.R. with Wiggins Ferry and Mill Creek Valley yards and elimination of surface grade of Missouri Pacific R.R. tracks on Poplar St. Another appropriation of $1,500,000 will be made for construction of elevated railway tracks and approach to Municipal Free Bridge at southern terminus, for which plans have been drawn. This work will include construction of 4400 ft. double-track elevated structure and 4000 ft. double surface track track on Gratiot St., elevated structure to be in form of "Y," tracks starting at southern side Chouteau Ave. and levee connecting with elevated line between Cedar and Plum Sts., extending west to curve on 2nd St. to connect with elevated tracks of Terminal R. R., then continuing to 7th and Gratiot Sts. to meet approach of Municipal Free Bridge. On north side elevated structure will start at Cedar Plum and 2nd Sts., curving to ground on north east line to Clark and Levee Sts., to connect with tracks of Missouri Pacific R.R. and St. Louis Transfer R.R., Mill Creek Valley yards and Municipal Free Bridge and by way of bridge to East St. Louis, Ill., yards and tracks of company.

California—California Southern R.R., Investment Bldg., Los Angeles, plans to build 10 mi. steam railroad from Blythe south, also build concrete siphon bridges to carry irrigation ditches under railway. Work will probably be done by day labor. C. H. Beggs, genl. mgr.

Excavation and Dredging

PROPOSED WORK

O., Kenton—Excavation Upper Scioto Drainage & Conservancy Dist., Kenton, rejected bids received Aug. 6, improving channel and building levee along Scioto River through here. About $400,000. Noted July 3.

Mich., Lansing—Drainage—See "Streets & Roads."

Minn., Bemidji—Drainage—Comrs. Beltrami Co. having preliminary survey made draining Red Lake Basin and Red Lake River from outlet to Red River of North at Grand Forks. About $779,300. S. D. Snyder, Bemidji, engr.

Minn., Warren—Ditches. Comrs. Marshall Co. having plans prepared by J. A. Lindsey, engr., Warren, building 4 main drainage ditches, total length 150 mi.

N. M., Ft. Summer Irrigation—City voted $400,000 bonds to build new concrete dam and gravity canal to irrigate 9000 acres in Pecos Valley. Engineer not selected.

Utah, Delta—Drainage — Bd. Supervs. Millard Co., D. D. No. 1, soon let contract furnishing materials and labor building drainage system. Work involves 361,000 cu.yd. earth excav., 688,000 lin.ft. 6-20 in. drain tile and 688,000 lin.ft. trenching. Caldwell & Richards, Vermont Bldg., Salt Lake City, archts.

Utah, Hinckley Drainage. Bd. Supervs. Millard Co., D. D. No. 1, soon lets contract furnishing materials and labor for building drainage system. Work involves 72,000 cu.yd. excav., 345,940 lin.ft. trenching and backfilling, and 345,940 lin.ft. 6-20 in. tile. Caldwell & Richards, Vermont Bld., Salt Lake City, archts.

Wash., Seattle Drainage— Bd. King Co. Comrs., Seattle, established Algona D. D. 2 mi. long, 1½ mi. wide containing 1,473.1 acres. J. J. Hunnes, co. engr. preparing plans and will call for bids before Sept. 1. Plans include 9¾ mi. ditches. Pierce Co. will join project at county line and carry water into Stuck River. About $19,751.

Ore., Hillsboro Ditch—Bd. Supervs. D. D. No. 7, Washington Co., soon lets contract constructing drainage ditches and 2 timber bridges involving 60,000 cu.yd. earth excav. About $10,000. Baar & Cunningham, Spalding Bldg., Portland, consult engrs.

Cal., Huntington Beach—Irrigation.—Property owners on Huntington Beach mesa organizing irrigation district to build small dams in Santa Ana River, instal pumps to lift water 75 ft. and build pipe lines to irrigate about 2500 acres. C. F. Fowler, member of com.

Cal., McArthur — Irrigation — J. W. Forgeus, Sharon Bldg., San Francisco, having estimate made by F. H. Tibbetts, engr., Alaska-Commercial Bldg., San Francisco for irrigation system in Fall River Valley, Shasta Co.

Cal., Modesto—Canal—P. Jones, engr. Modesto, recommended bond issue of $250,000 to enlarge and reline main canal with concrete and building drainage system, for Modesto Irrigation Dist.

Cal., Oxnard—Ditches.—Oxnard D. D. election Aug. 26 to vote on $200,000 bond to build 20 mi. ditches, main ditch to be 10-12 ft. deep, 15 ft. wide at bottom and 30 ft. wide at top. Olmsted & Gilbreth, 1112 Hollingsworth Bldg., Los Angeles, engrs.

Man., Winnipeg—Drainage—G. A. Grierson, minister pub. wks., soon lets contract constructing 42 mi. drainage ditches in D. D. No. 2. Work involves 314,000 cu.yd. excav.

BIDS DESIRED

N. Y., Brooklyn—Dredging. Until Aug. 20, by E. Riegelmann, boro. pres., dredging Gowanus Canal from its head to Hamilton Ave. and Newtown Creek Canal at and in canal and basin included within boundaries of Johnson and Varick Aves. and in Stagg St. basin.

Fla., Sanford—Ditches. Until Sept. 2, by Comrs. Seminole Co., building 9.18 mi. ditches, involving 58,660 cu.yd. excav. P. F. Williams, Sanford, engr. Noted June 19.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Phila.**—Dredging—Comrs. Fairmount Park let contract dredging high spots in Schuylkill River near Fairmount Park, to R. Patton, 601 North 34th St. About $25,000. Noted July 31.

Ariz., Phenix Drainage. City received bids building tile drainage system, from C. Fisher, 845 North 6th Ave., $141,712, Doyle Bros., Phenix, $132,850, G. S. Bryson & Sons, Stimson Bldg., Los Angeles, $136,625. Noted July 17.

★**Ont., Kingston**—Excavation. Provincial Government, Toronto, let contract excavating at Rouge Hill on Provincial Highway, involving about 60,000 cu.yd. dry excav., to Dufferin Construction Co., Toronto, $75 per cu.yd.

★**Ont., Metcalfe**—Drainage. Municipality let contract building extension drain in Grey Creek, near here, to D. B. Cameron, Berwick. Work involves 39,131 cu.yd. earth excav., $0.30 per cu.yd., 133 cu.yd. rock excav., $3.25 per cu.yd., 15 acres clearing, $50 per acre, grubbing, $0.60 per lin.ft. Total cost, $18,000.

Industrial Works

PROPOSED WORK

Mass., Williamstown—J. S. Boyd Co. soon lets contract building addition to weaving and finishing mills. About $75,000. E. F. Saxton, Tremont Bldg., Boston, consult. engr. and archt.

Mass., Williamstown—J. S. Boyd Co. having plans prepared by E. F. Saxton, consult. engr. and archt., Tremont Bldg., Boston, for 500 loom spinning and weaving mill, cost $500,000; also for developing water power.

Conn., Bridgeport—Bridgeport Mattress Co., 25 East Washington Ave., plans to build 4 story, 50 x 100 ft., brick and mill construction factory, concrete foundation, on East Washington Ave. About $40,000. F. A. Cooper, 1024 Main St., engr.

Conn., Hartford—Royal Typewriter Co., Inc., 150 New Park Ave., plans to build brick and concrete addition to plant. About $175,000. Private plans.

Conn., Mystic—Packer Tar Soap Co., Lincoln Ave., plans to build 1 story, storage plant, 1 story factory and 25 x 30 ft. power house, brick and concrete, concrete flooring and foundation. About $40,000. Bilderbeck & Langdon, Inc., Barrows Bldg., New London, engrs.

Conn., New Haven—New England Iron Wks., 96 Commerce St., soon receives bids building 1 story, 69 x 150 ft., brick and steel plant and 20 x 35 ft. brick office, concrete flooring and foundation, on Dixwell Ave. About $40,000. Private plans. Noted Feb. 20.

Conn., New Haven—Texas Oil Co., 17 Battery Pl., New York City, soon receives bids building 1 and 2 story, 38 x 100 ft. storage and office and 1 story, 40 x 56 ft. garage, rein.-con., rein.-con. foundation, on Forbes Ave, here. About $35,000. Private plan.

N. Y., Albany—Kelley-Dennin Co. plans to build 1 story, 150 x 150 ft., brick, concrete and steel garage, machine shop and salesroom, with 2 wings, on Bway. About $150,000. Address A. E. Lew, vice pres.

N. Y., Brooklyn—Thompson & Mellema, consult. engrs., 640 Bway., New York City, soon lets contract furnishing material and labor building concrete work for 2 story, 75 x 100 ft., rein.-con. garage, on Pearl St., for J. B. Silman, 1511 Emmons Ave.

N. Y., New York—M. Hausle, archt. and engr., 3307 3rd Ave., receives bids about Sept. 1, building 6 story, 100 x 120 ft. ice plant, brick and steel, rein.-con. flooring, concrete foundation, on Bedford Park Blvd., for N. Reinhardt, 972 Brook Ave. About $150,000.

N. Y., New York—J. O'Leary, 227 East 57th St., had plans prepared by J. M. Felson, archt. and engr., 1133 Bway., for 4 story, 55 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 225-227 East 67th St. About $50,000.

N. Y., New York—Port Morris Holding Co., c/o Winters & Co., 137th St. and Southern Blvd., having plans prepared by Ballinger & Perrott, archts. and engrs., 47 West 34th St., for 6 story, 375 x 382 x 316 x 390 ft. plans factory, rein-con. and steel, rein.-con. flooring, concrete foundation, on 141st St. and Walton Ave. About $500,000.

N. Y., New York—L. A. Sheinart, archt., 194 Bowery, receives bids about Aug. 25, building 2 story brick and steel garage, rein.-con. flooring, brick foundation, at 361-365 South St., for J. Kennedy, 378 Front St. About $60,000.

N. Y., Seneca Falls—Wescott Valve Co., Erie, Pa., plans to build 1 story brick factory, on Green and Spring Sts. About $100,000. Address P. R. Westcott, Seneca Falls, secy.

N. Y., Syracuse—H. H. Franklin Co., 302 South Geddes St., plans to build 60 x 140 ft. automobile plant brick, brick foundation. About $250,000. S. Firestone, Granite Bldg., Rochester, archt. and engr.

N. Y., Syracuse—Great Northern Warehouse, Inc., plans to build 7 story, 150 x 200 ft. rein.-con. warehouse, rein.-con. flooring, concrete foundation, on West Fayette St. About $400,000. Thompson & Binger, Gurney Bldg., archts. and engrs.

N. Y., Syracuse—Morrell-Soule Co., North Franklin and Plum Sts., had plans prepared by Thompson & Binger, engrs., Gurney Bldg., for 61 x 90 ft., cold storage plant, concrete. Cost between $80,000 and $90,000. Engineers will supervise construction.

N. J., Belleville—Overman Cushion Tire Co., Cortlandt and Rutgers Sts., plans to build 2 story, 50 x 138 ft. assembling room addition, brick. About $30,000. E. Grant, 397 Washington Ave., Newark, archt.

N. J., Newark—M. Hertz Leather Co., Oliver St., having plans prepared by J. A. Piggott, archts. and engrs., 9 Clinton St., for 3 story, 42 x 200 ft., rein.-con., brick and mill construction addition to factory. About $150,000.

N. J., Trenton—Standard Oil Co., New York Ave., plans to build repair shops, storage buildings and offices at its plant, here. About $200,000. W. M. Todd, 837 East State St., agt.

Pa., Phila.—Comery Schwartz Motor Car Co., 128 North Broad St., having plans prepared by C. E. Oelschlager, archt., 1615 Walnut St., building 6 story, 210 x 440 ft., concrete and brick auto service and truck station at 24 Market St., through to Chestnut St.

Md. Baltimore—F. A. Furst, pres., Furst-Clark Constr. Co., 1515 Fidelity Bldg., and other capitalists and financiers, plan to develop 200 acre tract from Spring Gardens to Fort McHenry, Baltimore Southwest Channel Harbor, for system of docks and warehouses. Plans include 200 x 1200 ft., concrete, covered pier, cost $825,000; 2 warehouses, $1,824,000; approaches, $400,000; bulkhead, $100,000; pier equipment, $40,000; roads, $40,000; railway trackage, $75,000; heating plant, $175,000; cranes, $86,000; locomotives, $25,000. Full development provides for 26 warehouses and eight 200 x 1200 ft. covered piers; several of the buildings to be used for manufacturing purposes. F. W. Kesselbaum, c/o Baltimore Dry Dock & Ship Building Co., Locust Point, engr.

N. C., Bessemer City—Huss Mfg. Co. plans to build factory, also 150 x 400 ft. warehouse and 100 x 200 ft. waste plant. About $500,000. Architect not selected.

Ala., Birmingham—Cruse-Crawford Mfg. Co., Ave. B and 22nd St., having plans prepared by W. T. Warren, archt., Empire Bldg., for 1 and 3 story, brick or tile garage. About $100,000.

O., Alliance—City election Sept. 8 to vote on $525,000 bonds to build gas plant.

O., Carthage (Cincinnati P. O.)—Lunkenheimer Co., Beekman, Tremont, Knox, Lawnway and Waverly Aves., Cincinnati, acquired site in Carthage comprising about 70 acres directly on Toledo Division of Baltimore & Ohio Southwestern RR., and having plans prepared for complete new plant. Buildings will be of 1, 2 and 3 story types, steel and concrete construction. Plans also include recreation center for employees, including assembly hall, club rooms, base ball grounds, tennis courts, swimming pools, dining room, etc., on tract of land lying directly opposite from main plant. Cost $2,000,000.

O., Cleveland—Christian Schwartzenberg & Gaede, archts., 1900 Euclid Ave., soon lets contract building 6 story, 107 x 125 ft., rein.-con., steel and brick factory, on West 3rd St. and Lakeside Ave., for Crown Land Co., East 22nd St. and St. Clair Ave. About $200,000. Noted Aug. 7.

O., Cleveland—Schwartz, Forney & Hexter Co., West 6th St. and Lakeside Ave., plans to build 5 story, 100 x 150 ft., rein.-con., steel and brick factory, on East 30th St. and Superior Ave. About $250,000. Architect not selected.

O., Newark—W. S. Weiant & Son had plans prepared by Bodenstein & Surmann, archts. and engrs., 405 2nd Natl. Bank Bldg., Cincinnati, for 2 and 3 story, 49 x 66 ft. power plant, concrete foundation.

O., Newton Falls — Made-Right Rubber & Tire Co. preparing plans for plant, to include 4 story, 60 x 240 ft., main building, 40 x 80 ft. boiler house and 75 x 75 ft. office building. About $225,000. Private plans.

Mich., Detroit—R. Flinn, archt., 435 Woodward Ave., preparing plans building 3 story, 70 x 110 ft., brick, steel and mill construction factory, on Riopelle and Winder St. About $35,000. Owner's name withheld.

Mich., Detroit—C. E. Rogers, 34 Goldsmith St., having plans prepared by Varney & Varney, archts., 307 Palmer Bldg., building 1 story, 100 x 214 ft., brick and steel factory, concrete foundation, on West Fort St. About $80,000.

Mich., Ecorse—Edgeworth Varnish Co., Phila., has acquired site on High St. and Michigan Central R.R., here, and plans to build 100 x 300 ft. factory. Architect not selected.

Ill., Chicago—Gardner & Lindberg, engrs., 38 South Dearborn St., soon receives bids building 10 story rein.-con. cold storage warehouse, concrete foundation, on Fulton and Morgan Sts., for Fulton Market Cold Storage Co., c/o engrs. About $4,000,000.

Kan., Wichita—Sinclair Refining Co., Wichita, and 111 West Washington St., Chicago, plans to build oil distributing plant here. Plans include 3 story, fireproof office building and several other structures. About $150,000. C. K. Birdsall, c/o owner, archt.

Neb., Alliance—Lowry & Henry plan to build 1 story, 100 x 140 ft. rein.-con., brick and timber garage, rein.-con. flooring, concrete foundation. About $70,000. H. W. J. Edbrooke, Tabor Opera House Bldg., Denver, Colo., archt.

Mo., Florrisant—Florrisant Serv. Co., Bellefontaine Rd., receives bids in January, constructing 2 story, 80 x 100 ft. freight storage building and 1 story, 60 x 100 ft. office, brick, concrete and steel, and 3 story, 100 x 100 ft. rein.-con., steel and brick garage and repair shop, rein.-con. flooring, rock foundation, on Bellefontaine Rd. Cost $60,000 and $100,000 respectively.

Mo., Jefferson City—W. C. Schmidt plans to build fireproof garage. About $25,000.

Mo., St. Louis—City plans to build two 3 story, 200 x 400 ft. and one 120 x 200 ft. rein.-con., steel and brick warehouses, rein.-con. flooring, rock foundation, on North Market St. and Mississippi River. About $300,000. C. E. Smith, City Hall, engr.

Mo., St. Louis—W. H. Faust, 524 South Spring St., Los Angeles, plans to build garbage reduction plant. About $400,000.

Mo., St. Louis—Miller Lightning Rod Co., plans to build 2 story, 100 x 300 ft. factory on 3rd and Geyer Sts. Cost to exceed $50,000. E. G. Miller, secy. Architect not selected.

Tex., San Antonio—Bear Rubber Mills, Ltd., plans to build 1 story, 300 x 360 ft. mill on Frio City Rd. About $200,000. Gulick, Hoff & Ries, Frost Bldg., engrs.

Okla., Hobart—City plans election soon to vote on $135,000 bonds to build electric light plant. V. V. Long & Co., 605 W. D. Capitol Hill, Oklahoma, engrs.

Okla., Tulsa—F. E. Gates, 614 South Independence St., Sapulpa, plans to build 2 story, 100 x 140 ft. factory on Elgin Ave. and Brody St., here. About $150,000. Architect and engineer not selected.

Idaho, Boise—Sherman Automobile Co. plans to build 1 story, 75 x 125 ft., brick, tile and steel garage, to include showroom, restrooms, stockrooms, etc. G. O. Goodwin, mgr. Tourtellotte & Hummel, Overland Bldg., archts.

Idaho, Idaho Falls—R. F. Bicknell, 141 Warm Springs Ave., Boise, plans to build 2 or 3 story, concrete, brick and frame plant, here. About $1,000,000. Architect not selected.

Utah, Manti—City having plans prepared by F. G. McGonagle, engr. Salt Lake City, for electric light plant. About $25,000.

Utah, Ogden—Midwest Dye & Chemical Co. plans to build factory, here, to manufacture salt, caustic soda, dyes, etc. About $100,000. L. T. Cannon, Salt Lake City, pres.

Wash., Centralia—Kane Shock Absorber Co., plans to build 1 story, 40 x 180 ft., machine shop and 60 x 60 ft. foundry, brick veneer, on Fords Praire. About $60,000.

Wash., Spokane—Pacific Coast Biscuit Co., plans to build additions to plant, including fuel oil tank, on Pacific Ave. and Bernard St. About $60,000.

Wash., Walla Walla—Walla Walla Tool & Wrench Co. plans to build 2 or 3 story, concrete and steel factory. About $200,000. Private plans.

Ore., Bend—J. Moore plans to build 2nd unit of 1 story concrete and frame soda ash and potash plant, on Summer Lake, 10,000 ton capacity. About $190,000.

Ore., Marshfield—Adelsperger & Conrad Co. purchased 26 acre Reynolds development site and plans to build 100,000 ft. daily capacity sawmill. About $150,000.

Ore., Portland—Log Cabin Baking Co., 265 Ivy St., having plans prepared for remodeling and building 1 story, 65 x 90 ft. addition to bakery and 3 story, 16 x 52 ft. addition to storage flour bin, concrete, concrete foundation, on Vancouver St. Cost including conveyors and freight elevators, $75,000. H. T. Rittman, mgr.

Industrial Works (Continued)

Ore., St. Helens—St. Helens Lumber Co. plans to increase capacity of lumber mill to 200,000 ft. daily by rebuilding loading shed and building addition and installing new bandsaw, edger, sorting tables, etc. About $50,000.

Cal., El Centro—Imperial Valley Milk Producers Assn. receives bids in September building 2 story, 150 x 300 ft. creamery on Main St. About $150,000. Noted May 8.

Cal., Los Angeles—Crane Co., 321 East 3rd St., purchased site and plans to build 5 story, 84 x 200 ft., concrete and brick addition to warehouse. Architect not selected.

Cal., Los Angeles—S. H. Van Nuys, Van Nuys Bldg., having plans prepared by Morgan, Walls & Morgan, archts., 1124 Van Nuys Bldg., for 4 story, 100 x 155 ft., rein.-con. garage and loft building, rein.-con flooring, concrete foundation on 11th and Flower Sts. W. P. Herbert, lessee.

Cal., Oakland—Pacific Wool Corp. had plans prepared by J. M. Haenke, archt., c/o Palace Hotel, San Francisco, for factory to consist of 3 story, 100 x 300 ft. warehouse, 3 story, 78 x 217 ft. scouring plant, 2 story, 78 x 217 ft. spinning shop, 1 story, 45 x 60 ft. power plant, 1 story, 35 x 90 ft. office and 30 x 560 ft. wharf, all rein.-con., with steel sash. About $800,000.

BIDS DESIRED

Mass., Worcester—Until Aug. 16, by S. H. Pitcher Co., archts., 44 Front St., building 3 story, 50 x 150 ft. brick garage, rein.-con. flooring, concrete foundation, on Austin St., for Worcester Paper Box Co., 7 Houchin Ave. About $60,000. Noted July 31.

Pa., Phila.—Until Aug 20, by W. F. Koelle & Co., archt., 26th and Oxford Sts., building 7 story, 49 x 186 ft., ice cream factory, rein.-con. and brick, on 8th and Cumberland Sts., for Breyer Ice Cream Co., 8th and Cumberland Sts.

Pa., Wilkes-Barre—Until Aug. 22, by G. F. Schroeder, archt., 14 Wietenkorn Bldg., building 2 story, 152 x 154 ft. steel and brick garage, rein.-con. flooring, rock foundation, on Northampton St., for D. S. Williams, 259 East Northampton St. About $60,000.

O., Cleveland—G. S. Rider, archt. and engr., Century Bldg., receiving bids building 10 story, 89 x 105 ft., rein.-con., steel and brick warehouse, at 5442 Blanche Ave., for Cleveland Worsted Mills Co., 6300 Bway Ave. About $400,000. Noted July 31.

O., Cleveland—G. S. Rider, engrs., Century Bldg., receiving bids building 2 story, 97 x 167 ft., rein.-con., steel and brick addition to factory, for Jordon Motor Car Co., 1057 East 152nd St. About $75,000. Noted July 31.

Mich., Detroit—Mildner & Eisen, archts., 924 Hammond Bldg., receiving bids building 1 and 2 story, 75 x 130 ft. brick and steel mill construction machine shop on 4th and Porter Sts., for Mutual Electric & Machine Co., 232 Fort St.

Mich., Grand Rapids—P. Lindhout, archt., Grand Rapids, receiving bids building 2 story, 75 by 125 ft. rein. con., steel and brick factory here, rein. con. flooring, concrete foundation, for Globe Truck & Vise Co., Grand Rapids. About $50,000.

Ill., Chicago—S. M. Eichberg, archt., 64 West Randolph St., receiving bids building 4 story, 100 x 330 ft. rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, on Kingsbury St. at Chicago River, for S. Birkenstein & Sons, Inc., 377 West Ontario St. About $300,000. Noted July 17.

Ill., Chicago—W. G. Uffendell, archt., 39 South State St., receiving bids for 5 story, 100 x 135 ft. rein.-con. factory, on Orleans St. and Institute Pl. for Dallas Brass & Copper Co., 225 North Jefferson St. About $200,000.

Minn., Minneapolis—Until Aug. 20, by State Bd. Control, Capitol, St. Paul, building 6 story, 120 x 180 ft., rein.-con. and brick storehouse, on University St. About $125,000. C. H. Johnson, Capital Life Bldg., St. Paul, archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Northampton** — Nonotuck Silk Co., Florence, let contract building 3 story, 80 x 120 ft. rein.-con addition to factory, on Bridge St. here, to W. F Kearns Co., 240 Albany St., Cambridgeport. About $36,000.

★**Mass., Pittsfield**—Berkshire Woolen Co. let contract building 1 story, 50 x 200 ft., brick addition to mill, concrete foundation, to J. R. Hampson & Co. About $25,000.

★**R. I., Providence**—M. Hickey, 246 Thurbers Ave., let contract building 1 story, 50 x 200 ft. brick and mill construction garage and service station, on Thurbers Ave. and Eddy St., to J. A. Hickey, Thurbers Ave. About $30,000. Noted July 3.

★**R. I., Providence**—Rhode Island School of Design, Waterman St., let contract building 4 story, 58 x 82 ft. jewelry plant, brick and concrete, concrete flooring and foundation, on Benefit St., to C. B. Maguire Co., 1206 Turks Head Bldg. About $125,000. Noted June 19 under "Buildings."

★**R. I., Providence**—U. S. Gutta Percha Co., 12 Dudley St., let contract building 5 story, 50 x 100 ft. brick and steel addition to plant, concrete foundation, on Dudley St. to Williams & Merchant, Inc., 86 Weybosset St. About $80,000.

★**Conn., Bridgeport**—Cornwall & Patterson Mfg. Co., 1730 State St., let contract building 1 story, 145 x 160 ft. brick addition to factory, concrete flooring, concrete and stone foundation, to Westcott & Mapes, Inc., 207 Orange St., New Haven. About $50,000.

★**Conn., Elmwood** (Hartford P. O.)—Jewell Belting Co., 55 Trumbull St., Hartford, let contract building 5 story, 66 x 370 ft. brick and mill construction factory, here, brick foundation, to F. J. Meagher, 100 Caya Ave., West Hartford.

★**Conn., Forrestville**—Peck & Young Mfg. Co., Stratford Ave., let contract building 1 story, 60 x 200 ft. factory, 1 story, 10 x 80 ft. garage and 1 story 25 x 35 ft. boiler house, brick, concrete foundation, to J. H. Grozier Co., 756 Main St., Hartford. About $50,000.

★**Conn., Norwalk**—New England Auto Accessories Corp., 50 South Main St., let contract building 80 x 150 ft. brick and concrete auto plant, concrete foundation, on West Ave. and Berkeley St., to Norwalk Bldg. Co., 229 Main St. About $65,000.

★**Conn., South Norwalk**—Nash Eng. Co., Wilson Rd., will build 3 story brick and mill construction addition to factory, rock foundation. About $30,000. Work will be done by day labor. Noted July 24.

★**Conn., Windsor Locks**—Ford, Buck & Sheldon, Inc., engrs., 60 Prospect St., Hartford, let contract to Bent-Bartlett Co., 43 Ann St., Hartford, building 84 x 135 ft., rein.-con. addition to factory and 84 x 100 ft. cotton plant, here, for J. R. Montgomery Co. About $80,000. Noted Aug. 7.

★**N. Y., Brooklyn**—J. Sklar, 133 Floyd St., will build 1 story, 100 x 150 ft., brick and steel garage, concrete foundation, on Vernon and Throop Aves. About $35,000. Work will be done by day labor.

★**N. Y., Carthage**—Natl. Paper Products Co., 1789 Montgomery St., let contract building brick addition to plant, to W. O. Adner, Franklin St. About $40,000. Noted Feb. 6.

★**N. Y., Long Island City**—Ballinger & Perrot, archts. and engrs., 17th and Arch Sts., Phila., let contract to Turner Constr. Co., 244 Madison Ave., New York City, for 5 and 6 story, 200 x 600 ft. rein.-con. and steel factory, rein.-con. flooring, concrete foundation, at Degnal Terminal, here, for Amer. Chicle Co., 19 West 44th St., New York City. About $2,000,000. Noted July 24.

★**N. Y., New York**—J. S. Hannon, 445 West 16th St., let contract building 2 story, 72 x 95 ft. brick and steel garage, rein.-con. flooring, concrete foundation, at 433-437 West 16th St., to I. A. Hoppers Sons Inc., 15 East 40th St. About $50,000. Noted July 17.

★**N. Y., New York**—J. Hoffman Brewing Co., 211 East 55th St., will convert 3 and 4 story, brick and steel brewing plant at 215 East 54th St., into garage, rein.-con. flooring. About $50,000. Work will be done by day labor. Noted July 3.

★**N. Y., New York**—A. Lobo, 1133 Bway., let contract building 2 story, 45 x 70 ft., brick and steel warehouse, rein.-con. flooring, concrete foundation, at 401-403 Canal St., to Gregorio & Co., 860 East 228th St. About $30,000. Noted July 31.

★**N. Y., Syracuse**—Syracuse Overland Co., 245 West Water St., let general contract building 3 story, 100 x 100 ft. brick garage, rein.-con. flooring, concrete foundation, at 405-9 Grake St., to E. A. Howard, Bostable Bldg., steel work, to Syracuse Eng. Co., Rosenbloom Blk. About $45,000.

★**N. Y., Utica**—C. A. Durr Packing Co., Ft. Schuyler St., let contract building 2 story brick addition to plant, to Thompson & Binger, Inc., Gurney Bldg., Syracuse. About $75,000.

★**N. J., Camden**—Standard Oil Co., 26 Bway., New York City, let contract building 4 story, rein.-con. and steel storage plant, rein.-con. flooring, concrete foundation, to White Eng. Co., 95 Madison Ave., New York City. About $600,000.

★**N. J., Jersey City**—Amer. Groceries Co., West Side Ave. and Carbon Pl., let contract building 4 story, 100 x 100 ft., mill construction warehouse, to Irvington Lumber & Door Co., 738 Broad St., Newark. About $150,000. Noted July 17.

★**N. J., Matawan**—A. P. Munning, c/o Lockwood, Greene & Co., archts., 101 Park Ave., New York City, let contract building 1 story, 42 x 115 ft., and 42 x 152 ft., rein.-con. and steel factories, concrete foundation, to H. V. Patten, Matawan. About $35,000. Noted June 26.

★**N. J., Passaic**—Genl. Silk Importing Co., c/o Lockwood, Greene & Co., archts., 101 Park Ave., New York City, let contract building rein.-con., brick and steel factory, covering 100,000 sq.ft. rein.-con. floor space, concrete foundation, to J. W. Ferguson, Paterson. About $200,000. Noted July 24.

★**N. J., Red Bank**—Standard Oil Co., 26 Bway., New York City, let contract building 2 story, rein.-con. and steel garage, rein.-con. flooring, concrete foundation, to White Eng. Co., 95 Madison Ave., New York City. About $100,000, cost plus percentage basis.

★**N. J., Trenton**—Standard Oil Co., 26 Bway., New York City, let contract building 3 story, rein.-con. and steel storage plant, rein.-con. flooring, concrete foundation, to White Eng. Co., 95 Madison Ave., New York City. About $300,000, cost plus percentage basis.

★**Pa., Cheswick**—Duquesne Light Co., 435 6th St., Pittsburgh, let contract building power house, here, (one unit of 60,000 k.w. is to be installed initially, ultimate capacity 300,000 k.w.), to D. P. Robinson & Co., Inc., 61 Bway., New York City.

★**Pa., Harrisburg**—Packard Motor Car Co., 317 North Broad St., let contract building 1 story, 140 x 180 ft. concrete and brick service station and sales room, to Central Constr. Corp., Commonwealth Bldg., Harrisburg. About $70,000.

★**Pa., Phila.**—Phila. Paper Co., 231 South Front St., let contract building 1 story, 55 x 192 ft., concrete and brick factory, on Nixon and Fountain Sts., to Brown Constr Co., 4600 Main St. About $25,000.

★**Pa., Pittsburgh**—Pittsburgh Gage & Supply Co., 30th and Liberty Sts., let contract building 6 story, 98 x 130 ft. brick addition to factory, rein.-con. flooring, concrete foundation, to J. W. Cowper & Sons Co., 60 Oliver Bldg. About $200,000.

★**Del., Newark**—Continental Fibre Co. let contract building 2 story, 60 x 240 ft. rein.-con. and steel factory, to Austin Co., Bulletin Bldg., Phila. About $56,000.

★**Del., Yorklyn**—Natl. Fibre Insulation Co let contract building 2 story, 60 x 140 ft., rein.-con. factory, to Austin Co., Bulletin Bldg., Phila. About $40,000.

★**Md., Baltimore** — Fenway Apartment Co., St. Paul and 34th Sts., let contract building 2 story, 54 x 108 ft., concrete and steel garage, cement flooring, concrete foundation, to Price Constr. Co., 210 Maryland Trust Bldg. About $55,000. Noted Aug. 7.

★**Md., Ellicott City**—C. A. Gambrill Mfg Co., 109 Commerce St., Baltimore, let contract building 7 story, 50 x 128 ft., rein.-con. and brick mill and warehouse, rein con. flooring, concrete foundation, here, to West Constr. Co., 907 Amer. Bldg., Baltimore. About $100,000. Plans include pen stock, concrete draft tube and tail and bridge races. Noted May 22.

★**Va., Roanoke**—Viscose Co. let contract building 2 story, 54 x 140 ft., rein.-con. factory, to D. J. Phipps, Roanoke.

★**Ia., Sioux City**—Marine Terminal Elevator Co., Grain Exch. Bldg., let contract building 46 by 90 ft. grain elevator, rein.-con. to Younglove Constr. Co., U. B. Bldg., Sioux City. About $500,000. Work includes head house and twenty four 20 x 99 ft. tanks.

★**Ky., Louisville**—B. F. Avery & Sons 7th and Lee Sts., let contract for 2 story, 100 x 322 ft. rein.-con. plant, to Natl. Concrete Constr. Co., Bd. of Trades Bldg About $115,000. Noted July 24.

Industrial Works (Continued)

★**O., Cleveland** — A. C. Bishop, archt., 427 Guardian Bldg., let contract to Younger & Farmer, 1670 Crawford Rd., building 5 story, 118 x 120 ft., concrete, steel and brick factory on West 46th St. and Train Ave., for Ko-Ko-Mar Co., Leader News Bldg. About $40,000. Noted July 17.

★**O., Cleveland** — Chester Realty Co., Williamson Bldg., let contract building 2 story, 55 x 120 ft., concrete, steel and brick garage, rein.-con. flooring, on East 65th St. and Carnegie Ave., to A. W. Laws Constr. Co., 2206 East 93rd St. About $50,000, Previous contract rescinded. Noted July 24.

O., Cleveland — Cleveland Illuminating Co., Illuminating Bldg., preparing plans for 3 story, 20 x 29 ft., concrete, steel and brick factory at 712 East 70th St. About $25,000.

★**O., Cleveland**—Corday & Gross, 113 St. Clair Ave., let contract building 2 story, 135 x 200 ft., rein-con., steel and brick factory and print shop, on East 24th St. and Chester Ave. to W. Dunbar Co., 8201 Cedar Ave. About $300,000. Noted Aug. 7.

★**O., Cleveland**—Dickey Grabler Mfg. Co., 10302 Madison Ave., let contract building 1 story, 69 x 220 ft., rein.-con., steel and brick machine shop, to W. Dunbar Co., 8209 Cedar Ave. About $50,000. Noted Aug. 7.

O., Cleveland—Vichek Tool Co., Mt. Auburn St., having plans prepared by G. S. Rider Co., archts., Century Bldg., for 1 story, 96 x 256 ft., rein.-con., steel and brick addition to factory. About $100,000, Noted Aug. 7.

★**O., Cleveland**—E. A. Weinberger, Society for Savings Bldg., let contract remodeling 4 story, 52 x 140 ft., rein.-con., steel and brick factory on Ontario St. and St. Clair Ave., to Uhl & Jaster Co., 1900 Euclid Ave. About $30,000. Noted July 31.

★**O., Columbus** — H. C. Holbrook, archt., 1014 Outlook Bldg., let contract to Knox & Phillip, Builders & Traders Exch., for 2 story, 123 x 150 ft., fireproof garage and salesroom, on East Long St., for O. G. Roberts, 177 North 4th St. About $75,000.

★**O., Columbus**—Timken Roller Bearing Co., Deuber Ave., Canton, let contract to D. W. McGrath, New 1st Natl Bank Bldg., erecting plant on 5th and Cleveland Aves., here. Plans include 282 x 482 ft. building, 164 x 66 ft., carbonizer house, 61 x 66 ft., boiler house and 36 x 62 ft. storage house, all 1 story, saw tooth construction. About $550,000. Noted July 10.

★**O., Dayton**—Consolidated Automobile Co., 222 West 3rd St., let contract building 2 story, 85 x 160 ft., rein.-con. and brick garage and salesroom, rein.-con. flooring, concrete foundation at 229 West 3rd St., to Frank Hill Smith Co., Inc., East 3rd St. About $85,000.

★**O., Dayton**—Memorial Garage & Sales Co. let contract building 4 story, 60 x 90 ft., rein.-con. and brick garage and salesroom, rein.-con. flooring, concrete foundation, on 1st and St. Clair Sts., to Frank Hill Smith Co., Inc., East 3rd St. About $75,000.

★**Ind., Indianapolis**—G. and J. Tire Co., 549 East Georgia St., let contract building 5 story, 100 x 400 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, to Stone & Webster, 38 South Dearborn St., Chicago. About $650,000.

★**Mich., Detroit**—Liberty Starter Co., West Fort St., let contract building 4 story, 62 x 119 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on 15th and West Fort Sts., to O. Misch Co., 725 Chamber of Commerce. Noted June 19.

★**Mich., Highland Park**—Ford Motor Co., let steel contract building 1 and 2 story, 408 x 520 ft., brick and steel storage building to American Bridge Co., Beecher St. and Michigan Central R R. Masonry work will be done by company.

★**Mich., Muskegon**—Piston Ring Co., Sanford and Keating Sts., let contract building 4 story, 55 x 133 ft. rein.-con., brick and steel factory, also 1 story 65 x 65 ft addition to factory and 60 x 65 ft addition to power house, to Natl. Constr. Co., Water and 1st Sts.

★**Ill., Chicago**—All Amer. Truck Co., 2952 West Chicago St., let masonry contract to H. Ericson Co., 139 North Clark St., building 1 story, 60 x 830 ft. brick factory, concrete foundation, on West Grand and 16th Aves. Total cost, $200,000. Noted June 12.

★**Ill., Chicago**—G. E. Nimmons & Co. archts., 122 South Michigan Ave., let contract to E. H. Stowell Co. 19 South La Salle St., building 4 story, 100 x 120 ft mill construction addition to factory, concrete foundation, on Ashland Ave. and 30th St., for Stein Hall & Co., 111 West Washington St. About $250,000. Noted July 10.

★**Ill., Chicago**—Triangle Motors, Inc., 2211 South Michigan Ave., let contract building 3 story, 60 x 125 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation, at 2229-3- South Michigan Ave., to Mueller Constr. Co., 179 West Washington St. About $85,000.

★**Ill., Kankakee** — Paramount Knitting Co., will build 4 story, 100 x 100 ft. rein.-con. and brick mill. About $100,000. Work will be done by day labor.

★**Wis., Beaver Dam**—Malleable Iron Range Co. let contract building 1 and 2 story, rein.-con. and brick addition to foundry, rein.-con. flooring, concrete foundation, to Hutter Constr. Co., 128-136 Western Ave., Fond Du Lac. About $30,000.

★**Minn., Duluth**—Matshall-Wells Co., Lake Ave., S., let contract building 4 story, 115 x 250 ft., rein.-con. brick and steel addition to warehouse and office, rein.-con. flooring, concrete foundation, to Jacobson Bros., 410 Columbia Bldg., $50,160. Noted July 31.

★**Minn., St. Paul**—See "Buildings."

★**Kan., St. Johns**—City let contract for electric light plant improvements, including equipment, building and stack, to Merkle Mchy Co., Interstate Bldg., Kansas City, Mo. About $47,800.

★**Neb., Hastings**—J. H. Haney & Co. let contract building 6 story, 75 x 120 ft., brick factory, rein.-con. flooring, concrete foundation, to W. M. Gedney, Hastings. About $225,000.

★**Mo., St. Louis**—F. G. Haueisen, 3100 Rauschenbusch Ave., let contract building 2 story, 73 x 128 ft., brick factory, concrete foundation, to H. Schulte, 4453 North Taylor Ave. About $35,000.

★**Idaho, Pocatello**—Pocatello Mill & Elevator Co. let contract building 50,000 bu. grain elevator, 25,000 bu. grain storage tank and 100 barrel flour mill, to Burrell Eng. & Constr. Co., 327 South La Salle St., Chicago. About $100,000.

★**Wash., Port Angeles**—Amer. Aircraft Corp. let contract to C. Kuppler & Son, Port Angeles, erecting 1 story, 100 x 200 ft., open frame aircraft building and wharf on Ediz Hook Spit. About $50,000.

★**Wash., Seattle**—Davis Automobile Co., will build 1st unit of plant consisting of 1 story, 26 x 160 ft., concrete factory. Cost to exceed $50,000. Work will be done by day labor under supervision of C. D. Wilson, archt., Mutual Life Bldg. Second unit to include 80 x 160 ft. building will be erected later.

★**Cal., Los Angeles**—Albertson Motor Co., 16th and Figueroa Sts., let contract constructing 2 story, 155 x 160 ft., rein.-con. garage and sales building, concrete foundation, to Leonardt & Pack, H. W. Hellman Bldg. About $70,000.

★**Cal., Los Banos** — Central California Creameries Co., let contract building 3 story, 150 x 150 ft. creamery, 1 story power house and 1 story warehouse, rein.-con. to Lange & Bergstrom, Sharon Bldg., San Francisco, $66,600. Noted Aug. 7.

★**Cal., Soledad**—Salinas Valley Diarymen's Assn. let contract building 2 story, milk handling plant, rein.-con. to Clinton Constr. Co., 140 Townsend St., San Francisco. About $75,000.

★**Cuba, Havana**—Aid Reduction Co., 120 Bway., New York City, let contract building 2 story, 98 x 108 ft., rein.-con. and steel plant, rein.-con. flooring, concrete foundation, to Hamilton & Chambers, 29 Bway., New York City. About $100,000. Noted April 17.

Buildings

PROPOSED WORK

Mass., Turners Falls Bank—T. M. James, archt., 185 Devonshire St., Boston, soon receives bids building brick bank here, concrete flooring and foundation, for Natl. Bank, 52 Ave. A. About $50,000.

Mass., Webster—Hotel—H. Lougue Vue Hotel Co. plans to build hotel on Lake Shore. About $250,000. G. Bihldorf, pres. Engineer not selected.

Mass., Worcester — Memorial Hall — City plans to build large auditorium in commemoration of soldiers and sailors. About $250,000. C. L. Allen chn municipal auditorium comn.

R. I., Providence — Business — W. G. Richards, archt., 17 Exchange St., receives bids about Aug. 20, building 3 story, 80 x 100 ft., brick and concrete, rein.-con. flooring, concrete foundation, on North Main St., for J. Marcus & Bro., 210 North Main St. About $60,000. Noted July 24.

Conn., Bridgeport—Church—L. A. Walsh, engr., 51 Leavenworth St., Waterbury, soon receives bids building 50 x 130 ft., brick and steel superstructure of church on Park Ave., for St. George Lithuanian Congregation, Park Ave. and Johnson St. About $50,000. M. A. Pankouskas, pastor

Conn., Hartford — Hotel—Berenson & Moses, archts., 1026 Main St., soon receive bids building 5 story, 120 x 130 ft., brick, concrete and steel apartment hotel, to include restaurant, dance hall, etc., concrete flooring and foundation, on Jewell Ct., for N. Carabillo, 5 Edwards St. About $225,000.

Conn., Hartford—Office—Hartford Fire Insurance Co., 125 Trumbull St., having plans prepared by E. S. Dodge, 15 Exchange St., Boston, for fireproof office building on Asylum St. About $1,000,000. Noted June 5.

Conn., Hartford—Office — Orient Insurance Co., 20 Trinity St., plans to build 6 story addition on Clinton St. A. G. McIlwaine, pres. Engineer not selected.

Conn., Hartford — Store — A. Steiger Co., 345 Main St., Springfield, plans to build department store on Main and Pratt Sts., here. About $500,000.

Conn., Middletown — Housing — E. B. Caldwell, engr., 886 Main St., Bridgeport, soon receives bids building twenty 1 and 2 story, brick and frame houses for workmen, for Middletown Housing Corp., 303 Main St. About $100,000. Noted June 26.

Conn., New Britain—Club—New Britain Boys Club, 85 East Main St., plans to build 1 story brick and concrete addition, concrete foundation to include baths, locker room and gymnasium. About $50,000 W. P. Crabtree, 272 Main St., engr.

Conn., Newington—Home—Connecticut Childrens Aid Society plans to build new home to include dormitory, school, hospital, nurses home and offices. About $500,000. Address C. E. Whitney, Bartholomew Ave., Hartford.

Conn., Norwalk—Bank—Fairfield Co Savings Bank, 51 Wall St., having plans prepared by J. M. Vance, archt., 24 North St., Pittsfield, Mass., for bank on Wall St. About $50,000.

Conn., South Manchester—Bank—Hutchins & French, engrs., 6 Beacon St., Boston, soon receive bids building 1 story brick, steel and concrete, rein.-con. flooring and foundation on Main St., for Manchester Trust Co., 1007 Main St. About $60,000 Noted July 17.

Conn., Trumbull—School—Town plans to build brick school in Long Hill Sect. No. 1. About $50,000. H. F. Randall, selectman. Engineer not selected.

Conn., Trumbull—School—Town plans to build brick school in Nichols Dist. About $50,000. H. F. Randall, selectman. Engineer not selected.

Conn., West Hartford—(Hartford P. O.) —School—Amer. School for Deaf, 65 Garden St., Hartford, plans to build several new schools. About $350,000. H. V. Perkins, pres. I. A. Allen, Jr., Inc., 904 Main St., Hartford, engrs.

N. Y., Albany—School—Bd. Contr. & Supply having plans prepared by A. Selkirk, archt., 133 North Pearl St., for P. S. 23, Whitehall Rd. About $300,000.

N. Y., Brooklyn—Temple—Masons of New York (Ridgewood Lodge) having plans prepared by Koch & Wagner, archts., 32 Court St., for 3 story, 100 x 100 ft. brick, steel and stone, brick foundation, on Bway. and Gates Ave. About $1,000,000.

N. Y., Gouverneur—Theatre—J. C. Carporter having plans prepared by A. W. Skinner Co., archts., Rothstock Bldg., Watertown, for 60 x 125 ft. brick, concrete and tile, on Main St. About $60,000.

N. Y., Herkimer—School—City voted $220,000 bonds to build 3 story brick, to replace North School. Address W. C. Prescott, chn. bldg. com. Noted July 17.

N. Y., Liverpool—School—Bd. Educ. plans to build 3 story brick and concrete. About $200,000.

N. Y., Lockport—Bank—Natl. Exch. Bank, 45 Main St., plans to build 3 story brick, concrete and steel, on Main and Pine Sts. About $100,000. W. E. McComb, pres.

N. Y., New York—Hotel—Hotel Plaza Operating Co., 1-13 West 59th St., having plans prepared by Warren & Wetmore

Buildings (Continued)

archts. and engrs., 16 East 47th St., altering 18 story, 150 x 200 ft. brick and steel. About $2,500,000. Address B. Beinecke, pres.

N. Y., New York—Hotel—Warren & Wetmore, archts., 16 East 47th St., receive bids about Aug. 16, building 180 x 200 ft. brick, steel and stone, brick foundation, on Park Ave. and 51st St., for D. M. Linard Co., c/o architects. About $7,500,000. H. Balcom, 16 East 47th St., engr. Noted June 26.

N. Y., New York—Loft—T. A. Meyer, archt. and engr., 114 East 28th St., soon lets contract building 12 story, 25 x 100 ft. brick, steel and stone, brick foundation, on Madison Ave. and 30th St., for S. Strauss & Co., 127 East 26th St. About $140,000.

N. Y., New York—Office—C. H. Gillespie, archt., 1123 Bway., receives bids about Aug. 30, building 6 story, 32 x 100 ft., brick, steel and stone, brick foundation, at 47-49 Beaver St., for Importers & Exporters Insurance Co., 17 South William St. About $75,000.

N. Y., New York—Office—Internatl. Tailoring Co., 97 East Houston St., having preliminary plans prepared by Starrett & Van Vleck, archts., 8 West 40th St., for 12 story, 116 x 142 ft., brick and steel, brick foundation, on 4th Ave. and 12th St. About $750,000.

N. Y., New York — Office — Munson Steamship Line, 82 Beaver St., having plans prepared by J. G. Rogers, archt. and engr., 367 Lexington Ave., for altering 15 story, brick and steel building. About $60,000.

N. Y., New York—Parish—St. Jude's Chapel, West 99th St., having plans prepared by Ludlow & Peabody, archts. and engrs., 101 Park Ave., for 5 story, 25 x 100 ft., brick and steel, brick foundation.

N. Y., New York—Store and Bank—Columbia University, 63 Wall St., having plans prepared by McKimm, Mead & White, archts. and engrs., 101 Park Ave., altering 5 story, brick, steel and stone, brick foundation, at 618-620 5th Ave. About $50,000.

N. Y., Rochester—Bank—Alliance Bank Bldg., had plans prepared by J. F. Warner, archt., for 2 story brick, concrete and steel, on Lake Ave., used as Ridgeway branch. About $250,000. J. G. Cutler, pres.

N. J., Cinnaminson—School—Bd. Educ. having plans prepared by J. F. Street, archt., 129 South 5th St., Phila., for 2 story, 70 x 120 ft., brick.

N. J., Newark — Office — Globe Indemnity Co., 45 Williams St., New York City, having plans prepared by F. Goodwillie and W. Bissell, engrs., 56 West 45th St., New York City, for 6 story, 100 x 200 ft., brick and steel on Washington St., here. About $1,000,000.

N. J., Plainfield—Convent — Sisters of Mercy plan to build convent to include chapel and assembly hall. About $300,000. T. J. Walsh, 153 North Warren St., Trenton, bishop.

N. J., Trenton—Offices—See "Industrial Works."

Pa., Altoona—Bank—Union Bank of Altoona, 8th Ave. and 12th St., plans to build 1 story, 75 x 75 ft. stone, brick and steel. About $100,000. Architect not selected.

Pa., Butler—Bank—Guarantee Safe Deposit & Trust Co., 231 South Main St., had plans prepared building 1 story, 60 x 98 ft. rein.-con., steel, brick and granite, rein.-con. flooring, concrete foundation, on Jefferson St. About $50,000. Weary & Alford Co., 1732 South Michigan Blvd., Chicago, archts.

Pa., Carbondale—Comfort Station—City plans to build 2 story, 40 x 50 ft. rein.-con., steel and brick, rock foundation, on Main St. About $50,000. Architect not selected.

Pa., East Pittsburgh—School—City election Aug. 29 to vote on $200,000 bonds to build school.

Pa., Harrisburg—Synagogue—Chev Sholem congregation having plans prepared by F. T. Fahnestock, archt., Patriot Bldg., for 1 story, 47 x 78 ft. Indiana limestone, on North Front St. About $50,000.

Pa., Phila.—Bank—Central Trust & Savings Co., 4th and Market Sts., plans to build brick bank at North 4th and Market Sts. W. C. Furber, 418 Walnut St., archt.

Pa., Phila.—Bank—Mutual Trust Co., 60th and Ludlow Sts., having plans prepared by Heacock & Hohansen, archts., 1218 Chestnut St., for 2 story, stone and brick.

Pa., Phila.—Chapel—St. Barnabus Roman Catholic congregation, 63rd and Buist Sts., plans to build stone chapel. G. I. Lovatt, 418 Walnut St., archt.

Pa., Wilkes-Barre—High School—City having plans prepared by R. Ireland, archt. and engr., North Washington St., building 3 story, 63 x 276 ft. with 75 x 75 ft. wing rein.-con., steel and brick, rein.-con. flooring, concrete, foundation, on Grant and Sherman Sts. About $400,000.

Md., Baltimore—Bank—Mercantile Trust & Deposit Co., Calvert and Redwood Sts., having plans prepared by Trowbridge & Livingston, archts., 527 5th Ave., New York City; remodeling and building 2 story, rein.-con., steel and brick addition. About $60,000.

Md., Baltimore — Theatre — Century Theatre Co., Inc. plans to build 2 story, 120 x 178 ft., rein.-con. and brick, concrete foundation, at 18 West Lexington St. and 1021 Clay St. About $750,000. C. E. Whitehurst, Park Ave. and Lexington St., pres., J. J. Zink, 213 North Calvert St., archt.

W. Va., Follansbee — Schools — Cross Creek School Dist. voted $150,000 bonds to build 90 x 120 ft., brick high school, and $75,000 bonds for 2 grade schools. M. L. Wells, Wellsburg, archt.

O., Cincinnati—Home—Orthodox Jewish Home for Aged, 1406 Myrtle Ave., receives bids about Aug. 25, building 3 story, 38 x 98 ft., brick, concrete foundation, on Maple Ave. About $50,000. H. M. Price, 901 Union Central Bldg., archt. and engr.

O., Cincinnati — Hotel — Gibson Hotel. Walnut St., plans to build addition on 5th St. About $1,500,000. Architect not selected.

O., Cincinnati—Memorial Hall—A. Wilson, 378 La Fayette Ave., plans to build memorial hall on Clifton Ave. Building will be donated to University of Cincinnati and will adjoin university group. About $400,000. Architect not selected.

O., Cleveland—Church—Third Reformed Church, 1531 East 36th St., having plans prepared by P. Matsinger, archt., 608 Caxton Bldg., for 1 story, 72 x 100 ft., rein.-con., steel and brick, on Eddy Rd. About $60,000. Noted Aug. 7.

O., Cleveland — Theatre — Hoffman Bros., Electric Bldg., having preliminary plans prepared by Lehman & Schmidt, archts., 210 Electric Bldg., for 4 Story, 101 x 164 ft., rein.-con., steel and brick, at 10210 Euclid Ave. About $250,000. Noted July 31.

O., Cleveland—Theatre—Loew Theatres, 1492 Bway., New York City, having plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, for 123 x 175 ft., steel and brick, brick foundation, on Euclid Ave., here. About $300,000.

O., Cleveland—Theatre—Loew Theatres, 1492 Bway., New York City, having plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, for 130 x 190 ft., steel and brick, brick foundation, here. About $310,000.

O., Cleveland—Theatre and Office—A. A. Allen Co., archts., 1900 Euclid Ave., receive bids in fall building 10 story, 150 x 225 ft., rein.-con., steel and brick, on East 14th St. and Euclid Ave., here, for Allen Bros., Richmond St., Toronto, Ont., c/o architects. About $175,000. Noted July 31.

O., Cleveland—Theatre and Office—J. Laronge Co., 214 Williamson Bldg., having plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, for 10 story, 160 x 188 ft., rein.-con., steel and brick, on East 14th St. and Euclid Ave. About $3,000,000. Noted July 31.

O., Columbus — Chemistry — Bd. Trustees of Ohio State University rejected bids received June 16, building 1 story, 140 x 205 ft., factory construction, rein.-con. flooring, concrete foundation, on campus. About $85,000. Noted June 12.

O., Columbus—Club—Bd. Trustees of Ohio State University rejected bids received June 16, building 3 story, brick, with two 30 x 130 ft. wings, rein.-con. flooring, on campus. About $240,000. Noted June 12.

O., Columbus — Store — A. Dohme, 130 South High St., plans to build 5 story, 62 x 187 ft., on 3rd and Broad Sts. About $375,000. Architect not selected.

O., New Carlisle — School — Bd. Educ. plans to build 3 story, 85 x 110 ft., rein.-con., steel and brick, concrete foundation. About $115,000. Hall & Lethly, Springfield, archts.

O., South Euclid — School — Bd. Educ. having plans prepared by W. H. Nicholas, archt., 1900 Euclid Bldg., Cleveland.

1 story, 75 x 150 ft., rein.-con., steel and brick. About $150,000. Noted Aug. 7.

O., Steubenville — Bank — Steubenville Bank & Trust Co. having estimates made and plans prepared for 12 story, 53 x 110 ft., granite, marble and white brick, on 4th & Market Sts. Walker & Weeks, 1900 Euclid Ave., Cleveland, and P. Clark, Steubenville, archts.

O., Tremont City—School — Bd. Educ. plans to build 2 story, 60 x 90 ft., rein.-con. and brick, concrete foundation. About $50,000. Hall & Lethly, Springfield, archts.

Mich., Detroit—Hotel and Lodge—Palestine Assn., 150 Fort St., plans to build 12 story, 100 x 130 ft., brick and steel, on Fort St. and Lafayette Ave. About $1,600,000. Fort Shelby Hotel, lessee. Architect not selected.

Mich., Detroit—Lodge House—Acacia Lodge, c/o A. Clubb, archt., 26 Goebel Bldg., having plans prepared for 3 story, 60 x 80 ft. brick, rein.-con. and stone, wood flooring, concrete foundation, on Mack Ave. near Fisher Ave. About $50,000.

Mich., Detroit—School and Club—St. Hedwigs congregation, St. Hedwig St. and Junction Ave., had plans prepared by H. J. Rill, archt. 753 14th St., for 3 story, 65 x 145 ft., brick and steel rein.-con. flooring, concrete foundation. About $200,000.

Mich., Grand Rapids — Seminary — St. Joseph Seminary, Boston St., having plans prepared by Spier & Gehrke, archts., 1317 Chamber of Commerce Bldg., Detroit, for 3 story, 90 x 200 ft. rein.-con. brick and stone, rein.-con. flooring, concrete foundation, on Boston St. and Union Ave. About $200,000.

Ill., Chicago—Office—Chicago Tribune Co., 6 South Dearborn St., retained J. Hunt, archt., 30 North Michigan Ave., to draw plans for 150 x 150 ft., on St. Clair and Illinois Sts. About $500,000.

Ill., Chicago—Store—E. Hillman, State and Washington Sts., plans to build 65 x 140 ft., at 16-18 North State St. About $1,250,000. Mundie & Jensen, 39 South La Salle St., archts.

Wis., Janesville — Bank and Office — Bower City Bank, Main and East Milwaukee Sts., having plans prepared by Childs & Smith, archts., 64 East Van Buren St., Chicago, building 6 story, 50 x 125 ft. rein.-con., stone and brick, rein.-con. flooring, concrete foundation. About $200,000

Ia., Ames—Armory—State Bd. Educ., Des Moines, having plans prepared by Proudfoot, Bird & Rawson, archts., 810 Hubbell Bldg., Des Moines, for 1 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. T. Sloss, bldg. supt. About $125,000.

Ia., Davenport—Theatre and Office—C. W. and G. L. Rapp, archts., 190 North State St., Chicago, receive bids in August building 10 story, 145 x 150 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on 3rd and Ripley Sts., for H. C. Kahl, c/o Walsh Kahl Constr. Co., Davenport. About $1,000,000.

Ia., Sioux City—Bank and Office—First Natl. Bank, c/o L. P. McMillin, pres., having plans prepared by W. W. Beach, archt., Sioux City, building 2 story, 50 x 100 ft., rein-con. and brick, rein-con. flooring, concrete foundation. About $75,000.

Minn., Centerville—School—Bd. Educ. rejected bids received July 16, building 2 story, 50 x 62 ft., concrete, brick and tile. About $50,000. Magney & Tusler Builders' Exch., Minneapolis, archts. and engrs. Noted July 10.

Minn., Glen Lake (Hopkins P. O.)—Hospital—Lenora Christian Preventorium, c/o Anti-Tuberculosis Assn., 25 Old Chamber of Commerce Bldg., Minneapolis, having revised plans prepared by Sund & Dunham, archts., 514 Essex Bldg., Minneapolis, for 3 story, 43 x 135 ft., rein.-con. and brick. About $75,000

Minn. Minneapolis—School—Bd. Educ. soon lets contract building 1 story, 60 x 194 ft. addition to Whitney School on 19th Ave., N., and Pierce St. About $90,000. Bureau Bldgs., c/o Bd. Educ., archts. Noted June 26

Minn., Princeton — School—School Bd. having plans prepared by Foss & Foss, archts., St. Cloud, for 75 x 116 ft. About $55,000

Kan., Atchison—Memorial Hall—City plans to build 2 story, brick memorial hall. About $185,000. R. Meier, 2526 Jule St., St. Joseph, Mo., archt. Noted July 24.

Kan., Independence—Bank and Office—Commercial Nat'l Bank having plans prepared by Weary & Alford, archts., 1907 South Michigan Ave., Chicago, building 6

Buildings (Continued)

story, 70 x 140 ft. rein.-con., brick and stone, rein.-con. flooring, concrete foundation. About $150,000. G. T. Guernsey, pres.

Kan., Lyndon—Court House—Osage Co. having plans prepared by W. E. Hulse & Co., archts., Hutchinson, building 3 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $200,000.

Kan., McPherson—Science Hall—McPherson College soon receives bids building 3 story, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $65,000. W. E. Hulse & Co., Hutchinson, archts. Noted June 5.

Kan., Pittsburg—School—Bd. Educ. plans to build fireproof school. About $275,000. W. T. Schmitt, 1634 West 10th St., Oklahoma, archt. Noted June 26.

Kan., Topeka — Dormitory — Washburn College, 17th and College Sts., rejected bids and will have revised plans prepared for 3 story, 75 x 150 ft. About $125,000. R. E. Scannell, Topeka, archt. Noted April 3.

Kan., Wichita—School—Bd. Educ. having plans prepared by L. Schmidt., archt., 121 North Market St., and soon receives bids building 3 story brick, to be known as Mark Twain School. About $250,000.

Neb., Hickman—School Bd. Educ. having plans prepared for 2 story, 60 x 100 ft., brick, brick and concrete foundation. About $50,000. Tyler, Brandt & Tyler, 418 Richards Blk., Lincoln, archts.

Neb., Norfolk—High School—City plans election soon to vote on $225,000 bonds to build 3 story high school. A. Showalter, supt. bd. educ.

Wyo., Lusk — Church — Trustees Congregational Church soon receive bids building 70 x 115 ft., pressed brick and timber, concrete foundation. About $50,000. W. N. Bowman, Central Savings Bang Bldg., Denver, Colo., archt.

Wyo., Powell — High School — Powell School Dist. having plans prepared by McIver, Cohagen & Marshall, archts., 407 Electric Bldg., Billings, Mont. for 2 story high school and gymnasium. About $60,000.

Mont., Lewistown—Grade School—School Dist. No. 1 soon receives bids building 2 story, 8 room school. About $50,000. O. F. Wasmansdorff, 403 Bank-Electric Bldg., archt.

Mo., Chillicothe — Church — Christian Church, c/o S. W. Nay, plans to build fireproof church. About $60,000. Architect not selected.

Mo., Columbia — Church, Etc. — Methodist Church South plans to building church and educational building. Cost including sites, $350,000. Architect not selected. Address S. W. Hayne, pastor.

Mo., Columbia — Dormitory — Stevens College plans campaign to raise $500,000 to build dormitories, classrooms etc. Address J. W. Wood, pres.

Mo., Excelsior Springs — Temple—Masonic Bldg. & Realty Co. having plans prepared by Owens & Payson, archts., Kansas City, for 3 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $100,000.

Mo., Florrisant—Office—See "Industrial Works."

Mo., Liberty—College—W. Jewell College plans to build. About $200,000. Architect not selected.

Tex., El Paso—City Hall—City plans election to vote on $175,000 bonds to build city hall. W. C. Stewart, city engr.

Tex., El Paso—Schools—City plans election to vote on $220,000 bonds to build schools.

Tex., Ft. Worth—Hotel—H. H. Morrison, engr., Fullerton Bldg., St. Louis, soon receives bids building 17 story, 108 x 200 ft and 108 x 220 ft. terra cotta, brick, concrete and steel, rock foundation, on 8th and Commerce Sts., for Winfield Hotel Co., Ft. Worth. About $1,000,000. Mauran, Russell & Crowell, Chemical Bldg., St Louis, archts.

Tex., Moody—High School—City plans to build 2 story school. Bonds for $50,000 voted for project. C. H. Page & Bro., Austin Natl. Bank Bldg., Austin, archts.

Tex., Wharton—High School—City plans to build 2 story, 60 x 112 ft. school. About $100,000. C. H. Page & Bros., Austin Natl. Bank Bldg., Austin, archts.

Okla., Alva — Gymnasium — State Bd. Affairs, c/o G. Clark, Oklahoma, having plans prepared for 1 story, 71 x 180 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, here. Layton, Smith & Forysth, 701 Majestic Bldg., Oklahoma, archts.

Okla., Frederick—Court House—Tillman Co. plans election soon to vote on $100,000 bonds to build brick courthouse, here. Architect not selected.

Okla., Hugo—Church—W. E. King, secy. bldg. com., Methodist Episcopal Church, having plans prepared by Hawk & Parr, archts., 501 Security Bldg., Oklahoma, for 2 story, 70 x 108 ft., brick and steel, concrete foundation. About $80,000.

Okla., Okmulgee—Church—First Presbyterian Church having plans prepared by Smith Rea, Lovitt & Senter, archts., Okmulgee, building 1 story, 57 x 124 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation. About $65,000.

Okla., Okmulgee — Theatre — S. H. D. Cook having plans prepared by Smith, Rea, Lovitt & Senter, archts, Okmulgee, building 2 story. About $100,000.

Okla., Ponca City—Business—E. C. Vetzel having plans prepared building 3 story, 50 x 140 ft., brick. Rixse & Jenkins, archts., Ponca City, soon receive bids. About $52,000.

Okla., Tulsa—Cans Motor Co., 1203 Admiral St., plans to build 2 story, 100 x 140 ft., brick factory, at 203 North Cincinnati St. About $55,000. Architect and engineer not selected.

Colo., Arvada — High School — Arvada School Dist. soon receives bids building 3 story, 60 x 125 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. H. W. J. Edbrooke, Tabor Opera House Bldg., Denver, archt.

Colo, Denver—Office—State Bldg. Comn., receives bids in October for 5 story, 112 x 114 ft. on Colfax Ave. and Sherman St. About $500,000. W. N. Bowman, Central Savings Bank Bldg., archt.

N. M., Santa Fe—Hotel—J. W. Cook, Coffeyville, Kan., plans to build 3 story, 150 x 200 ft., here. Cost between $100,000 and $125,000. Architect not selected.

Idaho, Twin Falls—Tabernacle and Academy—Latter Day Saints Church of Mormons plans to build 2 to 4 story, brick or stone, cost, $100,000, also addition to 5th St. church, $25,000.

Ariz., Tucson—Hotel—L. H. Manning having preliminary plans prepared by W. Bray, archt., Tucson, for hotel on Paseo Redondo St. About $250,000.

Wash., Tacoma — Business — Company, representing eastern capital, plans to build 15 story, concrete and brick, on Pacific Ave. and 11th St., here. About $100 000. G. W. Simpson, Phila. main stock holder. F. Webber, Morris Bldg., Phila., archt.

Ore., Astoria—Hotel — Weinhard Hotel Co. having preliminary plans prepared by Whidden & Lewis, archts., Wilcox Bldg., Portland, for 5 story brick hotel annex, concrete foundation. About $100,000. F. N. Whitman, mgr.

Ore., Klamath Falls — Theatre — H. W. Poole having plans prepared for 2 story, 50 x 103 ft. brick or concrete. Cost to exceed $50,000.

Cal., Capitola—Hotel—H. A. Rispin having preliminary plans prepared by G. E. McCrea, archt., 1st Natl. Bank Bldg., Oakland, for 5 story, concrete and timber, concrete foundation.

Cal., El Segundo—School—School Trustees soon receive bids building 2 story, concrete and brick, containing 12 rooms. About $90,000. Train & Williams, Exch. Bldg., Los Angeles, archts. Noted April 17.

Cal., Fresno—Library—Bd. Supervs. Fresno Co. purchased site on M and Mariposa Sts. and plan to build library. About $400,000. Address D. M. Barnwell, co. clk.

Cal., Fullerton—Lodge—Masonic Lodge plans to build 2 story, brick and terra cotta, on Spadra and Chapman Aves. About $60,000. Architect not selected.

Cal., Los Angeles—Loft—See "Industrial Works."

Cal., Martinez — High School — City voted $125,000 bonds to build school on 6 acre site. Noted July 10.

Cal., Modesto—Store—G. P. Shafer Co. incorporated with $250,000 capital stock and plans to build 4 or 5 story. W. S. Thompson, mgr. Architect not selected.

Cal., Oakland—College—St. Mary's College, Bway. and Hawthorne St., purchased 250 acre site, and plans to build college to include dormitories, chapel, library, theatre, stadium, etc. Architect not selected

Cal., Oakland—Office—See "Industrial Works."

Cal., San Francisco — Bank—Bank of Italy, Montgomery and San Francisco Sts., soon receives bids building 6 story, 65 x 75 and 75 x 100 ft., stone and steel, on Powell and Ellis Sts. Cost to exceed $500,000. Bliss & Faville, Balboa Bldg., archts. Noted April 17.

Hawaii, Honolulu—Bank—T. Ronneberg, engr., Crocker Bldg., San Francisco, soon receives bids building 3 story, rein.-con., steel and brick here, for Davies Co., Ltd., Honolulu. About $400,000. Dickey & Wood, Honolulu, archts.

BIDS DESIRED

Mass., Worcester—Hospital—Until Aug. 30, by G. C. Halcott, supt. pub. bldgs., building 2 story, 33 x 149 ft. brick, concrete foundation, on Belmont St. About $160,000. Fuller & Delano, 44 Front St., archts.

N. Y., East White Plains—School—Until Aug. 27, by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, building brick and steel, brick foundation, at Silver Lake, here, for Bd. Educ. About $80,000.

N. Y., Hobart—School—Until Aug. 23, by Bd. Educ. of Union Free Dist. No. 4, Sanford, building 2 story 36 x 100 ft. brick, steel and stone, here. About $300,000. Rasmussen & Wayland, 1133 Bway., New York City, archts.

N. J., Maple Shade—School—Until Aug. 18, by Bd. Educ., building 2 story, 63 x 113 ft., brick. About $80,000. W. C. Furbei, 418 Walnut St., Phila., archt. Noted July 24.

N. J., Trenton—Hotel—Until Sept. 3, by Stacy-Trent Hotel Co., Broad St. Bank Bldg., building 12 story, rein.-con., brick and steel on West State St. About $1,000,000 Esenweim & Johnson, Ellicott Sq., Buffalo, N. Y., archts. Noted August 7.

Pa., Farview (Carbondale P. O.)—Hospital—Until Sept. 6, by State Hospital for Criminal Insane, building 2 story, 41 x 170 and 18 x 40 ft., concrete, steel and brick, concrete foundation. C. Hillman & Son, 400 Chestnut St., Phila., archts.

Pa., Hazelton — High School —Until Aug. 16, by School Dirs. and D. A. Harman, archt., 89 North Church St., building 2 story, 60 x 300 ft. steel and brick, rein.-con. flooring, rock foundation, on Church St. About $250,000.

Pa., Hazelton — School — Until Aug. 16, by Bd. School Dirs. and D. A. Harman, archt., 89 North Church St., building 2 story, 50 x 50 ft., steel and brick, rein.-con. flooring, rock foundation. About $65,000.

Pa., Jeannette—Office—Elliott Co. receiving bids building 2 story, 57 x 182 ft., steel and brick, tile flooring, concrete foundation. T. Hannah, 209 9th St., Pittsburgh, archt.

Pa., Watsontown—School—Until Aug. 20, by G. S. Frederick, secy. bd. educ., building 2 story, 45 x 60 ft., brick, at Springtown, Delaware Twp., for Delaware Twp. School Dist. About $50,000. F. A. Hersh and F. J. Shollar, Commerce Bldg., Altoona, archts

Pa., West Bethlehem (Bethlehem P. O.) —School—Until Aug. 19, by Bd. Educ., building 2 story, 176 x 185 ft. rein.-con. and brick. About $200,000. Former bids rejected. Ritter & Shay, North Amer. Bldg., Phila., archts. Noted June 12.

O., Cleveland — Church — J. K. Katsary, archt., 303 Erie Bldg., receiving bids building 2 story, 46 x 85 ft., rein.-con., steel and brick, at 2187 West 14th St., for Hellanic Orthodox Community. About $75,000. Noted July 31.

O., Cleveland — Office — E. McGeorge, archt., 1800 Euclid Bldg., receiving bids building 2 story, 39 x 123 ft., rein.-con., steel and brick addition, for Parish & Bingham, 10601 Madison Ave. About $75,000. Noted July 31.

O., Cleveland—Salesroom—P. Matsinger, archt., 608 Caxton Bldg., receiving bids building 4 story, 20 x 119 ft., rein.-con., steel and brick, for L. Maxa, Pub. Sq. About $50,000.

O., Miamisburg—Business—Until Sept. 1, by R. Gebhardt, archt., Callahan Bank Bldg., Dayton, building 2 story, 50 x 125 ft., brick, brick foundation, on Main St., for B. Suttman. About $50,000.

Mich., Detroit — Mercantile — Smith, Hinchman & Grylls, archts., 710 Washington Arcade, receiving bids building 1 story, 90 x 200 ft. steel and brick addition, for Crowley Milner Co., Gratiot Ave. About $50,000 Noted Apr. 10

Buildings (Continued)

Mich., Detroit—Schools—Until Aug. 21, by C. A. Gadd, business mgr. bd. educ., building 1 story, 57 x 91 ft. addition to Ellis School No. 1110, on 35th and Junction Aves., cost $70,000; 2 story, 78 x 105 ft. school on Burns and Goethe Aves. to be known as Nichols School, $160,000. 2 story, 110 x 130 ft. school on Vinewood and Buchanan Aves., to be known as G M. Condon School, all rein.-con., steel and brick, rein.-con. flooring, concrete foundation. Malcolmson & Higginbotham, 404 Moffat Bldg., archts.

Ill., Aurora — Church — S. S. Beman, archt., 332 South Michigan Ave., Chicago, receiving bids building 1 story, 60 x 100 ft. brick and timber, concrete foundation, on Main and 4th Sts., for 1st Christian Science congregation. About $60,000.

Ill., Chicago—Library and Office—Holabird & Roche, archts., 104 South Michigan Ave., receiving bids for 15 story, 80 x 80 ft. steel and tile arch construction, concrete foundation, on Randolph St. and Michigan Blvd., for John Crerar Library, Marshall Field Bldg. About $1,250,000. Noted July 31.

Ia., Storm Lake — Gymnasium — Until Aug. 21, by Buena Vista College, c/o G. E. Mack, treas., building 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $56,000. Marten & Sutherland, Storm Lake, archts. Noted July 17.

Minn., Ely — School — L. J. White, clk. bd. educ., receiving bids for 1 story, 60 x 95 ft., rein.-con. and brick industrial school. About $80,000. H. C. Parsons, 600 Builders Exch. Bldg., Minneapolis, archt. and engr. Noted June 12.

Minn., Minneapolis — Hotel — Minnesota Hotel receiving bids for 15 story, 100 x 157 ft on 4th St. and 2nd Ave., S. About $800,000. Betrand & Chamberlin, 616 Northwestern Bank Bldg., archts.

Minn., Minneapolis—School—Until Aug. 18, by Bd. Educ., building 3 story, 63 x 116 ft., rein.-con. and brick addition to Willard School on Queen St. and 16th Ave., N. About $90,000. Bureau Bldgs., c/o Bd. Educ., archts. Noted May 8.

Minn., Montevideo—Theatre, Office and Lodges—Until Aug. 22, by F. D. Borene, secy. Home Bldg. Assn., Inc., building 3 story, 50 x 120 ft., concrete, brick and terra cotta. Cost between $65,000 and $70,000. P. O. Moe, 616 New York Life Bldg., Minneapolis, archt.

Minn., St. Paul — Hotel and Theatre — Until Sept. 15, by Toltz, King & Day, archts., 1410 Pioneer Bldg., building 16 story, rein.-con. and brick, rein.-con. flooring, rock foundation, on St. Peter St., here, for Hamm, Ruben & Finkelstein, Palace Theatre, Minneapolis. About $1,000,000. Noted July 3.

Minn., Theif River Falls — Bank and stores—Until Aug. 23, by 1st and Peoples State Bank, building 3 story, rein.-con. and brick. About $52,000. Sund & Dunham, Essex Bldg., Minneapolis, archt.

Kan., Manhattan — Engineering — Until Aug. 26, by State Bd. Administration, State House, Topeka, building 3 story, 22 x 56 ft. and 2 story, 50 x 112 ft., rein.-con., steel and brick, rein.-con. flooring, rock foundation. About $190,000. R. L. Gamble, 1414 Fillmore St., Topeka, archt. Noted Aug. 7.

Neb., Blue Springs—Bd. Educ. receiving bids building 3 story, 100 x 140 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $150,000. W. E Huise Co., Hutchinson, Kan., archts.

Tex., Cameron—High School—Until Sept. 1, by School Bd. Trustees, building 2 story, brick, rein.-con. and steel, rein.-con. flooring. About $100,000. C. H. Page & Bro., Austin Natl. Bank Bldg., Austin, archts. Noted June 26.

Tex., Ft. Worth—Office and Bank—Until Sept. 1, by Farmers Mechanics Natl. Bank, 712-14 Main St., for 24 story, 95 x 100 ft. rein.-con., brick and steel, rock foundation. About $1,500,000. Sanguinet & Staats, 1st Natl. Bank Bldg., archts. H. H. Morrison, Fullerton Bldg., St. Louis, Mo., engr. Noted July 3.

Tex., Victoria—Bank—Until Sept. 3, by Levy Bank & Trust Co., building 2 story, rein.-con., brick and steel, rein.-con. flooring. About $70,000. C. H. Page & Bro., Austin Natl. Bank Bldg., Austin, archts. Noted June 26.

Okla., Holdenville — Court House and Jail—Comrs. Hughes Co. receiving bids building 3 story, 88 x 96 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation. About $125,000. Layton Smith & Forsyth, 701 Majestic Bldg., Oklahoma, archts.

Okla., Ponca City—Club—Moose Lodge receiving bids building 3 story, concrete, steel and brick, concrete foundation. About $60,000. Layton, Smith & Forsyth, 701 Majestic Bldg., Oklahoma, archts.

N. S., Halifax—Schools—Until Aug. 30, by S. J. Wilson, secy. school comrs., building four 2½ story brick schools, rein.-con flooring, concrete foundation, in suburbs. About $180,000.

Que., Outremont—Convent—Until Sept. 1, by Sisters of Immaculate Conception, building 3 story, 50 x 72 ft. brick and steel, concrete foundation, on Queen Mary St. About $50,000. Private plans.

Ont., Peterborough—School—Until Sept 1, by G. H Thompson, secy. bd educ., building 2 story, concrete, steel and brick concrete foundation. About $100,000. W. and W. R. Blackwell, Peterborough, archts

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Attleboro**—School—Bd. Educ. let contract building 2 story, 57 x 106 ft., brick, steel and concrete addition to Bliss School, concrete foundation, wood flooring, to E. O. Dexter, Attleboro. About $100,000. Noted July 24

★**Mass., Pittsfield**—School—Bd. Educ let contract building 10 room school, to E. C. Carlson & Co., 310 Main St., Springfield. About $125,220. Noted June 5.

★**Conn., East Hartford** (Hartford P. O.)—High School—Town let contract for completing unfinished rooms in new High School on Chapman St., including gymnasium, classrooms and auditorium, to L. A. Miller, 22 Church St., Meriden. About $50,000. Noted July 17

★**Conn., Norwich** — Hospital — Norwich Hospital for Insane let contract constructing ward building, to H. Wales Lines Co., 134 State St., Meriden; 2 story, 60 x 120 ft. tuberculosis building, to Peck, McWilliams & Co., 47 West Main St. About $240,000. Noted June 12

★**Conn., Warehouse Point**—Home—Hartford Co. Home, Hartford, let contract building addition including new school, hospital, heating plant and dormitory, brick, concrete foundation here, to A. H. Tryon, 847 Main St., Hartford. About $200,000. Noted July 17

★**N. Y., Long Island City**—Studio—L. J. Selznick, 729 7th Ave., New York City, let contract building 200 x 600 ft. rein.-con and steel, rein.-con. flooring, concrete foundation, on Queens Blvd., Van Alst, Ely and Moore Sts., to Fleischmann Constr Co., 531 7th Ave., New York City. About $1,500,000. Cost plus percentage basis

SEWERS—WESTMONT, N. J.

Bids were received by city, July 22, (lowest 3) for constructing 9 mi. sanitary sewerage system and disposal plant and pumping station, from (A) W. P. Corson, 1141 Sycamore St., Camden, (awarded contract); (B) Penn Eng. & Constr. Co., 1119 North Howard St., Phila.; (C) B. Pizzimenti, Pitman. The unit bids were as follows:

	A	B	C
Section "A" Sewers and Appurtenances:			
538 lin ft. 8-in. t.c. pipe, 0–4 ft deep	$0.81	$0 95	$0.80
6,395 lin ft. 8-in. t.c. pipe, 4–6 ft. deep	.89	1 00	1.10
24,712 lin ft. 8-in. t.c. pipe, 6–8 ft. deep	1.07	1 04	1.40
408 lin ft. 8-in. t.c. pipe, 8–10 ft. deep	1.82	1 87	2.40
943 lin.ft. 10-in. t.c. pipe 0–4 ft deep	1.00	1 00	1.00
654 linft. 10-in. t.c. pipe, 4–6 ft. deep	1 19	1.55	1.25
1,622 linft. 10-in. t.c. pipe, 6–8 ft. deep	1.47	1.65	1.50
767 lin.ft. 12-in. t.c. pipe, 0–4 ft. deep	1.19	1.10	1.10
906 lin.ft. 12-in. t.c. pipe, 4–6 ft. deep	1.37	1.25	1.50
227 lin.ft. 12-in. t.c. pipe, 6–8 ft. deep	1.90	1.62	2.00
155 lin ft. 12-in. t.c. pipe, 8–10 ft. deep	2 29	2.50	2.50
60 linft. 8-in. c.i. pipe, 4–6 ft. deep	10 00	10 00	3.00
60 lin ft. 8-in. c.i. pipe, 6–8 ft. deep	13 00	12 00	4.00
60 lin ft. 8-in. c.i. pipe, 8–10 ft. deep	13 00	12 00	5.00
252 lin.ft. 10-in. c.i. pipe outfall	10 00	8 00	6 00
63 lin ft. 6x5 in. "Y" branches	.75	.75	.80
862 lin.ft. 8x5 in. "Y" branches	1 00	90	1.00
42 lin.ft. 10x5 in. "Y" branches	1.25	1 25	1.25
24 lin ft. 12x5 in. "Y" branches	1.50	1.50	1.50
5,375 lin.ft. 5-in. t.c. pipe house connections	.75	.65	.70
50 vertical ft. 5-in. t.c. pipe, house connections (deep)	2.00	1 00	1.00
10 manholes, 0–4 ft. deep	45.00	55.00	50 00
36 manholes, 4–6 ft. deep	55.00	65.00	60.00
79 manholes, 6–8 ft. deep	70 00	75.00	75.00
3 manholes, 8–10 ft. deep	100 00	100 00	100.00
4 flush tanks, type "A"	225.00	225.00	250 00
12 flush tanks, type "B"	150.00	155.00	175.00
1 flush tank, type "B-B"	125 00	155.00	160 00
2 flush tanks, type "C"	125 00	175.00	170.00
5 lampholes	20 00	15 00	20.00
65 manhole buckets	5.00	6 00	5.00
500 lin ft. 5-in. t.c. pipe (class B joints)	.07	.10	.15
200 lin.ft. 6-in. t.c. pipe (class B joints)	.09	.12	.20
2,500 lin ft. 8-in. t.c. pipe (class B joints)	.12	.14	.30
600 lin.ft. 10-in. t.c. pipe (class B joints)	.15	.18	.35
300 lin ft. 12-in. t.c. pipe (class B joints)	.20	.22	40
17 vertical ft. drop pipe	3.00	4.00	5 00
3,000 b.m. 2x8 in. rough hemlock or pine	70 00	77 00	80 00
Section "A" sub-total No. 1	$62,691	$63,777	$71,754
Haddon Avenue Sewer:			
260 lin ft 8-in t.c. pipe, 4–6 ft deep	1.00	1.30	90
3,209 lin ft. 8-in. t.c. pipe, 6–8 ft deep	1.20	1.44	1.00
108 lin ft. 8-in. t.c. pipe, 8–10 ft deep	.89	2.30	1.50
119 8x5 in. Y's	1.00	.90	1.00
1,035 lin ft. 5-in. t.c. pipe	1.00	.80	.70
1 manhole, 4–6 ft.	70 00	70.00	50 00
9 manholes, 6–8 ft.	100 00	90.00	65.00
3 flush tanks, type "B"	150.00	155 00	16.00
890 sq.yd. bituminous paving	2.00	2.60	2.00
Haddon Ave. sewer sub-total No. 2	$8,669	$9,801	$7,985
Rear of Haddon Avenue Sewer			
1,250 lin ft 6-in. t.c pipe, 0-4 ft deep	.73	95	80
1,582 lin ft 6-in. t.c. pipe, 4-6 ft deep	.80	1.00	90
317 lin ft. 6-in. t.c. pipe, 6-8 in deep	.95	1.34	1.00
165 lin ft 8-in. t.c. pipe, 0-4 ft deep	81	1.00	.85
311 lin ft. 8-in. t.c. pipe, 4-6 ft deep	89	1.10	.95
220 lin.ft. 8-in. t.c. pipe, 6–8 ft. deep	1.07	1.40	1.05
Rear of Haddon Avenue sewer sub-total No. 3	$3,125	$4,009	$3,408
Force Main Alternative Bid			
1,300 lin ft 6-in c.i pipe sub-total No. 4	$3,705.00	$5,900 00	$1,820.00
1,300 lin ft 6-in wood pipe, sub-total No. 5	2,600 00	4,810.00	1,300 00
Section "B" Disposal Plant and Pumping Station:			
Disposal plant	$18,923.31	$21,600	$19,250
Pumping station	7,361 00	8,900	7,250
Total for section "B"	$26,284	$30,500	$26,500

Buildings (Continued)

★**N. Y., New York** — Auditorium — Mt. Sinai Hospital, 100th St. and Madison Ave., let contract building 2 story, 100 x 120 ft., brick, steel and stone, brick foundation, to Cauldwell-Wingate, 281 4th Ave. About $150,000. Noted June 5.

★**N. Y., New York**—Bank—Natl. Park Bank, 2-4 Bway., let contract building brick, stone and steel addition, brick foundation, at 149 Fulton St., to M. Eidlitz, 30 East 42nd St. About $80,000. Noted May 22.

★**N. Y., New York**—Hotel—Twenty-two East 70th St. Corp., 206 Bway., let contract building 13 story, 55 x 100 ft. brick, steel and stone, brick foundation, at 850 Madison Ave., to Harvey, Abroms & Melius, 15 East 40th St. About $500,000.

★**N. Y., New York**—Hotel—Sixty West 68th St., Corp., Inc., 300 8th Ave., will build 11 story, 80 x 85 ft. brick and steel, brick foundation. About $450,000. Work will be done by day labor.

★**N. Y., New York**—Office—Post & Flagg, 28 Wall St., let contract building 6 story, 50 x 100 ft., brick, steel and stone, brick foundation, at 49-51 Broad St., to Cauldwell-Wingate, 281 4th Ave. Noted July 17.

★**N. Y., New York**—Store and Loft—L. M. Gerry, Newport, R. I., will alter 12 story, 55 x 210 ft., brick and steel, at 1115-1117 Bway., here. About $75,000. Work will be done by day labor.

★**N. Y., Syracuse**—Church—University Methodist congregation let contract building 1 story, 63 x 112 ft., brick, rein.-con. and steel, rein.-con. flooring, brick and rock foundation, on East Genesee St., to E. K. Fenno, 204 North Beech St. About $175,000.

N. Y., Utica—Hospital—State Hospital Comn., Capitol, Albany, received bids building 3 story, 40 x 206 ft. acute patients' hospital, with 35 x 58 ft. wings, and 3 story chronic patients' hospital with 41 x 83 ft. wings, both brick and rein.-con., for Utica State Hospital, Marcy Division, here, general contract, from Warren, Moore & Co., Wards Island, $857,565, W. F. Martens, Cutler Bldg., Rochester, $938,000. M. Kantrowitz, 20½ Market St., Albany, $942,388; heating, from Globe Automatic Sprinkler Co., Cahill Bldg., Syracuse, $88,600, J. W. Danforth Co., 70 Ellicott Sq., Buffalo, $92,590, H. C. Petersen Co., Inc., 20 Oneida St., $93,925; sanitary work, from H. C. Petersen Co., Inc., 20 Oneida St., $66,842, C. H. Darmstadt, Inc., 352 West 43rd St., New York City, $71,897, E. Joy Co., 133 Market St., Syracuse, $74,983; electric work, from C. H. Darmstadt, Inc., 352 West 43rd St., New York City, $20,789, G. E. Eng. Co., Inc., 417 Canal St., New York City, $21,520; Wheeler Green Electric Co., 31 St. Paul St., Rochester, $21,545. Noted July 3.

★**N. Y., White Plains**—School—Bd. Educ. let contract building P. S. No. 8, brick and steel, brick foundation, on Post Rd., to J. Nault, 106 Main St. About $85,000.

★**N. J., Newark**—Theatre—Fabian, Zucker, Steiner & Co., New York City, let contract building 1 story, 148 x 175 ft., rein.-con., brick and steel, on Branford Pl., here, to Gunn & Van Dale Co., 31 Clinton St. About $900,000. Noted March 6.

★**N. J., Plainfield**—School—Bd. Educ. let contract building 2½ story, 55 x 150 ft., brick and steel, brick foundation, to Stewart Willey Co., 1123 Bway., New York City. About $140,000. Noted Aug. 7

★**N. J., Verona** (Montclair P. O.)—Hospital—Comrs. Essex Co. (Newark) let contract building 3 story, concrete and steel hospital with five 1 story pavilions, in Orange Mountains, here, to W. G. Shawell & Co., Cadwell, $415,818. Noted June 12.

★**Pa., Pittsburgh** — School — Carnegie Technical Schools, 5128 Woodlawn Ave., let contract building 2 story, steel and brick addition, to Mellon-Stuart Co., Oliver Bldg. About $125,000.

★**Md., Baltimore** — Church — A. W. Wilson Memorial Methodist Episcopal congregation let contract building 1 story, 50 x 80 ft., rein.-con., marble and brick, concrete foundation, on Charles St and University Parkway, to D. M. Andrews Co., Mt. Vernon and 26th Sts. About $200. 00.

★**Md., Baltimore**—Parish House and Manse—Forest Park Presbyterian congregation, 3714 Springdale Ave., let contract building 2 story, 40 x 75 ft., stone, marble and brick, concrete and rock foundation, on Dalrymple and Garrison Aves., to C. W. Littleton & Son, 4313 Liberty Heights Ave. About $50,000. Noted June 12.

★**Md., Chestertown**—Bank—Third Natl. Bank, Baltimore and St. Paul Sts., let contract building 1 story, 38 x 72 ft., brick, granite and stone, tile flooring, stone foundation, to Ballinger & Perrot, 17th and Arch Sts., Phila. About $60,000.

★**O., Cleveland**—Office—Colburn Machine Co., 1040 Ivanhoe Rd., let contract building 1 story, 44 x 78 ft., rein.-con., steel and brick, to Hunkin Conkey Co., Century Bldg. About $80,000. Noted July 31.

★**O., Cleveland**—Office—Natl. Malleable Castings Co., 7706 Platt Ave., let contract building 6 story, 50 x 208 ft., rein.-con., steel and brick, on Quincy St. and Woodhill Rd., to Crowell-Lundoff Little Co., Meriam Bldg. About $300,000.

★**O., Columbus** — Salesroom — See "Industrial Works."

★**O., Dayton**—Salesrooms—See "Industrial Works."

★**Mich., Detroit**—Commercial and Hotel—H. Chalmers, 275 Iroquois Ave., let contract building 3 story, 90 x 226 ft., rein.-con., steel and brick, on Woodward and Parsons St., also 2 story, 95 x 200 ft. rein.-con., steel and brick, on Woodward and Watsons Sts., to F. H. Goddard, 516 Franklin St. About $175,000 and $150,000 respectively.

★**Mich., Detroit**—Hotel—W. S. Barr, c/o Baxter, O'Dell & Halpin, archts., 1024 Hammond Bldg., let contract building 4 story, brick and steel, wood flooring, to W. S. Pocock, 914 Hammond Bldg. About $125,000. Noted June 12.

★**Ill., Pana**—Greenhouses—W. A. Ameling, Maywood, let contract building system of greenhouses here, timber, brick and glass, to Pana Greenhouse Co., Pana. About $100,000.

★**Ia., Sioux City**—Store and School—Davidson Realty Co. will build 4 story, 95 x 150 ft. About $100,000. Work will be done by day labor.

★**Minn., Aurora** — High School — School Dist. No. 13 let contract building 3 story, rein.-con., brick and steel, rein.-con. flooring, to A. C. Thomas-Guthrie Constr. Co., Guardian Life Bldg., St. Paul, $430,700. Noted July 17.

★**Minn., Duluth**—Office—See "Industrial Works."

★**Minn., Morris**—Dormitory—State Bd Control, Capitol, St. Paul, let general contract building 2 story, 45 x 120 ft., at State Farm, here, to H. J. Frandsen, 510 Rice St., St. Paul, $54,000. Noted July 17.

★**Minn., St. Paul**—Hospital—Northern Pacific Beneficial Assn., 203 R.R. Bldg., let contract building 3 story, 80 x 280 ft., hospital and power plant, on Snelling and University Aves., to J. and W. A. Elliott, 906 Lumber Exch. Bldg., Minneapolis. About $200,000. Noted June 26.

★**Kan., Arkansas**—Church—Central Christian congregation let contract building 2 story, 66 x 114 ft., brick, to E. Staedelin & Son, Milford, Okla., $90,740.

★**Kan., Arkansas City**—Hotel—Arkansas Hotel Co. let contract building 5 story, 75 x 132 ft. rein. con., steel and brick, rein.-con. flooring, concrete foundation, to Swenson Constr. Co., 11th and Oak Sts., Kansas City, Mo. About $200,000. Noted Aug. 7.

★**Kan., Ft. Dodge**—Home—R. S. Gamble, state archt., Topeka, let contract building 1 and 2 story, 67 x 166 ft. with 40 x 51 ft. wing, rein.-con., brick, rein.-con. flooring, concrete foundation, to M. J. Green Manhattan, $74,895. Noted July 31.

★**Kan., Wichita**—School—Bd. Educ let contract building Emerson School, 3 story, 36 x 98 x 98 ft., rein.-con., steel and brick, rein.-con. flooring, to H. J. Ellis Constr. Co., North St. and Francis Ave., $74,488.

★**Neb., Lincoln**—School—School Dist let general contract building 2 story, 73 x 138 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on 33rd and Vine Sts., to F. Young, 24th and Holdrege Sts., $74,890; plumbing, to Newberg & Bookstrom, Lincoln, $25,995. Noted July 10.

★**Mo., St. Louis**—Store—Stix, Baer & Fuller Dry Goods Co., 7th and Washington Sts., let contract building 3 story, 90 x 226 ft., rein.-con., steel and brick addition, rock foundation, at 616-24 Lucas St., to Westlake Constr. Co., 717 Locust St. About $50,000.

★**Tex., Dallas** — Bank — Federal Reserve Bank, Commerce and Martin Sts., let contract building 5 story, brick, steel and stone, stone foundation, to G. A. Fuller, 949 Bway., New York City. About $500,000. Noted May 29.

★**Okla., Langston**—Dormitory—State Bd. Educ., Oklahoma, let contract building 2 story, 40 x 180 ft., brick, at Negro Agricultural and Normal University, here, to J. J. Rooney, 318 West Okmulgee St., Muskogee. About $50,000.

★**Okla., McAlester** — Temple — Masonic Order let contract building 3 story, 140 x 180 ft., brick and concrete, on Main St., to G. H. Deibler and J. DeFlorin, McAlester. About $250,000.

★**Okla., Norman**—Dormitory—Bd. Pub. Affairs, Oklahoma, let contract building 3 story rein.-con., steel and brick, rein.-con. flooring, concrete foundation, to Manhattan Constr. Co., 3rd and Fondulac Sts., Muskogee. About $157,500. Noted Aug. 7.

★**Okla., Okmulgee**—Club—Country Club let contract building 2 story, to E. S. Winn Constr., Co., Kansas City., Mo. About $65,000.

★**Okla., Okmulgee**—Hotel—Jennings & Post let general contract building 3 story, 75 x 100 ft. to Patti-Moore Constr. Co., Okmulgee. About $75,000.

★**Okla., Tulsa**—College—Kendall College let contract building 3 story, 39 x 225 ft., brick and concrete, on Kendall St., to A. T. Hingle, Tulsa. About $96,000.

★**Okla., Vinita**—Court House—Comrs. Craig Co. let contract building 3 story, 75 x 100 ft. brick., to Manhattan Constr. Co., 3rd and Fondulac Sts., Muskogee. About $147,000. Noted July 17.

★**Idaho, Moscow**—Bank—First Trust and Savings Bank let contract building 1 story, 40 x 75 ft., to A. Moorman & Co., St. Paul, Minn. About $55,000.

★**Wash., Grand Mound**—Cottages—State Bd. Control, Olympia, let contract building two 2 story, concrete and brick, here, to J. Lohrenz, South 1224 Maple St., Spokane, $115,087.

★**Wash., Olympia**—Club—B. P. O. E. Bldg. Comn. let contract building 3 story, concrete and brick, on Main St., to Knoll Bros., Olympia. Elks Bldg. Com. will supervise work. A. H. Christopher, chn. About $85,000. Noted July 24.

★**Wash., Orting**—Barracks, etc.—State Bd. Control, Olympia, let contract building barracks and warehouse on state grounds, for Soldier's Home, to W. B. Lance, 216 Pontius St., Seattle, $75,927. Noted June 12.

★**Wash., Pullman** — Dormitory — Washington State College let contract building 3 story, 32 x 60 ft., with one 30 x 100 ft. and one 30 x 80 ft. wings, to F. E. Peterson, Old Natl. Bank Bldg., Spokane, $111,432.

★**Cal., Fruitvale** — Hospital — California Memorial Hospital Corp., Monadnock Bldg., San Francisco, will construct group of hospital buildings, here. About $100,000. Work will be done by day labor.

★**Cal., Vallejo** — Hotel — Admiral Hotel Co., Inc., 808 Mechanics Institute Bldg., San Francisco, let contract building 6 story, 80 x 130 ft., rein.-con. and brick, concrete foundation, on Virginia and Sonoma Sts., to McDonald & Kahn, Rialto Bldg., San Francisco. About $250,000.

★**N. S., Halifax**—Naval—Navy League of Canada, Halifax, let contract building 4 story, 82 x 110 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, on Barrington and Smith Sts. to S. M. Brookfield, Halifax. About $292,000.

N. B., Moncton—Office—See "Miscellaneous."

★**Ont., Ottawa**—Store—A. W. Horwood, archt., Castle Bldg., Queen St., let contract to W. G. Adamson, 126 Sparks St., building 3 or 5 story, 60 x 10 ft. rein.-con. and brick, rein.-con. flooring, on George St., for A. J. Freiman, Rideau St. Cost between $60,000 and $80,000. Noted July 31.

★**B. C., Point Grey**—School—School Bd. rescinded contract let to Adkison & Dill, 707 Welton Bldg., Vancouver, building 3 story, rein.-con. and brick, concrete foundation, on Ash and Tupper Sts., Shaughnessy Dist., and relet same to Baynes & Horie, 836 Howe St., Vancouver. About $80,000. Noted July 24

Federal Government Work

PROPOSED WORK

Mass., Chatham—Gutters and Roofing—Spec. 4022—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build gutters and roofing for hangars, here. About $4000.

N. Y., New York—Turbo Air Compressor—Spec. 4016—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install, here. About $60,000

Federal Government Work (Continued)

N. Y., Rockaway—Gutters and Roofing—Spec. 4022—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build gutters and roofing for hangars, here. About $4000.

N. Y., Rockaway—Heating Hangar—Spec. 4021—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install, here. About $7000.

N. J., Cape May—Gutters and Roofing—Spec. 4022—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build gutters and roofing for hangars, here. About $4000.

D. C., Wash.—Mechanical Equipment and Piping — Spec. 3708 — Bureau of Yards & Docks, Navy Dept., plans to install mechanical equipment and piping in boiler plant, here. About $200,000.

D. C., Wash.—Sewers—Dist. Comrs., Lust Bldg., rejected bids received Aug. 1, building sewer in Illinois Ave. Noted Aug. 7.

D. C., Wash.—Timber Work—Spec. 4015—Bureau Yards & Docks, Navy Dept., plans to build timber work extension to quay wall. About $30,000.

Va., Hampton Roads—Gutters and Roofing—Spec. 4022—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build gutters and roofing for hangars, here. About $4000.

N. C., Wilmington—Officers' Quarters—Treas. Dept., Wash., D. C., rejected bids received July 15, building officers quarters at Marine Hospital, here. J. A. Wetmore, Wash., D. C., superv. archt. Noted July 24.

Fla., Pensacola—Removal of Pier—Spec. 4019—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to remove pier at Outer Ave., here. Bids to be opened at local yard. About $6500.

La., New Orleans—Equipment—Spec. 3882, Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids for mechanical and electric equipment for power plant, here. About $115,000; $10 deposit required for plans and specifications. Noted May 8.

Mont., Bozeman—Road Work—Bureau Pub. Rds., U. S. Dept. Agriculture, Missoula, plans to grade 5 mi. West Gallatin-Moose Creek Rd., 16 ft. wide, cost $20,000, 5 mi. West Gallatin-Swan Creek Rd., 16 ft. wide, $20,000. C. H. Purcell, Post Office Bldg., Portland, Ore., dist. engr.

Mont., Great Falls—Excavating—U. S. Recl. Serv. rejected bids received July 28, excavating canals for irrigation on Sun River project, involving 7200 cu.yd. excav. About $10,000. G. O. Sanford, Ft. Shaw, engr.

Mont., Great Falls—Road Work—Bureau Pub. Rds., Missoula, plans to build 10 mi. Riceville-Monarch Rd. through Sluice Box Canyon, here. About $10,000. C. H. Purcell, Post Office Bldg., Portland, dist. engr.

Tex., Pittsburg — Post Office — Treas. Dept., Wash., D. C., rejected bids received July 8, building, here. J. A. Wetmore, Wash., D. C., superv. archt. Noted July 17.

N. M., Portsmouth—Turbo Generator—Spec. 4017—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install 1000 kw. turbo generator, here. About $17,000.

Wash., Newport—Road Work—Bureau Pub. Rd., Missoula, Mont., receives bids about Aug. 20, clearing, grading and building drainage structures on 11.8 mi. Metaline Natl. Forest Rd., 12 ft. wide, Pend O'Reille Co., involving 39,000 cu.yd. earth and 5700 cu.yd. rock excav., 270 lin.ft. pile trestles, 1550 lin.ft. log culverts, etc. About $90,000. C. H. Purcell, Post Office Bldg., Portland, dist. engr. Noted Apr. 10.

Cal., Mare Island—Turbo Generators—Spec. 4018—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install 4000 kw. turbo generators, here. About $45,000.

BIDS DESIRED

D. C., Wash.—Fuel Oil—Until Aug. 25, by A. L. Flint, genl. purch. agt., Panama Canal, Wash., D. C., furnishing and delivering by steam, free of all charges, 300,000 bbl. fuel oil, domestic production, at Cristobal and 700,000 bbl. at Balboa.

S. C., Charleston—Quay Wall—Spec. 3773—Until Aug. 20, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. About $150,000; $10 deposit required for plans and specifications. Noted Jan. 23.

Ia., Carroll—Post Office—Until Sept. 8, by J. A. Wetmore, superv. archt., treas. dept., Wash., D. C., building here.

BRIDGE—WATERTOWN, N. Y.

Bids were received by city for constructing bridge over Black River on Pearl St., Sect. "A", from (A) Walsh Constr. Co., Davenport, Ia., (B) Peckham Constr. Co., Niagara Life Bldg., Buffalo, (C) Scott Bros., Arlington Blk., Rome; Sect. "B", (A) Peckham Constr. Co., (B) Walsh Constr. Co., (C) Scott Bros.; Sect. "C", river arch and lower deck only, (A) Walsh Constr. Co., (B) Peckham Constr. Co., (C) Scott Bros. The unit bids were as follows:

SECTION "A"	A	B	C
1,140 cu.yd. concrete, grade "A" arch ribs	$33 00	$32 50	$37 40
1,106 cu.yd. concrete, grade "A" floors, girders, etc.	23 00	31 50	37.40
285 cu.yd. concrete, grade "B" trans. walls and columns	22 00	31 50	36 00
328 cu.yd. concrete, grade "B" retaining walls	18 00	21 00	20 00
430 cu.yd. concrete, grade "B" pavement base	17 00	11 00	14 00
1,875 cu.yd. concrete, grade "C" abutments and footings	16 00	10 70	16 00
359,786 lb. steel reinforcing bars	05	.052	06
420 cu.yd. excavation, earth	1 50	2.25	1 50
460 cu.yd. excavation, rock	4.00	10 00	5.00
51 cu.yd. sand-clay cushion, above floor slabs	2 00	2 20	3.00
4,736 cu.yd. filling, approaches	2.00	1 60	2.00
145 cu.yd. ballast under trolley tracks	4.50	4 95	3.75
3,874 cu.yd. brick pavement and cushion	4 00	4 30	3.00
988.42 lin.ft. parapet walls	4 50	4 50	3.00
1,253 lin.ft. curb on fill	1 00	95	.85
5,790 sq.ft. sidewalk on fill	.35	40	.42
1,710 sq.yd. waterproofing, two-ply	.60	1 85	2.80
463 sq.yd. waterproofing, one-ply	40	1 15	1.65
10 pieces lamp posts	150 00	28 00	42 00
6 pieces trolley poles	100 00	50 00	55.00
2 pieces combination lamp and trolley poles	150.00	96 00	72.00
870 lin.ft. 1-in. metal conduit	25	45	.24
480 lin.ft. ¾-in. metal conduit	.20	34	22
77 lin.ft. ½-in. metal conduit	15	.29	.19
72 pieces junction and outlet boxes	2 00	2 60	2.40
16 pieces c. i. handhole frames and covers	25 00	5 00	6.00
32 pieces catch basins and track drains	35 00	44 00	22.80
4 pieces drainage screens	35 00	10 00	4.80
240 lin.ft. drainage line	1 50	1 00	2 00
Cofferdam for river arch abutments (lump sum)	4,000.00	1,400 00	5,000 00
Extended totals	$176,551	$178,221	$202,883

SECTION "B"	A	B	C
328 cu.yd. concrete, grade "A" railroad arch	$26.00	$22 00	$37.40
747 cu.yd. concrete, grade "A" floors, girders, etc.	31 00	21 00	37.40
113 cu.yd. concrete, grade "B" columns	25 50	20 00	25 40
875 cu.yd. concrete, grade "B" retaining walls	19.00	18 00	20.00
529 cu.yd. concrete, grade "B" pavement base	11.00	17 00	14.00
3,147 cu.yd. concrete, grade "C" abutments and footings	10.70	16.00	16.00
167,929 lb. steel reinforcing bars	052	.05	06
1,593 cu.yd. excavation, earth	2 25	1 50	1.50
27 cu.yd. sand clay cushion, above floor slabs	2 20	2 00	3 00
11,618 cu.yd. filling, over arch and in approaches	1 60	2 00	2.00
268 cu.yd. ballast under trolley tracks	4.95	4.50	3.75
4,071 sq.yd. brick pavement and cushion	4.30	4 00	3.00
853.28 lin.ft. parapet walls	4.50	4.50	3.00
1,835 lin.ft. curb on fill	95	1.00	.85
8,993 sq.ft. sidewalk on fill	45	.35	.42
1,453 sq.yd. waterproofing, two-ply	1 85	60	2.80
667 sq.yd. waterproofing, one-ply	1.15	.40	1.65
14 pieces lamp posts	28.00	150 00	42.00
8 pieces trolley poles	50 00	100.00	55.00
1 piece combination lamp and trolley poles	96 00	150 00	72.00
1,108 lin.ft. 1-in. metal conduit	.45	.25	.24
268 lin.ft. ¾-in. metal conduit	.34	20	.22
47 lin.ft. ½-in. metal conduit	.29	15	.19
43 pieces junction and outlet boxes	2.60	2.00	2.40
18 pieces c.-i. handhole frames and covers	5 00	25 00	6.00
10 pieces catch basins and track drains	44.00	35 00	22.80
75 lin.ft. drainage line	1 00	1.50	2.00
Stairway—West side	800 00	1,500 00	1,750.00
Stairway—East side	600 00	750 00	980 00
Steps Massey Street to jail	200 00	50 00	200.00
130 lin.ft. iron fence, rebuilt	1 70	7.00	2.09
Extended totals	$157,594	$169,381	$185,612

SECTION "C"	A	B	C
1,140 cu.yd. concrete grade "A"—arch ribs	$33 00	$34 00	$42.00
464 cu.yd. concrete grade "A"—floors, girders, etc.	23 00	33 00	42.00
197 cu.yd. concrete, grade "B"—retaining walls	18 00	23 00	25.00
1,456 cu.yd. concrete, grade "C" abutments and footings	16 00	12 00	20.00
269,598 lb. steel reinforcing bars	05	.06	.06
50 cu.yd. excavation, earth	1 50	2.50	1.50
460 cu.yd. excavation, rock	4 00	10 00	5.00
3,400 cu.yd. filling, approaches	2 00	1 70	2.00
524 sq.yd. brick pavement and cushion	4 00	4.40	3.00
411.5 lin.ft. parapet walls	4.50	4 70	3.00
571 sq.yd. waterproofing, two-ply	.60	1.90	2 80
256 sq.yd. waterproofing, one-ply	.40	1 20	1.65
20 lin.ft. ½-in. metal conduit	15	35	.19
4 pieces junction and outlet boxes	2 00	2 70	2.40
20 pieces catch basins	35 00	50 00	22.80
4 pieces drainage screens	35 00	10 00	4.80
130 lin.ft. drainage line	1 50	1 00	2 00
Cofferdam for river arch abutments (lump sum)	4,000 00	1,500 00	5,000 00
Extended totals	$106,768	$111,075	$137,340

Minn., Montevideo—Post Office—Until Sept. 5, by J. A. Wetmore, superv. archt. treas. dept., Wash., D. C., building, here. Former bids rejected. Noted July 17.

Kan., North Topeka—Post Office—Until Sept. 18, by J. A. Wetmore, superv. archt., treas. dept., Wash., D. C., building, here.

Cal., Mare Island—Completing Structural Shop—Spec. 3719—Until Aug. 20, by Bureau Yards & Docks, Navy Dept., Wash., D. C., completing structural shop, here. About $430,000; $10 deposit required for plans and spec. Noted Dec. 12.

Cal., Mare Island—Electric Lighting and Power Systems, Spec. 3982—Until Aug. 27, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing here. About $25,000; $10 deposit required for plans and specifications.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., New London**—Distributing System—Spec. 3989—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing distributing system here, to Lord Constr. Co., 105 West 40th St., New York City, $248,319, (180 days). Noted Aug. 7.

★**N. Y., New York**—Garage—Spec. 3873—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building garage at Medical Supply Base, here, to Caye Constr. Co., 299 Broadway, $61,200 (140 days). Noted Aug. 7.

N. J., Lakehurst—Hangar—Spec. 4001—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Aug. 6, building 1 dirigible hangar at Naval Air Sta., here, (1) work complete, from

Federal Government Work (Continued)

Irwin & Leighton, 126 North 12th St., Phila., Pa., (1) $2,747,000 (360 days), (4) add $156,000, (5) add $115,000, (6) add $30, deduct $15; (7) add $50, deduct $18, (8) add $1, deduct $25, (9) add $2, deduct $0.65, (10) $323,000, (12) add $45, deduct $20, (13) add $2, deduct $1.

G. F. Pawling, 1432 South Penn. Sq., Phila., Pa., (1) $2,854,000, (360 days), (2) add $131,000, (3) add $144,200, (4) add $250,000, (100 days), (5) add $220,000, (60 days), (6) add $30, deduct $19, (7) add $75, deduct $20, (8) add $1.15, deduct $0.06, (9) add $2.90, deduct $0.75, (10) $350,000, (12) $19, (13) $3.50, (4) deduct $125,000.

Warren-Moore Colonial Trust Bldg., Phila., Pa., (1) $2,917,407, (360 days), (4) add $241,314, (5) add $171,432, (6) add 23, deduct $15, (7) add $2.75, deduct $0.50 (8) add $0.95, deduct $10, (9) add $60, deduct $30, (10) deduct $313,560.

Lord Electric Co., 105 West 40th St., New York City, (11) $317,247, (240 days).

Baker Smith & Co., 576 Greenwich St., New York City, (11) $328,989 (210 days).

Riggs Distler & Stringer, 260 North Calvert St., Baltimore, Md., $349,997, (210 days). Noted July 31.

★**Md., Annapolis**—Garage—Spec. 3988—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building garage, here, to King Lumber Co. Charlottesville Va., $29,058, (120 days). Noted Aug. 7.

★**Md., Baltimore**—Dredging—U. S. Engr. Office, Custom House, let contract dredging channel to Curtis Bay, to Sanford & Brooks Co., Commerce St., $0.27 per cu.yd. Work involves 950,000 cu.yd. scow measurement with over depth dredging of 174,000 cu.yd. Noted July 31.

D. C., Wash.—Paving—Dist. Comrs., Dist. Bldg., received bids Aug. 6, paving streets and avenues, (1) laying standard asphalt (2½ in. surface, 2 in. binder before compression) on 6 in. concrete base, (a) natural pitch, Lake asphalt, (b) reduced oil asphalt; (2) laying vitr. block on 6 in. concrete; (3) laying standard asphalt; (2¼ in. asphalt surface, 2 in. binder, before compression) on 5 in. concrete base, (a) natural pitch lake asphalt, (b) reduced oil asphalt; (4) laying vitr. block on 5 in. concrete base, from

Eastern Paving Co., Colonial Trust Bldg., Phila., Pa., (1b) $3.07 per sq.yd., (2) $2.97, (3b) 6 in., $2.97, (4b) 5 in. $2.89.

Cranford Paving Co., Union Trust Bldg., (1a) $3.15, per sq.yd., (1b) $2.96, (2) $3.25, (3a) 5 in. $3, (3b) $2.82, (4) 5 in. $3.10.

★**D. C., Wash.**—Plumbing—Treas. Dept. let contract changing plumbing in Interior Dept. Bldg. to Nolan Bros., 1320 New York Ave., $4670.

★**D. C., Wash.**—Sewers—Dist. Comrs., Dist. Bldg., let contract building 9th and 12th Sts. relief sewers, to W. F. Brenizer, 101 New York Ave., N. E.; Minnesota Ave. and Upper Piney branch sewer, to G. Hyman, West Virginia Ave. and Morse St., N. E. Noted Aug. 7.

★**Fla., Jacksonville**—Dredging and Rock Removal—W. J. Bardin, engr., Jacksonville, let contract dredging and removing rock in Drummond Creek Cut, Johns River, to P. S. Ross, 75 Johnson Ave., Jersey City, N. J., $5.78 per cu.yd. Work involves 18,207 cu.yd. excav. Noted July 10.

Mich., Saulte Ste. Marie—Dredging—U. S. Engr. Office, Detroit, received bids July 22, dredging Grosse Pointe Channel, Lake St. Clair, involving 850,000 cu.yd. floating dredgwork with allowable over-depth amounting to 400,000 cu.yd. sand and clay, from Great Lakes Dredge & Dock Co., 104 South Michigan Ave., Chicago, Ill., $0.185 per cu.yd.; Fitzsimmons & Connell Dredge & Dock Co., 10 South La Salle St., Chicago, Ill., $0.24 per cu.yd.; Greiling Bros. Co., 124 North Adams St., Green Bay, Wis., $0.24 per cu.yd. Noted June 26.

Oregon—Road Work—Bureau Pub. Rds., 628 Post Office Bldg., received bids grading, grubbing and building concrete culverts (1) 6 mi. Sect. 1 (2) 6 mi. Sect. 2 Lake Crescent Sect. Olympic National Forest Rd., (a) 360 days, (b) 180 days, from Ericson Constr. Co., (1a) $137,823, (1b) $144,714, (2a) $116,765, (2b) $122,602; Rojette, Fobett & Winters, Seattle, Wash., (1a) $158,754, (1b) $174,473; J. Hampshire, Grants Pass, (1a) $143,261; Grant Smith Co., 275 Pine St., (1b) $130,103, (2c) $123,392; Puget Sound Bridge & Dredging Co., Central Bldg., Seattle, (2b) $208,961.

Ore., Portland — Road Work — Bureau Pub. Rds., U. S. Dept. of Agriculture, Portland, received bids grading, clearing, draining, etc., Zig Zag Sect. Mt. Hood Rd., involving 138 acres clearing, from Johnson Contg. Co., Lumber Exch. Bldg., $180,160; J. W. Sweeney, 728 McClay Bldg., $196,774; Pacific Bridge Co., foot of East Salmon St., $229,600. Noted Apr. 17.

Miscellaneous

PROPOSED WORK

Monument — New York, N. Y. — Bronx Chapter of Amer. Legion, c/o Starrett & Van Vleck, archts. and engrs., 8 West 40th St., having preliminary sketches made for 80 x 100 ft. brick, stone and marble monument, brick foundation. About $500,000.

Coal Trestle — Utica., N. Y. — C. F. Hanauer, 920 Canal St., purchasd site on Wheeler Ave. and Linden St. and plans to build rein.-con. and timber coal trestle, rein.-con. coal silos and conveying system. Cost between $20,000 and $25,000.

Swimming Pool — Belmar, N. J. — City council had plans prepared by C. B. Cook, archt., Asbury Park, for 50 x 150 ft., concrete and tile swimming pool at foot of 5th Ave. About $19,600.

Equipment, Machinery, etc.—Phila., Pa.—Dept. Health & Charities soon receives bids furnishing equipment for power house at Phila. Genl. Hospital, 34th and Pine Sts., including boilers, engines, piping and machinery. About $250,000. P. H. Johnson, 713 Sansom St., engr.

Retaining Wall—Pittsburgh, Pa.—City passed ordinance to rebuild retaining wall on Leander St., between Rust Way and westerly terminus thereof, rein.-con. N. S. Sprague, city engr.

Piers, Approaches, Bulkhead, Pier Equipment, Heating Plant, Cranes and Locomotives — Baltimore, Md. — See "Industrial Works."

Piers — Baltimore, Md. — Weyerhaeuser Timber Co., White Bldg., Tacoma, Wash., and 1015 Lexington Bldg., here, preparing plans for four, 120 x 580 ft., wood pile and timber piers on water front near Curtis Bay. About $100,000. W. E. Long, mgr. and engr. Noted Apr. 24 under "Industrial Works."

Piers — Baltimore, Md. — Baltimore & Eastern Shore Ferry Co., Inc., soon lets contract building 1200 ft., rein.-con. and timber pier, 35 ft. wide, including frame shed on each end, north of Bay Shore Park. Cost between $75,000 and $100,000. McLean Contg. Co., 1412 Fidelity Bldg., engrs.

Bulkhead—Eustis, Fla.—City voted $45,000 bonds to bulkhead on shores of Lake Eustis municipal pier and park.

Levee—Rayville, La.—Bd. State Engrs., 213 New Orleans Court Bldg., New Orleans, soon lets contract building Upper Leland Levee, involving 175,000 cu-yd. riverside enlargement; Carmicheal Levee, 25,000 cu.-yd. riverside enlargement. H. A. Mangham. secy.

Levee — Tallulah, La. — T. P. Kell, pres. Bd. Comrs., 5th Louisiana Levee Dist., at office State Engrs., New Orleans Court Bldg., New Orleans, soon lets contract cutting down and rebuilding present maintaining line and levee, false berme, etc., 65,000 cu.yd., Bourgere Levee in Concordia Parish.

Athletic Field—Detroit, Mich.—Masonic Athletic Assn., c/o G. W. Graves, archt., 43 John R St., having plans prepared improving 90 acre site for athletic field, to include swimming pools, grand stand, concrete drives and promenade, dock over Lake St. Clair, filling and preparing bathing beach and building concrete boat dock.

Retaining Wall—Grosse Pointe, Mich.—Village having preliminary surveys made by M. L. Brown & Son, engrs., 821 Chamber of Commerce Bldg., Detroit, for rein-con. retaining wall at St. Clair Lake. About $20,000. Noted May 15.

Rock Crusher — Foley, Minn. — Comrs. Benton Co. plan to purchase portable rock crusher with 20 ft. feeder and grill screen, equipped with Manganese die, (1) 9 x 16 in. jaw opening with 12-18 tons an hour capacity; (2) 11 x 20 in. jaw opening, 18-25 tons an hour capacity; J. E. Kasner, Suak Rapids, co. aud.

Cast Iron Pipe, Hydrants, Elbows, etc.—St. Cloud, Minn.—City soon lets contract furnishing 1644 lin.ft. 4 in. and 1340 lin.ft. 6 in. Class C bell and spigot type c.i. pipe, three 6 in. hydrants, one 4 in. gate and box, one 4 in. tee, one 6 in. gate and box, three 6 in. tees, two 4 in. radius elbows, etc. R. E. Borrowman, city engr.

Dam, Conduit, etc.—St. Paul, Minn.—See "Waterworks."

Dock—St. Louis, Mo.—C. E. Smith, city engr., soon receives bids building 900 ft. rein.-con. docks at foot North Market St. and Mississippi River, involving wet and dry excav. and wood piling. About $300,000.

Road Oil—St. Louis, Mo.—Bd. Aldermen appropriated $15,000 and passed ordinance to use receipts from gasoline tax, amounting to $300,000, to purchase road oil for use on streets and roads. J. B. Thomas, 317 City Hall, supply comr.

Parks—El Paso, Tex.—City plans election to vote on $100,000 bonds to build parks. W. C. Stewart, city engr.

Fire Alarm System—San Antonio, Tex.—City voted $150,000 bonds to install fire alarm system. H. Helland, city engr. Noted July 10.

Incinerator — San Antonio, Tex. — City voted $100,000 bonds to build incinerator. H. Helland, city engr. Noted July 10.

Parks—San Antonio, Tex.—City voted $200,000 bonds to build parks. H. Helland, city engr. Noted July 10.

River Improvements—San Antonio, Tex.—City voted $200,000 bonds for river improvements. H. Helland, city engr.

—Park — Albuquerque, N. M.—Bd. Pub. Wks. plans to build North Fourth St. Park, bounded by 3rd and 4th Sts., also Marble and State Ave. About $10,000 has been subscribed for project.

Lighting System — Logan, Utah — City had plans prepared by A. H. Chambers, engr., Logan, for 25 mi. ornamental street lighting system. About $30,000.

Safeguard Wall—Olympia, Wash.—Comrs. Thurston Co. soon let contract building concrete and rock safe-guard wall along Nisqually River from point 400 ft. south of Brown Bridge. Cost to exceed $10,000.

Cement—Astoria, Ore.—Port of Astoria rejected bids furnishing cement for Pier No. 3. Cost between $19,950 and $20,925. Noted June 26th under "Pier and Freight Shed."

Port Improvement—Astoria, Ore.—Port of Astoria sold $450,000 bonds to dredge and improve port. R. R. Bartlett, ch. engr

Dredges—Marshfield, Ore.—Port of Coos Bay having plans prepared by A. Sengstacken, secy., for two 15 in. suction dredges, for dredging channel. About $15,000 and $50,000 respectively.

Cast Iron Pipe—Portland, Ore. — City soon lets contract furnishing 130 ton 12 in., 240 ton 8 in., and 130 ton 6 in. c.i. pipe. P. McIntosh, city purch. agt.

Dock—Portland, Ore — Emerson Hardware Co. plans to build import and export lumber docks, 250 ft. frontage and 600 ft. approach. About $20,000. C. B. Stetson. 730 Everett St., mgr.

Wharf—Oakland, Cal.—See "Industrial Works."

Breakwater and Wharf—Meteghan, N. S.—Dept. Pub. Wks., Ottawa, Ont., soon receives bids rebuilding breakwater and part of wharf, here. About $14,000. A. Lafleur, Ottawa, engr.

Wharf—Murray Bay, Que.—Dept. Pub. Wks., Ottawa, Ont., soon receives bids building wharf at St. Etienne de Malbaie, near here. About $12,000. A. Lafleur, Ottawa, engr.

Wharf — Graham, B. C. — Dept. Pub. Wks., Ottawa, Ont., soon receives bids building wharf, here. About $12,000. E. Lafleur, Ottawa, engr.

Wharf—Kincolith, B. C.—Dept. Pub. Wks., Ottawa, Ont., soon receives bids building wharf, here. About $12,000. E. Lafleur, Ottawa, engr.

BIDS DESIRED

Asphalt—Brooklyn, N. Y.—Until Aug. 20, by E. Riegelmann, boro. Pres., furnishing and delivering 150,000 gal. refined asphalt in liquid form and 50 ton of 2000 lb. each of refined asphalt in packages. 3500 bbl. Portland cement, 1000 ton limestone or other suitable inorganic dust, 400 cu.yd. paving gravel, 105,400 feet board measure of lumber, 100 ton paving pitch, 4000 cu.yd. asphalt sand, 1200 cu.yd. binder stone, and regulating and grading Vermont Ave. from Highland Blvd. to Bulwer Pl.

Heating, Etc. — Hudson, N. Y. — Until Aug. 22, by A. W. Allen, pres. bd. mgrs., New York State Training School for Girls, replacing underground steam and water mains and heating equipment in school, here. L. F. Pilcher, Albany, state archt.; advertised in this issue.

Miscellaneous (Continued)

Cement—New York, N. Y.—Until Aug. 19, by H. Bruckner, pres Bronx Boro., furnishing and delivering 3000 bags Portland cement.

Garbage Incinerator—Syracuse, N. Y.—Until Aug. 25, by R. D. Roney, secy. bd. contr. and supply, building garbage incinerating plant on Hiawatha St. Noted Aug. 7.

Column Foundations—Philadelphia, Pa.—Until Aug. 26, by Dept. City Transit, 1211 Chestnut St., building 47 concrete column foundations for Frankford Elevated Ry., in Front St. near Arch St. and in Frankford Ave. between Dyre and Bridge Sts., including demolition of certain buildings at Front and Arch Sts., Contr. No. 504; construction of station platforms and shelters over these for Frankford Elevated Ry. at York and Dauphin Sts. and Girard Ave., including steel frame work and railing, rein.-con. platform floor, gutters, etc., Contr. No. 532. G. T. Atkinson, asst. dir.

Creosoted Wood Blocks—Baltimore, Md. Until Aug. 20, by Bd. Awards, c/o City Register, furnishing creosoted wood blocks. G. F. Weighardt, highways engr.; advertised in this issue.

Levee — Alexandria, La. — Until Sept. 15, by Bd. Comrs. Red River Atchafalaya & Bayou Levee Dist., improving 40,000 cu.-yd. Hudson Bayou; 90,000 cu.yd. Compton Lake to Bayou Latanier, Rapides Parish; 450,000 cu.yd. Bayou Rouge to Burton Lake; 800,000 cu.yd. Burton Lake to Darbonne Bay, St. Landry Parish. E. G. Richard, pres.

Revetment and Retaining Wall—Toledo, O.—See "Streets and Roads."

Cast Iron Pipe—Detroit, Mich.—Until Aug. 18, by J. A. Martin, comr. purchases & Supplies, Municipal Courts Bldg., furnishing 1500 tons c. i. water pipe with inside diameter of 6 in., 1500 tons 8 in., also 408 lengths of 12 ft. each, 6 in. diameter, with bell and spigot ends. Class "B".

Sea Wall—Rockwood, Mich.—W. H. Adams, engr., 1211 Vinton Bldg., Detroit, receiving bids furnishing labor and material for 750 ft. rein.-con. retaining or sea wall on shore of Lake Erie, for Port Mouille Shooting Club, Rockaway. About $20,000. Noted July 3.

Dam—Decatur, Ill.—Until Sept. 12, by city, building earth and concrete dam, 1900 ft. long on center line at top with height of about 28.5 ft. near center, concrete screen chamber, gates, conduits, concrete overflow spillway, etc. Pearse & Greeley, 39 West Adams St., Chicago, engrs.; advertised in this issue.

Water Tube Boiler, Etc.—Webster City, Ia.—Until Aug. 18, by City Manager, furnishing 1 watertube boiler, 1 steel stack, breeching, etc., also connections to heater system.

Road Machinery—St. Paul, Minn.—City is receiving bids for trench excavating machine and trench back filling machine. H. W. Austin, purch. agt.

Galvanized Iron Mains, Cast Iron Pipe, etc.—Greybull, Wyo.—Until Aug. 25, by Town Council, furnishing 2300 ft. 2 in. galvanized iron mains, 6040 ft. 4 in. c.i. pipe and 1460 ft. 6 in. c.i. pipe, also valves, hydrants, etc. G. W. Zorn, Greybull, engr.

Transit Sheds—Halifax, N. S.—Until Aug. 23, by C. B. Brown, ch. engr. Canadian Natl. Rys., Moncton, N. B., building two 2 story, 98 x 1258 ft., rein.-con. and brick, rein.-con. flooring, at South Terminals here. About $300,000. Foundation for same completed.

Retaining Wall—St. John, N. B.—Until Aug. 20, by G. G. Hare, engr., St. John, building concrete retaining wall to protect St. James St., for city. About $16,320.

Culverts, Piers—Grenville, Que.—Until Aug. 18, by A. F. Stewart, ch. engr., Canadian North R.R., building concrete culverts, abutments and piers between Mileage 59, L'Original and Ottawa, on Grenville subdivision.

Paving Bricks—Montreal, Que.—Until Aug. 18, by Administrative Comn., City Hall furnishing 80,000 Hillside grooved wire cut lug paving bricks. R. Bauset, city clk.

Wharf—Sillery, Que.—Until Aug. 28, by Dept. Pub. Wks., Ottawa, Ont., repairing Pointe Pizesau Wharf here, timber filled with stone. About $16,000. E. Lafleur, Ottawa, engr. Noted Apr. 10 under "Canada."

DAM—SAN FRANCISCO, CAL

Bids were received by Board Public Works, July 30, for constructing Hetch Hetchy dam, from (A) Utah Constr. Co., Eccles Bldg., Ogden, Utah, (awarded contract for proposition A); (B) same company, proposition C; (C) R. C. Storrie & Co. The unit bids were as follows:

	A	B	C
Dam with overflow spillway:			
65,000 cu.yd. excavation of earth and loose rock in open cut, below elevation 3500	$8.00	$8.00	$10.00
12,000 cu.yd. excavation of solid rock in dam foundation, below elevation 3500	11.20	11.20	10.00
28,500 cu.yd. excavation of earth and loose rock in open cut, above elevation 3500	1.50	1.50	3.00
22,000 cu.yd. excavation of solid rock in dam foundation, above elevation 3500	3.00	3.00	6.00
10,000 cu.yd. excavation in tunnel and in shaft	10.10	10.10	12.00
47,000 cu.yd. cyclopean masonry below elevation 3500	11.80	11.55	11.00
17,500 cu.yd. mass concrete below elevation 3500	15.00	14.75	13.00
251,800 cu.yd. cyclopean masonry above elevation 3500	11.00	10.75	10.25
44,200 cu.yd. mass. concrete above elevation 3500	14.30	14.05	13.00
2,500 cu.yd. mass concrete in tunnel and in shaft	17.25	17.00	15.00
200 cu.yd. reinforced concrete, Class "A"	21.60	21.35	20.00
300 cu.yd. reinforced concrete, Class "B"	20.15	19.90	18.00
550 cu.yd. precast dense concrete blocks	18.70	18.45	20.00
1,600 cu.yd. precast porous concrete blocks	17.30	17.05	20.00
12,000 sq.ft. mortar 1-in. thick, placed by means of a cement gun	.13	.13	.50
82,000 sq.ft. mortar ½ in. thick, placed by means of a cement gun	.11	.11	.30
200 cu.yd. grout placed under pressure	44.60	44.35	30.00
10,000 bbl. extra cement	5.00	5.00	6.00
Screen rack No. 1 (complete structure)	10,800.00	10,800.00	30,000.00
Screen rack No. 2 (complete structure)	6,500.00	6,500.00	25,000.00
Screen rack No. 3 (complete structure)	12,200.00	12,200.00	45,000.00
1,000 lin.ft. grout holes in rock	1.80	1.80	5.00
1,000 lin.ft. grout holes in masonry	.70	.70	1.00
880 lin.ft. drainage holes through masonry	.85	.85	1.00
48,700 lb. steel reinforcing bars	.07	.07	.10
23,600 lb. galvanized steel or iron work	.13	.13	.20
2,800 lb. bronze	1.15	1.15	2.00
13,000 lb. galvanized pipe and fittings	.13	.13	.20
200 lb. galvanized chains	.14	.14	.25
800 lb. cast iron gratings and frames	.14	.14	.10
10,000 lb. copper water stops	.60	.60	1.00
2,090,000 lb. placing metal work furnished by city	.03	.03	.03
530 sq.ft. doors faced with galvanized iron	.45	.45	2.00
17,000 sq.ft. painting concrete surfaces in waterways	.09	.09	.20
10 radial gates	1,200.00	1,200.00	3,500.00
Extended totals for dam with overflow spillway	$5,370,809	$5,279,346	$5,43 .010
Dam with siphon spillway:			
Totals for items 1-7, 9, 10, 13-24, 27-30, 32-34, same as above	$2.566,166 50	$2,537,779	$2,786,070
253,200 cu.yd. cyclopean masonry above elevation 3500	11.00	10.75	10.25
50 cu.yd. reinforced concrete, Class "A"	21.60	21.35	20.00
3,100 cu.yd. reinforced concrete, Class "B"	20.15	19.90	18.00
132,000 lb. steel reinforcing bars	.07	.07	.10
41,700 lb. galvanized steel or iron work	.13	.13	.20
13,700 lb. copper water stops	.60	.60	1.00
Acquiring and conveying to the city the legal right to construct and operate the siphon spillway (lump sum)	10,000.00	10,000.00	2,500.00
Extended totals for dam with siphon spillway	$5,447,793	$5,355,318	$5,475,910

Pier—Ottawa, Ont.—Until Aug. 19, by J. W. Pugsley, secy. Dept. Railways and Canals, Ottawa, rebuilding north pier at upper entrance to Farran's Point Canal.

Wharf—Ottawa, Ont.—Until Aug. 19, by R. C. Desrochers, secy. dept. pub. wks., building crib wharf in front of Government Fish Hatchery, Dauphin River, Man.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Boilers, etc.—Central Islip, N. Y.—State Hospital Comn., Capitol, Albany, let contract for one 600 h.p. boiler, 4 stokers, etc., for Central Islip State Hospital, here, to Chute, Thornton & Bayley Corp., 2 East 13th St., New York City. About $81,600. Noted July 24.

★Pipe—Fulton, N. Y.—Bd. Pub. Wks. let contract furnishing Class D, 1 and 16 in. c. i. pipe for new watermain from pumping station to Bway. bridge, to Camden Iron Wks., Camden. About $37,000. City will lay same. Total cost, $75,000.

★Sand—New York, N. Y.—F. L. Dowling, pres. Manhattan Boro., let contract furnishing and delivering 11,000 cu.yd. asphalt wearing surface sand, Grade "B," to C. W. Crane, $13,200. Noted July 31.

★Paving Blocks—Connellsville, Pa.—City Council let contract furnishing 80,000 paving blocks for Murphy Ave., to Fayette Fire Brick Co., Uniontown, cost $32.35 per 1000.

★Bulkhead—Phila., Pa. Dept. Wharves, Docks and Ferries, Bourse Bldg. let contract building with appurtenant work, Schuylkill River bulkhead, to McLean Constr. Co., Fidelity Bldg., Baltimore, Md., at $343,365. Noted July 24.

★Gas Pipe—Hamilton, O. City let contract furnishing 55,000 ft. 1¼ to 8 in. steel gas pipe, to M. D. Larkin Supply Co., East 3rd St., Dayton, $21,800.

★Ice Breaker—Toledo, O.—City let contract building 340 ft. timber ice breaker, 46 ft. wide, on Fassett St., to M. Rabbitt & Sons, 115 Nasby Bldg., $27,850. Noted June 10.

★Storage Tanks—Keokuk, Ia.—J. C. Hubinger Bros. Co. let contract for two 10,000 bu. rein.-con. grain storage tanks, to Burrell Eng. & Constr. Co., 327 South La Salle St., Chicago. About $15,000.

★Tank — Minneapolis, Minn. — Banner Grain Co., 722 Flour Exch., let contract, building 250,000 bu. grain storage tank, rein.-con., to Burrell Eng. & Constr. Co., 327 South La Salle, St., Chicago. About $75,000.

★Timber — Minneapolis, Minn. — City let contract furnishing 225,000 ft. fir timber from 2 x 10 ft. to 10 x 12 ft. in length, to Pacific Coast Lumber Co., Lumber Exch., $40 per M. Noted July 17.

Cast Iron Pipe—Caldwell, Kan.—See "Sewers."

★Foundations, etc.—Denver, Colo.—State Bldg. Comn. let contract to Seerie & Varnum, 605 Interstate Trust Bldg., Denver, building foundation and tunnel in connection with proposed 5 story, 112 x 114 ft. office building, on Colfax Ave. and Sherman St., cost $96,127. Total cost, $500,000.

Retaining Wall—Phoenix, Ariz. See "Streets and Roads" under Arizona.

★Interior Finishing—Olympia, Wash.—State Capitol Comn., Olympia, let contract finishing interior of Temple of Justice, to Pratt & Watson, Tacoma, $283,267.

★Power Plant Equipment—Los Angeles, Cal.—Bd. Pub. Serv. let contract furnishing generators and electrical equipment for power plant No. 2, in San Francisquito Canyon, to Genl. Electric Co., Rialto Bldg., San Francisco, $457,505; hydroelectrical appliances, to Wellman-Seever-Morgan Co., Rialto Bldg., San Francisco, $203,561. Noted June 12.

★Freight Shed—Moncton, N. B.—Canadian Natl. Ry., (Intercolonial Div.), let contract building combined freight shed and office, to Engineers & Contractors, Ltd., St. John. About $74,500.

★Breakwater—Port Arthur, Ont.—Dept. Pub. Wks., Ottawa, Ont., let contract building rein.-con. extension to breakwater, here, to Chambers, McCaffrey & McQuigge, Ltd., Excelsior Life Bldg., Toronto. About $684,000.

OFFICIAL PROPOSALS

OFFICIAL PROPOSALS

Bid Aug. 28

Sewer Construction

Lima, Ohio

Sealed proposals for the construction of South Side Main Relief Sewers, Contract No. 2, will be received at the office of the Director of Public Service, City Hall, Lima, Ohio, until 12:00 o'clock noon, Central Standard Time (1:30 o'clock so-called "daylight saving" time), of the 28th day of August, 1919, and at that time and place will be publicly opened and read The City of Lima reserves 30 days thereafter in which to act on the bids.

Alternate bids will be received for monolithic concrete, concrete segment block, vitrified segment block, reinforced concrete pipe or vitrified pipe as set forth on the blank form of proposal furnished by the City of Lima, Ohio. The total length of the sewer under this contract is about 12,200 feet, consisting of the following sizes: 72 inch circular; 60 inch by 98 inch semi-circular; 60 inch circular; 54 inch circular; 42 inch circular; 36 inch circular and 24 inch circular

In addition there is a weir chamber near Kibby St. and Central Ave., together with special junctions at various points along the line of the proposed sewer. Contractors attention is called to the fact that the borings, taken along the line of the work, show no rock except at a point near the river or outlet.

The work to be done under this contract (No 2) must be completed in accordance with the plans and specifications not later than twenty-two (22) months after the date of the award of the contract.

Copies of the plans, form of propsal, contract, bond and specifications may be inspected at any of the following offices:

Director of Public Service, City Hall, Lima, Ohio.

Fuller & McClintock, 170 Broadway, New York City.

Wm. G. Clark, 1047 Spitzer Building, Toledo, Ohio.

City Engineer, City Hall, Lima, Ohio

Copies of the plans and specifiactions with form of proposal, contract and bond may be obtained at the office of the City Engineer, City Hall, Lima, Ohio. A charge of ($6) dollars will be made for each set of plans and specifications. No charge will be made for the proposal blank.

Each proposal must be accompanied by a certified check upon a National Bank or Trust Company doing business in the State of Ohio, U. S. Government bonds or cash in the sum of eight thousand ($8000) dollars, made payable to the City of Lima, Ohio.

The bidder to whom the contract is awarded will be required to furnish a surety company bond in the sum of 50% of his bid

The City of Lima, Ohio, reserves the right to reject any or all bids, to waive any informalities in the bids received and to accept and bid which they deem most favorable to the interest of the City of Lima, Ohio.

A. L. METHEANY,
Director of Public Service.

VAUGHN C. MILLER
City Engineer

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

OFFICIAL PROPOSALS

Bids: Aug. 18.

Sanitary Sewerage System and Disposal Plant

Borough of Paulsboro, N. J.

Sealed proposals will be received by the Borough Council of Paulsboro, N. J., at the Council Chamber in the Black Building, on the 18th day of August, 1919, until 8:00 o'clock P.M., for the construction of a complete sanitary sewerage system, consisting of approximately 10.8 miles of 5 in., 6 in., 8 in., 10 in., 12 in., 15 in. and 18 in. Terra Cotta pipe sewers and house connections, 107 Manholes, 11 Flushtanks, pumping station and disposal plant.

Each proposal must be accompanied by a certified check, made payable to the Borough Clerk, for a sum equal to 5% of the amount of bid.

Plans and specifications are on file and may be seen at the Council Chamber, Paulsboro, N. J., or at the office of the engineers, Remington & Vosbury, 601 Market Street, Camden, N. J. Complete sets of plans and specifications may be obtained from the engineers upon a deposit of $10 of which sum $5 will be refunded upon return by September 1, of the same in good condition.

The Borough reserves the right to reject any or all bids.

DANIEL D. POTE,
Borough Clerk.

Bids: Aug. 18.

Gravel Loader Manufacturers

Hastings, Minn.

Sealed proposals will be received at the Office of the County Auditor, Dakota County, Hastings, Minn., until 2 P. M., Aug. 18, 1919, for the purchase of a mechanical loader, suitable to load gravel from pits into Auto Trucks.

Bids must be accompanied by a certified check payable to the County Treasurer for at least 5 per cent. of proposal, each proposal must be accompanied by a complete set of specifications of loader. The County Board of Dakota County reserve the right to reject any or all bids.

R. W DOWNS, County Auditor

OFFICIAL PROPOSALS

Bids Aug 25.

Paving

Allegheny, Pa.

Sealed Proposals addressed to the Supervisors of Allegheny Township, Cambria County, Penna., in care of the County Controller, Ebensburg, Penna., will be received until 2 o'clock P. M. of the 25th day of August, 1919, and opened and read publicly in the office of the County Commissioners at 2:30 P. M. of the same day, for the reconstruction of 17,490 feet of the Carrolltown Road from a point in the line of Charles M. Schwab, Esq. to the line between Allegheny and East Carroll Townships.

Alternate bids are requested as follows:—(1) On a four (4) inch vitrified clay paving block on a concrete base; (2) On a three (3) inch vitrified clay paving block or a concrete base and (3) On a one-course reinforced concrete pavement.

All labor and all material will be furnished by the contractor.

Proposal sheets may be obtained from the Engineer at his office, 80-81 Altoona Trust Building, Altoona, Penna., and the plans and specifications are there open for examination.

A set of the plans and a copy of the specifications may be obtained by depositing ten dollars ($10) with the Engineer This deposit will be refunded upon the return of the papers in good condition

Each proposal must be accompanied by a certified check of two thousand dollars ($2,000) as a guaranty of the good faith of the bidder.

Bidders are requested to make appointments with the Engineer to go over the proposed improvement and to examine the plans.

The Board of Supervisors of the Township of Allegheny reserves absolutely the right to reject any or all bids.

By order of Joseph V. Little, Edward Lens and Charles A. Long, Supervisors of the Township of Allegheny, Cambria County, Pennsylvania.

D. W. DILLMAN,
Township Engineer.

Bids Aug. 18.

Concrete Pavement

DEPARTMENT OF PUBLIC WORKS

Richmond, Va.

SEALED PROPOSALS will be received at this office until 12 M. MONDAY, AUGUST 18, 1919, for the grading and paving with concrete, or asphaltic concrete, or bitulithic pavement, of certain streets, amounting to approximately 107,000 square yards of paving, and other work pertaining thereto.

Forms of proposals, specifications and information furnishd upon application.

A certified check for $1,000, payable to the Director of Public Works to accompany each bid as a guaranty of execution of each contract.

The right to reject any and all bids, or to award the contract as a whole or in part is reserved by the Director of Public Works.

CHAS. E. BOLLING,
Director of Public Works.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—James H. McGraw, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, *Editor* — Charles Whiting Baker, *Consulting Editor*

Volume 83 — NEW YORK, THURSDAY, AUGUST 21, 1919 — Number 8

Impugning the Book Review

WHETHER a book is praised, damned with faint praise or damned utterly, the giving of the price of a book at the head of a book review brands the review as an "advertisement," according to a Postoffice Department ruling noted and commented on at length on p. 378, in the Engineering Literature section of this issue. *Engineering News-Record* accepts the ruling but under protest against its unreasonableness. It is true that the ruling applies to other journals, both engineering and literary, but that only increases the number of readers of book reviews who are denied useful information as to price because of an arbitrary bureaucratic rule.

Development Committees' Conferees

THERE met at Montclair, N. J., last week the conference committee representing the development committees of the four leading engineering societies. What resulted from their deliberations is not, of course, to be known until the report is published. Even though it is not possible to record the results of the deliberations or to discuss them, it is fitting that the early meeting of the conference committee should be called to the attention of the profession. It indicates a disposition to get something done, to hurry the day when the profession can get to work on a plan that will be certain to receive general acceptance. The delay of the development committees has caused much dissatisfaction. Their preliminary reports were not made and the conference committee authorized until June. The conferees apparently are determined that the delays which attended the development committees' work shall not characterize their deliberations. We are certain that the profession will appreciate the energy and the disposition that have been shown. We believe, too, that their report will have very careful study. The profession is ready to give its support to a broad, constructive program.

As Others See Us

MR. LEIGHTON'S statement, in a letter to the editor in this issue, that he was hurt by the aspersions cast upon engineers recently by an eminent statesman, can readily be believed. Even the cold reading of words cuts deeply. Are the views correct? Are engineers the "most unresponsive citizens"? Engineers have taken small part in civic affairs; that must be admitted. But that they are more backward than any other group we do not believe. American citizens unfortunately care very little about how their Government is conducted unless their pocketbooks are affected. The business man has responded when tariff revision or other legislation threatened his business; labor responded when there was opportunity to get a wage increase, but, except for the patriotism of the war period, the mass of the people have left the politicians in relatively undisturbed control. But the fact that engineers are no worse than other groups in discharging their civic duties is not a defense for their inactivity. As the builders of the present industrial order, they should long since have become one of the most influential groups of citizens. Fortunately, they are making progress; witness, the subjects discussed at engineering society meetings, as reported in this journal weekly. With the engineers, too, discussion is the forerunner of action. While, therefore, we do not believe that the statesman's words are entirely true, there is enough truth in them to shame our profession. With the perfection of the engineering society organization of the land, which we hopefully look for as a result of the work of the conference committee of the development committees, we should soon remove what criticism is now deserved.

Hydraulic-Fill Dam Construction

WHEN the hearings on the Miami Conservancy District flood-protection project were going on, three years ago, the tightness and permanence of dams built by the hydraulic-fill method was the outstanding feature of interest and discussion. At that time and later, also, the engineers of the district were studying the method very carefully, with a view to deciding whether it should be adopted as standard for the construction of the five great dams of the project. Their tentative conclusions were indicated in the specifications, which provided separately for several different methods of building the embankments, in order to obtain alternative bids and make it possible to select the cheapest method. Subsequently the hydraulic-fill method was adopted for all the dams, and now, following completion of the outlet conduits, active embankment work is in progress at the two largest structures. As the work goes on toward completion, knowledge is likely to be gained that will make the choice of method easier in the future. Heretofore the hydraulic method has been applied almost exclusively in the far West, though there it has been established for a long time by the success of many large dam enterprises. Yet relatively little has been known concerning the engineering facts and underlying data which should control such work. At Miami it is certain that the same careful technical study will be given to the operation of hydraulic method that was given to the prior problems of engineering design. Through this study the great operations whose preliminary stages are briefly described in another column will throw new light on hydraulic-fill work, and raise it the same plane of engineering precision that more familiar methods of construction occupy.

General Staff Bill a Menace to Army's Technical Services

IT HAS taken the war to demonstrate, as no amount of discussion or propaganda could have done, that the military policy of the United States is a matter of concern to professional men—particularly engineers. Experience has shown them that the bulk of the personnel for every staff corps of the Army must come, in a time of national emergency, from the civilian members of the various professions.

American engineers played a big part in the recent war. In the event of future hostilities even greater demands will be made upon them. It is for this reason that the Army bill, drafted by the General Staff and now under consideration by Congress, assumes for them an entirely new significance. They now know that they may be called from civil practice to serve again, and that whatever system of Army organization and administration is now adopted will be the one under which *they* will have to operate. This brings the matter pretty close to home.

A scrutiny of the General Staff bill discloses certain features which are bound to operate to the disadvantage of the Corps of Engineers and other staff departments in which high technical qualifications are required. The main objections are summarized on p. 358 by a correspondent well informed in matters relating to our military establishment. The outstanding defect in the proposed legislation is its clear intent to reduce the Army's staff corps or bureaus, in which is included the Corps of Engineers, to a condition of abject servility to the General Staff; the latter body is vested with practically unlimited powers to regulate the internal workings of departments with the details of which, as a general planning, directing and coordinating body, it should have no concern. Not only would the General Staff aspire to become, simultaneously, a planning and an operating body, but it would also limit promotions to the grade of general officer in such a way as to exclude engineers and other technically trained men from receiving rewards in the form of advancement to high rank for work well done. The bill is clearly drafted in the interests of the "line" officer—the infantryman, the cavalryman or the artilleryman—to the prejudice of the technical man. In fact, there is nothing in the bill to prevent an infantry officer, once having reached the rank of general officer, from becoming Chief of Engineers if the General Staff should so decide.

There is a great need on the part of officers of the General Staff, as well as those of the line, of an understanding of the scope and character of the work which the Army's technical troops and staff corps or bureaus are organized to perform. On this subject the ignorance of many officers in responsible posts seems almost unbelievable. If there was one lesson of all others which the war should have taught our Army, it was the importance of the Engineers in the A. E. F., not only as combat troops but also as constructors in the Services of Supply, where the whole vital system of transportation and storage of food and material was dependent upon Engineer-built utilities in the form of docks, depots, water-supply systems, railway yards and scores of other works. Without these works the armies could not have functioned. It would be a real misfortune, therefore, if Congress should enact into law any measure which would curtail the usefulness of the Engineer arm of the service.

As for the General Staff, it is apparently seeking to establish itself in a position of absolutism. It is clear to any one who has known General Staff officers or has observed the results of their efforts that, in the past, at least, they have not been omniscient. Especially on technical matters do they need advice. In the case of any future expeditionary force, why should we not have a General Staff of which the chiefs of corps or bureaus shall form a part? In the A. E. F., for example, why were the Chief Engineer, the Chief Signal Officer and other heads of important departments located at Tours, the headquarters of the S. O. S., instead of at General Headquarters in Chaumont? These officers were officially the technical advisers of the Commander-in-Chief—from whom, as a matter of fact, they were separated by a distance of several hundred miles, a condition hardly making for the greatest effectiveness. It is true that they had representatives at G. H. Q., but the interests of each staff corps, as well as of the Army as a whole, would have been much better served if their chiefs had been in a position, as members of the General Staff, to assist in shaping policies in accordance with the most efficient use of the organizations they headed.

In any new Army policy, the best interests of the service and of the country will require that the chiefs of the Engineer Corps and other staff departments should be members of the General Staff and not subordinate thereto, as is proposed in this bill. Only so can there be guarantee that these staff departments will function with the greatest effectiveness in future military undertakings.

Field for the Cheaper Types of Highway Pavements

COMMISSIONER Greene of the New York State Highway Department gives in detail in this issue the reason for the strong position he has taken in the public prints and before civic bodies in favor of none but permanent pavements on the roads under his jurisdiction. Commendatory comment has already been made in these columns on the Commissioner's stand—a stand quite opposite to that of some of his predecessors, who, instead of basing their policies on sound engineering grounds, allowed political exigency to rule. Mileage, that the greatest number of constituents might be pleased, even though the cost to themselves should eventually be huge, governed the former policies.

Highway engineers, therefore, will approve heartily the stand that Mr. Greene has taken—in insisting that for trunk-line traffic (and practically all the state roads are trunk roads) permanent pavements should be used. If he continues to have the strong support of the executive, New York State will be his debtor.

In an argument as strong as Mr. Greene's, however, it is likely that sight will be lost of the fact that his condemnation of the cheaper types of surfacing is not universal. He is speaking only of state-road conditions, obviously of those highways which carry either heavy traffic or at least quite a considerable volume, for east of the Mississippi and north of the Ohio only such roads are taken into a state trunk system. Mr. Greene

in his article, it is true, cites Road 430, which, he says, is a secondary road and does not carry heavy traffic. Obviously, he is here using "heavy" as a relative term, the comparison being with such important trunks as the Albany-Schenectady link.

Every one engaged in highway work well knows that the construction of the expensive types is not warranted on the by-ways, on the spurs from main routes to hamlets, and, in general, on what are termed light-traffic roads. Here the macadam and the gravel road, and, even more so, the lighter forms of bituminous construction, still properly hold sway.

To this principle every highway engineer will subscribe, just as he will to the principle of permanent surfacing for the heavy-traffic routes. The difficulties arise in the application of the principles. Where is the lower limit for the heavy-traffic type—or, to put it another way, what is the traffic density, say, in tons per day—which demands that the lighter type be abandoned and the more expensive pavement employed? Figures to enable such a determination to be made are being accumulated. There is value, too, in a close analysis of maintenance costs for different types under different densities of traffic. Traffic counts, as well as the excellent cost-keeping systems now becoming universal, are needed to give the data on which ultimate conclusions must be founded. But until the data are available, the judgment and experience of the engineer will continue to be determining in setting the dividing line between the light- and the heavy-traffic road.

Are the Cement Companies Profiteering?

AT THE direction of the Attorney General of the United States, suit is to be brought against 19 Eastern cement companies on complaint that these corporations have conspired to control—and to increase—the price of cement. The principal points of the complaint will be found in the news section of this issue.

As to the existence and activities of an alleged association (which, by the way, is not to be confused with the Portland Cement Association) this journal has no information. Nor do we feel that the users of cement care whether such an association exists or not, except in so far as its activities cause them to pay an undue price. If the cement companies have profiteered or are profiteering, if they have conspired to set aside the normal laws of competition to the injury of the public, then they should be punished, and restrained from such course hereafter.

Since the armistice there has been much complaint against the high price of cement, just as there has been against the high prices of other building materials—in fact, of all commodities. Not only has the complaint been that the prices are high, but the statements have have been made that the cement companies were profiteering. The only investigation of the question of which we know was made by a committee of the Duluth Engineers' Club. The committee found (see *Engineering News-Record* of Apr. 10, 1919, p. 744) that the "increased price of cement has not been proportionately greater than the average increase on other building materials."

Now that suit is to be brought, however, the "man in the street" will regard the Government's complaint in itself as sufficient evidence that there is a conspiracy on the part of cement companies and that there is profiteering. Users of cement, however, should naturally be better posted than laymen and, unless they have evidence supporting the Attorney General's complaint, should at least await the presentation of evidence before joining in the expected general condemnation of the cement companies.

On the complaint of conspiracy *Engineering News-Record* has no evidence, but on the question of prices there are certain facts open to all that the fair-minded man should bear in mind when reading the Government's complaint. We enumerate some of these, without comment:

1. When cement sold as low as 65c. a barrel at the mill, a fact much stressed by the Attorney General, it was common information that manufacturers were losing money.

2. Cement is a thoroughly standardized product and, accordingly, its price, like that of bread or milk or pig iron, tends through the natural processes of competition to be uniform with all sellers in any one locality.

3. If this law of competition were not operative, the prices quoted by different manufacturers should certainly have been different at the time when there was cut-throat competition, whereas everybody knows that quotations were the same even when the mills were losing money.

4. The price at the mills today is the same as the last price which the Government fixed for the purchase of cement for its own use during the war.

5. Despite the increase in wages and cost of supplies since the armistice, the price of cement has gone down (see *Engineering News-Record's* monthly quotations) and is now on the base of the final figure set by the Government for its own purchases.

6. The Government in fixing cement prices had full access to the cost sheets of the cement companies, and fixed the price so as to allow the manufacturers a 10% profit on their investment. Later investigations by the Government showed that because of increasing costs the actual profit to the cement companies under the Government-fixed price was 7 per cent.

As against these facts, it is also patent that, the price paid by the public during the war being 30c. a barrel above the Government price, the manufacturers made a larger profit on their sales to the public than they did to the Government. Whether this constituted profiteering depends upon a variety of considerations that will undoubtedly come into the open during the course of the suit. Such things are involved as the difference in margins between low-cost and high-cost producers; the return on the investment which is proper in a business such as that of the cement companies, subject as it is to large fluctuation, etc.

The facts detailed above do not, of course, constitute proof that there is no collusion, and the purpose in summarizing the situation is to refresh the memories of those who use cement. Their minds should be clear as to the public facts when they read the Government's complaint. If there be guilt, the people will not hesitate to approve of the punishment and will be the gainers by the Government's action. If the companies are innocent they should welcome the investigation and should be the gainers from the greater confidence in which, as a result of the suit, they will be held by the cement user.

Construction Details of the Lindsay-Strathmore Irrigation District, California

Well-Sinking Operations and Tests—Casings Perforated in Place—Well Collection and Pumping Systems—Cement-Lined Canals—Wood and Asphaltum-Impregnated Felt-Covered Steel Pipe Lines

By E. Court Eaton
Superintendent of the Lindsay-Strathmore Irrigation District, Lindsay, Calif.

THE Lindsay-Strathmore Irrigation District, in the San Joaquin Valley, California, pumps its entire supply from wells, distributes it to consumers through closed conduits and sells the water by meter. The following notes cover some of the more interesting details of well, canal and pipe construction, outlining difficulties met and overcome. They supplement an article on the flume construction published in *Engineering News-Record* of Sept. 6, 1917, p. 449.

The district was organized Oct. 25, 1915. It takes in an area of 15,575 acres, devoted principally to citrous fruits, although olives and grain are also grown. The original bond issue was for $1,400,000 or about $90 per acre. The value of the land and improvements is high and prices of $1000 and $1500 per acre for citrus-bearing orchards are not uncommon. In the year 1915, when the district was formed, approximately 8000 acres of the total had been under cultivation for some years, the water coming from wells sunk on each holding by the growers. As time went on and more land came under cultivation the water plane dropped at an average of about 10 ft. per year and water was increasingly hard to get and more and more expensive to pump. In 1915 the average depth of each well was about 250 feet.

The system finally adopted by the district covered the purchase of an area of 1200 acres of water-bearing land in the delta of the St. Johns and Kaweah Rivers, about 12 miles north of the district. Thirty-seven wells were to be developed in this area and the water was to be carried through three miles of main pipe line and discharged into an open ditch six miles long. At the lower end of this ditch the water was to be given a 160-ft. lift into a concrete flume, also six miles in length, from which pipe lines were to be run to supply a network of steel pipes covering the area of the district. For a portion of the southeastern part of the district, comprising about 2500 acres, at a higher elevation than the balance, a small pumping plant was to be put in, which gave the water a second 160-ft. lift for this section only.

The contract for the system as a whole was let in August, 1916, the contractor in turn letting out certain portions to subcontractors. The work was started in October, 1916, and completed in June, 1918, although the greater portion was completed and in use during the irrigation season which commenced in April, 1918.

Wells—The plan called for the drilling of 37 wells. It was estimated that these wells would give 2 sec.-ft. each or 100 miners' inches, with a drawdown of 35 ft. below the ground surface; each well to be approximately 100 ft. deep. This was based on the results obtained from two wells drilled in 1915. The test wells were each 16 in. in diameter, with perforated casing, and, after suitable development, gave over 125 miners' inches, with a depth to water of 35 ft., the normal depth of water then being 6 ft. below the ground surface.

A somewhat different type of construction was employed in the wells drilled under contract, which called for 18-in. plain casing perforated after completion.

Although these wells are shallow, considerable difficulty was experienced in drilling them, as the material below 40 ft. in depth is a coarse sand, mixed with 3-in. gravel and a large number of 6- to 8-in. boulders. The contractor's price for the work was low, and by the time it reached the subcontractor little was left to cover the difficulties nearly always present in well drilling.

Three well rigs were employed. Although double No. 12 casing with heavy shoes was used, by the time a depth of 90 ft. had been reached the heavy boulders had so distorted the shoe and casing that drilling beyond 100 ft. was difficult. However, sufficient water-bearing strata had been passed to give the required overflow.

After a number of wells had been completed and perforated, testing was started, and it became apparent at once that the results obtained from the original two wells were not equalled, except in a few cases, and that the average results were not up to those required, either in quantity of water or drawdown, although the material was substantially the same in all cases. It was evident that the wells had not been perforated as required. The perforator employed was a Mills, originally made for 16-in. casing and adapted to 18 in. by vertical metal strips in such a manner that sufficient support was not given to the casing to prevent distortion. It was found that in most cases the casing had been merely dented. Semicircular collars were put on the perforator to support the casing, and by the use of a longer knife, twice sharpened in perforating each well, better results were obtained, although even with this improvement the results have shown that the casings had not been sufficiently cut. Care had to be exercised not to perforate closer than 10 ft. to the top stratum (about 40 ft. below the ground surface), which is of quicksand, to prevent filling in the well with this class of material.

The wells that had been perforated were recut with the remodeled perforator, and results much better were obtained. It was also demonstrated that a prolonged development of each well was required—in some cases as much as two weeks of continuous pumping and surging before a well would give the required results. In no case did a well collapse due to overperforation but in a number of instances the perforator would strike the junction between a round and a longitudinal joint and the corner of the casing would bend, making it a difficult matter to remove the knife. A tapered end



COLLARS USED TO PREVENT DISTORTION OF CASINGS DURING PERFORATION

put on each end of the perforator, to act as a swedge, eliminated this trouble.

The difficulties encountered in drilling, perforating and testing consumed so much time that it was decided that since a sufficient supply could be obtained for the first irrigation season, the district would later put the wells in the required condition. Matters were further complicated by the fact that the subcontractors were daily losing money on this portion of the work. The number of wells drilled by the contractor was 35, of which six were rejected, due to distorted casing. Taken as a whole, better results would have been obtained if perforated casing had been used instead of the plain casing, although the difficulties encountered in drilling and developing would have been greater. The district has purchased a well rig and now has the completion and improvement of this well system under way, as will be described later.

The average results of tests of 29 of the wells as left by the contractor were as follows:

Depth of each well below ground surface, ft	102
Lineal feet perforated per well, ft	49
Total area of cuts per well, sq in	1,896
Percent opening of solid casing	6.1
Drawdown per well on test, ft	44.5
Discharge per well on test, sec.-ft	1.66
Drawdown, sec.-ft. per ft	0.0374

The maximum value of second-feet discharge per foot drawdown was 0.12 and the minimum 0.013. From this it appears that the specific capacity is too low, due to incomplete perforating caused by the perforator not going through, and also that sufficient development has not been practiced on each well. A small amount of clay is present, in certain strata, which tends to clog up the perforations, and until this is removed by blowing and surging the best results are not obtained.

Well Pumping Plants—Each well, as completed, has a concrete foundation supporting a vertical deep-well pump with a rated capacity of 1000 gal. per minute at 100-ft. head. The length of the pump below the top of the foundation is 25 ft., with 20 ft. of suction below each pump. A vertical 40-hp. 2200-volt motor is direct-connected to each pump. Two different makes of pump were equally employed. Careful shop tests on these pumps showed very little difference in efficiency, and the guarantees were met or exceeded. The guaranteed efficiency at rated head and discharge was 68%. A speed of 1170 r.p.m. is attained.

Each installation is provided with an individual motor controlled in the pump house, with an ammeter mounted above. Wiring is brought in through conduits running to a line pole outside the building, with a pole-top switch on this pole to cut off power from the building in case of repairs. All wiring is lead-covered cable in conduit. Each pump installation is housed in a wood building 10 ft. square with a tower to facilitate pulling the pumps.

Power is supplied from an outdoor substation at 2200 volts, by the power company, and distributed at the same voltage to each well by transmission lines built by the district. Overload and no voltage protection is provided in each station by relays.

Each pump is provided with a gate valve, a check valve, a pressure gage and an air gage, by means of which — by introducing air pressure — the depth to water can be measured conveniently and accurately. These pumps work directly through a wood-pipe system to a canal 3¼ miles distant.

Well Collector System—Each well discharges directly into a network of 14- to 44- in. wood pipe, and these pipes discharge into two 48-in. wood pipe laid side by side which empty into the low-level canal, the intake to which is approximately 58 ft. above the average ground surface at the wells.

All wood pipe of 14- to 24-in. diameter is machine-banded, and above this continuous stave redwood pipe is used. Heads vary from 20 to 80 ft. The pipe has 2 ft. of cover except where crossings are made on bridges over rivers and canals.

Laying pipe lines underground in an area where the normal water plane stood only 4 to 5 ft. below the surface, at a season of the year when sudden floods were liable to inundate the whole area, was not easy, and two floods were experienced with resulting flotation of large sections of pipe. Time was an important element, and the difficulties in relaying this pipe with the higher water plane consequent on the floods seemed almost insurmountable. Some pipe had to be laid with water in the trench. The second flood followed suddenly after the damage done by the first flood had been almost repaired.

The location of the work in a water basin such as this made labor hard to get and harder to keep. An undesirable element of labor—known as the I. W. W.—crept in, which, after delaying the work as much as was in its power, called a general strike by intimidation and placarded the district with sabotage posters and various painted signs. This strike extended to the whole work at a critical time, when more than 400 men were employed, and it was necessary to have an armed guard with each gang to induce the better class to return to work. The elimination of the undesirables was finally achieved, but even after this was done, and the pipe lines were completed, the results of their work remained, as was evidenced when water was turned into the line under pressure. Numerous leaks due to insufficient cinching showed up in a number of places. They were being repaired, but leaks broke out in other spots. Finally, the subcontractor dug out the whole 10½ miles of continuous stave pipe, recinched it and buried it again. In a number of locations, bands had been left barely tightened up. The difficulties attendant on doing this in a wet season, through a section of the country not only not in the irrigation district but hostile to it, can better be imagined than described. A great deal of credit is due to the pipe company for the sportsmanlike manner in which it attacked the work after the repeated setbacks experienced. The result of this has been a pipe line which, beyond a few minor leaks at junctions with steel fittings, has given no trouble.

A relief tower is installed on the junction of the well pipe system with the 48-in. mains, to relieve the pipe of surges due to power shutdowns.

Low-Level Canal—Six miles of an old earth ditch skirting the foothills north of the district was purchased and enlarged to give a bottom width of 6.33 ft., a depth of 3½ ft. and 1 : 1 side slopes, lined. The material in which the canal was located was adobe with a good deal of loose rock, and the enlargement required an excavation of 104 cu.yd. per 100 ft. About three miles of this was excavated with teams and slips, which gave much the better appearance. The remaining three miles was excavated with a steam shovel operated from mats laid across the ditch. With the relatively small amount of excavation to be made, numerous pockets from 1 to 1½ ft. below grade resulted and necessitated

expensive work in replacing earth and trimming. Thorough wetting and tamping were insisted upon.

The lining was 1 in. thick, shot on with cement guns, using a 1 : 4½ mixture of cement and sand, with 10% by volume of cement in lime added. It is reinforced with No. 18 poultry wire. The lining contained 18.23 sq.ft. per lineal foot. An average day's run was 175 ft. per ten hours.

The actual quantities of materials used during May,



TRANSITION FROM 48-INCH WOOD PIPE LINES TO LOW-LEVEL CEMENT-LINED CANAL

1917, which was a fairly representative month, were:

Lineal feet lined	5,500
Square feet lined	100,265
Cement used, sacks	3,386
Lime used, sacks	150
Fuel oil used in compressor, gal	763
Lubricating oil used in compressor, gal.	31
Payroll for month	
Foreman	$191 21
Engineer	88 33
Nozzleman	88 33
Helper	70 65
Gun operator	88 33
Laborers mixing	351 65
Cost of Materials	
Cement, per barrel	$2 75
Reinforcing wire, per 100 square feet	72

At the end of each day's run, a wood dam was placed in the canal and water immediately admitted to the completed section, so that within 48 hours after construction the canal was filled two or more feet.

The greater part of the work was done during the hottest time of the year, with temperatures ranging from 100 to 115° F. During the daytime exposed sections of lining were sprinkled with water.

The canal terminates at the lower end in a reservoir with a capacity of ¼ acre-ft., located at the main pumping station. Provision for overflow is made by means of a siphon spillway discharging through 2300 ft. of 30-in. concrete pipe into a waste reservoir, from which it seeps into the ground.

Main Pump Station—This station has a capacity of 85 sec.ft. It takes water from the lower end of the low-level canal, and gives it a 160-ft. lift into the intake to the high-level flume.

High-Level Flume—This is six miles long and carries the total flow for the district, distributing it through outlets into the pipe distributing system. The flume is laid on a bench cut from the hillside, the excavation for which averaged 90 yd. per 100 lin.ft. The excavation was completed six months in advance of the flume construction, thus allowing fills to settle thoroughly. The flume is 5.75 ft. wide at the bottom, 4 ft. deep, laid on a grade of 5 ft. per mile. It is of reinforced gunite construction with 2-in. sidewalls, the whole surmounted by a 4 x 6-in. rectangular beam, the beams on each side being tied together with ¾-in. bars. The forms consisted of 1-in. tongued-and-grooved flooring, kept thoroughly oiled, braced with 2 x 2-in. bracing. A set of 700 ft. of forms, with slight repairs, lasted the whole job. The side walls were shot on in two layers, the first being 1½ in. thick, up to the reinforcement. After about 15 min. the final ½ in. was applied. The reinforcement was held the required distance from the inside face with spacing bars. These bars were removed, as sufficient concrete had been shot on to insure the mesh having its proper position in the structure.



THE 48-INCH WOOD PIPE LINES AFTER FLOODING

An attempt was made to gunite the 4 x 6-in. beam on the top without forms, but it was found that unless this were done in several layers with sufficient time interval to allow partial settling, the mass was so heavy that it sagged forward and broke away. Small forms were placed above the side walls immediately after they had been completed, and the rebound from guniting, which had been caught on canvas, was used in pouring these beams. Ten per cent of cement was added to this material before placing.

For the most part, the flume was constructed during hot weather, with temperatures from 100 to 125° Fahrenheit.

Immediately after the construction of a section of side wall, burlap was hung from the beam over the sides and the walls were then kept thoroughly wetted for 24 hours. After this period, the flume was kept filled with water. The mix was 1 part cement to 4½ of sand, with lime in the proportion of 10 per cent. of the cement added.

The average rate of progress was 140 lin.-ft. per day, with a construction crew as follows:



DAM FILLED EACH RUN OF CEMENT LINING

1 foreman	$5 00
1 nozzleman	5 00
1 nozzleman's assistant	3 00
1 compressor operator	5 00
1 laborer shoveling sand	2 75
1 laborer screening	2 75
4 laborers mixing and turning over at $2 75	11 00
10 laborers finishing grade and wrecking forms at $2 75	27 50
3 carpenters setting forms at $4 00	12 00
4 men placing steel at $2 75	11 00
Total per day	$85 00

For the first two days after the flume was filled with water some "sweating" was noticeable but in the course of a few days this entirely disappeared.

Eleven outlets along the flume at different points feed the network of distributing pipes, and at the lower end of the flume a small forebay is constructed from which two main pipes lead—one a 30-in. steel main to supply the larger portion of the district through branch lines, and the other a 30-in. main to the El Mirador section. Venturi meters are provided in each of these lines to measure the discharge. The forebay has a siphon spillway discharging through 2400 ft. of 30-in. concrete pipe, into a creek bed.

Distribution System—The distributing system from which the grower obtains his supply consists of about 100 miles of slip joint, riveted steel pipe. The joints are 4 to 5 in. long, depending on the size of pipe. The



FOREBAY AT MAIN PUMPING STATION

steel employed was No. 16-gage for pipes from 4 to 16 in. in diameter; 14-gage for 18 to 26 in.; 12-gage for 28 to 30-in., and 10-gage for 34- and 36-in. pipes. The static heads run up to 75 feet.

To resist the action of the strong alkali soil in which the pipes are buried, they are covered with asphaltum-impregnated felt. The pipes are first given an initial dip and then redipped immediately before wrapping. Hot dip is also fed onto the covering as this is wrapped on under tension by machine. The wrapping is wound spirally on the pipe and lapped.

As the life of the pipe is largely dependent on the covering, particular attention was given to it. High-grade felt was impregnated with an asphalt mixed with certain gums to raise the penetration to 80. The finished product had a weight of 40 lb. per square, divided as follows: Felt, 10 lb.; saturated solution, 12; coating front, 12; coating back, 6. Rags averaging 10½ lb. per square went into the manufacture of this covering. The outside of the covering received a coat of flaked mica to prevent the adobe earth from adhering to the pipe and stripping the covering.

The dip was inspected and tested with care. Specifications called for this to have a penetration of not less than 0.15 cm. in 5 sec., using a No. 2 needle and 100-grain weight, or 77° by the method of the American Society for Testing Materials; melting point to be not less than 165° by the "hook-and-cube" method.

Pipes were laid by heating the butt ends and driving while hot, the joint being covered in the field with hot dip and felt covering; all pipes were buried with a



METHOD OF INSTALLING VALVES AND FITTINGS

2-ft. minimum cover over them. Trenching was done by machine, and pipes were carefully tamped and backfilled by hand. The pipes were all tied together as a network, and 155 valves were used for sectioning purposes. Valves were all "ventured"; a valve 2 in. smaller than the line was installed by means of two steel reducers.

A 30-in. main runs from the end of the flume, a distance of 4½ miles, discharging into a balancing reservoir. At a distance of ½ mile from this reservoir, suction pipes are brought from this main to the boosting station that supplies the El Mirador District of 2500 acres. This station contains three pumps aggregating 9½ sec.-ft. capacity. The pumps discharge into a small canal, known as high-level canal No. 2, five miles in length, which feeds the El Mirador pipe lines.

The balancing reservoir thus floats on the line and takes up fluctuations in flow, storing up at one time and being drawn upon at another. It has a capacity of 18 acre-ft. The canal has a 2-ft. bottom, is 1½ ft. deep, laid on a grade of 5 ft. per mile, and is gunite-lined like the low-level canal. The construction of this canal did not present any particular difficulties, except that the work had of necessity to be done during the winter months with the attendant troubles due to long hauls over adobe roads and delays occasioned by wet weather. The principal difficulty experienced was due to clogging by the damp air of compressor hose when guniting. In one case where a section had to be completed under adverse weather conditions it was necessary to keep fires burning around the air pipe to dry out the air.

Air Valves and Blowoffs—Air valves of the "air-and-vacuum" type were installed at principal elevations and dead ends. About 200 of these were put in. For the most part ½-in. valves were used, but a number of 1- and 2-in. were placed on the larger pipes. At low points 4-in. blowoffs were placed to drain the pipe lines.

A second article will deal with operation during the first or 1918 irrigation season, giving also some further notes on construction, and describing the meter system, which includes both master and consumers' meters.—EDITOR.

Classification of State, County and Municipal Salaries

Engineering Council Committee Formulates Scheme as Basis for Inquiry Into Needed Changes in Compensation of Engineers

AS A part of its investigation, the state and municipal section of Engineering Council's committee on classification and compensation of engineers is sending out a questionnaire to 161 state and city engineers, as noted in our issue of Aug. 14, 1919, p. 340.

Included in the questionnaire is a classification of engineering positions, reproduced herewith. This classification follows a general plan adopted by the full committee in order to facilitate comparisons among all branches of engineering service; it has been worked out in detail for state, county and municipal service in coöperation by the section committee and a special committee of the Municipal Engineers of the City of New York.

The latter committee included W. W. Brush, deputy chief engineer of the Department of Water-Supply, and five other engineers in various city or borough departments. The section committee of Engineering Council consists of Arthur S. Tuttle, deputy chief engineer of the Board of Estimate and Apportionment, New York City; F. W. Cappelen, city engineer of Minneapolis; and M. M. O'Shaughnessy, city engineer of San Francisco.

Classification of Engineering Positions in State, County and Municipal Service

Title	General Description of Position	Duties	Qualification
Consulting Engineer	On special duty of responsible character requiring special qualifications and initiative.	Giving expert advice on engineering work of the most important character, involving critical examination and report on questions of cost, design, specifications, construction, maintenance, operation or engineering policy.	Such training in civil, mechanical, electrical, sanitary, or other engineering branches as is evidenced by a professional degree granted on the completion of a standard course of instruction in an engineering school of recognized standing, with experience of not less than four years in the duties of Engineer and broad experience in the branch of engineering involved in the work concerned. If a professional degree has not been granted by an engineering school of recognized standing, an engineering experience of not less than fifteen years may be considered to qualify for this position, provided that the record of work performed gives substantial evidence of an engineering knowledge and ability of the highest order.
Chief Engineer, State Engineer, City Engineer, Deputy Chief Engineer, Deputy State Engineer, Deputy City Engineer.	Chief administrative officer having full charge of organization including determination of policy.	Assuming entire responsibility as the engineering executive for reports, estimates of cost, design, specifications, construction, maintenance or operation of engineering works or projects either that are to be constructed or are to be operated.	Such training in civil, mechanical electrical, sanitary, or other engineering branches as is evidenced by a professional degree granted on the completion of a standard course of instruction in an engineering school of recognized standing, with experience of not less than four years in the duties of Engineer and broad experience in the branch of engineering involved in the work concerned. If a professional degree has not been granted by an engineering school of recognized standing, an engineering experience of not less than fifteen years may be considered to qualify for this position, provided that the record of work performed gives substantial evidence of an engineering knowledge and ability of the highest order.
Engineer	Chief of major subdivision in responsible charge of large unit.	Supervising work requiring executive ability. Furnishing expert or critical engineering advice of a high order for executive action.	Such training in civil, mechanical, electrical, sanitary, or other engineering branches as is evidenced by a professional degree granted on the completion of a standard course of instruction in an engineering school of recognized standing, with experience of not less than three years in the duties of Senior Assistant Engineer. There may be substituted for a professional degree such training in engineering as would qualify the incumbent to properly perform the duties of this position.
Senior Assistant Engineer	Chief of intermediate subdivision in responsible charge.	Exercising independent engineering judgment and assuming responsibility in studies and computations necessary to preparation of plans, designs, reports, etc. Supervising work of small units in engineering organization	Such training in civil, mechanical, electrical, sanitary, or other engineering branches as is evidenced by a professional degree granted on the completion of a standard course of instruction in an engineering school of recognized standing, with experience of not less than two years in the duties of Assistant Engineer. There may be substituted for a professional degree such training in engineering as would qualify the incumbent to properly perform the duties of this position.
Assistant Engineer	Chief of minor subdivision	Taking charge of designs, surveys, or construction work involving considerable responsibility on small engineering projects or minor work on large projects.	Such training in civil, mechanical, electrical, sanitary, or other engineering branches as is evidenced by a professional degree granted on the completion of a standard course of instruction in an engineering school of recognized standing, with experience of not less than one year in the duties of Junior Assistant Engineer. There may be substituted for a professional degree such training in engineering as would qualify the incumbent to properly perform the duties of this position.
Junior Assistant Engineer	On general duty under direction but requiring special education and training and the use of initiative and originality.	Using surveying, measuring and drafting instruments, engineering tables and diagrams. Computing and compiling data for designs, reports and records. Inspecting or investigating minor details of engineering work and materials. Keeping notes of field work.	Such training in civil, mechanical, electrical, sanitary, or other engineering branches as is evidenced by a professional degree granted on the completion of a standard course of instruction in an engineering school of recognized standing, but not necessarily any experience in the practice of engineering, other than that which is incident to the attaining of such qualifications. There may be substituted for a professional degree such training in engineering as would qualify the incumbent to properly perform the duties of this position and would be a suitable foundation for the advancement of the incumbent to higher positions in the professional engineering service with further training in engineering.
Senior Draftsman	On general duty under direction but requiring special education and training and the use of initiative and originality.	Directing work of a drafting squad. Supervising preparation of maps, plans, etc.	
Draftsman	On subordinate duty requiring special education or training but not requiring special originality.	Preparing general working drawings where design is furnished. Plotting of notes and preparation of maps. Design of simple structures. Making computations and compiling data for reports, records, etc. Checking plans, surveys, etc.	
Junion Draftsman	On subordinate duty not requiring special education, training or originality.	Tracing and lettering maps and plans. Making simple drawings from sketches and data. Making minor calculations.	
Chief Instrumentman	On general duty under direction but requiring special education and the use of initiative and originality.	Directing work of field party on surveys or construction. Keeping notes, record of work, etc. Supervising construction or repair work. Directing and leading in the work of computing surveys, estimates, etc.	
Instrumentman	On subordinate duty requiring special education or training but not requiring special originality.	Running surveying instruments and adjusting and caring for same. Computing surveys, estimates, etc. Inspecting incidentally construction or repair work.	
Rodman	On subordinate duty not requiring special education, training or originality.	Running tape or levelling rod. Performing other miscellaneous subordinate duties in survey party in field or office, as directed.	

ENGINEERING COUNCIL'S CLASSIFICATION OF SALARIES AND POSITIONS FOR GOVERNMENT ENGINEERS

Network of High-Tension Transmission Lines for Spain

CONSTRUCTION of a national network of high-tension transmission lines, linking all the industrial centers of Spain with the larger waterfalls and coal mines, has been proposed to overcome the drought and the coal shortage which now hinder economical development of power.

According to George F. Paul, in an article in *Electrical World*, a special commission has been formed to study the problem, and has already listed 2,000,000 available horsepower from waterfalls capable of producing more than 2000 hp., each. The plan is to link all the available sources with the system and allow all those who desire to feed into the lines to do so, thus making the national system the general distributing agency.

Those utilizing the service will be required to furnish power at 50 cycles and probably 120,000 volts. In places where drought will affect the hydro-electric plants, it is planned to supplement them with power produced by low-grade coal which it is not economical to mine for general commercial purposes. The law will require the system to utilize for the most part electric power that is of hydraulic origin.

For financing the proposed system, the commission recommends that the enterprises which utilize it shall pay an annual fee representing the cost to the state in interest for obtaining the necessary capital, plus the cost of the care and maintenance of the system.

The state will fix the rates that are to be charged to the consumer for the service rendered.

High Cost of Maintenance of Light Macadam Highways

Large Sums Expended Annually Merely Keep Up Improved Roads—Narrow Roads More Expensive Than Wide

By Frederick Stuart Greene
New York State Commissioner of Highways

In answer to an inquiry resulting from the published statement that only concrete pavement would be built hereafter in New York State, Commissioner Greene has submitted the following communication.—Editor.

REGARDING recent articles that appeared in the daily press relative to high maintenance costs of water-bound and the lighter types of bituminous macadam roads, I desire to answer somewhat at length. The country is beginning a new era in highway construction, and I feel that anything that can be said to bring before engineers the danger of designing and constructing highways that will not stand up under modern traffic conditions should be said with emphasis and said now.

Upon taking office as Commissioner of Highways, I was astonished to find how large a sum the state is expends yearly merely to keep its improved roads in repair. When I was informed that the department had $5,500,000 to spend during 1919 upon the maintenance of 7400 miles of completed construction it seemed to me a large sum, but when I was told by our nine division engineers that this appropriation, which allows $743 per mile for both old and new roads, gave none of them enough money to put all of their roads in first-class condition, I could hardly credit their statements. This led me to investigate, and the deeper I went into the history and records of our highways the more astonished I became. If, before I had seen these records for myself, anyone had told me what the maintenance charges totalled in a few years on some of our roads, I would not have believed the figures. That the departmental records are correct, however, no one familiar with the system of accounts as conducted by our auditor, Sephrine D. Gilbert, can doubt. Mr. Gilbert has served the department as auditor for nine years, and has witnessed the coming and going of six different administrations.

Examples of Higher Maintenance on Roads

Here are some examples, taken from many roads upon which the maintenance charges have caused me serious thought:

Road No. 176 is a 2.31 mile stretch on the highway between Albany and Schenectady. It was built in 1906 of water-bound macadam, and cost $22,978.44. By Jan. 1, 1919, it had been in use for 13 years, and to maintain it and rebuild it during this period the state was forced to expend $95,721.38, making this road cost the state a total of $118,699.82.

Road No. 743, Babylon-Bay Shore, on Long Island, is 4.08 miles in length. It was built of macadam in 1908 at a cost of $44,600. The maintenance charges for 10 years amounted to $68,338.49. Here is a road which was a cheap one to build originally, but which in 10 years has cost the state a total of $112,938.49.

Road No. 589, Nevis-Blue Stores, in Columbia County, was built as a macadam highway, 3.77 miles long. It was completed in 1908 at a cost of $28,200. In 10 years the maintenance and reconstruction had amounted to $73,386.76, giving a total cost to the state of $101,586.76.

These three roads are on through routes and consequently carry heavy traffic, but our records show that there are many roads not on through routes upon which it is necessary to pay an excessive cost for maintenance. In many instances these are narrow roads, 14 ft. and even 12 ft. in width, where the wheels of traffic are constantly running in the same ruts, and the maintenance on such roads would indicate that here again is a false economy—that though the first cost of narrow pavements might seem a saving to the state, they are in reality a liability. For example, we will take road No. 438. This is a north and south connection running from the highway between Utica and Syracuse northerly to within a few miles of the city of Rome in Oneida County. It is clearly a secondary road, and traffic upon it is not heavy. This highway was accepted Oct. 1, 1908. It is 7.1 miles in length, and for the greater portion is but 14 ft. in width. It cost originally $83,000. To Jan. 1, 1919, the state had paid out for maintenance and reconstruction on this road a total of $88,910.57, which is at the rate of $1,252 per mile

In the western part of the state, Highway No. 853, another secondary road, running north from Batavia in Genesee County, a distance of 4.07 miles, was originally a water-bound macadam, completed in January, 1911. Here is one of our narrow 12-ft. pavements that cost the state the comparatively small sum of $16,700.86 to build, but which at the end of but eight years' service had cost to maintain $26,050.54, or $800 per mile per year. This highway does not connect two towns, it is merely a spur road running through a farming country, to end a mile south of the hamlet of Elba, and is so narrow that in England or France it would be called a lane.

Highway No. 586, beginning just west of Batavia, is on a through route. Built with a 16-ft. pavement of water-bound macadam, this road is 5.58 miles long, was accepted in the autumn of 1908, and cost $46,815. From Jan. 1, 1909, until Jan. 1, 1919, ten years, its maintenance charges totalled $71,607.24, or at the rate of $1280 per mile per year.

Highway No. 5145 is on the same route to the east of Batavia. This is a new bituminous-macadam road, accepted in December, 1912; it was built with a 6-in. sub-base, finished with a limestone surface and asphaltic binder. It is 4.44 miles in length, 16-ft. pavement, and cost $44,332.95. In its first six years of service it has cost the state $11,633.46 to maintain. This is one of our good macadam roads, constructed as well as we know how to build by the penetration method, but it has cost $437 per mile per year to maintain.

Cheaply Built But Expensive Roads

With the exception of highway 5145, these are examples of some of our cheaply built but expensive highways. There are many more that could be cited to show the false economy of building roads which have the one virtue, if it can be called a virtue, of low first cost. Below is submitted a list of roads which will give a better average of the cost and maintenance charges of cheaply built roads. These roads are taken from 18 different countries in the state; all of these roads were accepted in 1912, and the charges per year.

are taken only to Jan. 1, 1919. For our purpose of study, therefore, they have been in service 6½ years, and a road of this age can hardly be called old.

I have not been Commissioner of Highways long enough and I have been so busy since taking office, that I have not had sufficient time to make a thorough search into this matter of maintenance of the different types of pavements. But I have discovered enough to convince me that the life of a water-bound or a light bituminous-macadam pavement averages about seven years and can not be reckoned beyond 10 years. Our roads are built for the most part from 50-year bonds, and it does not require a financial genius to see that if we continue to construct and reconstruct roads five times before they are paid for once such a policy will inevitably lead to financial embarrassment.

COST AND MAINTENANCE OF MACADAM ROADS IN NEW YORK STATE

County	Road No.	Miles	Construction Cost	Maintenance Cost
Genesee	5090	4 47	$54,395.45	$75,081.76
Montgomery	5126	2 24	31,125.53	58,680.07
Jefferson	625	5.37	65,200.70	36,892.55
Livingston	5142	4.05	45,105.16	32,357.10
Onondaga	755	7 77	95,867.77	49,402.04
Ontario	5081	5.26	76,282.93	51,961.49
Otsego	708	4 60	54,457,48	23,440.42
Rensselaer	5107	.40	8,660.09	4,437.09
Rensselaer	680	3.92	39,211.46	21,910.29
Suffolk	5008	3.55	53,551.56	29,142.66
Suffolk	5111, 5112	10 01	100,924.06	74,888.14
Tompkins	5043	2.53	34,339.72	28,158.29
Wyoming	892	1.43	16,006.95	8,623.73
Dutchess	5092	4.15	51,792.70	41,772.67
Fulton	5096	.64	9,779.84	5,603.59
Herkimer	263	5.52	69,283.36	39,611.56
Nassau	5106	2.46	29,511.25	23,876.91
Oneida	839	1.21	13,861 57	9,764.43
Steuben	904	1.64	16,952.59	9,219.31
Steuben	907	4.13	52,156 0o	30,471.08
Steuben	5130	1 16	10,891.44	9,887.63
Wayne	919	3 87	26,515.09	37,062.18
		80 48	$955,872.76	$702,244.99

Condition Results From Unforeseen Conditions

I do not criticise my predecessors for their action in building these types. When New York first began its program of road improvement the water-bound road was the generally accepted type outside of city limits. Then when the automobile arrived and its tires began tearing away the road surface the department tried other types. But, do what they could, it seemed impossible to keep pace with the ever-increasing wear and the heavy and more destructive traffic that our roads were forced to carry.

The advent of the motor truck and its rapid growth have revolutionized traffic conditions. No one could have foreseen its remarkable growth. So I repeat that the building of these types of roads in the past was not an unpardonable error. But I do hold that a commissioner who has witnessed this growth of motor trucks, and has not sufficient vision to know that he must build permanent roads, even though their first cost is high, is not the right man for the place. Rapid as has been the development in motor trucks, they are still but at the threshold of their usefulness. The numbers of these vehicles will continue to grow in the future, and will grow with greater rapidity than it has in the past. The time is here when we must build for the future, and strive by every means to construct the most permanent road that engineering knowledge can devise.

Referring again to the records of this department, they show us that during the past four years our 208 miles of first-class concrete roads have cost $138 per mile per year for maintenance, and this cost is due largely to mistakes made with expansion joints, resulting in some comparatively expensive repairs, caused by sections of the pavement being destroyed by expansion. We have concrete roads, where expansion joints were placed as we now know how to place them, which cost us less than $50 per mile per year for maintenance. We have concrete roads on main traveled routes in this state that have been down five years and show so little wear that the broom marks, left as a finish to the surface, are still on that surface.

Our modern concrete roads, except for cracking, due to frost heaving, are as good today, so far as wear is concerned, as they were the day after their acceptance by the state, and we believe that we can now build *reinforced* concrete roads which will last certainly for 25 years, and all indications would point to a longer life. On the other hand, 2451 miles of water-bound macadam in this state have cost during the past four years $911 per mile per year to keep them in condition; this cost does not include reconstruction of a more permanent type, and these maintenance charges, it should be remembered, are based on lower prices for both labor and material than we have today.

Advocates of macadam roads have recently stated that in spite of their high maintenance charges they are, nevertheless, the most economical type when interest on first cost is considered. These advocates admit that they have not complete data as yet on reconstruction costs, but they say generally that the reconstruction of a concrete pavement is necessarily more costly than that of a macadam pavement. Aside from the fact that they have omitted to mention the longer life of the concrete pavement, their statement that reconstruction of a concrete road is more costly is open to question. Taking an average of our roads throughout the state, it has been found necessary to resurface the water-bound and bituminous-macadam (penetration method) roads at the end of about seven years of service. On the other hand, it is conservative to suppose that first-class concrete roads as now laid will last at least 15 years before resurfacing is necessary.

Cost of Bituminous Roads

The cheapest reconstruction that we now do on macadam roads is to lay a new two-course bituminous-macadam pavement over the old road. At present prices this costs an average of $16,700 per mile for a 16-ft. pavement. In Wayne County, Michigan, an old concrete road has been successfully resurfaced by placing a new reinforced-concrete top of 3-in. thickness. Let us suppose that we would wish to resurface with a 4-in. reinforced top, then a mile of 16-ft. pavement, requiring 1043 cubic yards of concrete for such resurfacing at $16 per cubic yard (which is not a low price) would cost $16,688. If these figures and premises are correct they show that the resurfacing of a concrete road at the end of 14 or 15 years is half the cost of the double resurfacing of a macadam road apparently necessary during the same period.

Further than this, a bituminous-macadam road requires re-oiling about once in every three years, to replace the volatile ingredients of the asphaltic binder which have evaporated. At the present time, to oil and cover the oil with small stone or screenings is costing from $475 to $500 per mile on a 16-ft. pave-

ment. We are dealing only with dollars and cents in this article, but it is not out of place to call attention here to the inconvenience of traveling a road which at the end of 15 years has had to be oiled twice and resurfaced twice, while the concrete road may have to be resurfaced once and oiled not at all.

In considering the relative total costs of a highway, including interest charges on first cost, we will deal only with the pavement, for the grading, culverts, etc. would cost the same, regardless of the type of road constructed. The following estimates are based on a pavement 16 ft. wide: For the concrete road, a section 6 in. thick at the sides and 8 in. thick in the center is taken. For both the water-bound and the bituminous-macadam pavement a 6-in. sub-base of field stone, with a 3-in. top course of broken stone, is taken.

At present prices the average cost of a water-bound pavement of this construction is approximately $17,500 per mile; a bituminous-macadam pavement, $18,900, and the concrete pavement, $25,812 per mile. This last cost is derived by multiplying 1912 cub. yd. of concrete by $13.50 per yard.

Maintenance records in the department show that to keep pavements in first-class condition, the water-bound macadam roads have cost approximately $950 per mile per year, bituminous-macadam approximately $600, and concrete roads of modern construction are costing less than $100 per mile per year.

Remembering that road history shows that the average life of a water-bound or a bituminous-macadam pavement is seven years in this state, that after seven years of present traffic conditions these types of pavements have to be reconstructed, we will, therefore, consider the total cost of the different pavements for that period:

	First Cost	4 Per Cent Interest 7 Years	Maintenance 7 Years	Total Cost
Water-bound macadam	$17,500 per mile	$4,900	$6,650	$29,050
Bituminous-macadam	18,900 per mile	5,292	4,200	28,392
Concrete	25,812 per mile	7,227	700	33,739

These figures show that by the time the two types of macadam pavements are worn out and in need of reconstruction, at a cost of approximately $16,000 per mile, the concrete pavement, which should be good for at least seven additional years, has cost only $4700 more than the cheapest type of highway that any state should now build.

From all available data, there is no doubt that at the end of 8 or 10 years of service, depending upon the amount of traffic, the concrete pavement is the most economical one that can be constructed.

These are but some of the reasons why I advocate a more permanent road than we have been building in the past, and it is my belief that, considering the new problems of traffic that we have to solve, the most practical pavement for a highway today is the one built of concrete.

Large Francis-Type Turbines

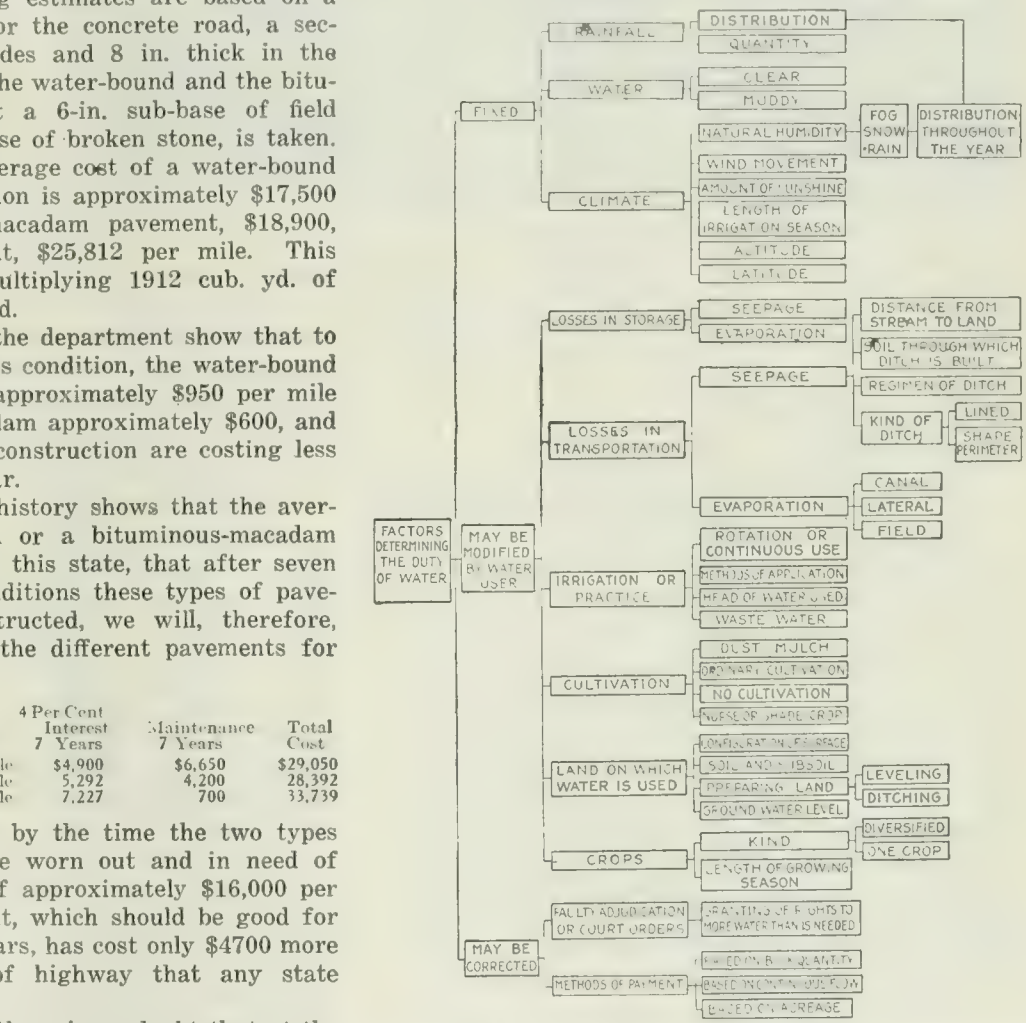
Francis-type turbines rated at 22,500 hp., and operating under a head of 800 ft., are to be installed at the Kern River No. 3 hydro-electric plant of the Southern California Edison Co. These wheels are said to be the highest-head turbines that have ever been built. The generators are of unusual design, in that they will furnish either 50-cycle or 60-cycle energy, two different systems being served.

Factors Determining the Duty of Water in Irrigation

By H. F. Robinson

Supervising Engineer, United States Indian Irrigation Service, Albuquerque, N. M.

MANY factors enter into the duty of water for irrigation. While they are well known to engineers dealing with the subject, yet their arrangement in diagrammatic form may be useful as a check list. This arrangement was first prepared by the writer for



CHECK DIAGRAM FOR DUTY OF WATER IN IRRIGATION

use in the court-room when acting as a witness in a suit for the adjudication of water where the duty of water was one of the vital points.

For the benefit of those not familiar with the subject, it may be noted that, according to Mead, "the duty of water in irrigation is the area of crop which can be matured with a given volume." As usually expressed by the depth of water used, it is the reciprocal of the above and may be stated as "the amount of water, expresssed in depth, applied during any irrigation season, necessary to produce the normal fruitage of any particular crop."

Largest Amount of Concrete Road Per Capita

According to the Portland Cement Association, Utah enjoys the distinction of having contracted since Jan. 1, 1919, the largest amount of concrete pavement per hundred thousand population contracted for by any state.

Block Yard Cheaply Improvised From Old Equipment

Low Bid and Rising Costs Met by Cutting Plant Investment—Output Maintained by Intelligent Oversight

PRECAST concrete blocks for revetting the widened Miami River at Dayton and Hamilton, Ohio, are being produced at a rate of 1200 blocks per day by a force of 20 men at a field factory now at Dayton, but which will be transferred to Hamilton later this season. This output of 60 blocks per man per day amounts to nearly 2 cu.yd. of concrete mixed and molded per man per day. By intelligent use of equipment on hand, and ingenuity in fabricating molds and special machines for the work, the contractor is realizing a profit at an exceedingly low contract price. His product is passing the rigid inspection of the engineers of the Miami Conservancy District with very few rejections.

Portions of the widened river channels at Dayton and Hamilton will have their banks paved with concrete. As shown in Fig. 1, the steep slope of the levee will be paved with a slab of reinforced concrete molded in

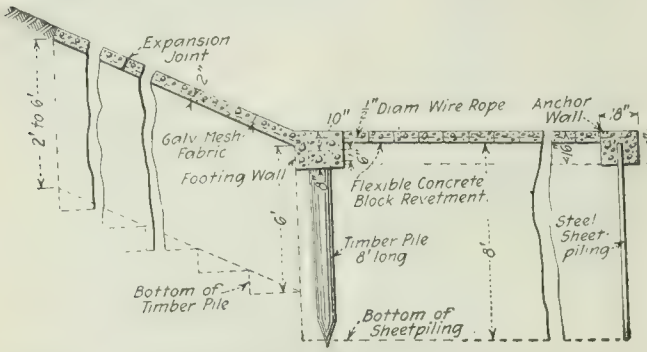


FIG. 1. LEVEE SLOPE AND FORESHORE REVETMENT FOR MIAMI RIVER FLOOD CHANNEL

place. The flatter slope from the toe of the levee out into the water will be paved with a flexible pavement of precast concrete blocks strung, like beads, on wire rope. About 400,000 blocks of the dimensions and form illustrated by Fig. 2 are required, and of these about 175,000 will be placed at Dayton and the remainder at Hamilton. A 1:2¼:4 mixture is employed, with gravel as the coarse aggregate.

The site for the block yard at Dayton is on the river bank. Here the dragline excavators which are widening the channel deposited a stock of gravel, as indicated by the diagram plan, Fig. 3. The preparation of the raw aggregate consists of crushing, washing and screening. A small derrick operating a clamshell bucket handles the gravel from the stockpile to a hopper over a jaw crusher set to 2-in. size. From the crusher the material is taken by a bucket elevator to the washer and

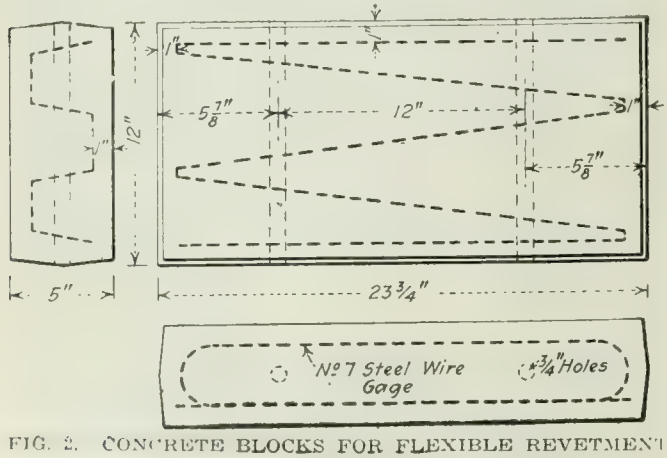


FIG. 2. CONCRETE BLOCKS FOR FLEXIBLE REVETMENT ON FORESHORE

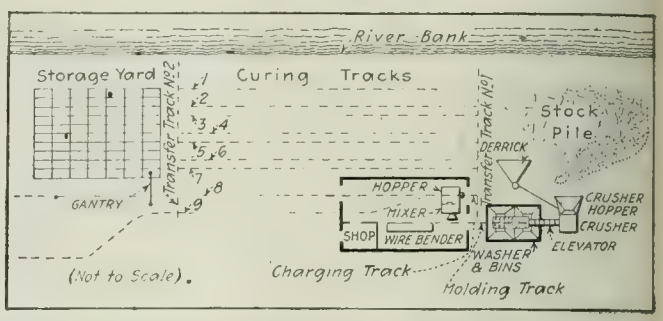


FIG. 3. LAYOUT PROVIDES FOR CLOSE SEQUENCE OF MOLDING OPERATIONS

screens, and sand and screened gravel are discharged into separate bins. Bottom gates drop the sand and pebbles into a partitioned car holding the exact amount and proportions for a batch. The car is pushed directly to the mixer and is side-dumped into the elevating charging skip. The derrick and the crushing and screening plant were assembled from equipment on hand. The mixer was also in stock.

Gang Mold on Flat-Car—From the mixer the concrete is discharged into a shallow elevated hopper with a side spout. A flat-car carrying a gang mold for 16 blocks passes under the hopper from the left, the molds are filled and the car passes out of the door to the right onto the rails of a transfer car which shifts the mold car to the curing track being filled, as shown in the layout, Fig. 3, and the view, Fig. 4. Here the blocks are spaded on the edges to flush the mortar against the forms, and are troweled smooth on top.

When the blocks are hard enough to handle, the mold car is run onto a transfer car on track No. 2 and is taken to the storage-yard track, where the blocks are removed and stacked by hand or by block and fall from the small portable gantry. When unloaded the car is again fitted up with the molds and proceeds to the mixer to repeat its service. The charging, molding and curing tracks are 24-in. gage; the transfer tracks are broad-gage and the tracks on the transfer car are, of course, 24-in. gage.

Second-hand brick-yard cars were the basis of the mold cars. These were fitted with heavy wooden platforms about 9 ft. long and 4½ ft. wide, and the tops of the platforms were covered with rust-resisting sheet metal. One hundred cars were fitted up. Each provided space for 16 molds, as indicated by the diagram, Fig. 5. Side and end boards and partition pieces 5 in. high formed the molds.

The ends and sides were single pieces of heavy board dished on the inside and sheeted with metal. The cross partitions, A-A, Fig. 5, were also single pieces dished and sheeted on both sides; they were made of 1-in. boards. The longitudinal portions, B-B, each consisted of four pieces of ⅛-in. board dished and sheeted on both sides. At each end these pieces had two tenons, b-b, which fitted into holes, a-a, in the cross partitions. When set up on the car platform, the assemblage of mold pieces was fastened rigidly by the wedges, c and

d, between the end plank and the fixed blocks, e-e. The metal setting was all No. 16-gage. The rods used to form the holes for the wire rope are placed in position, f, Fig. 6.

The car platforms and mold partitions were fitted and fabricated during the last winter by the men kept permanently on the contractor's payroll, and in the small shop shown on the plan. Only the sheeting was cut, stamped and punched at an outside metal-working shop. The car bodies cost, second-hand, about $10 each. The building of the platform and molds, including materials, cost $55 per car, making the total cost $65 for each mold car.



FIG. 4. MOLDING PLANT FABRICATES 1200 BLOCKS DAILY

Each block is reinforced by a one-piece wire frame bent as indicated by the block details, Fig. 2. To fabricate these frames from reeled wire, the apparatus shown in Fig. 6 was devised and built on the job. The reels of wire are placed on a spool set at an angle of

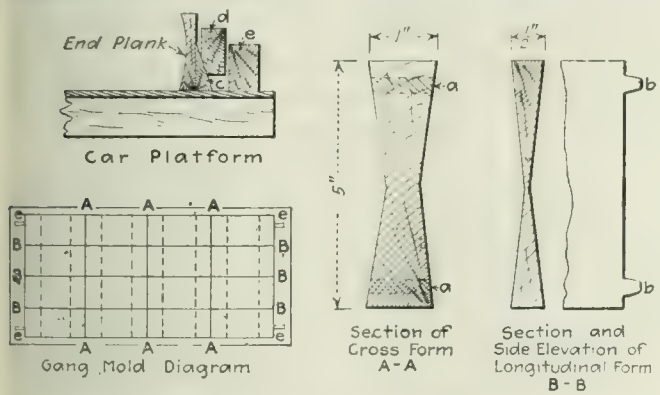


FIG. 5. DETAILS OF HOME-MADE BLOCK MOLDS

about 30° with the shop floor. This inclined position proved important; when set vertically or horizontally the spool did not unreel freely. From the spool the wire passes between the grooved wheels, A, and thence is threaded through a tube on the end of the hinged arm, B. It is then reeled single-lay on the device, C, which consists of a spur wheel from the face of which projects

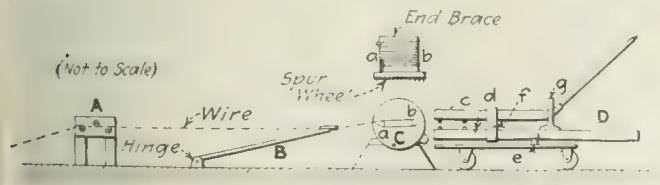


FIG. 6. IMPROVISED MACHINE FOR COILING AND FIXING REINFORCEMENT

the reel frame of two bars, a and b, braced apart at their outer ends.

As reeled on a-b the wire will uncoil partially when released, unless it is given a permanent set to keep it flat. The device, D, performs this setting operation. Two jaws, c and d, made of heavy timber are mounted on a car frame. These jaws are wide enough to embrace the full width of the flat reel on a-b. The lower jaw is hinged to the car platform at e, and the two jaws are hinged together at f. The car is pushed forward until the jaws grasp the reel of wire. The jaws are then closed with great force by means of the ratchet jack g, and the wire is set permanently into a flat reel. It is then cut at the proper points into the fractions of a reel necessary to form each a reinforcing frame for one block. These are bent to shape by hand.

When a car has been unloaded, its metal sheeting is cleaned and oiled and the forms are set up. Generally, the outside forms and the bars, f-f, for molding the holes have been removed as soon as the blocks are hard and while the mold car is on the curing tracks. By giving the bars a turn or two just as the block is taking its set they are easily pulled. The partition forms are removed when the blocks are unloaded for storage. All forms are cleaned and oiled for each set-up. The forms are set up complete with core bars in place and the reinforcing frame in position. The operation is rapid—when 1200 blocks a day are being molded 75 mold cars are prepared, poured and unloaded.

The plant was planned and constructed by the contractors, Price Bros., of Dayton, Ohio, with H. S. Price in direct charge.

Cost of Training the Students' Army Training Corps

Reporting the cost of the Students' Army Training Corps to the Committee on Education and Special Training, the business director, E. K. Hall, gives a gross cost, under original contracts and cancellation agreements, of $24,851,600. There were 686 contracts, or an average gross cost of $36,200 per contract. The total number of men for whose training the Government contracted was 228,990; but only 171,835 were actually inducted and in training on Nov. 15, 1918. Assuming the latter as in training from Oct. 1 to Dec. 21, 1918, an average of 82 days, these results are shown: Gross average cost per man trained, $144.50; gross average cost per trained man per day, $1.76. The cost of housing per man per day was $0.536; of subsistence per man per day, $0.724, and of instruction per man per day, $0.502.

The average cost for instruction under the vocational contracts was about 10% higher than the average for academic instruction.

General Staff's Army Bill Strikes at Corps of Engineers

Would Weaken Staff Departments' Control Over Their Own Operations—Line Favored in Naming of General Officers—General Staff To Be Absolute

There is now pending in Congress legislation governing the future military policy of this country. The administration bill, prepared by the Army's General Staff, grants to the latter body authority which, it is felt, will work to the disadvantage of such technical services as the Corps of Engineers. An engineer thoroughly familiar with the military establishment has submitted to this journal the following opinions on the subject.—EDITOR.

THE Secretary of War, under date of Aug. 3, 1919, transmitted to Senator Wadsworth for submission to Congress the draft of a bill drawn up by the General Staff of the Army, outlining a future military policy for the United States. The military student needs but a glance to realize that it is based on the Prussian system, though in some respects the bill outdistances the Prussian system in absolute General Staff control. When the civil world is turning to the technical man as the one preëminently fitted to solve the thousand and one pressing problems of a complex civilization growing ever more complex, this plan of the General Staff is calculated to put into a third-class position all technical organizations—if, indeed, it does not utterly destroy them—in the Army.

PROPOSED COMPOSITION OF ARMY

The first paragraph of the bill contains the following provisions:

That the United States Army shall consist of general officers of the line, a General Staff Corps, an Adjutant General's Department, a Judge Advocate General's Department, a Quartermaster Corps, a Medical Department (which shall consist of a Medical Corps, a Dental Corps, a Veterinary Corps and an Army Nurse Corps), a Corps of Engineers, an Ordnance Department, a Signal Corps, an Air Service, a Tank Corps, chaplains, band leaders, a Bureau of Insular Affairs, a Militia Bureau, detached officers, the professors and cadets of the United States Military Academy, detachments for schools and disciplinary barracks, the infantry, the cavalry, the field artillery, the coast artillery corps, an Officers' Reserve Corps, unassigned recruits, and the officers and enlisted men of the retired list.

This first paragraph tells what the Army is to be composed of, while the following sections or parts thereof show how the General Staff proposes to throttle all ideas except its own:

Section 2. . . . There shall be in the *line* of the Army six lieutenant generals, 32 major generals, and 88 brigadier generals. The general officers of the line who are authorized in this act for the various branches of the service shall be included in these numbers, and *the assignment of general officers to any branch, corps or department shall not create vacancies among general officers of the line.*

The Chief of Coast Artillery, officers on the active list who have held the rank of general officer by detail as chief of staff corps or bureaus, and the general officers of the staff, except those of the Medical Department, shall, on the passage of this act, be recommissioned as general officers of the line in the grades and with the dates of rank now held by them or heretofore held by them as head of a staff corps or bureau. In time of peace general officers of the line shall be appointed from the next lower grade of the line of the Army.

Section 3, Paragraphs 4, 5 and 7. The Chief of Staff, under the direction of the President or of the Secretary of War, shall have supervision of all agencies and functions of the military establishment, and shall perform such other military duties not otherwise assigned by law as may be assigned to him by the President.

The Chief of Staff shall be the immediate adviser of the Secretary of War on all matters relating to the military establishment, and shall be charged by the Secretary of War with the planning, development and execution of the Army program.

The duties of the General Staff Corps, under the direction of the Chief of Staff, shall be to prepare plans for the national defense and for the mobilization of the military forces in time of war; to investigate and report upon all questions affecting the efficiency of the Army and its state of military preparation for military operations; to render professional aid and assistance to the Secretary of War and to general officers and other superior commanders, *and to act as their agents in informing and coördinating the action of all the corps, bureaus and agencies* which are subject under the terms of this act to the supervision of the Chief of Staff; and to perform such other military duties not otherwise assigned by law as may from time to time be prescribed by the President.

Section 32. *The President may detail any officer to any military duty he may consider necessary and appropriate,* and for such period as he may think proper, subject only to the limitations contained in this act. The detail of officers to college duty and the employment of retired officers on active duty shall be as now provided by law, *but all other restrictions now proposed by law upon the assignment of officers for the performance of duties authorized by law are hereby repealed except as otherwise specifically provided in this act.*

"LINE" OFFICERS FAVORED

Running through all these paragraphs is the phrase "line of the Army." What is the "line of the Army"? As it is not defined in the bill, one must go back to precedent or to existing law for a definition. Heretofore the line has meant the infantry, the cavalry and the artillery. Every other department was a staff department. Indeed, in order that an engineer colonel in command of a regiment of engineers, while operating with a platoon of infantry commanded by a second lieutenant, should not be under the command of the second lieutenant, it was necessary a few years ago to pass a law that thereafter an engineer officer on duty with troops was a line officer. There is nothing in this bill that shows that an engineer officer on duty with troops is in the future to be a line officer. On the contrary, the second paragraph of Section 2 indicates clearly that the Corps of Engineers is a staff corps or bureau and hence not a part of the line. And only line officers may be made generals! Is this intended to prevent any engineer officer in the future from becoming a general officer? Is this in line with the "Psychology of War," a Fort Leavenworth textbook of a few years ago, in which occurred the statement that "engineer officers are fitted neither by training nor experience to command troops"? By the shades of Lee, Kitchener, Meade, McPherson, Johnston, what a thought!

Let us see just what the policies outlined in the above-quoted parts of the bill indicate. Under Section 2, in the second paragraph, it is noted that every chief of a *staff corps* on the active list of the Army is to be made a line officer upon the passage of the bill. The last sentence of that paragraph states that "general

officers of the line shall be appointed from the next lower grade of the line of the Army." Thus we see that after the present staff officers are put into the line no staff officer may ever be commissioned a general. The only exception to this is in the Medical Corps, whose chief is not to be made a line officer.

Furthermore, all staff departments, or rather "corps and bureaus," as they are called in this bill, except Engineers and Medical, are to have their commissioned personnel made up of details from the line. Thus, the man who aspires to make aviation his lifework, who aspires to serve in the Signal Corps, in the Judge Advocate General's Department, in the Finance Department, in the Motor Transport Corps, or in any of the other departments except the Medical and Engineers, must first pass an examination and become an infantryman, a cavalryman or an artilleryman. Under this rule he may never become anything else unless appointed a general officer. And, furthermore, he cannot, until he becomes a lieutenant colonel, ever spend more than four years out of any six in the staff department in which he would like to serve. From the infantry, the cavalry or the artillery, which he is forced to wed, he may never be divorced. What is the object?

The seventh paragraph of Section 3 states in part, "to render professional aid and assistance to the Secretary of War and to general officers and other superior commanders, *and to act as their agents in informing and coördinating the action of all the corps, bureaus and agencies which are subject under the terms of this act to the supervision* of the Chief of Staff." The eighth paragraph of that section states, "*the Chief of Staff shall be the immediate adviser of the Secretary of War on all matters relating to the military establishment,* and shall be charged by the Secretary of War with the planning, development, and execution of the Army program." Finally, Section 32 says, in part, "*the President may detail any officer to any military duty he may consider necessary and appropriate, and for such period as he may think proper, subject only to the limitations contained in this act.*"

General Staff To Be Absolute

Thus, the General Staff is to become absolute in every respect. It not only performs its proper duty as outlined in the first part of Paragraph 7, Section 3, " . . . to prepare plans for the national defense and for the mobilization of the military forces in time of war; to investigate and report upon all questions affecting the efficiency of the Army and its state of preparation for military operations," but it is to operate directly all staff functions, except the Medical Department and the Corps of Engineers, and by its authority to put staff officers in any place whatever to control in every detail, even those two departments. Combine all this *with promotion by selection provided for by Section 33 of this bill,* and czarism by heredity would have nothing on the General Staff of the United States Army.

This General Staff proposition is fundamentally wrong. What is needed is a strong General Staff, but it must be the planning, the controlling and the coördinating body of the Army, and nothing else. War plans, Army organization, coördination of the work of the various departments—there the duty of the General Staff ends. The instant it attempts to operate staff departments, or to lay down detailed rules of research or action in the development of technical departments, it ceases to be a planning and coördinating body and becomes an operating one. It ceases to be the "board of directors" and becomes the "operating department" of a great organization.

If the plan of the General Staff prevails, the man in a scientific department, with the two exceptions noted, far from being encouraged to put his thought and mind upon that department, is forced to stand or fall, when up for promotion, on his skill as an infantryman, a cavalryman or an artilleryman. Be he ever so wrapped up in the department he is serving, he will always be haunted by the specter of examinations in cavalry drills, in infantry tactics or in artillery firing, knowing that if he fails in those subjects he will not only lose his standing militarily but may be forced completely out of his chosen life's work.

Our staff departments must have their own officers commissioned in their own corps. When the war broke out the two departments that made *noteworthy successes without reorganization* were those two departments without any detailed officers in them, the Medical Corps and the Corps of Engineers. On the other hand, the most signal failures, requiring the most drastic reorganizations, occurred in the staff departments *made up largely of officers detailed from the line.* Such were the Ordnance Department, the Quartermaster Department and the aviation branch of the Signal Corps.

To Broaden Training

Not only must we commission officers in the various staff corps in order to keep them as specialists in those corps, but *we must go one step beyond what has ever before been done.* We must broaden the view of the technical man, and, let us not forget, we must broaden the view of the line officer at the same time.

Thus, instead of detailing line officers to do technical work in staff departments, let us, one year out of each five, detail the technical man to duty, say, four months with the infantry, 10 days with the cavalry, four months with the artillery, and the rest of the time with the other services with which he may come in contact. The technical officer will come back at the end of the year infinitely better fitted for work in the front line or in the laboratory in war.

In the same way, detail the line officer for duty with the staff departments. Let the line officer know that the duties of engineers are to build roads, lay out trenches, do demolition work, and do the scores of other highly technical jobs that devolve upon engineers in war. Your line man will come back with the proper vision and with better ideas on how to teach coöperation among all departments, by which means only can efficiency in war or peace be obtained.

Such a plan as this will develop generals, whether from the line or the staff, who will see that skilled engineers are not held as infantry reserves; who will see that highly valuable gas troops when bitterly needed in the front line are not put to work on roads; who, in short, in the future will see that trained and skilled staff soldiers are not set to doing work for which they are poorly fitted and for which other men can be trained in a quarter of the time.

Since every officer aspires or should aspire to become a general, let us see what are the qualities needed in a general. Decision? Yes. Executive ability? Yes. Boldness at times? Yes. Caution at other times? Yes—

but these qualities will not enable him to win battles unless he combines with those qualities a knowledge of the relative capabilities of a score or more of services in addition to the infantry and the artillery.

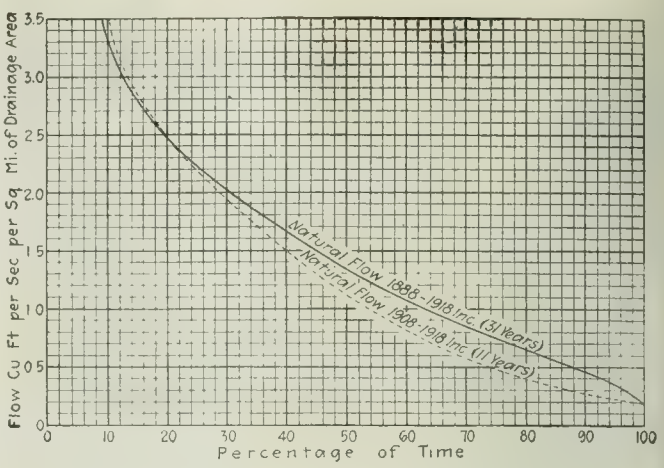
Then let the technical man of America rise and demand that this assault upon his profession be crushed; that the technical man be accorded in the Army, as he is accorded in civil life, an equal opportunity with all others to rise to any position to which his work and ability will carry him. Let the best officers become the generals of the future, be they from the infantry, the cavalry, the engineers or any other branch of the service, not excepting even the Medical Corps.

With this accomplished, your great general of the future as of the past may come from the line or he may come from the staff. He may be a Napoleon from the artillery, a Grant from the infantry, or a Lee or Kitchener from the engineers.

Long-Term Variations in the Flow of the Hudson River

By Edward H. Sargent
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PRIOR to 1907 very few stream gagings had been established in New York State. In that year the Water Supply Commission, now the State Conservation Commission, installed many stations. It was fortunate that this was no longer delayed, for 1908 and 1909 were extremely dry years. (See article, "Long-Term Variations in Stream Flow, Croton and Hudson Rivers," by the writer, *Engineering News*, Dec. 3, 1914.) Records have been kept at these stations up to date and it is thought that hydraulic engineers might be interested in learning how the flow for the period 1908 to date compares with the long-term flow, as shown by duration curves with the Hudson River at Mechanicville (drainage area, 4517 square miles), where records have been kept since 1888. Duration curves for the flow during these two periods have been computed and are shown on the accompanying diagram. The flow of the Hudson River at Mechanicville, since 1899, has been somewhat modified by the storage in the Indian Lake Reservoir, but this storage has been eliminated and the curves represent the computed natural flow of the river, except in so far as the flow is affected by the diversion to the Champlain Canal which affects both curves equally. It is apparent from an inspection of these curves, and it is further confirmed by a detailed study of the records, that there have not been sufficient wet years since 1908 to offset the dry years, and consequently the low-water portion of the duration curve for the last decade falls below the curve for the long term. It is evident that estimates of power based on the records from 1908 to date are conservative and that in the long run more power would be available.

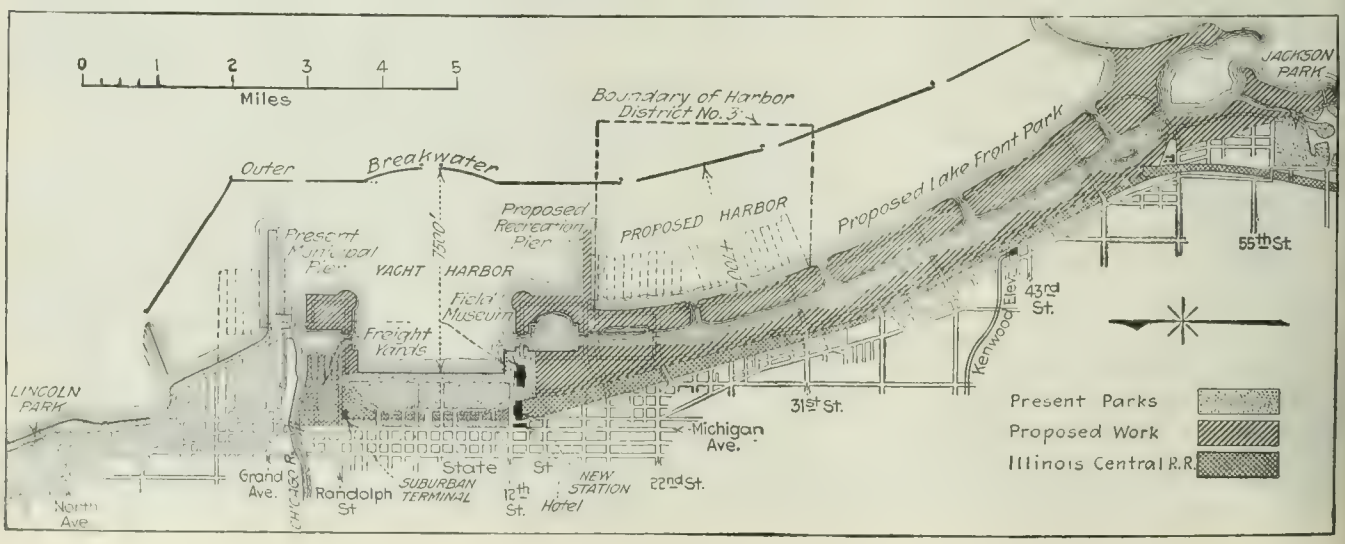


DURATION CURVES OF FLOW OF HUDSON RIVER

The records obtained at the various gaging stations in New York State can be found in the annual reports of the Conservation Commission and in those of the State Engineer and Surveyor, and also in the Water Supply Papers of the United States Geological Survey.

Correction—Chicago Lake-Front Improvement

The transposition of the explanations of the symbols carried in the legend on the map of the Chicago lake-front improvement, in *Engineering News-Record* of July 31, 1919, p. 216, makes it desirable to publish that the dotted area represents existing parks; the heavy single hatching shows the proposed lake-front development, and the double hatching indicates the property of the Illinois Central R. R. The map is printed again, in the illustration reproduced below, with the correct legend.



Concrete Barge Survives Launching at Singapore

Though Big Hole Was Punched in This Far Eastern Pioneer Concrete Vessel, It Was Soon Repaired for Service

CONCRETE ship construction has been started in the Far East. From China there have come a number of accounts of barges and even of oceangoing steamers, and now Singapore reports the construction of a large barge which through its survival of a launching accident testifies to the value of this new type of marine construction. This vessel is a reinforced-concrete car float built for the Federated Malay States Railways in 1917 by Brossard, Mopin & Co., of Singapore, and launched by the Singapore Harbor Board.

For some years the Straits of Johore, between Singapore Island and the State of Johore, have been connected by both passenger ferry boats and car-float ferries. Recently increased traffic made it necessary to add to the car floats, but as steel was practically unobtainable in the Far East during the war, reinforced concrete was adopted in preference to the remaining material, wood. P. H. Barriere, the Singapore representative of Brossard, Mopin & Co., was called in to design the reinforced-concrete car float, maintaining the general di-

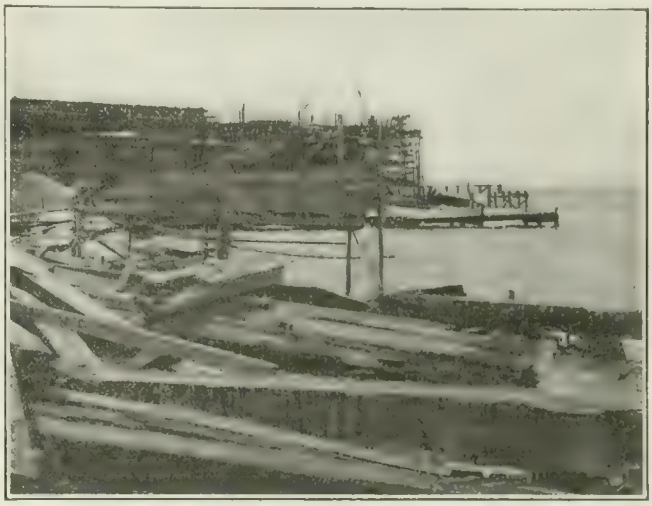


127-FT. CONCRETE CAR FLOAT OPERATING AT SINGAPORE ACROSS THE STRAITS OF JOHORE

mensions of the existing steel boats. These dimensions are: Length, 127 ft.; molded depth, 7 ft. 6 in., and beam, 27 ft. It is designed to carry safely all necessary deck fittings and machinery and six freight cars on rails placed along the longitudinal axis of the boat. The total weight of machinery and cars is about 150 tons. Longitudinally the hull is divided into three parts by means of two bulkheads under the rail and 3 ft. 3 in. apart. Further transverse bulkheads provide water-tight compartments. The hull is 3 in. thick, reinforced with $\frac{1}{4}$-in. bars spaced 4 in. in both directions. Only a part of the deck is of concrete; that is, at both ends, where heavy machinery is fixed. Amidships the deck is of 2-in. boards supported by transverse ribs.

Concrete was mixed in the proportion of $1\frac{1}{2} : 2 : 4$, with an aggregate of selected granite chips $\frac{1}{8}$ to $\frac{1}{2}$-in. size, and sea sand. The hull was rendered in a 1 : 2 cement-mortar. This adoption of this plaster was decided upon in order to combat the possible destructive effect of sea water, which is pronounced in the tropical seas of this vicinity.

The boat was built on transverse ways and supported on cradles and launching ways for side launching. At the moment the launching triggers were struck, however, one of the sliding ways at one end of the boat gave way. This end of the vessel slewed around, and under the unexpected strain the guides on the side of the launching ways gave way and a general collapse of the launching platform took place. One of the longi-



SHOWING PERMANENT LAUNCHING WAYS SHEARED CLEAN THROUGH

tudinal supports was stopped in its course, resulting in a drop of the boat of about 20 in., and the collapse of a cradle on the other side was responsible for a drop of about 6 ft. The shock of this last break was sufficient to break a 14 x 14-in. launching timber, where it was hit by the barge.

In spite of the accident, however, the boat righted itself and completed its course down the permanent ways to a well balanced flotation. For awhile it was thought that no damage was done, but a hasty inspection showed that several compartments were full of water. The boat was immediately beached and several holes similar to the one shown in the view were revealed. It was then towed to dry dock for repair.

There were altogether six damaged places, but in every case the damage was only local, extending a few



ONE OF THE HOLES PUNCHED IN CAR FLOAT

feet from the point of contact at the fall. The main structure was quite sound, presenting no cracks or other sign of deformation. In the dry dock the breaks were edged clean and concrete patches applied. After some tests and minor further patching, the boat was put in service and has been in successful service for a number of months.

Shipbuilding Equipment and Methods at Fore River
II—Shop Routing and Group Labor Systems

Hull Production Coördinated by Keeping Shop Ahead of Berths—Card System for Routing Material—Department of Material Stowage—Specialist Labor Groups—Piecework and Premium Payment

SHIPBUILDING at Fore River under the war-time pressure of the past two years, with greatly enlarged and modernized plant, and with a working force increased as fast as possible to about double the normal complement, led to some interesting changes in operating methods. Two developments of particular importance are a shop routing system, which schedules and keeps track of hull material from mold-loft to berth, and a specialist group labor system which has been applied to many of the outside departments, chiefly the fitting-out and trial departments. Notes on these two items of new system are given in the present article, to supplement a description of the hull-construction plant printed in *Engineering News-Record* of July 3, 1919, p. 19. It is worth emphasizing at this point, however, that the success of forced-draft shipbuilding at Fore River and the possibility of a quadrupling of the working force in not much more than six months by dilution processes alone depended very largely on the excellent quality of the old-time stock of shipbuilders in the yard, as well as on a remarkable spirit of drive and devotion which the entire organization exhibited. A few paragraphs dealing with this phase of the matter are given after the description of the operating methods noted.

Routing and Tracing Fabricated Material

When rapid production under the pressure of the war program started, fabricated material accumulated in such quantities that it made what seemed hopelessly unsystematic piles in the yard. With several hundred destroyer frames massed in a single pile, finding the right piece when wanted threatened to become impossible. It was necessary to develop a system for keeping track of every piece of finished material, and for detecting and expediting missing pieces.

A department of material stowage was therefore organized. This department, now comprising about 170 men, receives finished material at the weighing scales at the outgoing end of the fabricating shop, transports it and places it in storage, and remains in custody of it until delivery to the cranemen at the berths. It also keeps track of the requirements of the berths, and through this means it learns which pieces are missing, and traces out whether these have been made and misrouted or are as yet uncompleted.

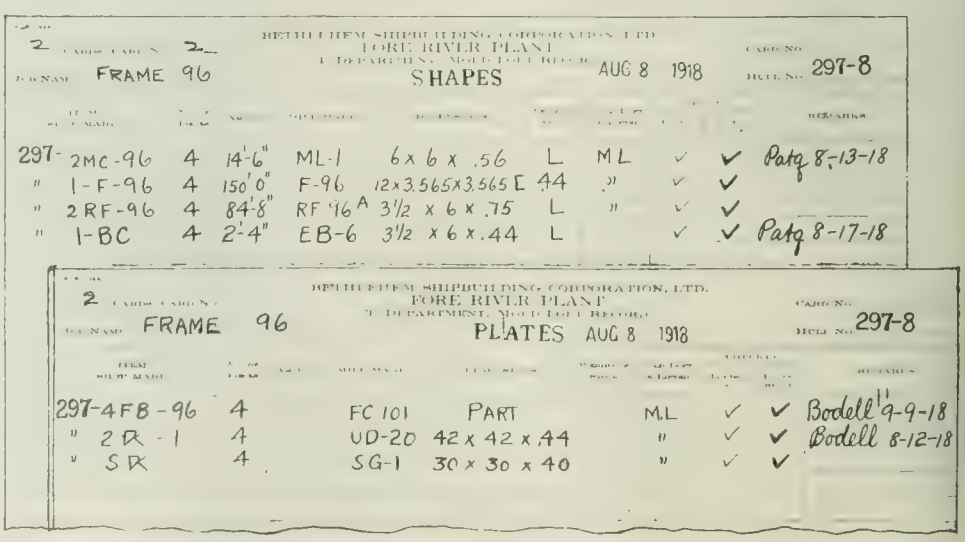
System in fabrication, to produce material in the sequence required by the ships, is, however, equally important with system in stowing and locating finished material. To coördinate the shop production with the berth requirements, an effective shop routing system was worked out. Beginning in the mold-loft, it takes the material through the shop to the material stowage, and thus ties together the three elements of the hull department—the shop, stowage, and berth.

System of Routing Material Through Fabrication

An order-card system, originating in the mold-loft, is the key element of the routing system. One of its results is that several checks are obtained on missing parts, and means are provided for tracing up pieces which have been overlooked or misrouted, from the building berth back to the mold-loft. Another result, perhaps even more important, is that fabrication is arranged in such order as to produce sequence rather than tonnage. The inside and outside hull departments dovetail, and yet work independently.

Order Cards Start in Mold-loft—Every drawing is analyzed in the mold-loft as soon as received there, and the parts called for by it are divided into "fabricating groups." Thus, each bulkhead, each floor, the entire shell, each deckhouse, and the like, forms a group. For every group a bill of material (Fig. 1) is made out on a card, Card A, which routes the group through the mold-loft. The analyzing and billing are carried on by the engineering clerk of the routing department, who has an office in the mold-loft. He is assisted by the head loftsman. Each individual piece of material receives a mark, and the size of stock is noted; the latter is possible because of a complete card index of the stock of raw material on hand in the plate yard, made up daily from the reports of the foreman of raw storage and kept in a card file in the loft office.

These card mold-loft orders are arranged in the sequence required to allow time for making the molds and for fabricating, as determined by experience. They are then handed out to the individual loftsman for mak-



BETHLEHEM SHIPBUILDING CORPORATION, LTD.
FORE RIVER PLANT
DEPARTMENT, MOLD LOFT RECORD

2 FRAME 96 — SHAPES — AUG 8 1918 — 297-8

297- 2MC-96	4	14'-6"	ML-1	6 x 6 x .56	L	ML	✓	✓	Patg 8-13-18
" 1-F-96	4	150'0"	F-96	12x3.565x3.565	L	44	"	✓	✓
" 2RF-96	4	84'-8"	RF 96 A	3½ x 6 x .75	L	"	✓	✓	
" 1-BC	4	2'-4"	EB-6	3½ x 6 x .44	L		✓	✓	Patg 8-17-18

BETHLEHEM SHIPBUILDING CORPORATION, LTD.
FORE RIVER PLANT
DEPARTMENT, MOLD LOFT RECORD

2 FRAME 96 — PLATES — AUG 8 1918 — 297-8

297-4FB-96	4	FC 101	PART		M.L	✓	✓ Bodell 9-9-18
" 2R-1	4	UD-20	42 x 42 x .44		"	✓	✓ Bodell 8-12-18
" 5R	4	SG-1	30 x 30 x 40		"	✓	✓

FIG. 1 MOLD-LOFT SCHEDULE CARD, LISTED FROM DRAWING CHECKED BY LOFTSMAN (CARD A)

ing molds of those items marked "ML" on the card, the lifted items being marked "L." As he makes the molds he checks off the successive items of the card and corrects any errors or omissions in the list; for example, he adds a missing dust collar on a floor frame. The molds themselves are checked for accuracy before they pass out of the loft, and here another verification of the card as well as of the mold is obtained.

When the loft card has finished with its final check, a copy is typed on a blank sheet with duplicator ribbon, and three copies of this sheet are made on separate cards (B, C and D) for the layer-out, the weighing office, and the department of material stowage. These are like the loft card except for the check columns. They are sent to the respective departments as soon as made out, and go on file there waiting for the material for which they call.

Work goes through the fabricating shop in a sequence determined by the layer-out in conformity with general orders issued from the superintendent's office, scheduling the major items of the required work. The foreman layer-out takes a B card from the "available work" box and hands it to one of his men as an order to lay out the group of material represented by the card. In case the card goes to several men, their respective names are properly entered opposite the items assigned to them. In this form the card goes to the material clerk, who requisitions the stock called for on the card. His requisition slips note (from the index of raw storage) the bay or section of the yard containing the required material, and also the name of the man to whom it is to be delivered. One copy of the requisition goes to the plate-yard foreman and one to the layer-out, the latter checking off the material as he receives it. When the piece is laid out he dates his copy of the slip, and from these dated slips a counter who makes the rounds once a day enters on the original group card the date of laying out. In this way the card automatically clears itself when all material on it has been laid out, or it comes up as a reminder if some of the parts remain uncompleted for an unduly long time; furthermore, the man who laid out the piece can always be traced, and errors or other unusual conditions followed up.

From the layout the material passes down through the shop without any accompanying order. At the scales it meets card C, which is in the hands of the weigh clerk. Here the weight is entered, and the piece is routed to the proper berth from the information given on the card; when completed the card is filed as a permanent record.

At the building berth the material meets the last card, D. A checker of the department of material stowage, at the berth, enters in a loose-leaf book the date of receipt and the location of the storage section in which he places the piece of material. A night clerk of the department receives all the checker's books and enters from them on the D card the date of receipt of the material opposite its item line. The location is not entered here, the checker at the berth being relied upon to locate all pieces from personal knowledge. However, the card shows when a given order is completed, and thus calls attention automatically to any forgotten or uncompleted items.

It is the duty of this stowage department to detect any omissions or delays in fabrication which would hold up the erection of the ship. Furthermore, in case material is found to be missing when called for by the rigger, the stowage clerk must trace it up through the series of records back to the layer-out, and hurry the missing part through. By this system the department of material stowage is enabled to provide for prompt supply of fabricated material and to hold the shop up to schedule. As the checkers keep posted in advance as to the needs of the various ships, it is possible to foresee shortages in delivery from the shop and take steps to change the fabrication schedule accordingly.

A few items are not handled by the group-card system. Tapered liners, for example, are in charge of a boss linerman, whose business it is to keep liners fitted and fabricated in advance of the setting of the plates to which they belong. Lifted work is made by card, but is handled on call from the berth. Orders, some 300 per day, pass forward from the office of the department of material stowage to the boss layer-out as soon as the ship has progressed to a point where the required molds can be lifted. From this moment on the procedure for the routing and entering on the card is the same as for mold-loft material.

Development of the routing system described began with a mold-loft schedule card devised by the head loftsman, and modified and enlarged to serve for the needs of the other departments through to the berths. The assistant hull superintendent was closely concerned with the working out of the system, under the general superintendent.

To bring the yard up to its full capacity (or, rather, overload capacity) in a few months—from about

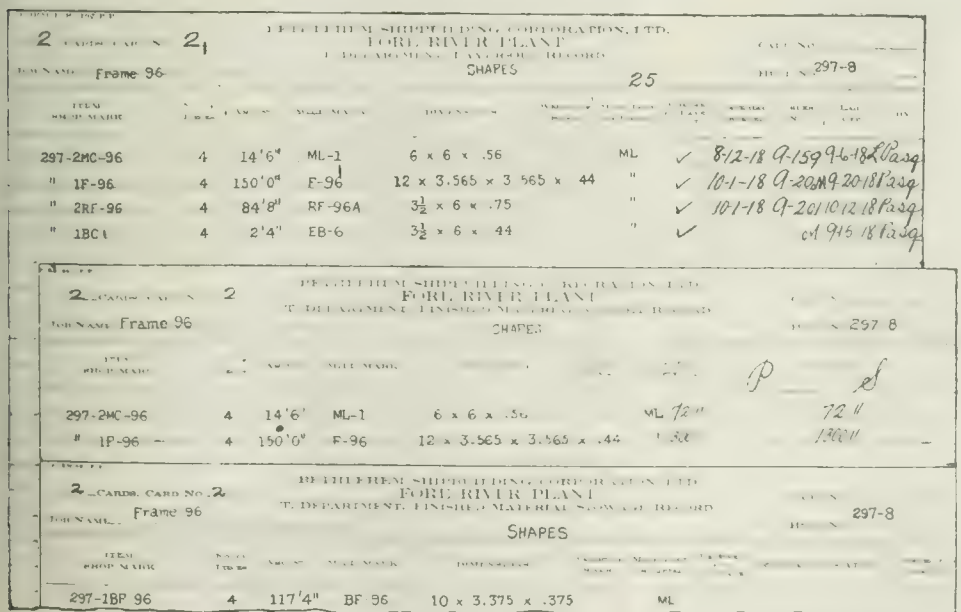


FIG. 2. ROUTING CARDS (B, C AND D) BY WHICH MATERIAL IS SCHEDULED AND TRACED FROM STORAGE PILE TO SHIP

4000 workers at the close of 1916 to over 20,000 a year later—it was necessary to take men of any grade available. Shipyards everywhere were bidding for men at this same time, and most of the men obtainable, therefore, were not only without shipyard exeperience but without any kind of mechanical training. Apprenticeship and intensive training were equally out of the question under the hurry conditions. The only thing that could be done was to put the men to work, under department and squad foremen who needed them and would develop them as rapidly as possible.

Success of Dilution System

This dilution process was successful. The credit, in large part, is given by those familiar with the plant to the men composing the core of the force. Many of these had been with Fore River for many years. In normal times Fore River draws its supply of labor from a population gifted with the native New England aptitude for mechanical work. Long service had produced a strong yard spirit, moreover. The foremen and gang leaders, and even the individual workmen, adapted themselves to taking up and using and training the newcomers energetically and devotedly. In many departments all the original workmen became gang leaders and subforemen. Throughout the organization a remarkable degree of effort was applied to the many-sided problem of high-pressure production with a green force, and it was this that brought success. The leaders in particular gave no thought to hours.

Due to the length of time required for developing skill in the new men, and the necessity, at the same time, of working up to schedule, the plan of developing efficiency by narrow specialization was tried. As a result, the yard organization has been developed so that there is a large number of individual specialist groups, chiefly in the outside work, which are shifted from ship to ship and work under a general supervisory force.

The plan of group organization is illustrated in the case of stern tube boring. Here men of four or five crafts are required, staging builders, electricians, riggers, machinists and the like. Such a gang is organized under the chief machinist, he being the man in charge of the principal operations. Prior to organizing this fixed group, it took 54 hours to bore the stern tube. With the group trained in working together, the time was progressively cut down to eight hours.

This is an extreme case of improvement in efficiency, perhaps, but gains have been recorded in all cases, largely because the men work together and acquire the routine of carrying out the successive steps of the work in proper order, in the most efficient way, and without loss of time. The same principle of organizing the group is followed in each case that was indicated above; the controlling operation determines who is placed in charge. In the gang which fits the periscope on submarines, for instance, the chief hull man is made foreman of the group.

First application of the specialist-group idea was made in the trial trip crew. The superintendent of machinery organized such a crew in the summer of 1918, when it became evident that, especially when destroyers were being produced at a rapid rate, prompt acceptance depended on handling the trial trip with a crew as well trained to the work as a regular sea-service crew. A "hand-picked" crew was made up, composed of men especially competent in the several branches of the work. In a short while this crew was so well trained to working together that it could get a better performance out of a new boat than the regular operating crew would be likely to secure in the first weeks of operation. A brief description of the trial-crew system was given in the *Emergency Fleet News* of Nov. 7, 1918, and it was there stated that "the practice of having the same men take out all ships has distinct value, inasmuch as it keeps the crew in constant touch with the problems that come up in trial trips and has resulted in the stopping of many faults on the instant; and here, as in everything else, the first step toward correction is discovering the trouble."

At present about a dozen of these specialist groups, some of them containing from 20 to 50 men, exist in the yard. The most important of them, besides the trial crew, are the various groups at the fitting docks. In the first section of the wet basin, where boilers are set, the work is handled by a hull group and an engineering group. In the second section, to which the boat is moved as soon as the heaviest installation work has been done and lighter crane service suffices, two engineering groups and one hull group are provided. One assistant to the superintendent is charged with the special duty of keeping track of all group operations and coördinating the various departments in their relations to them and providing against interferences.

Working at High Pressure

"One thing we are strong in," said an official of the yard, "is pinch-hitting. You can't develop that on money; you have to put the spirit into the men." This statement reflects the intense and willing concentration of effort in emergencies that was necessary for maintaining continuity of production under the extreme conditions imposed by the war demand. Men at Fore River say that the spirit needed for such concentration was there at all times, and could be depended upon in spite of the great dilution of the old-time labor stock and in spite of the unrest produced by the rapidly changing economic conditions.

An incident bearing on the working spirit is the following: During the builder's trial of a destroyer, the turbine rotor was damaged and the boat returned to its dock. This was at 3:30, on a Saturday afternoon, when the yard forces were scattered and there seemed no likelihood that anything could be done until Monday. Destroyers were never more urgently needed, and a delay of several days was a grave matter. The men in the yard knew this. Some of the installation machinists were still at hand when the boat came in, and they took hold of the job without waiting for orders.

By seven o'clock in the evening the rotor had been taken out of the turbine and was being hoisted out of the boat. In the meantime the superintendent had arranged for the necessary work in the shop, and before dark the rotor was under repair. The shop gang stayed at their work all night and Sunday morning, and by 11 o'clock on Sunday they were able to deliver the rotor to the destroyer dock. Here the installation force was ready for it, and at 6 in the evening their job was done. Monday morning at 8 the destroyer went out on its official trial trip, and was accepted.

Work at Fore River has been carried on by piece-

work and premium payment, practically to the exclusion of time payment. In the fabricating shop, straight piecework payment is most largely used; only occasionally is there an item of work suitable for setting time and paying premiums. Similarly, hull work is carried out so far as possible on a piecework basis. In the mechanical shops, on the other hand, premium payment is the rule, and an elaborate time-setting and rate-fixing department controls the work. A factor in the smooth working of this system has been the use of skilled craftsmen as time and rate setters.

Ownership of Plans and State Engineer's Right to Practice Defined

FROM time to time ethical questions come before the American Institute of Consulting Engineers for decision, and these are submitted to the committee on professional practice and ethics. The report of the committee is published in bulletin form. Two definite questions were recently submitted to the committee and the report has been made. They concern the rights of the engineer in regard to plans which he has prepared, and the right of engineers in public office to carry on private practice in lines and on projects which are likely to come for decision before the boards which they represent. These questions are known as cases 11 and 12; the questions and answers are given herewith:

Contractor's Right to Copyright Plans

Case 11—An engineer was retained by a client to advise him in reference to an engineering project and structure. The engineer submitted with his report complete drawings of the structure recommended by him. The client, with the permission of the engineer, submitted the plans to an engineering-contracting company, inviting a proposal to do the work. With such proposal the engineering-contracting company submitted a drawing identical with that of the engineer except that a few minor details and additions were included. Upon this drawing were stamped the words "Copyrighted by X-Y" (the title of the company).

Question: Was it a violation of professional ethics for X-Y to copyright the drawing under the conditions named?

Answer: The right of X-Y to copyright plans or documents originated and prepared by them cannot be questioned. This is also true of changes made by them in the designs and drawings prepared by others; provided it is made clear that the original plans are not their own; and that the changes or additions made by them, upon which copyright is claimed, are specifically described. In the case before us, it appears that this was not done.

X-Y had no title by authorship, ownership or assignment to the original drawings, and therefore no right to appropriate and copyright them. By copyrighting them the engineer himself is debarred from using them without their consent or compulsion. The copyright leads to the natural inference that the plans were designed and prepared wholly by them.

To copyright the drawings under these conditions, whether intentionally or inadvertently, was morally wrong, unjust and discourteous to the engineer, and therefore a flagrant violation of professional ethics.

Case 12—Engineer A is appointed to a state board which, by legislative enactment, is required to pass upon plans, specifications and designs for certain types of municipal improvements. This board also has jurisdiction over and is required to inspect and report upon the operation of certain types of municipal plants. This engineer, while sitting on the board and passing upon the plans and operations of the plants mentioned, practices in the state in which the board upon which he sits has jurisdiction, and prepares plans and specifications for plants which must be passed upon by the board, and also installs and operates plants, the inspection and operation of which it is the function of this board to regulate.

Question: Is it proper, or in accordance with professional ethics, for an engineer, while serving as a member of a public commission, to accept professional engagements that involve, or may involve, questions or matters that will come before the commission for official decision or action?

Answer: A fairly parallel question would be: Is it proper and in accordance with professional ethics for a judge to consult with, advise, and prepare, for a client, a suit at law that is to be tried before him as presiding judge?

The answer is as obvious in one case as in the other.

An engineer who accepts a public or quasi-public appointment under the conditions named in the statement is thereby debarred, not only by professional ethics, but by moral obligation and sound public policy, from accepting any engagement involving matters that may eventually come before him in his public capacity for consideration and decision.

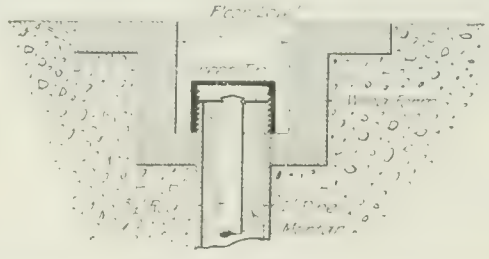
Evidence of intentional violation of this principle should be sufficient cause for the discipline or removal of the offender.

Depressed Permanent Bench Marks Set in Concrete Floors

By L. C. Scott
Sparrow Point, Md.

PERMANENT bench marks may be placed in old or new concrete floors by grouting iron rods in iron pipe with screw caps. In the case of old floors the holes must be cut, but in new floors the pipe may be set in the wet concrete by means of a circular form, shown in the illustration. When installed the device is a permanent and well protected bench.

To form the bench in old concrete a rough hole at least 1 in. larger than the wood form is dug. A ¾-in. rod slightly pointed at the upper end and notched with a hack saw about ½ in. down from the top is hung on the inside of a short piece of 2-in. iron pipe and set in



METHOD OF SETTING DEPRESSED BENCH MARKS

the middle of the hole. The rod is supported by a piece of sheet tin which fits into the notch and rests upon the top of the pipe within the screw cap. The pipe and rod are now grouted in by pouring around the outside of the pipe, which, being open at the bottom, fills up.

When setting benches in wet concrete the wood form is set flush with the floor level and thin concrete without coarse aggregate is worked around it. As it is worked, the mortar will rise through the bottom of the pipe around the iron pin. After the concrete has set, the wood form may be removed and also the cap and tin plate, and, if necessary, the pipe may be grouted.

In both cases, after the concrete has set, a 1-in. circular steel plate should be placed in the depression left by the wooden form. The screw cap forms a perfect protection for the bench, and the elevation should be stamped on its inner face, so as to be always available. This last precaution also insures the removal of the cap to obtain the elevation before holding the rod.

Extraordinary Repairs Made to a 1900-Ton Drawbridge

Turntable, Wheels and Drum Failing, the Number of Wheels Was Increased and New Upper Treads Placed—Drum Parts Restored by Heating and Jacking

By Thomas D. Fulton
Field Engineer, Bethlehem Steel Bridge Corporation, Bethlehem, Penn.

INCIPIENT failure of the turntable of the 1900-ton drawbridge by which the Lincoln Highway crosses the Passaic River east of Newark, N. J., required difficult repair and reinforcement work. Quite unusual methods had to be adopted, as it was vital that the bridge be kept in service while repairs were being made. Important war plants depended on the highway and river for their principal communication. The report of the Essex County engineer for 1918 shows that the drawspan was opened 9172 times during the year, an average of about 28 times per day when the river was free of ice as was the case during the past winter. Practically 5000 vehicles use the highway each day between 8 a.m. and 6 p.m. The total daily tonnage averages approximately 15,000 tons, exclusive of trolley cars.

The repair work included replacing the roller wheels and top treads, straightening the drum girder flange and stiffener angles by oxyacetylene heating, reinforcing the drum with special cast-steel stiffeners, installing new center pin and casting, providing properly for expansion in the fixed spans, and overhauling the driving machinery.

Origin of Bridge Troubles—During the work, conditions were found which help explain the origin of the troubles. As described in *Engineering News-Record* of Apr. 18, 1918, p. 775, the bridge was in such grave condition that the Public Utilities Commission demanded that immediate repairs be made to the turntable drum, to assure the safety of the street-car traffic. The wheels supporting the drum were breaking frequently, the upper tread was broken and bent out of shape traversely, and the drum girder flange and stiffeners were bending and buckling. The center casting, designed to hold the span in position, was loose and shifted around on the masonry as the span was turned.

The bridge was practically new, having been built in 1910. Soon after its erection the center casting broke and was replaced by a new solid casting with an 8½-in. pin, the design having been changed for erection purposes. Unfortunately, it was not possible, on account of the live-ring collar, to place anchor bolts of sufficient length to hold the new casting securely in place. The movement of the span off center at times, therefore, became so great that the driving pinions with gear teeth $2\frac{13}{16}$ in. deep were thrown out of mesh with the rack. This shifting of the span placed excessive stress on the live ring and the axles of the roller wheels, which were thus forced out of adjustment so that only a few wheels carried the load. Under this excessive loading many of them broke and, according to the bridge engineer of the Public Utilities Commission of New Jersey, the drum was strained so severely that its complete failure and collapse was considered possible.

Replacing the Rollers and Upper Tread—The number of roller wheels was increased from 52 to 65, adding one to each of the 13 sections. This necessitated the drilling of 52 holes in the inner and middle live-ring channels for the 2½-in. axles, locating them on exact radial lines; replacing the old outside channel of the live ring with 13 new and shorter sections; replacing the old horizontal plate separators between the wheels with vertical cast-steel separators; and adding new wheels and axles. This work was carried out by holding up bridge traffic ten or fifteen minutes at a time, when necessary.

The new top tread plates were erected by working four night shifts, one of 12 hours and three of six hours each, during which time the bridge, it was advertised, would be closed to all traffic. For this operation, five wheels were removed under one section and this outside live-ring channel section was replaced with separators. The old section of the top tread plate was removed and replaced with a new temporary section beveled from $1\frac{5}{8}$ in. at one end to 2 in. at the other, to allow for the ⅜-in. difference in thickness of the old worn plate and the new plates. The bridge was then revolved to bring a second section of old plate to the section of the live ring where the wheels were removed and, after wedging off the broken pieces of the old plate, the first new permanent top tread plate was erected. Sufficient holes were reamed out for special countersunk Mayari steel bolts to hold the new plates in position until all holes could be reamed out and 1⅛-in. rivets driven.

Another beveled plate was then placed to connect up the new plate with the next old plate, and the bridge was opened to traffic and allowed to operate slowly when necessary during the day. The second night, one beveled plate was removed and three more new plates were erected, care being taken in reaming the holes in the drum girder flange angles from ⅞ to $1\frac{3}{16}$ in. to keep the tread plates in a true circle and the joints tight. The last of the 16 plates was drawn into position with drift pins, making tight joints at both ends.

Straightening Drum Flange and Stiffeners—With special steel templets four $\frac{15}{16}$-in. holes were drilled in the web plate of the drum girder for each pair of the new cast-steel stiffeners, as shown in Fig. 1. Each

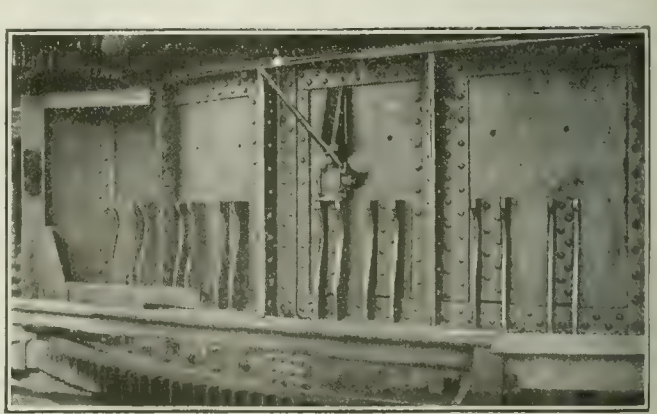


FIG. 1. NEW CAST-STEEL STIFFENERS AND SPECIAL JACKING BRACKET

stiffener had eight 1-in. holes. Also, one hole was drilled in the drum above each stiffener for holding the special jacking bracket. The stiffeners were then placed and held in position with ⅞-in. bolts while being forced down to a bearing on the flange angles and tread plate with 25-ton jacks. At the same time, heat was applied to the back of the flange angle with two oxyacetylene blowpipes, and 12-lb. mauls and Mayari steel bolts were used in forcing the angles to a bearing on the tread plates, as shown in Fig. 2. The other four holes were then drilled in the web of the drum girder to full size, and 1-in. rivets were driven. The four bolts were removed, holes were reamed out, and rivets were driven

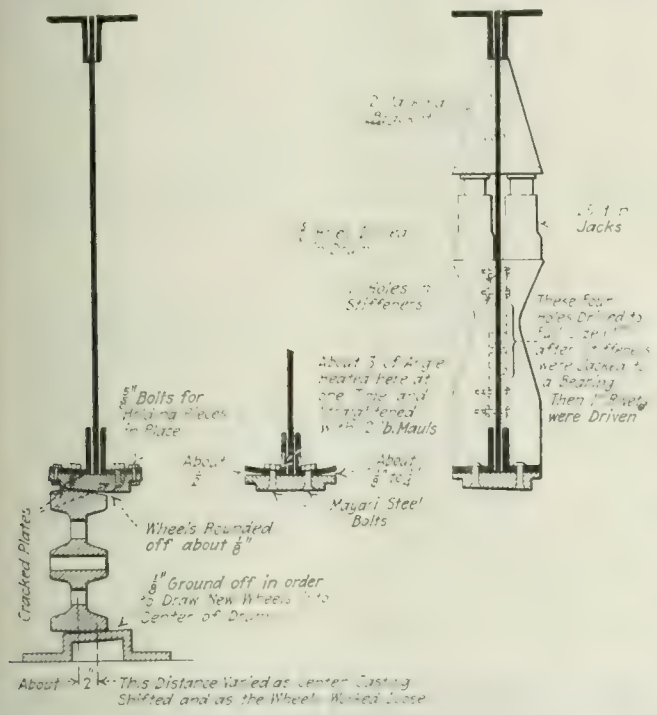


FIG. 2. DIAGRAMMATIC SKETCHES SHOW HOW DRUM GIRDER FLANGE WAS STRAIGHTENED

before the jacks were removed. All the holes for connecting the new tread plates to the flange angles were reamed out and 1⅛-in. countersunk rivets were driven.

The drum stiffener angles, the outstanding legs of which had been bent badly out of line, were heated and straightened. Vertical reinforcing plates were wedged in between the flange angles of the drum girder, riveted to the stiffener angles, as seen in Fig. 1. All loose rivets in the drum flange angles and splices were cut out and redriven.

New Center Pin and Casting—It was decided that the most feasible way to hold the span in position was to install a new center pin with a casting having a larger base so that it could be securely held with anchor bolts. By means of a steel templet placed around the old center casting, the center of the drawspan was determined. Thirteen 3½-in. holes were drilled in the granite masonry for the 3-in. anchor bolts, and eight 3½-in. holes were drilled for wedge bolts which could be inserted in pipes grouted in the holes and flush with the top of the masonry. The wedge bolts had square heads to be used in wedging the casting into position, as indicated by the sketch, Fig. 3.

After the thirteen live-ring struts were removed and the sixteen radial girders were disconnected, the casting, with collars in place, could be slid out. As the

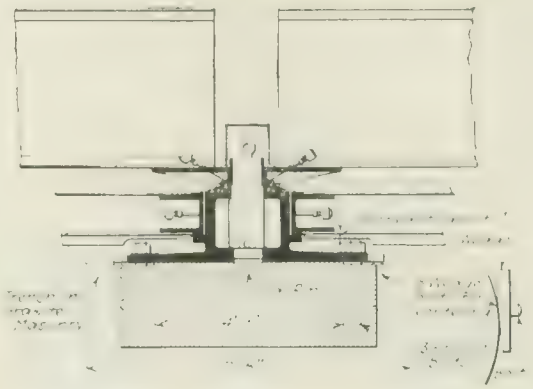


FIG. 3. NEW CENTER CASTING AND BOLTS FOR SECURING IN PLACE

center pin could not be pulled out of the old casting, two of the radial girders had to be cut to clear the top of the pin. The collar which connected the drum radial girders to the center casting had been badly worn. It was taken to a machine shop and bored out to fit the new pin, which was provided with a bronze bushing. The new iron center casting, Fig. 4, was made with a running fit for the live-ring collar. This collar had been protected from wear by a bronze bushing fitting over the old casting. However, this bushing had worked

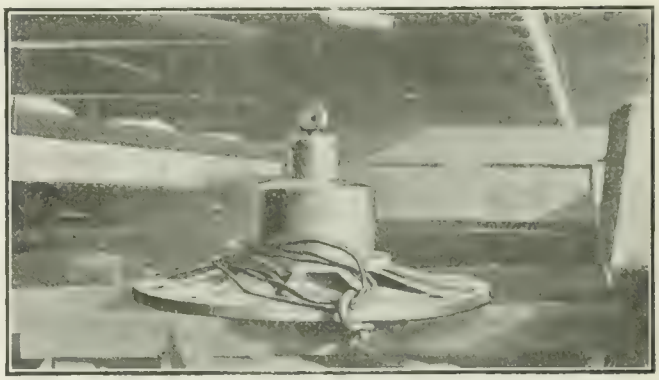


FIG. 4. NEW CENTER PIN AND CASTING BEFORE PLACING

loose and was being flanged out by rubbing on the radial girder collar above.

The eight wedge bolts held the new casting in position while the span was operated and the machined anchor bolts were being placed and grouted. Rust-joint material was rammed between the casting and masonry after the anchor bolts had been tightened. The new casting was provided with dust caps and automatic grease cups. An especially designed indicator, Fig. 5, with a knife-edge wheel, bolted to the drum and scribing a line on top of the rack, showed that there was no movement of the span after the new pin was in place. This indicator was also used, previous to changing center pins, to determine the way the bridge traveled in turning. (See sketch, Fig. 5, next page.)

To change the center castings, the river traffic was to have been suspended from 1 p.m. Saturday to 6 a.m. Monday. This time was extended to 9 a.m. Tuesday, as a short time after the work was started it was found that the old center pin projected 3 in. below the casting into the masonry. This necessitated cutting a clearance trench in the hard granite to make it possible to slide out the old casting and pin. To do this, it was dis-

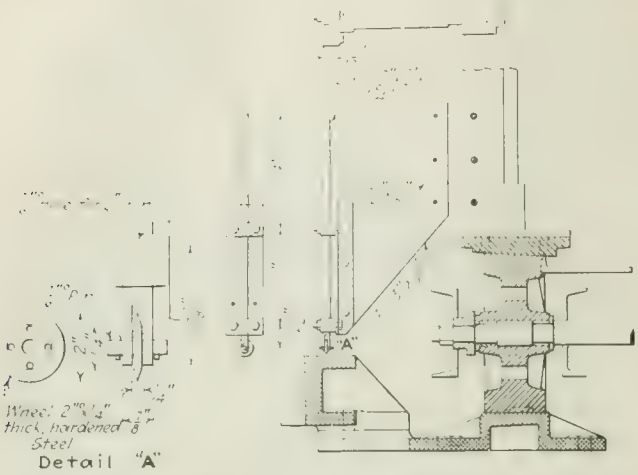


FIG. 5. INDICATOR FOR TESTING MOVEMENT OF SPAN

covered that an oxyacetylene flame chipped the granite quite readily and could be used under the old casting without damaging the rest of the masonry.

Rack Pinions and Driving Machinery Adjusted—To adjust the rack pinions, it was first necessary to repair the supporting brackets. The shifting of the bridge had allowed the pinions to jump out of mesh with the rack with such force that the bracket plates were bent and broken. New bottom plates much longer than the old plates were added to each of the four brackets and riveted to the bottom flange angles and top tread plates of the drum. Also, other reinforcing plates and angles were added with new and much larger bottom bearings for the driving shafts.

The radii and diameters of the rack were found to vary $\frac{3}{8}$ and $\frac{5}{8}$ in., respectively. Also the *greatest* diameter was $\frac{9}{16}$ in. less than that shown on drawings, or that of the pinions. Therefore, the pinion bearings on the brackets had to be planed off $\frac{5}{8}$ in., so that the pinions could be drawn into an established mean pitch line of rack. New collars, set-screws and keys were placed to keep the pinions from riding on the rack.

A number of the driving shafts were badly out of line and, when possible, were lined up and new gears were placed. All the bearing caps were adjusted, many bearings rebabbitted, and washers and keys placed to take up the lost motion. The third and fourth driving pinions added to the bridge in 1912 were no doubt made necessary by the lost motion caused by the variations in the radii of the rack, and the driving machinery not being properly set.

Grinding Top of Bottom Tread—The old live-ring wheels had never been properly adjusted and had run on the outer edge of the bottom tread plate, wearing unevenly the bevel of the plate. Before the new wheels could be drawn into their proper position, it was necessary, therefore, to grind about $\frac{1}{2}$ in. off the inner side of the bottom tread. This was accomplished by installing on the live ring a 10-hp. motor, a water tank, and special grinding machinery operating a 2 x 18-in. emery wheel, and grinding while the bridge was turned. The 65 wheels were then drawn into position and the nuts on the axles were fastened with lock nuts and special lock washers.

The wedges were adjusted to raise the ends of drawspan $\frac{3}{8}$ in. and prevent any hammering from live road. The horizontal shaft operating the wedges, lift rails and latch bars was turned 45°, placing the levers attached to it in a position to give the greatest power, and to lock the wedges. Shims were placed under the top and bottom shoes to wedge the drawspan up level with the fixed spans. The live-load impact caused by the span not being properly wedged had caused the end floor-beams to become permanently deflected $\frac{3}{4}$ in. These beams were reinforced on the drawspan by adding new top and bottom cover plates. Supports were placed under the fixed-span end floor-beams adjacent to the drawspan.

New latch bars were installed, and in placing them account had to be taken of the difference in the elevations of the piers. The east pier is 1 in. lower than the west pier, while the center pier supporting the drawspan is $\frac{1}{4}$ in. low on the east side. When wedges are drawn the west end tilts up 1 in. and the east end down a like amount. However, with the above errors in the elevations of piers it was possible to adjust the latch bars so they would trip when the span was turned end for end. The east fixed span was also found to be $1\frac{1}{8}$ in. out of line with the other two spans, probably due to the settlement of the abutment. The end adjacent to the drawspan was jacked into line.

Providing Clearance for Expansion—Since the abutments were constructed they apparently have been moved by the back fill, as the bottom chords were tight against the masonry and the rollers were out of position, as in Fig. 6. Also, the abutment end dams were tight against the end dams of the bridge and the street-car rails had no expansion joints. The end dams at the drawspan had been moved back several times and the ends of the stringers had been burnt off during hot summer weather to allow for expansion.

These conditions, together with the fact that the east fixed span was out of alignment, might account for the breaking of the original center casting. Binding be-

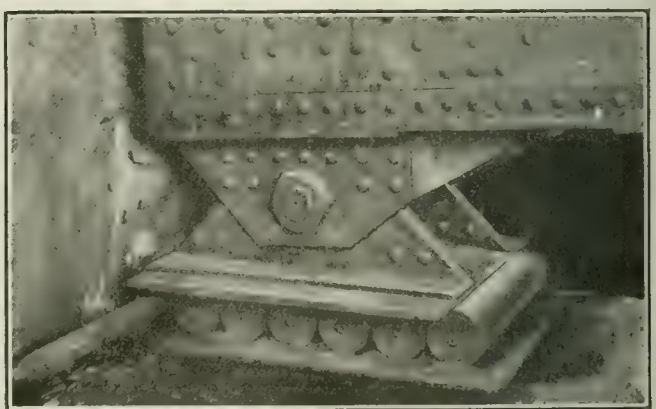


FIG. 6. FIXED-SPAN SHOE TIGHT AGAINST ABUTMENT

tween the east fixed span and the drawspan has always been a source of trouble.

The fixed spans were jacked up and the rollers were cleaned and reset with new anchor bolts, the end dams were reset, expansion joints placed in the street-car rails, and the abutments were cut back by oxyacetylene flame to allow for expansion of the fixed spans. At the drawspan all the end dams were removed and adjusted, being riveted with 1-in. rivets to new heavy beams supporting the buckle plates. (See Fig. 7, next page.) To adjust these end dams to the same clearance at both ends, the indicator used in centering the drum was attached to the end floor-beam of the drawspan and the

bridge was revolved, allowing the wheel of the indicator to cut a sharp line on top of each pier.

The floor system and the bottom chords were cleaned and painted; all gears and bearings were cleaned and automatic grease cups were installed; a lighting system was placed inside the drum, as well as platforms, stairways and oil pans. An indicator showing the exact location of the bridge in opening and closing was placed in the engine room to enable the engineer to control the swing span and avoid breaking the latch bars. Also, a brake was placed on the driving shaft for emergency use.

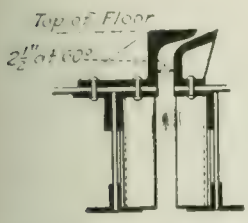


Fig. 7. BEAMS SUPPORT END DAMS

This work was carried out under the supervision of T. J. Wasser, county engineer of Hudson County, New Jersey. The Bethlehem Steel Bridge Corporation had the contract for fabricating and erecting all material. The writer acted as the corporation's erection foreman.

Telescopic Foundation Caissons Sunk in Bank Basement

Support New Vault Weighing 275 Tons—Quicksand Subsoil 45 Feet Deep—Work Did Not Disturb Bank Operations

By Frank H. Eastman
Foundation Engineer, New York City

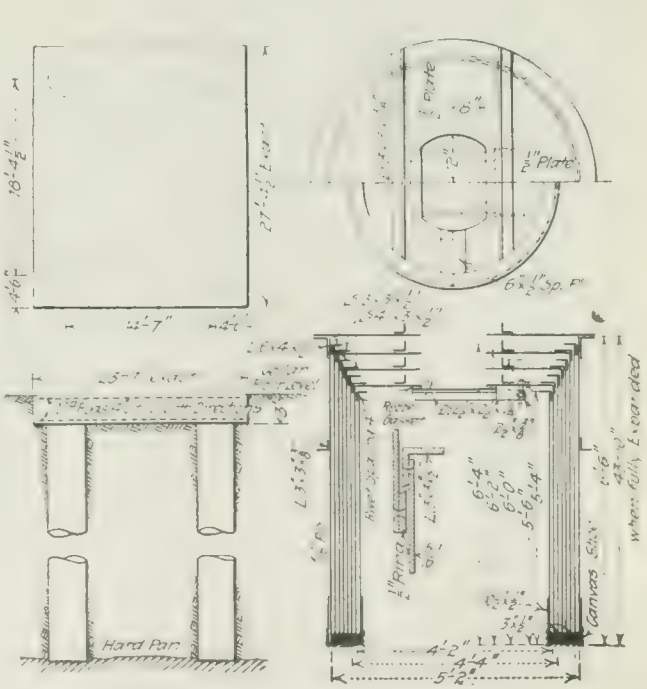
TELESCOPIC compressed-air caissons were used with complete success to make the foundation for a large vault in the basement of the Central Union Trust Co.'s building, 80 Broadway, New York, during the recent remodeling of the bank. Four new vaults were included in the work, the largest of which, 24 x 27 x 20 ft., weighing 275 tons, was so heavy a load that it was desired to found it on hardpan or bedrock as assurance against settlement. Construction had to be carried on in the low headroom and restricted space of the basement, however, and bank operations could not be interfered with; these facts and the danger of disturbing the footings of nearby building columns made the operation delicate and difficult. The William Young Co., contractor, New York City, carried out the work, its consulting engineer on the foundation being T. Kennard Thomson, who designed and constructed the foundation and proposed the use of the telescopic caissons.

Like many similar structures in lower New York, the Central Union Trust building rests on what has been termed a floating foundation, on the soil locally known as New York quicksand. This material has safely supported many fair-sized buildings and can be absolutely relied upon, provided it is not underdrained by subways or deeper excavation. The columns rest on brick piers supported on the quicksand only 1 ft. below the cellar floor. As the vault space would extend close to the footings of these piers on three sides and to the foundations of an existing vault on the fourth side, the sinking of deep foundations presented grave difficulties. Mr. Thomson planned to use a compressed-air system of shaft-sinking which he had used in 1909 for underpinning the Cambridge Building and had patented. In this system the top section of the shaft, constructed in the open, is capped with an air lock, and the shaft below is constructed by excavating in short sections and setting lining plates. This system was chosen for the vault foundations on the assumption that the excavation would be 30 ft. deep. On making borings, however, it was found that the piers would have to go down 45 ft., and Mr. Thomson therefore decided to adopt a modification of his plan patented by the late Ogden Merrill of the firm of Merrill-Ruckgaber Co., which was used by that firm at the New York Assay Office in 1909.

In this method the caisson sections are telescoped, and the sections below the upper or air-lock section are sunk successively by jacking down against the upper section. The method is more expensive than the Thomson shaft method, but avoids the necessity of excavating below the cutting edge to insert the lining segments. The quicksand of lower New York can nearly always be excavated a foot or two below the cutting edge without blowout. Thus, in a recent caisson foundation which the writer inspected, the cutting edge was stopped 2 ft. above hardpan and then 6 or 7 ft. of hardpan was removed without accident. This is probably the only time such a risk has been taken, and in the writer's opinion it should not be repeated. Excavating below the cutting edge in fine sand and clay and leaving a large excavation open for a day or two is a very different matter from excavating under a 4-ft. shaft for a few minutes while a lining plate is being set.

At the Central Union Trust Co. Building the final borings indicated rock or hardpan 62 ft. below street curb and about 45 ft. below cellar floor. Groundwater was found 8 ft. below the cellar floor. It was decided to build the four caissons of eight sections each, the bottom or smallest one being 4 ft. in diameter and 5 ft. 4 in. high (see sketch). The bottom ends of all sections were at the same level when the caisson was fully telescoped.

From the drawing it will be seen that inside the bottom of each section was riveted a band of 3 x ½-in. steel plate with the top edge beveled backward, adapted to engage the beveled edge of a steel angle riveted around the top of the next inner section. Thus, when any



TELESCOPIC CAISSONS USED IN CONSTRUCTING FOUNDATION FOR 275-TON BANK VAULT

section was forced down to its final position, the steel angle at its upper edge would catch on the steel rim plate at the bottom of the next outer section, thus preventing the sections from pulling apart.

Four diaphragms were built for each caisson, for the sake of stiffness and to afford frames for doors, using the cylinders themselves as air locks. When construction work started, however, it was found that 20-ft. headroom could be used, and, as a Mattson air lock was available that could be worked in this space, the diaphragm and doors inside the caissons were not used. This air lock was 4 ft. in diameter by 10 ft. high and had the outside door on the side of the lock.

The specifications called for the caisson sections to be calked against air pressure, but, as a matter of fact, it was necessary to use considerable putty and oakum to make them hold air; and, as this would not hold back water pressure from the outside, all the concreting was done under air pressure. Each section was 2 in. less in diameter than the one above it, so that, as the shell plates were $\frac{5}{16}$ in. and the edging bands $\frac{1}{2}$ in. thick, the theoretical clearance was $\frac{3}{16}$ in. on each side, or a total of $\frac{3}{8}$ in. For similar riveted work (the sections were butt-riveted) the clearance seems ample, while with welded sections less clearance would be needed.

Each caisson was set in a 6-ft. excavation made to receive it, so that the top was slightly below the cellar floor line. Then a trench about 3 ft. wide and deep was made all around and filled with concrete, to hold the caisson down against the air pressure. Four timber struts were set between the top of the caisson and the floor above, as extra safeguards.

Jacks Force Down Caisson Sections

Sinking was done by forcing the caisson sections down by jacks. The whole group of sections inside the first or outer one was shoved down by four 7-ton jacks (4 in. in diameter by 22 in. high) placed between the top of the second section and the inside of the roof of the outer section; until the nest was down far enough to give room for inserting these jacks they were placed between pairs of beams attached to the lower nest and to the air-lock shaft. When sinking had progressed to the point where the angle at the top of the second section came to bearing on the band at the foot of the outer section, four 6 x 6-in. oak struts were inserted to hold down the second section during the subsequent jacking. This process was repeated for the successive stages of sinking until the last section was down and the shaft bottomed in the hardpan.

When the first two caissons were delivered on the job, two 800-cu.ft. compressors were set up over the locations of the third and fourth caissons, with an air receiver over them. When the first two cylinders had been sunk and concreted, the compressors were moved to a position over them, permitting the third and fourth caissons to be sunk without going outside the space occupied by the vaults.

The compressors and the first two caissons arrived on the site Feb. 17, 1919, and air was put on Feb. 22. Eight men were worked in each shift.

Five working days of three eight-hour shifts each were required to complete one caisson shaft. The fourth caisson was completed Mar. 28, and the concrete vault-floor slab, 24 x 27 ft. by 2 ft. thick, was completed Apr. 9.

Excavation spoil was placed in tin pails, hoisted to the lock on top of the caisson and dumped; it was then put in canvas bags and carried out of the building at night. Concrete materials were brought in in the same way. Mixing was done by hand.

The first two caissons gave more or less trouble from jamming, making it quite difficult for the jacks to force the lower sections down. The last two caissons, however, though presumably the same as the first two in every respect, worked very freely, never requiring anything like the full strength of the jacks.

As each section went down, oakum and putty were used to seal all joints. This was found to be a cheap and effective material for sealing. These precautions were vital, for escape of compressed air or the entrance of material from the outside into the working chamber might have endangered the stability of the bank building.

The entire operation was carried on without the slightest accident and without any damage to the building. There was, however, an interesting occurrence during the sinking of the first caisson. The groundwater level suddenly rose about 9 ft. However, the water suddenly dropped back 10 ft. and gave no further trouble. No explanation of the peculiar occurrence was ever obtained. A leak in a water main or an extra high tide and wind might have been responsible. Needless to say, if such changes in the water level occur periodically the foundations of buildings now resting on quicksand may in time be seriously endangered.

The entire work of reconstruction in the Central Union Trust Co. Building was under the supervision of A. A. Macdonald, of the William Young Co., the contractor, and the writer was superintendent in charge for the company for the caisson foundation.

110-Foot Turntable With Adjustable Center

Anticipating the installation of new Mallet engines with 97-ft. $3\frac{3}{4}$-in. wheel base, the Pennsylvania R.R. has installed at Pitcairn, South Philadelphia, Erie, Kane and Renovo, Penn., and at Gardenville, N. Y., turntables 110 ft. long. Owing to the excessive depth which would be required for such a turntable if made center-bearing, and also because it is difficult to spot a locomotive of this size and weight with any degree of accuracy, it was decided to construct the turntable as a continuous girder supported at three points, with the weight of the table and its load distributed between the center bearings and the end trucks. Turntable tractors are provided to turn the new tables end for end in 60 sec. Two tractors are provided, either of which is capable of turning the table under emergency conditions. The maximum circumferential speed of the table is 240 ft. per minute. The adoption of a three-point support permitted the use of girders only 6 ft. deep, and reduced materially the depth of pit required. The center support is made adjustable by means of screw-operated wedges, the total range of adjustment being 1 in. The capacity of the center bearing is 860,000 lb., and it is fully grease-lubricated. The motors are equipped with solenoid brakes, which are applied instantly when the controller is turned off, and are released automatically when power is applied.

Hydraulicking Dam Embankment on Miami Flood-Control Project

Glacial Drift Excavated by Draglines, Hauled by Train to Hog Boxes, Mixed With Water and Then Pumped to Dam

ABOUT 9,000,000 cu.yd. of embankment construction is involved in the five retarding-basin dams of the Miami Valley flood-control operations. Not all of this yardage will be hydraulic fill, but so much will be that the work ranks as the largest of its kind. This season is the beginning of pumping, and ways that will later mark proved practice are being slowly worked out. Ultimately, records of hydraulicking will be precise and comprehensive, and a year from now an account of experience will be possible which will advance the definite knowledge of embankment construction of materials carried and deposited by water. Even now some of these lessons are foreshadowed, and a narrative of progress is useful.

Pumping has not proceeded far except for the dams at Taylorsville and at Englewood. There are about 1,200,000 cu.yd. in one and 3,500,000 cu.yd. in the other. The operations at these two dams, however, illustrate the two methods in handling materials hydraulically. One is to break down, sluice, distribute and deposit the earth wholly by water; the other is to excavate and transport the material mechanically and to employ water merely as the distributing and depositing agency. At all dams except Taylorsville and Lockington the latter method will prevail. It is, speaking generally, the adopted practice of the flood-control work and the special contribution of this work to the practice of hydraulic filling. At Taylorsville and Lockington special circumstances intervene to modify standard procedure.

At Englewood the material for embankment comes from a borrow pit in the valley 250 to 4000 ft. above the embankment. A cut 5 to 25 ft. deep, depending on the material encountered, is excavated over this area, and the material is hauled by trains to the dam, where it is dumped into a pit. From the pit, distribution is by pumping. This pit is called the "hog box," and the hog box is the ganglion of all the operations contributing to the embankment construction. At a conning tower here a trained inspector has every recording gage before his eyes and is in telephone connection with all critical points of the filling operations.

Two dragline excavators traversing the borrow pit area excavate and load to four trains, each having six to eight 12-cu.yd. dump cars and a 46-ton locomotive. The haul by train ranges from 600 ft. to 4000 ft. Two trains serve each excavator, and dump from a trestle into the hog box. The average is approximately 10 cu.yd. per car and 250 cars delivered per 10-hour day.

Operations at the hog box are explained by one of the views. The box is a rectangular structure with a railway track or trestle along one side, and it is located at the upstream toe of and about opposite the center of gravity of the fill. Its floor slopes from the trestle and also from each end to a low point, as at A, on each side of the transverse partition. Here there are gates which control the flow to an 8 x 10-ft. concrete sump covered by two 8-ft.-square grizzlies with 6 x 6-in. openings.

Four monitors, or hydraulic giants, move the materials in the hog box to the sump. Two of these, B and C, one at each end, face each other, and two, D and E, on the opposite side, face the trestle. Except to wash out a load stuck in a car, monitors D and E are seldom used. Two 10-in. pumps working to 135-ft. head



HOG BOX AT ENGLEWOOD TYPICAL OF HYDRAULIC FILLING METHODS AT MIAMI

supply water for the monitors. These pumps are arranged to operate either in series or parallel, but the power is so great that series operation has not yet been required and probably it never will be. Each pump is driven by a 100-hp. motor and has a capacity of 2000 gal. per minute. Any material, except lumps of indurated clay, which receives the attack of the monitor streams, is separated into its integral fragments before reaching the sump, and here the grizzlies remove the stones larger than six-inch.

Two centrifugal pumps, 15-in., pump from sump to embankment. Since the capacity of each of these pumps is 7000 gal. per minute, the monitors do not supply enough water, and the sump is connected by a 48-in. tunnel with the adjacent river. The monitors furnish 20% of the water and 80% is delivered by the tunnel. Each pump requires a 500-hp. motor.

At Taylorsville another set of conditions existed. The bulk of the dam is west of the river, and to form the new river channel and the emplacements for spillway and conduits at the east end of the dam a heavy cut had to be made east of the river. The earth portion of this cut is being pumped into the west embankment.

Embankment construction at Taylorsville is a thoroughgoing hydraulicking operation. The material loosened by blasting, principally on account of a single hard-clay stratum, is disintegrated by giants, sluiced to sumps and pumped into embankment. The equipment comprises three systems of pipes and pumps and two pump houses. The hill being cut down is on the east bank of the river, and the pump for hydraulic fill is located at its foot. This is a 15-in. motor-driven centrifugal pump of 5500-gal. capacity and 80-ft. maximum head. A trestle carries the discharge pipe across the river to the fill. The pump house for the jet pumps and the sluicing water pumps is on the west bank of the river. The jet pumps are two 1400-gal. 265-ft.-head centrifugals operated by 150-hp. motors. Their discharge pipe crosses the trestle to the 2½-in. giants in the cut. Two 5400-gal. 100-ft. head, 150-hp. pumps supply the sluicing water.

The volumes of material now being put into embankment are about 200 cu.yd. per hour at Englewood and 120 cu.yd. per hour at Taylorsville. Two pumps are operating at Englewood and one pump at Taylorsville. The volume of solids is from 7 to 8% of the total volume pumped. At Taylorsville measurements in fill show an increase of 25 to 50% over measurements in cut. Material in the cut is exceedingly dense and compact, and when broken up into its integral particles and redeposited, the coarse sizes at the edges of the fill and the fine sizes in the center, there is naturally a gain in space occupied.

The striking lesson of the pumping operations so far at both dams is the inability of cast-iron pump runners to withstand the wear. After handling 10,000 to 12,000 cu.yd., these runners are worn so as to be useless. Manganese steel runners are being substituted as fast as the old runners are worn out, and ultimately manganese shells will be employed. The new manganese runners show great endurance for the short time they have been operated, and appear to have solved the problem of wear.

The glacial drift of which the embankments are being built up suits hydraulic filling methods very perfectly. The gravelly portions break up and the clay ordinarily melts completely under the action of the jets. On the



GIANT BREAKS DOWN MATERIAL FOR HYDRAULIC FILL AT TAYLORSVILLE

fills the coarse and fine materials grade down well from edge to core. At Taylorsville a stratum of hard blue clay provides a variation from normal. The jets do not melt this clay. It breaks up with difficulty into fragments, which go through the pumps and discharge pipes intact, but are there rolled into almost perfect balls ranging in size from a grape fruit to a marble. These balls are deposited with the stones and pebbles of corresponding size. As there is an oversupply of fine material in the cut the balling up of this particular clay is rather an advantage. Blasting is necessary to insure successful action of the jets on the clay stratum.

Pipe lines are of three materials. For high-pressure lines to the giants, spiral riveted steel pipe is employed. Welded steel pipe delivers the material to the fill, and for sluicing water 18-in. wire-wound wood pipes are employed. At the end of the sluicing pipe in the cut at Taylorsville a 50-ft. length of canvas pipe has proved a decided convenience in quickly changing the direction of flow. At Taylorsville, also, side levees on the fill are built up by fine materials dropped through gates in the bottom of the final hundred feet of the discharge pipe. Similar levee construction at Englewood is being performed by dragline excavators traveling back and forth along the edges of the fill.

Construction and equipment of the hog boxes present two variations in floor structure and two in construction of grizzlies. At Englewood a hardwood floor of 2 x 4-in. stuff set close on edge is employed; at Germantown a 4-in. concrete floor has been built. These floors are



VOLUME OF 200 CU.YD. PER HOUR NOW BEING PUT INTO EMBANKMENT OF ENGLEWOOD DAM

subjected to heavy wear, and comparison of the two constructions promises useful data. At Englewood and Taylorsville the grizzlies or screens over the sumps are fixed, and stones too large to pass are removed by hand. This hand work is hard and disagreeable, and to eliminate it at Germantown a moving grizzly has been installed, which, it is expected, will automatically remove the oversize stones and deposit them in skips. This innovation is being watched carefully; its success will eliminate a disagreeable manual operation.

Hydraulicking methods, and, to a great extent, pump construction, have been worked out by the engineering staff of the Miami Conservancy District, of which Arthur E. Morgan is chief engineer, Charles H. Paul, assistant chief engineer, and C. H. Locher construction manager.

Traversing by a Thirty-Five Minute Angle Method

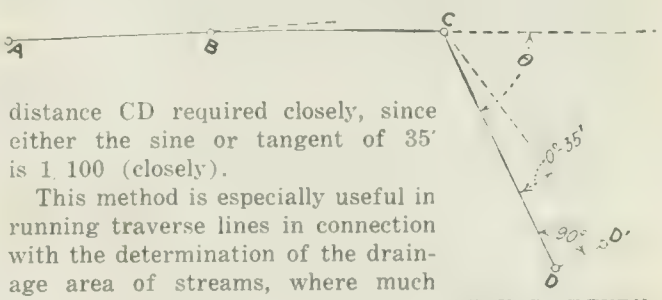
By John H. Sawkins
Schenectady, N. Y.

TRAVERSING by turning a 35′ angle and multiplying the offset by 100 to obtain the distance is a very convenient way to make a survey of this type. It gives results as close as the stadia and is perhaps superior to it, since the computation for distance is so simple. Besides, it is much quicker, especially in rough country, and all the equipment necessary is the transit, a cloth tape and two flagpoles.

The method is suggested by the accompanying sketch and is as follows:

Let ABCD be a portion of a transit traverse line, the *directions* of the lines AB,BC,CD, etc., being determined by deflection angles, as commonly used in railroad surveying. The *lengths* employing the 35′ method would be found as shown for line CD. With the transit at C, backsighted on B, the telescope is plunged and the point D (being selected by the front flagman) is sighted on, deflection angle θ being recorded to the right.

The front flagman then approximates a line DD′ at right angles to CD, and the transitman increasing or decreasing angle θ by *35 minutes*, lines in the flagman, who moves the flag along DD′ to some point at D′. Except for unusually long sights the line DD′ is short, and the approximation on the right angle CDD′ introduces little error. The flagman measures DD′ with a cloth tape, and this length times 100 gives the distance CD required closely, since either the sine or tangent of 35′ is 1.100 (closely).



METHOD OF TURNING ANGLE TO OBTAIN LENGTH OF TIME

This method is especially useful in running traverse lines in connection with the determination of the drainage area of streams, where much time could be saved in taking "shots" several thousand feet along the ridge line or divide. It would be impossible to take "shots" a mile or more in length by stadia, using a convenient length of stadia rod.

Sewage-Treatment Works at Langley Field, Virginia

Imhoff Tank With Receiving Bowls, Inlet Channels, Bar Screen, Distributing Channel With Downtakes —A Dosing Chamber, Ventilated Sprinkling Filters, and Final Settling Tanks to Be Added

By Thorndike Saville
Associate Professor of Sanitary Engineering, University of North Carolina, Chapel Hill

and

Carl L. Weil
Civil Engineer, New York City

UNUSUAL features of the Imhoff tank forming the unit of the Langley Field sewage-works thus far built are bowls and curved inlet channels to receive and break the force of the sewage discharged from the force mains leading from the ejectors, and a channel that distributes the sewage downward into the tank. Ultimately, a dosing chamber, a specially ventilated sprinkling filter and a final sedimentation tank will be added. Provision for possible chlorination of the effluent will be made.

Langley Field is the chief permanent aëronautical station of the United States. It is situated about four miles northwest of Hampton, Va., and occupies some 1769 acres between the northwest and southwest branches of Back River. The portion of the field given over to the town site drains into the southwest branch, a shallow tidal estuary.

The sewage is strictly domestic. There is, however, a considerable quantity of gasoline wastes from garages and hangars. This is a temporary condition, which will be eliminated as more permanent buildings are constructed from which independent drains, well trapped against gasoline, will be provided. The sewage is now partly, and eventually will be entirely, drained into two sets of Shone ejectors, located at opposite ends of the field, which deliver through 6-in. cast-iron force mains to the Imhoff tank.

The disposal plant is situated on a point of land (Fig. 1). The data upon which the Imhoff tank was designed are given in the accompanying table.

The sewage enters the Imhoff tank (Fig. 2) through the two force mains from the ejectors, which discharge into bowls in the screening platform. From these it flows through a curved channel, which is 12 in. wide at the upper end. It decreases to 10 in. at the portion where the screen is set. The screen consisted of four steel bars, ⅜ in. thick, 2 ft. wide and 4½ ft. long. These were set at an angle of approximately 14° with the horizontal and were spanned 2 in. on centers. Having passed the screen, the sewage flows to the curved distributing trough. In this are six circular openings, 6 in. in diameter, through which it flows into the hopper of the tank.

IMHOFF DATA, LANGLEY FIELD, VIRGINIA

General:	
Population (estimated) maximum	1,800
Average rate of flow, gal. per capita per day	100
Maximum rate of flow, gal. per capita per day	175
Sludge production, cubic feet per capita per day	0.00525
Imhoff tank, type, longitudinal horizontal flow:	
Width (interior), ft.	12
Length of water line (interior), ft.	30½
Minimum depth of water over top of sloping walls of chamber, feet	2.0
Minimum depth of water over slots at bottom walls of chamber, feet	9.5
Depth from top of dividing beam to bottom of sludge chamber	14.5
Total depth, feet	26.0
Number of slots	2
Horizontal width of each slot, inches	8
Clearance of each slot, inches	5
Length at elevation of slots, feet	20
Total capacity below minimum water line, gallons	16,180
Total capacity below ordinary maximum, gallons	16,850
Slope of long walls	1.43 on 1
Slope of long end walls	1.41 on 1
Cross-sectional area of chamber (normal), square feet	76.04
Cross-sectional area of chamber (average), square feet	70.50
Horizontal area, square feet	368.0

Hydraulic data:

Flow in Gallons per Day	Total in Second-Feet	Detention Period	Velocity in Feet Per Second: Normal	Average
Mean	175,000	0.272	2.25	0.0040
Maximum	306,250	0.475	1.32	0.0070

Inlet—Six holes each 6-inch diameter in bottom of influent channel
Outlet, six V-shaped weirs with angles of 90 degrees

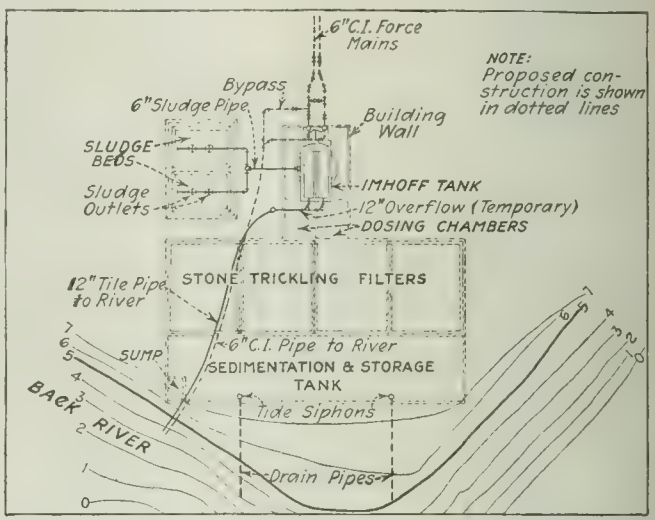


FIG. 1. LAYOUT OF LANGLEY FIELD SEWAGE-WORKS

The hemispherical bowl, into which the sewage discharges, and also the scrolled screening channel, were designed for converting into a reasonably quiet flow the sudden surges of sewage from discharges of the ejectors. This object has been satisfactorily achieved. The head on the ejectors, however, varies, and consequently it has been impossible so to regulate the flow that the sewage shall not spout up over the top of the bowls. This has been remedied by completing the spherical outline of the bowls by a galvanized-iron cover (see detail, Fig. 2). Figure 3 shows the sewage spouting from the uncovered bowl.

The sewage, dropping through the openings in the distributing trough (Fig. 4), falls upon the hopper end of the tank. The solids pass through the slots on each side of the triangular dividing beam, into the sludge-digestion compartment below. This storage space, computed to within 2 ft. of the slots, contains 3060 cu.ft. or 1.7 cu.ft. per capita. Based on a maximum population of 1800 and a contribution of 0.00525 cu.ft. of sludge per capita per day, there is capacity of nearly 11 months' sludge storage. Under conditions likely to obtain for a year or two, the population will not exceed 1,000 and the storage capacity will be sufficient for about 20 months. The sludge chamber will, therefore, have to be cleaned from once a year to once in 18 or 20 months, depending upon the population.

To aid in loosening the sludge when it is desired to pump it out through the sludge-discharge pipe, 2-in. lead water pipes have been placed as shown on section B-B. The sludge will be discharged by gravity under a 4-ft. head onto sludge-drying beds.

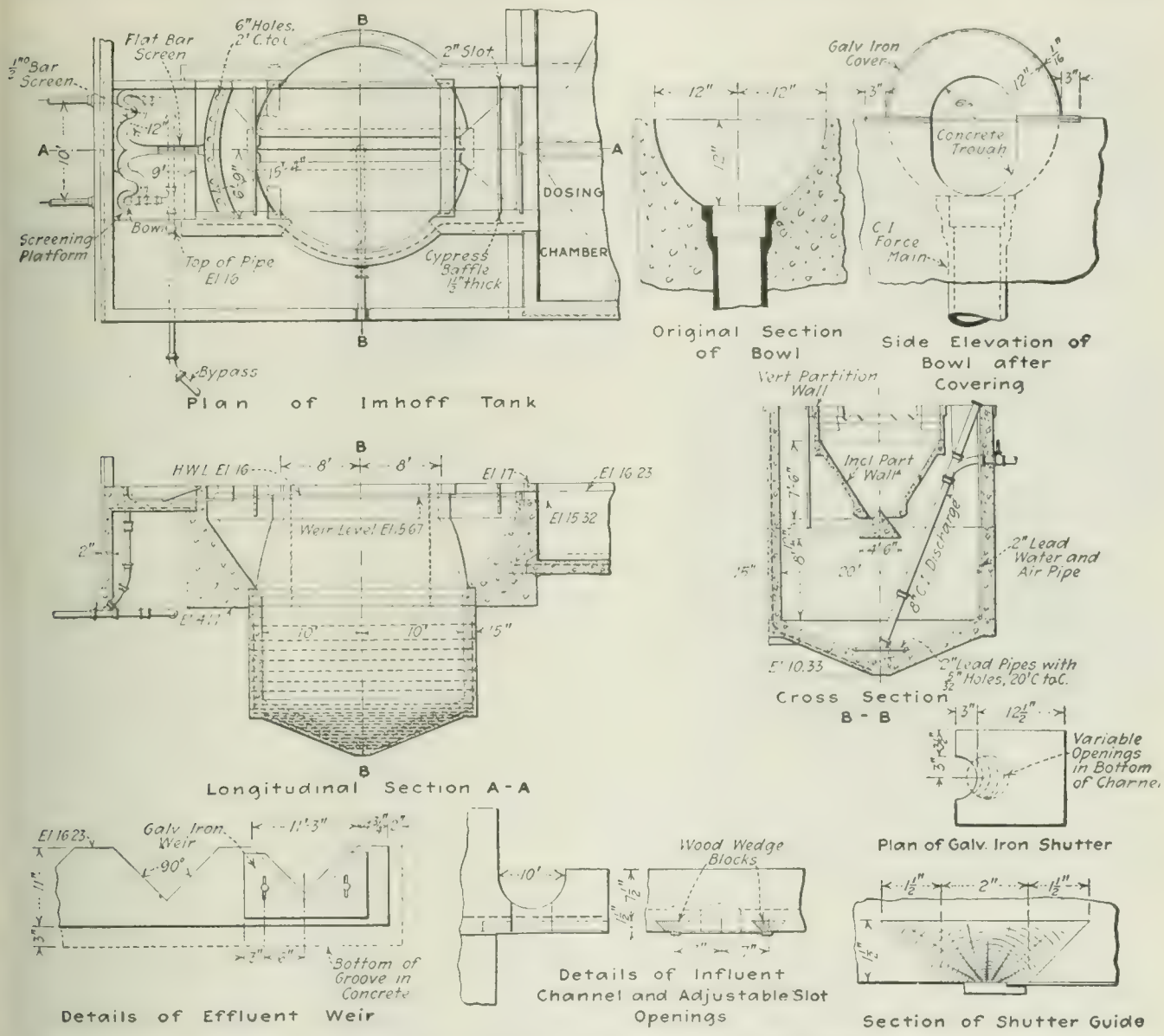


FIG. 2. INLET BOWLS AND CHANNELS, BAR SCREEN, DOWNTAKE DISTRIBUTING CHANNEL AND OTHER IMHOFF TANK DETAILS AT LANGLEY FIELD

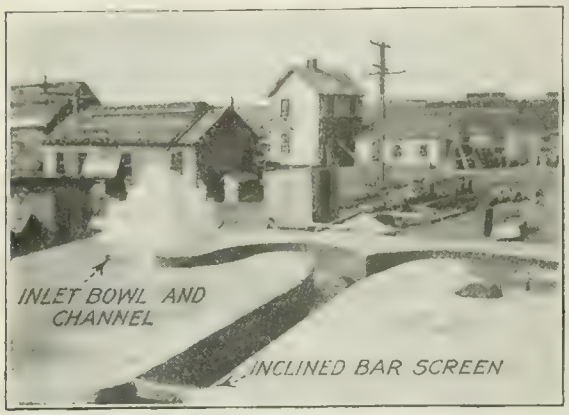
The sludge-drying beds present a total area of 1200 sq.ft. and allow for about 1-ft. depth of sludge. It will be some time before an effective area of 1 sq.ft. per person is exceeded. The beds are so arranged that if population growth makes more beds necessary they can be readily added to the existing beds. The beds as designed are of sufficient capacity to make it unnecessary to draw sludge more frequently than once a month. It is probable that these beds will have insufficient area to dry the sludge during wet months, and two additional beds have been recommended.

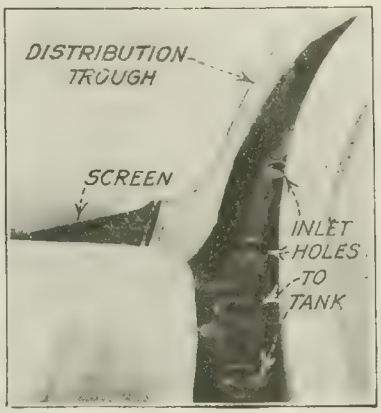
The liquid matter from the sewage flows through the compartment at rates and with detention periods shown in the table. From the settling compartment the liquid effluent passes over two sets of triangular notch weirs into the dosing chamber.

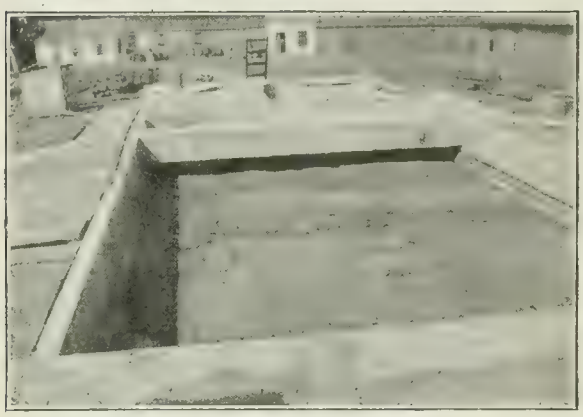
The dosing chamber contains approximately 14,000 gal. This is discharged by four 8-in. Miller siphons operating in pairs and discharging alternately upon each set of filter beds.

The filter beds (Fig. 5) are designed to treat 400,000 gal. per day. They are arranged in two units each of two beds. The units are dosed alternately by means of the siphons in the dosing chamber. The filters are to be of crushed stone, 6 ft. deep. The areas of each filter will be 2500 sq.ft., a total of 0.42 acres. The distribution of sewage is accomplished by means of Taylor nozzles. Nozzles giving a hexagonal spray have been used as providing the best aëration of sewage. These are spaced on a pattern which was devised for square sprays. In this manner it is believed that the best aëration, together with the best distribution, is accomplished.

The area and depth of the filters was determined by various factors. The depth of 6 ft. was all that could be allowed, on account of existing topography, and to attain the required head on the nozzles. The area was based on what was considered good practice, and upon consideration of the nitrogen load. At the Lawrence experimental filters it was shown (Report, Massachusetts State Board of Health, 1908) that for ordinary domestic sewage a nitrogen load of 10 grams per capita per day needed 13.3 cu.ft. per person, and for average sewage, with a nitrogen load of 15 grams per capita per







FIGS. 3 TO 5. GENERAL AND DETAILED VIEWS OF LANGLEY FIELD IMHOFF TANK

Fig. 3 shows incoming sewage spurting up from one of the two inlet bowls, due to the force of the discharge from the ejectors. This bowl was subsequently covered (see detail, Fig. 2). From the bowls the sewage flows through the curved inlet channel to an inclined bar screen, thence to a distributing channel (Fig. 4), from which it drops through circular holes to the Imhoff tank proper. The scum over the tank surface may be seen in Fig. 5, and beyond, the channels already mentioned may be traced.

day, there was needed 20 cu.ft. per person. These filters are designed to care for a population of 4000. Assuming average sewage at 15 cu.ft. per capita per day gives 60,000 cu.ft., which is met by these beds, 10,000 sq.ft. area and 6 ft. deep. As a matter of fact, the sewage is much more nearly domestic than average, and the filters will undoubtedly be able to treat more than 400,000 gal. per day without being overloaded.

Ventilation is obtained in two ways. Four brick chimneys made of hollow brick, with occasional openings, are placed on the center line of each filter unit. In addition, twelve chimneys, made of 6-in. terra-cotta pipe, with down hanging Y's, have been placed at the sides of each filter unit. This method of ventilation is somewhat original and, it is believed, will prove inexpensive and effective.

Distributor pipes are of tile and have been embedded approximately 2 ft. below the surface, both to prevent freezing and secure better distribution in and less clogging of risers. The floor drains are of split tile. Floors pitch at a grade of 1 in 300.

The sedimentation and storage tank is of 100,000 gal. capacity, giving six-hour storage at the maximum rate of flow of 400,000 gal. per day. This tank will remove the suspended matter in the effluent from the filters and will store the effluent to be discharged on the ebb tide. This is necessary because of lack of height in the beds, and is desirable from a sanitary standpoint. The effluent is discharged from the tank by means of a tide siphon, which operates automatically on the falling tide. In case of emergency, such as prolonged high storm tides, provision is made for pumping the effluent by a 300-gal. per minute centrifugal pump. A small chamber serves both as pump well and for applying chlorine for sterilization, should that be desirable.

The Imhoff tank was put in use Jan. 21. The first change was to provide hemispherical tops to the inlet bowls, as already described. The second was to remove the four bars forming the screen in the inlet chamber. These served only to interrupt toilet paper. It is believed that if sticks or other material greater than 2-in. in size should be passed through the ejectors it would be retained above the various holes in the distributing trough.

The sewage comes from the ejectors in a very fresh, highly comminuted state, with practically no settling solids. The rate of flow is 210,000 gal. per day or 175 gal. per capita per day. (March, 1919). Although this is a greatly excessive flow for the type of population here, and it will not be lessened until temporary boilers now used for heating are replaced by the permanent system, yet the flow even now is too slow for the proper operation of the tank. The influent is, under present conditions, more stable than the effluent. These conditions will be remedied as the population increases, as will follow after the completion of the permanent buildings on the field.

The sprinkling filter was designed in place of earlier proposed contact beds, because it was thought that this type of filter would best treat the relatively fresh effluent from the Imhoff tank. In the fresh and comminuted state in which the sewage now comes to the tank, there is relatively little settlement of large solids, and consequently the tank is "ripening" slowly and with very little odor. This is regarded as advantageous. It is expected that when the warmer season comes and the population increases, the tank will treat satisfactorily the larger flow. The effluent from the tank will be still fresher than at present and more susceptible to further treatment by sprinkling filters.

Scum Formed but Finally Broke Up

A layer of scum (Fig. 6) started to form on the tank soon after it was put in operation. In spite of the advice of various visitors to break this scum up or clean it off it was left undisturbed. The tank was apparently operating satisfactorily, with little odor, and the scum finally attained a thickness of 4 to 6 in. The scum was due chiefly to the excessive amount of grease, arising from poorly trapped outlets from mess halls. As more attention was paid to cleaning out grease traps, and as some of the mess halls were abandoned, the scum finally broke up without any action having been taken, and at present exists only as a viscous film not more than ½ in. thick.

As noted above, the effluent from the tank, while fairly clear, is not stable and is more putrescible than the influent. This condition will probably be main-

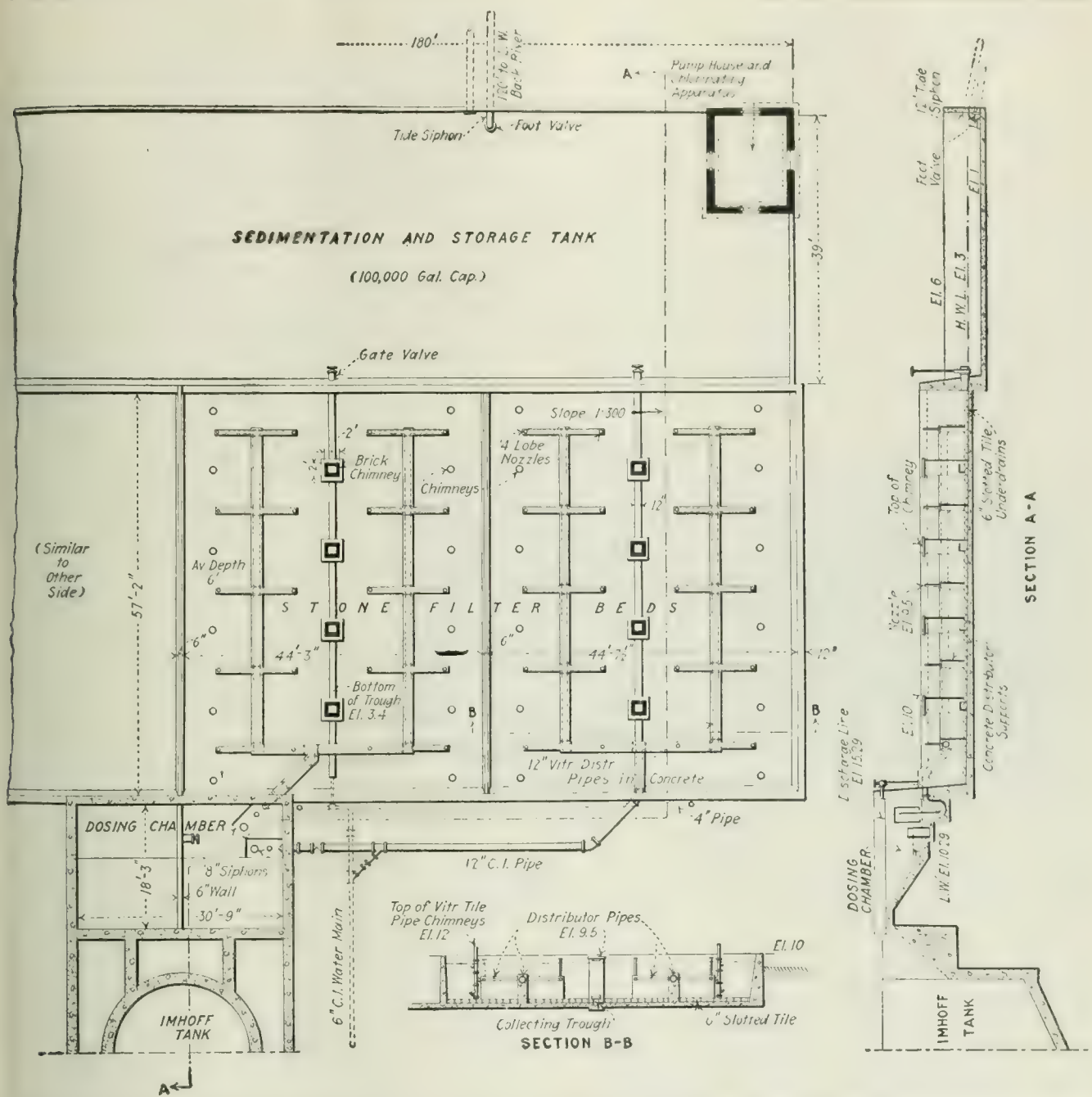


FIG. 6. DETAILS OF SEWAGE SPRINKLING FILTERS, SHOWING THEIR RELATION TO THE IMHOFF TANKS AND THE FINAL SEDIMENTATION AND STORAGE TANK

tained to a less extent even though the population and flow increase. In order to discharge a relatively stable as well as clear effluent into Back River, the sprinkling filters must be constructed as soon as possible. Every indication points to the fact that this combination of Imhoff tank and sprinkling filter will satisfactorily treat the sewage of a population ranging from 2000 to 4000 in number.

The general design of the sewage system and Imhoff tank was made by Ford Kurtz of the J. G. White Engineering Corporation, contractor for the first construction on the field. All of the construction and several changes in design were under the direction of the senior writer. The design of the sprinkling filters and the general plan of the disposal system were made by the writers. Col. William Lay Patterson and Major Howard were the commanding officers of the post during the construction work, and Capt. John McInerney was the officer in charge of construction. The senior writer was officer in charge of water-works, sewerage, and subsoil drainage.

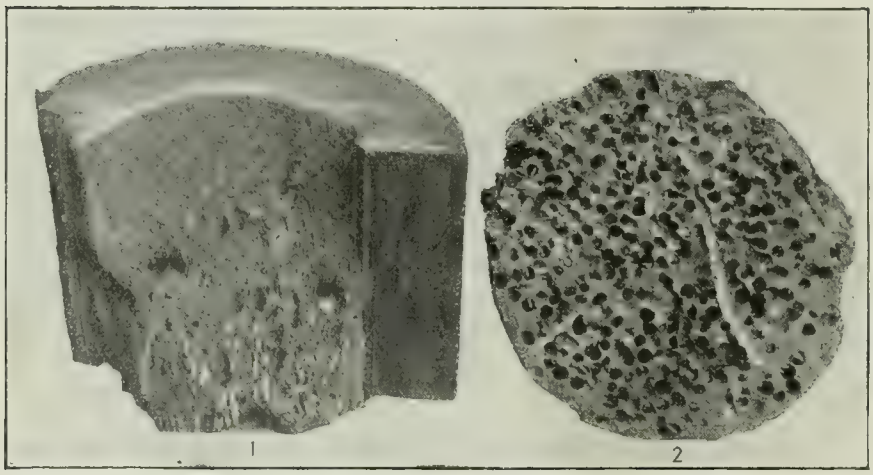
Closing Construction Openings In Dams

In building the 20-ft. reinforced cellular dam of the Rice Rips power plant in Maine, temporary openings were left in the deck. These, when the work was completed, were closed by means of reinforced-concrete slabs, constructed in place on the deck over the openings. Upon the cutting of the supporting cables, when it was desired to fill the pond, the slabs slid into place over the openings, making a permanent water-tight closure. The dam was built by the Central Maine Power Co. under the direction of T. H. Mason, chief engineer, after designs which were prepared by J. A. Leonard.

Creosote Piles Still Sound After 29-Year Service

Seventy Per Cent. of the 14,000 Piles Removed from Oakland Wharf Are Fit for Redriving—Effect of Borers

EFFECTIVE methods of treating wooden piles for salt-water service have become well established on the Pacific Coast, and in recent years there has been little modification of standard practice. Engineers are now agreed on the principles involved, and the dismantling of old wharves seems to check the accepted theories. An excellent example of this was the Long Wharf of the Southern Pacific R.R. on San Francisco Bay, which was removed this spring to make room for port improvements. This wharf consists of a long approach trestle extending out from the shore and terminating in five fingers or docks. It is the oldest creosoted pile structure thus far dismantled on the coast, and contained about 14,000 creosoted piles which have been in service for periods ranging from 18 to 29 years. Data about this structure were included in a general survey of creosoted pile experience on the Pacific Coast, which appeared in *Engineering Record* of July 18, 1914, p. 66.



SHOWING WHAT MARINE BORERS DO TO IMPROPERLY PROTECTED PILES

Left, section of untreated pile after less than two years service; taken from Long Wharf fender where creosoted piles were not used; borings by xylotrya; right, core destroyed by teredo and limnoria; mechanical injury of creosoted shell admitted borers; small holes by limnoria, large holes by teredo.

Of the 14,000 piles in the Long Wharf, interest centers particularly in 600 driven in February, 1890, in the section known as dock A, which supported coal bunkers. These piles, which were of Douglas fir, were well seasoned before being treated with creosote by the Bethel process in the fall of 1889. Records show that under a presure of 200 lb. per square inch and a temperature of 260° F., the piles absorbed 14.17 lb. of creosote per cubic foot. They were then driven by the company's regular crew in the ordinary way, no care being taken to protect them from injury more than was the custom in handling creosoted piles at that time. Of these 600 piles 33 were selected at random for test purposes when the wharf was being dismantled this year. Out of this number 22 (67%) were entirely sound; three (9%) had been slightly attacked by borers; six (18%) had been severely attacked, and two (6%) were so far damaged as to be unfit for further use. These percentages were typical of the entire lot, it is reported, and about 70% of the 600 are to be redriven just as they are.

The accompanying table shows the conditions in which piles, driven at different dates, were found:

Location	Date	Number Examined	Practically Intact		Attacked by Borers,		Unfit for Redriving	
			No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
Dock C	1897	523	333	64	74	14	116	22
Dock D	1899	1090	829	76	162	15	99	9
Dock E	1901	2485	1900	76	240	10	345	14

After careful examination it is reported that approximately 70% of the entire 14,000 piles are in condition suitable for redriving. The percentage rated as not suitable for redriving showed damage only between the mud line and the high-water mark and the other portions of these piles were in excellent condition.

The results of the very comprehensive and thorough study of piles made on this wharf are believed to confirm the theory that a creosoted pile is absolutely immune from attack of marine borers—whether teredo, limnoria, xylotrya or other varieties active in Pacific Coast waters—so long as the shell or portion of the pile impregnated with creosote remains intact. If the borer can gain access to the inner and untreated core without boring through creosoted wood, it is immaterial whether access be through defect in the wood, crack, knothole, mechanical injury or other means—the effect is the same. Once inside, the borer will work upward and downward in the untreated wood, but in no case have traces of borers been found in the creosoted section. It has been noted that the borings of the teredo cease when they reach a section where the limnoria are working, or, when the limnoria reach a section infested by the the teredo. The reason for this seems to be that the teredo is killed by sea water admitted through the borings of the limnoria.

The announcement that the old Long Wharf was to be dismantled aroused much interest among engineers interested in timber treatment. A delegation which went from Chicago especially to examine the piles represented the American Wood Preservers' Association and the Wood Preservers' Section of the American Railway Engineers' Association. The comprehensive and exhaustive report prepared by this joint committee is to be published for circulation at a later date.

Hay Lines Dam Slopes First Year

Straw or hay is often used as a lining for earth irrigation reservoir dams in Wyoming during the first one or two seasons. The purpose is to permit the fill to settle to a more permanent position before concrete or riprap is put on. The straw or hay is spread rather thickly and covered with chicken wire netting secured to the embankment by stakes. In some cases, stakes are driven before the covering wires are applied, being attached to them so that the wire can be held down close. This is the best practice, according to J. A. Whiting of Cheyenne, who has used the method on several dams. Hay is superior to straw; the latter is brittle and soon breaks up and is floated out by wave action.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Book Prices Barred by Postoffice

Through a Postoffice Department ruling, the prices of books reviewed or announced in this section will not be given for the present. Heretofore no pains have been spared to obtain and give these prices, because it was believed they were most useful information.

The Postoffice Department holds that under the zone postage act of Oct. 3, 1917, a book review must be classed as advertising matter, and must be subject to extra postage if the price of the book is given. *Engineering News-Record* would gladly pay the extra postage if that would end the matter, but under the law and ruling it would be compelled to stamp each book review "ADVERTISEMENT," which would be as untrue as "confessions" obtained under duress.

The reasoning of the Postoffice Department is substantially as follows: When publishers of books reviewed in a periodical carry advertisements of the same or other books in that journal, the fact indicates "the presence of a promotive or advertising element in the conduct of the department in which book reviews are inserted" in that publication. But "for the present" the Postoffice Department rules that where it is clear that book reviews are run for the benefit of readers rather than under an agreement with publishers, such reviews need not be classed as advertising, provided the prices are not given.

In other words, after the question is decided on its merits, the whole matter of whether a book review is an "advertisement" or not is nevertheless made to turn on whether the book price is given. Anyone who follows intelligently the book reviews in both technical and literary journals of standing knows that giving or withholding the price is no standard for deciding whether or not a review should be stamped "advertisement." And any such person also knows that the primary function of a book review is information to its readers and the raising of literary standards.

So far as information to the reader is concerned, it is quite true that the most important elements in a review are description and valuation of the book. But the reader also wishes some other facts bearing upon the possible purchase of the volume—such as size, binding, whether illustrated, the publisher and the price. All these the Postoffice Department permits the reviewing periodical to give except the price. The dollar mark brands the review as an "advertisement," even though the review declares that the book is worthless!

But why give the price? The Postoffice Department holds that where reviews are designed solely for the benefit of readers and not to promote sales, prices are "in no way essential to such purpose." Such an opinion is based on a confusion of ideas. Prices afford supplemental information to the reader who wishes to know not only whether the book is a good one, but also whether the price is commensurate with its probable value to him as deduced from the review. Why not give the reader of the review this useful information when it can be compressed within the space of two or three ems? The editor cannot begin to give elsewhere the same amount of useful information in so little space.

We have felt a special obligation to our readers in this matter of price giving, because so many of them are located in out-of-the-way places of this and other countries, without possible access to bookstores. This necessitates writing for prices, unless they are given in reviews or announcements, and writing may mean long delays, with serious inconveniences and professional and money losses. Technical books are for use, not amusement or general culture. The engineer wishes prompt news of their publication, their contents, their probable usefulness to him and their price. For the Postoffice to deny an essential element of this desired and useful information on the plea that price alone determines whether a review is an advertisement is to forbid a useful service for an unjustifiable reason.

Moreover, while the prices of books in many other fields—as fiction—are fairly well standardized, technical books vary widely in price and are often so costly as to make the element of cost largely controlling in determining whether an engineer shall buy a given new book. It is at the moment of reading the review that the reader of the review wishes to know the price, while all the other data are in mind.

Another point in the argument advanced by the Postoffice Department demands attention. In support of its ruling it states that two books reviewed in given issues of *Engineering News-Record* were announced both previously and subsequently in the advertising columns of the same journal. But it did not go far enough to ascertain, as it might have done by consulting the card index of our Engineering Literature section covering 18 years, that of the thousands of books reviewed only a small per cent. were ever advertised in the accompanying advertising pages, and that but few of the publishers of those books have even once used those pages in all that time. Moreover, many of the book notices in our Engineering Literature section are signed by outside reviewers, contributed by more than two hundred men, all of whom hold perfectly free pens in writing their reviews.

The sum and substance of the whole matter is that the readers of *Engineering News-Record*, and of scores of other periodicals as well, are denied highly useful information that can be conveyed in the fraction of a line, because of an arbitrary and unjust Postoffice Department ruling which makes the dollar mark in a book review the sole criterion of whether the review shall be classed as an "advertisement."

Test and Specification Data

TABLES OF MECHANICAL PROPERTIES OF MATERIALS—Washington, D. C.: Bureau of Standards. Paper; 8 x 10 in.; pp 51

Published in mimeographed form, this table of data on materials is intended to be revised from time to time. Test data and figures fixed by specifications are brought together in the table. Fifteen pages deal with ferrous metals. A somewhat larger space gives strength

data (hardness) for aluminum and its alloys and for copper alloys and miscellaneous metals. Finally, there are three pages on rubber, leather, and manila rope. The table is a useful list of reference data, though hardly as complete as might be desired—as indicated by the summary of subjects covered—and weak, in particular, on iron. It may be hoped that after some revision on the basis of experience it may be put out in printed form.

Boiler Feed-Water Reactions

REVIEWED BY GEORGE CHANDLER WHIPPLE
Professor of Sanitary Engineering, Harvard University

BOILER CHEMISTRY AND FEED-WATER SUPPLIES—By J. H. Paul, B.Sc., F. I. C., Consulting and Analytical Chemist. New York and London: Longmans, Green & Co. Cloth; 6 x 9 in.; pp. 242; illustrated.

This is a thorough discussion of the chemical reactions which are supposed to take place in a boiler, but most chemists will regard these reactions as fictitious and unsound. The idea which runs through the book is that the reactions between iron and carbonic acid and the carbonates result in the formation of such organic substances as formic acid, acetic acid, formaldehyde, etc., but the experiments offered in proof do not appear to be adequate or conclusive. That not all corrosion is due to dissolved oxygen, but that the water itself contributes oxygen by direct reaction with the iron at high temperatures, is well known, and it is not necessary to resort to the author's theory of organic acids to explain it.

In spite of this fanciful theory, the book contains some excellent material, with many analyses of boiler waters, and boiler scales and sludges. The results are all expressed in terms of combined acids and bases. No use is made of the new ideas of physical chemistry. One word of caution should be given. The author uses the term "free carbonic acid" to mean what is now commonly described as the "half-bound carbonic acid."

The book cannot be regarded as a sound treatise to be placed in the hands of engineers who do not understand chemistry.

Delaware River Bridge-Location Studies

DELAWARE RIVER BRIDGE AND TUNNEL COMMISSION: Report, 1919, to the Governor and General Assembly of the Commonwealth of Pennsylvania. Philadelphia, Penn.: The Commission, City Hall. Cloth; 7 x 10 in.; pp. 45; illustrated.

A notable study by Prof. Warren P. Laird, professor of architecture at the University of Pennsylvania, constitutes the body of this report. Thorough and keen massing of the traffic considerations which should influence the detail location of a bridge across the Delaware at Philadelphia is represented. In this field of bridge location our literature is scanty indeed, and the present report enriches it by a document of high value.

On Government Contracts

THE LAW OF GOVERNMENT CONTRACTS—By R. Preston Shealey, LL.M., Member of the Bar of the Supreme Court of the United States and of the District of Columbia. New York: Ronald Press Co. Cloth; 6 x 9 in.; pp. 300.

Possibly the greater usefulness of this volume to manufacturers and contractors who engage to supply materials to or to perform construction work for Uncle Sam will be in the general impression which will be gained that Federal contractual relations are sufficiently involved to require caution in fixing prices, promising delivery and discounting prompt payment. As a digest of the laws relating to Government contracts the book, so far as the layman in law may judge, is complete. A contractor for Government supplies or construction should read it to acquaint himself with its contents, place it convenient for reference when occasion for decision in any matter of contract agreement becomes necessary—and then play safe by calling in competent legal advice. The last statement is not uttered in sarcasm; it is added because the ramifications of Government authority and procedure in contractual relations are too many for the layman to evaluate correctly with only the aid of book instructions, however good that book may be.

The book consists of five parts—on Definitions, Implied Contracts, Performance, Breach and Procedure—and of four appendixes, the last a reprint of statutes relating to contracts with the United States. As previously stated, each part can be read to advantage, but if any parts are to be selected for special reading they may well be the section on Procedure and the appendix on Practical Suggestions. Special merits of the book are that, so far as may be, it is written in the language of the business man and not of the lawyer, and that it contains a good index.

Another Miami Technical Report

CONTRACT FORMS AND SPECIFICATIONS: With Atlas of Selected Contract and Information Drawings, to Accompany Part VI, Contract Forms and Specifications—By the Engineering Staff of the Miami Conservancy District. Dayton, Ohio: The District. Paper; 6 x 9 in.; pp. 192; illustrated.

Many engineers will welcome the opportunity afforded to obtain the standard contract forms and specifications for the dams and channel improvements of the great flood-protection works being executed by the Miami Conservancy District. The atlas contains 139 representative selections of plans made preparatory to letting contracts, and will also be widely appreciated.

The Draftsman as an Engineer

THE DRAFTSMAN—By Robert W. Shelmire. Chicago: The Scientific Publishing Bureau. Cloth; 5¼ x 8¾ in.; pp. 94.

That the draftsman is an engineer, that he should have more recognition and higher pay, and that organization is the only way in which he can secure such advancement, are the ideas presented by the author, but as to organizing he says, "the union method is beneath the intelligence of draftsmen." Working conditions and office management are discussed mainly in regard to unsatisfactory and undesirable practice. It would seem that more might have been said as to the better grades of offices, which probably are not so few as might be implied from the book. Employment, compensation and patents are other subjects taken up. The book deals with the social and business aspects rather than the technical side of the draftsman's occupation, and seems to bear rather heavily on existing unfavorable conditions, as a basis for advocating the adoption of higher standards and better methods on the part of the employers.

Taking Labor Into Partnership

INDUSTRIAL GOOD-WILL—By John R. Commons, University of Wisconsin. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 213.

Starting with the old theory that labor is a commodity, and its historical successor, that labor is a machine, the author speedily reaches his main thesis of industrial good-will as the solution of current problems of labor and capital. Good-will is treated primarily

in its relation to labor turnover, but the author is not confined to so narrow a conception.

Having considered employee and employer, the relations of both to the broader interests of the public are taken up. Next there is a chapter on "Democracy," in which the author urges that neither the individualism of the French revolutionists nor, at the other extreme, the class socialism of the Bolshevists, is truly democratic, but that all interests must be represented in settling our industrial problems, in accordance with the principles of representative government. Workmen's compensation, security of employment and wages, insurance, health, shop committees, education, loyalty, personality, and the special labor problems incident to industrial depressions, are each and all reviewed. In his concluding chapter, "The World," the author summarizes briefly and forcibly his opinions as to why the predictions announced seventy years ago by Karl Marx and his fellow Socialists in their "Communist Manifesto" have not come true.

The book is a concise, closely reasoned discussion of some of the great labor, social, industrial and governmental problems of the day. The style is so clear and the discussion so brief that the book can be easily read in an hour or two. The author is well known among economists, labor leaders and publicists for his long, keen and discriminating studies in the fields of labor and economics.

Electric Power Transmission

ELECTRIC POWER TRANSMISSION: Principles and Calculations; Including a Revision of "Overhead Electric Power Transmission"—By Alfred Still, Professor of Electrical Design, Purdue University; Member of the Institution of Electrical Engineers, Etc. Second Edition, Revised and Enlarged. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 407; illustrated.

The addition of a chapter on underground conduits has led to a change of title in the present edition of this book. The first edition, entitled "Overhead Electric Power Transmission," was reviewed at length and, in general, favorably, by C. D. Gray in *Engineering News* of Nov. 13, 1913, p. 996. In the present edition much of the material presented in the original issue has been replaced by new material, and portions of the appendixes to the first edition have been incorporated in the text. Some of the changes seem to be in line with suggestions made in the review by Mr. Gray already mentioned.

Holding Laborers

LABOR TURNOVER, LOYALTY AND OUTPUT: A Consideration of the Trend of the Times as Shown by the Results of War Activities in the Machine Shops and Elsewhere—By Fred H. Colvin, Associate Editor *American Machinist*, M. Am. Soc. M. E., and Franklin Institute. New York: McGraw-Hill Book Co., Inc. Cloth; 5 x 8 in.; pp. 152; illustrated.

Labor turnover of the factory and not of the construction job is discussed in this little book. There is, however, enough similarity at points between the two kinds of employment to command the interest of the construction manager in what the author has to tell of the means adopted to stabilize factory labor. It is the thesis of the author that efficiency—including, among other things, a stable working force—is directly proportional to the interest of the workman in his work. To create and maintain this intense interest is, consequently, the prime task of the works manager in the direction of efficiency engineering. The author develops his thesis in the first three chapters, entitled "Lack of Interest and Labor Turnover," "Building an Organization," and "Forgetting the Human Element," and in doing so makes an excellent case against the once numerous efficiency experts who gave their chief attention to dehumanizing production processes.

In the succeeding chapters, entitled "Securing Interests by Instruction," "Instruction in the Shop," "Non-financial Incentives," "The Employment Manager," "Latest Ideas of Leading Men," and "Collective Bargaining," examples are given of methods employed to arouse interest and develop loyalty. These examples are from shop management, but the fundamental principles which they demonstrate are common to industry, including engineering construction. The construction manager will find but little in this book which he can apply directly in his operations, but he will find a number of broad policies, stated very broadly, which he can work over to suit his different needs.

Castigliano Translated

ELASTIC STRESSES IN STRUCTURES: Translated from Castigliano's "Theorem de L'Equibre des Systemes Elastiques et Ses Applications"—By Ewart S. Andrews, B.Sc., Eng. (Lond.) Consulting Engineer, etc. London: Scott, Greenwood & Son. New York: D. Van Nostrand Co. Cloth; 7 x 10 in.; pp. 360; folding plates.

A translation of Castigliano's epoch-making work, published forty years ago, is here made available in the English language for the first time. The translator has endeavored to render the original accurately, with a change only in the mathematical notations. The work develops stress calculations for various types of framed structures by the method of least work. In practice, there has been no place for the application of this method to ordinary stresses, statically determined. Therefore, a great deal of the author's teachings and illustrations will prove to have little practical value. Its instructional and inspirational value, of course, is still great, and on this score the book deserves a place in every technical library that aims to give representation to analytical science.

Railways of India

HISTORY OF INDIAN RAILWAYS, Constructed and in Progress; Corrected up to Mar. 31, 1918. Simla, India: Railway Board. Paper; 8 x 13 in.; pp. 249.

This might more appropriately be called "Histories of the Indian Railways," since it gives statistical facts and figures for each railway, but it is in no sense a history of the railway system of India and contains no general summary or description of that system or its operation. It seems doubtful that the character of the information warrants the term "history" even as to the individual systems, and this information relates mainly to the period since each line was taken over by the Government. The railways are classified by width of gage and listed alphabetically for each class, except that some narrow-gage branches are listed with their broad-gage parent lines.

The information includes the length and date of opening of each line (or of the various sections of large systems) and the series of contracts with the Government as to operation and finance, together with statistical tables of earnings and expenses. Brief notes are given as to ruling grades, sharpest curves and construction of track, but no mention is made of structures, equipment or traffic. The "history" must be classed as an official "dry-as-dust" publication of little interest to any but those connected with or having business relations with the railways of India.

PUBLICATIONS RECEIVED

Under a Postoffice Department ruling made applicable to *Engineering News-Record* in July, 1919, it is no longer possible to give the prices of new publications announced under this head or of books reviewed in the preceding columns. Readers will therefore have to obtain this information as best they can. Most of the public documents and of the pamphlets announced may be obtained free on application, or at least by paying postage. So far as possible, the name and address of the publisher of each book and pamphlet are given in each entry.

ABRASIVES & ABRASIVE WHEELS: Their Nature, Manufacture and Use; A Complete Treatise on the Manufacture and Practical Use of Abrasives, Abrasive Wheels and Grinding Operations—By Fred B. Jacobs, New York: The Norman W. Henley Publishing Co. Cloth: 6 x 9 in.; pp. 338; illustrated.

AN AMERICAN LABOR POLICY—By Julius Henry Cohen, Author of "Law and Order in Industry," "The Law: Business or Profession?" "Commercial Arbitration and the Law." New York: The Macmillan Co. Cloth; 5 x 8 in.; pp. 110.

ANALYSIS OF BABBITT—By James Brakes, Chief Chemist, Chateaugay Ore & Iron Co., Member of the American Chemical Society, etc. Troy, New York: Allen Book & Printing Co. Cloth; 5 x 7 in.; pp. 169.
Designed to place before the mining, civil, electrical and mechanical engineer, and others who have had chemical analytical training, a small practical book on the analysis and manufacture of babbitt.

APPLIED CALCULUS: Principles and Applications; Essentials for Students and Engineers—By Robert Gibbes Thomas, Professor of Mathematics and Engineering at The Citadel, The Military College of South Carolina. New York: D. Van Nostrand Co. Flexible Cover; 5 x 8 in.; pp. 490; illustrated.

BIBLIOGRAPHY OF PETROLEUM AND ALLIED SUBstances in 1916—By E. H. Burroughs. Washington, D. C.: Bureau of Mines, Paper; 6 x 9 in.; pp. 159. 20c. from Superintendent of Documents.

BURNING STEAM SIZES OF ANTHRACITE WITH OR WITHout admixture of soft coal: Reprint of Engineering Bulletin No. 5; Prepared by the United States Fuel Administration in Collaboration with the Bureau of Mines. Washington, D. C.: Bureau of Mines. Paper; 6 x 9 in.; pp. 8; illustrated. 5c. from Superintendent of Documents.

CALIFORNIA BOARD OF STATE HARBOR COMMISSIONERS: Report, 1916-18, Submitted by the Commissioners, Arthur Arlett, President; John H. McCallum, Harry H. Cosgriff. San Francisco, Calif.: The Board. Paper; 6 x 9 in.; pp. 116; illustrated.

CANAL STATISTICS FOR THE SEASON OF NAVIGATION, 1918—Ottawa, Can.: Department of Railways and Canals. Paper; 6 x 9 in.; pp. 33.

CHAMBER OF COMMERCE OF THE UNITED STATES: Seventh Annual Meeting, May 1, 1919. Washington, D. C.: The Chamber. Paper; 6 x 9 in.; pp. 80.

COMMENTS ON THE RAILROAD PROBLEM—By Robert S. Lovett, President, Union Pacific System. New York: The Author. Paper; 5 x 8 in.; pp. 76.

COMMERCIAL POLICY IN WAR TIME AND AFTER: A Study of the Application of Democratic Ideas to International Commercial Relations—By William Smith Culbertson, Member of the United States Tariff Commission; With an introduction by Henry C. Emery, Sometime Chairman of the Tariff Board. New York and London: D. Appleton and Co. Cloth; 5 x 8 in.; pp. 418.
Broadly speaking, this book (1) reviews the effect of the war on American industries that enter foreign trade; (2) discusses the commercial policies of the United States with special reference to the tariff and to national control of our foreign commercial activities; (3) and, finally, it considers world commercial policies, ending with the chapter headed "Towards World Democracy." The author believes that nationalism and internationalism are both essential and should be complementary, not antagonistic.

CONNECTICUT PUBLIC UTILITIES COMMISSION: Report, 1918. Hartford, Conn.: The Commission. Cloth; 6 x 9 in.; pp. 684.

A CONTRIBUTION TO THE HYDROLOGY OF THE SAN LUIS Valley, Colorado—By William P. Headden. Reprinted from the "Proceedings" of the Colorado Scientific Society, Vol. XI, pp. 223-238. Denver, Colo.: The Society. Paper; 6 x 9 in; pp. 14.

COST KEEPING FOR SMALL METAL MINES—By J. C. Pickering. Washington, D. C.: Bureau of Mines. Paper; 6 x 9 in.; pp. 46. 10c. from Superintendent of Documents

DISABLED SOLDIERS' AND SAILORS' PENSIONS AND Training—By Edward T. Devine, Professor of Social Economy, Columbia University; Assisted by Lilian Brandt. (Preliminary Economic Studies of the War No. 12, Carneigie Endowment for International Peace) New York: Oxford University Press. Paper; 7 x 10 in.; pp. 471.

EMPLOYMENT MANAGEMENT, EMPLOYEE REPRESENTAtion and Industrial Democracy: Address Delivered before the National Association of Employment Managers, Cleveland, 1919. Washington, D. C.: U. S. Department of Labor. Paper; 6 x 9 in.; pp. 15.

ILLINOIS HIGHWAY IMPROVEMENT BLUE BOOK: A Reference for Illinois Highway Officials, and a Guide for other States That Desire to Copy "The Illinois Plan." Chicago, Ill.: Illinois Highway Improvement Association. Paper; 6 x 9 in.; pp. 136; illustrated.
Contains a complete description of the methods used in promoting state highway-aid legislation in Illinois and in winning votes for a $60,000,000 bond issue.

AN INVESTIGATION OF THE LOUSE PROBLEM—By William Moore, B.A., Associate Professor of Entomology in the University of Minnesota, and Arthur Douglass Hirschfelder, M.D., Professor of Pharmacology in the University of Minnesota. Research Publications of the University of Minnesota. Minneapolis, Minn.: The University. Paper; 7 x 10 in.; pp. 86; illustrated.
A wartime study which may be useful to medical officers and sanitary engineers in charge of contractors' and other camps.

AN INVESTIGATION OF THE STRESSES IN THE TRANverse Bent for Steel Mill Buildings—By C. S. Sperry. Reprinted from the "Proceedings" of the Colorado Scientific Society, Vol. XI, pp. 253-268. Denver, Colo.: The Society. Paper; 6 x 9 in.; pp. 14; illustrated.

MINING OPERATIONS FOR GOLD, COAL, ETC., IN THE Province of British Columbia: Report of the Minister of Mines, 1918. Victoria, B. C., Can.: The Minister. Paper; 7 x 10 in.; pp. 510; illustrated.

NATIONAL DEPARTMENT OF PUBLIC WORKS: Proceedings of Conference Called by Engineering Council, Apr. 23-25, 1919, Chicago, Ill. Address The Council, 29 W. 39th St., New York City. Paper; 6 x 9 in.; pp. 112.

A NATIONAL LUMBER AND FOREST POLICY—By Henry S. Graves, Chief Forester, Forest Service. Address before the American Lumber Congress, Chicago, Apr. 16, 1919. Washington, D. C.: U. S. Department of Agriculture. Paper; 6 x 9 in.; pp. 14.

ONTARIO HYDRO-ELECTRIC POWER COMMISSION: Annual Report, 1918. Toronto, Can.: The Commission. Paper; 7 x 10 in.; pp. 319; illustrated.

PACIFIC PORTS: Annual Number, 1919, Fifth Edition. Seattle, Wash.: Pacific Ports, Inc. Flexible Cover; 8 x 11 in.; pp. 550; illlustrated.
Information of value to shippers at all of the ports of the Pacific, in every country, are given in this annual. Further data on exports and the export business make up the remainder of the book.

PHYSICAL AND CHEMICAL TESTS ON THE COMMERCIAL Marbles of the United States—By D. W. Kessler, Assistant Engineer Physicist, Bureau of Standards. Washington, D. C.: Bureau of Standards. Paper; 7 x 10 in.; pp. 53; illustrated. Copies free upon request from the Bureau of Standards.

PRACTICAL APPLICATION OF THE METHODS RECENTLY Discovered for the Control of the Sprinkling Sewage Filter Fly—By Thomas J. Headlee, Ph.D., Entomologist of the New Jersey Agricultural Experiment Stations and State Entomologist. New Brunswick, N. J.: The Author. Paper; 6 x 9 in.; pp. 5; illustrated.
Enlarges somewhat, chiefly from the entomological side, information given by the same author in *Engineering News-Record* of Sept. 19, 1918, p. 533.

RAILWAY NATIONALIZATION IN JAPAN: Report, 1907-17, of Ten Years' Progress Under State Management. Tokyo, Japan: Imperial Government Rys. of Japan. Paper; 8 x 12 in.; pp. 206; illustrated.

SAFETY IN THE CONSTRUCTION AND USE OF LADDERS—By R. T. Solensten, Assistant Secretary, National Safety Council. Madison, Wis.: Industrial Commission of Wisconsin. Paper; 6 x 9 in.; pp. 16; illustrated.

SIXTH NATIONAL FOREIGN TRADE CONVENTION, REport, 1919. New York: National Foreign Trade Convention Headquarters. Cloth; 6 x 9 in.; pp. 649.

STONE IN 1917—By G. F. Loughlin and A. T. Coons. Washington, D. C.: U. S. Geological Survey. Paper; 6 x 9 in.; pp. 67.

A TEXT-BOOK OF HEAT AND HEAT ENGINES: Specially Arranged for the Use of Engineers Qualifying for the Institution of Civil Engineers, Etc.—By Andrew Jamieson, M. Inst. C.E., formerly Professor of Engineering in the Royal Technical College, Glasgow. Vol. I. Eighteenth Edition, Revised by Edward S. Andrews, B.Sc.Eng. (Lond.) London, Eng.: Charles Griffin & Co., Ltd. Cloth; 5 x 8 in.; pp. 551; illustrated.
In the present revision of this textbook, two volumes were deemed necessary on account of increased size. Thermo-dynamics, entropy, steam boilers and turbines and internal combustion engines have been left for Vol. II, now in preparation.

TIMBER: Its Strength, Seasoning, and Grading—By Harold S. Betts, M.E., Forest Service, U. S. Department of Agriculture. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 234; illustrated.

TREE TELEPHONY AND TELEGRAPHY—By Maj. Gen. George O. Squier, Chief Signal Officer, U. S. A., Member of the Institute. Reprinted from the *Journal of the Franklin Institute*, June, 1919. Philadelphia, Penn.: J. B. Lippincott Co. Paper; 6 x 9 in.; pp. 30; illustrated.

TWELFTH STREET, ST. LOUIS' MOST NEEDED COMMERcial Thoroughfare—By Harland Bartholomew, Engineer, City Plan Commission, St. Louis, Mo. Paper; 8 x 11 in.; pp. 15; illustrated.
Outlines a street-widening project for the benefit of a large part of the population of St. Louis, and shows proposed assessment area for distributing the cost.

VERMONT MINERAL INDUSTRIES AND GEOLOGY, 1917-18: Report of George H. Perkins, State Geologist and Professor of Geology, University of Vermont. Burlington, Vt. Cloth; 6 x 9 in.; pp. 247; illustrated.

WISCONSIN HIGHWAY MAINTENANCE: Devoted Especially to Patrol Maintenance on the State Trunk Highway System—Compiled by J. P. Donaghey, Maintenance Engineer, Wisconsin Highway Commission. Madison, Wis.: The Commission Paper; 6 x 9 in.; pp. 95; illustrated.
Designed for patrolmen and maintenance foremen, with special reference to earth roads. Much of the information given follows about the same lines as that presented in an article by A. R. Hirst, state highway engineer of Wisconsin, in *Engineering News-Record* of Dec. 10, 1918, p. 1128.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Illinois Brick Paving Specifications

Sir—On Apr. 23, 1919, the Illinois State Highway Department asked for bids for the construction of the unfinished sections of the Lincoln and Dixie Highways. Competitive bids were asked on concrete, brick, and bituminous macadam on a concrete base. No bids were received on brick, and the work was let for concrete construction. The question naturally arises, Why were no bids received on brick?

It is believed that a partial explanation of this condition can be found in the specifications themselves, as described in an article by the Illinois State Highway Engineer in *Engineering News-Record* of May 8, 1919, p. 905. It is there disclosed that Illinois has exclusively adopted the *rigid* type of construction as the standard for its primary-road system, and that the basis for this standard is "a concrete slab, 7 in. at the side and 8 in. at the center for 16- to 18-ft. widths." The only other types considered as suitable for this system are "monolithic brick" and "bituminous concrete on a concrete base." The nonrigid designs of brick and other pavements are barred. Brick, therefore, to be admitted in the Illinois program, must come in by way of one design, monolithic.

Considering the letting mentioned, and the engineer's paper, I should like to present three questions: (1) Is it wise to commit the state program to the rigid type of pavement? (2) If the rigid type is to be adopted, is it not designed too strong? (3) Were competitive bids on the several materials asked for on a fair basis?

Rigid Pavements

The action of the elements—contraction and expansion from temperature, and moisture changes—must be considered, especially in rigid pavements. After all our experience, is it safe to say that a general rule can be adopted to prevent damage from such causes? It is evident that no general design to overcome such stresses can be adopted, because the conditions are so many and varied. The slab is chemically bonded together as one stone. This composition is sensitive to thermal stresses and the impact of traffic. If the aggregates are uniformly hard, and the concrete mix is of the same quality throughout the slab, it can stand its own expansion and contraction better. The selection of aggregates, therefore, is of great importance. In speaking of rigid types, whether monolithic brick or concrete, they should be regarded as one, for in principle of construction and rigidity they are the same. To increase the depth of the slab does not prevent shrinkage cracks—perhaps only retards the action.

If there were not in existence thousands of miles of gravel, asphaltic-macadam, crushed-stone and Tarvia roads, and highways composed of brick laid on compacted gravel or broken stone, all doing good service, and having only one fault, then this theory of pavements (rigid, and rigid only) might be more nearly correct. The fact is, the universal road of the world is a flexible pavement. The "one fault" above mentioned is its lack of durable wearing surface.

Observe the heavily traveled roads through South Chicago, Hammond and Gary, leading through the steel district. The well graded roads shed the water to the side; there are ample ditches—yet the roads wear out. They do not break through and sink under traffic for lack of "beam strength." They go into holes because the aggregate is either ground to pieces or kicked out of place by traffic. It is the surface which fails, not the base. The base, like the ballast under the railroad, is porous and self-draining, if made of gravel or broken stone. This, when compacted, interlocks, is resilient and yielding to a degree, and sustains the heaviest loads. Can it be said these roads only lack the principle of rigidity to assure their traffic-resisting qualities? We would recommend covering the surface with a granite-like unit, having a face about 3 x 9 in., to assure the lasting quality of these roads.

Slabs Made Too Rigid

What evidence has the state highway department to justify it in increasing the depth of the rigid slab? C. C. Wiley, associate in civil engineering and head of the road school, University of Illinois (see *Brick and Clay Record* of June, 1919, p. 1067) says, "the rich mixtures for concrete roads were not adopted to give the pavement load-carrying strength, but to develop sufficient wear resistance." And furthermore, "Nobody knows just how thick a pavement base should be. In fact, this is impossible to determine with our present knowledge. We can only lay a road, and if it holds up we know it is strong enough, while if it breaks we know it isn't."

The experiments worked out in the road laboratory of the University of Illinois, and the roads which have been built according to those experiments, clearly prove that the transverse strength, even of a 6-in. slab supported by the compacted earth, is sufficient to support the heaviest road traffic. The saving of excessive concrete material without reducing the efficiency of the road means the saving of money. The late W. W. Marr, Illinois state highway engineer, working in harmony with the road laboratory at the University of Illinois, reached this conclusion: That the monolithic idea of brick-road construction provided a waterproofing for the graded roadway; that the roadway itself, if kept dry, was not affected by rains or frost and of itself produced sufficient load-bearing strength to support a thinner wearing surface composed of cement-filled brick.

Following this theory of the thinner slab, he approved 174 miles of 6-in. monolithic-brick roads designed for Vermilion County, Illinois. He had previously designed a series of test roads which were built near Danville, Ill. These test sections were built under the direction of P. C. McArdle, superintending engineer of Vermilion County, and they show that a 5-in. monolithic slab (4-in. brick on 1 in. of cement mortar, and a 6-in. slab (4-in. brick on 2 in. of mortar) are equally in a perfect state of preservation after four years of heavy traffic under steel tires and trucks. These test roads were described in *Engineering Record* of Sept. 30, 1916, p. 400. They prove that money can be saved by reducing the thickness of the slab, without reducing its efficiency as a "beam" or support for the road traffic.

In his article the engineer says, "the Illinois department has assumed that, in the light of our present knowledge it is reasonable to consider the combined concrete and brick slab to be equivalent, from a flexural standpoint, to a homogeneous concrete slab having the same quality of concrete." The tests at the University of Illinois show them to be equivalent, although the mix under the brick was 1:3:5, while the mix of the concrete slab was 1:2:3.

He further says, "under this assumption a monolithic brick road may be considered in exactly the same class as a concrete road, in so far as traffic-supporting capacity is concerned." Professor Wiley, in his article above referred to, says: "As a result of our tests of the rigid types, we firmly believe that a monolithic brick road is as strong, inch for inch of thickness, as the usual concrete road. In these tests we used a bottom course of 1:3:5 concrete with the brick, and made our comparisons with concrete slabs proportioned 1:2:3, all using aggregate such as is commonly acceptable in one-course concrete roads in central Illinois. Although the averages indicate a slightly greater strength in the brick combinations, I believe it safer to consider the two types as on a par, to allow for possible variations."

The brick slab as designed by the state engineer at the letting in question, specifying a 4-in. brick (the only type of standard paving brick on the market within shipping distance of the roads in question) although admittedly equal to the concrete slab in load-distributing strength when of the same thickness, was designed thicker than the concrete slab; consequently, from the standpoint of competition, it was much more expensive. We insist this was unfair. The mix under the brick was enriched over the specifications of former years and made more expensive by the addition of cement.

Three-Inch Brick More Expensive

It is true, one type of brick construction was designed the same thickness as the concrete slabs, but a 3-in. brick was used. Based on experience, manufacturers say it is about as expensive to make a 3-in. brick for cement filler as it is a 4-in. brick. The 3-in. column of clay reduces the machine capacity 25% in tonnage. There is no established market for the off grades of 3-in. brick with a wire-cut lug for cement filler. It would have been better for everybody had he kept to the 4-in. brick and designed the base 1 in. thinner, making the two slabs the same. But he preferred to adopt as his standard a brick which is not generally made and on the market.

In further explanation of his design he says, "the problem is somewhat different if 4-in. brick are used, because, if the same total thickness (7 in. at the side) is maintained, the base would be so thin as to require a finer aggregate and more care in construction." We cannot agree with him that the finer aggregate, when used in the base of monolithic pavements, increases either the cost or the difficulty of construction. In fact, contractors assure us that the exact opposite is true.

Nor do we think it fair to place the monolithic-brick slab of the most expensive design, even if it had been designed the same thickness as the concrete slab (which it was not) in competition with the concrete slab having the cheapest grade of aggregate. In his article the engineer states, "the stone available for macadam road building in Illinois is a comparatively soft limestone, which crushes under heavy rolling." Yet this same stone is admitted by him as the aggregate in the design of the concrete road. There is a big difference in the wear-resisting qualities of the two aggregates, limestone and vitrified brick. The reports from the state highway department on maintenance of the two types of road show a vast difference, the lesser cost of maintenance being in favor of the brick roads. In Vermilion County, Illinois, that part of the Georgetown road constructed of concrete with a limestone aggregate is showing much greater signs of abrasion than the brick section of the same road. The one best principle which the monolithic brick idea injects into the concrete road is a large granite-like aggregate for the surface.

Brick Has High Tensile Strength

A comparison between a paving brick and a section of concrete of the same size, the concrete being of the ordinary road variety, the test being made at the University of Illinois, shows that the tensile strength (pounds per square inch) of concrete is 520, as compared with 1499 for brick; that the beam or breaking strength (pounds per square inch) of concrete is 490 as compared with 2700 for brick; that the crushing strength (pounds per square inch) of concrete is 4200 as compared with 12,600 for brick. A further comparative test has frequently been made by making a series of concrete blocks of equal size with paving brick and submitting them to the rattler test for abrasion. This will show a difference too great to measure.

The test I have in mind showed that the brick, after being rattled for one hour, sustained a loss of 17%, while the concrete, after being rattled 20 min., showed a loss of 70%. Such tests as these, for tensile strength, beam strength, crushing strength, and abrasion, clearly show that the presence of a hard-burned shale brick in the surface of a concrete slab gives it a better wearing surface.

And we cannot agree with the statement of the engineer in his article which says, "any of the three types of rigid pavements considered—namely, concrete, brick and bituminous concrete on a concrete base—has sufficient wear-resisting qualities to make this factor comparatively unimportant." To every observer of road construction there must appear a great difference in the wearing qualities of the surface of brick and of concrete where gravel or limestone aggregate is used. Brick as a wearing aggregate costs more, lasts longer, is worth more, and should not be compelled to compete in price with limestone and gravel.

The commissioners of Wayne County, Michigan, who are the pioneers in the construction of concrete roads on a large scale, have adopted crushed granite or traprock for the coarse aggregate of the wearing surface. It would seem the State Highway Engineer of Illinois and the commissioners of Wayne County are pursuing different courses, both of which cannot be right.

At the letting in Springfield, the contractors refused to submit a bid on brick under the circumstances, although they were urged to do so. The universal answer of the contractors was that the construction specified for the brick pavements was very technical and almost impossible, and such as to make it useless to bid on brick because of the greater expense.

By reason of over-refinements in the monolithic specifications and discrimination against the brick road of common usage, it would seem that an attempt is being made to design brick off the program in Illinois.

HARVEY C. ADAMS, President,
Illinois Clay Manufacturers' Association.
Danville, Ill.

[Mr. Adams' letter was submitted to Mr. Older, who replied as follows:—EDITOR.]

Sir—Any argument for the adoption of the so-called flexible types of road construction, such as gravel, asphaltic-macadam, brick laid on compacted gravel or broken stone, etc., for a new trunk line system of any state, with our present knowledge of what future traffic on such a system may be like, would carry great weight if it were not for the fact that common observation indicates that while such roads may serve with low maintenance cost for many years under light traffic, yet they may, and frequently are, destroyed almost over night, or become excessively expensive to maintain, when the traffic changes to motor-truck transportation. Practically every engineer who has made a study of the subject is familiar with numerous examples which have occurred during the past few years.

Several miles of exactly the same type of road as that advocated by Mr. Adams exist each way from the City of Sterling, Ill., and, while these roads were constructed on an old macadam base presumably thoroughly compacted by traffic, and have been in service but three or four years, they show in considerable stretches unmistakable depressions and ruts; and certain sections must be taken up and relaid within one or two years or be utterly unfit for the passage of ordinary traffic. Again, a contractor who is building a stretch of Federal-aid road in Illinois has been refused the use of the brick streets of a small village because of the destructive action of the trucks he is using to haul his material. Endless examples of similar character can be cited of the practical destruction of city streets in Chicago and other places.

On the other hand, monolithic brick, concrete, and asphaltic concrete on an adequate concrete base have, in the main, withstood such traffic.

Are the designs for rigid pavements adopted by the State of Illinois unnecessarily thick and therefore expensive? Possibly so; but if this is the case it is my opinion that not only are monolithic brick designs unduly strong, but also the design for the concrete pavement and for bituminous-concrete top on a concrete base. One issue of the bulletin published by the United States Bureau of Public Roads gives illustrations of monolithic-brick pavements on a 4-in. concrete base having been destroyed by Army motor-truck traffic. Likewise, the destruction of thin or lean concrete slabs is also known.

As indicated in the original paper, it was the judgment of engineers of 11 states that stronger concrete slabs should be built, and if so, why not brick slabs of equal strength? The design of concrete slab adopted by Illinois averages about ¾ in. thicker than heretofore used. The proportions of concrete are not changed, but the specifications as to the amount of mixing water, curing of the concrete and the finishing of the subgrade are much more rigid. By these provisions we believe that the strength of the concrete slab being built under the present Illinois specifications is from 50 to 75% greater than under previous specifications.

In the article by Professor Wiley, referred to by Mr. Adams, Professor Wiley makes no claim for a greater strength in the monolithic-brick slabs than the concrete slabs tested. Mr. Adams quotes Professor Wiley as saying: "Nobody knows just how thick a pavement base should be. In fact, this is impossible to determine with our present knowledge." In the next paragraph Mr. Adams says, "those experiments clearly prove that the transverse strength even of a 6-in. slab supported by the compacted earth is sufficient to support the heaviest road traffic." The two statements are hardly consistent. I presume that the engineering profession has drawn its own conclusions from the result of Professor Wiley's tests. I would call attention to the low results secured where the brick courses were transverse and the brick surface of the slab placed in tension. This condition occurs in every brick road that has a transverse joint or crack.

The concrete base adopted by Illinois where 4-in. brick are used is of exactly the same thickness as where 3-in. brick are used, but composed of leaner concrete. The base, therefore, should be cheaper. Then, if 3-in. brick are so difficult and expensive to manufacture, it is hard to explain why at a recent letting in Illinois, where bids were submitted on both types, the bids for the 3-in. monolithic brick were more than 10% under those for the 4-in. brick.

As to the comparative wear on concrete and brick roads, it is hardly to be denied that a properly constructed vitrified-brick surface will resist abrasion better than limestone concrete. That this difference in wear resistance on rural roads in Illinois is critical is questionable. Milwaukee Ave., the main road leading north from Chicago, and the Dixie Highway, south of Harvey, leading south from Chicago, carry perhaps as much traffic as any rural highways in this state. The oldest sections of these roads constructed of 1:2:3½ concrete have been down six years, and in places still show float marks made in finishing the work.

ROADS NOT DESTROYED BY ABRASION

One can only give an opinion upon such a subject, but from observation it seems clear that the trunk line roads of Illinois, whether constructed of limestone concrete or vitrified brick, will eventually be destroyed in some way other than by abrasion of the surface.

The difference in the behavior of a soft stone in a macadam road and the same stone in a concrete surface is well known and obvious. In the macadam road under heavy traffic the stones grind against each other and become crushed and rounded. In Cook County, Illinois, a limestone macadam road was utterly pulverized by heavy trucks hauling stone over it for the construction of another road. The same trucks passed over a section of concrete road which was unaffected by the traffic, although composed of limestone of the same character obtained from the same district

In calling for bids on brick, concrete and bituminous concrete on a concrete base, there was no thought that any of these three types could compete with the other in first cost. In the opinion of the writer, it would be absurd to attempt to design brick roads or bituminous-

concrete pavements on a first-cost competition basis, unless it were obvious that each such design would have equal carrying capacity and durability, or require compensating maintenance expenditures. If it is reasonable to say, "Why not design brick roads thinner and cheaper?" then why not design concrete roads thinner and cheaper, and also other types, and continue to reduce the thickness until we have no pavement at all?

The economic problem is not one of competition in first cost, but that of least ultimate cost considering maintenance and renewal expenditures. There should also be considered the character of service rendered by each type, including comfort, appearance and delays incident to repairs.

CLIFFORD OLDER,
Chief Highway Engineer, Illinois.

Springfield, Ill.

Engineers' Education and Compensation

Sir—In Director Palmer C. Ricketts' letter in your issue of May 29, 1919, p. 1075, my one-time professor states, "but the cold fact remains that services in the long run receive the payment they are worth."

I would ask his attention to the following, which appeared in the Searchlight section of one of your recent issues:

> Civil engineer or mechanical engineer, wanted by consulting engineer to take charge of branch office in Eastern United States. Salary $150 to $200 a month. Man who has had experience in factory design and construction preferred.

Even back in 1912 would my esteemed professor have considered the recompense offered commensurate "payment" or are the years of experience necessary to be able to assume the responsibilities of the *managership* in question worth no more? With such prospects ahead, would he believe one inclined to tell any young fellow to follow as I did the advice given me to beg, borrow or steal the funds needed to finish my course, when it takes six to seven years after completion to return the money, and then, with what funds were laid by, to strike out for himself if one were so inclined?

Brooklyn, N. Y. ADOLF HINRICHS.

Activities of "Engineers' Union, Local No. 1," Visualized by Correspondent

Sir—The amount of space you have been giving in your correspondence columns to the subject of engineers' salaries leads me to believe that you may be interested in the following account of the organization of the Engineers' Union, Local No. 1.

From levelmen and draftsmen to chief engineers, they have organized in New York. The long awaited amalgamation of American brain workers with American hand workers has begun. A group of intellectuals who have clung tenaciously to their professional status have voluntarily surrendered their professional pride to place themselves under the protective guidance of the "hand workers."

The engineers of New York were not especially moved by the emotional tides that run in the heart of the world. They were not responding to revolutionary ideas caught out of the surcharged air. They had simply grown tired of wearing their white collars longer than they liked, eating poorer meals than agreed with them three times a day, moving their pinched families further and further out into the low-rent suburbs, thinking perpetually of having to quit the "game" that fascinated them, enduring what wage-workers are understood to have endured in the past. Their union is a product of simple economic pressure guided by herd instinct.

Last August, when New York engineers' "salaries" averaged $28 a week, the men, despairing of getting more money by individual pleading with their employers, called an organization meeting. A fair proportion of New York's hundreds of engineers came. An old-fashioned trade-union organizer addressed them as "brainless brain-workers." The words marked no new literary epoch in New York; but next day—pay day for one of the biggest companies—for the first time in years the pay envelopes were not ready. When they finally appeared, each envelope contained from $3 to $7 more than usual. Honest engineers questioned the management, but could get no explanation except the assurance that the amounts were not clerical errors and that the apparent mistakes were likely to be repeated next week.

Other companies developed the same mysterious habit. Did the Galileos of our American Rome sit back content in their ability to smoke cork tips instead of plain ones? Oddly enough, these brain-workers reacted just as certain other cultured, farsighted men, miners, hod-carriers, teamsters and plumbers, reacted some generations ago. "If," they soliloquized, "we got that from one meeting without making demands, what shall we get if we organize and demand?"

There had been an engineering organization in New York for years; but it was of the kind that didn't debase itself with consideration of wages, least of all with strikes. It was a salaried professional men's club, dedicated to the good-fellowship of smokers and banquets and to the flower fund for funerals, and to the reading of "papers." It was not such an association as would have dreamed of calling in an old-fashioned organizer from the ranks of the hand-workers for counsel. But it was done now, and the hand-workers showed them how to organize a real union. The new union grew. New York companies employing engineers had seizures every few months of that curious trembling which shook $3 to $7 more into the pay envelopes. Last spring the union presented demands—a $60 minimum for men in supervisory or equivalent positions, and $45 for those in subordinate positions.

How did the brain-workers arrive at those figures? Did they have statisticians make elaborate investigations of the cost of living for professional men and compare figures with an estimate of the social worth of engineers in the community, or indicate the ratio between the level of thought in New York and the state of the creative instincts in the engineering profession? Nothing of the sort. They simply asked the other union men on the job, the trench-diggers, carpenters, masons, ironworkers and such "rough-necks," what they were getting. These base mechanics, they knew, had been reopening their signed two-year contracts every few months and had been getting raise after raise, until they were getting what, to the brain-workers, seemed very handsome pay. The union designers and superintendents, in a stir of their old professional pride, decided that wages for originating and supervising the designs ought to be bigger than for merely carrying them out. The ironworkers' union, by which they were chartered, agreed to indulge their

vanity. So they tacked a few dollars onto the field riveters' scale—and demanded.

They ran slap into the same old problem which heroic pioneers, like the gasfitters and unbasted children's garment makers have always encountered, recognition of the union. And, like the miners and railroad men and glass-bottle blowers of old, the office men and field men had to establish in conference what was legally involved in their asserted right to collective bargaining. Their employers, like plumbing contractors before them, declared that to recognize the union meant handing over their control, meant "dictation of the business policy by employees," etc. Legalistic argument monopolized the conferences. There was a rumor that all the employers of engineers in America had their eyes on New York, hoping for a massacre. The organizers of the new union got strike sanction from the parent ironworkers' union, and the engineers began asking what the mighty "hand" unions could do to help the infant "brain" union in case of strike.

The engineers set an hour for a union meeting, to be attended by all members at all costs. The hour was in the middle of the work-day. The "hand" unions set the same day for a chapel meeting; the hour was a little past the middle of the work-day. Nobody said so, but the suspicion spread that the engineers might vote to strike, and that the mechanical unions, though bound by contracts not to strike, might find so much ordinary business to transact in chapel that field work would have to wait for days or weeks for chapel to adjourn. The employers decided that legal contention would waste money and provoke needless bad feeling. They withdrew their attorneys and settled.

In their first meeting after their victory the Engineers' Union, Local No. 1, did not spend its time discussing the relative efficiencies from the point of view of initial and maintenance costs, and the probable percentage of error, of the ice-bar and the duplex bar, nor was a paper read on the rainfall records in Iceland for the past 90 years. They discussed instead whether hours and working conditions weren't after all the next legitimate business of their union. They did not ask a committee to draw up an ideal curriculum for an engineering school, which should include more English and other cultural subjects, so that the graduates from the engineering schools might be more broadly gaged and educated men for the $125-$150 jobs they would fill if they were lucky. They debated instead what to do about the Public Service Commission's layoff of nearly 400 engineers. They noted that the railroad technical men had been granted an increase in salary; but they did not agitate and pass resolutions for the establishment of an utterly useless, aristocratic Engineering Academy for the gratification of the personal vanity of some of the exploiters of engineers' services.

You don't believe all this, do you? You're right, it *is* too good to be true. Such a union has not been formed; the meetings described were never held. The recital is a slightly modified account of the organization, not of engineers, but of reporters and editors in Boston, taken from the latest issue of the *New Republic*. Engineers have sharp intellects, are logical and accurate reasoners, accomplish wonderful things in the realm of applied science. But when you have said that, you have said all that you can say for them. When it comes to bettering the conditions of their profession—not, Heaven forbid, raising them to the level of those in the masons' or carpenters' trades, but just enough to place engineers merely at the level of stenographers—then all the acuteness of their minds, all the inexorableness of their logic, all their cool and analytical thought, doesn't seem to do them any good. And they let themselves—and what is worse, they let young boys who might be saved from what is in store for them if they begin the study of engineering—be fed with such stuff as, "A graduate in engineering is self-supporting from the time he graduates," by one professor; and, "I have never been out of a job in all the 23 years that I have been practicing," by a well-known secretary of one of the founder societies; and "Engineering services are being paid what they are worth," by the head of an engineering school, and similarly accurate statements by men of the same class, who have axes of their own to grind by making it appear that the profession is not what it really is, and who are so completely out of touch with the real conditions in the profession that their misleading and false statements, calculated to be impressive because of the prestige that attaches to their positions, are little short of criminal.

Newark, N. J. HARRY BERLIN.

As Others See Us

Sir—I heard something about engineers the other day from a great man—an acknowledged statesman, a high-minded politician, and a keen observer of people and events. His name, if I were permitted to tell it, would surprise every reader of this message. We were talking about our project for a National Department of Public Works. I am able to quote the statement almost verbatim, because the words burned in as they were uttered.

> Your task is appalling. You have been elected to lead engineers into a political reform. They are the most unresponsive citizens that we have. Your organization has a praiseworthy purpose, but if it were sponsored by almost any other group of reputable men than engineers there would be more promise of success. If your organization succeeds I believe you will find that it will not be the engineers who have carried through. Their aloofness and indifference to all matters outside of their own professional sphere are among the unexplainable things in our political life.

That statement hurt. How many other public men have the same opinion? As it comes from a high authority, who is not given to loose talk, it seems wise to pass it on.

M. O. LEIGHTON,
Chairman Engineers, Architects and Constructors' Conference on National Public Works.
Washington, D. C.

Salary Diagrams in College Catalogs

Sir—Apropos of the recent discussion in your columns on the compensation of engineers, between Mr. Ricketts and others, would it not shed light on the situation if the colleges prepared and published salary diagrams of their graduates, similar to those prepared a few years ago by the Am. Soc. C. E. Committee on the Compensation of Engineers? [See *Engineering News* of Jan. 4, 1917, p. 40.] Such a diagram, kept up to date and published each year in the college catalog, would be eminently fair and honest to prospective students, by giving them an idea of what they might expect in the line of work they were thinking of following.

Fort Shaw, Mont. GEORGE HENRY ELLIS.

Commends Tests for Shear Values of Timber Beams

Sir—The tests on shear values for yellow-pine beams by L. R. Manville and C. R. Hill in your issue of July 10, 1919, p. 69, are timely, and the writer believes the conclusions to be well taken.

The prevalent limiting values of safe unit horizontal shearing stresses for very short timber beams, or for timber beams with a heavy concentration near the support, have been annoying to the writer's sense of proper proportion for many years. Undoubtedly, other engineers have experienced the same difficulty in making the calculated size of a short timber beam subjected to a concentrated load, when designed with a maximum unit horizontal shearing stress of around 150 lb., conform to one's common-sense judgment of the necessary size. Such problems occur frequently, as in the case of a timber grillage, concentrated loads near the support of girders, etc.

The writer wishes to thank Messrs. Manville and Hill for making available the results of these interesting tests. HENRY D. DEWELL.

San Francisco, Calif.

Simple Method for Finding Section Modulus of I-Beams

Sir—Referring to the article entitled "Easily Memorized Method for Finding Safe Beam Loads," by Manton E. Hibbs, in your issue of July 17, 1919, p. 115: Another very simple way of arriving at the approximate section modulus of I-beams is to multiply the depth in inches by the weight per foot, and shift the decimal point one place to the left.

Thus, for a 9-in. 21-lb. I-beam, the section modulus would be found to be $9 \times 21 \div 10 = 18.9$. This method is easier than that suggested by Mr. Hibbs for depths of 6 to 10 in., inclusive. It is slightly less accurate than his method for depths of 12 in. and above. G. S. BURRELL.

New London, Conn.

Sir—The writer read with much interest Mr. Hibbs' method for finding safe beam loads, in your issue of July 17, 1919, p. 115, but believes that he has used a simpler method which requires no memorizing other than the ordinary knowledge of the size of beams and channels. This method is the following:

A beam or channel will support as many thousand pounds uniformly distributed for a span equal in length in feet to its depth in inches as its weight per foot in pounds. The load for any other span length is inversely proportional to the span.

For example, a 12-in. x 31½-lb. I-beam for a 12-ft. span would support $31\frac{1}{2} \times 1000$ lb., or 31,500 lb.; this is very close to 31,970 lb., the correct load as given in the tables. Or a 6-in. x 12.25-lb. I-beam for a 6-ft. span would support $12\frac{1}{4} \times 1000$ lb., or 12,250 lb., quite close to 12,910 lb., the correct load as given in the tables.

By comparing the safe uniform distributed loads obtained in this manner with those shown in handbooks it will be found that the method given above is sufficiently accurate for ordinary purposes.

Portland, Ore. W. H. CULLERS.

Engineering Specifications and Responsibility

Sir—Recently there was brought to my attention a specification which definitely fixed the method by which drain tile should be laid, and defined the device to be employed. Upon careful inquiry, I discovered the device was a patented fad of the engineer drafting the specifications. Now, we all will agree that such procedure, if required for personal gain, was improper, but on the other hand, if this engineer had discovered in practice a method that would insure a satisfactory installation of drains to allow the inflow of seepage water and that would exclude the quicksand, thus insuring a permanent structure, was he not justified in recommending this device and enforcing its use if necessary?

On the other side of this question, I had the opportunity of reviewing a specification which plainly stated that the contractor was free to employ any device and to use his own judgment in the matter of installing the drains, but that the commissioners of the drainage district would hold him responsible for a permanent and satisfactory structure. The engineer drafting the last-mentioned specification had explained to the board of commissioners that under an opinion handed down by the Supreme Court of the United States recovery could not be made against a surety company or the contractor if methods were required by the engineer and complied with by the contractor, and such methods were found to be the cause of failure.

We must all agree that the engineers' responsibilities diminish as the contractors' responsibilities are amplified, and should the contractors finally realize the importance of having superintendents and foremen with some engineering experience and ability, and should they discard the "'mule drivers" and "man killers," they would soon render the engineer and inspector a useless ornament on works of importance.

In conclusion, there are two great changes necessary in this important branch; the first is for students of engineering to acquire the additional knowledge necessary to equip them for the general management of construction works, and the second is the necessity for the contractor to realize that the standard of success is not measured by the dollars made, but by the success of the structures built. W. P. BULLOCK.

Kansas City, Mo.

Economic Side of Engineering Profession

Sir—It is to be hoped that the *Engineering News-Record* discussions of the economic side of engineering will lead to something more definite than a mere reiteration of the fact that all is not well with the profession. The point has been reached where all must admit the need of drastic action to quiet the growing unrest among technical engineers.

The immediate need is for a readjustment of the salaries of employed engineers. This part of the problem has been undertaken and will be pushed to a successful conclusion by the American Association of Engineers.

This is only a good beginning. The predicament in which we find ourselves is partly due to the fact that young men in ever-increasing numbers are attracted to engineering by the promises of large salaries, held out to them by the technical schools and colleges, as well

as by the correspondence schools and those so-called schools which attempt to turn out engineers and draftsmen by means of a few months of home study. The resulting oversupply of trained and half-trained engineers keeps wages down and makes it difficult for the engineer, particularly the young engineer, to keep continuously employed even at a low salary.

The proof of that statement is the system followed by many employers of engineers who "hire and fire" according to the slightest fluctuation of their need. The attempt to hold the young engineer over a dull period is reduced to almost nothing, because the employer can obtain unlimited engineer assistants at his own price and on short notice, due to this oversupply.

Moreover, another effect is beginning to be noticed. As the men new in the profession become disillusionized, some of the best of them begin to look toward other fields of endeavor for a living. If this tendency is allowed to increase, only two classes will continue in engineering—the idealists who are determined to stick to their chosen profession at whatever sacrifice, and the poorer grade of men who lack initiative and are content with any work as it offers a bare existence. Unfortunately, there are but a few of the first class compared with the second, which is only too numerous.

In spite of these things and others which might be mentioned, all tending to make the life of the technical engineer anything but enviable, there are movements on foot—one, at least, national in scope—to increase still further the supply of young engineers. The effort apparently has the support of many of the large technical educational centers, notwithstanding the fact that a part of the plan consists of an attempt to introduce a smattering of engineering theory into general business courses, with the notion of turning out, in this way, engineer executives. The result will inevitably be a still further cheapening of engineers and their work.

It is a generally accepted truth that one who offers adverse criticism of a condition or course of procedure should be ready with a remedy or substitute for the thing criticized. The simple way to get at this matter of oversupply is for professional engineers, through their associations and societies, to tell the exact truth.

This would offset the rather highly colored inducements offered by so many of the schools and colleges. Let the emphasis be put on the actual experience of the majority of technical men who work for a pittance under high-sounding titles, rather than on that of the few who really are successful materially and otherwise. Closely allied with this move should be the effort to pass proper license laws. Such procedure will cut the supply, it is true, instead of increasing it, and that will be regarded as heresy by many.

Cleveland, Ohio. ERNEST R. TAYLOR.

Fatigue Tests of Alloy Steels and Conclusions Therefrom

Sir—In your issue of July 10, 1919, appears a summary of a paper entitled "Some Fatigue Tests of Nickel Steel and Chrome-Nickel Steel," presented by the undersigned before the American Society for Testing Materials. In that summary it is stated that the authors drew certain conclusions quite different from the conclusions which they intended.

The *News-Record* summary states that the conclusion is drawn that "nickel steel has higher endurance qualities" than chrome-nickel steel. Again, it states that the authors drew the conclusion that "hardening and tempering do not improve the fatigue-resisting qualities of the metal, but rather have the opposite effect." The original paper states:

> In connection with the above paragraphs these test results should not, of course, be interpreted to mean that chrome-nickel steel is, in general, inferior in fatigue resistance to nickel steel. These tests give values for the two lots of steel tested, and it should be remembered that the original bar of chrome-nickel steel was worked down to a small size under a forge shop hammer. Injury to the structure of the material may have been done in that process.
>
> The tests also indicate that a given heat treatment may give high elastic static strength to steel without proportionately increasing its resistance to fatigue under repeated stress. This is shown by the convergence of the graphs for heat-treated steel and for annealed steel shown in Figs. 3, 4, and 5. Here again a warning should be sounded against drawing from these tests the general conclusion that all heat treatment is ineffective in increasing the resistance of a material to fatigue under repeated stress. The test results apply only to the particular conditions of heat treatment actually given to the specimens tested, but they do furnish an illustration of heat treatment which raised static elastic strength without proportionately increasing resistance to fatigue under reversals of low stresses.

It is further stated in the *News-Record* summary: "Both these conclusions, however, are made entirely on the hypothesis of the experimental (exponential?) law connecting stress and number of repetitions or alternations required for failure; in other words, the law under which the logarithmic plot of repetitions and stress would be a straight line. The logarithmic plotting method is used as the basis for all the conclusions drawn, although the experimental points are scattered on both sides of the arbitrarily drawn lines."

This statement is not correct. The original paper gave tables of results and graphs both with logarithmic coördinates and with ordinary coördinates. The figure given in the *News-Record* summary as "typical" is not typical, because it gives only the logarithmic diagram, omitting the diagram with ordinary coördinates, which in the original paper was placed beside the logarithmic diagram.

The whole point of the paper was to show that the fatigue-resisting strength of a metal for a large number of repetitions of low stress could not be determined either by determining the static "elastic limit" of the metal, nor by short-time, high-stress tests under repeated stress. For any two metals the ratios of the elastic limits, of the resistances to fatigue under high stress, and of the resistances to fatigue under low stress, may be three different quantities. This conclusion may be drawn either from the tabular values given in the original paper, from the graphs plotted with ordinary coördinates, or from the logarithmic diagrams. It is not dependent upon logarithmic plotting.

In this connection it should be noted that in the diagram given in the *News-Record* summary there has been inserted a plotted point for the heat-treated nickel steel which is shown very remote from the diagram, and which is not in the diagram of the original paper, and for which there are no corresponding values in the tables of data given in the original paper. This "wild" point throws no small discredit on the accuracy of the diagram, and is evidently a typographical error.

Urbana, Ill. H. F. MOORE,
ARTHUR G. GEHRIG,
University of Illinois.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

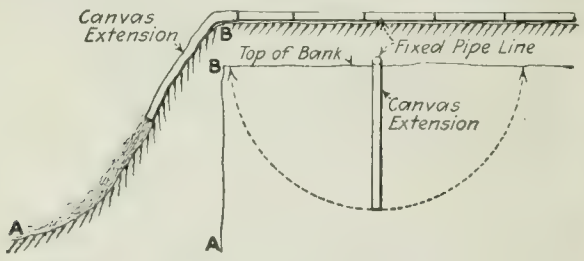
Keeping Scrap Cleaned Up Saves Money

BY ALBERT S. FRY
Morgan Engineering Co., Memphis, Tenn.

SALVAGE of all discarded materials, says J. W. Radford, makes workmen more careful of machinery and economical of repair parts. Mr. Radford, who is superintending the construction of about 5,000,000 cu.yd. of levees by walking draglines in the Inter-River Drainage District in Missouri, believes that it is economy for the contractor to keep scraps of iron, such as broken machinery parts, cleaned up and disposed of, and not to allow these to be thrown away along the right-of-way of the work. It is his opinion that a failure to salvage broken parts tends to carelessness, on the part of the workmen, with machinery and repair parts. It is not uncommon to walk along work where a dragline or dredge has passed and find broken parts left to rust. A wornout bucket discarded on top of a spoil bank is not an unusual sight. Mr. Radford thinks it is better to collect this scrap-iron and haul it where it may be sold or otherwise disposed of, even though doing so apparently costs more than to throw it away. A teamster can do this work at odd times, when he would be doing little work of any sort, and thus it really costs very little. The profit comes in the spirit which is instilled into the employees who go about their work with more care and appreciation of the value of the machines they are operating.

Canvas Pipe Gives Flexible Distribution of Sluicing Water

A CANVAS extension to the steel or wood-stave pipe line permits more flexible distribution of the sluicing water in hydraulic filling operations for the Taylorsville dam of the Miami River flood-protection works in Ohio. At Taylorsville a bank, A-B, is being cut down by hydraulic giants, and the material sluiced to centrifugal pumps which discharge through a pipe line to the dam embarkment. The water needed to float the excavated material to the pump comes by pipe line to the top of the bank. Here a 50-ft. canvas tube extension is attached to the end of the fixed pipe line and laid down the bank to discharge where the water is wanted. By swinging the canvas tube to the right and left, water can be delivered at any point of a considerable area of the bank face, without shifting the main pipe line. The diagram indicates the arrangement. Arthur E. Morgan is chief engineer, Charles H. Paul is assistant chief engineer, and C. H. Locher is construction manager of the Miami Conservancy District flood-control operations.



DISCHARGE OF SLUICE PIPE SHIFTED BY CANVAS EXTENSION

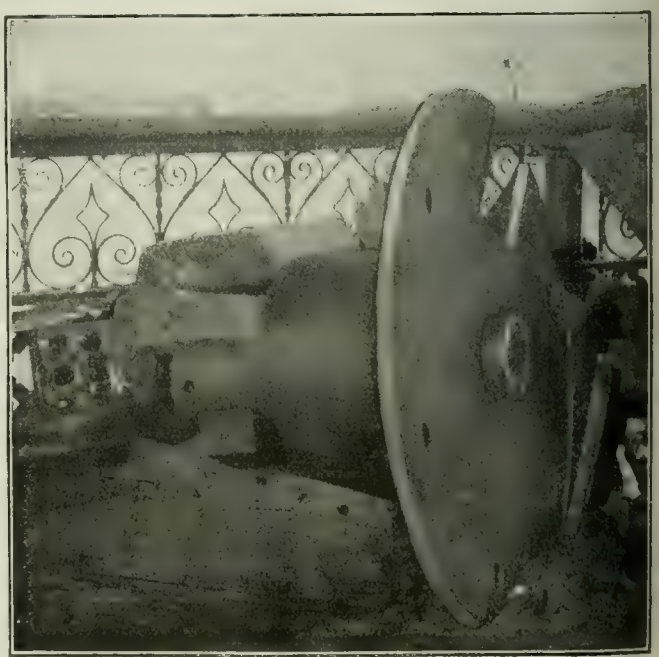
Other Articles in This Issue of Interest to Contractors:

Construction Details of the Lindsay-Strathmore Irrigation District — Page 348
Block Yard Cheaply Improvised From Old Equipment — Page 356
Telescopic Foundation Caissons Sunk in Bank Basement — Page 369
Hydraulicking Dam Embankment on Miami Flood-Control Project — Page 371
Illinois Brick Paving Specifications (Letter) — Page 383

Cutting Granite with Oxyacetylene Flame

DURING the repairs on a 1900-ton drawbridge, located where the Lincoln Highway crosses the Passaic River near Newark, N. J., it was found necessary to remove the center casting and pin, the latter being so tightly wedged that it was impossible to pull it from the casting which, with other damaged parts, is shown in the photograph. A description of the damaged portions of this bridge was published in *Engineering News-Record* of April 18, 1918, p. 775, and the details of repairs are described in this issue, p. 366.

After several unsuccessful attempts to draw the pin from the casting below which it projected down 3 in.



CASTING AND OTHER DAMAGED PARTS OF BRIDGE

into the masonry, it was found necessary to cut a trench in the hard granite so that the casting might be shifted laterally to one side for removal and replacement by a new and larger center casting. This trench was 4 ft. long, 9 in. wide and 3 in. deep, extending under the old casting.

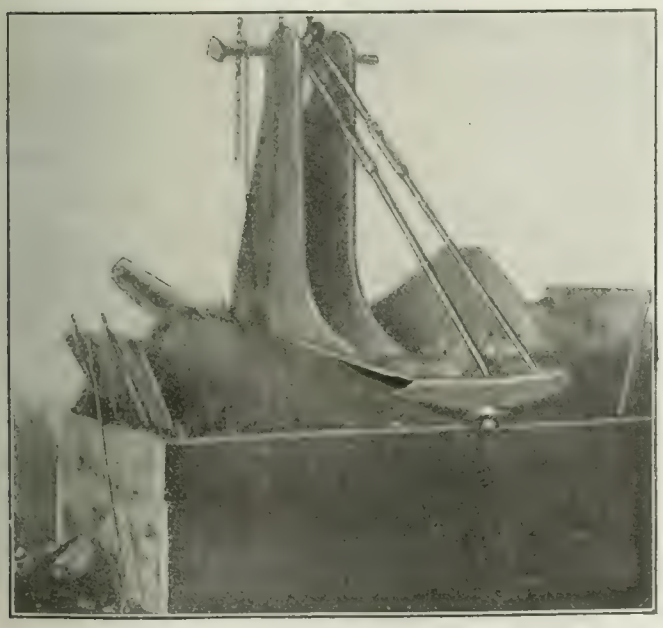
The cutting of the trench would have been an endless task had it not been discovered that an oxyacetylene flame chipped the granite quite readily and could be used under the old casting without damaging the balance of the masonry. The desired channel was thus quickly obtained. The flame was also used for cutting away the abutment back of the fixed span bottom chord to provide expansion clearance. This work was under the supervision of T. J. Wasser, county engineer of Hudson County, N. J., and was done by the Bethlehem Steel Bridge Corporation, with Thomas D. Fulton as erection engineer.

Repairing Orange-Peel Dredge Buckets Without Costly Delays

By J. C. Lamon
Alcoa, Tenn.

ORANGE-PEEL dredge buckets were repaired upon a job in Tennessee without the costly delays incident to shipping them to a foundry. This was done by simple blacksmiths' methods. The buckets had been damaged by lifting heavy stone on the Little Tennessee River hydro-electric development of the Knoxville Power Co., near Alcoa.

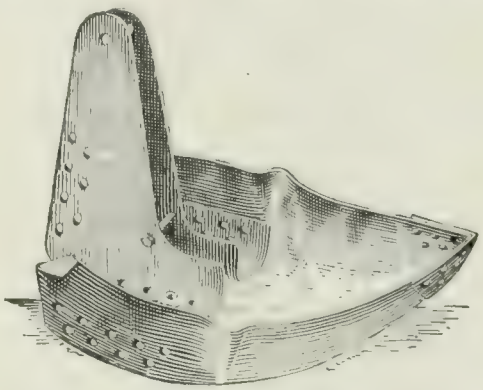
Lifting heavy stones had badly straightened the sectors, by overloading, the six-ton buckets being damaged the worst and becoming practically worthless for dredging purposes in the river. These distortions were corrected and the buckets were placed back in service practically as good as new. The methods followed in re-forming the sectors are shown in the accompanying illustrations. They were taken to the blacksmith shop, where they were dismantled, a special forge and blast pipe being constructed to accommodate the blades.



HEATING ORANGE-PEEL BUCKETS. NOTE ADJUSTMENT OF TURN-BUCKLES AND FORGE CONSTRUCTION

Heavy turnbuckles and rods were adjusted as shown, and the sectors were heated and pulled back to the proper radius by means of the turnbuckles.

By referring to the photograph, the arrangement can be noted, also the construction of the forge. A very narrow car was used with a heavy bed of hard coke, the fire being prepared as though heavy forging was to be done. The blades were heated evenly across the entire width, except the edges. Beginning with the



BUCKET BLADES WERE DEFORMED IF EDGES WERE HEATED

first heat at the base of the arm, the turnbuckles were tightened, until the correct radius was obtained at that point. They were then moved back out of the fire a short distance and another short heat was given, the turnbuckles being tightened as before. This operation was repeated until the correct shape of blade was obtained.

Difficulty was encountered from the fact that the blades would buckle at the outer edges when strain was put on by the turnbuckles. However, it was discovered that by keeping this part of the outer edges cool the natural shape of the bucket was retained. The sketch shows what happened to the bucket when the egdes were not kept cool.

Moisture Content of Dry Lumber

Variations in atmospheric humidity, and the greater capacity of air for moisture at higher temperature, cause marked variation in the moisture content of wood, leading to shrinking and swelling, with the well known disturbing influences of this action. The Forest Products Laboratory recommends that wooden articles be shaped and framed when their moisture content corresponds to that which will prevail in the average atmospheric state during their life, and to aid in determining this moisture content gives the table reproduced here:

When Relative Humidity of Air Is	The Moisture Content of "Dry" Wood Is		
	At Temperature of 70° F.	At Temperature of 140° F.	At Temperature of 212° F.
%	%	%	%
20	4.5	3.3	2.2
30	6.0	4.5	2.9
40	7.7	5.9	3.9
50	9.3	7.1	4.9
60	11.2	8.8	6.2
70	13.5	10.7	8.0
80	17.0	14.0	10.5
90	22.2	18.2	14.0
100	32.0	26.2	21.0

NEWS OF THE WEEK

New York, August 21, 1919

Would Build Public Works With Big Army Service Corps

A "Public Service Corps" of not less than 175,000 men, to be organized under Army regulations and trained and equipped to construct roads, levees, bridges or other public works, is provided for in a bill (H. R. No. 7777) introduced in Congress by Mr. Hulings. The corps would be organized on military lines, one battalion of four companies being selected in each Congressional district. It is proposed "to select the prescribed number of men by lot from amongst all of the unmarried men, citizens of the United States, residing in said district, who are between the ages of 18 and 21 years and who are physically capable of military service." The pay monthly for privates and noncommissioned officers would be as follows: Private, $50; corporal, $55; sergeant, $60; first sergeant, $65; sergeant major, $70. Commissioned officers would receive the pay of like grades in the infantry.

The Secretary of War, with the President's approval, is empowered, by the terms of the bill, to designate the work upon which the corps shall be employed and to enter into engagements with state authorities for the building of roads and other public works. The bill carries a $200,000,000 appropriation. The purpose of the bill is "to provide actual military training for the term of one year for an annual levy of the prescribed number of men and to employ the corps in building public roads." The corps would not be liable for military service beyond the boundaries of the United States.

Relief Sought for Unpaid Contractors on Government Work

To contractors on Government camp construction who were left without the hope of reimbursement for work already done, to say nothing of the right to complete their contracts, through a strict interpretation of the Army appropriation act by the Comptroller of the Treasury, relief is offered in a resolution recently introduced by Congressman MacKenzie, of Illinois. The resolution has already passed the House.

This resolution, which is in reality an enabling act, declares that Congress never intended to prevent payment for work and materials furnished under contract, although this was the interpretation put upon the bill by the Comptroller of the Treasury. The resolution covers all contracts for construction entered into by the War Department up to July 11, 1919.

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago. Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 505 Pearl St.

Secretary Baker in a letter to the Committee on Military Affairs regarding the measure asserts that it is not the intent of the War Department to obtain authority to undertake new construction work in any Army camp, nor even to complete unfinished construction, but only to effect a settlement of obligations already incurred.

American Engineers to Install Water-Works at Athens, Greece

Under the supervision of American engineers, the City of Athens, Greece, is to be provided with a modern water-works system. Last week a party of engineers from the firm of Ford, Bacon & Davis, New York City, who have been retained by banking interests in Greece to investigate the water-works situation, draw up the plans for the project, and supervise construction, sailed for Europe.

The party was headed by William E. Swift, of the Ford, Bacon & Davis organization, and formerly division engineer of the Hudson River Division of New York's Catskill Aqueduct, with headquarters at Cornwall-on-Hudson.

The project for a new water-supply for Athens has been under consideration for many years, according to a statement made to a representative of *Engineering News-Record* by George W. Bacon, just returned from abroad.

Action Is Begun Against Cement Companies

Complaint Alleges Combination in Restraint of Trade and Output Reduction, To Raise Prices

Nineteen of the leading American cement manufacturers are named as defendants in an action in equity instituted last week by Attorney General Palmer, acting through United States Attorney Joseph L. Bodine, of the District of New Jersey. The complaint charges the company with engaging in a combination and conspiracy in restraint of interstate trade, with restricting production of cement, with selling at uniform "delivered prices," and with more than doubling the prices received, exclusive of freight, thus contributing to the prevailing high cost of living.

The 19 cement companies named comprise the Atlas, Allentown, Alpha, Bath, Coplay, Dexter, Edison, Giant, Glens Falls, Hercules, Knickerbocker, Lawrence, Lehigh, Nazareth, Penn-Allen, Pennsylvania, Phoenix, Security and Vulcanite.

The complaint alleges that from 1905 to 1911 the defendant corporations were organized as members of the Association of Licensed Cement Manufacturers, and were required to sell portland cement at certain scheduled "delivered prices," with freight paid, which were uniform for any given point of delivery. Following a decision of the Court of Appeals in 1912, the association was abandoned, but the companies, it is stated, continued to consider it regular for all to make the same price at any given point of delivery, regardless of differences among them in cost of production and in freight rates from their mills to the points of delivery. However, there was no consistent adherence to uniform selling prices.

According to the bill of complaint, the aggregate production capacity of the mills of the several companies was 50,000,000 bbl. in the year 1915. It is charged that the output was restricted to about 30,000,000 bbl. in 1915, 29,000,000 bbl. in 1916 and 1917, and 23,000,000 bbl. in 1918.

In 1915 the defendants, the complaint states, created an unincorporated association, with offices, first in Philadelphia and now in New York, in charge of a salaried manager, clerical assistants, and traveling and investigating engineers. The association manager, the complaint states, received full information from the various companies regarding amounts of production and contracts for future delivery, compiled

such data, and distributed them to the members of the association. It is charged in the complaint that the object of these activities was the "restriction of the amount of cement produced, reduction in the amount of cement subject to future delivery at former prices, uniformity of prices for any given point of delivery and increases of such prices."

It is pointed out that the "mill price" of portland cement has been successively increased from about 65c. per barrel in 1915 to about $1.85 per barrel at the present time.

The defendant companies, as yet, have not filed their answer to the bill of complaint.

Bill Proposed To End Housing Corporation

Dissolution of the United States Housing Corporation is proposed in a bill recently reported in the House of Representatives. Its abolishment is advocated on the ground that it was created as a war-time measure, and Chairman Langley, of the Public Buildings Committee, finds ample justification for its abolishment.

Although the United States Housing Corporation is considered a temporary organization, Chairman Langley asserts that it is being perfected on a permanent basis, that personnel is even now being augmented, and that salaries have been unnccessarily advanced.

Should the Housing Corporation be dissolved, the buildings that have been constructed by it, and which are now under its jurisdiction, would be sold by the Secretary of the Treasury under the terms of the present bill.

Another bill has been drafted providing for a Bureau of Housing and Living Conditions, in the Department of Labor. The proposed bureau would aid the Housing Corporation to bring its work to completion, and then would take over all the plans, data and reports of the corporation, as well as those of the Housing and Transportation Division of the Emergency Fleet Corporation.

Thirty Ships Delivered by Fleet Corporation in Week

If the same speed with which vessels were turned over to the Shipping Board by the Emergency Fleet Corporation is maintained throughout the month as obtained for the week which ended Aug. 9, 1919, a new record in shipbuilding may be attained. Thirty vessels were delivered during that week, adding 97,550 gross tons to American shipping.

The total gross tonnage that has been delivered to date is 4,542,278, the total number of vessels being 1227. Sixteen of the 30 vessels are contract steel, 12 are wooden and two vessels are composite.

The record is 124 vessels, delivered in July, 1918.

Protest Against Plumb Plan Continues at Hearing

Warfield Plan Urged Before House Committee—Need for Future Government Aid

Continued protests against the Plumb plan for nationalizing the railroad system of the United States have, in the past week, marked the hearings now under way before the Interstate Commerce Committee of the House of Representatives, in Washington. The Warfield plan, advocated by the National Association of Owners of Railroad Securities, was put forward by witnesses at several of the sessions as being the most reasonable cure for the threatened railroad troubles. While protesting against the nationalization of the railroad system, it was, nevertheless, the view that Congress must give constructive relief to the situation for the present, to prevent plunging the railroads into bankruptcy.

Luther M. Walter, general counsel for the National Association of Owners of Railroad Securities, said of the Plumb plan:

"It is impossible and not in line with our interests and would not profit anybody. It may be used as a shibboleth, but I think that when it is examined and understood no one will support it."

Warfield Plan Advocated

Mr. Walter pointed out that a fundamental of the Warfield plan is that labor should participate in the earnings of the carriers and that division of excess profits over and above 6% should be made among the public, the employees and the owners of the property. He strongly urged the Warfield plan.

"The keystone of the Warfield plan," said Mr. Walter, "is a Congressional direction to the Interstate Commerce Commission that it shall make freight and passenger rates sufficient to pay operating expenses, maintain railroad properties, and give not less than 6% return upon the aggregate value of the property devoted to transportation in each of the principal traffic territories."

Samuel H. Veatch, president of the Savings Banks Association of New York State, testified on the following day that millions of American investors in banks, trust companies and other institutions which put their funds into railroad stocks are directly interested in the return of the railroads to private ownership on a basis that will afford adequate protection to security holders.

Forney Johnston, advisory counsel for the National Association of Owners of Railway Securities, while urging the Warfield plan, maintained that Congress must aid the railroads, at least for the present, else bankruptcy or Government ownership would be inevitable.

At the same time the campaign to prevent the return of railroads to private ownership was resumed Aug. 18, when Representative Huddleston introduced a resolution for the appointment of a committee of six members to investigate charges of corruption by financial interests, made by the four railroad brotherhoods and other labor organizations, when the Plumb plan was put forward prominently.

Forest Service Highway Work Handicapped

Work in carrying out the 270 projects in road maintenance and construction by the Forest Service of the Department of Agriculture has been somewhat handicapped because of the nonreceipt of materials and equipment from the War Department. They had been previously expected, according to representatives of the Forest Service.

About six months ago, after an act of Congress had provided for the turning over of surplus equipment, suitable for roadbuilding, by the War Department to the Department of Agriculture, the Forest Service petitioned the War Department for a number of motor trucks, cars and road machinery. Later revised petitions were sent in which included a request for 20,000 ft. of steel cable, a number of concrete mixers and about 250 sets of double harness.

It has been reported this week that all the Forest Service has received from the surplus material of the War Department to date is 32 Ford passenger cars and several million pounds of trinitrotoluol. After the passenger cars had been delivered to the various districts of the Forest Service, it was asserted, they could not be used as passenger cars because of a law passed by Congress declaring that no money shall be expended for the maintenance, equipment or repair of any passenger motor vehicle, unless specifically provided by law.

It is maintained that the Forest Service can use on its highway projects some road drags, drilling machines, forges, corrugated iron, tents, and numerous other articles now being declared surplus by the War Department.

It is stated that delay in turning over usable equipment to the Department of Agriculture has been a serious handicap in the far Western states where road construction work in the mountains can be carried on only during the summer months.

French Housing Contract Awarded to New York Firm

As a first step in the reconstruction of the devastated areas, the French Government has let a contract to the MacArthur Bros Co., engineers and contractors, New York City, for the erection of 2000 frame dwellings. It is expected that other contracts will soon be awarded for similar construction, according to officials of the company.

The houses will be frame structure, small, and all materials, both lumber and hardware, will be shipped to

France from the United States. It is quite probable, says A. H. Baer, of the company, that the houses will be demountable and will be shipped ready for immediate erection.

A. S. Dorsey, one of the engineers associated with the Paris office of the MacArthur Bros. Co. is expected from France daily, and he will be able to furnish data upon receipt of which his company can start immediate construction. Mr. Dorsey has been in France since February, studying possible engineering development, with the French Government.

United Engineering Society Pays Tribute to Carnegie

The committee appointed by the meeting of representatives of the four founder engineering societies Aug. 11, upon the death of Andrew Carnegie, has framed the following resolution to be spread upon the records and transmitted to members of the Carnegie family:

Andrew Carnegie's death on Aug. 11, 1919, at Lenox, Mass., brought to its close a career which greatly advanced all the engineering arts and sciences. By the introduction into the United States of the bessemer process for the production of steel, and by the establishment and development of steel plants which became the greatest in the world, he made available for engineers the most useful modern material for engineering construction. In the successful conduct of many industrial enterprises he amassed great wealth, the possession of which he came to regard with deep seriousness as a public trusteeship. While yet in full possession of his faculties, he devoted himself to the distribution of large portions of his fortune to projects for the benefit of mankind. He distributed his wealth not only in many directions, but also with the exercise of great wisdom based on careful investigation. His munificence provided large funds for the building of a home for the great national engineering societies and many associate societies. He was an honorary member of the American Institute of Mining and Metallurgical Engineers and American Society of Mechanical Engineers. He was personally known and loved by many engineers.

In view of these facts, be it

Resolved, that the American Societies of Civil, Mining, Metallurgical, Mechanical and Electrical Engineers, the United Engineering Society, and the Engineers' Club herein express their condolence to the family of Mr. Carnegie and record their sincere appreciation of the great contributions of Andrew Carnegie to the advancement of engineering, and of his friendly assistance in making possible beautiful homes for the Engineering Societies and the Engineers' Club, thus fostering the spirit of unity in the profession.

The committee is composed of Charles F. Rand, chairman; Dr. Alexander C. Humphreys and Calvin W. Rice for the founder societies; Lansing C. Holden, Robert A. Franks and E. Gybbon Spilsbury for the Engineers' Club.

At the meeting it was also voted that the chairman appoint four men to serve with himself as a committee to determine whether there should be a memorial to Mr. Carnegie by the engineering societies, and if so which form it should take, the committee to have power to make the necessary arrangements and carry them through. The members of the committee are Charles F. Rand, Lansing C. Holden, W. L. Saunders, J. A. Bensel and Prof. Comfort A. Adams.

Daylight-Saving Repeal Passed Over President's Veto

Repeal of the Daylight-Saving Law was passed by the House of Representatives, over the President's veto, by a vote of 223 to 101, Aug. 19.

In returning the measure for the second time without his signature, the President said he did so with "the utmost reluctance."

The President's message vetoing the bill follows:

"To the House of Representatives:

"I return this bill, H. R. 3854, 'An Act for the Repeal of the Daylight-Saving Law,' without my signature, but do so with the utmost reluctance. I realize the very considerable, and, in some respects, very serious inconveniences to which the daylight-saving law subjects the farmers of the country, to whom we owe the greatest consideration. But I have been obliged to balance one set of disadvantages against another. The immediate and pressing need of the country is production, increased and increasing production, in all lines of industry.

"The disorganization and dislocation caused by the war have told nowhere so heavily as at the industrial centers.

"It is to these that the daylight-saving law is of most service. It ministers to economy and to efficiency. And the interests of the farmer are not in all respects separated from these interests. He needs what the factories produce, along with the rest of the world. He is profited by the prosperity which their success brings about. His own life and methods are more easily adjusted, I venture to think, than those of the manufacturer and the merchant."

The Senate by a vote of 57 to 19 concurred in the action of the House.

Agitation for the repeal of the daylight-saving law first came from farmers, but recently some labor unions have come out in favor of the repeal measure.

Crane to Represent Associated General Contractors

Arrangements have been made to have C. A. Crane, secretary of the New York General Contractors' Association, represent the Associated General Contractors in New York territory. Offices of the Associated General Contractors of America, formerly at 1416 Broadway, have been moved to 51 Chambers St., New York City. L. L. Warfield, until recently Eastern field secretary, is no longer connected with the organization.

Bonus for Quartermaster Civilian Construction Employees

Through the activities of the Union of Technical Men, civilian employees in the Construction Division of the Quartermaster's Office will receive a $240 bonus, effective July 1, 1919. The bonus is given in accordance with an act of Congress approved Mar. 1, 1919.

On Mar. 10, 1919, the Union of Technical Men wrote to the Secretary of War, calling attention to the fact that employees in the storage office, Port of New York, Quartermaster Department, had received advanced salaries in accordance with a circular issued by the War Department July 27, 1918. After considerable correspondence with various branches of the Army the union recently received notice that a satisfactory adjustment had been made.

Civil Service Examinations

Canada—Junior engineer, Department of Public Works, Prince Rupert, B. C., $1680 per year. Application forms may be obtained from the offices of the Employment Service of Canada or the Secretary of the Civil Service Commission, Ottawa, and must be filed not later than Aug. 29.

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Patent investigator, patents section, War Department, $1200 to $1800 per year. File applications before August 26.

Expert patent investigator, patents section, War Department, $1800 to $2400 per year. File applications before Aug. 26.

Research engineer, $2,800 to $3,200 per year, Ordnance Department. File application before Sept. 2.

Research physicist, $2,700 to $3,200 per year, Ordnance Department. File application before Sept. 2.

Mathematics and dynamics experts, Grade I, $2,500 to $4,000 per year; Grade II, $4,000 to $5,000 per year, Ordnance Department. File application before Sept. 2.

Specification engineer, $2,400 per year; Chief Signal Officer's Office, War Department. File application before Sept. 9.

Chief metallurgist, $4,500 to $5,000 per year; assistant chief metallurgist, $3,600 to $4,500 per year, Ordnance Department. Applications must be filed before Sept. 16.

Junior highway bridge engineer, Office of Public Roads and Rural Engineering, Department of Agriculture, $1200 and $1600 per year, Sept. 17.

Computer, Ordnance, Navy Yard, Washington, D. C., $7.20 to $12 per diem, Sept. 17. File applications in time to arrange for examination at place selected by applicant.

Assistant examiner, Patent Office, Washington, D. C., $1500 to $1740 per year, Sept. 17 to 19 and Nov. 19 to 21. File applications in time to arrange for examination at place selected by applicant.

Engineer, $3000 per year; assistant engineer, $1800 to $2880 per year; junior engineer, $1200 to $1740 per year; engineering draftsman, $1200 to $3000 per year, Reclamation Service. Applications will be received until further notice.

ENGINEERING SOCIETIES

Calendar

Annual Meeting

NEW ENGLAND WATER WORKS ASSOCIATION Tremont Temple, Boston, Sept. 30, Oct. 1-3, Albany, N. Y.

AMERICAN SOCIETY OF NAVAL ENGINEERS; Secretary, Lieut. Com F. W. Sterling, U. S. N., Navy Department, Washington, D. C.; Oct. 7, Washington.

AMERICAN PUBLIC HEALTH ASSOCIATION; 169 Massachusetts Ave., Boston; Oct. 27-30, New Orleans.

The San Francisco Chapter of the American Association of Engineers, at its meeting Aug. 7, discussed plans for appointing a Western secretary, for entertaining F. H. Newell, the national president of the organization on the occasion of his San Francisco visit, and ways and means for promoting the interests of association members.

The North Carolina Society of Civil Engineers will hold its first annual convention at Wrightsville Aug. 22-23. Col. Joseph Hyde Pratt, U. S. A., will speak on "Lessons Learned from Roads in France." There will also be a discussion of North Carolina drainage problems and highway construction.

The Sacramento Chapter of the American Association of Engineers, at its meeting Aug. 5, authorized a committee, composed of R. E. Dodge and R. Walsh, to take preliminary action toward organizing a State Council of Engineers. The qualification committee reported the following as newly elected officers: President, W. S. Caruthers; vice-presidents, F. B. Gillette, R. Walsh and G. H. P. Lichthardt; secretary-treasurer, H. A. Lathrop. A special committee was appointed to arrange suitable entertainment when the chapter receives President Newell of the association.

PERSONAL NOTES

CAPT. BRUCE ALDRICH, U. S. A., has been appointed district engineer for the Asphalt Association for Canada, with headquarters at the office of the H. K. McCann Co., Ltd., Toronto, Ont. Mr. Aldrich was formerly in the office of the inspector of asphalt and cement, engineer department, District of Columbia, and later was engaged by the City of Baltimore, where he organized and equipped the municipal laboratory in which were tested all materials entering into new paving. As inspector of asphalts he supervised the laying of more than 3,000,000 sq.yd. of sheet asphalt and bituminous concrete, having on occasions as many as seven asphalt plants working at one time. He recently returned from service in France to his former position in Baltimore, from which he resigned to accept the position with the Asphalt Association, 15 Maiden Lane, New York.

ARTHUR H. BLANCHARD has been appointed professor of highway engineering at the University of Michigan, to occupy the chair recently established by the Board of Regents. He will retain his consulting office at Broadway and 117th St., New York City, until Sept. 15, after which he will be located in Ann Arbor, Mich.

CAPT. W. S. WYCHE, 2nd Engineers, U. S. A., has returned from overseas and has rejoined the Arkansas Valley Railway, Light & Power Co., Victor, Colo. He was decorated with the Croix de Guerre and palm.

THE HON. F. B. CARVEL, former Canadian minister of public works, has taken up his new duties as chairman of the Canadian Board of Railway Commissioners, succeeding Sir Henry Drayton, who has been appointed minister of finance.

M. NAKAMURA, engineer, of Tokio, is visiting Canada studying power development, and obtaining information on Canadian manufacturing plants. He states that interest in Japan in the development of electric power is very keen

A. W. MACPHERSON, for the past 15 years on the engineering staff of the San Francisco-Oakland Terminal Rys., of five of which he was chief engineer, has resigned to take up ranching. He contemplates the organization soon of a general contracting firm.

H. S. MCFADDEN, formerly with the Kansas State Highway Commission, is the president of the newly-organized KANSAS ENGINEERING CO., Topeka, Kan. The firm will specialize in road-surveys.

J. A. CAMPBELL, JR., and C. B. MCKEY are president and secretary, respectively, of the WESTERN ENGINEERING CO., Topeka, Kan., recently organized to handle Federal-aid road work.

BLAIR BOYLE, county engineer of Geary County, Kansas, has resigned to become county engineer for Bourbon County, Kansas, with headquarters at Fort Scott.

MAJ. ARTHUR H. PRATT, 26th Engineers, U. S. A., has been discharged from the Army and has been appointed designing engineer for the North Jersey District Water-Supply Commission, which is developing the Wanaque River at Midvale, N. J., to supply Newark and neighboring municipalities.

MAJ. E. A. KINGSLEY, Engineers, U. S. A., has just returned from France and has resumed his engineering practice at San Antonio, Tex. He left for France in September, 1917, and in October was assigned to the road department of the A. E. F. In January, 1918, he was made superintendent of roads for the intermediate section of the Army's lines of communication, from which position he was relieved in June of this year. All of the road construction and maintenance in the section were under his supervision. In 1904 Major Kingsley left railroad service to become engineer of Little Rock, Ark. Retiring from this position in 1911, he was appointed the county engineer at Little Rock, and two years later the first state highway engineer of Arkansas. He entered private practice in 1914, so continuing until he was commissioned in the Army in 1917.

CAPT. HOWARD F. BRONSON, U. S. A., for two years camp sanitary engineer at Camp Upton, Long Island, has received his discharge from the Army to return to the Pennsylvania State Department of Health as sanitary engineer in the engineering division.

A. M. CRAIN, of Detroit, has become associated with the Witherspoon Englar Co., engaged in building construction, Chicago, as vice-president. He was formerly a member of the firm of Janse Bros., Boomer, Crain & Howe. He will continue his work of specialization in the construction of grain elevators, power plants, industrial buildings and railway terminals.

HARTLEY ROWE, formerly in charge of building and design work in the Canal Zone for the United States Government, has been placed in charge of the new Detroit offices of LOCKWOOD, GREEN & CO., consulting engineers, New York City.

FRANK H. JOYNER, until recently road commissioner of Los Angeles County, Calif., and before his appointment to that position division engineer of the Massachusetts State Highway Commission, has become chief engineer of the California Willite Road Construction Co., and consulting engineer of the Western Willite Road Construction Co., Los Angeles.

CAPT. EDWARD VAN WINKLE, 24th Engineers, U. S. A., has received his discharge from the service and is now associated with FREDERICK A. WALDRON, consulting engineer, 37 Wall St., New York City. He will give special attention to industrial engineering.

T. H. JOHNSON, whose resignation as city engineer of Sioux City, Iowa, was announced in these columns last week, has entered private practice.

LIEUT. GEORGE A. GIORLOFF, U. S. A., has received his discharge from the service and has become associated with the Towanda Construction Co. as superintending engineer on state highway construction near Towanda, Penn.

N. M. LONEY has resigned as chief engineer of the American Can Co. and has been elected vice-president of the Thompson-Starrett Co., New York City. C. G. PREIS, assistant chief engineer, succeeds Mr. Loney as chief engineer.

CHARLES C. SMITH has resigned as city engineer of San Angelo, Tex., to become county engineer of Schleicher County, Texas.

WARREN B. BURCH, city engineer of San Luis Obispo, Calif., for the past four years, has become county engineer of San Luis Obispo County.

WILLIAM J. D. LYNCH has resigned as assistant engineer of Nutley, N. J.

W. H. RAMP has resigned as city engineer of Parkersburg, W. Va. He will be employed by the North Carolina State Highway Department.

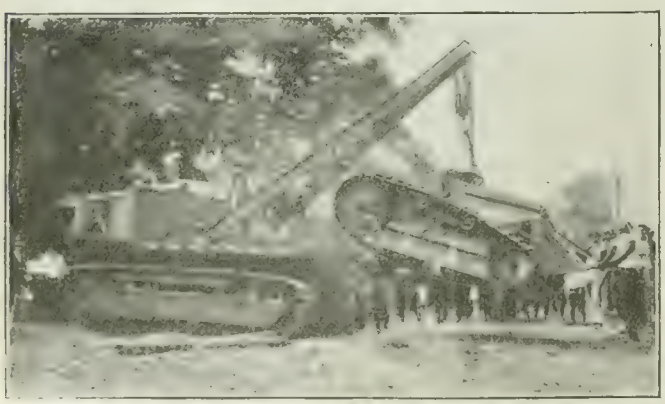
A. V. HOOKS, formerly assistant engineer of the Southern R.R., and recently discharged from the military service, has become resident engineer of the eastern district of the Southern Railroad.

GEORGE S. DUKS, it was announced in these columns recently, had been admitted into partnership with McClean & Wheaton, contractors, Moncton, N. B. Mr. Duks states that he has no relationship with the firm.

Track-Laying Tractor Crane of Ordnance Department

Among the various automotive units shown by the Army Ordnance Department at the summer meeting of the Society of Automotive Engineers at Ottawa Beach, the track-laying crane shown in the accompanying illustration shows possibilities for civilian use. The crane is shown lifting one of the three-ton tanks by the lifting rings provided for the purpose. The crane is also provided with a winch, which may be seen at the foot of the boom.

With the type of tread fitted to this machine, its usefulness is not limited by the nature of the ground over which it must work, as it can go practically anywhere. The low bearing pressure of the tracks permit its use in soft mud or snow where any other vehicle would be hopelessly mired. It is thought that such a device would be useful around large industrial works where it is necessary to lift heavy boilers and where, due to the progress of construction, unstable soil conditions would be likely to exist. The apparatus shown in the illustration is equipped with caterpillar tread as manufactured by the Holt Manufacturing Co., Peoria, Ill.



NEW TRACK-LAYING TRACTOR CRANE

BUSINESS NOTES

THE BUCYRUS CO., South Milwaukee, Wis., has opened an office at Pittsburg, Kan., for supplying electric- and steam-shovel spare parts to coal-stripping contractors and coal-mining companies operating in the Pittsburg district. The office is in charge of A. M. Neilsen.

THE GOULD MANUFACTURING CO., manufacturers of pumps, Seneca Falls, N. Y., has opened a district sales office in Detroit, Mich. This office will be located in the Dime Bank Bldg., and will be in charge of E. B. Gould, who recently returned from service in France.

THE BEDFORD FOUNDRY & MACHINE CO., Bedford, Ind., has appointed J. N. Kinney, contracting engineer, 30 Church St., New York City, as its New York representative.

THE WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., East Pittsburgh, Penn., has appointed A. B. Reynders as works manager of its East Springfield plant. Mr. Reynders was formerly director of production of the company at East Pittsburgh, and has been in the employ of the company since 1899. A. E. Kaiser, who has been assistant to the director of production since 1912, has been made director of production, to take Mr. Reynders' place.

THE CLINTON WIRE CLOTH CO., THE WRIGHT WIRE CO., THE MORGAN SPRING CO. and THE NATIONAL MANUFACTURING CO. have combined forces and coördinated manufacturing plants and facilities for greater service in supplying the wire and wire products manufactured by these companies. The organizations that have served in the past are to continue as before. The administrative offices will be at Worcester, Mass. The firm name will be the Clinton-Wright Wire Company.

THE READING ENGINEERING CO. has been organized by Eugene P. Reading, formerly with the Hubbard - Floyd Co., and will carry on a general equipment business, with offices in the Tribune Bldg., 154 Nassau St., New York.

THE NORTON CO. and the NORTON GRINDING Co., Worcester, Mass., will hereafter be conducted under the firm name of the Norton Co. under the direction of Charles L. Allen, president and general manager. The following appointments have been made: Vice-president and general sales manager, Carl F. Dietz; vice-president and foreign manager, W. LaCoste Neilson; sales manager, grinding-wheel division, Herbert Duckworth; sales manager, grinding-machine division, Howard W. Dunbar; superintendent, grinding-machine division, John C. Spence; chief engineer, grinding-machine division, Charles H. Norton.

THE SULLIVAN MACHINERY CO. announces the appointment of R. S. Weiner as district manager at El Paso, Tex., succeeding Don M. Sutor. Mr. Sutor has been transferred to the company's St. Louis office as district manager.

THE SOUTHERN CALIFORNIA IRON & STEEL CO. will begin immediate construction of a new plant at Huntington Park, on a site of 25 acres lying between the lines of the Salt Lake and Pacific Electric Ry., it is reported. The investment represented will be, roughly, $1,750,000. The officers of the company are A. C. Denman, Jr., president and general manager; E. G. Pratt, vice-president; S. K. Rindge, treasurer; A. W. Grier, secretary, and George B. Stephens, superintendent.

TRADE PUBLICATIONS

The following companies have issued trade publications:

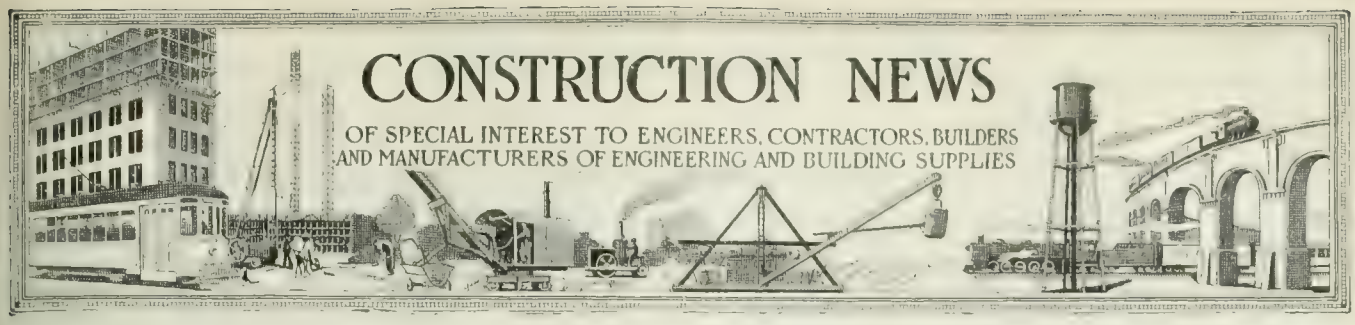
THE PELTON WATER WHEEL CO., San Francisco and New York; bulletin No. 12, 7¾ x 10½ in., 48 pages, illustrated; describes centrifugal pumps and their installation.

THE INDEPENDENT PNEUMATIC TOOL CO., 600 W. Jackson Boulevard, Chicago, Ill.; folder, 6 x 9 in., six pages, illustrated; describes hose couplings.

THE R. F. CARPENTER MFG. CO., 978 E. 64th St., Cleveland, Ohio; folder, 8½ x 11 in., four pages, illustrated; describes interior steel dividing partitions for offices and factories.

THE OSGOOD CO., manufacturer of excavating machinery, Marion, Ohio; catalog, 8½ x 11¼ in., 31 pages, illustrated; tells of the use of the company's steam shovels upon various work.

THE TROY WAGON WORKS CO., Troy, Ohio; booklet, 4 x 8 in., 57 pages; contains articles and letters from various firms and persons dealing with profit-sharing and bonus systems as applied to trucks, trailers, taxi and bus lines. The articles are illustrated with forms used in carrying out the various systems in use. Throughout, emphasis is laid on the human element, as well as the importance of keeping accurate cost records.



PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Aug. 25	Grey Bull, Wyo.	Aug. 14
Aug. 25	Williamston, N. C.	Aug. 21
Aug. 25	Royal Oak, Mich.	Aug. 14
Aug 26	Dalhousie, N. B.	Aug. 21
Aug 29	Spirit Lake, Ia.	Aug. 21
Aug 30	Berwick, N. S.	Aug. 14
Aug. 30	Clarksburg, W. Va. Adv. Aug. 7.	Aug. 7
Sept 17	Kansas City, Mo	Aug. 21

SEWERS

Aug. 25	Walnut Grove, Minn.	Aug. 7
Aug. 25	Lima, O. Adv. Aug. 7.	Aug. 7
Aug. 25	Royal Oak, Mich	Aug. 14
Aug. 25	Fairhaven, Mass. Adv. Aug 14.	Aug. 14
Aug. 26	Hartley, Ia	Aug 21
Aug 28	New York, N. Y.	Aug. 21
Sept. 1	Walnut Grove, Minn	Aug 21
Sept. 1	Inwood, Ia.	Aug 21
Sept. 3	Pocahontas, Ia	Aug. 21
Sept 4	Richmond, Ky. Adv Aug. 21.	Aug 21

BRIDGES

Aug 25	Willoughby, O.	Aug. 7
Aug. 25	Great Falls, Mont	Aug. 7
Aug. 25	Underwood, Wash.	Aug. 14
Aug. 25	Washington, Pa	Aug 21
Aug. 26	Kingwood, W. Va	Aug. 21
Aug. 26	Lockhart, S. C. Adv. Aug. 14.	Aug. 14
Aug. 26	Salt Lake City, Utah	Aug. 21
Aug 26	Lagrange, Ga.	Aug 21
Aug 26	Charleston, Mo	Aug 21
Aug 27	Monroe, Ga.	Aug 21
Aug 29	Beaufort, S. C.	Aug. 21
Aug. 29	Watertown, N. Y. Adv. Aug. 21.	Aug 21
Sept. 1	Duluth, Minn	Aug 14
Sept 2	Chester, S. C.	Aug. 21
Sept 2	Minneapolis, Minn	Aug 14
Sept. 2	Blue Earth, Minn.	Aug 21
Sept 3	Dubois Pa.	Aug 21
Sept 3	Three Rivers, Cal.	Aug. 21
Sept. 3	Toledo, O.	Aug 14
Sept. 9	Duluth, Minn.	Aug 14
Sept 12	Schenectady, N. Y. Adv. Aug. 21	Aug 21
Sept 16	Wayne, W. Va.	Aug 21
Sept. 23	Harrisburg, Pa Adv Aug 14	Aug 14

STREETS AND ROADS

Aug 25	Ebensburg, Pa	Aug. 7
Aug 25	Indiana	Aug 14
Aug 25	Washington	Aug. 14
Aug 25	California	Aug. 14
Aug. 25	Louisiana	Aug. 21
Aug 25	Seguin, Tex	Aug 21
Aug 25	Mt Pleasant, Mich	Aug 21
Aug 25	New York, N. Y.	Aug 21
Aug 25	Portland Ore	Aug 21
Aug. 26	Charleston, Mo.	Aug. 21
Aug 26	Michigan	Aug 21
Aug 26	North Carolina	Aug 21
Aug 26	Indiana	Aug 14
Aug 26	Maryland	Aug. 14
Aug 26	Bordentown, N. J Adv. Aug 14	Aug. 14
Aug. 26	Trenton, N. J. Adv. Aug. 14.	Aug. 14
Aug. 26	New York, N. Y.	Aug 7
Aug. 26	Guntersville, Ala.	July 31
Aug 27	Long Island City, N. Y	Aug 21
Aug. 27	Peru, Neb.	Aug 7
Aug. 27	Welch, W. Va.	Aug 14
Aug 27	Middletown, Del	Aug 14
Aug 27	New Jersey Adv Aug. 14	Aug 14
Aug. 27	Princeton, W. Va.	Aug. 21
Aug 28	New York, N. Y	Aug 21
Aug. 28	St Armand, Que	Aug 21
Aug. 28	Brooklyn, N. Y.	Aug. 21
Aug. 28	Helena, Ark.	Aug. 14
Aug. 28	Martinsburg, W. Va.	Aug 14
Aug. 28	Camden, N. J. Adv. Aug. 14.	Aug 14
Aug 28	Xenia, O.	Aug 21
Aug 28	Edgefield, S. C.	Aug. 21
Aug. 29	Greenfield, Ind.	Aug 14
Aug. 29	Port Arthur, Tex	Aug 21
Aug. 29	Ebensburg, Pa.	Aug 21
Aug 30	Berkeley Springs, W. Va.	Aug. 21
Aug 30	St. Martine, Que.	Aug. 14
Sept. 1	Arcadia, Fla.	Aug. 7
Sept. 1	Salt Lake City, Utah	July 24
Sept 1	Alexandria, La	Aug 21
Sept. 2	Waterville, Wash.	Aug. 21
Sept 2	Pascagoula, Miss Adv. Aug 21	Aug 21
Sept. 2	North Carolina	Aug. 21
Sept 2	Louisiana	Aug 21
Sept. 2	Independence, Mo.	Aug. 7
Sept. 2	Minneapolis, Minn	Aug 14
Sept. 2	Washington, Ga.	Aug 14
Sept. 2	Sylacauga, Ala.	Aug 14
Sept. 2	Maryland Adv. Aug 21	Aug 21
Sept. 3	Maine	Aug. 21
Sept. 3	Toledo, O.	Aug. 14
Sept. 3	Moultrie, G.	Aug. 14
Sept. 4	Fulton, Mo.	Aug. 21
Sept. 4	Rochester, N. Y Adv. Aug. 21.	Aug 21
Sept. 5	Little Rock, Ark	Aug 21
Sept 8	Seattle, Wash.	Aug 21
Sept. 8	Indiana	Aug. 14
Sept. 8	Monroe, Ga	Aug. 21
Sept 9	New York, N. Y Adv. Aug. 21	Aug 21
Sept. 9	Keyser, W. Va. Adv Aug 21	Aug 21
Sept 9	Jersey City, N. J	Aug 21
Sept 10	Bentonville, Ark	Aug. 21
Sept 10	Delaware Adv. Aug 21	Aug 21
Sept. 10	Waterloo, Ia.	Aug 7
Sept 16	Prosser, Wash	Aug 21
Sept. 16	New Orleans, La	Aug 21
Sept 18	Marion, Ark.	Aug. 21
Oct 10	Tacoma, Wash Adv Aug 14	Aug 14

EXCAVATION AND DREDGING

Aug 25	New York, N. Y.	Aug 21
Aug 26	Emmetsburg, Ia.	Aug 21
Aug 28	Granite Falls, M.	Aug 7
Sept 2	Sanford, Ala	Aug 14
Sept 5	Fort Dodge, Ia	Aug 21
Sept. 10	Toms River, N. J.	Aug. 21
Sept 22	Tower, Minn.	Aug 21

INDUSTRIAL WORKS

Aug 23	Philadelphia, Pa.	Aug 21
Sept. 1	Hastings, Minn.	Aug. 21

BUILDINGS

Aug. 25	Elizabeth, N. J.	Aug 7
Aug 25	Bayard, Neb.	Aug 7
Aug 25	Chicago, Ill.	Aug 7
Aug. 25	Dongan Hill, S. I., N. Y.	Aug 21
Aug 25	Richmond, Va.	Aug 21
Aug 26	Williamsport, Pa.	Aug 21
Aug 26	Oklahoma	Aug 21
Aug. 26	Weyburn, Sask.	Aug 7
Aug 26	Manhattan, Kan	Aug 14
Aug 27	East White Plains, N. Y.	Aug 14
Aug 27	Stoutsville, O.	Aug 7
Aug 27	Toronto, Ont	Aug 21
Aug. 28	Amos, Que.	Aug. 21
Aug 29	Toronto, Ont.	Aug. 21
Aug 30	Northfield, Minn	Aug. 21
Aug. 30	New Aberdeen, N. S.	Aug. 7
Aug 30	Worcester, Mass.	Aug. 14
Aug 30	Halifax, N. S.	Aug. 14
Sept. 1	St. Louis, Mo.	Aug. 21
Sept 1	Omaha, Neb.	July 17
Sept 1	Ft. Worth, Tex.	Aug. 14
Sept 1	Cameron, Tex.	Aug. 14
Sept 1	Miamisburg, O	Aug 14
Sept 1	Outremont, Que.	Aug 14
Sept 1	Willmar, Minn	Aug 21
Sept. 2	Twin Falls, Idaho.	Aug. 21
Sept. 2	Merced, Cal	Aug 21
Sept 2	Okmulgee, Okla	Aug 21
Sept. 3	Trenton, N. J	Aug. 14
Sept 3	Victoria, Tex	Aug. 14
Sept 4	Hartsdale, N. Y.	Aug 21
Sept 4	Bayonne, N. J.	July 31
Sept 4	Peterborough, Ont	Aug 14
Sept 4	Lyndon, Kan	Aug 21
Sept 4	Troy, N. Y.	Aug. 21
Sept 5	San Francisco, Cal	Aug 21
Sept 6	Fairview, Pa.	Aug. 14
Sept 11	Minneapolis, Minn.	Aug 21
Sept 11	Superior, Wis.	Aug 21
Sept. 12	Cloquet, Minn.	Aug. 21
Sept. 15	Pleasant Grove, Utah	July 24
Sept 15	St. Paul, Minn	Aug 14

FEDERAL GOVERNMENT WORK

Aug 25	Fuel Oil—Washington, D. C.	Aug. 14
Aug 25	Post Office—Mystic, Conn	July 31
Aug 26	Dredging—Honolulu, H. T. Adv. June 26	June 26
Aug 27	Sea Wall - New York, N. Y. Adv. July 31	July 31
Aug 27	Equipment—New Orleans, La.	Aug. 21
Aug 27	Electric Lighting and Power System, Spec 3982 Mare Island, Cal.	Aug. 14
Aug 27	Dredging—Norfolk, Va Adv. July 31	July 31
Aug 27	Lock and Abutment - Louisville, Ky. Adv. July 31	July 31
Aug 28	Road Work—Aberdeen, Md. Adv. Aug. 21.	Aug. 21
Aug 29	Post Office—Fayette, Mo	July 24
Aug 29	Dredging - New York, N. Y. Adv. July 31.	July 31
Aug. 29	Breakwater—Chicago, Ill. Adv. Aug. 7.	Aug. 7
Aug 30	Road Work—Montana	Aug 21
Sept. 2	Towboat—Memphis, Tenn.	Aug. 7
Sept 2	Miscellaneous Equipment—Washington, D. C. Adv July 10 and 17	July 10
Sept 2	Post Office—Kansas City Mo	July 24
Sept. 2	Dredging—New York, N. Y. Adv. Aug. 7	Aug. 7
Sept 4	Boiler Plant - Stapleton, N. Y. Adv Aug 21	Aug 21
Sept 4	Bridge—Arizona	Aug 21
Sept 5	Post Office—Montevideo Minn	Aug 14
Sept 7	Alterations to Post Office—Detroit, Mich. Adv Aug 21	Aug 21
Sept 8	Hangar, Lakehurst, N. J. Spec 4001	Aug 21
Sept 8	Post Office—Cloquet, Minn	Aug 14
Sept 10	Post Office—Douglas, Ga	July 31
Sept 10	Water and Sewer Systems and Fuel Oil Reservoir—Spec 1007, San Diego, Cal.	Aug 21
Sept 11	Earthwork — Memphis, Tenn. Adv. Aug. 21	Aug 21

Bids Close		See Eng. News-Record
Sept. 12	Remodeling Electric Passeager Elevator — Chicago, Ill. ..... Adv. Aug. 21	Aug. 21
Sept. 12	Pumps — New Haven, Conn. ..... Adv. Aug. 21.	Aug. 21
Sept. 15	Earthwork—St. Louis, Mo. Adv Aug. 21	Aug. 21
Sept 15	Post Office—Winnemucca, Nev. ..... Adv Aug 21	Aug. 21
Sept 15	Kitchen and Mess Hall — Stapleton, N. Y. ..... Adv. Aug. 21.	Aug. 21
Sept 18	Jetty Repair - Wilmington, Del. ..... Adv. Aug. 21	Aug. 21
Sept 18	Post Office—North Topeka Kan.	Aug. 14
Sept. 22	Material—Charlestown, W. Va	Aug. 21
Sept 22	Post Office — Charleston, W. Va.	Aug. 21
Sept 26	Post Office and Custom House—Providence, R. I. .. Adv. Aug. 21.	Aug 21
Oct 1	Valves, Gates, etc.—Denver, Colo. ..... Adv. Aug. 21	Aug. 21
Nov. 3	Post Office and Court House —Honolulu, H. T.	Aug. 21

MISCELLANEOUS

Aug. 25	Railway Ties — Toronto, Ont.	Aug. 7
Aug. 25	Cistern—Duluth, Minn	Aug 21
Aug. 26	Column Foundations—Philadelphia, Pa.	Aug. 14
Aug. 28	Silo—Savannah, Ga.	July 24
Aug. 28	Wharf—Sillery, Que.	Aug. 14
Aug. 29	Water Machinery—Trenton, N. J.	Aug. 21
Aug. 29	Protection Works — Laprairie, Que.	Aug. 21
Sept. 2	Sewage Pumping Machinery —Los Angeles, Cal.	Aug. 21
Sept. 2	Pier Shed—Seattle, Wash.,	Aug. 21
Sept. 2	Bulkhead, Wharf and Shelter Sheds, Wilmington, Del. ..... Adv. Aug. 21	Aug. 21
Sept 5	Pump—Bruce, S. D. ..	Aug. 21
Sept. 12	Dam—Decatur, Ill.	Aug. 14
Sept. 15	Levee—Alexandria, La.	Aug 14
Sept 23	Turbines, etc.—Saskatoon, Sask. ..... Adv. July 24.	July 24

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Va., Orange—Town voted $70,000 bonds to improve waterworks system, including filter plant, pumping equipment and force main. A. J. Harlow, mayor.

N. C., Franklinton—City soon receives bids building waterworks system. About $40,000. Engineer not selected.

S. C., Mullins—City will sell $20,000 bonds Sept. 1 to build waterworks and sewerage systems. Engineer not selected.

O., Columbus—City Council will be asked to appropriate funds for extending waterworks system, as recommended by J. H. Gregory, engr. Plans include new 67 ft. dam, 6,120,000,000 gal. capacity, in Scioto River above Dublin, cost $1,250,000, raising present dam 6 ft., $297,000, and reinforcements for distributing system, $550,000.

Mich., Ecorse—Village soon lets contract building elevated steel tank with capacity of 150,000 gal., 2 motor driven centrifugal pumps, with capacity of 500 gal. per minute, rein.-con. reservoir, 500,000 gal. capacity, and 8000 ft. water pipe. Separate bids on steel tank and on rest of job complete. R. A. Murdock, 706 Free Press Bldg., Detroit, engr.

Mich., River Rouge—Village soon lets contract furnishing labor and materials laying 1320 ft. 6 in. and 580 ft. 8 in. water pipe with specials and hydrants, to connect with Detroit city mains. About $15,000. G. Jerome, 1331 Majestic Bldg., Detroit, engr.

Minn., Mankato — City Council authorized $12,000 bonds to build waterworks.

Kan., Chanute — City voted $250,000 bonds to build waterworks and electric light plant.

Kan., Cherryvale—City plans to build extension to waterworks. About $40,000. Black & Veatch, Interstate Bldg., Kansas City, Mo., engrs.

Kan., Pretty Prairie — City election Aug. 28, to vote on $32,000 bonds to build waterworks. W. B. Rollins & Co., 209 Royal Exch., Kansas City, Mo., engrs.

Okla., Enid—City voted $320,000 bonds to build waterworks. Engineer not selected.

Utah, Provo—City plans to install 4 mi. 12 in. pipes from here to Pleasant View. About $20,000. R. Ferrer, supt. of waterworks.

Ariz., Phoenix—City had plans prepared for rein.-con. water conduit from Central to 3rd Aves. About $28,000. L. B. Hitchcock, city engr.

Ariz., Roosevelt—Salt River Valley Water Users Assn., Phoenix, plans to build 5000 k.w. steam generating plant for furnishing power to about 60 pumps which will be used to lower underground water level. C. A. Van der Verr, secy.

Cal., Arcadia—City voted $150,000 bonds to sink well, build 1,000,000 gal. concrete reservoir and smaller reservoir, lay 15 mi. pipe line and install 2 booster pumps and 1 pump at well. H. S. Gierlich, city engr. Noted May 22.

Cal., Oildale—Oildale Water Dist. No. 1 voted $20,000 additional bonds, making a total of $40,000, to sink wells, install pumps and lay pipe lines. Bids will soon be received. A. E. Stegeman, Bakersfield, co. surv. Noted Mar. 20.

Cal., San Diego—W. W. Patch, div. engr., state highway comn., Union League Bldg., Los Angeles, plans to build 15 mi. pipe line to bring water from Boundary Creek to Tecate Divide State Highway, San Diego Co. About $20,000.

Ont., Chatham—City having preliminary surveys, reports and estimates prepared by James, Loudon & Hertzberg, engrs., 36 Toronto St., Toronto, for new waterworks system, including intake, pumphouse, 5,000,000 gal. capacity rein.-con. reservoir, etc. About $200,000.

Ont., Forest—Town plans to build waterworks system to include electrically driven pumping equipment. Bylaw for same to be submitted soon. James, Loudon & Hertzberg, Excelsior Life Bldg., Toronto, engrs.

BIDS DESIRED

N. C., Williamston—Until Aug. 25, by Mayor, building complete waterworks and sewerage systems, including concrete or steel reservoir, water tower, 10 mi. water mains and 10 mi. sanitary sewers. About $50,000. G. N. Ambler, Richmond, Va., engr.

Ia., Dexter—H. H. Hough, city clk., receiving bids building waterworks system, including one 40,000 gal. standpipe, one 15 h.p. oil engine, one 200 gal. per minute pump, 29,000 ft. 4 and 6 in. c.i. pipe and 26 hydrants, etc. T. S. DeLay, Creston, engr.

Mo., Kansas City—Until Sept. 17th, by city purch. agt., City Hall, building 1 steam driven pumping unit. W. G. Goodwin, engr. and supt.; advertised in this issue.

Mo., Marysville—Until Sept. 2, by city, building 2 reservoirs, rein.-con. coagulatory plant, rein.-con. storage plant, two 600 g.p.m. motor-driven pumps, and one 7000 g.p.m. low service pump, involving 360 cu.yd. rein.-con., 180 cu.yd. concrete and 30,000 cu.yd. excav. About $35,000. E. E. Harper, 2408 East 30th St., Kansas City, engr. Noted Aug. 14.

Tex., Port Arthur — Until Aug. 29, by L. A. Watter, city clk., furnishing and building 300,000 gal. elevated water tank. C. E. Ridley, city engr.

N. B., Dalhousie—Until Aug. 26, by F. W. Holt, engr., Canterbury St., St. John, building complete reservoir, here for city. About $35,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. C., Rutherfordton**—City let contract laying 7500 ft. 6 and 8 in. pipes, to J. E. Cogle, Rutherfordton; filter, to Norwood Eng. Co.; storage dam, clear water basin and pumps, to Gear & Wilson, Rutherfordton. Total cost $30,000.

★**Mich., Grosse Pointe**—Windmill Point Land Co., 2258 Penobscot Bldg., Detroit, let contract to T. H. Igelhart, 209 South La Salle Ave., Chicago, furnishing labor and material laying 20,000 ft. 6 and 8 in. watermains in company's subdivision, to be connected with Detroit city mains. About $100,000.

★**Wis., Milwaukee**—Central Bd. Purchases let contract building 20,000,000 gal. pumping engine for North Point Pumping Station, to Allis-Chalmers Co., West Allis. About $225,000. Noted June 26.

★**Minn., Farmington**—E. H. Dorsey, city recdr., let contract laying 4800 ft. 6 in. water mains with valves, hydrants and accessories, to J. G. Ray, Waseca, $12,710. Noted July 24.

★**Minn., New Prague**—J. T. Rynda, supt. waterworks system, let contract building 60,000 gal. steel tank, to Pittsburg Des Moines Steel Co., Des Moines, Ia. About $6200. Noted July 31.

★**Minn., St. Cloud**—City let contract furnishing and laying 17,600 ft. 8-12 in. water mains, to Gedney & Murphy, 612 Globe Bldg., Minneapolis, $68,750. Noted July 31.

★**Kan., Caldwell**—City let contract excavating and constructing buildings for waterworks, to T. C. Brooks & Son, Jackson, cost $14,700, furnishing cast iron piping, to Nat'l. Cast Iron Pipe Co., Commerce Bldg., Kansas City, Mo., $44,216.

★**Neb., Omaha**—Metropolitan Water Bd. let contract laying water mains, involving 1920 ft. 8 in. and 4911 ft. 6 in. c.i. pipes, to Katz Constr. Co., Brandeis Theatre Bldg. About $13,500.

★**Mo., St. Louis**—St. Louis Manufacturing Co., 5301 Natural Bridge Rd., let contract building skelton water tower, to W. H. Haeseler Bldg. & Contg. Co., Wainwright Bldg. About $80,000.

Utah, Salt Lake City—City received bids building large conduit from reservoir in Parleys Canyon to Parleys High Line conduit, involving 15,850 ft. 48 in. cement pipes, 416 ft. 42 in. steel pipes, 24,000 ft. earth and 4000 ft. rock excav., from E. Smith, Kearns Bldg., $215,818; Gibbons & Reed, Kearns Bldg., $220,501; P. J. Moran, 850 South 2nd St. W., $185,673. Noted June 19.

Wash., Seattle—Bd. Pub. Wks. received bids Aug. 8, laying water mains in 12th Ave., N. E., et al, from G. Alfonso, 6th N. W. and West 88th Sts., cost $12,483; S. A. Moceri, Seattle, $13,210; C. Christofaso, Seattle, $13,886.

★**Cal., Los Angeles**—Bd. Pub. Serv. Comn., 645 South Olive St., will build hydraulic fill dam, 85 ft. high, 1235 ft. long at top containing 570,000 cu.yd. earthwork, on Los Angeles Acqueduct near Chatsworth Park, to be known as San Fernando Reservoir No. 1. Work will be done by day labor under supervision of W. Mulholland, engr., 645 South Olive St.

Sewers

PROPOSED WORK

N. Y., Salamanca—Bd. Pub. Wks. plans to build additions to sewerage system in southwestern section of city. About $21,000.

N. Y., Schenectady—City rejected all bids building storm and surface sewers in Union St., Woodland and Palmer Aves. Work will be readvertised. L. Sebring, city engr.

N. J., Bayonne—City soon receives bids building sewer in easterly side Hudson Blvd. between 45th and 46th Sts., together with all necessary appurtenances. About $10,000. C. J. O'Neil, clk.

N. J., Jersey City—City soon receives bids building 18 in. vitr. pipe sewer in Summit Ave., 85 ft. north of Honard Pl. to connect with sewer in Fairmont Ave. About $10,000. C. Van Kueren, city engr.

Sewers (Continued)

Pa., Smithton — Boro. Council receives bids about Aug. 25, laying 6700 ft. 4 in. pipe from Rostraver Twp. to South Huntingdon Twp. Reservoir adjacent to here. About $10,000. D. R. Walkenshaw, Greensburg, engr.

S. C., Mullins—See "Waterworks."

Mich., Muskegon Heights (Muskegon P. O.)—City having plans prepared by Hoad & Decker, engrs., Engineering Bldg., Ann Arbor, building system of vitr. crock lateral sewers, with connections, specials and manholes.

Mich., Pontiac—City having tentative plans prepared by C. W. Hubbell, engr., 2348 Penobscot Bldg., Detroit, building trunk line relief sewerage system for entire city. About $500,000.

Mich., Royal Oak—M. J. Brown & Son, engrs., 821 Chamber of Commerce Bldg., Detroit, received no bids furnishing labor and material building complete sewerage system and sewage disposal plant, involving 2200 ft. 8-10 in. vitr. crock sewers, Imhoff tank, ejector station and sprinkling filter, in Vinsetta Park subdivision for Vinsetta Land Co. About $25,000. Work will be readvertised. Noted Aug. 14.

Kan., Belle Plaine—City plans to build sewers in various streets. About $45,000. W. B. Rollins & Co., 209 Ry. Exch. Bldg., Kansas City, Mo., engrs.

Mo., St. Louis—J. W. Smith, engr., City Hall, soon receives bids extending Branch St. sewerage system. About $55,000.

Tex., Cleburne—City plans to build storm sewerage system. About $250,000.

Okla., Enid—City voted $180,000 bonds to build sewers. Engineer not selected.

Idaho, Rexburg—City council plans to install sewerage system throughout main streets. Vitr. or cement pipes. About $10,000

Wash., Toppenish—City plans to build 10,000 ft. 8 and 10 in. sewers. Cost to exceed $10,000 M. Bartlett, Toppenish, engr.

Ore., Portland—City received no bids building sewers in East 77th St. from Oregon to Halsey Sts., and in East 76th St. from East Burnside to East Glisan Sts. About $10,000 each. O. Laurgaard, city engr. Noted Aug. 14.

BIDS DESIRED

N. Y., New York—Until Aug. 28, by H. Bruckner, pres. Bronx Boro., building storm water drain and appurtenances in East 23rd St. from Hutchinson River to Harper Ave., combined sewers and appurtenances in East 233rd St. from Harper to Monticello Aves., Pratt Ave. from East 233rd St. and North Line of City of New York, Bell Ave. between Pratt and Strang Aves., Duryea Ave. between East 233rd St. and Strang Ave., Amundsen Ave. between East 233rd St. and Strang Ave., Seton Ave. between East 233rd St. and the summit north of Strang Ave., Monticello Ave. between East 233rd St. and Strang Ave., Strang Ave. between Bell and Monticello Aves., and a temporary connection at East 233rd St. and Monticello Ave., also building sanitary sewers and appurtenances in Eden Terrace between Boston Rd. and property of City of New York at point midway between Crawford and Palmer Aves. and between Rattlesnake Creek and Eden Terrace from such point to a point about southeast corner of Eden Terrace and East 233rd St., and in East 233rd St. from such latter point to DeReimer Ave., DeReimer Ave between East 233rd St. and Strang Ave. and combined sewers and appurtenances in Strang Ave. between Baychester and Grace Aves., Grace Ave. between Strang and Edenwald Aves., Edenwald Ave. between Grace and Ely Aves.

N. C., Williamston—See "Waterworks."

Ky., Richmond—Until Sept. 4, at office of L. P. Evans, mayor, building 30,831 ft. sanitary and storm sewers, with average cut of 8½ ft. S. F. Crecelius, city engr.; advertised in this issue.

Mich., Lansing—Until Sept. 2, by J. A. Parsons, city clk., building 11,370 ft. 8-36 in. sewers; city to furnish all pipe and castings; advertised in this issue.

Ia., Dexter—H. H. Hough, city clk., receiving bids building sewerage system and sewage disposal plant. Plans include 29,750 ft. 8-12 in. vitr. pipe, 28,880 cu.yd. earth trenching, 450 manholes, 62 cu.yd. filter concrete, 1030 cu.yd. filter sand and 82 cu.yd. filter gravel. T. S. DeLay, Creston, engr.

Ia., Hartley—Until Aug. 26, (change of date), by H. F. Broders, town clk., for construction of 1542 ft. rein.-con. rectangular sewer, ranging in size from 5 ft. x 5 ft. to 3 ft. 6 in. x 3 ft., 386 ft. 36 in circular sewer, vitr. or segmental block, 1340 ft. 33 in. circular sewer, vitr. or segmental block, 2679 ft. 8-24 in. vitr. sewer pipe, etc. H. R. Green, 197 North 2nd St., Cedar Rapids, engr. Noted Aug. 14.

Ia., Inwood—Until Sept 1, by city, building sewerage system and sewage disposal plant. C. H. Currie, Webster City, engr.

Ia., Pocahontas—Until Sept. 3, by city, building sewerage system and sewage disposal plant. C. H. Currie, Webster City, engr.

Minn., Walnut Grove—Until Sept. 1, by D. A. Malloy, rec., laying 4465 ft. 80 in. vitr. sewer tile, 2977 ft. 8 in., 1102 ft. 10 in., including 12 lampholes, 62 manholes and disposal plant with septic tank. About $50,000. Druar & Smith, 513 Globe Bldg., St. Paul, engrs. Noted June 12.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., West Springfield**—City let contract building 8 x 10 in. vitr. pipe sewers, 6 and 7 ft. deep, in various streets, to Middlesex Constr. Co., 7 Water St., Boston, $18,363.

★**Conn., Portland**—Sewer Comn. let contract building sewers in Central Sect., to S. Mazzotta, 90 Spring St., Middletown, $45,560. Noted July 31.

N. Y., New York—F. L. Dowling, pres. Manhattan Boro., received bids Aug. 11, reconstructing sewers in (a) East 72nd St. from 1st to 2nd Aves., (b) F St. and in continuation thereof, now known as Prescott Ave., from Dyckman St. to point 750 ft. north, from Reily Contg. Co., 118 East 89th St., (a) $19,304, (b) $15,327; Walton Contg. Co., 147 West 125th St., (a) $19,351; P. J. Kearns, 2306 Creston Ave., (a) $19,741; A. Gasparini, 1964 Honeywell Ave., (b) $15,311; Lexington Constr. Co., (b) $15,553. Noted Aug. 7.

★**O., Hamilton**—City let contracts to W. M. Davis, Hamilton, building 18 in. sanitary sewers in Ridgelawn Ave., cost $8075, 24 in. storm sewers in Liberty St., $4426; J. L. Walker Co., 231 Court St., building 12-18 in. sanitary sewers in 9th St., $9700.

★ **Mich., Detroit** — City let contract building Virginia Park Relief Sewer in Virginia Park from Wilson to 14th Aves., to W. Blanck & Co., 817 Forn Bldg. About $34,787. Work involves 1920 ft. 4 in. brick pipe. Noted Aug. 14.

★**Mich., Ecorse**—City let contract furnishing labor and material trenching, laying pipes and backfilling complete storm sewer in St. Cosme Ave., to Oakwood Constr. Co., 165 Fort Blvd., Detroit. About $17,500. Work involves 3000 ft. 12-24 in. vitr. pipe. Noted June 12.

★**Mich., Port Huron**—City let contract to C. Mugovero, Port Huron, building lateral sewers in alleys of blocks 181, 204 and 225, from Howard to Pine Sts., cost $2408 blocks 180, 205 and 224, from Pine to Wall Sts., $2612, blocks 179, 206 and 223, from Wall to Court Sts., $2668, blocks 178, 207 and 222, from Court to Union Sts., $4065, blocks 177, 208 and 221, from Union to Chestnut Sts., $4128, blocks 176, 209 and 220, from Chestnut to White Sts., $4121, Jenminson St., from 7th to 10th St., $11,661; to J. Kaumeier, Port Huron, building lateral sewers in Garfield St. from 10th to 12th Aves., $4534, and in 15th St from North to Beard Sts., $12,061. Noted Aug. 7.

★**Mont., Lewiston** — City let contract building storm sewers and 2905 ft. 8 in sanitary sewers in Storm Sewer Dist No. 5, to V. Sigvardt, 509 West Bebb St., storm sewers, $8207; sanitary sewers, $5894. Noted June 19.

★**Wash., Vancouver**—City Council let contract building 8 in. sewer in alley between 28th and 29th Sts., from Main to Harney Sts., to C. E. Braley, 1916 Reserve St., $1984; in alley between B and C Sts from 19th to 25th Sts. and from 25th to 26th Sts., to M. R. Sparks, Vancouver, $5231. Noted Aug. 7.

Ore., Portland—City received bids Aug. 8 building sewerage system in (a) East 37th St. and Raymond Ave., (b) 55th Ave S. E. and Harold Ave., (1) cement, (2) vitr., from Jacobsen-Jensen Co., 407 Stanton St., (a1) $42,819, (b1) $184,813; J. F Shea, North 2nd St., (a2) $40,655, (b2) $154,756; Azar & Co., Portland, (a) $42,318. Noted Aug. 14

Cal., Los Angeles—City received bids building cement pipe sewers in Homer St., et al., from W. Gosling, 3853 Montclair St., $24,888; A. Dalmatin, 818 East 10th St., $28,700; B. Deragno, Los Angeles, $35,807

★**Cal., Redwood City**—City let contract building outfall sewers, to Dreyfus Bros., San Mateo, $20,742. Noted June 19

★**N. B., Moncton**—City let contract building complete sewerage system in Baraccord St., to L. Stephen & Co., St. John, $12,786.

Bridges

PROPOSED WORK

Conn., New Haven—City plans to issue $250,000 bonds to build concrete and steel bridge over Quinnipiac River near Belle Rock.

Pa., Sunbury—Comrs. Northumberland Co. soon let contract building rein.-con girder bridge over Chillisquaque Creek, in West Chillisquaque Twp. O. Kramer, co. controller. Noted Oct. 10.

W. Va., Fayetteville—Fayette Co. Highway Dept. had plans prepared building two 25 ft. spans over Laurel Creek and two 60 ft. spans over Paint Creek About $15,000. J. K. McGrath, Fayetteville, engr.

N. C., Williamston—State Highway Comn., Raleigh, plans to build 3000 ft. concrete bridge over Roanoke River, here. About $350,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

Ill., Carlinville—O. B. Conlee, Macoupin Co. supt. highways, soon lets contract building Armor Bridge, 60 ft. span, 16 ft. roadway, involving 214 cu.yd. concrete, 30,790 lb. reinforcing steel, cost $6900, Corbin Bridge, 30 ft. span, 18 ft. roadway, 97 cu. yd. concrete, 11,920 lb. reinforcing steel, $3460, Sanders Bridge, 50 ft. span, 16 ft roadway, 186 cu.yd. concrete, 23,870 lb. reinforcing steel, $5800, Sauerwine Bridge, 6 ft. span, 25 cu.yd. concrete, 3245 lb. reinforcing steel, $670, all in Polk Twp.; Loveless Culvert, 4 ft. span, 21 cu.yd. concrete, 3610 lb. reinforcing steel, South Otter Twp., $680; Edminston Bridge, 8 ft. span, 26 cu.yd. concrete, 2650 lb. reinforcing steel, $590, Goshen No. 1 Bridge, 10 ft. span, 42 cu.yd. concrete, 2840 lb. reinforcing steel, $1070, Goshen No. 2 Bridge, 24 ft. span, 24 cu.yd. concrete, 1830 lb. reinforcing steel, $600, Haven Bridge, 8 ft. span, 73 cu.yd. concrete, 6540 lb. reinforcing steel, $2050, all in Barr Twp.; Cline Bridge, 6 ft. span, 43 cu.yd. concrete, 3670 lb. reinforcing steel Scottsville Twp., $990; Chiles Bridge, 10 ft. span, 43 cu.yd. concrete, 3020 lb. reinforcing steel, $1175, Roades Bridge, 10 ft span, 3210 lb. reinforcing steel, Bird Twp., $1145; Kahl Bridge, 24 ft. span, 106 cu.yd concrete, 9520 lb reinforcing steel, Shipman Twp., $2830. Noted June 5.

Tex., Texarkana—City plans to build steel bridge across Sulphur River at Blackman's Point. About $15,000.

Oregon—State Highway Comn., Portland rejected bids received Aug. 6 building bridges over Birdseye Creek near Rogue River and over Miller's Gulch on Pacific Highway, Jackson Co., involving 30,000 lb reinforcing steel, 200 cu.yd. Class "A" concrete, 450 lin.ft. wooden piling, 240 lin.ft. concrete hand rail. H. Nunn, Salem, state highway engr. Noted Aug. 7.

BIDS DESIRED

N. Y., Schenectady—Until Sept. 12 by E. S. Walsh, supt. pub. wks., Capitol, Albany, building abutments and approaches on Schenectady-Scotia bridge, rein.-con., extending from junction of State St. and Washington Ave. across Barge Canal Terminal channel, Van Slyck Island Barge Canal main channel, Hog Island and the Scotia channel, to point about 700 ft. north of junction of Schonowee and Mohawk Aves., Scotia Village; advertised in this issue.

N. Y., Watertown—Until Aug. 29 by Bd. Pub. Wks., building 2 span. rein.-con and steel bridge, 200 ft. long, 39 ft. wide over Black River on Factory St. About $50,000. Concrete Steel Eng. Co., 21 Park Row, New York City, engrs.; advertised in this issue

Bridges (Continued)

Pa., Dubois—Until Sept. 3, by Comrs. Clearfield Co., building various bridges, here. About $10,000

Pa., Ebensburg—See "Streets and Roads."

Pa., Washington — Until Aug. 25, by Comrs. Washington Co., for repairs and replacements to inter-county bridge over Monongahela River connecting Donora and Webster. J. S. Sell, controller. Westmoreland Co. T. J. Underwood, controller Washington Co.

W. Va., Kingwood—Until Aug. 26, by Preston Co., building 6 bridges, 1 double 26 ft span, 2 single 26 ft spans, 2 single 24 ft spans and one 16 ft span, all concrete. E. H. Wilhelm, Kingwood, engr.

W. Va., Wayne—Until Sept. 16, by Wayne Co. building substructure of 150 ft span, concrete bridge over Twelve Pole Creek. About $10,000. H. Levering, co. engr.

S. C., Beaufort—Until Aug. 29, (change of date) by Comrs. Beaufort Co., setting 7 rein.-con. piers under 400 ft. steel girder bridge over Whale Branch, tearing out wooden piling and concreting steel caisson turn pier, involving 550 cu.yd. rein.-con. and 3.9 tons reinforcing steel. About $14,000. J. R. Pennell, c/o State Highway Dept, Columbia, engr. Noted July 10.

S. C., Chester—Until Sept. 2, by Comrs. Chester Co., building 5 rein.-con. bridges, two 20 ft. clear spans, one 30 ft. clear span, one 60 ft. clear span and one 350 ft. long, all 16 ft. roadway. About $40,000.

Ga., Lagrange—Until Aug. 26, by Bd. Comrs. Rds. & Revenues of Troup Co., building bridge about 3 mi. from Hogansville, involving 111 cu.yd. Class A and 55 cu.yd. Class B concrete, 152 cu.yd. wet and dry excav., 28,000 lb. steel reinforcing, 25 cu.yd. riprap; also bridge about 1 mi. from Louise, 147 cu.yd. Class A and 6 cu.yd. Class B concrete, 150 cu.yd. wet and dry excav., 36,070 lb. reinforcing steel, 25 cu.yd. riprap. W. T. Tuggle, clk.

Ga., Monroe—Until Aug. 27, by Bd. Comrs. Rds. & Revenues of Walton Co., building 48 ft. bridge 1½ mi. from here, involving 65 cu.yd. Class A and 52 cu.yd. Class B concrete, 98 cu.yd. wet and dry excav., 9395 lb. reinforcing steel, also 190 ft. bridge about 4 mi. from here, involving 252 cu.yd. Class A and 155 cu.yd. Class B concrete, 233 cu.yd. wet and dry excav. and 50,322 lb. reinforcing steel. T. C. Aycock, chn.

Minn., Blue Earth—Until Sept. 2, by J. L. Herring, aud. Faribault Co., building Bridge No. 3130, 60 ft. deck girder, 22 ft. roadway, No. 3131, two 30 ft. spans, 20 ft. roadway, No. 3132, 18 ft. slab span 24 ft. roadway, cost $11,500; No. 2322-C, 24 ft. slab span, No. 2687-A, 24 ft. slab span, No. 2733-B, 16 ft. slab span, one 24 ft. slab span, and two box culverts, $10,500. R. J. Short, Blue Earth, engr.

Minn., Slayton—E. V. O'Brien, aud. Murray Co. receiving bids building Bridge No. 3040, 30 ft. rein.-con., rein.-con. abutments. No. 3058, 35 ft. rein.-con., 20 ft. roadway, No. 3155, 23 ft. girder and No. 3157, 16 ft. slab span, both 12 ft. abutments. About $12,000. P. L. Munder, Slayton, engr.

Mo., Charleston—Until Aug. 26, by Mississippi Co. Court, building steel bridges on Section A, Poplar Bluff-Cairo State Rd. About $12,095.

Utah, Salt Lake City—Until Aug. 26, by City Comn., building 68 ft. (exclusive of approaches) rein. con. arch bridge, 20 ft. wide, cost $20,000; also 48 ft. (exclusive of approaches) rein.-con. arch bridge, 20 ft. wide, on 4th South St., $16,000, both over Jordan River. S. Q. Cannon, city engr.

Cal., Three Rivers—Until Sept. 3 by Bd. Supervs., Tulare Co., Visalia, building rein.-con. bridge over South Fork of Kaweah River, near here, involving 228 cu.yd. rein.-con.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Lyons—E. S. Walsh, supt. pub. wks., Capitol, Albany, received bids building superstructure superstructure and approaches of highway bridge over Barge Canal below Lock No. 28 A, here, from Oppler & Reimer, Ellicott Sq., Buffalo, $44,105; Scott Bros., Arlington Blk., Rome, $41,987; Lozier, Shea & Henwood Co., Ellicott Sq., Buffalo, $45,788. Noted July 17 under "Excavation and Dredging, Albany."

N. Y., Rochester—E. S. Walsh, state supt. pub. wks., Capitol, Albany, received only bid completing 2 concrete bridges over Red Creek, Genesee Valley Park, here, Barge Canal Contr. No. 144-A, from Brown & Low Co. and Law Bros., Foster Ave., Schenectady, $69,286. Noted July 17 under "Excavation and Dredging, Albany."

★**N. J., Hoboken**—Delaware, Lackawanna & Western R.R., 90 West St., New York City, let contract building viaduct over tracks on Newark Turnpike, here, to Curtis Brothers, Longshore Ave., Phila. About $160,000.

★**N. J., Plainfield**—Comrs. Union Co. (Elizabeth) let contract building bridge on Sanford Ave., here, to A. E. Smith, 220 Park Ave., $14,745.

★**Pa., Harrisburg**—State Highway Dept. let contract building triple span highway bridge with 3 deck trusses, each 135 ft. 6 in. centre to centre, to Wyoming Co., Nicholson Twp. and Boro., to Anthracite Bridge Co., Mears Bldg., Scranton, $56,536; through truss highway bridge, 138 ft. centre to centre, York Co., York Twp., to C. A. and F. M. Wagman, Dallaston, $28,938. Noted Aug. 7.

★**W. Va., Morgantown**—Monongalia Co. let contracts to B. M. Chaplin Co., Morgantown, building Scotts Run Bridge, cost $8739, and Robinsons Run Bridge, $6485, both concrete girder type.

★**W. Va., Welch**—Comrs. McDowell Co. let contract building 3 rein.-con. bridges, 1 at Iaeger, and 2 near Roderfield, to Cronss-Thomas Eng. Contg. Co., Huntington. About $50,000.

★**W. Va., Welch**—McDowell Co. let contracts to Corns-Thomas Eng. Co., 1st Natl. Bank Bldg., Huntington, building 150 ft., steel truss bridge, 16 ft. wide, near Roderfield, involving 1000 cu.yd. concrete and 660 cu.yd. earth approach and fill, State Project No. 1105, cost $22,800; furnishing substructure and building 125 ft. steel truss bridge over Negro Branch Creek, also painting, laying concrete floor and repairing abutments of an old railway bridge, $18,-139. Noted July 24.

★**Illinois**—State Highway Comn., Springfield, let contracts to M & P Contract Co., building North River Bridge, Ganeer and Momence Twps., $28,789; Nichols Bridge, Limestone Twp., $1270; to J. A. Devars, Benjamin and Switcher Bridges, Aroma Twp., $2090; to H. Halpin, Cote Bridge, St. Anne Twp., $1120. All in Kankakee Co.

★**Wisconsin**—State Bridge Comn., Madison, let contract building Brown Deer Bridge, Milwaukee Co., Wisconsin Project No. 95, to Michie Constr. Co., 82 Wisconsin St., Milwaukee. Work involves 10,692 cu.yd. earth excav., $0.80 per cu.yd., 32 cu.yd. concrete for culverts, $22.50, 149 cu.yd. concrete for bridges, $19,920 sq.yd. concrete surfacing, $2.24, etc. Total cost $50,746.

★**Tex., Orange**—See "Streets and Roads."

★**Ariz., Phoenix**—T. Maddock, state engr., let contract building 120 ft. rein.-con. arch bridge over Queen Creek, on Mesa-Superior Highway, to Topeka Bridge & Iron Co., Stormont Bldg., Topeka, Kan., $14,000. Noted July 10.

★**Oregon**—State Highway Comn., Portland, let contracts to F. Jordan, Ashland, building 3 rein.-con. bridges over Neil Creek on Pacific Highway, Jackson Co., involving 27,000 lb. reinforcing steel, 375 cu.yd. Class "A" concrete, 600 lin.-ft. wooden piling, 200 lin.ft. concrete hand rail, cost $14,079; to J. F. Clarkson, Vancouver St., Portland, one 108 ft. one 90 ft. and one 70 ft. wood truss span bridges on John Day Highway, near Spray, Wheeler Co., 75 cu.yd. Class "B" concrete, 230 lin.ft. trestle approach, $17,885. Noted Aug. 7.

Oregon—State Highway Comn., Portland, received bids Aug. 6, building bridge over Molalla River on Canby-Aurora Sect. of Pacific Highway near Canby, Clackamas Co., consisting of three 80 ft. steel truss spans, two 30 ft. concrete spans, 266 lin.ft. timber trestle, 624 lin.ft. concrete hand rail, 266 lin.ft. timber superstructure, 1300 lin.ft. trestle piling, 2100 lin.ft. foundation piling, 167,000 lb. structural steel, 45,000 lb. reinforcing steel, 325 cu.yd. Class A concrete, 425 cu.yd. Class B concrete, from R. Wakefield, Worcester Bldg., Portland, $49,518; Portland Bridge Co., Yeon Bldg., Portland, $47,794; Parker & Banfield, Columbia Bldg., Portland, $50,676; 4 culverts and 3 bridges on Holmes-Gap Amity Sect. of West Side Highway, Polk and Yamhill Counties, 50,000 lb. reinforcing steel for bridges, 400 cu.yd. Class A concrete, 300 lin.ft. concrete hand rail, 600 lin.ft. wooden piling from A. D. Kern, Portland, $18,250. Noted Aug. 7.

Cal., San Diego—Bd. Supervs. San Diego Co. received only bid building 200 ft. rein.-con. girder at La Costa, from De Waard Bros., 207 Granger Bldg., $27,854. Noted July 31.

★**Cal., San Diego**—Bd. Supervs. San Diego Co. let contract building 180 ft. rein.-con. girder bridge near Cardiff, to Johnston & Gaston, San Diego, $26,899. Noted Aug. 7.

Reinforced Concrete

PROPOSED WORK

Pa., Pittsburgh—See "Industrial Works."
Cal., Los Angeles—See "Buildings."

BIDS DESIRED

Ga., Lagrange—See "Bridges."
Ga., Monroe—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ariz., Phoenix**—See "Bridges."
★**Cal., San Diego**—See "Bridges."
Cal., San Diego—See "Bridges."
★**Ont., Ottawa**—See "Miscellaneous."

Streets and Roads

PROPOSED WORK

Mass., Pittsfield—City soon receives bids building new concrete sidewalks on Curtiss Terrace, Onota and High Sts. About $10,-000.

N. Y., Rome—Bd. Estimate and Apportionment plans to issue $75,000 bonds to resurface various streets. J. L. Plunkett, city engr.

N. J., Elizabeth—Bd. Freeholders Union Co. plan to improve Mountain and Hazlewood Aves. About $60,000. J. Bauer, co. engr.

N. J., Jersey City—City soon lets contract repairing asphalt pavement on various treets. Cost to exceed $10,000. C. A. Van Keuren, city engr.

N. J., Jersey City—City plans to improve Waldo Ave. between Newark Ave. and Pennsylvania R.R. tracks, granite block. About $10,000. C. Van Kueren, city engr.

N. J., North Bergen—Town Council rescinded contract let to J. Devlin, 117 24th St., Guttenberg, repairing 34th and 35th Sts. About $100,000. Work will be readvertised. Noted Aug. 7.

N. J., North Bergen—Town soon lets contract repaving Courtland St., bituminous concrete. About $10,000. Noted Aug. 7.

N. J., Trenton—City plans to repair West Hanover, North Warren, Bellevue, Spring, Lafayette, Liberty, Quarry, Magowan, North Clinton, Cass, Ewing, Carrolls and Clinton Sts., brick and asphalt. A. Swan, city engr.

Pennsylvania — State Highway Dept., Harrisburg, received no bids building 12,-355 ft. 1 course rein.-con. or bituminous surface road on concrete foundation, Route No. 57, Rush Twp., Center Co.; 3812 ft. 1 course rein.-con. road, Blairsville Boro, Indiana Co.

Pa., Braddock—Boro. rejected bids grading, paving, curbing and recurbing Braddock Ave., involving 2500 sq.yd. vitr. brick on 6 in. concrete base, 6000 lin.ft. stone curbing and 5000 cu.yd. earth excav. Work will be readvertised soon. Harrop & Hopkins, Home Trust Bldg., Pittsburgh, engrs. Noted May 22.

Pa., East Pittsburgh—City election Aug. 29 to vote on $105,000 bonds to improve streets.

West Virginia—State Highway Comn., Charleston, soon receives bids grading and draining 7 mi. Franklin-Petersburg Rd., 22 ft. wide. About $48,000. Engineer not selected. Address E. Smith, Keyser, div. engr., West Virginia State Rd. Comn.

Streets and Roads (Continued)

W. Va., Hinton—Comrs. Summers Co. plan to grade 6 mi. Tallery Mountain Rd. About $38,000.

W. Va., Huntington—City soon lets contract for grading, curbing, guttering and paving with brick on gravel base, 1 mi. Locust, North Lincoln, Doulton, 11th, 19th, and 3rd Sts. About $50,000. A. B. Maupin, city engr.

W. Va., Lewisburg—Greenbrier Co. soon receives bids grading, 26 ft. wide, and paving with bituminous macadam, 9 ft. wide, on 20 mi. roads in Meadow Bluff Dist. About $180,000. F. K. Rader, Lewisburg, engr.

W. Va., Parsons—Comrs. Tucker Co. rejected bids received Aug. 6, grading 9 mi. Davis Dist.-Preston County Rd., 20 ft. wide, involving 38,800 cu.yd. excav. and 17,700 sq.yd. concrete, etc. About $75,000. J. J. Taney, Thomas, engr. Noted July 31.

W. Va., Petersburg—Comrs. Grant Co. plan to build 9 mi. Franklin-Petersburg-Patterson Creek Pike, surfacing 16 ft wide, grading 26 ft. wide, involving 45,000 cu.yd. excav., and 13,000 sq.yd. gravel surfacing, etc. About $47,200. Federal Government has been requested to appropriate $23,640 toward cost. A. C. Hoffman, Petersburg, engr.

W. Va., Princeton — Comrs. Mercer Co. soon receive bids resurfacing with macadam and changing from waterbound to bituminous following roads: 7.33 mi. from Carr Schoolhouse to Sand Lick; 9.04 mi. Bramwell-Rock Rd.; 9 mi. Bluefield-Bramwell Rd., 2.3 mi. from Virginia state line to Coopers Rd; 6.36 mi. Giatto-Rock Rd. K. E. Barton, Princeton, engr.

W. Va., Summersville—Comrs. Nicholas Co., had plans prepared grading and draining 2 mi. Belva-Summersville Rd., 20 ft. wide (steam shovel job) About $29,000. R. Williamson, Jr., Richmond, engr.

W. Va., Sutton—Braxton Co. having plans prepared building 9.6 mi. Weston and Gauley Bridge Turnpike, 18 ft. wide, involving 70,000 cu.yd. excav., etc. About $80,000. Federal Government has been requested to appropriate $39,937 toward cost.

North Carolina—State Highway Comn., Raleigh, plans to hard surface 6 mi. Winston-High Point Rd., cost $180,000; also 6 mi. Asheboro Rd. and road to Lexington, $180,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

N. C., Washington—Comrs. Beaufort Co. rejected bids received Aug. 12, paving 50 mi. highway. About $1,000,000. G. C. White, Durham, engr. Noted July 17.

Ga., Augusta—Streets and Drains Com. of City Council soon lets contract building 6000 sq.yd. pavement on 12th St. and Savannah Rd. from Millidgeville Rd. to connect with county pavement on Savannah Rd., and 10,000 sq.yd. pavement on 9th St. from Fenwick to Twiggs Sts. Bids will be accepted on asphaltic concrete on macadam base, asphaltic concrete on 4 in. concrete foundation, sheet asphalt on 4 in. concrete foundation, brick with monolithic or semi-monolithic construction, plain 6 in. concrete, wood block, etc. W. H. Wise, city engr. and pub. wks. comr.

Fla., Live Oak—Suwanee Co. election Sept. 16, to vote on $700,000 bonds to hard surface roads. Federal Government will appropriate like amount.

Ala., Andalusia—City soon lets contract for 50,000 sq.yd. concrete, brick, asphalt, wood block, bitulithic or other pavement, 1000 lin.ft. 6 x 18 in. concrete curb, 510 granite headers, 1400 ft. 4 in. terra cotta pipe for wiring, 26,000 lin.ft. 15 in. storm sewer pipe, 4600 lin.ft. 4 and 6 in. sanitary sewer connections, catchbasins, inlets, etc. M. D. Pace, city engr.

Miss., Senatobia—Tate Co. will let contract about Sept. 1, building 64 mi. roads involving 500,000 cu.yd. earth work. C. W. Johnson, 301 Wagner St., Water Valley, engr.

Miss., Vicksburg—Warren Co. election Sept. 2, to vote on $500,100 bonds to build roads.

Louisiana—State Highway Dept., New Orleans, soon receives bids building 40 mi. road in East Carroll Parish, running from Tallulah on Madison Parish Line to Arkansas State Line, 30 ft wide. About $400,000. D. Bine, 736 Maison Blanche, state highway engr.

O., Dayton—Montgomery Co. plans to pave 3.5 mi. Germantown Pike from Germantown northeast, 20 ft. wide, brick on concrete foundation. About $168,000. S. Sharts, co. surv.

O., Lisbon—Columbiana Co. received no bids Aug. 8, grading, draining and paving 2 mi. Salineville-Lisbon Rd., 14 ft. wide, involving 16,455 sq.yd. waterbound macadam. About $43,620.

Mich., Adrian—G. P. Love, city clk., received no bids laying bituminous macadam pavement 30 ft. wide, curbing and gutter ing, from north line Seeley St. to north line Albert St., also from north line Albert St. to city line on north. Noted July 10.

Mich., Detroit—Dept. Pub. Wks. soon receives bids paving Helen Ave. from Strong Ave. to Miller Ave., 26 ft. wide, cost $23,760; Gladstone Ave. from LaSalle Blvd. to Linwood Ave., 25 ft. wide, $8740; Marquette Ave. from 16th St. to Lawton Ave., 26 ft. wide, $23,600; Eastlawn Ave. from Kercheval Ave. to Charlevoix Ave., 26 ft. wide, $36,480; all asphaltic concrete on 6 in. concrete base with Amherst curbstone or Medina stone set in concrete; also alley between East Grand Blvd., Field, Theodore and Frederick Aves., 18 ft. wide, $3380, and alley between Hamilton Blvd., 3rd St., Blaine and Gladstone Aves., 18 ft. wide, $5800, 1 course concrete. C. W. Hubbell, city engr.

Mich., Detroit—Dept. Pub. Wks. soon lets contract paving following boulevards and alleys with 1 course concrete: Epworth Blvd. from Tireman Ave. to Dailey Ave., 46 ft. wide; Epworth Blvd. from Warren Ave., to Tireman Ave., 46 ft. wide; Alley No. 1058, between Hamilton Blvd., 3rd. St., Glynn Court and Calvert Ave., 19 ft. wide; No. 1060, between Woodward Ave., John R. St., Hancock and Warren Aves., 20 ft. wide; No. 1061, between East Grand Blvd., Field, Forest and Gratiot Ave., 20 ft. wide; No. 1062, between Dexter Blvd., Northwestern and Lathrop Aves., 18 ft. wide; No. 1063, between 18th, 17th, Magnolia and Myrtle Sts., 20 ft. wide; No. 1064, between Beaubien, St. Antoine, Palmer and Hedrie Sts., 20 ft. wide; No. 1065, between Melrose, Cameron, Custer Aves., East Grand Blvd., 20 ft. wide; No. 1066, between Avery, Lysander, Commonwealth and Forest Aves., 20 ft. wide, and No. 1067, between John R., Brush, Harmon and Rosedale Sts., 20 ft. wide, involving 13,732 cu. yd. excav., 12,903 lin.ft. curbstone, 21,430 sq.yd. sheet asphalt, 1293 sq.yd. granite, 358 cu.yd. concrete, 10,680 sq.yd. 1 course concrete, etc. C. W. Hubbell, city engr. Noted July 31.

Mich., Milford—Town having plans prepared grading and paving with 1 course concrete, highway at south village limits, also Mill, Huron, Summit, Main Sts. and Highland Rd. to village limits, involving 30,000 sq.yd. concrete. About $120,000.

Mich., River Rouge—R. J. Peters, village clk., received no bids grading and paving with 1 course rein.-con. 6 in. thick with armor plate expansion joints, Henry and Great Lakes Aves., Maple and Pine Sts. About $100,000. Work will be readvertised. Noted July 31.

Illinois—Dept. Pub. Wks. & Bldg., Springfield, soon lets contract improving roads in following counties: White Co., 4484 ft. Sect. D, Route 5, 10 ft. wide, gravel, cost $6690;

Iroquois Co., 11,700 ft. Sect. E, Route 7, 10 ft. wide, concrete, $28,866;

Macon Co., 38,795 ft. Sect. E, Route 5, 15 ft. wide, oiled earth, $30,788;

Lee Co., 2430 ft. Sect. F, Route 5, 16 ft. wide, $9184 and 2675 ft. Sect. G, Route 5-A, 10 ft. wide, concrete, $10,072;

Morgan Co., 3259 ft. Sect. D, Route, 1, 16 and 18 ft. wide, concrete, $12,878;

Ford Co., 3100 ft. Sect. D, Route 1, 10 ft. wide, brick, $14,971;

Jo. Daviess Co., 7675 ft. Sect. G, Route 2 26 ft. wide, earth., $6562;

Richland Co., 12 and 16 ft. span bridge, Sect. G, Route, 4, $5060 state, to furnish cement. C. Older, ch. highway engr.

Mo., Clayton—St. Louis Co. issued $3,000,000 bonds to grade, pave and improve graveled, macadamized and rock roads, bridges and culverts. W. Elbring, co. engr.

Mo., Clayton (St. Louis P. O.)—Memorial Park Assn., Central Nat'l Bank Bldg., soon receives bids extending Lucas and Hunt Rds. to gates of Memorial Park Cemetery, 32 ft. wide. About $16,000.

Mo., Joplin—City election Sept 16, to vote on $500,000 bonds to hard surface streets. Address J. F. Wise, secy.

Mo., Mexico—Audrain Co. election soon to vote on $1,000,000 bonds to hard surface roads.

Mo., Troy—J. S. Finley, secy. Lincoln Co., soon receives bids building 6½ mi. road near Elsberry. G. Crank, Elsberry, engr.

Tex., Amarillo—City plans election to vote on $150,000 bonds to pave streets.

Tex., Bryan—Brazos Co. soon lets contract surfacing and building rein.-con. drainage structures on Highway No. 2, Rd Dist. No. 2, Federal Aid Project No. 97, 15 ft. wide, 8.73 mi. gravel surfaced, 1.6 mi. concrete surfaced, involving 14,666 sq.yd concrete pavement, 42,619 cu.yd. unclassified earth excav., 41,762 lb. reinforcing steel, and 396 cu.yd. Class A and 148 cu.yd. Class B concrete, etc. About $99,996. H. Boyett, Bryan, engr. Noted Aug. 7.

Tex., De Leon Comanche Co. voted $750,000 bonds to improve roads.

Tex., Gonzales—Gonzales Co. voted $104,000 bonds to improve lateral roads and highways Nos. 3, 21 and 29. Wilder & O'Neal, Houston, engrs.

Tex., Huntsville—Kittrell Rd. Dist., Walker Co. plans election Aug. 23, to vote on $40,000 bonds to build roads.

Tex., Kountze—Hardin Co. Dist. No. 3, election on Aug. 30, to vote on $310,000 bonds to build roads. Engineer not selected. J. M. Combs, co. judge.

Tex., Rusk—Cherokee Co., Rd. Dist. No. 3, voted $350,000 bonds to build roads. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Tex., Wharton—Wharton Co. voted $200,000 bonds to improve roads.

Tex., Wichita Falls—Wichita Co. plans to build and drain 8.814 mi. concrete road from point 7 mi. north of here, southeast to Clay Co. line, 16 ft. wide, known as State Highway No. 2, cost $40,000 per mi.; 4.68 mi. Highway No. 22 from here to Archer Co. line, 16 ft. wide, $40,000 per mi J. M. Isbell, Wichita Falls, engr

New Mexico—State Highway Comn., Santa Fe, plans to build 10 mi. Federal Aid Project No. 19, from Myndus to Florida Mts., 20 ft. wide, cost $65,000; 8 mi. Federal Aid Project No. 21, from Rinconada to Cieniguilla, $96,000.

Wash., Prosser—City plans to pave various streets involving 37,796 sq.yd. concrete or bitulithic. About $115,000. E. H. Stradling, Prosser, Engr.

Wash., Toppenish—City plans to pave 15,000 sq.yd. various streets, bitulithic. About $10,000. M. Bartlett, Toppenish, engr.

Wash., Waterville—Douglas Co. plans to gravel surface 13 mi. Mansfield-Leahy Rd., 20 ft. wide. About $75,000. R. L. Richards, Waterville, engr.

Wash., Yakima—Cowiche, Macehs and Tieton Dists. plan to build 20 mi. hard surface and gravel roads. About $140,000. Work will be done under supervision of Yakima Co. W. C. Marion, co. engr

Oregon—State Highway Comn., Portland, rejected bids received Aug. 5 paving 8 mi. Corvallis-South Sect. West Side Highway, Benton Co. (concrete paver or railroad asphalt mixed furnished by state). H. Nunn, Salem, state highway engr. Noted July 31.

Oregon—State Highway Comn., Portland, received no bids Aug. 5, paving 6.7 mi. Forest Grove-McMinnville Rd., Washington Co., involving 15,000 cu.yd. macadam and 3 mi. Walker-Cottage Grove Sect. Pacific Highway, Lane Co., 6300 cu.yd. macadam. Noted July 31.

Oregon—State Highway Comn., Portland, rejected bids received Aug. 6, grading and paving 14.8 mi. Seaside-Astoria Sect. Columbia River Highway, Clatsop Co. H Nunn, Salem, state highway engr. Noted July 31.

Ore., Portland—City plans to eliminate all grade crossings of Oregon-Washington R.R. & Navigation Co., by grading and paving Sandy Blvd., East 60th, East 53rd, East 47th, Halsey, East 82nd and East 74th Sts., cost $575,481; also improve Ellis Ave from 2nd to Milwaukee Sts., $2734; Oswego St. from Smith Ave. to Bank St., $6463; Harrison St. from Front to Water Sts., $2639. O. Laurgaard, city engr.

Streets and Roads (Continued)

Cal., Blythe—City election Aug. 26 to vote on $95,350 bonds to grade and gravel surface 15 mi. road, 22 ft. wide, in 8 districts. Address H. H. Favour, Blythe, chn. good rd. com.

Cal., Fresno—Bd. Supervs. Fresno Co receives bids in September or October paving 14 mi. road on White's Bridge Ave. to within 1 mi. Kerman; 1½ mi. Belmont Ave., 5 mi. Blackstone Ave.; 12 mi. Elm Ave. to within 3 mi. Caruthers; 8 mi. Ventura Ave. to within 2 mi. Sanger; 5 mi. Shaw Ave. to within 1 mi. Clovis; 6 mi. Adams Ave. This is first section of roads to be paved under $4,800,000 bond issue recently voted. D. M. Barnwell, clk.

Cal., Martinez—Bd. Supervs. Contra Costa Co. receives bids in September paving 3 mi. concrete road near Knightsen.

Cal., San Diego—City Council had preliminary estimates made improving Granada Ave. from Upas St. to University Ave. Plans include 143,412 sq.yd. ⅞ in. asphalt on 5 in. concrete base, 2816 lin.ft. concrete curbing, 14,550 sq.ft. concrete sidewalk and 2748 lin.ft. c.i. water mains, etc. E. A. Rhodes, city engr.

Cal., San Luis Obispo—San Luis Obispo Co. election Sept. 23 to vote on $1,500,000 bonds to grade and pave roads with concrete and build bridges and culverts.

Cal., Santa Ana—City plans to pave Main St., involving 431,000 sq.ft. 6 in. concrete base with wire mesh and 2 in. asphaltic surface, @ $0.223 per sq.ft., total, $91,373, or $37,810 less if Pacific Electric Ry., Pacific Electric Bldg., Los Angeles, retains tracks now in street; resurfacing E St., $13,447. Address E. L. Vegeley, city clk.

Ont., Hamilton—Dept. Highways, Toronto, soon receives bids building 40 mi. Provincial Highway from here to Niagara Falls, 20 ft. wide. About $400,000. G. Hogarth, Parliament Bldgs., Toronto, engr.

B. C., Chilliwacke—City soon lets contract hard surfacing various streets with 2 in. Standard Bitulithic, 2 in. gravel bitulithic or 2 in. asphaltic concrete. About $30,000. J. W. B. Blackman, New Westminster, engr.

BIDS DESIRED

Maine—Until Sept. 3, by State Highway Comn., Augusta, grading, draining and paving 9.33 mi. road, Vassalboro Twp. and .21 mi., Brunswick Twp., bituminous macadam. P. D. Sargent, ch. engr.

New York—Until Sept. 9, by State Highway Comn., Capitol, Albany, improving 4.29 mi. highway, Chautauqua Co., also completing 4.94 mi. Chautauqua Co., 7.14 mi. and 7.77 mi. Columbia Co., 6.18 mi. Chenango Co., 5.84 mi., 3.39 mi. and 4.31 mi. Delaware Co., 9.14 mi., 3.18 mi., 0.59 mi., 1.06 mi. and 3.02 mi., Erie Co., 5.13 mi. and 2.9 mi. Fulton Co., 1.97 mi. Hamilton Co., 6.18 mi. and 4.89 mi. Madison Co., 8.64 mi. Ontario Co., 1.17 mi. Orange Co., 12.66 mi. Otsego Co., 5.5 mi. Tioga Co., 3.38 mi. and 5.86 mi. Tompkins Co., 3.17 mi. Ulster Co., 6.98 mi. Washington Co., 9.63 mi. Yates Co. F. S. Greene, comr.; advertised in this issue.

N. Y., Brooklyn—Until Aug. 28, by Park Bd., Municipal Bldg., New York City, furnishing material and labor for improving Park Circle at Prospect Park and Ocean Parkway and East Drive, Prospect Park between main entrance and Ocean Ave. entrance. F. D. Gallatin, pres.

N. Y., Long Island City—Until Aug. 27, by M. E. Connolly, pres. Queens Boro., regulating and repaving with sheet asphalt on broken stone macadam base, Hillside Ave. from Grand St. to Rocky Hill Rd., 4th Ward.

N. Y., New York—Until Aug. 25, by F. L. Dowling, pres. Manhattan Boro., regulating and repaving with granite block on concrete base, intersection of Bway. and Fulton St., with sheet asphalt on concrete base, roadway of Bway. from Morris to Vesey Sts., 28th St. from Lexington to 5th Aves., 110th St. from 2nd to 5th Aves., Lenox Ave. from 116th to 124th Sts., Lexington Ave. from 53rd to 79th Sts., Lexington Ave. from 95th to 97th Sts., with wood block on concrete foundation, Lexington Ave. from 53rd to 59th Sts., from 69th to 72nd Sts., from 73rd to 75th Sts., with granite block on earth foundation, Lexington Ave. from 59th to 66th Sts., from 69th to 72nd Sts., from 73rd to 75th Sts., on concrete foundation, Lexington Ave. from 75th to 79th Sts., with sheet asphalt on concrete foundation, Lexington Ave. from point 25 ft. more or less south of southerly boundary line of 79th St. to northerly boundary line of 79th St.

N. Y., New York—Until Aug. 28, by H. Bruckner, pres. Bronx Boro., paving with bituminous concrete on 5 in. concrete foundation, roadway of East 239th St. from Martha to Katonah Aves., on cement concrete foundation, East 170th St. from Jerome to Walton Aves., regulating, grading, setting curb, laying sidewalks and crosswalks, building inlets, receiving basins, drains, culverts, approaches and guard rails, Blackrock Ave. from Havemeyer to Pugsley Aves.

N. Y., New York—Until Aug. 28, by Park Bd., Municipal Bldg., for labor and materials required to repave where directed the cement walks of small parks in Manhattan Boro. F. D. Gallatin, pres.

N. Y., Rochester—Until Sept. 4, by F. W. Ward, secy. state bd. of armory comrs., 158 State St., Albany, for finished grading, walks and drives around Armory, here. L. F. Pilcher, Albany, state archt.; advertised in this issue.

N. J., Jersey City—Until Sept. 9, by Bd. Freeholders, Hudson Co., building Belleville Turnpike, macadam foundation. About $25,000. T. J. Wasser, co. engr.

Pa., Ebensburg—Until Aug. 29, by Supervs. Summerhill Twp., c/o H. T. Jones, controller, Cambria Co., rebuilding 1.37 mi. Beaverdale Rd., Summerhill Twp., 20-25 ft. wide, brick and concrete; also building concrete bridge over Laurel River. About $75,000. Owen & Plummer, Otto Bldg., Johnstown, engrs.

Delaware—Until Sept. 10, by State Highway Dept., Dover, building 6.70 mi. road from Frederica to Milford, Contr. No. 18; 3.75 mi. road from Harrington to Felton, Contr. No. 20; 0.15 mi. road from city line to 33rd St., Wilmington, Contr. No. 21; 0.65 mi. road from Market St. Bridge to city line, Wilmington, Contr. No. 22; all in New Castle and Kent Counties. C. M. Upham, ch. engr.; advertised in this issue.

Maryland—Until Sept. 2, by State Rds. Comn., 601 Garrett Bldg., paving 1 mi. Defense Highway from Camp Parole toward Chesterfield, Contr. AA-12, Federal Aid Project No. 28, and 2 mi. highway from Ingleside toward Barclay, Contr. Q-13, Federal Aid Project No. 37, Queen Anne's Co.; 1.90 mi. highway from end of concrete road south of Snow Hill to Girdletree, Contr. WO-19, Federal Aid Project No. 30, Worcester Co.; all concrete. F. H. Zouck, chn.; advertised in this issue.

W. Va., Berkeley Springs—Until Aug. 30, by Comrs. Morgan Co., building 2 mi. Berkeley Spring-Hancock Rd., surfacing 16 ft. wide, grading 24 ft. wide, involving 9000 cu.-yd. excav. and 14,000 sq.yd. cement concrete surfacing. About $42,000. C. A. Rathrock, Berkeley Springs, engr. Noted Aug. 7.

W. Va., Keyser—Until Sept. 9, by Comrs. Mineral Co., improving 7.66 mi. road in Elk Dist. A. A. Jordan, co. clk.; advertised in this issue.

W. Va., Princeton—Until Aug. 27, by Comrs. Mercer Co., rebuilding 1½ mi. Princeton-Athens Rd., 9 ft. wide, waterbound macadam, grading and draining 3 mi. road from Simmons to McDowell county line, 18 ft. wide, cost $30,000; paving 6 mi. Princeton-Flattop Rd., 16 ft. wide, involving 28,000 cu.yd. excav. and 54,000 sq.yd. waterbound macadam, $80,600. Noted May 22.

North Carolina—Until Sept. 2, by State Highway Comn., Asheville, paving 7.8 mi. Black Mt.-Azalea Rd. Bids will be received on all types of pavement. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

North Carolina—Until Aug. 28, by State Highway Comn., Div. Office, Greensboro, hard surfacing 8 mi. roads in Alamance Co. About $240,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr.

S. C., Edgefield—Until Aug. 28, by Comrs. Edgefield Co. relocating, grading, draining and surfacing with topsoil 8.42 mi. Dixie Highway from here to Turkey Creek, 30 ft. wide. About $35,067. Former bids rejected. J. R. Pennell, c/o State Highway Dept., Columbia, engr. Noted Aug. 7.

Ga., Monroe—Until Sept. 8, by City Council, paving, curbing and draining 24,000 sq.yd. Main St. About $75,000. J. B. McCrary Co., 3rd N. B. Bldg., Atlanta, engrs.

Miss., Pascagoula—Until Sept. 2, by F. Taylor, clk., Jackson Co., building concrete road, involving 1 acre clearing and grubbing, 16,000 cu.yd. grading, 8541 cu.yd. concrete, 185 lin.ft. culvert pipe, 5000 lbs. steel and 41,439 sq.yd. monolithic concrete; advertised in this issue.

Louisiana—Until Sept 2, by State Highway Dept., 736 Maison Blanche Bldg., New Orleans, paving 11.79 mi. Vinton-Orange Highway, 30 ft. wide, Calcasieu Parish. D. Buie, state highway engr.

Louisiana—Until Aug. 25, by State Highway Dept., 736 Maison Blanche Bldg., New Orleans, gravel surfacing and draining 19.8 mi. Alexandria-Oberlin Highway, 20 ft. wide and 14.5 mi. Alexandria-Melville Highway, Rapides Parish, 20 ft. wide. D. Buie, state highway engr.

La., Alexandria—Until Sept. 1, by city, paving 4th St., from Lee to Casson Sts., vitr. brick. Former bids rejected. I. W. Sylvester, city engr.

La., New Orleans—Until Sept. 16, by city, paving Common St. from Front to Magazine Sts., Natchez St. from Tchoupitoulas St. to Bank Place, Lafayette St. from Front to South Peters Sts., Girod St. from Water to South Peters Sts., St. Joseph St. from Front to Camp Sts., Howard Ave. from Front to South Peters Sts., Poeyfarre St. from Tchoupitoulas to Camp Sts., Calliope St. from Water to South Peters Sts., Gaiennie St. from Dock Bd. Roadway to Camp St., Erato St. from Water to Camp Sts., Front St. from Canal to St. Joseph Sts., South Peters St. from Canal to Thalia Sts., Tchoupitoulas St. from Canal to Race Sts., Annunciation St. from Howard Ave. to Thalia St., Constance St. from Julia to St. Joseph Sts. and from Howard Ave to Calliope St., Magazine St. from St. Joseph to Thalia Sts., St. Peter St. from Decatur to Rampart Sts., Orleans St. from Royal to Rampart Sts. and St. Ann St. from Decatur to Rampart Sts. Noted July 31 and Aug. 7. T. L. Willis, city engr.

La., New Orleans—Until Sept. 16, by city, paving, curbing, guttering, etc., following streets during 1920: Barracks St. from North Peters to Rampart Sts., Constance St. from St. Mary's St. to Louisiana Ave., Constance St. from Race to Orange Sts., 30 ft. wide, involving 1050 sq.yd. bituminous, wood block, or asphalt, on 6 in. concrete base, 180 cu.yd. concrete and 500 cu. yd. earth excav.; St. Mary St. from Magazine Pl. to Constance St., 30 ft. wide, 17,400 sq.yd. bituminous, wood block or asphalt on 6 in. concrete base, 2900 cu.yd. concrete and 7200 lin.ft. stone curbing, cost $150,000; 150 ft. Magazine St. from Richard to Felicity Sts., 40 ft. wide, bituminous, wood block or asphalt, on 6 in. concrete base; 330 ft. Richard St. from Constance to Magazine Sts., 30 ft. wide, bituminous, wood block or asphalt on 6 in. concrete base; Magazine Pl., from Felicity to St. Mary Sts., 30 ft. wide, 1050 sq.yd. bituminous, wood block or asphalt on 6 in. concrete base, 180 cu.yd. concrete and 500 cu.yd. earth excav. T. L. Willis, city engr.

La., New Orleans—Until Sept. 23, by city, paving Gravier and Poydras Sts. from Delta to Camp Sts., Magazine St. from Canal to St. Joseph Sts., Bank Pl. from Gravier to Natchez Sts., Birch St. from Carrollton Ave. to Eagle St., Clio St. from Magnolia to Claiborne Sts., Esther, Irma and Felicia Sts. from Bway. to Walnut St., Dufossat St. from Constance St. to Dock Bd. Roadway, Baronne St. from Howard Ave. to Melpomene St., Sycamore St. from Lowerline St. to Bway., Rampart St. from Calliope to Melpomene Sts., Girod St. from St. Charles to Rampart Sts., Notre Dame St. from Delta to Magazine Sts., and Julia St. from Dock Bd. Roadway to Magazine St. T. L. Willis, city engr. Noted July 31 and Aug. 7.

La., New Orleans—Until Sept. 23, by City Council, building sidewalks, curbing and paving roadway St. Bernard Ave. from Claiborne Ave. to Broad St., 8200 ft. long, 22 ft. wide. Work involves 190,000 sq.yd. wood block, asphalt, bitulithic or bituminous concrete on 6 in. concrete base, 11,700 sq ft. vitr. brick gutter, 3170 cu.yd. concrete, 5000 sq.yd. artificial stone sidewalks and 8200 lin.ft. stone curbing. About $190,000. T. L. Willis, city engr.

Streets and Roads (Continued)

O., Xenia—Until Aug. 28, by K. Riddle, city mgr., paving 15,000 ft. various streets, 30 ft. wide, involving 60,000 sq.yd. asphalt, brick or concrete. About $30,000.

Michigan—Until Aug. 26, by State Highway Dept., Lansing, shaping, draining and surfacing 6.036 mi. State Trunk Line Rd. No. 25-2, 16 ft. wide, Luce and Chippewa Counties, involving 66,056 sq.yd. waterbound macadam and 47,208 cu.yd. earth excav.

Mich., Mt. Pleasant—Until Aug. 25, by I. Brownson, city clk., grading, shaping and paving 3900 ft. Main St., 24 ft. wide, involving 10,000 sq.yd. concrete. About $30,000.

Ia., Waterloo—Until Sept. 10, at office of auditor, Black Hawk Co., building 6 mi. graveled roads involving 18,000 cu.yd. earth, 15,000 cu.yd. gravel and 29,000 ft. tile; advertised in this issue. Noted June 5.

Mo., Charleston—Until Aug. 26, by Mississippi Co. grading, paving, building culverts and drains on 15.3 mi. state road, from Poplar Bluff to Cairo (Sect. A), 2 course concrete pavement. About $391,943.

Mo., Fulton—Until Sept. 4, by city, paving 14,000 sq.yd. 10th St., macadam or gravel. F. E. Baker, city engr.

Ark., Bentonville — Until Sept. 10, by Comrs. Benton Co., improving Road Dist. No. 4, and building 100 lin.ft. steel bridge. R. D. Alexander, Eureka Springs, engr.

Ark., Little Rock—Until Sept. 5, by Comrs. Northern Rd. Impvt. Dist., Arkansas Co., at office of State Highway Comn., Little Rock, building 75.9 mi. roads, Warrenite on rolled stone base or cement concrete, asphaltic concrete, asphaltic macadam (penetration method) or clay gravel. J. A. Kenny, Suttgart, chn.

Ark., Marion—Until Sept. 18, by Bd. Comrs. Rd. Impvt. Dists. Nos. 7, 8 and 9, Crittenden Co., building 80 mi. earth road embankment. Morgan Eng. Co., 622 Goodwyn Institute Bldg., Memphis, Tenn., engrs.; advertised in this issue.

Tex., Seguin—Until Aug. 25, by Comrs. Guadalupe Co., building with gravel surface and bituminous top, 3.256 mi. Austin-San Antonio Post Rd., or Highway No. 2, 16 ft. wide, involving 17,192 lin.ft. grading and scarifying and 28,653 sq.yd. bituminous macadam. About $27,720. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Wash., Prosser—Until Sept. 16, by city, building 15,000 ft. concrete sidewalk, 4 ft. wide. About $21,000. E. H. Stradling, Prosser, engr.

Wash., Seattle—Until Sept. 8, by Comrs. King Co., graveling and building 1700 ft. timber trestle on 9.1 mi. Woodinville-Duval Rd., involving 34,000 cu.yd. fill. About $35,000. S. Humes, co. engr.

Wash., Waterville—Until Sept. 2, by Comrs. Douglas Co., grading, draining and surfacing 16 mi. Rd. No. 4, near Withrow, cost $90,000; 7½ mi. L. I. D. Rd. No. 4, near Waterville, $45,000; both crushed rock or gravel. R. L. Richards, Waterville, engr.

Ore., Portland—Until Aug. 25, by Comrs. Multnomah Co., clearing, grubbing and laying drainage pipes on Hospital Rd. No. 938 from Marquam Hill to Terwilliger Blvd., involving 1000 cu.yd. intermediate excav., 1000 cu.yd. overhaul, 174 lin.ft. 24 in. rein.-con. pipe, 174 lin.ft. 24 in. corrugated iron culvert, 112 lin.ft. 18 in. corrugated iron culverts, 1266 lin.ft. 12 in. corrugated iron culverts, 112 lin.ft. 18 in. rein.-con. pipe, 55,000 cu.yd. common and 4000 cu.yd. rock excav. W. A. Eatchel, co. roadmaster.

Que., St. Armand—Until Aug. 28, by M. Henry, c/o Dept. Rds., Quebec, building 4½ mi. Provincial Highway, here, 22 ft. wide, 3 mi. waterbound macadam, balance gravel. About $12,000.

B. C., Victoria—Until Aug. 25, by A. E. Foreman, engr., Dept. Pub. Wks., building 2 in. asphaltic concrete surface and repaving sub-grade (old macadam road) on 2½ mi. Rd. No. 3, Lula Island, Richmond Co., 16 ft. wide, involving 23,500 sq.yd. concrete. About $40,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Vermont**—State Highway Comn., Montpelier, let contract building 2.35 mi. bituminous macadam road, Fairlee Twp., to B. Perini, Ashland, Mass., $34,559; 1.4 mi. concrete road, Colchester and Essex Twps., to J. W. Duff, Inc., 146 Summer St., Boston, $43,613. Noted July 24.

★**Connecticut**—State Highway Comn., Hartford, let contracts, to F. B. Hastings, 1200 Wood Ave., Bridgeport, improving 4773 ft. Nichols Rd., Bridgeport Twp., $16,800; to F. Arrigoni & Bro., 605 Main St., Middletown, 4200 ft. Killingworth Rd., Chester Twp., and 5205 ft. Westmusie Rd., Canterbury Twp., $24,438; to Osborne-Barnes Co., Odd Fellows Bldg., Danbury, 5029 ft. Orange Sta. Rd., Orange Twp., $16,313; 5400 ft. Ells Hill Rd., Milford Twp., $29,792; to Interstate Constr. Co., Derby, 4515 ft. Hawleyville Rd., Newtown Twp., $14,901; to G. A. Wells, Groton, 4625 ft. Canterbury Rd., Plainfield Twp., $11,295; to A. Brazos & Sons, Inc., 66 Oak St., Middletown, 4350 ft. Gildersleeve Rd., Portland Twp., $11,285. Noted July 24.

★**Conn., Danbury**—City let contract repaving roadway on Main and Rose Sts., sheet asphalt, repaving and regulating White, Elm, River and Rose Sts., to C. W. Blakeslee & Sons, 58 Waverley St., New Haven. About $125,000. Noted Aug. 7.

★**Conn., Hartford**—Bd. Contr. & Supply let contract paving 6175 ft. Wethersfield Ave., to E. Balf Co., 26 State St., $81,247. Work involves 36,590 sq.yd. asphalt on 6 in. concrete base. Noted Aug. 7.

N. Y., Brooklyn—E. Riegelmann, boro pres., received bids Aug. 13, regulating and grading with Grade 1 granite blocks, roadway of Rogers Ave. from Eastern Parkway to Empire Blvd., from M. J. O'Hara, 557 3rd St., $50,085, F. J. Gallagher, 490 Park Pl., $54,842, Leonard Paving Co., 233 Bway., New York City, $54,910; also regulating and paving with asphalt, Rogers Ave. from Empire Blvd. to Flatbush Ave., from Brooklyn Alcatraz Asphalt Co., 407 Hamburg Ave., $159,535, Cranford Co., 52 9th St., $165,996, Sicilian Asphalt Paving Co., 41 Park Row, New York City, $167,224.

N. Y., New York—F. L. Dowling, pres. Manhattan Boro., received lowest 3 bids Aug. 11, regulating, regrading and repaving with granite block on concrete base, West 46th St. from 11th Ave. to west line of new 12th Ave., from Asphalt Constr. Co., Madison Ave. and 137th St., $21,223; W. J. Fitzgerald, 547 West 45th St., $21,540; Burnside Constr. Co., 270 Burnside Ave., $21,680. Noted Aug. 7, under "Sewers."

★**N. Y., Rochester**—Bd. Contr. & Supply let contract paving Loomis St., asphalt, to J. L. Friedrichs Co., Livingston Bldg., $12,624; Plymouth Ave., asphalt, to Whitmore, Rauber & Vicinus, 279 South Ave., $18,495.

★**N. Y., S. I., St. George**—C. D. Van Name, pres. Richmond Boro., let contract building concrete curb and steel guard rail, etc., on Tompkins Ave. and Manor Rd., to J. Curran, Stapleton, $2797 and $59,437 respectively; Richmond Terrace, to Kraemer-Leedecke, 114 East 56th St., New York City, $1338. Noted Aug. 14.

★**N. J., Elizabeth**—Bd. Freeholders Union Co. let contract to C. H. Winans, paving Westfield Ave., Springfield Twp. $11,170; West Grand St., $21,895; both concrete.

★**N. J., Hoboken**—City let contract repaving Bloomfield St. between 5th and 14th Sts., 6th St. between Bloomfield and Garden Sts., 7th St. between Bloomfield and Garden Sts., asphalt, to W. T. S. Crichfield, Washington St. About $324,980. Noted Aug. 7.

★**N. J., Jersey City**—Bd. Freeholders Hudson Co. let contract repaving Paterson Plank Rd., to Curtin Bros., Guttenberg, $80,042. Noted July 31.

★**N. J., Jersey City**—City let contract repairing Grand St. and Pacific Ave., granite block, to G. Van Keuren Co., Prior St. Cost plus percentage basis. Noted July 3.

N. J., Jersey City—Hudson Co. Blvd Comn. let contract improving Hudson Co. Blvd. from Paterson Plank Rd. to Hackensack Plank Rd., to Clinton Contg Co., West Hoboken. About $133,000

★**N. J., North Bergen**—Town Council let contract improving Hamilton Ave., to A. Caponi, 710 Sip Ave., West Hoboken, 99% of ($61,000, engineer's estimate). Noted Aug. 7.

★**N. J., Trenton**—Comrs. Mercer Co. let contract improving 41,460 sq.yd. Old York Rd., to G. Fitchcroft, Farmingdale, $49,140. Noted July 31.

★**Pennsylvania** — State Highway Dept., Harrisburg, let contracts building roads in counties as follows:

Bradford Co., 15,207 ft. vitr. brick and bituminous surface course on concrete foundation, Athens, Sayre and South Waverly Twps., to Warren Bros. Co., 142 Berkeley St., Boston, $188,060;

Chester and Delaware Counties, 46,815 ft. bituminous mixture with broken stone base, Tredyffrin, Easttown and Radnor Twps., to Cunningham Paving & Constr. Co., 1345 Arch St., Phila., $99,258;

Erie Co., 20,400 ft. bituminous surface course on concrete foundation and Hillside vitr. brick or 1 course rein.-con. and Hillside vitr. brick, Girard Twp., to Griff Constr. Co., 1117 State St., Erie, $192,005; 21,120 ft. bituminous surface course on concrete foundation or rein.-con., Mill Creek Twp., to C. N. Fry Constr. Co., Cherry and 19th Sts., Erie, $128,607;

Montgomery Co., 5575 ft. concrete, East Norrilton Twp., to Field, Barker & Underwood, Commercial Trust Bldg., Philadelphia, $35,100; 37,723 ft. bituminous surface course on concrete foundation or rein.-con., Springfield, White Marsh, Upper Dublin, Lower Gynedd Twps., to Mainwaring & Cummins, Inc., 5600 Germantown Ave., Phila., $242,302;

Montgomery and Bucks Counties, 15,893 ft. bituminous surface course on concrete foundation or rein.-con., Montgomery and New Britain Twps., to H. E. Eaton, Phila., $126,334;

Susquehanna Co., 52,606 ft. bituminous surface course on concrete foundation or rein.-con., Hopbottom Boro., Lathrop, Lenox, Harford, and New Milford Twps., to Gaylord Eng. & Constr. Co., Mears Bldg., Scranton, $342,627;

Union Co., 11,434 ft. concrete, Lewis Twp., to T. L. Evans & Son, 344 Terry St., Danville, $67,367;

Washington Co., 1106 ft. vitr. brick, Canonsburg Boro., to Hardy & Rankin, Canonsburg, $18,416;

Westmoreland Co., 12,065 ft. rein.-con., Hempfield Twp., to Dawson Constr. Co., Inc., Connellsville, $107,856; 7434 ft. rein.-con., North Huntingdon Twp., to Hillside Stone Co., Farmers' Bank Bldg., Pittsburgh, $111,966. Noted Aug. 7.

★**Pennsylvania**—State Highway Dept., Harrisburg, let contracts to Aronberg & McDonald, Norfolk, Va., building 14,481 ft. rein.-con., Eastvale Boro and North Sewickley Twp., Beaver Co., $138,432; 26,383 ft. rein.-con., Pine Creek Twp., Jefferson Co., $237,516; 29,627 ft. rein.-con. and Hillside vitr. brick, Union and Mahoning Twps., Lawrence Co., $242,817. Noted Aug. 7.

★**Pennsylvania** — State Highway Dept., Harrisburg, let contract building 14,286 ft. bituminous surface course on concrete foundation or rein.-con Piatt and Porter Twps., Lycoming Co., to W. J. Gephart, Pittsburgh, $126,272; 29,182 ft. rein.-con., Plainfield Twp., Northampton Co., to E. P. Arbogast, Stroudsburg, $217,812. Noted Aug. 14.

Pa., Phila.—Dept. Pub. Wks. received bids for (a) grading sections (1) Diamond St., (2) Erdrick St., (3) St. Vincent St., (4) 18th St., (b) paving sections of streets with asphalt and vitr. block gutters, (1) Belfield Ave., (2) Broad St., (3) Edgemont St., (4) Lansdowne Ave., (5) Limekiln Pike, (6) Osage Ave., (7) Pechin St., (8) Pentridge St., (9) Plum St., (10) Westford St., (11) 43rd St.; (c) paving Erringer Pl with vitr block; (d) paving with smooth dressed granite block Scotts Lane, (b 2) Wolf St., (e) improving with waterbound macadam and vitr block, sections of (1) Green St., (2) intersection of Park Line and Cliveden St., (3) Island Ave., (4) Ridge Ave., (5) 51st St., (f) repaving, (1) Courtland St., (2) Gerard Ave., (3) Ludlow St., (4) Lansdowne St., (5) Sansome St., (6) 34th St., (7) 49th St., (8) Susquehanna St., (g) repaving sections of streets with wood block, (1) Filbert St., (2) Woodland St; (h) repaving sections of streets with granite block, (1) Susquehanna St., (2) 10th St.; (i) building bridge on line of Holmes Ave., over sections of Pennsylvania RR. tracks and Longford Ave.; (j) repairing bridges from T. P. Lee, 5629 Cherry St., (a 1) $3026; R. P. Werner, 1007 Franklin Trust Bldg., (a 1) $3827, (a 2) $3667; F. Mark Constr. Co., 21st St. above Somerset St., (a 2) $4284, (4) $3979; Estate of R. P. Bennis, Chew and Price Sts., (a 2) $4287, (a 3) $3011, (c 1) $7155, (e 3) $1971; Friars & Jolley, 1414 South Penn

Streets and Roads (Continued)

Sq., (a 3) $2442, (a 4) $4828; T. Connor, 3329 North 5th St., (a 3) $2540; H. Kuemmerle, 310 Morris Bldg., (a 4) $4139; Eastern Paving Co., 401 Colonial Trust Bdg., (b 1) $12,323, (b 2) $10,794, (b 3) $10,847, (b4) $8574, (b5) $18,073, (b6) $4704, (b 7) $3560, (b 8) $3803, (b 9) $5101, (b 10) $5725, (b 11) $12,281, (f 1) $3201, (f 2) $31,943, (f 4) $29,884, (f 5) $4881, (f 6) $8878, (f 8) $7446; Union Paving Co., 30th and Locust Sts., (b 1) $12,735, (b 2) $10,189, (b 5) $16,346, (e 3) $27,258, (e 4) $66,923, (f 2) $26,094, (f 3) $4057, (f 4) $26,934, (f 5) $4374, (f 6) $6078, (f 7) $40,736, (f 8) $6315; Barber Asphalt Paving Co., 239 North 30th St., (b 1) $12,929, (b 2) $11,158, (b 3) $10,954, (b 4) $8168, (b 5) $17,309, (b 6) $4276, (b 7) $3230, (b 8) $3059, (b9) 4191, (b10) $4743, (b11) $11,592, (e 4) $85,648, (f 1) $2834, (f 2) $29,185, (f 3) $4060, (f 4) $37,549, (f 5) $3715, (f 6) $5331, (f 7) $47,398, (f 8) $5751; Mack Paving & Const. Co., Nicetown Lane and C St., (b3) $11,348, (b7) $3945, (b9) $4486; (b10) $5118, (c1) $6698, (e1) $4736, (e5) $7611, (h1) $17,329; Phila. Paving Co., 1345 Arch St., (b4) $9277, (b6) $4969, (b8) $3777, (f3) $4919, (f7) $54,118; J. Meehan & Sons, 915 West Dauphin St., (c1) $7149, (d1) $3621, (d2) $29,551, (e2) $1550, (f1) 4072, (h2) $9789; J. J. McHugh, 1430 South Penn Sq., (d2) $30,668, (e1) 4321, (e2) $1887, (e3) $1887, (g1) $5335, (h1) $15,229, (h2) $9931; Brown King Constr. Co., 1632 Commercial Trust Bldg., (d2) $32,037; M. J. McCrudden, 805 Franklin Trust Bldg., (e1) $4789, (e4) $84,428, (e5) $7684, Estate of D. McMahon, Germantown and Chelton Sts., (e5) $8214; E. C. Fish Co., 704 Real Estate Trust Bldg., (g1) $4212, (g2) $33,421, (h2) $10,098, (i) $188,767; Ryan Constr. Co., 33rd St. and Gray Ferry, (g2) $33,789; C. P. Bower, Tulip and Somerset Sts., (i) $187,665; W. Klingberg & Son, Inc., 50 Church St., New York City, (j) $1810.

★**Pa., Pittsburgh**—Allegheny Co. let contracts widening 10,500 ft. Verona Rd., Penn Twp., from 16-24 ft., asphaltic concrete surface on concrete foundation, to M. O'Herron Co., South 1st and McKean Sts., $64,792; 15,840 ft. Imperial and Clinton Rd., Findlay Twp., 16 ft. wide, to Columbus Asphalt & Paving Co., 1101 B. F. Jones Bldg., $106,481. Noted Aug. 14.

★**Maryland**—State Rds. Comn., 601 Garrett Bldg., Baltimore, let ontract paving 1.67 mi. Oakland Mill Rd., Contr. No. 500, to T. Mullan, 4001 Greenmount Ave., Baltimore, cost $47,981, 1.52 mi. Mt. Airy Rd., Contr. No. 511, to Peoples Lumber & Supply Co., Mt. Airy, $37,893, 1.08 mi. New Windsor Rd., Contr. No. 520, to Thomas, Bennett & Hunter, Westminister, $32,066, all 15 ft. wide, concrete, Carroll Co.; grading and draining 1.79 mi. Urbana Turnpike from Monocacy River Bridge to Hopeland, involving 17,915 cu.yd. grading, etc., Contr. F-27, Frederick Co., to M. J. Grove Lime Co., Lime Kiln, $24,295; paving 1.18 mi. Clarkesville Pike, 15 ft. wide, concrete, Contr. HO-8, Howard Co., to Claiborne, Johnston & Co., 910 Garrett Bldg., Baltimore, $52,422; 2 mi. York Rd. from Parkton toward Pennsylvania State Line, concrete, Contr. B-30 Baltimore Co., to T. Bresnan & Son, 2018 West North Ave., Baltimore, $64,912. Last item incorrectly noted in our issue of Aug. 7.

★**Md., Cumberland**—Allegany Co. will build 7 mi. highway from Barton to Pekin, 15 ft. wide, concrete, Contr. No. 317, cost, $26,893. State Rds. Comn., Baltimore, will appropriate half of cost. Work will be done by day labor.

★**W. Va., Huntington**—City let contract paving Oakland Ave., vitr. brick, to G. Hinkle, Carlisle Blk., $12,294.

★**W. Va., Lewisburg**—Comrs. Greenbrier Co. let contract grading and draining 6.5 mi. Ft. Springs Rd., 20 ft. wide, to Blodgett-Carola Co., Newark, O. About $43,230. Pipe to be furnished by county. Noted Aug. 14.

★**W. Va., Logan**—Logan Co. let contract paving 6000 ft. Logan-Monitor Jct. Rd., 16 ft. wide, involving 10,666 sq.yd. concrete, to Hard Constr. Co., Maysville, Ky., $2.60 per sq.yd. Total cost, $27,702.

★**W. Va., New Martinsville**—Comrs. Wetzel Co. will pave and grade 5 mi. New Martinsville-Wileyville Rd., surfacing 16 ft. wide, grading 26 ft. wide, vitr. brick on concrete base. About $83,300. Work will be done by day labor. Noted June 5.

★**W. Va., Wayne**—Comrs. Wayne Co. let contract grading and draining 3.2 mi. Armilda-Echo Rd., 26 ft. wide, to Shipe & Wentz, Barboursville, $41,103. Noted Aug. 14.

★**W. Va., Wellsburg**—Comrs. Brooke Co. will repair and resurface 1 mi. Wellsburg-Hollidays Cove Rd., 14 ft. wide, involving 7500 sq.yd. bituminous macadam. About $18,000. Work will be done by day labor.

★**W. Va., Wellsburg**—Comrs. Brooke Co. plan to build Eldersville-Colliers Rd., Washington Pike and Colliers Rd. Work will be done by day labor under supervision of G. Steenrod, co. engr.

★**W. Va., Wellsburg**—Comr. Brooke Co. let contract building 2 mi. River Rd., 16 ft. wide, involving 18,000 sq.yd. concrete, to Keeley Constr. Co., Clarksburg. About $56,000.

★**W. Va., Wheeling**—Comrs. Ohio Co. let contract paving 5365 sq.yd. National Rd. vitr. brick on 5 in. concrete base, to V. Vercoletti, Wheeling, $22,856.

★**W. Va., Wheeling**—Comrs. Ohio Co. let contract paving 3350 sq.yd. Zane St., vitr. brick on 5 in. concrete base, 3½ in. wire cut log, and ¾ in. sand cement cushion, to Coss & Otto, Wheeling, $13,433.

★**W. Va., Winfield**—Comrs. Putnam Co. let contract grading and draining 4 mi. Culloden-St. Albans Rd., 26 ft. wide, to Keeley Constr. Co., Clarksburg, $39,668. Noted June 24.

★**N. C., Lexington**—Comrs. Davidson Co. let contract improving streets., to Noll Constr. Co., 502 South Cedar St., Charlotte, $195,135. Work involves 25,000 sq.yd. asphalt, 35,000 sq.yd. bituminous concrete, 15,000 lin.ft. concrete curbing and guttering, 10,000 sq.yd. concrete sidewalks and 9000 cu.yd. earth excav.

★**N. C., Newton**—Catawba Co. let contract paving 1¼ mi. road, 28 ft. wide, to G. R. Mortine, Newton. About $90,000. Noted July 17.

S. C., Charleston—Comrs. Charleston Co. received bids surfacing 4.008 mi. Old State Rd. from Cosgrove Ave. to Berkeley Co. line, 50 ft. wide, from Powell Paving & Constr. Co., $137,301; Lawrence Constr. Co., 127 8th St., Augusta, Ga., $167,960; Waterfront Foundation Constr. Co., Charleston, $168,078. Noted Aug. 7.

★**Florida**—State Highway Comn., Tallahassee, let contract to Southern Clay Mfg. Co., Vol. St. Life Bldg., Chattanooga, Tenn., grading, draining and surfacing 6 mi. State Rd. No. 1, from Milton eastward, 16 ft. wide, involving 31,680 sq.yd. vitr. brick, 63,360 lin.ft. concrete curbing, and 25,129 cu.yd. earth excav. $113,227; to Finley Method Co., Daytona Beach, grading, drainage and surfacing with bituminous macadam 11.73 mi. State Rd. No. 2 from Columbia Co. line south to Burnetts Lake, 15 ft. wide, involving 103,223 sq.yd. bitumious macadam and 29,749 cu.yd. earth excav., etc., $186,631.

★**Ala., Birmingham**—Bd. Revenue Jefferson Co. let contracts grading 8 mi. Mt. Olive Rd., 20 ft. wide, involving 45,800 cu.yd. grading, 30,800 cu.yd. rock, to O'Brien Constr. Co., Birmingham, cost $89,446; repairing with bitulithic surface 26th St. from 1st to 8th Aves. and 3rd Ave. from 21st to 26th Sts., to Southern Bitulithic Co., Amer. Trust Bldg., $10,000; paving 2 mi. 1st Ave. from 41st to 47th St. and 67th to 77th Sts., 30 ft. wide, sheet asphalt on concrete base, to Dunn Constr. Co., Chamber Commerce Bldg., $82,940. Noted July 17.

Ala., Birmingham—Bd. Revenue Jefferson Co. received bids paving 1 mi. 1st Ave. from 71st St. to Roebuech Springs, 30 ft. wide, on concrete base, from H. N. Bowdry, Birmingham, $2.35 for asphaltic concrete; Dunn Constr. Co., Chamber Commerce Bldg., $2.95 sheet asphalt. Noted July 17.

★**Ala., Birmingham**—Bd. Revenue Jefferson Co. let contracts paving (a) 5.72 mi. South Bessemer Rd., Project No. 57, 20 ft. wide, involving 67,091 sq.yd. asphalt on 5 and 7½ in. concrete base, 27,606 cu.yd. grading, (b) 4 mi. Birmingham and Montgomery Highway, Project No. 18, 20 ft. wide, 47,520 sq.yd. bitulithic on 5 and 7½ in. concrete base, 17,300 cu.yd. grading, (c) 3.82 mi. Old Stouts Rd., Project No. 56, 20 ft. wide, 44,861 sq.yd. bitulithic on 5 and 7½ in. concrete base, 16,309 cu.yd. grading, (d) 5 mi. Jasper Rd., Project No. 59, 20 ft. wide, 59,111 sq.yd. on 7 and 9½ in. concrete base, 27,249 cu.yd. grading, (e) 5 mi. Mt. Pinson Rd., Project No. 55, 20 ft. wide, 58,893 sq.yd. bitulithic on 5 and 7½ in. concrete base, 15,795 cu.yd. grading (f) grading 3.2 mi. Leeds and Lovick Rd., Project No. 58, 24 ft. wide, to J. F. Morgan, Woodward Bldg., (a) $259,871; Southern Bitulithic Co., Amer. Trust Bldg., (b) $174,597, (c) $166,777, (d) $192,926; Lawrence Constr. Co., 127 8th St., Augusta, Ga., (e) $213,577; W. H. Taylor, Wilsonville, (f) $48,663. Noted July 24.

Louisiana—State Highway Dept., 736 Maison Blanche Bldg., New Orleans, received only bid Aug. 11, gravel surfacing and draining 17.89 mi. Natchitoches-Many-Natchitoches-Colfax Highways, 30 ft. wide, in Natchitoches Parish, from W. S. Bonner, New Orleans, $151,309. Noted Aug. 7 under "Natchitoches."

★**O., Columbus**—G. A. Borden, dir. pub. serv., let contracts grading, draining, laying water mains and paving 3rd St. from Livingston to Reinhard Aves. and Stanley Ave. from Heyl Ave. to 22nd St., asphalt, to Franklin Asphalt Paving Co., Columbus, cost $57,234 and $17,467 respectively; Monroe Ave. from Broad to Long Sts., asphalt, A. G. Pugh, Columbus, $10,528; Grant Ave. from 5th to 11th Aves., brick, R. F. Dienst, 2515 West Broad St., $38,529. Noted Aug. 14.

★**O., Hamilton**—City let contract paving 1500 ft. Dick, Edgewood, Rhea, Virginia and Gray Sts., 30 ft. wide, sheet asphalt on concrete base, to Federal Asphalt Paving Co., 125 Main St., $53,504. Noted Aug. 7.

★**O., Lisbon**—Columbiana Co. let contract grading, draining and paving 1.14 mi. New Waterford Rd., 14 ft. wide, involving 9419 sq.yd. bituminous macadam, to Hepburn & McLean, Lisbon, $24,279; 2.24 mi. Columbiana and Leetonia Rd., 18,316 sq.yd. bituminous macadam, to Morgan Bros., Leetonia, $46,127.

★**O., Springfield**—City let contract paving Limestone St. from North to Rice Sts., wood block and asphalt on concrete base, to E. Ryan, Cincinnati, $130,000. Contract was awarded on basis of revised estimate, after no bids were received on original estimate. Noted July 31.

★**O., Toledo**—Comrs. Lucas Co. let contracts to M. P. Hannin, 434 Valentine Bldg., paving 2.56 mi. Obee Rd., 10 ft. wide, involving 14,900 sq.yd. waterbound macadam and 11,854cu.yd. excav., cost $19,967, 2.96 mi. Midway Rd., 10 ft. wide, 17,240 sq.yd. waterbound macadam and 14,641 cu.yd. excav., $29,436, 1.44 mi. Suder Ave., 16 ft. wide, 13,590 sq.yd. plain concrete and 4437 cu.yd. excav., $34,293; T. P. Garrigan Co., 109 St. Clair St., 2.01 mi. Seaman St., 16 ft. wide, 18,910 sq.yd. waterbound macadam and 3400 cu.yd. excav., $34,684; P. Watters, 531 Lincoln Ave., 1.49 mi. Bennett Rd., 16 ft. wide, 14,500 sq.yd. 6 and 8 in. plain concrete and 5519 cu.yd. excav., $39,105; Schneider & Benschoter, 398 Batavia St., 1.02 mi. Bury Rd., 16 ft. wide, 9500 sq.yd. waterbound macadam and 3411 cu.yd. excav., $17,368. Noted July 31.

★**Mich., Detroit**—City let contract to J. Porath, 34 McGraw Bldg., paving Alley No. 1046, cost $3817; No. 1047, $1908; No. 1048, $1451; No. 1051, $1313; No. 1053, $2119; No. 1054, $1300; No. 1055, $2926; No. 1056, $3755; Otis Constr. Co., 806 Hammond Bldg., No. 1049, $4040; No. 1057, $5463; Talbot Co., 400 Penobscot Bldg., No. 1050, $3501; No. 1052, $4742. Noted Aug. 14.

★**Mich., Ecorse**—City let contract furnishing labor and material grading and paving Labadie and State Sts. to Rice Constr. Co., Wyandotte. About $52,000. Work involves 11,500 sq.yd. concrete and 7000 lin.ft. concrete curbing.

★**Ill., Alton**—Bd. Local Impvts. let contract paving West Cottage Ave., brick, to Stafford & Miller Constr. Co., Alton. About $5500.

★**Ill., Belleville**—St. Clair Co. let contract grading Belleville—Mascoutah Rd., to Tritt Bros., Belleville, $25,413.

★**Ill., Chicago**—Cook Co. let contract paving following state and road work, Nies Twp., Sect. 59-15d, Route No. 1-A, Crawford Ave. beginning at north city limits and extending north to point 2275 ft., 7 in. concrete, 18 ft. roadway with 4 ft. earth shoulders, to Ready & Callaghan Coal Co., 133 West Washington St., $14,708; Bloom and Rich Twps., Sects. 60-15d and 60-A, Route 30, Flossmoor Rd. at intersection with Dixie Highway and extending west to

Streets and Roads (Continued)

point 3702 ft., 7 in. concrete, 18 ft. roadway, with 3½ ft. earth shoulders, to Central Paving Co., 133 West Washington St., $22,529; Norwood Park Twp., Sect. 61-15d, Route No. 9C, Canfield Rd. beginning at south city limits and extending south to point 4512 ft., 7 in. concrete, 18 ft. roadway, 6 ft. earth shoulders, to A. L. Heagstedt, 133 West Washington St., $26,193. Noted July 31.

★**Wis., Clintonville**—City let contract grading and paving 2.1 mi. 3rd and Main Sts., 18 ft. wide, to Olson & Thompson, Clintonville, $17,492. Work involves 7000 sq.yd. concrete, 2109 lin.ft. concrete curb and gutter and 1850 lin.ft. concrete sidewalks.

★**Wis., Reedsburg**—City let contract grading and paving South Water and 6th Sts., 2.8 mi., Park Ave. 18 ft. wide, to Sweeney Bros., Main St., 21,790. Noted Aug. 7.

★**Ia., Marion**—City let contract improving main streets, to Ford Paving Co., 208 2nd Ave., Cedar Rapids, concrete paving $2.96 per yd., brick block, $3.94 per yd., grading, $0.80 per yd., curbing, $0.85 per ft.

★**Minn., Appleton**—H. W. Steele, village aud., let contract for 21,987 sq.yd. pavement, to Johnson & Drake, 905 Plymouth Bldg., Minneapolis, $3.36 per sq.yd. Noted June 26.

★**Minn., Little Falls**—Morrison Co. will grade and gravel 24 mi. Federal Aid Project No. 24, 24 ft. wide. Work will be done by county day labor. Former bids rejected. Noted August 14.

★**Minn., Madison**—Lac Qui Parle Co. let contract grading and graveling 20 mi. and graveling 30 mi. Federal Aid Projects Nos. 54, 55 and 56, 24 ft. wide, to Siems, Helmars & Schaffner, Guardian Life Bldg., St. Paul. About $115,000. Noted June 12.

★**Minn., Windom**—Comrs. Cottonwood Co. let contract grading 17 mi. Federal Aid. Project No. 43, State Rd. No. 12, 12 ft. wide, to Cameron, Joyce & Co., Keokuk, Ia. About $26,000. Noted May 29.

★**Kan., Junction City**—City let contract paving 13th St. from Jackson to Monroe St. and 9th St. to Highway, to E. T. Meek Co., Muskogee, Okla., 2 course concrete, $2.32 per sq.yd.; M. A. Amerman, Salina, vertical fibre on 5 in. base, $3.75 per sq.yd. Noted July 10.

★**Neb., Fremont**—Dodge Co. let contract paving 6 mi. road to H. Murphy Constr. Co., 204 Karbach Blk., Omaha, $179,270. Noted July 17.

★**S. D., Millbank**—Town let contract for 10,000 sq.yd. concrete paving 18 ft. wide, to Campbell Constr. Co., 3050 Hennepin Ave., Minneapolis, $35,749. Noted June 12.

★**Wyoming**—State Highway Comn., Cheyenne, let contract building 2.16 mi. Lincoln Highway from Laramie east, Contr. No. 32, Albany Co., Ames & Braisted, Laramie, about $26,153; 9.2 mi. Platt River Highway, Sect. 1, from Lingle to Torrington, Contr. 37, Goshen Co., to S. L. Smith, Henry, Neb., grading and culverts, $35,000, Levy Constr. Co., 630 Symes Bldg., Denver, concrete and bridgework, $11,000; 3.38 mi. Yellowstone Highway from Thermopolis north, Contr. No. 38, Hot Springs Co., to D. R. Malcolm, Casper, $30,000; 4.16 mi. Sheridan-Dietz Rd., Contr. 28, Sheridan Co., to J. E. Johnson, Sheridan, $45,000. Noted July 24.

★**Mont., Lewistown**—City let contract to C. W. Johnson, 216 West Corcoran St., grading and paving with bitulithic, Boulevard St. from 7th to 11th Aves., $16,833; boulevarding and grading various streets in Dist. No. 32, $21,862; boulevarding and grading Barnes St. from 5th to 6th Aves. and Erie St. from 4th to 9th Aves., $11,524. Noted June 19.

★**Mo., St. Louis**—Bd. Pub. Serv. let contracts to Granite-Bituminous Paving Co., Ry. Exch. Bldg., improving and paving Taska St. from Kingshighway to Brannon Ave. and Brannon Ave. from Walsh St. to Nottingham Ave., 40 ft. wide, cost $16,379 and $29,941 respectively; to J. F. McMahon Constr. Co., Title Guarantee Bldg., 7th and Chestnut Sts., rebuilding and paving Lombard St. from 2nd to 4th Sts., 40 ft. wide, $10,330. Noted June 26.

★**Texas**—State Highway Dept., Austin, let contract earth and gravel surfacing and building rein.-con. drainage structures on 10.849 mi. Highway No. 30, from 1 mi. north of Buffalo Gap south to 1 mi. west of Tuscola, 16 and 24 ft. wide, (b) 20.66 mi. Highway No. 30 from Abilene to Runnels Co. line, 16 ft. wide, (c) 2,998 mi. Highway No. 7, 16 ft. wide, (d) 5.405 mi. Highway No. 7, 16 ft. wide, from Womack Constr. Co., Houston, (a) $30,719, (b) $60,117, (c) $14,181, (d) $23,763; Sanders Bros., Miami, (a) $30,984, (b) $61,818, (c) $14,043, (d) $23,280. Noted Aug. 7.

★**Tex., Brownwood**—Brown Co. let contract building Oil Belt Highway through Blanket Precinct, to Smith & Helms, Temple, $87,791.

Tex., Canton—Van Zandt Co. received bids building graveled road and rein.-con. drainage structures on 9.889 mi. Highway No. 15 or Dixie Highway, Federal Aid Project No. 84, 24 ft. wide, from D. Laroe, Chandler, $126,213; Allhands & Davis, Wills Point, $133,128. Noted June 5.

Tex., Clarksville—Red River Co. received bids gravel surfacing and building rein.-con. drainage structures on 16 mi. Highway No. 35, known as "Choctaw Trail," 14 ft. wide, involving 33.56 acres clearing and grubbing, 543 cu.yd. Class "A" concrete, 89,265 cu.yd. unclassified earth excav., 34,394 lb. reinforcing steel, 816 bbl. Portland cement, etc., from Harris & Powell, Tyler, $79,773; Sline, Stanley & Beyers, Waco, $87,865; Allhands & Davis, Wills Point, $88,131. Noted July 17.

★**Tex., Orange**—Orange Co. let contract improving roads and bridges, to Westcott Eng. Co., 111 West Washington St., Chicago. About $1,000,000. Noted May 22.

Tex., Seymour—Baylor Co. received only bid draining and gravel surfacing with caliche or clay 4.31 mi. Highway No. 30, east and west of here, 16 ft. wide, involving 11,589 cu.yd. earth excav., 75 cu.yd. Class A, 31 cu.yd. Class B and 18 cu.yd. Class C concrete, 8409 lb. reinforcing steel and 146 ft. 12-30 in. c.i. pipe, from W. E. Stephens, Seymour, $24,401. Noted July 31.

★**Tex., Tyler**—Smith Co. let contract building roads, to D. K. Caldwell, Jackson, Miss. About $1,500,000.

Tex., Vernon—Wilbarger Co. received bid paving (a) 4.66 mi. Vernon-Oklaunion Rd., Highway No. 5, Federal Aid Project No. 57, 14 ft. wide, involving 43,600 sq.yd. pavement, (b) Vernon-Oklaunion Rd., involving 8180 sq.yd. pavement, (1) monolithic brick, (2) 3 in. brick, (3) 6 in. one course concrete, from H. K. McCollum, 1st Natl. Bank Bldg., Ft. Worth, (a1) $3.98 per sq.yd., total cost, $173,328, (a2) $4.30, $187,480, (a3) $3.63, $157,832; (b1) $3.45, $28,221, (b2) $3.85, $31,493, (b3) $3.25, $26,585. Noted Mar. 27.

★**Okla., Poteau**—City let contract paving main streets and alleys, with concrete, to Morgan Constr. Co., Little Rock, Ark. About $86,000.

★**N. M., Alamogordo**—City let contract laying concrete sidewalks on 10th St., New York, Indiana and Ohio Aves., 10 ft. wide, involving over 60,000 sq.yd. concrete on 4 in. concrete base, to A. M. Horn, Alamogordo, at $0.16½ per sq.ft. About $10,000.

★**Idaho, Sand Point**—City let contract building 241,857 sq.ft. concrete sidewalk, to Lord Constr. Co., Hamilton, Mont. About $48,000.

★**Utah**—State Highway Comn., Salt Lake City, let contract surfacing 2.94 mi. Provo Heber Rd. in Provo Canyon, 18-20 ft. wide, to Heislett Constr. Co., Salt Lake City, $32,270.

★**Wash., Centralia**—City Council let contract paving 1st St., et al., involving 11,055 sq.yd. 1 course concrete, to Hendricks, Albers & Son, Centralia, $33,353.

★**Wash., Kent**—City Council let contract building concrete sidewalks on 3 mi. Main St., et al., to Ford & White, Auburn, $16,768.

Wash., Seattle—Bd. Pub. Wks. received bids Aug. 8, paving 12th Ave. N. E., involving 9275 sq.yd. 6 or 7 in. concrete, 5920 lin.ft. concrete curbing and 2100 cu.yd. earth excav., from J. L. Smith, $31,448; Kaiser Paving Co., $32,541; Fiorito Bros., $35,770. Contractors all of Seattle.

★**Wash., Seattle**—Comrs. King Co. let contract grading and paving 3.19 mi. E. G. Sylvester Rd., 16 ft. wide, involving 29,675 sq.yd. 1 course concrete and 71,000 cu.yd. earth excav., to G. A. Ferguson, 628 11th Ave., $83,750. Noted July 24.

SEWERAGE SYSTEM—PLEASANTVILLE, N. J.

Bids were received by city for constructing sanitary sewerage system, from (A) Edwin G. Britz, 1759-61 Park Ave., New York City, (awarded contract); (B) E. H. Oliver Constr. Co., 1205 Real Estate Trust Bldg., Phila.; (C) Ralph E. Reily, 182½ Ferry Street., Easton, Pa.; (D) Bruno Pizzimenti, Pitman, N. J., 103,676; (E) Martin & Miller, Caldwell, N. J., $113,593. The unit bids of the lowest 3 bidders were as follows:

	A	B	C
790 lin.ft. 8-in. t.c. pipe, 0–4 ft. deep	$0.75	$0.98	$0.73
5,917 lin.ft. 8-in. t.c. pipe, 4–6 ft. deep	.80	1.00	.80
25,578 lin.ft. 8-in. t.c. pipe, 6–8 ft. deep	.90	1.05	1.15
1,782 lin.ft. 8-in. t.c. pipe, 8–10 ft. deep	1.40	1.90	1.80
865 lin.ft. 8-in. t.c. pipe, 10–12 ft. deep	1.80	2.50	2.80
261 lin.ft. 10-in. t.c. pipe, 0–4 ft. deep	1.00	1.15	.83
3,997 lin.ft. 10-in. t.c. pipe, 4–6 ft. deep	1.10	1.15	.90
3,175 lin.ft. 10-in. t.c. pipe, 6–8 ft. deep	1.20	1.20	1.20
1,483 lin.ft. 10-in. t.c. pipe, 8–10 ft. deep	1.80	2.00	2.00
586 lin.ft. 10-in. t.c. pipe, 10–12 ft. deep	2.30	3.00	3.00
218 lin.ft. 10-in. t.c. pipe, 12–14 ft. deep	3.00	4.50	4.50
120 lin.ft. 12-in. t.c. pipe, 0–4 ft. deep	1.20	1.20	1.00
1,532 lin.ft. 12-in. t.c. pipe, 4–6 ft. deep	1.50	1.20	1.00
384 lin.ft. 12-in. t.c. pipe, 6–8 ft. deep	2.00	1.70	1.34
1,142 lin.ft. 12-in. t.c. pipe, 8–10 ft. deep	3.00	2.10	2.40
544 lin.ft. 12-in. t.c. pipe, 10–12 ft. deep	4.00	3.00	3.40
240 lin.ft. 12-in. t.c. pipe, 12–14 ft. deep	5.00	4.00	4.80
60 lin.ft. 15-in. t.c. pipe, 0–4 ft. deep	1.70	1.70	1.20
100 lin.ft. 15-in. t.c. pipe, 4–6 ft. deep	2.10	1.90	1.40
40 lin.ft. 15-in. t.c. pipe, 6–8 ft. deep	3.00	2.45	1.60
96 lin.ft. 10-in. c.-i. pipe, 6–8 ft. deep	6.00	10.00	7.00
96 lin.ft. 10-in. c.-i. pipe, 4–6 ft. deep	5.00	10.00	6.00
60 lin.ft. 10-in. c.-i. pipe, 14–16 ft. deep	10.00	25.00	20.00
96 lin.ft. 12-in. c.-i. pipe, tunneled	15.00	25.00	30.00
36 lin.ft. 8-in. c.-i. pipe, 8–10 ft. deep	7.00	10.00	20.00
60 lin.ft. 12-in. c.-i. pipe, 16–18 ft. deep	18.00	30.00	30.00
969 t.c. 8x5 in. "Y" branches	.70	.80	.65
189 t.c. 10x5 in. "Y" branches	1.00	1.35	.75
100 t.c. 12x5 in. "Y" branches	1.25	1.65	.85
9,864 lin.ft. 5-in. t.c. house connections	.60	.65	.75
150 ver. ft. 5-in. t.c. deep house connections	.70	.40	.40
8 manholes, type "A" 0–4 ft. deep	45.00	63.00	50.00
26 manholes, type "A" 4–6 ft. deep	50.00	65.00	60.00
68 manholes, type "A" 6–8 ft. deep	60.00	80.00	80.00
12 manholes, type "A" 8–10 ft. deep	75.00	100.00	100.00
7 manholes, type "A" 10–12 ft. deep	90.00	120.00	135.00
2 manholes, type "A" 12–14 ft. deep	120.00	160.00	200.00
1 flush tank, type "A" 6–8 ft. deep	190.00	220.00	185.00
7 flush tanks, type "B" 6–8 ft. deep	120.00	190.00	125.00
4 flush tanks, type "B-B" 4–6 ft. deep	125.00	180.00	110.00
15 lampholes, complete	15.00	15.00	20.00
1,865 sq.yd. bituminous repaving	2.30	2.75	1.50
35,000 lin.ft. trench gravel repaving	.10	.06	.25
70 manhole buckets	4.00	6.00	5.00
500 lin.ft. 5-in. t.c. pipe, class "B" joints	12	.09	.08
2,500 lin.ft. 8-in. t.c. pipe, class "B" joints	15	.14	.10
2,000 lin.ft. 10-in. t.c. pipe, class "B" joints	18	.17	.15
2,000 lin.ft. 12-in. t.c. pipe, class "B" joints	22	.23	.20
200 lin.ft. 15-in. t.c. pipe, class "B" joints	.28	.28	.30
20 ver. ft. drop pipe in drop manhole	4.00	4.00	1.50
3,000 b.m. rough hemlock or pine, 2x8-in. plank	60.00	80.00	75.00
Extended totals	$86,310	$98,879	$102,979

Streets and Roads (Continued)

★**Oregon**—State Highway Comn., Salem, let contract grading 9.5 mi. Butte Creek Sect. of John Day Highway, Wheeler Co., to J. F. Clarkson, Vancouver St., Portland, $47,743; 9.8 mi., Canyonville-Myrtle Creek Sect. Pacific Highway, Douglas Co., to H. J. Hildeburn, Roseburg, $85,950; grading and macadamizing 8.5 mi. Yoncalla Sect. Pacific Highway, Douglas Co., to A. Anderson, Drain, $97,820; 9.7 mi. Haines-Baker Sect. Old Oregon Trail, Baker Co., to F. C. Oxman, Portland, $96,074; paving 4.16 mi. Salem-Brooks Sect. Pacific Highway, Marion Co., to Blake-Compton Co., Portland, $92,446; 2 mi. Dalles-Three Mile Sect. of The Dalles-California Highway, Wasco Co., to United Contg. Co., Northwest Bank Bldg., Portland, $46,189; 11.8 mi. Athena-Milton Sect., Umatilla Co., and macadamizing 4.5 mi. Stage Rd. Pass-Wolf Creek Sect. Pacific Highway, Josephine Co., to Warren Constr. Co., Journal Bldg., Portland, $260,940 and $40,125 respectively. Noted July 31.

Oregon—State Highway Comn., Portland, received bids Aug. 5, improving (a) .9 mi. Rainier City Sect. Columbia River Highway, Columbia Co., (b) 23.9 mi. Jefferson Co. Line-Bend Sect. The Dalles-California Highway, Deschutes Co., (c1) 5.3 Roseburg-Wilbur Sect. Pacific Highway, (c2) 11.1 mi. Canyonville-Galesville Sect. Pacific Highway, Douglas Co., (d) 1.4 mi. Divide-Douglas Co. Line Sect. Pacific Highway, Lane Co., (e) 3.9 mi. Lone Pine-Hot Lake Sect. Old Oregon Trail, Union Co., (f) 7.9 mi. Yamhill-Gaston Sect., Forest Grove-McMinnville Highway, Yamhill Co., (3) corrugated iron pipe, (4) crushed stone macadam, (5) broken stone macadam, (6) crushed gravel macadam, (7) run of bank gravel macadam, from Portland Bridge Co., Yeon Bldg., Portland, (a) $26,935; Johnson Contract Co., Lumber Exch. Bldg., (b3) $109,185; Clarke-Henry Constr. Co., (c1) $48,550; J. Hampshire Co., (c2) cost plus 10%; L. O. Herrold, Salem, (c2) $78,610; Warren Constr. Co., Journal Bldg., Portland, (c2) $74,243; J. H. Hawley & Co., (d4) $13,801, (d5) $13,801; Northwest Constr. Co., (f6) $106,672; Yamhill Co. Court, McMinnville, (f7) $93,893. Noted July 31.

Ore., Portland—City Council received bids Aug. 6, improving (a) East 72nd St. from East Glisan St. to Thorburn Ave., (b) East 6th St. and Tacoma Ave., (c) Stockton St. from Lombard to Oberlin Sts., (d) Linn Ave. from East 9th to East 11th Sts., (e) Kern Park from 67th St. S. E. to 46th Ave., (f) Webster St. from Denver Ave. to Gay St., (g) East Caruthers St. from Brushs 2nd addition to East 26th St., (h) East 13th St. from Alberta to Humboldt Sts., (i) Smith Ave. from Bristol to Fessenden Sts., (j) East 30th St. from Holman St. to Ainsworth Ave., (k) 5th Ave. from Nevada St. to Taylor's Ferry Rd., (l) Elliott Ave. from Hawthorne Ave. to Division St., (m) Kilingsworth Ave., from 30th to 42nd Sts., (n) East 8th and Jarrett Sts., (o) East 33rd St. from Shaver to Fremont Sts., (p) East 33rd and Tibett Sts., (q) East 69th St. from Siskiyou St. to Sandy Blvd., (r) Leo Ave. from Milwaukee to East 13th Sts., (s) East Market St., from 29th to 30th Sts., (t) Emerson St. from Denver Ave. to Delaware Sts., (u) East 12th St. from Going to Alberta Sts., (1) asphaltic concrete No. 1 in roadway, (2) asphaltic concrete No. 1 redress, (3) concrete pavement in roadway, (4) asphaltic concrete No. 1 top 2 in. thick, (5) concrete pavement No. 1 in roadway, (6) concrete No. 1 from

Warren Constr. Co., Journal Bldg., (a1) $1.42 per sq.yd., total $14,346, (b) $28,093, (c1) $1.59 per sq.yd., $6771, (d1) $1.53 per sq.yd., $5698, (f1) $1.48 per sq.yd., $4367, (g1) $1.31 per sq.yd., $1290, (h1) $1.42 per sq.yd., $2480, (j1) $1.43 per sq.yd., $7902, (l2) $1.89 per sq.yd., $25,129, (m1) $1.49 per sq.yd., $20,945, (n1) $1.48 per sq.yd., $14,107, (o1) $1.37 per sq.yd., $21,552, (p1) $1.85 per sq.yd., $11,708, (q1) $1.46 per sq.yd., $2951, (r1) $1.42 per sq.yd., $9843, (s1) $1.34 per sq.yd., $2860, (t1) $1.48 per sq.yd., $10,274, (u1) $1.42 per sq.yd., $8852;

Cochran Bros., Portland, (c3) $2.25 per sq.yd., $5605, (g) $1537, (h3) $2.10 per sq.yd., $2310, (n3) $2.15 per sq.yd., $13,639, (o) $22,226, (s) $2750, (t3) $2.10 per sq.yd., $9620, (u) $8466;

Municipal Paving Plant, (c4) $1.00 per sq.yd., $1332, (d) $1360, (f) $1430, (g) $622, (h) $935, (n) $4185, (o) $9486, (p) $5298, (r) $3736, (s) $656, (t) $4120, (u) $3218; J. Keating, (d5) $2.35 per sq.yd., $5737, (r5) $2.30 per sq.yd., $10,706;

S. Simonsen, 841 East 10th St., N., (k6) $2.10 per sq.yd., $14,243, (o6) $2.05 per sq.yd., $20,927, (p6) $2.08 per sq.yd., $12,252;

J. Rebman, (i) $2725; J. Rahn, (i) $3432. Noted Aug. 14.

★**Ore., Sheridan**—City let contract paving and placing drain tile on various streets, to V. R. Dennis Constr. Co., McMinnville and C. W. Cook, Sheridan. Work involves 2750 sq.yd. asphaltic concrete, 5237 sq.yd. waterbound macadam and 3000 sq.yd. resurface macadam. Noted July 31.

★**Cal., Colusa**—City let contract paving Main St., et al, to Clark & Henry Constr. Co., Stockton. About $75,000. Work involves concrete paving $.26 per sq.ft., finish grading, $0.03 sq.ft., concrete curbs and gutters, $1 lin.ft.

★**Cal., Fairfield**—Bd. Supervs., Solano Co., let contract grading and paving 6 mi. roads in Suisun Valley, concrete, to Bates & Borland, 593 Market St., San Francisco, $143,220.

★**Cal., Los Angeles**—Bd. Pub. Wks., let contract building 4½ mi. highway from here to San Pedro Harbor, known as Municipal Impvt. Dist. No. 7, 20 ft. wide, to P. L. Ferry, 614 East Acacia St., Glendale, $156,093. Work involves 435,000 sq.ft. concrete paving, $0.15 per sq.ft., 214,280 sq.ft. grading, oiling and rolling, $0.05, excavation, $70,000, concrete, timber, vitr. pipe culverts, bulkheads, etc., $10,000, 258 ft. cement curb, $0.50 per ft. Noted July 24.

★**Cal., Los Angeles**—City let contract building Normandie Ave., involving 148,028 sq.ft. grading, 142 sq.ft. asphalt paving, 147,886 sq.ft. Warrenite paving, 724 lin.ft. cement curbing, 2990 sq.ft. cement walks, 6247 sq.ft. concrete gutters, 1610 sq.ft. granite block gutters, and 6 in. house connecting sewers, to G. H. Oswalk, 356 Bway., $44,034.

Cal., Martinez—Bd. Superv. Contra Costa Co. received only bid surfacing 4⅔ mi. road between Pittsburgh and Antioch, asphalt, from A. H. Kapperud, Martinez, $33,000.

★**Cal., Newport Beach**—City let contract paving 28th, 30th and 31st Sts. and alley, to Rogers Bros. Co., 350 Merrick St., Los Angeles, street paving, $.258 per sq.ft., alley paving, $.083 per sq.ft., total, $18,480. Noted July 31.

★**Cal., Oakland**—City let contract improving 37th Ave. from East 14th St. to southwest line, involving 7361 sq.yd. oil macadam, 3218 lin.ft. concrete curbing and 12,457 sq.ft. concrete guttering, to Hutchinson Co., 444 17th St., $17,632; 87th Ave., involving 5573 sq.yd. oil macadam, 3703 lin.ft. redwood curbing and 10,596 sq.ft. concrete guttering, to Bates & Borland, Bway. and 12th St., $13,223. Noted Aug. 14.

★**Cal., San Diego**—City Council let contract to Fairchild-Gilmore-Wilton Co., 25 14th St., improving Morena Blvd. and Linda Ave., involving 4940.6 cu.yd. excav. and 4122.3 cu.yd. embankment in berms at 50 cts. per cu.yd., 343,424 sq.ft. 1½ in. Warrenite on 4 in. concrete base, 25 cts. per sq.ft., culverts, $6000. Noted Aug. 7.

Railways

BIDS DESIRED

Connecticut—Connecticut Co., 185 Church St., New Haven, soon receives bids laying about 1,000 ft. grooved rail tracks with several switches over State and Water Sts. Bridgeport, in connection with new plaza. About $35,000.

Ontario—City of Toronto soon receives bids building double track line on Bloors St. from Quebec to Runnymede Aves. About $160,000. R. C. Harris, City Hall, engr.

Ontario—City of Toronto having report prepared by R. C. Harris, city engr., for extension of civic electric car line and purchase of new cars, equipment, etc. About $5,000,000.

Excavation and Dredging

PROPOSED WORK

Miss., Oxford—Ditches—Bd. Drainage Comrs., Lafayette Co., soon lets contract building ditches in Taylor and Wells Creek D. D. C. W. Johnson, 301 Wagner St., Water Valley, engr.

Miss., Pittsboro—Ditches—Calhoun Co. Bd. Drainage Comrs. soon lets contract building ditches on Loosa Schoona River D. D., involving 1,250,000 cu.yd. excav. C. W. Johnson, 301 Wagner St., Water Valley, engr.

Ore., Klamath Falls—Reclamation—Doak & Brown and J. F. Adams plan to reclaim about 95,000 acres tule land on Upper Klamath Lake and build 25 mi. dyke; also repair 15 mi. Klamath dyke. About $80,000.

Cal., Placerville—Irrigation—S. G. Beach appointed chairman of committee to secure estimates for irrigation system to cover 30,000 acres in central part of El Dorado Co. Engineer not selected.

BIDS DESIRED

N. Y., New York—Dredging—Until Aug. 25, by M. Hurlburt, comr. docks, Pier A, Battery Pl., dredging 115,000 cu.yd. at north and south sides Pier 59, south side Pier 64, north and south sides pier at West 52nd St., north and south sides West 54th St. pier, south side West 58th St. pier, North River, Manhattan Boro., 29,000 cu.yd. east side Pier 36, north side Pier 50, 51, 52, East 4th St. and bulkhead foot East 14th St., East River, Manhattan Boro., Contr. 1625.

N. J., Toms River—Ditch—Until Sept. 10, by Mosquito Extermination Comn., New Brunswick, cutting 40,000 lin.ft. ditching, 10 in. wide, 15 in. deep, 2500 lin.ft., 10 in. wide, 30 in. deep in Salt Marshes of Ocean Co. also 130,000 lin.ft., 30 in. deep, Cape May Co. (Cape May). T. J. Headlee, executive officer.

Ia., Emmetsburg—Drainage—Until Aug. 26, by W. F. Eagon, aud. Palo Alto Co., for drainage work in Dist. No. 41, involving 111,512 cu.yd. earth excav. and 14,355 lin.ft. 6-20 lin.ft. tile. About $100,000. G. R. Campbell, Emmetsburg, engr.

Ia., Ft. Dodge—Drainage—Until Sept. 5, by M. N. Osmundson, engr., Ft. Dodge, for drainage work, involving 86,000 cu.yd. earth excav., 46 intakes, etc., in Webster and Humboldt Counties. About $87,161.

Minn., Redwood Falls—Drainage—L. P. Larson, co. aud., receiving bids building Ditch No. 24, Sec. 11, Branches 26 to 31, involving 1000 ft. 20 in. tile, 2900 ft. 18 in., 3500 ft. 16 in., 1200 ft. 15 in., 3400 ft. 14 in., 4300 ft. 12 in., 10,800 ft. 10 in., 6800 ft. 8 in., 1600 ft. 7 in., 3700 ft. 6 in. tile, 28 sewer pipe inlets, cost, $14,057; Sect. 9, Branches 12 to 24, 2000 ft. 22 in. tile, 2000 ft., 20 in., 1400 ft. 18 in., 4100 ft. 16 in., 3000 ft. 14 in., 12,100 ft. 12 in., 10,900 ft. 10 in., 12,100 ft. 8 in., 4650 ft. 7 in., 3700 ft. 6 in. tile, 42 sewer pipe inlets with c.i. grates and 1 bulkhead, $19,438; Sect. 10, Branches 25A to 25M, 500 ft. 22 in. tile, 1400 ft. 20 in., 3900 ft. 14 in., 7200 ft. 12 in., 10,600 ft. 10 in., 800 ft. No. 2 18 in. sewer pipe with cement joints, 36 sewer pipe inlets, $17,527. F. H. Anthony, Morgan, engr.

Minn., Tower—Dredging—Until Sept. 22, by W. H. Borgen, aud. St. Louis Co., (Duluth, dredging 5000 lin. ft. channel to depth of 8 ft. below water line near Tow Rivers, involving 5000 lin.ft. pile protection and 27,911 cu.yd. excav. Former bids rejected. Noted July 31.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—Dredging—E. Riegelmann, boro. pres., let contract dredging Wallabout Canal from Hewes St. to point 1500 ft. north of Hewes St., to New Jersey Shipbuilding & Dredging Co., 66 Orchard St. About $18,810. Noted Aug. 7.

Industrial Works

PROPOSED WORK

Mass., Springfield—A. Freedman, 27 Church St. soon receives bids building 1 story, 70 x 107 ft., brick and concrete garage, rein.-con. flooring, concrete foundation, on Liberty St. About $25,000. Private plans.

Mass., Worcester—E. T. Chapin, archt., State Mutual Bldg., soon receives bids building 1 story, 55 x 120 ft., brick and concrete garage, rein.-con. flooring, concrete foundation, on Pleasant St., for F. W. Lewis, 384 Pleasant St. About $30,000.

R. I., Providence—D. M. Watkins Co., 95 Pine St., plans to build 2 story, 100 x 125 ft. brick and mill construction factory, concrete foundation, on Pine and Foster Sts. About $70,000. W. R. Walker & Son, 17 Custom House St., archts.

R. I., Woonsocket—French Worsted Co., Hamlet Ave., soon lets contract building 1 and 2 story, 46 x 249 ft., brick and mill construction addition to wool sorting plant, concrete foundation. About $50,000. W. F. Fontaine, 285 Main St., archt.

Industrial Works (Continued)

Conn., East Hartford—Safety Ladder Co., 200 Tolland St., having plans prepared for 2 story factory and storage shed. About $25,000. Private plans.

Conn., Hartford—Boring & Tilton, archts. and engrs., 52 Vanderbilt Ave., New York City, receive bids about Aug. 27, building 4 story, 58 x 112 ft., rein.-con. and steel addition to factory, rein.-con. flooring, concrete foundation, for Whitney Mfg. Co., Bartholomew Ave.

Conn., New Haven—New Haven Stove Repair Co., 488 State St., soon receives bids building 1 story, 60 x 105 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on State St. About $25,000. J. Weinstein, 6 Church St., archt.

Conn., New Haven—H. Puddicombe & Co., 87 Orange St., plan to build 1 story, 44 x 88 ft. brick, steel and concrete warehouse, rein.-con. flooring, concrete foundation, on Henry and County Sts. About $28,000. C. E. Hubbell, 320 5th Ave., New York City, archt.

Conn., Plainville—W. J. Cahill Co., 19 North George St., Meriden, plans to build brick warehouse on Whitney St., here. About $40,000. Architect not selected.

Conn., Storrs (Eagleville P. O.)—Connecticut Agricultural College plans to build new dairy barns and dormitory to replace ones recently destroyed by fire. About $150,000. Engineer not selected.

Conn., Windsor Locks—Greenwood & Noerr, archts. and engrs., 847 Main St., Hartford, soon let contract building 5 story, 55 x 100 ft., rein.-con. addition to mill, concrete foundation, for C. H. Dexter & Son, Inc., Windsor Locks. About $100,000.

N. Y., Binghamton—Kroehler Mfg. Co., Frederick St., plans to build 4 story, 100 x 150 ft. brick factory. Cost between $125,000 and $150,000.

N. Y., Dunkirk—Amer. Locomotive Wks., North Jay St., Schenectady, soon receives bids building 1 story, 70 x 244 ft. brick, rein-con. and steel shop, concrete foundation. About $70,000. Private plans.

N. Y., Geneva—O'Malley Motor Co. plans to build 3 story, 50 x 100 ft., brick garage, machine shop and service station, on Canal and Exchange Sts. About $40,000. Address P. O'Malley, Geneva.

N. Y., Long Island City—W. C. Van Brunt Iron Wks, 14th Ave., plans to build 300 x 310 ft. rein.-con. and steel factory, concrete foundation, on Borden Ave., Marsh and Fox Sts. Architect not selected.

N. Y., New York—F. Alberti, 186 Bleecker St., having plans prepared by F. E. Vitolo, archt. and engr., 56 West 45th St., for 1 story, 59 x 83 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 68 7th Ave. About $30,000.

N. Y., New York—Bronx Consumers Ice Co. having plans prepared by M. Hansle, archt. and engr., 3307 3rd Ave., for altering 1 and 2 story, 146 x 155 ft. ice plant, brick and steel, on Devoe Ave. and 180th St. About $60,000.

N. Y., New York—C. Cory Co., 290 Hudson St., having plans prepared by R. C. Cory, archt. and engr., 39 Cortlandt St., for 6 story, 75 x 150 ft., brick and rein.-con. factory, rein.-con. flooring, concrete foundation. About $200,000.

N. Y New York—D. Golden, 150 Bway., having plans prepared by P. J. Murray, archt., 141 East 40th St., for 4 story, 100 x 100 ft. brick and steel service station, brick foundation, at 229 West 60th St. About $80,000.

N. Y., New York—Swift & Co., 32 10th Ave., soon let contract building 10 story rein.-con. and steel refrigerating plant, rein.-con. flooring, concrete foundation, on West 14th St. About $1,000,000. Private plans. Noted July 31.

N. Y., Poughkeepsie—O. Wolpert, archt. and engr., 63 Park Ave., New York City, soon lets contract building 1 story, 80 x 140 ft. brick and steel factory, rein.-con. flooring, concrete foundation, on Fulton St., here. About $50,000. Owner's name withheld.

N. Y., Syracuse—Dyneto Electric Co., Wolf and Park Sts., plans to build 1 story, 70 x 200 ft. plant. About $50,000. Architect not selected.

N. J., Bayonne—See "Buildings."

N. J., Bloomfield—N. J. Convery Co., archts., 9 Clinton St., Newark, soon lets contract building 2 story, 80 x 96 ft., brick and mill construction factory, on Llewellyn Ave., here, for J. Brocki & Co., 8 Railroad Ave., Newark. About $30,000.

N. J., East Orange—Ward Baking Co., Southern Blvd., New York City, having plans prepared by C. B. Comstock, archt. and engr., 110 West 40th St., New York City, for concrete, brick and steel addition to bakery, concrete foundation, here. About $100,000.

N. J., North Bergen—J. A. Migel, Inc., 442 4th Ave., New York City, soon lets contract building rein.-con. and steel silk mill on Hudson Blvd. About $500,000. D. Seabury, 12 East Ave., Pawtucket, R. I., archt.

N. J., Trenton—Belle-Meade Sweets Co., Prospect St., plans to build 1 story, 40 x 200 ft. addition to factory. About $40,000. W. W. Slack & Sons, St. Regis Bldg., archts.

Pa., Phila.—Hess-Bright Co., Front and Erie Sts., plans to build 2 story, 42 x 105 ft., rein.-con. and brick factory.

Pa., Pittsburgh—S. A. Maxwell & Co., Pittsburgh, having plans prepared by Hunting-Davis Co., archts. and engrs., Century Bldg., for 9 story, 52 x 88 ft. rein.-con., wholesale wall paper house, concrete foundation, on Isabella and Sandusky Sts.

Pa., Shamokin—W. A. Mullen having plans prepared by W. H. Lee, archt., 32 South 17th St., Phila., for 2 story, 41 x 50 ft., brick and timber factory.

Md., Baltimore—McCormick & Co., McCormick Blk., Pratt St. and Market Pl., acquired site on Light, Barre and Charles Sts., and plan to build warehouse. About $80,000.

Md., Baltimore—Ottenheimer Bros., 413 North Howard St., acquired site on Milton Ave., Chase St. and Pennsylvania R.R. and plans to build factory. About $150,000.

Va., Richmond—Tower—Binford Electric Co., 5 Governor St., and A. F. Hunt, archt., 1107 East Main St., soon let contract building 2 story, 90 x 116 ft. warehouse and office, on 4th and Cary Sts. About $50,000.

O., Cleveland—Brown Fence & Wire Co., 6532 Juniata Ave., plans to build 3 story, rein.-con., steel and brick warehouse, on 100 x 180 ft. site. About $125,000. Architect not selected.

O., Cleveland—M. S. Kohn, 991 Blvd., plans to build 4 story, 75 x 235 ft., rein.-con., steel and brick garage and theatre, at 3910 Lorain Ave. About $150,000. Architect not selected.

O., Cleveland—S. Machecek, East 91st St. and Perkins Ave., plans to build 2 story, 75 x 100 ft., steel and brick factory. About $30,000. Architect not selected.

O., Cleveland—Martin Baking Co., 3419 Carnegie Ave., preparing plans for 4 story, 100 x 130 ft., rein.-con., steel and brick addition. About $50,000.

O., Cleveland—W. M. Pattison Co., 777 Rockwell Ave., having plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., for 4 story, 161 x 192 ft., rein.-con., steel and brick addition to factory, at 9205 Detroit Ave. About $100,000.

O., Cleveland—F. Riley, Williamson Bldg., plans to build 2 story, 89 x 205 ft., rein.-con., steel and brick garage, at 8812 Carnegie Ave. About $60,000. Architect not selected.

O., Cleveland—Standard Equipment Co., West 106th St. and Lorain Ave., plans to build 2 story, 75 x 100 ft., concrete and brick addition to factory, on West 110th St. and Lorain Ave. About $25,000. Architect not selected.

O., Cleveland—F. B. Stearns Motor Co., Euclid Ave. and Lakeview Rd., plans to build 4 story, 200 x 400 ft., rein.-con., steel and brick addition to factory on Lakeview Rd. About $300,000. Architect not selected.

O., Cleveland—Ward Baking Co., Southern Blvd., New York City, having plans prepared by C. B. Comstock, archt. and engr., 110 West 40th St., New York City, for bakery, concrete and steel, rein.-con. flooring, concrete foundation, on Superior St., here. About $600,000

O., Cleveland—G. W. Worder Co., 6530 Carnegie Ave., preparing plans to build 2 story, 47 x 120 ft., steel and brick addition to factory. About $25,000.

O., Columbus—Carroll-Thompson Co., 539 East Long St., plans to build 3 story, 50 x 150 ft., concrete and brick garage and salesroom, on East Long St. About $75,000. L. D. Matthews, 500 South Central Ave., archt.

O., Dayton—Hubbell & Williamson, 926 Reibold Bldg., soon receive bids building 2 story, 40 x 125 ft., rein.-con. and brick garage and salesroom, rein.-con. flooring, concrete foundation, at 109 South Perry St. About $30,000. Private plans.

O., Dayton—Natl. Cash Register Co., Main and K Sts., soon receives bids building 5 story, 60 x 500 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on South Main St. About $1,000,000. Private plans.

O., Dayton—Republic Dayton Motor Sales Co., 132 East 2nd St., plans to build 1 story, 65 x 200 ft., rein.-con. and brick garage and salesroom, rein.-con. flooring, concrete foundation, on Lehman St., near Main St. About $75,000. Architect not selected.

O., New Lexington—R. G. Thackee soon lets contract building 3 story, 64 x 124 ft., fireproof warehouse. About $60,000. O. C. Darst, Brunson Bldg., Columbus, archt.

O., Piqua—Atlas Underwear Co. plans to build 4 story, 80 x 140 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation. About $125,000. Architect not selected.

O., Toledo—Larrowe Milling Co., Rossford, plans to build one 85 x 100 ft., one 85 x 320 ft., and one 85 x 400 ft., rein.-con. and steel warehouses, all 1 story, on East Bway., here. About $500,000.

O., Toledo—Refrigeration Eng. Co., 301 Nasby Bldg., plans to build factory. About $500,000. F. B. Riley, pres. Architect not selected.

Mich., Bay City—J. P. Beck, 1125 Janes St., Saginaw, plans to build 3 story, 100 x 100 ft., rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation, on Washington St., here. About $75,000. Architect not selected.

Mich., Detroit—General Ice Co., 225 Grand River Ave., having plans prepared by D. R. Wells, archt., 435 Woodward Ave., building 2 story, 90 x 131 ft. brick and steel wagon shop and barns, wood and rein.-con. flooring, concrete foundation, on Crane Ave., near Mack Ave. About $50,000.

Mich., Greenville—Moore Plow & Implement Co. having plans prepared by F. P. Allen & Son, engrs., Grand Rapids, building 1 story, 50 x 80 ft. brick and steel foundry, concrete foundation.

Mich., Highland Park (Detroit P. O.)—Maxwell Motor Co., Oakland Ave., soon lets contract building 1 and 2 story, 315 x 557 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation.

Mich., Kalamazoo—Western Board & Paper Co. had plans prepared by Billingham & Cobb, archts., Kalamazoo, for 2 story, 28 x 60 ft., rein.-con. storage building, rein.-con. flooring, concrete foundation. Noted June 26.

Ill., Chicago—Agar Provision Co., 310 North Green St., plans to build 5 story, 125 x 190 ft. factory, on Fulton and Green Sts. About $400,000. Architect not announced.

Ill., Chicago—Buckley Dement & Co., 632 Sherman St., having preliminary plans prepared by R. S. Smith, archt., 111 West Monroe St., for 6 story, 100 x 120 ft. concrete and steel printing and mailing plant, rein.-con. flooring, concrete foundation, on Jackson Blvd. and Throop St. About $300,000.

Ill., Chicago—H. Channon Co., 150 North Market St., having plans prepared by A. S. Alschuler, archt., 28 East Jackson St., for 7 story, 120 x 180 ft., rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, on Randolph and Market Sts. About $400,000.

Ill., Chicago—E. Edelman & Co., 351 East Ohio St., having plans prepared by A. S. Alschuler, archt., 28 East Jackson St., for factory, on Crawford and Shubert Aves. About $250,000.

Ill., Chicago—Wilson-Jones Loose Leaf Co., 3021 Carrol Ave., plans to build 2 story, 250 x 400 ft. factory, on Ohio St. and Spaulding Ave. About $400,000. Architect not announced.

Wis., Barton—J. M. Fellenz Co., c/o J. M. Fellenz, Menomonee Falls, plans to build 2 story, 80 x 128 ft. brick and steel factory, concrete foundation, on Main St., here. Cost between $30,000 and $40,000. Architect not selected

Industrial Works (Continued)

Minn., Minneapolis—Long, Lamoreaux & Long, archts., Andrus Bldg., soon lets contract building 4 story 84 x 105 ft., rein.-con. and hollow tile warehouse, on 9th Ave., S and 3rd St., for Berman Bros., 227 North 1st St. About $75,000. Noted Aug. 7.

Kan., Chanute—See "Waterworks."

Kan., Salina—Webber Milling Corp. having plans prepared by Lehrack Contg. & Eng. Co., engrs., 725 Gloyd Bldg., Kansas City, Mo., building rein.-con. grain elevator. About $400,000. J. Webber, pres.

Mo., St. Louis—Locust St. Annex Realty Co., 1519 Locust St. plans to build 8 story warehouse. About $300,000. Architect not selected.

Mo., St. Louis—H. J. Wise, engr., Post-Dispatch Bldg., soon receives bids building 2 story, 90 x 252 ft., brick, concrete and steel addition to laundry, rein.-con. flooring, rock and concrete foundation, for A. J. Fuerbacher, c/o Superior Laundry Co., 1745 South 18th St. About $80,000. E. Hess, 3226 Magnolia Ave., archt.

Tex., Waco—Texas Cordage Mill Co., plans to build plant. About $125,000.

Colo., Denver—Denver Post Printing & Publishing Co., 1544 Champa St., soon receives bids building 4 story, 50 x 125 ft., rein.-con., steel and brick, publishing house, rein.-con. flooring, concrete foundation, on Champa St. between 15th and 16th Sts. About $150,000. H. W. J. Edbrooke, Tabor Opera House Bldg., archt.

Cal., Huntington Park—Southern California Iron & Steel Co., 417 Mateo St., Los Angeles, plans to build plant here to consist of open hearth mill, nut and rivet shop, 2 warehouses, office, forge shop, machine shop and galvanizing plant, all concrete, steel and corrugated iron. Cost, including site and equipment, $1,750,000. Architect not selected.

Cal., Long Beach—Long Beach Sash & Door Co. plans to build plant on 250 x 330 ft. site on Anaheim St. and Euclid Ave. About $100,000.

Cal., Los Angeles—Barker Bros., 726 South Bway., having plans prepared by W. J. Saunders, archt., 229 Laughlin Bldg., for 3 story, 50 x 130 ft., rein.-con. warehouse on Hewitt St., near Palmetto St.

Cal., Los Angeles—Bd. Pub. Serv. plans to build power plant on South Fork of Kern River, cost $10,000,000. E. F. Scattergood, 645 South Olive St., ch. electrical engr.; also extend Los Angeles aqueduct and build feeders in Owen's River Valley to increase supply. W. Mulholland, city engr.

Cal., Los Angeles—Madsen Iron Wks., 16th St. and Santa Fe Ave., purchased five-acre site in Vernon industrial dist. and plans to build new plant.

Cal., Los Angeles—Matthews Paint Co., 219 South Los Angeles St., plans to build 2 story brick factory and warehouse on Ave. 26 and San Fernando Rd. About $75,000. Architect not selected.

Cal., Martinez—Standard Oil Co., Bush and Sansome Sts., San Francisco, applied to City Trustees for lease on waterfront on which to build distributing plant. Cost between $100,000 and $150,000.

Cal., Pasadena—Warrenlite Co., Davenport, Ia., leased 318 x 515 ft. site on Marengo Ave. and Wallis St., here, and plans to build plant. About $100,000. Architect not selected.

Cal., Torrance—Torrance Window Glass Co. plans to reconstruct factory. Plans include several frame, galvanized iron and brick buildings. About $25,000. Architect not selected.

Ont., Brantford—Brantford Piano Case Co., Alice St., plans to build 3 story, 60 x 80 ft. concrete and brick factory addition to present plant, concrete foundation. About $80,000. Engineer not selected.

Ont., Chatham—Gray-Dort Motors Co., Ltd., Colborne St., having plans prepared by Daniels & Vickery, archts., Chatham, for 3 story, 60 x 120 ft. concrete, steel and brick factory, concrete foundation. About $100,000.

BIDS DESIRED

Conn., Bridgeport—Bridgeport Brass Co., Grand St., receiving bids building 1 story, 150 x 220 ft., rein.-con. brick and steel addition to shop, rein.-con. flooring, concrete foundation. About $150,000. H. M. Lane Co., 701 Owen Bldg., Detroit, Mich., engrs. Noted Aug. 7.

Pa., Phila.—Until Aug 23, by H. Trumbauer, archt., Land Title Bldg., constructing 2 story, 36 x 75 ft., concrete and brick factory, for Ridpath & Potter, Fox and Ontario Sts.

O., Akron—Akron Bakery Co., 178 South Forge St., receiving bids building 2 story, 69 x 132 ft., rein.-con. and steel addition. About $80,000. McCormick Co., Century Bldg., Pittsburgh, archts. Noted Aug. 7.

Mich., Allegan—Overton Creamery Co. receiving bids building creamery and dairy to include 40 x 50 ft. power house, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. McCormick Co., Century Bldg., Pittsburgh, Pa., archts. Noted July 31.

Mich., Detroit—Smith, Hinchman & Grylls, archts., Washington Arcade, receiving bids building 2 story, 127 x 144 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Russell St. and Harper Ave., for Amer. Blower Co., 1400 Russell St.

Ill., Chicago—A. M. Harroun, 5501 Cornell Ave., receiving bids for 1 story, 100 x 150 ft., brick and timber garage, brick foundation, on Lake Park Ave. and 55th St. About $25,000. L. E. Smith, 5501 Prairie Ave., archt.

Ill., Chicago—Z. E. Smith, archt., 5501 Prairie Ave., receiving bids for 4 story, 60 x 125 ft., rein.-con. and brick factory and office building, rein.-con. flooring, concrete foundation, on State St. and 36th Pl., for Overton Hygienic Mfg. Co., 5200 South Wabash Ave. About $125,000.

Ia., Spirit Lake—Until Aug. 29, by city building waterworks extensions. About $50,000. C. H. Currie, Webster City, engr.

Minn., Hastings—Until Sept. 1, by State Bd. Control, Capital, St. Paul, building 1 story, 45 x 140 ft. rein.-con. and brick, power plant. About $125,000. C. H. Johnston, Capital Bank Bldg., St. Paul, engr.

BRIDGE—HUNTLEY, MONT.

Bids were received by State Highway Commission, Helena, for constructing bridge over Yellowstone River, from (A) Security Bridge Co., 502 North 32nd St., Billings, (awarded contract); (B) Illinois Steel Bridge Co., 208 South La Salle St., Chicago; (C) Burke & Co., Omaha, Neb. The unit bids were as follows:

	A	B	C
1,070 cu yd. class "B" concrete	$29.82	$28.60	$37.85
765,000 lb structural steel erected	.087	.0932	.089
10,500 lb reinforcing steel in place	.09	.09	.10½
90,000 ft.b.m. lumber in floor	64.00	58.00	59.00
10,215 cu.yd roadway embankment from channel excavation	.70	1.25	1.50
13,876 cu yd levee embankment from channel excavation	1.05	1.50	1.65
10,215 cu yd. roadway embankment borrow	.50	.80	.80
13,876 cu yd. levee embankment borrow	.60	1.00	.95
24,091 cu yd. channel change excavation	.40	.65	.80
1,679 cu.yd bank sloping	.40	.60	.60
172 sq.yd. 6-in. concrete slabs	2.75	2.50	3.00
2,579 sq yd 4-in. concrete slabs	2.00	1.80	2.60
1,776 sq yd 4-in. concrete mattress	2.65	3.00	3.00
2,903 cu yd rip rap in wire containers	5.00	4.75	5.50
2072 sq.yd. brush mattress	.70	1.00	.80
12 cu yd class "C" concrete	27.50	25.00	30.00
360 lin ft piling in footing	1.00	1.00	.90
320 lin ft. piling in jetty	1.00	1.00	.90
2,166 cu yd. random rip rap in slopes	4 00	5.00	4.50
1,881 cu yd hand laid rip rap placed	1.80	2.00	2.25
3,416 cu yd jetties	2.75	2.75	3.00
666 lin ft. ¾-in. galvanized wire cable	.03	.08	.09
19,314 lin.ft ¾-in galvanized wire cable	.07	.06	.07
150 sq yd. 4-in wire mesh delivered	.90	.70	.70
Extended totals	$163,341	$181,410	$195,242

PIER—PHILADELPHIA, PA.

Bids were received by the Department of Wharves, Docks & Ferries (lowest 3), Bourse Bldg., Aug. 5, for the construction, with appurtenant work, of the Schuylkill River Bulkhead, west side, south of Penrose Ferry Bridge, from (A) McLean Contg. Co., Fidelity Bldg., Baltimore, Md. (awarded contract); (B) Snare & Triest, Penn Bldg.; (C) E. H. Vare, 1120 Race St. The unit bids were as follows:

	A	B	C
Entire work (yellow pine), (lump sum)	$243,000	$256,300	$277,000
Entire work (fir), (lump sum)	236,000	250,600	277,000
103,000 cu yd. trench dredging	.28	.30	.35
2,900 tons rip rap in front of sheet piling	4.35	3.40	3.70
600 tons rip rap facing of embankment	4.35	6.00	4.00
16,000 tons cobble fill in front of sheet piling	1.45	1.20	1.34
6,000 tons cobble fill in back of sheet piling	1.45	1.20	1.38
25,000 cu yd. first class fill	.75	.80	.81
1,900 cu.yd. second class fill	.75	1.60	1.15
1,900 cu.yd. dredged fill	.25	1.70	.67
10 days dredging plant—day of 10 hours	300.00	250.00	275.00
10 days dredging plant—day of 20 hours	550.00	500.00	550.00
1,000 hours mechanics	1.50	1.20	1.00
1,000 hours laborers	.75	.90	.60
Total items 2 to 13, inclusive	$107,365	$106,630	$112,458
Extended grand totals	$343,365	$357,230	$389,458
Unit prices for additional work:			
Vertical piles, per pile	$30.00	$35.00	$40.00
Inclined piles, per pile	33.00	40.00	50.00
Pile shoes, per shoe	4.00	2.00	7.50
Sheet piling, dove tail type, 38 ft long, per h lin ft	55.00	45.00	60.00
New sawed yellow pine timber, M ft b m	120.00	125.00	150.00
New sawed Douglas fir timber, M.ft.b.m	115 00	135.00	150.00
Bolts, nuts, washers, spikes, etc., per lb	.08	.06	.10
No. 2 concrete, per cu yd	15.00	18.00	16.00
Cast steel bollards, each	145.00	150.00	20.00
Corner protection shapes, per lin.ft	.18	.25	.25

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Clinton—L. S. Gottlieb, archt. 101 Park Ave., New York City, let contract to Genl. Bldg. Co., Boylston St., Boston, building 4 story rein.-con., steel and brick mill, rein.-con. flooring, concrete foundation, for Roubaix Mills, 792 Main St. Noted Aug. 7.

★Mass., Mittineague (West Springfield P. O.)—Strathmore Paper Co. let contract building 4 story, 78 x 98 ft., brick and mill construction addition to factory, concrete foundation, to D. O'Connell's Sons, 480 Hampden St., Holyoke. About $70,000. Noted July 31.

★Mass., South Boston (Boston P. O.)—Boston Wharf Co., 195 A St., let contract building 7 story, 90 x 167 ft., brick and concrete storage plant, concrete foundation, to J. M. and C. J. Buckley Co., 128 Vernon St., Worcester. About $200,000.

★Mass., Worcester—W. H. Hill Envelope Co., 48 Water St., let contract building 5 story, 64 x 75 ft., brick and rein.-con. factory, concrete flooring and foundation, to J. J. Power, 15 Ashland St. About $45,000.

Industrial Works (Continued)

★**Mass., Worcester**—Jefferson Mfg. Co., Grove St., let contract building 1 story, 60 x 149 ft., brick, concrete and steel weave shed, rein.-con. flooring, concrete foundation, to J. J. Roberts, 4 Wall St. About $30,000.

★**Mass., Worcester**—Lockwood, Greene & Co., engrs., 93 Federal St., Boston, let contract to Aberthaw Constr. Co., 27 School St., Boston, building 1 story, 51 x 85 ft., rein.-con. and steel storage plant, rein.-con. flooring, concrete foundation, on Grand St., for Crompton & Knowles Loom Wks., Grand St. About $50,000. Noted July 24.

★**Mass., Worcester**—Wyman & Gordon Co., 30 Bradley St., let contract building 1 story, 30 x 220 ft. dye house, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Madison, Gold and Bradley Sts., to E. J. Cross Co., 82 Foster St. About $30,000.

★**R. I., Woonsocket**—French Worsted Co., Hamlet Ave., let contract building 2 story, 61 x 132 ft. brick and steel dye house, concrete foundation, to J. C. Bouvier Co., 189 Sayles St. About $32,000.

Conn., Bridgeport—H. Hubbell, Inc., State St. and Bostwick Ave., let contract building 1 story, 82 x 140 ft., brick and concrete addition to storehouse, rein.-con. flooring, concrete foundation, on Lesbia St., to Van Stone & Van Stone, 328 Park Ave. About $25,000.

★**Conn., Bridgeport**—Hunter & Havens, 233 Middle St., let contract building 1 story, 65 x 215 ft., brick, steel and concrete warehouse and 2 story, 55 x 65 ft., brick and concrete office, rein.-con. flooring, concrete foundation, on Water St., to T. J. Pardy Constr. Co., Seaview Ave. About $60,000.

★**Conn., East Norwalk** (South Norwalk P. O.)—Goldstein Bros., East Ave. and Winfield St., let contract building 2 story, 50 x 101 ft. ,rein.-con. factory, rein.-con. flooring, concrete foundation, to Austin Co., 217 Bway., New York City. About $30,000.

★**Conn., New Haven**—M. Massari, 142 Bradley St., will build 1 story, 55 x 86 ft. brick and concrete garage, with two 16 x 48 ft. ells, rein.-con. flooring, concrete foundation, on Bradley St. About $25,000. Work will be done by day labor. Noted July 3.

★**Conn., Stamford**—Alladins Rock Realty Co., 111 Manhattan St., New York City, let contract building rein.-con. plant, on Keeler's Ave., here, to Turner Constr. Co., 244 Madison Ave., New York City. About $90,000.

★**N. Y., Brooklyn**—Coney Island Bldg. Corp., c/o L. Gold, 44 Court St., will build 1 story, 75 x 135 ft. rein.-con. and steel garage at 954 Fulton St. About $23,000. Work will be done by day labor.

★**N. Y., Brooklyn**—L. Gold, 44 Court St., will build 1 story, 100 x 100 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on Ave. Q and East 9th St. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—L. Gold, 44 Court St., will build 2 story, 120 x 180 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on Atlantic Ave. near Franklin Ave. About $35,000. Work will be done by day labor.

★**N. Y., Brooklyn**—S. Greenstein, 206 West 29th St., New York City, will build 1 and 2 story, brick and steel garage, rein.-con. flooring, brick foundation, on Flushing Ave., here, to cover 16,000 sq.ft. floor space. Work will be done by day labor.

★**N. Y., Brooklyn**—E. A. Laboratory, Inc., 80 Bway., let contract building 2 story, 100 x 100 ft. brick and steel factory, concrete foundation, on Spencer St. and Myrtle Ave., to Barney-Ahlers Constr. Co., 110 West 40th St., New York City. About $95,000.

★**N. Y., Brooklyn** — Magid, Katzman & Strober, 58 Boerum St., will build 1 story, 100 x 185 ft. brick and steel warehouse, garage and workshop, rein.-con. flooring, concrete foundation, on Jefferson St., Wykoff and Flushing Ave. About $120,000. Work will be done by day labor. Noted July 31.

★**N. Y., Brooklyn**—Smith Builders, 142 East 43rd St., will build 1 story, 70 x 130 ft. brick and steel garage, brick foundation, on 4th Ave. and 62nd St. About $40,000. Work will be done by day labor.

★**N. Y., Long Island City**—L. Gold, 44 Court St., Brooklyn, will build two garages, one 5 story, 100 x 175 ft. brick, steel and rein.-con., on 7th Ave. and Pierce Ave., and one 2 story, 100 x 150 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation, on 8th St. and Jackson Ave.; also 1 story, 95 x 235 ft. brick and steel factory, on Harris and Van Alst Aves. Cost, $220,000, $50,000 and $150,000 respectively. Work will be done by day labor.

★**N. Y., Long Island City**—Wappler Electric Co., Harris Ave., let contract building 2 story, 175 x 255 ft. brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Van Alst and Harris Aves., to Turner Constr. Co., 244 Madison Ave., New York City.

★**N. Y., New York**—Kelley-Springfield Tire Co., 200 West 57th St., let contract building 4 story, 100 x 115 ft. warehouse and 1 story, 60 x 100 ft. service station, brick and steel, rein.-con. flooring, brick foundation, on 10th Ave. and 54th St., to H. H. Oddie, 12 East 44th St. About $100,000. Noted Aug. 7.

★**N. Y., New York**—United Dressed Beef Co., 32 10th Ave., let contract to B. Sinek, 120 Bway., building 5 story, 75 x 103 ft. cattle pen, and 7 story, irregular shaped packing plant, rein.-con. and steel, rein.-con. flooring, concrete foundation, on 1st Ave. and 44th St. About $175,000 each. Noted July 31.

★**N. Y., Syracuse**—J. A. Heffernan, 721 South Salina St., will build 2 and 3 story, 56 x 99 ft. steel garage, rein.-con. flooring, concrete foundation, on East Genesee St. About $50,000. Will be done by day labor.

★**N. Y., Syracuse**—Merrell-Soule Co., North Franklin and Plum Sts., let contract building 5 story, 61 x 90 ft. cold storage plant, concrete, rein.-con. flooring, concrete foundation, to Turner Constr. Co., 244 Madison Ave., New York City. Cost between $80,000 and $90,000. Noted Aug. 14.

★**N. J., Jersey City**—See "Buildings."

★**N. J., Newark**—O. Heineman Phonograph Co., Wilson Ave., let contract building 80 x 120 ft., rein.-con. addition to plant, to Amer. Concrete Co., 27 Clinton St. About $140,000.

★**N. J., Newark**—J. E. Lehman Co., 197 Grand St., New York City, let contract building 112 x 160 ft. machine shop and factory, to Amer. Concrete Steel Co., 27 Clinton St. About $68,000.

★**N. J., Newark** — New Toy Co., 143 Bleecker St., let contract building 2 story, 60 x 100 ft., rein.-con. factory, at 219 Central Ave., to Irvington Lumber & Door Co., 738 Broad St. About $108,000.

★**N. J., Trenton**—T. Maddock & Sons, Perry and Carroll Sts., let contract constructing 3½ story, 30 x 154 ft. addition to pottery plant and 1 story, 40 x 154 ft. kiln building, both brick and steel, on Perry St., to L. Lawton & Son, Broad St. Bank Bldg. About $50,000.

★**Pa., Bangor**—Zipkes, Wolff & Kudoff, archts., 25 West 42nd St., New York City, let contract building 2½ story, 50 x 100 ft., brick and steel factory, rein.-con. flooring, brick foundation, here, to J. Steel, Bangor. About $80,000. Owner's name withheld. Noted June 26.

★**Pa., McKee's Rocks**—Hankey Baking Co. let contract building 2 story, 60 x 100 ft. bakery, steel and brick, to C. Nauman, McKee's Rocks. About $35,000. Noted July 31.

★**Pa., Phila.**—L. H. Gilmer Co., Cottman and Keystone Sts., let contract building 2 story, 57 x 183 ft., concrete, steel and slow-burning construction addition to factory, to H. J. Holman, 34 South 17th St. About $50,000.

★**Pa., Phila.**—J. Miller & Sons Co., 16th and Reed Sts., let contract building 3 and 5 story, 90 x 118 ft., rein.-con. and brick factory, to Wark Co., 1737 Filbert St. Noted Aug. 7.

★**Pa., Phila.**—A. Schoenhut Co., Adams and Sepvivo Sts., let contract building 2 story, 50 x 130 ft., concrete and brick boiler house and factory, on Amber and Venango Sts., to P. Haibach, 1261 North 26th St.

★**Pa., Phila.**—Sharples Specialty Co., 23rd and Westmoreland Sts., let contract building 1 and 2 story, 75 x 180 ft., rein.-con., steel and brick factory, to Barclay Williams, 1713 Sansom St. About $65,000.

★**Pa., Pittsburgh**—California Ave. Garage Co. let contract building 1 story, 60 x 95 ft., rein.-con. garage, rein.-con. foundation, on California Ave. and Challis St. to Nicola Bldg. Co., Penn and Denniston Ave. About $25,000.

★**Pa., Pittsburgh**—T. Pringle, archt., 410 Oliver Ave., let contract to Toupet, Beil & Conley, 127 North Highland St., for building 2 story, 50 x 120 ft., rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on Baum Blvd., for A. W. Mellan Bldg. Co., Keystone Brick Co., lessee. About $35,000. Noted July 3.

★**Pa., Reading**—Narrow Fabric Co., Wyomissing, let contract building 5 story, 90 x 456 ft. factory, rein. con. flooring,, near Phila. & Reading R.R. tracks, here, to Stone & Webster, 147 Milk St., Boston. About $500,000. Work involves 8000 cu.yd. rein.-con., 450 tons reinforcing steel, 8500 cu.yd. rock and earth excav. Noted Aug. 2?

★**O., Cleveland**—Grant Motor Car Co., East 131st St., let contract building 2 story, 63 x 262 ft., rein.-con., steel and brick addition to factory, on East 131st St. and Kirby Ave., to W. I. Thompson Co., 6110 Euclid Ave. About $75,000. Noted Aug. 7.

★**O., Dayton**—Dayton Metal Bodies Co., Pennsylvania Ave., let contract building 1 story, 90 x 200 ft., steel and brick factory, brick foundation, on Pennsylvania and Wampum Aves., to J. Lowes, Schwind Bldg., South Ludlow St. About $50,000.

★**O., Springfield**—Amer. Radiator Co., 1210 West Main St., let contract building 3 story, 65 x 110 ft., rein.-con. and brick warehouse and repair shop, rein.-con. flooring, concrete foundation, on Isabelle St., to J. W. Cowper Co., Fidelity Bldg., Buffalo, N. Y. About $25,000.

★**O., Springfield**—Hess & Lewis, West North St., let contract building 1 story, 70 x 100 ft., brick garage and salesroom, rein.-con. flooring, brick and rock foundation, to W. Poole, Springfield. About $35,000.

★**Mich., Detroit**—Gordon Pagel Co., 461 Chene St., let masonry contract building 2 story, 125 x 170 ft, brick and steel addition to bakery, rein-con flooring, concrete foundation, on Henricks and Duboise Sts., to G. D. Nutt, 632 Farwell Bldg., steel contract to Russell Wheel & Fdry. Co., Chene St.

★**Mich., Detroit**—A. Harvey's Sons Mfg. Co., 1st St., let contract building 1 and 2 story, 60 x 100 ft. concrete, steel and brick foundry, rein.-con. flooring, concrete foundation, on Bellevue Ave. and Michigan Central Ry., to Walbridge Alldinger Co., 2356 Penobscot Bldg. Noted July 31.

★**Mich., Detroit**—Morgan & Wright, Bellevue Ave., let contract building 2 additional stories to present building, 1 section 50 x 175 ft. with two 50 x 125 ft. wings, rein.-con. and steel, rein.-con. flooring, to Bryant & Detwiler Co., 2336 Dime Bank Bldg.

★**Mich., Detroit**—Packard Motor Car Co., East Grand Blvd., let contract building 4 story, 80 x 196 ft and 80 x 201 ft. rein.-con. and brick service station, rein.-con. flooring, concrete foundation, on Woodbridge and St. Antoine Sts., to Bryant & Detwiler Co., 2336 Dime Bank Bldg.

★**Mich., Detroit**—Raseman & Freer, archts., 1302 Penobscot Bldg., let contract building 1 story, 140 x 240 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Connant St., for Swedish Crucible Steel Co., Butler St. and Grand Trunk Ry., to Russell Wheel & Fdry. Co., Beecher Ave. and Belt Line Ry.

★**Ill., Chicago**—Cook Co. Stock Co., 2325 South La Salle St., let contract to Shank Co., 30 North La Salle St., building 1 story, 600 x 1100 ft. warehouse, and 1 story 300 x 950 ft. factory, steel frame construction with brick exterior, 3 story, 100 x 120 ft. and one story, 100 x 300 ft. mill construction warehouses, 1 story, 60 x 200 ft., brick and concrete garage and repair shop, on 31st and Kedzie Aves. About $1,000,000.

★**Ill., Chicago**—G. Merz & Sons, 118 West Superior St., let contract remodeling 3 story, 78 x 125 ft., mill construction factory, to R. C. Wieboldt, 1534 Van Buren St. About $25,000.

★**Neb., Gibbon**—Gibbon Roller Mill Co. let contract building 3 story, 32 x 105 ft. rein.-con. mill, to Schrack Constr. & Eng. Co., 412 Amer. Bank Bldg., Kansas City, Mo. About $55,000.

Industrial Works (Continued)

★**Neb., Omaha**—A. Hospe, 1513 Douglas St., let contract building 6 story, 44 x 133 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, at 109-11 South 10th St., to W. P. Deverell, 435 Exch. Bldg., $83,475.

★**Mo., Kansas City**—J. W. Jenkins & Sons Music Co., 1013 Walnut St., let contract building 7 story, 150 x 152 ft. rein.-con. and brick warehouse, rein.-con. flooring, to Bliss Bldg. Co., Kansas City. About $200,000.

★**Mo., St. Louis**—Ely & Walker Dry Goods Co., 16th and Washington Sts., let contract building 5 story, 65 x 150 ft. factory, at 1400 North 6th St., to Hartman & Schuermann, Odd Fellows' Bldg. About $500,000.

★**Mo., St. Louis**—General Motors Co., Flint, Mich., let contract building three 3 story, 200 x 750 ft., rein.-con., steel and brick factories, rein.-con. flooring, concrete foundation, on Natural Bridge Rd. and Union Blvd., here, to G. A. Fuller & Co., 175 5th Ave., New York City. About $2,000,000. Noted July 24.

★**Mo., St. Louis**—International Fur Exch., 2nd and Market Sts., let contract constructing 7 story, fur exchange and storage building, rein.-con. and steel, on 4th and Market Sts., to J. A. Godfrey & Co., Wainwright Bldg. About $500,000.

★**Mo., St. Louis**—Mississippi Valley Iron Co., 6500 South Bway., let contract building 1 story, 29 x 82 ft. engine house and 1 story, 36 x 93 ft. factory, rein.-con., steel and brick, rein.-con. flooring, concrete foundation, at 6407 Water St., to Fruin-Colnon Contrg. Co., Merchants Laclede Bldg. About $32,000.

★**Mo., St. Louis**—St. Louis Independent Packing Co., 3815 Chouteau Ave., let contract building 4 story, 97 x 145 ft., rein.-con., steel and brick warehouse, rein.-con. flooring, concrete foundation, to A. H. Haeseler Constr. Co., Wainwright Bldg. About $50,000. Work to be done on percentage basis.

★**Mo., St. Louis**—Woods Down Box Co., 12th and Mullanphy Sts., let contract building 28 x 46 ft., rein.-con., steel and brick addition to factory, rein.-con. flooring, rock foundation, at 1221 Mullanphy St., to R. H. Mathews, 4441 Laclede Ave. About $30,000.

★**Okla., Enid**—J. Morris, 2nd St. and Bway. let contract constructing 2 story, 50 x 150 ft., brick, stone and rein.-con. garage and sales building, to A. F. Stewart, 1213 State Natl. Bank Bldg., Oklahoma. About $60,000.

★**Okla., Norman**—Norman Mercantile Co. let contract building 1 story, 50 x 150 ft. wholesale house, concrete, steel and brick, rein.-con. flooring, to Kahoe & Pierson, Norman. About $150,000.

★**Okla., Oklahoma**—J. K. Wells, Amer. Natl. Bank Bldg., let contract building 2 story, 75 x 135 ft., brick, stone and rein.-con. garage at 700 Blk. North Bway., to A. F. Stewart & Co., 1213 State Natl. Bank Bldg. About $50,000.

★**Ariz., Phoenix**—See "Buildings."

★**Wash., Seattle**—Frederick-Boyd Co., Westlake and Lenora Sts., let contract building 3 story, 60 x 108 ft., concrete factory, on Westlake and Ward Sts., to Hurley-Mason Co., Lowman Bldg. About $25,000.

★**Ont., London**—C. S. Hyman & Co., Richmond St., let contract building 3 story, 80 x 100 ft., rein.-con. and brick addition to tannery, rein.-con. flooring, concrete foundation, to P. H. Secord & Son, Nelson St., Brantford. About $300,000.

★**Ont., Oshawa**—Gananoque Springs & Axel Co. let steel contract building 1 story, 80 x 200 ft., factory and office, concrete and steel, concrete foundation, to Dominion Bridge Co., Imperial Life Bldg., Toronto. About $100,000. Balance of buildings will be erected by owner.

★**Ont., Walkersville**—Smith, Hinchman & Grylls, archts., Washington Arcade Bldg., Detroit, Mich., let contract, to W. E. Wood Co., 1805 Ford Bldg., Detroit, building 2 story, 60 x 337 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Walker Rd. and Seminole St., here, for Motor Products Co., Walker Rd. Noted July 24.

MILL CREEK FLOOD CONTROL—ERIE, PA.

Bids were received by the city for completion of Sects. Nos. 3 and 4 of Mill Creek Flood Control Project, from (A) Peckham Constr. Co., Niagara Life Bldg., Buffalo, N. Y.; (B) Claiborne-Johnston & Co., Inc.; (C) Folwell-Ahlskog Co., 24th and State Sts., (awarded contract). The unit bids were as follows:

SECTION 3

	A	B	C
Taking care of water (lump sum)	$10,000.00	$10,400.00	$15,000.00
29,000 cu.yd. excavation, class "A" earth	1.80	1.90	2.00
8,400 cu.yd. excavation, class "B" earth	2.15	4.00	3.00
39,000 cu.yd. excavation, class "D" rock	3.80	2.80	3.50
9,600 cu.yd. excavation, class "E" rock	5.70	6.00	4.50
1,500 cu.yd. excavation, class "F" earth	2.40	4.00	3.40
1,200 cu.yd. excavation, class "G" rock	7.00	6.50	5.00
1,200 cu.yd. excavation, class "H" concrete masonry	4.80	5.00	5.00
1,400 cu.yd. excavation, class "J" stone and brick masonry	2.25	5.00	4.00
2,500 sq.yd. excavation, class "K" pavements	.75	2.00	2.40
17,600 cu.yd. concrete, class "A" tube	12.00	9.55	10.50
500 cu.yd. concrete, class "B" ribs, walls, etc	13.00	20.00	25.00
500 cu.yd. concrete, class "E" rough	6.20	9.55	9.00
150 cu.yd. concrete, class "F" manholes, etc	11.70	12.55	20.00
105 tons reinforcing steel, furnishing and placing	92.00	109.00	100.00
160 tons reinforcing steel, placing only	42.00	33.00	30.00
50 tons structural steel	204.00	150.00	200.00
17 tons iron castings	144.00	175.00	200.00
60 tons cast iron pipe	97.00	110.00	100.00
50 ft. vitrified sewer pipe, 6 in	.30	1.00	.80
80 ft. vitrified sewer pipe, 9 in	.50	1.00	1.50
100 ft. vitrified sewer pipe, 12 in	.60	2.00	2.30
400 ft. vitrified sewer pipe, 15 in	1.10	2.00	3.00
160 ft. vitrified sewer pipe, 18 in	1.50	3.00	4.00
200 ft. vitrified sewer pipe, 24 in	2.50	3.00	6.00
50 ft. vitrified sewer pipe, 36 in	6.00	6.00	10.00
120 cu.yd. brick masonry	23.50	45.00	25.00
Underpinning structure No. 7 (lump sum)	4,800.00	7,300.00	6,000.00
Underpinning structure No. 8 (lump sum)	9,300.00	26,000.00	15,500.00
Underpinning structure No. 9 (lump sum)	2,000.00	1,000.00	1,100.00
Underpinning structure No. 10 (lump sum)	4,000.00	8,000.00	5,500.00
Underpinning structure No. 10A (lump sum)	350.00	1,000.00	600.00
Underpinning structure No. 14 (lump sum)	2,900.00	6,000.00	2,600.00
Underpinning structure No. 15 (lump sum)	4,800.00	10,000.00	6,000.00
Underpinning structure No. 15A (lump sum)	350.00	1,000.00	1,300.00
Underpinning structure No. 16 (lump sum)	350.00	1,000.00	700.00
Underpinning structure No. 16A (lump sum)	350.00	2,500.00	900.00
Underpinning structure No. 17 (lump sum)	4,400.00	7,500.00	7,200.00
4,100 lin.ft. tile in invert 8 in	65	.50	1.00
12 flop valves, 12 in and less	60.00	50.00	75.00
10 flop valves, 15 in. to 24 in	120.00	100.00	230.00
200 lin.ft. supporting water pipes, etc	3.60	4.00	8.00
15 tons steel for taking care of traffic	105.00	110.00	[200.00
40,000 ft. timber for taking care of traffic	96.00	110.00	150.00
28,500 bbl. Portland cement	2.60	3.00	3.00
Extended totals	$685,703	$697,448	$703,830

SECTION 4

	A	B	C
Taking care of water (lump sum)	$10,000.00	$16,400.00	$10,000.00
30,000 cu.yd. excavation, class "A" earth	1.30	1.80	1.20
2,700 cu.yd. excavation, class "B" earth	2.00	4.00	2.30
33,000 cu.yd. excavation, class "D" rock	3.00	1.95	2.50
2,500 cu.yd. excavation, class "E" rock	5.00	6.00	4.00
550 cu.yd. excavation, class "F" earth	2.25	4.00	3.00
250 cu.yd. excavation, class "G" rock	6.50	6.50	5.00
850 cu.yd. excavation, class "H" concrete masonry	4.50	5.00	5.00
1,050 cu.yd. excavation, class "J" stone and brick masonry	2.15	5.00	3.00
1,800 sq.yd. excavation, class "K" pavements	.70	2.00	2.40
17,200 cu.yd. concrete, class "A" tube	11.50	10.55	12.00
200 cu.yd. concrete, class "B" ribs, walls, etc	12.25	20.00	20.00
300 cu.yd. concrete, class "E" rough	5.85	10.55	9.00
105 cu.yd. concrete, class "F" manholes, etc	11.00	12.50	20.00
306 tons reinforcing steel	86.00	109.00	100.00
7 tons structural steel	190.00	150.00	200.00
18 tons iron castings	135.00	175.00	200.00
50 tons cast iron pipe	90.00	110.00	100.00
150 ft. vitrified sewer pipe, 6 in	.30	1.00	.80
110 ft. vitrified sewer pipe, 9 in	.50	1.00	1.50
110 ft. vitrified sewer pipe, 12 in	.60	2.00	2.30
130 ft. vitrified sewer pipe, 15 in	1.00	2.00	3.00
50 ft. vitrified sewer pipe, 18 in	1.40	3.00	4.00
75 ft. vitrified sewer pipe, 24 in	2.30	3.00	6.00
20 ft. vitrified sewer pipe, 36 in	5.95	6.00	10.00
30 cu.yd. brick masonry	22.00	45.00	25.00
Underpinning structure No. 1 (lump sum)	3,000.00	5,000.00	3,500.00
Underpinning structure No. 2 (lump sum)	1,500.00	4,100.00	2,600.00
Underpinning structure No. 3 (lump sum)	3,000.00	2,500.00	3,300.00
Underpinning structure No. 4 (lump sum)	3,000.00	5,000.00	4,000.00
Underpinning structure No. 5 (lump sum)	1,000.00	800.00	700.00
Underpinning structure No. 6 (lump sum)	5,000.00	11,500.00	11,100.0
450 ft. intercepting sewer, 30 in	4.15	7.50	10.00
4,050 lin.ft. tile in invert 8 in	.60	.50	1.00
8 flop valves, 12 in. and less	55.00	50.00	75.00
6 flop valves, 15 in. to 24 in	115.00	100.00	230.00
50 lin.ft. supporting water pipes, etc	3.25	4.00	8.00
15 tons steel for taking care of traffic	100.00	110.00	200.00
20,000 ft. timber for taking care of traffic	90.00	110.00	150.00
26,500 bbl. Portland cement	2.60	3.00	3.00
Extended totals	$509,449	$531,910	$539,288

*The company which was awarded the contract were not the lowest bidders but they received both sections as they deducted 5% which brought them $14,000 lower than the others.

Buildings

PROPOSED WORK

Mass., Boston—School—Bd. Educ. plans to build 36 room school on Fenway St. About $750,000. Architect not selected.

Mass., West Springfield—School—Town having plans prepared by McClintock & Craig, archts., 33 Lyman St., Springfield, for 1 story brick, steel and concrete school on Westfield St., Tatham School Dist. About $50,000. F. H. Sibley, town clk. Noted June 19.

Buildings (Continued)

Mass., Worcester—Office—Federal Development Co., 10 State St., Boston, having plans prepared by F. A. Kendall, archt., 45 Bromfield St., Boston, for 11 story, 106 x 128 ft., on Main and Walnut Sts.

Conn., Bristol—Hotel—A. J. Mussy, 170 Main St., purchased site on Prospect St. and plans to build brick, concrete and steel. About $200,000. Architect not selected.

Conn., Hartford—School—City soon lets contract building 3 story, 108 x 139 ft. brick, concrete and steel addition to Brown School on Talcott St., to include assembly room, gymnasium, etc. About $200,000. I. A. Allen, 904 Main St., archt. Noted July 24.

Conn., Glenville — School—Greenwich Twp. having plans prepared by Guilbert & Betelle, archts., 665 Broad St., Newark, N. J., for 3 story, 12 room grammar school, here. About $120,000.

Conn., Litchfield—Church—Rossiter & Muller, archts., 15 West 38th St., New York City, soon receive bids building native stone and terra cotta church, rein.-con. flooring, on Main St., here, for St. Michael's Protestant Episcopal congregation, Litchfield. About $100,000. Noted Feb. 13.

Conn., Newington—Home—House of Good Shepherd, 170 Sisson Ave., Hartford, plans to build home, here. About $150,000. J. J. Nilan, bishop. Architect not selected.

Conn., Storrs (Eagleville P. O.)—Dormitory—See "Industrial Works."

Conn., Washington—Memorial Hall—Washington War Bureau, Washington Depot, having plans prepared for 2 story brick memorial hall to include auditorium, offices and various society rooms. About $75,000. E. K. Rossiter, 15 West 38th St., New York City, archt.

Conn., West Hartford (Hartford P. O.)—School—Boring & Tilton, archts. and engrs., 52 Vanderbilt Ave., New York City, receive bids about Aug. 25, constructing 3 brick, steel and stone buildings, brick foundations, here, for Amer. School for Deaf, 65 Garden St., Hartford. About $500,000. Noted Aug. 14.

N. Y., Brooklyn—Bank—Greater New York Savings Bank, 5th Ave. and 12th St., had plans prepared by Shampan & Shampan, archts., 50 Court St., New York City, for 2 story, 60 x 100 ft. brick, steel and stone, brick foundation, on 5th Ave. and 9th St.

N. Y., Brooklyn — Theatre — Carlson & Wiseman, archts. and engrs., 226 Henry St., receive bids about Sept. 1, building 3 story, 203 x 302 ft. brick and steel, brick foundation, on Flatbush Ave. and Albermarle Rd., for J. Manheimer, 1694 49th St. About $450,000. Noted June 12.

N. Y., Buffalo—School—St. Matthews Roman Catholic Church plans to build 2 story brick, at 46 Wyoming St. About $50,000. Address Bldg. Com.

N. Y., Buffalo—Theatre—Shea's Theatre, 40 Court St., plans to build 100 x 200 ft., on Main St. About $1,500,000. Architect not selected.

N. Y., Jamaica—Hospital—St. Mary's Hospital, Shelton Ave., plans to build 5 story, 100 x 150 ft., brick and steel addition, brick foundation. About $250,000. Architect not selected.

N. Y., Lackawanna (Buffalo P. O.)—Store—H. J. Kelly plans to build 3 story brick on Ridge Rd. and South Park Ave. About $60,000.

N. Y., New York — Hotel — Starrett & Van Vleck, archts. and engrs., 8 West 40th St., preparing plans for 15 story, 80 x 115 ft. brick, steel and stone, brick foundation, on 72nd St. and West End Ave. About $1,000,000. Owner's name withheld.

N. Y., New York—Hotel—Thirty West 59th St., Incorporation, 120 Bway., having plans prepared by J. E. R. Carpenter, archt. and engr., 681 5th Ave., for 14 story, 50 x 80 ft. brick, steel and stone, brick foundation, at 30 West 59th St. About $450,000.

N. Y., New York—Hotel—Three Hundred and Five West End Corp., 200 West 72nd St., having plans prepared by Schwartz & Gross, archts., 347 5th Ave., for 14 story, 100 x 143 ft., brick, steel and stone, brick foundation, at 301-303 West End Ave. About $400,000.

N. Y., New York—Memorial—Natl. Com. Phi Gamma Delta Fraternity, 511 5th Ave., plans to build brick, steel and stone, brick foundation. About $200,000. Architect not selected.

N. Y., New York—Office and Laboratory—R. S. Copeland, Dept. of Health, having plans prepared by C. B. Meyers, archt., 1 Union Sq., for 10 story, 100 x 100 ft., brick and steel, brick foundation, at 136 West 30th St. About $700,000.

N. Y., Norwich—Library—City having plans prepared by Tooken & Marsh, archts., 101 Park Ave., New York City, for brick, steel and stone. About $125,000. Noted July 17.

N. Y., Syracuse—Institution—Onondaga Orphans' Home having plans prepared by G. Wright, archt., City Bank Bldg., for institution on East Genessee St. Plans include one main building and undecided number of cottages. About $500,000. Engineer not selected.

N. Y., Utica—High School—Bd. Educ. soon receives bids building 188 x 207 ft. Junior High School in 16th Ward. About $250,000. Kiehm & Jennison, Utica, archts. Noted June 26.

N. Y., Utica—School—Bd. Educ. having plans prepared by E. J. Berg, archt., 223 Elizabeth St., for new Mohawk St. School, to include industrial shops. About $300,000. J. Kemper, city engr.

N. J., Bayonne — Hospital — Bd. Dirs. Bayonne City Hospital plan to build addition to hospital, also power plant and nurses' home. About $250,000. R. Sluter, 79 West 41st St., member of com.

N. J., Collinswood — Church — St. Johns congregation rejected bids building 3 story, 30 x 70 ft., stone. E. F. Durang, 1220 Locust St., Phila., archt. Noted Aug. 7.

N. J., Newark—College—St. Benedicts College plans to build addition to college, also gymnasium. About $150,000.

N. J., Newark—Mercantile—Kar-Hock Co., 231 Halsey St., having tentative plans prepared for 3 story, hollow tile and pressed brick, on Brandford Pl.

N. J., Trenton—Bank—Mechanics Natl. Bank, State and Warren Sts., plans to build 14 story bank. Address N. A. K. Bugbeem, 231 West State St., chn. com.

N. J., Trenton—Headquarters—City plans to remodel police headquarters, on Chancery St., cost, $55,000, also build new steel cells, $20,000. G. B. La Barre, dir. pub. safety.

Pa., Phila.—Bank — Chelton Trust Co., 5614 Germantown Ave., plans to build 1 story, 60 x 90 ft., brick, on Broad St., above Roosevelt Blvd. About $50,000. Harris & Richards, Drexel Bldg., archts.

Pa., Phila.—Hospital—Methodist Episcopal Hospital, Broad and Wolf Sts., had plans prepared by H. W. Castor, archt., 21 South 12th St., building 5 story, 80 x 125 ft., fireproof, on Broad and Ritner Sts.

Pa., Pittsburgh—School—Pittsburgh College of Chiropractic soon lets contract building 2 story, 60 x 98 ft. brick addition, concrete foundation, at 130 South Fairmont St. About $75,000. Address R. M. Trimble, Ferguson Bldg., archt.

Pa., Reading—Store—Harold Furniture Co., 812 Penn St., soon receives bids building 6 story, 40 x 270 ft. brick. F. A. Muhlenberg, Flanders Bldg., Phila., archt. Cost to exceed $50,000.

N. C., Oxford—Hospital—Grand Lodge Masons, Charlotte, plan to build 2 story hospital here. About $50,000. C. C. Hook, Trust Bldg., Charlotte, archt.

O., Cleveland—Commercial—E. McGeorge, archt., 1900 Euclid Ave., preparing plans and soon receives bids building 2 story, 83 x 163 ft., rein.-con., steel and brick, at 1900 Prospect Ave., for Kennedy Co., 1900 Euclid Ave. About $85,000.

O., Cleveland — Commercial — F. P. Schreiner, East 55th St. and Cedar Ave., plans to build 2 story, 86 x 200 ft., rein.-con., steel and brick. About $50,000. Architect not selected.

O., Cleveland—Office—Chandler Motor Car Co., East 131st St. and St. Clair Ave., plans to build 5 story, 42 x 95 ft., rein.-con., steel and brick. About $100,000. Architect not selected.

O., Cleveland—Theatre—See "Industrial Work."

O., Cleveland—Theatre and Office—Eveland Theatre Co., Hippodrome Bldg., plans to build 10 story, 150 x 200 ft., rein.-con., steel and brick, on East 7th St. and Prospect Ave. About $1,500,000. Architect not selected.

O., Columbus—Salesroom—See "Industrial Works."

O., Columbus—Schools—City voted $1,432,562 bonds to build schools in spring. Plans include eight 12 room buildings, cost $248,000 each, and changes in present ones, $350,000.

O., Dayton—Salesroom—See "Industrial Works."

O., Middletown—High School—City plans election soon to vote on $300,000 bonds to build high school.

O., West Liberty—School—Bd. Educ. plans to build 3 story, rein.-con. and brick, concrete foundation. Bonds for $95,000 voted for project. Address S. H. Stanley, supt. schools. Architect not selected.

Mich., Detroit—Community House—Westminster Presbyterian congregation, Woodward and Parsons Sts., having plans prepared by G. M. Lindsey, archt., 2201 Dime Bank Bldg., constructing 2 story, 114 x 118 ft., rein.-con., brick and steel, concrete foundation, on Glynn Court and Hamilton Blvd. About $100,000.

Mich., Detroit — Hospital—Providence Hospital, West Grand Blvd. and 14th St., having plans prepared by L. Kamper, archt., 752 Book Bldg., building 4 story, 75 x 85 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on West Grand Blvd. About $75,000.

Mich., Detroit—Mercantile—D. L. Colwell, 701 Old Whitney Bldg., having plan prepared by Williams Bros., archts., 1111 Kresge Bldg., for 3 story, 150 x 160 ft rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on Grand River Ave. near Hobson Ave. About $100,000.

Mich., Detroit—Office and Mercantile—Walsh & O'Dell, archts., 1327 Chamber of Commerce Bldg., preparing plans for 2 story, 80 x 108 ft., brick, stone and steel concrete foundation, on Gratiot Ave. near Brush St. Owner's name withheld.

Mich., Detroit—Police Headquarters—Police Dept., c/o J. Inches, comr., Bates and Farmer Sts., having preliminary plans prepared by A. Kahn, archt., Marquette Bldg., for 2 story, rein.-con., stone, steel and brick, rein.-con. flooring, concrete foundation. About $300,000.

Mich., Detroit—Schools—Bd. Educ., 50 Bway. Ave., having tentative plans prepared by Malcolmson & Higgonbotham, archts., 404 Moffet Bldg., for high school, junior high schol and elementary school, rein.-con., steel and brick., rein.-con. flooring, concrete foundation. About $1,000,000.

Mich., Detroit—Theatre—C. W. Brandt, archt., 1114 Kresge Bldg., prepared plans for 2 story, 100 x 160 ft., rein.-con., terra cotta, brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. About $150,000. Owner's name withheld.

Mich., Ferndale—High School—Bd. Educ rescinded contract let to H. Mueller, 1711 Ford Bldg., Detroit, and having revised plans prepared for rein.-con., brick and steel, concrete foundation. About $90,000. G. Haas, 1514 Kresge Bldg., archt.

Mich., Martin—School—Bd. Educ. having plans prepared by E. S. Batterson, archt., 918 Lane St., Kalamazoo, building 1 story, brick, stone and steel addition, wood flooring, concrete foundation. About $75,000

Mich., River Rouge — Church — River Rouge Methodist Episcopal congregation having plans prepared by W. E. N. Hunter, archt., 1306 Chamber of Comerce Bldg., constructing 1 story, 80 x 80 ft., brick and stone, wood flooring, concrete foundation, on West Jefferson and Elm Sts. About $75,000.

Mich., Romeo — Temple and Stores—Romeo Masonic Lodge having plans prepared by G. W. Graves, archt., 43 John R St., Detroit, for 2 story rein.-con. and brick, concrete foundation. About $60,000.

Ill., Chicago — Hall — G. J. Breinig, Rockford, c/o H. J. Schlacks, archt., 721 North Michigan Ave., having plans prepared for 1 and 2 story, 140 x 200 ft. dance hall, rein.-con., concrete foundation, on Grace St. and Bway., here. About $150,000.

Buildings (Continued)

Ill., Chicago — Hotel — Sheridan-Wilson Hotel Co., c/o W. W. Ahlschlager, archt., 111 West Washington St., having plans prepared for 12 story, 130 x 225 ft., on Sheridan Rd. and Wilson Ave. About $2,000,000.

Ill., Chicago—Hotel—J. R. Thompson, 350 North Clark St., having preliminary plans prepared by Marshall & Fox, archts., 721 North Michigan Ave., for 16-22 story, 70 x 160 ft., on Dearborn and Madison Sts. Cost between $3,000,000 and $4,000,000.

Wis., Eau Claire—Bank—Union Natl. Bank, Grand Ave. E and Barstow St., plans to build 2 story, 60 x 150 ft. brick. About $100,000. G. B. Wheeler, pres. E. Hutchens, 703 Wisconsin St., engr.

Ia., Spencer—Hotel—E. C. Tangney, Sheldon, having plans prepared by Boyd & Moore, archts., 314 Securities Bldg., Des Moines, for 4 story, brick, here. About $100,000.

Minn., Ada — High School — City voted $50,000 bonds to build new high school.

Minn., Minneapolis — Hotel — Nicollet Hotel Co., Nicollet and Washington Sts., plans to build 8 story, rein.-con. and brick, containing 800 rooms, at Gateway Ave. About $1,500,000. G. Dixon, mgr. Architect not selected.

Minn., St. Paul—Administration—Salvation Army, 534 Minnesota St., having sketches made for concrete and brick, at 1471 West Como Ave. About $110,000. Architect's name withheld.

Kan., Cottonwood Falls—High School—Chase Co. election Sept. 2 to vote $100,000 to build rural high school.

Kan., Emporia — Bank — Citizens Natl. Bank having preliminary plans prepared by Weary & Alford, archts., 1907 South Michigan Ave., Chicago, building 7 story, 62 x 130 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $350,000.

Kan., Ft. Scott—Auditorium—City plans to build victory auditorium. About $200,000. W. F. Schmidt, 1634 West 10th St., Oklahoma City, Okla., archt.

Kan., Haven—High School—Bd. Educ. voted $60,000 bonds to build high school.

Kan., Peabody—Hotel—F. P. Steinhauer Assn. having plans prepared by J. H. Felt Co., archts., 802 Grand Ave. Temple, Kansas City, Mo., building 3 story, 50 x 140 ft., brick, to be known as Hotel Forrester.

Kan., Stanley—High School—Bd. Educ., c/o P. L. Kellogg, clk., having plans prepared by T. W. Williamson, & Co., archts., 418 Central Natl. Bank Bldg., Topeka, building 2 story, concrete, steel and brick, concrete foundation. About $55,000.

Kan., Wichita—Bank—State Saving & Mercantile Bank, 115 East Douglas Ave., having plans prepared by Childs & Smith, archts., 64 East Van Buren Ave., Chicago, building 4 story, 55 x 140 ft., rein.-con. and brick, rein.-con. flooring.

Neb., Omaha—Stores and Office—G. W. Smith, Warrenton Park, Me., plans to build 10 story, 66 x 132 ft. rein.-con. and brick, on 10th and Harney Sts. About $250,000. Architect not selected.

N. D., McIntosh — Court House—Ashley Co. plans to build court house. Bonds for $75,000 voted for project.

Wyo., Casper—Hall—Moose Lodge plans to build 2 story hall. About $65,000. DuBois & Goodrich, Casper, archts.

Wyo., Sheridan—Church—First Methodist Episcopal congregation plans to build 2 story, 120 x 130 ft., on Works and Tschirgi Sts. About $100,000. T. P. Barber, 74 Bank Bldg., Colorado Springs, Colo., archt.

Mo., Galena — Court House — Comrs. Stone Co. having plans prepared by C. H. Sudhoelter Co., archts., 215 West 9th St., Joplin, for court house. About $50,000. Noted July 24.

Tex., Arlington—Art Building—Grubbs' Vocational College plans to construct mechanics art and shop building; also temporary barracks and mess hall. About $60,000. A. Williams, dean.

Tex., Bowie—Schools—Bd. Educ. plans to build 3 story, 112 x 186 ft. high school and 3 story, 64 x 192 ft., grade school. About $350,000. Sanguinet & Staats, 1st Natl. Bank Bldg., Ft. Worth, archts. Noted June 5.

Tex., Dallas—Salvation Army, Southwestern Life Bldg., plans to construct 6 story, 62 x 96 ft., building. About $100,000. G. Wood, brig. genl.

Tex., Ennis — Theatre — J. M. Savey plans to build theatre on West Knox St. About $50,000.

Tex., Ranger — Station — Texas & Pacific R.R., Griffin and Pacific Sts., Dallas, plans to build passenger station on Main St., here. About $100,000. E. F. Mitchell, ch. engr.

N. M., Albuquerque — Hospital — E. H. Norris, archt., Cromwell Bldg., soon lets contract building 2 story, brick, concrete foundation, on East Grand Ave., for Cipes Sanatorium, Inc. About $85,000.

Ariz., Phoeinx—Legion—Amer. Legion, State Chapter, plans to construct legion building on 7th Ave., between Madison and Jefferson Sts. About $75,000. Architect not selected.

Ariz., Yuma — School — School Trustees soon receive bids building 2 story, brick and concrete, containing 20 rooms. About $125,000 available. N. F. Marsh, 211 Bway. Central Bldg., Los Angeles and V. O. Wallingford, Goodrich Bldg., Phoenix, archts.

Wash., Seattle — Mission Home — First Presbyterian congregation having plans prepared by J. A. Creutzer, archt., Leary Bldg., for 1st unit of Oriental Mission Home, on 9th Ave. S and Welfare St., including 2 story, 110 x 120 ft., brick building. About $55,000. Total amount to be expended $150,000.

Cal., Bishop—School—Trustees Bishop Union High School Dist. plan to build school. Election soon to vote on $150,000 bonds for project. W. H. Weeks, 75 Post St., San Francisco, archt.

Cal., Long Beach — Lodge — I. O. O. F., Lodge No. 390 plans to build on 75 x 150 ft. site on American Ave. D. L. Bathurst, secy. Architect not selected.

Cal., Los Angeles—Club—B. P. O. E. Lodge No. 99 plans to build club, cost $1,000,000. Committee appointed to select site. L. V. Youngworth, chn. Architect not selected.

Cal., Los Angeles—Hotel—H. Biescar, c/o W. J. Saunders, archt., 229 Laughlin Bldg., soon lets contract building 8 story, 55 x 126 ft., rein.-con., containing 155 rooms, on 8th and Hope Sts.

Cal., Los Angeles — Office — Los Angeles Ry., Pacific Electric Bldg., prepared preliminary plans for 11 story, 65 x 176 ft., rein.-con., brick, terra cotta and hollow tile, concrete foundation, on 11th St. and Bway. About $400,000.

Cal., Los Angeles — Store — A. Hamberger & Son, 8th St. and Bway., had preliminary plans prepared by A. C. Martin, archt., 430 Higgins Bldg., for 4 story, 200 x 320 ft., steel and terra cotta, addition, rein.-con. flooring.

Cal., Modesto — School — City election Sept. 4 to vote on $165,000 bonds for addition to high school and $185,000 bonds for new grammar school. J. J. Donovan, archt., 414 13th St., Oakland, prepared preliminary plans. Noted June 5.

Cal., Oakland—College—Bd. Trustees St. Mary's College purchased 250 acre site on Foot Hill Blvd. and plan to build college.

Cal., San Diego — Store — Sunshine Realty Co. plans to build 8 story, 100 x 100 ft., rein.-con. C. S. Holzwasser, pres. Holzwasser, Inc., Bway., lessee. Architect not selected.

Cal., San Francisco—School—Bd. Pub. Wks. having plans prepared by J. Reid, Jr., archt., 1st Natl. Bank Bldg., for 2 story, 12 room, masonry, on Harrison St. About $90,000.

Que., Montreal—Theatre—Allen Theatre Co., Richmond St. E., Toronto, Ont., having plans prepared by C. H. Crane and E. G. Kiehler, archts., 2325 Dime Bank Bldg., Detroit, Mich., for 2 story, 45 x 70 ft. rein.-con. steel and brick, rein.con. flooring, concrete foundation, on McGill St., here. About $250,000 Noted July 31.

Ont., Ingersoll—Collegiate—Bd. Educ. recommended that bylaw be submitted and plans drawn for building 3 story, concrete, steel and brick, concrete foundation. About $120,000. Architect not selected.

Ont., London—Store and Office—Grafton Co., Dundas St., having plans prepared by Watt & Blackwell, archts., Bank of Toronto Bldg., and soon receives bids building 3 story, 60 x 125 ft. concrete, steel and brick, rein.-con. flooring, rock foundation. About $75,000.

BIDS DESIRED

N. Y., Hartsdale—School—Until Sept. 4, by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, building 1 story, brick, steel and stone, brick foundation. About $75,000.

N. Y., S. I., Dongan Hills—School—Until Aug. 25, by C. B. J. Snyder, supt. school bldgs., Municipal Bldg., New York City, building P. S. No. 11, on Jefferson Ave. between Garretson and Cromwell Aves., Richmond Boro.

N. Y., Troy—Armory—Until Sept. 4, by F. W. Ward, secy. state bd. armory comrs., 158 State St., Albany, building armory here, also installing heating, sanitary and electric work in same. L. F. Pilcher, Capitol, Albany, state archt.; advertised in this issue. Noted July 17.

Pa., Cristy Park (McKeesport P. O.)—Office—Natl. Tube Co., Frick Bldg., Pittsburgh, receiving bids constructing 3 story, 46 x 90 ft. office building and 3 story, 47 x 64 ft. time building here, rein.-con. and brick, rein.-con. flooring, concrete foundation. E. Stotz, Monongahela Bank Bldg., Pittsburgh, archt.

Pa., Phila. — Synagogue—Fieldstein & Scharf, archts., 1328 Chestnut St., receiving bids building 2 story, 75 x 100 ft., concrete and brick, on Belfield and Broad Sts., for Beth Shalom congregation. About $100,000. Noted June 12.

Pa., Williamsport—Schools—Until Aug. 26, by Bd. Educ. building two 2 story, 150 x 200 ft., brick, steel and rein.-con. schools one on Wayne Ave. and Newberry St. and the other on Curtin Ave., north of Braden Park. About $150,000 each. E. E. Joralemon, 547 Franklin St., Buffalo, N. Y., archt. Noted July 17.

Va., Eastville—Hotel—Until Aug. 25, by B. F. Mitchell, archt., 500 Seaboard Bank Bldg., Norfolk, building 3 story, 62 x 108 ft. brick and timber, rock and brick foundation, here, for Northampton Hotel Corp., Eastville. About $75,000.

Va., Richmond—Theatre—Until Aug. 25, by Carneal & Johnston, archts. and engrs., 707 Chamber of Commerce Bldg., building 1 story, 94 x 123 ft., on 8th and Broad Sts., for Vincent & Wells Co. About $150,000.

Fla., Jacksonville—Schools—Until Aug. 30, by Bd. Pub. Instruction, 203 Court House, building brick additions to Duval High school and school at Fairfield. R. A. Benjamin, Bisbee Bldg., archt.

O., Canton—School—Bd. Educ. receiving bids building 2 story, 114 x 200 ft., rein.-con., steel and brick, on 16th and Vine Sts. About $200,000. F. C. Warner, 767 Hippodrome Bldg., Cleveland, archt. Noted July 24.

O., Cleveland — Sales — W. S. Ferguson Co., archts., 1900 Euclid Ave., receiving bids building 2 story, 107 x 222 ft., rein.-con., steel and brick, on East 30th St. and Chester Ave., for H. T. Neighbors, 1900 Euclid Ave. About $75,000.

O., Fletcher—School—Until Sept. 8, by Bd. Educ., Brown Twp., building 2 story, 70 x 110 ft., rein.-con. and brick, concrete foundation. About $50,000. G. R. Walker & Co., 1301 Conover Bldg., Dayton, archts.

O., Massillon—Store and Office—Snyder-Hess Co., Erie St., receiving bids building 8 story, 79 x 163 ft., steel and brick, concrete foundation, on Mill and Main Sts. W. R. Powell, 705 Rose Bldg., Cleveland, archt. Noted July 24.

Mich., Detroit—Hospital—A. King, archt., Marquette Bldg., receiving bids building 4 story, 35 x 70 ft, rein-con. and brick addition to hospital, rein.-con. flooring, concrete foundation, on Willis Ave. and John R St., for Grace Hospital, Willis Ave. About $75,000.

Mich., Flint—Theatre—W. S. Butterfield, genl. mgr. Flint Theatre Co., Saginaw St., receiving bids building 1 story, 50 x 90 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Louisa and Saginaw Sts. About $100,000.

Ill., Chicago Heights—Club and Theatre—P. Gerhardt, archt., 64 West Randolph St., receiving bids for 5 story, 100 x 142 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Illinois and Oak Sts., for Chicago Heights Country Club. About $350,000 Noted June 12.

Buildings (Continued)

Ill., Evanston — Parish — Tallmadge & Watson, archts., 189 West Madison St., receiving bids for 2 story, 45 x 140 ft., stone and timber, rock foundation, on Homan and Lee Sts., for St. Luke's Episcopal Parish, 404 Lee St. About $50,000.

Wis., Superior—Auditorium—Until Sept. 11, by City Clerk, building 3 story, 102 x 140 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, on 14th St. and Ogden Ave. About $150,000. J. O'Bach, 1111 Tower Ave., archts. and engrs.

Minn., Cloquet—City Hall and Jail—Until Sept. 12, by J. Parks, city clk., building 2 story, 40 x 80 ft. brick and stone, rein.-con. flooring, concrete foundation, on Arch St. About $50,000. Halstead & Sullivan, Palladio Bldg., Duluth, archts. and engrs. Noted June 17.

Minn., Minneapolis — School — Until Sept. 11, by Bd. Educ. building 1 story, 60 x 140 ft. addition to Whitney School on 19th Ave., N. E. and Pierce St. About $52,000. Bureau of Bldgs., c/o Bd. Educ., archts. Noted Aug. 14.

Minn., Minneapolis—Theatre—Hamm, Finkelstein & Ruben, Palace Theatre, receiving bids building 1 story, 100 x 140 ft. steel, terra cotta and brick on Nicollet Ave., near 14th St. About $175,000. Kees & Colburn, Plymouth Bldg., archts. Noted June 5.

Minn., Northfield—Science Hall—Until Aug. 30, by St. Olaf College, building 3 story, 76 x 200 ft. brick, stone, concrete and steel, rein.-con. flooring, concrete and rock foundation. About $200,000. N. E. Mohn, Endicott Bldg., St. Paul, archt. Noted July 3.

Minn., Willmar—Service—Until Sept. 1, by Bd. Control, Capitol, St. Paul, building 2 story, 45 x 120 ft., rein.-con. and brick, at state asylum here. About $85,000. C. H. Johnston, Capitol Bank Bldg., St. Paul, engrs. and archts. Noted July 3.

Kan., Lyndon—Court House—Until Sept. 4, by Osage Co., building 3 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $200,000. W. E. Hulse & Co., Hutchinson, archts. Noted Aug. 14.

Mo., St. Louis—Bank—Until Sept. 1, by Mauran, Russell & Crowell, engrs., Chemical Bldg. or C. Gilbert, archt., 244 Madison Ave., New York City, building 4 story, 127 x 164 ft., rein.-con., terra cotta, steel and brick, rein.-con. flooring, rock foundation, for 1st Nat'l. Bank, Bway and Locust Sts. Cost to exceed $1,000,000.

Mo., Sugar Creek—School—Until Aug. 28, by Bd. Educ., building 2 story, 63 x 86 ft., school and 1 story, 24 x 50 ft., boiler house, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $65,000. A. B. Anderson, 818 New York Life Bldg., Kansas City, archt.

Okla., Oklahoma City — Church—First Church Christ, Scientist, c/o G. P. Westesvelt, receiving bids building 2 story, 90 x 100 ft., brick, concrete and steel, concrete foundation. About $100,000. C. L. Butler, Tulsa, archt.

Okla., Oklahoma—Office—F. P. Johnson, 140 West Main St., receiving bids building 3 story, 50 x 140 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $75,000. Hawk & Parr, 501 Security Bldg., archts.

Okla., Oklahoma—School—Until Aug. 26, by Bd. Educ. building 2 story, 63 x 211 ft., rein.-con., steel and brick, rein.-con flooring, concrete foundation, at 1215 North Durland St. About $90,000. Layton, Smith & Forsythe, 701 Majestic Bldg., archts. Noted June 5.

Okla., Oklahoma—School—Until Aug. 26, by Bd. Educ. building 2 story, 63 x 245 ft., rein.-con., steel and brick, rein.-con. flooring, at 2317 North Western St. About $90,500. Layton, Smith & Forsythe, 701 Majestic Bldg., archts. Noted June 5.

Okla., Okmulgee—Theatre—Until Sept. 2, by L. H. D. Cook, building 2 story, 50 x 140 ft., concrete, steel and brick, rein.-con. flooring. About $100,000. Smith, Rea, Lovitt & Senter, Okmulgee, archts. Noted Aug. 14.

Idaho, Twin Falls—Church—Until Sept. 2, by Bldg. Com. of St. Edwards Church, building 2 story, 56 x 120 ft. brick and terra cotta. About $55,000. E. H. Gates, Twin Falls, archt.

Cal., Merced—Schools—Until Sept. 2, by Bd. Trustees of Merced Union High School Dist. erecting group of concrete and brick or hollow tile high school buildings. About $180,000. Bids will be taken on 13 different segregated portions of work. Former bids rejected. Allison & Allison, 1405 Hibernian Bldg., Los Angeles, archts.

Cal., San Francisco—State—Until Sept. 5, by W. F. McClure, state archt., Forum Bldg., Sacramento, furnishing and erecting structural steel frame and iron work for state building, here. Cost of completed building, $1,000,000. Bliss & Faville, Balboa Bldg., archts.

Que., Amos—Bank—Until Aug. 28, by L. A. Amos, archt., 78 Crescent St., Montreal, building 2 story, 55 x 60 ft., concrete, steel and brick, concrete foundation, on Notre Dame St., here, for Bank of Hochelaga, St. James St., Montreal. About $60,000.

Ont., St. Catharines—Schools—School Bd. receiving bids building two 2 story, brick and steel, concrete foundation. About $140,000. A. E. Nicholson, 46 Queen St., archt. Noted June 5.

Ont., Toronto—Bank—Darling & Pearson, archts., 2 Leader Lane, receiving bids building 3 story, 60 x 80 ft. brick and steel, concrete foundation, on Wellington St., for Merchants Bank of Canada, 13 Wellington St. W. About $80,000. Noted Apr. 25.

Ont., Toronto—School—Until Aug. 27, by Bd. Educ., building 2 story, addition to school on Morley Ave., concrete, steel and brick, concrete foundation. About $80,000. J. Seddall, Confederation Life Bldg., archt.

Ont., Toronto—School—Until Aug. 27, by W. C. Wilkinson, secy. bd. educ., building 2 story, steel and brick, rein.-con. flooring, concrete foundation, on Kingston Rd., to be known as Norway Primary School. About $100,000. George & Moorehouse, 65 Victoria St., Toronto, archts. Noted Apr. 24.

Ont., Toronto—School—Until Aug. 29, by Bd. Educ., 155 College St., building 2 story addition to school on Keele St., concrete, steel and brick, concrete foundation. About $60,000. Chapman & Oxley, Harbor Bldg., archts.

Ont., Toronto—School—Until Aug. 29, by Bd. Educ., 155 College St., building addition to Earl Gray School, on Jones Ave., 2 story, concrete, steel and brick, concrete foundation. About $60,000. E. G. Bud, 6 King St., West Toronto, archt. Noted Apr. 24.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Worcester** — Houses—Worcester Housing Corp. let contract building twenty 2 story, brick and timber houses for workmen, to E. J. Cross Co., 82 Foster St., and 6, to J. J. Powers, 15 Ashland St. About $150,000. Noted July 17.

★**Conn., Bridegport**—Office—See "Industrial Works."

★**Conn., Hartford**—Business—I. A. Allen, Jr., archt., 904 Main St., let contract to Korder & Sawyer, 45 Gold St., remodeling lower and upper floors of 4 story brick building on High and Allyn Sts., for G. F. Heublein, Inc., 196 Trumbull St. About $100,000. Noted July 24.

★**Conn., Hartford**—Office—Hartford Times, 716 Main St., let contract building 3 story, steel, brick and stone, brick foundation, on Prospect St., to M. Eidlitz, 30 East 42nd St., New York City. About $100,000.

★**Conn., Ridgefield**—Bank—First Natl. Bank, Main St., let contract building 1 story, 25 x 40 ft. brick, steel and concrete, rein.-con. flooring, concrete foundation, to W. A. Smith & Son, 188 Cannon St., Bridgeport. About $50,000. Noted Aug. 7.

★**Conn., Terryville** — Housing — Eagle Lock Co., South Main St., let contract building thirty 1 story timber houses for workmen, concrete and stone foundation, at Hillside Park, to Westinghouse, Church, Kerr Co., 30 Church St., New York City. About $75,000. Private plans.

★**Conn., Waterbury**—Office—Scovill Mfg. Co., 99 Mill St., let contract building 4 story brick and rein.-con., rein.-con. flooring, concrete foundation, on Cole, Baldwin and Mill Sts., to M. Eidlitz & Sons Co., 30 East 42nd St., New York City. About $150,000. Noted July 24.

★**Conn., Waterbury**—Restaurant—King-Yen Co., 61 East Main St., let contract converting brick and timber building on Bank St., into restaurant, to G. A. Upham, West Main St. About $50,000.

★**N. Y., Buffalo** — Office Buffalo Fdry. & Machine Co., 1543 Fillmore Ave., let contract building 2 story, 70 x 90 ft. concrete and brick, rein.-con. flooring, concrete foundation, on East Ferry St., to B. I. Crocker, Builders Exch. About $70,000. Noted Aug. 7.

★**N. Y., Gloversville**—Temple—Trustees Masonic Order let contract building brick, steel and concrete temple, to W. Lyon & Son, Herkimer. About $68,950.

★**N. Y., New Rochelle**—School—Dept. Educ. let contract building 3 story, brick, steel and stone, brick foundation, to E. Dieditsch, 383 Madison Ave., New York City. About $200,000.

★**N. Y., New York** — Bank — Seaboard Natl. Bank, 18 Bway., let contract building 3 story, 80 x 94 ft. brick, steel and stone, brick foundation, on Broad and Beaver Sts., to C. T. Wills Constr. Co., 286 5th Ave. About $350,000. Noted Apr. 24.

★**N. Y., New York**—Clinic—Vanderbilt Clinic, 437 West 59th St., let contract building 3 story, brick and steel addition, brick foundation, to Wharton, Green & Co., Inc., 37 West 39th St. About $50,000.

★**N. Y., New York** — Loft — T. A. Meyer, archt. and engr., 114 East 28th St., let contract to Continental Iron & Steel Co., 2 Rector St., building 12 story, 25 x 100 ft., brick, steel and stone, brick foundation, on 30th St. and Madison Ave., for S. Straus & Co., 127 East 26th St. About $140,000. Noted Aug. 14.

N. Y., New York — Office — Cunard Steamship Co., 25 Bway., let contract building 250 x 250 ft. brick, steel and stone, brick foundation, to Hines & Todd, 101 Park Ave. About $4,000,000. Noted Dec. 12, 1918.

★**N. Y., New York**—Office, etc.—New York Edison Co., Irving Pl. and 15th St., let contract building 3 story, 55 x 75 ft., brick and steel office and power house, brick foundation, at 31 Hester St., to G. Sykes Co., 70 East 45th St.

★**N. Y., New York**—Office and Loft—R. H. Almiroty, archt. and engr., 220 5th Ave., let contract to H. P. Wright Co., 25 West 42nd St., building 6 story, 27 x 100 ft., brick and steel, brick foundation, at 31 West 57th St., for Sohmer & Co., 315 5th Ave. About $75,000. Noted July 3.

★**N. Y., New York** — Stores — Fouval Realty Co., 135 Bway., will build 2 story, 75 x 90 ft. brick and steel, brick foundation, on Tiebout Ave. and Fordham Rd. About $65,000. Work will be done by day labor.

★**N. Y., Schenectady**—Theatre—M. Spiegel, Strand Theatre Bldg., New York City, let contract making necessary alterations to 2 story, brick and steel theatre, here, to Jarden Co., 507 5th Ave., New York City. About $100,000. Noted July 17.

★**N. Y., Watertown**—Bank—Watertown Natl. Bank, 100 Court St., let contract building 1 story, 100 x 100 ft., brick, steel and stone, brick foundation, on Public Sq., to Kelly & Kelly, 12th St., Long Island City. About $60,000. Noted June 26.

★**N. J., Jersey City**—Office, Show Room, etc.—Buick Motor Co. let contract building 4 story, 78 x 148 ft., brick on Bergen Ave., to W. Robinson, Inc., Jersey City. About $75,000.

★**N. J., Newark**—Office—Hay Fdry & Iron Wks., Lentz Ave. and Plum Point Lane, let contract building 4 story, 50 x 100 ft., 1st floor to be rein.-con., others to be steel with brick walls, concrete floors, to Amer. Concrete Steel Co., 27 Clinton St.

★**Pa., Phila.**—Bank—Northwestern Trust Co., 23 Ridge and Columbia Sts., let contract building 1 and 2 story, 50 x 80 x 100 ft. rein.-con. and steel, to P. Haibach, 1261 North 26th St. About $75,000.

★**Md., Baltimore**—Hall—Trustees Morgan College, Hillen Rd., let general contract building 2½ story, 85 x 200 ft., stone and brick, stone foundation, to be known as Carnegie Hall, to C. E. Ehman & Son, Beauregard Ave., near Woodburne; plastering to J. H. Hampshire, 15 East Fayette St.; total cost, $85,000. Noted May 22.

Buildings (Continued)

★**La., Shreveport** — Club — Shreveport Country Club let contract building clubhouse, to W. H. Werner, Shreveport. About $75,000.

★**O., Canton**—Rest House—Pennsylvania Lines West of Pittsburgh, Penobscot Bldg., Detroit, Mich., let contract building 4 story, 120 x 250 ft., rein.-con., brick and terra cotta, at Pennsylvania Sta., here, to Walbridge-Alldinger Co., 2356 Penobscot Bldg., Detroit. Noted July 3.

★**O., Cleveland**—High School—F. C. Warner, archt., 767 Hippodrome Bldg., let contract to P. Kirschner Co., 1008 Hippodrome Bldg., for 3 story, 125 x 200 ft., rein.-con., steel and brick, on Lee Rd., for Bd. Educ. About $300,000. Noted Apr. 17.

★**O., Springfield**—Office—R. C. Gotwald, archt., Gotwald Bldg., let contract to J. A. Poss, Springfield, building 3 story, 52 x 150 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on West Columbia St., for Springfield Metallic Casket Co., Center St. About $60,000. Noted July 24.

★**O., Springfield**—Salesrooms—See "Industrial Works."

★**Mich., Detroit**—Chapel—Providence Hospital, West Grand Blvd. and 14th St., let contract building 4 story, 40 x 140 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to J. Finn, 2373 Woodward Ave. About $75,000. Noted July 24.

★**Mich., Detroit**—Store and Hotel—G. A. Lindke, Monroe and Farmer Sts., let contract building 3 story, 140 x 159 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on Woodward Ave. and Peterboro St., to Detroit Metal & Steel Co., 1st and Congress Sts. About $300,000. Noted Aug. 7.

Mich., Detroit—Theatre and Bank—Zemon & Wetsman, 1020 Chamber of Commerce, let contract building 2 story, rein.-con., brick and steel, on Linwood Ave. and Virginia Park, to H. Carew, 210 Joseph Campau Ave. Noted July 31.

★**Ill., Bement**—High School—Bd. Educ. let contract building 3 story, 50 x 200 ft., brick and stone, rein.-con. flooring, concrete foundation, to English Bros., Champaign. About $125,000.

★**Ill., Rockford**—Church—S. M. Seator, archt., 35 North Dearborn St., Chicago, let contract to C. A. Juhl, 133 West Washington St., Chicago, for 1 story, 60 x 115 ft., brick and stone, concrete foundation, on Palm and Court Sts., for 1st Baptist congregation, Church and Mulberry Sts. About $60,000. Noted Aug. 7.

★**Minn., Albert Lea** — Grade School — Bd. Educ. let contract remodeling and building 2 story addition, to C. M. Tattager, Albert Lea, $52,226. Noted July 31.

Minn., Sauk Center — Cottages — State Bd. Control, Capitol, St. Paul, received bids building two 2 story, 35 x 80 ft., frame cottages, at State Home for Girls, here, (general contract) from N. P. Frandsen, 510 Rice St., St. Paul, $53,400; heating and plumbing, M. J. O'Neil, 60 East 6th St., St. Paul, $17,697; electric work, Beck Eng. & Constr. Co., Plymouth Bldg., Minneapolis, $12,070. Noted July 3.

★**Kan., Salina**—Academy—Sisters of St. Joseph, Concordia, let contract building 4 story, 150 x 300 ft. brick, rein.-con. flooring, for Mt. St. Mary's Academy, here, to Swenson Constr. Co., Kansas City. About $600,000; cost plus percentage basis.

★**Neb., College View** — School — Bd. Educ. let contract building 2 story, 65 x 100 ft., brick, to R. O. Stake, 346 North 28th St., Lincoln, $51,886.

★**Neb., Omaha** — A. W. Gordon, 8th and Dodge Sts., let contract building 5 story, 126 x 132 ft., rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, on 9th and Dodge Sts., to P. Kiewitt & Sons, 754 Omaha Nat'l Bank. About $200,000.

Wyo., Douglas—School—School Dist. received bids Aug. 2, building 3 story, from E. Raevill, Douglas, $52,793; W. G. Calaghan, Thermopolis, $53,333; C. C. Young, Casper, $54,400. Noted July 31.

★**Mo., Hallsville**—High School—Bd. Educ. let contract building 2 story, 50 x 70 ft., rein.-con., stucco, steel and brick, rein.-con. flooring, rock foundation, to Hallsville Constr. Co., Hallsville. About $60,000.

★**Mo., Morrisonville**—School Bd. Educ. let contract building 2 story, 63 x 110 ft., concrete, brick and steel, to H. O. Hirsch Co., Wainwright Bldg., St. Louis. About $50,000. Noted July 31.

★**Mo., St. Louis**—Hotel—Fremont Investment Co., 810 Chestnut St., let contract building 4 story, 45 x 103 ft., rein.-con., steel, brick and terra cotta, rock foundation, at 5564 Pershing Ave., to Cornwell Constr. Co., 810 Chestnut St. About $55,000.

★**Mo., St. Louis**—Store—Arthur Realty Co., 6th and Washington Sts., let contract building 11 story, 90 x 150 ft., steel and concrete, to Westlake Constr. Co., 717 Locust St. About $480,000.

★**Okla., Ada** — School—State Bd. Pub. Affairs, c/o G. Clark, secy., let contract building 2 story, brick and rein.-con., rein.-con flooring, to Manhattan Constr. Co., 3rd and Fondulac Sts., Muskogee. About $95,000.

★**Okla., Oklahoma** — Church — Grace Methodist Episcopal Church, South, c/o C. A. German, let contract building 2 story, 60 x 90 ft., brick, concrete and steel, concrete foundation, to W. L. Hawk, 714 North Ollie St. About $52,000.

★**Ariz., Phoenix** — Office — D. B. Heard, Central and Adams Sts., et al, let contract constructing 4 story, 70 x 148 ft., rein.-con. and brick office and newspaper building, rein.-con. flooring, concrete foundation, to J. W. Martin, Phoenix. About $250,00.

★**Cal., Arcata** — School — State Eng. Dept., Forum Bldg., Sacramento, will build rein.-con. and brick school, to be known as Humboldt Normal School. About $250,000. Work will be done by day labor under supervision of J. W. Dutton, c/o State Eng. Dept., Forum Bldg., Sacramento.

★**Cal., Fresno**—Schools—Bd. Educ. engaged Trewitt & Shields, 1819 El Dorado St., to superintend construction of all schools under $2,000,000 bond issue. They will do all work expected of general contractor and will purchase materials and receive a compensation of 4% of cost. Bids will be received later on portions of work not usually included in general contract.

★**Cal., San Francisco**—Loft—Imperial Realty Co. let contract building 6 story, 50 x 120 ft., rein.-con., rein.-con. flooring, concrete foundation, on Geary St., to Barrett & Hilp, Sharon Bldg. About $150,000. Cost plus percentage basis. Livingston Bros., c/o G. A. Lansburgh, Gunst Bldg., lessee. Noted June 26.

★**Cal., Tulare** — Schools — School Trustees let contract building 2 schools, each containing 8 rooms, hollow tile walls, concrete foundation, to Barkelew & Gould, Fresno, $68,000. Noted May 8.

★**Que., Montreal**—Church and Presbytery—St. Augustine Roman Catholic congregation let contract building 60 x 110 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on St. Viteu St., to M. J. Stack Co., 167 McCord St. About $135,000.

★**Ont., Oshawa**—Office—See "Industrial Works."

★**Ont., Trenton**—School—Pub. School Bd. let contract building 2 story, concrete, steel and brick, concrete foundation, to Acer & McNab, Trenton. About $60,000.

Federal Government Work

PROPOSED WORK

R. I., Newport—Structural Steel—Spec. 4023—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to furnish for torpedo repair job, here. About $10,000.

Pa., Ft. Mifflin—Fire Protection System—Spec. 3779—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids extending fire protection system, here. About $20,000; $10 deposit required for plans and spec. Noted Jan. 30.

Pa., Phila.—Boat and Storage Building—Spec. 4012—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon lets contract building, here. Noted July 31.

Pa., Phila.—Cranes—Spec. 4013—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon lets contract installing cranes in boat and general storage building, here. Noted July 31.

Md., Baltimore—Dredging—Harbor Bd. petitioned Maryland congressmen to have bill introduced in Congress directing U. S. Chief of Engineers to have surveys made for dredging 40 ft. channel, from Cape Henry to Baltimore, distance about 150 nautical miles.

D. C., Wash.—Mechanical Equipment and Piping — Spec. 3708 — Bureau Yards & Docks, Navy Dept., soon receives bids installing mechanical equipment and piping for boiler shop, here. About $200,000; $20 deposit required for plans and spec. Noted Aug. 14.

D. C., Wash.—Timber Work—Spec. 4015—Bureau Yards & Docks, Navy Dept., soon receives bids for extension to quay wall, here. About $30,000; $10 deposit required for plans and spec. Noted Aug. 14.

S. C., Charleston—Mechanical Stokers—Spec. 4010—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids installing, in central power plant, here. About $11,000; $10 deposit required for plans and spec. Noted July 31.

Ga., Dawson—Post Office—Treas. Dept., Wash., D. C., rejected bids received July 25, building here. J. A. Wetmore, superv. archt. Noted July 31.

S. D., Rapid City—School—C. Sells, comr. Indian Affairs, Wash., D. C., rejected bids received July 16, building school at Indian School Reservation, here. Noted July 24.

Wash., Puget Sound — Building — Spec. 4009—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids building extension to Building No. 178, here. About $50,000; $10 deposit required for plans and spec. Noted July 24.

Wash., Puget Sound (Bremerton P. O.)—Reciprocating Air Compressor—Spec. 3837—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids installing, here. About $62,000; $10 deposit required for plans and spec. Noted Apr. 3.

BIDS DESIRED

R. I., Providence—Post Office and Custom House—Until Sept. 26, by J. A. Wetmore, superv. archt., treas. dept., Wash., D. C. remodeling, here; advertised in this issue.

Conn., New Haven—Pump—Until Sept 12, by J. A. Wetmore, superv. archt., treas dept., Wash., D. C., for motor driven triplex pump, in U. S. Post Office, here; advertised in this issue.

N. Y., Stapleton—Boiler Plant—Until Sept., 4, by J. A. Wetmore, superv. archt. treas. Dept., Wash., D. C., for temporary boiler plant, at U. S. Marine Hospital, attendants quarters, here; advertised in this issue.

N. Y., Stapleton—Kitchen and Mess Hall—Until Sept. 15, by J. A. Wetmore, superv. archt., treas. dept., Wash., D. C., for construction of kitchen and mess hall for U. S. Marine Hospital, here; advertised in this issue.

N. J., Lakehurst—Hangar—Spec. 4001—Until Sept. 8, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building dirigible hangar at Naval Air Sta., here. Noted Aug. 14.

Del., Wilmington—Jetty Repairs—Until Sept. 18, by U. S. Eng. Office, Old Federal Bldg., repairing jetty at mouth of Broadkill River; advertised in this issue.

Md., Aberdeen—Road Work—Until Aug. 28, by J. D. Moen, constr. officer, Aberdeen Proving Ground, building 5 mi. concrete roads, 16 ft. and 20 ft. wide, all within reservation Aberdeen Proving Ground; advertised in this issue.

W. Va., Charlestown—Material—Until Sept. 22, by J. A. Wetmore, superv. archt., treas. dept., Wash., D. C., furnishing material for building post office, here.

W. Va., Charlestown—Post Office—Until Sept. 22, by J. A. Wetmore, superv. archt., treas. dept., Wash., D. C., building post office, here.

Ala., Florence—Floating Plant—U. S. Eng. Office, Florence, receiving bids for floating plant, two 12 in. non-condensing suction dredges with revolving cutters, 2 revolving sand and gravel screens, capacity 175 cu.yd. per hour each, 1 tow boat, 16 in. x 7 ft. non-condensing engines, 15 26 x 120 x 6 ft. barges, 1 8 x 40 ft. launch, about 40 h.p. Give full description, location, condition and price wanted; advertised in this issue.

La., New Orleans — Equipment — Until Aug. 27, by Bureau Yards & Docks, Navy Dept., Wash., D. C., for mechanical and electric equipment for power plant, here. About $115,000; $10 deposit required for plans and spec. Noted Aug. 14.

Tenn., Memphis—Earthwork—Until Sept. 11, by Mississippi River Comn., 1st and 2nd Dists., Custom House, building about 2,270,000 cu.yd. earth work in Upper St. Francis, Lower St. Francis and White River Levee Dists.; advertised in this issue.

Mich., Detroit—Alterations to Post Office—Until Sept. 7, by J. A. Wetmore, superv. archt., treas. dept., Wash., D. C., altering lighting fixtures, etc., in Post Office, here; advertised in this issue.

Federal Government Work (Continued)

Ill., Chicago—Remodeling Electric Passenger Elevator—Until Sept. 12, by J. A. Wetmore, superv. archt., treas. dept., Wash., D. C., remodeling electric passenger elevator at U. S. Marine Hospital, here; advertised in this issue.

Montana—Road Work—Until Aug. 30, by Bureau Pub. Rds, U. S. Dept. of Agriculture, Missoula, grading and draining 3.6 mi. Glacier Park-Summit Natl. Forest Rd., Glacier Co. About $20,000. C. H Purcell, Post Office Bldg., Portland, Ore., dist. engr. Noted May 1.

Mo., St. Louis—Earthwork—Until Sept. 15, by Secy. Mississippi River Comn., 1511 Internatl. Life Bldg., building about 155,000 cu.yd. earthwork in Clear Creek Drainage & Levee Dist., Ill.; advertised in this issue.

Col., Denver—Valves, Gates, etc.—Until Oct. 1, by U. S. Recl. Serv., furnishing balanced needle valves, high pressure emergency gates and sluice gate for North Tunnel of the Pathfinder Dam, North Platte Project, Nebraska-Wyoming. A. P. Davis, ch. engr.; advertised in this issue.

Nev., Winnemucca—Post Office—Until Sept. 15, by J. A. Wetmore, superv. archt., treasury dept., Wash., D. C., building, here; advertised in this issue.

Arizona—Bridge—Until Sept. 4, by Bureau Pub. Rd., U. S. Dept. of Agriculture, Albuquerque, N. M., building 215 ft. bridge over Salt River, near Tonto and Crook Natl. Forests, here. J. S. Bright, Luna Strickler Bldg., Albuquerque, N. M., dist. engr.

Cal., San Diego—Water and Sewer Systems and Fuel Oil Reservoir—Spec. 4007. Until Sept. 10, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. About $200,000; $10 deposit required for plans and spec. Noted July 24.

H. T., Honolulu—Post Office and Court House—Until Nov. 3, by J. A. Wetmore, superv. archt., treas. dept., Wash., D. C., building U. S. Post Office and court house, here. About $1,000,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., New York**—Dredging—U. S. Engr. Office, 39 Whitehall St., let contract dredging in Raritan River, N. J., to Atlantic Gulf & Pacific Co., Park Row Bldg., $0.1489 per cu.yd. of stone measurement. Total cost, $225,000. Noted July 10.

★**Pa., Erie**—Dredging—U. S. Engr. Office, 540 Federal Bldg., Buffalo, N. Y., let contract dredging, trenching and filling with rock, capped with rubble mound and sand fill protection, on Presque Isle Peninsula, Erie Harbor, to Great Lakes Dredge & Dock Co., 104 South Michigan Ave., Chicago. About $214,000.

★**D. C., Wash.**—Pavements—Dist. Comrs., Dist. Bldg., let contract laying asphalt pavements, to Cranford Paving Co., Union Trust Bdg. About $150,000. Noted July 24.

★**D. C., Wash.**—Paving—Dist. Comrs., Dist. Bldg., let contract paving streets and avenues, sheet asphalt, to Cranford Paving Co., Union Tfust Bldg. About $500,000. Noted Aug. 14.

★**S. C., Charleston**—Cranes—Spec. 3670—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing 2 cranes, here, to Morgan Eng. Co., East Bway., Alliance, O. About $93,550 (190 days).

★**Ill., Great Lakes**—Groins—Spec. 4004—Bureau Yards & Docks, Navy Dept., Wash., D. C., received only bid Aug. 13, building groins for shore protection, at Naval Training Sta., here, from Great Dredge & Dock Co., 104 South Michigan Ave., Chicago, $196,720 (90 days). Noted July 31.

★**Tex., Galveston** — Boathouse — Treas. Dept., Wash., D. C., let contract building boat house, boat basin and landing, for U. S. Quarantine Sta., here, to J. Jacobson, 313 22nd St., $39,566. Noted Aug. 7.

★**Utah**—Road Work—Dist. Comrs., Dist. Bldg., Salt Lake City, let contract building forest road from Logan to Garden City, earth with gravel, or shale surface, to Christianson Constr. Co., Salt Lake City. About $120,100.

Miscellaneous

PROPOSED WORK

Gateway—Branford, Conn.—Town having plans prepared by R. Williams, archt., 185 Church St., New Haven, for granite and concrete memorial gateway, concrete foundation, at park entrance. About $25,000.

Swimming Pool, etc.—Woodmont, Conn.—W. H. Bradley, Center St., Meriden, had plans prepared by R. Williams, archt., 185 Church St., New Haven, for rein.-con. swimming pool, seawall and bathhouse, at summer home on Hawley Ave., here. About $25,000.

Swimming Pool—Detroit, Mich.—City having plans prepared by Dept. Parks and Blvds. and Recreation Comn., 822 Farwell Bldg., for 100 x 300 ft., rein.-con. swimming pool, 2½ to 5½ ft. deep. About $10,000.

Road Grader — Cloquet, Minn. — City plans to purchase road grader. J. A. Parks, clk.

Cast Iron Pipe, Castings, Etc. — Tracy, Minn.—City plans to purchase c.i. water pipe and castings, also hydrants, gate valves, etc J. R. Fletcher, clk.

Transmission Line — Arlington, Kan. — City voted $20,000 bonds to build electric transmission line.

Transmission Line — Partridge, Kan. — City voted $20,000 bonds to build transmission line.

Dam—Eastland, Tex.—City plans to build dam across north fork of Leon River, ¾ mi. long. About $124,000.

Wharf, Dock—Orange, Tex.—City plans to build wharf and dock. About $150,000. C. H. Page & Bros., Austin Natl. Bank Bldg., Austin, archts. W. E. Simpson & Co., Hicks Bldg., San Antonio, engrs.

Cables — Spokane, Wash. — Home Telephone Co., 501 2nd St., plans to build underground and aerial cables in Glenwood Dist. near Hillyard. About $10,000. H. A. Shearer, engr.

Harbor Improvements—Richmond, Cal.—City election Sept. 23, to vote on $400,000 bonds for harbor improvements to include 15,250 ft. sheet piling, cost, $130,000, and dredging certain channels, etc. U. S. will also dredge certain channels. Federal government will expend $328,000.

BIDS DESIRED

Water Machinery — Trenton, N. J.—Until Aug. 29, by A. Bugbee, supt. city comn., furnishing 25,000,0000 and 20,000,000 gal. steam driven centrifugal pumps, 1 generator, 1 motor, appurtenances, etc. at city pumping station. About $150,000. J. R. Fell, 134 North Clinton Ave., engr.

Bulkhead Wharf and Shelter Sheds — Wilmington, Del. — Until Sept. 2, by Bd. Harbor Comrs., City Hall, building 476 ft., timber and rein.-con. bulkhead wharf, and the necessary dredging incident thereto. **C. H. Grant, secy.**; advertised in this issue.

Cistern—Duluth, Minn.—Until Aug. 25, by G. P. Phillips, city comr., building rein.-con. cistern, 200,000 gal. capacity, 38 ft. diameter, 25 ft. high, for Duluth Water & Light Dept., Commercial Club Bldg. H. G. Tischer, city engr.

Pump—Bruce, S. D.—Until Sept. 5, by City Clerk furnishing 1750 h.p. motor-driven pump, 350 gal. per minute. L. P. Wolff, Guardian Life Bldg., St. Paul, Minn., engr.

Road Oil—St. Louis, Mo—Until Aug. 27, J. F. Thomas, supply comr., 317 City Hall, furnishing Street Dept., with 300,000 gal. light weight road oil. Noted Aug. 14.

Pier Shed — Seattle, Wash. — Until Sept. 2, by Port of Seattle Comn., building Pier B East Shed, 120 x 1000 ft., mill construction, at Smith's Cove Terminal. About $500,000. Noted Aug. 7 under "Smith Cove."

Protection Works — Laprairie, Que. Until Aug. 28, by Dept. Pub. Wks., Ottawa, for protection work improvements to dyke, involving timbr and stone fill. About $11,000. E. Lafleur, Ottawa, Ont., engr. Noted Aug. 7.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Lumber and Piles—New York, N. Y.—Dept. Docks & Ferries, received lowest 3 bids Aug. 12, furnishing and delivering lumber and piles, from Central Timber Export Co., 115 Bway., $28,586; S. A. Miner, 17 Battery Pl., $32,232; H. S. La Fond Co., 1 Madison Ave., $138,023.

★**Paving Material — New York, N. Y.**—H. Bruckner, pres. Bronx Boro., let contract furnishing and delivering 150,000 gal. tar road oil, to Barrett Co., 17 Battery Pl., $15,000; 3000 bags Portland cement and 5000 cu.yd. 1½ in. broken trap rock, rock stone and 2500 cu.yd. broken trap rock stone screening, to New York Trap Rock Corp., 101 Park Ave., $21,478. Noted July 17.

Plumbing—New York, N. Y.—Dept. Educ received lowest 3 bids for plumbing and drainage of addition to and alterations in P.S. 6, on Tremont Ave., Bronx Boro., from J. J. Kenney, 236 West 20th St., $43,000; J. A. Graf, 152 Canal St., $44,782; Wells Newton Co., Ave. B and 17th St., $45,813.

Roof—Randalls Island, N. Y.—I. Townsend, pres. bd. mgrs., received bids repairing roof for House of Refuge, here, from Connors Bros. Co., Inc., 15 West 91st St., $11,911; P. T. Cox Contg. Co., Inc., 114 Nassau St., $12,700; J. M. Knopp, 544 West 43rd St., $19,255. Contractors all of New York City.

Harbor Improvements—Atlantic City, N. J.—City received bids improving harbor, from Matthew Bros., Red Bank, $187,382; Coast & Inland Dredging Co., $187,382. Noted July 10.

★**Dam — Morris Plains, N. J.** — Dept. Architecture, 142 West State St., Trenton, let contract building dam near State Hospital, here, to Underground Specialty Co., 1476 Bway, New York City. About $14,600. Noted June 19.

★**Paving Block—McKeesport, Pa.**—City let contract furnishing 130,000 Hillside paving block for use in Spring St., to Metroplitan Brick Co., McKeesport, $33.75 per 1000.

★**Crane Shed—Detroit, Mich.**—Studebaker Corp., Brush St. and Harper Ave., let contract building 1 story, 40 x 200 ft., steel crane shed, rein.-con. flooring, concrete foundation, to Wisconsin Bridge & Iron Co., 1362 Penobscot Bldg.

Roof Trusses — Detroit, Mich. — City Water Comn., 232 Jefferson Ave., received bids furnishing and building roof trusses and roof complete over engine room and pumping station (span of trusses 67 ft., building 67 x 307 ft.), from Wisconsin Bridge & Iron Co., 1362 Penobscot Bldg., $62,000; Culbertson & Kelly, 814 Ford Bldg., $70,997; Whitehead & Kales, Beecher St. and Michigan Central Ry., $84,365.

★**Paving Blocks—Kalamazoo, Mich.**—City let contract furnishing 1,800,000 paving bricks, f.o.b Kalamazoo, to Carlisle Paving Brick Co., Portsmouth, O., $64,430. Noted May 15.

★**Foundation — Duluth, Minn.** — Fidelity Investment Co., Lake Ave., S., let contract for foundation for 4 story, 114 x 252 ft. office, to Jacobson Bros., Columbia Bldg., $60,200. Noted Aug. 7.

★**Lamp Standards — Osawatomie, Kan.**—City let contract furnishing 102 metal lamp standards, etc., to Kelley Constr. Co., 314 South Barstow St., Eau Claire, Wis., $10,949.

★**Tank and Tower — Sharon Springs, Kan.**—City let contract building 50,000 gal. tank and 100 ft. tower, to Chicago Bridge & Iron Co., 105th and Thropp Sts., Chicago.

★**Foundation—Denver, Colo.**—Denver Post Printing and Publishing Co., 1544 Champa St., let contract building concrete foundation for 4 story, 50 x 125 ft. publishing house, on Champa St., between 15th and 16th Sts., to Kress Constr. Co., Denver. About $20,000.

★**Rolling Doors—Portland, Ore.**—Comr. Pub. Docks let contract furnishing steel rolling doors at dock sheds, St. Johns Terminal, to Variety Mfg. Co., Portland. About $14,150.

★**Bulkhead — Los Angeles, Cal.** — See "Streets & Roads."

★**Foundation—Los Angeles, Cal.** — Goodyear Tire & Rubber Co., Market St., Akron, O., let contract building foundation for 3 story, 300 x 580 ft. rubber mill, at 6701 Central Ave., here, to Hunkin-Conkey Constr. Co., 6701 Central Ave. About $60,000. Noted July 31 under "Industrial Works."

★**Lighthouse—Ottawa, Ont.**—Dept. Marine let contract building rein.-con. lighthouse, fog alarm and dwelling combined, in Triple Island, Northern British Columbia, to J. H. Hilditch, Prince Rupert. About $35,000.

OFFICIAL PROPOSALS

Bids: Sept. 12.

Canal Improvements

STATE OF NEW YORK
OFFICE OF SUPERINTENDENT OF PUBLIC WORKS
Albany, N. Y.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Friday, September 12th, 1919, at which place and hour they will be publicly opened and read, for improving the New York State canals pursuant to the provisions of Chapter 147 of the Laws of 1903, and amendatory and supplementary laws, and Chapter 735 of the Laws of 1917 and Chapter 634 of the Laws of 1919, as follows:

SCHENECTADY—SCOTIA BRIDGE ABUTMENTS AND APPROACHES

This contract will provide for constructing the abutments and approaches of a reinforced concrete bridge, to extend from the junction of State Street and Washington Avenue in the city of Schenectady, across the Barge Canal terminal channel, Van Slyck Island, the Barge Canal main channel, Hog Island and the Scotia channel, to a point about three hundred feet north of the junction of Schonowee Avenue and Mohawk Avenue in the village of Scotia.

The construction of all roadway pavements, concrete sidewalks and curbs supported on new fill, track work, trolley wires and feeders, lamps and wiring, drains and other incidental work, will not form a part of this contract; also, a gap will be left in the Scotia approach to provide for the maintenance of traffic for electric cars, vehicles and pedestrians.

Contract plans, sheets 1 to 7 inclusive.

All work must be completed before the expiration of fifteen months after the date of signing the contract.

Plans may be seen and detailed specifications, engineer's estimate of quantities, proposal blanks, forms of contract and bonds required, and other information for proposers, may be had at the office of the Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Eastern Division, Wedgeway building, Schenectady, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y., at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spaulding's exchange, Buffalo, N. Y.

Copies of detailed plans or drawings may be obtained from the State Eengineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or state bank in good credit within the state and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of the contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the State for doing the work, and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the state will be enhanced thereby.

EDWARD S. WALSH,
Superintendent of Public Works.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: Sept. 9.

Bulkhead Wharf and Shelter Sheds

Wilmington, Del.

Proposals will be received until Tuesday, September 9th, 1919, at the office of the Board of Harbor Commissioners, City Hall, Wilmington, Del., for the construction of a timber and reinforced concrete bulkhead wharf, approximately 476 feet long, and the necessary dredging incident thereto.

Plans and specifications for the work may be obtained upon application to the undersigned and upon the deposit of Ten ($10.00) Dollars, which sum will later be refunded upon the return of said plans and specifications.

No proposal will be considered unless accompanied by a certified check to the order of the Board of Harbor Commissioners for Two Thousand Five Hundred Dollars ($2500.00), or a satisfactory guaranty bond in equal amount.

The right is reserved to reject any or all bids.

Board of Harbor Commissioners,
City Hall,
Wilmington, Del.
CHARLES H. GANT,
Secretary.

Bids: Sept. 4.

Construction, Heating, Sanitary and Electric Work

Troy, N. Y.

Sealed proposals for Construction, Heating, Sanitary and Electric Work, State Armory, Troy, N. Y., will be received by Col. Frank W. Ward, Secretary, State Board of Armory Commissioners, 158 State Street, Albany, N. Y., until 3 o'clock P.M., on Thursday, Sept. 4, 1919, when they will be publicly opened and read. Proposals shall be enclosed in an envelope furnished by the State Architect, sealed and addressed, and shall be accompanied by a certified check in the sum of five per cent (5 per cent) of the amount of the proposal. The contractors to whom the awards are made will be required to furnish surety company bond in the sum of fifty per cent (50 per cent) of the amount of the contract within thirty (30) days after official notice of award of contract and in accordance with the terms of Specifications Nos. 3327, 3328, 3329 and 3330. The right is reserved ot reject any or all bids. Drawings and specifications may be consulted at the Armory of the 2nd Infantry, Bolton Hall, Troy, N. Y., at the Office of the State Board of Armory Commissioners, 158 State Street, Albany, N. Y., and at the New York Office of the Department of Architecture, Room 618 Hall of Records Building, and at the Department of Architecure, Capitol, Albany, N. Y. Drawings and specifications and blank forms of proposal may be obtained at the Department of Architecture, Capitol, Albany, N. Y., upon reasonable notice to and in the discretion of the State Architect, L. F. PILCHER, Capitol, Albany, N. Y.

Dated: August 1, 1919.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—James H. McGraw, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, *Editor* — Charles Whiting Baker, *Consulting Editor*

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Construction Labor

IN THE spring this journal warned those who were figuring their highway bids on the theory that wages would fall later in the year that they were taking dangerous chances. The correctness of our expectations is now being proved. Labor has not been plentiful and has been held only by wage increases. Unfortunately, all work is backward this season despite the strong urging, immediately after the signing of the armistice, to make preparations for the next season's work. Had work been let and started in proper time much of it would have been done at the lower wages. As it is, prudence would indicate the wisdom of pushing work as hard as possible so as not to carry it over into next year. Price and wage recessions may come by April, 1920, and for that we all earnestly hope. On the other hand, there may come an advance. The wise contractor will get his work out of the way.

Low-Production Crisis

TWO weeks ago we suggested that the President was the natural leader in the present high-cost-of-living and low-production crisis. He sounded the note in his cost-of-living message to Congress. Now he follows it with an address to the country and to the railroad shopmen on the occasion of granting the latter a wage increase. He does not exaggerate, in our judgment, when he says: "We are face to face with a situation which is more likely to affect the happiness and prosperity, and even the life, of our people than the war itself . . . An admirable spirit of self-sacrifice, of patriotic devotion, and of community action guided and inspired us while the fighting was on. We shall need all these now, and need them in a heightened degree, if we are to accomplish the first tasks of peace. They, are more difficult than the tasks of war—more complex, less easily understood—and require more intelligence, patience and sobriety." So far, so good, but the end is not yet. There is need for a continued propaganda and an exercise of the great influence of the Presidency upon all who labor, whether with the hand or with the brain. The need is for greater production. Going with that need is the requirement that profiteering shall be stopped. To that end the Government is addressing itself with energy. The other task the President has begun, but there is need for continuing his propaganda.

Aims of Engineering Schools

THE controlling considerations in the selection of the teaching staff and in the planning of the instruction in the new Harvard Engineering School are thus stated by President A. Lawrence Lowell: "To train men to think; to lay a broad and deep foundation with a superstructure which can be completed only gradually from the training and observation that come from practical experience; to encourage the student to understand each problem so thoroughly that he can apply the same principles intelligently in the solution of different kinds of problems; and, finally, to train men to be good citizens as well as good engineers." President Lowell has expressed in a few words the principles that are probably subscribed to in theory by all engineering teachers, but which, on an impartial study, many of them would have to admit had been violated in the planning and conduct of engineering courses. What we have been trying to do in discussions of engineering education lately is not so much to discover new principles as to prove again to ourselves the validity of old principles, and to inquire whether the methods we have been pursuing square with what is sound in theory. President Lowell's declaration is a good one. We find the same principles widely subscribed to. We hope, however, that all who accept them in theory will remember the homely phrase that "the proof of the pudding lies in the eating thereof." Do engineering courses produce the results that President Lowell lays down as the purpose of the new engineering school?

Airplane Travel

SPECULATION has naturally been rife among laymen as to the probability of the early introduction of the airplane into regular passenger service. Its possibilities appear to be so great that one is eager to see the predicted development begin. For some time there has been regular passenger service between Paris and Brussels, while this week's cables tell of the inauguration of service between London and Paris. Those who have studied the situation account for the slowness of development on two grounds—the natural conservatism of capital in venturing into a new and untried field beset, apparently, by peculiar hazards, and the lack of suitable, centrally located landing fields. They do not believe that the dangers of airplane travel when calmly considered are a deterrent from the standpoint of the operating company, though the risks may tend to discourage prospective passengers. Airplane travel, of course, is not attended with the degree of safety of rail or even water travel, but the constant use of airplanes for transporting British diplomats between London and Paris, from the very beginning of the peace conference, shows the confidence of the British air service and British officials in this mode of travel. Safety measures are receiving careful study—parachute experiments, for example—and these will go far to remove the fears that the public now entertains. As to landing fields, a new civic and civil engineering problem enters here. The landing of passengers far out in the suburbs is naturally a handicap, even though

automobiles are in waiting. In this respect, too, advances are to be looked for. Landing and starting in smaller areas than are now felt necessary will surely come. Incidentally, the success of the New York-Washington airplane mail service should not be forgotten. It gives warrant for the optimism of those who contend that there is no physical reason why a New York-Chicago passenger airplane service should not be in operation.

Lake Port Planning

THERE can be little doubt that the future development of our Lake ports will proceed along lines different from those followed in the past, though not much has been done toward planning this future development. With one or two exceptions, all are narrow river harbors, and most of them cannot remain such if they are to handle large volumes of water traffic. The proposal made that the Chicago River be closed and its functions turned over to a lake-shore harbor, noted in a brief item in our issue of Aug. 14, is new evidence of the fact that Lake port planning is behindhand. No one will venture to claim that, if the river were closed forthwith, lake-front facilities could be made ready within a reasonable time, or even that a sound lake-front plan could be agreed upon in the near future.

Cleveland's long-continued efforts to begin river-straightening work, and its construction of lake-front piers at the same time, show that the inadequacy of existing harbor facilities is making itself seriously felt. It would seem also that at Cleveland the river interests have unusual strength, as is but natural in view of the existence of many industrial sites along the river above the city. In Milwaukee thought has also been directed to the port problem, though in a very different way. A disastrous collision two years ago brought the evils of the river-harbor system there painfully into view *Engineering News-Record* at that time suggested abandoning the river as a harbor, and the same thing was later recommended by a local engineering body, after study of the situation. The case of Chicago is closely analogous to that of Milwaukee.

There is no lack of difficult questions involved in the general problem of developing the lake ports along progressive lines. Yet no study of the problem has been made, so far as we know. The Cleveland planning and what has been done by the Chicago commission may possibly be regarded as preliminary steps toward a full study. However, not only the harbor and its dockage need to be considered, but also the means of integrating them with the city—its markets, its industries and its railways. Each feature is merely a detail in the broad program of development which must be followed if results of maximum value are to be realized.

Nowhere in the country has water transportation so important a meaning as along the Lakes. Yet, despite the excellence of the natural transportation facilities at the disposal of the Lakes cities, general freight commerce has failed to grow. If the great advantages in productive power given by these facilities are to be retained, the terminal problem—the Lake-port problem—must be worked out. For the present, inertia and the hampering influence of long-established river habits stand in the way of adequate recognition of its importance.

Drawbridges as Machines

WHAT causes led to the remarkable breakdown of the Lincoln Highway swingbridge over the Passaic River have not been fully cleared up. But it is certain that the observations made in the course of the repairs now completed (see *Engineering News-Record* of Aug. 21, 1919, p. 366) lay significant emphasis on maintenance as a vital essential of good drawbridge service.

At the time the dangerous state of this bridge was reported, progressive deterioration of the turntable had gone so far as to threaten destruction of the bridge. No causes lying outside the turntable itself were then known, but the article points to several of these causes. It is clear that every movable bridge should *as a whole* be considered a machine, needing skill and care in inspection, adjustment and renewal of parts. But this point is often undervalued; there is a temptation to regard a drawspan as the equivalent of a fixed structure with the addition of some simple mechanism that will take care of itself. The present case shows that such a faulty view may result not only in waste of money but in serious danger.

Furthermore, it is worth noting not only that the complex mechanical elements of such a span are the portion which is most likely to give trouble in service, but also that the structural and mechanical conditions of the bridge may be interdependent to an unexpected degree. This interdependence may account for many of the observed conditions in the Passiac River draw, not easily explained by themselves. Among the factors that seem to have been involved are inadequacy of expansion provision in the approach spans, settlement or tipping of abutments and rest piers with resultant fouling of the draw by the approaches, displacement of the turntable center, uneven bearing of the rollers, and irregularity of the upper track. Several of these factors exerted mutual influence, or, perhaps, some of them were created by others. Which were primary and which secondary has not been made evident. But if the possible sources of trouble in a drawbridge are so numerous, the special importance of careful maintenance and of early attention to any improper condition is quite obvious.

The Asphalt Association

AS THE readers of this journal know, a group of competitive companies has recently formed the Asphalt Association, an organization for the promotion of their product. Associations of that kind have come to be the rule in forward-looking industries. Their formation is an advantage to the fields they serve, and we have no doubt that engineering work will profit no less from the coming of the Asphalt Association than it has from the advent of similar bodies.

The advantages that accrue from association work flow chiefly from the consequent enlarged viewpoint which the individual members take of their opportunities and of their responsibility to the public and that special branch of it which they serve. Selling problems, which naturally dominate the individual company when left to itself, are tempered with a new and higher ideal of service, even though the company has hitherto given much thought to service to its customers. In saying that, there is no reflection on the past procedure of the asphalt companies. The same raising of standards

has been noted in the metal-lath, the lime, the cement, the brick and other industries. The reason for it is not hard to find. When proceeding alone, the selfish motive naturally comes to the fore. When an association is formed and progressive American business men discuss their mutual problems, the greatest good of the greatest number is sure to dominate and control policies—and that requires the rendering of a very superior service. As one bit of evidence in support of this view one needs only to recall that practically every industry upon the formation of a promotional association has established a research laboratory in which the general problems of the industry and of the given field are studied. It does not assume the research work of the individual companies, but takes up the broader problems. Such study is certain to benefit the given field and the public in general.

Another benefit that always follows in the wake of promotional associations is a recognition of the limitations of the product. A company cannot profit over a long period of years by selling its wares for uses for which they are not fitted. Yet that very practice is found in many industries. The progressive companies refuse to indulge in it, and when association work is established their views—the higher standards—dominate. In the asphalt industry, no less than in any other, there are limitations that should be set—to the gain of the public and of the industry itself.

Nor are the benefits to be deprecated merely because such procedure happens at the same time to be "good business." In fact, the rendering of a superior service should properly be attended with higher rewards to those who give the service.

The Asphalt Association has a great story to tell. Material for the propaganda is at hand in abundance. Its analysis and publication will be a help to the engineering profession. We wish the association success in its endeavors.

The Motor Bus for City Traffic

IT WILL not do to dismiss lightly the statement of Mayor Hylan of New York that the future of surface transit lies with the motor bus, be it in New York City or elsewhere. His statement of Aug. 7 may have been made in a moment of pique, and his figures may be somewhat awry, but some new phenomena in street-railway strikes compel attention to his remarks upon the supersession of the street railway by the motor bus.

Hardly two or three years ago a street-railway strike meant practically complete paralysis of the community. A few weeks ago there was such a strike in Pittsburgh. In the words of a neighboring electric-railway manager, "the Pittsburgh strike created hardly a ripple." In New York we still carry a vivid recollection of the strike of the Brooklyn Rapid Transit employees, early this August. Inconvenience the Brooklyn strike caused aplenty, but after the second or third day mighty few people failed to get to their work or business on time. What was the reason? The motor truck impressed from every line of industry!

As if by magic, thousands of trucks appeared from everywhere. Some had boards or commandeered chairs for seating. Most had nothing at all except standing room. But, mark, *they got there*, and in less time than had been required by the street-car straitjacketed to the rails. In Brooklyn the acting borough president actually obtained 300 passenger motor-buses from Newark, much as Winston Churchill had requisitioned exactly the same number of London buses in October, 1914, to provide emergency transport for the Antwerp expedition. Such successful improvisation of transit facilities could hardly go unnoticed by a layman, and we hope its lesson will not be lost upon the street railways themselves which are logically the means to coördinate all methods of mass transportation, whether on rails or rubber.

There is no warrant for Mayor Hylan's assumption that bus riders can be carried at a 5c. flat fare, but if to the American people is offered faster and more comfortable travel than that afforded by the street car, they will pay the price willingly. Nor is there any immediate prospect that the surface lines of New York need be torn up if the operating company realizes that since it cannot compete with the rapid-transit lines for the long rides at a flat fare, its proper field is short-haul traffic at short fares—in brief, the zone system as just adopted by the Public Service Railway of New Jersey. The abandonment of such routes as the 28th and 29th St. lines in New York is a missed opportunity to give the short-ride fare a trial. A motor-bus line, with a graduated fare, put in its place, would stand a better chance of making money; first, because a vehicle that goes right up to the curb is a strong invitation to ride; second, when the buses were no longer busy after the commercial hours, they could be transferred at once to avenues where pleasure traffic is heavy, or rented out to clubs for outings, as in the palmy days of the electric railway.

Doubtless, the matter of greatest interest to the highway engineer will be the question of the weight and number of such auto-buses. Mayor Hylan refers casually to such monsters as 80 to 100-passenger vehicles, probably having in mind the great sightseeing trucks. Of these, so small a number is in use that their effect on road wear is insignificant; nor are they used in intensive all-day, frequent-stop service. The standard bus of the Fifth Avenue Coach Co., seating but 44 passengers, weighs five tons, while the proposed enlarged bus of the London General Omnibus Co.—the result of years of experience—will seat no more than 46. The New York company is already using pneumatic tires on some buses as a reducer of gasoline and upkeep, and the London company is planning to do likewise.

It is probable, therefore, that the motor buses of the immediate future will not weigh any more than many loaded motor trucks. Any paving that can bear up under the big, solid-tire freight carriers should make good under the lighter, pneumatic-tire passenger vehicles. An 80 to 100-passenger bus would cancel largely one of the chief advantages of the bus, its ability to worm out of traffic jams, and also its opportunity to make somewhat better schedule speeds than the street car because of fewer stops.

If the very wide experience of Great Britain is to be taken as a guide, the motor bus will not replace the street car, but will supplement it and prove an incentive toward giving better transit over rails. The most desirable consummation, as we have hinted, would be for one management to handle the mass transportation of the community as a whole, regardless of the means of transit used.

Paving of Streets and Aisles, Brooklyn Army Supply Base

Types Suit Traffic and Construction Conditions—Granite Used for Heavy Traffic, Asphalt Blocks for Medium and Special Construction, and Bitulithic for Light Traffic

PAVING on the streets and aisles of the South Brooklyn Army supply base was of three kinds, designed to suit the different traffic and construction conditions. The main streets were paved with granite block, the open park between the building and the dock line, known as the "farm," with bitulithic, the piers with asphalt block and the traffic aisles in the buildings with thin asphalt block. The peculiar drainage conditions on the main streets made it necessary to adopt special sections for the granite street, while the speed with which the work had to be done required winter work and special plans for handling materials.

Expediency as well as adaptability figured in the selection of paving materials for the various sections of the work. It was hard to obtain rail deliveries, and where possible water delivery was used. For instance, it was possible to bring in the asphalt block by all-water route from the plant to the dock floors. This was one of the determining features, aside from those given below.

Referring to the paving plan, Fig. 1, it will be seen that First Ave. and the heavy trucking streets around the warehouses and along the hauling platforms were paved with granite block. This material was also used on one-half of 58th St., extending from First Ave. to Second Ave. Heavy types of Army motor trucks operate over these streets. When the job is completed, 47,000 sq.yd. of granite will have been used.

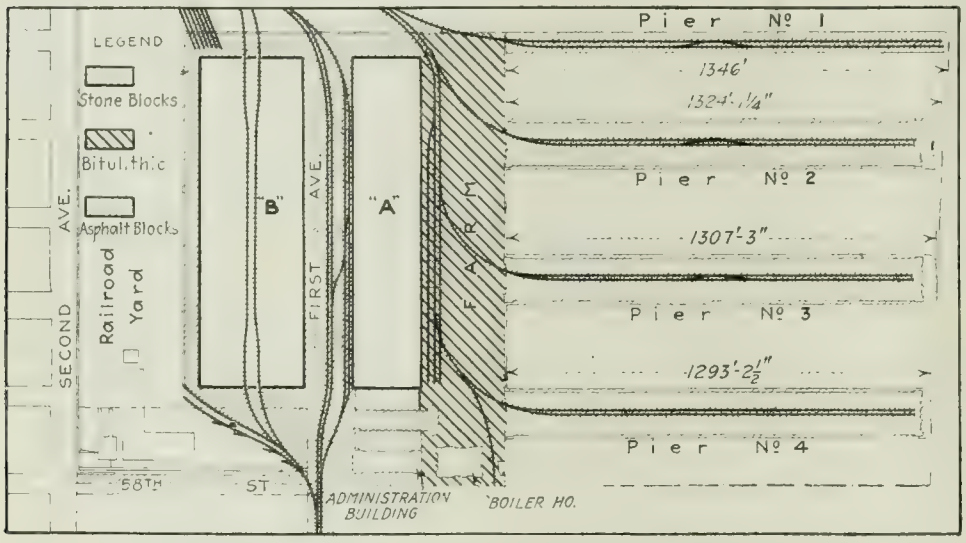


FIG. 1. LOCATION PLAN OF VARIOUS TYPES OF PAVEMENT AT ARMY BASE

Standard New York specifications are being used in laying the blocks, which are 5¼ in. deep except in the car tracks, where they are 4 in. on a 1-in. sand cushion. A 2-in. sand cushion is used on the regular work. The base consists of 6 in. of 1:3:5 concrete and, after the blocks are laid they are grouted with portland cement grout in a proportion of 1 of cement to 1 of sand. In the car tracks the blocks next to the rail are specially grooved to give clearance to the wheel flanges, as a T-rail is used instead of a girder rail.

A departure from the usual custom is seen in the use of cross expansion joints every 50 ft., in addition to the longitudinal expansion along the curb and between the pavement and building walls. That there might be no delay when the job started, the blocks were delivered some time before the work of laying started. They were piled in the yard by means of a clam-bucket locomotive crane which unloaded them from the cars and deposited them upon the piles. When they were required, they were loaded on trucks by means of a steam shovel.

While it would seem that such treatment is severe, and that there would be a great amount of chipping due to handling with the clam and the steam shovel, visual inspection does not indicate that the blocks were injured to any extent. The pile of blocks and the steam shovel may be seen in Fig. 2. By this method of delivery and piling it was possible to have the blocks all on the job when required, in spite of the bad transportation conditions during the war period. All through the Army base construction this principle of piling an adequate storage to counteract difficult transportation conditions was followed. The granite block used upon this contract are being laid by the Asphalt Construction Co. of New York, under a subcontract.

Drainage—The surface drainage at the Army base is taken care of mainly on the through heavy-traffic streets. The profile, Fig. 3, (see next page) in connection with the plan, shows the general details of this drainage. The main streets were dished at the center to keep the water away from the car tracks and loading platforms along the buildings as much as possible, and, to carry off the water, catchbasins were placed at frequent intervals, about 80 ft. apart, so as not to require much variation in the center line grade.

As the streets are practically level, it was necessary to use great care to obtain this drainage without either causing a wavy appearance of the street or having puddles of water standing upon the surface. Construction of a section of the pavement is shown in Fig. 4.

Construction—The methods used in the construction of the granite-block streets were not out of the ordinary. However, the subgrade conditions caused considerable worry to the engineers and contractors. This was particularly the case on First Ave., which had ex-

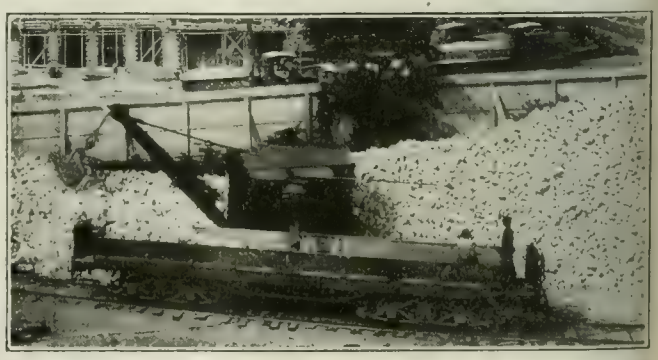


FIG. 2. HANDLING GRANITE BLOCKS BY MEANS OF STEAM SHOVEL—VERY LITTLE CHIPPING OCCURRED

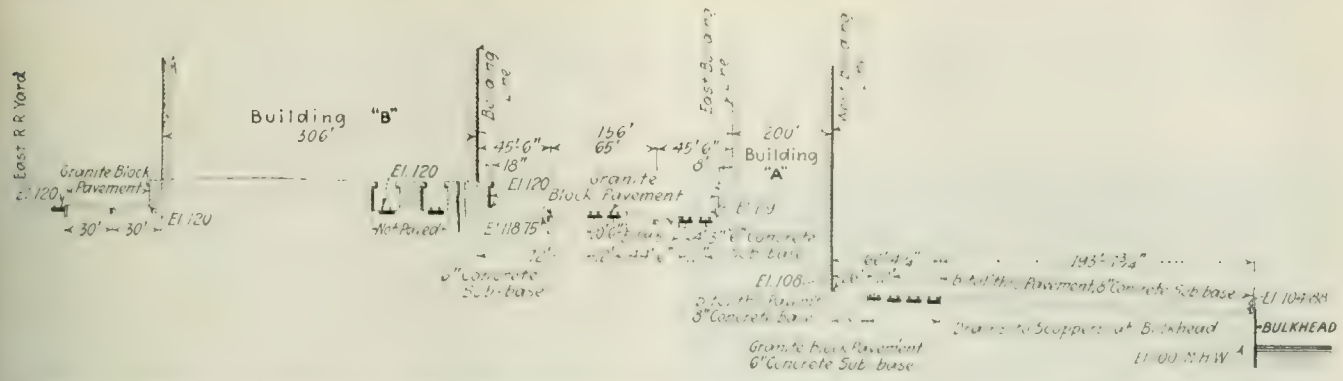


FIG. 3. PROFILE OF SITE, SHOWING METHOD OF HANDLING DRAINAGE AT BROOKLYN ARMY SUPPLY BASE. NOTE THAT STREETS ARE DISHED AT THE CENTER

tensive excavations to a depth of from 5 to 26 ft. extending across the street and along the edges of the buildings. It was not possible to permit these excavations to settle for a long time before the pavement was constructed, and it was necessary to use great care in backfilling and puddling in the material. This was done in thin layers which were either thoroughly



FIG. 4. GRANITE PAVEMENT AT ARMY BASE HAD TO BE CONSTRUCTED IN SHORT SECTIONS

tamped or puddled with water. To the present time no settlements are apparent.

While such unstable subgrade conditions might seem to dictate another form of construction, it was decided to put in the usual heavy concrete base and a grouted granite surface. This was done inasmuch as the subgrade is largely of sand, which, it is thought, will not settle much after being carefully backfilled. Another precaution was the putting of scrap-iron reinforcement over the deep cuts.

The piecemeal methods which it was necessary to use in constructing the pavement—due to the great number of different kinds of construction going on in the street at the same time in putting in subways and overhead bridges from building to building—made impossible an economical management of the work. Therefore, cost data would be of little value. The base was laid in sections where it was possible to work without interfering with other construction, and the cushion and the granite surface were laid and grouted in the usual manner. Neither the monolithic construction nor the semimonolithic construction using a cement sand bed was used upon the granite paving of this work. The grout filler was deposited on most of the work with a small mixer and was covered with straw to protect it from the frost. Fig. 5 shows the completed pavement on First Ave., with the bridges and location of the underground tunnels which extend across directly under the archways.

Where traffic is medium and where there are special construction requirements, asphalt block is used for the surfacing. It is used on the lower floor of the four steamship piers, and in one case on the upper deck at the entrance of the pier. Block of a different thickness was used in a large number of the traffic aisles throughout the buildings. Two different styles of asphalt block were used upon the job. One size was 5 x 12 x 2 in. and was used for the heavy-traffic construction upon the piers and on some of the street work, and on the bridges running from the piers to the warehouses. They were also used on the loading platforms around the two large warehouses, A and B, shown on the plan. The second style of block was 4 x 8 x 1¾ in. and was used in the traffic aisles and around the elevators on the third floors of both warehouses and in the traffic aisles of the basement of warehouse B.

One of the illustrations, Fig. 6, shows the floor as laid on the piers. These piers are 1300 ft. long by 150 ft. wide, and have double car tracks running their entire length. Motor trucks are used upon the floors adjacent to the tracks and run out from the piers to deliver goods to the various warehouses. These piers are entirely founded upon piles capped with concrete, upon which the superstructure is built. It was thought that the asphalt block would be less liable to crack and show up badly if there should be any settlement or heavy vibration of the piers due to bumping by steamships.



FIG. 5. VIEW OF FIRST AVENUE AND ARCHWAYS WHICH INTERFERED WITH PAVEMENT WORK

The same consideration did not affect the upper floors of the piers, as this vibration would naturally be relieved by the resiliency of the steel work. Of the large blocks 81,000 sq.yd. were used, while 23,000 sq.yd. of the



FIG. 6. ASPHALT BLOCK PAVEMENT ON PIERS. NOTE HEAVY MOTOR TRUCKS AT SIDES

thin blocks were used in the other work. The blocks were furnished and laid by the Hastings Pavement Co., of Hastings-on-the-Hudson, N. Y.

Each size of block was specially made and proportioned to fit the service for which it was to be used, special formulas being used for the composition of the blocks. They were delivered to the work by boat, and special apparatus was used to facilitate handling. The methods used in handling are described in the columns of this issue devoted to "Hints to the Contractor."

Construction—Specifications of the most approved type were used in laying these blocks. A very smooth concrete base was required, and the blocks were laid on ½ in. of 1:3 mortar mixed with just sufficient water to permit the cement to set. This mortar bed was struck to a true and even surface by means of a light I-beam straight-edge, traveling over two rows of steel strips which were set to conform to the desired surface grade. The blocks, being uniform in depth, were laid with close joints, and required no rolling other than slight ramming as they were being set. After being laid the 2-in. blocks received a light coat of sharp, fine sand, which was thoroughly broomed into the joints. Fig. 6 shows the completed surface and the type of traffic which it sustains.

In the traffic aisles of the building, on the floors mentioned above, it was not thought proper to use the plain concrete floor. It was found that the tractors and trailers used upon these floors were quite destructive, due to the cast-steel wheels, which had a ridge running around at the center of the tread. This caused heavy concentration at the center, and tended to cut up the concrete pavement. For this reason it was thought wise to substitute the asphalt block in some of these aisles, the thinner blocks being used.

Laying proceeded practically as with the 2-in. depth, except that, instead of filling the joints between the blocks with sand, they were filled with cement grout, the proportion being about 1 of cement and 1 of very fine sand, mixed thin with water. This construction was used because it allowed traffic upon the blocks much sooner than when they were filled with sand, as the grout stiffened up the construction. The traffic upon these aisles is largely composed of electric tractors with trailers.

Construction for Light Traffic—Besides the two types of construction mentioned, there was the paving used upon the open area between warehouse A and the bulkhead which is known as the "farm." This entire area was covered with a bitulithic surface. The basement floor of warehouse A received a similar construction. The "farm" area required about 26,000 sq.yd. of paving, while the lower floor of warehouse A required about 14,000 square yards.

Very little heavy traffic is contemplated on the "farm" area; it is expected that electric tractors with trailers will do the hauling.

Plans—The plans for this work call for an 8-in. concrete base with a regular 2-in. bitulithic surface laid according to the Warren Bros. standard specifications. The section shown in connection with the plan shows the method of drainage, which is from the building, A, directly to the bulkhead line, the pavement having a continuous slope and draining through scuppers at the bulkhead. Fig. 7 shows the plan of this area, together with the piers and the construction plant which was installed to take care of the work.

Construction—A complete, portable asphalt plant was deemed necessary to carry on this work properly. It was installed near the bulkhead, and materials were delivered, heated and mixed at the site, and delivered by motor trucks to the pavement surface. Compaction of the surface was secured by the use of a 10-ton roller, after which the surface received a squeegee coat. A general view of the asphalt plant is given in the cut.

The work is being done by the Construction Division of the Army. Brig. Gen. R. C. Marshall, Jr., is chief of the construction division, Lieut. Col. H. S. Crocker is constructing quartermaster, and Major J. W. Cerny

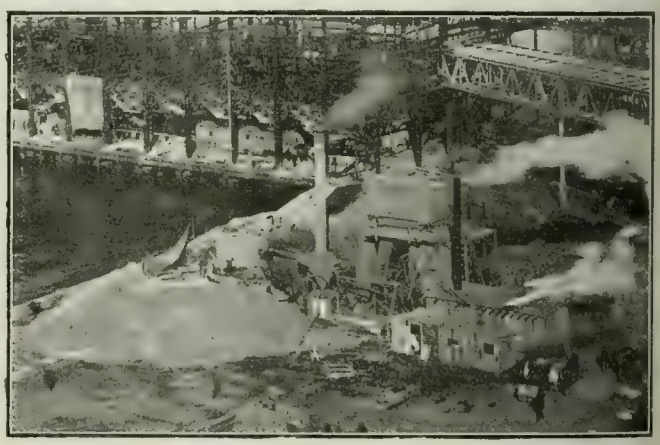


FIG. 7. SPECIAL ASPHALT PLANT USED IN LAYING BITULITHIC PAVEMENT

is directly in charge of the part of the work described. The general contractor is the Turner Construction Co., New York, and the paving was done by subcontract as noted in the text.

Co-Author of Article

The name of the co-author of the article, "Sewage-Treatment Works at Langley Field, Virginia," in *Engineering News-Record* of Aug. 21, 1919, p. 374, should have been given as Carl L. Weir instead of Carl L. Weil.

Amendments to St. Louis Zoning Ordinance Passed

By Harland Bartholomew
Engineer, City Plan Commission, St. Louis, Mo.

AFTER a year of successful experience with the new zoning ordinance, the City Plan Commission of St. Louis, Mo., recommended to the Board of Aldermen several amendments which experience had proved desirable. Three of these amendments have been passed by the board. The principal change was made to meet the objection to providing rear yards on all properties in the high-value commercial district. Under the new amendment, the rear-yard provision of 2 in. in depth for each foot of building height is retained, but where a builder wishes to depart from this provision he may do so by providing somewhat greater open spaces in the form of yards or courts elsewhere on his lot. The text of the amendment is as follows:

The provisions for rear yards, heretofore provided, may be waived as to buildings to be used for hotel, industrial or commercial purposes providing for courts or yards, open to the sky, having the following percentages of lot area for the several districts: "A" district, 15% of the lot area on an interior lot above the first story; "B" district, 10% of the lot area above the first story on corner lots and 20% of the lot area above the first story on interior lots; "C" district, 25% of the area of the lot above the first story.

The second amendment applies to the area regulations. It reduces slightly the required depth of rear yards for apartment houses, and increases the width of side yards and inclosed courts. The rear-yard requirements are reduced from 4 to 2½ in. for each foot of building height, and the side-yard requirement is increased from 1½ to 2½ in. in width for each foot of building height, and the outer court requirement is increased from 1½ to 3 in. for each foot of building height.

New Provisions Are Satisfactory

Inasmuch as the majority of the residents live on the sides rather than at the rear of the apartment houses, as constructed in St. Louis, the new provisions are much more satisfactory. Furthermore, considerable confusion arose as to which were side and which rear yards for large apartment houses built on corner lots. By equalizing the widths of both rear and side yards, the confusion is avoided. The text of this amendment is as follows:

A tenement or apartment house in the "B," "C" or "D" area district exceeding 30 ft. in height shall have a rear yard 2½ in. deep for each foot of building height; when side yards are provided, they shall be 2½ in. wide for each foot of building height; and when outer courts are provided, they shall be 3 in. wide for each foot of building height.

The third amendment exempts theaters, motion-picture houses, clubs, auditoriums, places of amusement or buildings intended to be used for casual occupancy only, or buildings used exclusively for storage or warehouse purposes, in the "A," "B" and "C" area districts, from area provisions, permitting these buildings to occupy 100% of the lot. The text of this amendment is as follows:

Any theater, motion-picture house, club, church, auditorium, place of amusement or building intended or used for casual occupancy only, or any building used exclusively for storage or warehouse purposes in the "A," "B" and "C" districts may occupy 100% of the area of the lot or plot.

Sunstroke and Lightning as Viewed by Compensation Commissions

By Chesla C. Sherlock
Des Moines, Iowa

IF A workman engaged at work on a dam or on an irrigation project or bridge suffers a sunstroke, is he entitled to compensation? This is a question which has been settled in the affirmative after a great deal of controversy.

It was urged that sunstroke was not an accident arising out of the employment, because it was a hazard suffered by all in the community; that the man who happens to be in the vicinity is just as likely to suffer sunstroke as the man at work. The courts seemed to favor this view, and have quite generally held that sunstroke is not a compensable accident. But the Iowa Industrial Commissioner has said: "Sunstroke, in order to be compensable, must be the result of extraordinary conditions not common to the requirements of ordinary service. A workman who succumbs to heat while exposed only to the hazard of laborers of his community generally on a hot day should not be encouraged to move for compensation allowance. On the other hand, a workman who is stricken in the performance of duty in which unusual heat exposure is involved, exposure not common to the laborers of the community in general, is apt to be well within the limits of compensable injury."

Finally, the courts have concluded that if the employment increases the hazard from sunstroke so that it is greater than the hazard common to everybody in the community, then the workman suffering a stroke may recover compensation.

As to whether lightning is an accident or not, there does not seem to be much contention. The Wisconsin commission has said :

"Lightning stroke is not popularly spoken of as an accident where it comes from the action of the elements without the agency of man. When the agency (industry) through the agency of man combines with the elements and produces injury to the employee by lightning stroke, it may well be said that the injury grows out of the employment and is accidental."

In a Minnesota case it was said: "If the deceased was exposed to injury from lightning by reason of his employment, something more than the normal risk to which all are subject, if his employment naturally accentuated the natural hazard from lightning and the accident was natural to the employment, though unexpected or unusual, then a finding is sustained that the accident from lightning was one 'arising out of the employment.' "

Deepest Mine Is Shaft of Michigan Tamarack

According to the United States Geological Survey, shaft 3 of the Tamarack mine, Houghton County, Michigan, is the deepest mine in the world, with a depth of 5200 ft. Other shafts of the Tamarack and of the Calumet and Hecla mine in the Lake Superior region reach depths of between 4000 and 5000 ft. Three shafts of the Prizbram silver mines, Austria, have penetrated to depths of 3300 ft. The Victoria quartz mine, at Bendigo, Australia, is 4300 ft. deep, and a number of shafts in the Transvaal gold region have been sunk to depths of nearly 4000 feet.

Correcting Steel-Tape Readings for Sag and Stretch

Charts Diminish Labor in Computing Corrections—Working Pull Should Equal 2000 Times Weight of One Foot of Tape

By Walter S. Weeks
Associate Professor of Mining, University of California, Berkeley, Calif.

THE correction of measurements by the steel tape for sag and stretch is usually a tedious process. A greater part of the work may be eliminated by using a pull which is always a definite multiple of the weight of 1 ft. of tape, and plotting a correction curve that applies when this pull is used. Charts may then be made, as in Figs. 1 and 2, from which these corrections may be read directly.

The pull that I have selected is 2000 times the weight of 1 ft. of tape. This I call the "working pull." The pull should be exerted at the upper end of an inclined tape. The operation of using this definite pull may be simplified by placing a stop or collar on the spring-balance at the proper mark.

Referring to Fig. 1, the horizontal figures show the length of the tape in use. The vertical figures at the left show the correction in feet. Any ordinate of the

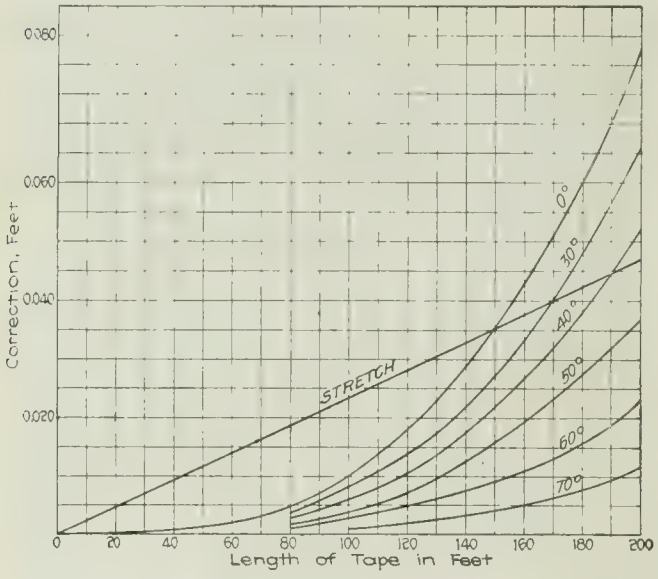


FIG. 1. STEEL TAPE CORRECTIONS FOR STRETCH AND SAG AT VARIOUS INCLINATIONS

straight line marked "Stretch" is the amount that the tape stretches for the length in use.

A tape, supported at the ends only, of course hangs in a curve. Any ordinate of one of the curved lines on the chart is the difference between the length of the arc and the chord between the two ends. The different curves on the chart are for different angles of inclination. The angle of inclination is designated at the right-hand end of each line.

Let us suppose we are measuring the distance horizontally between two points and the tape reads 100.0 feet. What is the true distance?

From the chart, the tape has stretched 0.0234, so that the true distance along the arc of the tape is 100.0 + 0.0234 = 100.0234. The distance we want is along the chord. From the chart, the ordinate of the 0° sag curve at 100 feet is 0.01, so the true distance along the chord between the two points is 100.0234 — 0.01 = 100.0134.

The stretch correction and the sag correction are always in opposite direction, so all we really have to do is to measure the distance between the two lines. Place one point of a pair of dividers on the intersection of the feet line with the sag line, and the other point on the intersection of the stretch line and the feet line. Transfer this distance to the scale at the left where the correction is read in feet.

If the stretch line is above the sag line, the tape is virtually too long; and if the sag line is above the stretch line the tape is virtually too short. If we are measuring the distance between two points and the tape is too long, we have read too little, so the correction must be added. If the tape is too short we have read too much, so the correction must be subtracted.

If we are laying out a line of definite length, if our tape is too long it is evident that we must subtract the correction to find the point where the tape must be held. The opposite is true if the tape is too short.

Fig. 2 is a chart which is a more simple expression of the combined corrections for a horizontal tape. Any ordinate of this curve gives the combined corrections of

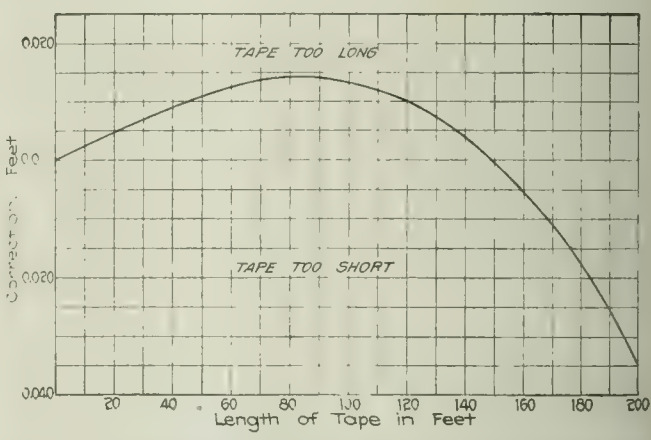


FIG. 2. COMBINED CORRECTIONS FOR STRETCH AND SAG FOR LEVEL MEASUREMENTS

sag and stretch. It is almost as simple to include in our corrections the changes in length due to variations in temperature, and to include the factors entering into the standardization of the tape.

Such a chart is printed in the University of California "Publications in Engineering" in a paper entitled "A Graphical Method for the Correction of Steel Tapes," by the writer. The paper also contains a discussion of the theory on which the present charts are based. It may be obtained by sending 10c. to the manager of the University Press, Berkeley, Calif.

A chart for correcting steel tapes from 200 to 500 ft. can be found in the *Mining and Scientific Press*, of May 19, 1917, Vol. 114, p. 703.

The charts here published apply only when a pull is exerted on the tape which is 2000 times the weight of 1 ft. of tape. I selected this factor to keep the combined error due to sag and stretch as small as possible. If the surveyor makes a practice of using this pull he will be able to correct his measurements at a glance, and, if he does not care to correct them, he can feel sure that with any tape up to 200 ft. he will have an error due to sag and stretch not greater than 1 part in 4000.

Engineers Protest to President Against Plumb Plan

Council of the American Institute of Consulting Engineers Points Out the Economic Fallacies in the Proposals of the Railway Brotherhoods—Wages Have Advanced Faster Than Living Costs

The following statement, which is quoted in full, has been addressed to the President of the United States by the Council of the American Institute of Consulting Engineers, Aug. 19, 1919, over the signatures of Lewis B. Stillwell, president of the institute, and F. A. Molitor, secretary.—EDITOR.

THE Council of the American Institute of Consulting Engineers has given much consideration to the statement appearing in the public press on Aug. 3, 1919, signed by the executive heads of the Brotherhoods of Locomotive Engineers, Railway Trainmen, Locomotive Firemen and Enginemen, and the Order of Railway Conductors, respectively, and also by the president of the railway department, American Federation of Labor.

In view of the coercive and somewhat threatening tone of this statement, and the fallacies in the economic arguments presented in it, the council feels impelled by a sense of public duty to address you upon the subject, and to file copies of this communication with the committees of interstate commerce of the two houses of Congress.

This institute fairly represents the thought and sentiments of the civil engineering profession which has played such an important part in the development of our railway systems—a profession which has been the pioneer in the location and construction of the railways and has taken a progressive and leading part in their scientific operation. In view of these facts, we feel that our analysis of the statement of the brotherhoods merits full consideration.

The statement contains an argument for an increase of wages for the railway employees as a privileged class and a plea for a somewhat startling solution of the railroad problem, in that the latter contemplates Government ownership of the railroads with management in which the brotherhoods practically dominate.

1. The statement is made that "labor faces a persistently serious situation due to the cost of living and the impossibility of wages keeping pace with the depreciation of money." We suggest in answer that railroad labor does *not* face any more serious situation than that which confronts the average American citizen, especially the clerical and professional classes and the majority of investors, most of whom are, indeed, suffering more severely than railroad labor.

2. The statement is made that "the railroad employees are in no mood to brook the return of the lines to their former control." The natural inference formed from this coercive language is that the railroad employee has forgotten the vested property rights guaranteed by our Constitution, as well as the relation which the transportation system of the country bears to the interests of the general public.

3. The statement is made that " . . . inflated profits and the cost of goods mount faster than the wage level. A few grow wealthy and the multitude is impoverished." We will show later from statistics that this is an erroneous statement. It is a matter of common knowledge that the many are less impoverished today than in any other period of our country's history. At no time has railroad labor enjoyed more of the luxuries of life than now.

4. The statement further adds, "not only have we suffered from inadequate wages, but the public has paid an extortionate tax for transportation, a tax based on inflated values. . . ." Our search of available statistics reveals the following as an answer to the foregoing quotation:

MONTHLY WAGES PER MAN OF ALL RAILWAY LABOR

1916	$75 00
1917	90 00
1918	110 00
1919	125 00

The average wage paid is now such that any further and material general increase cannot be justified unless it is to be assumed that railway labor is entitled to preferential treatment as compared to workers in other fields.

It is stated that the average increase of wages paid the members of the four railroad brotherhoods since 1916 has amounted to about $800 per annum, an increase of more than 60%. In addition to previously granted increases in wages, the press states that requests for further increases, now in process of formulation but not officially presented, will, in the instance of the four brotherhoods, amount to, approximately, $300,000,000 per annum, and that the requests of other units of railroad workers who have already asked increases, and those who are preparing to do so, will amount to an additional $500,000,000 per annum, or a total of $800,000,000 per annum—a startling amount in the face of existing deficits of railroad operating income.

During the periods named, rates have averaged as follows:

REVENUE PER PASSENGER PER MILE (CENTS)

1916	1917	1918
2.04	2.09	2.60

REVENUE PER TON PER MILE (MILLS)

7.07	7.15	9.0
Increase,	1%	26%

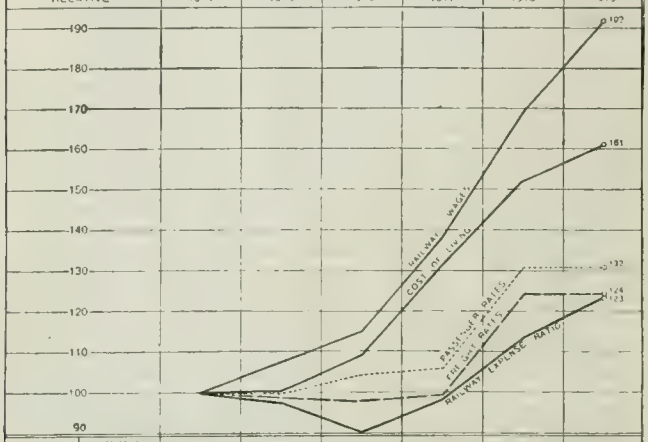
These rates, compared with those which obtain elsewhere, show that our people enjoy a much lower charge for freight than any other country in the world, and the statement that our rates for transportation are extortionate is not justified.

The figures for 1918 given above also reflect the increase of passenger and freight rates made under Government operation to meet the increased payrolls, and the Director General of Railroads has recently stated that these increased rates are not sufficient to meet the existing railroad payrolls, and that a further increase of, approximately, 10% will be needed to offset the continued deficits of operation.

We respectfully suggest that the above figures refute the statement of the brotherhoods that they are suffering from inadequate wages. Our investigations show that railway wages have increased faster than the cost of living, which is contrary to the statements made by the brotherhoods. The cost of living from 1914 to March, 1919, has increased 61%, whereas all railway wages have increased 92%. We respectfully invite your attention to an accompanying diagram which graphically shows the trend of railway wages, rates, and the cost of living. [See next page.]

UNITED STATES

CHANGES SINCE COMMENCEMENT OF EUROPEAN WAR IN RAILWAY RATES, RAILWAY LABOR, RAILWAY OPERATING RATIO, AND COST OF LIVING



		1914	1915	1916	1917	1918	1919
RY. OPER. RATIO	PER CENT OPER. EXPS. TO P. REVS.	72.35	70.25	65.54	70.48	81.25	88.50
	PERIOD	Year ended June	Year ended June	Year ended Dec.	Year ended Dec.	Year ended Dec.	Month of April
RAILWAY LABOR	MONTHLY WAGES PER MAN	$65	$70	$75	$90	$110	$125
	PERIOD	Year ended June	Year ended June	Year ended Dec.	Month of Dec.	Year ended Dec.	Month of Jan.
RAILWAY RATES	REV. PER PASS. MILE MILLS	19.76	19.79	20.42	20.91	26	26
	REV. PER TON MILE MILLS	7.23	7.22	7.07	7.15	9	9
	PERIOD	Year ended June	Year ended June	Year ended Dec.	Year ended Dec.	Last 6 Months	Based on increases of June 1918

RAILROAD WAGES HAVE INCREASED FASTER THAN LIVING COSTS

Authorities, "Cost of Living," reports of National Industrial Conference Board. Other data: Reports of Interstate Commerce Commission and United States Railroad Administration. The above figures are to March, 1919. Advance figures of "cost of living" to July, 1919, show an increase of 70.8 per cent.

5. Mention is made of "the railroad profiteers . . . of Wall Street." This is a generality that hardly needs refutation but is, however, deserving of criticism.

In 1916 there were 30,706 miles of railroads in the hands of receivers, showing to what low ebb railroad credit had sunk, and the consequent financial condition of the alleged "profiteers." Statistics show that the great bulk of railroad securities is not held in "Wall Street," as the term is commonly used. On the contrary, there are no securities of our commonwealth more broadly held by our people than our railroad securities, excepting war issues of Government bonds. There are, approximately, 700,000 stockholders of our railroads whose holdings average about $13,000 par per stockholder. From the records obtainable in respect to the distribution of railroad bonds, we find that the savings banks of our country own about $1,214,000,000 and the other banks about $472,000,000, making a total of $1,686,000,000. There are more than 11,000,000 depositors in the savings banks who are directly interested in those bonds, because their savings have been invested in them. In addition, our insurance companies hold bonds of about $1,520,000,000, and there are 34,000,000 insurance policyholders whose policies are in no small measure secured by these investments. As there are, according to the last published report of the Interstate Commerce Commission, about $10,000,000,000 worth of railroad bonds in the hands of the public, then $3,206,000,000, or 32%, of them are held by insurance companies and banks in which the public has a direct and personal interest.

Another point of public interest, it seems to us, is the fact that the four brotherhoods have, according to the American Federation of Labor, a membership of 480,000, all of whom are not, however, employed upon the railroads. According to the last Interstate Commerce Commission report, about 322,000 trainmen are engaged upon the steam railroads, as compared with a total number of all railroad employees of 1,800,000. It is, therefore, plainly seen that the powerful and well organized labor organizations which bespeak your consideration and that of Congress in favor of their solution of the railroad problem, and their threatening demands in respect to an immediate increase in wages, comprise only about 18% of all the railroad workers. For your consideration, and to show that the railroad workers are a comparatively small proportion of our total citizenry engaged in gainful pursuits, we submit the following from the latest census reports:

Occupation	Male Employees of All Ages
Agricultural pursuits	14,777,000
Mining and minerals	1,109,000
Manufacturing industries	11,484,000
Transportation, all classes	3,264,000
Trade	4,156,000
Public service	528,000
Professional service	1,912,000
Domestic and personal service	4,285,000
Clerical	1,938,000
Miscellaneous	750,000
Total	43,206,000

Note: 100 units ignored.

The percentage of all males in the transportation service (including trolley lines and other means of transportation) is 7.7% of the total, those engaged on steam railroads 4.2% of the total, and the members of the brotherhoods only eight-tenths of 1% of the total males engaged in gainful pursuits. It is the larger percentage for whom we bespeak your consideration.

6. The statement is also made that "the cost of capital would be reduced from the present 6 to 7% paid to Wall Street to 4% paid upon Government securities."

This we affirm to be a serious misstatement. The last report of the Interstate Commerce Commission shows that the average annual interest rate on the total bonds outstanding against the railroads of this country was 4.9%, and upon the stock of our railroads but 3.91%, so that the statement in respect of the 7% as the cost of capital employed is entirely erroneous and misleading.

The rate of interest on our Government bonds prior to our entry into the war was indeed less than the interest paid upon the railroad securities, due in part to privileges enjoyed by the holders of Government securities which are accepted as security for notes issued, deposits, reserves, etc. It is significant that the last loan, popularly called the Victory Loan, carried an interest rate of 4¾%. Our net public debt on Apr. 1, 1917, was $1,207,827,886, a per capita debt of $11.59. On May 31, 1919, the total gross debt was $25,921,151,273.75, or about twenty times greater, making a per capita debt of about $230. It is believed that the valuation of the railroads has progressed at least far enough to enable us to estimate that any fair valuation of the railroads of our country will approximate $18,000,000,000. Should the Government either assume this obligation or take over the railroads as suggested by the brotherhoods, it follows that the Government credit will be extended to the amount of $18,000,000,000, and we

feel assured this amount of additional capital will not be available at less than a 5% interest rate. Furthermore, the increase of the public debt would depress the value of the war loan held by millions of our patriotic people.

While the whole problem of our transportation system is under consideration, we suggest the scrutiny of all legislative restrictions which have been imposed upon the railroads and which have led to increased operating charges without compensating advantages to the public. A specific case in point is what is commonly termed the "full-crew law."

We feel that the remedy for the present high cost of living rests not in increased wages, but in increased production, which largely rests in the hand of labor, in that increased efficiency and energy on their part will stimulate the output, resulting in increased output per unit. Recent inquiries and searches have revealed the fact that the output per unit has been decreasing in late years, coincidently with the increase in wages and shorter hours and, consequently, until this is corrected by greater individual industry, living costs cannot become normal.

We commend and indorse your recent remarks that strikes and labor unrest retard production in general and increase the cost of all commodities, and we believe that your continued influence in this direction will result in better labor discipline, without which efficiency is impossible.

We hope we have advanced a sufficient answer to the demands of the brotherhoods to show the fallacy of their arguments and the unstable economic foundation of their proposed solution of the railroad problem. We plead for a fair and comprehensive investigation of the subject of increased wages. We feel that any increase of railroad wages should be considered with the greatest caution, being mindful of the conditions reflected in the above statistics. We remember that all classes of our people are confronted with the same conditions as the railroad brotherhoods and that they are considering the subject with patience and a mutual understanding that should suggest to the brotherhoods an equal consideration of the public good. In so far as the plan proposed by the railroad brotherhoods for the solution of the difficult railroad problem is concerned, we hope that you will use your great influence against it and urge some other plan which is based upon sound economic policy.

St. Paul Municipal Bank After Six Years' Work

After six years of operation, the "municipal savings bank" of the City of St. Paul, Minn., described in *Engineering News-Record* of Nov. 8, 1917, p. 878, had deposits totalling $3,635,000 on July 1, 1919. The "bank" is operated by one clerk. It accepts deposits and issues 4% certificates redeemable on demand and with interest, whether the money has been on deposit a day or a year. For the investment of its deposits the "bank" buys tax certificates and bonds of the City of St. Paul, particularly at times when the city would have to pay high rates for loans through commercial channels. Within the past 12 months the "city bank" has taken $100,000 of 4½ per cent. 30-year water bonds, $600,000 of 4½ per cent. school bonds and $750,000 of 5 per cent. tax levy certificates, which, it is stated, were not commercially marketable at those rates. It is reported that the water-bond transaction alone will save the city $105,000 of interest charges.

Main-Route Highway Construction in New Jersey

Work on the Route Between Jersey City and Philadelphia of Heavy-Slab Type—Drainage Main Feature—Convict Labor on One Section

CONSTRUCTION of the main route between Jersey City and Philadelphia by the New Jersey Highway Commission is of a most substantial type, being designed for the heaviest motor traffic. Proper drainage is a main consideration, and this is uncommonly complete. It is designed in such a way as to make it more or less accessible, while every precaution is taken to prevent it from becoming clogged and ineffective. The work is largely let by contract, but on one section the state is doing the work by convict labor.

In designing the road, the Highway Commission has aimed to provide for the heaviest traffic expected for the next twenty-five years. The slab is 18 ft. wide, 10½ in. at the center, and 8 in. at the side. Reinforcement, however, is not provided. The concrete mixture is 1:2:3, and is laid directly on top of an old macadam foundation, in all places where it has not been necessary to remove the latter to obtain a better grade.

As stated, one of the items of design concerning which the department is very particular is drainage. Wherever the soil is of a nature to drain poorly, such as clay, herringbone drainage is placed under the surface, and in all cases drains are built along the edges of the slab. These drains are made of 8-in. vitrified tile in a large proportion of the work, and are built with lamp-holes every 300 ft. to provide for inspection in locating any stoppage. The construction of these lamp-holes is shown in the view herewith. The depth of trench below subgrade is 3 ft., or 3 ft. 10½ in. below finished grade. It is 18 in. at the bottom, and has the necessary side slope to stand well. A 1-in. plank is placed in the bottom of the trench. Upon this the tile is placed, and suitable cast-iron lamp-hole covers are provided at the top, as shown in the view.



DESIGN OF LAMP HOLES FOR TILE DRAINAGE

When the tile has been placed, crushed stone or slag is piled over the same to a depth of about 18 in., to facilitate drainage. To keep the earth from passing down through the stone and into the tile from above, a layer of about 3 to 4 in. of straw is placed on the top of the stone, between it and the earth filling. Although it had rained for a week preceding a recent inspection, the surface water had been taken care of so well that the subgrade was practically dry, and the contractor was able to resume work on the day after the rain.

A view on the next page shows the type of surface which is being obtained by the use of a Lakewood



SURFACE OBTAINED ON NEW JERSEY HIGHWAY BY USE OF MECHANICAL FINISHER

mechanical tamping machine with a belt finishing attachment at the rear.

The contract, which is known as Route 1, Sec. 4, is being executed by Hugh Nawn, of Philadelphia and Boston.

Convict labor is being used by the state on another section of the same highway known as Route 13, Sec. 4. This extends from Kingston to Franklin Park. While the same concrete section and proportions are being used, the work is being done by the tamping templet and belt finishing method The section is 18,370 ft. long.

Special equipment is used in connection with this convict work, in the form of a mixer loader, a view of which is shown. This loader eliminates the use of wheelbarrows, by giving leeway for the shoveler where the distribution of material is inaccurate.

It is reported that convict labor has worked very efficiently to date upon this contract. The Highway Department pays the Prison Board at the rate of $2 for eight hours. With a gang of 28 convicts, a superintendent, an inspection foreman, two finishers and a



MIXER LOADER AS USED ON NEW JERSEY CONVICT LABOR WORK

mixer man, 230 ft. of 18-ft. roadway, 10½ in. at the center, and 8 in. at the side, was completed July 24. The foreman stated that the gang should average about 200 ft. per day. The work is all under the supervision of H. G. Thompson state highway engineer. H. D. Robbins is division engineer and F. W. Conover is resident engineer.

Double-Track Water-Type Ashpit· Pennsylvania Railroad

Pit 300 Feet Long Built in 26 Days — Portable Concreting Plant—Ash-Handling Crane and Safety Devices

RAILWAY ashpits of the water-filled type are coming into rather extensive use, and a large reinforced-concrete ashpit of this type, capable of accommodating six of the largest Mallet locomotives, has been completed recently by the Pennsylvania R.R. in connection with the revision of its engine terminal facilities at Youngwood, Penn. The pit is 300 ft. long and has sloping sides, with a track carried over each side by reinforced-concrete piers and girders. Cantilever brackets on these girders support concrete slab platforms for the use of the men working on the pit side of the tracks when cleaning the ashpans of the locomotives. The design of this ashpit is shown by the accompanying views and drawings.

Special consideration has been given to the safety of the men working at the pit. Besides the hand railing along the edge of the platforms the open spaces between the rails of the pit tracks will be protected by lines of ¾-in. steel rods spaced 12 in. apart and laid parallel with the rails. In each track, at each end of the pit, is a sloping floor or deck between the rails, with bars placed across the open space at the bottom of



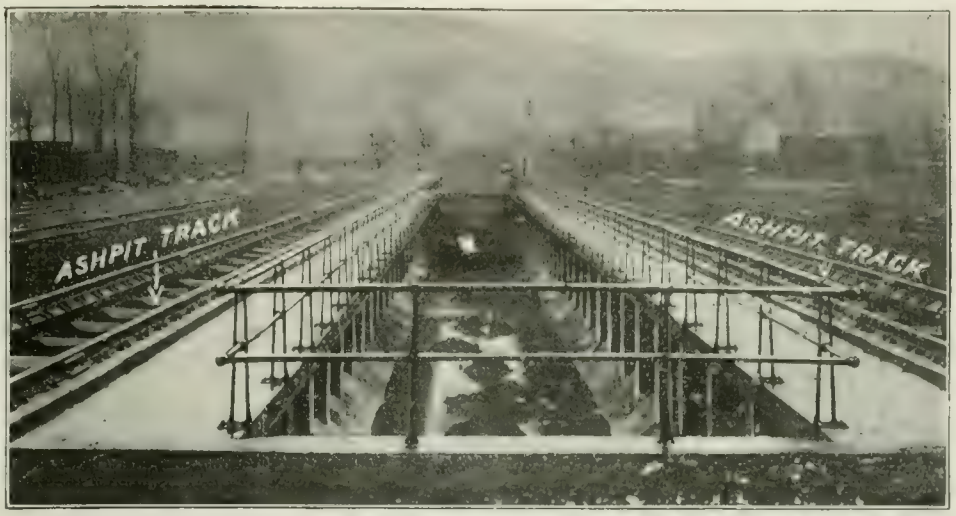
INTERIOR OF ASHPIT SHOWS CANTILEVER PLATFORMS FOR CLEANERS

the slope. This will warn men who may be walking between the rails at night or during heavy storms, and will prevent them from falling into the pit.

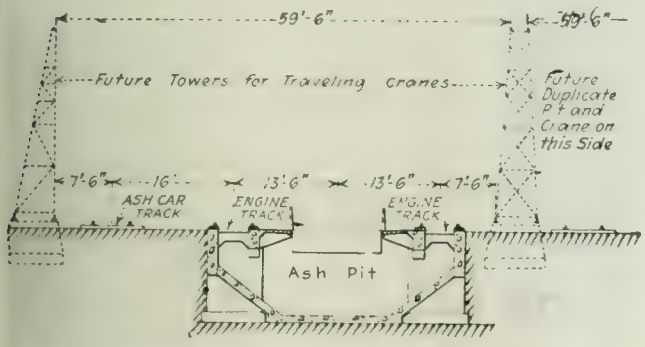
Removal of ashes from this pit is effected at present through the use of a grab bucket handled by a locomotive crane, this crane being operated on one or the other of the pit tracks during slack intervals. Eventually, however, an overhead traveling crane will be installed on an elevated runway extending the full length of the pits. The crane will have a span of 59½ ft., covering the two ashpit tracks and also a third track for the use of ash cars. Provision is made for a second ashpit parallel with the first one, and the towers on one side of the present pit will be of such shape as to carry two runways.

An average of 70 locomotives per 24 hours have their fires cleaned here and are concentrated on the pit in approximate intervals of six hours, so that the cleaning

operation must be done quickly in order that the engines may go onto the repair pits and be in readiness for service in the next period. Ashes are removed from the pit once a day at the most favorable interval. This work consumes about four hours and requires only one man, who, when not so employed, is engaged in other work about the engine terminal. A decided advantage claimed for this type of pit is its large capacity, since in case of labor shortage or failure of the ash-handling appliances the ashes could accumulate for three or four days without interfering with the work of cleaning fires. Rapid progress was made in the construction of this pit, 26 working days being required, from Nov. 28 to Dec. 24, 1918, although this was the period of greatest labor shortage. With a working force of about 120 men the average turnover was 28 men daily. Day and night shifts were worked most of this time. Although freezing weather occurred, it did not retard work on the pit or affect the strength of the concrete. On account of being depressed below the ground, the pit lent itself very readily to protective measures for preventing frosted concrete. A light framework was erected over the structure and covered with tarpaulins and tar paper, and salamanders were placed under this. After the concrete was poured, live steam was permitted to escape into the inclosure, to provide a moist heat which not only prevented freezing but assisted in thoroughly seasoning the concrete.



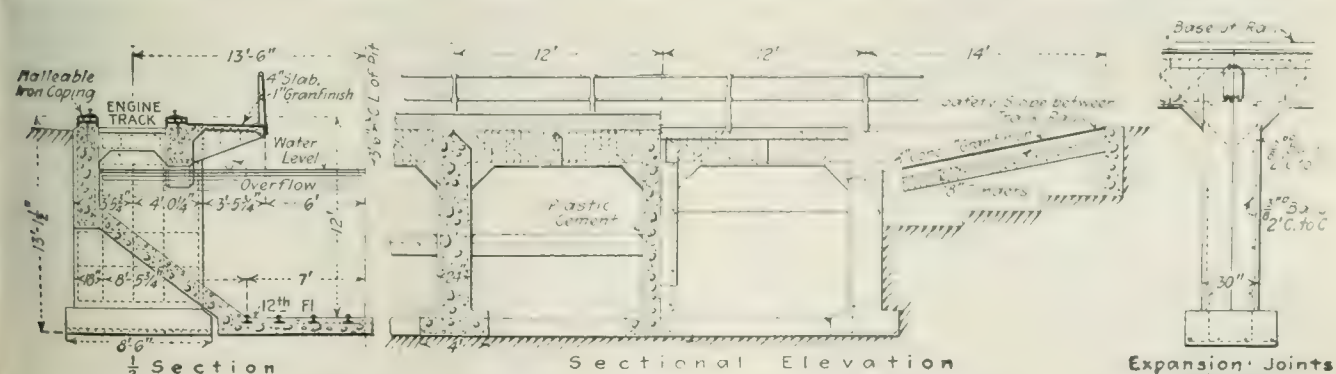
WATER-TYPE ASHPIT IN USE ON THE PENNSYLVANIA RAILROAD AT YOUNGWOOD, PENNSYLVANIA



LOCOMOTIVE ASHPIT WILL HAVE OVERHEAD CRANE FOR REMOVING ASHES

Excavation on the first 60-ft. length revealed a pocket of quaking gumbo entirely incapable of supporting the weight of the floor and its load of water and ashes. This gumbo was removed, the excavation having a depth of 18 ft. to bedrock. The piers were founded on this rock, and the excavation was backfilled to the level of the concrete floor, using granulated furnace slag thoroughly tamped. For the remaining portion of the pit the excavation was in hard and compact gravel, so hard, in fact, that blasting was necessary to loosen it sufficiently for its removal with a 1-yd. grab bucket operated by a stiff-leg derrick mounted on rails and moving on the center line of this structure. Excavation for the piers, however, was carried down through this gravel formation to bedrock. Water was encountered in the excavation work and was a source of considerable trouble, making it necessary to have a 10-in. centrifugal pump running day and night.

Pier footings, except for the first 60-ft. length, were poured in the excavations, without forms. All form work was of lumber. Concrete was made in the proportion of 1:2:4, using clean river sand and river gravel, the latter being known locally as pea gravel, the largest particle of which could pass through a §-in. screen. A portable concrete plant was rigged up, having a 1-yd. mixer and a 40-ft. steel tower mounted on a flat-car on a track paralleling the work, the concrete being distributed through chutes from this tower. No attempt was made to waterproof the pit, as the



PENNSYLVANIA RAILROAD DESIGN OF WATER-TYPE ASHPIT

groundwater level is about 3 ft. below rail level and the entrance of this outside water would reduce the amount necessary for filling. The seepage, however, is found to be trivial.

The work was under the direction of Robert Faries, division engineer, Pittsburgh division, and in direct charge of C. W. Richey, who is the assistant division engineer.

The contractor was J. Toner Barr, of Pittsburgh, Penn., with E. H. Gibson as his superintendent.

Steel Spur Dikes for Shore Protection

SPUR dikes composed of steel spider frames connected by wire strands are being used to check erosion of banks and foreshore along the Kaw River in Kansas. Each frame or spider consists of three angles 16 ft. long, secured together at the intersection and forming a structure that will stand in any position, while cables of wire are stretched between the ends of the angles.

When these frames or units are set in a row to form a spur dike they are connected by a horizontal cable which is tied to the center of each frame and has its shore end attached to an anchor. Sand, silt and drift



SPUR DIKES FOR SHORE PROTECTION HAVE STEEL SPIDER FRAMES

begin to accumulate around the legs of the frames, and in turn tend to increase the accumulation, while sand is deposited also in the still water beyond the dike until a protective foreshore is built up in front of the river bank.

Bridge abutments have been protected by one or two dikes, but when a long stretch of bank is to be protected there must be a series of them, generally about 200 ft. apart. The frames are assembled at the site. About 40 installations have been made. This device is the invention of J. W. Kellner, manager of the Patent Steel Jetty Co., Silver Lake, Kan.

Method for Estimating Storm-Water Run-Off

The name of the author of the article on "Graphical Method for Estimating Storm-Water Run-Off," printed in *Engineering News-Record* of Aug. 7, 1919, p. 282, should have been given as Ralph W. Horne, instead of Ralph W. Horner. In the second paragraph of the article, clause (3) should have ended with (2) instead of (1).

Protecting the Banks of Savannah River Through Augusta

Development of Methods Used and Data on Cost of Rock Face Revetment Placed in Pre-War and War Years

By E. C. Garvin

Brunswick, Ga.; Formerly Assistant Engineer, United States Engineer Department, Augusta, Ga.

BANK protection has been imperative on the Savannah River at Augusta, Ga., for many years. Above the city the river has a rock bottom and heavy slope. Augusta is situated at the very point where the slope of the river changes abruptly from a steep to a gradual incline. At and below Augusta the stream meanders through the coastal plain, where the banks are soft and easily eroded. At the upper end of the city front the river forms a sharp bend. During floods the current attacked the Georgia bank along the entire city front, which resulted in a loss of great quantities of material. The instability of this bank prevented proper terminal development for navigation and also precluded the construction of a levee which Augusta had been seriously considering since the freshet of 1908.

The earliest form of bank protection on this river consisted of spur dikes or "spurs" which extended out from the bank, approximately normal to the current, and formed a combination of shore protection and contraction works. The maintenance of these structures was costly. They soon became flanked by high-water erosion, necessitating extended revetment at the shore ends and frequent renewals of a complete protection work consisting of several dikes. The dike proper was built up of brush fascines each about 2 ft. in thickness, each fascine sunk in place with rock. Enough of these layers were used to bring the structure up to the desired height and grade, and the completed spur was crowned with a substantial layer of rock so that no brush was exposed on top. Several costly failures brought this form of protection into disfavor.

The spur design was superseded by a training wall, locally called a "dike," which follows closely the low-water line of the shore being protected. The design of this has undergone various modifications, dictated by experience, in an effort to attain an economical adjustment between original cost and annual maintenance. The dike proper consists of brush fascines placed between a double row of piles, tied together at the top, the brush being weighted down by a top layer of rock. The distance between the two rows is about 7 ft., the piles in the row next to the river are spaced about 6 ft. apart and in the row next to the bank about 8 ft. apart. The brush rests on the bed of the river and extends up to an elevation of about 4 ft. above low water, the top rock bringing the completed structure up to about 5 ft. above this datum. The protection work is thus a vertical wall about 7 ft. wide and from 5 to 20 ft. in height.

The dike is connected with the bank at intervals

varying from 50 to 200 ft. by breaks similar in design to the spurs previously described. These breaks are built on a uniform grade from the top of the dike to the crest of the bank or as near the crest as practicable. The purpose of the breaks is to deaden the current behind the dike and prevent flanking. In some cases a brush mattress, sunk with rock, is built from the dike towards the channel to prevent undermining. The ratio by volume from brush to rock for an entire protection work varies from 8:1 to 12:1. The pre-war cost varied from $5 to $10 per lin.ft. of bank protected. This form of protection has rendered satisfactory service where the river bend has a moderately flat curvature, but has failed completely at a few places where the bend is very sharp.

Along portions of the city front of Augusta the bedrock is within a few feet of the river bottom. This prevented the use of piles and precluded the longitudinal dike for bank protection. In addition to this, navigation and city interests demanded a form of protection having the utmost degree of permanence. A stone revetment was adopted and built. This consisted of a layer of broken stone spread on the roughly graded bank and covered with a layer of paving stone placed to form a more or less even pavement. The foot of the pavement was supported by a mass of rock, deposited in a dredged trench, the top of the trench rock coming up to about a foot above low water. The paving stone was well bonded with the trench rock against which it abutted. On the first two sections or contracts the pavement or revetment proper was carried up the bank to an elevation of 18 ft. above low water, which is about 8 ft. below the crest of the bank; on the third section the bank was paved to the crest. The area between the top of the pavement and the bank crest was graded, and sodded with Bermuda grass.

In its natural condition the bank was covered with bushes and small trees. In building this revetment the vegetation and the top soil were removed, marked irregularities were smoothed out, gullies were filled and the entire area to be paved was roughly graded to conform to the natural slope which the river had carved for itself, except that no slope was allowed steeper than 1½ horizontal to 1 vertical. The trench was excavated along easy lines following closely the low-water contour.



REVETMENT COMPLETED TO 18 FT. ABOVE LOW WATER

It had a bottom width of 10 ft. and was excavated to 12 ft. below low water unless rock was sooner encountered. The trench rock was placed immediately behind the excavator, which was equipped with a 1-yd. dipper at one end and a boom equipped with a grapple at the other end.

The riprap stone of the trench varied in size from 50 lb. to several tons, only a sufficient amount of small stones being placed to fill the voids and to make a thorough bond with the pavement.

The stone for the subpavement was run-of-the-crusher broken to such size that all would pass a 2-in. mesh and no more than 2% a ¼-in. mesh screen. The subpavement was laid to a thickness of six inches.

The paving stone was generally rectangular in shape, having an upper area not less than 1 sq. ft. The first contract provided for a top pavement in one layer 18 in. thick. The contractor furnished stone cut almost to

TABLE I. TABLE OF MATERIAL PLACED AND CONTRACT PRICES, STONE REVETMENT, SAVANNAH RIVER, AUGUSTA, GA.

Trench Excavation Cu.Yd. Estimated Amount	Trench Excavation Cu.Yd. Amount Actually Excavated	Trench Excavation Cu.Yd. Unit Cost (Cts.)	Trench Rock Short Tons Estimated Amount	Trench Rock Short Tons Amount Actually Placed	Trench Rock Short Tons Unit Cost	Subpavement Short Tons Estimated Amount	Subpavement Short Tons Amount Actually Placed	Subpavement Short Tons Unit Cost	Top Pavement Short Tons Estimated Amount	Top Pavement Short Tons Amount Actually Placed	Top Pavement Short Tons Unit Cost	
40,000	30,641	45	54,000	51,417*	$1 65	16,000	15,381	$2.25	48,000	43,952	$2 12	1st Section Hawks Gully to Center Street (1911-1913)
11,000	12,816	60	25,500	25,658	2 00	4,500	4,199	2 50	11,500	12,253	2.60	2nd Section Center Street to East Boundary (1914-1915)
None	None	None	3,500	2,521	3.30	2,000	1,329	3 80	2,300	2,578	4 30	3d Section King Mill Tail-race to 850 ft. below (1917-1918)

* Includes 3,287 tons placed after completion of contract to restore rubble mound to grade. Grading the bank and planting Bermuda sod were included in price bid for trench excavation and for stone.

TABLE II. UNIT COSTS ON STONE REVETMENT, SAVANNAH RIVER, AUGUSTA, GA.

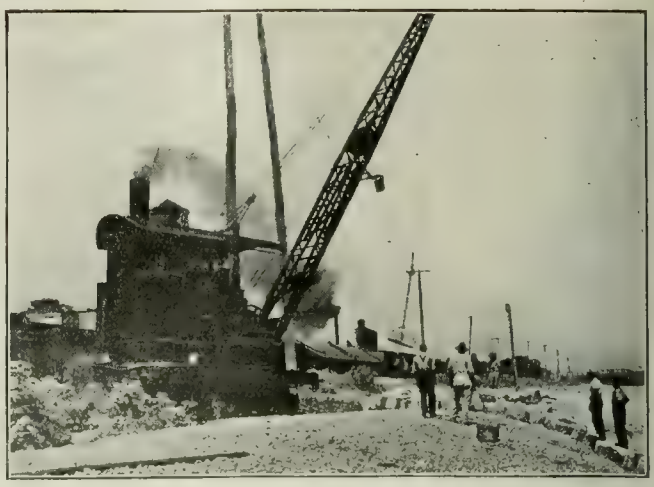
Trench Total Length (Ft.)	Area Paved (Sq.Yd.)	Trench Excavation per Lin.Ft. (Cu.Yd.)	Trench Rock per Lin.Ft. Short Tons	Substone per Sq.Yd. Short Tons	Top Stone per Sq.Yd. Short Tons	Cost of Trench Excavation and Rock per Lin.Ft.	Cost Substone per Sq.Yd.	Cost Top Stone per Sq Yd	Total Cost per Lin.Ft. of bank Protected	
7,670	57,200	4.00	6.70	0.269	0.768[2]	$12 86	$0.61	$1 63	$28.59	1st Section Hawks Gully to Center Street
3,250	20,000	3.94	7.89	0.210	0.613[3]	18 16	.53	1.60	28.96	2nd Section Center Street to East Boundary
850	7,000	None	3.00[1]	0.190	0.369[4]	9.85	.72	1.59	28.77	3d Section King Mill Tail-race to 850 ft. below

[1] No trench; rubble mound built up from river bed. [2] 18-inch stone used for about 13 per cent of entire area, 12-inch stone 87 per cent of area. [3] 12-inch stone throughout. [4] 6-inch stone throughout

dimension sizes, and it was laid with only about 5% of voids; thus the revetment became stronger and more massive than necessity required. It was soon discovered that the paving stone as placed was greatly exceeding the estimate, so the thickness was reduced from 18 in. to 12 in., without sacrificing anything in respect to permanence. On the work in the vicinity of the King mill the top pavement was again reduced to 6 in. thickness. Of the entire revetment along the city front about 1000 lin.ft. were paved with 18-in. top stone, about 10,400 lin.ft. with 12-in. stone and 850 lin.ft. with 6-in. stone.

This paving stone ranged in size from 50 pounds to several tons. The small stones were placed by hand and the larger pieces were placed with a locomotive crane operating from trestles (which were susequently removed) or from service tracks built along the top edge of the revetment.

The work so far done is in three major sections, each authorized by a different river and harbor act, and each section covers a separate contract. On the first two sections (from Hawks Gully to East Boundary St.) the City of Augusta paid half the cost and on the third section the Federal Government bore all the expense. The entire work was done under Government supervision.

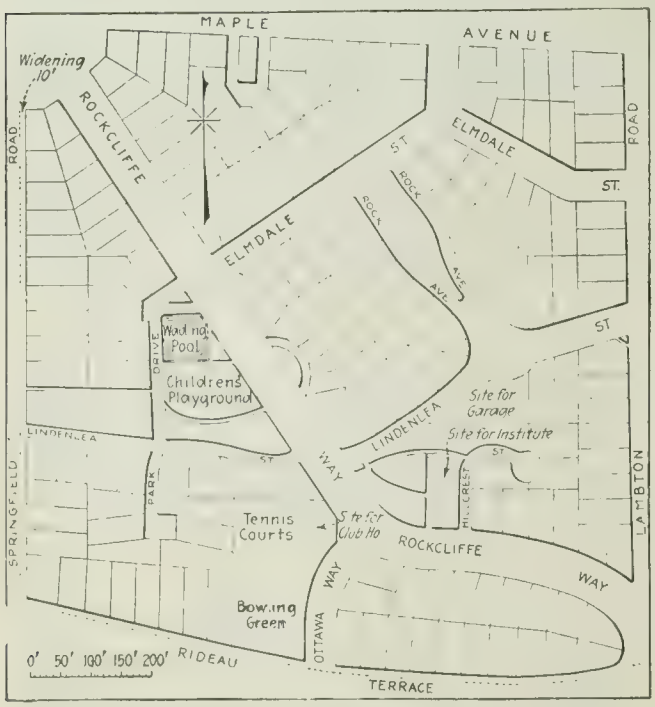


PLACING TOP PAVEMENT WITH LOCOMOTIVE CRANE ON SAVANNAH RIVER REVETMENT

The Lindenlea Garden Suburb and Housing Plan, Ottawa

Land Acquired by Ottawa Housing Commission and Laid Out Under Direction of Dominion Town-Planning Adviser

LAND for a development to be known as the Lindenlea Garden Suburb has been acquired by the Ottawa Housing Commission of Ottawa, Ont., and has been laid out under the direction of Thomas Adams, town-planning adviser to the Canadian Conservation Commission. It is expected that houses will be built at once.



PLAN OF LINDENLEA GARDEN SUBURB, OTTAWA

Most of the houses will be detached and erected on lots having a frontage of 30 to 60 ft. Over 200 applications have been received for house sites, as compared with 168 sites available.

The tract of land acquired has an area of about 22½ acres. Of this over 2½ acres, or fully 10%, has been set aside for parks, playgrounds, and other open spaces, including sites for a community garage and an institute.

The land is somewhat rocky and the topography uneven. The street system and lot subdivisions have been planned to effect economy in street construction as well as with an eye to the best possible appearance. As shown by the accompanying plan, there is a principal street, called Rockcliffe Way, laid out as a diagonal thoroughfare. This is 66 ft. wide along its entire length. Near one end there is a short connecting road called Ottawa Way, from which a good view may be had of the whole of the Dominion Parliament building. The minor streets are of less width, varying with the probable future traffic, and are so laid out that for the most part the lots are regular in shape, although not always rectangular.

In a report on the project Mr. Adams states that the total cost of the land was about $66,000. Incidental expenses of some $15,000 will be incurred. Streets will be macadamized to a width of 14 to 16 ft., and it is expected that this work will be done by the city. The lots are being sold for $340 to $600 each, or 12.8c. per square foot on the average, with a range of from 10 to 15c. Lots fronting on Rideau Terrace, which has already been provided with partial improvements, would be sold at an added price of 75c. a front foot.

Most of the trees will be preserved. An effort is being made to insure the placing of electric and telephone wires at the rear of the dwellings, so that the streets will be kept free from poles. This will mean that the street lighting will have to be arranged by underground wiring, which can be carried out inexpensively as compared with underground wiring for electric services to the dwellings.

A feature of the scheme is a public garage, to prevent the expense of having separate garages attached to each house where a car is kept. There is also a site reserved for a residents' club.

Municipally-Owned Landing Fields

THE status in July, 1919, of the attempt being made by the Director of the Air Service, War Department, to secure the provision of a considerable number of well distributed municipally owned landing fields, has been summarized for *Engineering News-Record* by First Lieut. Armin F. Herold, by authority of the director, as follows:

Boston, Mass., is setting aside part of Franklin Park, one of the city's playgrounds.

Albany, N. Y., has a good municipally owned field which it is putting into condition to be inspected and accepted by us.

At Binghamton, N. Y., the owners of the Endicott Johnson Shoe Co. are donating a field and preparing the necessary supplies and equipment toward making this field a first-class landing field. It is now ready for use, although it is still in need of some improvement.

Buffalo, N. Y., has accepted our terms in selecting a site.

New York City has referred our letter of Apr. 30 to a committee and proper city departments for action. It is apparently in favor, but not very active.

Rochester, N. Y., is ready to coöperate with the Air Service and is now selecting a field.

Syracuse, N. Y., has a field ready for inspection.

Philadelphia, Penn., is setting aside the tract known as the Belmont Plateau. This is not a strictly first-class location, but it is the best the city has to offer within its corporate limits.

Scranton, Penn., is establishing its own field, for the proposed Lackawanna Air Trail; this, it is understood, is well under way.

Winston-Salem, N. C., has, it is understood, a field ready for use and an officer will be sent to that place in a very short time to make an inspection, it is expected.

Atlanta, Ga., has a field which has been put in good condition, but at present has no hangar or supply facilities. It is ready to establish this field in accordance with our specifications at such time that we may be able to assure the city that it will be used by the Government or the Postoffice Department.

At Macon, Ga., the race-track field will probably be accepted this month and rated as second-class.

Daytona, Fla., offers the use of the beach; it does not care to go to the expense of establishing a field.

Jacksonville, Fla., is very active in the establishment of a municipally owned field, and in a few weeks the field will be ready for acceptance, it is expected.

Kissimmee, Fla., has a field which is ready for inspection and probably satisfactory for acceptance.

Cleveland, Ohio, has a field which, it is understood, is in condition to be used, but no definite steps toward cooperation with the Air Service have been taken.

Springfield, Ill., is very desirous of being added to our list, as it has a good field and is willing to meet all requirements of our specifications.

Topeka, Kan., is setting a splendid example for the rest of the state by establishing a municipal landing field.

Oklahoma, Okla., has a field which has been used somewhat by our fliers. The post has been operated as a municipal landing field. This field is very unsatisfactory, and probably will not be accepted.

Columbus, N. M., is a village of about 1200, and has neither the means nor the funds to maintain a field in accordance with our specifiations. The village is leasing a field to be used for landings, and will do all that its limited funds will allow.

Phoenix, Ariz., has a field established through public contribution and from money received by means of a carnival, and is ready to expand this field to meet our requirements.

Tucson, Ariz., has a field ready for inspection.

Los Angeles, Calif., is establishing a field.

Cities by which no definite action has been taken or from which no replies have been received in answer to letters sent to them by the Director of the Air Service are are follows:

Uniontown, Penn.; Richmond, Va.; Raleigh, N. C.; Columbia, S. C.; Mobile, Ala.; Baton Rouge and New Orleans, La.; Columbus, Ohio; Chicago, Ill.; Kansas City, Mo.; Beaumont, Flatonia and Texarkana, Tex.; Yuma, Ariz.; Bakersfield and Fresno, Calif.

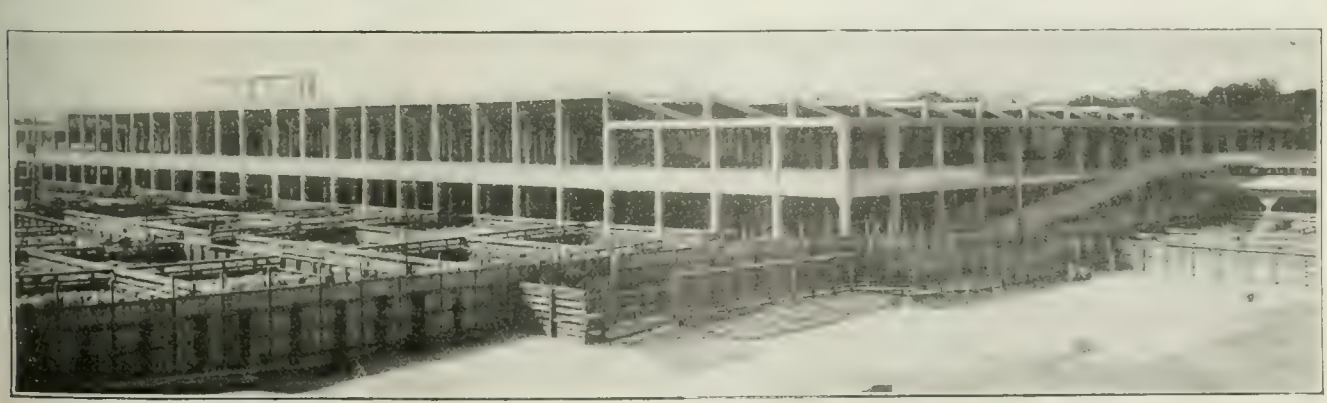
Large Concrete Building at Stockyards

FIRE-RESISTING and sanitary conditions at a large double-deck sheep barn for the Denver Union Stockyard Co. are insured by the use of concrete. The structure is 422 x 320 ft., having stories 12½ ft. high, with no side walls, although a 4-ft. parapet extends around the second floor. The panel spacing is 16 x 16 ft., except for a 20-ft. width at the central driveway. Inserts in the columns provide for the attachment of fences and gates to form pens. Concrete drinking troughs are provided.

Flat-slab construction for the second floor is designed for a load of 150 lb. per square foot. Drainage planes formed in both floors provide for flushing. A sawtooth roof is used, but with a flat slab for the four outer panels, where it is assumed that sufficient light will be afforded by the open sides. Concrete ramps about 15 ft. wide have grades of 16% for the sheep runs and 11% for driveways used in handling supplies.

To resist wear from hoofs a 1-in. granolithic finish is given to the floors and ramps.

While the first cost was approximately double that of a timber structure, the repair cost is reduced to a minimum, and the fire-resisting and sanitary qualities are special advantages. This building was designed and built by the C. S. Lambie Co., Denver, Colo., its details and reinforcement being planned by the Corrugated Bar Co., Chicago.



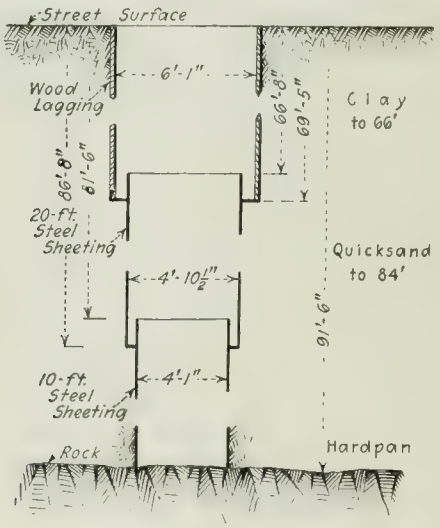
CONCRETE SHEEP BARN AT DENVER STOCK YARDS HAS OPEN SIDES

Foundations in Quicksand and Watery Gravel

Wells Lined With Wood and Steel Sheeting—Heavy Pumping Required—Motor Trucks Handle Excavation and Concrete

SINKING wells for concrete cylinder piers in a city street and through quicksand and water-bearing gravel had to be done in building the foundations for the Canal St. viaduct in Chicago. Four rows of piers built in open wells constitute the foundations for the columns. The contract for the first section of the work called for 120 wells 3 ft. 10 in. in diameter to be sunk to bedrock at an average depth of 90 ft. Three rows are in the existing street and sidewalk and the fourth is in a cleared site along the east side of the street.

Work was begun with open wells or caissons of the usual Chicago type, having a diameter of 3 ft. 10 in. inside the wood lagging, this lagging being in 5-ft. lengths and braced by steel rings. Quicksand was encountered at a depth of 66 ft. and necessitated a change in the method of sinking. Steel sheeting was tried in 30-ft. lengths, but gravel and large stones beneath the quicksand tended to split and deflect the long piles, and



FOUNDATION WELLS SUNK THROUGH QUICKSAND BY STEEL SHEETING

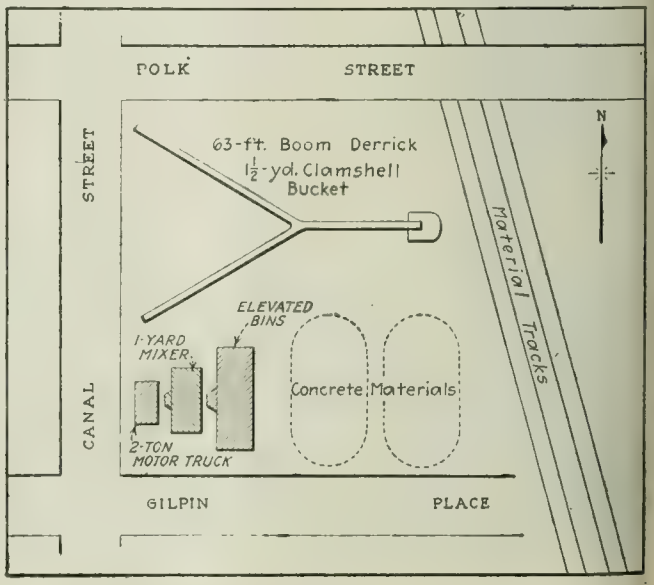
after a few were driven it was necessary to pull them and make another start. A ring of 20-ft. piles was driven readily and was followed by a ring of 10-ft. piles, this last ring reaching the rock. With the increased stiffness and decreased wedging action from external pressures this method proved successful.

Changing to steel sheeting necessitated increasing the diameter of the wells already started to 6 ft. 1 in. and the others were started with this diameter. Inside this was the first ring of steel sheeting, 4 ft. 10½ in. in diameter, and inside of this again was the second ring which extended to rock and had a diameter of 4 ft. 1 in. This construction is shown in the drawing. The height of overlap of the two rings of steel sheeting was necessary on account of the pressure of the quicksand. While the volume of concrete was increased materially, the greater sectional area permitted the use of a leaner mixture, 1:3:6 instead of 1:2:4.

It was necessary to build 30 wells in this way. Quicksand extended from about 66 ft. to 84 ft. below the street level, occurring mainly at the north end of the site. At the south end water-bearing gravel was encountered at a depth of 76 ft., but this did not require steel sheeting. The amount of water to be handled was as high as 500 gal. per minute, and in some cases it was necessary to have five pumps at work on one well. The other 90 wells were in firm clay and were sunk in the usual way, with a diameter of 3 ft. 10 in. inside the wood lagging. In spite of the difficulties encountered every well was sunk and concreted successfully. The equipment included two air compressors of 350-cu.ft. and one of 160-cu.ft. capacity, three 100-hp. boilers, 12 well pumps, and three pneumatic sheet-pile hammers weighing 600 lb. each and two of 1300 lb. each.

As a rule, six wells were in progress simultaneously at the north end and eight at the south end of the work. Each group formed a row parallel with the street, so that at all times there was sufficient clear width of roadway to accommodate regular traffic as well as the motor trucks handling excavated material. The usual tripod frame and hoist was erected over each well, the endless cable operating the group of hoists being led through a conduit under the paving of intersecting streets. At each well there were six men, including a hoist man and a dump man at the top. As it was found economical to have all steel sheeting placed by the same gang, the wells were started in such a way that not all of those in a group would reach quicksand at the same time. This also enabled the pile hammers to be used to better advantage. Wells involving steel sheeting averaged 25 shifts of 8 hours; the others averaged 20 shifts.

Concrete was hauled and placed by two-ton motor trucks having 1-yd. dumping bodies, the entire batch being dumped directly into the well. Both excavated material and concrete were handled in Canal St., the paving of which was left intact except as cut out for the wells. A concrete plant with a 1-yd. mixer was installed between the street and the adjacent railway tracks, a derrick with a 1½-yd. clamshell bucket unloading sand and gravel from cars to stock piles and delivering material to the overhead bins at the mixer as required. During freezing weather live steam was turned into perforated pipes buried in the stock piles. The derrick bucket also handled the cement, transfer-



CONCRETE-MIXING PLANT FOR FOUNDATIONS

ring the sacks from the shed to the charging platform at the mixer.

The contract had the usual clause in regard to such wells, providing that in case water and quicksand made it impossible to use ordinary methods of open-air sinking the work should be done on a cost-plus basis from the time when the more difficult conditions were encountered. It was based on unit prices, differentiating between three mixtures of concrete and between excavation where material was disposed of at the site or removed from the site. This work was started Nov. 15, 1917, but was stopped in May, 1918, on account of war conditions. It has been resumed for the 26 wells remaining under the old contract and 10 additional wells. Of these 20 have the combined steel and wood lining and 16 have wood lagging to rock.

This viaduct will be 1600 ft. long, from Harrison St. to Taylor St., and 800 ft. is under contract. It is part of the improvements in connection with the new union station, and as it will extend over part of the new freight terminal of the Chicago, Burlington & Quincy R.R. the plans are approved jointly by the railway, the city and the Chicago Union Station Co. The Wells Brothers Construction Co. has the contract and P. A. Wells is superintendent in charge of the work.

Fire Hazards Met in Storage of Fuel Oil

Precautions Necessary in the Installation of Fuel-Oil Tanks in Industrial Plants, Observed By Insurance Companies

By J. W. Lord

Engineer, Boston Manufacturers' Mutual Fire Insurance Company, Boston, Mass.

This paper was read at the recent convention of the American Concrete Institute as a part of a symposium on the design, construction and use of concrete tanks for the storage of fuel oil, a type of structure which came into wide use during the war on account of the shortage of hard fuel and of the steel of which to make tanks for the storage of the substitute liquid fuel.—Editor.

PETROLEUM as fuel for mechanical purposes was first used at the refineries of the oil companies, where byproducts were used under boilers and for heating. The first application in furnaces at factories insured by the Associated Factory Mutual Fire Insurance Cos. was about 1888. The introduction, however, was gradual. As early as 1889, following the well known policy of the company of advising its members as to safeguards needed for adequately protecting their interests, preliminary rules for installing fuel oil were drawn up by the Boston Manufacturers' Mutual Fire Insurance Co., and in this, as in all similar work, the idea was not to raise arbitrary objections to processes which were deemed advantageous, simply because involving a hazard, but rather to advise what experience showed to be necessary in order to remove the hazard or take precautions so that it would not endanger the establishment itself or the continuity of its operation.

As an outcome of investigations and experience, it was definitely determined that either a gravity feed for burners, or delivering oil under air pressure, which is in a way equivalent to a gravity system, was not safe and ought not to be used at any plant. Direct pumping to burners is the only safe practice and this has been adopted as a standard. At first, in some cases, the standpipe for maintaining a constant head was adopted, but this practice was discontinued, pressure now being maintained by pumping against a relief valve with an overflow back to the tank. By this means a very uniform pressure is available.

All fuel-oil storage should be underground. The tanks should be located well away from main buildings and not near fire protection mains. Each tank should be independently vented, and the vents should be protected by fire arresters. Steel tanks should hold not more than a carload and should be rustproofed, and, if set in a pit, should be filled around with sand or sound earth free from acid or ashes.

Rules for Construction of Concrete Tanks

Quite recently, concrete has been successfully adopted for fuel-oil tanks of large capacity, and rules for the construction of these have been formulated by the inspection department of the Associated Factory Mutual Fire Insurance Cos. Whether steel or concrete tanks are used, all connections should be taken from the top, as otherwise in the event of settlement the piping will become broken and the entire contents of the tank discharged, incurring not only loss of the oil but possibility of danger. Great difficulty has also been experienced with concrete tanks in making connections oil-tight when under pressure.

The unloading station for tanks at the railway siding should be located well away from buildings, should be level to avoid possibility of a tank-car moving after unloading has commenced, and the ground should be sloped so that oil could not reach buildings in event of accident while unloading. The unloading station should have a metal or concrete pan so that oil will not saturate the ground; this should be large enough to catch the entire contents of the car. The connection for the tank car should be of either pipe with swing joints or metallic hose, thus avoiding rubber hose.

Where storage tanks are installed in batteries there should be valves in connecting pipes between tanks, so that any one tank may be cut out at will. All connections into tanks should extend to the bottom, so that the end of the pipes will be sealed.

There may be cases where it will be found impracticable to bury the storage tanks, and in a large yard, where the ground slopes away from the buildings, they may be sometimes safely arranged by building the tank above ground and surounding it with a levee, enclosing a space sufficiently large to contain one and one-half times the entire contents of the tank, with an allowance for an accumulation of snow and water. The levee should be drained, and discharge pipes should pass over the levee rather than through it. A tank should never be installed under these conditions near enough to buildings to cause damage if on fire.

Whatever the location of the tank, delivery should never be by gravity. In some cases a small service tank, which should be lower than the pump, may be used, and this may be filled from the storage tank by means of an open connection using a funnel. The service tank is not advised, however, unless necessary, as it complicates the system and introduces the spilling of oil at funnel connections.

The pump maintaining pressure to burners should always be located at higher elevation than the tank, and should be so arranged as to prevent siphonic action when the tank is higher than the burners.

All piping should drain back to the storage tank from the burners. The suction pipe should have a foot valve, in order to avoid delay in starting, and also to keep the pipe full, and should be so arranged that the foot valve may be readily removed. Piping should be buried and exposed only where rising from the ground to the burners. It should never be overhead. Valves should all be of the outside screw-and-yoke type, so that their position may be seen at a glance.

Fittings should be extra heavy, and the entire oil system subjected to 150-lb. hydrostatic pressure before being used, as when a burner or pipe becomes clogged there is a tendency to clear by rapping on it, and if the pipe is weak it will be broken and discharge the contents on the floor or into the furnaces.

The supply of oil and air or steam for atomizing should be interlocked in such fashion that if for any reason the air or steam for atomizing should fail the flow of oil would also cease. This can be accomplished, where air is used, by driving a rotary pump by a sprocket chain from the blower supplying the air for atomizing. A reciprocating air pump should have the air supply taken from the same line as the atomizing supply and beyond the point from which the air for atomizing is taken. Where a steam pump is used and air for atomizing, the steam for the pump should be controlled by a valve actuated by the atomizing air pressure. With a reciprocating steam pump and steam used for atomizing, the steam for both purposes should come from the same source.

Pump and Pump House

The pump house should be made noncombustible, with brick or concrete walls and concrete roof. If located inside the main building, the pump should be cut off from the remainder of the room by a substantial masonry wall. If electrically driven, the motor should be cut off from the pump room by a noncombustible partition, and pumps operated by shaft passing through the wall, with switches and fuses located in the motor room.

There should always be a bypass around the fuel oil pump so that all oil may be drained for repairs.

Furnace buildings should, as far as possible, be noncombustible throughout and with all steelwork protected by concrete, and should ordinarily be protected with automatic sprinklers. Where fuel-oil apparatus is located in upper stories of buildings, oil pipe should run up the outside of the building and be protected by incasing in a larger pipe, the furnace being located close to the outside wall so that the run of piping inside may be kept at a minimum. The inside piping should be laid in covered shallow trenches in the floor. Where an oil pipe necessarily runs under a building, it should be incased in a larger pipe made up with tight joints pitched to drain outside the building to small wells, so that leaks may be quickly detected.

Where a tank is filled by tank wagon the inloading station should be at the curb, so that the tank wagon need not enter the yard where fire in the tank wagon might cause large loss to buildings in the vicinity and it would be extremely difficult to extinguish it.

Although a considerable amount of fuel oil now being used is of heavy grade, it should be understood that under certain conditions the oil presents all the hazards of a lighter oil. In order to use the heavier grades at all, it is necessary to heat them, which results in fluidity and introduction of the hazards of the lighter oils. The apparatus as installed will be permanent, and it is entirely possible that with the discovery of new oil fields lighter grades may be used. There have also been cases where unsuitable oil has been received and attempts have been made to remedy the situation by the addition of benzine. The quantity of benzine added would necessarily be indefinite, and the hazard of the oil thus materially increased. It is, therefore, important that with any oil system installed safeguards should be adopted to care for definite hazards.

On the principle that "an ounce of prevention is worth a pound of cure" the efforts of the Boston Manufacturers' Mutual Fire Insurance Co. have been directed largely toward prevention rather than toward method of extinguishing oil fires, although these also have been thoroughly investigated. None of the means of extinguishing ordinary fires is entirely satisfactory when applied to oil fires, and, in fact, there does not at the present time appear to be any certain method. The most satisfactory apparatus, however, is the foam extinguisher, in which two solutions are mixed and pumped onto the surface of the oil, producing a smothering effect and, in cases, complete extinguishment.

Great Care Needed in Cleaning Tanks

An important feature of fuel-oil storage is the necessity of taking precautions to avoid loss of life when cleaning out the tanks. The vapors are extremely poisonous, and as they are heavier than air it is only possible to remove them from the tanks by pumping out. With the presence of sludge, however, which continuously gives off the gas, this method will not suffice. The only safe way then is for workmen to wear either a diver's helmet or a gas mask, and this precaution should always be taken.

Where the steam in a plant is entirely maintained by the use of fuel oil, any material interruption to this service would result in shutting down the steam plant, and consequently the heating facilities would be suspended. In order to be assured of reliability in oil supply, the pump set should be in duplicate.

Summing up the whole question of the use of fuel oil, the general rules which should be followed are few and simple and are briefly stated in the following:

1. Storage tanks should be underground and well away from main buildings and fire mains, and so located that oil cannot flow from them onto the surface of streams in the vicinity.
2. Unloading stations for either tank cars or tank wagons should be safely located and constructed.
3. All piping should be buried and graded to drain back to the tank.
4. Supply to burners should be by pumping, and oil and air or steam for atomizing should be interlocked.
5. The entire system should be mechanically strong to prevent the possibility of breakage.
6. Scrupulous care should be observed in maintaining neat and orderly conditions around the tanks, pumps and oil-burning apparatus.
7. Plans for proposed fuel-oil installations should always be submitted for approval to the underwriters having jurisdiction, before work is commenced.

Largest Use of Electric Power on Construction Work

Dayton Flood Protection Works Use 8000 Hp. From Central Plant, in Motors of 5 to 500 Hp., for Pumps, Excavators, Concrete Mixers and Other Equipment Scattered Over 1000 Square Miles

ELECTRICITY is not particularly a cheaper power, but it is a much more convenient power for widely scattered construction outfits. Fuel is conserved, and the equipment and labor required for serving construction plants are materially reduced. These are the conclusions of the engineers of the Miami Conservancy District, who are purchasing electric current equivalent to about 8000 hp. for the work on the five dams and the two channel-widening operations by which the floods of the Miami Valley will be controlled.

No greater utilization of electric power has been made in engineering construction than in the Miami Valley. No other construction operation has employed electricity as extensively for so many purposes and for actuating motors of such varied size. Current is consumed for some twenty purposes. The motors operated vary from 5 hp. to 500 hp. All types of machines—excavators, pumps, screens, mixers, compressors and shop tools—are motor-operated.

Grasp of the reasons influencing the adoption of electric power requires first a clear understanding of the scope and character of the construction operations. At five points, as numbered on the general map, Fig. 1, flood-retarding basins are being created by building dams. At two more points, numbered 6 and 7, river channels are being widened and deepened and confined by levees. Six of these operations are grouped within a rectangle of approximately 20 x 45 miles, in which is situated Dayton, Ohio, the headquarters of the flood-control operations and the location of a modern electric power plant of large capacity. The seventh operation is at Hamilton, another important center, with local power plants of ample capacity to furnish the amount of power required.

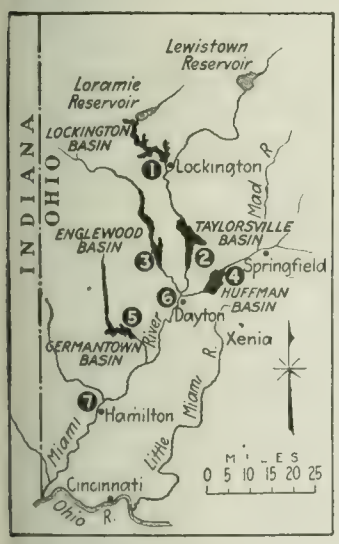


FIG. 1. SEVEN MAJOR CONSTRUCTION OPERATIONS

The five dams are earth embankments pierced by concrete conduits and spillways. Construction of the embankments is largely by hydraulic filling, which calls for large and powerful pumping plants. Excavating machines are required, however, for stripping, for trenching cutoffs, digging cuts for conduits and spillways, taking out borrow pits and for miscellaneous excavation and embankment work. The largest of these excavating units are the 280-hp. dragline machines. For the concrete work there are gravel screening and washing plants, mixing plants and derricks for handling forms and concrete. There are numerous unwatering pumps and well drills, and small equipment for various purposes. The channel operations require mainly outfits of heavy dragline excavators of 250 hp. or more. At each dam a workman's camp requires power for shops and for pumping the water-supply. At one of the camps there are an ice-making plant, a bakery and other equipment for the commissary service. At all camps the cottages, bunkhouses and other service buildings require current for lighting and domestic uses.

About 10,000 hp. is required at all the seven operations, not including haulage by steam locomotives, gasoline motors, motor trucks and tugboats. The division of this total among the several operations varies with their relative progress. At each operation, also, the purposes for which power is required, and to some extent the amount of power, vary with the stage of construction. For example, at each of the dams when concreting is finished, which is comparatively early in the total construction period, much of the concreting plant is dismantled. Meanwhile, as the concreting outfits go out of commission, hydraulic filling begins and increases to a maximum. At all operations the points of power consumption are in part fixed and in part mobile. Excavators, derricks and unwatering pumps are constantly shifting positions, while the water-supply, gravel washing and screening and shop plants remain in one place throughout their service. Finally, since there is interchange of plant units between operations, the same kind of power is essential for all, except perhaps in the case of isolated subsidiary operations.

Why Electric Power Was Adopted

The decision to purchase electric power from commercial central stations was made after thorough consideration of steam and gasoline power generated at individual units. As a matter of fact, a considerable amount of steam-operated equipment is used because it was most suitable for certain isolated points or because war conditions prevented obtaining the electric equipment when needed. The Dayton Power & Light Co. had a plant of 60,000-hp. capacity serving many transmission lines radiating through the territory, and was outfitted and stood ready quickly to build the additional lines required for the flood-control construction operations. Ample current was available to meet the demands of this work.

Electric power presented advantages in adaptability. Current was necessary to light the camps and the construction operations, and was also desirable for many minor power uses. Steam power would have necessitated a generating plant at each camp to supply this current; with electricity the lighting and domestic power problem became simple. Neither steam nor gasoline power presented any superiority in applicability. In fact, in certain applications motors were greatly superior. For operating centrifugal pumps, of which many of numerous sizes are employed, electric motors promised to be decidedly more effective and compact and could be more easily removed in case of floods during construction.

Reliability and economy of power were major con-

siderations. The modern central station, with its several interlocking units, each large enough to generate all the power required, would rarely default in maintenance of supply, it was reasoned. Cutouts in transmission were regarded as a small hazard, and the power company was equipped to restore current with minimum delay. It was believed that induction motors of the sizes wanted for construction equipment would compare in reliability with any steam or gas motor commonly employed. In brief, electric power, it was considered, presented less hazard to continuity of supply than was likely to arise in fuel delivery and boiler and engine breakdowns if steam power were used.

In respect to economy, the comparison was between the high equipment cost, the better utilization of fuel and less attendance required by electric power, and the lower equipment cost, poorer utilization of fuel and greater attendance required by steam power. The mechanical horsepower cost at the machine was not greatly different.

With the factors which have been named balancing somewhat evenly in the aggregate, electric power appeared to be more easy to serve to the machine. For example, a dragline outfit working in the river at Dayton required simply a central transformer station on shore and an individual scow-mounted transformer at each machine. At the dams a central transformer station and several smaller transformer outfits serving individual machines or a group of equipment met the requirements. The superiority of electric-power service appeared evident when contrasted with the transportation of coal to all of these individual machines and groups of equipment over railways and construction roads and across country, its unloading and reloading, and its service from piles and bins. The gain in mobility of equipment also would be material. With motors connected directly to the pump shaft, an unwatering pumping outfit could be mounted and housed on a single frame and hauled by a truck or shifted by a derrick as a unit. In case of the large hydraulic-fill outfits, which must risk overflow at flood seasons, a derrick would lift out the motor when danger came and replace it when the danger had passed, so that pumping might proceed with comparatively little damage to be repaired.

With electric power chosen, distribution and motor equipment were problems to be determined and solved. The central station produces three-phase, 60-cycle, 6600-volt alternating current. This voltage is too low for economical transmission and too high for direct use at the construction operations. Transformers were therefore essential factors of the problem. The determination was to step up the current at the station to 33,000 volts and at each operation again to transform it first to 2300 volts for job distribution and again by local transformers to 440 volts and 220 volts for delivery to the machine motors or for lighting and camp uses.

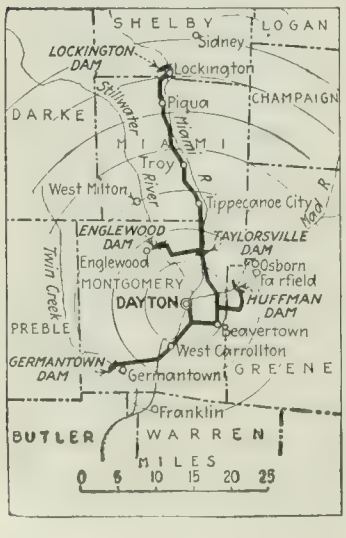


FIG. 2. POWER TRANSMISSION LINES

Transmission lines had in large measure to be constructed to serve the several operations. These lines are indicated by the map (Fig. 2) on which arcs are drawn five miles apart. The longest transmission, to Lockington dam, is nearly 40 miles. The lines are of the usual three-wire type, using wood poles, steel cross-arms and porcelain insulators. The poles average 25 to the mile; every fourth pole is grounded. Bare copper wire (No. 00 on trunk line and No. 2 or No. 4 B. & S. gage on branches) is used. Line construction was completed for the most part early in 1918 and was performed by the forces of the power company.

Distribution of power concerns the constructor most directly. In general features it was similar at all operations, and is best explained by description in detail of the equipment at Englewood, the largest of the five dams, where about 3000 hp. is required. The substation is located on high ground, which is the practice at all operations, for two reasons: (1) To keep the station well above freshets and (2) to isolate it as a safety measure. It comprises a lightning arrester, a switch tower, a 33,000-voltmeter, and six 400-kva. 33,000-2300-volt transformers.

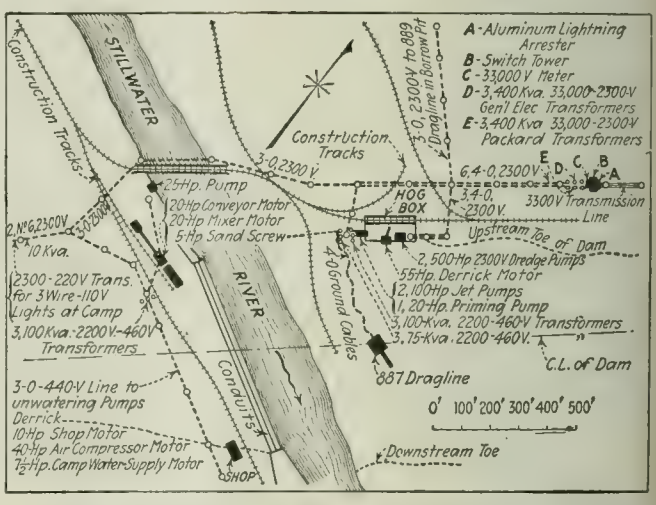


FIG. 3. ELECTRIC POWER DISTRIBUTION SYSTEM, ENGLEWOOD DAM CONSTRUCTION

Distribution from the substation to the various equipment motors is clearly indicated by the plan, Fig. 3. The bulk of the current, and also the heaviest current, go to the 15-in. dredge pumps, each operated by a 500-hp. 2300-volt motor. Ultimately, when two booster pumps are installed for high lifts, 2000 hp. will be consumed for pumping. Except the pumps for hydraulic fill, all machines are operated by 440-volt motors, the 2300-volt current being stepped down by transformers, located as shown by the drawing, except in case of the borrow-pit dragline excavators. For these a portable transformer is shifted with the movements of the machine. Each dragline has a 200-hp. hoist motor, a 75-hp. swinging motor and a 3-hp. air-compressor motor for working the air brakes and friction clutches. All transmission lines are on poles except the take-off cables for the draglines, unwatering pumps, well drills and some other mobile equipment. For these, ground lines of insulated, waterproof, armored cables are used.

Smaller power capacity is required at each of the other operations. Power is purchased at rates based

on the current used and on the maximum demand for current during the month, all current being metered. The meters, located at the main substation, are a graphic-recording maximum-demand meter and a polyphase kilowatt-hour meter. A portion of a record from a maximum-demand meter is illustrated, Fig. 4.

Safety received careful attention. All transformer stations are fenced in and conspicuously marked with danger signs. The voltage of every line is indicated by the color or the shape of the insulator fixtures, so that a lineman knows at a glance the voltage with which he has to deal

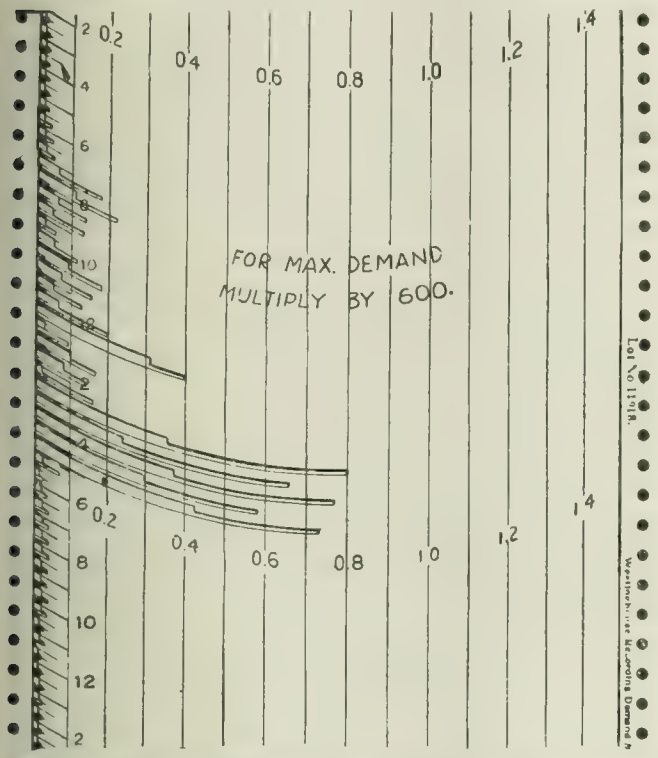


FIG. 4. MAXIMUM POWER DEMAND CHART, TAYLORSVILLE DAM, FOR ONE DAY

The numerals at the left indicate the hour of day; the graph line shows the demand for half-hour periods; the numerals across the chart are multipliers used in computing the maximum demand; 0.8 × 600 = 480 kilowatts, maximum of power used Oct. 26, 1918.

Choice of motor equipment involved a number of problems. The current available pointed to alternating-current motors. Induction motors, moreover, are particularly adapted to construction work. They are mechanically simple and durable; they withstand rough handling and dust and mud, and they require a minimum of attendance, which may be comparatively unskilled. For the majority of uses a constant-speed motor was preferable, and squirrel-cage type induction motors met the conditions. The dredge pumps, dragline excavators, derricks and other similar equipment called for variable speed, and slip-ring motors were chosen.

Since the dredge pumps require the greatest amount of power for the longest time, particular study was given to the choice of the pump motors. Variable speed was essential, and choice lay between direct-current motors and slip-ring alternating-current motors. The former required additional apparatus to convert the current, but were more economical to operate; the latter saved the additional investment but had a higher operating cost. Balancing the two sets of charges, there was left little advantage to either type of motor. Choice, therefore, became a question of relative advantages in operation. The direct-current motor was more complex and required a more skilled attendant, besides involving the operation of the additional apparatus. Consideration of these reasons led to the selection of slip-ring alternating-current motors running at 350 to 500 revolutions per minute.

Besides mechanical efficiency and economy, salvage value and interchangeability were important factors. Sizes and kinds of motor were purchased which would

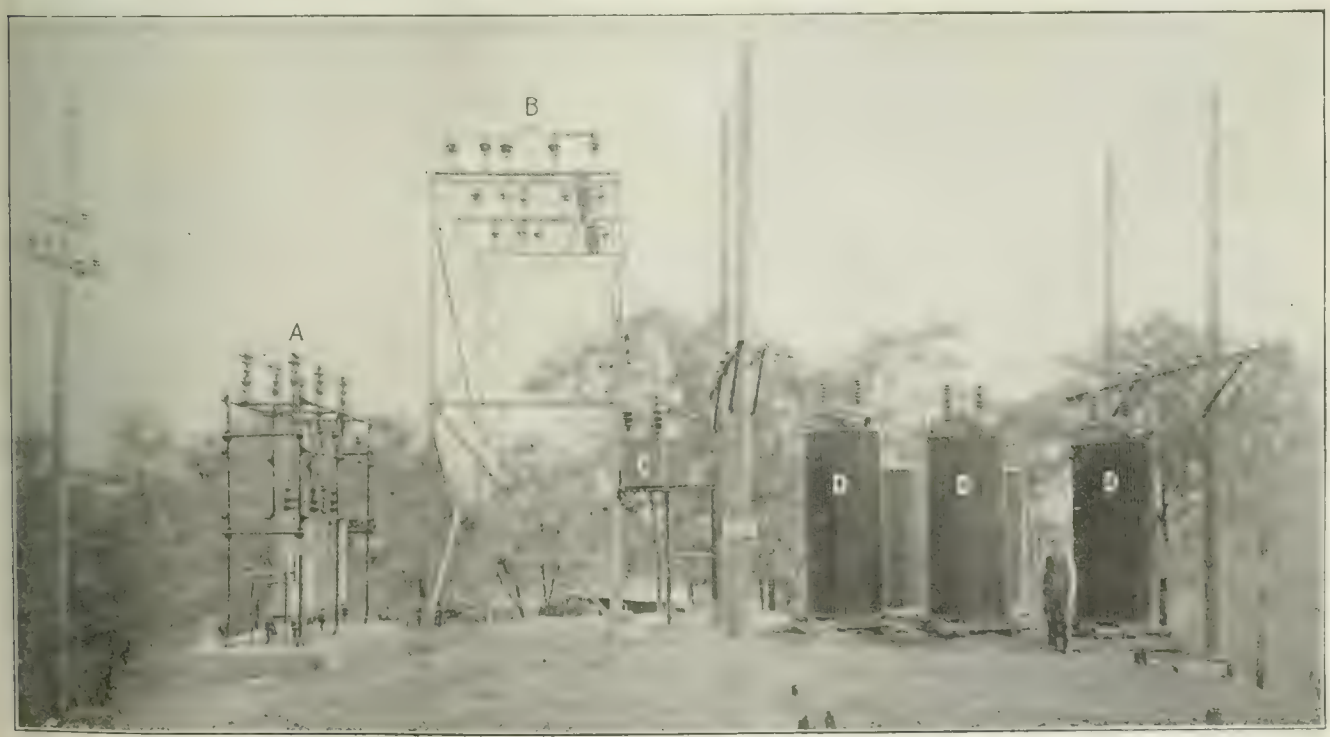


FIG. 5. SUBSTATION UNDER CONSTRUCTION FOR ENGLEWOOD DAM

A, aluminum lightning arrester; B, switch tower; C, 33,000-volt meters; D, two sets of three 33,000- to 2300-volt transformers

bring the largest second-hand prices at the completion of the work. To permit transfer of motor equipment from machine to machine or from one operation to another, and to reduce the variety of spare parts kept for replacement, the same makes and sizes of motors were desirable.

Lower cost per mechanical horsepower at the machine is not the factor that determined the choice of electric power for construction equipment in the Miami Valley. With all costs on both sides fully presented, electric power is not much, if at all, less expensive than steam power might be. The superiority of electricity lies in the facts that it clears the construction operations of the multitudinous tasks of distributing fuel, and reduces the number of workmen to be recruited and directed. It also conserves fuel, an object of consideration when the power was planned, and later, when the war had developed, an object of vital importance. Fuel efficiency at the central station is between 14 and 15%. Transmission and motor losses reduce the efficiency to perhaps 12 per cent at the machine.

The small boiler and engine outfit on construction work rarely gives an efficiency exceeding 4½%. Absence of workmen serving equipment is so noticeable that it invariably excites comment from visitors familiar with construction operations, and this is due in large measure to electric operation. These advantages, rather than the lower cost of mechanical power, are the chief reasons for the employment of electrical construction equipment.

Construction is by force account by the Miami Conservancy District, of which Arthur E. Morgan is chief engineer; Charles H. Paul is assistant chief engineer, and C. H. Locher is construction manager. Frank Harvey is the electrical engineer.

Determining Bearing Value of Alloys

According to the subcommittee on bearing metals of the Research Committee of the American Society of Mechanical Engineers, the only mechanical or physical test of a bearing alloy that can serve a useful purpose is to find whether the alloy has a sufficiently high factor of safety against possible distortion or rupture under specified service conditions at service temperature.

Their studies have convinced the members of the subcommittee that without the application of modern metallography any investigation of this subject is a waste of time. For example, it is entirely due to the dissimilarity of crystals in bronze that it makes a better bearing alloy than brass. The essential characteristic of all bearing alloys is a structure made up of alternately hard and relatively soft microscopic particles intimately mixed. The softer crystals are more readily abraded, and therefore wear slightly below the surface of the bearing crystals, and thus form slight depressions which serve for the retention of the lubricant.

The subcommittee makes the suggestion that a bearing metal may be defined as an alloy that is capable of retaining a lubricant on a bearing surface. It believes that much more can be learned from a study of failures and in studying old bearings, together with their journals, than from accelerated service tests in laboratories.

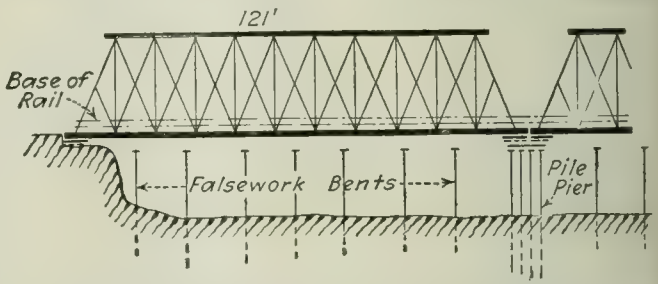
Timber Bridge Problems on the Alaska Railway

Standard Designs for 121-Foot Spans on Sheathed Pile Piers — Car Ferry in Place of Future Steel-Truss Bridge

TIMBER truss spans used extensively on the Alaskan Government Ry. consist mainly of 121-ft. Howe-truss through and deck spans of standard designs, with 56-ft. pony truss spans for small openings. Bridging Alaskan rivers involves careful consideration of flood, drift and heavy ice, especially in streams fed by glaciers, and these factors have to be reckoned with in regard to erection falsework as well as pier construction. As delivery of material is likely to be uncertain at points located far from a base of supply, arrangements have been devised for carrying a temporary deck on the falsework bents in cases where material for the trusses is delayed.

Douglas fir is used exclusively, except that Alaska spruce has been employed to a limited extent for temporary structures and a few small spans. Working stresses are taken at 1200 to 1400 lb. per square inch for bending and 1000 lb. for compression, in case of fire, and 800 lb. for bending in case of the native spruce. No allowance for impact is included in these stresses. Rods and bolts are of wrought iron of 50,000-lb. tensile strength, or of soft bessemer or open-hearth steel conforming to the structural steel specifications of the American Society for Testing Materials. All truss spans are designed for Cooper's E-50 loading.

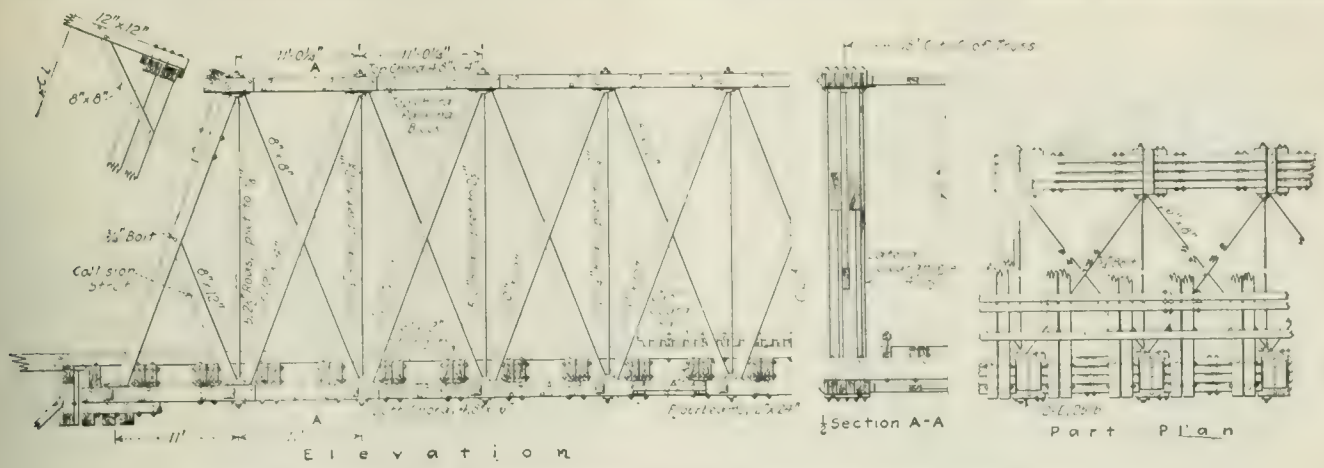
The general design and details of the 121-ft. through truss span are shown in the accompanying drawings. The top and bottom chords are composed of four sticks



TYPICAL 121-FT. TIMBER TRUSS SPAN WITH PILE PIER AND FALSEWORK, KNIK RIVER BRIDGE

8 x 14 in. and 8 x 16 in., respectively, with cast-iron angle blocks for the truss members and transverse steel channels as bearings for the washers of the vertical tension rods. Splices in the chord timbers are made with clamp bars having their ends hooked over lugs on clamp blocks bolted to the timbers. Floor-beams are pairs of 12 x 24-in. sticks, on which are track stringers composed of pairs of 8 x 12-in. sticks and single jack stringers of the same size. A camber of 0.126 ft. is framed into the truss by means of blocking under the panel points of the bottom chords on the falsework during the erection of the bridge, the final adjustment being made by the tension rods.

The piers have four rows of piles with diagonal bracing and have an outside sheathing of horizontal planks to prevent the lodging of ice and drift. In tidal waters, where the current may flow in either direction with changes of the tide, a pile cluster is placed 10 ft. above and below each pier to act as a fender and ice breaker. Falsework bents are arranged as shown in

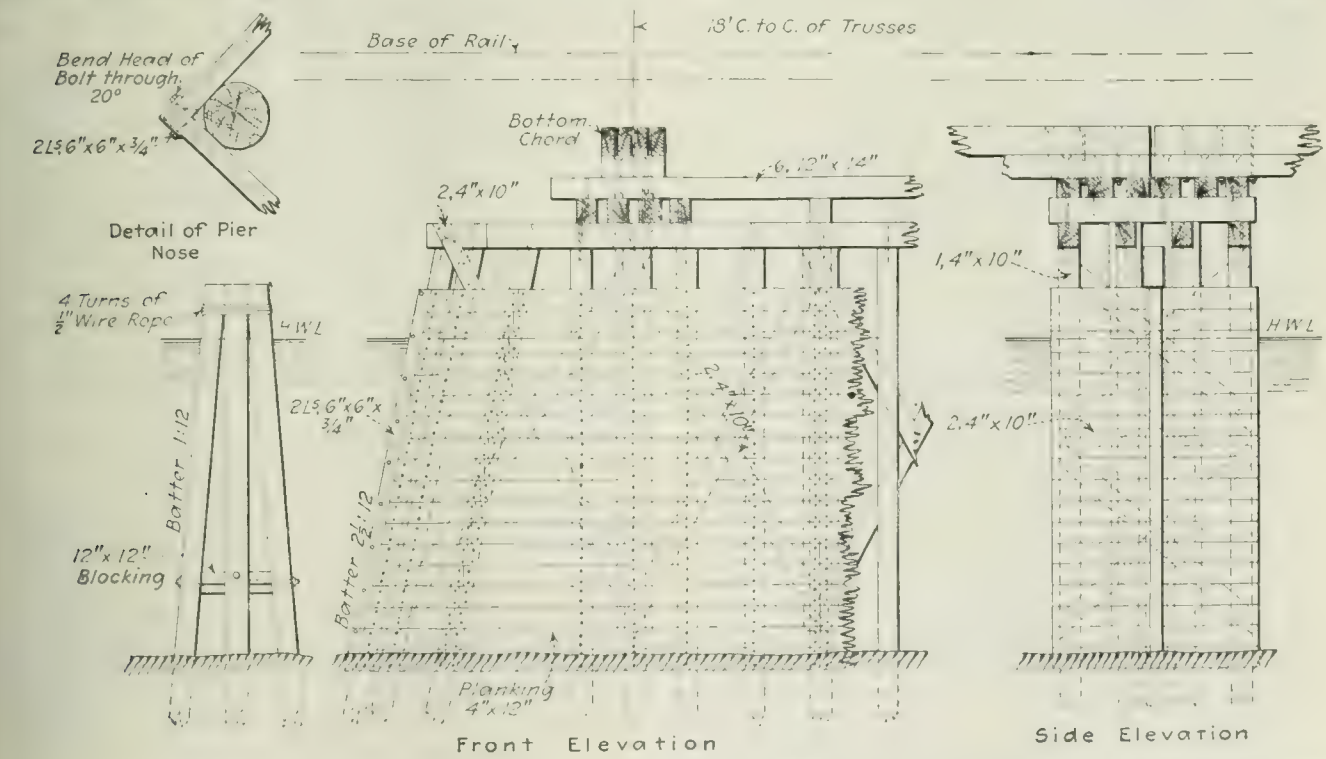


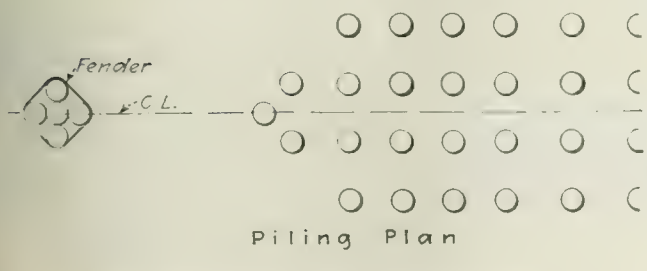
STANDARD DESIGN OF 121-FOOT TIMBER TRUSS THROUGH SPAN, ALASKAN RAILWAY

one of the drawings. Each bent has a 24-ft. cap, 12 x 12-in., driftbolted to four vertical piles which are spaced 14 ft. on centers for the inner and 22 ft. for the outer piles.

Carrying the floor or deck temporarily on the falsework bents is a special arrangement made in order to provide for handling traffic when material for the trusses is not at once available. Two lines of stringers composed of two and three sticks with ends overlapping are laid on the falsework caps, with a transverse timber across them at each bent. Upon these timbers is a second and similar course of stringers carrying the track ties. The ties, stringers and cross timbers are secured by loose bolts termed "drop bolts," which resemble drift bolts but are fitted to holes bored to $\frac{1}{8}$-in. larger diameter. This construction enables the temporary deck to be dismantled readily and without injury to the timbers.

Two of the larger bridges of this type, across the Knik and Matanuska Rivers, have six and five 210-ft. through truss spans, respectively. In these cases special provision had to be made for ice and floods, as both

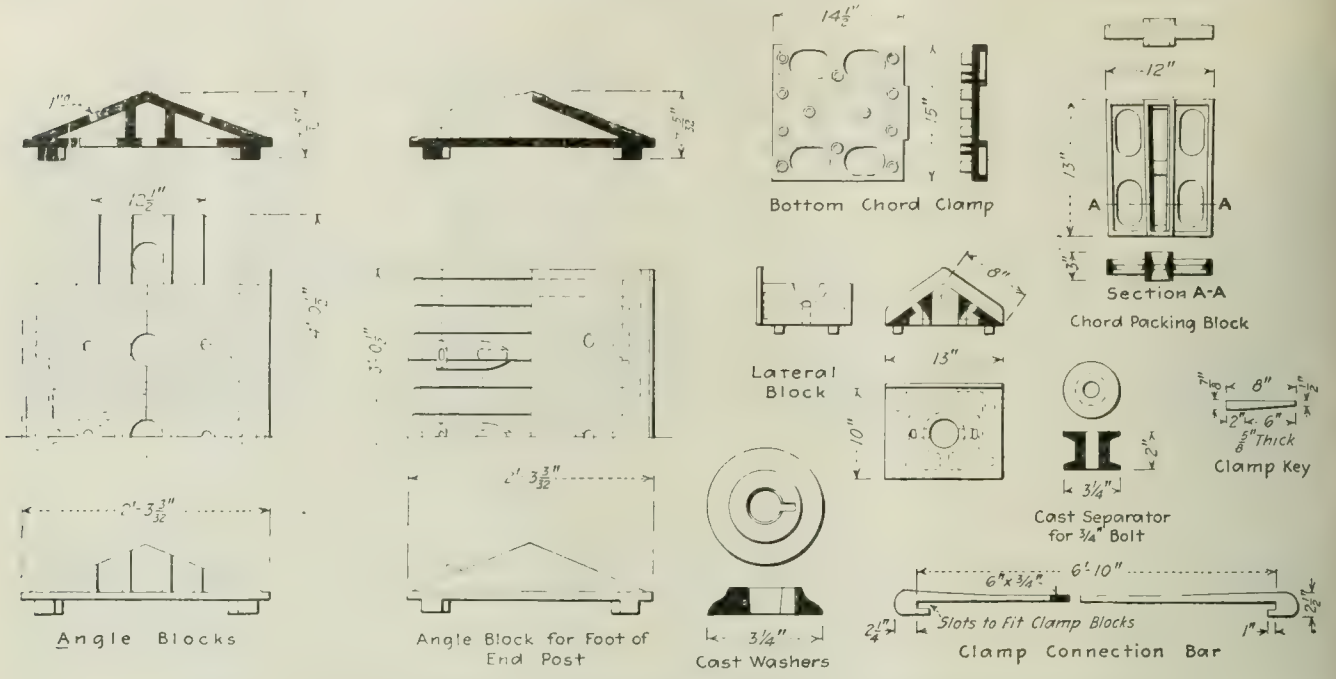




SHEATHED PILE PIER FOR BRIDGES

rivers originate from large glaciers and carry immense quantities of floating ice and drift at certain seasons.

The Matanuska River (or Chatonka, meaning "swift river") carries a large volume of water and quantities of driftwood. The Knik River (or Skidina, meaning "tent-house or summer-house river") comes from a glacier which has an extensive lake behind it. This lake overflows occasionally and breaks through the glacier, causing a destructive flood which covers the entire delta at the mouths of the two rivers. These floods occur generally during September and last from three to four



DETAILS OF THE IRONWORK OF TIMBER TRUSS USED ON THE ALASKAN RAILWAY

weeks. The two bridges are located close to the mouths of the rivers and frequently the current is upstream, owing to the high tides in Knik Arm, which is a branch from Cook Inlet. The extreme difference in level between high and low tides is about 42 ft. at Anchorage and more than this at the bridges, which are about 30 miles further up Knik Arm.

The largest bridge on the railway system will be that over the Tanana River at Nenana, where the width is over 800 ft. and soundings have shown fine sand down to a depth of 90 ft. This is to be a steel bridge on concrete piers with ice breakers, and probably a lift span will be provided on account of the river navigation. As this structure cannot be built for some time, it is proposed to establish a ferry to carry cars during the summer, while in winter a track can be laid on the ice.

All of this railway work has been under the direction of William C. Edes, until recently chairman and chief engineer of the Alaskan Engineering Commission. W. J. H. Fogelstrom is bridge engineer, and the construction is done by railway forces under his supervision.

Calculating Machines in Geological Survey

Extensive use of calculating machines in the work of the United States Geological Survey includes adding machines for totaling long columns of statistics and computing machines for a wide variety of purposes. In working up records of stream discharge, adding machines with a tabulating attachment can, in one operation, tabulate the daily discharge and determine the monthly average. In the physical and chemical laboratory of the survey the machines are found particularly useful in the computation of mathematical tables, the reduction of data of observations and the evaluation of physical constants by the method of least squares. For such work the machines are considered preferable to logarithmic tables when five or more decimals are required, as their use is found to impose less strain upon the eyes, while the mental effort required to operate the machine is generally less than that of making interpolations from a table.

Proposed Types of Vehicular Tunnel Under the Hudson River

Brief History of New York-New Jersey Tunnel Project—Traffic Estimates—Details of the Plans Being Considered

VARIOUS possible types and details of tunnel sections for the New York-New Jersey tunnel under the Hudson River are now under consideration, and a contract for further rock boring has recently been let. The following short historical sketch, together with details of various proposals, is taken from the report of an informal discussion at a meeting of the American Society of Civil Engineers, published in the *Proceedings* for May, 1919, p. 249. As the War Department restrictions require only a clear channel of 1000 ft., with 40 ft. depth, either the trench method or a subaqueous tunnel can be used.

According to the short historical account given by Edward A. Byrne, chief engineer, Department of Plant and Structures, New York City, although the construction of a bridge across the Hudson River had been agitated for many years it was not until 1906 that official action was taken by the States of New York and New Jersey. In that year both states appointed bridge commissions to report on the advisability of building a bridge. In 1913 additional powers were granted to the New York commission by the legislature, enabling it to direct its attention to tunnel construction; the New Jersey commission received like powers from the legislature of that state.

In February, 1913, Jacobs & Davies, consulting engineers, reported to the commission that a tunnel was entirely feasible. In January, 1917, a board of engineers consisting of W. H. Burr, Ralph Modjeski and G. B. Moran reported to the Public Service Corporation of New Jersey in favor of the construction of a tunnel by the trench method. In September, 1917, Gen. George W. Goethals was retained by the Joint Commission to report on the best type of tunnel to be built, and in November of that year he recommended the construc-

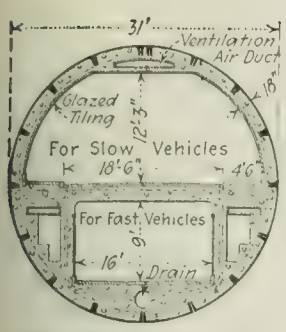
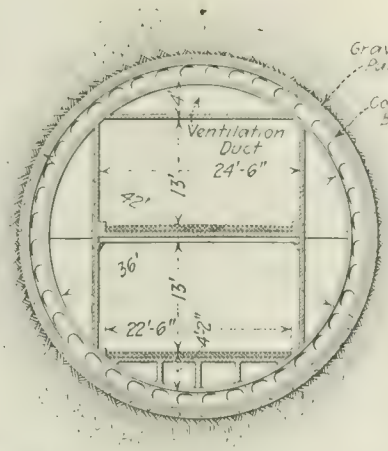
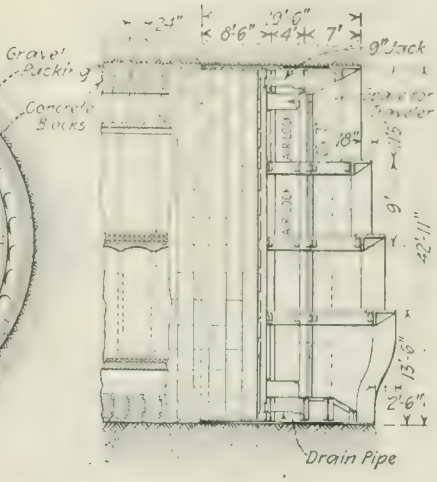


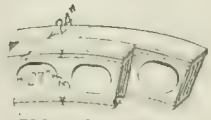
FIG. 1 - Jacobs and Davies 1910

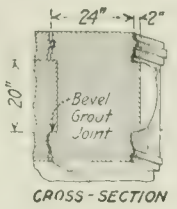




FIGS. 1 AND 2. TWO DESIGNS OF SHIELD-DRIVEN TUNNEL

FIG. 2 - O'Rourke's Modified Design, 1919





Details of Concrete Block

At left is a design of Jacobs & Davies for a medium-size tube, superseding the firm's original design for small tubes; at right is O'Rourke's revision of his previously published plans for a large tunnel and a shield to drive it.

tion of a single tunnel with two levels, using the shield method and precast concrete blocks.

Two tubes to be built by the shield method were recommended in the report by Jacobs & Davies, each having a roadway width of 17 ft. and a headroom of 12½ ft., the inner diameter to be 22 ft. and the outer diameter 25 ft. in each case, with the New Jersey terminal at Twelfth Street, Jersey City, and the new York terminal on Canal Street. For lining, cast iron was recommended, with a concrete facing. In 1910 the same firm prepared a plan for a two-level tunnel, a cross-section of which is indicated in Fig. 1 herewith.

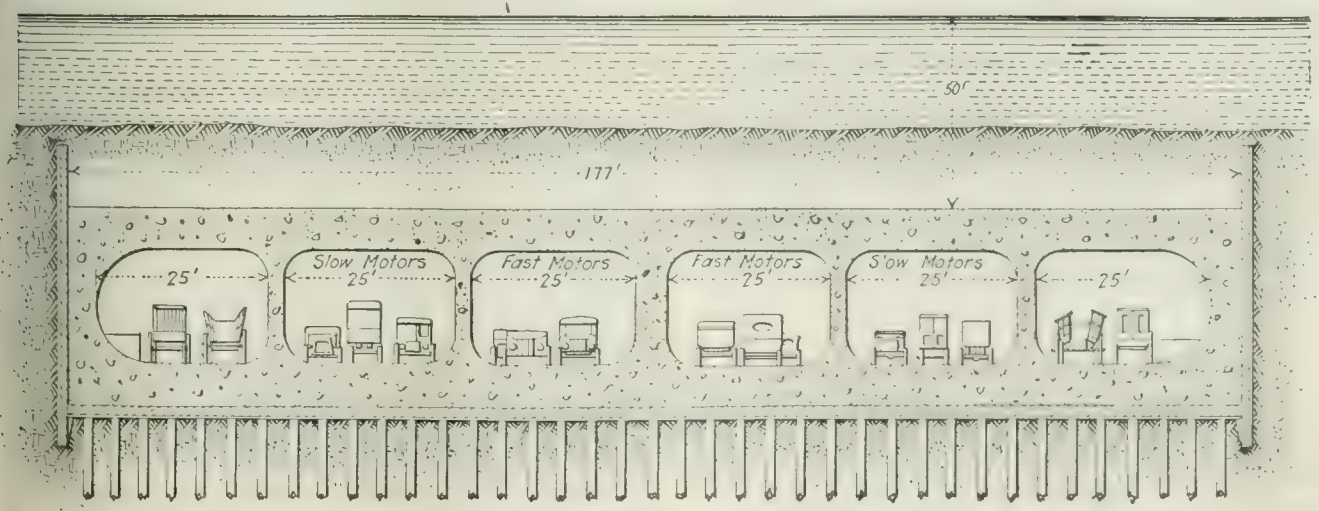
Mr. Byrne pointed out that ample headroom is afforded for each type of traffic. For example, the highest slow-moving truck is about 10 ft. 3 in high, for which a headroom of 12 ft. 3 in. is provided; the highest limousine automobile is 7 ft. 10 in., with headroom of 9 ft. The estimated cost at pre-war prices was $11,000,000. The total traffic capacity was given as 5,000,000 per year.

The Burr, Modjeski and Moran report, in favor of the trench method, recommended that the section in the river be of reinforced concrete resting upon timber piles. It was to be generally elliptical in section, the inner major axis 28 ft. 4 in., the outer axis 36 ft. 5 in.; the over-all distance from top of piles to roof 28 ft. 10 in. One roadway 17 ft. wide with headroom of 13 ft. and two foot-walks, one 5½ ft. and one 3½ ft. wide, were to be provided. The estimated cost was $6,899,000, and the traffic capacity 15,417,600 vehicles per year.

As stated by Mr. Byrne, the reconstruction commission of New York has invited criticism of the Goethals plan, the points raised being: (1) Is the type of tunnel proposed possible of construction? (2) After it is constructed, is it usable? (3) Are the estimates of cost anywhere near correct?

The unusual size of the single tunnel, 42 ft. outside diameter, as illustrated in Fig. 2 herewith, requires a special type of shield which has been designed by J. F. O'Rourke, consulting engineer and president, O'Rourke Engineering & Construction Co., New York City. This shield is divided horizontally into four sections, and has multiple air chambers in its forward part, as illustrated in the longitudinal section of Fig. 2. Details of the precast concrete blocks are also shown. General Goethals has approved this shield and states that it will do the work of excavating the tunnel.

The roof of this tunnel will be 50 ft. below mean low water, and the tunnel 9300 ft. long. General Goethals' estimate of cost is $12,000,000, and at a hearing before



PROPOSED SECTIONS FOR NEW YORK-NEW JERSEY VEHICULAR TUNNEL UNDER HUDSON RIVER

the reconstruction commission Mr. O'Rourke submitted a proposal to build the tunnel complete for $11,500,000 at the present war prices. The traffic estimate for this tunnel is 36,500,000 vehicles per year. A detailed description of the proposed shield, patented by Mr. O'Rourke, was published by him in *Engineering News-Record* of Mar. 21, 1918, p. 563.

In Fig. 3 is shown the proposed reinforced-concrete tunnel section recommended by T. K. Thomson and Francis L. Stuart, consulting engineers, New York City. In the discussion Mr. Thomson said that although the ventilation could be taken care of, yet separate compartments should be provided for foot passengers and horse-drawn vehicles, and for the fast and slow motor traffic. Asserting that the tunnel would rise and fall with the tide, and that the tunnel lining with the proposed concrete blocks would not be as strong as that of the Pennsylvania tunnels, for example, he said that it would be better to construct a tunnel which would always be rigid and in a state of equilibrium, and that this could be done by the open-trench method.

Trench Method Applied on Large Scale

By the dredging of a channel and the driving of an ample number of foundation piles to receive them the tunnel sections could be built on the surface like a boat, with bottoms, sides and roof of reinforced concrete say 6 ft. thick. The length of the sections could be 1000 ft. or more, and an air chamber could be provided below in order to permit any additional excavation, if desired, after the section had been sunk. He asserted that the tunnel could be placed at a higher level than a shield-driven tunnel, thus shortening the approaches by a thousand feet or more, and that, without costing any more to construct, it would have three times the capacity of the shield-driven tunnel.

Amos Schaeffer, consulting engineer, Borough of Manhattan, New York City, after saying that two smaller tunnels could without doubt be shown to cost less than the larger one, went into details regarding the capacity or traffic requirements. Reviewing the assumptions upon which the capacity of 100,000 vehicles per day claimed for the one large tunnel was obtained, he concluded that the capacity of the proposed tunnel is greater than necessary for the present needs of traffic and of the immediate future, since the assumptions were based upon a 24-hour day, whereas a 12-hour day is the longest that could be used as the time basis. Claiming a margin of safety of not less than 100% for reduced spacings between vehicles of 30, 40 and 60 ft. for speeds of 3, 9 and 15 miles per hour respectively, he finds a capacity of 74,000 in both directions, based upon a 12-hour day and six lines of traffic. If traffic should increase 8% per annum over the 8000 vehicles per day assumed for 1922 at the completion of the tunnel, there would be 37,160 vehicles per day in 1942; or, 20 years after its completion only about one-half its capacity would be required.

Motor-Express Route Tariff Sheet Adopted

A motor-express route tariff sheet has been promulgated by the Highway Transport Committee of Douglas County, Nebraska, and has been adopted by the State Public Utilities Commission. It is believed that this committee is the first organization in the country to compile and have adopted such a tariff sheet.

Rough Field Tests for Concrete Sands

IN REMOTE places it is sometimes difficult to make proper quantitative tests of the various sands available for concrete work. In some operations for the Hawaii Loan Fund Commission, A. O. Rose, who was then assistant engineer of the commission, developed a bending test which he considers gave him values of importance in the particular case.

The isolated location of various structures, the high transportation costs, and the questionable quality of certain local sands, made it necessary to determine the relative suitability of the materials available for certain contemplated structures. These materials were a fine, black beach sand with rounded grains, a gray, volcanic sand, San Diego sand used as ballast by vessels from California, and fine grit from the crushing of blue lava rock.

Test bars 1 in. square in section and 12 in. long were cast of 1 : 3 mortar mixture, using a standard brand of portland cement and the various sands mentioned. At the end of a seven-day period the bars were tested to destruction as beams with a 10-in. span and a concentrated load applied midway between the supports. Knife-edge supports were approximated by the use of triangular sections of hard wood, and concentration of load at the center of the span was obtained by applying weight to a round iron ¼-in. rod placed across the top of the beam at the center point. Load was applied by slowly pouring sand into a bucket supported beneath the beam by hooks attached to the iron rod. The weight causing failure was determined, and the tensile strength of the mortar was then obtained by computing the extreme fiber stress at the lower edge of the test bar.

The general results obtained from these tests are:

Material	Mixture	Tensile Strength, Lb. per Sq.In. Low	High	Average
Portland cement	Neat	545	747	660
Black beach sand	1:3	54	134	96
Volcanic sand	1:3	130	242	177
San Diego sand	1:3	144	314	232
50% crusher grit 50% volcanic sand	1:3	149	228	208

Although the beach sand noted above was in general use for concrete work, its use on the work was prohibited on account of the heavy loadings involved. Volcanic sand and crusher grits were used for the greater portion of the work, the San Diego sand being relatively expensive and the crusher grits alone requiring admixture of other fine aggregate at times, to secure proper consistency of the concrete.

Cheyenne Corner Gutters Depressed

Depressed gutters around corners from cross-walk to cross-walk are installed in many of the main streets of Cheyenne, Wyo., to carry the storm water, as storm drains have only recently been authorized by a $300.000 bond issue voted upon favorably July 27. Water is carried across streets under the crossing, a flat arch of corrugated iron covered with concrete forming the wide and low conduit. The corner gutters are about 2 ft. wide and 4 to 6 in. deep, the outer curb being level with the road. Most of the construction was put in before the advent of the automobile, for the gutter forms a serious hazard to the reckless driver who cuts corners. The 80-ft. width helps. No streets are paved, for the natural disintegrated granite when shaped and then watered makes an ideal surface during all kinds of weather.

Principles Underlying Determination of "Fair Value"

Report of the Committee on Valuation of the American Electric Railway Association Defines Bases for Appraising Public-Utility Properties for Rate Making

The following is the report, in full, of the Committee on Valuation of the American Electric Railway Association, which will be presented at the convention of the association this fall, in Atlantic City. The report has been made public by the Executive Committee of the association. The Committee on Valuation consists of Philip J. Kealy, chairman, George Weston, W. J. Harvie, B. E. Tilton, J. N. Shannahan, W. H. Sawyer, Charles E. Bailey and Martin Schreiber.—EDITOR.

THIS report is predicated upon the assumption that public utilities in the future will be regulated by national, state and municipal authorities to the extent necessary to insure good service to the public and to provide a sufficient income to cover the costs of the service, including fair wages to labor and a fair return upon the investment. The rate of investment return should be such as will attract investors and the security of the investment should be placed beyond question so that the companies may obtain, at minimum rates, the capital required for the extensions, betterments and improvements necessary to keep pace with population growth and future transportation requirements. It is further anticipated that public service commissions and other interested governing bodies will recognize the opportunity that the present emergency affords them to perform a good and useful public duty by safeguarding the integrity of utility investments and by establishing methods that will insure good service to the public. They should be as liberal in their dealings with the companies as the urgency and gravity of the present general situation demand, and a proper consideration of the public interest and general economic stability will permit. On the other hand the companies should only ask for such treatment as a fair analysis of the conditions warrants, and that they can with propriety and reasonable assurance defend.

How Shall "Fair Value" Be Determined?

Two very important items involved in determining the proper rates of fare that any company may charge to produce an adequate gross income are the "fair value" and "rate of return" to be allowed upon such value.

In view of the great importance of the item of "fair value," in rate making negotiations, the association requested the valuation committee to prepare, at the earliest possible date, a report setting forth its recommendations as to the proper procedure to follow in determining "fair value." It was the hope that through the work of this committee, representing practically all of the street railway companies in the United States, there could be evolved a method of valuation based upon safe economic principles, and acceptable to investors, public utility commissions and other public rate making bodies. In attacking this problem your committee realizes the many conflicting opinions that have prevailed and the many mistakes that have been incorporated in public utility valuations in the past. However, it is the unanimous opinion of the committee that it is the earnest desire of all interested parties, the courts, public utility commissions, municipalities and other governing bodies, as well as the companies, to evolve a method of arriving at the fair amount of capital upon which to base a return and that this can be accomplished by the application to the problem of common sense business methods.

There can be no question but that the investor in any public utility serving the public is entitled to a fair return upon his investment until it has been returned to him. Accepting this principle as an "axiom" every dollar spent in creating the property including the individual efforts (the equivalent of money) of the promoters, organizers and builders of the property, and including the superseded property unamortized out of the earnings of the road, should be included in the "fair value," also, an investor in a company is entitled to a reasonable return upon his actual original investment, plus the appreciation of the property, including its value as a "going concern," as compensation for his "initial risk" or "hazard" and his skill in successfully operating the property. In other words, an increase in capital value is the same as an increase of new capital.

General Principles of Valuation Stated

With these general premises in mind the committee makes the following statement of general principles involved:

1. Where "original investment" is used as a basis of "fair value" and complete "original cost" data, covering all expenditures including promotion, organization, cost of financing, contingencies, etc., are available, there should be added to these original cost figures any appreciation, including a fair value for going concern, and there should be no deduction for unamortized superseded property or for accrued physical depreciation in a well maintained property.

2. Where full and complete original cost data are not available, the "cost to reproduce new" method should be used. An inventory of the existing property should be made using prices as of the date of the inventory. This date should coincide with the time the valuation is being made, the prices being expressed herein as "prices of today." To this "bare bones" inventory and unit price summation should be added the proper "overhead" percentages, "going value" and other development costs to complete a full "fair value" for "rate making purpose," and there should be no deduction for accrued physical depreciation in a well maintained property.

It is seldom that the older properties have a complete, reliable record of total actual expenditures and therefore it has become the almost universal practice to inventory the existing property and apply unit prices to the different items of construction.

In some cases, valuations have been made upon several different bases: (1) Original cost data. (2) Reproduction cost with prices as of dates of construction. (3) Reproduction cost with price as of today. (4) Reproduction cost with prices averaged over several years.

In all cases the proper overhead charges and development costs should be added to determine a fair value for rate making purposes.

Items to be considered in estimating fair value for "rate making."

(a) Promotion expense	
(b) Organization expense	
(c) Brokerage	
(d) Construction costs	(Based upon actual property inventory at prices as of the day and date of inventory.)
(e) Overhead direct charges not included in (d)	Engineering and superintendence. Storeroom expenses, cost of handling materials, clerks, general office help, contingencies. Contractors' profit. Carrying charges during construction. Taxes during construction. Insurance during construction.
(f) Going concern	(1) Cost of consolidation (2) Superseded property (3) Created value (4) Development costs
(g) Working capital	

Definition of Terms

Promotion Expense—The initial work necessary to start a public utility enterprise requires the time, effort and work of capable men to plan the proposed service, to show its public necessity, to estimate the possible business and prepare construction costs, gross receipts and operation expense statements, and the preliminary work necessary to procure franchises, etc. This work is a service of value to the public and represents a money value properly chargeable to capital account.

Organization Expense—An efficient organization must be carried during the formation and construction period consisting of legal, financial and business experience and ability to arrange for and carry on the details of company organization and the creation and construction of the property. This expenditure is a proper charge to capital account.

Brokerage—The money necessary to create the properties must be arranged for through sales of stock and bonds, and bankers or brokers are generally engaged to place the securities and collect the money as required. This means: The payment of commissions, preparation of mortgage, service of registrar (corporate and individual), service of trustees, cost of certification, revenue stamps, cost of recording mortgage, public service commission costs for approval, advertising, and other expenses, and this brokerage cost should be included in any investment estimate for rate making.

Construction Costs—A detailed inventory and classification of the existing physical property forms the basis of all "cost-to-reproduce-new" valuations, to which should be applied unit prices and costs or value as of the date of inventory. The value based upon present day prices is then in accord with the current rates of wages, the current cost of material and the current value of a dollar and is economically sound. To the "bare bones" inventory at unit prices must be added the direct and indirect overhead charges not included in the unit prices for rails, other construction materials, labor costs, etc., all as enumerated.

Overhead Charges—The items of direct overhead charges enumerated above should require no further explanation. The purchasing of the materials, their transportation, sub-delivery, accounting, inspection, etc., require supervision and direction and the effort of large forces of storeroom and general office help, inspectors and checkers, the cost of which is not included in unit prices.

The general and detail design of all parts of the property requires the work of engineers and architects and their assistants to prepare drawings, bills of material, working specifications and purchase contracts, take the general direction of the work in the field, make estimates of cost, progress estimates and partial payment estimates for all contracts and generally supervise the progress of all parts of the construction, the cost of which could not be included in unit prices.

During the progress of the work, cash must be provided to pay the current labor, material costs and partial payment contract estimates, and interest must be paid upon this capital as it is invested during the period of construction and before the property can earn a return. The same is true of taxes, and insurance, both fire and accident. Interest, taxes and insurance during the construction period are a part of construction costs and should be a capital charge.

In the building and erection of a large property many contracts are entered into for specific kinds of materials in quantities, special machinery, track work, buildings, etc., and the item of contractors' profit is one of the construction costs that must be included in "fair value" for rate making.

Contingencies an Important Item

The item of contingencies is an important one in any cost estimate whether it is to furnish advance information to financiers and promoters, or in connection with any large public improvement, or our own problem, "the establishment of a reasonable and just investment value." This item covers the uncertainties, commissions, additions and extras attendant upon any construction job, large or small, and among many other things, includes the following unforeseen but ever-present items of delay: Removal of obstructions, the appearance of conglomerate, hardpan, or solid rock in excavations where earth had been estimated, slides in open cuts, the removal and restoration of water pipes, gas pipes, electric wires and other underground improvements, underpinning of buildings, etc. The item of the removal of underground obstruction alone often equals 25 per cent of the total construction costs in subway work. To quote from the paper on "Overhead Charges" presented by Philip J. Kealy in the 1916 report of this committee, the following statement appears under the heading "Incidentals or Contingencies."

During a recent hearing before the Valuation Committee of the Interstate Commerce Commission, Mr. Holbrook, chief engineer of the Union Pacific Railroad, stated that after the completion of the Lucin cutoff across Great Salt Lake, he had his engineering staff estimate the cost of the work already completed and the highest estimate was 40 per cent. under the actual cost.

This item of contingencies is a real item of cost in every job and ranges from 10 to 50 per cent of the total cost and in some hazardous undertakings such as under-water tunnel or foundation work the actual cost is sometimes many times greater that the "bare bones" bill of material contract-specifications estimate of costs.

Going Concern—(Health of the Property). This represents the value that exists in a completed, matured, successfully operated property and embraces the items of "readiness to serve," a "built up successful business," etc., as compared with a new property in the course of

construction, or the immature condition usually prevalent at the beginning of its operation. Other development costs, including an amount equal to the deficiency of net earnings below a fair return upon the fair investment due solely to the time and expenditure reasonably necessary and proper to the development of the business and property to its present stage and not comprised in the valuation of the physical property are also involved in this cost.

Cost of Consolidation—In the past competing companies were granted franchises in the same community and duplication of operating organizations and other expenses resulted together in less efficient and more expensive service to the public. Under one management the public has benefited by a lower average fare, the more direct routing of cars and an extension of service for a single fare. Much time, effort and expense are usually involved in bringing about a consolidation. This development expense is of value to the public, and its cost is a proper charge to capital account.

Superseded Property—A public utility company is entitled to repayment for all of its property consumed in the service of the public. The ordinary replacement or renewal of property actually worn out in the service is charged to operating expense and is therefore amortized out of earnings. It is only when large replacements of property are made necessary by extraordinary changes of motive power such as from horse car to cable or electricity or both, or by wreckage due to violent storms, earthquakes or other unusually destructive calamities, or when because of improvements in the art, the general type of car or other property in service is replaced in large quantities that it becomes impracticable to amortize immediately out of earnings and new capital must be used. This new capital should be included in "fair value" upon which to base a return until such time as it has been amortized.

Created Value—This item covers an important element of value that properly may be a part of "going concern value." It represents the value due to the utility having been brought into existence and becoming alive and a vital part of the community. Having pioneered the growth of the city or community and enhanced the value of both private and public property, the utility itself should be justly credited with part at least of the value it so created.

Working Capital—Every business should have a "cash reserve" or "working capital" to "cushion" the rise and fall between income and expenditure, to carry the materials and supplies account, and especially to fortify it against any reasonable financial emergency that may arise. An adequate allowance for this item should be included in capitalization.

Bond Discount—This item has been set up as one of the problems to be considered in "rate making." A new public utility seldom sells its securities at par, but bond interest is paid upon par value and must be included in the rate of return. The question of "bond discount" has been considered in many public service rate cases and has been allowed as capital in some instances. In the majority of cases, however, it has been considered as representing prepaid interest and therefore a matter to be included in rate of return rather than to be capitalized.

The prevailing practice in making valuations for rate making adopted by public service commissions and other public utility supervising bodies in the past has been the "cost-to-reproduce-new-less-depreciation" method. There has been little argument between the companies and those representing the public about correctness of inventories. More differences of opinion have arisen with respect to unit prices, overhead and "going value" percentages, and the method of determining the amount of depreciation to be deducted

Depreciation has been classed by all students of the subject as an operating charge and not a capital account item. The only provision that can be made to take care of depreciation is by making proper repairs and proper renewals when necessary and these expenditures should be charged as an operating expense, that is, in the case of renewals the original cost of the thing replaced should be charged to renewals and any excess or betterment is a proper charge against capital. The integrity of the capital investment is thereby maintained against depreciation to the extent practicable or economically possible. An exact standard of percentage physically good to apply to any well maintained electric railway property is difficult to establish because this percentage will vary in different properties and is influenced by different types of property and equipment, the physical characteristics of soil and other local conditions, and usage. A property consisting of a large percentage of elevated or subway construction will show a much higher percentage of the total investment physically good than a surface electric railway property. Every public utility property should be maintained at 100% operating condition, but it is both impractical and uneconomical to maintain any property approximately 100% physically good. This is true for the reason that the physical per cent good of any property will vary from approximately 100% in the case of a new property, to 80% or less, in an older property, depending upon the age, the different stages of renewal cycles through which the property has passed, and the amount of additions and betterments.

Accrued Depreciation and Deferred Maintenance

There is a certain amount of total accrued depreciation that never can be taken care of in any operating, growing property. In other words, as stated above, the only practicable, economical expenditure that can be made to offset depreciation is to make repairs, and renewals when physically necessary. There is no fairness or logic in an attempt to penalize a company because it has not done the impossible. The full original investment remains in the property and the investor is entitled to a return upon every dollar until the investment is repaid to him. Where a property has not been kept in good physical condition and there is unmistakable evidence of "deferred maintenance" the subject should receive special consideration and if the property being valued has been a prosperous one in the past and the fact is in evidence that the money that should have been expended for renewals and repairs has been diverted to other uses of benefit to the company, the company should be required to make good this deferred maintenance, the cost to be charged to its individual account and not to operating expense.

If, on the other hand, it can be shown that a company carrying deferred maintenance has been well managed but that the income has not been sufficient to pay the increased costs of operation, franchise obligations and

interest and, in addition, properly maintain the property, then provision should be made in the rate adjustment to permit the company to earn the amount necessary to put the property in good operating condition.

Your committee wishes to emphasize its conclusions with respect to the subject of accrued depreciation in the strongest manner possible, as follows:

Where a property has been maintained in good operating condition and an appraisal is being made to determine investment value for "rate making" or for sale to municipality, state or government, no deduction should be made for accrued depreciation.

Mechanical Method for Determining Reactions in Continuous Girders

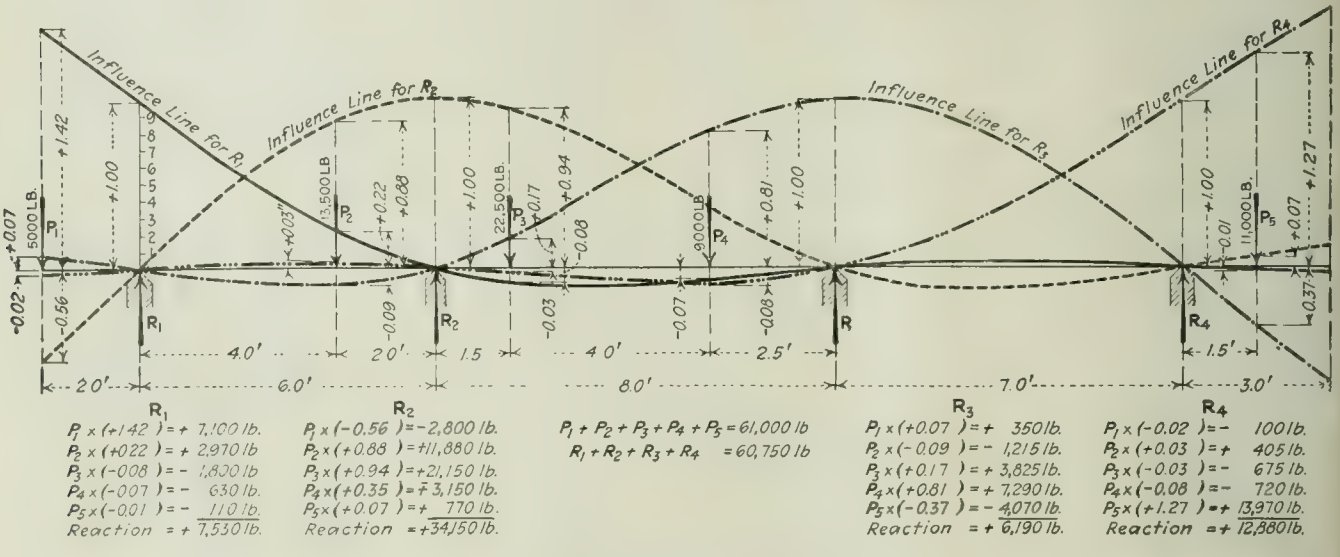
By R. Fleming
American Bridge Company, New York City

THE average engineer is called upon only at irregular and widely separated intervals to deal with some phase of the continuous girder. This necessitates his turning to a textbook and reviewing the subject, but the knowledge gained is forgotten by the time the subject comes up again. Prof. George E. Beggs of Princeton University has devised a simple mechanical method for determining the reactions at the supports of continuous girders due to concentrated or uniform loading. Within an hour after the professor explained the method to him, the writer had purchased a 3-ft. spline such as are used in drawing curves and was finding the reactions in the example herewith. The method may be described as follows:

It is assumed that the supports are on the same level and that the moment of inertia is constant. Lay out the supports and the loads in their correct relative position, and at each support lay off, perpendicular to the line joining the supports, an ordinate equal to unity, according to any convenient scale. Place the spline so that the upper edge coincides with the level of supports. Choose the support for which the reaction is first desired, and insert a pin at each of the other supports. At the chosen support press the spline upward until it reaches the top of the line unity.

The spline will take a curve, easily drawn by passing a pencil along the upper edge. This curve is the influence line for the reaction sought. At each load draw an ordinate to this curve. The length of the ordinate at any load, according to the scale used in drawing the unit ordinate, multiplied by the load equals the reaction from that load at the support without the pin. Distances above the line joining supports are plus and distances below are minus, and the algebraic sum of the reactions from the separate loads is of course the total reaction. In a similar manner reactions may be found at each of the remaining supports. Uniform loads may be divided into few or many concentrated loads, according to the degree of accuracy required.

This method is based upon the fundamental principles: First, that loads and deflections are directly proportional; and second, the Maxwell theorem of reciprocal deflections. The latter is applied to the beam with one support considered removed. For example, the reaction at R_2 for unit load at that point is unity, and is represented by the unit deflection. If, instead of a deflection of unity at R_2, any other deflection occurred at this point, the corresponding reaction R_2 would be equal to this deflection (times unity). According to Maxwell's theorem, the deflections at R_2 due to unit load in any position are given by the deflected position of the spline under that unit load. Hence the deflected spline with unit deflection at R_2 is the influence curve for the reaction R_2 due to unit load moving over the beam, provided the spline be of uniform cross-section and perfectly straight in its unstrained position.



REACTION FOR CONTINUOUS BEAM BY MECHANICALLY-DRAWN INFLUENCE LINES

In the example herewith the reactions R_1, R_2, R_3 and R_4 obtained from the curve are 7530; 34,150; 6190, and 12,880, while determined by the analytical method they are 7392; 34,304; 6782, and 12,524 lb. A closer agreement of the mechanical with the analytical method could have been obtained if the horizontal distances had been drawn to a larger scale (vertical scale unchanged).

Professor Beggs used a 10-ft. pole and nails, on a floor, to check the influence lines of the triple-span continuous-truss bridges on four supports of the Bessemer & Lake Erie R.R. over the Allegheny River near Pittsburgh. (This bridge is illustrated in *Engineering News-Record* of Feb. 22 and Mar. 15, 1917.) In an hour he checked within 1% results that had taken several days to determine by analytical methods.

Factors in the Selection of Pumps for Small Water-Works

Operating Economy Important Because of Financial Limitations—Various Types Reviewed—Some Cost Comparisons

Changes in type, the number of types now available, and the urgency for economy in water-works of limited resources, all combine to make timely and important the paper on "Engines for Small Water-Works," by Henry A. Symonds, civil engineer, Boston, Mass., printed in the "Journal of the New England Water Works Association" for June, 1919, and abstracted below.—EDITOR.

IN DESIGNING a plant for pumping water for a small community, it is usually the case that the per capita cost of operating and maintenance is greater than in the large city plants, and it is important that a careful study be made of the relative merits of the different forms of power available, their adaptability, first cost, and efficiency when operating to do the particular work desired.

It is usually the case that strict economy must be practiced in the introduction of these works, and studies relative to first cost have usually been made to bring the cost of the work within the ability of the communities to pay. Not so much attention, however, has been paid to the question of relative efficiency and daily cost of operation, and it frequently occurs that plants are in operation which the citizens of the town, and even the water-works officials themselves, believe to be highly economical, and that are the reverse. The difference in cost of operation may be so great as to make it good business to pay a much higher price for an economical unit.

Water Power—The early use of power for pumping water in the small-town installations was largely by water power or steam, and it is possible that water power is coming back into use for pumping purposes, but probably through the medium of the hydro-electric plants, as it is not common to find good water privileges so located as to be directly available for pumping from the approved sources of water-supply.

Steam Pumps—Steam has been used for many years very efficiently in many small plants.

Steam Turbines—The development of the centrifugal pump, which has now found so wide a field, was closely identified with the bringing out of the steam turbine.

The Ideal Small Pumping Plant

The centrifugal pump has been known for a great many years, but for a long time after it was invented the difficulty of getting suitable drive with sufficiently high speed retarded the development of successful operation of this type of pump. The real growth of this pump has occurred in the past ten years, during which time the use of the steam turbine and the electric motor with direct connection to the centrifugal pump has brought up the efficiency of the pump to a relatively high stage. At the present time the use of the steam turbine as applied to pumping water is mainly in the large units, and the motor is generally adopted for driving the smaller plants.

The result of the use of steam is, on the whole, satisfactory, but for the small water plants it is subject to the objections that the economical pumping machines with boilers are expensive and occupy much space, and provision for large storage of coal and adequate pumping-station buildings are required, all of which conditions add to the first cost of the plant and are aggravated by the fact that licensed engineers are required to operate such a station.

Today we consider the ideal small pumping engine that which is economical in first cost, and is self-contained; i.e., operates from a source of power which is part of the engine or at least located in the same station. It is desirable to have it occupy as small space as is practicable, be simple in operation and not require the services of licensed men, easily repaired, quickly started, using fuel which is readily available at all times, and be capable of producing power at a relatively low unit cost.

Electric Motor—Many of the conditions of an ideal plant are met by the electric motor, and the electrical installation has become more and more common. The advantages are: Low first cost; it requires little space; low cost of maintenance; no expert supervision; it is especially well adapted to drive centrifugal pumps with direct connection, which saves friction loss of gears, and prevents noise; it may have automatic control; it may operate during periods of low load at central station, thereby getting lower rates; instant starting; as it has no reciprocating parts, it can be left to operate without attendance better than any other form of drive. The use of electricity has two serious defects in the average municipal plant; namely, it is not self-contained, but depends upon a line of wires and a power plant, usually at a distance, for its operation. For this reason neither one nor two units in a pumping station operated from the same plant are satisfactory to the insurance authorities, as they rightly claim that an accident to the wire line or the power plant will put both units out of use as quickly as one and leave the town or city in an unprotected condition in case of fire.

Attendance the Large Item of Cost

The advocates of the use of motors base their claims of low cost of operation upon the fact that attendance may be a minimum and that this is really the large item in operating small water plants. The writer believes that this argument has considerable merit, and that the improvement in efficiency brought about recently in the centrifugal pumps, and the low cost of the pump and motor, with the advantages above referred to, make this form of pumping plant a very close competitor of, and in some cases it will be found actually to be a better business proposition than, the other types of pumps and engines in spite of the difference in efficiency.

Gasoline Engine—Another form of drive which has been used in some of the small pumping plants is the gasoline engine. This form of power has practically all the advantages above mentioned except cost of operation, and in this it falls down badly, as it is operated upon a fuel of such high cost as to make the operation per horsepower-hour too high for practical purposes in the ordinary municipal water-works. However, in plants where an emergency unit is wanted and electricity is not available or desirable for any reason, the gasoline engine may meet the requirements in a satisfactory manner.

Producer Gas—The gas producer as a source of power corresponds to the boiler in a steam plant. It has

a great many advantages, and when combined with a proper engine for utilizing the gas to the best advantage may be considered as having most of the requirements of the ideal plant. This form of power has been used for some time, and, so far as the writer has record, with good satisfaction in all cases. Gas produced in this way may be used in various types of internal-combustion engines with slight modification. A plant of this kind can be installed at reasonable first cost, is self-contained in so far the power is generated directly next to the engine itself, and operates at a remarkably low cost upon a relatively inexpensive form of coal. The plant takes up more room than some of the other types, and calls for a larger pumping-station space.

Fuel-Oil Engines—In the writer's experience, in nine cases out of ten fuel-oil engines have proved an ideal installation for plants from 25 to 150 hp., and for this reason it may be proper to give some extra details regarding this engine. The term "fuel oil" is here used to mean any oil, from the heavier crude petroleum up to kerosene.

Fuel-oil engines are to-day known under two general heads as Diesel and Semi-Diesel, or surface ignition.

Semi-Diesel Engines

The idea conceived by Diesel is the bringing into compression a mixture of air and oil vapor to a point where heat is generated sufficient to ignite the combination. The compression reached varies from 500 to 1100 lb. per square inch, but when the proper temperature occurs the gases burn rather than explode, and it is the claim of the producers of the Diesel type that this slower burning conserves the power of the gases, and the energy realized is utilized almost entirely in pushing the piston through the length of its stroke. In order to permit of the great pressure produced by this process, the machine must be exceedingly heavy, and the great amount of work which is required to perfect the Diesel engine makes it too expensive for the ordinary requirements of small water-supply plants.

The Semi-Diesel, or surface-ignition engine, on the other hand, gets its power by the explosion of a mixture of air and oil gas in the cylinder under compression around 200 to 300 lb. per square inch. While part of the energy is undoubtedly used in the shock against the metal of the plunger and cylinder, the resulting thrust produces motion of the piston, which is connected through the crosshead, or directly to a crank shaft which gives the motion to the driving pulley or gear.

The Semi-Diesel seems to meet all the ordinary requirements of the ideal engine described above, and while the first cost of this engine is considerably greater than that of the gasoline engine or the electric motor, the operating costs are so low that this outweighs in most cases the advantages of the low first cost of the other machines.

In the types which are considered as small pumping outfits, designed to pump the water for communities of from 1,000 to 10,000 inhabitants, the engines required ranged from 25 to 150 hp., but in the writer's opinion there is a large field for a still larger oil engine, and there are some machines now being produced that show wonderful efficiency in operation. They are of the Semi-Diesel type, but are able to operate on the poorest grade of fuel oil, and even tar products which have to be heated before it is possible to get them into the cylinders. The oil used runs as low as 18° Beaumé, while in the smaller machines—that is, below 60 hp.—the writer knows of good results with oil heavier than 26° Beaumé, and with 25- to 35-hp. engines kerosene or light oils of that grade have seemed to give the most satisfactory results. Pre-war prices ranged from 2c. to 7c. for the various grades.

The ordinary time of starting with fuel oil is from 12 to 18 min., but engines of this type may be equipped with apparatus which permits of instant starting by electric ignition and gasoline, the fuel oil being turned on after a few minutes, without interruption of the operation of the engine. This latter contrivance is of especial value where but little storage of water is possible and pumps have to be operated in case of fire, as the delay in heating the cylinder head may be serious if the supply of water is not available.

Electric Motor Versus Oil Engines

It is claimed by the advocates of the electric motor, in comparison, that the motor requires little attendance, while the oil engine calls for constant supervision. This claim is not entirely substantiated in practice, for many of the oil plants are operating for long periods of time without attendance. This of course assumes that there are duplicate units which will take care of any fire hazard if repairs are necessary. It should also be considered that constant attendance does not eliminate many of the breakdowns.

Perhaps the most satisfactory combination that can be installed for a small pumping plant for general municipal needs is made up of two duplicate units, of which it is probable that the fuel-oil engine meets the needs fully as well as any other drive which has been developed up to this time.

One advantage, of considerable importance in some cases, that steam machines have over most of the other types is in the varying of speed in operation. The speed in the electric motor and of the internal-combustion engines is variable only to a small extent, ex-

COMPARATIVE FUEL AND FIRST COSTS OF VARIOUS TYPES OF PUMPING PLANTS FOR SMALL WATER-WORKS

1,500 g.p.m., 250-ft. total head; operating 300 days per year, nine hours per day; theoretical hp., 94.7.

Pump	Drive	Pump Efficiency Per Cent.	Hp Required	Cost of Fuel per Hp. Hour	Total Fuel Cost Per Hour	Per 300 Days	Estimated Cost of Plant	Remarks
Vert. triplex	Fuel-oil engine	85	112	$0.004	$0.498	$1,209.60	$17,189	Guarantee—1 hp. for 0.55 lb. fuel oil per hour. Price fuel oil, 4c. per gal
Centrifugal	Fuel-oil engine	71	134	0.004	0.536	1,547.20	16,343	
Vert. triplex	Steam turbine	85	112	0.0075	0.840	2,268.00	13,657	Coal at $6 per ton (2,000 lb.)
Centrifugal	Steam turbine	71	134	0.0075	1.005	2,713.50	9,957	
Vert. triplex	Electric motor	76	123	0.0124	1.55	4,185.00	11,116	Efficiency is combined pump and motor. Electricity cost, 0.9c. per hp.-hr. plus "service charge" of 77c. per hp., based upon max. hp. in use, per month
Centrifugal	Electric motor	64	148	0.0124	1.84	4,968.00	6,248	
Cross-compound, fly-wheel, steam pumping engine						1,350.00	17,000	
Compound-duplex Deane steam pump (original plant). Rate about 700 g.p.m.						2,725.61		Actual figures of present cost. Rate of pumping about 700 g.p.m.

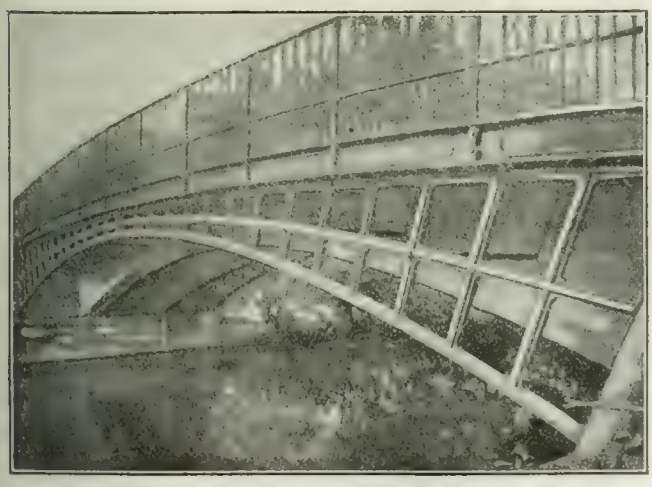
cept by change gears or belt pulleys, and it is sometimes necessary to pump to waste or through a bypass back into the suction, an uneconomical process, in order to keep the rate of delivery as desired.

The writer had occasion, a short time ago, to make a comparison of different types of pumping plants, to determine which plant would best meet the needs of a community. In connection with this, the results of investigation of different units were tabulated and are here given (see page 431). The figures are not to be considered as exact, either of operation or first cost, but are obtained by using quotations and guaranteed efficiencies by the manufacturers of the different lines of machinery. These figures were also taken before the extreme rise of prices which has occurred since we entered the war, and, while they are far above the averages of five years ago, it is probable that they are nearer what we may expect in the next few years than pre-war prices.

Historic Arch Bridges Strengthened

AS DESCRIBED in a short announcement in *Engineering News-Record* of July 17, 1919, p. 134, two historic cast-iron bridges in Shropshire, England, built by Thomas Telford nearly a century ago, have been strengthened for modern traffic. The four-rib arch structure in the parish of Stokesay, between Shrewsbury and Ludlow, was found to have two of the cast-iron ribs fractured at various points, as illustrated in the diagram herewith, reproduced from an article by the designer of the reinforcement, Major A. T. Davis, in the *Surveyor* for July 4, 1919, p. 3. The following details of the work are taken from this article:

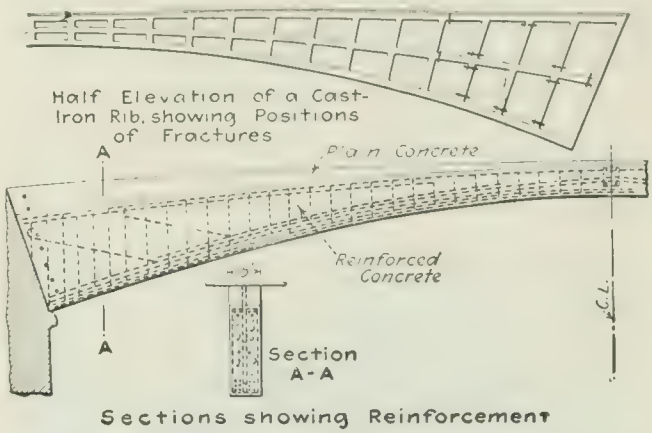
Various methods of making repairs were considered. Strengthening by flitching of fishplates was regarded as out of the question, partly because of the difficulty of boring rivet or bolt holes in the cast iron without causing undue weakness, and partly because of the difference between the elasticity of cast iron and of mild steel or wrought iron; more especially, however, because such treatment would not have increased the weight-carrying capacity of the bridge beyond that of its strength before fracture, which was certainly unequal to the requirements of the present day.



OLD CAST-IRON ARCH BRIDGE BEFORE INCASEMENT

As no evidence of damage was found in the two outer ribs, these were left untouched, thereby avoiding any noticeable alteration in the appearance of the structure. The two center ribs were incased in reinforced concrete, 18 in. wide, as shown. At the center of the span their width is increased to 3½ ft. at the top, and they are braced transversely by a 12 × 14-in. horizontal member.

The work was executed by the use of staging suspended from the outer ribs, the timbering being long enough and rigid enough to carry the weight of the concrete. It was also secured to the structure laterally for resistance to any flood pressure, owing to the fact that the River Onny is subject to sudden floods. The original intention was to strengthen one rib at a time, to enable the bridge to be used for ordinary light traffic first on one side and then on the other. Finally, however, it was thought better to avoid all vibration by diverting the traffic to a by-road a short distance away, and carry on the work on both ribs simultaneously. The bridge is now capable of bearing a rolling load of 30 tons on a 10-ft. wheel base.



METHOD OF REINFORCING WITH CONCRETE

The other, or Cound bridge, carries the main road between Shrewsbury and Wenlock across a tributary of the River Severn. In this case, also, two of the cast-iron ribs were incased in reinforced concrete.

The strengthening work was carried out in both cases under the plans and superintendence of Major Davis by Messrs. L. G. Mouchel & Partners, Ltd., of Westminster, England.

Motor-Vehicle License Fees in Massachusetts

Recently the legislature of Massachusetts enacted a motor-vehicle law in which the following license fees were established:

Capacity of 1 ton or less	$10
" 2 tons and over 1 ton	20
" 3 tons and over 2 tons	30
" 4 tons and over 3 tons	40
" 5 tons and over 4 tons	50

Note. For any capacity over five tons, $50 for the first five tons, and an additional amount of $10 for each additional ton or part thereof.

For all commercial trailers equipped with non-resilient metal tires, double the above fees shall be collected, and for electro-motor trucks and electric commercial vehicles used solely as such, and for all commercial trailers equipped with pneumatic or resilient metal tires, one-half of the above fees shall be collected. For the purpose of this act, the term "trailer" does not include a pair of wheels commonly used as an implement for other purposes than transportation.

Standard Lookout House Adopted for Forest Fire Service

THE North Pacific district of the United States Forest Service has adopted a standard house for construction on high lookout points and has erected eight such structures, the highest being that on Mount Adams, which has an elevation of 12,307 ft. The essential features of the house itself are a main living-room, 12 x 12 ft. with a band of glass windows on all sides, and a cupola 6 x 6 ft. in the roof, also surrounded by a band of glass, in which are placed necessary instruments and equipment for observation and report.

As a result of previous varied experiences, the conclusion has been reached that the only satisfactory type of house is one located on the extreme summit, which provides the lookout observer not only with a comfortable home, so that he is able to be on duty at all hours throughout the fire season, but which also enables him to keep under constant observation the area surrounding the station.



STANDARD LOOKOUT HOUSE, WASHINGTON NATIONAL FOREST

The walls and floors of the standard building are of double construction. Much more care is necessary in erection than with ordinary buildings, since driving rainstorms frequently occur at mountain summits and force water through cracks and openings never discovered in ordinary situations. Most of the houses constructed were shipped from Portland, Ore., ready-cut and fitted for erection, the various timbers and boards being cut into short lengths and tied into bundles convenient for packing. Only two pieces are longer than 8 ft., these two being 2 x 6-in. timbers 12 ft. long. The average weight of such a ready-cut lookout house bundled for shipment, and including hardware, bolts, guys for cable, nails, etc., is approximately 6400 lb. Each piece is lettered or numbered, and the corresponding letter or number is placed upon a blueprint for the guidance of the constructing officer. The house is guyed by cables attached to each corner.

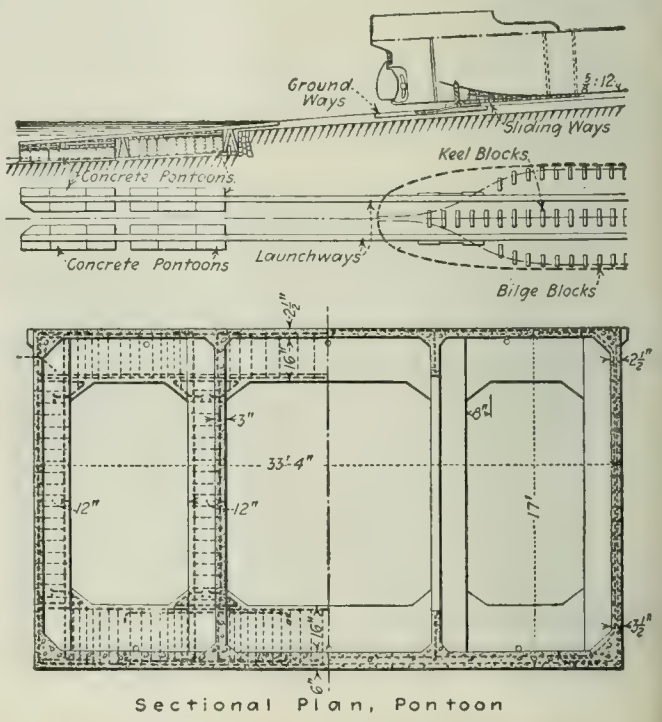
Ready-cut houses have already been completed, or nearly completed, at Mount Adams, El. 12,307, and Mount Saint Helens, El. 9675, in the Columbia National Forest; Kiona Peak, El. 6100, Rainier National Forest; Windy Peak, El. 4920, Mount McLaughlin, El. 9760, and Rustler Peak, El. 6200, in Crater National Forest; Huckleberry Mountain, El. 5500, in the Cascade National Forest.

The Rustler Peak house was placed upon a 12-ft. steel tower, the top of the mountain being somewhat round so that this additional elevation was necessary to obtain a good view in all directions.

The value of mountain lookouts as a means of detecting and locating forest fires has been thoroughly established by the Forest Service. The lookout man on the summit of Mount Hood (El. 11,225), in the Oregon National Forest, reported 56 fires in 1916 and 64 in 1917. On two occasions campfires at the base of Mount Adams, 55 miles away, were discovered and correctly located. In 1917 all but five of the fires between Mount Jefferson and the Columbia River, a distance of 80 miles, were discovered and reported from the Mount Hood lookout. These five were small campfires left unextinguished but discovered and put out before gaining any headway.

Concrete Pontoons Form Water End of Launching Ways

CONCRETE ships are being built at Barrow-in-Furness, England, by the Ferro-Concrete Ship Construction Co., Ltd., at a site where the quay is about 10 ft. above the rock-bottom bed of the channel and where the high-tide level slightly overtops the quay wall. In order to take care of the outboard end of the launching ways, it was decided to use concrete pontoons in the location and of the general design shown in the accompanying drawing. Four of these pontoons were built, 33 ft. 4 in. long, 17 ft. wide and 10 ft. deep, with the general framing details shown in the drawing. These pontoons are floated into place at the end of the ground ways, and after being adjusted in position are flooded, the quantity of water admitted being sufficient to prevent them from being shifted by successive tides. When the pontoons have to be moved the water is allowed to drain out at low tide, and they are floated to a new position on the next rising tide. The pontoons are moved from way to way as required for launching. An article describing the yard and the numerous concrete craft, consisting of 1000-ton barges, 1150-ton ocean-going steamers and 750-hp. steam tugs, appeared in *Engineering* for May 16, 1919, in an article by W. N. Twelvetrees.



CONCRETE PONTOONS FOR OUTBOARD END OF END-LAUNCHING WAYS

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Three Openings to One Graduate

Sir—I note in *Engineering News-Record* of July 17, 1919, p. 141, a letter by F. N. Harris, entitled "Stop College Supply of Graduate Engineers."

Perhaps Mr. Harris does not know that for several years now there have been about three openings for every college graduate in engineering. We have usually had, here at Michigan, 200 graduates a year and from 500 to 600 applications. This year we had less than 100 graduates and probably 250 or 300 applications. What is true of Michigan, I assume to be also true of the other engineering schools.

Graduates who used to receive from $45 to $75 a month now receive from $125 to $200. The indications are that the numbers coming to engineering colleges next year will be larger than ever before.

M. E. COOLEY,
Dean, College of Engineering, University of
Ann Arbor, Mich. Michigan.

The Development Committee's Report

Sir—A close survey of the proposed items of "reform" in the report of the committee on development of the American Society of Civil Engineers shows that the society is to go on record as strongly urging the engineer to enter into the civic and political life of the nation, with the one aim of purifying and dignifying it. W. W. K. Sparrow in the July 17 issue of your journal said that two of the reasons why engineers are not appreciated were "lack of activity in public affairs, and lack of publicity concerning the engineer and his worth and his relation to the better health, comfort and welfare of the community."

Along this particular line, the writer suggests that each of the local associations have a publicity bureau. The parent body cannot advertise local material to a local citizenry. Any publicity effort must be intensive and thorough, and consequently the territory covered by any one local unit must be limited in size

Chicago, Ill. R. E. SPEAR.

How May the Young Engineer Receive His Training in Technical Writing?

Sir—As a recent graduate in engineering, and having a desire to keep in practice in technical writing, the problem faces me, "How to do it." The engineering magazines are apparently reserved for the older members of the profession—those who have spent a life of concentrated experience and are now telling their stories—and those in fewer number who write as they work. How did these men bridge the period between graduation and the "day of reckoning" when they felt they had something worthwhile to tell other engineers? Was rust allowed to gather upon their literary attributes, during the formative period?

Our attitude in college toward language courses, especially English—in fact, toward anything outside of strictly engineering subjects—is, "They are a waste of time." If a channel existed through which the technical literary aspirant might express himself after graduation, would not the interest in the writing of correct English in technical schools be stimulated? Would not the general level of engineering writing by engineers be elevated thereby?

The engineer, we are told, does not rank socially with members of other professions—to name two, those of law and medicine. His name seldom appears in the daily news, as does that of Lawyer Smith who wins a popular verdict for his client Jones. All the more reason why the engineer should give a good account of himself the few times he does appear before the public. May not the young engineer look to the older members of the profession for light and guidance in vitalizing interest in the English language e'er the "English ain't no use nohow" methods become crystallized?

Boston, Mass. J. WENDELL MOULTON.

[The way "to do it" is to do it and keep doing it. The engineering graduate—and, for that matter, the undergraduate as well—should seize every opportunity that comes his way, and should go out of his way for opportunity, to describe engineering studies and construction and express his thoughts on professional matters, and on such public questions of the day as his education and training qualify him to discuss with sound reasoning. To make such writing vital and appealing it should be addressed to some circle of readers in each case, even though it be an imaginary circle.

It is a mistake to assume that there is any lack of channels for anyone with useful information or inspiring suggestion. The technical press, engineering societies, the daily press, civic and commercial organizations, all afford an outlet. It is a bigger mistake to suppose for a minute that any public medium can long be maintained for utterances that contain neither information nor inspiration.

Finally, if either engineering students or young engineers in practice wish to be able to write clearly and appealingly, they must never cease reading the best masters of English, whose writings not only serve as a model of expression but give that breadth of mind and culture which many engineers lack so sadly.—EDITOR.]

Transit or Plane-Table for Topography

Sir—Referring to the query of Hargraves Wood (*Engineering News-Record* of July 10, 1919, p. 95) as to the relative advantages of using a transit or a plane-table for topographical surveying, I note your issue of Aug. 14, pp. 332-333, contains three answers to his question, which is not clearly stated. By transit, no doubt, stadia is meant. There is a vast difference between making a topographical survey of a large area and running a preliminary line for a railroad. For the former a stadia transit and a plane-table are well fitted, and if the area is a large one, elevations with a Y-level are usually taken at governing stations or points, to check up the stadia work.

As F. J. Howes says, "railroad surveys cover a comparatively long and narrow strip of ground," and if the preliminary line is skillfully run, extensive width of topography is not needed. Thousands of miles of railroads in the United States have been built on the surveyed lines of which not one foot of topography was

taken. In my opinion, the use of a plane-table for taking topography along a railroad survey (not a reconnaissance) is not defensible; in fact, it would not be used at all in wooded country. Mr. Howe also says, "a plane-table will give accuracy greater than that obtained by common methods." This I also desire to controvert. I cannot conceive any greater accuracy than that of obtaining contours by hand level and graduated rod in cross-section lines, working from known center-line elevations. On cleared ground a clinometer will give fair accuracy if special care is used.

On the Guanajuato branch of the Mexican Central Ry., with which I was associated, all the contour maps were made in the field. The surveyed line was plotted on sheets 19 x 24 in., on a scale of 1:2500 metric system, which was required by the Mexican Government. Contour intervals were 2 m. From the level elevations, contours ending in 2 and multiples were spotted along the center line. These maps were taken into the field and pinned to a light drafting board, and by means of straps were fastened to the back of a Mexican peon, who served as a perambulating easel. Contours were drawn in as fast as taken, and all natural and artificial features were also plotted.

To sum up, methods must be used which will suit the particular kind of work to be done. I would suggest to Mr. Wood that he procure a copy of the paper, published by the American Society of Civil Engineers, entitled, "Recent Stadia Topographic Surveys, Notes Relating to Methods and Cost," and listed as No. 880.

Buffalo, N. Y. EMILE LOW.

The Electric Railway As a Freight Carrier

Sir—If it is not too late, an addition may be in order to the article by Charles Whiting Baker in your issue of July 10, 1919, on "Freight Transport by Railway and by Motor Truck." On reading this article, I was struck by the fact that, despite its comprehensive treatment of steam railroads and motor trucks, so little was said about either the interurban or the urban electric railway's performances and possibilities in this field. Indeed, the only reference consists of a few lines under the heading, "Electric Traction Not Feasible for Light Traffic," and no cognizance is taken of the fact that there are thousands of miles of electric interurban railways on which goods are handled, from the extensive interchange of standard freight cars down to the smallest express package. Some survey of the achievements of electric railways appears all the more essential because of the position that they occupy midway between the trunk-line steam railroad and the neighborhood motor-truck service.

Although American city railways have not given the same attention to the carriage of parcels as have their British brethren, the American interurban railway has made far greater strides in the carriage and interchange of freight. Strictly speaking, the average American interurban is simply a railroad of the same gage as, but somewhat lighter construction than, its older steam brother; while a number are right up to steam-railroad standards. The chief obstacle to their fuller coöperation with steam railroads, which could more frequently use them as short-line, terminal or distributing railroads, is the still rankling prejudice remaining from the days when the electric interurban builder blithely cut his passenger and freight rates below cost. For all that, thousands of cars are interchanged with steam railroads annually on such systems as the British Columbia Electric Ry., the Pacific Electric Ry., the Illinois Traction System, the Detroit United Ry., the Fort Dodge, Des Moines & Southern Ry., etc. This interchange business, of course, is entirely aside from local less-than-carload or even carload traffic. As for the handling of express parcels, the Electric Express Co. coöperation of interurban electric railways in this field. Any number of electric railways have contracts to carry of Cleveland, Ohio, is an almost venerable example of the packages for the old-line express companies, while properties like the Connecticut Co. have built up a very large short-haul business based upon the principle of short headways.

When, in 1918, our steam railroads were jammed with war traffic, it occurred to a number of us that it would be desirable to see what relief the starving electric railways might afford to parallel steam railroads by taking over some short-haul passenger and freight business. It cannot be said that the steam railroads were very enthusiastic when they were asked to shunt their overflow to their electric neighbors, although the data gathered by A. B. Cole showed that the electric railways could do much, despite their inability to permit through running for more than a few hundred miles. In fact, at least one electric railway, because of old antagonisms, was unwilling to serve as a link in such through service!

The investigation conducted by Mr. Cole during 1918 showed conclusively that electric railways were not only doing a great deal of goods business, but that they could do still more, provided that more through runs were possible; that motive equipment specifically designed for freight service were used and, most important, that the electrics grasped the many opportunities *not* overlooked by the wideawake motor-truck operator. Those who wish to study this subject in more detail will find this necessary complement to Mr. Baker's article in the contribution by Mr. Cole entitled "Electric Railways Are in a Position To Haul More Freight," published in the *Electric Railway Journal* for May 11, 1918, and distributed in pamphlet form by the American Electric Railway Association, New York.

Just as the electric railway cut into the short-haul business of the steam railroad, so has the motor truck cut into the business of the electric railway. It goes without saying that the convenience of door-to-door delivery afforded by the motor truck often offsets, for 25 to 50-mile runs, its higher charges for carrying goods where time is of the essence of the contract. Nevertheless, a large proportion of present motor trucking is economic waste. You can carry hundreds of thousands of tons of freight over an electric short-line railway and the rails will show no perceptible signs of wear; while the same amount of traffic hauled *at a lower rate of speed* by motor truck will ruin anything but a concrete roadway. The public, not the carrier itself, pays for this waste.

As an example of what a really live electric railway can accomplish on so short a haul as 12 miles, I will quote what the Interurban Ry., of Des Moines, Iowa, did during the war in furnishing Camp Dodge with all needful supplies. This railway hauled over 10,000 standard freight cars, totaling 500,000 tons of freight, in 1000-ton to 1500-ton trains of 20 to 30 cars each at an

average speed of 15 to 18 miles an hour! There were but four men to the train, so that the haul per man was a mere 250 to 375 tons per trip. Had this job been assigned to motor trucks, each driver surely would not have averaged better than five tons per trip. To haul 500,000 tons, fully 100,000 men-trips would have been needed, compared with 1666 men-trips (assuming 300 tons per man) via the electric railway. In other words, if the motor trucks could have equalled the speed of the electric railway, they would still have required 30 times the man-power. And what would the best of Roman roads have looked like after 100,000 motor-truck runs?

I am well aware that the contrast would be more favorable to the motor truck in cases where the collection and distribution of the material is of retail character. However, I have quoted this instance, and mentioned other examples of electric-railway performances in handling of freight, chiefly to bring out the fact that the electric railway is a factor which must be respected by both the steam railroad and the motor truck, competing as it does for bulk freight with the former and for package freight with the latter. The engineer and the economist should try dispassionately to determine the most efficient uses of each, paying due regard, of course, to the great emergency value inherent in the self-propelled vehicle because it can be sent anywhere at almost any time.

WALTER JACKSON,
Consultant on Electric Railway Service.
Brooklyn, N. Y.

The General Staff's Army Bill

Sir—Permit me a few words in reference to the article, "General Staff's Army Bill Strikes at Corps of Engineers," and your editorial comments thereon, in your issue of Aug. 21.

One's attitude towards this bill depends somewhat on one's conception of what the General Staff is and of the functions of the Corps of Engineers. The General Staff is conceived to be the brains of the Army, its personnel not being permanent and being selected by an impartial board from the ablest officers of the various arms of the service, including the Corps of Engineers. If this is done so that specialists are available to advise on all technical matters relating to their arm or corps, including the Engineers, one can see no harm in such a body formulating an order to enable the Chief of Staff to command the Army under the direction of the President and the Secretary of War, as someone must do this and the Chief of Staff is helpless without a staff to advise him.

As to the functions of the Corps of Engineers, this body, like the Signal Corps, can accomplish nothing alone, and clearly it is an accessory to the combat troops, and particularly to the infantry, whose servant it is, and, to a less extent, to the artillery also. If these conceptions are correct, there can be no other conclusion but that the Corps of Engineers should be directed by the same body that commands the rest of the Army.

As to the relations of the staff and the line, this is an old problem, and to carry out the suggestions in this article would carry the Army back twenty years, when we fought a war without a General Staff and with permanent staff departments each acting independently, and we all know the result. We have only to compare the confusion and scandals of the Spanish War with the results obtained in this war, to decide which is best.

Since the Spanish War, military legislation has been directed toward eliminating permanent staff officers, and except in the Engineer and Medical Corps, there are very few of them left, and staff positions are now filled by temporary details from the line. Time was when the Army had only one battalion of engineer troops, so that all field officers in the Corps of Engineers, with the exception of one major, were staff officers, but with the regimental organization of engineer troops, authorized by the national defense act of June 3, 1916, and the regiments of engineers, more than 25 in number, contemplated by the act now under consideration, it is not likely that the Engineers will suffer on account of the provision of the act making staff officers ineligible to promotion to general officers.

It is true that under this act a general officer, trained as an infantryman, could be assigned to command the Corps of Engineers, but it is not likely that this will be done, as we must assume that the Army will be administered with the same intelligence and common sense that prevail in civil life.

The Army under its general officers, assisted by their staffs, has ended the war and has handled a problem of great magnitude and difficulty, and deserves great praise instead of censure. One cannot deny that mistakes were made, that square pegs were forced into round holes, and that many technical men of high standing in civil life were not used to the best advantage, and consequently, feel that their talents were not apreciated. But the bodies of too many boys remain over there, and too many have returned with permanent disablements, for the country to pay much attention to those who only had their feelings hurt.

The remedy is not obstructive criticism, but assisting the country to obtain a military policy that will enable the technical men of civil life, who are to assist the Army in war, to be trained with their professional fellows in the Army in time of peace, so that they will learn to work together and to appreciate the abilities of each other, and thus eliminate friction and the lack of confidence.

GEORGE D. SNYDER.
New York City.

Salaries for Technical Instructors

Sir—It is not often that I pay much attention to the "Positions Wanted" columns of *Engineering News-Record*, but the recent controversy in your pages concerning engineers' salaries has compelled me to scan them frequently of late. In the issue of July 31, just at hand, I find the inclosed:

> INSTRUCTORS wanted: The College of Engineering of the University of Illinois is in need of several instructors in steam engineering and mechanical engineering laboratory practice; one instructor in railway mechanical engineering; one instructor in ceramic engineering; one instructor in highway engineering; and two instructors in general engineering drawing at salaries of $1500 to $1800 for ten months. Technical graduates having some practical and teaching experience desired. Inquiries should be accompanied by a complete statement of training and experience, a recent photograph and a list of references. Address Dean C. R. Richards, University of Illinois, Urbana, Illinois.

This I think is *well worth a full page display* in your reading matter columns, so that he who runs will be compelled to read it. I cannot understand how Dean

Richards of one of the best known and top-notch engineering colleges, the College of Engineering of the University of Illinois, has the nerve to sign his name to such an advertisement and then turn around and solicit students for that school.

Frankly now, would you care to send your son to school to be instructed in such a science as engineering and expect him to acquire any knowledge, except such as he could dig out himself, at the hands of a professor of that science competent to earn only $150 per month for ten months in the year? I think not, and I know that I would not. When I went to school I looked upon the teacher or professor as the essence of practical knowledge—and here is a great university dispensing it at $150 per month, and evidently the second figure of $180 per month is the maximum any individual in the whole faculty can look forward to. If that advertisement could be placed in the hands of the fathers of the boys who expect to take those courses this year, I fully believe that the practical fathers would reduce the attendance by 50% without batting an eye.

I have in the past had a high opinion of the University of Illinois' engineering department, and on numerous occasions have recommended that school to aspiring students; but never again, at least not until it is willing to pay a price that would induce real talent to enter the teaching of this noble science.

Unfortunately, this school is not the only one which has so low an opinion of the value of such services, for other advertisements of a similar nature appear in the same columns. I should think the editor of the Searchlight section of *Engineering News-Record* would feel ashamed to accept such an advertisement from such a school, unless it could name a price commensurate with the qualifications required.

Some of your correspondents, in discussing engineers' wages, have held the term draftsman in contempt, but let me tell them that during the past winter boys with only a high-school drafting course have been filling jobs all over the country as draftsmen—yea, verily, they were hardly fit to be called tracers even, and pulling down $150 per month. And employers were glad to get them. I can name many such young men, who have no idea of what an engineer really is, who are getting wages supposed to entice the talent of the land to teach.

CARL H. FULLER.

Mobile County, Alabama.

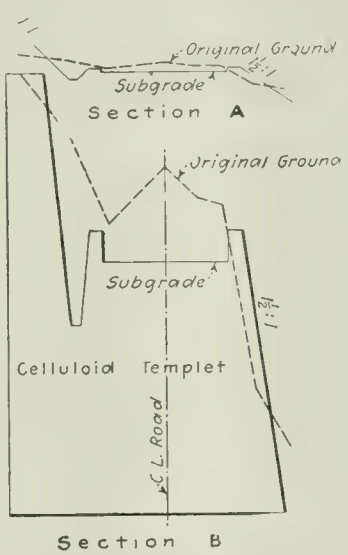
Exaggerated Cross-Sections Measured by Planimeter

Sir—In preparing plans for highway work, one of the most tedious tasks is balancing a grade line and computing earthwork. The practice in this office is to plot cross-sections, and, using a celluloid templet, draw the outlines of the finished road thereon, obtaining the end areas by means of a planimeter. This method has been satisfactory, in general, but it has been found that in cases of light cut-and-fill, as in paving or reconstruction of existing roads, the scale usually employed of 10 ft. to 1 in. vertically and horizontally, does not always give satisfaction, and areas obtained by the planimeter vary, by a percentage too great to be ignored, from those obtained by direct calculation.

To obtain accurate results, where the cut or fill was but a fraction of a foot, required rather closer platting and more accurate handling of the planimeter and templet than are usually obtained from the average draftsman. With a view to obtaining closer results and of giving greater freedom of action in the use of planimeter and templet, the writer suggested the use of exaggerated cross-sections and templets, and, in practically all work of the present season involving over 20 miles of paving, this has been done. The results have been very satisfactory, and to date no serious complaint has been made by contractors or others concerned in the construction of these roads, that the computed quantities or distribution charts have been in error, beyond that to be expected from errors in taking levels or in estimating the shrinkage or swell factors.

The scales adopted are 10 ft. to 1 in. horizontally, and 1 ft. to 1 in. vertically. This permits the ready use of the standard 10 x 10 cross-section paper as before (only it must be kept in mind that each line in vertical scale represents $\frac{1}{10}$ ft.) and, furthermore, it allows the use of the planimeter with the same setting as for the natural scale of 10 ft. to 1 in., always keeping in mind to move the decimal point one place to the left in reading areas, the result invariably being 10 times the correct figure.

The accompanying sketch shows the same cross-section in both natural and exaggerated scales; an examination will show that a slight displacement of the templet or of platted points in Section B will have a great deal less effect upon the area than will the same displacement in Section A. At first glance the exaggerated section appears startling, but it has been found that after a day or so of practice even the most conservative draftsman becomes accustomed to its use. Everyone working with the system finds much relief, chiefly because of the ease with which a difference of $\frac{1}{10}$ ft. may be noted, and because of the knowledge that extreme care in tracing lines with the planimeter point is not so essential to accuracy.



NATURAL AND EXAGGERATED CROSS-SECTIONS

It is realized that the vertical scale adopted has a tendency to limit its use to roads where the cuts and fills are light, but the system may be found advantageous in cuts and fills not expected to be more than 6 or 8 ft.; primarily, however, it was intended for paving and similar work.

All work of the King County engineer's office is done under the direction of Samuel J. Humes, county engineer, and by his sanction the foregoing method was adopted for use.

C. P. MOWRY.

Seattle, Wash.

Design of Swimming Tank

Sir—In an article on the swimming tank in *Engineering News-Record* of July 17, 1919, p. 135, Mr. Viterbo says the tank bottom was designed for the hydrostatic head of 9 ft. 8 in., which gives a pressure of 600 lb.

per square foot on the tank bottom. This water elevation is, I judge, the overflow level. In addition to the above he has added a live load of 100 lb. per square foot for the swimmers. It seems to me when a swimmer gets into a tank he displaces an amount of water equal to his weight and causes the tank to overflow, thus preventing the increased bottom pressure assumed by the writer of the article.

San Antonio, Texas. M. D.

[In response to an inquiry, Mr. Viterbo explains that in the original design the depths were 11 ft. 3 in. at the high point and 6 ft. 9 in. at the low point, while the high-water level was 19 in. below the overflow level, so that when the tank was filled to the normal level, displacement due to the entrance of swimmers would not cause overflow. Hence the assumption that swimmers would produce a superimposed live load. However, after the building had been commenced the depths were changed to 9 ft. 8 in. and 5 ft. 2 in., respectively, but as this reduced the load no change was made in the assumptions for loading.—EDITOR.]

Water-Hammer in Penstocks and Economy of Design

Sir—Referring to the correspondence on the above-mentioned subject in your issue of June 19, 1919, p. 1222, I have been examining Minton M. Warren's formula, as given therein, in the light of the experiments of Camichel, Eydoux and Gariel. These were carried out on the penstocks of a hydro-electric plant at Soulom, France, in 1916.

It is evident from their results that this formula is gravely inaccurate. It is difficult to see why it should be adopted by engineers in your country in preference to the formula of Michaud, $h = \frac{2LV}{gT}$, which was first published in 1878. It is, of course, only applicable when $T > \frac{2L}{a}$, and when the closing of the gate is a linear function of time.

I inclose a table of experimental results extracted from "Des Coups de Bélier," by Camichel, Eydoux and Gariel (published by Edouard Privat, of Toulouse, France), and showing the water-hammer actually obtained, compared with that calculated by the Warren and the Michaud formulas. It will be noted that the water-hammer actually observed was in some cases more than 50% in excess of that given by the Warren formula.

OBSERVATION ON PENSTOCK AT USINE DE SOULOM, FRANCE

Length, L = 1759 ft. Internal Diameter, D = 32 in. (mean)
Static Head, H = 830 ft. a = 3580 ft. sec.

Time of Closing Gate in Sec.=T	Initial Velocity of Water in Sec.-ft.=V	Water-Hammer Observed, Ft.=h	Water-Hammer Calculated by Warren's Formula, Ft.	Water-Hammer Calculated by Michaud Formula, Ft.
5.00	9.30	156.0	111.1	203.0
3.37	6.22	170.0	118.0	202.0
2.50	4.50	187.0	122.0	195.0
2.00	3.60	208.0	130.0	197.0
1.46	2.67	215.0	150.0	202.0

Referring to the letter by Austin H. Reeves, it is difficult to see why he shirks the calculation of a, the velocity of vibration. This is given very simply by Allievi's formula $a = \frac{32{,}500}{\sqrt{48.3 + 0.5\frac{D}{e}}}$ in foot-pound-second units, where D = internal diameter in inches and e = thickness in inches, for steel penstocks.

Although this vibration velocity is not of any great importance in using Warren's formula, yet it is essential for the calculation of the highly important critical time, $2L/a$.

In conclusion, any of your readers who are interested in this subject would do well to study the work referred to above. The works of Allievi and De Sparre, although more theoretical, are also very valuable.

ERIC CREWDSON,
of Gilbert Gilkes & Company, Limited.
Kendal, Westmoreland, England.

[Proof of Mr. Crewdson's letter was submitted to Mr. Reeves, whose reply follows—EDITOR.]

Sir—The following points seem pertinent in discussing Mr. Crewdson's letter:

1. That since Mr. Crewdson says he has examined Mr. Warren's formula, it seems queer that he has, in order to obtain a "very simply", given Allievi's formula $a = \frac{32{,}500}{\sqrt{48.3 + 0.5\frac{D}{e}}}$, when Mr. Warren's formula $a = \frac{4660}{\sqrt{1 + 0.01\frac{D}{e}}}$ is more simple and gives the same result.

2. The present writer did not shirk the calculation of a.

3. The writer believes that "the highly important critical time, $2L/a$ would be more safely and economically expressed if a were taken as 2600 (that is, that the critical time might, for safety in penstock design, better be expressed $T = L/1300$), for the following reasons:

a. In order that the penstock may be designed safely, the factor of safety against water-hammer should be such as to limit the maximum fiber stress in the steel to less than the elastic limit of the steel, and, therefore,

b. Thin sections should, and usually do, determine the value of a, which in turn determines the critical T, even though the thicker sections experience the greatest shock; and furthermore

c. Because the thinner sections, due to joint efficiency and corrosive action, make a value for a of approximately 2600 seem desirable.

4. Therefore, I should have been more pleased if Mr. Crewdson, instead of saying, "it is difficult to see why he shirks the calculation of a, the velocity of vibration," had asked why I favored making the critical $T = L/1300$.

5. The designer (and he is the exception) who actually designs his penstock safely and economically against water-hammer from a manufacturer's T is the one who I think will agree with me that the critical time T should, from a scientific standpoint, be lengthened to equal approximately $L/1300$.

Charlotte, N. C. AUSTIN H. REEVES.

Some Reasons Why Standard Structural Specifications Are Necessary

Sir—In an editorial in your issue of July 3, 1919, p. 2, you say:

A railway engineer of unusually long experience says of standard design codes: "Standard specifications are a curse. They divest the individual engineer of responsibility and make him work to rule rather than to conscience."

. . . Unquestionably, a record of the conclusions and judgments developed by experience in bridge construction and maintenance, those conclusions which represent the sum of bridge knowledge, should be briefed in a document available for the general guidance of bridge engineers. But shall such a document take the form of a rigidly drawn set of rules, or shall it be modeled on another pattern? This is the essential problem presented.

It seems to me that a discussion of the standardizing of structural steel practice is in place at this time, when the American Railway Engineering Association is considering revision of its specifications. The writer's attitude, as expressed previously on more than one occasion, is that the more completely so-called common sense and professional judgment are eliminated, and structural designing reduced to rule, the better for the structures and the safety of the public. This is diametrically opposite to your editorial attitude.

In checking plans and examining structures during a period of more than a quarter century, I have many times found errors in design and details that could not possibly have been perpetrated by designers if they had observed certain rules of design, some of them of the simplest nature. Many times I have, in correspondence with designers, had the utmost difficulty in convincing them that their designs were faulty and actually dangerous—this because there was no rule published that covered the particular case in question.

Your railway engineer of long experience need not worry about the individual engineer's lack of opportunity to exercise his conscience. There is no better way to exercise the conscience than to work strictly in accordance with a set of good rules. Furthermore, there is nothing more at variance than the consciences of a lot of different individuals, whereas the laws of stability and equilibrium are as constant and invariable as the eternal hills and care as little for the passing opinions of professional men, no matter who they be.

Where would structural engineering be if it were divested of the rules of design that demand that unit stresses be so much for tension, so much for compression, so much for shear? Suppose every engineer should say that his conscience tells him that rivets are worth so much. All would be different; there would be confusion worse confounded. One man would use 10,000 lb. per square inch; another 25,000. If the second man's structure should fail, would it be because of the lack of a good, uniform standard of design or would it be because of his faulty conscience?

Some years ago some men high in the profession reached the conclusion that because of the magnitude of some very large bridges these structures could be safely designed with unit stresses far higher than the small fry had to use on their small-fry structures. It is hardly necessary to remind the profession that one of these large bridges fell, and another had to have the floor system revised to make its floor area approach more nearly to its carrying capacity.

A few months ago I had to condemn a large drawspan partly because the plane of the lateral system was 4 or 5 ft. out of that of the chords, and no provision had been made for the bending stresses produced. Some of the laterals had actually bent until they were useless. It would be the simplest kind of thing to require in specifications that where lateral systems are not in the plane of the chords, provision for the bending stresses must be made in the design. This is just the kind of thing that many designers cannot see. They say it is "their practice." If an ironclad rule were written into specifications, it might be "their practice" on something else, but they would learn that it is not good practice or safe design anywhere.

The simple little requirement that the distance center to center of trusses is the span length of floor-beams, and the distance center to center of floor-beams is the span length for stringers, has avoided countless disputes and has redeemed many a bridge from actual flimsiness. It is a fact that designers will, in spite of this, want to introduce their "conscience" and use a span less than these specified distances.

Lack of standard rules of design would introduce great unfairness in competitive designs. One designer would have a certain idea as to how the design of a certain structure should be made, whereas his competitor would have a conscience that is not so exacting. The latter would get along with much less steel—thin, unstiffened web plates, unbraced flanges, rod laterals instead of stiff members.

A specification writer who laid stress on professional judgment and whose work had some clauses not capable of definite interpretation, when asked personally by the writer the meaning of one of these clauses, stated that he would interpret it for a fee of $50. The clause could easily have been put in understandable English, and in such shape would be useful, for it would describe some definite kind of steel construction. All parts of specifications should be capable of only one interpretation, so that even here there is no room for judgment or so-called common sense. Ambiguity cannot help anyone, and it is apt to harm the structure.

I have just finished inspecting some very remarkable high viaducts, running to more than 200 ft. in height. The only kind of originality they show is strict adherence to the best rules of design and workmanship. Plans were checked, material was inspected as well as shop and field work. The steelwork was carefully painted with red-lead paint and has been repainted since. Conscience? Yes, every evidence of it, but conscience that has followed the rules of design and fabrication to the letter. The bridges are as good as the day they were finished. In contrast, the condemned drawspan to which reference has been made bears the stamp of a kind of professional judgment and common sense that evidently cared little for rules but thought that the structure designed was just the one for the case.

It is not meeting the needs of the case to embody (and embalm) these rules of design in a textbook or unauthoritative manual. They should be written in standard specifications where they are a law and not a mere opinion. Textbooks are frequently too theoretical and frequently unpractical in much that they say. There are textbooks that tell how to design a mill building, and there is perhaps not a mill building in existence that was designed that way. There is such a thing as being too strict and too theoretical, and there is also such a thing as being too lax and leaving too much to be taken for granted. The former breeds bad structures because the strict and theoretical rules are perforce ignored; the latter has the same effect because there are no rules to apply.

Pittsburgh, Penn. EDWARD GODFREY.

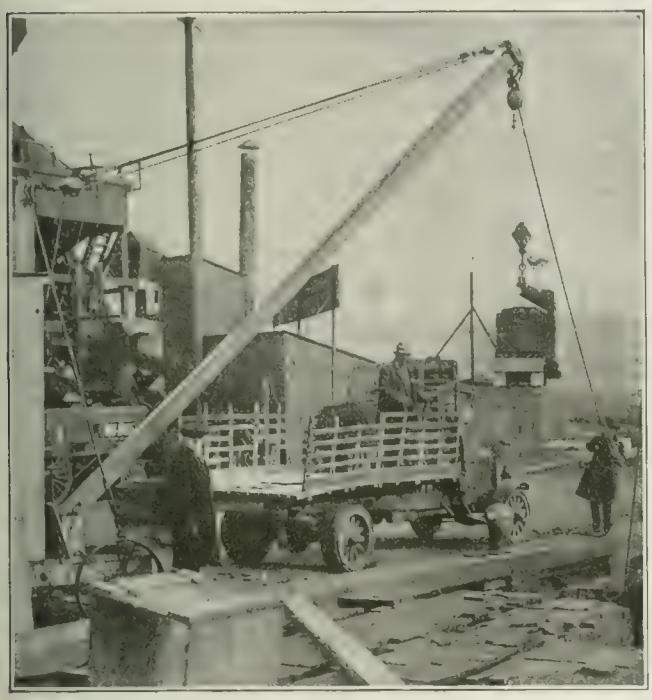
HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Asphalt-Block Handling at Army Base

SPECIAL handling apparatus was used in transporting and delivering the asphalt block to the job at the South Brooklyn Army supply base. The blocks were specially piled at the manufacturing plant so that they could be readily picked up from the boat. There was thus only one piling operation from plant to pavement.

To accomplish this result, rectangular platforms were



LIFTING ASPHALT BLOCK (NOTE SPECIAL TONGS)

constructed upon which the blocks were piled. These may be seen in the view, under the packages being handled. The platforms were constructed in such a way that tongs could be slipped under them from a derrick, to keep them properly balanced. The derrick hooks are shown, lifting the platforms and loading them upon motor trucks for delivery at various parts of the job.



COWAN TRANSVEYORS PASSING UNDER PLATFORMS DELIVER BLOCK

Other Articles in This Issue of Interest to Contractors:

Largest Use of Electric Power on Construction Work — Page 417

Foundations in Quicksand and Watery Gravel — Page 414

Sunstroke and Lightning as Viewed by Compensation Commissions — Page 403

Those which were used upon the piers were lifted directly from the boat to the pier-floor level. By piling in this way, using a jib crane, 140,000 two-inch blocks could be loaded upon the average scow.

When the scows arrived at the Army base pier a similar pair of derrick tongs lifted the packages from the scow to the dock, where electric Cowan transveyors ran under the platforms, as shown, and delivered them to any part of the work. These transveyors ran in trains, so that one tractor hauled a trailer of the same type, with the exception that it had no motor. When the blocks reached their destination at the pavement side, the truck and trailer were automatically lowered, leaving the piles standing upon the platform. By this method, it was possible to get the blocks quickly to any part of the work with only one handling. This work was done by the Hastings Pavement Co., as stated on p. 402 of this issue, under the general contract by the Turner Construction Co., of New York, with the Construction Division of the Army, as noted.

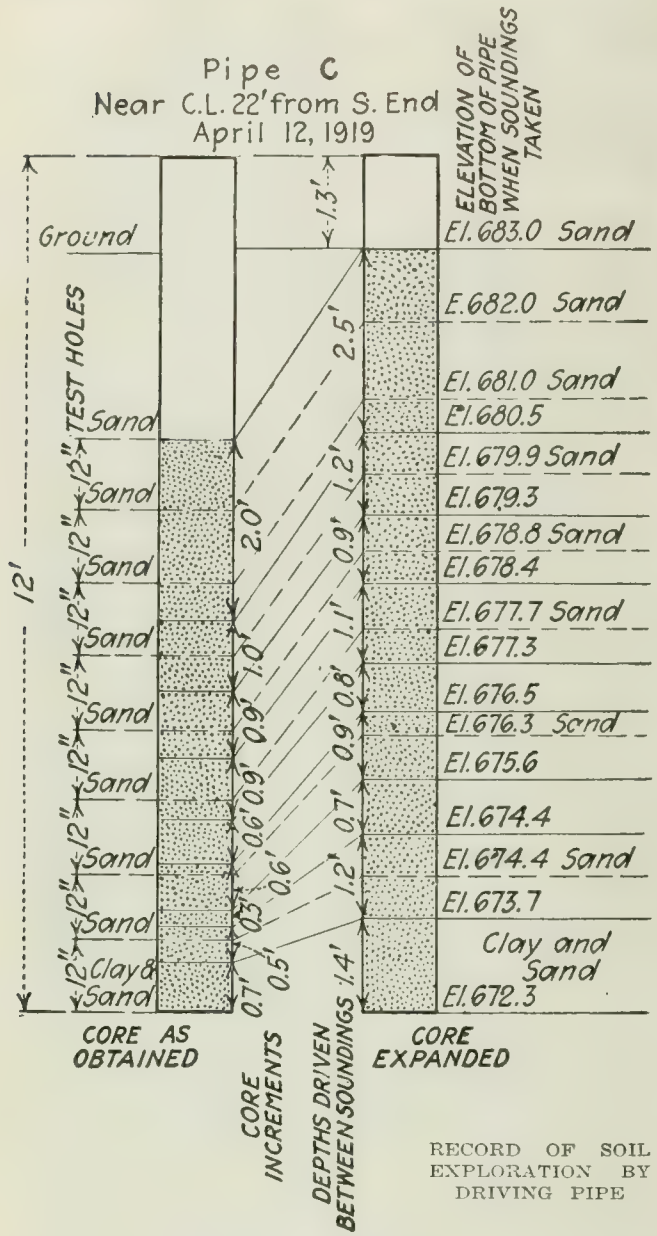
Soil Exploration by Pipe Sounding

BY R. C. CHANEY

Construction Engineer, River Channel Improvement, Columbus, Ohio

THE character of the soil below foundations to be built was determined in a satisfactory manner by means of an arrangement devised by the writer, on the Columbus flood protection work now under way. A 6-in. wrought-iron pipe 15 ft. long was driven as a pile in swinging leads at selected locations in the unwatered cofferdams for the piers and abutments of the Town St. arch bridge of reinforced concrete.

At intervals of 1 ft. in the length of the pipe, 1-in. holes were drilled for sampling the core obtained. For the purpose of determining the core increments, the pipe



RECORD OF SOIL EXPLORATION BY DRIVING PIPE

is sounded at every foot of penetration. The pipe is driven to depth and pulled, and the core is sampled.

Then, as shown in the drawing, the log of the soundings and samples allows the expansion of the core to its original height, and a section is obtained showing very definitely the character of soil within the limit of depth practicable for the device, which limit is imposed by the difficulty of pulling. The pipe is particularly useful here, where the material encountered is a tough blue clay, with strata of gravel and sand. In one case a pocket of quicksand was sounded by this means and the bottom found to be blue clay. Greater depth of determination may be reached by the development of a head for the pipe that would withstand greater pulling strains.

Radiators Outside on Oil-Driven Draglines Secure Cooler Air, Save Space

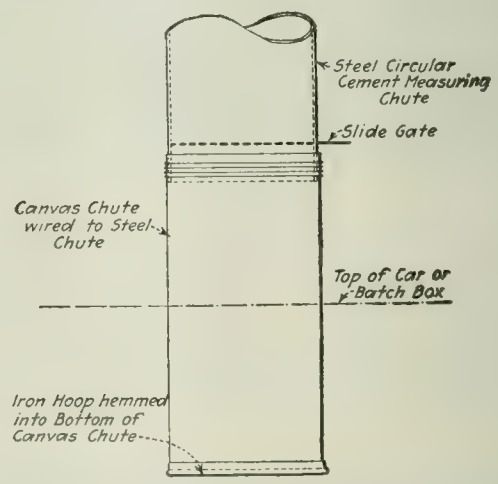
ON THE extensive drainage work now being done on the Rio Grande irrigation project of the United States Reclamation Service, a number of dragline excavators are being used. J. L. Burkholder, drainage engineer, United States Reclamation Service, Denver, Colo., informs *Engineering News-Record* that by placing the radiators for the engines on the outside, as shown in the view, cooler air was secured and space was saved inside the house for operation and making repairs.



RADIATOR ON OUTSIDE OF EXCAVATOR SERVES TWO PURPOSES

Use of a Canvas Chute Prevents Cement Dusting

THE dust cloud which results when cement is dropped into a car or batch-box from the vertical measuring chute of a bulk-cement bin can be prevented by wiring a hoop-weighted canvas chute to the bottom of the steel chute. This device has been successfully employed by G. P. Scharl, contractor, Milwaukee, Wis., on a concrete paving job on which bulk cement is being used.



CANVAS EXTENSION PREVENTS DUST CLOUD ARISING FROM CEMENT

A 12-in. circular measuring chute is employed. When cement is charged into a batch-box, the canvas extension is swung into the box, where the iron hoop holds it down, and then the gate is opened. When the charge has entered the canvas chute it is lifted, allowing the cement to run out gently and with no drop. It is then swung into the next batch-box.

The cement chute when not in use can be swung to one side to be out of the way of the work, and fastened in place.

NEWS OF THE WEEK

New York, August 28, 1919

Sanitary Engineers Recently in Service Need Positions

A considerable number of sanitary engineers who were in Army service during and after the war are in need of positions and assert that they are quite out of touch with opportunities for work, *Engineering News-Record* is credibly informed. These men include some who have recently received their discharge and others are likely to be discharged soon. Altogether there were about 180 men in the sanitary engineering section of the Office of the Surgeon General, and it is estimated that 75% of these are technically trained sanitary engineers. Information regarding the men wishing positions and their qualifications may be obtained by addressing the Sanitary Engineering Section, Office of the Surgeon General, United States Army, Washington, D. C.

First Government Concrete Ship Is Commissioned

On Aug. 16 the concrete steamship "Atlantus" was turned over by the United States Shipping Board to the Raporel Steamship Line, of New York, for operation in the West Indian service of the company. This is the first of the Government concrete ships to be put into service. The "Atlantus" is a 3500-ton freighter, built at Wilmington, N. C.

St. Louis Municipal Bridge Subject to Illinois Taxation

Suit brought by St. Clair County, Illinois, to compel payment of taxes by the City of St. Louis, Mo., on the easterly half of the municipal bridge across the Mississippi River, has been decided in favor of the Illinois contention. The county court held that taxation is proper because the bridge is intended to produce revenue by the lease of its railway deck. The east or Illinois half of the bridge has been valued at $600,000 by the assessors, and the 1918 taxes on this amount, which were in suit, are about $17,000. The bridge with its present approaches cost over $6,000,000.

T. H. Wiggin to Design Grand Canal Improvement in China

Thomas H. Wiggin has resigned his position as designing engineer with the Board of Water-Supply of the City of New York, and is now on his way to China, where he will remain about six months on the work of the preliminary designs for improving the Grand Canal. Joseph Ripley is chief engineer in charge of surveys and studies for this work and John R. Freeman is consulting engineer.

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago. Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 505 Pearl St.

Mr. Wiggin recently returned from two years of active service with the A. E. F. in France, where he was on the staff of the Chief Engineer, Line of Communication (afterward known as Director of Construction and Forestry), and had charge of the section of water-supply and sewerage. He entered the army from the Engineer Officers' Reserve Corps, in which he was captain, and received successive promotions to major and lieutenant colonel.

As officer in charge of the water-supply section of the Division of Construction and Forestry of the A. E. F., Lieutenant Colonel Wiggin had general supervision over all of the water-supply projects in the zone of the Services of Supply. Among the works constructed were a curved concrete dam at Savenay, and important additions to the water-supply systems at Brest and St. Nazaire, the main embarkation centers for the American Army in France. Water-supplies also were installed at all of the big hospital centers, and some of them, such as those at Mars and Mesves, with 20,000-bed capacities, represented full-sized cities.

In recognition of his work as officer in charge of the water-supply section, Lieutenant Colonel Wiggin last April received from the Commander-in-Chief, A. E. F., a citation for "exceptionally meritorious and conspicuous services."

Townsend Bill and State-Aid Law Not in Conflict

That the passage of the so-called Townsend national highway bill will have no detrimental effect upon Federal state-aid work is the opinion of Senator Townsend, as expressed in the following letter sent Aug. 11 to S. M. Williams, chairman of the Federal Highway Council:

"Replying to your inquiry concerning my views as to the effect of the passage of the so-called Townsend national highway bill upon the present or future of the Federal state-aid law, now in existence, I hasten to say that such effect cannot be by any possibility detrimental to the state. The object of the bill introduced by me is to establish and maintain a national system of highways, according to a national plan, connecting the different states of the Union, and affording an example of proper highway construction, which will be beneficial to the states. The bill does not in any manner injuriously affect existing law; in fact, it provides that the commission created under it shall have charge of the Federal-aid law, and shall make reports annually to the Congress as to what is being accomplished under existing law, and make such recommendations for the future as the operation of the law and its results seem to make necessary. The two systems of road building are separate and distinct, except that they are under control of the same Federal commission. The appropriations, however, cannot be mingled, and the results will be known and properly appraised by the people from time to time. If the present Federal-aid law proves satisfactory, it will, as a matter of course, be continued, and probably enlarged; if the proven results are not satisfactory, that law will be discontinued. And what I say of the Federal-aid law will be true of the bill now pending before the Senate.

"The commission appointed under the law, it may safely be presumed, will be high-grade men, representing different sections of the country, and their lifework will be to serve the people by furnishing the best possible highway transportation facilities."

Illinois Surveyors' License Law

An act passed by the Illinois legislature requires those who practice land surveying after Jan. 1, 1920, to have a certificate of registration issued by a county board consisting of the recorder and two land surveyors appointed by the county judge. Applicants for registration must be 21 years of age, with four years of experience and training, and must pass an examination

in surveying. Certificates must be renewed annually. The examining board is appointed by the Governor, who has named W. D. Jones, of Chicago, as secretary and treasurer. This law applies to counties having a population of 250,000 and over. It exempts county surveyors and employees of city, county and state governments, as well as those of the Federal Government.

New Engineering Society List

Engineering News-Record has prepared a new 1919 list of technical societies and national engineering trade associations of the United States and Canada. The list is in booklet form, 4¼ x 6¾ in., 22 pages. The present list is a revision of the one prepared in 1917, and contains many additions.

The societies have been divided into national, state and district, and local organizations. The information consists of the office addresses of these societies; the name of the president and the secretary; the address of the secretary; the number of members and the usual months of the annual meetings.

A limited number of copies of the booklet are available to those who would find them useful, such as the officers of engineering societies and others who may be interested. They may be obtained by application to *Engineering News-Record*, Editorial Department, 10th Ave. at 36th St., New York City.

Army Surplus Materials for Sale

Various materials and equipment used by engineers and contractors, such as caterpillar tractors, escort wagons, metallic measuring tapes and spades, are included in current announcements of surplus materials offered for sale by the War Department.

Fourteen Gray, wide-drive, drum tractors of the commercial type used for road-building and agricultural projects, of 18-36 hp., are for sale at $1640 each, f.o.b. warehouse, Gray plant, Minneapolis.

Two hundred and fifty escort wagons at Jeffersonville, Ind., will be sold to the highest bidder Sept. 10, when bids will be opened by the Surplus Property Officer, Zone Supply Office, at Jeffersonville.

Some 4000 or 5000 metallic and steel measuring tapes stored in Chicago will be sold to the highest bidder Sept. 15. Bids will be opened by the Surplus Property Officer, Zone Supply Office, 1819 W. 39th St., Chicago. There are over 1400 steel tapes of 100-ft. length.

About 38,000 new steel spades, in New York, will be sold to the highest bidder Sept. 10, when bids will be opened by the Surplus Property Officer, Zone Supply Office, 461 Eighth Ave., New York City.

Inquiries for further information should be directed to the Ordnance Salvage Board, Ordnance Department, 6th and B Sts., S.W., Washington, D. C., or to district offices in the large cities.

Agree on Principle of Self-Supporting Roads

House Committee Witnesses Opposed to Railroad Plans Necessitating Government Guarantees

Virtual agreement on the principle of establishing railroad rates to make the carriers self-supporting, and opposition to any plan which would virtually call for Government guarantees and the making up of operating deficits out of the national treasury, marked the testimony of some of the chief witnesses before the Interstate Commerce Committee of the House of Representatives in Washington in the past week. The witnesses included George A. Post, chairman of the railroad committee of the Chamber of Commerce of the United States, Howard Elliott, R. S. Lovett, and Alba B. Johnson, formerly president of the Baldwin Locomotive Works.

Mr. Post presented the plan adopted by letter ballot of the Chamber of Commerce, which was outlined in *Engineering News-Record* of June 26, 1919, p. 1281. The plan is flatly opposed to Government ownership and provides for the establishment of rates which will make the railroads self-supporting.

While no definite plan was presented in detail by Mr. Elliott, he urged the principle of adjusting rates so that the roads shall be self-supporting rather than adopting the policy of continuing appropriations from the Treasury. Mr. Elliott also testified that ownership by individuals "with wise, energetic and honest management and operation under suitable, thorough and protective regulation" would produce the best results for the country. He emphasized the necessity of establishing a "self-supporting" level of rates in order to attract sufficient capital for necessary expansion of transportation facilities.

Judge Lovett emphasized the statement that the railroad situation as it now exists is merely a question of credit. He pointed out that the Government does not propose to guarantee dividends and that the investor must depend upon net earnings under the regulations which Congress will prescribe. The investor must decide whether he will risk his money in railroads or put it in some other business. He joined the other witnesses in urging the establishment of a principle of self-supporting rates, but pointed out that revision would have to be made in the accounting rules of the Interstate Commerce Commission before this could be done, since "the amount chargeable to maintenance and repairs, under the Interstate Commerce Commission's regulations, is not sufficient to make the renewals and repairs necessary to maintain the railroad property."

The most radical feature of Mr. Johnson's testimony was the recommendation for establishing a Federal Transportation Board to determine the amount of revenue "necessary to the public interest" to be earned by the railways. This plan provides for the continuance of the Interstate Commerce Commission as a court to insure that "in getting things done, the men of action [the Federal Transportation Board] shall not ride roughshod over the citizens and communities who use the facilities."

Council Urges Engineer for Interstate Commerce Commission

Engineering Council, through its chairman, J. Parke Channing, has addressed a letter to President Wilson urging the appointment of an engineer to fill the existing vacancy on the Interstate Commerce Commission. It is pointed out that the transportation systems of the country are largely the creation of engineers, and that the genius and knowledge of the engineer are essential to the successful operation and maintenance of the properties. Mr. Channing's letter requests the appointment of a man who adds to his other qualifications the training and experience of an engineer in transportation problems.

San Francisco Wins Lawsuit to Protect Water Rights

The so-called Poopenaut Valley condemnation suit, whereby the City of San Francisco has sought to establish the right to condemn land in the Poopenaut Valley, four miles below the Hetch Hetchy dam site, has been decided by Judge C. W. Nicol, of Tuolumne County, in favor of the city. The suit was brought to determine whether the lands in Poopenaut Valley owned by the Yosemite Power Co. could be acquired by the city to provide for possible future additions to its mountain reservoir system.

National Society May Regulate British Engineering Practice

In England an effort is being made to regulate the practice of engineering through the agency of the Institution of Civil Engineers. If the campaign is successful that body will receive statutory powers whereby its decision will be the one by which candidates for admission to the profession will be admitted or rejected. To discover the attitude of the membership toward this subject the following letter ballot was recently sent out by the secretary:

I, ————, approve of the Institution of Civil Engineers taking steps to obtain statutory powers to prescribe the qualifications and to conduct examinations for admission to the profession of civil engineering, to keep a register of civil engineers, and to prevent persons who are not duly qualified from holding themselves out as members of that profession.

Investigating Grain Elevator Accident

The Hon. J. D. Reid, minister of railways and canals, Canadian Government, has appointed a board of engineers to ascertain the cause of the recent Government grain-elevator explosion at Port Colborne. On the board are Col. C. N. Monsarrat, consulting engineer for the Government; A. St.

Laurent, assistant deputy minister of public works; D. A. McLachlan, engineer in charge of the Port Nelson terminals of the Hudson Bay R.R.; and John Murphy, electrical engineer of the Department of Railways and Canals.

Theodore Cooper Dies in Eighty-First Year

Theodore Cooper, for thirty years one of New York's best known consulting engineers, an authority on bridge design and construction, and former instructor in the United States Naval Academy, died Aug. 24 at his home, 353 W. 57th St., New York City. He was 80 years of age, and unmarried.

Mr. Cooper was born at Cooper Plains, N. Y., Jan. 12, 1839, and was graduated from the Rensselaer Polytechnic Institute in 1858. His first work of engineering responsibility was done in connection with the construction of the Hoosac tunnel on the Troy & Greenfield R.R., in 1861.

At the outbreak of the Civil War, Mr. Cooper entered the United States Navy as third assistant engineer. His service with the Navy lasted until 1872, part of which time he served as instructor in engineering and chemistry at the Naval Academy. At the time of his resignation from the Navy he held the rank of first assistant engineer.

Mr. Cooper then became resident engineer on the construction of the St. Louis bridge. Later he was superintendent of the Delaware Bridge Co.'s shops at Phillipsburg, N. J. Still later he became assistant general manager and superintendent of the Keystone Bridge Co., of Pittsburgh.

Establishing himself as consulting engineer in 1879, Mr. Cooper designed the Seekonk bridge at Providence, R. I.; the Sixth Street bridge at Pittsburgh; the Second Avenue bridge over the Harlem River, New York City; the Newburyport bridge over the Merrimac, and the Junction bridges over the Allegheny. He also designed and superintended the construction of the Laredo shops of the Mexican National R.R. He was appointed by President Cleveland a member of a board of five engineers to determine the Hudson River bridge span in 1894. Other consulting work included the New York Public Library and the Quebec bridge, and work for the Suburban Rapid Transit Co., the New York Rapid Transit Commission, the Boston Rapid Transit Commission and the Harlem River Commission. He retired from active practice in 1907. Besides being a member of the American Society of Civil Engineers, to which society he was admitted in 1874 and which he served as director in 1884 and 1885, Mr. Cooper held membership in the Military Order of the Loyal Legion, the New York Chamber of Commerce, the New York Historical Society and the Century Association. He was also a life member of the Naval Institute and the Society of Fine Arts, and a corresponding member of the Institute of Architects.

Mr. Cooper was a frequent contributor of technical papers at sessions of the American Society of Civil Engineers, and on two occasions he received the Norman medal from that society, his papers, "The Use of Steel For Bridges," contributed in 1880, and "American Railroad Bridges," being so distinguished.

Famous Bridge Engineer



THEODORE COOPER

An important contribution of Mr. Cooper to railroad bridge construction was his "General Specifications for Iron Railroad Bridges and Viaducts," published in 1884, forming the first authoritative specifications on bridge construction that had been published and circulated. Those first specifications were revised from time to time and republished, along with specifications for highway bridges and for foundations and substructures of highway bridges and electric-railway bridges. The seventh edition of his steel railroad bridge specifications was issued in 1906.

Even more than through his specifications, however, Mr. Cooper's name became universally familiar to bridge engineers through his system of locomotive and train loading for bridge design. Composed of a wheel system representing the heaviest locomotives of that time, followed by a uniform load whose amount in pounds per foot bore a simple relation to the driving-axle load, this system proved so convenient, and was excellently adapted to modification for increasing weight of trains and engines by simple multiplication, that it quickly won a commanding position, and for many years now has been the almost universal standard for railway-bridge design in America. Theodore Cooper also exerted a strong influence toward bringing about the adoption of wheel-load analysis for railway bridges in place of uniform-load or other methods, and the moment tables which he published made it possible to carry out the analysis rapidly and conveniently.

Graphically Shows Effect of Production on Living Cost

Under the caption, "Let's Go," the Chicago *Herald and Examiner* published the following editorial Aug. 22:

"Put one hundred men on an island where fish is the staple article of sustenance. Twenty-five of the men catch fish. Twenty-five others clean the fish. Twenty-five cook the fish. Twenty-five hunt fruit and vegetables. The entire company eats what thus is gathered and prepared.

"So long as everybody works there is plenty. All hands are happy.

"Ten of the allotted fish catchers stop catching fish.

"Ten more dry and hide part of the fish they catch.

"Five continue to catch fish, but work only part of the day at it.

"Fewer fish go into the community kitchen.

"But the same number of men insist upon having the same amount of fish to eat as they had before.

"The fifty men who formerly cleaned and cooked the fish have less to do owing to the undersupply of fish. But they continue to demand food.

"Gradually greater burdens are laid upon the fruit and vegetable hunters. These insist upon a larger share of fish in return for their larger effort in gathering fruit and vegetables. It is denied them and soon twenty of the twenty-five quit gathering fruit and vegetables.

"But the entire one hundred men continue to insist upon their right to eat.

"The daily food supply gradually shrinks. The man with two fish demands three bananas in exchange for one of them. The man with two bananas refuses to part with one for fewer than three fish.

"Finally, the ten men remaining at work quit in disgust. Everybody continues to eat. The hidden fish are brought to light and consumed. Comes a day when there is no food of any kind. Everybody on the island blames somebody else.

"What would seem to be the solution?

"Exactly! We thought you would guess it.

"For we repeat that you can't eat, buy, sell, steal, give away, hoard, wear, use, play with or gamble with WHAT ISN'T."

Salt Lake and Denver Railway Project Is Revived

A company organized and headed by Governor Bamberger of Utah proposes to build a railway east from Provo into the Uintah basin, to provide for the development of coal, oil, timber and other resources of the district, and the project includes the extension of the road to Craig, Colo., the present western terminal of the Denver & Salt Lake R.R., known as the Moffat line. The total length would be about 310 miles,

giving a 600-mile direct route between Denver and Salt Lake City. It is intended to limit the grades to 2% and the curves to 10°, thus giving the Uintah basin a favorable outlet westward.

Government Receiving Bids for Sale of City of Nitro

The War Department is offering for sale the town of Nitro, W. Va., a complete industrial community embracing 737 manufacturing buildings, and housing accommodations for 20,000 persons, including utilities and civic improvements. The town was built by the Government at a cost of approximately $70,000,000, and is the site of the second largest smokeless-powder plant in the world.

Bids must cover not only the powder plant and other industrial units, but also the buildings comprising the community. Bids will be opened at 12 o'clock noon, Sept. 30, 1919, at the office of the Chairman of the Ordnance District Salvage Board, 1710 Market St., Philadelphia, Penn.

Civil Service Examinations

New York State. Bridge designer, office of Transit Construction Commissioner, $1500 to $2100, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

New York State. Junior assistant engineer, State Engineer and Highway Department, $1200 to $1440, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

New York State. Junior engineer, Transit Construction Commission, New York City, $1200 to $1500, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

New York State. Sanitary engineering inspector, State Department of Health, $1320, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Research engineer, $2,800 to $3,200 per year, Ordnance Department. File application before Sept. 2.

Research physicist, $2,700 to $3,200 per year, Ordnance Department. File application before Sept. 2.

Mathematics and dynamics experts, Grade I, $2,500 to $4,000 per year; Grade II, $4,000 to $5,000 per year, Ordnance Department. File application before Sept. 2.

Specification engineer, Office of Chief Signal Officer, War Department, Washington, D. C., $2000 to $2400 per year, Sept. 9. File applications before Sept. 9.

Chief metallurgist, $4,500 to $5,000 per year; assistant chief metallurgist, $3,600 to $4,500 per year, Ordnance Department. Applications must be filed before Sept. 16.

Computer, Ordnance, Navy Yard, Washington, D. C., $7.20 to $12 per diem, Sept. 17. File applications in time to arrange for examination at place selected by applicant.

Junior highway bridge engineer, Office of Public Roads and Rural Engineering, Department of Agriculture, $1200 to $1600 per year, Sept. 17. File applications with commission at Washington in time to arrange for examination at place selected by applicant.

Assistant examiner, Patent Office, Washington, D. C., $1500 to $1740 per year, Sept. 17 to 19 and Nov. 19 to 21. File applications in time to arrange for examination at place selected by applicant.

Engineer, $3000 per year; assistant engineer, $1800 to $2880 per year; junior engineer, $1200 to $1740 per year; engineering draftsman, $1200 to $3000 per year, Reclamation Service. Applications will be received until further notice.

ENGINEERING SOCIETIES

Calendar

Annual Meeting

NEW ENGLAND WATER WORKS ASSOCIATION Tremont Temple, Boston, Sept. 30, Oct. 1-3, Albany, N. Y.

AMERICAN SOCIETY OF NAVAL ENGINEERS; Secretary, Lieut. Com. F. W. Sterling, U. S. N., Navy Department, Washington, D. C.; Oct. 7, Washington.

AMEPICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS, 304 E. Walnut St., Bloomington, Ill.; Nov. 11-14, New Orleans.

The Washington State Good Roads Association will hold its 20th annual convention at Yakima, Wash., Sept. 1-2. At a recent meeting of the executive committee a resolution was passed favoring the cutting up of road contracts into several smaller jobs, so that the small contractor could bid more easily. It will be urged at the convention that the Federal Government construct the proposed military highway from the Mexican border to British Columbia.

The Duluth Engineers' Club discussed the national water-power bill at its monthly meeting Aug. 19. A report on the bill prepared by a committee was read by Howard J. Underhill; indorsement by the club was recommended. The conclusions of the report were generally indorsed, but it was referred back for minor amendments. Protection of the dye industry was unanimously indorsed by vote of the club.

The Salt Lake Chapter of the American Association of Engineers was installed Aug. 16. Dr. F. H. Newell, president of the association, addressed the chapter.

The Los Angeles Chapter of the American Association of Engineers is endeavoring to affiliate with itself the Engineers and Architects' Association of Southern California.

The Tidewater Virginia Chapter of the American Association of Engineers, at a recent meeting, charged Norfolk, Va., dealers with profiteering. One member asserted he bought lumber outside the state, paid transportation costs, and then was $5 under prices given by a Norfolk dealer.

The Colorado Society of Engineers held a special meeting Aug. 12. A dinner was given to Dr. F. H. Newell, who delivered an address on the desirability of affiliation with the American Association of Engineers. The membership is being canvassed concerning the opinion on such affiliation.

The Utah Society of Engineers, at a special meeting in Salt Lake, Aug. 13, was addressed by Philip N. Moore, past president of the American Institute of Mining Engineers, on the proposed National Department of Public Works. W. W. DeBerard, Western editor of *Engineering News-Record,* spoke on "Professional Engineering Publicity Problems Analyzed." The meeting was held in conjunction with the local sections of the A. I. M. E., the A. I. E. E., the Am. Soc. C. E., and the American Mining Congress.

The Oregon Society of Engineers has been installed as a chapter of the American Association of Engineers. The installation was directed by Dr. F. H. Newell, president of the association.

The Omaha Chapter of the American Association of Engineers, at its meeting Aug. 12, organized a committee, headed by J. A. Bond, city engineer of Omaha, to study paving so that its investigations and recommendations may be sent to the county commissioners of Douglas County. The county recently voted a $3,000,000 bond issue for good roads.

The Pennsylvania Railroad Section of the American Association of Engineers is seeking the coöperation of all engineering organizations in Pennsylvania to obtain the appointment of two engineers to fill vacancies on a commission created by the last session of the legislature to supervise the construction of a bridge across the Delaware River at Philadelphia.

PERSONAL NOTES

CHARLES E. GREGORY, formerly engineer of drainage and sewage disposal, Borough of Manhattan, New York City, has resigned, to become deputy engineer of the North Jersey District Water-Supply Commission.

WILLIAM L. HANAVAN has resigned from the engineering staff of the New York Public Service Commission and has become associated with the Vulcanite Portland Cement Co. Prior to his connection with New York subway construction he was for a number of years on the Catskill Aqueduct work.

J. O. GREENWAY has resigned as drainage engineer for Yakima County, Washington, to become engineer for the Washington Brick, Lime & Sewer-Pipe Co., Spokane, Wash.

HARVEY A. ANDERSON, assistant engineer physicist, United States Bureau of Standards, has resigned, to become aëronautical engineer in charge of the physical testing section, research division, of the naval aircraft factory in Philadelphia. Mr. Anderson is the author of the Bureau of Standards' publication on "Mechanical Properties of Materials."

GILBERT K. COOPER and GEORGE B. MCCLARY, Chicago, have formed the partnership of COOPER & MCCLARY, civil engineers. Mr. McClary was recently discharged from the Army, having served as a captain of engineers in France.

ROBERT THOM, formerly county surveyor of Tuolumne County, California, has become county engineer. The office of county surveyor has been abolished, as noted in *Engineering News-Record* of July 24, 1919, p. 197.

PAUL D. PRATT, chief engineer of the Montana State Highway Commission, has resigned, to become associated with the State Highway Construction Co., Helena.

EDWARD N. LAKE, formerly manager and treasurer of the Krehbiel Co., electrical and mechanical engineers, Chicago, is now president of the LAKE ENGINEERING Co., City Hall Square Bldg., Chicago. Previously he was resident engineer for the STONE & WEBSTER COMPANY.

ROBERT B. WARNER and W. R. CASEY have opened offices in Springfield, Mass., under the firm name of WARNER & CASEY, architects and engineers.

CHARLES W. MCKAY has taken charge of the appraisal division of L. V. Estes, Inc., Chicago.

W. H. TIMBIE, for the past year engaged in educational work with the War Department, and prior to that time instructor in applied science at both Wentworth and Pratt Institutes, has been appointed associate professor of electrical engineering in the Massachusetts Institute of Technology. Mr. Timbie is the author of books relating to electrical engineering.

CAPT. W. E. DARROW, 33rd Engineers, U. S. A., has received his discharge from the service and has returned to his position as assistant engineer, New York State Highway Department, with headquarters at Utica.

HENRY N. FREES, former superintendent on various United States Steel Corporation's housing projects, has become a vice-president of the W. J. Parsons Housing Co., Chicago.

LEONARD MACBEAN, contractor and engineer, has transferred his main office to New York City, at 30 E. 42nd St. M. W. PLUMB, who has been with the United States Shipping Board as traffic engineer of the second district, is associated with Mr. MacBean.

J. L. LYTLE, district engineer, United States Reclamation Service, Provo, Utah, and G. F. MCGONAGLE, state engineer of Utah, have been appointed advisory engineers in charge of collecting data for the storage of flood waters of the Jordan and Weber Rivers. A. F. PARKER, consulting engineer, Ogden, Utah, will have active charge of the work. A fund of $10,000 has been subscribed in eight counties where the reclamation of 100,000 to 200,000 acres might be effected.

J. L. MCCONNELL has resigned his position with the American International Shipbuilding Corporation and has opened an office at 105 W. Monroe St., Chicago, making a specialty of the design of industrial plants. Previous to the war he was engineer for Holabird & Roche, architects, of Chicago.

JOHN N. EDY, heretofore assistant chief engineer of the Montana State Highway Commission, has been appointed chief engineer of the commission, the appointment to be effective Sept. 1, 1919. He succeeds PAUL D. PRATT, whose resignation is noted elsewhere in these columns.

JAMES L. BRUFF, who, for 12 years prior to 1917 was connected with the TURNER CONSTRUCTION Co., and since that time has been vice-president of the JOHN W. COWPER Co., INC., engineers and contractors, Buffalo, N. Y. has resigned his position to take charge of the contract department of THOMPSON & BINGER, INC., at their Syracuse office.

FRANCIS B. SMITH, engineer for the San Francisco Bridge Co., is returning to San Francisco after about 10 years in Hawaii, where he was in charge of construction of the Government dry dock recently completed at Pearl Harbor.

SYLVESTER Q. CANNON, city engineer of Salt Lake City, Utah, has been relieved of the duties of superintendent of the Water Department, which duties he assumed, as a measure of economy, during the war. H. K. BURTON, water-supply engineer in Mr. Cannon's office, has been appointed to the position.

LE GRAND BROWN, formerly an engineer in Rochester, N. Y., who has been engaged in consulting work in California for a number of years, has been appointed deputy city engineer of Rochester.

S. B. ROBERTSON, successively division engineer of the Pennsylvania Lines West, superintendent of the Erie and Ashtabula division, superintendent of the Cleveland and Pittsburgh division, and general superintendent of the Lines West, has resigned to become associated with the B. F. Goodrich Rubber Co., Akron, Ohio.

JOSEPH A. MURRAY, JR., has resigned as lieutenant, junior grade, U. S. N., and has returned to the Bureau of Engineering, Albany, N. Y., where he has been appointed engineer in charge of the sewage-disposal system.

CAPT. GERMAIN P. GRAHAM, 20th Engineers, U. S. A., has been discharged from the service and has resumed his work as assistant engineer in charge of construction, Bureau of Engineering, Albany, N. Y.

H. E. BILGER has resigned as road engineer with the Illinois Highway Department, and has become consulting engineer for the Monmouth Stone Co., Monmouth, Ill. Mr. Bilger has been with the highway department for 12 years.

E. V. CAMP, consulting engineer, Atlanta, Ga., has been employed by the county commissioners to supervise engineering work in connection with road building in Murray County.

CHARLES W. ATTWOOD and ERNEST H. TRYSELL, Detroit, Mich., have announced a partnership under the firm name of ATTWOOD & TRYSELL, architects and engineers.

CAPT. A. STEARNS WILSON, Engineers, U. S. A., has been discharged from the service and has reopened consulting and contracting offices at 51 E. 42nd St., New York City.

H. S. MATTIMORE, for 15 years connected with the New York State Highway Commission, nine years being spent in charge of physical testing work, has resigned and has accepted a similar position with the Pennsylvania State Highway Commission.

J. C. MCCULLOUGH, superintendent of the Panhandle Line, Pennsylvania R.R., succeeds S. B. ROBERTSON as general superintendent of the Pennsylvania Lines West. The resignation of Mr. Robertson is noted elsewhere in these columns.

A. E. CHANDLER has resigned from the California Water Commission, whose work he has been directing for several years. Mr. Chandler will take charge of the water department in a firm of San Francisco attorneys, the new name of which will be Haven, Athearn, Hall & Chandler.

OBITUARY

THOMAS COLE, for 33 years secretary of the Institution of Municipal and County Engineers, with headquarters in London, died Aug. 3, aged 73 years. For the past five years he had been the institution's honorary secretary. Mr. Cole was associated with various engineers in London engaged in railway and other work, until he opened an office for practice as a consulting engineer.

MAJOR GEORGE SYKES, Engineers, U. S. A., who recently returned from service overseas, died Aug. 21 at Flushing, N. Y., aged 38. Prior to entering the Army in 1917 Major Sykes practiced engineering and building construction in New York City.

THOMAS KING, for many years a Brooklyn, N. Y., contractor and builder, died at his home there Aug. 19, aged 74 years.

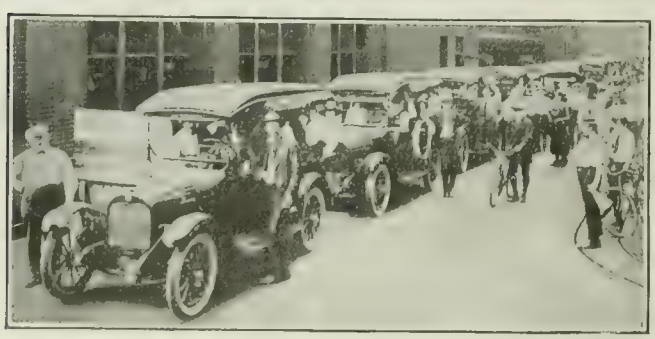
WILLIAM P. CUNNINGHAM, commonly known among engineers and contractors in the East as "Bill" Cunningham, regional manager of the Allied Machinery Co. of America, and formerly with the Lakewood Engineering Co., died at his home in Glen Ridge, N. J., Aug. 14, following an acute attack of appendicitis and an operation therefor.

Light, Fast Business Cars Solve Street-Car Strike Problem

A wide range of usefulness of the light type of commercial motor car was demonstrated recently during the street-car strike in Detroit. Cars were tied up nearly a week, and although thousands of employees lived several miles from the factory of Dodge Bros., the factory continued in operation throughout the strike period. This was made possible by a thorough system of transportation in which screen-side business cars by the hundreds were employed.

The cars were routed at regular intervals over all sections of the city, picking up employees at appointed places and hurrying them to their work. In the evenings the same cars lined up in imposing fleets at the factory gates, as shown in the accompanying illustration, and carried the employees home.

Officials of the plant found that there was actually less tardiness during the strike than there is ordinarily, when employees depend on street cars for their transportation. The screen-side business car is as speedy as the average passenger car and is designed for half-ton capacity.



BUSINESS CARS USED FOR EMPLOYEES DURING STREET-CAR STRIKE

BUSINESS NOTES

THE JEFFREY MANUFACTURING CO., Columbus, Ohio, has opened an office in the Book Bldg., Detroit, in charge of O. B. Wescott.

THE CHICAGO PNEUMATIC TOOL CO. has moved its Cincinnati office from the Mercantile Bldg. to the Walsh Building.

THE READING ENGINEERING CO., INC., 154 Nassau St., New York City, has been formed by James P. Reading, formerly of the Hubbard-Floyd Co., New York City, to carry on a general equipment business.

THE FISHER GOVERNOR CO., Marshalltown, Iowa, has opened an office in New York City at 1 Franklin St.; it will be in charge of P. L. Rhodes.

THE MERRILL-STEVENS SHIPBUILDING CORPORATION, Jacksonville, Fla., and the LOUISIANA SHIPBUILDING CORPORATION, Slidell, La., have established an office in New York City at 280 Broadway, in charge of Orlando H. Taylor as New York representative of the two companies, and W. W. Helvenston as purchasing agent of the Merrill-Stevens corporation.

THE WESTINGHOUSE AIR BRAKE HOME BUILDING CO. has recently been organized with a capital of $1,000,000. The chief function of the new company will be the transaction of all business relative to the real estate and dwellings which have been transferred by deed to the new company by the Westinghouse Air Brake Company.

THE UNIVERSAL PORTLAND CEMENT CO., Chicago, has combined the promotion and inspection bureaus under the name of "Service Bureau." J. H. Libberton, formerly engineer, promotion bureau, and inspecting engineer, in the general offices of the company in Chicago, has been appointed manager of the Service Bureau; G. E. Warren, assistant manager; J. W. Lowell, Eastern manager, Pittsburgh; J. H. Chubb, Northwestern manager, Minneapolis; and O. L. Moore, chief cement inspector, Chicago.

TRADE PUBLICATIONS

The following companies have issued trade publications:

THE CHICAGO PNEUMATIC TOOL CO., Chicago; leaflet announcing "Boyergrip," designed to fit over muzzle of pneumatic riveter, to provide full control of hammer without the grasping of the heated cylinder.

THE TROY WAGON WORKS CO., Troy, Ohio; booklet, 8 x 8 in., 22 pages; explains how to figure what a motor truck can do, and gives tables of comparative cost data, and charts to figure road resistance; also, catalog, 8 x 9 in., 23 pages, illustrated; shows details of slow-speed trailers for use behind slow-speed tractors.

THE EARLE GEAR & MACHINE CO., Wayne Junction, Philadelphia, Penn., catalog, 9½ x 6¾ in., 18 pages, illustrated; subject of the catalog, centrifugal pumps.

THE BALL ENGINE CO., Erie, Penn.; folder, 8½ x 11 in., six pages, illustrated; describes Type B Erie locomotive crane.

THE TABER PUMP CO., 297 Elm St., Buffalo, N. Y.; leaflet, 6 x 9 in., four pages, illustrated; describes Taber rotary type G pumps.

THE AUSTIN CO., Cleveland; booklet, 4 x 9 in., six pages; tells of Austin standard factory buildings, industrial plants and their equipment.

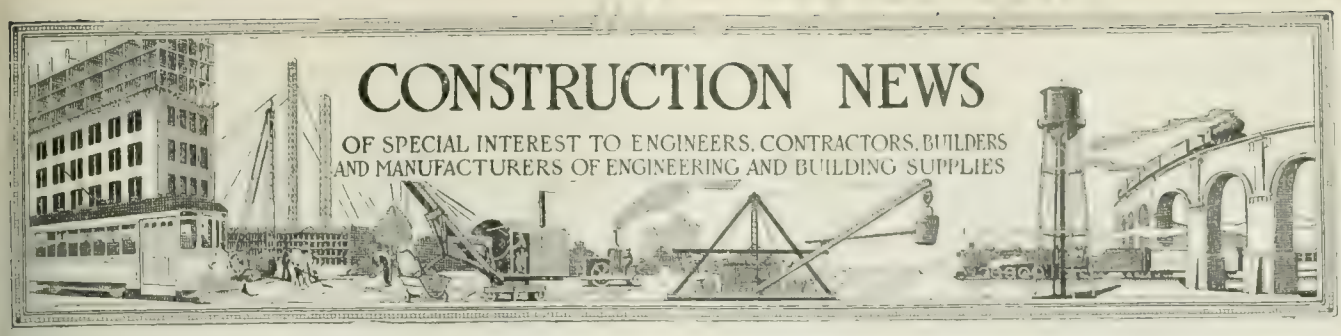
THE EDWARD F. TERRY MANUFACTURING CO., New York City; bulletin, 8½ x 11 in., illustrated; describes the "Contractor Locomotive Crane" as used under various conditions in construction work.

C. K. THOMAS AND CO., consulting export engineers, 10 Bridge St., New York City; booklet, 3½ x 5½ in., 10 pages, entitled "Service"; outlines the company's service to exporters, as consulting engineers.

THE INTERLOCKING CULVERT CO., Benham Bldg., Denver, Colo.; catalog, 9 x 11½ in., 22 pages, illustrated; describes various types and uses of "Wendelken" interlocking concrete culverts.

THE MARION STEAM SHOVEL CO., Marion, Ohio; booklet, 5½ x 8 in., 64 pages, illustrated; tells of various types and uses of Marion steam shovels, and includes information regarding the Marion factory and processes.

THE DAVIS-BOURNONVILLE CO., Jersey City, N. J.; pamphlet, 8½ x 11 in., six pages; describes the "Pyrograph," a machine designed for accurate cutting work in the boiler shop with the oxyacetylene torch.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Sept. 1	Elmhurst, Ill. ..... Adv. Aug. 28.	Aug. 28
Sept. 2	Altus, Okla	Aug. 28
Sept. 3	Cowley, Wyo.	Aug. 28
Sept. 4	Wingdale, N. Y ..... Adv. Aug. 28	Aug. 28
Sept. 10	Central Islip, N. Y..... Adv. Aug. 28	Aug. 28
Sept. 10	Rock River, Wyo..... Adv. Aug. 28	Aug. 28
Sept. 11	Wendell, N. C.....	Aug 28
Sept. 16	Statesville, N. C	Aug. 28
Sept. 17	Kansas City, Mo.....	Aug. 21

SEWERS

Sept. 1	Walnut Grove, Minn.....	Aug 21
Sept. 1	Inwood, Ia.	Aug 21
Sept. 3	Pocahontas, Ia.	Aug 21
Sept. 3	Pittsburgh, Pa.	Aug. 28
Sept. 3	Leesburg, Fla.....	Aug. 28
Sept. 4	Richmond, Ky. ..... Adv. Aug. 21	Aug. 21
Sept. 5	Bexley (Columbus P. O.), O	Aug. 28
Sept. 9	Kendall, Ind. ..... Adv. Aug. 28.	Aug. 28
Sept. 10	Rock River, Wyo. ..... Adv. Aug. 28	Aug. 28
Sept. 10	Binghamton, N. Y.....	Aug. 28

BRIDGES

Sept. 1	Duluth, Minn.	Aug. 14
Sept. 2	Chester, S. C.....	Aug. 21
Sept. 2	Minneapolis, Minn.	Aug. 14
Sept. 2	Blue Earth, Minn.	Aug. 21
Sept. 3	Visalia, Cal.	Aug 28
Sept. 3	Dubois, Pa.	Aug. 21
Sept. 3	Three Rivers, Cal	Aug 21
Sept. 3	Long Island City, N. Y...	Aug 28
Sept. 3	Toledo, O	Aug. 14
Sept. 9	Duluth, Minn.	Aug. 14
Sept. 9	Columbus, O	Aug 28
Sept. 9	Danville, Ill. ..... Adv. Aug. 28	Aug. 28
Sept. 9	Lake Geneva, Wis.....	Aug. 28
Sept. 10	Columbus, O.	Aug. 28
Sept. 12	Schenectady, N. Y..... Adv. Aug. 21.	Aug. 21
Sept. 15	Portsmouth, Va.	Aug. 28
Sept. 16	Wayne, W Va.....	Aug. 21
Sept. 17	Pasco, Wash.	Aug. 28
Sept. 22	Norristown, Pa. ..... Adv. Aug. 28.	Aug. 28
Sept. 22	Duluth, Minn.	Aug. 28
Sept. 23	Harrisburg, Pa..... Adv. Aug. 14.	Aug. 14

STREETS AND ROADS

Sept. 1	Arcadia, Fla.	Aug. 7
Sept. 1	Salt Lake City, Utah.....	July 24
Sept. 1	Alexandria, La.	Aug. 21
Sept. 1	Tunica, Miss	Aug 28
Sept. 2	Waterville, Wash	Aug. 21
Sept. 2	Pascagoula, Miss. ..... Adv. Aug. 21	Aug. 21
Sept. 2	North Carolina	Aug 21
Sept. 2	Louisiana	Aug 21
Sept. 2	Independence, Mo.	Aug 7
Sept. 2	Minneapolis, Minn.....	Aug 14
Sept. 2	Washington, Ga.	Aug 14
Sept. 2	Sylacauga, Ala.	Aug 14
Sept. 2	Maryland ..... Adv Aug 21.	Aug 21
Sept. 2	Bellevue, Pa.	Aug 28
Sept. 2	Newton, N. J.....	Aug 28
Sept. 2	California	Aug 28
Sept. 2	Dyersburg, Tenn.	Aug 28
Sept. 2	Bemidji, Minn.....	Aug 28
Sept. 2	Connecticut	Aug. 28
Sept. 2	Little Rock, Ark.	Aug. 28
Sept. 2	Kansas City, Kan.	Aug 28
Sept. 3	Baltimore, Md	Aug 28
Sept. 3	Huntington, W Va.	Aug. 28
Sept. 3	Pittsburgh, Pa.	Aug. 28
Sept. 3	Brooklyn, N. Y.....	Aug. 28
Sept. 3	Maine	Aug 21
Sept. 3	Toledo, O.	Aug. 14
Sept. 3	Moultrie, Ga.	Aug. 14
Sept. 4	Fulton, Mo.	Aug 21
Sept. 4	Rochester, N. Y..... Adv. Aug. 21.	Aug. 21
Sept. 4	Coldwater, O.	Aug. 28
Sept. 4	Charlotte N C	Aug 28
Sept. 5	Thief River Falls, Wis....	Aug. 28
Sept. 5	Little Rock, Ark.....	Aug 21
Sept. 8	Seattle, Wash.	Aug 21
Sept. 8	Indiana	Aug. 14
Sept. 8	Monroe, Ga.....	Aug. 21
Sept. 8	Vercheres, Que.	Aug. 28
Sept. 8	Como East, Que.....	Aug 28
Sept. 8	Bakersfield, Cal.	Aug. 28
Sept. 9	New York, N. Y..... Adv. Aug. 21.	Aug. 21
Sept. 9	Keyser, W. Va. ..... Adv. Aug. 21	Aug. 21
Sept. 9	Jersey City, N. J...	Aug 21
Sept. 9	Indiana	Aug 28
Sept. 9	Whiteville, N. C	Aug 28
Sept. 9	Trenton, N. J.....	Aug. 28
Sept. 10	Centerville, Tenn.	Aug. 28
Sept. 10	Bentonville, Ark.	Aug. 21
Sept. 10	Delaware ..... Adv. Aug. 21	Aug. 21
Sept. 10	Waterloo, Ia.	Aug. 21
Sept. 12	Trenton, N J	Aug 28
Sept. 15	Clayton, Mo.	Aug. 28
Sept. 15	Sanford, Fla.	Aug 28
Sept. 15	New Mexico	Aug 28
Sept. 16	Lewisburg, W Va. ..... Ad.. Aug 28	Aug. 28
Sept. 16	Griffin, Ga	Aug 28
Sept. 16	New Mexico	Aug 28
Sept. 16	Prosser, Wash	Aug 21
Sept. 16	New Orleans, La.	Aug. 21
Sept. 18	Marion, Ark.	Aug. 21
Sept. 20	Madill, Okla.	Aug. 28
Sept. 22	Lyons, Kan	Aug 28
Oct. 10	Tacoma, Wash. ..... Adv. Aug. 14.	Aug. 14

EXCAVATION AND DREDGING

Sept. 2	Sanford, Ala.	Aug. 14
Sept. 5	Fort Dodge, Ia.....	Aug. 21
Sept. 10	Toms River, N. J.....	Aug. 21
Sept. 22	Tower, Minn.	Aug. 21

INDUSTRIAL WORKS

Aug. 31	Long Island City, N. Y....	Aug. 28
Sept. 1	Hastings, Minn.	Aug. 21
Sept. 2	Kohler, Wis	Aug 28
Sept. 5	Sheboygan, Wis.	Aug. 28
Sept. 3	Minneapolis, Minn.	Aug 28
Sept. 10	Two Rivers, Wis.....	Aug. 28
Sept. 15	New York, N. Y.....	Aug. 28

BUILDINGS

Sept. 1	St. Louis, Mo.	Aug. 21
Sept. 1	Omaha, Neb.	July 17
Sept. 1	Ft. Worth, Tex.	Aug. 14
Sept. 1	Cameron, Tex.	Aug. 14
Sept. 1	Miamisburg, O.	Aug. 14
Sept. 1	Outremont, Que.	Aug. 14
Sept. 1	Willmar Minn	Aug 21
Sept. 1	Montreal, Que	Aug 28
Sept. 2	Twin Falls, Idaho.....	Aug 21
Sept. 2	Merced, Cal	Aug 21
Sept. 2	Okmulgee, Okla.	Aug. 21
Sept. 2	Berkeley, Cal.	Aug. 28
Sept. 2	Wichita Kan	Aug 28
Sept. 2	Philadelphia, Pa	Aug 28
Sept. 2	Crookston, Minn.	Aug 28
Sept. 3	Trenton N J	Aug 14
Sept. 3	Atlantic City N J	Aug 28
Sept. 3	Victoria, Tex	Aug 14
Sept. 4	Hartsdale N Y	Aug 21
Sept. 4	Bayonne N J	July 31
Sept. 4	Peterborough, Ont.	Aug 14
Sept. 4	Lyndon, Kan	Aug 21
Sept. 4	Troy, N. Y.	Aug 21
Sept. 5	Taycheedah, Wis.	Aug. 28
Sept. 5	San Francisco, Cal.....	Aug. 21
Sept. 6	Fairview, Pa	Aug 14
Sept 10	Kings Park, N. Y.....	Aug 28
Sept 11	Minneapolis, Minn.	Aug 21
Sept. 11	Superior, Wis.	Aug 21
Sept 12	Cloquet, Minn	Aug. 21
Sept. 12	Council Bluffs, Ia.	Aug. 28
Sept. 15	Pleasant Grove, Utah....	July 24
Sept. 15	St Paul, Minn	Aug 14
Oct. 1	St Paul, Minn.	Aug 28
Oct. 1	Virginia, Minn	Aug 28

FEDERAL GOVERNMENT WORK

Sept. 2	Towboat—Memphis, Tenn..	Aug. 7
Sept. 2	Miscellaneous Equipment—Washington, D. C. ..... Adv July 10 and 17	July 10
Sept. 2	Post Office—Kansas City, Mo	July 24
Sept. 2	Dredging New York, N. Y.. Adv Aug 7	Aug. 7
Sept. 2	Finishing Machine Shop and Heat Treatment Building and Half-Yard Runaways—Nicetown, Pa..... Adv. Aug. 28.	Aug. 28
Sept. 3	Equipment—Spec 3882—New Orleans, La.	Aug. 28
Sept. 3	Roadwork — Republic, Wash	Aug. 28
Sept. 4	Boiler Plant — Stapleton, N. Y. ..... Adv. Aug. 21.	Aug. 21
Sept. 4	Bridge—Arizona	Aug 21
Sept. 5	Post Office — Montevideo, Minn.	Aug. 14
Sept. 7	Alterations to Post Office—Detroit, Mich. ..... Adv. Aug. 21	Aug. 21
Sept. 8	Hangar — Spec. 4001 — Lakehurst, N. J.....	Aug. 21
Sept. 8	Post Office—Carroll, Ia ..	Aug. 14
Sept. 9	Forge Shop Extension, Shell and Case, Shop Buildings—Philadelphia, Pa.... Adv. Aug 28	Aug. 28
Sept. 10	Post Office Douglas, Ga ..	July 31
Sept. 10	Water and Sewerage Systems and Fuel Oil Reservoir —Spec 4007, San Diego, Cal.	Aug. 21
Sept. 10	Torpedo Track, Electric Trolley and Hoist and Gyro —Spec 4008—Pearl Harbor, Hawaii	Aug 28
Sept. 11	Earthwork — Memphis, Tenn. ..... Adv. Aug. 21	Aug 21
Sept. 12	Remodeling Electric Passenger Elevator — Chicago, Ill. ..... Adv. Aug. 21.	Aug 21
Sept. 12	Pumps — New Haven, Conn ..... Adv. Aug. 21.	Aug. 21
Sept. 15	Earthwork St Louis, Mo	Aug. 21
	Adv. Aug. 21.	
Sept. 15	Post Office—Winnemucca Nev ..... Adv. Aug. 21.	Aug 21
Sept. 15	Kitchen and Mess Hall — Stapleton, N. Y..... Adv Aug 21.	Aug. 21
Sept. 17	Development of Base — Spec. 3762 — Key West, Fla	Aug 28
Sept. 18	Sewerage System Waters Service Lines and Electric Lighting Plant—Washington, D C	Aug 28
Sept. 18	Jetty Repair — Wilmington Del ..... Adv Aug 21	Aug 21
Sept. 18	Post Office—North Topeka, Kan	Aug 14
Sept 22	Material — Charlestown W Va	Aug 21
Sept. 22	Post Office — Charleston, W Va	Aug 21
Sept 24	Mechanical Stokers—Spec 4010—Charleston S C	Aug. 28
Sept. 24	Reciprocating Air Compressor — Spec 3837 — Puget Sound, Wash.....	Aug 28

Bids Close		See Eng. News-Record
Sept. 26	Post Office and Custom House—Providence, R. I. Adv. Aug. 21.	Aug. 21
Sept. 29	Dredge, etc.—Wilmington, N. C. Adv. Aug. 28.	Aug. 28
Sept. 30	Remodeling Hospital—Boston, Mass	Aug. 28
Oct. 1	Valves, Gates, etc.—Denver, Colo. Adv. Aug. 21.	Aug. 21
Oct. 1	Electric Lighting and Power Systems—Spec 3982—Mare Island, Cal.	Aug. 28
Oct. 6	Post Office—St. Johnsburg, Vt.	Aug. 28
Oct. 10	Dredge—New York, N. Y. Adv. Aug. 28.	Aug. 28
Nov. 3	Post Office and Court House—Honolulu, H. T.	Aug. 21

MISCELLANEOUS

Sept. 2	Sewage Pumping Machinery—Los Angeles, Cal.	Aug. 21
Sept. 2	Pier Shed—Seattle, Wash.	Aug. 21
Sept. 2	Bulkhead, Wharf and Shelter Sheds—Wilmington, Del. Adv. Aug. 21.	Aug. 21
Sept. 2	Paving Materials — Portland, Ore.	Aug. 28
Sept. 3	Wharf — St. Jean Orleans, Que.	Aug. 28
Sept. 3	Harbor Improvements — Newport Beach, Cal.	Aug. 28
Sept. 5	Pump—Bruce, S. D.	Aug. 21
Sept. 9	Street Lighting System — Dell Rapids, S. D.	Aug. 28
Sept. 12	Dam—Decatur, Ill.	Aug. 14
Sept. 15	Levee—Alexandria, La.	Aug. 14
Sept. 16	Breakwater—Petit Rocher, N. B.	Aug. 28
Sept. 17	Wharf—Meteghan, N. S.	Aug. 28
Sept. 17	Breakwater—Quaco, N. B	Aug 28
Sept. 22	Wharf—Naramata, B. C.	Aug. 28
Sept. 23	Turbines, etc.—Saskatoon, Sask. Adv. July 24.	July 24

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Ga., Columbus—City plans to expend $15,000 to improve waterworks system, including new filtration plant, pumps, etc. W. D. Fraser, city engr.

La., Lafayette—See "Streets and Roads."

Wis., Markesan—City having plans prepared by W. G. Kirchoffer, engr., 31 Vroman Blk., Madison, for water supply system. Cost between $20,000 and $30,000.

Minn., Buffalo—City plans to build water mains in various streets. About $25,000.

Minn., Great Falls—City plans election to vote on $225,000 bonds to build 100,000 gal. storage reservoir and 24-in. supply main for Boston Heights Addition. L. B. Evenson, 716 4th Ave. N, engr.

Neb., Ord—City plans to improve waterworks system and install sewers in various streets. About $75,000. Rohrbaugh Eng. Co., 929 City Natl. Bank Bldg., Omaha, engrs.

N. D., Fairmont—City having plans prepared by W. C. Buck, engr., 1245 West Minnehaha Parkway, for installing new waterworks well system. About $5000.

Wyo., Greybull — Town soon lets contract furnishing materials and labor for extensions to waterworks system, involving 2300 ft. 2 in., 6040 ft. 4 in. and 1500 ft. 6 in. galvanized ironpipe. G. W. Zoin, town engr.

Tex., Vernon—City plans to extend water mains and sewers. About $20,000. A. J. Robinson, city engr.

Okla., Collinsville—City retained Johnson & Benham, engrs., Firestone Bldg., Kansas City, Mo., to prepare plans for water purification plant, filters, settling basins, etc. Election Sept. 3, to vote on $40,000 bonds for project.

Okla., Lindsey—City voted $25,000 bonds to build water supply system. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Okla., Madill—City retained Johnson & Benham, engrs., Firestone Bldg., Kansas City, Mo., to investigate source of water supply. Probably solution will be impounding reservoirs. About $150,000.

Okla., Perry—City voted $166,000 bonds to install new waterworks system.

Okla., Tonkawa—City having plans prepared by Johnson & Benham, engrs., Firestone Bldg., Kansas City, Mo., for complete waterworks system. Bonds for $100,000 sold for project.

Utah, Spanish Fork—City voted $15,000 bonds to enlarge and extend waterworks system.

Ore., Portland—Villa Ave.-Base Line Mutual Water Co. recently incorporated with $14,000 plans to build private mains in city for private use. About $10,000.

Ont., York—F. Barber, engr., 40 Jarvis St., Toronto, rejected bids laying 6 in. c.i. watermains in various streets. Noted July 31.

BIDS DESIRED

N. Y., Central Islip—Until Sept. 10, by State Hospital Comn., Capitol, Albany, for artesian well for additional water supply at North Colony Power Plant, Central Islip State Hospital, here. L. F. Pilcher, state archt.; advertised in this issue.

N. Y., Wingdale—Until Sept. 4, by C. F. Rattigan, supt. prisons, Capitol, Albany, for concrete dam, c.i. pipe line, mechanical gravity filter plant, at Wingdale Prison, here; advertised in this issue.

N. C., Statesville—Until Sept. 16, by city, building 1 clear water basin lined with concrete, 1,000,000 gal. capacity. Former bids rejected. R. L. Greenlee, Statesville, engr. Noted July 24.

N. C., Wendell—Until Sept. 11, by Mayor, building 3 mi. water pipe lines, deep well, pump, tower and tank; also 5 mi. sewers and sewage disposal plant. About $30,000. G. White, Durham, engr.

Mich., Highland Park (Detroit P. O.)—Until Sept. 8, by City Council, 20 Gerald Ave., furnishing 4 motor-driven centrifugal pumping units and 1 motor-driven vacuum pumping unit. D. C. Gowing, clk.; advertised in this issue.

Ill., Elmhurst—Until Sept. 1, by city, building 96,797 lin.ft. 4-12 in. c.i. water mains, 217 hydrants, 1500 lead pipe house connections, one hundred forty-two 4-12 in. gate valves. E. Hancock, 2047 Ogden Ave., Chicago, engr.; advertised in this issue.

Wyo., Cowley—Until Sept. 3, by City Council for labor and material building and laying 2800 ft. 8 in., 3366 ft. 6 in. and 2244 ft. 4 in. c. i. pipe, valves and fire hydrants. Cotner & Cotner, Lovell, engrs.

Wyo., Rock River—Until Sept. 10, at office of Secretary Town Council, building 9540 ft. 6 in. c.i. pipe and installing 15 Ludlow fire hydrants. About $19,000. E. K. Nelson, engr. in charge.; advertised in this issue.

Okla., Altus—Until Sept. 2, by City Clerk, extending and improving waterworks system. About $100,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. C., Warsaw—City let contract building waterworks system, as follows: pipe laying, to W. Z. Williams & Co., Georgia Gas Co. Bldg., Macon, Ga., $8019; pumps, to Sydnor Pumps & Well Co., 302 East Main St., Richmond, Va., $2290; c.i. pipe, to Glamorgan Pipe & Fdry. Co., $13,272; boiler, also tower and tank, to Schofield's Sons Co., Hammond and Boundary Sts., Macon, Ga., $2900 and $7190, respectively; valves and hydrants, to Darling Valve & Mfg. Co., $2224. Noted July 17.

★Mich., Redford—B. E. Taylor, 501 Ford Bldg., Detroit, let contract laying 35,000 ft. 8 in. c.i. water pipe in subdivisions in vicinity of Grand River Ave., here, to W. C. Hoy, Redford. About $35,000.

★Mich., River Rouge—Village let contract furnishing labor and materials laying 1330 ft. 6 in. and 580 ft. 8 in. c.i. water pipe with specials and hydrants, to J. A. McDace, Fairview Ave., Detroit. About $6500. Noted Aug. 21.

★Minn., Hinckley—City let contract building distribution system, hydrants, steel tower, tank, iron pipe, etc., to Minneapolis Steel and Machy. Co., 29th St. and Minnehaha Ave., Minneapolis, $27,508. Noted July 10.

★Mont., Denton—City let contract building 200,000 gal. reservoir, supply mains, fire hydrants, etc., to Two Miracle Co., 437 Ford Bldg., Great Falls, $64,878. Noted June 19.

★Mont., Scobey — City let contract completing waterworks system, including 100,000 gal. steel tank, etc., to G. W. Kemper, Minot, N. D., $96,269. Noted July 31.

★Ariz., Jerome—City trustees let contract laying pipe for fire line system, to J. D. Newcomb. About $13,600. (City to furnish pipe.)

★Cal., Santa Barbara—City let contract furnishing 8700 lin.ft. 24 in. continuous stave redwood pipe for line from Pedregosa Creek power house to Sheffield Reservoir, to Redwood Manufactures Co., Pittsburgh, $27,199.

★Ont., York—York Co. let contracts to Murphy Constr. Co., Toronto, for laying water mains in Bernice St., $3831, Florence St., $2302, Thornhill St., $3882; to MacNamara Bros. & Co., Saulte Ste Marie, Hanson St., $2220, Atlas St., N., $959, Robina St., $3714, Fay St., $2665; to A. Cavoti, Toronto, Miller St., $1587. Work involves about 8000 ft. 6 in. c.i. water pipe. Noted July 31.

Sewers

PROPOSED WORK

Mass., Chicopee—City appropriated $15,000 to build 24 in. vitr. sewer pipe in Roosevelt Ave.

N. J., Jersey City—City plans to lay sewers in Summit Ave. between Cranford St. and Fairmont Ave. About $12,000. C. Van Keuren, city engr.

N. J., Trenton—City Comn. soon receives bids building ¾ mi. of sewers in Ohio, Spruce, New York and Mulberry Sts. About $20,000. I. R. Fell, city engr.

Pa., Ellwood City—Boro. rejected bids building various sections of sewers in 4th ward. About $42,000. Noted July 24.

Pa., Morrisville—City plans to build 17 mi. pipe sewers and sewage disposal plant through entire city. About $265,000. T. F. Bowe, East Rutherford, N. J., engr.

Mich., Detroit—Dept. Pub. Wks. soon lets contract furnishing labor and material except manhole rings and covers for finishing complete egg shaped sewer, involving 5372 ft. 2 ft. 9 in. x 4 ft. 3 in., brick, vitr. segmental block, rein.-con. or plain concrete pipe. C. W. Hubbell, city engr.

Mich., Detroit—Dickinson Real Estate Exchange, 205 Old Whitney Bldg., soon lets contract furnishing labor and material building complete sewerage system in Avon Park subdivision, involving 12,226 ft. 8-20 in. vitr. crock sewer, 29 brick manholes. About $20,000.

Wis., Manitowoc—City having plans prepared by A. H. Zander, engr, City Hall, excavating and laying 2.1 mi. 10 in. vitr. or concrete pipe sewer in various districts. About $25,000.

Wis., Markesan—City having plans prepared by W. G. Kirchoffer, engr., 31 Vroman Blk., Madison, excavating and laying pipe sewer and installing sewage disposal plant. About $30,000.

Neb., Ord — See "Waterworks."

Mo., St. Louis—Bd. Pub. Wks. soon receives bids rebuilding 450 ft. Branch St. sewers. C. E. Smith, City Hall, engr.

Tex., Vernon—See "Waterworks."

Okla., Enid—City plans to build sewerage system and sewage disposal plant. About $175,000. Black & Veatch, Interstate Bldg., Kansas City, Mo., archts.

Okla., Nowata—See "Streets and Roads."

Idaho, Buhl—City plans to build 68,000 lin.ft. sewer in Dist. No. 3 and 84,322 lin.ft., Dist. No. 4, 6-36 in pipe. About $29,000 and $38,000 respectively.

Wash., Yakima—City plans to build complete sewerage system. Bonds for $350,000 voted for project. C. F. Wilson, Yakima, engr.

Ore., Astoria—City Council plans to build drainage and sewerage system in Dist. No. 1, 8 in. vitr. or cement pipe. About $51,000. E. G. Gearhart, city aud.

Ore., Portland—City Council soon lets contract building sewer in East 24th St., vitr. or cement, (120 days). Cost will exceed $10,000. O. Laurgaard, city engr.

Ore., Portland—City Council adopted resolution to build sewers, lampholes, catchbasins, manholes, sewer branch and service pipes, in Johnson St., from 6th to 7th Sts., 6th St. from Johnson to Glisan Sts., East 15th St. from East Alden to East Stark Sts., East 69th St. from Flanders to Davis Sts., East 69th St. from East Flanders to East Glisan Sts. About $11,752. O. Laurgaard, city engr.

BIDS DESIRED

N. Y., Binghamton—Until Sept. 10, by State Hospital Comn., Capitol, Albany, for sanitary work and sewage disposal for power plant, Binghamton State Hospital, E. S. Elwood, secy. state hospital comn. L. F. Pilcher, Capitol, Albany, state archt.

Sewers (Continued)

Pa., Pittsburgh—Until Sept. 3, by City Controller, laying 8 to 15 in. sewers in Grandview Ave, Fallowfield, McCandless and Richmond Sts. N. S. Sprague, City Council Bldg., engr.

N. C., Wendell—See "Waterworks."

Fla., Leesburg—Until Sept. 3, by city building 5.5 mi. 8-10 in. pipe sewers, with necessary appurtenances and sewage disposal tank. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, Ga., engrs. Noted July 2.

O., Bexley (Columbus P. O.)—Until Sept. 5, by L. S. Higgins, clk., laying 6000 ft. 36-60 in. main sewers with branches running in northerly direction; also laying 3200 ft. 15 in. and 4800 ft. 18 in. sanitary sewers in same trench with main sewers. About $200 000. Jennings, Lawrence Co., 511 Hartman Bldg., Columbus, engrs.

O., Coldwater—See "Streets and Roads."

Ind., Kendallville—Until Sept. 9, by C. E. Michaelis, city clk., for material and work for constructing following improvements: resolution No. 47, providing for storm water sewer in Sheridan St. alley Railroad, Rush, Summit, Williams, Oak, Mitchell, Harris and Richmond Sts.; resolution No. 48, storm water sewer in Garden, Diamond, Sheridan, Clark, Burnam and East Sts.; advertised in this issue.

Wis., Taycheedah — Until Sept. 5, at State Engineer's Office, Capitol, Madison, building 1020 ft. 10 in. sewer, sewage disposal plant, 262 lin.ft. 5 x 6½ ft. tunnel, 3334 sq.ft. sidewalk and 4430 lin.ft. roads and drives.

Ia., Corning—Until Sept. 2, by W. C. Chubb city clk., building sewage disposal plant and improving sewerage system, involving 20,000 ft. 8-12 in vitr. pipe. Archer & Stevens, 609 New England Bldg., Kansas City, Mo., engrs. About $40,000. Noted July 17.

Wyo., Rock River—Until Sept. 10, at office of Secretary Town Council, building 4630 ft. 8 in. and 2470 ft. 6 in. clay sewer. E. K. Nelson, engr. in charge; advertised in this issue.

Ark., Blytheville — Until Sept. 4, by Comrs. D. D. No. 17, building 5000 ft. 3 x 4 ft. and 4 x 7½ ft. rein.-con. storm sewers in district. Pride & Fairley, Blytheville, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., New York**—F. L. Dowling, pres. Manhattan Boro., let contract reconstructing sewers in East 72nd St., to Reilly Contg. Co., 118 East 89th St., $19,304; F St. and in continuation thereof, now known as Prescott Ave. from Dyckman St. to point 750 ft. north to A. Gasparini, 1964 Honeywell Ave., $15,311. Noted Aug. 21.

★**Pa., Forty Fort** (Kingston P. O.)—Boro let contract building sewerage system, to Banks & Howe, Forty Fort. About $139,000. Noted July 24.

★**N. C., Warsaw**—City let contract for labor for laying 7000 ft. 8 in., 3000 ft. 10 in. and 6000 ft. 12 in. vitr. pipe, to W. Z. Williams & Co., Georgia Gas Bldg., Macon, Ga., $13,184, pipes, to Pomona Terra Cotta Co., Pomona, $4207. Noted July 17.

O., Cleveland — City received bids laying 3120 ft. 3-6 ft. 3 in. brick and 660 ft. 12-24 in. vitr. pipe sewers in Kinsman Rd. from East 135th to 140th Sts., from Manson Co., 346 The Arcade, $75,771; Gallagher Burks Co., 1339 Irene Ave., $77,923; River Constr. Co., 12909 Mayfield Rd., $78,269.

★**Ill., Chicago**—Bd. Local Impvts. let contract building Crawford Ave. sewerage system, to Ryan Co., 4500 West Division St., 1 concrete bulkhead, $15,000, 900 ft. 10½ ft. 4R brick sewer, $100 per ft., 1 concrete siphon, $20,000, 2660 ft. 10½ ft. 4R brick sewer, $45 per ft., 5320 ft. 10 ft. 3R brick sewer, $32 per ft., 5320 ft. 9½ ft. 3R brick sewer, $29 per ft., 2660 ft. 9½ ft. 3R brick sewer, $28 per ft., 5320 ft. 7½ ft. 3R brick sewer, $24 per ft., 1340 ft., 4 ft. 2R brick sewer, $10 per ft., 1340 ft. 3½ ft. 2R brick sewer, $9 per ft., 1000 ft. 3 ft. 2R brick sewer, $8 per ft., 670 ft. 18 in. D.S. sewer, $2.50 per ft., 670 ft. 15 in. D.S. sewer, $2 per ft., 1340 ft. 6 ft. 2R brick sewer, $14 per ft., 1000 ft. 5½ ft. 2R brick sewer, $13 per ft., 1000 ft. 5 ft. 2R brick sewer, $12 per ft., 1340 ft. 4½ ft. 2R brick sewer, $11 per ft., 670 ft. 3½ ft. 2R brick sewer, $9 per ft., 1340 ft. 3 ft. 2R brick sewer, $8 per ft., 1340 ft. 2 ft. D.S. sewer, $3.50 per ft., 180 ft. 15 in. wing sewers, $4 per ft., 850 ft. 12 in. wing sewers, $3 per ft., 158 brick manholes, $60 each, 347 brick catchbasins, $70 each, 191 brick house drains, $30 each, 800 cu.yd. macadam pavement, $6 per cu.yd., 2500 sq. yd., 2½ in. asphaltic, $.75 per sq.yd., 7000 sq.ft. 5 in. concrete sidewalks, $.20 per sq.ft., 2000 lin.ft. cinder sidewalks, $.40 per lin.ft., 20,000 cu.yd. excav., $1.25 per cu.yd., total cost, $964,440. Noted July 31.

★**Wis., Manitowoc**—City let contract excavating and laying 10 in. vitr. pipe sewer in Main and 10th Sts., to Gray-Robinson Co., North 8th St. About $15,000.

★**Minn., St. Cloud**—A. W. Buckman, city clk., let contract building 5 blocks 36 in. segmental sewers in Dist. No. 7, to J. P. Bejenius, St. Cloud, $14,065. Noted July 31.

★**N. D., Edgeley**—City let contract building extensions to sewerage system, to Fraser & Danforth, 810 Guardian Life Bldg., St. Paul, Minn. About $85,900.

★**Mont., Scobey**—City let contract installing 20,000 lin.ft. 8-18 in. vitr. pipe sewer, to G. W. Kemper, Minot, N. D., $49,485. Noted July 31.

★**Mo., Holden**—City let contract installing sanitary sewerage system and sewage disposal plant, to J. O'Neil, Leavenworth, Kan. About $57,000. Noted June 26.

★**Mo., Kansas City**—Bd. Pub. Wks. let contract building Turkey Creek Sewer, to T. Kelley & Sons, Ltd., 504 Lindsay Bldg., Winnipeg, Can. About $2,453,749. Noted July 3.

★**Ariz., Phoenix**—City let contract building tile drainage system to C. Fisher, 854 North 6th Ave. About $124,711. Noted July 17.

★**Wash., Toppenish**—See "Streets and Roads."

★**Ore., Portland**—City Council let contracts to J. F. Shea, North 2nd St., building sewerage system in East 37th St. and Raymond Ave., $40,655, and in Harold and 55th Aves., $154,755, both 8 in. vitr. pipe. Noted Aug. 21.

Cal., Los Angeles—Bd. Pub. Wks. received only bid building rein.-con. sewage pumping pit in Manchester Ave., from J. F. Blee, 500 Stimson Bldg. About $12,000.

Cal., Oakland—City Council bids Aug. 14, building storm sewers in Kingsland Ave., involving 541 ft. 18 in. and 411 ft. 21 in. tile pipe, from Hutchinson Co., 444 17th St., $10,198; Bresse Burgund Co., East Oakland, $12,864; J. Heafey, 22 Mesa St., $11,913.

Bridges

PROPOSED WORK

Virginia—State Highway Comn., Richmond, soon lets contract building 25 ft. rein.-con. bridge and approaches ¾ mi. south of Emporia, Greensville Co.; also one 50 ft., rein.-con. bridge and approaches near Clarksville, Mecklenburg Co.

W. Va., South Charleston—Comrs. Kanawha Co. and Charleston Interurban Traction Co. plan to build bridge over Kanawha River, at South Charleston, to replace toll bridge now in use and owned by Chesapeake & Ohio R.R. About $300,000.

Ga., Bainbridge—Comrs. Decatur Co. plan to build rein.-con. bridge over Flint River. About $225,000. W. G. Harrell, chn. J. A. Mortlan, c/o State Highway Dept., Tallahassee, Fla., engr.

Minn., Pine City—A. P. Edin, aud. Pine Co. rejected bids building Bridge No. 3128 between Sects. Nos. 28 and 29; No. 3126, 30 ft. rein.-con. deck girder span; No. 3125, 2 rein.-con. abutments, 36 ft. steel trusses, hauled 9 mi. About $11,600. Work will be readvertised. W. J. Buckley, Pine City, engr. Noted Aug. 14.

Kan., Bonner Springs—Comrs. Wyandotte Co., (Kansas City), soon let contract building 100 ft. steel pony truss with concrete flooring and abutments, 22 ft. wide, near here. O. K. Williamson, Kansas City, engr.

Mo., Fulton—See "Streets and Roads."

Wash., Spokane—City plans to build 110 ft. concrete arch bridge, 34 ft. wide, over Hangman Creek on Riverside Ave., involving 27,000 cu.yd. earth approach and fill. About $25,000. A. D. Butler, city engr.

Cal., Red Bluff—Bd. Supervs. Tehama Co. having plans prepared by Weeks & Day, engrs., Phelan Bldg., San Francisco, for 17 concrete bridges along state highway. Bids for first bridge will be received in September. Bonds for $521,000 voted for project. Noted July 24.

BIDS DESIRED

N. Y., Long Island City—Until Sept. 3, by M. E. Connolly, pres. Queens Boro., building timber deck bridge on site of Flushing Incinerator, 31st Ave. between 130th and 131st Sts., 3rd Ward.

Pa., Norristown—Until Sept. 22, by W. D. Heebner, controller Montgomery Co., building rein.-con. bridge of 10 arch spans and 9 rein.-con. girder spans with retained fill approaches, over Schuylkill River, Schuylkill Canal and Phila. & Reading Ry. Co. tracks, between Conshohocken and West Conshohocken; advertised in this issue.

Va., Portsmouth—Until Sept. 15, by W. B. Bates, city mgr., building 686 ft. creosoted wood pile bent bridge, 20 ft. wide, earth filled approaches, over Bain's Creek from west end of King St. to Olive Branch Cemetery, including draw span. Alternate bids will be received for steel or concrete bridge.

O., Columbus—Until Sept. 9 by Comrs. Franklin Co., building superstructure for (1) Hayden Run Bridge over Hayden Run, on Dublin Pike, Norwick Twp., 66 ft. long and 21 ft. single track clear roadway; (2) Taylor Bridge (a) over Rocky Fork Creek on Taylor Pike, Plain Twp., 45 ft. long and 18 ft. single track clear roadway; (3) Taylor Bridge (b) over branch of Rocky Fork Creek on Taylor Pike at Lorenzo Taylor Farm, Plain Twp., 38 ft. long 18 ft. single track roadway; (4) 42 ft. bridge over Rocky Fork Creek on Boehm Rd. at Anna Brown Farm, Plain Twp., 18 ft. single track clear roadway; (5) 32 ft. bridge over North Fork of Indian Run on Brand Rd. at Jeremiah Cosgray farm, Washington Twp., 16 ft. single track clear roadway; (6) 43 ft. bridge over North Fork Indian Run at Mary Hutchinson Farm, Washington Twp., 16 ft. single track clear roadway; (7) 38 ft. bridge over North Fork of Indian Run at John Dun Farm on Jerome Rd., Washington Twp., 16 ft. single track clear roadway; (8) laying creosoted lumber and block floor on bridge over Black Lick Creek at intersection of Reynold Lane and Black Lick Pikes and East Broad St., Jefferson Twp., 106 ft. long and 18 ft. wide. W. J. Herman, clk.

O., Columbus—Until Sept. 10, by Comrs. Franklin Co., building Platter Bridge, 24 ft. wide, over Big Walnut Creek, on Lockbourne Rd., Hamilton Twp. Superstructure involves 1,095 260 lb. steel, 26 771 lb. reinforcing steel and 167 cu.yd. concrete; substructure involves 2200 cu.yd. dry and 480 cu.yd. wet excav., 80 cu.yd. Class "A" and 1100 cu.yd. Class "B" concrete; approaches involve 6328 sq.yd. bituminous concrete, 7000 cu.yd. excav., 5540 sq.yd. waterbound macadam and 6134 lin.ft. penetration macadam berme; also re-erecting span from old Broad St. Bridge, Columbus. About $200,000. J. A. Dun, Court House, engr.

Pa., Danville — Until Sept. 9, by Vermilion Co., building bridge in Div. No. 7, Vance Twp. P. C. McArdle, engr.; advertised in this issue.

Wis., Lake Geneva—Until Sept. 9, by J. Skeels, city engr., building Lake Geneva Bridge, 40 ft. rein.-con. arch with baluster railing, including 368 cu.yd. concrete and 11,840 lb. steel, etc.

Arkansas—See "Streets and Roads."

New Mexico—Until Sept. 15, by State Highway Comn., Santa Fe, paving and building bridges on 5.396 mi. State Rd. 13, Sects. 2 and 3, Lincoln Co., known as Federal Aid Project No. 11, involving 9579 cu.yd. class 1, 1295 cu.yd. class 2, and 2295 cu.yd. class 3 excav., 2615 station yd. overhaul, 4576 cu.yd. two cource gravel surfacing, 706 lin.ft. 18 in. and 68 lin. ft. 24 in. corrugated metal culverts, 64 cu.yd. class B 19 cu.yd. class C concrete, 608 lin. ft. wooden piling, 8328 ft. B. M. wooden substructure and 21,864 ft. wooden superstructure. L. A. Gillett, c/o State Highway Dept., engr.

New Mexico—See "Streets and Roads."

Wash., Pasco—Until Sept. 17, by Auditor Franklin Co., Pasco, building 1556 ft. steel bridge over Snake River, near here, consisting of one 301 ft. cantilever two 259 ft. anchor arm, two 260 ft. and one 217 ft. spans, and approaches for Franklin and Walla Walla Counties. Noted Apr. 24 under "Walla Walla."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Apollo**—Comrs. Armstrong and Westmoreland Counties let contract repairing joint county bridge, here, to Farris Eng. Co., Empire Bldg., Pittsburgh, $15,274. Noted July 24.

★**W. Va., Morgantown**—Comrs. Monongalia Co. let contract building 2 rein.-con. bridges, to B. M. Chaplin Co., Morgantown, $15,224.

★**Ala., Birmingham**—Bd. Revenue Jefferson Co. let contracts to J. H. Scruggs Constr. Co., Amer. Trust Bldg., for rein.-con. bridge over Elyton Canal, on 3rd Ave.,

Bridges (Continued)

80 ft. long, 115 ft. wide, $23,320; to A. E. Bearden removing substructure of steel bridge from Lewisburg to Brookside cut-off road, $5326; to Southern Bridge Co., 39th St., removing, dismantling and re-erecting same, $4175. Noted July 17.

★**Michigan**—State Highway Comn., Lansing, let contract to J. P. Rusche, Grand Rapids, building 200 ft. rein.-con. arch bridge, over Thornapple River, consisting of one 70 ft. and two 65 ft. spans, involving 598 cu.yd. rein.-con., 882 cu.yd. concrete, 25 tons steel, State Trunk Line Bridge No. 93, Kent Co., cost, $38,000; to Denton & Johnson, Saginaw, building 260 ft. rein.-con. bridge, over Cass River, in Bridgeport Twp., two 130 ft. low Pratt trusses, abutments, pier and floor, involving 104 cu.yd. rein.-con., 784 cu.yd. concrete and 150 tons steel, State Trunk Line Bridge No. 127, Saginaw Co., $17,100.

Wis., West Bend—Parsons & Orbert, engrs., 627 M. & M. Bank, Milwaukee, received bids building 50 ft. rein.-con. and steel bridge, 22 ft. wide, on Main St., here, for city, from J. Schneider Constr. Co., Main St., Menasha, $17,860; Michie Constr. Co., Grand Ave., Milwaukee, $18,900; Berres & Baer, West Bend, $22,150. Noted July 31.

★**Ia., Sioux City**—City let contracts building twenty-one 16 x 32 ft. I-beam bridges, and one 16 x 60 ft. pony truss bridge, to Clinton Bridge Co., 101 South 2nd St., Clinton, $14,200; one 16 x 90 ft. pony truss bridge with concrete flooring and 1 concrete abutment, to Pickens Eng. Co., Sioux City, $9485.

★**Minn., Duluth**—St. Louis Co. let contracts to Strom Bros., Two Harbors, building bridge on McQuade Rd., $2120, Ryan Rd. over Sucker River, $3345; McCabe & McCabe, 602 Metropolitan Bank Bldg., Minneapolis, Morris Thomas Rd., over small stream, $1180, Decker Rd., over small stream, $2745; Wausau Iron Wks., Wausau, Wis, State Rd. No. 1 over Little Fork River, $5994; Wakefield Rd. over Little Fork River, $7457, Kelsey-Brimson Rd., over Whiteface River, $8234, Floodwood-Cromwell Rd., over small stream, $8990, Alborn-Brookston Rd., over St. Louis River, $31,919, Ditch Rd. No. 6-20, over St. Louis River, $11,911, Vermilion Rd., over St. Louis River, $12 041; Asby & Maturi, Hibbing, 2 bridges on Vermilion Lake Rd., over small stream, $3218, on State Rd. No. 1 over small stream, $1930, 5 bridges on Vermilion Lake Rd., over small streams, $12,820, Goodwell Rd. over Sturgeon River, $9316, Everett Rd. over small stream, $5786, Chisholm Rd., over small stream, $3800, Heino Rd., over small stream, $3800, 3 bridges on Chisholm Rd. over Sturgeon River, $29,965; Iowa Bridge Co., 712 Hubbell Bldg., Des Moines, Ia., Burnside Rd. over small stream, $2607; D. Graham 325 Worthington St., Hibbing, bridges on Floodwood-Cromwell Rd., over little streams $9335, Savana Rd. over Savana River, $7231; L. E. Raum, Floodwood-Cromwell Rd., over small stream, $1669. Noted July 24.

★**Wash., Everett**—Comrs. Snohomish Co. let contract building 180 ft., steel span with 2 concrete piers and trestle approach, to N. Fleiness, Seattle, $18,971.

★**Cal., Dismores**—Comrs. Humboldt Co., Eureka, let contract building rein.-con. arch bridge over Little Van Duzen Creek, near here, to Padgett & Kelly, Eureka, $29,853.

★**Cal., West Butte**—Bd. Supervs. Sutter Co., (Yuba City) rejected bid building rein.-con. bridge over Butte Slough, near here. Work will be done by day labor under supervision of E. Von Geldern, co. surv. Noted Aug. 7.

★**Cal., Willows**—Bd. Supervs. Glenn Co. let contracts to F. H. Nielson, 8th St., Orland, building 3 concrete bridges over Willow, Salt and Westberg Creeks, cost, $17,160; also rein.-con. bridge over Stoney Creek near Winslow, $23,420. Noted June 24.

★**Que., St. Adelaide**—Municipal Council let contracts building substructure for concrete and steel bridge over De Palos Creek, to C. Lamb, Chandler, steel contract to McKennon, Holmes & Co., Sherbrooke. Total cost about $18,500.

Reinforced Concrete

PROPOSED WORK

N. Y., Port Chester—See "Industrial Works."

Virginia—See "Bridges."

Ore., Portland—See "Industrial Works."

BIDS DESIRED

Pa., Norristown—See "Bridges."

Pa., Phila.—See "Industrial Works."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Phila.**—See "Industrial Works."

★**Pa., Pittsburgh** — See "Industrial Works."

★**Ala., Birmingham**—See "Bridges."

Cal., Dismores—See "Bridges."

Streets and Roads

PROPOSED WORK

Conn., Brookfield — City appropriated $20,000 to repair old roads and build new road from Mansfield Home to Iron Wks. Engineer not selected.

Conn., Milford—City having plans prepared for 1½ mi. asphalt road on 6 in. concrete base. About $50,000. V. B. Clark, City Hall Bldg., Ansonia, engr.

N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro, received bids repaving with wood block within the franchise area of the Richmond Light & R.R., etc., from J. Johnson Sons, Port Richmond, $114 673; J. E. Donovan, 2205 Richmond Terrace, Port Richmond, $127,936; C. Vanderbilt, 24 Elizabeth St., West New Brighton, $134,795.

N. J., Hoboken—City soon lets contract grading, paving and improving Jefferson St. from 8th to 13th Sts., granite block. About $50,000. Noted July 17.

Pennsylvania—State Highway Dept., Harrisburg, received no bids Aug. 19, building 11,640 ft. rein.-con., Gilpin Twp. Armstrong Co. Noted July 31.

Pennsylvania — State Highway Dept., Harrisburg, rejected bids for 8118 ft. rein.-con. Route 59 and 13,027 ft. rein.-con. and Hillside vitr. brick Route 60, Clearfield Co., 5950 ft. rein.-con. and Hillside vitr. brick, Route 247, Sect. 4, Fayette Co.; 41753 bituminous surface course on concrete foundation or rein.con., Route 195, Dauphin and Perry Counties; 25,737 ft. bituminous surface course on concrete foundation or rein.-con. Route 68, Juniata and Synder Counties, Routes 195 and 229; 32,047 ft. rein.-con. and Hillside vitr. brick, Westmoreland Co. Noted Aug. 14.

Pa., Chartiers (Pittsburgh P. O.)—Town soon lets contract grading, paving and curbing Lakewood Ave. from Pittsburgh City Line to Oak St., involving 2060 sq.yd. vitr. brick, on 6 in. concrete base, 1730 lin.ft. concrete curbing, 10,840 cu.yd. earth excav. and 1247 cu.yd. fill. Andrews & Southard, 509-10 Curry Bldg., Pittsburgh, twp. engrs.

Pa., Gallitzin—H. F. Conrad, boro. secy., 706 Hemlock St., soon lets contract paving Dauson Rd., 20 ft. wide, involving 3000 sq.yd. 1 course rein.-con. on 5 in. concrete base, 100 lin.ft. concrete curbing and 1000 cu.yd. excav. About $25,000. D. W. Dillman, 80-81 Altoona Trust Bldg., Altoona, engr.

Pa., Pittsburgh—City plans to grade, pave and curb Caton St. from Beechwood Blvd. to Shady Ave., cost $30,000, Pioneer Ave. from West Liberty Ave. to Brookline Blvd., $180,000. Fort Hill Rd. from Fernleaf to Sterling Sts., $13 000, Oberlin St. from Lemington Ave. to Sprague St., $41,000 Eccrue Way from Kelly St. to Felicia Way, $8400, vitr. brick and stone block on 6 in. concrete base, concrete curbing. N. S. Sprague, city engr.

Pa., Scranton—City plans to grade and pave Vine St. from Taylor Ave. to Arthur Ave., 17th Ward, sheet asphalt and stone blocks on concrete base. About $39,716. W. A. Schunk, city engr.

W. Va., Buckhannon—Comrs. Upshur Co. rejected bids received Aug. 11, paving 10.4 mi. 16 ft. cement concrete pavement on certain streets of Buckhannon and 4 main roads radiating from the city. Work will be readvertised. About $250,000. W. C. West, co. rd. engr. Noted July 31.

W. Va., Charleston — Kanawha Co. voted bonds and having plans prepared paving Cabin Creek Kayford Rd., $165,000, Paint Creek Rd., $85,000, Kelly's Creek Rd., $10,000, South Side River Rd., $400,000, North Side River Rd., $250,000. (all in Cabin Creek Dist.), Ruffner Hollow-Elk View Rd., $50,000, Indian Creek Rd., $50,000, Elk River (south side), $100,000, Elk River (north side), $200,000. (all in Elk Dist.) Cambells Creek Rd., Malden Dist., $80,000, Point Pleasant Pike, $10,000, North Side Rd., $35,000, Dunbar Rd., $114,000. (all in Union Dist.) Noted June 5 and July 3.

W. Va., Charleston — "See Buildings."

W. Va., Elkins—Randolph Co. voted $94,000 bonds to improve roads in Beverly Dist. F. A. Parsons, co .engr. Noted July 3.

W. Va., Parsons—Tucker Co. plans to pave and drain 6¾ mi. Parsons-Elkins Rd., 24 ft. wide, involving 34,000 cu.yd. excav., etc. About $57,150. H. N. Freeman, Parsons, engr.

W. Va., Petersburg—Comrs. Grant Co. plan to grade 9 mi. Pansy-Arthur Rd., 16 ft. wide. About $47,200. E. C. Smith, Piedmont, engr.

W. Va., Sutton—Comrs. Braxton Co. plan to grade 9.6 mi. McNutt-Napier Rd., 16 ft. wide. About $79,875. P. J. Walsh, Charleston, engr.

W. Va., West Union—Comrs. Doddridge Co. plan to improve 17½ mi. road from Harrison to Tyler County lines. About $622,377.

Fla., Palmetto—City voted $60,000 bonds to pave streets.

Miss., Meridan—Dist. No. 4 of Lauderdale Co. voted $100,000 bonds to rock surface trunk roads in district.

Miss., Quitman — Clarke Co. voted $65,000 bonds to build Burlington Highway to connect with Lauderdale Co., rock.

La., Lafayette—City election Sept. 11, to vote on $350,000 bonds to pave, gravel, drain and extend water mains.

Michigan—State Highway Dept., Lansing, soon lets contract shaping, draining and macadam surfacing 5.737 mi. State Trunk Line Project 12-2, 16 ft. wide, Delter Co. involving 17,576 cu.yd. earth excav., 53,788 sq.yd. waterbound macadam, 10,265 lb. reinforced steel and 363 cu.yd. concrete; shaping, draining and gravel surfacing 2.458 mi. State Trunk Line Rd. 44-1, Ionia Co., 7881 cu.yd. earth excav. and 23,077 sq.yd. gravel. F. F. Rogers, state highway engr.

Michigan—State Highway Dept., Lansing, having surveys made grading, shaping, draining and surfacing 10 mi. Saginaw Turnpike, Oakland Co., from Potters Corners to Genesee Co. line.

Mich., Detroit—Dept. Pub. Wks. soon lets contract furnishing labor and material for trenching, laying vitr. pipe and building manholes, etc., in lateral sewer No. 3114, in block bounded by Erwin, Rohns, Bessemore and Georgia Sts.; No. 3115, by Iroquois, Peter, Hunt and Bessemore Sts.; No. 3141, by 12th, Idaho, Terminal R.R. and Midland Sts.; No. 3144, by Greenwood, 4th, and Merrick Sts. and Reed Pl.; No. 3145, by Dexter, Lawton, Boston and Calvert Aves.; No. 3146, by Wildemere, Linwood, Boston and Calvert Aves.; No. 3147, by Dexter, Lawton, Calvert and Lawrence Aves.; No. 3148, Wildermere, Linwood, Calvert and Lawrence Aves.; No. 3149, by Dexter, Lawton, Lawrence and Webb Aves.; No. 3151, by Wildermere, Linwood, Lawrence and Webb Aves.; No. 3171, west line of Cody's sub., McDonald, Vernor and Wheeler Sts.; No. 3172, by Turner, Livernois, Elmhurst Aves. and north line Green's sub.; No. 3173, by 12th, Hamilton, Burlingame and Webb Aves.; No. 3174 by Newport, Philip, Old City line and Mack Aves.; No. 3177, Malvern from Van Dyke to Maxwell St.; No. 3178, by Drexel, Newport, Old City line and Mack Aves.; No. 3187, Log Cabin, West line Highland Park, Fenkell and Puritan Ave.; No. 3189, by Shelby, Griswold, Michigan and State Sts.; No. 3190, by Cadillac, Bewick Aves., and North of Warren St., involving 50 653 lin.ft. 10-33 in. pipe, 157 manholes. C. W. Hubbell, city engr.

Ill., Chicago—Bd. Local Impvts. rejected bids received July 23rd, paving Homer St., from Albany to Kedzie Aves., North Latrobe, North Lockwood and North Long Aves., from Grand to Fullerton Aves., Dickens St. from Laramie to Lockwood Aves, Palmer and Belden Aves., from Laramie to Long Aves, Wrightwood, Gole, Pine Groves Aves. and Hampton and Lehman Courts. Noted July 17.

Ill., Chicago—Bd. Local Impvt. rejected bids received Aug. 1, paving alley between Montrose, Cullom, Ashland and Paulina Aves., alley between Addison St., Cornelia Ave., Halsted St. and Reta Ave., alley between Harrison and Flournoy Sts., Spaulding and Homan Aves., alley between Van Buren, Congress, Washtenaw Sts., and California Ave., alley between Blackhawk and Division Sts., Holt and Dickson Aves., alley between Fillmore and 12th Sts., Francisco Ave. and Richmond St., alley between Chicago Ave., Superior St., Hoyne Ave. and Leavitt St. C. D. Hill, ch. engr. Noted Aug. 14.

Streets and Roads (Continued)

Wis., Manitowoc—City plans to grade and pave with 1 course concrete and build sidewalks with combined curb and gutter on 1.8 mi. Manila St., 26 ft. wide. Engineer not selected.

Wis., Manitowoc—A. H. Zander, engr., City Hall, soon lets contract grading, curbing, guttering and paving with 2 course rein.-con. 1.9 mi. 18th St. from Wollmer to North End., 18 ft. wide, involving 12,500 sq.yd. concrete. About $25,000.

Ia., Leon—City retained Shockley Eng. Co., engrs., 740 Reserve Bank Bldg., Kansas City, Mo., to prepare plans paving 53 blocks, 24-28 ft. wide, involving 30,000 to 40,000 sq.yd. asphaltic concrete, sheet asphalt, bitulithic, brick or concrete. About $125,000.

Minn., Grand Rapids—Itasca Co. voted $2,000,000 bonds to build roads. R. W. Action, Duluth, engr. Noted July 31.

Kan., Bonner Springs—City plans to oil and place screenings on 50,000 sq.yd. macadam pavement also patch and repair old macadam. About $10,000. Shockley Eng. Co., 740 Reserve Bldg., Kansas City, Mo., engrs.

Kan., Frankfort—City having plans prepared by Shockley Eng. Co., engrs., 740 Reserve Bank Bldg., Kansas City, Mo., building 6600 ft. 2nd, Walnut and 4th Sts., 18 ft. wide, gravel. About $20,000. Cost to be borne by city, state and Federal Government.

Kan., Kansas City—Comrs. Wyandotte Co. soon let contract grading, paving and building culverts on 1¼ mi. Wilson Rd., 18 ft. wide, concrete.

Kan., Mound City—Linn Co. having plans prepared by C. Jacoby, engr., 527 Shukert Bldg., Kansas City, Mo., building 12 mi. Federal Aid Highway, 18 ft. wide, waterbound macadam.

Kan., Troy—City retained Archer & Stevens, engrs., New England Bldg., Kansas City, Mo., to prepare plans for 30,000 sq.yd. pavement, 30 ft. wide. About $100,000.

Kan., Washington—City retained Black & Veatch, engrs., Interstate Bldg., Kansas City, Mo., to prepare plans for paving and curbing 9 blocks various streets, vertical fibre brick.

Neb., Ralston—Village soon lets contract paving 1½ mi. 75th, 77th, 79th, Oakwood, State, Serum, Maywood and Miller Sts., involving 20,080 sq.yd. paving and 15,000 lin.ft. curbing. About $69,087. H. A. Nelson, 424 Bee Bldg., Omaha, engr.

Mont., Conrad—Pondera Co. election soon to vote on $150,000 bonds to build roads. Federal Government will appropriate toward cost. J. N. Edy, State Highway Dept., Helena, engr.

Mont., Mondak—Roosevelt Co. election soon to vote on $200,000 to build roads. Federal Government will appropriate toward cost. J. N. Edy, c/o State Highway Dept., Helena, engr.

Mo., Fulton—Comrs. Callaway Co. retained Shockley Eng. Co., 740 Reserve Bank Bldg., Kansas City, Mo., to prepare plans grading, graveling, building culverts and bridges on 19 mi. road, 9 ft. wide, in New Bloomfield Special Rd. Dist. About $140,000

Tex., Amarillo—Potter Co. voted $750,000 bonds to improve Highways Nos. 5, 13 and 83, branching out from here. R. C. Johnson, co. judge.

Tex., Bastrop—Bastrop Co. plans to improve, gravel surface and build concrete drainage structures on 8.51 mi. Highway No. 3-A, from Travis Co. line southeast, 16 ft. wide. About $60,000. J. B. Price, co. judge. A. L. White, c/o State Highway Dept., Austin, engr.

Tex., Clarksville—Red River Co. rejected bids gravel surfacing and building concrete drainage structures and bridge on 16 mi. Highway No. 35 known as "Choctaw Trail," 14 ft. wide. P. V. Creager, Clarksville, engr. Noted Aug. 21.

Tex., Coledan—Coleman Co. election Sept. 27, to vote on $500,000 bonds to macadamize, gravel and pave roads in Precinct No. 8. W. M. Weathered, co. judge.

Tex., Highland Park (San Antonio P. O.)—City voted $110,000 bonds to pave 15,000 sq.yd. various streets. Myers & Noyes, Highland Park, engrs.

Tex., McKinney—Collins Co. plans to build 25 mi. Henry Exall or State Highway No. 6, 16 ft. wide, macadam base 7 in. compact; all bridges and culverts of rein.-con. About $328,932. J. B. Crokett, McKinney, engr

Tex., Mt. Vernon—Franklin Co. rejected bid gravel surfacing 11.13 mi. and concrete surfacing 1.24 mi., also building concrete drainage structures on Highway No. 1 from Hopkins to Titus Co. line, 9 mi. 14 ft. wide. Work will be readvertised. Noted Aug. 7.

Tex., Port Arthur—City plans to improve 40 mi. streets in business section. About $270,000. L. A. Witter, clk.

Okla., Collinsville—City retained Johnson & Benham, engrs., Firestone Bldg., Kansas City, Mo., to prepare plans for 6500 ft. brick or asphaltic concrete pavement, 33 ft. wide. About $100,000.

Okla., Nowata—City plans to improve streets, involving 53,000 sq.yd. pavement, 41,581 cu.yd. excav., 41,951 ft. curb and gutter, 2381 ft. curb, 840 ft. double gutter, also 5000 ft. 10-24 ft. storm sewers, 17 manholes and 51 catchbasins. Archer & Stevens, 609 N Eng. Bldg., Kansas City, Mo., engrs.

Okla., Oilton—Creek Co. election Sept. 16, to vote on $1,000,000 bonds to build 35 mi. highway. M. C. Binkley, co. highway engr.

Idaho—State Highway Comn., Boise, having plans prepared for grading and surfacing with crushed rock 22.4 mi. Lewiston-Moscow Rd. About $307,000. D. P. Olson, state highway engr.

Idaho, Buhl—City soon lets contract paving 154,000 sq.yd. streets in Paving Dist. No. 2, 5 in. crushed rock and asphalt base with 2 in. bitulithic surface. C. J. Kalina, clk.

Idaho, Wallace—Comrs. Shoshone Co. plan to grade 3 mi. Kellogg-Wallace Rd., 24 ft. wide. About $70,000. W. J. Bassett, Cœur d'Alene, engr.

Utah—State Highway Comn., Salt Lake City, soon lets contract building 24 mi. road from Moab to La Salle, Federal Aid Project No. 6, earth and gravel 18 ft. wide, also 38 mi. road from Thompson Springs to Moab, Federal Aid Project No. 5, earth, 18 ft. wide. I. R. Browning, state highway engr.

Ariz., Tucson—Pima Co. election Sept. 23, to vote $1,500,000 bonds building county highways.

Wash., Vancouver—City plans to pave East 22nd St., concrete or asphaltic concrete. About $30,000. W. Schwarz, city engr.

Oregon—State Highway Comn., Salem, soon receives bids paving 15 mi. John Day east section of Columbia River Highway, Gilliam Co., involving 55,000 cu.yd. common, 54,000 cu.yd. rock, and 15,000 cu.yd. intermediate excav., 200 sq.yd. concrete, 1638 lin.ft. 12-36 in. concrete or corrugated iron culvert, 114,300 cu.yd. overhaul, 1020 yd. overbreak, 540 cu.yd. rock wall. About $350,000. H. Nunn, state highway engr.

Ore., Ashland—City plans to grade and pave Ashland Blvd., bitulithic type E on crushed rock or gravel base. About $20,000.

Ore., Astoria—City Council adopted resolution to pave Glasgow and Agate Sts. from Florence to Almeda Sts., 24 ft. wide, concrete Nos. 1 and 2, or asphaltic concrete pavement and concrete curbs. About $11,000. E. G. Gearhart, city aud.

Ore., Bend—City soon lets contract paving Newport Ave., cost $12,116, Wall St., $1058, West 5th St., $605, concrete or asphaltic concrete. R. B. Gould, city engr.

Ore., Clatskanie—City Council adopted resolution to improve Nehalem and Bridge Sts., to include grading, filling, constructing concrete curbs, laying sewer and drainage pipes. About $10,000. G. B. Conyers, city recdr.

Ore., Portland—City Council soon lets contract paving portions of 45th St., S. E., 53rd, Vernon and Linn Aves., and East 60th St. from East Glisan to Oregon Sts., concrete, asphaltic concrete on crushed rock base, bitulithic and gravel macadam, cost $50,000; Olin St., Elliott and East 30th Aves., 46th Ave., S. E., from 67th to east line Kern Park, also Killingsworth Ave., sheet asphalt, concrete Nos. 1 and 2, gravel macadam, and building artificial stone or asphaltic concrete sidewalks. O. Laurgaard, city engr.

Ore., Portland—City rejected bids paving Killingsworth Ave. and East 30th St. O. Laurgaard, city engr. Noted Aug. 21.

Ore., Portland—City plans to improve Portsmouth Ave. from Willis Blvd. to Columbia Slough, cost $5806, East 19th St. from Pacific St. to Holladay Ave., $1517, East Pine St. from East 20th to East 22nd Sts., $891, 41st St. from Francis Ave. to Hall's Addition, $1279. East 8th St. from Madrona to Holland Sts., $1324, concrete or bitulithic. O. Laurgaard, city engr.

Ore., Tillamook—City plans to pave remaining unpaved portions of 7th and 3rd Sts., asphaltic concrete or concrete Nos. 1 and 2. About $10,000. F. B. Stranahan, city recdr.

Ore., Tillamook—City Council adopted resolution to grade and pave with concrete, asphaltic concrete or bitulithic, Stilwell and 1st Aves., 9th, 10th, 11th and 12th Sts. About $13,200. F. B. Stranahan, city recdr.

Cal., Long Beach — City plans to pave 6 blocks Anheim St., 60 ft. wide, concrete and bituminous surface. F. Hoffman, city engr.

Que., Montreal—City Council soon lets contract paving 3000 ft. Belgrave Ave., 30 ft. wide, bituminous macadam cost, $12,000; 2000 ft. Elmhurst St., 30 ft. wide, asphalt, $8000; 3000 ft. Hortubise St., 30 ft. wide, asphalt, $12,000; also building 15,000 ft. sidewalks on Northcliff Ave. from Sherbrooke to Notre Dame de Grace Sts.; 4000 ft. Wilson Ave. from Sherbrooke St. to Canadian Pacific Ry. tracks; 5000 ft. Old Orchard Ave. from Church to Munkland Sts.; 900 ft. St. Marguerite St. from St. Antoine to Richelieu Sts.; 7000 ft. St. Emile St. from Courcelles St. to Beaudoin Sts.; 1000 ft. Sir. George E. Cartier Park from St. Emile St. to Canadian Pacific Ry. tracks, all to be 4 ft. wide, $32,500.

Ont., Ft. William—C. B. Dynes, city engr., soon lets contract for 1550 lin.ft. curb and gutter and 4300 sq.yd. asphalt, asphaltic concrete or bitulithic pavement on 6-in. concrete base.

Ont., Ottawa—City soon receives bids paving Booth St. from Somerset St. to Grand Trunk Ry., St. Patrick St. from Sussex St. to MacKenzie Ave., Murray St. from Cumberland St. to King Edward Ave., and Goulburn Ave. from Somerset to Osgoode Sts., asphalt and wood block on concrete base. About $45,000. A. F. McCallum, City Hall, engr.

Ont., York—Town plans to build ½ mi. tarvia road, 24 ft. wide, and 15,000 ft. 4 and 4½ ft. concrete walks part with integral curbs, on Weston Rd., Bernice and Crescent Sts., Dennes and Woodbine Aves. About $35,000. F. Barber, 40 Jarvis St., Toronto, engr.

BIDS DESIRED

Connecticut — Until Sept. 2, by State Highway Comn., Capitol, Hartford, improving 16,060 ft. Thomaston Rd., Watertown Twp., 5365 ft. Bantam Lake Rd., Litchfield Twp., 10,450 ft. Bethlehem-Bantam Lake Rd., Litchfield and Morris Twps., 4378 ft. Coventry Rd., Bolton Twp., 4150 ft. Silver Lane, East Hartford Twp., 6300 ft. Piquot Ave., Fairfield Twp., all bituminous macadam, 18,400 ft. road from Thompson to Webster, Thompson Twp., 3 in. bituminous macadam over 5 in. base, 5175 ft. Short Beach Rd., East Haven Twp., 3837 ft. Grove St., Putnam Twp., 11,734 ft. Branchville Rd., Ridgefield Twp., concrete. C. J. Bennett, state highway comr.

N. Y., Brooklyn—Until Sept. 3, by E. Riegelmann, boro. pres., regulating and grading, Cleveland St. from New Lots Rd. to Hegeman Ave., regulating, curbing and laying sidewalks on Cleveland St. from New Lots Rd. to Hegeman Ave., West 11th St. from Ave. S to Ave. T, regulating, curbing and paving with permanent asphalt on 6 in. concrete foundation, roadway of Colonial Rd. from 76th to 77th Sts., regulating and paving with permanent asphalt on 6 in. concrete foundation, Colonial Rd. from 85th to 86th Sts., 66th St. from 19th to 20th Aves., regulating, grading, curbing, laying sidewalks and paving with permanent asphalt and Grade 1 granite on 6 in. concrete foundation, portion of roadway west of railroad tracks of New Utrecht Ave. from point 71 ft. north of Ovington Ave. to Bay Ridge Ave., regulating, grading, curbing and laying sidewalks on West 11th St. from Ave. R to Ave. S, 20th Ave. from 82nd to 83rd Sts., regulating and paving with permanent asphalt on 6 in. concrete foundation, roadway of 66th St. from 19th to 20th Aves.

New Jersey—Until Sept. 12, by State Highway Comn., Broad St. Bank Bldg., Trenton, improving 3865 sq.yd. State Highway Route No. 1, Sect. 1A, Metuchen Twp., Middlesex Co., concrete. A. L. Grover, ch. clk.; advertised in this issue.

New Jersey—Until Sept. 10, by State Comn., Broad St. Bank Bldg., Trenton, repairing State Highway Route No. 1, from Trenton to New Brunswick and from New Brunswick to Elizabeth, also State Highway Route No. 4, from Rahway to Betsey Ross Farm near Middleton. A. L. Grover, ch. clk.; advertised in this issue.

Streets and Roads (Continued)

N. J., Newton—Until Sept. 2, by Bd. Freeholders Sussex Co., paving 37,000 sq.yd. Ross Corner-Sussex Rd., bituminous penetration surface on macadam foundation. R. L. Slater, clk.

N. J., Trenton—Until Sept. 9, by Bd. Freeholders Mercer Co., repaving East State St. and Whitehead's Rd., Hamilton Twp., involving 8620 sq.yd. sheet asphalt and 2220 sq.yd. Hillside brick on Portland cement concrete base. G. H. Royle, dir. New Roads Dept.; advertised in this issue.

Pa., Bellevue (Pittsburgh P. O.)—Until Sept. 2, by Borough Council, grading, paving and curbing section of Irwin Ave. Work involves 2660 cu.yd. grading, 800 lin. ft. dressed curb and 2140 sq.yd. brick paving. P. H. Martin, 331 4th Ave., Pittsburgh, boro. engr.

Pa., Duquesne—Until Aug. 30, by City Clerk, grading, paving and curbing 1550 lin. ft. Crawford Ave. from Wood St. to Centre Ave., 30 ft. concrete pavement with integral curb, 550 lin.ft. Wool St. from Crawford to Burns Aves., 24 ft. concrete pavement with integral curb, 650 lin.ft. Viola Ave. from South 5th to Auries S s., 24 ft. wide, 320 ft. South 6th St. from Viola to Priscilla Aves. 24 ft. wide, 320 lin.ft. Poplar Alley from Viola to Priscilla Aves., 15 ft. driveway. Alternate bids will be received on concrete pavement with integral curb and repressed vitr. paving block on furnace slag foundation with concrete combination curb and gutter on Viola Ave., from South 6th St. and Poplar Alley. R. B. Dell, city engr. J. Olson, supt. streets and pub. impvts.

Pa., Emsworth (Pittsburgh P. O.)—Boro. receiving bids grading, paving and curbing Locust St. with vitr. brick and stone curbing. About $15,000. P. H. Martin, 331 4th Ave., Pittsburgh, engr. Noted Aug. 14.

Pa., Pittsburgh—Until Sept. 3, by City Controller, grading, paving and curbing McCandless St. from 53rd to 56th Sts., vitr. brick or stone block on 6 in. concrete base. N. S. Sprague, City County Bldg., engr. Noted Aug. 7.

Md., Baltimore—Until Sept. 3, by Bd. Awards, raising and renewing curbs and sidewalks on University Parkway Bridge over Stoney Run, involving 1950 sq.ft. cement footway, 100 ft. new armored concrete curb and 250 ft. armored concrete curb raised. G. F. Weighardt, city engr.

W. Va., Huntington—Until Sept. 3, by city, grading, paving and curbing alley between 19th and 20th Sts. and 9th and Artisan Aves., 20 ft. alley extending from 29th St. 75 ft. north of its intersection of Collis Ave. to 20 ft. alley in rear of what is known as Winters Rd., 10½ alley between 10th and 11th Aves. and 9th and 10th Sts., Court Alley from 9th to 10th Sts., 11th Ave. between 5th and 6th Sts., and 6th St. west from intersection of 11th Ave. to North Blvd., Blvd. Ave. and between east side of Washington Blvd. and west side 16th St., 15th St. from Blvd. Ave. to Grove St., 9th Ave. between 1st and 5th Sts., Dresden Ave., between 17th and 20th Sts., Charleston Ave. from 12th St. to 14th St. (Shelton Lane), Charles St. between 10th Ave. and 9½ Alley, 4th St. between 7th Ave and Chesapeake & Ohio Railway right of way. A. P. Maupin, city engr.

W. Va., Lewisburg—Until Sept. 16, by P. C. Hogsett, clk., Greenbrier Co., improving 20 mi. road in Meadow Bluff Dist., grading 26 ft. wide paving 9 ft. wide. F. K. Rader, co. rd. engr.; advertised in this issue. Noted Aug. 21.

N. C., Charlotte—Until Sept. 4, at Dist. Office State Highway Comn., Greensboro, hard surfacing 14 mi. Charlotte-Monroe Rd., Mecklenburg Co. About $400,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr. Noted July 3.

N. C., Whiteville—Until Sept. 9, by city, paving 20,750 sq.yd. sheet asphalt and 12,280 lin.ft. concrete curb and gutter.

Ga., Griffin—Until Sept. 16, by Comrs. Spalding Co. building 4 mi. road between here and Pike Co. line, 18 ft. wide, involving 42,240 sq.yd. 6½ in. concrete. About $150,000. G. M. Harrington, Griffin, engr.

Fla., Sanford — Until Sept. 15, by City Council, paving and draining 1.5 mi. 9th St., brick. About $30,000. F. T. Williams, Sanford, engr.

Miss., Tunica—Until Sept. 1, by Bd. Supervs. Tunica Co. building 41 mi. gravel roads. T. Williams, clk.

Tenn., Centerville — Until Sept. 10, by Highway Comn. Hickman Co., improving various roads, involving 177,000 cu.yd. excav., drainage structures, etc. This is a section of system of roads designated under recent $225,000 bond issue. H. E. Hamilton, co. engr.

Tenn., Dyersburg—Until Sept. 2, by L. E. Carne, mayor, paving 4000 ft. Main St., et al., 30 ft. wide, involving 40,000 sq.yd. vitr. brick, asphalt, concrete or asphaltic concrete, 16,189 lin.ft. concrete curbing and guttering, 785 lin.ft. header, 3580 cu.yd. earth excav., etc. Blakeman & Brayton, Dyersburg, engrs.

Ohio—Until Sept. 12, by State Highway Comn., Columbus, building roads in following counties:

Adams Co., Sect. "R" Cincinnati West Union Rd., 6.255 mi. grading, constructing bridges and culverts and paving with waterbound macadam, cost $114,200.

Ashtabula Co., Sect. "B" Cleveland-Meadville Rd., 1.44 mi. grading and resurfacing with brick, $4279.

Columbiana Co., Sect. "E-1" Lisbon-Canton Southern Rd., .51 mi. grading, constructing bridges and culverts and paving with waterbound macadam, $19,765.

Galia Co., Sect. "E-2" Gallapolis-Ironton Rd., 1.015 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $23,168.

Guernsey Co., Sect. "K" Cambridge- Coshocton Rd., 2 mi., grading, constructing bridges and culverts and paving with Hillside brick, $8400.

Harrison Co., Sect. "N-1" Cadiz-Carrollton Rd., 2.46 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $63,581.

Sect. "N-2" Cadiz-Carrolton Rd., .48 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $12,146.

Henry Co., Sect. "C" Bryan-Napoleon Rd., 2.4 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $57,940.

Sect. "D-1" Bryan-Napoleon Rd., 9 mi., grading, constructing bridgs and culverts and paving with waterbound macadam, $27,123.

Jackson Co., Sect. "A" Portsmouth-Oak Hill Rd., 2.48 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $41,460.

Jefferson Co., Sects. "F" and "G-1" Ohio River Rd., 2.328 mi., grading, constructing bridges and culverts and paving with brick, $111,876.

Lawrence Co., Sect. "L" Ohio River Rd., 4.386 mi., grading, constructing bridges and culverts and paving with bituminous macadam or monolithic brick, $124,703.

Lorain Co., Sect. "Q" Milan-Elyria Rd., 1.21 mi., grading, constructing bridges and culverts and paving with rein.-con., $47,310.

Mahoning Co., Sect. "Y" Canfield-Poland Rd., 1.88 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $30,578.

Mercer Co., Sect. "D-2" Celina-Wabash Rd., 1.872 mi., grading, constructing bridges and culverts and paving with plain concrete, $52,099.

Sect. "G" St. Marys-Celina Rd., 5.49 mi., grading, constructing bridges and culverts and paving with plain concrete, $159,359.

Sect. "Celina" St. Marys-Celina Rd., .25 mi., grading and paving with plain concrete, $6917.

Montgomery Co., Sect. "C" Dayton-Germantown Rd., 3.35 mi., grading, constructing bridges and culverts and paving with rein.-con., $102,941.

Sect. "P" Dayton-Indianapolis Rd., .39 mi., grading and paving with semi-monolithic brick, $31,132.

Morgan Co., Sect. "H-1" McConnellsville-New Lexington Rd., 3.26 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $79,645.

Noble Co., Sect. "D" Caldwell-Woodsfield Rd., 3.929 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $92,440.

Sect. "E" Caldwell-Woodsfield Rd., 2.814 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $57,898.

Sect. "F" Caldwell-Woodsfield Rd., 2.719 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $59,833.

Perry Co., Sect. "Q" Newark-New Lexington Rd., 1.78 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $48,856.

Sect. "R" Newark-New Lexington Rd., 3.068 mi., grading, and paving with bituminous macadam, $77,786.

Sect. "P" Logan-New Lexington Rd., .1 mi., grading and paving with monolithic brick, $7513.

Sect. "E-2" Zanesville-New Lexington Rd., .2 mi., grading, and paving with brick, $7750.

Pickaway Co., Sect. "T-1" Columbus-Portsmouth Rd., .44 mi., grading, constructing bridges and culverts and paving with semi-monolithic brick, $23,881.

Portage Co., Sects. "T, U, V and W" Ravenna-Warren Rd., 10.467 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $218,473.

Ross Co., Sect. "A-1" Dayton-Chillicothe Rd., .76 mi., grading, constructing bridges and culverts and paving with concrete or monolithic brick, $25,370.

Sect. "B-1" Dayton-Chillicothe Rd., 1 mi., grading, constructing bridges and culverts and paving with concrete or monolithic brick, $29,386.

Scioto Co., Sect. "A-12" Portsmouth-Jackson Rd., 2 mi., grading, constructing bridges and culverts and paving with monolithic brick, $80,738.

Shelby Co., Sect. "F" Sidney-Wapakoneta Rd., 3.521 mi., grading, constructing bridges and culverts and paving with plain concrete, $102,500.

Sect. "G" Piqua-Sidney Rd., 2.065 mi., grading, constructing bridges and culverts and paving with plain concrete, $95,732.

Summit Co., Sects. "A, B, C, D and E" Akron-Cleveland Rd., 16.707 mi., grading, constructing bridges and culverts and paving with brick or concrete, $877,768.

Tuscarawas Co., Sect. "F" Canton-Canal Rd., 1.47 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $42,028.

Vinton Co., Sect. "F" McArthur-Jackson Rd., .31 mi., grading and paving with bituminous macadam, $5233.

Sect. "G-3" McArthur-Athens Rd., building bridge, cost $1970.

Sect. "D" McArthur-Gallapolis Rd., 3.62 mi., grading, constructing bridges and culverts, $25,398.

Warren Co., Sect. "D" Cincinnati-Columbus Rd., 4.05 mi., grading, constructing bridges and culverts and paving with waterbound macadam, $64,930.

Wood Co., Sect. "A" Fremont-Perrysburg Rd., 3.48 mi., grading, constructnig bridges and culverts and paving with bituminous macadam, $78,050.

Sect. "B" Fremont-Perrysburg Rd., 3.85 mi., grading, constructing bridges and culverts and paving with bituminous macadam, $67,100.

O., Cardington—Until Sept. 3, by village, grading, curbing and paving 2nd, Park and Waters Sts. T. E. Buck, Mt. Gilead, engr.; advertised in this issue.

O., Cleveland — City receiving bids paving Henley Ave. from West 92nd to 99th Sts., involving 17,800 sq.ft. 5 in. brick paving and 1255 cu.yd. excav.; Emily Ave. from West 82nd to 88th Sts., 11,046 sq.ft. 5 in. brick paving on 6 in. concrete base. R. Hoffman, city engr.

O., Coldwater—Until Sept. 4, by A. P. Link, city clk., paving Main, 2nd, South, College, 6th, Walnut and Mill Sts., involving 25,818 cu.yd. grading, 2669 lin.ft. 8-36 in. pipe sewer, 16,916 lin.ft. drain tile, 15,505 lin.ft. straight and 978 lin.ft. circular curbing, 408 lin.ft. straight and 25 lin.-ft. circular concrete curbing and guttering, 46,778 sq.yd. pavement, etc. G. Champe, Toledo, engr.

Indiana—Bd. Co. Comrs. building roads in following counties:

Sept. 9, St. Joseph Co., South Bend, 34,765 ft. gravel road, Liberty Twp., known as W. F. Newcomer et al. Rd. A. F. Wolf, co. aud.

Sept. 10, Tipton Co., Tipton, 13,266 ft. course concrete road, Liberty Twp., known as Scott Skinner Rd. C. Grishaw, co. aud.

Ill., Monticello—Until Aug. 30, by Piatt Co., building 2600 ft. of 10 ft. brick pavement on Sect. F-15d, Route 8. Cement to be furnished by county. T. J. Anderson, co. supt. highways.

Minn., Bemidji—Until Sept. 2, by Comrs. Beltrami Co., clearing, grubbing, grading, ditching and building culverts on 4½ mi. State Rd. No. 11, Job No. 1903; County Rd. No. 123, Job No. 1907; County Rd., Nos. 16 and 24, Job No. 1914; County Rd. No. 15, Job No. 1904; County Rd. No. 113, Job No. 1905. About $25,000. S. D. Snyder, Bemidji, engr.

Minn., Thief River Falls—Until Sept. 5, by T. P. Anderson aud. Pennington Co., improving 5 mi. Federal Aid Project No. 67, State Rd. No. 1 and State Aid Job No. 1907, involving 4.5 acres clearing, 39,460 cu.yd. grading, 5345 cu.yd. surfacing and 3947 cu.yd. ditching, etc. Separate bids will be received on grading, surfacing and incidental work. About $45,000. H. G. Martz, St. Hilaire, engr.

Kan., Kansas City—Until Sept. 2, by city, for 40,000 sq.yd. brick, asphaltic concrete and concrete pavement. About $125,000. W. Barclay, city engr.

Streets and Roads (Continued)

Kan., Lyons—Until Sept. 22, by Rice Co., building 10.5 mi. brick road, west of here, 18 ft. wide. S. Ainsworth, Lyons, engr. Noted July 3.

Mo., Clayton—Until Sept. 15, by W. Elbring, co. engr., St. Louis Co., building 52.36 mi. St. Charles, Manchester and Gravois Rds., brick and concrete bases with warrenite surface, and LeMay Ferry Rd., brick or concrete base with bitulithic surface. About $1,171,320. Noted June 12.

Arkansas—Until Sept. 2, by State Highway Dept., Little Rock, grading, paving, building culverts and bridges, on 25 mi. road, 16 ft. wide, in Monellton Rd. Dist. About $500,000. Harrington, Howard & Ash, Orear-Leslie Bldg., Kansas City, Mo., engrs.

Okla., Madill—Until Sept. 20, by city, paving 56 blocks, 36 ft. wide, involving 60 000 sq.yd. rein.-con. pavement. About $375,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

New Mexico—Until Sept. 16, by State Highway Comn., Santa Fe, building 5 432 mi. State Rd. No. 15, Sect. 3, Lea Co. known as Federal Aid Project No. 16. L. A. Gillett, c/o State Highway Dept., engr.

Wash., Ritzville—Until Sept. 2, by Comrs. Adams Co., grading, draining and surfacing 13 mi Donohue 2d. No. 3, crushed rock and gravel, also 8.5 mi. Donahue Rd. No 4, crushed gravel. F. R. Hewett, Ritzville, engr. Noted May 22.

California—Until Sept. 2, by State Highway Comn., 515 Forum Bldg., Sacramento, paving 7.4 mi. road between Beatrice and Eureka (1-Hum-1-G), Humboldt Co., involving 35,800 cu.yd. excav., 7420 cu.yd. Class "A" Portland cement, 2000 lin ft. 12-36 in. corrugated metal pipe, 1800 lin.-ft. guard rail and 154 each hauling and setting monuments; 12.8 mi. road between Oakdale and easterly boundary (111-Sta-13-B), Stanislaus Co., 45,000 cu yd. excav., 12,725 cu.yd. Class "A" Portland cement, 812 lin. ft. 12-24 in. corrugated metal pipe and 204 each hauling and setting monuments; 9.4 mi. road between Galivan and Irvine (V-11-Ora-2-B), Orange Co., 4780 cu.yd Class "A" Portland cement and 32,434 sq.yd. asphalt surface. A. B. Fletcher, highway engr.

Cal., Bakersfield—Until Sept. 8, by V. Van Riper, city clk., paving 10 blks. 21st, 22d, 23d and 24th Sts., et al, 1½ in. bitulithic on 3 in. asphaltic concrete base, concrete curbs, gutters, etc. About $50,000. R. H. Hubbard, city engr.

Que., Como East (Como P. O.)—Until Sept. 8, by W. Sanderson, Como East Ave., paving 10 mi. Provincial Highway, water bound macadam, 20-27 ft. wide, for Dept. of Roads. About $30,000.

Que., Vercheres—Until Sept. 8, by A. M. Cormier, Boloeil, paving 6 mi. waterbound macadam road 18-20 ft. wide, in Vercheres Co. for Dept. Rds., Quebec. About $20,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Taunton**—City let contract laying granite block pavements for 1 year to Simpson Bros., Corp., Devonshire St., Boston. About $30,000.

★**Rhode Island** — State Highway Comn., Providence, let contract building 5 mi. Post Rd. from Westerly to Charlestown, to A. D. Bridges Sons Inc., Hazardville, Conn., $101,417. Noted July 17.

★**Connecticut**—State Highway Comn., Hartford, let contract paving concrete road, Windsor Locks Twps., to Lane Constr. Co., 37 Colony St., Meriden. About $35,000.

★**N. Y., Albany**—Bd. Contr. & Supply let contract paving Rensselaer Ave., concrete, and Lawn St., brick, to P. W. Mulderry, 6 St. Josephs Terrace, $30,955.

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres. let contract regulating and grading Rogers Ave. from Eastern Parkway to Empire Blvd., to M. J. O'Hara, 557 3rd St., $50,085; Rogers Ave. from Empire Blvd. to Flatbush Ave., to Brooklyn Alcatraz Asphalt Co., 407 Hamburg Ave., $159,-535. Noted Aug. 21.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids Aug. 15, regulating, grading, curbing, laying sidewalks and paving, (a) Anthon Ave., (b) Boulevard, (c) Broad St., (d) Buckley St., (e) 4th St., (f) Freedom Ave., (g) Gunther Ave., (h) Hancock St., (i) Hunterspoint Ave., (j) Moor St., (k) Nurge St., (l) O'mstead Pl., (m) Poland St., (n) Woodside Ave., (o) St. Felix Ave., (p) 16th St., (q) Van Cortland Ave., from Sicilian Asphalt Paving Co., 41 Park Row, New York City, (a) $6509, (e) $22,-628, (f) $46,076, (i) $29,712, (k) $3762, (l) $7205, (m) 14,443, (q) $9060;

Borough Asphalt Paving Co., 1301 Metropolitan Ave., Brooklyn, (a) $6623, (i) $28,685, (q) informal;

Uvalde Asphalt Paving Co., 1 Bway., New York City, (a) $6930, (e) $24,238, (f) $45,-225, (i) $32,821, (k) $4218, (l) $7535, (m) $14,580, (q) $9173;

Hastings Paving Co., 25 Broad St., New York City, (b) $29,260;

C. A. Myers, foot of Stagg St., (b) $30,-225, (c) $13,235, (h) $1817, (o) $4820;

Peace Bros., 20 Main St., Flushing, (c) $11,735, (d) $10,850, (h) $1953, (j) $20,100, (n) $136,259, (o) $4921;

T. Welsh, (c) $13,782;

W. Welsh, Astoria, (d) $5280, (j) $8875;

A. A. Johnson, (d) $7125, (j) $13,101;

R. A. Hess Corona, (g) $22,539;

E. W. Fitzpatrick, 128 3rd Ave., Astoria, (g) $22,554;

F. J. Clancy, Corona, (g) $23,622, (n) $127,248;

C. Gallagher, Woodhaven, (h) $1735, (o) $4479;

Cleveland Trinidad Paving Co., Flushing Ave., Brooklyn (j) $31 291, (m) $13,885;

Annarock Eng. & Constr. Co., Long Island City, (n) $126 560;

Holding Realty Corp., Long Island City, (p) $26 114;

J. J. Kreager, (p) $41,400. Noted Aug. 7.

★**N. Y., Seneca Falls**—City let contract paving Clinton, Chapel, Mynderse, Bridge and Green Sts., to M. C. Soper, 82 Cayuga St. About $47,757.

★**N. J., Jersey City**—City let contract grading and paving Hutton and Stegman Sts., asphalt, to W. T. S. Crichfield, Washington St., Hoboken. Cost to exceed $25,-000. Noted June 26 and July 31.

★**Pennsylvania** — State Highway Dept., Harrisburg, let contract to E. J. Corcoran, Plains building 22,435 ft. 1 course rein.-con. road, Route No. 161, Schuylkill Co., $324,-591; to Bowler & Anderson, Clearfield, building 17,977 ft. 1 course concrete road, Route No. 59, Clearfield Co., $195,585. Noted Aug. 14.

Pennsylvania — State Highway Dept., Harrisburg, received bids building roads in counties as follows:

Allegheny Co., 21,299 ft. rein.-con., Moon and Crescent Twps., from M. O'Herron Co., South 1st and McKean Sts., Pittsburgh, $225,204, J. B. Reed Co., 550 Bway., McKees Rocks, $257,814, J. H. De Carpentier & Sons, 521 Falls Ave., Youngstown, O., $258,845;

Bucks Co., 812 ft. vitr. brick, Falls Twp., from F. G. Meyers Co. Inc., 1218 Chestnut St., Phila., $13,872, C. T. Eastburn, 803 Broad St. Bank Bldg., Trenton, N. J., $16,981;

Cambria Co., 13,232 ft. rein.-con. and vitr. brick, Cresson and Gallitzin Twp., from P. C. Azzara, Cresson, $144,782, Coles-Englehart Co., Ebensburg, $167,340;

Chester Co., 29,586 ft bituminous macadam (Pennsylvania method) on Telford foundation, Westtown, East Goshen and East Whiteland Twps., from R. H. Johnson Co., Wayne, $190,578, W. P. McDonald Constr. Co., 1010 Penn Sq. Bldg., Phila., $199,290, Winston & Co., 240 Fair St., Philadelphia, $200,444.

Delaware Co., 7314 ft. bituminous macadam (Pennsylvania method) on Telford foundation, Upper Darby Twp., from W. P. Johnson, 4039 Lancaster Ave., Phila., $44,399, V. Di Franceson, Llanerch, $44,-389, Field Barker & Underwood, Commercial Trust Bldg., Philadelphia, $44,799;

Fayette Co., 4101 ft. vitr. brick, North and South Union Twps., from E. W. Cornish & W. Miller, 620 and 622 Fayette Title & Trust Bldg., Uniontown, $51,475, G. S. White Co., Jenkins Arcade, Pittsburgh, $64,663, R. D. Thomas & Co., 6 Boundary St., Pittsburgh, $68,566;

Northampton Co., 8226 ft. rein.-con., Nazareth and Palmer Twps., from H. B. Tranger, National Park, N. J., $67,616, R. S. Rothbun Contr. Co., 409 Vine St., Bethlehem, $67,769, McInerney & McNeal, Inc., 702 Northampton Natl. Bank Bldg., Easton, $71,191;

Washington Co., 22,287 ft. rein.-con., Cecil Twp., from Crossan Constr. Co., 710 Land Title Bldg., Phila., $206,366, S. Gamble Co., Carnegie, $217,265, G. S. White Co., Jenkins Arcade, Pittsburgh, $235,103;

Westmoreland Co., 57,775 ft. rein.-con. and Hillside vitr. brick, Penn and Salem Twps., from R. H. Cunningham & Sons Co., 600 Penn Ave., Turtle Creek, $683,794, McCrady Bros. Co., 308 6th St., Braddock, $715,586, T. H. Gill Co., 2nd Mutual Bldg., Binghamton, N. Y., $776,645; 31,227 ft. rein.-con. and Hillside vitr. brick, Hempfield and Sewickley Twps., from J. I. Dick, Scotdale, $305,502, G. S. White Co., Jenkins Arcade, Pittsburgh, $350,206, McCrady Bros. Co., 308 6th St., Braddock, $363,018;

Wyoming and Lackawanna Counties, 71,-063 ft. bituminous surface course on concrete foundation or rein.-con., Clarks Summit, Glenburn Boros. and Abington Twp., Lackawanna Co., Clinton and Nicholson Twps., Wyoming Co., from Rutiven Rees & O'Brien, 212 Carter Bldg., Scranton, (Class A) $468,327, A. McMullen Co., 1309-10 Finance Bldg., Philadelphia, $486,033, Gaylord International Eng. & Constr. Co., Cedar Ave. and Orchard St., Scranton, (Class A) $501,308;

Lehigh Co., 16,218 ft. rein.-con., Salisbury Twp. from J. McGraw Co., 1010 Commercial Trust Bldg., Philadelphia, $106,897, R. A. Rathbun Contr. Co., 409 Vine St., Bethlehem, $111,101, G. Merdinger, Wilbut Trust Bldg., South Bethlehem, $111,323;

Luzerne Co., 31,418 ft. bituminous surface course on concrete foundation or rein.-con., West Paxton and Exeter Boroughs and Exeter Twp., from Richardson Hand, Wilkes-Barre, $228,547, H. B. Sproul Constr. Co., 218 Adams Ave., Scranton, (Class A) $237,886, Trinidad Asphalt Paving Co., Larksville (Wilkes-Barre P. O.), $272,086.

Lycoming Co., 15,683 ft. bituminous surface course on concrete foundation or rein.-con., Wolf Twp. and Picture Rock Boro., from Winston & Co., 240 Fair St., Kingston, N. Y., $155,377, Warren Bros. Co., 142 Berkeley St., Boston, (Class D) $186,778;

Mercer Co., 2431 ft. rein.-con., Mercer Boro., from Burns Bros., 525 South Mill St., New Castle, $26,794, Faber Eng. & Constr. Co., 824 Bessemer Bldg., Pittsburgh, $29,307, G. C. Cleaver Co., East Mahoning St., Punxsutawney, $33,114. Noted July 31.

★**Pa., Juniata**—Boro. Council let contract paving 4200 ft. 3rd St., 11th Ave. and Bway. to Boro. line, 30, 36 and 42 ft. wide, concrete, to Gregory Paving Co., Lewistown. About $68,000. Noted July 31.

★**Pa., Phila.**—City let contract grading and paving Delaware Ave., to J. J. McHugh, 1430 South Penn Sq., $108,127. Work involves 1000 cu.yd. grading, $0.69 per cu.yd., 12,058 yd. granite block paving on concrete base, $6.29, 5980 yd. granite block on gravel bed, $5.23, 10 sq.yd. vitr. block on concrete base, $5, 10 cq.yd. granolithic sidewalks, $3, 10 sq.yd. granite block repaving on concrete base, $5, 15 sq.yd. granite block repaving on gravel bed, $1, etc. Total cost, $108,127.

Pa., Phila.—Dept. Pub. Wks. received low bids Aug. 18, grading (a) Cheltenham, Michner and Williams Sts., (b) Osceola St., (c) Jackson St., (d) Dorcas St., (e) Oxford St.; paving with asphalt and vitr. gutters, (f) Hutchinson St., (g) Warrington Ave., (h) Windsor St., (i) Wingohocking St., (j) 6th St., (k) 7th St., (l) 16th St., (m) 26th St.; paving with bituminous pavement and vitr. block gutters, (n) Benezet St., repaving (o) Emerald St., (p) Norris St., (q) Ridge St., (r) Susquehanna St.; repaving (s) Kensington Ave., (t) Germantown Ave., (u) Columbia Ave.; resurfacing with bituminous macadam, (v) 8th St.; furnishing and placing 6 in. straight granite curb, (w) Fairmount Ave.; repairing and painting bridges on (x) Belmont and Girard Sts., (y) Germantown Ave. over Wissahickon Creek, (z) 6th and Allegheny Sts., (a1) 57th St. over West Chester and Pennsylvania R.R., from

I. K. Davis, 20th and Spencer Sts., (a) $28,670.

O'Neill Co., 127 East Mermaid Ave., (a) $38,182; (b) $1354.

T. Connor, 332 North 5th St., (a) $28,637.

Estate of D. McMahon, Post Office Bldg., Germantown, (b) $354.

R. P. Wenner, Franklin Trust Bldg., (c) $1177; (d) $3001; (e) $2187.

J. J. Harnett, Deveraux and Jackson Sts., (c) $1600.

Estate of R. P. Bennis, Chew and Price Sts., (d) $2535; (v) $10,295.

T. P. Lee, 5629 Cherry St., (e) $1843.

Eastern Paving Co., 401 Colonial Trust Bldg., (f) $5691; (g) $7839; (h) $3520; (i) $3930; (j) $4760, (k) $5759; (l) $4320; (m) $4036, (o) $12,272; (p) $39,499; (q) $38,036; (r) $24,970; (w) $6249.

Barber Asphalt Paving Co., 239 North 30th St., (f) $6491; (g) $7847; (h) $3461, (i) $4057; (j) $4819; (k) $5894, (l) $4657, (m) $3906; (n) $8483; (o) $11,499; (p) $38,135; (r) $23,433.

Union Paving Co., 30th and Locust Sts., (n) $8012; (o) $11,578; (p) $36,450; (q) $37,015, (r) $22,477.

Phila. Paving Co., 1345 Arch St., (g) $8844; (h) $3860; (q) $56,821

Streets and Roads (Continued)

Mack Paving & Contg. Co., Nicetown Lane and C Sts., (n) $7880.

J. Meehan & Son, 915 West Dauphin St., (s) $78,018; (t) $36,647; (u) $51,589; (w) $4028.

Cunn & Murray, 1345 Arch St., (s) $78,-135; (t) $35,645.

M. J. McCrudden, 805 Franklin Trust Bldg., (s) $81,536; (t) $35,770; (v) $9285.

Monahan & Loose, 3016 Chestnut St., (y) $28,600.

Mundy Paving & Contg. Co., 228 Alden St., (y) $31,341.

M. & J. B. McHugh, 892 North Markoe St., (w) $6249; (y) $30,776; (z) $32,645; (a1) $3490.

Belmont Iron Works, 22nd and Washington Sts., (z) $34,421; (a1) $2770.

W. Klingberg & Son, 50 Church St., New York City, (x) $2269.

Ryan Contg. Co., 33rd St. and Grays Ferry Ave., (u) $53,095.

E. C. Fish Co., 704 Real Estate Trust Bldg., (u) $53,932. Noted Aug. 14.

★**Pa., Phila.**—Dept. Pub. Wks. let contract improving (a) 8th St. from Chelton to 66th St., (b) Roosevelt St. and North East Blvd., (c) Island Ave. from Eastwick to Tinicum Island, (d) Green St. from Horter to Carpenter Sts., (e) Green St. from Wynnefield to Overbrook Sts., paving (f) Osage Ave., (g) Pentridge St., (h) Plum St. from Ditman to Torresdale St., (i) Erringer Pl from Manheim to Clapier St., (j) Westford Rd. from Geneva to Marwood Sts., furnishing and placing curb on (k) Fairmount Ave., painting and repairing bridges on (l) Germantown Ave. over Wissahickon Creek, repairs to bridges on (m) 20th St. and Penn Ave., 19th St. and Penn Ave. west of 18th St., to M. J. McCrudden Co, Franklin Trust Bldg., (a) $9285; C. P. Bower, Tulip and Somerset Sts., (b) $187,665; Union Paving Co., 30th and Locust Sts., (c) $27,258; J. J. McHugh, 1430 South Penn Sq., (d) $4321; Mack Paving & Contg. Co., Nicetown Lane and C St., (e) $7611; (i) $6698; Barber Asphalt Paving Co., 239 North 30th St., (f) $4276; (g) $3059; (h) $4191; (j) $4743; J. Meehan & Son, 915 West Dauphin St., (k) $4028; Monaghan & Loose, 3016 Chestnut St., (l) $28,600; W. Klingberg & Son, Inc., 50 Church St., New York City, (m) $1810. Noted Aug. 21.

Pa., Pittsburgh — City received bids grading, paving and curbing (a) Exeter St., from Frank St. to Greenfield Ave., involving 1346 sq.yd. vitr. brick and 1217 sq.yd. stone block on 6 in. concrete base, 2100 lin.ft. concrete curbing and 5532 cu.yd. earth excav., (b) Jean St. from Fairdale St. to Sutherland Ave., 673 sq.yd. vitr. brick on 6 in. concrete base, 500 lin.ft. concrete curbing, 1036 cu.yd. earth excav., (c) Stadium St. from Radcliffe to Stafford Sts., 695 sq.yd. vitr. brick on 6 in. concrete base, 260 lin.ft. concrete curbing, 1500 cu.yd. earth excav., 220 cu.yd. concrete wall, (d) Sebring Ave. from Fallowfield Ave. to point 90 ft. westwardly, 365 sq.yd. stone block on 6 in. concrete base, 200 lin.ft. concrete curbing, 594 cu.yd. earth excav., 465 sq.yd. concrete sidewalk, (e) Stafford St. from Stadium St. to point 234 ft. southwardly, 550 sq.yd. old stone block on 6 in. concrete base, 130 lin.ft. concrete curbing, 206 lin.-ft. recut and reset sandstone curbing, 855 cu.yd. earth excav., (f) Veronica St. from Sundeman St. to Straubs plan of lots, 1410 sq.yd. vitr. brick on 6 in. concrete base, 1115 lin.ft. concrete curbing, 2135 cu.yd. earth excav., (g) Fallowfield from Sebring St. to Bayonne Ave., 1175 sq.yd. stone on 6 in. concrete base, 956 lin.ft. concrete curbing, 2405 cu.yd. earth excav., (h) Cowan St. from Dillworth St. to Southern Ave., 1460 sq.yd. stone block on 6 in. concrete base, 894 lin.ft. concrete curbing. 1824 cu.yd. earth excav., (i) Singer St. from Tokio to McKee Sts., 3600 sq.yd. stone block on 6 in. concrete base, 3068 lin.ft. concrete curbing, 3206 cu.yd. earth excav., 6480 cu.yd. earth embankment, from M. Ott & Co., 416 Warrington Ave., (a) $19,717; M. O'Herron Co., South 1st and McKean Sts., (a) $20,204, (c) $9283, (e) $3248, (f) $9221, (h) $10,900, (i) $29,074; Booth & Flynn, 1942 Forbes St., (a) $21,946, (g) $11,584, (h) $10,968, (i) $31,217; J. B. Reed Co., 550 Bway., (b) $5509, (c) $8721, (e) $3936; J. J. Neelan, Pittsburgh, (b) $4908, (f) $10,269; McDonnough & O'Toole, Pittsburgh, (b) $4912, (c) $9057, (d) $2876, (e) $3371; Pittsburgh Paving Co., Bakewell Bldg., (d) $2400, (f) $9719; F. Donatelli, Pittsburgh, (d) 2459, (g) $11,020. Noted Aug. 14.

★**Pa., Pittsburgh** — Comrs. Allegheny Co. let contract paving Ardmore Blvd., involving 36,600 sq.yd. asphaltic concrete, to Booth & Flynn, 1942 Forbes St., $235,-975. Noted Aug. 14

★**Pa., Sunbury**—Comrs. Northumberland Co. let contract improving 2.24 mi. Columbiana-Leetonia Rd., to Morgan Bros., Leetonia, $46,127; 1.14 mi. Columbiana and New Waterford Rds., to Hepburn Bros., Lisbon, $24,729.

★**Virginia**—State Highway Comn., Richmond, let contracts to J. R. Ford & Co., Lynchburg, building 2 mi. road from Bocock to Rustburg, 16 ft. wide, penetration macadam, Campbell Co., cost $46,056, 4½ mi. road from Lynchburg to Judiths Creek, 16 ft. wide, waterbound macadam, Bedford Co., $100,500; McKinney & Harvey, Farmville, 0.72 mi. concrete road from Roanoke to Raleigh Court, Roanoke Co., $24,-904; C. Carson, Riverton, 1.56 mi. concrete road from Front Royal to Riverton, Warren Co., $23,000; L. J. Chandler, Virginlina, 1.59 mi. concrete road from Cape Charles to Bayside Rd., Northampton Co., $49,000. Noted June 19.

★**W. Va., Charleston**—Comrs. Kanawha Co. let contract to G. T. Fogle & Co., St. Albans, improving 3 mi. Sissionville Rd., 13 feet between edging. Work includes laying bituminous concrete surface on concrete base (which has already been constructed); refined oil asphalt to be used. Noted July 24.

★**W. Va., Parsons**—Comrs. Tucker Co. will build 9 mi. Davis-Dist. Preston County Rd., 20 ft. wide, involving 38,800 cu.yd. excav. and 17,700 sq.yd. cement concrete surfacing. About $75,000. Work will be done by day labor. Noted Aug. 21.

★**W. Va., Ripley**—Comrs. Jackson Co. let contract building 5 mi. Ripley-Parkersburg-Turnpike, 20 ft. wide, to Cisler & Morse, Marietta, O., $14,330. Noted July 31.

★**W. Va., Ripley**—Comrs. Jackson Co. let contracts paving 1.1 mi. streets, 20 ft. wide, in Ravenswood Twp., involving 18,000 sq.yd. concrete, to C. Kennedy & Son, Parkersburg, $42,663; 1 mi. streets in Ripley Twp, involving 4000 sq.yd. concrete, to Cisler & Morse, Marietta, Ohio, $11,760. Noted July 24.

★**W. Va., Summerville**—Comrs. Nicholas Co. will grade and drain 2 mi. Belva-Summersville Rd., 20 ft. wide. About $29,000. Work will be done by day labor. Noted Aug. 21.

★**W. Va., Wellsburg**—Comrs. Brooke Co. will grade, drain, and surface with concrete and macadam 1 mi. Wellsburg Wheeling Rd., 16 ft. wide. About $30,000. Work will be done by day labor. Noted May 22.

★**Ga., Augusta**—City let contracts paving 6000 sq.yd. 12th St. and Savannah Rd., 6 in. concrete, to A. J. Twiggs & Son, Herald Bldg., $2.24 per sq.yd.; 10,000 sq.yd. 9th St. from Fenwick to Twiggs Sts., asphaltic concrete on macadam base, and 20,000 sq.yd. Broad St. from 5th to east boundary, sheet asphalt on concrete base, to Ely Constr. Co., Lamar Bldg., $1.70 and $2.45 per sq.yd. respectively. Noted Aug. 21.

★**Ky., Louisville**—City let contracts to Bickel Asphalt Co., 6th and Lee Sts., Louisville, paving 330 mi. Kreeger Ave. from Elliston to Charles Aves., 30 ft. wide, involving 150 sq.yd. vitr. brick gutter, 910 sq.yd. asphalt, 1060 sq.yd. 6 in. concrete base, 620 lin.ft. stone curbing, 650 cu.yd. earth excav., cost $5383, Rastiller Ave. from Frankfort to Payne Aves., 170 sq.yd. vitr. brick guters, 1100 sq.yd. asphalt, 1270 sq.yd. 6 in. concrete base, 690 lin.ft. stone curbing, 1000 cu.yd. earth excav., $6444, 610 mi. Prospect Ave. from Pope to Stole Aves., 30 ft. wide, 300 sq.yd. vitr. brick gutters, 1730 sq.yd. asphalt, 2030 sq.yd. 6 in. concrete base, 955 lin. ft. stone curbing, 420 cu.yd. earth excav., $9206; to Louisville Asphalt Co., Floyd and Lee Sts., Louisville, 600 mi. Quadiant Ave. from Eastern Parkway to Stevens Ave. 30 ft. wide, 265 sq.yd. vitr. brick, 1740 sq.yd. asphalt, 2005 sq.yd. 6 in. concrete base, 1120 lin.ft. stone curbing, 3300 cu.yd. earth excav., $12,256, 750 mi. Ormby Ave. from 21st to 23rd Sts., 20 ft. wide, 300 sq.yd. vitr. brick gutters. 1375 sq.yd. asphalt, 1675 sq.yd. 6 in. concrete base, 1366 lin.ft. stone curbing, 800 cu.yd. excav., $8651.

O., Cleveland—City received bids paving (a) Fidelity Ave. from West 101st St. to West Blvd., involving 14,500 sq.ft. brick paving on 6 in. concrete base, (b) Loretta Ave., from West Blvd. to West 101st St., 28,750 sq.ft. 4 in. brick on 6 in. concrete base, (c) Franklin Ave. from West 66th St. to Franklin Circle, 22,100 sq.yd. asphalt, (d) Kinsman Rd from East 93rd to East 140th Sts., 118,600 sq.ft. 5 in. brick on 6 in. concrete base, (e) Kinsman Rd. from East 140th St. to city limits, 106,000 sq.ft. 5 in. brick on 6 in. concrete base, (f) Superior Ave. from East 39th to 47th Sts., 11,340 sq.ft. 4 in. wood block on 8 in. concrete base, (g) East 4th St. from Euclid to Prospect Aves., 10,752 sq.ft. 4 in. wood block on 8 in. concrete base, (h) Superior Ave. from East 47th to 55th Sts., 11,230 sq.ft. 4 in. brick on 8 in. concrete base, (i) Westfield Ave. from London Rd. to Wayside Ave., 16,670 sq.ft. 4 in. brick on 6 in. concrete base, (j) West 44th St. from Hyde to Starsdale Aves., 24,400 sq.ft. brick, from Freshwater Paving Co., 11,712 Detroit Ave., (a) $10,171; (b) $19,505, (j) $12,701; Baldwin Bros., 4500 Euclid Ave., (a) $10,497, (b) $19,803, (d) $72,255, (e) $77,395, (g) $12,880, (j) $12,868; Amer. Paving Co., Marshall Bldg., (c) $40,955; Kelly & Myers, Society for Society Bldg., (c) $41,268; McHugh Bros., 724 Guardian Bldg., (c) $41,274; A. M. Pejsa, 2359 East 93rd St., (d) $75,249, (e) $75,155, (f) $96,-964, (h) $96,513; Burnett Hathaway Co., Society for Savings Bldg., (d) $92,292, (e) $88,391, (g) $12,614; Bentley Bros., 1836 Euclid Ave., (f) $110,886, (g) $13,112, (h) $108,526; Rieley Bros., 357 The Arcade, (f) $110,943, (h) $107,049, (i) $10,906; G. B. Herring, Society for Savings Bldg., (i) $10,548; Gould & Maybach, 823 East 150th St., (i) $10,784; Roehl Bros., West 25th St. and Clark Ave., (j) $12,045.

O., Columbus—G. A. Borden, dir. pub. serv., received bids grading, draining, curbing, laying water mains and repaving with (a) sheet asphalt with brick gutters, (b) asphalt with old stone gutters, (c) brick, 10,096 ft. 5th Ave. from Perry St. to alley west of Parker St., from Cleveland Trinidad Paving Co., The Arcade, Cleveland, (a) $113,479, (b) $115,579; A. G. Pugh, Columbus, (a) $126,257; Andrews Paving Co., Rentschler Bldg., Hamilton, (b) $123,621; Franklin Asphalt Paving Co., Columbus, (c) $118,499; B. F. Patterson, Columbus, (c) $126,759. This contract is held up by injunction suit of property owners. Noted Aug. 14.

★**O., Columbus**—G. A. Borden, dir. pub. serv., let contract grading, draining, curbing, laying water mains and paving 448 ft. Findlay Ave. from Olentangy St. to north terminus, brick, to R. J. Dienst, 2515 West Broad St., $7610; 1112 ft. Dennison Ave. from 5th to King Aves., asphalt, Cleveland Trindad Paving Co., The Arcade, Cleveland. $12,578. Noted Aug. 14.

★**O., Oxford**—Village Council let contract paving and curbing ½ mi. High St., 33 ft. wide, involving 10,000 sq.yd. vitr. brick, to J. Hennessey, Piqua, $35,500. Noted July 31.

★**O., Toledo**—D. H. Goodwillie, dir. pub. serv., let contract paving 7670 ft. Fairmont Park and Ottawa Additions, 24 ft. wide, involving 17,980 sq.yd. 2½ in. bituminous concrete on 6 in. concrete base, 14,990 lin. ft. concrete curbing and guttering and 3161 cu.yd. earth excav., to Harris & Tansey, 504 Nasby Bldg., Toledo, $89,047. Noted July 31.

★**Michigan**—F. F. Rogers, state highway comr., Lansing, let contract grading, draining and surfacing 3.78 mi. State Trunk Line Rd. No. 12-1, Mackinaw Co. involving 35,483 sq.yd. gravel and 13,045 cu.yd. earth excav., to E. Brown, Charles, $41,000; 3.155 mi. State Trunk Line Rd. No. 50-1, Lenawee Co., involving 6941 cu.yd. concrete and 4954 cu.yd. earth excav., to Hillding & Robe, Rega, $91,216; also shaping and surfacing 5.972 mi. Federal Aid Project No. 7, Alcona Co., involving 8771 cu.yd. gravel, to W. T. Hill, Prescott, $47,000. Noted Aug. 14.

★**Michigan**—State Highway Dept., Lansing, let contract to Cline & Boelus, Spring Lake, grading, draining and surfacing 1.236 mi. State Trunk Line Rd. 11-3, 16 ft. wide, concrete, $25,054; H. A. Hozie, 1426 4th St., Grand Rapids, 5.878 mi. Sect. A, State Trunk Line Rd. 12-1A, 16 ft. wide, concrete, $142 747; H A. and M. C. Nichols, Hastings, Sect. B-C, State Trunk Line Rd., No. 23-3, $102,381. Noted Aug. 7 and 14.

Mich., Detroit—City received bids paving with sheet asphalt or asphaltic concrete on 6 in. concrete base, Berea curbstone, (a) Fenkell Ave., (b) Colfax Ave., (c) Clements Ave., (d) Florida Ave., (e) Fullerton Ave., (f) Northfield Ave., (g) Otsego Ave., (h) Olivet Ave., (i) Pingree Ave., (j) Schroeder Ave., (k) Sylvan St., (l) Wilson Ave., from W. B. Brady Constr. Co., 1972 Grand River Ave., (a) $94,746, (b) $21,298, (c) $16,762, (d) $56 857, (e) $36,804, (f) $41,492, (g) $13,605, (h) $4318, (i) $37,265, (j) $18,041, (k) $5840, (l) $5380; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a) $92,655, (b) $21,794, (c) $16,437, (d) $57,617, (e) $36,032, (f) $42,422, (g) $14,044, (h) $4258, (i) $38,557, (j) $17,666, (k) $5684, (l) $5586; Detroit Asphalt Paving Co., 20 McGraw Bldg., (a) $90,152, (b) $20,820, (c) $16,490, (d) $54,808, (e) $36,633, (f) $40,596, (g) $13,839, (h) $4082, (i) $37,444, (j) $16,982, (k) $5577, (l) $5488. Noted Aug. 14.

Streets and Roads (Continued)

★**Mich., Redford**—B. E. Taylor, 501 Ford Bldg., Detroit, let contract furnishing labor and materials laying 250,000 sq.yd. 1 course concrete paving in subdivisions near Grand River Ave., here, to Otis Cement Constr. Co., Hammond Bldg., Detroit. About $65,000.

★**Illinois**—Dept. Pub. Wks. & Bldgs., Div. Highways, Springfield, let contracts to R. F. Conway Co., 133 West Washington St., Chicago, improving Sect. O, LaSalle-Grundy Co., Sect. H and G, La Salle Co., Sect. Q and P-29a, Grundy Co., $675,000; Sect. A, Cook-Lake Co. and Sect. B, Lake Co., $269,724; Sects. C, D, K-15d, Lake Co., $289,267; to Warner Constr. Co., 189 West Madison St., Chicago, Sect. N-15d and B, La Salle Co., $149,088; to A. Fahrig, Edwardsville, Sect. Y, Madison Co., $128,524; to H. H. Hall Constr. Co., East St. Louis, Sects. U and Q, Madison Co., $186,466, Sects. 32 and P-15d, $180,534; to McElwee & Rogy, 425 Moss Ave., Peoria, Sect. F, Peoria Co., $16,881; to Hill & Barth, Amboy, Sect. C, Lee Co., $10,072; to Cameron & Joyce, Keokuk, Ia., Sect. K, Tazewell Co., $23,724. Noted Aug. 7 and 21.

★**Illinois**—Dept. Pub. Wks. & Bldgs., Div. of Highways, Springfield let contracts building Sects. I and W, Springfield-East St. Louis Highway, Madison Twp., to Cameron, Joyce, Smith & Elder, Keokuk, Ia., $242,032; Sect. V, Springfield-East St. Louis Highway, Fayette Twp., to H. W. Horst Constr. Co., Horst Bldg., Rock Island, $128,416; Sect. 1, Route 16 Springfield-East St. Louis Highway, Litchfield Twp., to White & Braley Co., Litchfield, $10,000; Sect. H, Route 6, Nokomis-Witt Highway, Nokomis Twp., to Arva & Wakefield Co., Litchfield, $10,000. Noted July 17.

★**Illinois**—Dept. Pub. Wks. & Bldgs., Springfield, let contract improving roads in following counties: Lake Co., 5100 ft. Sect. J, Route 6, 18 ft. wide, involving 10,200 sq.yd. concrete and 4080 cu.yd. excav., etc., to W. A. Black, Waukegan, $21,600; Montgomery Co., 22,340 ft. Sect. H, Routes 4 and 6, 24 ft. wide, 59,573 sq.yd. earth and 8815 cu.yd. excav., to Awe & Warfield, Lincoln, $8177; 24,897 ft. Sect. I, Route 16, 24 ft. wide, 66,392 sq.yd. earth and 13,540 cu.yd. excav., to White & Braley, Litchfield, $9803; Alexander Co., 16,470 ft. Sect. D, Route 1, 15 ft. wide, 27,450 sq.yd. gravel and 8896 cu.yd. excav., to W. T. Bland, Cairo, $37,561.

★**Illinois**—Dept. Pub. Wks. & Bldgs., Springfield, let contract improving 38,795 ft., Sect. E, Route 5, 15 ft. wide, Macon Co., involving 64,658 sq.yd. oiled earth, 23,067 cu.yd. excav., etc., to Stewart & Fluss, Oriana, $26,472; 12 and 16 ft. span bridge, Sect. G, Route 4, Richland Co., to L. V. Chesrown, Olney, $5058. Noted Aug. 21.

★**Ill., Chicago**—Bd. Local Impvts. let contracts paving Archer Ave., to Ready & Callaghan Coal Co., 133 West Washington St., $67,021; South Bishop St., to J. A. Sackley Co., 179 West Washington St., $8210; Brompton Ave., to White Paving Co., 17 North La Salle St., $9676; Carmen and North Fairfield Aves., to R. F. Conway Co., 133 West Washington St., $7605 and $74,497 respectively; North Menard Ave., to Amer. Asphalt Paving Co., 133 West Washington St., $19,704; Wabansia Ave., to Standard Paving Co., 29 South La Salle St., $45,064; East 103rd Pl., East 104th St., East 104th Pl., East 105th St., East 105th Pl., East 106th and East 107th Sts., Stephenson, Langley, Corliss and Erickson Aves., to J. A. McGarry Co., 189 West Madison Ave., $169,056. Noted July 17.

★**Ill., Chicago** — Bd. Local Impvts. let contracts to Central Paving Co., 179 West Washington St., paving alley between Sunnyside, Galt, Clarendon and Hazel Aves., $4066, alley between Menomonee and Eugenie Sts., Cleveland Ave. and Mohawk St., $3424, alley between Sunnyside, Galt, Hazel Aves. and Sheridan Rd., $3566; to R. R. Anderson & Co., 1841 West Lake St., alley between Granville and Hood Aves. and Bway. and Lakewood Ave., $3946; to Contg. & Material Co., 10 South La Salle St., alley beween East 63rd and East 64th Sts. and Ingleside and Drexel Aves., $3231; to P. J. O'Brien Co., 29 South La Salle St., alley between Huron, Erie and Leavitt Sts. and Oakley Blvd., $5937; alley between Washington Blvd., Madison, Ada and Sheldon Sts., $8737; to Amer. Asphalt Paving Co., 133 West Washington St., Clyde Ave. from East 73rd to East 75th Sts., $15,137, Clyde Ave. from East 92nd to East 93rd St., $7735, East 72nd St. from South Shore Drive to East 71st St., East 71st St. from South Shore Drive to point 122 ft. east, $10,754, South Hoyne Ave. from West 107th to West 111th Sts., 108th Pl. from Hoyne Ave. to point 160 ft. east, West 110th St. from Longwood Dr. to Hoyne Ave., $49,913. Noted Aug. 14.

Ill., Chicago—Bd. Local Impvts., received bids Aug. 13, paving (a) alley between Eastwood, Wilson and Clarendon Aves. and Hazel St., involving 498 cu.yd. excav., 1010 sq.yd. 7 in. concrete paving, 20 ft. 8 in. sewer tile, 1 brick catchbasin,

(b) alley between Marianna St., Wrightwood Ave., Best St. and Sheffield Ave., 315 cu.yd. excav., 1250 sq.yd. 2 in. concrete pavement on 5 in. crushed slag,

(c) alley between Berteau and Belle Plaine Ave., Paulina and Hermitage Sts., 527 cu.yd. excav., 1250 sq.yd. 7 in. concrete, 518 ft. 10 in. sewer tile, etc.,

(d) alley between East 64th and East 65th Sts., Evans Ave. and Langley St., 250 cu.yd. excav., 1070 sq.yd. 7 in. concrete.

(e) alley between West 63rd and West 64th Sts., Throop and Ada Sts., 415 cu.yd. excav., 1460 sq.yd. 7 in. concrete, 170 ft. 10 in. tile sewer, etc.,

(f) alley between East 32nd and East 33rd Sts., Prairie and Forest Aves., 250 cu.yd. excav., 910 sq.yd. 7 in. concrete,

(g) alley between West 32nd and West 33rd Sts., Shields and Princeton Aves., 1201 ft. concrete curbing, 200 cu.yd. excav., 925 sq.yd. vitr. brick on 6 in. concrete,

(h) alley between East 56th and East 57th Sts., Drexel Blvd. and Maryland Ave., 130 cu.yd. excav., 1070 sq.yd. 7 in. concrete,

(i) alley between East 59th and East 60th Sts., Wabash and Michigan Ave., 220 cu.yd. excav., 1122 sq.yd. 7 in. concrete, 240 ft. 10 in. tile sewer, etc.,

(j) alley between East 40th and East 41st Sts., Drexel Blvd. and Cottage Grove Ave., 882 ft. concrete curbing, 214 cu.yd. excav., 565 sq.yd. vitr. brick on 6 in. concrete,

(k) alley between East 42nd Pl., East 42nd St., St. Lawrence and Vincennes Aves., 1460 ft. concrete curbing, 540 cu.yd. excav., 1165 sq.yd. vitr. brick on 6 in. concrete,

(l) alley between East 63rd and East 64th Sts., Langley and Evans Sts., 362 cu.yd. excav., 1260 sq.yd. 7 in. concrete.

(m) alley between West 86th Pl., West 87th St., Vincennes Ave. and Sangamon St., 225 cu.yd. excav., 1140 sq.yd. 7 in. concrete,

(n) alley between Taylor St., Roosevelt Rd., Lincoln St. and Winchester St., 511 cu.yd. excav., 1402 sq.yd. 7 in. concrete, 260 ft. 10 in. tile sewer, etc.,

(o) alley between Wilson and Sunnyside Aves., Albany and Troy Sts., 543 cu.yd. excav., 1155 sq.yd. 7 in. concrete,

(p) Augusta St. from Kildare St. to Cicero Ave., 5300 ft. concrete curbing, 5300 cu.yd. excav., 10,040 sq.yd. asphalt pavement on 6 in. concrete, 160 ft. 10 in. tile sewer, etc.,

(q) Barry Ave. from Robey St. to Hoyne Ave., 650 ft. concrete curbing, 700 cu.yd. excav., 1020 sq.yd. asphalt pavement on 6 in. concrete,

(r) Cambridge St. from Diversy to Surf Sts., 970 ft. concrete curbing, 600 cu.yd. excav., 1500 sq.yd. asphalt pavement on 6 in. concrete, etc.,

(s) Homer St. from Albany to Kedzie Aves., 870 ft. concrete curbing, 480 cu.yd. excav., 1300 sq.yd. asphalt on 6 in. concrete, etc.,

(t) Potomac Ave. from Homer to Central Park Aves., St. Louis Ave. from Evergreen St. to Potomac Ave., 2940 ft. concrete curbing, 4500 cu.yd. excav., 4700 sq.yd. asphalt on 6 in. concrete, 110 ft. 10 in. tile sewer, etc.,

(u) Argyle St. from Spaulding Ave. to the Sanitary Canal, 3040 ft. concrete curbing, 2300 cu.yd. excav., 4120 sq.yd. asphalt on 6 in. concrete, etc.,

(v) Wrightwood Ave. from Lake View Ave. to North Clark St., Dole Ave. from Lehman Court to North Clark St., Pine Grove Ave. from Wrightwood Ave. to Surf St., Hampton Court from Deming to Diversy Sts., Lehman Court from Wrightwood Ave. to Diversy St., 9750 ft. concrete curbing, 6000 cu.yd. excav., 15,000 sq.yd., asphalt on 6 in. concrete, etc., from

J. A. Ross & Co., 4561 Armitage Ave., (a) $3265, (c) $5468, (o) $3618;

R. R. Anderson Co., 1841 West Lake St., (a) $3346, (b) $3825, (e) $4838, (f) $2649, (h) $2732, (i) $4005, (n) $5379, (o) $3677;

Central Paving Co., 179 West Washington St., (a) $3445, (b) $4625, (c) $5548, (d) $2948, (e) $4859, (g) $5559, (h) $2900, (i) $4282, (j) $3695, (k) $7034, (l) $3708, (m) $3176, (n) $5369;

J. Dillon & Co., 179 West Washington St., (b) $4740, (d) $2973, (g) $5588, (j) $3601, (k) $6917, (l) $3733, (m) $3153;

P. J. O'Brien & Co., 29 South La Salle St., (c) $5588, (d) $3018, (e) $4915, (f) $2956, (n) $5355, (o) $3677;

Contg. & Material Co., 3219 South Michigan Ave., (f) $2900, (g) $5508, (h) $2886, (i) $4254, (j) $3640, (k) $7049, (l) $3793, (m) $3299;

Amer. Asphalt Paving Co., 133 West Washington St., (p) $43,371, (q) $4985, (r) $6235, (t) $22,583, (u) $18,610, (v) $65,166;

Standard Paving Co., 29 South La Salle St., (p) $43,694, (s) $5689, (t) $22,338;

R. F. Conway Co., 133 West Washington St., (p) $43,826, (q) $4989, (r) $6022, (s) $5764, (t) $23,168, (u) $18,248, (v) $64,312;

White Paving Co., 17 North La Salle St., (q) $4890, (r) $6009, (s) $5644, (u) $18,411, (v) $64,162. Noted Aug. 7.

★**Wisconsin**—State Highway Comn., 208 Stephenson Bldg., Milwaukee, let contract improving Milwaukee-Waukesha Rd., Waukesha Co., Federal Aid Project No. 63, to Blodgett & Clayton Constr. Co., 204 Grand Ave., Milwaukee, involving 1441 cu.yd. earth excav., $1.25 per cu.yd., 9542 sq.yd. concrete surfacing, $1.95, and 22,300 lb. steel reinforcing, $.08, total, $22,193. Noted July 17.

★**Wisconsin**—State Highway Comn., 208 Stephenson Bldg., Milwaukee, let contracts improving Whitefish Bay-Brown Deer Rd., Milwaukee Co., Federal Aid Project No. 103, to Froming Bros., Milwaukee, involving 6311 cu.yd. earth excav., $.96 per sq. yd., 48 cu.yd. concrete in culverts, $22. and 17,682 sq.yd. concrete surfacing, $2.14, total cost, $44,973; North Fond du Lac Rd., Federal Aid Project No. 102, Waukesha Co., from F. Hildebrand, Jr., 1315 Forest Home, Milwaukee, 5973 cu.yd. earth excav., $.95 per cu.yd., 105 cu.yd. concrete in culverts, $20 and 24,354 sq.yd. concrete surfacing, $2.20, etc., $62,091. Noted Aug. 7.

★**Minn., Bemidji**—Beltrami Co. let contract grading and graveling 16 mi. Federal Aid Project No. 76, 24 ft. wide, to Lett Bros., Bemidji, $63,816. Noted June 26.

★**Minn., Elk River**—Sherburne Co. let contract paving 11 mi. Federal Aid Projects Nos. 44 and 60, 16 ft. wide, to W. S. Harris, 1442 Pillsbury Ave., Minneapolis, and Widell & Co., Mankato, $186,000 and $230,000 respectively. Noted April 17.

★**Minn., Grand Rapids**—City let contract concrete paving 3½ blocks, to M. Hanson, Coleraine, $14,827. Noted July 17.

★**Minn., Ivanhoe**—Lincoln Co. let contract grading and graveling 3 mi. State Rd. No. 5, Job 1902, 24 ft. wide, to L. C. Trybon, Porter. Work will be done on day labor basis. Noted July 24.

★**Minn., Ortonville**—A. V. Randell, and Big Stone Co., let contract grading and graveling 10 mi. Federal Aid Project No. 66, State Rd. No. 3, 24 ft. wide, to Larkin Constr. Co., Ortonville. About $61,000. Noted June 24.

★**Minn., St. Paul**—H. W. Austin, city purch. agt., let contract paving Grove St. between Mississippi and Lafayette Sts., to Fielding & Shipley, 216 University Ave., $31,355. Noted Aug. 7.

★**Minn., Slayton**—City let contract paving 20,000 to 25,000 sq.yd. streets, 18 ft. wide to Hanlon & Okes, Library Exch., Minneapolis, $3.50 per sq.yd.

★**Minn., Warren**—Comrs. Marshall Co let contract building Federal Aid Project No. 81, State Rd. No. 1, 24 ft. wide, to M. W. Barnard, Globe Bldg., St. Paul, $107,794. Noted Aug. 7.

★**Kan., Iola**—Allen Co. rejected bids hard surfacing 4½ mi. Federal aid road, 18 ft. wide. Work will be done by day labor. Noted Aug. 7.

★**North Dakota**—State Highway Comrs. Bismarck, let contract building 22 mi. concrete road east and west through Napoleon, Federal Aid Project No. 35, to F. M. Hass, Minot, and C. H. Dunlay, Sanger. About $67,000.

★**N. D., Fargo**—City let contract paving 3rd St. between 1st and 2nd Aves., involving 7000 sq.yd. bituminous concrete, to W. E. Kennedy, Fargo. About $28,000.

★**N. D., Fargo**—Comrs. Cass Co. let contract building 26 mi. Alice Turnpike Highway Rd., earth, to T. Twichell, Mapleton, $14,148.

★**Montana** — State Highway Comn., Helena, let contract gravel surfacing 3 mi. Billings-Cody Way, to A. Carlson, Columbus, $27,589. Noted July 24.

★**Montana**—State Highway Dept., Helena, let contract gravel surfacing 18 mi. Sun River Rd., Cascade Co., to White, Brown & Leahy, Great Falls, $35,888. Noted Aug. 14.

★**Arkansas**—State Highway Dept., Little Rock, let contract building Washington Co. Road Dist. No. 1, to J. T. Code & E. M. Wheelock, Springfield, Mo., involving 24.790

Streets and Roads (Continued)

cu.yd. excav., 23,958 cu.yd. gravel base course or broken stone, 11,812 cu.yd. gravel road surface, 240 cu.yd. class A concrete, 176 cu.yd. class B concrete, 241 cu.yds. cement rubble masonry. About $105,315.

Tex., Bryan—Brazos Co. received bids building gravel surfaced and plain concrete road and rein.-con. drainage structures on 10.33 mi. Highway No. 2, Rd. Dist. No. 2, known as Millican-Navasota Rd., 15 ft. wide, from Sline, Stanley & Byers, Waco, $106,687; Boyett & Sherman, Houston, $110,126; Cook & Arrington, Crockett, $115,251. Noted Aug. 21.

★**Tex., Canton**—Van Zandt Co. let contract building gravel surfaced road and rein.-con. drainage structures on 9.889 mi. Highway No. 15, Federal Aid Project No. 84, 15 ft. wide, to D. Laroe, Chandler, $126,-213. Noted Aug. 21.

★**Tex., Clarksville**—Red River Co. let contract building 2.18 mi. State Highway No. 37 or Jim Hog Highway, Federal Aid Project No. 95, 14 ft. wide, involving 7700 ft. gravel surfacing and 3800 ft. concrete surfacing, to J. A. Goodman, Clarksville, $14,-125. Noted July 17.

★**Tex., Dallas**—City Comn. let contract paving Forest Ave. from Meadow to 2nd Aves., and Fletcher St. from Terry to Parry Aves., to Texas Bitulithic Co., 1101-6 Praetorian Bldg., $26,018 and $11,707 respectively; Good St. from Elm to Bryan Sts., to Standard Eng. & Constr. Co., Interurban Bldg., $28,097.

★**Tex., Ranger**—City let contract for 116,000 sq.yd. pavement, to Genl. Constr. Co., F. & M. Bank Bldg., Ft. Worth, $574,-920.

Tex., Roby—Fisher Co. received bids for (a) placing, spreading, hauling, gravel surfacing and building drainage structures on 9 mi. Highway No. 4, known as Rotan-Aspermont Rd., 15 ft. wide, involving 20 acres clearing and grubbing, 70,000 cu.yd. unclassified earth excav., 42,400 lb. reinforcing steel, etc., (b) gravel surfacing and building rein.-con. drainage structures on 6 mi. Highway No. 4 from North Roby to Rotan, State Aid Project No. 83, 2700 lin.ft. machine work, 40,750 cu.yd. unclassified earth excav., from J. F. Hamer, Ft. Worth, (a) $71,768, (b) $35,798; Sanders Bros., Miami, (a) $76,487, (b) $39,732.

★**Okla., Broken Arrow**—City let contract paving 3 blocks Main St., brick, to J. H. Hamilton, Tulsa. About $100,000.

★**Idaho, Bonners Ferry**—City let contract paving Main St. and graveling Kootenai and Bonner Sts., to T. Broad, Bonners Ferry, $31,500.

Arizona—State Highway Dept., Phoenix, received bids building Tempa-Mesa Highway, Federal Aid Project No. 8, (a) Sect. 1, (b) Sect. 2, from McElrath & Shumway, Mesa, (a) $41,255, (b) $162,757; G. R. Curtis, 2440 East 26th St., Los Angeles, (a) $41,104, (b) $165,815; McPeak & Dillon, (a) $39,794, (b) $173,025; Southwestern Contg. Co., 13th and Lincoln Aves., Phoenix, (a) alternate bids, $41,534, $45,397 and $42,420, (b) $165,949, $183,731 and $172,756.

★**Wash., Centralia**—City Comrs. let contract paving D and 4th Sts., Tower Ave., etc., to Allred, James & Hendricks & Albers & Son, Centralia, $33,354. Noted Aug. 7.

Wash., Seattle—Bd. Pub. Wks. received bids Aug. 16, paving 36th Ave. South, involving 2020 sq.yd. concrete, 1546 lin.ft. concrete curbing and guttering and 600 cu.yd. earth excav., from J. L. Smith, Seattle, $11,434; C. L. Creelman, 106 10th St., $11,967; Fiorito Bros., Seattle, $13,428.

★**Wash., Toppenish**—City let contracts to Standard Asphalt Paving Co., Monroe and Bridge Sts., Spokane, paving with gravel bitulithic and building curbs on 6370 sq.yd. Washington St. and Parker Way, cost $22,020; also 100 lin.ft. 8 in. concrete pipe sewer, 17 manholes, 10 lampholes, etc., $8825. Noted Aug. 21.

★**Wash., Vancouver**—Bd. Comrs. Clarke Co. let contract paving 4.6 mi. Sect. 2, Battle-ground Vancouver Rd., asphaltic concrete, to United Contg. Co., Northwestern Bank Bldg., Portland, $103,985.

Oregon—State Highway Comn., Portland, received bids Aug. 14, paving 6 mi. Forest Grove Rd., Yamhill Co., from Warren Constr. Co., Journal Bldg., Portland, 600 cu.yd. clay or other earth filler, $1.50 per cu.yd., 15,500 cu.yd. screened gravel macadam, $6.17 per cu.yd., 100 cu.yd. gravel, $5.37 per cu.yd., 1500 lin.ft. 6 in. porous drain tile, $0.45 per ft., total cost, $97,747; Washington Co. Court, Hillsboro, 600 cu.yd. clay or other earth filler, $0.75 per cu.yd., 15,500 cu.yd. crushed rock, broken stone or run of bank gravel, $2.75 per cu.yd., 100 cu.yd. broken stone, $2.75 per cu.yd., 1500 lin.ft. 6 in. drain tile, $0.12 per ft., $43,530.

★**Ore., Portland**—City let contracts to S. Simonsen, 841 East 10th St., N., paving 5th Ave. from Nevada St. to Taylor's Ferry, $14,244, East 33rd St. from Tremont to Shaver Sts., $20,939, both with concrete; to Warren Constr. Co., Journal Bldg., Leo Ave. from East 15th to Milwaukee Sts., $9843, East 6th St., $28,053, East 72nd St. from East Glisan St. to Thorburn Ave., $14,346, Tibbetts St., $11,708, all with bitulithic type E, East 69th St. from Siskiyou St. to Sandy Blvd., concrete, $2951; to Cochran Bros., Portland, Emerson St. from Denver to Delaware Sts., $9620, East Market St. from East 30th to East 29th Sts., $2751, Webster St. from Denver to Gay Sts., $4256, all concrete No. 1, also grading, paving and building concrete curbs on Jarrett St., $13,639. Noted Aug. 21.

★**Cal., Colusa**—City let contract paving 4th, 6th, 7th and Jay Sts., bitulithic, waterbound macadam shoulders and concrete curbing, to Clark & Henery Constr. Co., Hearst Bldg., San Francisco. About $25,000.

Cal., Los Angeles—Bd. Supervs. Los Angeles Co. received bids paving 14.19 mi. Sierra Madre Rd. between Lancaster and Redman Twp., oil macadam with disintegrated granite base from White & Gaskill, Long Beach, $218,000; Rogers Bros. Co., 350 Merrick St., Los Angeles, $222,000; G. S. Benson & Sons, Stimson Bldg., Los Angeles, $234,500.

★**Cal., Martinez** — Bd. Supervs. Contra Costa Co. let contract surfacing 3.7 mi. road from Pittsburgh to Antioch, asphalt, to A. H. Kopperud, Byron, $33,988. Noted Aug. 21.

★**Cal., Oakland**—City Council let contract improving 34th Ave. and Davis St., involving 2962 sq.yd. oil macadam, 1990 lin.ft. redwood curbing and 6014 sq.ft. concrete guttering, to Oakland Paving Co., 5000 Bway., $10,205.

★**Cal., San Jose**—Bd. Supervs. Santa Clara Co. let contract paving King Rd., oil macadam to C. J. Lindgren, Monadnock Bldg., San Francisco, $13,875.

★**Cal., San Jose**—Bd. Supervs. Santa Clara Co. rejected bids surfacing Tully, Center and Storey Rds., et al. Work will be done by day labor under supervision of I. L. Ryder, co. surv. About $10,068.

★**Cal., South San Francisco**—City Trustees let contract grading and paving Swift Ave., asphalt, to Raish Imprt. Co., 46 Kearney Bldg., San Francisco, $24,300.

★**Que., Lennoxville**—Dept. Rds., Quebec, let contract building 5½ mi. Provincial Highway, here, 20 to 22 ft. wide, to P. J. Wolf, Notre Dame St., Sherbrooke, $18,119.

★**Que., Three Rivers**—Dept. Pub. Wks., Ottawa, Ont., let contract building new concrete sidewalks in connection with new public building here, to A. Heon & Co., Three Rivers. About $13,800.

★**Ont., Caledonia**—Town let contract building 8000 ft. bituminous macadam road, 20 ft. wide, to McCrea, Campaign & Cook, Niagara Falls. About $40,000.

★**Ont., Casselman**—Dept. Highways, Toronto, let contract building 4 mi. Ottawa Rd., 22 ft. wide, bituminous macadam, to J. Grenon, St. Peter Ave. About $14,000.

★**B. C., North Vancouver**—City let contract surfacing 23,200 sq.yd. Marine Drive, 2 in. asphaltic concrete, to Columbia Bitulithic Co., 402 Pender St. W., Vancouver, $1.85 per sq.yd., total cost, $42,000. Noted Aug. 7.

Railways

PROPOSED WORK

Ohio—O. E. Carr, city mgr., Springfield, soon receives bids relaying 1500 ft. double track on Limestone St. from North to Main Sts. and from Washington to Rice Sts., for Springfield Rv. Co., 44 South Limestone St. About $95,945. G. C. Chadderdon, ch. engr.

Missouri—United Rys. Co., 39th and Park Aves., St. Louis, soon receives bids building and repairing 21 mi. electric railway tracks. About $750,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**California**—Sutter Basin Co., California Fruit Bldg., Sacramento, let contract building 18 mi. railroad from Knights Landing north through Reclamation Dist. No. 1500, known as Sutter Basin Project, to Shattuck-Edinger Co., 525 Market St., San Francisco. About $225,000

Excavation and Dredging

PROPOSED WORK

Minn., Granite Falls—Ditch—G. C. Wilson, aud. Yellow Medicine Co., soon lets contract digging and building Ditch No. 11, involving 7500 6 in., 1500 ft. 7 in., 2160 ft. 18 in., 4464 ft. 10 in., 2960 ft. 14 in. and 2160 ft. 18 in. tile. About $10,000. N. D. Thayer, Granite Falls, engr.

Minn., Hastings—Excavation—State Bd. Control, St. Paul, receives bids in fall building 600 lin.ft. tunnel at State Asylum for Insane, here. About $90,000. C. L. Pillsbury Co., Metropolitan Life Bldg., Minneapolis, engrs.

Mont., Bridger—Canal—Sand Creek Ditch Co., plans to build 7 mi. canal. H. A. Veeder, secy. Cost to exceed $10,000. Engineer not selected.

Mont., Clinton—Irrigation—Clinton Irrigation Dist. plans to build ditches, canals and flumes for reclaiming about 3000 acres. About $30,000. R. W. Angevine, 222 West Spruce St., Missoula, interested.

Mont., Joliet — Canal — Joliet-White Horse Bench Irrigation Dist., Carbon Co., plans to build diversion dam and canals to reclaim 6000 acres. About $180,000. F. G. Kimball, Billings, engr.

Mont., Shelby — Irrigation — Toole Co., Irrigation Dist. plans to build 40 mi. canal to reclaim 285,850 acres. Cost will probably exceed $3,000,000. Gerharz-Jacqueth Eng. Co., 514 1st Natl. Bank Bldg., Great Falls, engrs.

Ore., Baker—Irrigation—Pocahontas Mining & Irrigation Co. plans to irrigate 14,085 acres in Baker Co. Plans include building canals, laterals and flumes to carry water from Mill and Marble Creeks. About $250,-000. P. Cupper, Salem, state engr.

Ore., Grandview — Irrigation — Suttles Lake Irrigation Co. plans to build canals and laterals for irrigation project in Jefferson Co., water to be taken from Suttles Lake. About $395,000. C. I. Henline, pres.

Cal., Turlock—Irrigation—Turlock Irrigation Dist. plans to improve irrigation system. Plans include lining 6 mi canal with 675,000 sq.ft. concrete, cost $95,000; digging 15 mi. drainage ditches, $104,000; clearing main laterals and building new gates, falls, etc., $26,000; enlarging portion of main canal, $15,000.

BIDS DESIRED

Miss., Carrollton — Excavation — Bd. Comrs. Potacocowa Creek D. D., Avalon, received no bids building channel, levees, etc., in Carroll and Grenada Counties. Work is still open to contractors and bids will be accepted for same. Morgan Eng. Co., Goodwyn Institute, Memphis, Tenn., engrs. Noted Aug. 7.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Ft. Edward—Excavation—E. S. Walsh, state supt. pub. wks., Capitol, Albany, received bids completing excavation of canal between here and Crocker's Reef, Barge Canal Contr. No. 194, from W. F. Martens, 245 Cutler Bldg., Rochester, $15,-230; Dunbar & Sullivan Dredging Co., Waterford, $29,980. Noted July 17 under "Albany."

★**Miss., Gulfport**—Drainage—Bd. Comrs. Long Beach D. D., Harrison Co., let contract for 12.9 mi. drainage ditch to Winston Dredge Co., Louisville, $0.12½ per cu.yd.

★**Que., Three Rivers** — Channel—Dept. Pub. Wks., Ottawa, Ont., let contract dredging channel and basin in eastern outlet of St. Maurice River, to Simpson Bros. Co., Ltd., 232 St. James St., Montreal. About $30,480. Noted July 17.

★**B. C., New Westminster**—Dredging—Dept. Pub. Wks., Ottawa, Ont., let contract dredging north arm of Fraser River, here, to Pacific Constr. Co., Ltd., 510 Hastings St., W., Vancouver. About $152,000. Noted July 17.

Industrial Works

PROPOSED WORK

Mass., Chicopee—Torrington Co., Springfield St., soon lets contract building 4 story, 50 x 100 ft. brick and mill construction addition to factory, concrete foundation. About $50,000. Private plans. Noted June 5.

Mass., Florence (Northampton P. O.)—Florence Mfg. Co., Pine St., soon lets contract building 4 story, 75 x 127 ft. brick and mill construction addition to plant, concrete foundation. About $70,000. Private plans.

Mass., Worcester—A. I. Asher, 16 Harding St., having plans prepared by E. T. Chapin, archt., 340 Main St., for 2 story, 152 x 163 ft. brick garage, concrete foundation, on Green St. About $150,000.

Industrial Works (Continued)

Mass., Worcester—Coppus Eng. & Equipment Co., Park Ave., plans to build 1 story foundry. About $80,000. Architect not selected.

R. I., Central Falls (Pawtucket P. O.)—Ghndana Silk Mills soon lets contract building 2 story, 78 x 128 ft., brick and mill construction mill, concrete foundation, on Washington St. About $70,000. D. Seabury, 12 East Ave., Pawtucket, engr.

R. I., East Greenwich—Greenwich Mills receives bids about Sept. 20, building 4 story, 35 x 100 ft., brick and mill construction addition to mill, concrete foundation. About $35,000. T. C. Herrmann, 17 Exchange St., Providence, archt.

R. I., Providence—D. M. Watkins Co., 95 Pine St., receives bids about Sept. 29, building 5 story, 95 x 120 ft., brick and mill construction factory, concrete foundation. About $125,000. W. R. Walker & Son, 17 Custom House St., archts. Noted Aug. 21.

R. I., Woonsocket—McClintock & Craig, engrs., 33 Lyman St., Springfield, Mass., soon let contract building 1 and 2 story, 90 x 135 ft., brick and mill construction addition to plant, concrete foundation, for Gold Mark Knitting Co., 83 Railroad St. About $50,000. Noted July 10.

Conn., Bantam—Bantam Ball Bearing Co, having plans prepared by Fletcher-Thompson, Inc., engrs., 1089 Broad St., Bridgeport, for 2 story, 50 x 300 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation. About $65,000.

Conn., East Norwalk (South Norwalk P. O.)—Crofut & Knapp, Water and Tolles Sts., South Norwalk plans to build brick and concrete factory, on Van Zandt Ave. About $125,000. Engineer not selected.

Conn., Groton—M. Pollack & Co., Willimantic, soon receives bids building 3 story, 60 x 170 ft., brick and mill construction factory, 1st floor concrete, concrete foundation, here. About $90,000. J. A. Stevens, Lowell, Mass., archt. Noted June 12.

Conn., Hartford—G. Zunner, archt., 756 Main St., soon receives bids building 3 story, 35 x 46 ft. brick warehouse and store, concrete foundation, on Windsor and Orchard Sts., for D. Freedman, 121 Windsor St.

Conn., Shelton—Peterson & Hendee, Caroline St., Derby, having plans prepared for 2 story brick and concrete warehouse, on Howe Ave. About $25,000. Private plans.

Conn., Waterbury—City rejected plans prepared by C. Gilbert, archt., 244 Madison Ave., New York City, and are having new plans prepared by F. A. Webster, archt., 51 West Main St., for 1 story brick and concrete garage, rein.-con. flooring, concrete foundation, on Field St. Bids will be received in about 2 weeks. (Local contractors only.) About $30,000. Noted July 3.

Conn., Winnipauk (Norwalk P. O.)—Norwalk Tire & Rubber Co., had plans prepared for 5 story, 85 x 160 ft., brick and rein.-con. addition to factory, rein.-con. flooring, concrete foundation. About $100,000. Private plans. W. P. Petrie, ch. engr. Noted June 19.

N. Y., Buffalo—Beaver Co., Beaver Rd., soon lets contract building 1 story, 144 x 522 ft., mill construction or rein.-con. plant, concrete foundation, on River Rd. About $150,000. Private plans.

N. Y., Buffalo—Niagara Machine & Tool Co., 683 Northland Ave., having plans prepared by H. E. Plumer, engr., Ellicott Sq., for 1 story, 90 x 108 ft. addition to assembly and machine shop, brick and steel, concrete foundation. About $75,000.

N. Y., Jamestown—Monarch Furniture Co., East 2nd St., having plans prepared by R. A. Froehurg, archt., Jamestown, for 4 story, 40 x 100 ft., mill construction, factory, concrete foundation. About $25,000.

N. Y., New York—Amer Bosch Magneto Corp., 223 West 46th St, plans to build 12 story, 75 x 100 ft., brick, steel and stone factory and salesroom, rein.-con. flooring, brick foundation, on 60th St. and Bway. About $700,000. Architect and engineer not selected. Address J. A. MacMartin, of Am. Bosch Magneto Corp., Springfield, Mass.

N. Y., New York—R. G. Cory, archt. and engr., 39 Cortlandt St., receives bids about Sept 10, building 6 story, 75 x 150 ft., brick and rein.-con factory, rein.-con. flooring, concrete foundation, for C. Cory Co., 290 Hudson St. About $200,000. Noted Aug. 21.

N. Y., Port Chester—Mint Products Co., Inc., 299 Madison Ave., New York City, had plans prepared by Lockwood, Greene & Co., archts, and engrs., 101 Park Ave., New York City, for rein.-con. factory, rein.-con. flooring, concrete foundation, here. About $400,000.

Pa., Phila.—N. H. Dickinson, archt., 1705 Chestnut St., receives bids in 10 days, building 2 story, 50 x 327 ft., rein.-con. and brick factory on Kensington Ave., for Rockland Hosiery Co., Kensington Ave. and North St.

Pa., Pittsburgh—Oakland Express & Transfer Co., 229 Atwood St., soon lets contract building 2 story, 35 x 68 ft., storage plant, brick, rein.-con. flooring, concrete foundation. C. B. Siedler, Lloyd Bldg., archt.

Md., Baltimore—H. F. Doelman, engr., 507 North Charles St., soon lets contract building 4 story, 35 x 145 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Cross St. and Key Highway, for W. B. Cassell & Co., 1027 South Howard St. About $60,000. Noted July 10.

Md., Baltimore—R. L. Harris, archt., 2027 Kennedy Ave., soon receives bids building 2 story, 60 x 90 ft. storage plant, brick and timber, brick foundation, for Crystal Ice Co., Chester St. and North Ave. About $70,000.

Md., Baltimore—G. R. Callis, Jr., archt., 55 Knickerbocker Bldg., soon lets contract building 5 story, 83 x 197 ft., rein.-con. and brick warehouse, concrete foundation, for Genl. Coffee & Tea Co., Light and Lee Sts. About $65,000. J. Posey, 925 Fidelity Bldg., consult. engr. Noted July 10.

Md., Baltimore—Horowitz Garage Co., 1001 East Baltimore St., soon receives bids building 2 story, 60 x 140 ft., rein.-con. and brick garage, concrete foundation, at 109-11-13 North High St. About $50,000. G. R. Callis, Jr., 55 Knickerbocker Bldg., archt.

Md., Baltimore—Sherwood Bros., Bank and 8th Sts., plan to rebuild 1 and 2 story, 75 x 200 ft., rein.-con. warehouse and oil refining plant, concrete foundation. About $100,000.

Md., Baltimore—Simmons Co., 612-22 West Pratt St., acquired site on Key Highway near Fort Ave., and plans to build factory and warehouse. About $75,000.

W. Va., Fairmont—Dreher, Churchman, Paul & Ford, archts., 1424 Walnut St., Phila., soon lets contract building 1 story, 280 x 360 ft., brick and concrete factory, for West Virginia Metal Product Co., Fairmont. Noted June 5.

W. Va., Riversville—Monongalia Valley Traction Co., Fairmont, plans to double capacity of power plant here, and extend high tension lines to Meriden, Grafton and Riversville. About $1,000,000. G. M. Alexander, Fairmont, engr.

N. C., Durham—Durham Hosiery Mills plans to build cotton mill. About $2,000,000. Architect not selected.

O., Cleveland—Chandler Motor Car Co., East 131st St. and St. Clair Ave., having plans prepared by E. McGeorge, archt. and engr., 1900 Euclid Ave., for 3 story, 80 x 400 ft., rein.-con., steel and brick addition to machine shop. About $200,000. Noted July 31.

O., Cleveland—Cleveland Plain Dealer Co., East 6th St. and Superior Ave., plans to build 6 story, 40 x 198 ft., rein.-con., steel and brick addition to publishing plant. About $250,000. Architect not selected.

O., Cleveland—Colburn Machine Tool Co., 1041 Ivanhoe Rd., having plans prepared by G. S. Palmer, archt. and engr., Century Bldg., for 1 story, 192 x 238 ft., rein.-con., steel and brick factory. About $100,000. Noted Aug. 7.

O., Cleveland—Fulton Fdry. Co., 1209 Marquette Rd., having plans prepared by Watson Eng. Co., archts. and engrs., 1101 Hippodrome Bldg., for 1 story, 100 x 111 ft., rein.-con., steel and brick addition to foundry, on East 75th St. and Morgan Rd. About $70,000. Noted Aug. 7.

O., Cleveland—Martin Barris Co., 2048 West 3rd St., plans to build 2 story, 36 x 165 ft., rein.-con., steel and brick power house and sawmill. About $100,000. Architect not selected.

O., Cleveland—Republic Stove Co., 1761 East 39th St., preparing plans for 3 story, 60 x 112 ft., rein.-con., steel and brick factory. About $50,000.

O., Dayton—C. F. Sheffler, 221 Northwestern Ave., plans to build 2 story, 70 x 150 ft., rein.-con. and brick, dry cleaning plant, concrete foundation, on South Main St. About $25,000. Architect not selected.

O., Dayton—R. Weisenborn, 710 West 3rd St., plans to build 2 story, 66 x 132 ft., rein.-con. and brick garage and salesroom, rein.-con. flooring, concrete foundation. About $30,000. G. Wiesenborn, West 3rd St., archt.

O., Middletown—Middletown Journal, 4th and Park Sts., plans to build 3 story, 50 x 165 ft., rein.-con. and brick printing plant, concrete foundation, on Main St. About $60,000. Werner & Adkins, 45 Mitchell Bldg., Cincinnati, archts.

O., Springfield—Knoop Baking Co., Piqua, plans to build 3 story, 60 x 130 ft., rein.-con. and brick baking plant, concrete foundation, on Jefferson St., here. About $75,000. Architect not selected.

Mich., Detroit—Detroit Soluble Oil Co., Beard St. and Michigan Central Ry., plan to build rein.-con., brick and steel plant, on Dix Ave. and Michigan Central Ry Architect not selected.

Mich., Highland Park (Detroit P. O.) Smith, Hinchman & Grylls, archts., Washington Arcade, Detroit, receives bids about Sept. 7, building 1 and 2 story, 315 x 557 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Oakland and Massachusetts Aves., for Maxwell Motor Co., Oakland Ave. Noted Aug. 21.

Mich., Lansing—Hall Lumber Co., Michigan Ave. and Larch St., plans to build 2 story, 50 x 200 ft., rein.-con. and steel mill, rein.-con. flooring, concrete foundation, on North Larch St. Architect not selected

Mich., Marysville—Detroit Edison Co., D. Whitney Bldg., Detroit, plans to build electric generating station, to contain 30,000 kw. unit, on St. Clair River and Bunce Creek, here. Private plans.

Ill., Chicago—Gramm-Bernstein Motor Truck Co., East Wayne and Scott Sts., Lima, O., plans to construct 2 story, 70 x 190 ft., rein.-con. auto sales and service building, rein.-con. flooring, concrete foundation, at 2439 Wabash Ave., here. About $150,000. Architect not announced.

Ill., Vandalia—Lund-Maudlin Shoe Co., 1101 Washington Ave., St. Louis, soon receives bids building 5 story, 100 x 200 ft., concrete and steel factory, rein.-con. flooring, rock foundation. About $110,000. B. W. Williams, c/o owner, archt.

Wis., Barton—Stevens Mfg. Co. having plans prepared by J. E. Hennen, archt., 74 South Main St., Fond du Lac, building 2 story, 80 x 128 ft. brick, rein.-con. and steel factory rein.-con. flooring, brick foundation, on Main St. About $30,000.

Wis., Clintonville—Topp-Stewart Tractor Co. plans to build 3 story, 80 x 300 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation on Main St About $60,000. Architect not selected

Wis., Fond du Lac—Galloway-West Co. 24 West Division St., having plans prepared by M. Tullgren & Sons, archts., 1236 1st Natl. Bank Bldg., Milwaukee, for 2 story, 80 x 200 ft., rein.-con. and brick creamery and power house.

Wis., Janesville—Samson Tractor Co. having plans prepared by F. D. Chase, Inc., engrs., 645 North Michigan Ave., Chicago, building new heating plant, 1st unit to have 2000 hp. capacity.

Minn., St. Paul—St. Paul Welding Co., 173 West 3rd St., having plans prepared by M. A. Wright, archt., Pittsburgh Bldg., St. Paul, building 2 story, 36 x 75 ft. brick and concrete shop, at 173 West 3rd St. About $115,000.

Kan., Emporia—McCord & Kistler Mercantile Co., 201 Kansas Ave., Topeka, having plans prepared by C. D. Cuthbert archt., 435 Kansas Ave., Topeka, building 2 story, 75 x 150 ft., rein.-con., steel and brick warehouse, rein.-con. flooring, rock foundation. About $70,000.

Kan., Topeka—Whiteker Bros. 1st St. and Kansas Ave., having plans prepared building 1 story, 100 x 151 ft. concrete garage, rein.-con. flooring, concrete foundation J. C. Holland & Son, 719 Mills Bldg., archts. Hedrick & Hoff, Interstate Bldg., Kansas City, Mo., engrs. Noted Jan. 23.

Mo., Kansas City—R. A. Curtis plans to build 4 story, 100 x 120 ft., concrete garage, rein.-con. flooring, concrete foundation, on Admiral and Grand Sts. About $85,000. Hedrick & Huff, Interstate Bldg., engrs.

Mo., Kansas City—A. Whitman, 31st St. and Gilham Rd., plans to build 1 story, 140 x 200 ft., rein.-con. garage, rein.-con. flooring, concrete foundation. Hedrick & Huff, Interstate Bldg., engrs. W. Besecke, Interstate Bldg., archt.

Mo., St. Louis—Donk Bros. Coal Co., 314 North 4th St., soon receives bids building 3 story warehouse. About $50,000. Architect not selected.

Mo., St. Louis—Scullin Steel Co., 6700 Manchester Rd., soon receives bids building 2 story, brick, steel and rein.-con. addition to mill, concrete foundation, at 1835 Knox St. About $30,000. Architect not selected.

Okla., Perry—City voted $84,000 bonds to improve light plant.

N. M., Albuquerque—M. J. O'Fallon, 16th and Wynkoop Sts., Denver, having plans prepared by Frost & Frost archts., 817

Industrial Works (Continued)

Mills Bldg., El Paso, Tex., building 1 story, 50 x 200 ft. concrete warehouse, 10,000 ft. floor space, on North 1st St. About $50,000.

Idaho, Coeur d'Alene—Home Builder Mine & Milling Co. plans to build nitrate plant near Coeur d'Alene Lake. First unit to cost $50,000. Ultimate cost $500,000.

Wash., Blewett—Pehastin Lumber Co. plans to rebuild lumber and box plant recently destroyed by fire. Plans include 2 or 3 story, concrete and frame building, capacity of 12,000 boxes daily. About $100,000.

Wash., Montesano—South Side Lumber Co. acquired site in southern part of city and plans to build 1 story, concrete and frame sawmill, 50,000 ft. daily capacity. About $55,000. G. Elfbrandt, pres. Private plans.

Wash., Pullman—Community Milling Co. plans to remodel Pullman Flour Mill and erect two 2 story, brick and frame units, concrete foundation, 100 bbl. capacity each. About $75,000. Private plans.

Wash., Spokane—Inner Circle Property Co. plans to build 4 story, rein.-con. garage, rock and concrete foundation, on 4th and Columbia Sts. About $55,000. J. W. Godwin, 1020 Summit Ave., pres. Private plans.

Wash., Vancouver—Clarke Co. Prune Growers have organized association and preparing plans for prune drier and packing plant, 2 story, frame, concrete foundation. About $50,000. L. F. Russell, Washougal, chn.

Ore., Crabtree—Long Bell Lumber Co., R. A. Long Bldg., Kansas City, Mo., plans to build 1 story sawmill, here. About $75,000. R. A. Long, pres.

Ore., Junction City—G. A. Wilhelm having plans prepared for 2 or 3 story, 100 x 125 ft. concrete garage, concrete foundation. About $50,000. Architect's name withheld.

Ore., Portland—C. L. Boss, 617 Washington St., having plans prepared by E. B. MacNaughton, archt., Concord Bldg., for 2 story, 60 x 200 ft. brick and tile distributing house, on 19th St. and Trinity Pl. About $65,000.

Ore. Portland—Central Waxed Paper Co., 5600 Fillmore St., Chicago, purchased site in North Portland, adjacent to Swift & Co., and plans to build 2 or 3 story, concrete and steel plant, 18,000 to 20,000 lb. daily capacity. About $100,000. A. Christ, Pres.

Ore., Portland—Doernbecher Mfg. Co., East 28th St., having plans prepared by Jacobberger & Smith, archts., Bd. Trade Bldg., for 2 story, 21 x 225 ft., concrete and timber addition to factory. About $25,000.

Ore., Portland—Meier & Frank, 5th and Morrison Sts., purchased block bounded by 13th, 14th, Everett and Flanders Sts., and are having plans prepared for 10 story rein.-con. and steel, wholesale house, 500,000 ft. floor space, and will build 2 story addition to department store on 5th and Morrison Sts., 50,000 ft. floor space. J. L. Meier, genl. mgr. Architect's name withheld.

Cal., Modesto—Pratt-Lowe Preserving Co., Bellomy and Campbell Sts., Santa Clara, plans to build addition to cannery, here, cost $30 000; also rein.-con. warehouse, on 9th and C Sts., $40,000.

Cal., San Diego—San Diego & Arizona Ry., Spreckels Bldg., soon lets contract building 60 x 200 ft., rein.-con. freight depot. D. W. Pontius, genl. mgr.

Ont., Windsor—Fisher Body Co., Edna St., Walkerville, having plans prepared for 4 story, rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on Arthur and McDougal Sts. About $700,000.

B. C., Burnaby—Gregory Tire & Rubber Co., 1404 Standard Bank Bldg., Vancouver, plans to build 1 story, 100 x 240 ft. mill construction factory, on Euclid Ave. and Collingswood St., here. About $50,000.

BIDS DESIRED

N. Y., Long Island City—Until Aug. 31, by Ballinger & Perrott, archts. and engrs., 47 West 34th St., New York City, building 8 story, 126 x 200 ft. rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Degnon St., here, for Sawyer Biscuit Co., 404 East 32nd St., New York City. Noted June 12.

N. Y., New York—Until Sept. 15, by Buchman & Kahn, archts. and engrs., 56 West 45th St., building 6 story, 75 x 200 ft. brick and steel addition to factory, rein.-con. flooring, concrete foundation, on Ave. D between 13th and 14th Sts., for Fagle Pencil Co., 703 East 13th St. Noted Apr. 24

Pa., Phila.—C. E. Oelschlager, archt. and engr., 1615 Walnut St., receiving bids building 4 story, 125 x 250 ft., rein.-con. addition to factory, for Goodyear Tire & Rubber Co., Huntingdon and Broad Sts. Cost to exceed $50,000.

Pa., Phila.—P. Grant, 113 Chestnut Ave., receiving bids building 2 story, 50 x 98 ft. brick garage and machine shop, on Marsden and Longshore Sts. E. A. Wilson, 1218 Chestnut St., archt.

Pa., Pittsburgh—R. M. Trimble, archt., Ferguson Bldg., receiving bids building 2 story, 30 x 60 ft. rein.-con. laundry and garage, stone foundation, here, for Surburban Genl. Hospital, Bellevue.

O., Cleveland—J. M. Miller, archt., Guardian Bldg., receiving bids building 2 story, 65 x 100 ft., rein.-con., steel and brick factory, on Prospect Ave., for Auto Equipment Co., Blackstone Bldg. About $60,000.

O., Cleveland—Osborn Eng. Co., engrs., 2848 Prospect Ave., receiving bids building 3 story, 100 x 200 ft., rein.-con., steel and brick addition to factory, on Warner Rd., for Ideal Tire Co., East 17th St. and Euclid Ave. About $125,000. Noted July 24.

O., Cleveland—Pompeian Mfg. Co., 2104 Superior Ave., receiving bids building 6 story, 75 x 150 ft., rein.-con., steel and brick factory and office, on East 24th St. and Wayne Ave. About $250,000. Private plans.

O., Cleveland—G. A. Schibble, archt., Cleveland Heights, receiving bids building 6 story, 150 x 200 ft., rein.-con., steel and brick factory, on Ontario St. and Fountain Court, for M. A. Bradley, Marion Bldg. About $100,000. Noted July 3.

O., Dover—Tuscora Rubber Co. receiving bids building 3 story, 200 x 300 ft., rein.-con., steel and brick factory. About $300,000. W. C. Owen Co., 1900 Euclid Ave., Cleveland, archts. Noted May 1.

Mich., Detroit—Stahl & Kinsey, archts., 435 Woodward Ave., receiving bids building 1 and 2 story, 100 x 260 ft., rein.-con. and brick factory, on Detroit Terminal Ry., near Deguinder St., for Fruehauf Trailer Co., 1371 Gratiot Ave. Noted July 24.

Mich., Detroit—D. R. Wells, archt., 435 Woodward Ave., receiving bids building 2 story, 90 x 131 ft., brick and steel wagon shop and barn, concrete foundation, on Crane Ave., near Mack Ave., for Genl. Ice Delivery Co., 275 Grand River Ave. About $50,000. Noted Aug. 21.

Mich., Detroit—Young Bros., Franklin St., receiving bids building 1 and 2 story, 105 x 161 ft., steel, brick and concrete factory, rein.-con. flooring, concrete foundation, on Beufait Ave. C. W. Brandt, 1114 Kresge Bldg., archt.

Ill., Chicago—Marshall & Fox, archts., 721 North Michigan Ave., receiving bids for 3 story, 100 x 150 ft., rein.-con and brick service station, concrete foundation, on Indiana Ave. and 23rd St., for Cadillac Automobile Co., 2301 South Michigan Ave. About $100,000.

Ill., Chicago—Osborn Eng. Co., engrs., 2848 Prospect Ave., Cleveland, receiving bids for 3 story, 200 x 350 ft. brick, rein.-con. and steel factory, on La Salle St., for Century Rubber Co., 1346 Rawson St. About $200,000. Noted July 31.

Ill., Chicago—Moores & Dunford, engrs., 38 South Dearborn St., receiving bids for 6 story, 50 x 120 ft., rein.-con. and brick storage plant, rein.-con. flooring, concrete foundation, at 6345 Bway., for S. S. David, c/o engineers. About $100,000.

Ill., Chicago—E. R. Krause, archt., 22 West Monroe St., receiving bids building 3 story, 50 x 80 ft. mill construction factory, brick foundation, on Orleans St. and Institute Pl., for A. C. Henschel & Co., 312 West Superior St. About $75,000.

Wis., Kohler—Until Sept. 2, by Kohler Co., and Brust & Philipp, archts., Free Press Bldg., Milwaukee, building 4 story, 180 x 260 ft. concrete, brick and steel factory, concrete foundation, on Elm St. About $40,000. Noted Aug. 7.

Wis., Sheboygan—Until Sept. 5, by W. C. Weeks, archts., 730 Ontario Ave., building 2 story, 60 x 85 ft. brick, rein.-con. and steel garage, brick foundation on Wisconsin Ave., for H. C. Prange Co., 731 North 8th St. About $65,000. Noted July 10.

Wis., Two Rivers—Until Sept. 10, by Juul & Smith, archts., Imig Bldg., Sheboygan, building 2 story, 60 x 150 ft. brick and steel factory, concrete flooring, concrete foundation, on Main St., for S. Schwartz & Son. About $30,000. Noted July 17.

Minn., Minneapolis—Until Sept. 3 (change of date), by State Bd. Control, St. Paul, building 6 story, 120 x 180 ft., rein.-con. and brick storehouse, on University St. About $125,000. C. G. Johnson, Capital Life Bldg., St. Paul, archt. Noted Aug. 14.

Ont., Guelph—International Malleable Iron Co., Beverly St., is receiving bids building 1 story, 120 x 190 ft., concrete and brick addition to factory, concrete foundation. About $35,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Chicopee Falls**—Chicopee Mfg. Co., West Main St., let contract building 1 story, brick and steel addition to weave shed, rein.-con. flooring, concrete foundation, on West Main St., to F. T. Ley & Co., Inc., 499 Main St., Springfield. About $100,000. Noted July 31.

★**Mass., East Springfield**—(Springfield P. O.)—Atlantic Refining Co., 503 Turks Head Bldg., Providence, R. I., let contract constructing plant on Page Blvd. and Robbins St., to Metzger & Fisher Co., Otis Bldg., Phila. About $50,000. Plans include five 1 and 2 story rein.-con. buildings, rein.-con. flooring, concrete foundation.

★**Mass., Greenfield**—Amer. Tap & Die Co., 16 Arch St., let contract constructing 1 and 2 story, brick and mill construction addition to factory and office building, rein.-con. flooring, concrete foundation, to Clifford & Martin, 35 Graves Aves., Northampton. About $35,000.

★**Mass., Holyoke**—G. P. B. Alderman & Co., archts., Alderman Bldg., let contract to Casper Ranger Constr. Co., 20 Bond St., for 2 story, 60 x 75 ft. brick and concrete plant, rein.-con. flooring, concrete foundation, on Sargent and Beach Sts., for Halls Dairy, Inc., 11 Brooks Ave. About $60,000. Noted July 24.

★**Mass., Millbury**—A. C. Jackson, Oxford, let contract building 2 story, 60 x 80 ft. brick and concrete garage, concrete foundation, on South Main St., here, to S. Frazier, Millbury. About $25,000.

★**Mass., Springfield**—Gagnier & Angers, 327 Main St., will build 1 story, 82 x 85 ft. brick and mill construction factory, concrete flooring, concrete foundation, on Summer St. About $25,000. Work will be done by day labor.

★**Mass., Springfield**—Republican Co., Main St., let contract building 3 story, 96 x 100 ft. brick, steel and concrete plant, rein.-con. flooring, concrete foundation, on Cypress Ave. and Boylston Sts., to Flynt Bldg. & Constr. Co., 356 Main St., Palmer. About $100,000. Noted July 24.

★**Mass., Worcester**—Leland-Gifford Co., 1025 Southbridge St., let contract building 2 story irregular shaped, brick and mill construction addition to factory, concrete foundation, to E. J. Cross Co., 82 Foster St. About $50,000.

★**R. I., Albion**—Valley Falls Co. let contract building 4 story, 72 x 130 ft., brick and mill construction mill, concrete foundation, to P. Greene, Lonsdale. About $35,000.

★**R. I., Pawtucket**—J. and P. Coats, Inc., 366 Pine St., let contract building 4 story, 132 x 308 ft. spinning mill with 22 x 35 and 21 x 36 ft. ells, 4 story, 105 x 308 ft. twisting mill with two ells and 2 story, 48 x 82 ft. picker house, rein.-con. and brick, rein.-con. flooring, concrete foundation, to J. W. Bishop Co., 109 Foster St., Worcester, Mass. About $1,000,000. Noted June 12.

★**R. I., Pawtucket**—Glendana Silk Mills, Washington St., let contract building 2 story brick and mill construction mill, concrete foundation, to E. H. Bigney, 17 Custom House St., Providence. About $50,000.

★**R. I., Pawtucket**—Prescott Corp., Central Ave., let contract building 1 story, 55 x 225 ft., brick and mill construction mill, to Central Constr. Co., Slater Trust Bldg. About $60,000.

★**Conn., Ansonia**—H. C. Cook Co., Beaver St., let contract building 1 and 2 story, 60 x 250 ft. brick, concrete and timber addition to factory, concrete foundation, to Casper Ranger Constr. Co., 20 Bond St., Holyoke, Mass. About $40,000. Noted June 26.

★**Conn., Bridgeport**—Bryant Electric Co., 1421 State St., let contract building 4 story, 60 x 220 ft. brick and mill construction addition to factory, concrete foundation, on Hancock St., to W. Martin & Sons, 164 State St. About $90,000.

★**Conn., Bridgeport**—City let contract building 2 story, 150 x 200 ft., brick and concrete stable, garage and storage plant, rein.-con. flooring, concrete foundation, at Seaside Park, to S. W. Hubbel Bldg. Co., 589 Knowlton St. About $50,000. Noted Aug. 7.

★**Conn., Bridgeport**—J. Schwartz, c/o W. Schmidt, archt., 1188 Main St., will bui'd 1 story, 50 x 114 ft. brick and concrete garage, rein.-con. flooring, brick founda-

Industrial Works (Continued)

tion, on North Main St. About $25,000. Work will be done by day labor. Noted May 8.

★**Conn., Fairfield**—G. Drouve Co., Drouve St., Bridgeport, let contract building 1 story, 120 x 200 ft. and 1 story, 30 x 80 ft. factories, also 2 story, 40 x 42 ft. office, brick and steel rein.-con. flooring, concrete foundation, to W. R. Phillips & Co., 24 John St., Bridgeport. About $90,000.

★**Conn., Hartford**—Hartford Electric Light Co., 226 Pearl St., let contract building power station with 100 000 kw. or 125,000 h.p. capacity, on Colts Meadows to Stone & Webster, 147 Milk St., Botson. About $1,000,000.

★**Conn., New Britain**—Stanley Rule & Level Co., 111 Elm St., let contract building 5 story, 40 x 60 ft., and 3 story 30 x 36 ft. factories, brick and mill construction, concrete foundation, to B H. Hibbard Co., 153 Arch St. About $38,000.

★**Conn., Shelton**—S. Blumenthal & Co., 37 Canal St., let contract building 1 story, 40 x 180 ft. weave shed and 4 story, 50 x 120 ft. factory addition, rein.-con., rein.-con. flooring, concrete foundation, to Thomuson & Binger Co., 280 Madison Ave., New York City. About $70,000.

★**Conn., Stratford** (Bridgeport P. O.)—Raybestos Co., Bostwick and Railroad Aves., Bridgeport, let contract building 1 story, 90 x 160 ft brick and steel factory addition, rein.-con. flooring, concrete foundation, on East Main St., here, to J. R. Sheehan, 211 State St., Bridgeport About $45,000.

★**N. Y., Brooklyn**—P. J. Carroll, 141 96th St., will build 1 story, brick and steel garage, rein.-con. flooring, brick foundation, on 4th Ave. and 92nd St. About $30,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Fush-Bocker Impvt. Co., 391 Christopher St., will build 1 story, 100 x 125 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on George St. between Knickerbocker and Flushing Aves. About $35,000. Work will be done by day labor. H. Kotler, pres.

★**N. Y., Brooklyn**—Libond Realty Co., 44 Court St., will build 1 story, 100 x 160 ft., brick and teel garage, rein.-con. flooring, concrete foundation, on 33d St. and 4th Ave. About $35,000. Work will be done by day labor.

★**N. Y., Brooklyn**—M. C. K. Contg. Co., 2168 Dean St., will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Fulton and Sackman Sts. About $25,000. Work will be done by day labor. A. Margolis, pres.

★**N. Y., Brooklyn**—J. B. Sillman, 1511 Emmons Ave., will build 2 story, 100 x 150 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on Pearl St. About $40,000. Work will be done by day labor.

N. Y., Buffalo—Bd. Pub. Wks. received bids building 2 story, 175 x 400 ft., concrete barn, rein.-con. flooring, concrete foundation, on Hudson St., from Metz Bros., 1295 Filmore Ave., $180,500; G. Schaaf Co., 258 Kingsley St., $199,997.

★**N. Y., Buffalo**—Wire Wheel Corp. of America, 1700 Elmwood Ave., let contract building 1 and 2 story, 59 x 195 ft., brick and steel addition to plant and forge shop, concrete foundation, to J. W. Cowper Co., Fidelity Bldg. About $65,000.

★**N. Y., Dunkirk**—Amer. Locomotive Wks., North Jay St., Schenectady, let contract building 1 story, 70 x 244 ft., concrete and steel carpenter shop, concrete foundation, to Lackawanna Bridge Co., Bell and Abby Sts., Buffalo. About $70,000. Noted Aug. 21.

★**N. Y., New York**—Amer. Radiator Co., 104 West 42nd St., let contract building 2 story, 115 x 185 ft. rein.-con. and steel factory and warehouse, rein.-con. flooring, concrete foundation, on Exterior and 149th Sts., to Post & McCord, 101 Park Ave. About $120 000.

★**N. Y., New York**—Buick Auto Repair Shop, 244 West 49th St., let contract building 1 story, 100 x 200 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 54th St. near 8th Ave., to Smith & Leo, 103 Park Ave. About $400,000.

★**N. Y., New York**—F. E. Vitolo, archt. and engr., 56 West 45th St., let contract to F. Angilelli, 25 Hewes Ave., building 5 story, 100 x 130 ft. brick and steel garage, rein.-con. flooring, concrete foudnation, at 541-551 West Bway., for Cuneo & Posta, 73 West Washington Sq. About $100,000. Noted June 5.

★**N. Y., New York**—Natl. Biscuit Co., 409 West 15th St., let contract building 2 story, 124 x 161 ft., brick, steel and rein.-con. bakery, rein.-con. flooring, concrete foundation, at 469-485 Bethune St., to I. Beers, 162 East 23rd St. About $125,000.

★**N. Y., New York**—H. O. Chapman, archt., 334 5th Ave., let contract to J. T. Brady, 103 Park Ave., for 7 story, 130 x 200 ft. brick and steel factory, rein.-con. flooring, concrete foundation, at 543-545 West 43rd St., for Park & Tilford, 529 West 42nd St. Noted June 26.

★**N. Y., New York**—J. Pedersen, 148th St. and 3rd Ave., will build 1 story, 65 x 155 ft., brick, steel and concrete garage, rein.-con. flooring, concrete foundation, on West Farms Rd. and 176th St. About $30,000. Work will be done by day labor. Noted Aug. 7.

★**N. J., Maurer**—Barber Asphalt Paving Co. let contract building rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation to Westinghouse, Church & Kerr, 37 Wall St., New York City. About $80,000.

★**N. J., Newark**—Amer. Platinum Wks., New Jersey Railroad Ave., let contract factory, to F. Kilgus, Inc., 13 South 6th building 3 story, 50 x 130 ft., rein.-con. St. About $100,000.

★**Pa., Erie**—See "Miscellaneous."

★**Pa., Phila.**—Genl. Mfg. Co., Delaware and Bigler Sts., let contract for 3 story, 100 x 300 ft., rein.-con. and brick fertilizer factory and storage building, to H. P. Friend, Inc., Boyer Arcade Bldg., Norristown.

★**Pa., Phila.**—Germania Worsted Mills, A and Indiana Sts., let contract building 3 story, 60 x 80 ft., concrete and brick factory, to W. Steele & Sons, 16th and Arch Sts. About $75,000.

★**Pa., Phila.**—Hood Mfg. Co., 19th and Westmoreland Sts., let contract building 3 story, 80 x 140 ft., concrete factory, to W. Steele & Sons, 16th and Arch Sts. About $120,000.

★**Pa., Phila.**—Pennsylvania Sugar Co., 135 South 2nd St., let contract building 2 story, 177 x 246 ft., concrete and brick storage on Shackamaxon and Delaware Aves., to O'Meara Constr. Co., 253 South Quinse St. About $150,000.

★**Pa., Phila.**—Phila. Drying Machine Co., 3351 Stokley St., let contract building 3 story, 80 x 170 ft., concrete and brick factory, on Stokley and Westmoreland Sts., to W. Steele & Sons, 16th and Arch Sts. About $45,000.

★**Pa., Pittsburgh**—Painter-Dunn Co., Center and Millvale Sts., let contract building 2 story, 100 x 150 ft. addition to present garage and storage plant, rein.-con. flooring, to Golden & Creek, 5th Ave. About $38,000.

★**Pa., Pittsburgh**—Waverly Oil Co., 54th St. and Allegheny Valley Street Ry., let contract constructing 6 story, 71 x 81 ft. rein.-con. and steel oil storage building and office, rein.con. flooring, concrete foundation, to D. T. Riffle, Keenan Bldg. About $92,000 (without tanks). Noted Aug. 7.

★**Md., Baltimore**—McCormick & Co., McCormick Blk., Pratt St. and Market Pl., let contract building 8 story, 240 x 320 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Light, Barre and Charles Sts., to M. A. Long & Co., Charles and Baltimore Sts. About $1,250,000. Noted Aug. 21.

★**Md., Hagerstown**—Brenner & Fleisher, Inc., 308 West Church St., let contract remodeling steel and brick warehouse, concrete foundation, to W. L. Middlekauff, 655 West Washington St. About $150,000.

★**W. Va., Huntington**—Voegele & Dinning Co., 603-5 4th Ave., let contract building 3 story, 80 x 150 ft. candy factory, rein.-con., rein.-con. foundation, on 7th Ave. and 7th St., to Arnold Constr. Co., 105 South La Salle St., Chicago. Noted July 24.

★**N. C., Ronda**—Ronda Cotton Mills, Inc., will build 1 story, 80 x 300 ft., brick and timber, cotton mill, brick and concrete foundation. About $250,000. Work will be done by day labor.

★**O., Canton**—Pennsylvania Lines West of Pittsburgh, Penobscot Bldg., Detroit, let contract building 1 story, 90 x 300 ft., steel and brick oil tank shop, at terminal, here, to Walbridge-Aldinger Co., 2356 Penobscot Bldg., Detroit.

★**O., Cleveland**—Christian, Schwartzenberg & Gaede, archts., 1900 Euclid Ave., let contract to S. W. Emerson Co., 1900 Euclid Ave., building 6 story, 107 x 125 ft., rein.-con., steel and brick factory, on West 3rd St. and Lakeside Ave., for Crown Land Co., East 22nd St. and Superior Ave. About $200,000. Noted Aug. 14.

★**O., Cleveland**—Natl. Lamp Wks., Nela Park, let contract building 2 story, 64 x 139 ft., rein.-con., steel and brick service building, to Crowell-Lundoff Little Co., Meriam Bldg. About $150,000. Noted Aug. 7.

★**O., Cleveland**—Natl. Malleable Castings Co., 7706 Platt Ave., let contract building 3 story, 49 x 62 ft., rein.-con., steel and brick, research laboratory, at 10509 Quincy Ave., to Crowell-Lundoff Little Co., Meriam Bldg. About $50,000. Noted July 31.

★**O., Cleveland**—G. S. Rider Co., archts. and engrs., Century Bldg., let contract to Hunkin-Conkey Co., Century Bldg., for 10 story, 89 x 105 ft., rein.-con., steel and brick warehouse at 5442 Blanche Ave., for Cleveland Worsted Mills Co., 6300 Bway. Ave. About $400,000. Noted Aug. 14.

★**O., Cleveland**—G. S. Rider, archt. and engr., Century Bldg., let contract to Hunkin-Conkey Co., Century Bldg., for 2 story, 97 x 167 ft., rein.-con., steel and brick addition to factory, for Jordan Motor Car Co., 1057 East 152nd St. About $75,000. Noted Aug. 14.

★**O., Cleveland**—Vichek Tool Co., 8711 Mt. Auburn St., let contract building 1 story, 96 x 256 ft., rein.-con., steel and brick addition to factory, to Hunkin-Conkey Co., Century Bldg. About $100,000. Noted Aug. 14.

★**O., Columbus**—Richards, McCarty & Bulford, archts., Hartman Bldg., let contract to Frank Hill Smith Co., Inc., 120 Bway., New York City, for 6 story, 45 x 187 ft., rein.-con. factory, on Fulton and High Sts., for C and E Shoe Co., Fulton St. About $300,000.

★**O., Dayton**—Dayton Eng. Laboratories Co., East 1st St., let contract building 6 story, 200 x 200 ft., rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation, on Taylor and Pitt Sts., to Danis-Hunt Constr. Co., 1st and Webb Sts. About $300,000. Noted July 10.

★**O., Dayton**—Seyhold Machine Co., Louie St., let contract building steel and brick machine shop, brick foundation, to Austin Co. 16112 Euclid Ave., Cleveland. About $133,000.

★**Mich., Detroit**—Natl. Biscuit Co., 42-56 Woodridge St., let contract building 4 story, steel and brick bakery and sales office, on Milwaukee Ave., to G. A. Fuller, 540 Penobscot Bldg. Noted June 12.

★**Mich., Detroit**—M. W. Sales & Co., 76 East Jefferson Ave., let general contract building 1 story, 50 x 200 ft., steel warehouse, concrete foundation, to J. F. Dayton, 300 Holden Bldg., steel contract to L. Hall, Ferry Ave. and Grand Trunk Ry.

★**Ill., Chicago**—Hill Pump Valve Co., 2307 Archer Ave., let contract building 1st unit of plant, 1 story, rein.-con. and brick, concrete foundation, on Belmont Ave and Knox St., to Stresenreuter Bros., 3020 South Halsted St. About $100.000.

★**Ill., Peoria**—Natl. Warehouse Co. let contract building 7 story, 80 x 140 ft., rein.-con. warehouse, concrete foundation, on Cedar and Washington Sts., to F. B. Hasbrouck, 325 Ellis St. About $200,000.

★**Wis., Peshtigo**—Peshtigo Pulp & Paper Co., let contract building 1 story, 70 x 242 ft. brick, rein.-con. and steel mill, rein.-con. flooring, brick foundation, on Main St., to Jorgenson Constr. Co., Main St., Denmark. About $59,000. Noted July 24.

★**Wis., Port Washington**—City let contract building 1 story, 40 x 180 ft. brick, rein.-con. and steel power plant, rein.-con. flooring, brick foundation, on Main St., to J. Ubbirk, Main St., $40,890. Noted July 10.

★**Wis., Sheboygan**—F. Blocki Co., North 8th St., let contract building 2 story, 113 x 155 ft. brick and steel factory, brick foundation, on 13th St., to H. Loesing, North 15th St. About $38,500. Noted May 29.

★**Neb., Falls City**—City let contract building 1 story, concrete, steel and brick power plant, to Merkle Mach. Co., 508 Interstate Bldg., Kansas City, Mo. About $43,100.

★**Neb., Omaha**—Lundgren Bros., 4956 Dodge St., let contract building 1 story, 45 x 240 ft., steel and brick garage, concrete foundation, to Kiewitt & Sons, 746 Omaha Natl. Bank Bldg. About $35,000.

★**Neb., Omaha**—Skinner Packing Co., 904 1st Natl. Bank, let contract building 8 story, 99 x 132 ft. warehouse, rein.-con. and brick, rein.-con. flooring, concrete foundation, on 12th and Douglas Sts., to G. W. Stiles Constr. Co., 1218 1st Natl. Bank Bldg. About $500,000.

★**N. D., Fargo**—Pence Motor Co., 800 Henn Ave., Minneapolis, Minn., let contract building 4 story, 75 x 140 ft. brick and concrete warehouse, here, to T. F. Power, 419 9th St. About $50,000

Industrial Works (Continued)

★**N. D., Minot**—Grams Bros. let contract building 3 story, 50 x 140 ft. bakery, to G. H. Bergenhagen, Minot. About $50,000. Noted June 19.

★**Mo., St. Louis**—Ely & Walker Dry Goods Co., 16th and Washington Sts., let contract building brick addition to warehouse at 1519 Locust St. and 1510-18 St. Charles Sts., to J. Stewart & Co., Inc., Boatmen's Bank Bldg. About $300,000.

★**Mo., St. Louis**—H. Horowitz, Boatmen's Bank Bldg., will build 1 story, 60 x 200 ft. brick, steel and concrete shop and factory, at 3948 West Pine St. About $30,000. Work will be done by day labor.

★**Mo., St. Louis**—Lowell Bleachery Co., 7718 Polk St., let contract building 3 story, 103 x 105 ft., brick, steel and concrete bleachery, rein.-con. flooring, concrete and rock foundation, to Sutherland B'dg. & Contg. Co., 915 Olive St. About $50,000.

★**Mo., St. Louis**—Traffic Truck Corp., 2nd and McKissock Sts., let contract building 3 story, 150 x 200 ft., brick, steel and concrete factory, rein.-con. flooring, rock foundation, on North 2nd St., to Murch Bros., Constr. Co., Ry. Exch. Bldg. About $50,000.

★**Wash., Seattle**—H. H. Gulstine, Yakima, let contract building 3 story, 60 x 120 ft., candy factory, brick and concrete, rein.-con. flooring on Virginia and Terry Sts., here, to Great Northern Constr. Co., N. Y. Blk. About $45,000. Langert-Aronson Candy Co., lessee.

★**Cal., Pittsburg**—Columbia Steel Co., 503 Market St., San Francisco, will build additions to steel and corrugated iron rolling plant, here. About $250,000. Work will be done by day labor.

★**Cal., San Francisco**—Rosenberg Bros. & Co., 330 California St., let contract building 2 story, rein.-con. warehouse on Davidson and Rankin Sts., to Braunton Bros., 180 Jessie St. About $65,000.

★**Que., Longue Pointe**—Montreal Locomotive Wks., 145 St. James St., Montreal, let contract building 2 story, 30 x 70 ft., and 40 x 50 ft. concrete, steel and brick foundry and machine shop, concrete foundation, on Notre Dame St., here, to D. G. Loomis & Co., St. Patrick St., Montreal. About $84,000.

★**Que., Maisonneuve**—United Shoe Machy. Co., 1100 Bement Ave., let contract building 3 story, 40 x 71 ft., steel and brick factory, concrete foundation, on Bennett Ave., to D. G. Loomis & Co., St. Patrick St., Montreal. About $64,000.

★**Que., Montreal**—Natl. Brewers Co., Ltd., 36 Chaboillez Sq., let contract building four 4 story, concrete, steel and brick additions, concrete foundation on Dupre St., to Atlas Constr. Co., Belmont St. About $455,000.

★**Que., Westmount**—Arena Co. let contract building 75 x 110 ft. rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on St. Catherine St. W., to F. A. Grothe, 6 Cuthbert St., Montreal. About $120,000. Noted Apr. 24.

Buildings

PROPOSED WORK

Mass., Gardner—Assembly—Comm. on Mental Diseases, 36 State House, Boston, soon receives bids building 2 story brick and concrete addition to assembly hall, here; rein.-con. flooring, concrete foundation, for Gardner State Colony, here. About $75,000. W. M. Bacon, 27 Kilby St., Boston, archt.

Mass., Holyoke—Business—Wells Hardware Co., Inc., 346 Main St., purchased site and plans to construct 4 story business building. About $50,000. Architect not selected.

Mass., Holyoke—Theatre and Business—Victory Theatre Co., Bridge St., Springfield, having plans prepared by Mowel & Rand, archts., 185 Devonshire St., Boston, for brick and rein.-con., rein.-con. flooring, concrete foundation, on Suffolk and Chestnut Sts., here. About $350,000. Noted May 22.

Mass., Springfield—Church and School—St. George Greek Orthodox Society having plans prepared by B. Wozny, 381 Main St., for 2 story brick and steel, on Patton St. About $75,000.

Mass., Worcester—School—City plans to build 2 story, 49 x 91 ft. brick addition, on Rice Sq. About $60,000. G. T. Tribe, 306 Main St., archt. Engineer not selected.

Mass., Worcester—School—State Bd. Educ., State House, Boston, plans to build 3 story, 90 x 145 ft., brick trade school for girls, rein.-con. flooring, concrete foundation, at 22-28 High St., here. About $250,000. Frost & Chamberlain, 390 Main St., archts. Engineer not selected.

R. I., East Providence (Providence P. O.)—Bank—Industrial Trust Co., 49 Westminster St., Providence, plans to build 1 story, 50 x 100 ft., on Warren Ave. and Barrington Parkway. About $50,000. Architect not selected.

Conn., Bridgeport—Store and Loft—F. A. Cooper, archt., 1024 Main St., soon receives bids building 2 story, 65 x 214 ft., brick, concrete and steel, rein.-con flooring, concrete foundation, on Stratford Ave. and Kossuth St., for Mendelson Bros., 622 Water St. About $60,000.

Conn., Manchester—School—Town having plans prepared by F. Farley, archt., 15 West 38th St., New York City, for fireproof school, on Spruce St., 9th Dist. About $150,000. Noted July 24.

Conn., Milford—Business—W. M. Irving, 33 River St., soon receives bids constructing 3 story, 60 x 110 ft., brick business building to include stores and offices, concrete foundation, on New Haven Ave. and Broad St. About $50,000. Taylor & Dempster, 5 East Drive, archt.

Conn., New Haven—Bank—Mechanics Bank, Church and Center Sts., having plans prepared altering and building brick and steel addition. About $50,000. C. S. Palmer, 191 Church St., archt.

Conn., Plantsville—Hotel—A. Behan, West Main St., plans to build 100 room hotel, on Main and Bristol Sts., brick, concrete and steel. About $100,000. Architect not selected.

Conn., Rockville—Hospital—Rockville City Hospital plans to build new hospital on High St. About $100,000. F. T. Maxwell, chn. Architect not selected.

Conn., Waterville (Waterbury P. O.)—Church—Grace Methodist Society, 57 Wheeler St., plans to build church. About $50,000. Architect not selected.

Conn., Winsted—School—Gilbert School, Park Pl., receives bids about Sept. 10, building 2 story, 30 x 61 ft., brick and concrete addition, concrete foundation. About $50,000. E. E. Benedict, 51 Leavenworth St., Waterbury, archt.

N. Y., Brooklyn—Home and Hospital—Brooklyn Hebrew Home and Hospital for Aged, Howard and Dumont Aves., soon receives bids building 4 story, 90 x 100 ft. brick, stone and steel addition, brick foundation. About $100,000. L. A. Abramson, 220 5th Ave., New York City, archt. and engr. Noted May 15.

N. Y., Brooklyn—Office—Slee & Bryson, archts. and engrs., 154 Montague St., receive bids about Sept. 22, building 3 story, 65 x 90 ft., brick and steel, brick foundation, on Jay St. and Willoughby Ave., for Home Title Insurance Co., Jay and Pearl Sts. About $100,000. Noted July 31.

N. Y., Brooklyn—School—Dept. Educ. having plans prepared by C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City for P. S. No. 144, 4 story brick and limestone brick foundation on Howard Ave. and Prospect Pl. About $200,000.

N. Y., Jamaica—Hospital—St. Mary's Hospital, Shelton Ave., having plans prepared by F. J. Berlenbach, archt. and engr., 260 Graham Ave., Brooklyn, for 5 story, 100 x 150 ft., brick and steel addition, brick foundation. About $250,000. Noted Aug. 21.

N. Y., Long Island City—School—Bd. Educ., 500 Park Ave., New York City, having plans prepared by C. B. J. Snyder, archt. and engr., Municipal Bldg., New York City, for 4 story brick and terra cotta brick foundation, on Curtis Ave., between Bway. and Belmont Ave. About $200,000.

N. Y., Niagara Falls—School—City having preliminary plans prepared by C. R. Phelps, archt., Gluck Bldg., for 2 story, 60 x 160 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on 24th St. About $150,000.

N. Y., Oswego—High School—Bd. Pub. Wks. plans to build 2 story rein.-con., rein.-con. flooring. About $350,000.

N. Y., Syracuse—Hospital—St. Mary's Maternity Hospital, 128 Spring St., plans to build 3 story, 50 x 125 ft., rein.-con., concrete foundation. About $75,000. J. A. Randall, S. A. & K. Bldg., archt. and engr.

N. J., Jersey City—School—St. Aloysius congregation, West Side Ave., plans to build brick school at West Side and Kensington Aves. About $100,000.

N. J., Ridgewood—Library—City Comrs. plan to build library, to be known as G. I. Pease Memorial Library. About $100,000.

Pa., Avalon (Pittsburgh P. O.)—School—C. Strong, archt., Union Bank Bldg., soon lets contract building 1 story (ultimately 2 story), 45 x 120 ft., rein.-con., rein.-con. flooring, for St. Titus congregation. About $50,000.

Pa., Bethlehem—Church—Presbyterian Church having plans prepared by C. W. Bolton & Sons, archts. Witherspoon Bldg., Phila., for 1 story, 75 x 120 ft. stone. About $50,000.

Pa., Phila.—Bank—Mutual Trust Co., 60th and Ludlow Sts., soon receives bids building 2 story, brick, on 6th and Market Sts., Heacock and Hohansen, 1218 Chestnut St., archts. Noted Aug. 14.

Pa., Phila.—Church—7th St. Methodist Church, 7th and Norris Sts., having plans prepared by C. W. Bolton & Sons, archts., Witherspoon Bldg., for 1 story, 75 x 120 ft. stone. About $50,000.

Ala., Birmingham—Schools, etc.—City voted $2,000,000 bonds to construct new elementary schools and additions to present buildings, $1,000,000 for new high schools and rebuilding Central High School, $500,000 auditorium, $500,000 for addional fire stations and equipment and $500,000 for new city hall and public library combined. J. Kendrick, city engr.

Ala., Florence—Schools—City voted $200,000 bonds to build additional schools.

Mich., Detroit—Lunch Room—H. L. Bowles & Co., 204 Bowles Bldg., plans to build 3 story, 60 x 100 ft. rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Michigan Ave. About $200,000. Architect not selected.

Mich., Detroit—Market—Municipal Bureau of Markets, Municipal Courts Bldg., plans to build 1 story steel addition to market, concrete flooring, concrete foundation, on Russell and High Sts. About $50,000. Architect not selected.

Mich., Detroit—Mercantile—Frank Bros. Iron & Metal Co., East Grand Blvd. and Orleans St., plans to bulid 4 story, 65 x 250 ft., brick and steel, concrete foundation, on Woodward Ave. Architect not selected.

Mich., Grand Rapids—Seminary—Spier & Gehrke, archts., 1317 Chamber of Commerce Bldg., Detroit, receives bids about Sept. 1, building 3 story, 90 x 200 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on Boston St. and Union Ave., for St. Joseph Seminary. About $200,000. Noted Aug. 14.

Mich., Detroit—Theatre—C. W. Brandt, archt., 1114 Kresge Bldg., receives bids about Sept. 6, building 2 story, 100 x 160 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. About $150,000. Owner's name withheld. Noted Aug. 21.

Ill., Chicago—Hospital—State Hospital Comn., Springfield, purchased 550 x 600 ft. site between Lincoln, Wood, Polk and Taylor Sts., here, and plans to erect group of buildings. About $4,000,000. E. D. Martin, Springfield, state engr. in charge.

Ill., Chicago—Office—A. W. Shaw Co., 5 North Wabash Ave., having plans prepared by D. H. Burnham & Co., archts., 209 South La Salle St., for 2 story, 120 x 210 ft., brick and steel, concrete foundation, on Cass and Erie Sts. About $150,000.

Wis., Menominee Falls—School—Bd. Educ. plans to build high school to replace one destroyed by fire. About $70,000. G. B. Rhodes, supt.

Wis., Sheboygan—Bank and Office—Security Natl. Bank, 529 North 8th St., plans to build 2 or 3 story, 99 x 150 ft. brick, rein.-con. and steel, brick foundation, on Center and 8th Sts. About $70,000. Architect not selected.

Wis., Sheboygan—Office—Vollrath Co., West Michigan Ave., having plans prepared by Brust & Philipp, archts., 405 Bway., Milwaukee, building 3 story, 80 x 120 ft. brick, rein.-con. and steel, rein.-con. flooring, brick foundation, on Michigan Ave. About $55,000.

Wis., West Bend—School—City plans to build 3 story, 90 x 160 ft. brick, rein.-con. and steel, brick foundation, on Main St. About $60,000. Foeller & Schoeber, 123 North Washington St., Green Bay, archts.

Ia., Elvira—School—Bd. Educ. having plans prepared by C. A. Dieman & Co., archts., 408 Granby Bldg., Cedar Rapids,

Buildings (Continued)

building 2 story, brick and stone. About $50,000. W. Seamar, R. R. No. 1, Clinton, secy.

Minn., Balaton—School—Bd. Educ. receives bids in fall building 2 story, brick and rein.-con., grade and high school. About $75,000. C. H. Parsons, Builders' Exch., Minneapolis, archt. Noted June 12

Minn., Duluth—Exchange—Zenith Telephone Co. having plans prepared by A. H. Stom, archt., 601 Endicott Bldg., St. Paul, building 4 story addition, on 1st Ave. About $75,000.

Minn., Fergus Falls—Courthouse and Jail—Ottertail Co. having plans prepared by Buechner & Orth, archts., 500 Shubert Bldg., St. Paul, for courthouse and jail. About $400,000.

Minn., St. Paul—Church—St. John's congregation having plans prepared by Alden & Harris, archts., Exch. Bank Bldg., for 1 story, 70 x 125 ft., brick and stone, on 5th and Forest Sts. About $130,000.

Kan. Augusta—Hospital — City having plans prepared by J. R. Switzel, archt., Augusta, building 3 story, 44 x 120 ft., rein.-con., steel and brick, rein.-con. flooring, rock foundation. About $100,000.

Kan. El Dorado—Church—First Baptist congregation plans to build 2 story, brick. About $80,000. J. H. Felt & Co., 802 Grand Ave. Temple, Kansas City, Mo., archts.

Kan., Hutchinson—Bank — State Exch. Bank, c/o F. W. Cotter, pres., having plans prepared by W. E. Hulse & Co., archts., Hutchinson, building 6 story, 75 x 150 ft., rein.-con., steel and brick, rein.-con. flooring, rock foundation. About $300,000 Noted June 19.

Kan., North Topeka (Topeka P. O.)—School—Bd. Educ. having plans prepared by T. W. Williamson & Co., archts., 418 Central Natl. Bank Bldg., Topeka, for 2 story, 66 x 84 ft., brick, rock foundation. About $50,000. Engineer not selected.

Neb., Clay Center—School—Bd. Educ. plans to build 2 story, brick school. About $100,000. W. E. Hulse & Co., Hutchinson, Kan., archts.

Neb., Fairview—School—Bd. Educ. plans to build 2 story brick school. About $50,000. W. E. Hulse & Co., Hutchinson, Kan. archts.

N. D., Bismarck—Bank—First Guarantee Bank having plans prepared by A. Moorman & Co., archts., Chamber Commerce Bldg., St. Paul, Minn., building 2 story, 50 x 60 ft. stone. About $60,000.

Mont., Havre—Bank or Office—Havre Natl. Bank plans to build 3 to 5 story, 30 x 140 ft., on 3rd Ave. and 2nd St. About $150,000. A. S. Reth, cashier. Architect not selected.

Mont., Missoula — Theatre — Smead-Simonds Theatre Co. plans to build 4 story, 68 x 190 ft. theatre on Higgins Ave., to be known as Liberty Theatre. About $200,000. O. Bakke, Gibson Bldg., archt.

Mo., St. Louis—Store and Office—J. T. Trumbell, Laclede Bldg., plans to build 4 story, 60 x 130 ft. concrete and brick, rock foundation, on Grand Ave. About $60,000. Architect not selected.

Tex., Beaumont—Hotel—Beaumont Hotel Co., Crockett and North Park Sts., plans to build hotel. About $80,000. Mann & Stern, 708 A. O. U. W. Bldg., Little Rock, archts.

Tex., Dallas — Gymnasium — Bd. Educ. plans to construct manual training building and gymnasium at Bryan St. High School. About $60,000. Lang & Witchell, Southwestern Life Bldg., archts.

Tex., Georgetown — High School—City voted $100,000 bonds to build high school.

Tex., Weatherford—Hotel—Weatherford Hotel Co. plans to build 4 story, 54 x 97 ft., brick. About $100,000. D. S. Castle, Abilene, archt.

Okla., Tulsa—Church—Methodist Church plans to build 4 story, 80 x 140 ft., concrete, stone and brick, rein.-con. flooring, concrete foundation. About $200,000 Hedrick & Huff, Kansas City, Mo., engrs. G. Winkler, 414 Palace Bldg., archt.

Okla., Tulsa—Club—D. R. Travis, Travis Heights, having plans prepared by N. B. Fleming archt. and engr., Kennedy Bldg., building 2 story, 70 x 100 ft., brick and stone. About $90,000.

Okla., Tulsa—Office—Tidal Oil Co., 6th and Cheyenne Sts., plans to build 3 story, 65 x 90 ft. rein.-con., at 604 South Cheyenne St. About $50,000. Architect not selected.

Colo., Denver—Schools, etc—City election Sept. 23, to vote on $8,000,000 bonds to build and furnish new schools.

Wash., Aberdeen—Armory—State Bd. Control, Olympia, having preliminary plans prepared for armory, here. State Legislature appropriated $100,000 for project.

Wash., Chehalis—Gymnasium—State Bd. Control, Olympia, rejected bids received building concrete or brick, at Boys' Training School, here. $60,000 available for project. Plans will be revised and work readvertised. J. Zittel, Jaimeson Bldg., Spokane, arch.

Wash., Hoquiam—Home—City plans to build 2 or 3 story, brick or stone home for Amer. Legion. Committee has been appointed to select site. About $50,000. N. J. Blagen, c/o Gray Harbor Mill Co., promoter. Architect not selected.

Wash., Port Angeles—Hall—Loyal Order of Moose, Lodge No. 991, plans to build 3 story, brick or concrete. About $50,000. M. Camp, secy. W. K. Nattinger, aud. Architect not selected.

Ore., Astoria—Hotel—Astoria Apartment Co. soon lets contract building 3 story, 60 x 200 ft. brick. About $150,000. F. M. White, Chamber Commerce Bldg., Portland, archt. H. M. McBride, Yeon Bldg., Portland, pres.

Ore., Echo—Bank—Bank of Echo plans to build 2 story stone or pressed brick, on Main and Bonanza Sts. About $50,000. R. B. Stanfield, cashier. Architect not selected.

Ore., Portland—Business—Houghtaling & Dougan, archts., Henry Bldg., soon let contract building 4 story, 100 x 120 ft., rein.-con., rein.-con. flooring, concrete foundation on Bway. and Everett St., for Mitchell, Lewis & Staver, 346 East Morrison St. About $85,000

Cal., Los Angeles — College—California School of Religion plans to erect group of college buildings in Hollywood Sect. About $700,000. Address C. C. Chapman, Fullerton. Architect not selected.

Cal., Pasadena — Hospital — Pasadena Hospital Assn. having preliminary plans prepared for 6 story, fireproof addition to hospital on Congress and Fairmont Sts. About $500,000. Address D. Blankenhorn, 45 South Raymond Ave. Architect not selected.

Ont., Oshawa—Church—St. George's congregation having plans prepared by E. Smith & Sons, archts., 33 Scott St., Toronto, for 1 story, steel and brick, concrete foundation. About $95,000. Noted July 17.

Ont., Ottawa—Office—Dept. Pub. Wks., Ottawa, soon lets contract building 4 story timber, concrete foundation, on Victoria St. About $55,000. R. C. Wright, c/o Dept. Pub. Wks., archt.

Ont., Toronto — Hotel — King Edward Hotel Co., King St., E., having plans prepared by Esenwein & Johnson, archts., Ellicott Sq., Buffalo, N. Y., for 15 story, steel, brick and stone addition, rein.-con. flooring, concrete foundation. About $1,500,000. O. E. Goldschmidt, 116 West 39th St., New York City, engr. Noted Aug. 21.

Ont., Toronto—Hotel—United Hotels Co. purchased site on King St. and plans to build 15 story 92 x 198 ft. hotel. About $2,000,000. G. O'Niel, King Edward Hotel, mgr.

Ont., Toronto—Machinery Hall, etc.—Canadian Natl. Exhibition, 36 King St., plans to construct machinery hall and manufacturer's building, brick and steel, in Exhibition Park. About $1,500,000.

B. C., Vancouver—Bank—Bank of Montreal, 109 St. James St., Montreal, plans to build 8 story, 75 x 120 ft. on Granville and Dansmuir Sts., here. Cost between $500,000 and $1,000,000. Architect not selected

BIDS DESIRED

N. Y., Kings Park—Hospital—Until Sept. 10, by State Hospital Comn., Capitol, Albany, building, heating, sanitary and electric work for Kings Park State Hospital here. E. S. Elwood, secy. state hospital comn. L. F. Pilcher, Capitol, Albany, state archt.

N. J., Atlantic City—School—Until Sept. 3, by H. D. Dagit, archt., 4527 Pine St., building 2 story, 95 x 135 ft., brick and terra cotta, on Atlantic and Massachusetts Aves., for Holy Spirit Roman Catholic congregation.

Pa., Phila.—Bank—H. Miller, archt., 1420 Chestnut St., receiving bids building 1 story, 36 x 80 ft. stone and granite, at 23 East King St., for Peoples Natl. Bank, 7th and Girard Sts. About $100,000.

Pa., Phila. Hospital—Until Sept. 2, by H. W. Castor, archt., 21 South 12th St., building 5 story, 80 x 125 ft., brick, for Methodist Episcopal Hospital, Broad and Ritner Sts. Noted Aug. 21

O., Cleveland—Office—See "Industrial Works."

O., Cleveland—Theatre and Office—A. M. Allen Co., engrs., 1900 Euclid Ave., receiving bids building 10 story, 150 x 225 ft., rein.-con., steel and brick, on East 15th St. and Euclid Ave., here, for Allen Bros., Richmond St., Toronto, Ont. About $275,000. C. H. Crabe, 235 Dime Bank Bldg., Detroit, Mich., archt. Noted Aug. 14

O., Cleveland Heights (Cleveland P. O.)—School—Bd. Educ. receiving bids building 2 story, 100 x 200 ft., rein.-con., steel and brick addition, on Roxboro Rd. About $90,000. F. C. Warner, 767 Hippodrome Bldg., archt. Noted Apr. 10.

O., Mechanicsburg — School—Until Sept. 18, by Bd. Educ., building rein.-con. and brick, rein.-con. flooring, concrete foundation. Former bids rejected. Auditorium has been eliminated from original plans. About $75,000. R. C. Gotwald, Gotwald Bldg., Springfield, archt. Noted Aug. 7

Mich., Cadillac—Church—W. E. N. Hunter, archt., 1306 Chamber of Commerce, Detroit, receiving bids building 1 story, 80 x 80 ft. rein.-con. and brick, concrete foundation, for 1st Methodist congregation. About $50,000. Noted July 17

Mich., Detroit—Hotel—R. H. Marr, archt., 1204 Kresge Bldg., receiving bids building 3 story, 35 x 200 ft., brick, steel and stone, concrete foundation, at 34 Piquette Ave., for Vinton Co., Vinton Bldg. About $100,000. Noted July 24.

Mich., St. Louis—School—Until Sept. 1, by M. E. Hull, secy. Bd. Educ., building 2 story, brick, steel and rein.-con. addition, concrete foundation, in Dist. No. 1. About $50,000. Cowles & Mutscheller, Chase Bldg., Saginaw, archts. Noted July 24

Ill., Belleville—High School—Until Dec. 6, by Riester & Rubach, archts., Belleville, building 5 story, 80 x 160 ft., for Bd. Educ. About $198,000. Noted June 5.

Ill., Chicago—Bank—C. Hatzfeld, archt., 7 South Dearborn St., receiving bids for 2 story, 35 x 90 ft., brick and timber, concrete foundation, on 101st St. and Ewing Ave., for East Side Trust & Savings Bank, c/o Architect. About $60,000.

Ill., Chicago—Theatre, Stores, etc.—A. L. Levy, archt., 111 West Washington St., receiving bids building 3 story, 90 x 150 ft. rein.-con. and steel theatre, store and office building, rein.-con. flooring, concrete foundation, at 2040 West Division St., for Reingold & Auerbach, 856 North Clark St. About $250,000.

Ia., Council Bluffs—School—Until Sept. 12, by Bd. Educ., building 2 story, 60 x 300 ft., rein.-con., brick and steel, rein.-con. flooring, rock foundation. About $260,000. Proudfoot, Bird & Rawson, Hubbell Bldg., Des Moines, archts.

Ia., Des Moines—Bank—Bankers Trust Co., 500 Walnut St., receiving bids for remodeling 1 story, 44 x 136 ft., rein.-con., brick and stone. About $100,000. A. H. Anderson, 117 South Wabash St., Chicago, archt.

Minn., Crookston—Dining Hall—Until Sept. 2, (change of date), by C. H. Johnson, archt., Capital Bank Bldg., St. Paul, building 3 story, 50 x 150 ft. brick at State Experimental Farm, here. About $85,000. C. L. Pillsbury Co., Metropolitan Life Bldg., Minneapolis, engrs. Noted July 3.

Minn., Hibbing—Bank—A. Moorman & Co., archts., Chamber Commerce Bldg., St. Paul, receiving bids building 2 story, 105 x 125 ft., for 1st Natl. Bank, 301 3rd Ave. About $150,000. L. C. Newcombe, cashier. Noted July 24

Minn., St. Paul—Store. Until Oct. 1, by Buechner & Orth, archts., Shubert Bldg., building 5 story, 75 x 100 ft., rein.-con. addition to store on 7th and Robert Sts., for Emporium Co., Robert St. between 7th and 8th Sts. About $150,000. Noted June 19

Minn., Virginia -Court House. Until Oct. 1, by W. H. Borgen, and St. Louis Co., building 2 story, 85 x 120 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, on 3rd St. About $250,000 Croft & Boerner, Lonsdale Bldg., Duluth, archts. and engrs. Noted July 24

Kan., Wichita—School. Until Sept. 2, by Bd. Educ., building Mark Twain School, 3 story, 109 x 185 ft., brick, rein.-con. flooring, concrete foundation. About $200,000. L. Schmidt, 121 North Market St., archt. H. A. Nahle, Reliance Bldg., Kansas City Mo., engr. Noted Aug. 14.

Buildings (Continued)

Ariz., Globe—High School—Until Sept. 15, by G. R. Hill, clk. School Dist. No. 1, Gila Co., building brick and concrete addition to high school. About $165,000. Frost & Frost, El Paso, Tex., archts. Noted June 12.

Cal., Berkeley—School—Until Sept. 2, by Secy. Bd. Educ., building 1 story, 60 x 291 ft., brick addition to school on Russell St., rein.-con. flooring, concrete foundation. About $55,000. C. H. Snyder, 251 Kearney St., San Francisco, engr. W. R. Ratcliff, Jr., 1st Natl. Bank Bldg., archt.

Cal., Berkeley—School—Until Sept 2, by Bd. Educ. building 1 story, 89 x 175 ft., frame addition to school on Claremont Ave., concrete foundation. About $55,000. J. W. Plachek, 2014 Shattuck Ave., archt. Noted June 26.

Que., Montreal—Church—Until Sept. 1, by V. Venne, archt., 76 St. Gabriel St., building 60 x 94 ft., steel and brick, on St. Denis St., for Notre Dame congregation. About $150,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., New Bedford**—Theatre, etc.—Cohen Bros., 225 Mt. Pleasant St., let contract constructing 2 story, 75 x 120 ft., brick and rein.-con. theatre, store and office building, rein.-con flooring, concrete foundation, on Acushnet Ave., to E. A. Abbott Co., 3 Park St., Boston. About $175,000. Noted June 19.

★**Mass., Turners Falls**—Bank—T. M. James, archt., 185 Devonshire St., Boston, let contract to J. H. Thomas, Turners Falls, for 1 story, 40 x 60 ft. brick and concrete, rein.-con. flooring, concrete foundation, on Ave. A and 5th St., for Crocker Natl. Bank, 52 Ave. A. About $50,000. Noted Aug. 14.

★**Mass., West Fitchburg** (Fitchburg P. O.)—Housing—Amer. Woolen Co., Shawmut Bank Bldg., Boston, let contract building thirty 1 and 2 story, 4, 5 and 6 room, brick and frame houses for workmen, concrete foundation, to The Housing Co., 308 Boylston St., Boston. About $100,000.

★**Mass., Willimansett** (Holyoke P. O.)—Housing—G. Haarmann & Co., Inc., Commerce St., Holyoke, let contract building group of 2 and 2½ story brick and timber houses for workmen, concrete and brick foundation, here, to P. J. Kennedy & Co., Inc., 464 Maple St., Holyoke. About $50,000. Noted Aug. 7.

★**R. I., Wakefield**—Theatre—A. Miller, c/o H. A. Lewis, archt., 75 Westminster St., Providence, let contract building 2 story 52 x 95 ft. concrete, rein.-con. flooring, concrete foundation, on opera house site, here, to L. N. Oatley, Wakefield. About $50,000. Noted May 8.

★**Conn., Bridgeport**—Lodge—Sons of St. George Society, 176 Fairfield Ave., let contract building 3 story, 60 x 150 ft. brick, terra cotta and steel, rein-con. flooring, concrete foundation, on Stratford Ave., to Vaustone & Vaustone, 328 Park Ave. About $65,000. Noted June 5.

★**Conn., Hartford**—Office — Connecticut Genl. Life Insurance Co., 64 Pearl St., let contract building 5 and 6 story, brick, steel and stone, brick foundation, on Elm St., to M. Eidlitz, 30 East 42nd St., New York City. Noted Jan. 16.

★**Conn., Hartford**—Office—Hartford Fire Insurance Co., 125 Trumbull St., let contract building brick, concrete and steel, rein.-con. flooring, concrete foundation, on Farmington Ave., to M. Eidlitz & Sons Co., 30 East 42nd St., New York City. About $1,000,000. Noted Aug. 14.

★**N. Y., Brooklyn**—School—Y. M. C. A., 1181 Bedford Ave., let contract building 3 story, 75 x 100 ft., brick, steel and stone, brick foundation, on Bedford Ave. and Monroe St., to Wills-Egeloff, 101 Park Ave., New York City.

★**N. Y., Buffalo**—Theatre—J. Kozanowski, 754 Fillmor Ave., let masonry contract building 1½ story, 54 x 135 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Bway., to Metz Bros., Fillmore Ave. About $60,000.

★**N. Y., Elmhurst**—Temple—Mispah Lodge, F. & A. M., let contract building 2 story, 50 x 100 ft., brick and steel, brick foundation, on Whitney Ave., to J. C. Woodruff, 1 Bridge Plaza, Long Island City. About $130,000.

★**N. Y., Jamaica**—Theatre—Long Island Motion Picture Co., Inc., will build 135 x 140 ft., brick, steel and stone, brick foundation, on Fulton St. About $250,000. Work will be done by day labor.

★**N. Y., Lackawanna**—Temple—F. & A. M. Lackawanna Lodge 887, let contract building 2 story, 50 x 100 ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on Ridge Rd., to G. Schantz, Seneca St., Buffalo. About $75,000.

★**N. Y., Long Island City**—Bank—Long Island City Savings Bank, Bridge Plaza, let contract building 4 story, 70 x 80 x 100 ft., brick, steel and stone, brick foundation, on Hunter Ave. and Academy Pl., to Gillis-Campbell Co., 101 Park Ave., New York City. Noted June 19.

★**N. Y., New York**—Hotel—Warren & Wetmore, archts. and engrs., 16 East 47th St., let contract to Thompson-Starrett Co., 49 Wall St., for 180 x 200 ft. brick, steel and stone, brick foundation, on Park Ave. and 51st St., for D. M. Linard Co., c/o architects. Noted Aug. 14.

★**N. Y., New York**—Hotel—Three Hundred Five West End Corp., 200 West 72nd St., will build 14 story, 100 x 143 ft. brick, steel and stone, brick foundation, at 301-303 West End Ave. About $400,000. Work will be done by day labor. Noted Aug. 21.

★**N. Y., New York**—Office—Amerigus Realty Co., 71 Bway., let contract altering 16 story brick and steel, at 32 Bway., to H. V. Vought Constr. Co., Grand Central Terminal. About $100,000. Noted Aug. 7.

N. Y., New York—Office—One Hundred Ten William St. Corp. will build 18 story brick, stone and steel addition, brick foundation, on William and John Sts. Work will be done by day labor. Noted June 12.

★**N. Y., Pelham**—School—Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, let contract to Moody Eng. Co., 90 West St., New York City, building 2 story, 168 x 171 ft., brick and steel, brick foundation for Bd. Educ. About $115,000. Noted Aug. 7.

★**N. J., Maple Shade**—School—Bd. Educ. let contract building 2 story, 63 x 113 ft. brick, to G. W. Shaner & Son, Palmyra. About $36,000. Noted Aug. 14.

★**Pa., Allentown**—Theatre and Office—Wilmer & Vincent Theatre Co., 1451 Bway., New York City, let contract building 3 story, 116 x 116 and 58 x 90 ft. steel and brick, on 5th and 6th Sts. here, to Ochs Constr. Co., 442 Wire St. Noted June 12.

★**Pa., Butler**—Bank—Guarantee Safe Deposit & Trust Co., 231 South Main St., let contract building 1 story, 60 x 98 ft., rein.-con., steel, brick and granite, rein.-con. flooring, concrete foundation, on Jefferson St., to G. W. Stiles, La Salle St., Chicago. About $50,000. Noted Aug. 14.

★**Pa., Erie**—School—Bd. School Dirs. let general contract for new East High School, to H. Shenk Co., 12th and Sassafras Sts., $868,736; heating and ventilating systems, to Gannon & Carey, 903 Parade St., $48,000; plumbing to Huffman-Wolfe Co., Columbus, O., $23,300. Noted July 24.

★**Pa., Phila.**—Home—G. I. Lovatt, archt., 418 Walnut St., let contract to P. J. and J. T. Whelan, Lincoln Bldg., constructing several 3 story concrete and brick buildings, on Wyalusing and 49th Sts., for St. John's Home. Noted July 24.

★**Pa., Phila.**—Theatre—D. Hogan, 6043 Columbia St., will build 1 story, 42 x 150 ft., brick, stone and terra cotta, on 70th and Elmwood Sts. About $50,000. Work will be done by day labor.

★**Pa., Spring City**—Infirmary—East Pennsylvania State Institute for Feeble Minded let contract building 2 story, 28 x 170 with two wings, 40 x 80 ft. brick and stone, to F. Keiser, Pottstown, $157,300. Noted Aug. 7.

★**N. C., Troy**—Court House and Jail—Montgomery Co. let contract building 4 story, 65 x 110 ft., rein.-con., steel and brick, rein.-con. flooring, rock, brick and concrete foundation, to J. W. Stout & Co., Sanford. About $125,000.

★**O., Canton**—Locker Room—Pennsylvania Lines West of Pittsburgh, Penobscot Bldg., Detroit, let contract building 2 story, 62 x 66 ft., steel and brick, rein.-con. flooring, concrete foundation, here, to Walbridge-Aldinger Co., 2356 Penobscot Bldg., Detroit.

★**O., Cleveland**—Church—Third Reformed Church, 1531 East 36th St., lot contract building 1 story, 72 x 100 ft., rein.-con., steel and brick, on Eddy Rd., to D. Lindhorst Co., Amer. Trust Bldg. About $60,000. Noted Aug. 14.

★**O., Cleveland**—Office—E. McGeorge, archt. 1900 Euclid Ave., let contract to W. I. Thompson Co., 6110 Euclid Ave., building 2 story, 39 x 123 ft., rein.-con., steel and brick addition, for Parish & Bingham Co., 10601 Madison Ave. About $75,000. Noted Aug. 14.

★**O., Cleveland**—Salesroom—P. Matsinger, archt., 608 Caxton Bldg., let contract to Forschner Co., East 10th St. and St. Clair Ave., building 4 story, 20 x 119 ft., rein.-con., steel and brick, for L. Maxa, Pub. Sq. About $50,000. Noted Aug. 14.

★**Mich., Decatur**—School—Bd. Educ. let contract building 2 story, rein.-con., brick and steel, concrete foundation, to H. L. Vander Horst, Kalamazoo. About $64,800. Noted July 3.

★**Mich., Flint**—Church—Van Leyen, Schilling & Keough, archts., 1115 Union Trust Bldg., Detroit, let contract to Duboise Constr. Co., Flint, building rein.-con. and brick church, on Beach St., for St. Mathews congregation. Noted July 31.

★**Mich., Negaunee**—Church, School and Parish House—Van Leyen, Schilling & Keough, 1115 Union Trust Bldg., Detroit, let contract to Foster Constr. Co., 114 Grand St., Milwaukee, Wis., building church, 60 x 120 ft., also parish house and school, each 40 x 60 ft., rein.-con., brick and steel, for St. Paul's congregation. About $150,000. Noted July 31.

★**Mich., Wahjamega**—Hospital—E. R. Dunlop, archt., 709 Hammond Bldg., Detroit, let contract to Spence Bros., 1 Brewer Bldg., Saginaw, building 1 story, 43 x 265 ft., brick, steel and rein.-con., concrete foundation, for Michigan Colony for Epileptics. About $79,000. Noted Aug. 7.

★**Ill., Chicago**—Hospital—D. S. Klafter, archt., 64 West Randolph St., let contract to Ebenholtz & Jorgensen, 2757 West North Ave., for 6 story, 36 x 150 ft., rein.-con., tile and brick, rein.-con. flooring, concrete foundation, on Hoyne Ave. and Monroe St., for West End Hospital, 2058 West Monroe St. About $100,000. Noted June 5.

★**Ill., Chicago**—Sales—Foltz & Brand, archts., 111 West Washington St., let contract to A. Brundage, 110 South Dearborn St., for 3 story, 110 x 150 ft., rein.-con. and brick auto sales and storage building, concrete foundation, on 22nd St. and Union Ave., for H. F. DuPont, of New York, c/o architects. About $125,000. Noted July 3.

★**Ill., Joliet**—Store—L. F. Beach & Co. let contracts building 4 story, 60 x 150 ft., rein.-con., rein.-con. flooring, concrete foundation, on Cass St. and Chicago Ave., as follows: stone and carpentry, to A. Groth & Co., Joliet; steel and erection to Joliet Bridge Co., Joliet. About $250,000. Noted June 26.

★**Ia., Marshalltown**—Hospital—Sisters of Mercy, Davenport, let contract building 3 story, 48 x 103 x 104 ft., rein.-con., brick and stone, here, to Lightner Bros., 611 Security Bldg., Cedar Rapids. About $200,000.

★**Minn., Ely**—School—Bd. Educ. let contract building 2 story, 141 x 150 ft. rein.-con. and brick industrial school, to Madsen & Peterson, 646 Builders' Exch. Bldg., Minneapolis, $168,580. Noted Aug. 14.

★**Minn., Rochester**—Hotel—Kahler-Roberts Corp. let contract building 8 story, 50 x 140 ft., rein.-con., to G. Schwartz & Co., Rochester. About $1,000,000. Cost plus percentage basis. Noted July 10.

Minn., Winona—Normal School—State Bd. Control, St. Paul, received only bid building 3 story, 46 x 130 ft., rein.-con. and brick, here, from H. W. Seidlitz, Winona, $93,500. Noted July 3.

★**Neb., Blue Springs**—School—Bd. Educ. let contract building 3 story, 100 x 140 ft., rein.-con., steel and brick, rein.-con flooring, rock foundation, to J. P. Riddle, Douglas Blk., Omaha, $51,151. Noted Aug. 14.

★**Neb., Omaha**—Church—Our Lady of Lourdes Parish, 2118 South 32nd Ave., let contract buildng 1 story, 52 x 130 ft., brick and concrete foundation, on 32nd and Francis Sts., to McGowan & Jacobberger, 2708 Meredith Ave. About $76,000.

★**N. D., Jameston**—Hospital—State Bd. Administration, Bismarck, let contract building 4 story, 170 x 180 ft. concrete and brick, to State Hospital for Insane, here, to W. J. Kearns Co., Valley City. About $150,000. Noted Aug. 7.

★**Wyo., Manville**—Hotel—Niobrara Investment Co. let contract building 4 story, 110 x 132 ft. concrete, to Casper Home Builders, Casper. About $200,000; percentage basis.

★**Wyo., Worland**—High School—Bd. Educ., Washakie Co., let contract building 2 story, 76 x 130 ft. concrete, to Ventch Co., Billings, Mont. About $61,000.

Buildings (Continued)

★**Mo., Excelsior Springs**—Hotel—A. J. Dean, 1007 Waldheim Bldg., Kansas City, will build 3 story, 30 x 130 ft., rein.-con., steel and brick addition to Plaza Hotel, rein.-con. flooring, rock foundation. About $100,000. Work will be done by day labor.

★**Mo., St. Louis**—Office—Consolidated Investment Co., Syndicate Trust Bldg., let contract building 7 story, 70 x 130 ft., brick, steel and concrete, rock foundation, at 301 North 9th St., to J. Hill Constr. Co., Syndicate Trust Bldg. About $50,000.

★**Tex., Breckenridge**—Bank—First Natl Bank let contract building 50 x 100 ft., brick and stone, to J. N. Mayfield, Breckenridge. About $100,000.

★**Tex., Dallas**—Office—Downtown Development Assn. let contract building 12 story, 100 x 100 ft., rein.-con. and brick, rein.-con. flooring, on Main and Lamar Sts., to Gilsonite Contg. Co., Great Southern Life Bldg. About $700,000. Noted July 17.

★**Okla., Durant**—School—Bd. Educ let contract building 3 story, 60 x 114 ft., rein.-con., steel and brick, rein.-con. flooring, rock foundation, to Manhattan Constr. Co., 3rd and Fon du lac Sts., Muskogee. About $101,000.

★**Okla., Tulsa** — Church — Centenary Methodist Church, 629 North Denver St., let contract building 2 story, 79 x 92 ft., rein.-con., at 621 North Denver St., to J. B. Wilson, 229 Lynch Bldg. About $135,000.

Nev., Winnemucca—Court House—Bd. Supervs. Humboldt Co. received lowest bid building 2 story, rein.-con., granite and tile, here, from H. S. Williams, Hearst Bldg., San Francisco, $126,000. Noted June 19.

★**Ariz., Morenci**—High School—School Trustees let contract building 2 story, frame and plaster, to L. Moore Contg., Two Republics Bldg., El Paso, Tex., represented by J. L. Westerman, Clifton. About $110,000. Noted July 3.

★**Ore., Eugene**—Gymnasium, etc.—Bd. Regents, University of Oregon, let contract constructing 3 story, 86 x 276 ft., gymnasium and club building for women, brick, brick foundation, on campus, to W. O. Heckart, Eugene. About $200,000. Noted Aug. 7.

★**Cal., Eureka**—Theatre—R. Swazey let contract building 40 x 130 ft., rein.-con., on 4th and G Sts., to A. Anderson, Eureka. About $100,000. Ackerman & Harris, Hippodrome Circuit, San Francisco, lessee.

★**Cal., Modesto**—Store—G. Perley, 704 12th St., let contract building 3 story, 50 x 140 ft., brick, to G. J. Ulrich, 419 Sycamore St. About $60,000.

★**Cal., San Francisco**—Office—Metropolitan Life Insurance Co., 600 Stockton St., let contract building concrete and steel addition, to J. R. Furlong, Monadnock Bldg., $100,535.

★**Cal., San Rafael**—Church—St. Raphael's Parish let contract building rein.-con. church, to J. L. McLaughlin, 244 Kearney St., San Francisco. About $50,000.

★**Que., Hudson Heights**—School—School Bd. Comrs. let contract building 3 story, 40 x 50 ft., concrete, steel and brick, concrete foundation, on River Rd., to D. W. Long, 240 William St., Montreal, and J. H. Hutcheson, 92 St. Ambrose St., Montreal. About $53,000.

★**Que., St. Anne des Monts**—Church—Congregation of St. Anne let contract building 50 x 84 ft. concrete, steel and brick, concrete foundation, on St. Francis Xavier St., to A. H. Morin, Main St., Trois Pistoles, $139,750.

★**Ont., Sandwich**—School—Van Leyen, Schilling & Keough, archts., 1115 Union Trust Bldg., Detroit, Mich., let contract to Wells & Gray, Bank of Commerce Bldg., Windsor, building 2 story, 60 x 85 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Wyandotte St., for Bd. Educ. About $60,000. Noted July 31.

★**B. C., Point Grey**—School—School Bd. let contract building 3 story, rein.-con., rein.-con. flooring, concrete foundation, on Granville and 25th Aves., to Hodgson, King & Marble, 508 London Bldg., Vancouver, $69,939.

Federal Government Work

PROPOSED WORK

Md., Annapolis—Boilers—Spec. 4025—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install 3 boilers here. About $45,000.

Md., Annapolis—Power House—Spec. 4026—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $85,000.

D. C., Wash.—Post Office—Post Office Dept. plans to build post office at 416 7th St., S. W., complete with equipment, heating, light, water, safe, parcel post and postal savings bank equipment and rural delivery fixtures.

Va., Hampton Roads—Engine House, Blacksmith, Plumbing and Machine Shops—Spec. 4027—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $160,000.

Wyoming—Road Work—J. S. Bright, dist. engr., U. S. Forest Service, 301 Custom House Bldg., Denver, Colo., soon receives bids grading 33.72 mi. sects. 5 to 9, Wind River National Rd., Tremont and Lincoln Counties, involving 144 acres clearing and grubbing, 155,600 cu.yd. earth and 3350 cu.yd. rock excav., 5700 cu.yd. dry rubble masonry, four 10 ft. span, one 12 ft. span, two 16 ft. span, one 20 ft. span, three 30 ft. span, two 40 ft. span and three 50 ft. span bridges. Noted May 1.

Wyo., Laramie — Road Work — U. S. Forest Serv. plans to build 9 mi. Brooklyn Lake Rd., 24 ft. wide, Albany Co. About $30,000. J. S. Bright, Tramway Bldg., Denver, Colo., dist. engr.

Idaho—Road Work—U. S. Forest Reserve plans to build 52 mi. highway into Elk City, connecting with Lewis and Clark Highway. About $290,000 available. R. C. Schmelz, surv.

Wash., Puget Sound — Engine Room Extension — Spec. 4021 — Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build. About $40,000.

Cal., San Francisco—Aerial Defense Buildings—Constr. Div., War Dept., plans to build aerial defense buildings, to include three 60 x 400 ft. hangars, 100 x 150 ft. machine and engine repair shop, 75 x 100 ft. supply storehouse, 75 x 100 ft. barracks, administration building, guard house, photographic laboratory, officers' quarters and 20 cottages. About $1,000,000.

BIDS DESIRED

Vt., St. Johnsburg—Post Office—Until Oct. 6, by Treas. Dept., Wash., D. C., building post office, here. J. A. Wetmore, supervy. archt.

Mass., Boston—Remodeling Hospital—Until Sept. 30, by Treas. Dept., Wash., D. C., remodeling main building of U. S. Marine Hospital, here. J. A. Wetmore, supervy. archt.

N. Y., New York—Dredge—Until Oct. 10, by U. S. Engr. Office, 39 Whitehall St., building and delivering dipper dredge; advertised in this issue.

Pa., Nicetown—Finishing Machine Shop and Heat Treatment Building and Half-Yard Runways—Until Sept. 2, by Office of Constr. Quartermaster, U. S. Midvale Gun Plant, building, here; advertised in this issue.

Pa., Phila—Forge Shop Extension, Shell and Case Shop Buildings—Until Sept. 9, by Officer in Charge of Constr., Frankford Arsenal, building, here; advertised in this issue.

D. C., Wash.—Sewerage System, Water Service Lines and Electric Lighting Plant—Until Sept. 18, by Comr. Indian Affairs, Wash., installing sewerage system, water service lines and electric lighting plant at Standing Rock School, N. D.

N. C., Wilmington — Dredge, Etc. — Until Sept. 29, by U. S. Engr. Office, Wilmington, purchasing clam-shell dredge Hercules, steam launch Mercur and gasoline launch Frances; advertised in this issue.

S. C., Charleston—Mechanical Stokers—Spec. 4010—Until Sept. 10, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing in Central Power Plant, here. About $11,000; $10 deposit required for plans and spec. Noted Aug. 21.

Fla., Key West—Development of Base—Spec. 3762—Until Sept. 17, by Bureau Yards & Docks, Navy Dept., Wash., D. C., developing base, here. About $1,670,000. $20 deposit required for plans and spec. Noted Jan. 16.

La., New Orleans—Equipment—Spec. 3882—Until Sept. 3 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing mechanical and electrical equipment for power plant, here. About $115,000; $30 deposit required for plans and spec. Noted Aug. 21.

Wash., Puget Sound—Reciprocating Air Compressor—Spec. 3837—Until Sept. 24, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing, here. About $62,000; $10 deposit required for plans and spec. Noted Aug. 21.

Wash., Republic—Road Work—Until Sept. 3 by Bureau Pub. Rds., 628 Post Office Bldg., Portland, Ore., grading 6 mi. Laurier South-National Forest Rd., Ferry Co., involving 17 acres clearing, and 57,600 cu.yd. earth and 8100 cu.yd. rock excav.

Cal., Mare Island—Electric Lighting and Power Systems—Spec. 3982—Until Oct. 1, (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing, here. About $25,000; $10 deposit required for plans and spec. Noted Aug. 14.

Hawaii, Pearl Harbor (Kauhua)—Torpedo Track, Electric Trolley and Hoist and Gyro—Spec. 4008—Until Sept. 10 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building here. About $25,000; $10 deposit required for plans and spec. Noted Aug. 7.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Conn., Mystic—Post Office—Treas. Dept., Wash., D. C., received bid Aug. 25, building post office, here, labor only, from J. Miles & Son, 393 Main St., Worcester, Mass., $32,707. Noted July 31.

N. Y., Stapleton — Water Supply Connections — Treas. Dept., Wash., D. C., received bids Aug. 19, building water supply connections at U. S. Marine Hospital, here, from C. F. Mentsinger & Son, 354 Bway., Brooklyn, $2755, (40 days); J. R. Proctor, Inc., 74 Courtland St., New York City, $2982, (60 days); G. E. Engr. Co., 22 Laight St., New York City, $4988, (45 days). Noted Aug. 7.

Pa., Phila. — Boat Storage Building—Spec. 1012—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids building, here, (1) work complete, from

Foulkrod Co., 1406 Commonwealth Bldg., (1) $306,460, (150 days); (2) add $19, deduct $14; (3) add $90, deduct $15; (4) deduct $11,780; (5) $6,785, alternative, (1) $284,078, (150 days); (5) $6,431.

Stang & Mitchell, 733 Real Estate Trust Bldg., (1) $310,547, (180 days); (2) add $47, deduct $8; (3) add $2.60, deduct $0.10; (4) $10,357; (5) $11,267.

Irwin & Leighton Co., 126 North 12th St., (1) $324,400, (150 days), (2) add $20, deduct $10; (3) add $1, deduct $0.10, (4) deduct $6500; (5) add $8000; (6) deduct $18,000. Noted Aug. 21.

Pa., Phila.—Cranes—Spec. 4013—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids installing traveling overhead cranes in boat and general storage building, (1) work complete, from

Niles, Bement Pond Co., 111 Broadway, New York City, (1) $25,500, (120 to a 150 days); (2) $8760; (3) $12,600; (4) $1700; (5) $12; Chesapeake Iron Works, Westport, Md., (1) $27,210, (120 days); (2) $9250, (3) $13,160, (4) $1600, (5) $40; Whiting Fdry. & Equipment Co., Harvey, Ill., (1) $28,915, (2) $10,715, (3) $13,650, (4) $1050, (5) $12. Noted Aug. 21.

★**Pa., Phila.**—Dredging—U. S. Engr. Office, Phila., let contract dredging in Schuylkill River, to Maryland Dredging & Contg. Co., Finance Bldg., Sects. 1, 4 and 5, $.22 place, $.29 place and $.45 scow, respectively; Amer. Dredging & Contg. Co., Mariner & Merchant Bldg., Sects. 2 and 3, $.226 and $.298 scow, respectively. Noted July 31.

D. C., Wash.—Canal Wall—Dist. Comrs., Dist. Bldg., received bids Aug. 19, reconstructing portion of canal wall west of Aqueduct Bridge, wall "A", (1) excav.; (2) concrete, class "A"; (3) concrete, class "B"; (4) rein. steel; (5) cofferdam; wall "B"; (1) excav.; (2) excav. above 36; (3) rock excav., (4) concrete above 36; (5) concrete below 36, from

Hyde & Baxter, Wash., wall "A" (1) $5; (2) $20; (3) $17; (4) $0.08, (5) $5000; wall "B" (1) $5, (2) $15, (3) $20; (4) $15; (5) $15.

W. F. Brenizer, 101 New York Ave., N. E., Wash., (1) $4; (2) $30; (3) $25; (4) $0.07; (5) $13,500.

Piel Constr. Co., 2519 Edmondson Ave., Baltimore, Md., wall "A", (1) $6.61; (2) $30.74; (3) $20.88, (4) $0.09; (5) $5600; wall "B" (1) $6.61; (2) $21.61, (3) $7.50; (4) $29.75; (5) $45.74. Noted July 31.

★**D. C., Wash.**—Portable School Buildings—Dist. Comrs., Dist. Bldg., let contract furnishing 24 portable school buildings, to Hyde & Baxter, Wash., $78,850.

★**D. C., Wash.**—Repairing Wharf—Dist. Comrs., Dist. Bldg., let contract repairing sand and gravel wharf on Water St. between 9th and 10th Sts., S. E., to J. Trout Constr. Co., Wash., cut off piles, remov-

Federal Government Work (Continued)

of track, etc., $373 per M. B. M.; framing and emplacing all 12 x 12 in. timber, $24.60 per M. B. M.; furnishing, framing and emplacing all except flooring, $128 per M. B. M.; furnishing and emplacing all flooring, removal of old floor, $114 per M. B. M.; furnishing and placing all hewn cross ties, $2.45 each; furnishing and spiking in position all steel rails, $98.50 per ton. Noted Aug. 7.

Va., Norfolk — Roofing — Spec. 4005 — Bureau Yards & Docks, Navy Dept., D. C., received bids Aug. 20, roofing emergency hospital buildings, here, from J. T. Davis Slate, 129 South Bromley Ave., Scranton, Pa., $24,706, (50 days); King Lumber Co., Charlottesville, Va., $36,900, (60 d ys); T. S. Gassner Co., 4545 Wayne Ave., Phila., $43,259, (60 days). Noted July 31.

S. C., Charleston—Quay Wall—Spec. 3773—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids building at Navy Yard, here, (1) work complete, from Smith, Hauser & MacIsaac., 18 East 41st. St., New York City, (1) $365,152; (180 days); (2) $55,494; (3) $46,305; (1) $320; (5) $28; (6) add $0.47, deduct $0.37; (7) add $0.87, deduct $0.78.

Snare & Triest Co., 8 West 40th St., New York City, (1) $387,400, (180 days); (2) $55,000; (3) $42,000; (4) $320; (5) add $25, deduct $20; (6) add $0.50, deduct $0.20; (7) add $0.80, deduct $0.30.

H. P. Converse Co., 31st St. and Colonial Ave., Norfolk, Va., (1) $550,000, (180 days); (2) $60,000; (3) $40,000; (4) $300; (5) add $35, deduct $9; (6) add $1, deduct, $0.05; (7) add $1.60, deduct $0.05. Noted Aug. 14.

★**Ill., Cairo**—Pump, etc.—Treas. Dept., Wash., D. C., let contract installing new motor driven triplex pump, etc., in Post Office and Custom House, here, to J. J. O'Shea, 1203 Washington Ave., $3250. Noted July 17.

★**Wyo., Hardin**—Canal Improvements—U. S. Reclamation Serv., Billings, Mont., let contract building Frannie Canal of Shostone Project, to F. Briggs, Deaver, Schedule (1), $1150; E. R. Parsons, Edgar, Mont., and J. Smith, Fromberg, Mont., Schedules (3), (15) and (16), $4110; N. S. Bean, Warren, Mont., $1173; Riley Bros., Warren, Mont., Schedules (4), (5) and (11), $3935; H. Downer, Deaver, Schedules (6), (7), (8), (12), (13) and (14), $6214; A. Gillis, Box 705, Billings, Mont., Schedules (9) and (10), $2658; W. A. Bullard, Box 73, Kane, Schedule (17), $1490.

★**Ore., Klamath Falls**—Dyke—Dept. of Interior, Wash., D. C., let contract dyking 2500 acre swamp between Rattle Snake and Hank's Points, here, to J. F. Adams. About $30,000.

Cal., Mare Island—Completing Structural Shop—Spec. 3719—Local Navy Yard received bids Aug. 12, completing 300 x 600 ft. structural shop, from Clinton Constr. Co., 140 Townsend St., $491,000; Lange & Bergstrom, Sharon Bldg., $506,453; Lindgren Co., Monadnock Bldg., $521,000. Contractors all of San Francisco. Noted Aug. 14.

Miscellaneous

PROPOSED WORK

Coal Trestle — Easthampton, Mass. — Hampton Co., Hampton Mills, soon receives bids building concrete and steel coal trestle, here. About $15,000. McClintock & Craig, 33 Lyma St., Springfield, engrs.

Foundation—Providence, R. I.—Kendall, Taylor & Co., engrs. and archts., 93 Federal St., Boston, soon let contract building foundation for 5 story, 78 x 143 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, for Rhode Island Hospital, Eddy St. Total cost, $150,000. Noted Mar. 13 under "Buildings."

Transmission Lines — Riversville, W. Va.—"See Industrial Work."

Parks—Perry, Okla.—City voted $10,000 bonds to improve parks.

Amusement Park—Pocatello, Idaho—C. W. McGillis, 50 East 5th St. and C. Evans, both of Salt Lake City and B. Slater, Pocatello, organized local company and having preliminary plans prepared for amusement park, to include 80 x 120 ft swimming pool, playground athletic apparatuses, water and light systems, etc. About $100,000.

Lighthouses—Ottawa, Ont.—Dept. Naval Serv. plans to build automatic lighthouses near Ft. Churchill, by which horns, sirens, lighthouses, etc., are to be electrically controlled from shore by submarine cable. About $50,000.

BIDS DESIRED

Street Lighting System—Dell Rapids, S. D.—Until Sept. 9, by city, for installation of ornamental series street lighting system consisting of 130 c.i. posts with lamps, lamps' sockets and globes, cut outs, 2 switch boards, meters, transformers and steel tape lead covered cables. L. K. Larson, mayor.

Paving Materials—Portland, Ore.—Until Sept. 2, by S. C. Pier, city purch. agt., furnishing crushed rock, rock screenings, sand, gravel and filling material for period of 3, 6, 9 and 12 months respectively. About $25,000. O. Laurgaard, city engr.

Bay Improvements—Newport Beach, Cal.—Until Sept. 3, by L. H. Wallace, for improvement, development and protection of Newport Bay, as follows: (1) extension of jetty and construction of jetties and revetments and other improvements at proposed mouth of Santa Ana River, (2) construction of dam at Bitter Point, (3) excavation at proposed mouth of Santa Ana River, (4) dredging channel at Newport Bay, (5) dredging channel over bar, (6) building wharf and warehouse, (7) building spur track at wharf. Bids will be received and considered for all of project, or for any part or parts thereof. Leeds & Barnard, Central Bldg., Los Angeles, consult. engrs.; advertised in this issue.

Wharf—Meteghan, N. S.—Until Sept. 17, by R. S. Desrochers, secy. dept. pub. wks., Ottawa, Ont., repairing and renewing wharf here. Noted Aug. 14.

Breakwater—Petit Rocher, N. B.—Until Sept. 16, by R. C. Desrochers, secy. dept. pub. wks., Ottawa, Ont., repairing breakwater here.

Breakwater—Quaco, N. B.—Until Sept. 17, by R. C. Desrochers, secy. dept. pub. wks., Ottawa, Ont., rebuilding eastern breakwater here.

Wharf—St. Jean d' Orleans, Que.—Until Sept. 3, by R. C. Desrochers, secy. dept. pub. wks., Ottawa, Ont., building and repairing wharf here.

Wharf—Naramata, B. C.—Until Sept. 22, by R. C. Desrochers, secy. dept. pub wks., Ottawa, Ont., building wharf, here. Noted June 26.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Tank — Waterville, Me.** — Wyandotte Worsted Co. let contract for 115,000 gal. storage tank, concrete, to T. I. Ellis, 171 Westminster St., Providence.

★**Coal Trestle—Chicopee Falls, Mass.**—Chicopee Mfg. Co., West Main St., let contract building rein.-con. coal trestle, to F. T. Ley & Co., Inc., 499 Main St., Springfield. About $10,000.

★**Tank—Bristol, R. I.**—Natl. India Rubber Co. let contract for 150,000 gal. storage tank, concrete, to T. I. Ellis, 171 Westminster St., Providence.

★**Granite Curbing — Providence, R. I.** — City let contract furnishing 11,000 ft. granite curbing, to R. B. Marriott & Sons, Oneco, Conn. Cost $11,000.

★**Tank—Providence, R. I.**—Amer. Silk Spinning Co., Admiral and Whipple Sts., let contract for 80,000 gal. oil storage tank, concrete, to T. I. Ellis, 171 Westminster St

★**Tank—Woonsocket, R. I.**—Alsace Worsted Co., East School St., let contract for 110,000 gal. storage tank, concrete, to T. I. Ellis, 171 Westminster St., Providence.

★**Tank—Woonsocket, R. I.** — Montrose Worsted Co., East School St., let contract for 45,000 gal. storage tank, concrete, to T. I. Ellis, 171 Westminster St., Providence.

★**Tank—Woonsocket, R. I.** — Rosemont Dyeing Co., East School St., let contract for 92,000 gal. storage tank, concrete, to T. I. Ellis, 171 Westminster St., Providence.

Tracks—Brooklyn, N. Y.—J. H. Delaney, comr. transit constr., 49 Lafayette St., New York City, received lowest 3 bids Aug. 19, furnishing and installing tracks for portion of Culver Rapid Transit R.R. extending over and along Shell Rd. and West 6th St. from point near Ave. X to Sheepshead Bay Rd., from Slattery Eng. & Constr. Co., 7 East 42nd St., New York City, $58,829; Ward & Tully, 2047 West 11th St., $69,561; T. Crimmins Contg. Co., 624 Madison Ave., New York City, $90,461. Noted Aug. 7.

★**Bulkhead—New York, N. Y.**—M. Hurlburt, comr. docks, Pier A, Battery Pl., North River, let contract furnishing labor and material for building bulkhead platform between East 79th and East 80th Sts., East River, and depositing riprap thereat, to Riverside Contg. Co., 39 Cortland St. About $10,000. Noted Aug. 7.

★**Lumber and Piles—New York, N. Y.**—Dept. Docks and Ferries let contract furnishing and delivering lumber and piles, to Central Timber Export Co., 115 Bway., $28,586. Noted Aug. 21.

★**Plumbing—New York, N. Y.**—Dept. Educ. let contract for plumbing and drainage of addition to and alterations in P. S. No. 6, on Tremont Ave., Bronx Boro., to J. J. Kenney, 236 West 20th St. About $43,000. Noted Aug. 21.

★**Pier—Jersey City, N. J.**—Central Railroad of New Jersey, Pier 14, North River. let contract building rein.-con. and steel pier, to Westinghouse, Church & Kerr, 37 Wall St., New York City. About $35,000.

★**Foundation, etc.—Erie, Pa.**—Dirs. Erie Co. Poor Dist. let contract building foundation of Erie Co. Almshouse, also constructing power plant and laundry, for same, to Constable Bros., 5th and Sassafras Sts. About $118,900.

★**Heating and Ventilating Systems—Erie, Pa.**—See "Buildings."

Tracks—Phila., Pa.—Dept. City Transit, 1211 Chestnut St., received bids constructing tracks of Frankford Elevated Ry., on elevated structure on Front St., Kensington Ave. and Frankford Ave., between Callowhill and Harrison Sts., about 5.6 mi. long, Contr. No. 562, from Snare & Triest, Pennsylvania Bldg., $462,010, M. and J. B. McHugh, 892 North Market St., $521,828, North Amer. Ry. Constr. Co., 1320 Monadnock Bldg., Chicago, $539,339. Noted July 24.

★**Pier — Baltimore, Md.** — Baltimore & Eastern Shore Ferry Co., Inc., 110 East Lexington St., let contract building 1200 ft., rein.-con. and timber pier, 35 ft. wide, including frame shed on each end, north of Bay Shore Park, to McLean Contg. Co., 1412 Fidelity Bldg. Cost between $75,000 and $100,000. Cost plus percentage basis.

★**Cast Iron Pipe—Detroit, Mich.**—J. A. Martin, comr. purchases & supplies, Municipal Courts Bldg., let contract to Amer. Cast Iron Pipe Co., 512 1st Nat. Bank Bldg., Chicago, furnishing 500 tons 6 in. c.i. water pipe, $0.83 per ft. and 500 tons 8 in. c.i. pipe, $1.19 per ft. Noted Aug. 14.

★**Greenhouses—St. Louis, Mo.**—H. Knoll, 800 Kansas Ave., will build 1 story, concrete and glass greenhouse, etc. Work will be done by day labor. About $10,000.

★**Lumber—St. Louis, Mo.**—City let contract furnishing various kinds of lumber, to Boeckeler Lumber Co., Hall and Mallinckrodt Sts., $588,175.

★**Stone—Souris, P. E. I.**—Dept. Pub. Wks., Ottawa, Ont., let contract delivering and placing stone on portion of seaward side of breakwater here, to Phillips & Mutch, Charlottetown. About $53,800. Noted May 22.

★**Wharf—Berthier, Que.** — Dept. Pub. Wks., Ottawa, Ont., let contract building and repairing wharf here, to N. Letourneau, Montmagny, $17,556. Noted July 3.

★**Caissons, etc.—Grand Mere, Que.**—Laurentide Co., Ltd., McGibbons St. and 3rd Ave., let contract sinking caissons, 60 ft. long, 10 ft. wide, 40 ft. deep below water level, and building piers for new tail race block, to Fraser, Brace & Co., St. Patrick St., Montreal. About $150,000.

★**Wharf—Ste. Anne de Beaupre, Que.**—Dept. Pub. Wks., Ottawa, Ont., let contract rebuilding and repairing wharf here, to O. Poliquin, Portneuf, $26,201. Noted July 10.

★**Heating Tunnel—Ottawa, Ont.**—Dominion Government let contract building heating tunnel on Wellington St., to Doran & Devlin, Sparks St. About $15,000.

★**Wharf—Thessalon, Ont.**—Dept. Pub. Wks., Ottawa, let contract building wharf here, to A. G. Tweedie, Saulte Ste. Marie. About $10,000. Noted June 26.

★**Pier—Toronto, Ont.**—Dept. Pub. Wks., Ottawa, let contract rebuilding portion of superstructure of east pier at eastern entrance of Toronto Harbor, 400 ft. long, to C. S. Boone Dredging & Constr. Co., Excelsior Life Bldg., $31,095. Noted July 10.

★**Wharf—Comax, B. C.**—Dept. Pub. Wks., Ottawa, Ont., let contract repairing wharf here, to Fraser River Pile Driving Co., Ltd., New Westminster. About $17,400. Noted June 26.

★**Wharf—Saanichton, B. C.**—Dept. Pub. Wks., Ottawa, Ont., let contract repairing wharf here and at Sydney and Roberts Bay, to McDonald, Watson & Whittier, 520 Sayward Bldg., Victoria, $10,948. Noted July 10.

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Serving the Profession

ENGINEERING literature approaches its highest practical value in such an article as that on multiple-arch dams by R. P. McIntosh, on another page of this issue. Not enough dams of this type have been built to have established an accepted technique of design, but there will be a growing use with an increasing knowledge of their possibilities. For that reason an engineer who has grounded himself in the little-known details of the dam's design serves his profession well by so definite and comprehensive an analysis as Mr. McIntosh has prepared.

No Oppression by any Group

OUR emphasis of the need for the President to take the leadership in enunciating sound doctrine in the present economic crisis has been vindicated by the events of last week. The officers of the American Federation of Labor and of the railroad shopmen's union have hearkened to his appeal and will postpone for 90 days the threatening shopmen's strike. Under his exposé of their striking when an arbitration proposal was pending, the shopmen returned to work; while similarly the strike of California trainmen collapsed when the Director General of Railroads put the case before the country, telling the public that the employees were out contrary to the instruction of their own officers and to their agreement with the Government. In critical issues public opinion rules. Consequently, a strong leader who is in the right, who stands firm and who fearlessly goes before the country, is sure to win. Unjust employers of the autocratic type long since have felt the heavy hand of public opinion—witness the present labor laws. The railroads in their sorry plight are an example of the vengeance of the people. As employers have had to learn the lesson so, too, must employees.

Real Cost of Highways

ALTHOUGH reference is made on the front cover to the article by Mr. Breed (p. 450), giving facts and figures on New York State highway work, the subject is important enough to warrant repetition in these columns. While spending millions on road construction, the people have been giving little heed to what they are getting for their money. They are told, officially, that so many *miles* of road have been built, and this information has seemed to satisfy them. In the face of present high costs, however, it is not likely that this complacency will long continue. When the taxpayers, after paying for the construction of nondurable types of highway on heavily traveled routes, are called upon again, in a few years, for funds to *reconstruct* these same routes, they begin to see that mere "mileage" means very little. The lesson is made still more impressive when the fact is realized that much of this construction, as is the case in New York, is done with funds from 50-year bonds. In New York it has been necessary to reconstruct 1594 miles of highway in order to retain 6912 miles originally built. Mr. Breed presents data, on cost and life of roads, covering a 21-year period. Particular value attaches to such information as this, for it supplies evidence which can be used in supporting economically sound policies of state highway construction.

Getting Engineering Retainers

CONSULTING engineers are properly inclined to be conservative when they speculate on the legitimacy of methods of obtaining retainers. Some, the profession knows to its regret, are not scrupulous, but we are speaking here of those who want to stay within ethical bounds. Some of these, recent conversation shows, are inclined to lean so far backward as to have a deadly horror of anything that savors of salesmanship. Methods of "promotion," however, are as varied as men and products. They range from flamboyant advertising and diamond-studded effrontery to a quiet call on a client fully satisfied with a previous engagement. Recently we talked with an able engineer who desired to move to a more attractive locality, but who foresaw slow progress by reason of his lack of acquaintance. On the very same day a member of a successful engineering firm from the same city came to inquire as to prospective engineering enterprises on which consultants are employed. To our surprise he and his partners were awaiting developments and had not even called upon their long list of influential and satisfied clients to learn what new work was in prospect. These men were neglecting an asset, the lack of which may deter the other inquirer from changing his residence and professional practice to the city in question. Common business prudence is surely warranted in the conduct of an engineering office. The firm referred to may properly go well beyond the obvious step of keeping in touch with their former clients and might well suggest that the latter use their influence in favor of the firm when, in directorates and otherwise, the need of engineering services comes up for discussion. Many an engineer will remark that we had better concern ourselves with the curbing of engineers who overstep professional bounds, and that there is no need to encourage promotional work. We had been inclined to that view ourselves, but recent experiences show that there are in our ranks some—probably many—fine-grained, able men who lean over backward.

Crediting the Army's Engineers

WE HAVE received a letter from a former major of Engineers, with which we have much sympathy. He had sent *Engineering News-Record* an article on his water-supply work in France, which treated mat-

ters covered to some extent in Mr. Tomlin's articles, but which might nevertheless have been acceptable were it not that our readers want peace, not war, data. During the conflict we devoted much space to war work. With the signing of the armistice the whole country applied itself to the restoration of normal conditions. Our readers no longer wanted military articles, and we promptly addressed ourselves to the task of helping them return to their normal mode of thinking. Yet, note the sound ring of these words from our correspondent when our position was made known to him: "You take the same attitude as the thoughtless, careless citizen in the street. 'The war is over—forget it!' This notwithstanding the facts that the peace treaty is not yet ratified by our country, we still have thousands of soldiers in France, the Mexican situation is as critical as ever, our military establishment is again struggling with inadequate appropriations, and we are as far from adopting a sound military policy as ever—perhaps farther, if all magazines adopt your policy. I congratulate you that while the war was in progress you gladly gave a large amount of space to it, but I also deeply regret that engineer officers who were anonymous during the war must now forever remain so, so far as your publication is concerned." With this point of view we deeply sympathize. Those men who put through the great enterprise should have due credit. To put their names on a bronze tablet is not enough. In the records of the War Department the methods employed will be set down; the technical side will thus be cared for. As for the personal element, the organizations, not the individuals, will be credited in the military records. One suggestion may be in order—that addresses on war work would be excellent additions to engineering society programs this winter. There the speaker can inject anecdote and personality and relieve the formal recital of work that to his hearers will have interest merely and not direct value.

War Designs in Peace Work

OBVIOUSLY, there may be military engineering procedures and developments that throw light on the design and methods used in peace. These should certainly come to light. They are as much a part of the substantial treasury of professional experience as are the works of peace. Such, for example, are the bridges developed by our Army, a subject which will shortly have full and adequate treatment in this journal.

Under-Maintaining the Railroads

TO THE engineer there is hardly a more important phase of the present railroad situation than the status of maintenance of the physical plant, under Federal control. It is now generally known that maintenance is seriously below normal. An able analysis of the conditions is presented in this issue, in an article by a railroad executive.

The Federal-control act provides that the properties shall be returned to their owners in substantially as good repair and complete equipment as they were received by the Government on Jan. 1, 1918. Since the Government assumed control on short notice, a detailed survey of actual physical conditions was not possible, so that it is necessary to consider expenditures for maintenance during the three-year "test period" as a basis of comparison. On account of the advance in the cost of labor and materials, items of expenditure must be equated to cover the relative costs of renewal and repair during Government control as compared with the test period. Thus we arrive at a comparison of rates of expenditure equated as to cost.

The facts and figures given are worthy of the most serious consideration. A considerable "deficit" exists in the maintenance of the lines under Federal control, both in track and equipment. Unless this deficit is made up and the rate of renewal increased to the old standard, our transportation system—and, consequently, the service which it renders—will be seriously impaired. The deficit must be made up whether the roads are returned to private operation or not. In other words, a physical condition is here the question, not a matter of financing or ownership.

While war conditions naturally shut off a large portion of the supply of renewal materials, these conditions have not existed since the armistice, and yet renewals have not been materially increased. It is true that in some cases, and in particular in the case of ties, large material contractors were driven out of the market by the rules and specifications of the Railroad Administration, so that some time might have been required in reëstablishing a normal source of supply. But it appears that no effective measures have as yet been taken in this direction.

Since the country is already under-supplied with transportation, the situation calls for immediate and vigorous action on the part of the Railroad Administration and, if need be, by Congress, in providing the necessary appropriations to make up the existing deficit in the maintenance of the roads.

Integrating the Architectural Profession—An Example for Engineers

IT HAS not been lost on engineers that the architects have had marked success in organizing for their own welfare and the service of the public. They have (in the American Institute of Architects) a code of ethics "with teeth"; they have standardized, and secured general adoption of, a procedure for architectural competitions; they have had a large degree of recognition in the formulation of public building policies and in the drafting of building codes, and they have put through in many states laws covering the practice of their profession. Because their organizations have been so effective, a new organization step they are taking is of special interest.

There has just been formed in New York State—*leading members of the American Institute of Architects taking an active part therein*—the New York State Association of Architects, a body which aims to include the *entire profession* in the state and which will devote its energies to improving the status of the architect. It will admit to its ranks not merely the architect in independent practice and the employed architect, but the draftsmen as well. There is to be no breaking up into classes. When the interests of the whole profession are at stake, all are to work together, employer and employed.

In engineering lines we have a somewhat similar movement—the American Association of Engineers—but with this very important difference, that it was not started, nor is it now supported, by the leaders of the profession. The latter, through the founder societies, are supporters of Engineering Council.

But, comparing the new movement with either the American Association of Engineers or Engineering Council, there is another distinct point of difference. The purpose of the association is to be broadly construed. It is to look after legislation for the interests of the profession—and to that end large membership will be of material help; it is to undertake "welfare" work, and, strange as it may sound to engineering ears, accustomed now to the advocacy of the separation of technical from civic and welfare activities, it is to undertake technical work. There are two reasons for the inclusion of the technical: To assist in the education of those who are not members of or eligible to membership in the institute, and to help the architects in the smaller communities in the solution of their problems.

Curious it will sound to engineers, too, to learn that the institute is not affrighted by the new organization but actually is encouraging the formation of similar associations in other states. It goes even farther; it asks that delegates from such state organizations be sent to the institute's conventions—with the evident purpose of coördination and coöperation. With the members of the institute acting as leaders in the state associations, that body will inevitably be the federating agency for all architectural activity.

Plunged deeply just now in the problem of professional reorganization, engineers may well draw inspiration from the breadth of vision displayed by the architects. When the conference committee of the development committees reports, we are sure to have before us a plan for the integration of the engineering profession. In that time may we have the vision of the architects, that, seeing the great purposes of the plan—assuming that it is adequate—we may brush aside minor difficulties and quickly put it into effect!

Concrete Under Repeated Stress

FEW structures of concrete are subjected to stresses of highly variable intensity. The nature of the service to which concrete is ordinarily applied is responsible for this fact, rather than any hesitancy on the part of engineers. No reason exists for doubting the permanence of structures exposed to nothing beyond the commonly used working stresses, though they be stressed a very great number of times in succession; and this fact may be stated just as confidently for concrete as for steel. But while for steel we have favorable positive evidence to support the statement just made, we lack such support in the case of concrete. New uses of the material are likely to change this state of affairs by supplying either favorable or unfavorable evidence, and we may soon have need for the knowledge furnished by facts of that kind.

Alternating stresses occur in pronounced form in the framework of a ship. As measurements made by engineers of the Emergency Fleet Corporation show, the stresses in, say, the deck of a concrete ship are just as continuously varying as those in a steel ship. Each wave that the vessel rides bends the ship's structure first upward and then downward, reversing the stresses by virtue of which the ship resists the bending. And these stresses are of respectable magnitude. Since the continuity of wave action in rough weather adds up the number of alternations rather rapidly, service experience should be available in relatively short time to tell of the deterioration, or the opposite, of reinforced concrete in this unusual stress-service.

Railway bridge service involves stress repetition, but in less intense form. Numerous concrete viaducts of the trestle type exist on our railroads, but in general the material of which they are made is exposed only to a unidirectional stress range, and this of moderate amount. When concrete is applied to elevated-railway structures in rapid-transit service, however, a high range of stress variation is likely to be involved, and probably reversals (in the rigid-frame type of column-and-girder structure); and the number of stress repetitions or reversals will mount up very much more rapidly than in ordinary railway viaducts. For the design of such structures there should be opportunity to obtain most valuable guide indications from the service of concrete in ships.

As to the nature of the destructive action resulting from repetition or reversal of relatively high stress—the so-called fatigue—we have no knowledge. For steel we know that it does occur, and there are some hypotheses as to its cause, but there our knowledge ends. We do not know even that it occurs in concrete, except perhaps for indications given by a few experiments in connection with the ship studies. However, the engineer's attitude is likely to be that, if a strong and tough material like steel is injured by high-stress repetition, then cement, a brittle material, must surely be held to be affected in similar manner. Until more exact knowledge is forthcoming, practical design will probably be controlled by such an assumption.

Direct transfer to concrete of the impact-allowance method used for steel-bridge design involves two points worth notice, however. By the impact-allowance method the action is regarded in effect as a load increase, in place of a strength decrease. It is an easy step to the conclusion that the "impact" of the load represents the same increase, whether concrete or steel be the structural material; or perhaps less for concrete on account of its greater weight. Yet the fact is that we have no reason whatever to assume that the strength decrease due to repetition or reversal (if effective at moderate stresses) may not be much greater for concrete than for steel. Caution in the use of impact allowances therefore seems advisable, so long as we combine in a single process the allowances for true increase of load-effect (i.e., true impact) and for stress repetition.

How far the question of localized stress concentration enters the problem of repetition effect is another important factor of uncertainty. Broadly viewed, steel may be regarded as a highly homogeneous substance, at least when compared with concrete. But there can be no doubt that in reinforced concrete, where there is transfer of stress between steel and matrix throughout the stressed body, local stress concentration must play a determining part in repetition or reversal effect. So far as the Fleet Corporation experiments have gone, they have pointed toward this conclusion, in fact.

Judgment will of necessity be resorted to in deciding upon the proper treatment of this subject in concrete design. For the reasons indicated, however, it is suggested that care needs to be used in taking over the methods used in steel designing, without careful scrutiny of the actions they are meant to cover and the peculiarities of the two materials.

What Has New York State Received for Its $100,000,000 Highway Expenditures?

Analysis of Work Done During 21-Year Period, 1898-1919, Shows Economic Fallacy of Increasing Mileage With Nondurable Types of Construction Involving High Maintenance Costs

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SINCE 1898, when it made the first appropriation for $50,000, New York State has spent $99,900,000 for new roads. Since 1909, when the figures were first available, it has spent $30,327,995.06 for maintenance and repair, a total expenditure of over $130,000,000.

What have we for it? Briefly, 7181 miles of improved road, Jan. 1, 1919, and eight through routes traversing the state.

That may satisfy the unthinking, but it challenges the attention of the road builder. He would have us express the result in terms of permanent construction features, such as alignment, drainage, culverts and bridges, foundation, and the dollar values of what we have left in surfacing. He would scan the temporary features, the semi-durable pavements, the snow fences and the like, and their maintenance charges. He would be interested in the organization of our highway department and its engineering costs. And, as indirect results of the highway movement, he would know what can be gaged in respect to its effects upon land values, upon traffic, and upon public wealth. Such questions it is the purpose of this paper to answer, as far as the definite facts at our disposal will permit. We collate the facts now because we believe it is the psychological moment for their consideration.

Total Expenditure $130,000,000

The $130,000,000 that New York State has already expended is only a drop in the bucket of moneys that will be poured forth throughout the country upon highways in the next ten years. From its last bond issue, plus the share to be contributed by towns and counties, New York has still available for new roads $24,800,000. Add to this $490,000,000 appropriated or pending appropriation by various other states; $200,000,000 of Federal aid, to be doubled by the states using it; and further contributions by counties and towns, and the total is almost $1,000,000,000 for good roads. So urgent is the need to expedite the work upon the roads, so apparently ample are the funds, that we are inclined to gallop ahead with the same rash expenditure that characterized war-time necessities—with a "Build a Road at any Price" slogan. But wisdom should moderate haste while we formulate the results we desire and the best methods of obtaining them. Now is the time to think in terms of economy; to remember that, after all, a billion is a billion, that each dollar of it wasted is so many feet less of good road; that highways are constructive and not destructive, and that we need every mile of them we can stretch out of the money, to help reduce the national debt.

Because New York State was among the pioneers in highway work—its first roads having just come of age—its experience should be a warning against much foolish and extravagant practice, and an index to certain satisfactory results.

In all that follows, the writer would emphasize that the scope of this article is the whole 21 years, and that no administrations, much less any individuals, are subject for special praise or censure. Where success has been achieved, it has been through zeal for public welfare and the good-roads movement, through vigorous, hard work, honesty and efficiency, and through application of the scientific spirit to every practical detail. Failures have occurred sometimes through errors of judgment inevitable in the experimental stage of any work; often through shortness of vision in anticipating needs of the future. Where fraud, extravagance and superficiality have been deliberate there is less occasion to pillory the offenders than to blame the public conscience which condones the offences. Just so long as the public permits its great works to be matter of partisan politics, just so long it will have to tolerate methods and results that would be scorned by any reputable private enterprise. When the public holds its workers to a high standard of ethics and demands strength and soundness in their work instead of speed and show, then it will get value commensurate with expenditure. Whatever blame falls is not upon administrations, but upon the public conscience back of them.

Let us first consider what proportion of the $130,000,000 was expended upon permanent construction features and how.

Surfacing

Starting at the top, because surfacing is the obvious part of a road, we have built a total of 8506 miles of *pavement*, of which there exist to-day 6912 (269 miles built in 1918 not included.) We have lost 1594 miles, or 19%. The following table, dated Jan. 1, 1918, shows the number of miles that were originally constructed of each type and the number that have had to be reconstructed:

TABLE I. EXISTING AND RECONSTRUCTED MILEAGE AS OF JANUARY 1, 1918

	Mileage Now Existing	Mileage that Had to Be Reconstructed	Total of Miles Built
Gravel and water-bound macadam (gravel 125 miles)	2248	1402	3650
Bituminous macadam, penetration method	3346	120	3466
Second-class concrete (carpet top)	163	53	216
Reomac and rock asphalt	29	10	39
Bituminous macadam (mixing method) on macadam	37	6	43
Brick	552	3	555
Cement concrete	408		408
Bituminous macadam (mixing method) on concrete	63		63
Stone block	22		22
Bitulithic	16		16
Sheet-asphalt	15		15
Asphalt-block	13		13
Total	6912	1594	8506

Putting it conversely, in order to retain possession of the 6912 miles of pavement we have had to build 1594 additional miles. In dollars those miles today, of the same type of pavement, would represent $13,400,000, a heavy charge against our investment.

Increase of traffic aggravates the condition on the older semi-durable pavements. In 1916 we had to resurface or reconstruct 202 miles; in 1917, 238 miles.

The table justifies some comment.

Gravel roads, of course, are expensive today for such heavy traffic as the good-roads movement has developed in New York State and is developing throughout the United States. They were built five to twenty years

ago to sustain horse-drawn traffic. With a surface treatment they may be used for light motor traffic up to about 400 tons a day during the seasons of soil stability.

The water-bound roads were designed for loads of from one to five tons. They have been shattered by the heavier, motor-driven loads. As such loads are inevitable upon any improved road, the use of water-bound macadam should be confined to isolated places and to spur lines and feeder routes where the prospective traffic will not exceed 800 tons a day for the next six years. Even then, water-bound roads must be surface-treated and built with the utmost care. Their low first cost, under present average traffic conditions, is offset within five years by high maintenance and reconstruction costs.

Bituminous-macadam penetration-method roads are disrupted by the pounding and impact of heavy vehicles because of the mobility of the crust when it is not sufficiently thick. To build the crust so that it will sustain heavy traffic increases the cost of the pavement to that of a durable type, its disadvantage then being higher maintenance charges. The average life of the bituminous macadam is slightly longer than that of the surface-treated water-bound.

Second-Class Concrete Discarded

The second-class concrete is now entirely discarded in favor of first-class, having been only a feeler toward the better article. New York's experience with this older type has been costly—more than $1000 per mile per year for maintenance and upkeep.

Rocmac and rock asphalt have proved generally unsatisfactory for the traffic conditions to which they have been subjected.

Bituminous macadam, mixed-method, on macadam foundation, has not given such good results for the cost involved as it has when placed on concrete.

The success of brick pavement and of bituminous macadam, mixed-method, depends upon proper foundation, skilled selection of materials and great care in construction. Brick laid in towns and villages and wherever the drainage is thorough has been very satisfactory. The three miles that had to be relaid contained poor brick, were built on a poor foundation and used a sand cushion, which best practice now discards in favor of the cement-sand (motor-bed) or the monolithic type.

The pavements on which no reconstruction had to be done were cement-concrete, stone-block, sheet-asphalt, asphalt-block, bituminous macadam, mixed-method, on concrete, and bitulithic.

The bituminous macadam, mixed-method, on concrete having been laid only in the past few years on New York State highways, has not yet had the chance fully to prove itself under hard service with heavy truck traffic. All present indications are in its favor. The other types in this group, which, with the brick we classify as permanent, have demonstrated their endurance not only in New York State but wherever they have been laid throughout the country.

Table I indicated the relative permanence of the various types of pavement in New York State. The following tables indicate relative costs. Columns 2, 3 and 4 of Table II give the average cost of building each type in New York State in 1915 (our last stable figures before the war-time inflation) which, multiplied by the total miles of that type, indicates what our roads would have cost in 1915. Today, of course, they would cost far more; during the years when most of them were actually built they cost far less.

TABLE II. FIRST COST (BASED ON 1915 PRICES), MAINTENANCE COSTS AND "REAL" COST (INCLUDING MAINTENANCE AND RESURFACING)

	First Costs (Estimated on Basics of 1915 Prics			Maintenance Cost for Entire Roadway			Real Cost of Pavement
				Average Cost per Mile per Year			
Type	Average Costs per Mile	No. of Miles	*Approximate Worth if Built at 1915 Prices	Miles Maintained 1915-1918	Maintenance and Resurfacing 1916-1917, Including Reconstruction to a More Permanent Surface	Over 5-Year Period, Including Maintenance and Resurfacing	
Column Number	2	3	4	5	6	7	8
Bituminous penetration	$13,000	3,346	$43,498,000	2,793	$490	$505	$15,450
Gravel	7,500	125	937,500	173	843	1,246	11,715
Water-bound macadam	10,250	2,123	21,760,750	2,451	911	1,063	14,805
Brick	25,000	552	13,800,000	284	210	.....	26,050
Cement concrete	15,300	408	6,242,400	208	138		15,990
Second-class concrete	13,200	163	2,151,600	291	938		17,890
Stone-block	37,000	22	814,000				
Mixing-method, bituminous on concrete	20,000	63	1,260,000	89†	356†	.	
Mixing-method, bituminous on macadam	17,000	37	629,000				
Rocmac and rock asphalt	16,100	29	466,900				
Bitulithic	29,400	16	470,400				
Sheet-asphalt	30,000	15	450,000				
Asphalt-block	25,100	13	326,300				
Totals		6912	92,806,850				
Miles built in 1918 and accepted	269 at $13,700		$3,685,300				
Miles built in 1918 too late for acceptance, 85% estimated as paid.	(94 at $13,700)		1,094,630				
Miles built in 1918 on existing contracts,	(279 at $13,700) 80% paid		3,057,840				
			$100,644,620				

Remarks: Figures for all types of fewer than 50 miles have not been extended because of possible injustices in striking small averages.

* Estimated on basis of 16 ft.-wide, 6-in. thick pavement, where the foundation is of broken stone; where the foundation is of concrete it is estimated as 5 in. thick. Many roads are narrower, a few are thicker. This seemed a fair average.

† For all types of mixed-bituminous, both on macadam and concrete bases.

These cost data are significant merely as suggesting how the $130,000,000 was spent. The value that we have today from that expenditure is quite a different matter.

Columns 5, 6 and 7 explain themselves. Maintenance figures are given for the past four years because the roads then are the culmination of the policies of all the preceding years. Comparing column 6 with column 2, we see that high maintenance cost goes with low first cost. Estimating the *real* cost of the pavement, column 8, for a period of five years, by adding to first cost the cost of maintenance each year, we find that cement concrete takes the lead for permanent low cost, with brick a fair second and bituminous macadam, mixed-method, coming in third. This, be it remembered, only in respect to cost. Other considerations that help to determine the choice of a pavement might quickly destroy this order. Moreover, even in respect to cost it must be remembered that the figures given are averages of *every* road under maintenance throughout the state. They do not tell the entire truth, because they fail to discriminate between the cost of roads built suitably for the traffic they must sustain, and those not so built. For instance, the average cost of water-bound and bituminous macadam, including that on light-traffic roads, might not lead one to suspect their almost prohibitive maintenance on through routes for heavy traffic. The following is an illustration:

The X-Y road was built in 1908 as a 7 and 8-in. water-bound macadam, 5.14 miles long, at a cost of $59,500. Maintenance and repair for the first three years was $24,555.11. Then, in 1912 and 1913, it had to be resurfaced, and a 3-in. bituminous-macadam penetration-method top was used. The cost of resurfacing and maintenance from 1912-1919 has been $81,093.05, making the total cost of that road to date $165,148.16, and we still have only 5.14 miles of an impermanent type that requires an immediate expenditure of another $8000 to make it fit for traffic.

What New York State's experience proves, in the above tables, is the utter waste and folly of building miles upon miles of cheap pavement to fatten political "pork." A road is not the possession of one village or of one boss. It belongs to the whole country and should be built for the welfare of the whole country, regardless of local rivalries. Every weak link threatens the entire chain of communication and checks the flow of economical transportation. The tables show that there is rarely a sound economic reason for building cheap, impermanent types of pavement. When there is such a reason, let it dominate. Otherwise, in the spending of that billion, let us build for permanence. And may the people be taught to demand permanence in their roads—for upon the people rest the ultimate cost and the ultimate responsibility.

Had New York State followed from the beginning the policy that experience has since taught, we should now have almost all of those lost 1594 miles and about 400 others (on the basis that the average maintenance, resurfacing and reconstruction cost could have been cut one-third or more by building of better types), whose first cost has been consumed under the old policy by excessive maintenance charges upon impermanent types. That represents a definite money loss of $6,000,000, plus an inestimable loss in the public wealth that accrues from two thousand miles of good roads. Will the people henceforth in the states where the billion is to be expended tolerate such losses? I think not.

Alignment

Pavement is only one factor in the 7181 miles of road that our $130,000,000 has bought us. Part of the money has been spent on alignment. Since 1907, wherever it has been practicable and reasonable in cost, all curves have been widened by the removal of buildings and the grading back of corners to allow at least a 400-ft. sight distance. It has been proved that this is the least distance compatible with safety for motor traffic. Fills have been widened and guard rails eliminated wherever possible. The extent of such improvement is indicated by statistics from 100 miles of pavement. These show that the land takings necessary amounted to 65.4 acres, comprising 226 parcels or rights-of-way: that there were 161 cases of widening; that 53 corners were cut back with curves eased and widened, and that 13 new locations were made to improve grade and alignment.

There has been debate in the department as to the economy of straightening curves and reducing grades. The problem formulates itself thus: The cost of a curve to each vehicle is the amount of fuel necessary to regain the original momentum lost in slowing up for the curve. Multiplying the average amount by the number of vehicles taken by a traffic census during a fixed time, you can approximate the cost of the curve in fuel for one year. If the saving in fuel is greater than 4 per cent of the expenditure necessary to eliminate the curve, then the expenditure is warranted; that is, a saving of $400 would warrant the expenditure of $10,000 for the improvement. I take 4 per cent as the basis of capitalization because of the inevitable increase in traffic. In the past four years almost $200,000 was spent in widening and banking curves. This work can be more cheaply done under first construction.

The economy of lengthening line to save grade is doubtful. The question is: Does the amount of fuel, or motor energy, necessary to climb the grade, exceed the amount that would be consumed by the additional distance traveled over a less grade? The indeterminate factor, which makes even an approximate answer impossible, is the amount of fuel saved on the down-grade. We have simply followed the policy of reducing the distance and grade wherever it was possible, figuring on an estimated basis of the saving to the traffic that will use the road.

Width and Shoulders—Drainage and Foundations

Akin to alignment is width of roads. In 1898 there were few miles of road in the state, outside of the large cities, wider than 12 ft. Now, there are few miles of state road being built narrower than 16 ft. Much of the money contributed by towns and counties has been expended in additional width of road from 2 to 8 ft. Almost all new roads since 1915 have had specified widths of from 16 to 20 ft. During these four years approximately $300,000 has been spent in widening old roads, yet, notwithstanding this fact, it has been necessary to spend large amounts of maintenance money to keep up the shoulders on heavily used roads. The necessity has been forced upon us by increase in traffic. An improved road that is also a narrow road is a menace. It attracts to itself more traffic than it can accommodate, and resulting wrecks strew its shoulders. No main highway should be designed less than 20 ft. for pavement surface and 32 ft. between ditches. Subsidiary roads should be at least 16 ft., with shoulders extended to 26 ft., and curves widened from 4 to 8 ft. for safety. All highways when built should be designed so as readily to permit additional widening. This, especially in the 16-ft. road, should be a factor in the choice of pavement. Had our roads been designed of adequate width and so as to be easily widened, the state would have been saved much money. Now that it has been shown by numerous traffic censuses that any improved road attracts to itself approximately 200 per cent. increase in traffic during the first year after its completion, there is no excuse for new roads narrower than 16 ft., or for any incapable of being widened.

In design, construction and maintenance, shoulders have been too much regarded as distinct from pavement proper. They are an integral part of the width of the roadway, and crumbling or unstable shoulders very soon mean disintegrating pavements. They should be built to sustain a proportionate part of the loading for which the road is designed.

Of the money expended for drainage, much has been wasted and lost, primarily through inadequate design. It is impossible to determine exactly the total loss in dollars upon this one feature of our highway work, because in any loss of pavement that occurs the blame must be divided indeterminately between crust and

drainage. By an inspection made in 1916 of 4733 miles of road to ascertain the cause of 758,000 sq. yd. of breakups, equivalent to 83 miles of 16-ft. pavement, defective drainage was discovered in 50 per cent. of the cases. The worst defects were due to inadequate design, insufficient foundation, lack of proper inspection and ignorance of soil conditions. The ground that to the uninitiated seems beautifully stable in July may become a quagmire in November, April and May. It requires an expert, trained in practical soil and foundation conditions, to prescribe the necessary amount of drainage, and he will be more accurate if he receives reports on soil and weather conditions throughout the four seasons and has the opportunity to observe the project after the spring thaws, when the greatest soil instability occurs. Ignorance, carelessness and haste cause faulty inspection; and desire to cheapen the work so as to extend mileage has often been responsible for inadequate design.

Efficient Drainage Needed

Even where design and construction were adequate, failure in drainage was very frequently found through the clogging of drains, ditches and culverts, insufficient outlets, too small an amount of drain areas, etc. This should be prevented for surface drainage by the removal, from the area along the roadway, of obstructive vegetable growth; for subsurface drainage, by keeping the outlets open and by insistence upon patrolmen doing their work. Given drainage that is 90 per cent. efficient, the cost of maintenance along the highways of the future will be so lessened as to make our former figures appear ridiculous.

Foundations are of permanent value. Their shortcomings are visited not upon themselves, but upon the pavements above them. We have 3400 miles of broken-stone foundations averaging 3 in. in depth, or better. These are the roads 6 in. in depth with a 3-in. top and a 3-in. bottom course. We have approximately 1000 miles of durable pavement with a foundation of 5 in. of concrete. Foundations generally have but one defect, the lack of depth which afflicts 3400 or more of our miles. For the purpose for which these miles of road were designed the depth may have been adequate, but it did not anticipate their allurement to traffic. Now the old foundations must be deepened to at least 9 in. to meet the demands upon them. It is cheaper to lay a good foundation once for all than to renew pavements. The rate of development of traffic during the past ten years, and the prospective limitation of loading to the five-ton truck, affords us some standard of measure by which to plan. It is fair to say that no new road, or road to be reconstructed, should be built with a foundadation of less than 9 in., if it be of broken stone, and the depth should range from that, according to prospective traffic upon the road, up to 15 in., which is the lowest possible allowance for through routes.

A concrete foundation should be at least 6 in. deep, and should range from that, according to prospective traffic and type of surface selected, up to 9 in. on through routes.

If the sorry choice has to be made, it is better to build a cheap pavement on a good foundation than a good pavement on a poor foundation. But with the money available there should be no occasion for such a choice.

The state has spent $510,000 of its highway money in eliminating grade crossings, representing a total expenditure by the state, counties and railroads of $1,340,000, with a permanent gain in safety to all users of roads. Henceforth, in deciding new location the necessary money should be spent at the start to avoid grade crossings. They are wrong anywhere in these days of traveling at high speed.

One other gain we have in our highways proper which cannot be expressed in money: It is that stability of soil which accrues to a road through years of usage. The firm consolidation, under impact, of even the old earth roads illustrates what I mean. It is like goodwill in a business, inestimable but potent, and it is the possession of nine-tenths of our roads today. In reconstructing or rebuilding a road, the grade, wherever possible, should be high enough to make use of this stability of soil, as it will give greater stability to the new crust or pavement and will many times lessen the amount of drainage necessary.

Adjuncts to the road, such as guard rail, snow fences, signposts and the like, have cost the state approximately $1,259,400 and have a present valuation of $670,200. As in the case of every other factor, we must remember that normal depreciation and even excessive first costs are more than offset today by the abnormal increase in prices since the work was done, and consequently in the present valuation. Maintonance of those factors is a big item. It should be less in the future, when the old painted wooden guard will, in many cases, be eliminated by the lengthening of culverts and broader shoulders, or replaced by the more artistic and serviceable concrete parapet, and when all signposts throughout the country are made simple, and a uniform scheme of banding on poles is adopted such as has given satisfaction in the New England States.

So far we have been talking of *costs*, for which either actual or approximate figures have been given. "Actual" figures are those taken direct from statistics in the Highway Department; "approximate" figures are taken from averages of data collected from many roads in every section of the state. We come now to the debatable estimate of present values.

Present Values

It would be unjust and misleading to formulate in dollars the worth of what we have today, strong as is the temptation to do so. Too many undetermined factors enter into such an appraisal, to give it validity. This much, however, is definite: For our $130,000,000 we have only 1092 miles of durable pavement. The average life of the semi-durable or nondurable types which comprise more than 5820 of our remaining miles is not more than five years, at nominal maintenance. Most of these roads have already passed that age, and are kept in service only through excessive maintenance. That is a poor return for our investment. We can, and must, get far better results from future expenditures. But the depreciation must not blind us to the benefits we have gained. Highways are means to ends, not ends in themselves; although built at exorbitant cost, they have served their purposes well.

They have given to people and products greater freedom of movement. What that has meant in life, liberty and the pursuit of prosperity can be faintly surmised from the howl that goes up whenever a mile of road is shut off for repairs. It cannot be estimated in dollar values.

The highways have enhanced land values wherever they have been built. Farm lands contiguous to improved roads have increased in value from $10 an acre to $30 an acre. In New York State, between 1890 and 1900, the decrease in farm values was approximately $80,000,000. The United States census shows that between 1900 and 1910 there was an increase along improved roads in New York State of $381,758,000 when only $36,200,000 had been spent for improvement. This pertains only to rural districts. The increase in value of land adjacent to cities and towns is apparent as soon as highways are improved. In some parts of Westchester County, which is just north of New York City, land values along improved roads have gone up 200 per cent. within a year after the road was built.

They have helped produce flourishing hotels all over the State. The rundown boarding house of twenty years ago has given place to the enterprising inn of today.

They have encouraged travel. The census of foreign cars, those from other states, taken in New York State in August, 1917, shows 1955 foreign cars in and out of our state daily on four routes. This average would hold up through July, August and September; i.e., 90 days which, multiplied by 978 cars (½ of those in and out) would give 88,020 cars during the season on these four connections. Allowing an average of four passengers to a car, this would mean 352,080 persons coming into the state. At an expenditure of $5 a day apiece—too little, as any tourist knows—that would mean a yearly gross income to the state of $7,041,600 for an average stay of four days. There are nineteen other routes, all bringing tourists. The income from this source shows partly why good roads pay.

Advantages to the farmer from our roads have been expatiated upon—better market facilities, lower freight rates, no idle teams, and so forth and so forth. Certain it is that the banks show a large balance to the credit of New York State's farmers. How much of this is due to improved highways makes interesting speculation.

We might have had more and better highways for our money; in many cases we should have had them. Yet our investment has probably added proportionately as much to the welfare of the state and its people as any other amount expended hitherto upon public works.

Unloading Refuse Trailers by Net and Pole

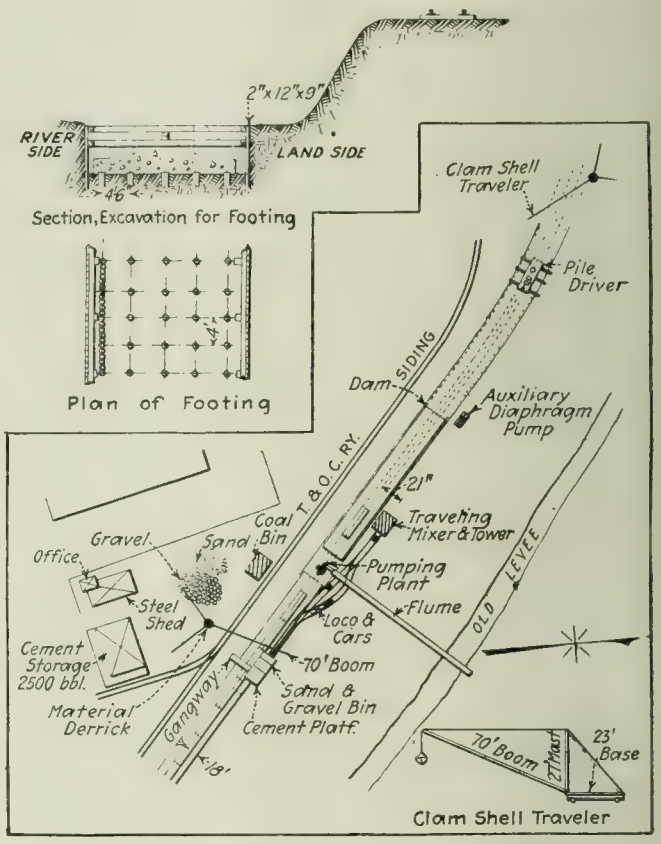
Quick unloading of garbage and refuse trailers at Calgary, Canada, is effected by means of a net and pole. The mixed refuse, after being collected in 2½-yd. two-wheeled carts drawn by one horse, is hauled to loading stations and dumped into electric motor-drawn trailers of 18-cu.yd. capacity. The trailer bodies are 8 x 4 x 18 ft. Before the refuse is dumped into them, a rope net is spread over the bottom and up the sides. When the trailer arrives at the incinerator the net is pulled together at the top, a pole is run through it, lengthwise of the trailer, a hook and cable are attached to the center of the pole, the side of the trailer body is let down, and the whole load is hauled out and dumped into the receiving pit. Power is applied either from a drum or by manipulating the clamshell bucket used to move the stored garbage from the pit to the incinerator. A trailer can be emptied in 2 or 3 min. Three or four trailers are hauled by one motor truck, conditions permitting. J. J. Dunn is chief sanitary inspector.

Concrete Wall Construction Is Continuous Process

Trenching, Sheeting and Bracing, Piledriving, Form-Setting and Concreting Outfits Move in Procession

A PROCESSION of operations each self-contained and all in step is putting speed into high concrete wall construction at Columbus, Ohio. Wall 25 ft. high and running a little less than 5¼ cu.yd. per foot is being completed at a rate of 76 ft. per week. In an occasional week 20 ft. additional has been completed. This progress includes excavation, sheeting and bracing and piledriving, besides wall construction proper. Measured by volume, the usual week's work is 400 cu.yd. of wall completed.

North of Broad St., Columbus, Ohio, on the southwest bank of the Scioto River, the earth levee of the new flood channel is replaced for 1200 ft. by a heavy reinforced-concrete wall. Except at the ends where the wall forms



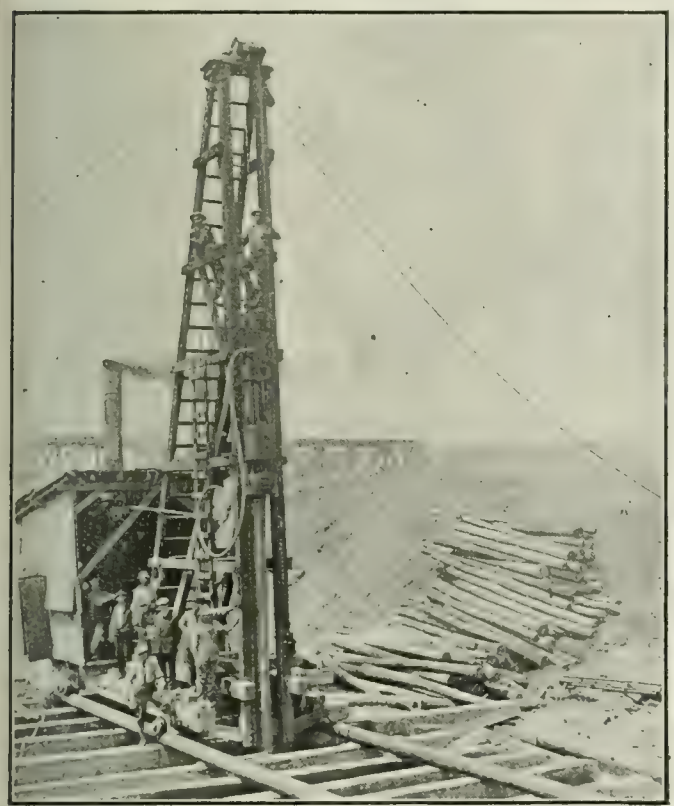
TRAVELING PLANT IS EMPLOYED FOR CONSTRUCTING CONCRETE WALL

into bridge abutments and where it is 30 ft. high, the wall is 21½ ft. high on a footing 21 ft. wide. The rear face of the wall has a batter of 1 in. per foot and the front face is vertically curved to a radius of 74 ft.; its width over the coping is 2½ ft., and under the coping overhang is 2 ft.; it is 7 ft. through at the footing, which is 21 ft. wide, 3½ ft. thick at the wall which stands in the center and 2½ ft. thick at the edges. Piles spaced 4½ ft. across the wall and 4 ft. longitudinally carry the footing.

Construction involves none except the usual wall-building operations: Trench excavation, sheeting and bracing, piledriving, form building and concreting. Its

exceptional feature is the train of equipment for performing the several operations in sequence and the coordination of these operations so that they advance in order and at the same speed. The various plant units and their arrangement are shown by the diagram plan and the views.

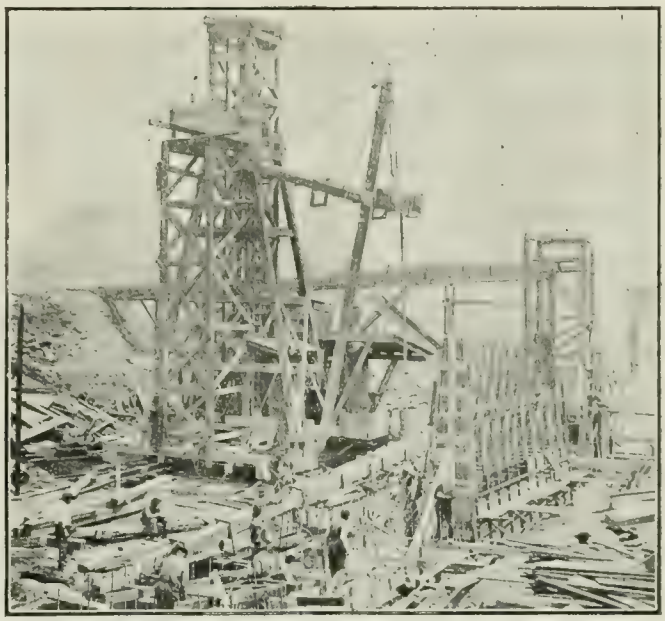
The first unit of the plant is a stiff-leg on four wheels which travels on a track at one side of the trench location. Equipped with a three-drum, 7 x 10-in. hoist and a rotary swinging engine, this traveler operates a ½-cu.yd. clamshell for trench excavation, and with the bucket removed places the bracing. The bracing carried forward dismantled from where the footing has been completed is assembled just ahead of the digging, and as the trench is made ready the assembled units are lifted and set in place by the traveler. The trench is carried down only about seven feet and is sheeted.



PILEDRIVER FOR CONCRETE WALL CONSTRUCTION HAS TRANSVERSE AND LONGITUDINAL MOVEMENT

All piledriving is done through the bracing, which causes some annoyance in the handling of the long sticks but is not seriously troublesome. The driver has 39-ft. leads, a two-drum, 6 x 8-in. engine and a No. 2 steam hammer. Travel across track is on pipe rollers on transverse track timbers and along trench by spool-rollers on the pipe rollers. When the piles are driven and sawed off, the footing forms are set. The lower rangers and cross-braces of the bracing frames are taken out, and the forms are hung from the top cross-braces, as is indicated by the dotted lines on the sketch of the trench section.

The concrete is all placed from a traveling mixing plant. First, the footing is poured several sections ahead of the wall itself. Then the wall is built in sections 30 ft. long, using steel forms with wood bulkhead or end forms. One full set of steel forms for a 30-ft. section and posts for another section are provided, the posts for the section ahead being erected and lined up while the form for the preceding section is being poured.

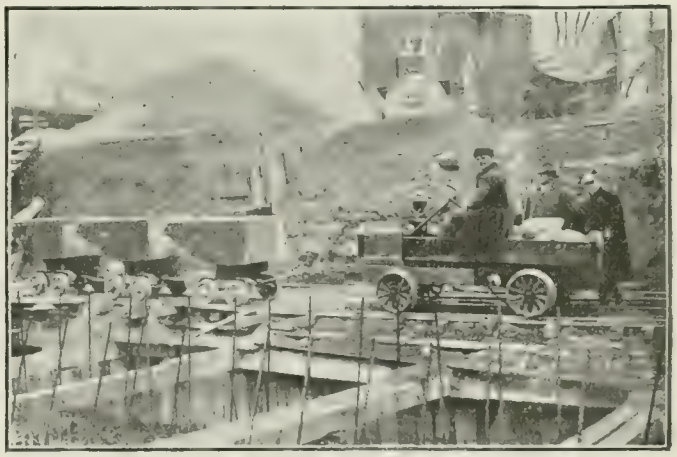


SECTIONS OF WALL CONCRETED FROM TRAVELING TOWER AND CHUTES

When the forms used for the concreted section are taken down, the plates are shifted ahead and fastened to the posts already set while the posts are carried forward and erected for another section. The forms are dismantled and reërected for each section. Considerable trouble is experienced in getting good alignment, particularly of the coping, which is cast in one piece with the wall.

A ½-cu.yd. mixer and a 40-ft. tower mounted on a platform on wheels form the concreting plant. From the tower, chutes lead to the forms; a boom supports the chutes. As indicated by the view, the tower stands at the front of the platform. Behind it stands the mixer, located so that it discharges into the tower hoist bucket and so that its charging skip drops to the ground over the rear edge of the platform.

Cars loaded with proportioned batches at the elevated bins run to the mixing plant and dump directly into the



CONVERTED FORD HAULS MATERIALS CARS TO MIXER

charging skip. A Ford converted into a locomotive hauls the cars in trains of three. When the mixer plant moves ahead, the materials truck is disconnected at the rear of the switch and the disconnected section is pulled ahead with the mixing plant. A section of track inserted in the gap left behind the switch connects the line up again.

The sand bin, which holds 33 cubic yards, and the gravel bin, holding 67 cu.yd., are stationary, and straddle the track so that cars running underneath are charged from bottom gates. A derrick and a clamshell charge the bins from stock piles supplied by motor trucks. Cement is wheeled on runways to the cement platform at the rear of the bins.

About 50 ft. beyond the bins is a stationary pumping plant consisting of a 10 x 12-in. double-suction pump and a 5 x 8-in. centrifugal pump in a housing set in a gap formed by leaving unconcreted two sections of the wall. These pumps draw from a sump and deliver against a 35-ft. head to a flume extending on a trestle to and over the crest of the old levee. The practice is to operate the double suction pump for two hours in the morning to pull down the night's accumulation of water and then keep the work drained by continuous operation of the centrifugal pump. Water flows to the sump in a channel between the edge of the footing and the trench side. At the end of the footing there is a plank dam.

Here the flow of water from the unconcreted trench is lifted over the dam by a portable pumping outfit which consists of a double 4-in. diaphragm pump operated by a 6-hp. gasoline engine. As the footing advances, the dam and the pump are moved ahead.

The contract calls for about 6200 cu.yd. of concrete. The contractor is D. D. McGrath & Sons, Columbus, Ohio, whose superintendent is W. A. Jones. The work is a portion of the Scioto River channel improvement for flood protection at Columbus. Henry Maetzel is city engineer of Columbus and R. H. Simpson is engineer in charge.

Fire Losses in the United States

American cities of 20,000 population and over in which the fire losses exceeded $5 per capita numbered 35 in 1918, compared with 29 in 1917 and with 23 in 1916, according to the latest report of the committee on statistics and origin of fires of the National Board of Fire Underwriters. The range for the 35 cities in 1918 was from $21.74 for Burlington, Vt., to $5.08 for Tulsa, Okla., and the median city in 1918 was Charlotte, N. C., with a per capita loss of $7.34. In 1916 Jersey City headed the list with a per capita loss of $27.71; in 1915, Newport News, Va., $28; and in 1914, Galveston, Tex., with a loss of $33.06 per capita.

For the entire United States, urban and rural, the average per capita fire loss in 1918 was $2.76 and in 1917, $2.42. The excess of 34c. in 1918, the committee states, is not accounted for by the $30,000,000 loss due to forest fires in Minnesota. Further details for the cities of over 20,000 population are given in the July *Quarterly of the National Fire Protection Association*, wherein it is stated that the cities of the size indicated that fail to report their fire losses are increasing in number.

The Newark Garbage-Feeding Contract

By James W. Costello
Engineering Supervisor, Bureau of Street Cleaning and Refuse Collection, Newark, N. J.

EIGHT times the monthly average top price for live killing hogs in Chicago is the price per ton that will be paid the City of Newark, N. J., for its garbage under a contract for disposal by feeding to hogs, awarded on July 3. The contract runs for five years. The contractor is the National Utilization Co., Arthur N. Pierson, president, Woolworth Building, New York City. The city will deliver the garbage to a piggery on the shore of the Passaic River, where it will be weighed. The city agrees to enforce its separation ordinance and to attempt to collect all hotel and restaurant garbage. It is estimated that when full separation is effected the daily collection will be about 100 tons, and that during the summer peak months about 5000 hogs will be fed. The estimated population of Newark is 450,000.

On account of the limited area available at the site of the piggery, which, as stated, is on the Passaic, intensive methods will be employed. The hogs will be housed in unit buildings 100 x 100 ft. in plan, which will accommodate from 800 to 1000 hogs. A double, concrete driveway and feeding floor 24 ft. wide extend through the center of each building, with a gutter on each outer edge next to the pens. The gutters discharge into large grease traps, to prevent solids reaching the sewer. The pens are arranged on either side of the driveway, and have a slight pitch toward the gutters. There are five pens on each side, equipped with an automatic drinking fountain. Each pen opens into a yard 50 ft. deep. The houses are of the sawtooth type, with windows the entire length below the eaves and in the peak.

The collection of all city refuse was done by contract until 1916, when the contractor terminated the contract on the ground that the separation ordinances were not enforced. The collection was then taken over and carried on by municipal forces. In March, 1919, a new ordinance was introduced requiring the separation of ashes, rubbish and garbage. At the present time separation is effective in about 50 per cent. of the city.

A police officer and an inspector are assigned to each district to enforce this ordinance, and the results have been very gratifying. Separation of the refuse in the remainder of the city will be completed about Sept. 15, 1919.

The erection of a reduction plant of a 150-ton capacity was contemplated, but the present cost of building material was considered prohibitive, an estimate received from one company being $750,000, exclusive of the site.

The city has about six square miles of meadow land, and refuse of all classes has formerly been dumped on this land. There is a contract for the salvaging of the material. The city receives $3000 annually for the privilege, and in addition the contractor supplies all labor necessary to keep the dumps and the roads leading thereto in good working condition. It is planned to erect, when separation is completed in the entire city, a utilization plant for rubbish, and when this is realized only ashes will be deposited on the meadow land. The area of the city is 23 square miles.

The "Upkeep" of the Railways Under Federal Control

An Analysis of the Conditions of the Railway Properties Now as Compared With January 1, 1918, When They Were Taken Over by the United States Government

By a Railroad Executive

THE Federal-control act, under which the Government took over the operation of the railways, provides that the Director General shall annually, as nearly as practicable, expend and charge to railway operating expenses, such sums for the maintenance, repair, renewal, retirement and depreciation of the property as may be requisite in order that such property may be returned to the company at the end of Federal control in substantially as good repair, and in substantially as complete equipment, as it was Jan. 1, 1918.

If the annual expenditures and charges for such purposes during the period of Federal control, and the fair distribution thereof over the same period, are equal, in the aggregate (subject to adjustments due to difference in the cost of labor and material, and the extent of use) to the average annual expenditure and charges for such purposes during the "test period," it shall be taken as a full compliance with the obligations of the Government.

The question whether or not the Director General has fulfilled his obligation to maintain the railway properties, as contemplated under the Federal-control act, is at once a vital one. If not, what is the relative condition of the properties *now* as compared with Jan. 1, 1918, and what will be the probable condition when the properties are returned to their owners on Jan. 1, 1920, as directed by the President?

The Government assumed control of the railways, by proclamation of the President, "overnight," so that no time was allowed to make a detailed survey of the actual physical conditions of each element of the properties as of Jan. 1, 1918, and establish a "physical balance sheet." In order, therefore, to determine as accurately as may be whether the physical condition (whatever it may have been on that date) has been adequately maintained, it is necessary to consider the expenditures made in the maintenance, or "upkeep," of the properties during Federal control compared with similar periods during the "test period" (July 1, 1914, to July 1, 1917). Such expenditures must be equated to cover such items as relative costs of labor and material, extent of use, efficiency of labor, quality of material, influence of deferred work on future costs, in order to bring the two periods upon parallel bases for comparison.

Accurate Comparisons Difficult

The problem of determining the equation factor to apply to the "test period" expenditures is a very difficult one. The increase in wages, back-time allowances, overtime penalties and decrease in labor efficiency, account for 100% or more, in the labor costs alone for the year 1918, compared with the average of the test period. The material equation factor is not as high as the labor factor, for the reason that materials from stock were largely used and those were charged out on prices at which such materials were purchased before the present high prices prevailed. But in the replacement of such materials by the Government, in returning the properties to the owners, it will be necessary to pay current market prices for material purchased to make up deficiencies in stock. Therefore, the present material equation factor generally used, and varying from 35% to 60%, is considered too low.

If it were possible in every element of property to determine the actual relative quantity or units of labor and material expended for the two periods under discussion and then to find the difference and apply current prices to the results, the actual over or under expenditure, as the case may be, in each element could be readily ascertained. Such methods can be applied to many of the important items in maintenance of way and structures expenditures, as, for example, rails, ties, ballast, bridges, trestles and culverts, telegraph and telephone lines, buildings, signals and interlocking plants, etc.

The maintenance of equipment, especially as it pertains to freight train cars, is very difficult to determine accurately, for the reason that under Federal control this equipment was "pooled," resulting in "home" or system equipment being largely on foreign lines, so that the extent of the repairs to such equipment could not be definitely determined. It is, however, a well known fact that freight equipment has not been maintained to the same extent during Federal control as it was during the test period, because foreign lines do not spend as much for repairs on foreign equipment as they do on their own. Many roads which had from 60% to 90% of their own cars on their lines during the test period have had the situation reversed, so that from 60% to 90% of foreign cars were on their lines during the Federal-control period.

The experience of some of the larger railway systems as to the relative upkeep of their property under Federal control, as compared with the period under private control, and the condition of the property now as compared with that on Jan. 1, 1918, will indicate generally the situation as applied to the railways as a whole.

Maintenance of Items in Detail

An analysis of the important elements of the property and their relative upkeep and condition will enable one to arrive at a fair conclusion as to the general result:

Rail—During the year 1918 the Director General of Railroads purchased no new rail for the railways under Government control. Normally, from 1,500,000 to 2,000,000 tons of new rail are required annually. The only new rail laid in 1918 was from contracts made by the corporations previous to Federal control, and the total amount laid in 1918 is approximately one-half the normal requirements. The only new rail contracted for by the Director General for 1919, thus far, is 200,000 tons. The maintenance of rail on branch lines, where relieved rail from main lines is usually placed, has been correspondingly deferred, owing to the failure to provide new rail.

The reasons for the failure to supply the requisite quantity of rail for normal maintenance during 1918 was the necessity for using steel primarily for war purposes, a good and sufficient reason. But upon the signing of the armistice, in November, 1918, there was no good reason why the rail deficiency existing should

not have been made up—at least in part—and large orders for new rail immediately placed. Not only has this not been done, but only about *one-tenth* of the annual quantity of rail required has thus far been ordered for 1919.

There is perhaps no element of property which has deteriorated to a greater extent than the rail, the most important item which goes to make up a good railroad. The prospects are that at the end of Federal control the railways will be from 18 months to two years behind in their normal rail requirements—equivalent to 2,000,000 to 3,000,000 tons of new rail.

Ties—Tie renewals have not been maintained during Federal control. The deficiency in maintenance of this item will range on an average of 30% to 40% in 1918 for the railways under Federal control. This deficiency is due to several causes, among which are changing of specifications, methods of inspection, payment for ties, and a centralization of control for the purchase and distribution of ties, contrary to the long established practices in effect on railways in various parts of the country.

Tie Contractors Driven out of Market

The large tie contractors who have for years been the main factors in supplying the railways with their annual tie requirements turned their attention to the production of other forest products, after failing to obtain from the Railroad Administration a modification of the rules and regulations which the latter sought to enforce, as against the practicable methods long in use.

There has been a large reduction, under Federal control, in the supply of treated ties, due in part to failure to obtain ties for treatment in time for proper seasoning, also in part to the inability to obtain the necessary supply of creosote oil. The zinc-chloride process has been utilized to a certain extent to make up the deficiency in the creosote treatment, but this process will not furnish protection in the more moist and humid climates to equal the former practice of the use of creosoted ties. The quality, therefore, as well as the quantity of ties, has depreciated. Taking this into consideration, the tie condition under Federal control will be placed at about 40% as compared with the test period.

Some of the larger railway systems usually carried a sufficient supply of ties for two years' requirements; i. e., on Jan. 1, 1919, the ties required for 1920 would be on hand, ready for seasoning and treatment. On a number of such roads, on Jan. 1, 1919, there was on hand as little as 25% of the ties required for the year 1919 alone. This will indicate the extent to which the tie stocks have been depleted.

The situation with respect to switch ties and side-track ties is even more critical. During 1918, on most roads very few switch ties and side-track ties were supplied, the needs of main tracks being properly first considered.

At the close of Federal control Jan. 1, 1920, the tie situation will be such that the railways as a whole will be about one year's renewals behind in normal tie requirements.

Other Track Material—This item embraces frogs, switches, crossings, guard rails, angle bars, tie-plates, track bolts and spikes and other track equipment. The deficiency in the supply of material of this character during 1918 was due principally to the absorption of steel for war purposes. This condition, however, ceased with the signing of the armistice, and no effort has been made since to place orders and secure the necessary supply of such material.

On typical roads the deficiency in maintenance of this item will amount to about 40%, as compared with the average of the test period.

Ballast—The annual requirement for repair ballast, as distinguished from new ballasting, is a considerable item, and is necessary properly to maintain track conditions as to surface and line and prevent deterioration of rails, ties and other track fixtures. During 1918 ballast conditions have not been maintained to the same extent as during the test period, there being a deficiency of about 30% on typical important railways.

Bridges, Trestles and Culverts—During 1918 the renewal of steel bridges was necessarily deferred, owing to the difficulty of obtaining material which was primarily absorbed for war uses, so that there has been an accumulation of work of this character. During 1919 twice the average annual program should have been carried out to make up the deficiency of 1918. No effort has been made to accomplish this, and in regard to the renewal of steel bridges the roads will return to private operation, at the end of 1919, at least one year, and on some roads probably more, behind in the maintenance of this item.

In the item of wooden bridges and trestles the year 1918 shows a deficiency of from 40% to 50% on typical roads, which is due to the inability to obtain material during the early part of 1918. The necessary effort has not been put forth to make up this deficiency. It is evident that the deficient maintenance in this item at the end of Federal control will amount to 30% to 40% of the average of the test period.

Buildings—Under Federal control there has not been the amount of new construction of buildings replacing old structures that obtained under private control, and the repairs to buildings generally have not been as extensive as under private operation. There is a deficiency of maintenance of buildings of all classes of approximately 25 per cent.

Upkeep of Equipment—The upkeep of equipment under Federal control as compared with the test period is very difficult of exact determination, particularly with respect to freight train car equipment, for the reason that under Federal control this class of equipment has been "pooled," and the payment of per diem for the use of freight cars was discontinued on July 1, 1918; this has resulted in "home" cars being on foreign lines, up to as high as 85% to 90% of a road's ownership.

"Foreign" Equipment Under-Maintained

The effect of this situation has been that the repair or maintenance of cars owned by a particular company while such cars were on "foreign" lines has been neglected, because in many instances the necessary material for such cars was not available. Also, foreign roads have no interest in the ownership—and therefore the condition of such foreign cars—and only the absolutely necessary repairs have been made to keep them moving. There has also been a change made in the method of charging for certain repairs of cars while on foreign roads, which expense must now be borne by

the foreign roads, while formerly such repairs were chargeable to the owning roads. Naturally, under this method foreign roads make the minimum repairs, to reduce operating costs.

Another element which affects the maintenance of equipment under Federal control is the reduction in the efficiency of labor as compared with that in corporate operation. The system of car repairs on the "piecework" basis, which was largely in effect under private control on most roads, has been entirely abolished under Federal control, owing to concessions made to labor organizations. This has not only reduced the efficiency of labor but has tremendously increased the cost of repairs per unit, which has resulted in a cost, on certain items, two to three hundred per cent greater than that which prevailed on the piecework basis.

Labor Inefficiency and High Costs

The practice of permitting certain classified repairs to equipment to be made by particular employees only has greatly increased the cost of the work and has reduced the efficiency of labor. As an illustration, where formerly one employee and a helper have performed a particular piece of work, such as taking down and setting up a "nozzle" in a locomotive, it will now require as many as six different classes of employees to perform such work. This practice has also resulted in poorer work, as it is difficult to place the responsibility for defective work where so many men are engaged upon it.

Locomotive equipment has been maintained in better condition under Federal control than any other class. This equipment has been kept on home roads and, except in particular instances, the previous practice of maintaining it has been continued. There has however, been a very large expenditure for labor-saving appliances, such as mechanical stokers, power grate shakers, reverse gears and other appliances which save the labor of engine crews without adding any efficiency to the locomotive. These items have added to the cost of maintenance of locomotives.

The maintenance of passenger cars under Federal control has not been kept up to the standard of the test period, because, owing to troop movements and the heavy passenger traffic due to war activity, passenger equipment has not received the usual general repairs which were customary under private control on account of its intensive use. The repairs to passenger equipment are behind about 25% as compared with the test period; with the reduction in troop movements it would be possible between now and the end of Federal control, Jan. 1, 1920, to make up a large part of this deficiency in maintenance if the proper effort and plans were made.

In the item of freight train car maintenance it is estimated that for the year 1918 the deficiency is from 30% to 40% on typical railways. On such freight cars as have been on foreign lines the amount expended for freight-car maintenance is about one-half that which has been expended on cars which were on home roads. With 70% to 85% of freight cars away from home, the extent to which freight-car equipment has been undermaintained can be readily estimated. It is estimated that at the end of Federal control the maintenance of freight cars will be nearly one year behind the usual program.

The deficiency in maintenance of the property of the railways during the larger part of 1918 was in part justified by war conditions such as the inability to get necessary materials, the shortage of labor and the intensive use of the plant, making usual repairs impracticable in many instances.

On the signing of the armistice, Nov. 11, 1918, this condition, however, was changed, and it would have been possible to make good this deficiency in many items. The whole deficiency could have been made up by the end of Federal control, by a proper program and with due regard to the necessities of the case.

The policy adopted by the United States Railroad Administration will not return the roads to their owners with the same maintenance expended upon them during the period of Federal control as during the test period. On the contrary, there is a policy to return them in an under-maintained condition, so that the administration will owe the railway companies for undermaintenance, rather than that a balance will be due the administration for overmaintenance. It is believed that this is an unfortunate policy and against the public interest. The public must depend upon the railways for adequate service to meet the ever-increasing demands.

The very least that should have been done was to return the properties in as good condition and with as complete equipment as when the roads were taken over by the Government, as contemplated under the Federal control act.

Deferred maintenance is a very delusive matter. It will cost the corporations two dollars in many cases to make good one dollar of deferred maintenance, if their properties are returned to them in a depleted condition. It will also make it impossible for the corporations to fulfill their proper functions when the roads are turned back to private control, and it will be years before the deficiency in maintenance, as well as the disorganization, is made good. The country has paid dearly for its experience in Government control and railway operation, but if it will save the country from the greater peril of Government ownership the public in the end will have profited by the experience.

Water-Works Rates and Meters in Kansas

Data concerning water rates and the use, ownership and maintenance of water meters in Kansas municipalities are presented and summarized by F. M. Veatch, acting engineer, Kansas State Board of Health, in a recent issue of *Kansas Municipalities*, published at Lawrence. Requests for information were sent to 213 superintendents. Of these 113 replied — 102 for municipally owned and 11 for privately owned works. Within the past five years 43.5% of the 113 works have changed their rates and 56.5% have not. Water bills are paid monthly in 98 cities and quarterly in 15. There is a hydrant charge, averaging $31.40, in 43 cities, or 38% of the number reporting. Of the 113 cities, 93, or 82.3%, have over and 17, or 15%, have under 50% of their taps metered and only three works, or 2.7%, depend on flat rates. Ownership of meters is 48% by either the city or the company, 39% by consumers and 13% mixed. Meter installations are 52% by the city or company and 48% by consumers, and maintenance of meters is 65% by the works and 35% by the consumers.

Large Train-Shed Raised Without Traffic Interruption

Subsidence of Pile Foundations of Lackawanna Railroad Structure at Hoboken, New Jersey—Behavior of Cast-Iron Columns—Progressive Jacking

THE Delaware, Lackwanna & Western R.R. has just completed the raising of the smoke-duct train-shed at Hoboken, N. J., which covers about five acres and weighs some 9000 tons. The work was done without interruption to traffic in the terminal, which amounts to 50,000 passengers per day. During 13 years of service there had been irregular settlement, in amounts of 5 to 16 in., in the pile foundations driven into the mud of what once was the bed of the Hudson River. It had, therefore, been necessary to bring the trucks up to a temporary grade, and it was recently decided to raise the shed to a permanent level in order to accommodate the largest locomotives on all tracks. During the work, the raising of one section at a time by simultaneous jacking of the columns was abandoned after it had been found possible to jack continuously from one end of the structure to the other, without disconnecting it at each expansion joint. A feature of the settlement and raising was that some important changes in the design of the original structure were suggested. The shed was built in 1906 and was the first of the Bush type, or smoke-duct, train-sheds in this country. The general plan and elevations are shown in Fig. 1. Details of the typical section are shown in Fig. 2. The train-shed itself is supported on 207 cast-iron columns. It is divided laterally by expansion joints at every fifth column and at the point adjoining the roof of the concourse. Descriptions of the structure appeared in *Engineering Record* of June 24, 1905, p. 706, and in *Engineering News* of Sept. 20, 1906, p. 297.

The foundations of the shed consist of four-pile clusters supporting each of the column piers. The platforms and tracks are carried on piles at 9-ft. centers. All of the piling is over 80 ft. in length. As measured at the columns, settlement of 5 to 16 in. had occurred. While the reasons for settlement are not apparent, it is thought to have been brought about by the same general conditions as those which almost invariably have produced settlement in heavy structures supported on piles driven in the silt of the Hudson River. Irregular settlement of the tracks had also occurred, so that it was necessary to bring them up to a temporary uniform grade. Since this made it impossible to use all of the tracks for the largest locomotives in service, it was recently decided to raise the shed, and, now that this has been completed, the tracks will be brought up to permanent grade, and the level of the train platform will be raised by filling in with concrete. Typical profiles of old and new levels are shown in Fig. 3.

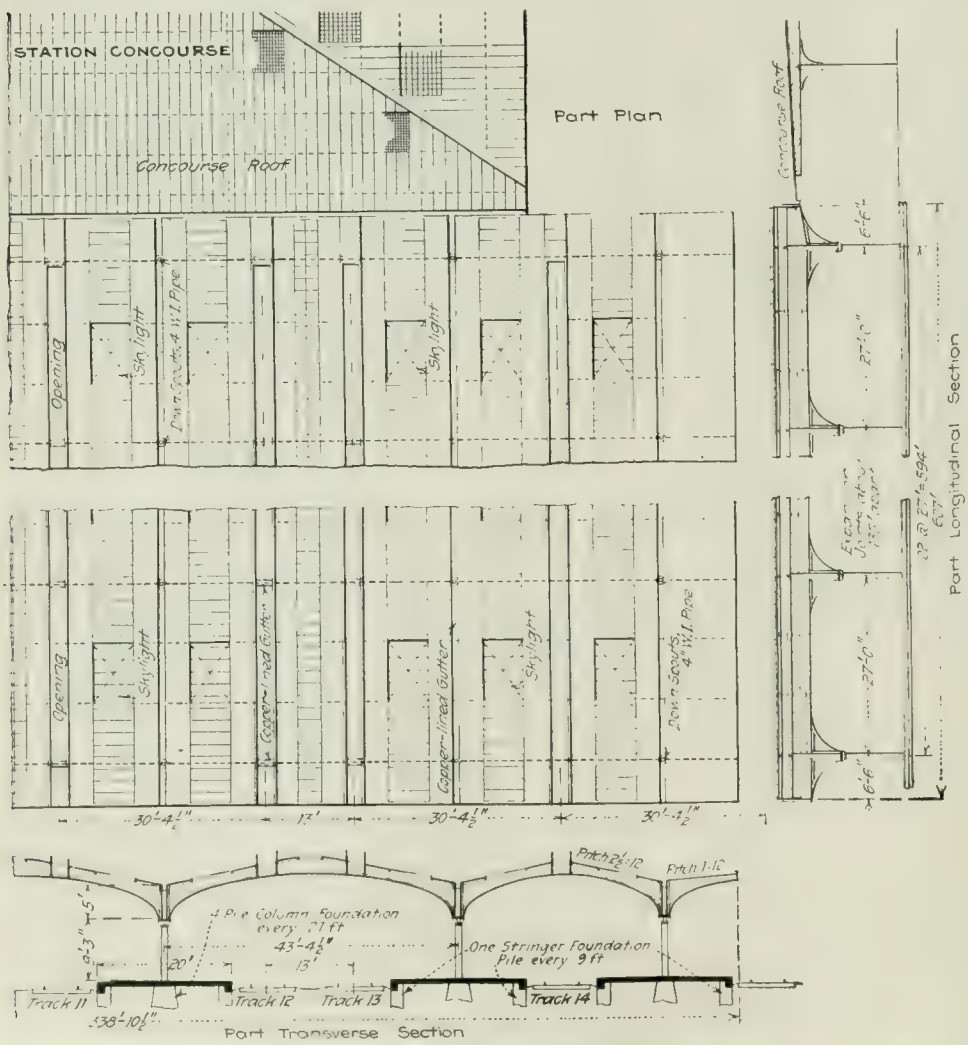


FIG. 1. TRAIN-SHED OF LACKAWANNA RAILROAD, COVERING FIVE ACRES, RAISED AFTER SETTLEMENT OF PILE FOUNDATION

In raising the shed, one of the most important considerations was to insure the continuous and uninterrupted service of all portions of the terminal, with as little inconvenience to passengers as possible. Only a small space, which was roped off down the centers of the platforms, was reserved for jacking operations. Difficulty was experienced in making temporary provision for drainage during the heavy rains which occurred during the work, as the downpipes were located inside the columns and had to be disconnected at the base before raising started.

It was at first thought that further settlement might occur as soon as jacking operations began, and provision was made accordingly by the use of jacks capable of making lifts considerably greater than those called for. During all periods of the work it was necessary to exercise the greatest care to avoid too rapid or unequal jacking, in order to prevent damaging

the structure. It was considered necessary to disconnect the shed laterally at each of the four expansion joints and at the roof of the concourse, dividing it up into five sections so that each section could be raised separately by jacking all of the columns simultaneously.

Preparations for the work involved cutting away the concrete around the bases of the columns and removing

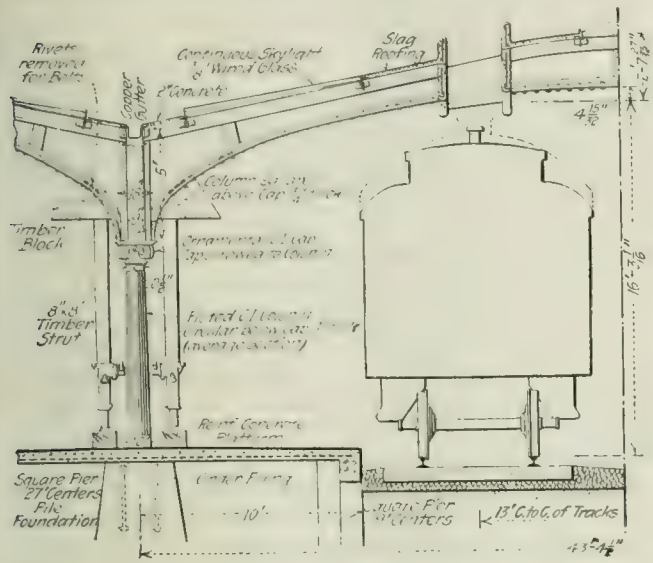


FIG. 2. DETAILED CROSS-SECTION—JACKS IN POSITION

rivets from the flanges forming the section of the roof support next to the columns, in order to provide for bolting on wooden blocks to take the jacking shores, as shown in Fig. 2. The jacks were set on timber blocks placed on the concrete train platform and worked against 8 x 8 timber struts placed under the blocks at the tops of the columns.

When jacking started, the east section of the shed had been separated from the rest of the structure by disconnecting of the expansion joints at the fifth column and at the concourse roof. Some of the columns were considerably lower than those adjacent to them on both sides, and it was believed at first that these columns (which required the greatest lift) could be raised approximately to the elevation of those adjacent to them, with a comparatively small jacking force. It was found, however, that certain portions of the structure had taken a permanent set and that the columns adjacent to the lower joints had also to be raised slightly during the first period of jacking. All of the columns in the section were then jacked simultaneously to the required elevations.

It was indicated during the raising of this section that the remainder of the shed could be jacked continuously without disconnecting at the other three expansion joints, and at a saving of considerable expense. The method employed is shown diagrammatically in Fig. 4. The bents of columns in the next section (A, B, C, D and E) received an average lift of, say, 2 in.; columns A, B, C and D would then receive an additional lift; then columns A, B and C, and so on, until the new elevations had been reached. As soon as the required lifts had been made, the bases of the columns were concreted in and the jacks were removed. Then jacks would be applied to the adjacent columns, F, G, H, etc., and the process carried on continuously to the far end of the shed, until jacking and concreting were completed. There has been no apparent failure, due to jacking, in any of the longitudinal members.

Experience developed during the settlement and raising of the structure has demonstrated, in the opinion of some, the desirability of several changes in the original design. It was found that about 30 of the 207 cast-iron columns had failed. As far as could be determined, not more than five or six had failed in jacking. It was noted that several had cracked longitudinally, and it is thought that this type of failure had undoubtedly been produced by bursting from freezing. In some of the columns the failure took place in the machined portion, extending for 4 or 5 ft. into a tight fit in the bases of the fabricated roof arches. While it is recognized that erection stresses and wind stresses may have been a contributing factor in the failures, the conclusion has been drawn that stresses set up during settlement were

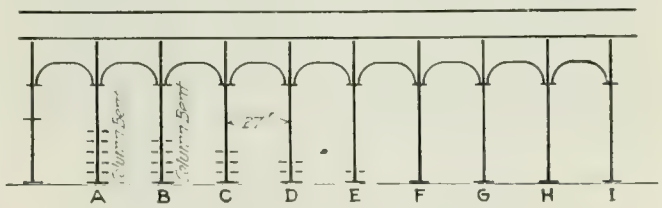


FIG. 4. SHED RAISED BY PROGRESSIVE JACKING

the chief factor in most of the breakages, and that steel columns should be used rather than those of cast iron, for similar structures, when settlement is at all likely.

Following the raising of the shed, the skylight area is now being reduced by half, through the substitution of reinforced-concrete slabs. It was found very expensive to maintain so large an area of wired-glass sky light, on account of excessive breakage, and skylights of the

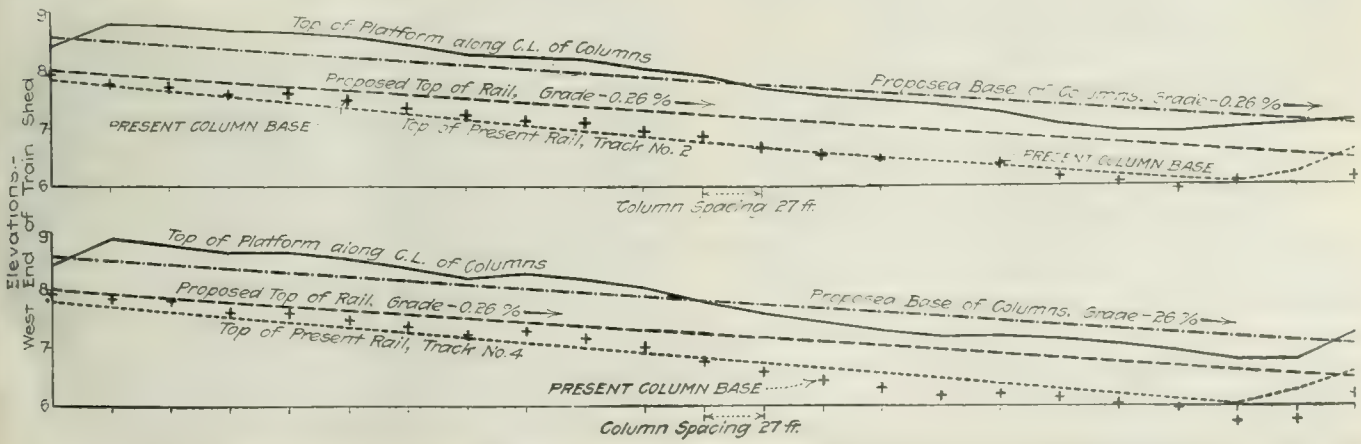


FIG. 3. TYPICAL PROFILES OF OLD AND NEW LEVELS. LIFTS OF 5 TO 16 INCHES REQUIRED

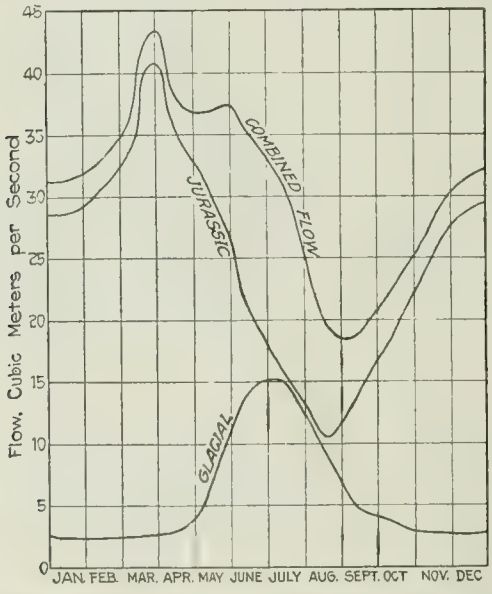
vault-light type will be substituted for the remaining skylight area. Another suggested improvement, over the original design, is in the drainage system. On account of the inaccessibility of the downpipes inside the columns, connecting with central drains under the tracks, and difficulties experienced from clogging with cinders, it is thought that drains on the outside of the columns would be preferable and that, in a new design, manholes in the train platforms should be provided to give access to the central drains in the event of serious clogging.

The work of raising the shed commenced early in June with the cutting away of the concrete around the column bases. About ten men were engaged in this work continuously for approximately a month. At the same time, work was started removing a sufficient number of rivets from the flanges of the arches so that blocks could be bolted on. This was still in progress after jacking had started in the middle of July. Jacking was completed Aug. 12. About 40 men were engaged in the work. It was done by the forces of the railroad company, in charge of L. L. Tallyn, acting chief engineer, A. E. Deal, bridge engineer, and M. H. Doughty, division engineer.

Utilizing Differences in Seasonal Stream Flow in France

By Edward H. Sargent
Senior Assistant Engineer, New York State Conservation Commission, Albany, N. Y.

In making an investigation of the water-power possibilities in France susceptible of use by the American Expeditionary Forces, the writer came upon an interesting utilization of the difference in phase of rivers having their origin in different climates. The rivers in France which rise in the Alps are called "glacial" streams, while those that flow through the central part



SEASONAL VARIATIONS OF GLACIAL AND JURASSIC STREAM FLOW IN FRANCE DUE TO CLIMATIC EFFECT

of France are called "Jurassic." The "glacial" streams, as their name implies, are fed from the melting of snow and ice, and consequently have their highest flows in the summer months. The "Jurassic" streams are more akin to the streams of the Eastern United States and have their high flows in the spring and the low flows in the summer. One of the larger water-power companies, the "Compagnie d'Energie Electrique du Litteral Méditerranéen," took advantage of this difference of phase of two rivers and developed and interconnected water-power plants on both rivers.

The flow of the individual rivers and of the two combined are shown on the accompanying diagram. As the heads of the two plants are about the same, it is interesting to note the effect of adding the corresponding flows of the two streams. The diagram shows that the period of the lowest water of one river almost coincides with the period of the highest water of the other. The lessening of the need of auxiliary power by this happy combination is very apparent.

The English Land Drainage Act of 1918

Largely extended powers to provided land-drainage works and to organize drainage boards are now available in England, according to an article by H. T. Wakelam, county engineer of Middlesex, England, in *The Surveyor and Municipal and County Engineer* of Aug. 8, 1919. Mr. Wakelam states that action under the drainage acts of 1847 and 1861 had proved to be "so difficult and expensive that, owing to the extraordinary conditions and requirements in connection with the production of food during the war it became necessary for the Government" to pass supplementary legislation.

The primary object of the new act is to make possible flood-prevention work to obviate floods that "have been caused by inadequate drainage, and in many cases by complete lack of drainage facilities."

Under the new act, petitions may be submitted to the Board of Agriculture and Fisheries by county councils, county boroughs, existing drainage boards and land owners, for the formation of drainage areas to be administered by drainage boards. County councils may also petition the board named to enable them to take over the powers, duties and properties of existing drainage authorities. In such cases the Board of Agriculture and Fisheries consults with the Local Government Board before ordering a transfer.

Drainage boards organized under the new act are authorized, according to Mr. Wakelam, "to undertake flood prevention and other works of an engineering character at the cost of the owners of any lands within such areas as may be prescribed and which may benefit from the carrying on of any such work."

The act is outlined in considerable detail by Mr. Wakelam in the article mentioned.

Gas Producers at Small Water-Works Station

Gas producers are used as a source of power at the water-works pumping station of Manchester, Mass., according to a statement by Henry A. Symonds, civil engineer, Boston, in a paper on "Engines for Small Water-Works," published in the *Journal of the New England Water Works Association* for June, 1919. One producer supplies two 65-hp. engines direct-connected to two Gould's vertical triplex pumps, each having a capacity of 700 g.p.m., operating against a head of 280 ft. The second producer supplies 50-hp. engines direct-connected to two Gould's double-acting triplex pumps, having a capacity of 530 g.p.m., each against a head of 280 ft. These units show an efficiency of 150,000,000 ft.-lb. per 100 lb. of fuel in daily operation.

Corrugated Spacer Used for Wood-Block Pavements

Simple Cardboard Device Spaces Blocks, Provides for Expansion and Stops Bleeding—Method of Laying Changed

By John S. Crandell
Consulting Engineer, The Barrett Company, New York City

TO PREVENT bulging of wood-block pavements due to swelling a corrugated cardboard spacer was tried recently on W. 34th St., New York City, between 5th and 6th Aves., with satisfactory results. While giving a uniform spacing for the admittance of filler, thus sealing the pavement against the percolation of water, the spacer also allows for expansion. Furthermore, bleeding of the filler is stopped, as the spacing material acts as a dam. The only change in construction methods is in setting the blocks.

Thirty-fourth street is subjected to intense traffic, both pleasure and commercial. The old wood-block pavement had been cut and had settled in a number of places, and it became necessary to re-lay much of the surface. As far as possible, the old block was salvaged and used for re-laying. Probably 75% of the repair was made with the old block. The new block is of width different from the old, but of the same depth. On removing the block, it was found that the sand cushion had shifted considerably, causing much of the unevenness of the pavement. Therefore a sand-cement bed was substituted for the plain sand cushion, and the blocks were bedded on it.

Numerous devices have been tried in the past to space wood blocks sufficiently to permit the entrance of paving pitch into the joints. For a number of years the wood-block pavements in London, England were laid with strips of wooden lath between the rows of blocks. While this undoubtedly spaces the blocks so that the filler readily finds its way to the bottom of the joints, lath is not sufficiently compressible to permit the blocks to expand at the bottom, and buckling takes place whenever the blocks absorb water. Lug block is also used and has proved satisfactory in overcoming buckling, but nothing has been used as a spacer between plain rectangular blocks that had been successful in permitting them to expand.

The corrugated card-board used on 34th St. to accomplish this result is single-faced and is laid in the transverse joints of the pavement, as shown in the view.



CORRUGATED CARDBOARD SPACER PERMITS EXPANSION

Itis $\frac{3}{16}$ in. thick by $1\frac{1}{4}$ in. deep. The paver must change his method of laying the blocks so as to lay one row continuously across the street, as the strip interferes with the usual method of laying four or five rows at once. However, after a short time the pavers are able to lay almost as rapidly as under the old method. The foreman, John F. Schlier, stated that he was able to lay the same yardage per day using the strip as without it.

After the pavement is laid, paving pitch is poured over the blocks and squeegeed into the joints in quantities



PITCH SQUEEGEED INTO JOINTS

sufficient to fill them to one-half their depth. Sand is swept into the unfilled space, and the pavement is immediately ready for traffic. The end joints of the blocks are filled by the pitch running around the corners from the transverse joints. Thus, all of the interstices in the surfacing are completely sealed against the entrance of water, and every joint is an expansion joint, permitting the blocks to expand to their maximum size without causing any buckling of the pavement.

One noticeable feature was the absence of filler on the top of the blocks. When properly squeegeed the pitch finds its way readily into the joints, and the tops of the blocks are practically free from it. This undoubtedly will prevent the formation of objectionable mat coats of filler. The spacer also acts as a dam to prevent the filler, which extends only slightly above it, from running to the gutters, no matter how great the crown or grade.

While the spacer is $\frac{3}{16}$ in. in thickness, it is impossible to keep the joints down to that width. The open spacing may be seen in an illustration. Measurement of a large number showed that the average width is $\frac{1}{4}$ inch. At the present writing, the patches have been down several weeks, and there is no sign of bleeding or of the blocks dragging under traffic.

Corrugated paper is inexpensive and can be obtained in quantity from manufacturers, and cut to the required size. Ordinarily, the paper comes in rolls 250 ft. long by 36 in. wide. This can be cut by the manufacturers into strips 250 ft. long by $1\frac{1}{4}$ in. wide, or any other width that is desired. However, experiment has shown that $1\frac{1}{4}$ in. is the most satisfactory width to use. A patent has been applied for by the writer.

The work described was laid under the supervision of William E. Dey, engineer of maintenance, Bureau of Highways, Borough of Manhattan.

Fundamentals in the Design of a Multiple-Arch Dam

Applicability and Restrictions of This Type of Structure and Principles Controlling Its Design—Illustrated by the New Lake Eleanor Dam for San Francisco Water-Supply

By R. P. McIntosh
Hydraulic Engineer, City Engineer's Office, San Francisco, Calif.

MULTIPLE-ARCH concrete dams are comparatively recent in engineering practice, but they are receiving increasing favor, particularly on the Pacific Coast. Their use, however, has not been wide enough as yet to establish any standards of applicability or design. In the preparation of the plans for the Lake Eleanor dam, a unit of the Hetch Hetchy water-supply for San Francisco, the writer, under the direction of M. M. O'Shaughnessy, city engineer, and with the collaboration of R. J. Wood, devoted some attention to the standardization of the design of dams of this type. Lars Jorgensen, consulting hydraulic engineer, also collaborated on these plans. From this work there developed some conclusions that seem worth recording for future reference.

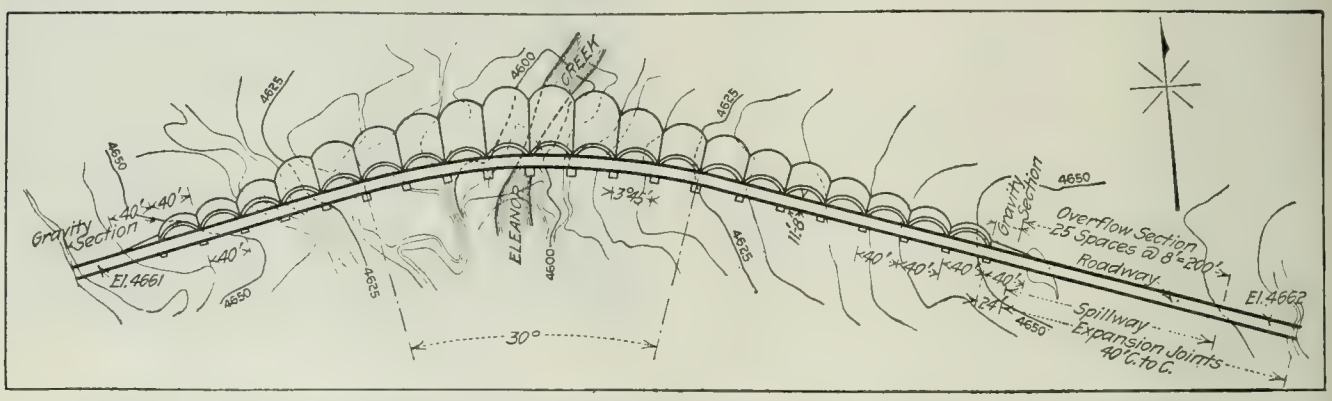


FIG. 1 PLAN OF LAKE ELEANOR DAM FOR HETCH HETCHY WATER-SUPPLY, SAN FRANCISCO

General Considerations in Design—Application of the multiple-arch dam should be limited to locations where there is a solid rock foundation, or one which can be thoroughly solidified by artificial means, thus entirely preventing the settlement of any of the buttresses.

For dams higher than 125 ft. the buttresses become large and require a great deal of bracing in order to prevent failure by buckling. The cost of the structure above this 125-ft. height increases quite rapidly, and, except in certain cases where special topographic features or other conditions govern, it will probably be found that a single arch or other type of dam will be more economical. For the usual conditions met, and for dams less than 100 ft. in height, the multiple-arch type may effect a saving in cost of from 10% to 25% over either the single-arch or the gravity concrete dam.

Under all conditions of water load, the arches are practically subjected to compressive stresses only, and no steel would be required if it were not for the fact that tension may be found to exist over part of the arch section when stresses due to temperature changes and rib shortening are considered.

Arch Span—In deciding on the arch span, several points must be kept in mind: (1) The total concrete in the buttresses is theoretically independent of the arch span; (2) the span length should be a constant throughout the structure; (3) short-span arches will require less material than long-span ones; however, the cost of the structure may not be less with short spans, since a great deal of additional form work is required, and also the satisfactory placing of the concrete and steel in the thin sections becomes slow, tedious and expensive; (4) a certain minimum thickness of first-class concrete is required in the arches for water-tightness, and this would have to be provided, even if short spans were used; (5) very thin buttresses (based on short arch spans) would require excessive bracing to prevent failure by buckling before the unit stresses even approached the crushing strength of the material.

Based on a study of the above facts, the most economical limits for the arch span will be found to vary from about 25 to 50 ft., depending upon the height of the dam, the 50-ft. span being used for dams about 100 ft. in height.

Length of Upstream Radius—It is a well known fact that the most economical arch is one which subtends a central angle of 133½°, and that variations up to 15% from this value do not increase the volume of the arch more than 1% or 2%, and this is permissible in order to meet other conditions. (See Am. Soc. C. E. *Transactions*, Vol. LXXVIII, p. 690.) With the central angle and span known, the upstream radius is readily calculated. This radius should be kept a constant from the top to the bottom of the arch.

Slope of Water Face—For a given arch span, upstream radius, allowable unit stress, and height of dam, there is an "economical slope" for the water face which will give the minimum volume to the dam. In computing the volume for several cases (in which the arch and pier footings, braces, etc., were not considered) it was found that for heights of 50 to 75 ft. the economical face slope was about 50° with the horizontal, and for dams from 25 to 50 ft. high this angle is nearer 60°. However, a variation of a few degrees will have practically no influence on the final cost of the structure.

Arch Thickness—A preliminary or trial arch thickness can be found from the simple formula: $t = PR/q$ where t = arch thickness in feet for any horizontal depth; P = water pressure in pounds per square foot; R = radius of upstream face in feet and q = average stress in pounds per square foot. However,

since the radius of the arch is usually comparatively small, the above formula will give a thickness which should be considered the minimum, and it will usually be found desirable to increase this thickness very materially in order to secure water-tightness as well as an arch which has sufficient stiffness for the span length. Of course, the same result could be obtained by using a low value for q, the intensity of stress. The designer will have to assume a practical thickness for the arch ring near the top, since the above formula (being based on water pressure) gives a zero value for t. When the final analysis of the stress in the arch is made, it will be necessary (as will appear later) to include one component of the weight of the arch itself along with the water pressure.

Shape of Arch—It has been customary in most of the multiple-arch dams built to make the arch barrel a cylinder; that is, the radius is given in a normal plane making a normal section circular, the thickness at the crown and springing line being the same. This is obviously incorrect, since a point at the crown of the arch will always be higher than a corresponding point at the springing line, and this difference in elevation causes a normal arch ring to be subjected to a variable loading—which means, if the normal section is a circle, that the line of pressure will not even approximately coincide with the arch axis. Unnecessary bending stresses are thus introduced. This is more noticeable in the upper part of the structure.

The more logical method is to make the radius horizontal, giving a circular section of constant thickness in a horizontal plane, where the water pressure is a constant. A normal section will then be elliptical and the thickness will increase from the crown to the springing line, giving greater stability to the arch ring.

By this method the center line of the arch ring and the line of pressure can be made to coincide quite closely for all depths.

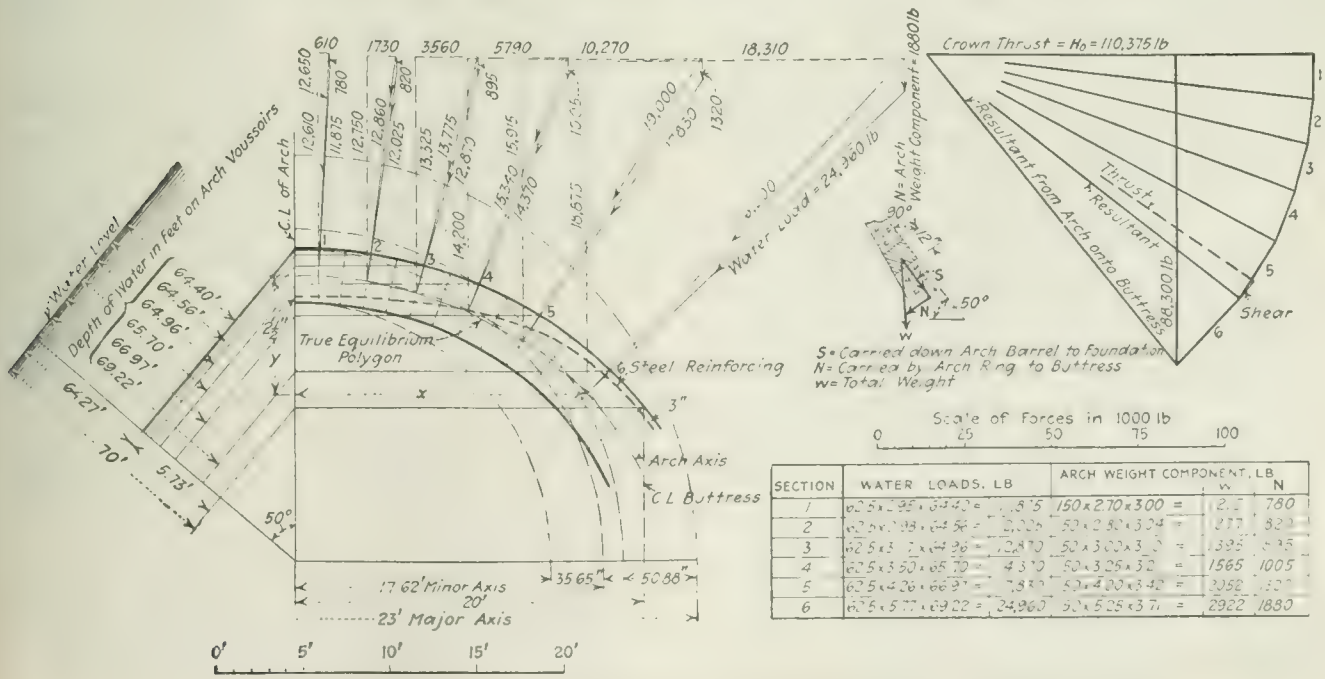
It is better to make the top few feet of the arch barrel vertical (it will be circular), since if the inclined face is carried to the top there will be triangular portions of the barrel at the top, next to the buttresses, which will be subjected to cantilever bending, there being nothing to offer a reaction along the top end or face.

The extreme upper and lower ends of the inclined arch barrel are not capable of being rigidly analyzed.

Division of Arch Weight—The weight of the arch barrel itself is carried in part to the buttress and in part down the arch to the foundation. Since these two components are sometimes confused, the small diagram in Fig. 2 is used to illustrate the conditions. The weight of each element (w always acting vertically) can be considered as broken up into two components, N and S. The S component is carried down the arch to the foundation, and the N component is carried by the arch into the buttress. Furthermore, regarding the normal component N there exists a difference of opinion among designers as to the direction of its action. Some engineers consider it to act normal to the arch face at all points and therefore to be directly additive to the water pressure. It is believed that the more correct method is to consider N as always acting normal to the face of the buttress. It naturally follows that the amount, point of application and line of action of the resultant force on the buttress will vary considerably, depending on which of the above two methods is used.

As a contention for the latter method, the following argument against the former should be noted: In the limiting case in which the arch barrel subtends an angle of 180°, if the last element of the arch next to the face of the buttress is considered, it will be seen that the line of action of the S component down the arch barrel is here parallel to the face of the buttress, and if the N component (always at right angles to S) acts normal to the arch face, it would also be acting at right angles to the direction of the weight w. In other words, we would be resolving a force into two components, one of which forms an angle of 90° with the original force, and this, of course, is impossible.

Buttresses—The buttresses are first given some trial dimensions based on the designer's judgment, care being taken that the upstream face of the buttress is at all



SECTION	WATER LOADS, LB	ARCH WEIGHT COMPONENT, LB	
		W	N
1	62.5 x 3.5 x 3.40 = 745	150 x 2.70 x 3.00 =	1215 780
2	62.5 x 3.98 x 64.56 = 2,000	150 x 2.80 x 3.04 =	1277 820
3	62.5 x 3.[illegible] x 64.96 = 2,870	150 x 3.00 x 3.[illegible] =	1395 [illegible]
4	62.5 x 3.50 x 65.70 = 4,310	150 x 3.25 x 3.2 =	1565 1005
5	62.5 x 4.26 x 66.97 = 7,830	150 x 4.00 x 3.42 =	2052 1320
6	62.5 x 5.77 x 69.22 = 24,960	150 x 5.25 x 3.7[illegible] =	2922 1880

FIG. 2. STRESS ANALYSIS OF AN ELLIPTICAL ARCH RING OF DAM AT 70-FOOT DEPTH

points wide enough to receive the two adjacent arches. This trial section is then analyzed to see that the amount and distribution of the stresses are within the allowable practical limits. The graphical method is the most convenient for this purpose. The dimensions and batter for the buttresses in the low part of the dam (near the ends) need not be kept the same as for the high sections.

There should be some form of bracing between the buttress such as reinforced struts or beams, etc., which are capable of withstanding either tension or compression. It is also well to place small stiffening wings or counterforts on the buttresses near their downstream face (and at other points if desired).

The amount and distribution of steel in the buttresses is mainly dependent on the designer's judgment. At the upstream face, or junction with the arches, additional stiffness should be provided by embedding three or four rods (hooped as in columns) on a slope parallel to that of the face arches. This construction also offers an extra means of tying the arch reinforcement into the buttress. Some of the struts between buttresses should be placed opposite these inclined girders. It is considered by some designers that in case one arch should fail this hooped column or inclined girder will take up and distribute to the buttress the unbalanced thrust from the remaining arches and thus prevent the entire dam from collapsing. While there may be a tendency for the girder to act in this way, no such dependence should be placed on it in designing.

The reinforcement in the buttress, aside from taking care of the temperature and part of the shearing stresses, acts in conjunction with the system of counterforts and braces between piers, helping to take care of wind stresses and to stiffen the pier against buckling.

Forms—The form work, scaffolding, etc., play a very important part in multiple-arch dams, and for this reason should receive special consideration. If this is not done, the cost of the dam may be considerably increased, due not only to the quantity of lumber required but to the large number of carpenters and laborers necessary to keep the form work ahead of the concrete pouring and thus prevent delay in the completion of the structure.

The fact that the normal section of the arch barrel is made elliptical, rather than circular, does not introduce any additional difficulty into the construction work, if the proper design is made, and the office work is increased only slightly.

Design of the Eleanor Dam

The above principles will probably be more readily understood by giving an outline of their application to a specific case. For this purpose the Eleanor dam will be used.

This dam lies in the Sierra Nevada Mountains at an altitude of 4650 ft. It was recently completed and is one of the first units of San Francisco's great Hetch Hetchy water-supply project. The main purpose of the present low dam is to supply water for a power plant for construction purposes.

As shown by accompanying plans, the dam consists of 20 arches, each with a span of 40 ft. and inclined at an angle of 50° with the horizontal. The eight center arches are themselves on a curve. At the ends of the dam, gravity sections are used, one of which is of the overflow type and provides the necessary spillway.

The foundation is solid rock. The height of the central arches is practically 70 ft. This dam will form part of the upstream toe of a future rock-fill dam similar to the Morena Dam, San Diego, with an ultimate height of 150 to 175 ft., and this accounts for the dam being curved in plan.

From various preliminary studies it was decided that the most economical dam meeting present and future requirements would result with a pier spacing of 40 ft. and a face inclined at an angle of 50° to the horizontal.

The radius of the upstream face of the arch barrel was made 23 ft. in a horizontal section. This, with the 40-ft. buttress spacing, gives a subtended central angle of 120° 50′, which differs less than 10% from the theoretical economic value. (See Fig. 3.) The top 7 ft. of the arches is made vertical, the horizontal radius of 23 ft. being maintained.

Arch Thickness in Horizontal Planes—The upper 7 ft. (vertical) was made 15 in. thick, which was considered to be about the practical minimum to meet all conditions. At the maximum depth of 70 ft. the thickness is pracically 4 ft. horizontally and 3 ft. 1 in. in a normal plane. Substituting the 4-ft. thickness in the

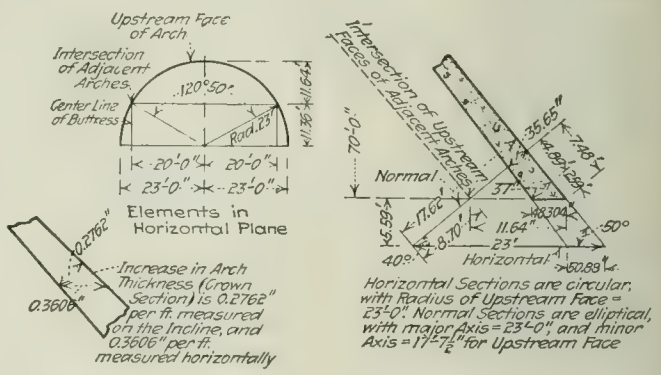


FIG. 3. DETAIL POINTS IN DESIGN OF MULTIPLE-ARCH DAM

formula $t = PR/q$, the average stress due to water pressure is seen to be only 175 lb. per square inch. This will be increased somewhat by the additional weight component, etc.

Buttresses—The dimensions of the buttresses for this dam (Fig. 4, next page) were governed somewhat by the fact that it was necessary to carry a 12-ft. roadway along the top. This roadway, which was designed continuous, also served to tie the whole structure securely together at the top, and lessens the number of struts required between piers. It will be noticed that the batter on the sides of the lower piers is less than for the high ones.

Typical Calculations at 70-Foot Depth—The section of the elliptical arch ring, which strikes the buttress at a depth of 70 ft., is shown in Fig. 2. There is also shown in this figure the loading (consisting of water load and the portion of the concrete arch ring weight which is carried to the buttress), as well as the force diagram and true funicular or equilibrium polygon. The dimensions of the arch ring will be clear from an inspection of Fig. 3.

Unless the designer has, by means of his experience or otherwise, made a good guess as to the thickness of the arch barrel, he will find on analyzing the arch rings at various depths that the equilibrium polygons will deviate considerably from the arch axis, and it

will be necessary to assume a new thickness and run through the analysis again.

In testing the preliminary arches a great deal of labor can be saved by using an approximate method such as is given in "Reinforced-Concrete Construction," by Hool, Vol. III, pp. 46 and 58. When a tentatively satisfactory section has been found by the above method, it should be completely analyzed by the elastic theory in order to obtain the true equilibrium polygon and determine the true stresses. After one or two trials an arch shape and thickness can be found in which the equilibrium polygon coincides very closely with the arch axis throughout its entire length, thus giving lower maximum stresses.

The method of analyzing the arch ring by the elastic theory will not be gone into in detail in this article, since the method is entirely standard and can be bound in any good treatise on reinforced concrete, such as Hool or Turneaure and Maurer. The method is essentially as follows: The arch ring is divided into an even number of sections in such manner that S/I is constant for all.

The loads on the sections are next computed and their line and point of application shown on the arch ring. The next step is to compute the thrust, shear and bending moment at the crown (this thrust will act horizontally and the shear will be zero for the present case; that is, symmetrical loading). Construct the force diagram and equilibrium polygon as shown in Fig. 2. Determine thrusts, shears, bending moments and eccentric distances at the centers of the divisions of the arch ring. These thrusts and shears are readily found with sufficient accuracy from the force diagram (as shown) but the moments should be computed algebraically. Compute the thrusts, shears, and moments, due to variation of temperature and rib shortening. Combine the thrusts, shears and moments due to the loads with those resulting from temperature and rib shortening and compute the maximum stresses, compression in the concrete and tension in the steel. It will be found that the shears are usually small and need not be considered. Thrusts and moments due to rib shortening are also, as a rule, comparatively small.

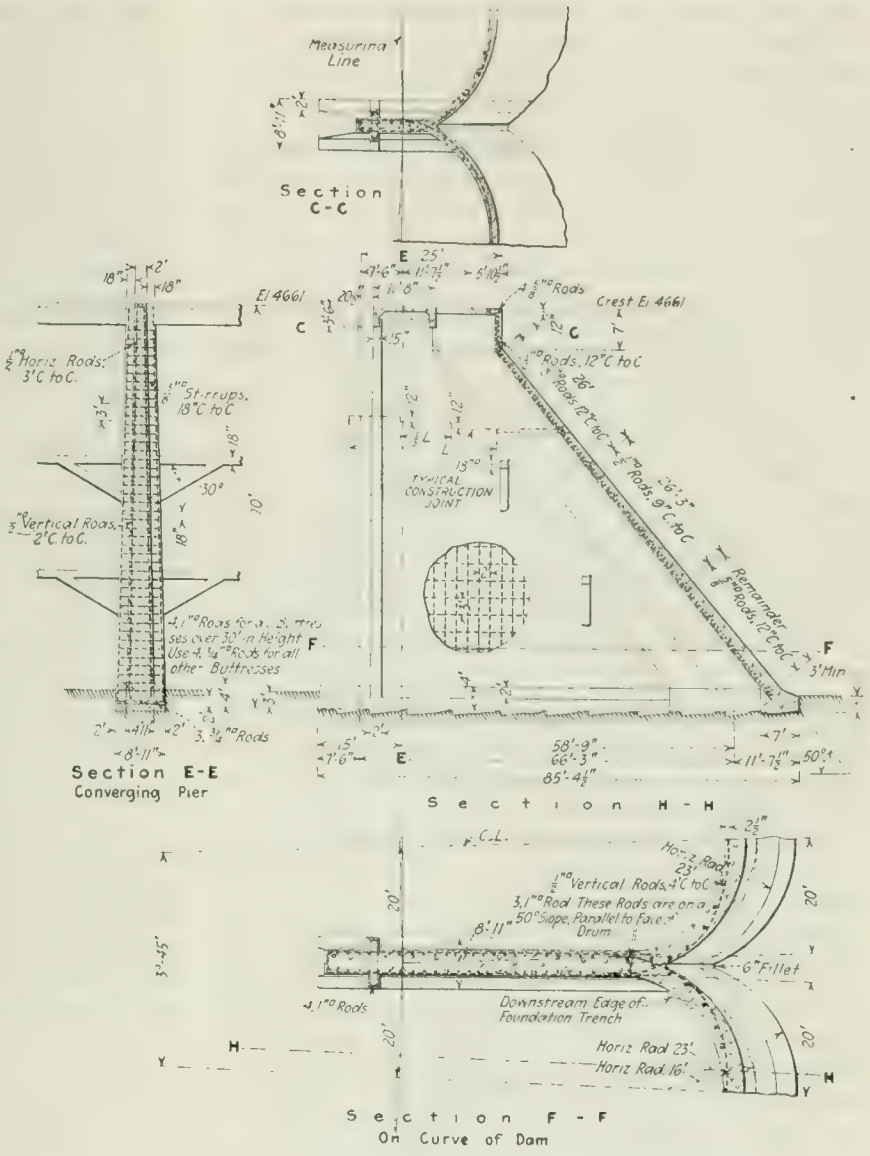


FIG. 1. DETAILS OF THE CONSTRUCTION OF THE LAKE ELEANOR DAM

The stresses in the concrete of the Eleanor dam, computed as outlined above, were kept slightly below 300 lb. per square inch and the stresses in the steel below 4000 lb. per square inch (due to water load only).

Temperature considerations are more important in the upper part of the structure, since the lower portion is usually covered with water. Also, the lower portion of the arch barrel is thicker and more heavily reinforced.

Rib shortening stresses, as stated above, are usually small. The crown thrust when found may be expressed as a percentage of that due to temperature, then the resulting moments and stresses will be this percentage of those due to temperature change.

The analysis for temperature and rib-shortening stresses is a part of the standard elastic theory and need not be considered in detail here. For method of finding these stresses as well as obtaining the maximum stresses in the arch ring, see Turneaure and Maurer, pp. 342-343, and Hool, Vol. III, pp. 50-60.

In the Eleanor dam, considering the arch ring at the bottom of the vertical portion of the barrel (that is, 7 ft. below the top) there is, for a temperature change of 50°, a crown thrust of 1060 lb. and a crown moment of 4110 ft.-lb. The average stress due to water load on the arch is 8050 lb. per square foot and the total thrust 10,060 lb. (thickness of ring 1.25 ft.). Crown thrust due to rib shortening is 100 lb.; crown moment, 385 ft.-lb., with crown moment due to water load taken as zero. The combined crown thrust is 11,220 lb., the combined crown moment, 4495 ft.-lb., and the resulting stresses in pounds per square inch are 215 for concrete and 3200 for steel.

It might be well to note that the temperature stresses may never actually be as large as computed, since the change in temperature is gradual, and tests seem to in-

dicate that some sort of "flow" occurs in the concrete which tends to relieve the stress to a certain extent. The amount of this relief may be as high as 50% (or more), depending on the relative magnitude of the stress and the time factor.

Buttress Design—The dimensions given to the buttress, together with the bracing, counterforts and steel reinforcing, are clearly shown in the accompanying figures.

The most important external forces acting on the buttress are the arch thrusts (or, more correctly, the component acting normal to the face of the buttress). The effect of wind pressure need not usually be considered if the buttresses are well braced.

To indicate the method, the buttress analysis is shown for a depth of 70 ft. (or at the foundation). (Fig. 5.) From the stress analysis of the arch ring at 70-ft. depth it is seen that the component of the arch thrust normal to the buttress is 88,300 lb., and since the buttress is subjected to this force from an arch on each side the amount must be doubled. This quantity, 176,600 lb., is then laid off at right angles to the face of the buttress to any convenient scale, as shown.

The top 7 ft. of the arch barrel is vertical and of constant thickness (15 in.). The normal component of the thrust on the buttress is 8925 lb., or 17,850 lb. for two arches. The normal component of the thrust on the abutment from the elliptical arch at the top of the inclined arch barrel (in line *AB*) is 13,900 lb., or 27,800 lb. for two arches. These thrusts are laid off as shown in Fig. 5, and the diagram *TOLXERT* is completed as shown. This area will represent the pressure on the buttress, the resultant passing through the center of gravity. An allowable approximation which simplifies the work and is on the side of safety may be introduced at this point, namely, the simple triangular diagram *PLXP* can be substituted for the irregular area noted above.

The method of completing the analysis is clearly shown in the figure and requires no detailed discussion. The total external force (8,057,400 lb.) is combined with the total weight of buttress (1,928,600 lb.) and the resultant (9,412,000 lb.) is determined in amount, line of action, and point of application. This analysis can be made for several horizontal sections in the buttress, and lines of pressure drawn.

The intensities of vertical pressure (p_1 and p_2) at the downstream and upstream toes of buttress are then determined by the standard formula:

$$p_2 \text{ at } K = \frac{4b - 6ks}{db^2} \times V \text{ and } p_1 \text{ at } L = \frac{4b - 6Ls}{db^2} \times V,$$

where d = width of base, p_2 = 20,060 lb. per square foot and p_1 = 1460 lb. per square foot.

The absolute maximum intensity of stress in the section at 70-ft. depth is $p_3 = \frac{p_2}{\cos^2 \phi}$. It acts parallel to the downstream face and on a plane at right angles to that face; p_3 = 20,300 lb. per square foot.

The intensities of pressure p_2 and p_3 are somewhat larger in the narrower horizontal section just above the spread footing of the buttress, but here they do not exceed 250 lb. per square inch.

In making the analysis of the buttress, it is customary to investigate the effect of shear at the various horizontal joints; however, it will usually be found that this is not a governing feature as regards the safety of the structure, if well built. This is more especially the case where the buttress is reinforced. If H is the horizontal component of the resultant thrust on the joint, V the vertical component, f the coefficient of friction, A the area, and S the shearing resistance per unit of area, then for safety against shear $H \leqq fV + SA$. Although S has an appreciable value, it is more or less indeterminate, and therefore usually neglected, and in that case if H is greater than fV, the additional shear may be considered to be taken up by part of the reinforcement.

In multiple-arch dams, the effect of uplift is generally neglected. This is justifiable, since the upstream face in nearly all cases is covered with a coat of mortar (½ to 1 in.) applied with a cement gun, which tends to make the structure more nearly water-tight. Moreover, any water which does enter the upstream face would probably percolate through the arch rather than along it and into the buttress. If it is desired to take account of the uplift, probably as good an assumption as any is to consider it as acting with an intensity of two-thirds the hydrostatic head at the upstream face, and decreasing uniformly to zero at the downstream face.

Forms do not come within the limits of this article, except that it should be stated that a three-centered curve can be used to approximate the true ellipse of the arch.

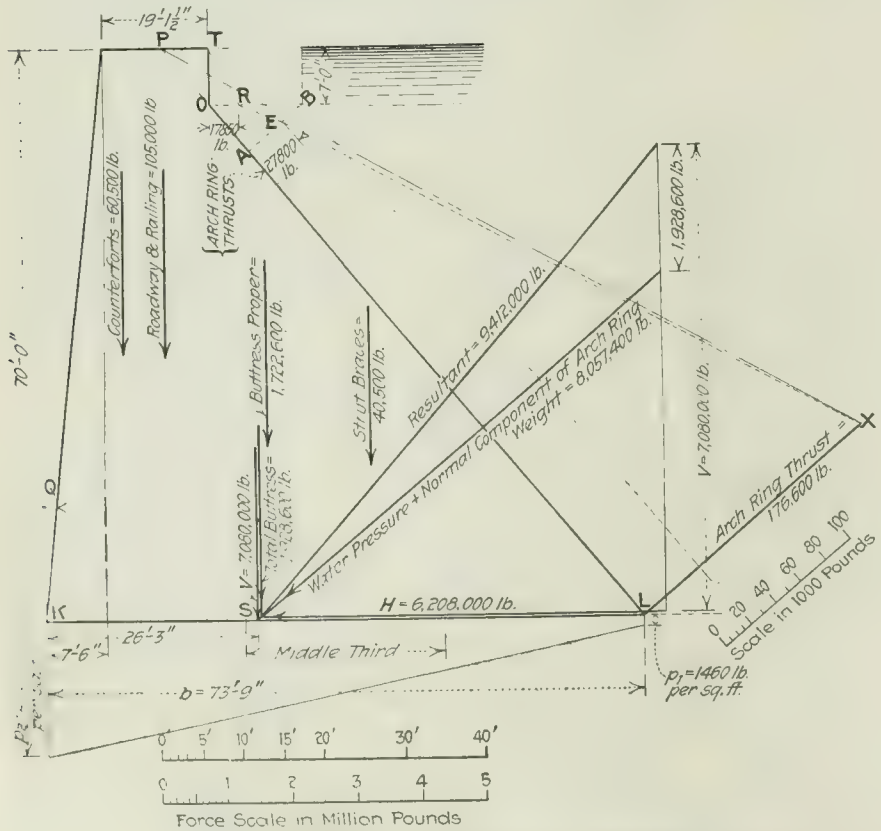


FIG. 5. STRESS ANALYSIS IN BUTTRESS OF MULTIPLE-ARCH DAM AT 70-FOOT DEPTH

Investigation of Odors From Lake at Madison, Wisconsin

Sewage Plant Gets Popular Blame, but Study Will Include Algæ, Trade Wastes and Surface and Street Drainage

COMPLAINTS of objectionable odors from Lake Monona, which receives the effluent from the sewage-disposal plant at Madison, Wis., led last summer to assertions of incomplete treatment of sewage at this plant, but investigation made in May, 1919, by John W. Alvord, consulting engineer, Chicago, indicates, in his opinion, that the plant is not to blame.

His report suggests that there are other and more important causes for the odors which were so offensive in the summer and autumn of 1918, and recommends that further study be made to determine the cause and provide a remedy. Most of the odor appears to be at points distant from the outlet of the sewage-disposal plant. Mr. Alvord points out that in 1917 he had an examination made of the working of this plant. and was so satisfied with its efficiency that he advocated similar sedimentation tanks for the plant at the United States Naval Training Station at Great Lakes, Ill., which has been in successful operation now for about 18 months.

Causes of Odors from Lake

Several causes for the objectionable odors are suggested by Mr. Alvord, including increased plant growths in the lake, trade wastes and street washings from storm sewers. As stated in his report, old residents agree that at times Lake Monona has given out considerable odor in the summer and autumn, this being described usually as of a decaying vegetable nature, with some reminder of the stable. With increasing population contributing pollution around the lake, the odors are said to be increasingly noticeable and objectionable. Some observers have asserted that the lake is peculiarly subject to algæ and other organic growths, such as occur even in reservoirs and lakes not subject to pollution, and the decay of which may produce very offensive odors.

Plant food for such vegetation may be furnished by the nitrates of inert sewage effluent as well as by agricultural drainage, with its pollution of varying character. It is pointed out that at Madison, apart from the sewage effluent, such food may be furnished by wastes from a large beet-sugar factory, the gas works and other industrial plants, as well as by surface drainage and the street washings from storm sewers.

It has been suggested by E. J. Tully, state sanitary engineer, that while the effluent from the municipal sewage plant is 99% stable, yet the harmless and unobjectionable nitrates which it contains may aid in promoting the growth of vegetation which later decays and putrefies and which causes the trouble. Mr. Alvord thinks that this theory is plausible, but he points out that if it is true no sewage plant in such a situation, however well operated, will be finally satisfactory if the proportion of nitrates which it contributes to plant life is large. Furthermore, there is no evidence as to the proportionate effect of the plant food from this effluent as compared with other and apparently greater sources of plant food which are poured into the lake.

Among the complaints discussed is the charge that raw sewage has been discharged from the plant into the lake. This the report states is "entirely unreasonable," as there is no way in which sewage can be bypassed, nor any occasion to bypass it, because the plant has considerable excess capacity. On the other hand, the plant has a good record, since the tanks have been in operation for nearly six years and the final percolating filter for over two years, with no dissatisfaction until 1918, when odors from the lagooning of sludge created prejudice against the plant. Another good record is that careful tests have shown the effluent to be almost continuously satisfactory, to the extent of being about 99% stable nearly all of the time.

Some aftergrowths occur occasionally in the final effluent, but there is enough dilution in the Yahara River at all times to oxidize such matter promptly and fully. Inert matter in the effluent may at times discolor it and cause aftergrowth which in dying causes a slight odor, but this is not large in amount or important in such plants, even when operating most successfully. The State Board of Health has recommended further treatment and clarification of the effluent. Mr. Alvord says that the aftergrowths and inert matter can be intercepted and removed if necessary, but he suggests that the expense might be considerable and that it is important to know first their relative importance as a factor in the problem, since it is possible that the money may be more advantageously expended when more is known about the cause of the odors in the lake. In view of these facts, Mr. Alvord states his opinion as follows: "It is difficult to understand how raw sewage or the spent sewage effluent can be considered as having any great or indirect influence in creating odors, much of these odors being observed in distant parts of the lake, and it is improbable to my mind that this can be the case."

Sludge disposal by lagooning appears to be a cause of odors in the vicinity of the sewage plant. Certain changes in the plant are recommended to improve this condition, but this has no relation to the problem of odors from lake water and will be noted in a separate article. The city has engaged Alvord & Burdick, consulting engineers, Chicago, to conduct an extensive physical, chemical and biological investigation of the lake odors. This investigation is to cover the rest of the season of 1919, and it is expected that a full report on this interesting problem will be made early next year.

Pipe Laying by Force Account in Salt Lake

Unit costs of labor on 6-in. water mains in Salt Lake City, Utah, to provide work for men returning from Government service, were $1.35 per cubic yard for excavating and backfilling trenches and $0.19 per linear foot for laying. The pipe cost $1.33 per linear foot, and the total cost of pipe valves, hydrants, special castings, trenching, laying and backfilling was $2.33. This included direct supervision only. Engineering cost 2.33% and inspection 0.55% additional. The foregoing figures are for a typical job done in January, 1919. This and similar work were authorized by a special act of the legislature and was limited to extensions costing not over $6000 each. Force-account work under authorization in August, 1919, totalled 55,200 ft. and was estimated to cost $134,500. W. A. Alexander is construction engineer in charge, under S. Q. Cannon, city engineer.

Viaduct Protected From Snowslides by Concrete Walls

Slides Damaged Tower Columns in Cascade Mountain Gorge — Bases of Shore Bents Incased in Concrete

By E. E. Adams
Assistant Engineer, Great Northern Railway Company, Seattle, Wash.

DESTRUCTIVE snowslides early in 1918, following warm weather and heavy rains which brought down the deep snows of the early winter months, did serious damage to three mountain gorge viaducts of the Great Northern Railway Co. in Washington. These structures are on the western slope of the Cascade Mountains, where the line descends on a 2.2% grade. To prevent similar damage, concrete protection walls have been built, incasing the bases and the lower parts of the exposed tower bents.

The most serious damage was done at a point just west of Alpine, Wash., where the line crosses a mountain ravine 350 ft. wide and 130 ft. deep on a plate-girder viaduct carried on steel towers, known as Bridge 408. Apparently a natural dam of débris had formed in the gorge far above the bridge, and when the rains loosened up the heavy snow that had fallen during the late months of 1917 this dam broke. The mass went down the channel Jan. 2, 1918, and struck bents 3 and 4 of the viaduct. The lower column sections, the cross-

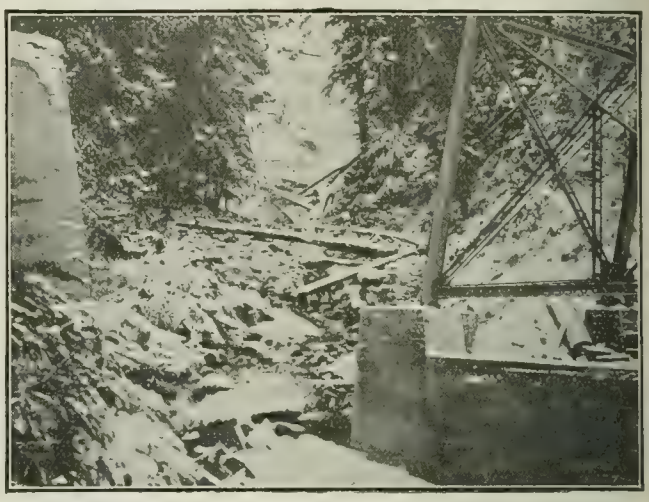


FIG. 2. SLIDE ZONE BETWEEN BENTS 3 AND 4 (LOOKING UP THE GORGE)

struts and the bracing of bent 3 were damaged and twisted, but the tower did not fall. In bent 4 the lower section of the upstream column was completely torn out, together with the upper parts of both concrete pedestals; the top of the bent was thrown out of true alignment and the girders settled, although the truss action of the bracing held the structure from falling.

Temporary repair of the damage was accomplished by setting up four heavy timber shoring bents, two on each side of the damaged bent 4. Thus supported, the structure carried traffic for nearly a year, until a decision had been reached as to means for giving permanent protection to the structure. The method adopted was to build concrete protection walls around the bases of bents 3 and 4, as shown in the drawing, Fig. 1, herewith.

Under the final plan, massive concrete walls incasing the lower sections of the bents were to be constructed, their foundations being carried to solid rock and the upstream ends of the walls being extended diagonally upstream into the bank as shear walls, to a junction with solid rock. The work was carried out accordingly, with only minor modifications to suit conditions as they developed. These walls will deflect future slides of snow, boulders or timbers into the channel between them, and away from the steelwork.

When construction was begun it proved to be necessary first to remodel the shoring bents, as the inner post on either side was so close to the steel as to be in the way of footing excavation. The lower sections of these posts were therefore taken out and the upper portions carried on sets of 8 x 16 timber stringers resting on short posts placed farther out (see falsework sketch in Fig. 1). Footing excavation for the protection walls was then carried out, by hand work, and extended well down into the boulder foundation. The damaged sections of bent 4 were cut away by oxy-acetylene torch, and the old concrete pedestals removed, before the new concrete was placed.

For concreting, storage and mixing platforms were

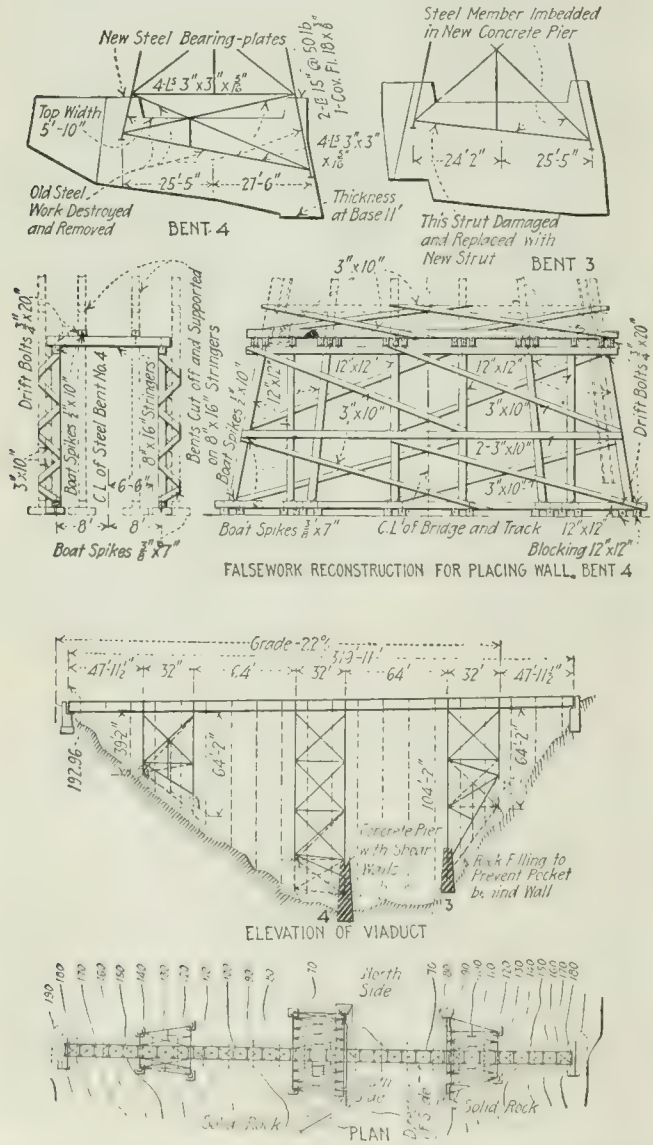


FIG. 1. VIADUCT DAMAGED BY SNOWSLIDES; CONCRETE PROTECTION WALLS, AND FALSEWORK TO SUPPORT GIRDERS DURING CONSTRUCTION OF WALLS

built under the end of the bridge, receiving concrete aggregates direct from cars on the track above. The materials went from storage to the mixer by gravity, and the mixed concrete was chuted direct to the forms. The chutes were made of wood, and the concrete (1 : 3 : 5) was mixed wet enough to flow easily. The total concrete placed was 473 cu.yd. at bent 3, and 584 cu.yd. at bent 4, a total of 1057 yd., weighing approximately 2200 tons. From the standpoint of protection, this is to be compared with 97 cu.yd., weighing 194 tons, in the four old concrete pedestals.

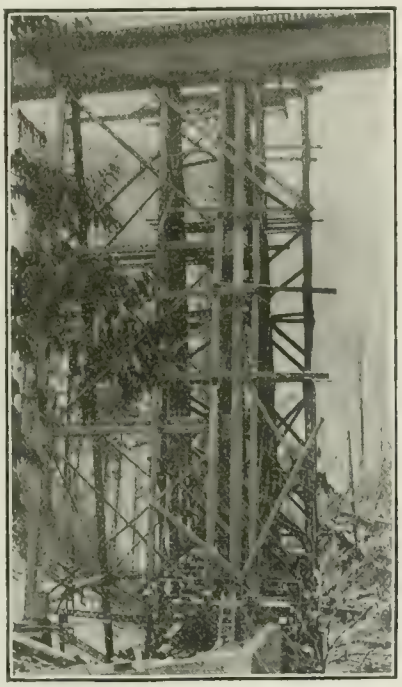


FIG. 3. LOOKING DOWN THE GORGE; PROTECTION WALL AT BENT 4

The writer is of the opinion that column protection for all structures carrying railroad track is of vital importance, and the engineer designing foundations in mountainous countries should have full data as to the slide characteristics or other destructive possibilities of the waterway or channel.

Similar column protection has been applied by the Great Northern to two other bridges in the Cascade Mountains where slide or flood damage is likely. This work, as well as that on Bridge 408 shown by the illustrations, was carried out by railway forces, under the direction of A. H. Hogeland, chief engineer, and O. S. Bowen, principal assistant engineer, Great Northern Railway Company.

It has been concluded by capable engineers that the menace of slides in the higher altitudes of the Cascade Mountains is largely due to the removal of valuable standing timber and to forest fires and other causes developing along the railroad lines, all tending to expose large barren snow areas on the upper slopes and leading to the formation of slide zones in the more precipitous ravines. These conditions affect the western slope of the Cascades more seriously than the eastern slope because of its greater steepness and smaller capacity for the runoff of flood waters. It may be anticipated that more slide trouble will develop in the future than has been experienced in the past, and protection work of the kind described may therefore have to be carried out on a larger scale than hitherto, especially on the western slope of the range.

Water-Power Development in Sweden

Water-power development in Sweden has been developed to the extent of 1,105,000 turbine horsepower, or 18% of the 6,200,000 hp. available, according to a report made by Albert Halstead, United States consul general at Stockholm.

Safety in Operating Traveling Cranes

RULES for the safe operation of electric traveling cranes, formulated recently by a committee of the Association of Iron and Steel Electrical Engineers, contain two points worth general notice. They prescribe that crane operation during construction or repair work should be governed by a special signal code prepared by the management, instead of by the ordinary manual or oral directions. Such special signals should also govern in all unusual lifts or crane motions, as when parts of machinery are removed or replaced, or when two cranes are worked together to lift one load. The special signals should be given by a designated person known by the operator to have the appropriate authority.

Another rule affecting repair or construction work relates to work done on or near crane runways. For proper safety of such work it is required that track torpedoes be placed on the crane runway rail nearest the cab, not less than 75 ft. away from the point where men are working on the runway. Two torpedoes should be used at each point, and the operator, on hearing a torpedo explode, should immediately stop his crane. Notification of work on or near the runway should be given to the crane operator before the work is begun, and a flagman should be detailed to ride in the cab of the crane, with the sole responsibility of looking after the safety of the workmen. This flagman is also the one to place the track torpedoes. The rules are published in the "Proceedings" of the association for 1918, together with the discussion upon them at the Baltimore convention, held last September.

Of the general rules included, the following are noteworthy: "A signal to stop the travel of a crane or the movement of any of its parts, by whomever given, should be obeyed," and "A motor should not be started, to make a lift, if the operator knows that an improper hitch has been made with chains or slings, or if hooks permanently attached to the crane fixtures are not properly adjusted." Another rule states: "It is not good practice to make side pulls. If they are permitted they never should be made by use of the ladle hoist," referring in this case more specifically to conditions in furnace buildings.

Durability of Piles in Intertidal Space

How far above low water are untreated wood piles protected by saturation? This question has been asked a number of engineers by the Forest Products Laboratory, at Madison, Wis. In tidal waters the portions of piles above mean low tide, although completely immersed only part of the time, may be practically saturated all the time. Wood constantly saturated with water is not subject to decay, and this fact makes the height to which saturation extends above low tide a question of considerable interest to the designing engineer. The opinion of most of the engineers asked is that untreated piling in water not infested with marine wood borers will remain sound indefinitely if cut off at half-tide. This height ranges in various ports from 2.3 to 4.5 ft. above low water. At certain places on the Atlantic coast piles cut off at the height of half-tide are still sound after from 50 to 100 years of service. Untreated piling is destroyed by marine borers more rapidly than by decay, and the information given would, of course, have no practical use where these organisms are active.

Diagram for Computing Band Spacing for Wood-Stave Pipe

For Pipe 1 to 20 Feet in Diameter, Under Heads of From 10 to 200 Feet and for Band Diameters of ⅜ to 1¼ Inches

By Willis T. Batcheller
Engineer, Municipal Light and Power System, Seattle, Wash.

THE accompanying chart is being used in the field for spacing the bands on the Cedar River pipe line now being constructed to supply water for the new 16,000-hp. hydro-electric plant of the City of Seattle. The entire conduit will consist of about 7500 ft. of 78-in. wood-stave pipe and some 2000 ft. of steel penstock. Of the 600 ft. of static head on the turbines 500 ft. occurs in the last 2000 ft.

Although the principles of design used for the band space are not new, the writer believes that the chart is.

In the design of wood-stave pipe the bands are proportioned to carry the entire strain. The band area is, therefore, equal to the area of the metal in a steel pipe having a joint 100% efficient. The equation for the band area per linear foot of pipe is then:

$$A = \frac{0.434HD12}{2S} = \frac{2.604HD}{S} \qquad (1)$$

and the number of bands per hundred feet of pipe is

$$N = \frac{260.4HD}{S\,a} \qquad (2)$$

The band spacing in inches is, therefore,

$$B = \frac{12}{N} = \frac{12SA}{2.604HD} = \frac{4.608SA}{HD}$$

D = inside diameter of pipe in inches
H = maximum static head on pipe in feet
A = area of band steel per linear foot of pipe
a = area of steel in one band
N = number of bands per hundred feet of pipe
B = band spacing in inches
S = allowable fiber stress in pounds per square inch.
0.434 = pressure per square inch per foot of head.

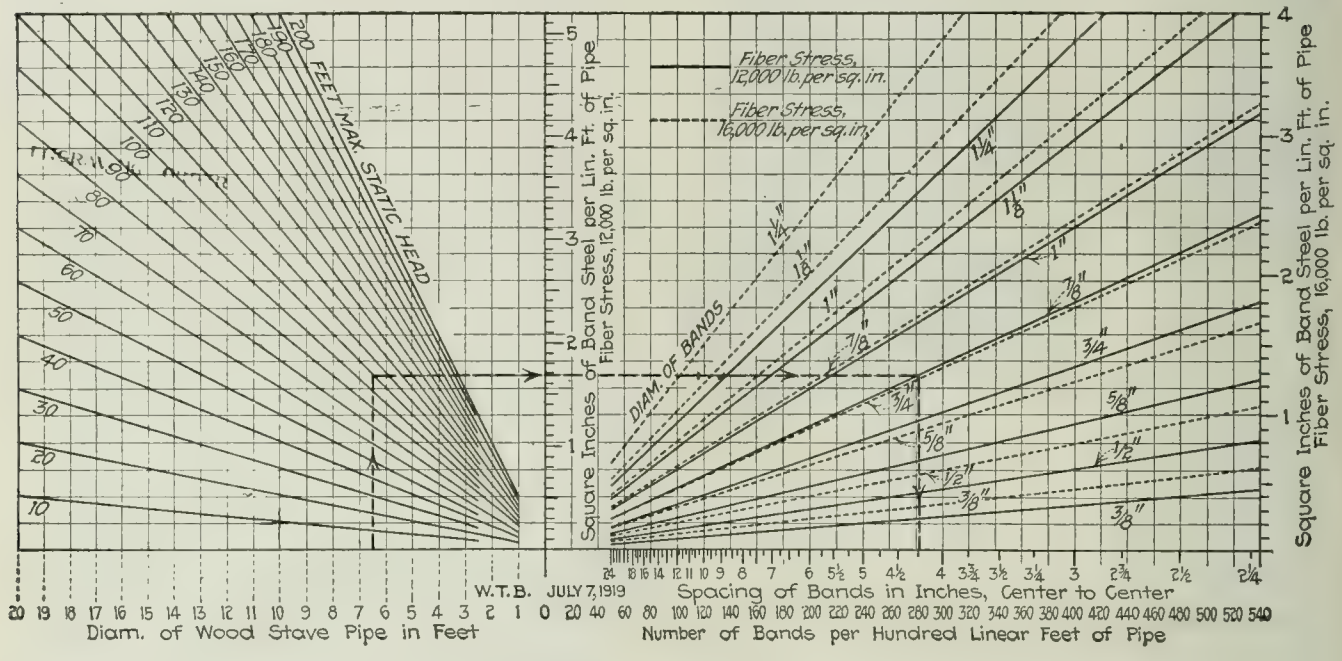
Substituting a fiber stress of 12,000 lb. per square inch in Eq. (1), (2) and (3), we have

$$A = 2.17 \times 10^{-4}\,HD \qquad (4)$$

$$N = 0.0217\,\frac{HD}{a} \qquad (5)$$

$$B = \frac{55{,}300A}{HD} \qquad (6)$$

Using the above equations, values were computed and curves plotted covering the ordinary range of conditions met in practice. The method of using the chart will be illustrated by an example. Given 6½-ft. wood-stave pipe with a maximum static head of 100 ft. and using ⅞-in. bands, what will be the band spacing in inches and the number of bands per hundred feet of pipe?



DIAGRAMS FOR SPACING BANDS ON CONTINUOUS WOOD-STAVE PIPE
The two diagrams mentioned in the text have here been combined in one by adding the dotted lines and also the second scale at the right for computations with 16,000-pound fiber stress

Starting at 6½ on the pipe-diameter scale, going up vertically to the intersection with the line representing 100 ft. of head, thence horizontally to the ⅞-in. band-diameter line and down to the lower scale intersection, gives a band spacing of 4¼ in. and the number of bands as 282 per 100 ft. of pipe.

Although 200 ft. of head will be found to be the maximum ordinarily used for wood-stave pipe, any pipe for heads in excess of this amount may be computed by using one-half the head and multiplying the number of bands by two or dividing the spacing by two.

A similar set of curves was prepared, using a fiber stress of 16,000 lb. per square inch, in which case Eq. (4), (5) and (6) become

$$A = 1.63 \times 10^{-4}\,HD \qquad (7)$$

$$N = 0.0163\,\frac{HD}{A} \qquad (8)$$

$$B = \frac{73{,}728A}{HD} \qquad (9)$$

If values of fiber stress, other than those plotted, were used, the problem could be solved by means of either chart, and the resulting band spacing adjusted in proportion to the fiber stresses.

Paper Cylinders Used for Molds for Concrete Test Pieces

Substitutes for Heavy Steel Molds Are Light, Collapsible and Portable—Prove Acceptable on Government Work

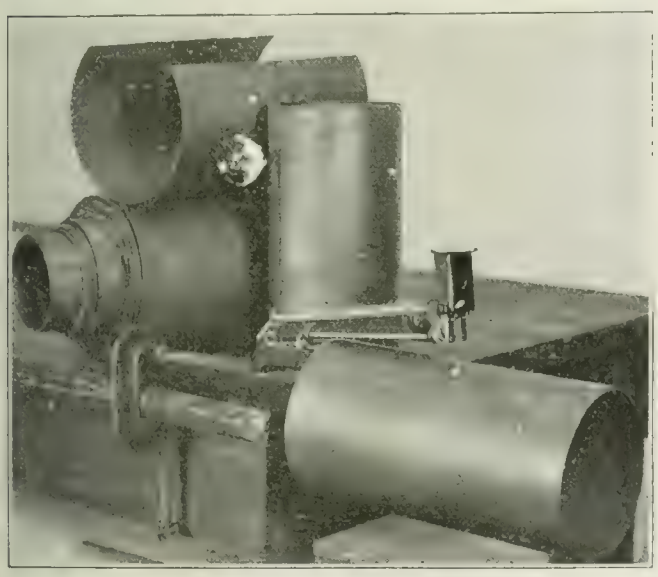
By Watson Davis
Assistant Engineer, United States Bureau of Standards, Washington, D. C.

TESTING concrete as made in construction work, and the linking of these tests with laboratory work and control are problems that confront the testing engineer or the engineer in charge of carefully designed reinforced-concrete construction. As an aid in this problem, the Bureau of Standards is using a light, collapsible, portable paper mold as the form in which to cast concrete test cylinders. The distinctive improvement in the mold is that it is slit lengthwise in order to allow nesting during shipment, and that it can be assembled at the job by lacing up with a stapling machine.

As the 6 x 12-in. molds weigh only 7 oz. each (one-fiftieth as much as ordinary steel molds, which weigh about 22 lb. each), and as they can be nested for shipping and easily assembled just before use, they make the taking of concrete test cylinders on the job much simpler than when it is necessary to use heavy and bulky steel molds.

These paper cylinders have been used by the Bureau of Standards in its work, and by the concrete ship section of the Emergency Fleet Corporation in testing the concrete used in the pouring of concrete ships and barges.

The accompanying photograph shows an assembled



ASSEMBLING PAPER MOLDS FOR TEST CYLINDERS

mold, a package of nested molds, and the stapling machine that is used to lace up the molds.

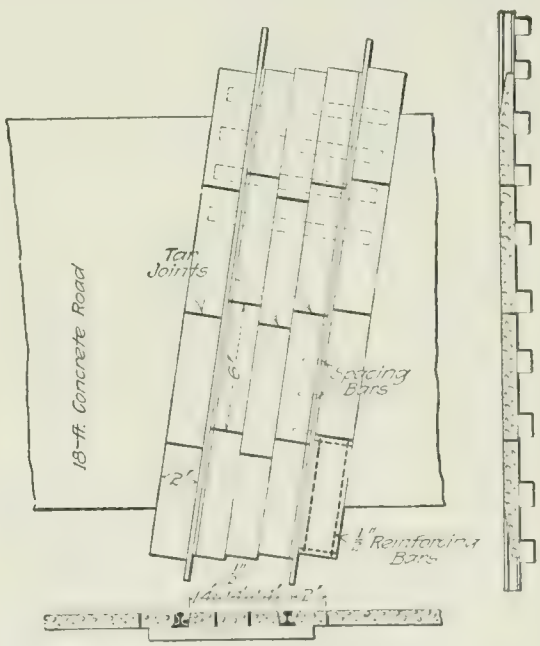
The mold consists of a two-ply cardboard cylinder, as usually manufactured, which is slit lengthwise, and then dipped in hot paraffin to make it waterproof. When nested for shipment 25 cylinders make only slightly more bulk and weigh about half as much as one steel mold such as ordinarily used in laboratory work. About twenty-five ½-in. wire staples, spread every ½ in., are used in lacing up the mold along the slit. The stapling machine weighs only 4½ pounds.

The molds are used only once, and can be left on the cylinder as a protection to the concrete during shipment to the laboratory. Comparative tests, using paper and steel molds, have been made, and show that the paper mold does not affect strength results. No paper caps for base and top are used, but a layer of neat cement paste placed in the bottom of the mold just before pouring the concrete, and a layer of paste on top, prevent loss of water and drying out of the concrete. These neat cement caps also provide satisfactory bedding surfaces during the compression test if they are ground smooth on a flat steel plate sprinkled with carborundum.

The cost of the paper molds is about 10c. each, and the stapling machine can be bought for about $12.00.

Sectional, Removable Concrete-Slab Railroad Crossing

SECTIONAL, concrete-slab railroad crossings are proposed for the road system of Wayne County, Michigan. The general design and layout of these crossings are shown in the accompanying illustration. Each of the sections used between the rails is 6 x 1.4 ft., with a thickness equal to the height of rail. Sections outside the rail are 2 ft. wide. Reinforcement consisting of ½-in. bars is used as shown, and tar joints bind the



REMOVABLE CONCRETE-SLAB RAILROAD CROSSING

sections together. Those inside and next the rail have projecting spacing bars which come in contact with the web of the rail, leaving clearance for the wheel flanges.

Surveys of the various railway crossings in Wayne County have been made, and the board of county road commissioners, of which Edward N. Hines is chairman, has suggested to the engineering departments of the various roads that they be permitted to install this slab construction at county expense, the county also to maintain it after installation. It is believed that this will make a much smoother and more serviceable crossing than the old planked crossing, and, at the same time, leave the crossing equally accessible for repairs. As yet no crossings of this type have been installed.

Operation Methods and Results on the Lindsay-Strathmore Irrigation District

Well Tests and Reconstruction—Operation Results of Well and Main Pumping Plants—Water-Hammer in Wood Pipe Lines—Repairs to Steel Pipes—Gravity and Pressure Consumers' Meters

By E. Court Eaton

Superintendent of the Lindsay-Strathmore Irrigation District, Lindsay, Calif.

SOME of the construction methods employed and difficulties overcome in the Lindsay-Strathmore Irrigation District, California, were described by the author in *Engineering News-Record* of Aug. 21, 1919, p. 348. This article will give some operating experiences and results obtained in 1918, the first season in which the new works were used. The supply is pumped from wells, is repumped, some being lifted still higher by a booster plant, and is distributed through pipes and two types of meters to the consumers, having previously passed master meters.

Well Tests and Reconstruction—When the irrigation season started in April, 1918, 30 wells were available, the other seven being in such condition that it was impossible to pump them—due, for the most part, to casing deformed while drilling was done. It was estimated, however, that the 30 wells would fulfill the requirements for the first season, when only a little over half the acreage in the district would be under cultivation and require water. During January, February and March, 1918, total of 1525 acre-ft. was pumped, used almost entirely for testing out pumps, filling and testing wood and steel pipe lines, canals and reservoirs. None of this water was sold for irrigation purposes. The average results obtained throughout the season by months are shown by Table I:

TABLE I. WELL YIELDS BY PUMPING

Month, 1918	No. of Wells Pumped	Pump Hours, Total	Total Pumped, Acre-Ft.	Av. Depth to Water During Pumping, Ft.	Average Head on Pumps, Ft.	Av. Discharge per Well, Sec.-Ft.
Jan.	8	.....	517	Not used for irrigating		
Feb.	11	.....	650	Not used for irrigating		
Mar.	8	.....	358	Not used for irrigating		
April	27	8,245	818	46.3	118.8	1.73
May	29	19,556	2338	46.4	124.3	1.445
June	29	19,786	2510	51.2	129.4	1.529
July	29	21,740	2740	50.7	128.3	1.525
Aug	30	20,814	2420	51 4	133.2	1.405
Sept	29	19,645	2090	53 2	129.9	1.288
Oct	21	10,407	1110	53 2	129 2	1 290
Nov.	11	3,798	394	54.8	126.0	1.255

The actual average static head from the ground surface at the wells to the water surface in the low-level canal to which the water is pumped is 58 ft. The records show the poor results obtained compared with what is required. This condition is due to incomplete perforation of the well casings and insufficient well development, both causes combining to give an excessive drawdown in the wells and a consequent total head of over 125 ft. on the pumps, which were rated to give their maximum discharge at 100-ft. total head.

At the close of the irrigation season the district purchased a well rig, an air compressor and a gas engine, and the required tools, and in 1919 put under way the redrilling of the eight wells left uncompleted and also began perforating and developing the worst of the other wells in order to put them in shape to deliver the increased quantity necessary for the season of 1919.

The new wells are being drilled with casings of three sizes. A plain 18-in. casing is put down to a depth of about 50 ft. for a pit to take the pump. Below this a 16-in. perforated casing is driven as far as possible, followed by 12-in. perforated casing as far as required, about 175 ft.

The drilling with perforated casing is more difficult, owing to the sand coming in through the perforations, leaving the large boulders against the casing with the voids unfilled. As the casing is shoved down these loose boulders tend to rotate and thus to deform the casing. The smaller perforations instead of the larger cut made by the perforator also make it a more difficult matter to develop the well and clear out the perforations, but better results will ultimately be obtained than by attempting to perforate after drilling is completed.

Wells Blown Out With Compressed Air

An air compressor, capacity 140 cu.ft. per minute, is used, and the well blown out for two days through a 3-in. iron pipe, which is afterward used as an air lift to clean the sand out of the bottom of the well. The result of this treatment has been to improve the wells so treated; in some cases the discharge has been doubled at the same time that the drawdown has been cut from one-third to one-half.

One of the two makes of deepwell pumps used carries the load of the vertical shafting and runners on ball bearings run in an oil chamber, and the other has a water-cooled bearing. On the latter bearing, a cheap grade of oil can be used without trouble; in the other, care must be taken to obtain a suitable heavy oil, to avoid trouble from overheating. More oil is also used in the oil type, due to the construction of the bearing allowing the throwing out of oil.

The oil finally adopted has the following properties: Viscosity, 150 at 212° F.; cold test, 40 to 60; flash test, 530; fire test, 615; gravity, 25.3.

Power for operating the well motors is furnished by the Mount Whitney Power & Electric Co. from an outdoor substation on the southern boundary of the district's property, on which the wells are situated, and is metered on the low-tension side of the power company's transformers. The power thus paid for by the district includes the line losses in the 2200-volt distributing lines to the wells, which are as follows: 1.47 miles 2200-volt 4/0 copper wire; 2.02 miles 2200-volt 1/0 copper wire; 5.47 miles 2200-volt No. 6 copper wire. The power rate is one established in 1915 by the state Railroad Commission for large consumers, and consists of a monthly maximum demand charge of $2.70 per kilowatt, based on a 15-min. demand, plus an energy charge of ½c. per kilowatt-hour. Under this rate, and with continuous running at full load, it would be possible to obtain a rate of 0.625c. per kilowatt-hour, but under conditions of small storage and rains likely to occur at the beginning and end of the season, this advantage has not been obtained. Table II (see next page) shows the results of the year's irrigation season, from which the

TABLE II. WELL PUMPING PLANT OPERATIONS AND EFFICIENCY

Month, 1918	Pumpage, Acre-Ft.	Av Current per Well Amp	Consumption, Kw-Hr	—Power Per Kw-Hr	Cost— Per Acre-Ft per Ft Lift†	Plant Efficiency Per Cent.
Apr.	1175	9 82	247,200	1 129	1 996	55.8
May	2338	9.54	573,600	0 655	1 292	51.9
June	2510	9.16	616,800	0 644	1.221	51 9
July	2740	9 18	650,400	0 628	1.161	55 4
Aug.	2420	9.08	601,920	0 646	1 087	55 1
Sept.	2090	8.74	535,680	0 704*	1 545*	51 8
Oct.	1110	8.56	289,100	0.811*	1.635*	50.9
Nov.	394	8.57	12,000	1 017*	2.460*	42.4

*Includes 10 per cent. surcharge allowed to power company by Railroad Commission

†Lift is head including friction.

plant efficiency has been worked out. This efficiency includes all losses in lines, the lighting of pump houses and other incidental losses.

The greatest difficulty is, of course, experienced in the months at the beginning and end of the season, when a period of several days of rainy or even cloudy weather will change the demand for water.

Unfortunately, the location of canals, flumes and pipe lines is such that any large storage is impossible, although a certain amount of relief is obtained by storing water in the canals and flumes by breastgates.

Owing to the distance of the wells from the district, any increase or decrease in the supply takes about eight hours to affect the distributing system, and the matter of estimating and anticipating the flow has been one that has required considerable attention. Frequent power shutdowns, due to overloading of the power company's system and restriction of the use of oil for steam auxiliaries during the war, have increased this difficulty.

Changes Due to Increased Drawdown in Wells

The increased drawdown in the wells made it necessary to add 10 ft. of pump column on 18 of the well pumps, and an additional 10 ft. of suction pipe was put on 26 of the wells. Ten feet of submergence of the suction pipe gave freedom from air troubles due to entrained air in the water flowing from the perforations into the well. Daily records were kept giving the time of starting of each pump, with pressure-gage readings, depths to water and ammeter readings.

A chief operator and two helpers, each provided with saddle horses, took care of the 29 wells pumped. With a more continuous power service, one of these men might have been dispensed with, but a momentary fluctuation in voltage was sufficient to shut down some or all wells, requiring two hours' time to make the rounds and get all the wells back into service, and additional help had to be employed for this emergency. Pumps have to be carefully started to avoid water-hammer which was not completely taken care of by the relief tower.

Wood Pipes—These pipe lines, after final completion by the contractor, have been entirely satisfactory and have given no trouble with the exception of a few minor leaks, generally occurring at the junction of the steel fittings with the wood pipes. The pipes have been subjected to a certain amount of water-hammer which must have been severe when 30 wells were suddenly shut down owing to power going off the line. No opportunity occurred for the measurement of this with all wells on the line, but during the latter part of the season, when three wells only were running, a few were taken.

On stopping one well of the three, the pressure dropped from normal (26 lb.) to 14 lb.; in 3 sec. more it had risen to 28 lb. and then fluctuated between 28 and 22 lb., in decreasing swings of the needles, until normal was finally reached in 85 sec. from the time the well had been shut down. With two wells still running, the third well was thrown on with the gate valve wide open. The pressure rose in ½ sec. from 26 to 34 lb. and in 1½ sec. dropped to 16, then gradually rose, with slight fluctuations of not over 1 lb., to 29 lb. in 8 sec., and from here fluctuated slowly until in a total of 90 sec. it had returned to normal.

Water-Hammer—When it is remembered that this occurred in a section of pipe 200 ft. away from the well, with only three wells running with low velocity in the pipe, it will be realized that considerable strain must have been put on these lines when they were running at their maximum values. However, no serious leaks resulted, although there were a few places where minor leaks always broke out immediately after a shutdown had occurred. The relief tower undoubtedly helps somewhat, but to give full protection, a larger riser to the tank would have to be provided and provision made to take care of overflow, with consequent wasting of water.

Pipes Have Withstood Conditions Well

Further and more accurate determinations of water-hammer, with more suitable equipment, will be made this year. The results from operation have shown, however, that the pipes have stood very well the conditions to which they have been subjected. Air and vacuum valves have been installed at all dead-ends and principal elevations.

Venturi Meters in Wood Pipes—Two 48-in. venturi tubes had been placed, one in each main wood line, to measure the total flow from the wells. As the meters were located near the discharge into the canal, where only 6 or 8 ft. of head was available, the float-operated types were installed. For a short time these worked satisfactorily, but soon the openings from the throat and inlet to the tubes became clogged, as there was not sufficient head to allow these to be blown out. The result was that the recorders did not respond rapidly to changes in flow, in some cases taking 15 min. or more after a shutdown to return to zero. These openings will be enlarged. It would probably have been better to locate these tubes at points of higher pressure and use pressure-type instruments.

Low-Level Canal Lining—This canal had been gunited, and, in trimming, allowance was made for 1 in. thickness of lining. Due to the uneveness in finishing, the resultant thickness of lining was from 1½ to 2 in. in some locations. The junction of the 1 : 1 side slopes with the bottom could not practically be made a sharp corner, but when finished took the form of a rounded fillet. These two factors combined to cut down slightly the sectional area of the canal, but there will be no difficulty in getting the required maximum flow (75 sec.-ft.) through the canal. Measurements of flow in the canal, made with a current meter, gave a value of Kutter's n of 0.01699, or very close to that which had been assumed, 0.0175.

The rough finish of the surface of the lining makes it particularly easy for algæ to obtain a hold, and the elimination of this has entailed considerable expense, so that the growth would not find its way into the pipes and clog up meters. It is felt, however, that with the experience gained during the season just past this

item will be considerably reduced during 1919. The results obtained are described in an article appearing in *Engineering News-Record* of Feb. 20, 1919, p. 382. The canal will ultimately be covered. The lining of the canal has given excellent results, only one small breakage occurring, due to heaving of the bottom where sufficient tamping had not been done.

As there is no storage at the lower end of this canal, and to prevent loss by waste, radial breastgates were provided at one-mile intervals, to hold back the water in case of a power shutdown. These will be provided with solenoids so arranged that they can be immediately lowered from a central point, making a considerable saving in time and labor, and also a saving in loss of water.

Main Pumping Station—Beyond a few minor repairs, this station gave no trouble during the season. The units installed and the guaranteed efficiencies are as follows:

Pumps					
Number	Size, In.	Capacity, Gal. per Min.	Head, Ft.	R.p.m.	Efficiency, Per Cent.
3	18	10,000	160	1175	80
1	12	4,000	160	1175	79
2	8	2,000	160	1175	73

All are direct-connected to induction motors. As in the case of the wells, power is supplied from an outdoor substation at the same power rate as for the well system. The actual results obtained are given in Table III. The plant efficiency includes all losses. The use of lights, heaters, etc., is included.

TABLE III. OPERATIONS AT MAIN PUMPING STATION

Month, 1918	Pumpage, Acre-Ft.	Consumption, Kw.-Hr	Cost of Power per Kw.-Hr., Cts.	Head, Ft.	Cost of Power Cts. per Acre-Ft. per Ft Lift	Plant Efficiency Per Cent.
Apr.	1175	297,000	1.06	159.2	1.681	64.6
May	2338	600,000	0.683	154.7	1.135	61.7
June	2510	609,600	0.682	152.3	1.084	64.7
July	2740	636,000	0.650	158.3	0.951	70.0
Aug	2420	528,000	0.684	158.3	0.943	74.4
Sept.	2090	573,000	0.725*	164.1	1.211*	61.3
Oct.	1110	273,600	0.817*	159.2	1.261*	66.4

*Includes 10 per cent. surcharge allowed to power company by Railroad Commission.

Having units of several different capacities was a great convenience, this allowing various flows to be handled with maximum efficiency.

Two operators—12-hour shifts each—took care of this station, and during the winter season the plant was handled by one man living in a nearby residence. During this time alarm circuits have been wired up for notification in case of stoppage or overflow.

Boosting Station El Mirador—This station provides an additional 160-ft. lift to take care of 2500 acres in a high section. As only 350 acres were under cultivation during 1918, the cost of operating this plant and district was out of proportion to the revenue received. A considerable additional area will come in during the present season, which will relieve matters somewhat. No difficulties were experienced at this station.

Distribution System Repairs—The pipe lines, which are of light, riveted steel, were filled with water in February, 1918, after they had been laid an average of six months. They were filled very slowly to avoid sudden shock to the pipe. A number of cement bands had been used at the junction of main and branch lines. On applying the pressure a number of leaks developed, although the greater number did not show up for several weeks. These leaks were probably very small at the beginning, and the ground, being very dry, absorbed the water without its showing on the ground surface until the leak had cut itself to a large leak.

In all, up to Nov. 30, 1918, about 500 leaks developed, or five per mile of pipe. Most of the first leaks that showed up were in cement bands put on to join up sections of main and branch lines, but, considering the number of bands put on, these made up a relatively small number.

Thrust blocks of concrete had been put in at all elbows and almost all tapered fittings, and in a few cases leaks developed due to insufficient bracing, or a small leak would soften the ground, allowing movement of the block. These also made up a relatively small percentage, as did cases where rivets had not been securely driven or had been left out altogether, the greater number of leaks being at the slip joint of the pipe. The majority of these leaks were due to too much "belling" of the butt ends of the pipe to facilitate the laying, and consequent open space where the dip was ultimately blown out; and some, especially in the larger pipes, where the "spuds" used in fitting the joints together had been left in too long after the pipe had partly cooled. A number of the leaks in these slip joints may have been due to the fact that the pipe was laid at the hottest time of the year, after the pipes had lain above ground and had been exposed to a temperature of 100 to 115° F. They contracted after being covered up, causing loosening up at the slip joints. Some of the leaks in the slip joints were caused by forcing a section of pipe down into the trench to make a slight vertical bend, after the joint had cooled, to conform to inequalities in the grading of the ditch.

Leaks Calked and Cement Bands Applied

The method employed in making repairs was the same for all sizes of pipe. After a section of wrapping was dug out and taken up, the leak was calked with redwood splinters, and a cement band, 2 in. larger in diameter than the pipe and 8 in. long, was put on and calked with neat cement. Where possible, this was done with the full head of water on the pipe. On the smaller pipes, up to 12-in. diameter, this worked all right, but on pipes larger than this the bands had an increasing tendency to give trouble, and there were cases where a leak had been repaired three times and then failed to hold.

An investigation of these bands showed that on the larger pipes, up to 26- and 36-in. diameter, a cement band of 16-gage iron had been used with the longitudinal seam on the band made up, in some cases, of 5¼-in. stove bolts. Some of these pipes are subjected to heads of 60 to 70 lb., and if the cement is considered as a calking medium only—as would be the case if a crack developed—this band is strained beyond the ultimate strength of the steel. An examination of some of these showed a crushing of the plate outside the bolts. Cement bands now being put on are of steel of the same gage as the pipes, with a longitudinal seam so bolted that it has a joint efficiency of 70%, the same as called for in the specifications for the pipe. The larger pipes are now being repaired with a reinforced-concrete collar 6 in. thick, and no further difficulty has been experienced. The average cost of repairing each leak is $10, including 10% overhead charges.

Portable recording pressure gages were purchased,

and have been located at various points on the system, including dead-ends, and have failed to show any indication of water-hammer. Particular care is always taken in operating line valves to open and close these slowly.

Method of Serving Water—The main riveted steel pipe line laid in the road is tapped at a point opposite that to which the grower requires his supply. This tap is made by means of a 3-in. brass saddle which is bolted on the riveted steel main, and a 3-in. wrought-iron pipe connects with this and runs to the property line, terminating in a 3-in. gate valve. This gate valve is the property of the irrigation district, is kept locked and adjusted only by the "zanjeros," or water tenders, either to cut off the supply altogether or give not more than the allotted rate of flow.

Next to this is installed a second 3-in. valve which is the property of the grower, and is used by him in case of an emergency, to cut off or cut down his flow. Next to this valve is placed the water meter by which the consumption is measured, and by means of which the grower is billed monthly for water. These meters are installed by the irrigation district but are paid for and are the property of the grower.

Consumers' Meters—Two types of meters are in use —one, commonly known as the "gravity" and the other as the "pressure" type. The "gravity" meter consists of a vertical spindle terminating at the lower end in a short screw impeller, the upper end of which is connected to a gear train registering acre-feet on an inclosed dial. The spindle is supported on ball bearings in a circular, galvanized-iron "can" with vertical baffles, and the water flows over a partition down through these baffles, rotating the impeller and thus recording the quantity of water used by the grower. The whole is set in a vertical, concrete standpipe. Water is led in through one side, passes through the meter and then out on the opposite side.

As this meter is open at the top, it is only installed at locations where not over 6-ft. head is required to supply the static and friction head on the grower's property. Where inequalities in the land and friction in the grower's pipe lines are such that a greater total head than 6 ft. is required, these meters are not installed, due to the cost of the concrete stands housing the meters being too great, and the labor of setting up at heights over this being excessive. Two sizes of this type are used, one having a maximum capacity of 25 and the other of 50 miners' inches. The miners' inch is taken as being equivalent to $\frac{1}{50}$ second-foot.

The meter stands consist of sections of ordinary concrete pipe; 26 in. for a 25-in. meter, and 30 in. for a 50 miners'-inch meter. The loss of head in friction in these meters is very small—not over 0.5 ft. at rated maximum flow. The meters are especially designed for irrigation purposes where extreme accuracy at very low flows is not required at the low rate at which water is charged, compared with the rate for domestic water.

The "pressure"-type meter consists of a standard inclosed water meter and is used at points where a greater head than 6 ft. is required to cover the head due to elevation in the land and friction in the growers' pipe lines. The meter is an inclosed turbine meter, having a rubber impeller rotating between fixed diffusion vanes. A number of different makes of these meters were tried. The best satisfaction has been given by one having a long impeller with a fair-sized clearance between the impeller and the stationary ports through which the water flows to the impeller. This meter, although not designed for irrigation purposes, has been developed to handle water carrying sediment. The manufacturers make an especially designed gear train, and recording device, registering in acre-feet. Up to date this meter has given good satisfaction.

With the other pressure types the impeller was small and had very small clearances provided between fixed and rotating parts to give accuracy at all ranges, with the result that even a small quantity of sand was sufficient to lodge a few grains between fixed and moving parts, resulting in breaking of the impeller. One manufacturer redesigned his type of meter, removing the fixed diffusion vanes and improving the meter somewhat, at the sacrifice of accuracy at low flows, but a need is felt for an inclosed irrigation meter of reasonable accuracy having a sufficiently rugged construction to withstand small quantities of sand and sediment, and having a much smaller loss of head than those in use at present.

The loss of head in friction in the meters of this type in use at present is over 40 ft. at rated discharge, so that sufficient pressure must be available in the line to supply the losses in the meter in addition to the static and friction heads occurring in the grower's system.

Distribution of Water—An attempt was made at the commencement of the season to allot the water in the order of application, the grower being allowed the equivalent of what would give $1\frac{3}{4}$ acre-ft. per acre in one irrigation season of six months. The method employed was for a grower to make an application, giving the acreage and the length of time it would require him to complete this irrigation. When the time had come for a grower's irrigation to start, one of the district's "zanjeros," or water tenders, opened the district 3-in. valve at the property line and timed the grower's meter with a stop watch, setting and locking the valve so that more than this flow could not be taken. No fixed schedule was possible, however, for the 1918 season and alterations and adjustments had to be made from time to time.

This condition was due in part to (1) the shortage of water in the past few years, so that some growers required more water than others to wet up the land; (2) to the fact that salt had appeared in the old individual wells before the district had been completed, and an increased quantity was needed to wash this out of the soil; and (3) the high returns expected from corn during the year 1918, which resulted in a good deal of this being planted after the irrigation season had started. The principal reason why no fixed schedule could be followed was the poor power service, due to war conditions, and as it was impracticable to have any large amount of storage on the system, schedules could not be carried out and the growers' time allotment would have to be extended, throwing out the whole schedule.

The system is designed to supply a quantity of water giving a duty of water of $1\frac{3}{4}$ acre-ft. per acre, on the basis of a six months' irrigation season, and allotments were made on this basis. But it is more economical to allow the grower to use water at three or four times this rate, and get through his irrigation, the saving

occurring in lowered loss from evaporation of water from the soil.

A chief water tender and two "zanjeros" handled all the services. A card was kept for each irrigator. These were filled out at the office and turned over to the "zanjeros" in the order received. After water had been turned on, the cards were filed away under date due to be turned off, so that an exact record of the quantity required every day by each irrigator could be kept and the same quantity of water turned on every day as was turned off.

Growers take water from meters, and distribute, in most cases, through concrete pipe lines with hydrants at each row. In general, it is found more economical in handling water not to carry it in furrows further than across 10 acres, from one pipe line. Trees are spaced approximately 20 ft. apart. Navel oranges are picked in November, and Valencias in April. A crop of 10 boxes of the oranges per tree is considered a large crop.

The irrigation season for the year 1918 started Apr. 18 and ended Nov. 30. The total quantity of water sold during this period was 13,157 acre-ft. The total acreage in the district is 15,575, and of this 7904 were under cultivation during the season of 1918, divided into 7271 acres of oranges, lemons and grapefruit and 633 acres of corn, grain and vegetables. This gives a duty of water of 1.66 acre-ft. per acre.

The cost of the water for the 1918 season was $77,662, or $5.90 per acre-ft. to the grower.

The water is suitable for drinking purposes, as shown by frequent tests made by the State Board of Health, and the above figures include water used the year around for domestic purposes.

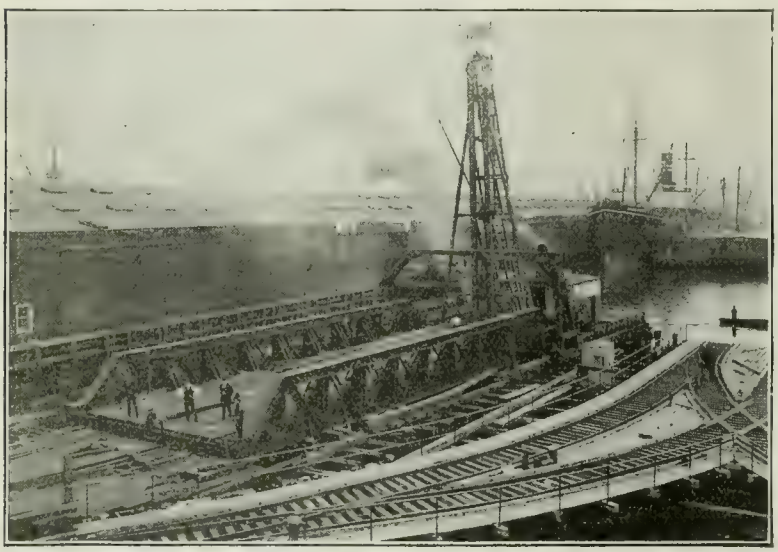
The system has been entirely satisfactory. It has been exceptionally free from repairs due to defects always to be expected in the first season's operation of a system having nearly forty individual pumps and motors.

The men employed to handle the pumps and distribution of water were all men from the towns in the vicinity of the district, and a great deal of credit is due them for the interest taken and for their coöperation, which were essential in making a success of the first irrigating season.

Move 200-Ton Transfer Bridge on Pontoons in New York Harbor

PONTOONS, one permanent and the other adjusted for the occasion, were used to float a 200-ton steel transfer bridge from the old site alongside of Pier 38, Atlantic Basin, New York City, to the new site between the adjacent Pier 37 and Pier 38. The work is at the Atlantic terminal of the New York Dock Co. As shown in the view, a new approach with tracks leading to the transfer bridge from two directions had been built before any of the moving operations started on the pontoon proper.

As is customary in such structures, the outer end of the bridge is supported by a pontoon with adjustment devices for varying the elevation of the outer end of the bridge to accommodate differences of elevation in the carfloats that may be brought to the bridge. In order to move the transfer bridge another pontoon was filled with water and placed under the inner end of the structure at low tide. The anchor bolts there were cut with a gas flame and the rising tide, together with the increasing buoyancy of the pontoon, due to the siphoning out of the water, raised the bridge from its old seat and left it floating free to be moved as required.



CAR-TRANSFER BRIDGE BEING LIFTED BY PONTOONS FROM OLD LOCATION



BRIDGE JUST BEING FLOATED INTO NEW POSITION

In order to steady the structure, guy lines were fastened at the corners of the bridge and led to the top of the piledriver nearby. The engine of the piledriver was then used to move the structure, lines leading to the adjoining piers having been put out in all directions from the winches, and the short voyage was accomplished by pulling and hauling on these lines.

It required 29 minutes to move the bridge from its old location to the new. After it was placed in its new position, the falling tide and the refilling of the pontoon caused it to drop on to the new bridge seat, and the new anchors were placed and fastened as soon as possible, leaving the bridge in proper position for operation at the new site.

The work was done by the Robbins-Ripley Co., under the direction of Robert Hoppen, Jr., chief engineer of the New York Dock Co., but the details of the work were under the direction of M. J. Weigand, principal assistant engineer.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Designs for Rondout Creek Bridge Compared

Sir—Your presentation of the comparative designs for the Rondout Creek bridge, in your issue of Aug. 14, has been read with interest, and the engineering profession should certainly appreciate the opportunity of examining comparative studies of this kind. There may be more valuable instruction given in the form of reasons why a certain design was rejected than would be given by the most careful description of the accepted design.

In the present instance the writer fails to discover, after reading the article, any satisfactory reason, from the standpoint of good engineering, which would have made necessary the change from the original design. As the study of the new design indicates that one of the main piers will be placed in the same location as the main pier of the original design, the stability of which was questioned, it is to be regretted that the type of foundation which is now proposed under this pier should not have been shown. From a casual inspection it appears that the loading on this pier will not be materially lessened, and it is difficult to understand what modification of the foundation is now proposed which would not also have been considered for the original design.

The writer believes, also, that most engineers would assign considerable bearing value to the reinforced-concrete mattress, 13 ft. in thickness, resting on sand and gravel material and inclosed by heavy concrete sheet piling extending about 15 ft. below the bottom of the mattress and completely inclosing the bearing material. It is assumed that the danger from scouring has been eliminated by the construction of the bulkhead shown, or otherwise provided for.

With regard to the appearance of the two designs, the first has a certain symmetry and a graceful outline which satisfies the eye. From the standpoint of cost, comparative figures are not given, but it will be the writer's guess that the added foundations and masonry work in the second design will make it exceed considerably the cost of the first design.

W. E. BELCHER,
Engineer, American International Ship-
Hog Island, Penn. building Corporation.

Supports Principles of Plumb Plan

Sir—Perhaps one may be pardoned for failing to see the logic of your editorial on the Plumb plan. Industry has always been "autocratically" managed by the employers; to be managed by the workers is a different matter, evidently.

The Plumb plan eliminates the capitalist—gets rid of the exploitation which is graven in the history of the railroads of the United States from the days of Jim Fiske to Mellen.

And is it such a wonderful thing that those who run the railroads for the capitalists should run them for the people, and those who manage them for the capitalists should manage them for the people?

Under the Plumb plan the management is under the direction of 15 persons:

Five represent the whole people, the Government.
Five represent the managing, directing officials.
Five represent the railroad workers.

You say the last five will control the other ten. How?

Through the votes of the two million workers on the railroads. But how about the twenty million voters in other walks of life?

And the control is to last 100 years.

Mr. Plumb says in the current issue of *The Nation* that the bill reserves to Congress the right to terminate the arrangement at any time, for cause. And, anyway, it is a bill before Congress. Is a bill pending in Congress unalterable, like the laws of the Medes and Persians or like Mr. Wilson's League of Nations?

Cannot the bill now before Congress be altered or amended to safeguard the control of the whole over the part?

The principle is good, and it ought not to be impossible to apply it with sufficient safeguards. Or is your opposition simply against taking the railroads from the control of the private owners?

The proposition is "Bolshevistic," "Socialistic"—of course it is. Shall we be scored by words?

"May we not" look abroad and see that Socialism is coming on fast?

After all, engineering is not bound up with capitalism—and the engineer is more appreciated in Bolshevic Russia than in the United States. THOMAS FLYNN.

New York, N. Y.

[Another letter supporting the Plumb plan has been received. It is signed "R. R. Engineer" and was mailed from Flushing, N. Y. If the author will send his name, we shall be glad to print the letter.—EDITOR.]

Coöperation or Competition Among Engineers?

Sir—Among all the talk about what must be done to obtain the rewards for engineers commensurate with their services and intellectual attainments, and to make of the engineering profession a closely knit group of citizens allied for the development of common interests and for the fulfillment of citizenship obligations, there is one word that must be spoken again and again, that must be written so often that it will be ever before the eyes of engineers, that must be present in our minds as a perpetual guide—and that word is coöperation.

No one denies that there are great advantages to be had by a coöperation of allied interests, but in making a practical application of the term to the engineering profession engineers at times seem strangely backward. Whether this is due principally to indifference, to ignorance, or to an absolute incapacity to recognize the truth and follow it, cannot be determined yet, and until it can be and has been determined it is impossible to say which of these possible explanations is the cause of incidents detrimental to the development of real coöperation, such as the one recounted here.

The commissioners of a certain county were about to approve a bond issue of several million dollars for highway construction. Among the various provisions was one increasing the salary of the county engineer

by a multiplier of about three. Such a salary was by no means too large for the active administrator of such a fund, but unfortunately there were a number of other engineers in that county who were making much less than the salary proposed for the county engineer. When it was announced that it was proposed to establish such a salary for the county engineer, some of the smaller fry promptly pronounced the salary too high. The county commissioners were puzzled but naturally gave deciding weight to the bushwhackers. Here were citizens who were in a position to say what engineering services were worth who declared that one of their number was to be overpaid.

Of course, if the county engineer's salary were kept down, so would be the salaries of district engineers and resident engineers and instrument men, and, furthermore, a lower scale would have the effect of keeping down the salaries of engineers in municipal work and the fees of those in private practice. The commissioners were also impressed with the business acumen of these engineers. "Here," they said, "are men who don't care how little they make; in fact, they insist on being paid less than the public is willing to pay them. How public-spirited! How unselfish!" And they proceeded to reduce the proposed salary. Verily, if any engineer throws a brick at a proposed increase in the salary of another engineer, the brick will rebound disastrously to the thrower.

Coöperation means more than mere membership in an association and more than mere assistance lent to engineering activities; it means a practical, unselfish, broad-minded, shoulder-to-shoulder attitude on all engineering questions. Anything less, and the engineering profession will fall far short of the goal it hopes to reach.

C. E. DRAYER, Secretary,
Chicago, Ill. American Association of Engineers.

Enunciates Need for Pavement Design

Sir—As an engineer, engaged for several years past in the "design" and construction of hard-surface or rigid pavements costing from $25,000 to $100,000 per mile, I have followed with a great deal of interest the agitations and controversies appearing in *Engineering News-Record* on the subject of "design" of pavements, thickness of slabs, etc. I am encouraged more and more to believe the truth of a statement made by myself some five years ago, that there is no such thing as design of pavements in use today, that the pavement sections are guessed, and that the thickness, stiffness and rigidity of a pavement slab as now constructed are but the engineer's personal estimate of a sufficient structure, based upon his best judgment or on the performance of similar structures previously built, modified by a more or less generous factor of ignorance.

Attempts are made to regulate the loads coming upon or passing over a pavement structure, yet not one of these pavement structures is designed for a definite maximum load, and nobody can state with any accuracy what weight is a safe load to permit on the structure.

Tests are made with indefinite purpose, and at once each paving-material interest bursts forth in loud acclaim that the tests clearly prove its material to be the only one for the purpose.

For ten years engineers have been proclaiming their lack of knowledge of pavement design, and more loudly today than ever before. Protestation will not dispel ignorance. Enlightenment alone is the antidote. Why, then, cannot these truths be sought out and coördinated, to the useful purpose of designing our pavement structures in as efficient and economical a manner as our bridges and buildings are now designed?

The Federal Government maintains departments for technical investigations and research; many states support engineering experiment stations, all of which could very profitably expend part of their efforts in seeking those principles which must be fundamental to the actual design of a pavement structure.

Pavement design must be based upon a knowledge of the physical characteristics of soils supporting pavements, and the distribution and magnitude of the bending and shearing stresses developed in the loaded slab, as well as the physical characteristics of the material of which the slab is constructed.

When these truths are known and made usable, the little man with the side whiskers and market basket can declare dividends on his highway investments and can tell his neighbor what weight of load will be permitted upon his property.

This country is spending no less than a million a day on pavement construction, as well as other millions in maintaining road improvements which have been inadequately conceived and corruptly born. Can it afford to continue the present hit-or-miss methods when the expenditure of a few hundred thousand dollars in well directed effort might permit us to build roads that will last longer, serve better, and, in the end, cost less?

Not before the use of airships becomes universal will the need for this enlightenment be wanting.

South Bend, Ind. D. MOOMAW,
Road Engineer, St. Joseph County, Indiana.

Specify Kind of Bidders, Says Engineer

Sir—"A Practical Engineer" in a letter to the editor, issue of July 3, p. 38, protests against letting a contract to the lowest bidder if such bidder is inexperienced. The solution is to specify the kind of bidders desired, in the same way that the kind of material is specified, in order that the low bid may be accepted. The rejection of a low bid is almost invariably a cause of trouble. The object of specifications is to have the work completed in a satisfactory manner, and it is just as necessary to specify the experience, capital and equipment of the contractor as it is to specify the quality of material he must use.

Topeka, Kan. LLOYD B. SMITH,
Topeka Engineers' Club.

[With Mr. Smith's letter was inclosed a bidding blank on which contractors are required to furnish information regarding their credit, previous experience on similar work, and a list of equipment they will employ.—EDITOR.]

Status of United States Housing Corporation

Sir—In *Engineering News-Record* of Aug. 21, p. 393, under "News of the Week," is an article entitled "Bill Proposed to End Housing Corporation." The second sentence reads as follows: "Its [the United States Housing Corporation's] abolishment is advocated on the ground that it was created as a wartime measure, and

Chairman Langley, of the public buildings committee, finds ample justification for its abolishment."

Upon first reading of this article it would seem that you have passed snap judgment and accepted the report of the public buildings committee through its chairman, Mr. Langley, which report was written without anyone in the Housing Corporation being invited or given an opportunity to be heard with reference thereto. I doubt that *Engineering News-Record* intended to infer what it does, and that it really intended to mean that Chairman Langley *claims* to find "ample justification for its abolishment." However, the article gives the impression that the Housing Corporation has been profligate and should be abolished.

The statement that the Housing Corporation is being perfected on a permanent basis, that the personnel is even now being augmented, and that the salaries have been unnecessarily advanced, cannot be substantiated by facts. Every member of the Housing Corporation realizes that it was organized to meet a war emergency, that the work which it has been carrying on since the armistice was signed is for the purpose of salvaging as much material and labor as possible for the United States Government, and that upon completion of the houses and all work connected therewith the houses will be put up for sale and the Corporation closed out as speedily as possible. The personnel has steadily decreased, and no new members have been taken on except to fill vacancies of those who have resigned to accept permanent and more lucrative positions. Where salaries have been advanced there has been a corresponding increase in duties and responsibilities.

When the armistice was signed the Housing Corporation had 97 projects in various parts of the country in stages from design to partial completion. Upon cessation of hostilities steps were taken to conserve funds, and 70 projects were abandoned. Of the 27 projects which were continued, nearly all were curtailed. Work was continued on the 27 projects (1) because it was apparent that a greater salvage value could be secured by carrying them to completion than by abandoning them; (2) they would have large peace-time value for the Army and Navy.

The only reason why any member of the Housing Corporation will be opposed to H. R. Bill 7656 is because he believes it will be contrary to public interest. Congress, by an amendment to the present housing act, has already provided for the rapid closing up of the affairs of the Housing Corporation and the selling of its houses and lands. This is being most expeditiously done, in accordance with the present act, by the United States Housing Corporation. The transfer to any other department would involve loss of time, great delay and endless expense to the Government. The present officials are now acquainted with all the details, and new organization would, of necessity, have to become acquainted with all these details and information.

Upon publication of H. R. Bill 7656 and the report of the committee on public buildings and grounds, L. K. Sherman, M. Am. Soc. C. E., president of the Housing Corporation, wrote to the Hon. Burt M. Fernald, chairman of the Senate committee on public buildings and grounds, Washington, D. C., requesting that the Senate immediately investigate the Housing Corporation because of the slanderous attack in the report of the House committee under Mr. Langley. On Aug. 15 Mr. Sherman wrote to Senator Fernald, giving detailed information on certain parts of his letter of Aug. 2. Irving E. Macomber, vice-president of the Housing Corporation, on Aug. 2, wrote to the Hon. John W. Langley, chairman of the committee on public buildings and grounds, House of Representatives, Washington, D. C., requesting that the House investigate the Housing Corporation. Every member of the Housing Corporation welcomes an investigation, even though it means that he must put in considerable overtime in order to get out the detailed information requested by the Senate and by the House.

On p. 347 of the same issue of your journal is an editorial dealing with the charge of profiteering by the cement companies. This editorial treats the question in a very fair and honorable manner, and I wish to congratulate you for the equitable treatment you have given the subject.

If you had given the United States Housing Corporation the same consideration that you did the cement companies, the impressions conveyed in the article entitled "Bill Proposed to End Housing Corporation" would be vastly different.

CHARLES E. HENDERSON,
Principal Assistant Engineer, United States Housing Corporation.
Washington, D. C.

Army Needs Better Psychology More Than New Organization, Says Correspondent

Sir—Your issue of Aug. 21, pp. 358 and 346, indicates that the perennial fight over the organization of the military establishment of the United States is again in full swing, this time in the arena of Congress.

The opinions on the subject furnished in the issue in question by the "engineer thoroughly familiar with the military establishment," as well as in your editorial thereon, are distinctly interesting and instructive. It is to be hoped that other opinions will promptly come forth, more especially opinions formed from actual contact with the workings of the military establishment both here and abroad during the recent war, together with specific sustaining facts when these are needful or useful. The subject is broad, vital and many-sided, requiring for effective understanding thorough consideration from many angles as well as careful analysis of many specific facts. Discussion should not be to the end of arraying the various elements involved on the old familiar lines of class, departmental, clique and personal interests, but to the end that this vital problem should be attacked on broad, intelligent and constructive lines. The Army bill should be framed with no unfair or enervating distinctions, but so that rank and authority shall be determined and conferred as far as possible on the basis of ability to perform, and not unduly on the basis of blind vested right or automatic rule of seniority.

Much sympathy will be found with the opinions of both the communication and editorial comment as to the features of the Army bill discussed. Giving the line a monopoly of the general rank smacks somewhat of the union spirit and perhaps has its origin in the same purpose that would bar civilians from rank and functions for which their qualifications and experience peculiarly fit them, to make place for regular Army officers less

qualified—often not qualified at all—for the functions in question.

However, experience both at home and abroad indicates that the basic trouble with our military establishment is not so much in its legal composition as in the multitudinous defects of its operation. A perfect system can be hopelessly debauched by incompetent and unfair operation, while an imperfect system can secure good results if it is intelligently administered and loyally served.

Apparently, the A. E. F. functioned for nearly a year under the old bureaucratic régime, with an embryonic General Staff, possessing almost no powers, termed the "Coördinating Board." Then, just as the A. E. F. was beginning field operations on a considerable scale, the General Staff was suddenly brought into existence and called upon to function intensively, with broad and penetrating powers. That results effected by this new order of things were unsatisfactory from many points of view seems only natural, especially from the points of view of line, departments and corps; but that the continuance of the old bureaucratic régime, with a toothless and clawless General Staff or Coördinating Board, would have secured better results, lacks convincing demonstration, to say the least. The departments and corps had fallen down seriously in many vital matters and were consuming valuable time and resources of talent in wrangling and struggling for advantage. Even the Corps of Engineers, which your correspondent rates as successful, was from start to finish torn by internal strife, in which the railroad policy formed a conspicuous storm center. Also, an intimate analysis of the performance of the Medical Corps, which your correspondent also classes as successful, would doubtless disclose much to criticise and correct. In fact, all departments and corps, as well as all branches of the line, developed many defects and weaknesses which must be eliminated in a great measure in order to secure in the Army establishment such efficiency as will enable it to stand the gaff of war work with odds not in its favor. The day may be much nearer than is generally realized when we shall have to take on single-handed something more than Mexico or Spain.

But the creation of a general staff with autocratic powers and a disposition to extend its participation beyond the general determination, control and coördination of the Army policy, and into the details of department corps and bureau administration and operation, seems like inserting a new train of gears into a machine to correct defective lubrication.

A general staff, with proper functions properly understood and properly performed, is doubtless essential to a high degree of military efficiency, but it must confine itself to its legitimate functions and must be so constituted as to render these functions effective. The general staff should contain as department heads and bureau chiefs the best talent in the service, and, by means of its capacity for understanding, determining and coördinating, rather than by its authority created by law, should command the respect, confidence and loyal coöperation of all branches of the service.

Thus far the General Staff appears to have created the impression of being a heavy burden added to those already imposed on the other branches of the service, with few compensating advantages, and its army of subordinates of being a pestiferous lot without definite or useful functions, and with a strong desire to justify their existence and aspirations for preferment by interfering with the affairs of other people already amply supplied with legitimate troubles.

This impression is doubtless due largely to inadequate understanding on both sides, which time, patience and experience alone can remove, but its removal will be undoubtedly seriously retarded by the creation of too much vested General Staff authority and extension of that authority too far and too intimately in parallel with the authority of the working forces of line, departments and corps.

In military work, as in all other work, there can properly be but one line of control. If "High Command" requires other lines of participation in the operations involved, these lines of participation must be definitely subordinate to the line of control. When the two clash, one or both must be changed. When "High Command" elects to operate unduly through a subordinate line of participation something is probably wrong with "High Command," chiefly in that it has failed to organize its line of control effectively and is trying to correct this failure by irritating and disorganizing methods.

The basic trouble with the functioning of the General Staff is exactly the same as that with the functioning of all other branches of the service—inordinate ego. The paramount object of creating an effective organization in time of peace, or of winning the war when war is on, is too often subordinated to personal, clique or class ambition, and struggle for advantage and promotion. It is notorious that the Army establishment during peace is a hot-bed of intrigue and strife for promotion, with scant regard for the good of the service or for personal ethics. In time of war this condition is greatly aggravated by intensified ambition and is not abated by patriotism, as some have fatuously thought.

To abate the malign influence of this condition, to compel constant loyalty to the paramount object, to encourage initiative and sense of personal responsibility, to develop and use the efficient and eliminate the inefficient, to exercise intelligence, discrimination and fairness in selecting, promoting and distributing personnel—all these considerations seem more important than the technical composition of the General Staff established by Congress.

The case demands a better psychology rather than a better system of organization. When the better psychology is obtained a better working system will follow automatically, rather than by legislation. If the better psychology is not obtained, no system will check the degeneration of both our military efficiency and of our patriotism.

"EX."

Book Reviews and the Post Office

Sir—I have just read your editorial on "Book Prices Barred by Postoffice." We have stood so much from the Postoffice Department the past year or two that this particular bit of inanity is simply in line with much else. But it goes rather too far. It is a serious inconvenience, in addition to being senseless.

Who is the particular fool who did it? Some individual must have made the ruling. Find out and ask him, publicly, Why? Placing personal responsibility is the best cure for such idiocy. Go to it!

Baltimore, Md. C. J. TILDEN.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Large Concrete Pipe Grouted at Special Joints

WELL holes were not provided for in the excavation estimates of a 48-in. reinforced-concrete bell-and-spigot storm-water drain on Fourth Ave., Salt Lake City, Utah. When the superintendent of construction found that there had been allowed only 1½ in. beyond the overall horizontal diameter of the bells, he devised a scheme whereby the joints could be grouted in much the same way that a lead joint is poured, but without the necessity of working around the bell after the pipe was pushed home. The end of the spigot is cast with a ring, set in the bottom of the form so as to make an annular space between the bell and the spigot 1½ in. wide, 1½ in. deep at the end of the spigot and 1¼ in. at the other end. The chamfer allowed the pipe to be pulled from the form without chipping. Access to the annular ring for pouring is provided by casting a rectangular opening 2 x 12 in. through the bell. The pipe is laid with this hole on top.

To hold in the grout during pouring, a ring of jute of the cheapest quality is placed around the pipe near the spigot end before it is entered into the bell. It is then rammed home with a long stick, and earth is backfilled against it. On the inside of the pipe oakum is packed into the opening, and a strip of 18-gage sheet steel is braced against the oakum. More oakum is used than enough to fill the joint, to take up the inequalities of the abutting pipes. By inserting a wire into the annular ring, the foreman can readily agitate the grout should anything create a stoppage or should the grout become air-bound. He notes such an occurrence by counting the number of buckets of grout poured, three buckets usually being required.

After setting a short time, the steel band on the inside is removed three or four joints back, the oakum is pulled out, and the joint is pointed up. Backfilling of the whole trench takes place within 48 to 72 hours after the pouring, but it can take place the same day if desired.

The whole procedure is carried on rapidly with a gang of five men and a foreman, a four-legged gantry or tower on rollers straddling the trench facilitating greatly the lowering operation and the entering of the spigot into the bell. The gantry is 12 ft. high, with 6 x 6 in. corner posts and a headframe from which a steel pulley block supports a five-part line. A hand winch operates the line, and the whole frame is rolled along on a plank track in the setting of the pipe. The rollers are 5 in. in diameter and 18 in. long and are set in bearings. Three men can move the gantry unless it is carrying a pipe, in which case bars are used at the rollers. The material is coarse gravel well packed with enough clay to make it stand vertical. In parts of the trench a volcanic ash is encountered at the bottom; this stands up well for a few feet in depth unless wetted. Speed in getting the joints placed quickly in these places is a factor. Ordinarily the above crew can lay eight pipes per day.

This work is under the general supervision of S. Q. Cannon, city engineer, with W. A. Alexander, construction engineer, directly in charge. The contractors are Shepard & Weber, to whom the pipe is furnished by the C. F. Massey Co., Chicago.

Other Articles in This Issue of Interest to Contractors:

Concrete Wall Construction Is Continuous Process — Page 454

Large Train-Shed Raised Without Interruption of Traffic — Page 460

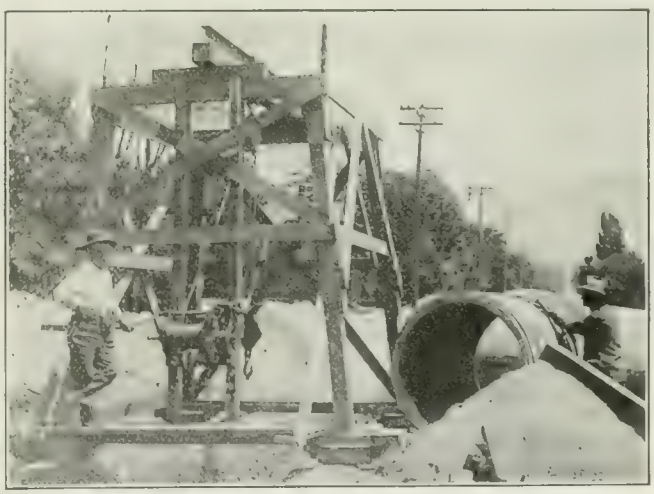
Corrugated Spacer Used for Wood-Block Pavements — Page 463

Move 200-Ton Transfer Bridge on Pontoons in New York Harbor — Page 478

Specify Kind of Bidders, Says Engineer (Letter) — Page 480



CONCRETE PIPE CAST WITH ANNULAR RING FOR GROUTING JOINTS



GANTRY TOWER ON ROLLERS FOR LAYING PIPE

Tight Nuts on Construction Bolts

EXPERIMENTS with loose nuts and tight nuts on bolts having a short threaded length have been made under the direction of H. E. Weightman, chief engineer of the Engineering Service Co., Chicago, who reports that the tests indicate a decided advantage for bolts having the tight-fitting nuts. Bolts of this kind are used extensively on electric-line work and also on construction work for guy clamps and anchors and for bonding reinforcement bars.

Field or service trials extended over a period of three years. Clamps with three and four bolts, some with finger-fit nuts and others with tight-fit nuts, were placed on pole lines of electric companies in different parts of the country. Records were kept of each clamp; they showed that nuts which could be run down by hand (or had a finger-fit) would work loose much more readily than the tight nuts (those requiring a wrench to turn them). Speed tests showed that a lineman could place as many clamps with tight-nut bolts as with loose-nut bolts; the time consumed in turning down the nuts is only a small portion of that required to assemble the anchor, guy and clamps. Tensile tests for shear on the threads were made on the bolts and nuts and gave results demonstrating that bolts with tight-fitting nuts have appreciably greater resistance to stripping of the thread then those with loose-fitting nuts.

For a vibration test, kegs of bolts with tight and loose nuts were placed in a small cart arranged with a motor drive to represent a delivery wagon traveling over rough roads. After it ran 200 hours, which is about the maximum service trip, it was found that nearly 50% of the loose nuts had worked off the bolts, even though they had been run down the full length of the 1½-in. threaded portion. Of the tight nuts only 1% were loose, although these nuts had been run down only the depth of the nut, with one additional turn to make them tight. These nuts were applied by a friction threader used by the manufacturer in running the nuts on the bolts before they were packed in the kegs for shipment.

It is stated by Mr. Weightman that in the past it has been the general practice to use loose-fitting nuts, and that at present the majority of the bolts are thus equipped. However, several manufacturers now supply tight-fitting nuts. The same prices are quoted, as the manufacturers explain that the only expense involved is that of adjusting the machine for the change from loose to tight fit. With less play or slack there is less chance of the thread of the nut or bolt being stripped when under stress, and the nut is less likely to work loose under vibration. The tight nut can be entered on the bolt with the fingers, and the use of the wrench for the remainder of the distance is not objectionable, because the threaded length to be covered is relatively short and the time required for bringing the nut to bearing is negligible, especially since a wrench must be used in any event for the final tightening of the nut.

As a result of the tests and service trials, Mr. Weightman's specifications now include the following provision: "When the face of the nut is flush with the end of the bolt the fit shall be neither so loose that any play or rocking between the nut and the thread of the bolt can be felt, nor so tight that the nut cannot be turned off with the fingers or run down the remaining length of the threads with a 6-in. wrench."

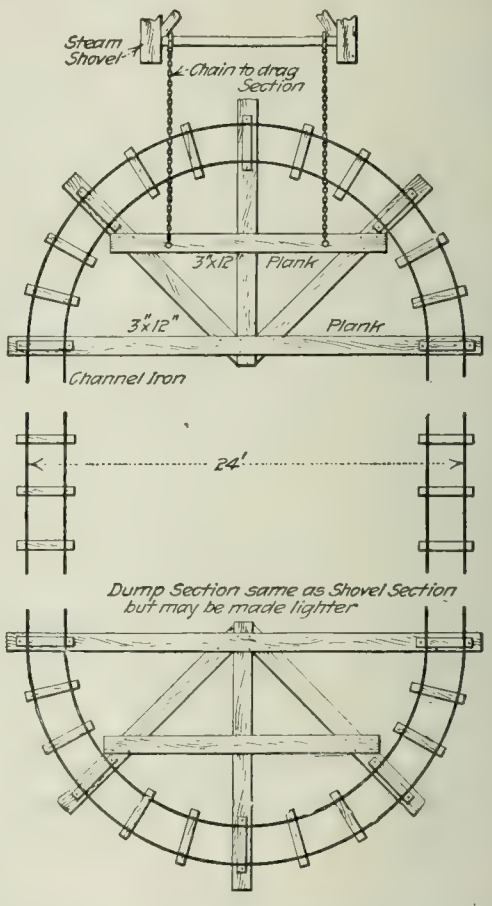
Endless-Track Arrangement for Carrying Away at Steam Shovels

By D. J. McFadden

New Jersey State Highway Department, West Portal, N. J.

AN ENDLESS, switchless track arrangement is being used by the New Jersey State Highway Department, which has two steam shovels at work in building a state road with convict labor near West Portal, N. J. The advantage of the arrangement is that the dump cars are always in gage with the steam shovel, and there is no useless track or useless travel of cars. In this work it is aimed to have the fill always up to grade as it is extended.

As shown in the accompanying illustration, the track arrangement consists in having two semicircular sec-



ARRANGEMENT OF ENDLESS, SWITCHLESS TRACK

tions, one of which is chained to the rear of the steam shovel while the other is at the end of the fill. As the steam shovel moves up and the fill extends, the intervening track is lengthened; the growing space being bridged by the use of channel irons placed upon the top of the rail ends to carry the dump-car wheels across until a new rail-length can be inserted.

On the work described, 24-in.-gage track was used in 15-in. lengths, and the channel irons were made 20 ft. long. The forward semicircle is drawn as the steam shovel moves ahead. The semicircle at the fill end is easily moved by three men. It is made of somewhat lighter construction, not being so thoroughly braced. In setting up the tracks, slight allowance has to be made at the joints between the semicircle and the track, to provide for the extra clearance required by the channel irons which fit over the ball of the rail.

NEWS OF THE WEEK

New York, September 4, 1919

Contractors Form Insurance Company

As a medium of cost reduction to contractors in bonding and compensation insurance, the Contractors' Service Corporation has been organized as a subsidiary of the Associated General Contractors of America. This special-service feature will be operated by B. Clinton Mackey, Luther E. Mackall and a prominent liability underwriter.

In order to insure the proper functioning of this new organization, Daniel A. Garber, president of the Associated General Contractors of America, calls upon its 400 members to make use of this new service feature. "If this be done," asserts Mr. Garber, "the volume of business will be such as to give the managers of the corporation a very large influence in fixing rates and in obtaining proper coverage and prompt service."

For the convenience of the members of the Associated General Contractors of America, agencies of the Contractors' Service Corporation will be established in the principal cities.

Engineers Will Tender Banquet to Hoover

Arrangements are being made, under the auspices of the American Institute of Mining and Metallurgical Engineers, for a banquet to be held in New York City in honor of Herbert C. Hoover shortly after his arrival, which is expected some time in the middle or latter part of this month. The officers of the general committee are W. L. Saunders, 11 Broadway, New York City, chairman; Charles F. Rand and E. P. Mathewson, vice-chairmen.

Lumber Order for French Contract Being Placed

All lumber that will go into the construction of the 2000 frame dwellings which MacArthur Bros. recently contracted to erect for the French Government will be shipped from Jacksonville, Fla.

Ten million feet, board measure, will be required. Orders for materials are now being placed, and shipment will begin in about two months. The dwellings will be one-story, three-room structures. They will probably be erected by French labor under American supervision.

Striking Western Trainmen Heed Hines Ultimatum

Striking enginemen and trainmen in California, Nevada and Arizona who had, last week, temporarily tied up transportation in the districts affected, returned to work after an order had been issued by Director General of Railroads Hines which stated that all men on strike would be dropped from the rolls if they did not return to work by Aug. 30. The strike was in sympathy with the striking employees of the Pacific Electric Railway Co., the lines of which are privately operated.

Officers of the American Federation of Labor have also acquiesced in President Wilson's request that 90 days elapse before action be taken by the railroad shopmen. The President indicated that strikes only aggravated already serious living conditions and that through avoiding strikes greater opportunities for the reduction of living costs were possible.

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago. Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 505 Pearl St.

Form New York State Highway Council

The New York State Council of the Federal Highway Council was recently organized in New York City, with the following officers:

Chairman, Arthur H. Blanchard, president of the American Road Builders' Association and president of the National Highway Traffic Association; vice-chairmen, Frederick S. Greene, New York commissioner of highways; Lieut.-Col. Theodore Roosevelt; E. J. Mehren, editor of *Engineering News-Record;* George M. Graham and D. C. Fenner; Secretary-Treasurer, H. W. Perry, manager of the Trailer Manufacturers' Association of America.

Would Return Roads Under Rigid Control

Bill Before Senate Provides for Division Into Regional Systems Privately Owned

Under a bill offered in the Senate, Sept. 2, by Senator Cummins of the Interstate Commerce Committee, the railroads would be returned to private ownership, but divided into 20 to 35 operating units, or regions, under a rigid system of Federal control to be exercised by a new Railway Transportation Board and by the Interstate Commerce Commission, which would retain the power of reviewing rates. It is expected that the program outlined in the measure may have the support of the majority of the Senate, notwithstanding the fact that the Esch bill, already introduced in the House of Representatives, provides for the return of the railways to their owners without the restrictions of the present Cummins bill.

The Railway Transportation Board, created under the bill, consists of five members, appointed by the President, to be approved by the Senate, at $12,000 a year. None of these officials may be associated in any capacity with a railroad.

The Interstate Commerce Commission is to exercise general jurisdiction over the formation of the new railroad plan and is to maintain the supervisory power it now has over rates.

Under one provision of the bill railroad employees would share in any excess of profits accrued under the new method. The proportion of profits to be thus distributed is to be based upon a "fair return upon the value" of the railroad property. This would be determined by the Railway Transportation Board.

One-half of the excess profits would be applied under this scheme, first, in improving the conditions of work of railroad men, and after that there would be a direct share in the excess return. The other half of the excess profits would be placed in a fund for the use of the railroad board in the purchase of equipment, or for lending it to individual railroads for that purpose.

Wage questions would be decided by a joint committee comprising railroad workers and owners. One provision of the bill stipulates against strikes or lockouts.

The issue of railroad stocks and bonds is regulated under the measure, being put under the control of the Interstate Commerce Commission. Governmental approval of new lines or extensions and of all bonds relating to them would be required.

Railroad Security Owners Ask Guaranteed Returns

The presentation to Congress of a memorial from the railroad security owners of the country, petitioning for a railroad settlement that will guarantee a fixed return on investments, by S. Davies Warfield, president of the National Association of Owners of Railroad Securities, was a feature of the proceedings during the past week before the committee on interstate and foreign commerce of the House of Representatives.

The memorial was issued over the signatures of various banks and insurance companies throughout the country. It states that the real question at issue is the fixed-percentage return provided in the Warfield plan and that all the rest becomes mere machinery. The memorial draws the comparison between the present Federal reserve act and the legislation which it urges in the form of the Warfield plan of the National Association of Owners of Railroad Securities. It is emphasized that the keystone of the situation is the ratemaking power.

The memorial states that it is issued "by or on behalf of the 50,000,000 American citizens owning or directly interested in railroad securities—including over 9,000,000 savings depositors, 33,000,000 insurance policyholders and millions of others whose investments in national and state banks largely represent railroad securities—trust estates and individual investors."

Gompers, Home From Europe, Is Silent on Plumb Plan

Although asked repeatedly for a statement of opinion upon the Plumb plan for railroad nationalization, Samuel Gompers, president of the American Federation of Labor, upon his return from Europe, where he went to serve American labor interests at the Amsterdam session of the International Trades Union Congress, replied, "I reserve the right to refuse to answer to that question."

Mr. Gompers did discuss freely European conditions and the war's possible effects on labor. He asserted that "whoever has not learned that autocracy or kaiserism, whether it be military, political, commercial or industrial, is a dead issue, has not learned the real lesson of the war."

As a corollary, Mr. Gompers, in addressing a meeting of the striking actors of the Actors' Equity Association, asserted that "all men and women in the professions who work for salaries or wages have the right, the unqualified right, to sit in the councils which determine their pay and the conditions under which they work."

Discussing political and social conditions on the European continent, Mr. Gompers said: "Bolshevism, I learned, is on the wane. It has failed in its hopes and aims, and the people who looked to it for political, economic and social salvation find that they have no peace, no bread, and no work. This will precipitate the downfall of Bolshevism."

Daniels Dedicates Naval Dry Dock

The naval dry dock at Pearl Harbor, H. I., was dedicated Aug. 21 by Secretary of the Navy Daniels. Mrs. Daniels acted as sponsor, pressing the electric button that flooded the structure. The dry dock was completed several months ago, it being unwatered for the first time Apr. 11, 1919. Peculiarities in its design and construction were described in *Engineering News-Record* of July 25, 1918, p. 173. The dry dock has a clearwater basin 1010 ft. long and 101 ft. wide at the bottom clearance. The distance from the top of coping to the floor is 43½ ft.

A. A. E. Chapter Joins New York Engineers in Pay Demand

The New York Chapter of the American Association of Engineers has approved a report from its public service committee recommending the flat increase of $500 per year in the pay of technical engineers employed in the various city departments of New York City and by the Public Service Commission and transit construction commissions, which increase was previously requested in a letter from the New York Union of Technical Men, Local No. 16,388, American Federation of Labor, addressed to all city and rapid transit officials of New York City, including the borough presidents.

As yet no definite settlement has been reached nor have definite replies been received by the New York Union of Technical Men to its request for a flat $500 increase. This is presumed to have been due to the fact that a number of officials have been away on vacation.

A short time ago the union issued a statement purporting to indicate that the average salary of the New York City technical man was less than the minimum salary paid in San Francisco.

Wheeling Begins Civic Development

Civic development, demanded by the need for increased housing areas, has been started in Wheeling, W. Va. Maurice Scharff, of the engineering firm of Morris Knowles, Inc., Pittsburgh, Penn., has opened offices in Wheeling, and surveys have been started on three possible schemes of development. These three schemes are the extension of Chapline St. so as to connect with the National Pike at Fulton; the reclamation of the Wheeling Creek area; and making accessible the Chapline Hill.

The project is financed by the Wheeling Improvement Association, an organization of representative business men.

Motor-Truck Lines Planned for Rural New York

To coöperate in the establishment of motor-truck express lines in those rural sections of New York State where farmers are having most difficulty in getting their perishable products to market quickly, is one of the functions of a commission recently appointed by Governor Smith. The chairman is former Representative Peter G. Ten Eyck, and other members are Frederick S. Greene, state commissioner of highways; Professor Boyle of the State College of Agriculture; William E. Dana, chairman of the Council of Farms and Markets, and F. W. Fenn of the National Automobile Chamber of Commerce. The committee will work, through farmers' organizations and municipal officials, to encourage the opening of truck routes. No state appropriation will be asked at present.

It has been found that in many cases farmers are unable to get their goods to New York markets as quickly as are shippers from Florida who have the benefit of direct express service. Farmers with small shipments for short hauls have often found their goods delayed. The commission estimated that 50% of the perishable produce grown in the state does not get to market.

In favor of the motor express lines it was stated that the delivery of food by this means could be accomplished at three-fifths the cost of railroad delivery and at a gain in speed.

Criticizes Canadian Salary Ratings

In a letter, Aug. 27, to Alfred D. Flinn, secretary of Engineering Council, Arthur S. Tuttle, chairman of that body's committee on classification and compensation of engineers, objects to the proposed "Classification of the Civil Service of Canada," as recommended recently by Arthur Young & Co. The same firm, it is understood, is performing a similar service for the United States Congressional committee on reclassification and compensation of Government employees, including engineers.

"In general," Mr. Tuttle points out, "promotion through most of the [Canadian] grades is by increments of about $120, the minimum and maximum rates of each being respectively higher and lower than the rates fixed for the grades below and above, this resulting in a comparatively small salary range for each position and in this respect corresponding with what seems to have been the general practice heretofore. This treatment is one which it would seem desirable to modify, to the end that the relative ability and experience of men performing similar work may be given adequate recognition."

Exceptions are noted in the case of "topographical engineer," where a salary range from $2160 to $3120 is pro-

posed, and in the case of promotion from "junior electrical engineer," at a maximum salary of $1980, to "electrical engineer," with a minimum salary of $2640, each of the two latter grades having an extreme salary range of only $360. In the case of "chief draftsman," "structural engineer," and "chief topographical engineer," maximum salaries are proposed of $3000, $3240, and $3840, with no provision for promotion to other engineering grades, although for each position the qualifications required are such as to indicate ability to progress to high positions in the service. A table also shows that only six engineering positions are open to compensation at a rate of more than $6000 per annum.

"It would seem," says Mr. Tuttle, "that this report is open to serious criticism on the grounds that it fails to group engineering service along orderly lines, that it provides too narrow limits for promotions within a grade, and that the compensation proposed for all grades is inadequate for the service rendered. The latter criticism seems particularly pertinent in comparison with the rates now being demanded by organized labor. The practicability of properly meeting present-day conditions by the addition of a 'special war bonus' to the proposed rates, in order to meet the present high cost of living, is also to be questioned on the ground that, and as set forth in the circular letter issued by the council's committee on classification and compensation of state and municipal engineers, the 'revolutionary change in the cost of living' is one which "unless modified by further economic disturbance is likely to be permanent or to continue for a long time to come.'"

Joint Meeting Planned for Road Discussion

As the county commissioners of the State of Washington and those of the State of Oregon are to hold their annual convention during the same days, Sept. 11-13, inclusive, arrangements have been made to hold a joint meeting of the two state bodies to discuss coöperation in state highway building, as well as other matters of mutual interest. The Washington commissioners will hold their convention in Vancouver. Portland will be the meeting place of the Oregon commissioners.

New Quarters for American Association of Engineers

Within the next two or three weeks, it is announced, the national headquarters of the American Association of Engineers will be moved from its present location at 29 S. La Salle St., Chicago, to the Nepeenauk Bldg., 63 E. Adams St., where lease has been taken for 6000 sq.ft. of office space. The Chicago chapter, which now has over 1100 members, will take over the space vacated by the national headquarters of the association.

Asphalt Association Investigates College Highway Courses

In order properly to equip technical school graduates for the administrative, executive, business and engineering positions in national, state, county, town and municipal highway departments of the United States and in the Dominion, provincial and municipal departments of Canada, the engineers of the Asphalt Association have planned and are developing a rather comprehensive educational campaign.

Preliminary investigations show that but 25 of 93 colleges examined are giving satisfactory fundamental training in highway engineering as a part of the civil engineering course. This statement comes from Arthur H. Blanchard, professor of highway engineering, University of Michigan, who is associated with the engineers of the Asphalt Association in the development of their educational plan.

That the enormous size of the highway building schedule, indicated by the 1919 appropriation of $500,000,000 in the United States and a relatively large amount in Canada, demands technically efficient and businesslike engineers to direct the expenditure of this vast sum, is the stand taken by the association's engineers. Consensus of opinion among highway engineers and educators indicates that highway engineers should have the broad technical training which the four-year course in civil engineering gives. It is the contention of such engineers that the annual waste of millions of dollars in the United States in highway construction will not cease until the profession of highway engineering is placed on an equal basis with structural, hydraulic, sanitary and other branches of civil engineering.

This plan of the Asphalt Association contemplates coöperation with colleges and universities throughout the United States and Canada, whereby increased attention will be given to courses of instruction in highway engineering.

Treatment of Stockyards Waste in Chicago

That the cost of treatment of trade wastes from the Chicago stockyards at an activated-sludge plant to be built by the Sanitary District of Chicago may be assessed with reason upon the packing companies, is the conclusion of a joint report, dated Aug. 19, 1919, made to the Sanitary District by committees of the Chicago City Club, the Woman's City Club, the Chicago Woman's Club and the 29th ward. The district proposes to assume 15% of the operating expense. The packers have claimed that to assess the balance against them would be unfair but have offered to pay 40%, not as an obligation but as a concession in the interest of arriving at a settlement.

Public policy in such cases in the future should recognize waste disposal as an element in cost production, according to the report. Taxation by the district has been proposed in the present case, but this would place an additional burden upon other plants which produce little or no trade waste for disposal by the Drainage Canal, and the estimated operating cost of $825,000 would increase the tax rate of the district by nearly 20%. It has been asserted frequently that the packers pay 16% of the taxes raised by the district, but the report points out that the correct figure is about 3%, the higher figure being based probably upon a statement that 16% of their taxes is paid to the district. On the other hand, they contribute from 16 to 25% of the sewage to be treated. The conclusion arrived at is that the Sanitary District would be justified in charging the packers with the entire cost of disposing of their trade wastes, and in extending the same policy to other industries. The offer of 40% is considered inadequate, especially when made as a gratuity.

In a report made by representatives of the Sanitary District and the packers in 1917 (see *Engineering News-Record* of June 21, 1917, p. 594) it was recommended that a single unit of the proposed plant should be built at first as an experiment. The present report, however, points to the wide development and use of the activated-sludge process since that time, and urges that under the 1917 plan, with time allowance for a test of the first unit, a plant of sufficient capacity to care for all of the stockyards wastes could not be completed for several years. It is urged that such a delay in ending the present objectionable situation would be unfortunate.

Colonel Wilgus Made Officer of Legion of Honor

Col. William J. Wilgus, of New York, who was deputy director-general of railways in the American Expeditionary Forces in France, and received the Distinguished Service Medal from the United States, has been made an Officer of the Legion of Honor by the French Government in recognition of his services during the war.

Motor and Horse Traffic Separated on New York Bridges

Separation of horse and motor-vehicle traffic was put into effect on two of the East River bridges in New York City last week because of traffic congestion, which was specially troublesome during a street-car strike in Brooklyn some weeks ago. The Brooklyn Bridge roadway is henceforth a highway for horse-drawn vehicles only and the Manhattan Bridge a highway for motor vehicles only. The intent is to separate slow traffic from fast traffic and thereby avoid interference and increase the capacity of both bridges.

This order is the first result achieved by a committee of city officials which

has been appointed by the Mayor to study traffic conditions on the bridges and devise means of improving them and, if possible, increasing the traffic capacity. Edward A. Byrne, of the city's Department of Plant and Structures, is secretary of this committee. One of the facts which this committee faced at the outset was a remarkably heavy and constantly growing vehicle traffic, most serious on the two southerly bridges, which lead to the business center of Brooklyn. During the strike already referred to, the traffic grew to excessive density, and the amount of the traffic, in conjunction with interference between fast and slow vehicles, produced intolerable congestion. The committee was appointed immediately after the strike, and its work is likely to continue for some time to come.

Endowment Fund Drive On For M. I. T.

To meet the increased cost of instruction, and to balance the loss of financial support from the State of Massachusetts, withdrawn because of a clause in the new constitution, a nation-wide drive for $10,000,000 has been started by the endowment fund committee of the Massachusetts Institute of Technology. The committee is headed by H. Coleman du Pont, and its headquarters are at his offices, 120 Broadway. The other members of the committee are Theodore N. Vail, Charles A. Stone, Otto H. Kahn, and Charles Hayden, of New York; Everett Morse of Boston, Edmund Hayes of Buffalo, and Dr. Richard C. MacLaurin, president of the institute.

Contributions will be received by Mr. du Pont or by Mr. Stone at the offices of the committee. It is expected that the drive will close Jan. 1, 1920.

New York Association of Architects Admits Draftsmen

Draftsmen, as well as registered architects, are eligible to membership in the New York State Association of Architects, according to the terms of a new constitution, recently made public. Draftsmen must be over 21 years of age and employed in the office of an architect elegible to membership in the association. Such draftsmen may become junior members. The only privilege of membership denied junior members is the vote at meetings of the association.

Commenting upon this clause in the constitution, the *Bulletin* of the association, in its first issue, recently published, says: "If architecture is to take its rightful place in the upbuilding of the new world, there must be joined in one effort all those who are engaged in architectural work—whether as employers or employees, beginners or experts. The whole group of architects and those who are to be the architects of the future must move forward together."

To Discuss Sanitary Engineering at Public Health Meeting

Water-supply and sewage disposal are the principal topics which will be discussed at the meeting of the sanitary engineering section of the American Public Health Association, to be held in connection with the annual meeting of the association in New Orleans Oct. 27-30. The reports of the committees on water-supply and sewage will be presented before the section.

Other reports to be made at the meeting of the engineering section are those of the following committees: On sanitary control of waterways, Harrison P. Eddy, chairman; on water-works operation and analytical methods, Edward Mayo Tolman, chairman; on sewage-works operation and analytical methods, C. B. Hoover, chairman; on refuse collection and disposal, E. D. Rich, chairman; on milk pasteurization, H. A. Whittaker, chairman. C. G. Earl and Kenneth Allen are chairmen of the committees on water-supply and sewage disposal, respectively.

The tentative list of papers to be delivered before the section includes the following: "Water Supply and Typhoid Fever," by Col. George A. Johnson; "Operating Features of the St. Louis Water-Works," by E. E. Wall; "Control of Water-Purification Plants in Ohio," by W. H. Dittoe; "Typhoid Fever Outbreak in Charleston, W. Va.," by Edward Mayo Tolman, and "The Engineer in Public Health Work," by Morris Knowles and Maurice Scharff. It is also expected that papers will be presented by Thorndike Saville, Frederick Bass and Charles Saville.

Indiana Spending $5,000,000 on Roads

About 80 miles of road are now under contract by the new Indiana State Highway Commission, the work being scattered over the state and consisting of sections from 5 to 12 miles in length. Bids on approximately 58 miles of highway will be opened early in September. All of the work let so far is for cement concrete, except two sections of bituminous concrete. It is the policy of the commission to reconstruct as soon as possible the worst stretches of road in the state highway system, as in this way the cost of maintenance can be reduced considerably and the system can be kept in better condition.

With the letting of work in September, practically 130 miles of highway will be under contract, and the total amount of these contracts will be about $5,000,000. It is intended to let between 300 and 400 miles additional between September, 1919, and March, 1920, the main portion of this being let, probably, after Jan. 1, 1920.

Survey parties are now in the field, and office forces are busy in the preparation of plans and specifications for this work. In addition, a considerable number of bridges, of more than 20-ft. span, are to be advertised during the latter part of this year or early in 1920. All of this road and bridge work is under the direction of H. K. Bishop, chief engineer of the Indiana State Highway Commission, Indianapolis.

Civil Service Examinations

New York State. Bridge designer, office of Transit Construction Commissioner, $1500 to $2100, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

New York State. Junior assistant engineer, State Engineer and Highway Department, $1200 to $1440, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

New York State. Junior engineer, Transit Construction Commission, New York City, $1200 to $1500, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

New York State. Sanitary engineering inspector, State Department of Health, $1320, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Specification engineer, Office of Chief Signal Officer, War Department, Washington, D. C., $2000 to $2400 per year, Sept. 9. File applications before Sept. 9.

Chief metallurgist, $4,500 to $5,000 per year; assistant chief metallurgist, $3,600 to $4,500 per year, Ordnance Department. Applications must be filed before Sept. 16.

Computer, Ordnance, Navy Yard, Washington, D. C., $7.20 to $12 per diem, Sept. 17. File applications in time to arrange for examination at place selected by applicant.

Junior highway bridge engineer, Office of Public Roads and Rural Engineering, Department of Agriculture, $1200 to $1600 per year, Sept. 17. File applications with commission at Washington in time to arrange for examination at place selected by applicant.

Assistant examiner, Patent Office, Washington, D. C., $1500 to $1740 per year, Sept. 17 to 19 and Nov. 19 to 21. File applications in time to arrange for examination at place selected by applicant.

Engineer, $3000 per year; assistant engineer, $1800 to $2880 per year; junior engineer, $1200 to $1740 per year; engineering draftsman, $1200 to $3000 per year, Reclamation Service. Applications will be received until further notice.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

NEW ENGLAND WATER WORKS ASSOCIATION; Tremont Temple, Boston, Sept. 30, Oct. 1-3, Albany, N. Y.

AMERICAN SOCIETY OF NAVAL ENGINEERS: Secretary, Lieut. Com. F. W. Sterling, U S.N., Navy Department, Washington, D. C.; Oct. 7, Washington.

AMERICAN PUBLIC HEALTH ASSOCIATION: 169 Massachusetts Ave., Boston; Oct. 27-30, New Orleans.

AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS; 304 E. Walnut St., Bloomington, Ill.; Nov. 11-14, New Orleans.

The San Francisco Association of Members of the American Society of Civil Engineers, at a meeting Aug. 19, voted to favor the national Department of Public Works and indorsed the formation of a California Council of Engineers. A paper on the development of San Francisco harbor was presented by Frank G. White, chief engineer, Board of State Harbor Commissioners.

The Engineers' Club of San Francisco, Aug. 21, listened to a luncheon talk by John R. Freeman, who was passing through San Francisco on his way to China to "modernize the Grand Canal." The talk was under the auspices of the local section of the American Society of Mechanical Engineers. On Aug. 26, F. H. Newell spoke before the club on the subject, "The Engineer in Modern Life; His Needs and Ideals." This meeting was under the auspices of the local chapter of the American Association of Engineers.

The Detroit Engineering Society will hold the opening meeting of the season Sept. 5. Maj. Edwin Denby, U. S. M. C., and several members who have been overseas, will address the meeting. A report from the committee on the housing problem will be presented.

The Toledo Chapter of the American Association of Engineers was formally installed Aug. 26 by Maj. Garrison Babcock, U. S. A., past president of the association.

PERSONAL NOTES

CAPT. LUCIUS A. FRITZE, Sanitary Corps, U. S. A., has become associated with the technical staff of Wallace & Tiernan Co., Inc., New York City, manufacturers of chlorine control apparatus. Captain Fritze, who was sanitary officer of the Rainbow Division, after the armistice was assigned to the Office of the Surgeon General in Washington and while there prepared a history of the Sanitary Corps of the A. E. F. Captain Fritze will be manager of a new office which Wallace & Tiernan Co. are opening in Kansas City, Mo., serving territory comprised in the states of Montana, Wyoming, Colorado, North Dakota, South Dakota, Nebraska, Kansas and Missouri.

G. A. CARROLL has returned from military service and has been appointed division engineer, Chicago, Rock Island & Pacific Ry., with headquarters at Eldon, Mo. Mr. Carroll was previously division engineer of the El Paso division.

LIEUT. COL. FRANK B. MALTBY, Engineers, U. S. A., has received his discharge and will be a member of the advisory committee to the War Claims Board, Washington, D. C. Lieutenant Colonel Maltby was section engineer of Base Section 1, with headquarters at St. Nazaire, France, and was decorated by the French Government with the cross of Chevalier of the Legion of Honor.

CAPT. HAROLD M. LEWIS, commanding Co. D, 502nd Engineers, recently returned from France after nineteen and a half months' foreign service and has received his discharge. Captain Lewis is a graduate of Williams College and Rensselaer Polytechnic Institute; before the war he was resident engineer for Charles W. Leavitt, landscape engineer, New York City, on the reconstruction of the estate of Charles M. Schwab at Loretto, Penn.; he has resumed his connection with the same organization.

GEORGE H. SHAW, formerly sanitary engineer of the division of shipyard sanitation, United States Public Health Service, has been appointed chief of the division of housing and sanitation in the Bureau of Health at Philadelphia, Penn.

SOL. PINCUS, associate sanitary engineer, United States Public Health Service, has been detailed to Little Rock, Ark., for the purpose of investigating the quality and state control of water-supplies in Arkansas and Oklahoma.

H. E. BILGER, road engineer, Division of Highways, State Department of Public Works, Illinois, has submitted his resignation, thereby terminating a service of 12 years. On Sept. 1 he became consulting engineer for the Monmouth Stone Co., Monmouth, Ill.

H. E. M. KENSIT, for two years with Canadian engineers in France and, after being wounded at Vimy Ridge, assigned to the Ministry of Munitions of War, England, has returned to the Dominion Water Power Branch, Ottawa, Ont.

GEORGE LAWRENCE SMITH, having completed his work on the Boston Army supply base, of which project he had charge, has returned to his private practice of architect, associated with FAY, SPOFFORD & THORNDYKE, consulting engineers, Boston.

C. S. OGILVIE, assistant engineer, Grand Trunk Ry., Ottawa, Ont., has been transferred to the Montreal division, with offices in Montreal.

R. B. JOHNSON, assistant engineer, Montana division, Oregon Short Line, has resigned to enter private practice at Idaho Falls, Idaho.

C. M. BAKER, associate sanitary engineer, United States Public Health Service, has become State Sanitary Engineer of Wisconsin, with headquarters at the offices of the State Board of Health, Madison.

T. C. FISCHER has resigned as office engineer, Central Railroad of New Jersey, with headquarters in New York City, to become corporate engineer at the same point.

MAJ. FRED PATSTONE, 217th Engineers, U. S. A., has received his discharge and has resumed his position as city engineer of Manila, P. I.

W. S. KINNEAR & CO., engineers, New York City, announce the opening of a branch office in Detroit, under the management of L. W. KINNEAR.

J. A. BROAD, Newberry, Mich., county engineer of Luce County, has been appointed by Governor Sleeper a member of the State Board of Examiners of Architects, Engineers and Surveyors.

R. B. REASONER, recently back from military duty overseas, has returned to his work as division engineer, Oregon Short Line, with headquarters at Pocatello, Idaho.

L. H. NISHKIAN, formerly consulting structural engineer, Board of Public Works, San Francisco, has opened offices in the Monadnock Bldg., San Francisco, to engage in the general practice of civil engineering.

A. H. HOULT has been appointed assistant engineer, Montana division, Oregon Short Line, succeeding R. B. JOHNSON, resigned to enter private practice, as noted elsewhere.

PROF. CHARLES M. STRAHAN, department of engineering, University of Georgia, has been appointed, by the Governor, chairman of the State Highway Commission.

I. O. GIBBLE has been appointed engineer in charge of the newly opened Detroit office of the United States Structural Company.

A. C. BRADLEY, recently released from military service, is to return to his duties as division engineer, Chicago, Rock Island & Pacific Ry., with headquarters at El Reno, Okla.

A. D. LUDLOW, engineer of sewers, Kansas City, Mo., recently tendered his resignation to the Board of Public Works, effective Sept. 1. Mr. Ludlow

completed the plans for the Turkey Creek sewer, contract for which was awarded Aug. 22 to Thomas Kelly & Sons, of Winnipeg, Canada, for $2,453,749.

ALBERT T. RHODES has been appointed district engineer of the Asphalt Association, with headquarters at Worcester, Mass.

CAPT. G. R. B. SYMONDS, Engineers, U. S. A., has been discharged from the service and has been appointed highway engineer, District 9, Bureau of Public Roads.

THE C. E. GRUNSKY CO., engineers, San Francisco, has been organized to take over the business of the American Engineering Corporation. C. E. GRUNSKY is manager of the new corporation.

E. B. HUNLEY, previously of the 545th Engineers, A. E. F., has resumed his duties as assistant engineer of the Idaho division, Oregon Short Line.

E. S. NEEDHAM, formerly corporal, 46th Co., 20th Engineers, has received his discharge in England and has opened an office in London as structural engineer.

LIEUT. FREDERICK WHEELER, Engineers, U. S. A., has received his discharge from the Army and is now holding the position of chief of party with the California Highway Commission.

MESSRS. KASTENHUBER AND ANDERSON, having been discharged from the Army, have reopened their office at Easton, Md., and will resume the practice of engineering and surveying.

T. L. PIDOCK, recently released from military service, has returned to his work as chief draftsman, maintenance-of-way department, Oregon Short Line, with headquarters at Pocatello, Idaho.

OBITUARY

THOMAS MCNALLY, president of the Monongahela Construction Co., and of Thomas McNally & Son Co., died at his home in Pittsburgh, Penn., Aug. 24. He was born in Pittsburgh, Oct. 8, 1858. He began work as a newsboy in 1864; continued until 1870, when he began steamboating from Pittsburgh to New Orleans, working as cabin boy, deck hand and lamp trimmer, until 1877, when he quit the river and went to work as a laborer on the construction of the Pittsburgh & Lake Erie R.R., shortly afterward being made foreman of the piledriving and trestle gang. He went into the subcontracting business in 1881 and constructed the present B. & O. R. R. trestle from Federal St. to Woods Run. In 1883 he went with Booth & Flinn on general contracting, and on leaving them in 1889 began business for himself. He executed some large contracts.

CHARLES T. CHURCH, former city engineer of Geneva, N. Y., died Aug. 25. He was 85 years old and he was born in Churchville, N. Y. He was a graduate of Union College, and a member of the American Society of Civil Engineers. He was city engineer of Geneva from 1902 to 1909 and superintendent of public works.

Chicago Exhibit to Show Advance in Chemical Industry

The advance made by this country in the chemical industry during the war will be shown at the fifth national exposition of chemical industries which will open in Chicago Sept. 22, in the Coliseum and the First Regiment Armory, during the week of the meetings of the American Institute of Mining and Metallurgical Engineers, the American Ceramic Society, the American Electrochemical Society, and the Technical Association of the Pulp and Paper Industry. As great a number of exhibitors as last year will be represented, as well as many who have never exhibited before.

Motion pictures, including a series furnished by the United States Bureau of Mines, will furnish a feature in the program and will show actual processes and industrial methods.

BUSINESS NOTES

THE PARKER MOTOR TRUCK CO., Milwaukee, Wis., has appointed C. C. Newburn as assistant sales manager.

THE MANSFIELD STEEL CORPORATION, Detroit, Mich., has promoted A. Brauer from body designer to assistant to the general manager, in charge of production.

THE NAZARETH FOUNDRY & MACHINE CO., Nazareth, Penn., has appointed George Taylor Clift as superintendent.

THE BATES & ROGERS CONSTRUCTION CO., Cleveland, Ohio, received Aug. 29 the contract for 16.7 miles of 18-ft. 4-in. reinforced-concrete state highway on the Akron-Cleveland road. The contract involves the sum of $826,000.

THE KING TRAILER CO., Ann Arbor, Mich., has opened a factory branch in Dallas, Tex., in charge of A. G. Williams, Southwestern sales manager.

THE W. F. KEARNS CO., Boston, which has recently completed the large Boston Army supply base, involving the expenditure of $28,000,000, has reorganized under the name of Kearns Construction Co., with practically the same officers. The firm has issued an elaborate booklet illustrating $40,000,000 worth of recent work; most of it is in the vicinity of Boston.

THE GREEN ENGINEERING CO., East Chicago, Ind., has appointed E. L. Sullivan representative in the Pittsburgh district, including western Pennsylvania, eastern Ohio and the western part of West Virginia.

TRADE PUBLICATIONS

The following companies have issued trade publications:

THE TRUSCON STEEL CO., Detroit, Mich.; handbook, 8½ x 11 in., 80 pages, illustrated; contains complete descriptions, plans and illustrations of steel window installations; also describes continuous steel sash and Truscon "operator."

THE FISHER GOVERNOR CO., Marshalltown, Iowa; booklet, 6 x 9 in., 24 pages, illustrated; describes various types of Fisher traps and installations in pumping and power plants.

THE PELTON WATER WHEEL CO., San Francisco and New York; bulletin No. 12, illustrated; describes water wheels and their installation.

THE WEBER CHIMNEY CO., Chicago, Ill.; pamphlet, 5 x 9 in., 56 pages, illustrated; presents descriptions, drawings, views and dimension lists of concrete chimneys.

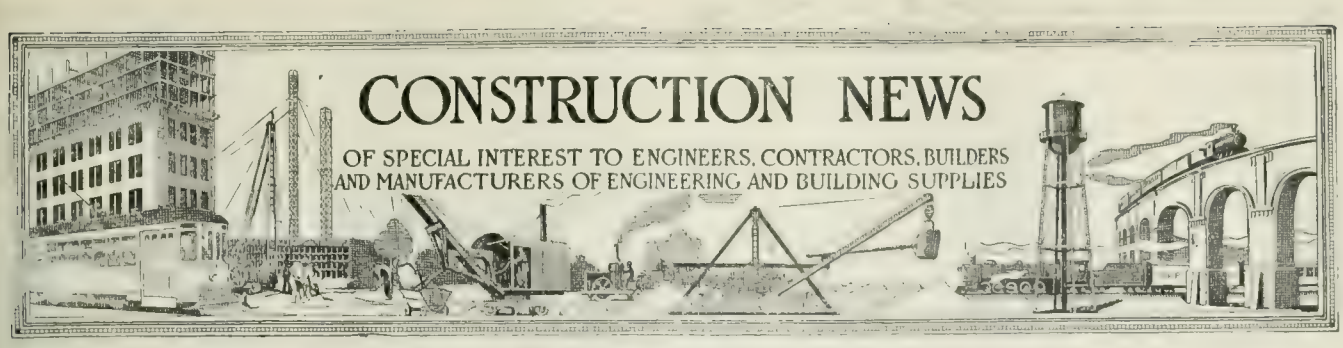
THE GEORGE HAISS MANUFACTURING CO., INC., New York City; booklet 719, 7 x 9½ in., 15 pages, illustrated; tells of Haiss clamshell buckets for dredging and material handling and Haiss hoisting equipment.

THE NATIONAL PRESSED STEEL CO., Massillon, Ohio; "National Steel Lumber Handbook," for use in building construction; gives information on light-weight, fire-resisting systems of construction in steel lumber, with specifications.

THE WAGNER MANUFACTURING CO., Cedar Falls, Iowa; catalog No. 18, 7¾ x 10¾ in., 56 pages, illustrated; gives descriptions and price lists of overhead carrier system for factories, docks and warehouses; also trolley hangers for sliding and folding doors and sliding fire doors.

THE WELLMAN-SEAVER-MORGAN CO., Cleveland, Ohio; bulletin No. 27, 8½ x 11 in., 10 pages, illustrated; treats of Wellman-Seaver-Morgan automatic ore unloaders as installed at the docks of the United States Steel Corporation, Conneaut, Ohio.

S. F. BOWSER & CO., INC., Fort Wayne, Ind.; leaflet, illustrating the Bowser system of battery storage for lubricating oil for motor vehicles.



Price advances are indicated by **heavy type**; declines by *italics*.

PIG IRON—

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$30 35	$30 35
Northern Basic	27 55	27 55
Southern Ohio No. 2	28.55	28 55
NEW YORK, tidewater delivery		
2X Virginia (silicon 2.25 to 2.75)	32 40	32 40
Southern No. 2 (silicon 2.25 to 2.75)	35.20	35.20
BIRMINGHAM		
No. 2 Foundry	27.75	28.00
PHILADELPHIA		
Eastern Pa	30 65*	30 65
Virginia No. 2	32.10–34.10†	32 10 34 10
Basic	30.90*	30 90
Grey Forge	29.90*	29 90
CHICAGO		
No. 2 Foundry Local	**26.75**	26.75
No. 2 Foundry Southern	**28.00**	28.00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	**28.15**	28.15
Basic	**27.15**	27.15
Bessemer	**29.35**	29 35

*F. o. b. furnace. † Delivered.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	$45 00	$55 00	$45 00	$65 00
Standard openhearth rails	47.00	57 00	47 00	67 00
Light rails, 8 to 10 lb	2.58½*	3 13*	2 83½*	3 13 *
Light rails, 12 to 14 lb	2.54*	3 09*	2 79*	3 09*
Light rails, 25 to 45 lb	2.45*	3.00	2.70*	3.00*

*Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				San
	Current	One Year Ago	Chicago	St. Louis	Francisco
Standard spikes, ⅝-in. and larger	$3.35	$3.90	$4 27	$4 44	$5 65
Track bolts	4.35	4.90	5.17	Premium	6.65
Standard section angle bars	3.00		4.22	Premium	4.60

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

		7 In. x 9 In by 8 Ft. 6 In.	6 In. x 8 In by 8 Ft.
Chicago	Plain	$1.48	$1.33
San Francisco	Douglas Fir—Green	1.42	1.00
San Francisco	Douglas Fir—Creosoted	2.12	2.00

Prices per tie at Missouri mills; St. Louis prices about 25c higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0 55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak (No. 4)	$0.80	No. 5	.87

Note.—Add 36c. each for treatment.

PIPE

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
¼ to 3 in. butt welded	47%	57 5%	45%
2½ to 6 in. lap welded	42%	53.5%	41%

	Galvanized		
	New York	Chicago	St. Louis
¼ to 3 in. butt welded	31%	44%	30%
2½ to 6 in. lap welded	27%	41%	27%

Malleable fittings, Class B and C, from New York stock sell at +1.3% list prices. Cast iron, standard sizes, 10% off.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York						
	Current	One Month Ago	One Year Ago	Chicago	St Louis	San Francisco	Dallas
4 in	$57 30	$55.30	$64 75	$58 80	$52 00	$77 55	$65 00
6 in and over	54.30	52.30	61.75	55.80	49 00	74.55	62 00

Gas pipe and 16-ft. lengths are $1 per ton extra.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh basing card of National Tube Co. for steel pipe, Cardiff A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	50½%	24%	¾ to 1¼	39½%	23½%
½	54½%	40%			
¾ to 3	57½%	44%			

LAP WELD

2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 6	34½%	21½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	46½%	29%	¾ to 1¼	39½%	24½%
½	51½%	39%			
¾ to 1¼	55½%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2½ to 4	35½%	23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Malleable fittings. Class B and C, banded from New York stock sell at list 2% off. Cast iron, standard sizes, 20% off.

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.:

	New York				
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35.00	$35 00	$22.50	$30.00		$33.44
4	51 00	51 00	27.00	40.00	$45.00	50 16
5	65 00	65.00	45.00	50.00	65.00	62 70
6	90 00	90 00	55.00	60.00	90 00	83.60
8	130.00	130.00	100.00	80.80	150.00	133.76

SEWER PIPE—The following prices are in cents per foot for carload lots:

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$0 09	$0.126		$0.09		$0 132
4	09	.126		.09	$0 15	.132
5	135	.189		.135	1875	.207
6	135	.189	$0 16	.135	.225	207
8	21	.294	.21	.21	3475	.2875
10	315	.441	.29	.315	.45	4025
12	405	.567	.37	.405	60	.5175
15	51	.766	.56	54	9375	7475
18	.75	1.05	91	.875	1.275	9775
20	.90	1.26	1 14	1.05	1 71	1 15
22	1 20	1.68	1.46	1.40		1.495
24	1 35	1.935	1.56	1.80	2 125	1.725
27	2 145	2 795	1.90	2.75		2.5875
30	2 376	3.096	2.57	3.45		3.1625
33	3 15	4 05	3.09	4.00		4 025
36	3 5875	4 6125	3.37	4.35		4.60

	3	5	8	12	24	36
Boston	$0 078	$0 117	$0.182	$0 351	$1 17	$3.28
St. Paul	12	18	.28	45	2 00	4.75
Denver	105	16	.25	.425	1 575	
Seattle			.36	.64	2 25	
Kansas City	12	18	25	50	1 80	4.60
Los Angeles	0825†	1375†	.2475	.44	1 50†	
New Orleans			50 per cent off			
Cincinnati	08	.1215	.189	.3645	1 215	3.1775
Atlanta			34	.55	2.00	
Montreal			58 per cent off			
Detroit	081	1215	.189	.3645	1 215	2.7675
Baltimore	.114	.171	.266	.513	1.71	

†4-in., 6-in., 30-in. respectively.

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices per gallon in tank cars 8000 gal. minimum f.o.b. place named:

	Current	One Month Ago
New York, 45-65% asphalt	$0.04¼	$0.04½
New York, brand asphalt	.06	.06
New York, binder	.06½	.06½
New York, flux	.04¾	.04¾
St. Louis, 40% asphalt	.04½	06
Chicago, 15-20% asphalt	.10	10
Chicago, 100% dust layer	11	.11
Dallas, 40-50% asphalt	07	.07
Dallas, 60-70% asphalt	.08	.08
Dallas, 75-90% asphalt	10	.10
San Francisco, 75-95% asphalt, per bbl	2.10	2.10

ASPHALTUM—Price per ton in packages and bulk in carload lots:

	Brand	Package	Bulk
New York	Texaco	18 00	$14.00
Chicago	Mexican	33.00	31.00
San Francisco	California	17 00	13.75
Dallas	Texaco and Mexican	32 00	30.00
Seattle	D grade	23.50	.....
Denver	Trinidad	45.00	.....
Denver	California	38 00	.....
St. Paul	Mexican	21 00	.....
Kansas City	Mexican	*26.00*	*24.00*
Atlanta	Standard	24 00	19.80
New Orleans		16.50	.....
St. Louis	Stanolind	24 90	18.40
Detroit	Bermudez	48 00	.....
Baltimore	Manco	43.00	.....
Los Angles		.....	13.50
Montreal		.....	18 70

PAVING STONE—

Chicago	About 4x8x4 dressed	$2.45	sq.yd.
	About 4x8x4 common	2.20	sq.yd.
San Francisco	Basalt block 4x7x8	57 75	per M
Kansas City	Granite	3 00	sq.yd.
Boston	5-in. granite	110.00	per M
St. Paul	Sandstone	1 75	sq.yd.
Atlanta	Granite	1.85	sq.yd.
Detroit	Granite, small	2.75	sq.yd
Baltimore	Common	2.25	sq.yd.
Montreal	Granite	5.90	sq.yd.

FLAGGING—

New York	Bronx	$0.21	sq.ft.
	Manhattan	.22	sq.ft.
	Queens, 5 ft. square	.23	sq.ft.
	5x20-in. cross-walk	.75	lin.ft.
Chicago	18 in. wide	.70	lin.ft.

WOOD BLOCK PAVING

	Size of Block	Treatment	Per Sq.Yd.
New York	3½	16	$3.25
New York	4	16	3.50
Chicago	4	16	3 10
Chicago	3½	16	2.95
Chicago	City specifications		3 10
St. Louis	3½	16	2.45
St. Louis	4	16	2.70
Seattle	4	16	2.55
Kansas City	4	16	3.00
St. Paul	3½	...	3.13
Atlanta	3½	16	2.25
New Orleans	3½	16	2.63
New Orleans	4	16	3.00
Dallas	3½	18	3.17
Dallas	4	18	3.56
Baltimore	3½	16	3.60
Montreal	4	16	4.60

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd.:

	Gravel 1½ In. Current	Gravel 1½ In. One Yr. Ago	Gravel ¾ In. Current	Gravel ¾ In. One Yr. Ago	Sand Current	Sand One Yr. Ago
New York	$2.00	$2 00	$2 00	$2.00	$1.25	$1.25
Denver	1.60	1 60	1.60	1 60	1 25	1.10
Chicago	1.35	1.45	1.35	1.45	1.35	1.45
Kansas City	2.50	2 15	3 00	2.60	1 00†	.50†
St. Louis*	1 78	1.25	1 82	1.35	1.68	1.45
Seattle	1.25	1 00	1 25	1.25	1.25	1 25
Dallas	2.50	2 00	2 50	2.00	2.25	1.40
St. Paul	1.25	1 25	1.35	1.50	.60	.60
San Francisco	1 15	1 20	1.15	1.20	1.15	1 20
Boston	1.60	2 00	1.60	1.75–2	1.00	1 00
New Orleans	2.40	1 50	2.40	.70	1.20	2.25
Atlanta	2.00‡	...	....	....	1.10‡	...
Detroit	2 00	....	2.00	....	2.00	....
Baltimore	1 54	...	1.75	....	.65	...
Montreal	1 20‡	...	...	...	1 10‡	...

*Fine white sand, Pacific and Ottawa per ton, *6. †Kaw River sand is $1.50 per yd. ‡ per ton.

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In. Current	1½ In. One Year Ago	¾ In. Current	¾ In. One Year Ago
New York	$1.65-1.75	$1.70	$1 75-1 85	$1.85
Chicago	1.30	1.20	1.30	1.20
St Louis	1 50	1.08	1 50	1.08
Dallas	2 70	1.51	2.70	1.55
San Francisco	1 50	1.20	1 50	1.20
Boston	3.00*(del)	1.75	3 00*(del)	1.75
St. Paul (lime)	1.15†	1.15	1 25	1.40
Denver	...	1.60	1 60	1.60
Kansas City	1 90	1.70	2 00	1.80
Seattle	1 50	1 30	1 50	1 30
Atlanta	2 25	1.50	2 35*	...
New Orleans	4 00		4 35	...
Los Angeles	1 20	1.50	1 20	1.60
Detroit	1 65	...	1 65	....
Baltimore	1.25		1 50	....
Montreal	1 90*		2 15*	....

*Per ton. †Limestone, traprock, $1 60 and $1 80 per ton for 1½ and ¾-in.

LIME—Warehouse prices:

	Hydrated per Ton Finished	Hydrated per Ton Common	Lump per 200-Lb. Barrel Finished	Lump per 200-Lb. Barrel Common
New York	$17 50	$14.50	$2.90*	$2.65*
Kansas City	*21.00*	21 00	2 30	2.20
Chicago	18 00	17.50	1.80	1 10
St. Louis	22 00	18 00	...	2.00
Boston	22.75	18.25	3.75*	3.40*
Dallas	30.00	...	2 75	...
Cincinnati	13 60	11.95	13 70‡	10.70‡
San Francisco	30 00	.....	2.80†	...
St. Paul	23.00	20.00	1.60	1 50
New Orleans	...	17.50	...	2.20
Atlanta	...	1.90	1.80	1 95
Detroit	20 00	18.40	3.00*	3 00*
Seattle	30.00	....	3.05†	2 80†
Los Angeles	...	...	3.05†	2.80†
Baltimore	*18 85*	*13 75*	...	11.37‡
Montreal	20 00	20.00	15.00‡	15.00‡

* 300-lb barrels † Per 180-lb. barrel. ‡ Per ton.
NOTE—Refund of 10c per barrel

NATURAL CEMENT—Price to dealers for 500 bbl. or over, f.o.b., exclusive of bags:

St. Paul (Austin)	$1.45
Kansas City (Ft. Scott)	1.40
New Orleans	2.52
Atlanta (Magnolin)	1.85

PORTLAND CEMENT—Current prices are for barrels in carload lots, without bags, to contractors:

	Current	One Month Ago Without Bags	One Year Ago With Bags
New York	$2.30	$2.30	$3.35
Jersey City	2.27	2.27	2.99
Boston	2.42	2.42	3.00
Chicago	2.00	2.00	2.45
Pittsburgh	2.05	2.05	2.55
Cleveland	2.32	2.32	2.72
Detroit	2 08	2.08	2.68
Indianapolis	2.27	2.27	2.62
Toledo	2.12	2.12	2.62
Milwaukee	2.11	2.11	2.56
Duluth	2.10	2.10	2.60
Peoria	2.12	2.12	2.56
Cedar Rapids	2.18	2.18	2.68
Davenport	2.14	2.14	2.64
St. Louis	2.20	2 20	2.70
San Francisco	2.43	2 43	2.88
New Orleans	2.36	2.36	....
St. Paul	2.20	2 20	2.80
Denver	2.67	2.67	3.07
Kansas City	2.26	2 26	2.70
Seattle	2.53	2 53	3.33
Dallas	2.03	2.03	2.60
Atlanta	2.50	2 50	...
Cincinnati	2.90	2.90	2.80
Los Angeles	2.78	...	2.78

NOTE—Bag charge is generally 15c. each.

TRIANGLE MESH—Price per 100 sq.ft. in carload lots:

PLAIN 4-INCH x 4-INCH MESH

Style Number	Sectional Area Square Inches per Ft.	Pitts-burgh Width	New York	Chicago	St. Louis	Dallas	San Francisco
032	0.032	$0 92	$1.16	$0.98	$0.99	$1.13	$1.32
049	0.049	1.18	1.48	1.26	1 26	1.43	1.67
068	0.068	1.44	1.86	1.53	1.56	1.79	2.06
093	0.093	1.85	2.39	1.97	2.00	2 41	2.65
126	0.126	2.28	3.02	2.43	2.47	2.92	3.28
153	0.153	2.72	3.59	.90	2.95	3.48	3.93
180	0 180	3.12	4.13	3.33	3.39	3.99	....
245	0.245	4.12	5.44	4.40	4 47	5.27	....
287	0.287	4.76	6.29	5.08	5.16	6.10	6.86
336	0.336	5.52	7.30	5.89	5.99	7.06	....
395	0.395	6.40	8.45	6.83	6.94	8.19	.....
			PAVING				
036P	0.036	$0.71	$0.92	$0.76	$1.77	$0.80	.....
053P	0.053	1.00	1.28	1.06	1.08	1 12	.....
072P	0.072	1.26	1.66	1.34	1.37	1.46	.....
097P	0.097	1.62	2.12	1.73	1.76	1.88	.....
049R	0.049	1.00	1.28	1.06	1.08	1.12	....
067R	0.067	1.26	1.65	1. 4	1.37	1.46	.....
089R	0.089	1 62	3.11	1.73	1.76	1.88	....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths. Galvanized is about 10% higher.

EXPANDED METAL LATH—Prices in carload lots per 100 yd. for painted are as follows:

Gage	Weight	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
27	233	$29 10	$34.07	$29 00	$29.00	$34.00	$32.75
26	250	30.45	35.23	30 50	30.00	35.00	34.50
25	300	31.90	36.51	32 00	.....	37.00	36.75
24	340	33.50	37.73	33.00	33.00	40.25	39.25
22	450	36.60	40.48	.....	.....	.....	43.30

About 10% additional for smaller quantities.

BARS, CONCRETE REINFORCING—Following quotations are per 100 lb.:

ROLLED FROM BILLETS

In.	Mill Pittsburgh	New York Current	New York One Year Ago	Chicago	St. Louis	Dallas	San Francisco
¾ and larger	$2.35	$3 37	$4 14½	$3.37	$3 68	$4 75	$4 60
⅝	2.40	3 42	4 19½	3 42	3 74	4 80	4 65
½	2.45	3.47	4 24½	3.47	3.79	4 95	4 70
⅜	2 60	3.62	4.39½	3.62	4 04	5 00	4.85
¼	2 85	3 87	4 64½	4 87	4 19	5 05	5.10

Twisted bars cut to length take extra of 27½c. per 100 lb. Extra on deformed bars, uncut, 7½c.

ROLLED FROM RAILS

	Chicago	St. Louis	Dallas		Chicago	St. Louis	Dallas
¾ in. and larger	$3 45	$3 45	$4 25	⅝	$3 70	$3.70	....
⅝	3.50	3.50	4.30	½	3.95	...	...
½	3 55	3.55					

BRICK—To contractors price per 1000 in cargo or carload lots is as follows:

	Common Current	Common One Month Ago	Common One Year Ago	Paving Brick	Paving Block
New York	$15.00	$15 00	$14.00	No Quotations	
Chicago	12.00	12 00	11.00	...	.....
St. Louis, selected	18 00*	16 00	16 00	$26.00	.....
St. Louis, salmon	12 00	10 00	10 00	.....	.....
Denver	14 00†	13.00	9.50	.....	38.00
Dallas	18 57	18 00	14.03	27.30	.....
San Francisco	12 50	12.50	12.00	.....	.....
Boston	18 00	18.00	16.00	30.00	45.50
New Orleans	19 00	17 50	19 00	18.50	18.50
St Paul	13 00	13.00	9.40	30 00	36.50
Kansas City	16.00	15 00	13.00	42.50	.....
Seattle	15.00	15.00	15.00	.....	42.00
Cincinnati	17.00	16 00	13.00	.....	.....
Atlanta	16.00	15.00	.....	40.00	.....
Los Angeles	12.50	12 50	10.00	.....	.....
Montreal	15.00	15.00	.....	81.00	....
Detroit	20 00	19 00	....	37.00	...
Baltimore (del)	18.00	18.00	.....	22 00	*42.50*

† Salmon is $13 in Denver. *Hard brick, $14.

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	New York Current	New York One Year Ago	Chicago	St Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12	$0.11475*	$0.10125	$0 08	$0 08	$0 1125	$0 1088	
6x12x12	153*	.13500	.112	105	15	.09	$0 1512
8x12x12	.204*	....	.144	15	.	115	1944
10x12x12	.....	.....	.168	.17	.....	.2546	.2268
12x12x12	.....	.....	.208	.208	....	.3082	.2916

*Delivered below 72nd St.

	4x12x12	8x12x12	12x12x12
Boston	$0 10	$0 22	$0.30
St Paul	.065	.13	185
Cincinnati	78	104	20925
Kansas City	.0786	.15	205
Denver	.1250	18	25
Seattle	09	.175	30
Atlanta	09	.16	25
Los Angeles	.082	.154	
New Orleans	.165	.22	325
Detroit	.0842	1579	.2264
Baltimore	115	21	2875
Montreal	.19	28	34

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh, together with quotations per 100 lb. from warehouses at places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in	$2 45	$3 47	$4 24½	$3 54	$3 47	$4 45	$5 50
Channels, 3 to 15 in	2 45	3 47	4 24½	3 54	3 47	4 45	5 50
Angles, 3 to 6 in., ¼ in. thick	2.45	3 47	4 24½	3 54	3 47	4 45	5 50
Tees, 3 in. and larger	2.45	3 52	4.24½	3.54	3 47	4 45	5 50
Plates	2.66	3.67	4.49½	3.54	3.67	4 90	5.75

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	New York Current	New York One Yr. Ago	Warehouse Chicago	Warehouse St Louis	Warehouse San Francisco	Warehouse Dallas
¾ in. and larger	$4 20	$4.72	$5 65	$4 72	$4 79	$6 05	$7 50

CONE HEAD BOILER

¾ in and larger	4 30	4 82	5 75	4 82	4 89	6.15	7 50
⅝ and 11/16	4 45	4 97	5 90	4 97	5 04	6 30	7 50
½ and 9/16	4.70	5.32	6 25	5.32	5.29	6.65	7 75

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in and 2in. take an extra of 25c.

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l	3-Ply c.l.	3-Ply l.c.
No. 1 grade	$1.50	$1.75	$1 90	$2 15	$2 30	$2 55
No. 2 grade	1.35	1 60	1 70	1 95	2 05	2 30

Asbestos asphalt-saturated Felt (14 lb. per square) costs $156 per ton.

Slate-surfaced roofing (red and green) in rolls of 108 sq ft costs $2 25 per roll in carload lots and $2.50 for smaller quantities.

Shingles, red and green slate finish, cost $6.00 per square in carloads; $6 25 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$70 00	$70 00	$71 00	$71.00
Tar pitch (in 400-lb bbl)	21 00	18.00	22.00	19.00
Asphalt pitch (in barrels)	34.00	34.00	37 50	37 50
Asphalt felt	68.00	48.00	72.50	72 50

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St Louis	Chicago	San Francisco	New York Current	New York One Yr Ago
No. 10	3.55	4 64	4.57	5.80	4.57	5.495
No. 12	3 60	4 69	4 62	5 75	4 62	5 545
No. 14	3.65	4.74	4.67	5.90	4.67	5.595
No. 16	3.75	4.84	4.77	6.00	4 77	5 695
Black						
*Nos 18 and 20	4.15	5 24	5 42	6 75	5 30	6 295
*Nos. 22 and 24	4.20	5 29	5 47	6.80	5 35	6 345
*No. 26	4.25	5.34	5 52	6.95	5.40	6 395
*No. 28	4.35	5.44	5 62	7.05	5 50	6 595
Galvanized						
No 10	4 70	5 79	5.97		6 20	6 845
No 12	4 80	5 89	6.07	7.30	6 25	6 945
No 14	4 80	5 89	6 07	7 30	6 30	6 945
Nos 18 and 20	5 20	6 19	6 37	7 60	6 60	7 245
Nos 22 and 24	5 25	6 34	6 52	7 75	6 75	7 295
*No 26	5.40	6 04	6 67	7 90	6 90	7 445
*No 28	5 70	6 79	6.97	8 20	7 20	7 745

*For painted corrugated sheets add 30c. per 1000 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel	$2 25	$1.86	$2.50	$2.00	$2 48	$2 05
5-gal. cans	2 40	1.96	2.75	2.15	2.68	2.25

WHITE AND RED LEAD—Base price per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Yr. Ago Dry and In Oil
100-lb keg	13 00	14 50	11 25	11 00	13 00	10.50
25 and 50-lb. kegs	13 25	14 75	11 50	11 25	13.25	10.75
12½-lb keg	13 50	15 00	11 75	11 50	13 50	11.00
5-lb cans	15 00	16 50	13 25	13 00	15 00	13.00
1-lb cans	16 00	17 50	13 25	13 00	16.00	13.00

500 lb lots less 10% discount. 2000 lb. lots less 10-2½% discount

LUMBER

San Francisco—Prices of rough Douglas fir No 1 common, in more than carload lots:

	Lumber Prices in Yards at San Francisco 6-8-12 and 14 Ft.	10-16-18 and 20 Ft.	22 and 24	25 to 32 Ft
3x3 and 4	$34 50	$35 00	$36 00	$38 00
3x6 and 8	35 50	36 00	37 00	39 00
4x4 6 and 8	36 00	37 00	38 00	40 00
3x10 and 12	36 00	37 00	38 00	40 00
3x14	36 50	37 50	38 50	40 50
4x10 and 12	36 00	37 00	38 00	40 00
4x14	37 00	38 00	39 00	41 00

	24 Ft. and Under	25 to 32 Ft.	33 to 40 Ft
6x10	$35 50	$37 50	$38 50
6x14	37 00	39 00	40 00
8x10	35 50	37 50	38.50
8x14	37 00	39 00	

New York, Chicago and St. Louis

	Southern Pine New York* 20 Ft. and Under	Southern Pine New York* 22-24 Ft.	Southern Pine Chicago 20 Ft. and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft. and Under	Yellow Pine St. Louis 22-24 Ft.
3x 4 to 8x 8	$48 00	$49 00	$51.00	$52.00	$40.00	$42.00
3x10 to 10x10	52 00	53 00	55.00	56 00	43.00	45.00
3x12 to 12x12	56 00	57 00	57.00	58 00	45 00	46.50
3x14 to 14x14	60 00	61 00	62 00	63 00	50.00	52.00
3x16 to 16x16	69 00	70 00	65.00	66 00	53.00	55.00
3x18 to 18x18	74 00	75 00	69.00	70.00	57.00	58.00
4x20 to 20x20	99 00	80 00	...	..	.....	.....

* Prices from Lumbermen's Bureau

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x12 add $2. For merchantable add $2 to sizes 10 x 10 and under For prime add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In. x 20-Ft. and Under P.	Fir	Hemlock	Spruce	12 x 12-In. 20 Ft. and Under P.	Fir
Boston	$50.00	$49.00	$48.00	$48.00	$50.00	$50.00
Kansas City	51.00	51 25	51.25	...	57.00	48.50
Seattle		30.00	...	...	.	31.00
New Orleans	45.00		.....	...	48 00	...
St. Paul	60.00	61 00	60.00	46.00	62.00	63.00
Atlanta	55.50	57.50	58.00	68.00	68.50	70.50
Baltimore	46.00			..	60.00	.....
Cincinnati	45.00	45.00	42.00	42 00	48 00	48.00
Montreal	58.00	65 00†	65.00	58.00‡	58.00	58.00

	1-In. Rough, 10 In x 16 Ft and Under P.	Fir	Hemlock	2-In. T. and Gr. 10 In. x 16 Ft P.	Fir
Boston	$50 00	$50 00	$48 00	$50.00	$50.00
Kansas City	78 50	64 75	64.75	81.75	77 75
Seattle		31.50	....	.	31.50
New Orleans	54 00		...	55.25	...
St. Paul	58.00	55.00	54.00	63.00	56.00
Atlanta	80.00	85.00	.....	65.00	67.50
Baltimore	42.00	...	...	40.00	.....
Cincinnati	45 00	43 00	42.00	45.00	45.00
Montreal	60 00*	59 00	44.00	65.00	63.00

* 2x8 costs $56 † Up to 32 ft., above that add $4 ‡ Also tamarac.

Los Angeles—Base price (2x3x16 ft.), Douglas fir or hemlock, $43.
Detroit—Base price, yellow pine (3x8x20), $43

Dallas—Yellow pine. Price per M:

2x4 to 2x12—12, 14 and 16	$57.50
2x4 to 2x12—10, 18 and 20	60.00
2x4 to 2x12—22 and 24	62 50
4x4, 4x6, 6x6, 8x8 and 3x8	61.25
8x10, 10x10 and 3x10	62 50
12x12 and 3x12	67.50

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Chicago	San Francisco	Dallas
Wire	$3 25	$3 90	$3.90	$5.25	$5.00
Cut	4.25	5.40	5.50	6.65	6.40

FREIGHT RATES

On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	$0.30	New Orleans	$0.38½
Buffalo	.17	New York	.27
Chicago	.27	Pacific Coast (all rail)	1.25*
Cincinnati	.23	Philadelphia	.24½
Cleveland	.17	St. Louis	.24
Denver	.99	St. Paul	.49½
Kansas City	.59	Detroit	.33
		Baltimore	.33

Note—Add 3% transportation tax. * Minimum carload, 80,000 lb.

Contractors' Miscellaneous Supplies

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55	$2.55	$4

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+12½%
Galvanized cast steel rigging	7½%
Bright plow steel	35%
Bright cast steel	22½%
Bright iron and iron tiller	5

San Francisco: Galvanized, less 5%, bright, less 25%.
Chicago, +5 on galvanized, 30–2½ off on bright.

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ¼-in., 8 ft., ⅜-in., 6; ½-in., 4½; ⅝-in., 3½; ¾-in., 2 ft. 10 in.; ⅞-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200 ft. coils:

Boston	$0.25	Kansas City	$0.27
New York	.27	New Orleans	.25½
Chicago	26½	Los Angeles	.28
St. Paul	.28	Seattle	.25
San Francisco	.24	St. Louis	.26½
Atlanta	.29½	Montreal	.32
Denver	.29½	Detroit	.28
Cincinnati	.29	Baltimore	.25

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb keg for black powder.

	Low Freezing 40%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York		$0.27	$0.30		$2.40
Boston	$.2225	.2425	.2675	$.3100	2.20
Kansas City	.19	.2375	.2625	.30	2.25
New Orleans	.2375*	.2275	.2475		

Seattle	$0.1425	$0.185	$0.21	$0.315	$1.90
Chicago	.1875	.2125	.2550	.2975	2.15
St. Paul	.19	.2375	.2625		2.45
St. Louis	.19	.2325	.2375	3000	2.40
Denver	.1775	.22	.245	.2875	2.25
Dallas			.288	.342	2.75
Los Angeles	.21	.26	.30	2.75	
Atlanta	.20	.225	.245		2.45
Baltimore	.19	.23½	.28½	.30	2.35
Cincinnati	.1875	.2125	.2325		2.35
Montreal	.28	.31	.34	.39	

* For 50%.

POLES—Price of Western red cedar poles is as follows:

	New York Current	New York One Year Ago	Chicago	St. Louis	Denver
6-in. x 30-ft	$5.82	$5 60	$5.17	$4.55	$5.17
7-in. x 30-ft	7.65	7.45	6.85	6.10	6 85
7-in. x 35-ft	11.10	10.80	10 00	8.95	10.00
8-in. x 30-ft	12.65	12.30	11.35	10 10	11.35
7-in. x 40-ft	12 85	12 50	11 50	10.20	11.50
8-in. x 45-ft	18 90	18.40	16.90	15 00	16.90
8-in. x 50-ft	22.65	22.05	20.30	18.00	20.30

10c. higher freight rates on account of double loads.

For plain pine poles, delivered New York, the price is as follows:

10-in. butts, 5-in. tops, length 20-30 ft	$9.00
12-in. butts, 6-in. tops, length 30-40 ft	11.50
12-in. butts, 6-in. tops, length 41-50 ft	12 50
14-in. butts, 6-in. tops, length 51-60 ft	21.00
14-in. butts, 6-in. tops, length 61-71 ft	23.50

Note—At the present time it is almost impossible to give accurate prices on poles. The above are only nominal.

	Dallas Aug. 1, 1919
6-in. x 20-ft	$4.60
6-in. x 30-ft	7.10
8-in. x 30-ft	8.45
8-in. x 35-ft	10.38

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges.

	New York	Chicago	St. Louis
No. 1 railroad wrought	$23.00	$21 00	$22.00
Stove plate	17.50	22 00	22.50
No. 1 machinery cast	25.00	24.00	23 50
Machine shop turnings	11.00	10.00	13 00
Cast borings	11.00	12.50	13.00
Railroad malleable cast	16.00	20.75	20.50

SHIP SPIKES—Current prices per 100 lb.

In.	San Francisco Galv.	San Francisco Black	Seattle Black
¼	$9 20	$8.50	$8.55
⅜	8.75	6.75	8.25
½	8.60	6.60	8.30

Pittsburgh base, $3.85 per 100 lb.

LABOR RATES AND CONDITIONS THROUGHOUT THE COUNTRY

S means scarce; E, enough; P, plentiful

Cities	Bricklayers	Carpenters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor
Atlanta	$0.90S	$0.70	$0.50	$0.45	$0 60	$0 75	$0.35
Baltimore	1.00E	0.85P	0 87½E	0 46 to 0.54E	0 74S	0.87½E	0.35 to 0 43S
Boston	.60-.70P	.80-.90P	.80-1.00P	.60-.70P	80P	.80-1.00P	.52½- .62½P
Cincinnati			.70		.50		
Dallas	1.00E	.87½S	.87½E	.37½-.40S		.75S	.35S
Denver	1.00E	.87½	.93¾	.59⅜		.87½	.40-.50
Detroit	1.00S	.80P	.90P	.60S	.90	.85-.90	.55S
Kansas City	1.00	.85	.90	.68¾	.77½	.90	.57½
Los Angeles	.87½E	.75E	.75P	.56-.75S	.75P	.75P	.50-.62½E
Montreal	.75	.70S	.60S	.45-.50S	.55P	.40-.55S	.30-.45S
New Orleans	.87½S	.75	1.00	.60	.80-1.00	.75	.30-.35
New York	.87½	.81¼	.87½	.57½	.81¼	.87½	.56¼
Pittsburgh	1.00	.90	.90	.60	.60	1.00	.40-.45S
St. Louis	1.00	.87½	1.00-1.12½	.70	.80-.92½	.90	.40-.45
St. Paul	.87½	.75	.80	.50	.80	.85	.47½
San Francisco	1.25E	1.00E	1.00E	.87½E	1.00E	1.00E	.45-.50E
Seattle	1.12	.93¾	.94	.75-.80	.90	1.00	.75S

Remarks

Atlanta—Some bricklayers are receiving $1 to $1.25 an hour. General shortage of skilled labor. No strikes.

Baltimore—Structural iron workers are asking $1.

Boston—Common labor is being obtained at considerably less than the union scale; in some cases as low as 35c.; on larger jobs, 45c.

Denver—All classes are asking for $1, decision wanted Sept. 1.

Los Angeles—No general strikes. In San Diego carpenters have struck on several jobs for $7 a day.

Montreal—Bricklayers threaten strike. Some carpenters and structural iron workers on strike. Good labor scarce account of exodus of foreigners, which comprise 75 per cent. of Canadian labor.

New York—Bricklayers on strike since Aug. 15, for $10 a day; painters on strike for $8.

Pittsburgh—No strikes.

St. Louis—Skilled labor, 50c. to 70c. Building laborers, 90c. Bricklayers on sewers, 50c.

St. Paul—On Aug. 12, bricklayers asked for $1, ignoring agreement to work until May 1, 1920, at 87½c. Sewer diggers, 50c. an hour; paving-block layers, 50c.; teams, 90c

San Francisco—All lines busy. No strikes.

Seattle—Considerable residence construction; building construction improved over last month. Street and road work booming. Labor situation easier, although there is a shortage in skilled labor.

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Sept. 6 York, Ont. ..... Sept. 4
Sept. 7 Hespeler, Ont. ..... Sept. 4
Sept. 8 Algonac, Mich. ..... Sept. 4
Sept. 9 Mountain Lake, Minn. ..... Sept. 4
Sept. 9 Williamston, N. C. ..... Sept. 4
Sept. 9 Paradise, Utah. ..... Sept. 4
Sept. 9 Kearney, N. J. ..... Sept. 4
Sept. 10 Central Islip, N. Y. ..... Aug. 28
Adv. Aug. 28
Sept. 10 Grand Forks, N. D. ..... Sept. 4
Sept. 10 Rock River, Wyo. ..... Aug. 28
Adv. Aug. 28.
Sept. 11 Wendell, N. C. ..... Aug. 28
Sept. 15 Pitman, N. J. ..... Sept. 4
Adv. Sept. 4.
Sept. 16 Statesville, N. C. ..... Aug. 28
Sept. 16 South Amboy, N. J. ..... Sept. 4
Sept. 17 Kansas City, Mo. ..... Aug. 21

SEWERS

Sept. 8 Irvington, N. J. ..... Sept. 4
Sept. 8 Ivanhoe, Minn. ..... Sept. 4
Sept. 8 Viroqua, Wis. ..... Sept. 4
Sept. 9 Kendall, Ind. ..... Aug. 28
Adv. Aug. 28.
Sept. 9 Lamberton, Minn. ..... Sept. 4
Sept. 10 Rock River, Wyo. ..... Aug. 28
Adv. Aug. 28.
Sept. 10 Binghamton, N. Y. ..... Aug. 28
Sept. 11 Foley, Minn. ..... Sept. 4
Sept. 15 Alexandria, La. ..... Sept. 4
Sept. 16 Lake City, S. C. ..... Sept. 4
Adv. Sept. 4.
Sept. 18 Drew, Miss. ..... Sept. 4

BRIDGES

Sept. 8 Fayetteville, W. Va. ..... Sept. 4
Adv. Sept. 4.
Sept. 8 Gainesville, Ga. ..... Sept. 4
Sept. 9 Duluth, Minn. ..... Aug. 14
Sept. 9 Columbus, O. ..... Aug. 28
Sept. 9 Danville, Ill. ..... Aug. 28
Adv. Aug. 28.
Sept. 9 Lake Geneva, Wis. ..... Aug. 28
Sept. 10 Columbus, O. ..... Aug. 28
Sept. 10 Illinois ..... Sept. 4
Sept. 12 Schenectady, N. Y. ..... Aug. 21
Adv. Aug. 21.
Sept. 13 Tacoma, Wash. ..... Sept. 4
Sept. 13 Pittsfield, Ill. ..... Sept. 4
Sept. 15 Portsmouth, Va. ..... Aug. 28
Sept. 15 Wayne, W. Va. ..... Aug. 21
Sept. 15 Dublin, Ga. ..... Sept. 4
Sept. 17 Pasco, Wash. ..... Aug. 28
Sept. 22 Norristown, Pa. ..... Aug. 28
Adv. Aug. 28.
Sept. 22 Duluth, Minn. ..... Aug. 28
Sept. 23 Harrisburg, Pa. ..... Aug. 14
Adv. Aug. 14.

STREETS AND ROADS

Sept. 8 Seattle, Wash. ..... Aug. 21
Sept. 8 Indiana ..... Aug. 14
Sept. 8 Monroe, Ga. ..... Aug. 21
Sept. 8 Vercheres, Que. ..... Aug. 28
Sept. 8 Como East, Que. ..... Aug. 28
Sept. 8 Beaver Falls, Pa. ..... Sept. 4
Sept. 8 Bakersfield, Cal. ..... Aug. 28
Sept. 8 Wayne, W. Va. ..... Sept. 4
Sept. 8 Port Huron, Mich. ..... Sept. 4
Sept. 8 Louisiana ..... Sept. 4
Sept. 8 Stafford, Kan. ..... Sept. 4
Sept. 9 Michigan ..... Sept. 4
Sept. 9 Maryland ..... Sept. 4
Sept. 9 Massachusetts ..... Sept. 4
Sept. 9 Jersey City, N. J. ..... Sept. 4
Sept. 9 New York, N. Y. ..... Aug. 21
Adv. Aug. 21.
Sept. 9 Keyser, W. Va. ..... Aug. 21
Adv. Aug. 21
Sept. 9 Jersey City, N. J. ..... Aug. 21
Sept. 9 Indiana ..... Aug. 28
Sept. 9 Whiteville, N. C. ..... Aug. 28
Sept. 9 Trenton, N. J. ..... Aug. 28
Sept. 10 Centerville, Tenn. ..... Aug. 28
Sept. 10 Bentonville, Ark. ..... Aug. 21

Bids Close		See Eng. News-Record
Sept. 10	Delaware ..... Aug. 21 Adv. Aug. 21	
Sept. 10	Waterloo, Ia.	Aug. 21
Sept. 10	Denver, Colo.	Sept. 4
Sept. 10	Salt Lake City, Utah	Sept. 4
Sept. 10	Pawnee, Okla.	Sept. 4
Sept. 12	Indiana	Sept. 4
Sept. 12	Quebec	Sept. 4
Sept. 12	Wisconsin	Sept. 4
Sept. 12	Washington, Kan.	Sept. 4
Sept. 12	Trenton, N. J.	Aug. 28
Sept. 13	Arizona	Sept. 4
Sept. 14	Quincy, Fla.	Sept. 4
Sept. 15	North Carolina	Sept. 4
Sept. 15	Clayton, Mo.	Aug. 28
Sept. 15	Sanford, Fla.	Aug. 28
Sept. 15	New Mexico	Aug. 28
Sept. 15	Bolair, Md. ..... Adv. Sept. 4.	Sept. 4
Sept. 15	Washington	Sept. 4
Sept. 16	Maryland ..... Adv. Sept. 4.	Sept. 4
Sept. 16	Lewisburg, W. Va. ..... Adv. Aug. 28.	Aug. 28
Sept. 16	Griffin, Ga.	Aug. 28
Sept. 16	New Mexico	Aug. 28
Sept. 16	Prosser, Wash.	Aug. 21
Sept. 16	New Orleans, La.	Aug. 21
Sept. 17	Rockwall, Tex.	Sept. 4
Sept. 18	Marion, Ark.	Aug. 21
Sept. 20	Madill, Okla.	Aug. 23
Sept. 20	Fayetteville, Ark.	Sept. 4
Sept. 22	Lyons, Kan.	Aug. 28
Sept. 23	Keyser, W. Va. ..... Adv. Sept. 4.	Sept. 4
Oct. 1	Faribault, Minn.	Sept. 4
Oct. 10	Tacoma, Wash. ..... Adv. Aug. 14.	Aug. 14

EXCAVATION AND DREDGING

Sept. 8 Albert Lea, Minn. ..... Sept. 4
Sept. 9 Niagara Falls, Ont. ..... Sept. 4
Sept. 10 Toms River, N. J. ..... Aug. 21
Sept. 10 Benson, Minn. ..... Sept. 4
Sept. 18 Montreal, Que. ..... Sept. 4
Sept. 22 Tower Minn. ..... Aug. 21
Sept. 22 Duluth, Minn. ..... Sept. 4

INDUSTRIAL WORKS

Sept. 8 Denver, Colo. ..... Sept. 4
Sept. 9 Ft. Atkinson, Wis. ..... Sept. 4
Sept. 10 Two Rivers, Wis. ..... Aug. 28
Sept. 11 Chilton, Wis. ..... Sept. 4
Sept. 15 New York, N. Y. ..... Aug. 28
Sept. 17 Mont Alto, Pa. ..... Sept. 4

BUILDINGS

Sept. 6 Sheboygan, Wis. ..... Sept. 4
Sept. 9 Hamilton, Ont. ..... Sept. 4
Sept. 9 Hibbing, Minn. ..... Sept. 4
Sept. 10 Kings Park, N. Y. ..... Aug. 28
Sept. 10 Sheboygan, Wis. ..... Sept. 4
Sept. 11 Minneapolis Minn. ..... Aug. 21
Sept. 11 Superior, Wis. ..... Aug 21
Sept. 12 Cloquet, Minn. ..... Aug. 21
Sept. 12 Council Bluffs, Ia ..... Aug. 28
Sept. 15 Pleasant Grove, Utah ..... July 24
Sept. 15 St. Paul, Minn. ..... Aug. 14
Sept. 15 Norwich, N. Y. ..... Sept. 4
Sept. 15 Salt Lake City, Utah ..... Sept. 4
Sept. 16 Bethlehem, Pa. ..... Sept. 4
Sept. 16 Framingham, Mass. ..... Sept. 4
Sept. 20 Cap de la Madeleine, Que. ..... Sept. 4
Sept. 20 Montevideo, Minn. ..... Sept. 4
Sept. 20 Elk City, Okla. ..... Sept. 4
Sept. 22 Holton, Kan. ..... Sept. 4
Sept. 25 Moncton, N. B. ..... Sept. 4
Oct. 1 St. Paul, Minn. ..... Aug. 28
Oct. 1 Virginia, Minn. ..... Aug. 28

FEDERAL GOVERNMENT WORK

Sept. 8 Hangar — Spec 4001 — Lakehurst, N. J. ..... Aug. 21
Sept. 8 Post Office—Carroll, Ia ..... Aug. 14
Sept. 8 Riprap — Tompkinsville, N. Y. ..... Sept. 4
Sept. 9 Forge Shop Extension Shell and Case Shop Buildings—Philadelphia, Pa. ..... Aug. 28
Adv. Aug. 28.
Sept. 9 Damp-Proofing — Washington, D. C. ..... Sept. 4
Sept. 9 Riprap — Tompkinsville, N. Y. ..... Sept. 4
Sept. 10 Post Office—Douglas, Ga. ..... July 31

Bids Close		See Eng. News-Record
Sept. 10	Water and Sewerage Systems and Fuel Oil Reservoir —Spec. 4007, San Diego, Cal.	Aug. 21
Sept. 10	Torpedo Track, Electric Trolley and Hoist and Gyro —Spec. 4008, Pearl Harbor, Hawaii	Aug. 28
Sept. 10	Structural Steel — Spec 4003—Newport, R. I.	Sept. 4
Sept. 11	Earthwork — Memphis, Tenn. ..... Adv. Aug. 21	Aug. 21
Sept. 11	Levee Work — Memphis, Tenn.	Sept. 4
Sept. 12	Remodeling Electric Passenger Elevator — Chicago, Ill. ..... Adv. Aug. 21.	Aug. 21
Sept. 12	Pumps — New Haven, Conn. ..... Adv. Aug 21	Aug. 21
Sept. 15	Earthwork—St. Louis, Mo. Adv. Aug. 21	Aug. 21
Sept. 15	Post Office—Winnemucca, Nev. ..... Adv. Aug 21	Aug. 21
Sept. 15	Kitchen and Mess Hall — Stapleton, N. Y. ..... Adv. Aug. 21	Aug. 21
Sept. 17	Development of Base — Spec. 3762 — Key West, Fla	Aug 28
Sept. 17	Turbo Generator — Spec. 4017—Portsmouth, N. H.	Sept. 4
Sept. 17	Turbo Alternator — Spec. 4011—Charleston, S. C.	Sept. 4
Sept. 18	Dredging—Newport, R. I.	Sept. 4
Sept. 18	Sewerage System—Water Service Lines and Electric Lighting Plant—Washington, D. C.	Aug. 28
Sept. 18	Jetty Repair — Wilmington, Del. ..... Adv. Aug 21	Aug. 21
Sept. 18	Post Office—North Topeka, Kan.	Aug. 14
Sept. 22	Material — Charles Town W. Va.	Aug. 21
Sept. 22	Post Office — Charleston, W. Va	Aug 21
Sept. 24	Mechanical Stokers—Spec 4010—Charleston, S. C.	Aug. 28
Sept. 24	Reciprocating Air Compressor — Spec 3837 — Puget Sound, Wash.	Aug. 28
Sept. 26	Post Office and Custom House—Providence, R. I. Adv. Aug. 21	Aug. 21
Sept. 29	Dredge, etc.—Wilmington, N. C. ..... Adv. Aug. 28.	Aug. 28
Sept. 30	Remodeling Hospital—Boston, Mass	Aug. 28
Sept. 30	Dock—Charleston, S. C.	Sept. 4
Sept. 30	Hospital — Spec 3931 — Pearl Harbor, Hawaii	Sept. 4
Sept. 30	Rubble Mound Breakwater Cleveland, O.	Sept. 4
Oct. 1	Valves, Gates etc.—Denver, Colo. ..... Adv. Aug. 21.	Aug. 21
Oct. 1	Electric Lighting and Power Systems—Spec 3982—Mare Island, Cal.	Aug. 28
Oct. 6	Post Office—St. Johnsburg, Vt.	Aug. 28
Oct. 10	Dredge—New York, N. Y. Adv. Aug. 28	Aug. 28
Oct. 10	Post Office—Lock Haven, Pa.	Sept. 4
Nov. 3	Post Office and Court House —Honolulu, H. T.	Aug. 21

MISCELLANEOUS

Sept. 8 Garbage Incinerator—Syracuse, N. Y. ..... Sept. 4
Sept. 9 Street Lighting System — Dell Rapids, S. D. ..... Aug 28
Sept. 10 Wharf—Las Pas, Man. ..... Sept. 4
Sept. 12 Dam—Decatur, Ill. ..... Aug. 14
Sept. 12 Wharf — Depot Harbor, Ont. ..... Sept 4
Sept. 15 Levee—Alexandria, La. ..... Aug. 14
Sept. 16 Breakwater—Petit Rocher, N. B. ..... Aug. 28
Sept. 17 Wharf—Meteghan, N. S. ..... Aug. 28
Sept. 17 Breakwater—Quaco, N. B. Aug. 28
Sept. 17 Breakwater — Whitepoint, N. S. ..... Sept. 4
Sept. 22 Wharf—Naramata, B. C. Aug. 28
Sept. 23 Turbines, etc.—Saskatoon, Sask. ..... July 24
Adv. July 24.

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Fla., Miami—City election Oct. 16 to vote on $35,000 bonds to build high-pressure pumping station water mains.

O., Ansonia—City receives bids about Sept. 10 building water system and light plant. About $45,000. G. L. McKibben, Van Wert, consult. engr.

Ia., Ladora—City voted $18,000 bonds to build waterworks system.

Minn., Clearwater—See "Sewers."

N. D., Minot—City election Sept. 29, to vote on $280,000 bonds to build Imhoff tank and sewerage system. E. J. Thomas, Minot, engr.

Okla., Ada—City election Sept. 18, to vote on $335,000 bonds to extend and improve waterworks and sewerage systems.

Okla., Newkirk—City voted $70,000 bonds to extend waterworks.

Okla., Okmulgee—City soon receives bids improving waterworks system. About $200,000. Burns & McDonnell, 400 Interstate Bldg., Kansas City, Mo., engrs

Okla., Paul's Valley—City election in September to vote on $20,000 bonds to drill deep wells.

Colo., Denver—Municipal Waterworks Dept. receives bids in about 10 days laying 2¾ mi. 20-24 in. c.i. pipe, same being extension from 27th and Staut Sts. to Stock Yards. About $150,000. B. Lawther, c/o Owner, engr.

Utah, Salt Lake City—City soon lets contract laying 2130 ft. 16 in., 1200 ft. 20 in., 2300 ft. 24 in. and 8794 ft. 30 in. c.i. pipe on pressure line in Sunnyside Ave. About $182,000. S. Q. Cannon, city engr.

Wash., Wenatchee—City Council having plans prepared extending waterworks system. About $50,000.

Ore., La Grande—City retained L. C. Kelsey, engr., Portland, to prepare plans and supervise construction for new concrete dam at Beaver Creek intake for extension of water system. Cost will exceed $5000.

BIDS DESIRED

N. J., Kearney—Until Sept. 9, by F. Bent, state archt., State House, Trenton, furnishing material and erecting water tower and tank, at Soldiers' Home, here. About $5000.

N. J., Pitman—Until Sept. 15, by Boro. Council building improvements to water distribution system, Contr. No. 1, involves steel standpipe 20 ft. in diameter and 125 ft. high, Contr. No. 2, foundation for standpipe, Contr. No. 3, furnishing 337 tons 4-8 in. c.i. water pipe, 20,383 lb. specials, 13 fire hydrants and 27 valves, Contr. No. 4, laying 3.3 mi. 4-8 in. c.i. water pipe, Contr. No. 5, building 1 or more artesian wells. Remington & Vosbury, 601 Market St., Camden, engrs; advertised in this issue; noted July 31.

N. J., South Amboy—Until Sept. 16, by city, furnishing, delivering and erecting complete mechanical equipment of artesian waterworks plant, including new buildings for housing machinery and boilers, pumping station with boiler house annexed, radial brick stack and foundation, concrete reservoir and pump sump, concrete foundations for buildings, machinery, boilers, floors, etc., 2 watertube boilers and stack breeching, 1 duplex triple expansion, direct-acting pumping engine, 1 duplex compound direct-acting pumping engine, 2 turbine pumps, motor driven, vertical type, 1 cross-compound steam, 2 stage air compressor, 1 single stage, straight line air compressor, 1 surface condenser with combined air and circulating pump, 1 boiler feed pump, 2 feed water heaters, 1 venturi water meter, steam and exhaust connections to boilers and machinery, suction and discharge mains to pumps and reservoir, water discharge mains from pumps to existing standpipe, water mains from standpipe to existing distributing system, air lift system for 3 artesian wells and collecting system for spring water. P. J. Coakley, clk.

N. C., Williamston—Until Sept. 9, (change of date) by Mayor, building complete waterworks and sewerage systems. About $50,000. J. N. Ambler, Richmond, Va., engr. Noted Aug. 21.

S. C., Lake City—See "Sewers."

Mich., Algonac—Until Sept. 8, by K. A. Houlter, village pres., furnishing labor and material laying 450 ft. 16 in. waterworks intake, to include wet well, screens, screen house, gates, foot valves, venturi meter, etc., also 3 horizontal motor-driven centrifugal pumping units.

Wis., Viroqua—See "Sewers."

Minn., Mountain Lake—Until Sept. 9, by H. C. Hanson, village clk., installing motor-driven, double-stroke, deep well pump.

N. D., Grand Forks—Until Sept. 10, by City Council, repairing roof over clear water basin at 3rd St. and Minnesota Ave., rein.-con. water-proof. About $13,000. C. S. Giles, 909 North 3rd St., engr.

Utah, Paradise—Until Sept. 9, by City Council, building waterworks system and storage reservoir, involving 13 mi. 1-6 in. steel pipe, 200 cu.yd earth excav., etc. T. H. Humphries, Logan, engr.

Ont., Hespeler—Until Sept. 7, by H. Johnston, engr., Kitchener, and M. E. Jardine, city clk., furnishing and laying 5448 lin.ft. 6-12 in. c.i. watermains. About $22,000.

Ont., York—Until Sept. 6, by F. Barber, twp. engr., 40 Jarvis St., Toronto, furnishing and laying 27,600 lin.ft. c.i. watermains in sections of Amherst, Jesmond, Ashbury, Roach, Humewood, Craydon, Ray, Rutherford Eglinton, Brownhill, Barr, Elora, Bushey, Jasper, Langden, Orla, Chryessa, Gray, Outlook, Lauder, Mitchell, Northland, Lavina, Ostend Aves., Victoria Humber Crest and Northcliffe Blvds., Cliff, Lapp, Spears, McCormack Sts. About $100,000. Noted Aug. 28.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—City received bids Aug. 22, installing new sluice gates, air rams and counterweights at Moon Island reservoir, Squantum Dist., from Coleman Bros., Chelsea, $16,860; Coffin Valves Co., Neponset St., $16,860; G. H. Bryne, 166 Devonshire St., $18,055.

★**N. Y., Rochester**—Bd. Contr. & Supply let contract laying 36 in. watermain across Genessee River on McLean Pl., to M. H. Ripton, Livingston Bldg., $21,003.

★**Pa., Osceola Mills**—Osceola Water Co. let contract constructing elevated steel tower, in connection with waterworks system, to Pittsburgh Des Moines Steel Co., Curry Bldg., Pittsburgh.

★**O., Bucyrus**—Bucyrus Development Co. let contract to Rust Eng. Co., Keenan Bldg., Pittsburgh, building 500,000 gal. rein.-con. reservoir and earth dam for impounding reservoir, for Bucyrus waterworks. About $63,000. Chester & Fleming, Union Bank Bldg., Pittsburgh, engrs.

Minn., Duluth—City received bids building rein.-con. reservoir, from G. H. Lounsberry, 322 East Superior St., $13,570; Jacobsno Bros., Columbia Bldg., $14,000; MacLeod & Smith, Sellwood Bldg., $14,500.

★**Minn., Litchfield**—City let contract building 7880 lin.ft. 8 in. and 2235 ft. 10 in. water mains in various streets, to E. Linhordt, Litchfield, $13,086.

★**Minn., Walker**—State Bd. Control, St. Paul, let contract extending water supply system, to Woodrich Constr. Co., Metropolitan Life Bldg., Minneapolis, $25,558; heating system in connection with above will be awarded later.

★**Colo., Denver**—Municipal Water Wks. Dept. will replace conduit on 29th Ave. from Lowell Blvd., to Ashland Ave. Sta., about 2½ mi., involving 7000 ft. 36 in., c.i. pipe. About $171,000. Work will be done by day labor.

Sewers

PROPOSED WORK

N. J., Hoboken—City had plans prepared and soon receives bids building sewers in 7th, 11th and 15th Sts. About $100,000.

N. J., Newark—Passaic Valley Sewerage Comn. soon lets contract building superstructure for Venturi Meter Chamber, also building superstructure for effluent controlling chamber.

Pa., Carmichaels—Town voted $14,300 bonds to install sewers and pave various streets.

Pa., Hazelton—See "Streets and Roads."

N. C., Raleigh—City plans to install sewer pipes in various sections. About $20,000. E. H. Paco, city comr.

Fla., Miami—City election Oct. 16 to vote on $50,000 bonds to build sewage disposal system.

O., Dayton—City plans election soon to vote on $628,000 bonds to build storm sewers in Miami & Erie Canal, Baker, Troy and Campbell Sts., Kenwood, Earnest, Euclid, Norwood and Lorain Aves., and Dry Creek Hollow. O. E. Eichelberger, city engr.

Minn., Clearwater—City plans to build sewers and water mains in various streets. About $70,000. Bradley Eng. Serv., St. Cloud, engr.

Minn., Duluth—City soon receives bids building sewer in 2nd Ave. between Michigan St. and Lake Ave. About $10,933. L. Ayers, city engr.

Minn., Luverne—City voted $24,000 bonds to build storm sewers in various streets. W. Bauer, city clerk.

Kan., Belle Plaine—City Clerk soon lets contract building 6¾ mi sewers and sewage disposal plant. W. B. Rollins Co., 209 Ry. Exch. Bldg., Kansas City, Mo., engrs. Noted Aug. 21.

Neb., Fairbury—See "Streets and Roads."

Okla., Ada—See Waterworks."

Wash., Wenatchee—City Council having plans prepared building sewers in ¾ area in southern part of city. About $200,000.

BIDS DESIRED

N. J., Irvington—Until Sept. 8, by Town Council, building trunk line storm water sewerage system, involving 4460 lin.ft. 48-84 in. and 1160 ft. 5 x 7 ft. sewer, 12 storm sewer manholes, 1480 lin.ft. 3-15 in. sanitary sewer, 1 sanitary sewer drop manhole, 6 sanitary sewer manholes, 3 flush tanks, 1000 cu.yd. concrete foundation, 5000 ft. b.m. spruce timber, 5000 ft. b.m. hemlock, 500 cu.yd. solid rock, and 2500 cu.yd. quicksand excav.; lateral branches, involving 6010 lin.ft. 15-36 in. sewer, 26 manholes, 43 catch basins, 1000 lin.ft. 15 in. and 600 lin.ft. 12 in. catch basin chutes, 500 cu.yd. rock and 5000 cu.yd. quicksand excav., 1000 ft b.m. spruce timber and 3000 ft. b.m. hemlock sheeting.

S. C., Lake City—Until Sept. 16, by L. R. Truluck, chn. pub. wk., building sewerage and waterworks system; advertised in this issue.

Miss., Drew—Until Sept. 18, by City Council, building 4.7 mi. 8-12 in. sanitary sewers, pumping station and disposal plant. J. H. Weatherford, 64 Porter Bldg., Memphis, Tenn., engr.

La., Alexandria—Until Sept. 15, by City Council, building extension to sanitary sewerage system; separate proposals being taken on sewer pipe required which will be purchased directly by city and on construction work of pipe laying, trenching and constructing manholes, flush tanks, etc. Work involves 84,690 ft. 8-24 in. pipe, 110 manholes, 46 flush-tanks. I. W. Sylvester, city engr.

Wis., Viroqua—Until Sept. 8, by E. J. Older, city clk., laying 906 ft. 10 in. and 238 ft. 8 in. vitr. pipe sewers, 1575 ft. 6 in. sewer connections, 4 manholes, 59 lead service connections, etc.; also laying 1300 ft. 8 in. and 48 ft. 6 in. water pipe, 4 hydrants and 5 valves. W. G. Kirchoffer, Vroman Blk., Madison, engr.

Minn., Foley—Until Sept. 11, by H. Bettendorf, village clk., building sewerage system and disposal plant, involving 4188 lin. ft. 8-18 in. salt glazed vitr. pipe, twenty-six 5 ft. catch basins, one 3 ft. manholes, one hundred and seventy-nine 6 x 10 Y's and fifteen 6 x 18 Y's. About $13,400. Noted Aug. 7.

Minn., Ivanhoe—Until Sept. 8, by village installing sewers in Sewer Dists. Nos. 2, 3 and 4. L. B Muchlinski, recdr.

Minn., Lamberton—Until Sept. 9, by F. A. Beisersdorf, city recdr., installing sewers in various streets, involving 13,823 ft. 8 in., 1471 ft. 10 in., and 1875 ft. 12 in. vitr. pipe, 10 lampholes, 5 manholes, etc. About $30,000. Noted Aug. 7.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—City let contract laying 308 ft. 3-6 in. concrete sewer in Albany St., to J. W. O'Connell Co., Boston. $14 157. Work involves 700 cu.yd. earth trenching.

N. Y., New York—H. Bruckner, pres. Bronx Boro., received bids Aug. 28, building (a) storm water drain and appurtenances in East 233rd St., (b) combined sewers and appurtenances in Eden Terrace, etc., from Fenlack Constr. Co., (a) $132,213, (b) $122,534; J. O'Leary, (a) $136,909; Anita Constr. Co., (a) $147,000, (b) $140,500; C. MacDonald, (b) $122,999. Noted Aug. 21.

Sewers (Continued)

★**N. Y., Rochester**—Bd. Contr. & Supply let contract building new sewage disposal plant in 23rd Ward, to Whitmore, Rauber & Vicinus, 279 South Ave., $49,927. Noted May 1.

N. J., Hackensack—Hackensack Impvt. Comn. received bids building (a) disposal plant, (b) sewerage system, from Simpson & Brown, 90 West St., (a) $974,176; Smith, Hauser & McIsaac, 18 East 41 St., (a) $774,402, (b) $1,197,021; H. E. Fox Constr. Co., 18 East 125th St., (b) $602,339. Noted July 24.

★**O., Cleveland**—City let contract laying 3120 ft. 3-6 ft. 3 in. brick and 660 ft. 12-24 in. vitr. pipe sewers in Kinsman Rd. from East 135th to East 140th Sts, to Manson Co., The Arcade, $75,771. Noted Aug. 28.

★**Mich., Redford**—B. E. Taylor, 501 Ford Bldg., Detroit, let contract trenching and laying 35,000 lin.ft. 8-24 in. vitr. crock sewers, etc., in vicinity of Grand River Ave., here to W. C. Hoy, Redford. About $35,000.

★**Wis., Manitowoc**—City let contract excavating and laying 2.8 mi. 8 in. vitr. pipe sewer in 8th, 16th and Washington Sts., to Gray-Robinson Co., 8th St. About $20,000. Noted Aug. 28.

★**Minn., Waseca**—J. Madigan, city clk., let contract laying 14,894 ft. tile drain, to W. C. Johnston, Jr., Waseca, $12,597. Noted July 24.

★**Mont., Shelby**—City let contract installing sewage disposal plant and 10 in. sewer extensions, to Two Miracle Concrete Co., 437 Ford Bldg., Great Falls, $10,450 and $25,289 respectively.

Bridges

PROPOSED WORK

New Jersey—State Highway Comn., Broad St. Bank Bldg., Trenton, rejected bids building following rein.-con. bridges, two 10 x 30 ft., one 15 x 30 ft and one 13 x 30 ft., Hammonton-Ancora-Atco Sect. Work will be readvertised. C. A. Mead, 790 Broad St., Newark, engr. Noted Aug. 7.

Pa., Lewistown—City plans to build 80 ft. span bridge, 55 ft. wide, on South Main St., probably deck girder type, concrete floor. About $40,000. C. C. Brown, Reedsville. engr.

W. Va., Kingwood—Comrs. Preston Co. soon let contract building following rein.-con. girder bridges: 1 double 26 ft. span, 1 single 26 ft. span, two 24 ft. spans, one 20 ft. span and one 16 ft. span. About $10,000. H. E. Wilhelm, Kingwood, engr.

Ga., Chatsworth — See "Streets and Roads."

Ga., Newton—Baker and Mitchell Counties appropriated $15,000 each to build bridge across Flint River, here. Federal Government will appropriate an additional $30,000 for project.

Fla., St. Petersburg—City plans to build new bridge over Booker Creek, on West Central Ave. About $15,000.

O., Dayton—City plans election soon to vote on $120,000 bonds to build 2 bridges over Wolf Creek on Bway. and Deal St. O. E. Eichelberger, city engr.

Idaho, Lewiston — See "Streets and Roads."

BIDS DESIRED

W. Va., Fayetteville—Until Sept. 8, by R. J. Stegall, clk., Fayette Co. building two 60 ft. concrete arch bridges near Westerly; two 25 ft. slab bridges near Dempsey and one 40 ft. timber bridge near Lively. J. K. McGrath, co. rd. engr.; advertised in this issue.

W. Va., New Martinsville—Until Sept. 13, by S. Myers, clk. Wetzel Co., building 5 concrete bridges, 2 in Magnolia Dist., 2 in Grant Dist. and 1 in Center Dist. G. W. Comstock, co. rd. engr.

Ga., Dublin—Until Sept. 16, by Comrs. Laurens Co., building steel and concrete bridge across Oconee River, here. About $150,000. Federal Government will appropriate ½ of cost. Noted Feb. 6.

Ga., Gainesville—Until Sept. 8, by Comrs. Rds. & Revenues, Hall Co., building bridge over Chattahoochee River, 4½ mi. west of Lula. Contract will be let for steel bridge upon present stone piers, but same to be remodeled or cemented where needed and raised 5 ft. higher by cement caps to be 5 ft. thick and 18 ft. long, two 113 ft. spans, and two approaches, 80 ft. and 100 ft. long respectively.

Mich., Port Huron — See "Streets and Roads."

Illinois—Until Sept. 10, by Dept. Pub. Wks. & Bldgs., Springfield, building Mackinaw River Bridge, on Peoria-Springfield Highway, Tazewell Co., consisting of seven 50 ft. concrete spans and one 170 ft. steel span, 20 ft. roadway, involving 832 cu.yd. Class "A" and 713 cu.yd. Class "B" concrete, 163,630 lb. reinforcing steel, 6629 lb. rockers and plates, 151,800 lb. structural steel, 5085 lin.ft. untreated piles, etc. Cement to be furnished by state. About $54,154, excluding cement. C. Older, ch. highway engr.

Ill., Pittsfield—Until Sept. 13, by Pike Co., building two 10 ft. span and one 22 ft. span bridges, involving 152 cu.yd. concrete and 15,245 lb. reinforcing steel. G. Lyons, co. supt. highways. Noted July 17.

Wash., Tacoma—Until Sept. 13, by Comrs. Pierce Co., building four 100 ft. Howe truss bridges over South Prairie Creek on section of Pioneer Way known as Bond Issue Proposition No. 9. C. A. Campbell, co. aud. and clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Tex., Abilene**—Taylor Co. let contract building two 50 ft. steel span bridges, 16 ft. wide, with rein.con. approaches on Highway No. 1, to Austin Bros., 1815 Coombs St., Dallas, $12,767. Work involves 35,200 lb. structural steel, 1024 lb. reinforced steel, 409 cu.yd. classes A, B and C concrete, etc.

★**Tex., Seguin**—Guadalupe Co. let contract to A. D. McClain & Co., Houston, building 3 bridges on Highway No. 3, one 100 ft. span, 3 panels of I-beam approaches 20 ft. each, over Geronimo Creek, one 60 ft. steel span, 2 panels of I-beam approaches 20 ft. each and one 50 ft. steel span, all to be built on concrete piers, 18 ft. roadway. About $22,500.

Utah, Salt Lake City—City received bids building 68 ft. rein.-con. arch bridge on 5th South St., over Jordan River, from Steel Constr. Co., Salt Lake City, $24,317, A. J. Gillis, Kearns Bldg., $30,588, Schuler & Sornson, Salt Lake City, $31,208; 48 ft. rein.-con. arch bridge on 4th South St., over Jordan River, from Steel Constr. Co., Salt Lake City, $22,115, Midland Bridge Co., Salt Lake City, $27,714, A. J. Gillis, Kearns Bldg., $28,647. Noted Aug. 21.

★**Wash., Chelan Station** (Chelan P. O.)—Wernatchee-Beebe Orchard Co. let contract building piers for 630 ft. span bridge with 650 ft. approach to McRae Bros., Amer. Bank Bldg., Seattle. Work on superstructure will be done by day labor. Total cost. $75,000.

Structural Steel

BIDS DESIRED

Ga., Gainesville—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Osceola Mills**—See "Waterworks."

★**Pa., Pittsburgh** — See "Industrial Works."

Reinforced Concrete

PROPOSED WORK

Ont., Toronto—See "Industrial Works."

BIDS DESIRED

Ga., Dublin—See "Bridges."

PRICES AND CONCRACTS AWARDED

(★Indicates award of conract)

★**Pa., Phila.**—See "Industrial Works."

Streets and Roads

PROPOSED WORK

New Jersey — State Highway Comn., Broad St Bank Bldg., Trenton, rejected bids resurfacing 13,170 cu.yd. Brown's Mills-Lakehurst Rd., Burlington Co. Work will be readvertised. Noted Aug. 14

Pa., Hazelton—City plans election to vote on $750,000 bonds to improve streets, sewers and schools. J. Rough, city engr

Pa., Turtle Creek—City rejected bids paving Greensburg and Penn Aves. Noted Aug. 14.

Pa., York—York Co. voted $2,500,000 bonds to build roads. Noted July 24.

Virginia—State Highway Comn., Richmond, soon lets contract building 6.25 mi top soil road between Willis Mountain and Shepherd's Store, Project No. 39, Buckingham Co.; 11 mi. gravel road from Burrowsville to Spratley's Store, Project No. 58, Prince George Co.

W. Va., Morgantown—Monongalia Co. rejected bid paving 4½ mi. road from Maidsville Landing to Pennsylvania State line. County will probably do work.

W. Va., Wheeling—City soon lets contract paving 40,000 sq.yd. 16th, South, Eoff and North Huron Sts., 4 in. vitr. block on 6 in. concrete base, with 2 in. cement and sand cushion. H. A. Conrad, city engr.

N. C., Gastonia—Gaston Co. voted $500,000 bonds to improve road.

S. C., Chester—City plans election to vote on $140,000 bonds to pave various streets

Ga., Chatsworth—Murray Co. voted $100,000 bonds to build roads and bridges. E. V Camp, Atlanta, consult. engr. Noted July 10.

Ga., Sulphur Springs—W. C. Beck, chn good rds. com., soon lets contract building 1½ mi. road leading from here to top of Lookout Mt., all hillside work, 16 ft. roadbed, 10% grade.

Ga., Trenton—Dade Co. voted $40,000 bonds to repair road from Sulphur Springs to Alabama line and from Wildwood to Tennessee line. State will appropriate $44,000 for project.

Ala., Troy—City Council plans to pave 1 mi. North Three Notch St from end of present pavement to Cemetery St., vitr. brick.

La., Colfax—Grant Co. voted $210,000 bonds to build and complete roads. Noted July 31.

La., Columbia—Comrs. Caldwell Co. plan to issue $500,000 bonds to build roads.

La., Gretna—Comrs. Jefferson Co. received no bids paving various streets. Noted Aug. 7.

La., Pointe a la Hache—Comrs. Plaquemines Parish plan election Sept. 10 to vote on $50,000 bonds to build roads in Dist. No. 1.

Ky., Mt. Sterling—City plans to pave Samuels Ave., West High St., to point beyond Antwery Ave., West Main St. to city limits, East Locust to Queen St., West Locust to Richmond Ave. and Richmond Ave. between Locust and Main Sts.

Ohio—State Highway Comn., Columbus, rejected bids received Aug. 5. resurfacing Sects. "J," "G" and "G-2" Cleveland-Wooster Rd., bituminous concrete, Cuyahoga Co. Work will be readvertised.

O., Dayton—City plans to pave 1200 ft. Forest Ave. from Lehman to Neal Sts., 40 ft wide, involving 5000 sq.yd. wood block on concrete base. About $20,000. O. E. Eichelberger, city engr.

O., Toledo—City plans to pave 2965 ft. Dorr St., 38 ft. wide, involving 7556 sq.yd. vitr. brick, 5435 lin.ft. curbing and 6763 cu.yd. earth excav., cost $59,154; 1354 ft. Wayne St. from Andora Dr. to Westwood Ave., 30 ft. wide, 4170 sq.yd. vitr. brick, 2396 lin.ft. curbing and 1800 cu.yd. excav., $29,574. H. C. McClure, city engr.

Indiana — State Highway Comn., Indianapolis soon lets contract grading and paving with (a) brick, (b) concrete, (c) bituminous concrete, 8.4 mi. road from Franklin to Greenwood, Johnson Co., (a) $423,975, (b) $315,343, (c) $212,308; 4.6 mi. Natl. Rd. from Illinois state line to West Terre Haute, Vigo Co. (a) $240,214, (b) $172,102, (c) $212,308; 10.2 mi. French Lick Rd. from Vanderburg Co. line to Boomville, Warwick Co., (a) $750,896, (b) $438,776 (c) $550,172; 12.4 mi. French Lick Rd. from Orange Co. line to Bedford, Lawrence Co., (a) $683,270, (b) $504,500, (c) $660,000; 11.3 mi. Lincoln Highway from Shenville to Horter Co. line, Lake Co., (a) $577,313, (b) $418,425, (c) $547,218; 7 mi. Range-Line Rd. (a) $402,-

Streets and Roads (Continued)

947, (b) $284,813, (c) $369,534; 2.9 mi. Ranger-Line Rd., from Center Twp., line to Miami Co. line, (a) $177,108, (b) $123,034, (c) $160,650. H. K. Bishop, c/o State Highway Dept., engr.

Michigan—State Highway Dept., Lansing, soon lets contract snaping, surfacing and building drainage structures on 7.532 mi. State Trunk Line Rd. No. 18-8, Arenac Co., involving 70,699 sq.yd. gravel and 25,197 cu.yd. earth excav.; 3 407 mi. State Trunk Line Rd. No. 13-11-B, Charlevoix Co., 31,982 sq yd. gravel, 194 cu.yd. concrete and 20,622 cu.yd. earth excav.; 2 950 mi. State Trunk Line Rd No. 12-7, and 1 478 mi. State Trunk Line Rd. No. 12-8, Menominee Co., 41.556 sq yd gravel and 34.395 cu.yd. earth excav.; 2 027 mi. State Trunk Line Rd. No. 17-1, Jackson Co., 113 cu.yd. concrete and 11,892 cu.yd. earth excav.

Mich., Detroit—Dept. Pub. Wks. soon lets contract paving with asphaltic concrete on 6 in. base, with Berea, Medina or Amherst curbstone, Apple St. from St. John St. to Michigan Ave., Central Ave. from McGraw to Radcliffe Aves., Eastlawn Ave. from Kercheval to Charlevoix Aves., Fulton Ave. from Springwells to Willsie Aves., Helen Ave. from Strong to Miller Aves and from Harper to Strong Aves., Homer Ave. from Springwells to Lawndale Aves., Hazlett Ave from Milford to Tireman Aves., Marquette Ave. from 16th St. to Lawton Ave., Parkdale Terrace from McGraw to Warren Aves., Radcliff Ave from Central Ave. to Lonyo Blvd., Springwells Ave. from Malta to Michigan Aves., 26 ft. wide, involving 27,053 cu.yd. excav., 37,082 lin.ft. curbstone, 51,183 sq.yd. paving, 990 cu.yd. concrete, and 2155 ft. retaining stone. C. W. Hubbell, city engr.

Wis., Manitowoc—City plans to grade and pave 1.2 mi. Huron and 8th Sts., 20 ft. wide, brick or concrete, combined curb and gutter. About $15,000.

Neb., Fairbury—City retained C. McCrae, engr., Republic Bldg, Kansas City, Mo., to prepare plans for paving 100 000 sq.yd. streets, also to improve storm sewers. About $500,000.

Wyoming—State Highway Comn., Cheyenne, plans to gravel 10 mi. Big Goose Creek Rd., Sheridan Co. About $100,000. J. E. Jellick, Sheridan, engr.

Montana—State Highway Comn., Helena, plans to gravel surface 3 mi. Marion Rd., Flathead Co. About $10,900. Federal Aid applied for. J. N. Edy, state highway engr.

Tex., Anahuac—Chambers Co. plans to improve, drain, grade, mud or clam shell surface 12 mi. highway No. 35 from here to Liberty Co. line. 12 ft wide. About $66,000. H. P. Compton, Liberty, engr.

Tex., Falfurrias—Brooks Co. rejected bid received excavating, grading, sub-grading, caliche surfacing etc., 10.75 mi. Highway No. 12. About $31.701. H. S. Bedell, Falfurrias, engr. Noted Aug. 14.

Tex., Port Lavaca—Calhoun Co. plans to clear, grub scarify, reshape, shell surface and build trestle on 4.621 mi Highway No. 29, from here to Wittnebert Gate, 24 ft. wide. About $13 663. R H Phillips, Natl. Bank of Commerce, San Antonio, engr. Noted Jan. 30.

Tex., Seguin—Comrs. Guadalupe Co soon let contract grading, surfacing and building drainage structures on 14.6 mi. Highway No. 3, west from here, 15 ft. wide. About $69.957. Hess & Skinner, South Western Life Bldg., Dallas, engr. Noted June 19.

Tex., Uvalde—Uvalde Co., Sabinal and Utopia Precincts, voted $200,000 bonds to build State Highways Nos. 3 4 and 30, etc. This is in addition to $250,000 bonds previously voted.

Okla., Sapulpa—Creek Co. election Sept. 9, to vote on $1,000,000 bonds to build roads.

Idaho, Boise—W. J. Hall, comr. pub. wks., soon lets contract paving 3.6 mi. Fort Hall-Gibson Sect. of Yellowstone Park Highway.

Idaho, Lewiston—Nez Perce Co. election Oct. 7 to vote on $400,000 bonds to build and improve roads and bridges.

Utah, American Fork—City soon lets contract paving 30,000 sq.yd. various streets, with 7 in. rein.-con. on 6-in. concrete base with 2 in. topping. About $125,000. Huddleston & Fiero, Kearns Bldg., Salt Lake City, engrs.

Washington—State Highway Bd., Olympia, completed preliminary survey of Ocean Beach Highway from Coal Creek west of Kelso through Cowlitz and Wahkiakum Counties. An appropriation of $35,000 will be available for construction work in Cowlitz Co. next year and a contingent appropriation of $75,000 will be available for work in Wiahkiakum Co. C. Signer, state highway engr. R. M. Gillis, Kelso, dist. engr.

Wash., Tacoma—City soon receives bids paving Pacific Ave. from 24th to 96th Sts., 12 ft. wide. About $150,000. Bids will be received on all standard types of pavement. J. C. Manley, city engr.

Ore., Beaverton—City Council soon lets contract grading, draining and paving Watson St. from 1st to 4th Sts., concrete or asphaltic concrete. About $12,000. T. A. Garrow, 422 Northwestern Bank Bldg., Portland, city engr.

Ore., Beaverton—City Council soon lets contract grading, draining curbing and paving Hamilton St. from Estes to Watson Sts., North Bway St. from Watson St to Oregon Electric Depot crossing, concrete, asphaltic concrete or bitulithic. Cost to exceed $10 000 T. A. Garrow, 422 Northwestern Bank Bldg., Portland, city engr.

Ore., La Grande—City plans to pave M St. from 4th to Cedar Sts., also alley from 4th to Chestnut Sts. between Jefferson and Adams Sts., concrete or asphaltic concrete. About $10,000.

Ore., Pendleton—City Council approved plans to pave Garfield St., from Raley to Mark Sts., concrete. About $10,000. J. A. Fee, city atty.

Ore., St. Helens—City soon lets contract improving various streets. About $25,000. E. E. Quick, city recdr.

Cal., San Bernardino—Bd. Supervs San Bernardino Co., soon receives bids paving 1 mi. Mt. Vernon Ave., 16 ft. wide, concrete. About $20,000. L. R. Lothrop, San Bernardino, engr.

BIDS DESIRED

Massachusetts—Until Sept. 9, by State Highway Comn., Boston, for 2000 ft asphalt macadam road, Lexington Twp., 4700 ft. macadam oil road, 18-22 ft. wide, Wrentham Twp., 9900 ft. macadam state road, 18-22 ft. wide, Norwell Twp. A. W. Dean, state highway engr.

N. J., Highland Park (New Brunswick P. O.)—Until Sept. 8, by L. K. Smith boro. clk., paving, grading and curbing 35,000 sq.ft. Lincoln and 1st Aves., involving 1600 bbls. cement, 850 cu.yd. stone or gravel and 500 cu.yd. sand. About $45,000. J. T. Hopkins, Highland Park, engr.

N. J., Jersey City—Until Sept. 9, by city, paving with granite blocks on present concrete foundation Newark Ave. from Summit to West Side Aves., cost, $75 000; improving Danforth Ave. between Hudson Blvd. and West Side Ave., $36,152; improving Eastern Parkway between Ocean and Garfield Aves., asphalt on concrete base, $15,000. C. Van Keuren, city engr.

Pa., Beaver Falls—Until Sept. 8, by Town Council, paving 6th Ave. from 8th to 22nd Sts. Bids will be accepted on vitr. brick, cement and asphalt surface. J. P. Leaf, boro. engr.

Maryland—Until Sept. 9, by State Rds. Comn., 601 Garrett Bldg., Baltimore, paving 6 mi. highway from state road near Owensville toward Shadyside, 15 ft. wide, gravel, Federal Aid Project No. 34, Contr. AA-15, Anne Arundel Co.; 2 mi. highway from Beallsville toward Dickerson, 15 ft. wide, 3 ft. dirt shoulders, involving 8800 sq.yd. 6 in. concrete, Federal Aid Project No. 10, Contr. No. M-16, Montgomery Co. J. N. Mackall, state highway engr.

Maryland—Until Sept. 16, by State Rds. Comn., 601 Garrett Bldg., Baltimore, building 0.78 mi. highway through Manchester, Contr. No. C1-24, Carroll Co.; 3 mi. highway from Hughesville toward Benedict, gravel, Federal Aid Project No. 25, Contr. No. Ch-15, Charles Co. F. H. Zouck, chn.; advertised in this issue.

Md., Belair—Until Sept. 15, by Comrs. Harford Co., building 1¼ mi. state aid highway from Wilson's Corner to Streett's Gate, 15 ft. wide, concrete. J. N. Mackall, c/o State Rds. Comn., 601 Garrett Bldg., Baltimore, engr.

W. Va., Keyser—Until Sept. 23, by A. A. Jordan, clk. Mineral Co., building 12 mi. Ridgely-Alaska Rd., 16 ft. gravel surface roadway; advertised in this issue. Noted Mar. 27.

W. Va., Wayne—Until Sept. 8, by Comrs. Wayne Co. grading and draining 5 mi. Wayne-Kenova Rd. and surfacing ½ mi. Huntington-Kenova Rd., brick. About $70,000. H. A. Levering, Ceredo, engr.

North Carolina—Until Sept. 15, by State Highway Comn., Raleigh, building 4.5 mi. road, 18 ft. wide, in Granville Co., involving 52 sq.yd. class B concrete, 28,366 cu yd. earth excav. and 1100 lin.ft. 12-18 in. vitr. pipe. About $15,000. W. S. Fallis, state highway engr.

Fla., Quincy—Until Sept. 16, by J. P. Smith, city clk., paving 27,000 sq.yd. various streets. J. B McCrary, 3rd Natl. Bank Bldg., Atlanta, Ga., engr.

Louisiana—Until Sept. 8, by State Highway Dept., Maison Blanche Annex, New Orleans, graveling, ditching, etc., 13.85 mi. Port Allen-New Roads Highway, West Baton Rouge Parish, 20 ft. wide. D. Buie, state highway engr.

Louisiana—Until Sept. 8, by State Highway Dept., New Orleans, gravel surfacing and draining 19 8 mi. Alexandria-Oberlin Highway, Rapides Parish, 20 ft. wide, and 14 5 mi. Alexandria-Melville Highway, Rapides Parish, 20 ft. wide. No bids received on former advertisement. D. Buie, state highway engr. Noted Aug. 21.

Indiana—By Bd. County Comrs., building roads in following counties:

Sept. 12, Clark Co., Jeffersonville, building 14.361 ft. crushed stone road, Charlestown Twp., known as Charlestown and Lexington Rd. G. W. Stoner, co. aud.

Wells Co., Bluffton, building 13,172 ft. stone road, Jefferson Twp., known as J. W. Gibson et al. Rd.; 10,594 ft. stone road, Union Twp., 15,806 ft. stone road, Jefferson Twp., paving 1219 ft concrete street, Uniondale Twp. C. F. Kain, co. aud.

Sept 15, Montgomery Co., Crawfordsville, building 6710 ft. gravel road, on county line between Sugar Creek and Franklin Twps., known as Marion A. Davis Rd. W. F. Batman, co. aud.

Marion Co., Indianapolis, building .49 mi. road in Center Twp. known as O. Lee et al Rd., 61 mi. road, Warren Twp., known as J. W. Behrmann et al Rd., 1.12 mi. road, Franklin Twp., known as R. H. Collins et al Rd., 1.72 mi. road, Wayne Twp., known as A. L. Wisby et al Rd. L. K. Fesler, co. aud.

Sept. 18, Allen Co., Ft. Wayne, building 1.78 mi. road, Lake Twp., known as Vaghn Rd., 2.3 mi. road, Lake Twp., known as Butt Rd. A. C. McCoy, co. aud.

Michigan—Until Sept. 9, by State Highway Dept., Lansing, shaping, surfacing and building drainage structures on 2.596 mi. State Trunk Line Rd. No. 47-1, 16 ft. wide, involving 24,364 sq.yd. gravel and 6000 cu.yd. earth excav.

Mich., Port Huron—Until Sept. 8, by Comrs. St. Clair Co., furnishing labor and material building 4¾ mi Assessment Dist. Rd. No. 5, Harris Rd., 9 ft. trench gravel, on 22 ft. grade, involving drainage ditches, culverts, bridges, etc. Noted July 31.

Wisconsin—Until Sept. 12, by State Highway Comn., Court House, La Crosse, improving Fountain City-Winona Rd., Buffalo Co., Federal Aid Project No. 87, involving 38 099 cu.yd. earth and 2619 cu. yd. rock excav., 357 cu.yd. Class "A" concrete, culverts and bridges, 133 sq.yd. concrete surfacing, etc.; Hunter's Bridge Rd., La Crosse Co., Federal Aid Project No. 52, 12,250 sq.yd. bituminous macadam surfacing. Noted Aug. 7.

Wisconsin—Until Sept. 12, by State Highway Comn., Spooner, improving Barron-Turtle Lake Rd., Barron Co., Federal Aid Project No. 101, involving 12 acres clearing and grubbing, 28,997 cu.yd. earth and 1985 cu.yd. borrow excav., 476 cu yd. Class "A" concrete, culverts, bridges, etc.

Minn., Faribault—Until Oct. 1, by Comrs. Rice Co., improving Job No. 1903, State Rd. No. 1, 24 ft. wide, involving 71,223 cu.yd. excav., 15,077 cu.yd. gravel surfacing, culverts, etc., $400,000; Job No. 1904, State Rd. No. 16, 24 ft. wide, 46,892 cu.yd. excav., 8569 cu.yd. gravel surfacing culverts, etc., $250,000. W. P. Chapman, Faribault, engr.

Streets and Roads (Continued)

Minn., St. Louis Park—Village Clerk receiving bids building 2442 sq.yd. sidewalks. About $12,000.

Kan., Stafford—Until Sept. 8, by city, furnishing labor and material building 4939 lin.ft. combined curb and gutter, 250 lin.ft. single curb, 132 lin.ft. double gutter, and 7034 lin.ft. 10-27 in. storm sewers. Archer & Stevens, New England Bldg., Kansas City, Mo., engrs.

Kan., Washington—Until Sept. 12, by city, paving and curbing 9 blocks various streets, involving 19,385 sq.yd. asphaltic concrete, brick or 2 course concrete. Black & Veatch, Interstate Bldg., Kansas City, Mo., engrs. Noted Aug. 28.

Ark., Fayetteville—Until Sept. 20, by Comrs. Rd. Impvt. District, No. 5 at office of Hamilton & Shreve, engrs., Fayetteville, building roads in district, Washington Co., involving 46,580 cu.yd. excav., 30,896 cu.yd. gravel, 264 cu.yd. Class A and 30 cu.yd. Class B concrete, 1732 lin.ft. 15-24 in. pipe and one 100 ft. steel span highway bridge; advertised in this issue.

Tex., Rockwall—Until Sept. 17, by Comrs. Rockwall Co., building concrete or monolithic brick road and rein.-con. drainage structures on 13.36 mi. Highway No. 1, from Dallas to Collin Co. lines, 18 ft. wide. About $544,000. J. Montgomery, Rockwall, engr. Noted Aug. 14.

Okla., Pawnee—Until Sept. 10, by City Clerk, building 18,000 sq.yd. concrete pavement with integral curb, grading, draining, etc. C. H. Mullins, city engr.

Colo., Denver—Until Sept. 10, by city, grading, curbing, and surfacing 50 blocks in Harmon Impvt. Dist. No. 1, a phalt, crushed slag, granite, on hard boulders, loam sand and gravel. About $167,261. Noted Apr. 17.

Utah Salt Lake City—Until Sept. 10, by City Comm., paving 4410 ft. 8th South St. from 3rd to 9th West Sts., also 4th West St. from 8th to 9th South Sts., 22 ft. wide, involving 8050 lin.ft. curb and gutter, 7 in. thick on rein.-con. pavement.

Arizona—Until Sept. 13, by T. Maddock, state highway engr., Phœnix, building Sect. 1 A Tucton-Florence Highway, involving 14,126 cu.yd. excav., 40,370 sq.yd. pavement and incidental drainage, etc.; advertised in this issue.

Washington—Until Sept. 15, by State Highway Bd., Olympia, clearing, grading and draining 12.2 mi. Inland Empire Highway between Ellensburg and Roza, Kittitas Co.; 2.2 mi. Chelan-Okanogan Highway between Chelan and Chelan Falls, Post Rd. Project No. 45, Chelan Co.; 4.8 mi. Pacific Highway from Seattle north, King Co.; 3.6 mi. Natl. Park Highway between La Grande and Alder, Pierce Co., 2 mi. Olympic Highway from Forks south, Clallam Co.; grading, draining and surfacing, 7.2 mi. Inland Empire Highway between Dayton and Delaney, gravel, Columbia Co.; 10.8 mi. Inland Empire Highway between Dodge and Central Ferry, Post Rd. Project No. 46, Garfield Co. J. Allen, state highway comr.

Quebec—Until Sept. 12, by M. Henry, engr., c/o Dept. Rds. Quebec, paving and ditching 5 mi. Concession Range and Main Rds. waterbound macadam on gravel base, St. Brigide Twp., $20,000; graveling and ditching 6 mi. Provincial Highway, 18 to 20 ft. wide, Hinchinbrooke Twp., $18,000.

Ont., York—Until Sept. 6, by F. Barber, twp. engr., 40 Jarvis St., Toronto, building 12,000 ft. concrete sidewalks 4 and 4½ ft. wide, on Bernice Crescent, Dennis, Gamble, McRoberts, Poulton and Torrens Aves., and 800 ft. tarvia pavement on concrete base, 16 ft. wide, on Westmount Ave. About $18,000. Noted Aug. 28.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—State Highway Comm., Boston, let contract building 3700 ft. state road, Middleton Twp., involving 17,000 gal. bituminous macadam, 2500 cu.yd. excav. and 2900 ton broken stone, etc., to W. B. McIntosh, Wilmington, $24,374; 2900 ft., Charlton Twp., 1120 cu.yd. concrete, 1900 cu.yd. excav., 500 cu.yd. rock and 140 ft. 12 in. c.i. pipe, to C. Bianchi Co., Framingham, $21,945; 7100 ft., Leominster Twp., 42,000 gal. bituminous macadam, 1250 cu. yd. excav. and 1850 ton broken stone, etc., to D'Onfro Bros., Leominster, $31,278; 4000 ft., Agawam Twp., 28,000 gal. bituminous material, 1500 cu.yd. excav., 3000 cu.yd. stone fill and 2800 ton broken stone, to Luchini & Sons, Milford, $29,343.

★**Mass., Boston**—City let contracts paving 363 ft. roadway on Chelsea Bridge, involving 1614 sq.yd. creosote block, to Standard Eng. Co., 15 Northern Ave., $13,621; Fayette Ave., 3500 sq.yd. bituminous macadam and 1870 cu.yd. excav., to J. Doherty Co., Boston, $10,229; Bennington St., East Boston Dist., 8500 sq.yd. granite block on 6 in. concrete base, to McGuire & McGourty Co., Boston, $37,687.

New York—State Highway Dept., Albany, received bids Aug. 26, improving roads in following counties: (a) Montgomery Co., 3.7 mi. Palatine Bridge-Stone Arabia, Rd. No. 517,

(b) Rensselaer Co., 1.27 mi. Oakwood Ave., Rd. No. 1527,

(c) Saratoga Co., 9.06 mi. Schuylerville-Gansevoort, Rd. No. 1461,

(d) Suffolk Co., 5.86 mi. Cold Spring-Hunting on-Fort Salonga, Part 1, Rd. No. 1525, completing roads in following counties:

(e1) Cayuga Co., 6.06 mi. Fleming-Scipio, Part 2, Rd. No. 1327-A, (e2) 5.45 mi. Venice Center-Genoa, Rd. No. 1414.

(f) Chautauqua Co., 5.65 mi. Jamestown-Ashville, Rd. No. 1380-A,

(g) Franklin Co., 10.36 mi. Malone-Chateaugay, Rd. No. 5613,

(h) Livingston Co., 8.34 mi. Conesus-Wayland, Rd. No. 1321-A,

(i1) Madison Co., 6.51 mi. Munnsville-Pratts Hollow-Pine Woods, Rd. No. 1360, (i2) 5.65 mi. Oneida Lake-South Bay and Oneida-South Bay, Part 2, Rd. No. 1361,

(j) Seneca Co., 2.13 mi. Willard-Ovid Rd., No. 1401-A,

(k) Ulster Co., 10.24 mi. Napanoch-Montela Rd. No. 603,

(l) Washington Co., 2.06 mi. Cambridge-Ash Grove, Rd. No. 1109, also completing repair roads in following counties: (m) Cortland Co., .42 mi. Cincinnatus, Rd. No. 377, Repair Contract No. 1003, from

A. F. Schaffer, Schenectady, (a) $128,316;

Campbell & Wall, Troy, (b) $39,041;

Troy Contg. Co., Troy, (b) $39,094;

MacArthur Bros., 120 Bway, New York City, (c) $331,866;

J. J. Guinan Contg. Co., 2314 Gravesend Ave., Brooklyn, (c) $333,457;

Dale Eng. Co., Mann Bldg., Utica, (c) $353,053, (d1) $124,332, (i2) $98,777;

R. W. S. Corp., New York City, (d) $199,189;

Universal Steel Export Co., Inc., 26 Cortland St., New York City, (d) $214,646;

C. D. Schlemmer, Islip, (d) $214,770;

Cayuga Co., Auburn, (e1) $103,432, (e2) $180,687;

Mesler & Summers, Inc., 1266 Seneca St., Buffalo, (f) $218,638;

J. A. Hughes, Wellman Bldg., Jamestown, (f) $248,153;

W. T. Thayer & Co., East Main St., Chateaugay, (g) $67,538;

McCarthy & Rock, Winthrop, (g) $69,076;

Atlanta Constr. Co., Atlanta, (h) $221,118;

C. H. Van Auken, Fulton Chain, (i1) $120,754;

H. W. Roberts & Co., 610 Lansing St., Utica, (i1) $124,308;

C. B. Van Slyke, Jr., Clinton, (i2) $91,078;

Hendrickson-McCabe Co., Syracuse, (i2) $91,360;

Greenfield Constr. Co., 89 Main St., Hornell, (i2) $94,631;

J. Conley, Ithaca, (j) $45,730;

J. W. Gurnett, Watkins, (j) $47,228;

Armstrong & Trowbridge, Napanoch, (k) $34,598;

DeGraff & Hogeboom, Inc., Kingston, (k) $34,745;

Troup & Sherwood Co., Haverstraw, (k) $34,763;

W. G. Fox, Nelson Ave., Saratoga Springs, (l) $9837;

N. E. Young, Union, (m) $12,982;

W. R. Kimmey, Hudson Falls, (m) $13,162;

J. D. Rust, Syracuse, (m) $13,412. Noted Aug. 7.

N. Y., Brooklyn—Park Bd., Municipal Bldg., New York City, received bids Aug. 28, furnishing material and labor for improving (a) Park Circle, (b) East Drive, (c) sidewalks, from Uvalde Asphalt Paving Co., 1 Bway., New York City, (a) $27,603, (b) $135,147; Consolidated Asphalt Paving Co., 52 9th St., (a) $28,808, (b) $127,195; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (a) $29,308, (b) $131,437; M. J. Rooney, 126 West 90th St., New York City, (c) $1491, J. L. Brennan, (c) $1474; F. Gradwohl, 839 West 178th St., New York City, (c) $1504. Noted Aug. 21.

★**N. Y., Buffalo**—City let contract to Rock Asphalt & Constr. Co., Morgan Bldg., paving Stevens St. from East Ferry St. to point 700 ft. north, 26 ft. wide, involving 2027 sq.yd. Spec. B German rock asphalt on 6 in. concrete base, $10,954; Poultney St. from Kensington to Hutchinson Aves., 26 ft. wide, 2556 sq.yd. German rock asphalt on 6 in. concrete base and Medina sandstone curbing, $14,089; Bird Ave. from Niagara St. to Soldiers Pl., 30 ft. wide, 2?,042 sq.yd. German rock asphalt Spec. B, on 6 in. concrete base, $92,800; Crescent Ave. from Parkside Ave. to Colvin St., 26 ft. wide, 2756 sq.yd. German rock asphalt, Spec. B, and Medina sandstone curbing on 6 in. concrete base, $25,440; Argus St. from Essex St. to Roesch Ave., 26 ft. wide, 2?86 sq.yd. German rock asphalt on 6 in. concrete base and Medina sandstone curbing, $12,059; Cassy St. from William St. to point 198 ft. south, 26 ft. wide, 577 sq.yd. dressed Medina sandstone and cement grout filler on 6 in. concrete base, $4307; Breckenridge St. from Niagara St. to Erie Canal, 26 ft. wide, 1273 sq.yd. Medina dressed sandstone blocks on 6 in. concrete base, $9249; Floss Ave. from Genesee Ave. to Delavan Ave., 24 ft. wide, 6312 sq.yd. German rock standard asphalt and Medina sandstone curbing on 6 in. concrete base, $34,047; to Erie Contg. Co., Morgan Bldg., Harriett St. from Delevan Ave. to north end of street, 26 ft. wide, 4615 sq.yd. brick on 6 in. concrete base, $25,000; to H. P. Burgard Co., 1968 Fillmore Ave., Schuehle St. from East Ferry St. to Northland Ave., 28 ft. wide, 2400 sq.yd. asphalt and Medina sandstone curbing on 6 in. concrete base, $21,990; Cornwall St. from Delavan to Warwick Aves., 24 ft. wide, 7285 sq.yd asphalt on 6 in. concrete base and Medina sandstone curbing, $35,900. Noted July 17 and 31.

N. Y., Buffalo—City received bids paving (a) Kilhoffer St., 24 ft. wide, involving 2135 sq.yd. vitr. brick or asphalt on concrete base,

(b) Richlawn St., 26 ft. wide, 3772 sq.yd. vitr. brick or asphalt on concrete base,

(c) Elmer St., 26 ft. wide, 4621 sq.yd. vitr. brick or asphalt on concrete base,

(d) Tamarack St., 26 ft. wide, 1749 sq.yd. vitr. brick or asphalt on concrete base,

(e) Meriden St., 26 ft. wide, 3103 vitr. brick or asphalt on concrete base,

(f) Abby St., 28 ft. wide, 4657 sq.yd. vitr. brick, sandstone block dressed or asphalt on concrete base,

(g) Lark St., 24 ft. wide, 1677 sq.yd. vitr. brick or asphalt on concrete base,

(h) Colfax Ave., 26 ft. wide, 3615 sq.yd. vitr. brick or asphalt on concrete base,

(i) Page St., 26 ft. wide, 2486 vitr. brick or asphalt on concrete base,

(j) Fuller St., 26 ft. wide, 3280 sq.yd. vitr. brick or asphalt on concrete base,

(k) Howell St., 26 ft. wide, 1423 sq.yd. vitr. brick or asphalt on concrete base,

(l) Amber Ave., 26 ft. wide, 4165 sq.yd. vitr. brick or asphalt on concrete base,

(m) Sheffield Ave., 26 ft. wide, 6612 sq.yd. vitr. brick or asphalt on concrete base,

(n) Magnolia St., 24 ft. wide, 1490 sq.yd. vitr. brick or asphalt on concrete base.

(o) Willett St., 26 ft. wide, 6178 sq.yd. vitr. brick or asphalt on concrete base,

(p) Kensington Ave., 30 ft. wide, 592 sq.yd. asphalt on concrete base, all Medina curbing, (1) asphalt, (2) brick, (3) blocks, from

Rock Asphalt & Constr. Co., Morgan Bldg., (a1) $11,986, (b1) $20,249, (c1) $25,364, (d1) $9873, (e1) $16,609, (f1) $28,430, (f3) $36,382, (g1) $9334, (h1) $21,240, (i1) $13,905, (j1) $17,776, (k1) $8392, (l1) $21,782, (m1) $35,627, (n1) $8117, (o1) $33,997, (p1) $3421;

H. P. Burgard Co., 1968 Fillmore Ave., (a1) $12,155, (b1) $20,760, (c1) $23,530, (d1) $10,080, (e1) $17,310, (g1) $9555, (h1) $18,965, (i1) $13,650, (j1) $18,180, (k1) $8685, (l1) $24,180, (m1) $36,445, (n1) $8235, (o1) $34,790, (p1) $3555;

Streets and Roads (Continued)

Erie Contg. Co., Morgan Bldg., (a2) $11,400, (b2) $19,500, (d2) $9400, (e2) $16,000, (f2) $26,300, (i2) $14,000, (j2) $17,800, (k2) $8300, (m2) $34,500, (n2) $8000, (o2) $33,500;

B. F. Soire, 24 Colonial Circle, (2) $25,450, (g2) $9329, (h2) $20,550, (l2) $25,450. Noted July 17 and 31.

★**N. Y., Fredonia**—City let contract paving Eagle St., brick, to P. B. Colgan, Dunkirk. About $52,000.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids Aug. 27, regulating and repaving with sheet asphalt on broken stone macadam base, Hillside Ave. from Grand St. to Rocky Hill Rd., 4th Ward, from Union Paving Co., Bway. and 112th St., $151,376; Consolidated Asphalt Co., Brooklyn, $176,678; Cleveland-Trinidad Paving Co., Flushing Ave., Brooklyn, $199,847. Noted Aug. 21.

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contracts, to Sicilian Asphalt Paving Co., 41 Park Row, New York City, regulating, grading, curbing and laying sidewalks, on Anthon Ave., $6509, 4th St., $22,628, Hunterspoint Ave., $29,742, Nurge St., $3762, Olmstead Ave., $7205, Van Cortland Ave., $9060; to Hastings Paving Co., 25 Broad St., New York City, Boulevard, $29,260; to Peace Bros., 20 Main St., Flushing, Broad St., $11,735; to W. Welsh, Astoria, Buckley St., $5280; Moor St., $8875; to Uvalde Asphalt Paving Co., 1 Bway., New York City, Freedom Ave., $45,225; to R. A. Hess, Corona, Gunther Ave., $22,539; to C. Gallagher, Woodhaven, Hancock St., $1735; St. Felix Ave., $4479; to Cleveland Trinidad Paving Co., Flushing Ave., Brooklyn, Poland St., $13,885; to Annarock Eng. & Constr. Co., Long Island City, Woodside Ave., $126 560; to Holding Realty Co., Long Island City, 16th St., $26,114. Noted Aug. 28.

N. Y., New York—H. Bruckner, pres. Bronx Boro., received bids Aug. 28, paving with bituminous concrete on 5 in. concrete foundation, (a) East 239th St., (b) East 107th St., (c) regulating and grading Blackrock Ave., from Uvalde Asphalt Paving Co., 1 Bway., (a) $7089, (b) $12,676; Asphalt Constr. Co., 2197 Madison Ave., (a) $7240, (b) $11,673; Mt. Vernon Grading Constr. Co., Mt. Vernon, (c) $22,657; I. Cavalluzzo, 1538 Walton Ave., (c) $23-620; Watson Co., East Tremont Ave. and Westchester Creek, (c) $24,292. Noted Aug. 21.

N. Y., New York—F. L. Dowling, pres. Manhattan Boro., received bids Aug. 25, regulating and repaving with granite block on concrete base, intersection of (a) Bway., (b) with sheet asphalt on concrete base, roadway of Bway. from Morris to Vesey Sts., (c) 28th St., (d) 110th St., (e) Lenox Ave., (f) Lexington Ave., (g) with wood block, Lexington Ave., from M. I. Sachs, (a) $3109; P. J. Kearns, (a) $3630; D. J. McCarthy, (a) informal; Sicilian Asphalt Paving Co., 41 Park Row, (b) $54,413, (c) $28,121, (d) $37,208, (e) $49,870, (f) $119,480; Uvalde Asphalt Paving Co., 1 Bway., (b) $56,638, (c) $27 955, (d) $35,404, (e) $50,861, (f) $121,173; Cleveland-Trinidad Paving Co., Flushing Ave., Brooklyn, (b) $58,485, (c) $27,071, (d) $37,997; J. L. Brusstar, Harlem River and 150th St., (c) $27 653, (d) $37,561, (e) $47,799, (f) $91,945; Asphalt Constr. Co., 2197 Madison Ave., (d) $36,773, (e) $48,754, (f) $89,198, (g) $141,420. Noted Aug. 21.

★**N. Y., Rochester**—Bd. Contr. & Supply let contract grading and paving approaches to Clarissa St. Bridge, to Whitmore, Rauber & Vicinus, 279 South Ave., $45,872; Peckham St., asphalt, to J. Frederichs Co., Livingston Bldg., $12,575.

N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., received bids Aug. 21, repaving (a) Richmond Terrace from Western Ave. to Elizabethport Ferry, (b) Richmond Terrace from Treadwell Ave. to Harbor Rd., (c) Castleton Ave. from Clove Rd. to Caroline St., (d) Brook St. from Richmond Turnpike to Jersey St., (e) Wadsworth Ave. from Bay St. to Tompkins Ave., (f) Bay St. from Bayview to Wadsworth Ave., (g) Lindenwood Rd. from J. E. Donovan, Port Richmond, (a) $6300, (b) $54,121, (c) $4200, (e) $3750; J. Johnson Sons, Port Richmond, (a) $7081, (b) $53,900, (c) $3800, (e) $3900, (f) $2825, (g) $1170; C. Vanderbilt, 24 Elizabeth St., West New Brighton, (a) $8190, (b) $47,493, (c) $3895, (e) $4800, (g) $1200; Leedecke & Sachs, (b) $48,310, (d) $11,680; Uvalde Asphalt Paving Co., 1 Bway., New York City, (f) $2550; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (f) $32.85. Noted Aug. 14.

★**N. Y., Schenectady**—Bd. Contr. & Supply let contract grading, curbing and paving James and Robinson Sts., to B. Trimpoli, Schenectady, $12,347.

★**N. J., Bordentown**—City Comrs. let contract paving about 1 mi. Burlington, 2nd, Church, Mary and Spring Sts., concrete, to J. F. Burke Co., 309 Park Ave., Plainfield, $22,606. Noted Aug. 14.

★**N. J., Camden**—Bd. Freeholders, Camden Co. let contract improving portion King's Highway, Haddonfield Twp., to McInerney & McNeal, Inc., Easton, Pa., involving 3051 cu.yd. excav., 7715 sq.yd. bituminous macadam, 1653 sq.yd. concrete gutters, etc. About $42,949. Noted Aug. 14.

★**N. J., Hoboken**—City let contract repaving 6th and 7th Sts. from Washington St. to Bloomfield Ave., granite block, to A. Lettieri & Son Co., 261½ Wayne St., Jersey City. About $117,000.

★**N. J., Trenton**—Bd. Freeholders, Mercer Co., let contract building 1600 ft. Sect. 2-A River Rd., Hopewell Twp., to Gibbs & Morgan Co., 12 North Willow St., $29,595. Noted Aug. 14.

★**Pennsylvania**—State Highway Dept., Harrisburg, let contracts building roads in counties as follows:

Fayette Co., 4101 ft. vitr. brick, North and South Union Twps., to E. C. Cornish and W. Miller, 620-22 Fayette Title & Trust Bldg., Uniontown, $51,475;

Lehigh Co., 16,218 ft. one course rein.-con. from Emaus to Allentown to J. McGraw Co., 1010 Commercial Trust Bldg., Phila., $106,897;

Lycoming Co., 15,683 ft. bituminous surface course on concrete foundation or rein.-con., Wolf Twp. and Picture Rocks Boro., to Winston & Co., 240 Fair St., Kingston, N. Y., $155,377;

Wyoming and Lackawanna Counties, 71,063 ft. bituminous surface course on concrete foundation or rein.-con., Clarks-Summit, Glenburn Boroughs and Abingdon Twp., to Ruthven, Rees & O'Brien, 212 Carter Bldg., Scranton, $468,327;

Luzerne Co., 31 418 ft. bituminous surface course on concrete foundation or rein.-con., West Pittston and Exeter Boroughs and Twps., Richardson Hand, Wilkes-Barre, $228,548;

Bucks Co., 812 ft. vitr. brick, Falls Twp., to F. G. Meyers Co., Inc., 1218 Chestnut St., Phila., $13,914. Noted Aug. 28

★**Pa., Allegheny**—Supervs. Allegheny Twp. let contract rebuilding 17,490 ft. Carrolltown Rd., 17 ft. wide, from Bradley Jct. to Loretto Boro. line, vitr. brick on 4 in. concrete base, to Lord & Clark, Hastings, $183,230. Noted Aug. 7.

★**Pa., Chartiers**—(Pittsburgh P. O.)—Town let contract grading, paving and curbing Lakewood Ave., from Pittsburgh City line to Oak St., to J. B. Reed Co., McKees Rocks. About $13,000. Noted Aug. 21.

★**Pa., Connellsville**—Comrs. Fayette Co. let contract building 7335 ft. concrete road, 18 ft. wide, to be known as McClellandtown Rd., to J. L. Brown, Uniontown. About $65,000. Noted July 31.

Pa., Emsworth (Pittsburgh P. O.)—Boro. received bids grading, paving and curbing Locust St., from McDonough & O'Toole, Pittsburgh, $16,100, R. V. Baldwin, Coraopolis, $16,800, S. Baumgardner, Bellevue, $19,300. Noted Aug. 28.

★**Pa., Lebanon**—City let contracts paving Sects. 1 and 2 of streets from Cumberland to Mangan Sts., involving 5400 sq.yd. 2½ in. lug block on 5 in. base, pitch cushion and filler, to Pugh & Dolan, Pottsville, $7521 and $23,688 respectively; Sect. 3, 10,000 sq.yd. 2 in. bitulithic on 5 in. concrete base, to H. Neumeyer, Bethlehem, $38,128.

★**Md., Baltimore**—Bd. Awards let contract furnishing materials and flushing surface of Edmondson, Forest Park, Gwynn Oak, Rogers, Greenspring and Gwynne Falls Aves., to Pennsylvania Eng. & Constr. Co., Lawnsdowne, Pa., at 28 cts. per sq.yd. Noted Aug. 14.

★**W. Va., Fairmont**—City let contract paving 3000 ft. Morgantown Ave. concrete, to T. Shuttle, Fairmont. About $18,000. Noted Aug. 7.

★**W. Va., Huntington**—City let contract paving 12th Ave., 3rd and 4th Sts., to Duncan & Griffith, Huntington, $17,960.

N. C., Hickory—City rejected all bids rereceived Aug. 28 for cementing sidewalks on main streets. Work will be done by day labor. Cost between $15,000 and $20,000.

★**Fla., Seabreeze**—City let contract paving portions of 7 streets, grouted brick, to Alabama Paving Co., Birmingham, Ala., $168,300.

★**O., Cleveland**—City let contracts to Freshwater Paving Co., 11712 Detroit Ave., paving Loretta and Fidelity Aves. from West 101st St. to West Blvd., brick, cost $19,505 and $10,171 respectively; Amer Paving Co., Marshall Bldg., Franklin Ave. from West 66th St. to Franklin Circle, asphalt, $40 955; Baldwin Bros., 4500 Euclid Ave., Kinsman Rd. from East 93rd to East 140th Sts., asphalt, $72,255; A. M. Pejsa, 2359 East 93rd St., Kinsman Rd. from East 140th St. to city limits, and Superior Ave. from East 47th to East 55th Sts., brick, $75,155 and $96,513 respectively, Superior Ave. from East 39th to 47th Sts., wood block, $96.964; Burnett Hathaway Co. Society for Savings Bldg., East 4th St. from Euclid to Prospect Aves., wood block, $12.614; G. B. Herring, Society for Savings Bldg., Westfield Ave. from London Rd. to Wayside Ave., brick, $10,548; Roehl Bros., West 25th St. and Clark Ave., West 44th St. from Hyde to Starsdale Aves., brick, $12,045. Noted Aug. 28.

Ind., Indianapolis—City received lowest 3 bids resurfacing South St. and repaving streets involved in track elevation project, from Mead Constr Co., Lemcke Annex, $92,205, J. N. Morgan & Son, $92,600, Marion Co. Constr. Co., 1600 South West St., $92,000.

★**Michigan**—State Highway Dept., Lansing, let contract shaping and surfacing 5.707 mi. State Trunk Line Rd. No. 35-3, Delta Co. 16 ft. wide, involving 53,571 sq. yd. waterbound macadam, to Bichler Bros., Gladstone, $42,445.

★**Michigan**—State Highway Dept., Lansing, let contract grading, draining and surfacing Assessment Dist. Rd. No. 256, 6.485 mi. macadam, to Skeldon & Ryan Constr. Co., Box 172, Central Station, Toledo, O., $123,706, 1.176 mi. concrete, to Hilding & Robe, Rega, $35,911; also grading and surfacing 7 083 mi State Trunk Line Rd. No. 25-3, involving 66,485 sq.yd gravel, to Bd. Luce Co. Rd. Comrs., Newberry, $68,000. Noted Aug. 14.

★**Michigan**—State Highway Dept., Lansing, let contract shaping, surfacing and building drainage structures on 3.497 mi. State Trunk Line Rd. 24-1, Mecosta Co., 16 ft. wide, to Bd. Co. Rd. Comrs., Mecosta Co., Big Rapids, $53,879. Work involves 32,648 sq.yd. gravel and 30,104 cu.yd. earth excav.

★**Michigan**—State Highway Dept., Lansing, let contract to J. Decker, Rogers City, grading, surfacing and building drainage structures on 5.026 mi. State Trunk Line Rd. No. 72-1, Alcona Co., 15 ft. wide, involving 44,229 sq.yd. gravel and 23.798 cu yd. earth excav., $60.425; to Bichler Bro., Gladstone, shaping, grading and surfacing 3 258 mi. State Trunk Line Rd. No. 35-4, Delta Co., 16 ft. wide, involving 30,582 sq. yd. waterbound macadam, $24,231. Noted Aug. 14.

★**Ill., Moline**—City let contract paving 24th Ave. from 13th to 16th Sts., to D. J. Ryan Constr. Co., 41 1st Natl. Bank Bldg., Davenport, Ia., $14.447; 48th St from 2nd to 5th Aves., to S. D. Hicks Constr. Co., 1430 29th St., $10,639. Noted May 1.

★**Wisconsin**—State Highway Comn., Grand Rapids, let contract to Garvey-Weyenberg Constr. Co., 812 College St., Appleton, building 3 97 mi. Wausau-Stevens Point Rd., Marathon Co., involving 8076 cu.yd. earth and 108 cu.yd. borrow excav. at $.90 per cu.yd., 41,979 sq.yd. concrete surfacing, $.94; 43.9 cu.yd. class "A" concrete, $22, and 1209 lin.ft. guard rail, $.60 per lin.ft. Total cost, $50,202. Noted Aug. 7.

★**Wis., Appleton**—City let contract paving Dakota Ave., Mill and Pleasant Sts., 7½ in. concrete, to Johnson & Drake, 905 Plymouth Bldg., Minneapolis. About $85,000.

★**Wis., Manitowoc**—A. H. Zander, engr., City Hall, let contract grading, curbing, guttering and paving 1 mi. 18th and Washington Sts., 18 ft. wide, involving 7980 sq.yd. concrete, to W. O. Bahr, Manitowoc, $18,750. Noted Aug. 28.

★**Wis., Reedsburg**—City let contract grading, curbing, guttering and paving 2 mi. East Main St., 18 ft. wide, involving 17,850 sq.yd. vertical fibre brick, to Sweeny Bros., Main St., $24,780. Noted Aug. 14.

Streets and Roads (Continued)

★**Minn., Brainerd**—C. W. Mahlun, aud. Crow Wing Co., let contract improving 3.7 mi. Federal Aid Project No. 75, State Rd. No. 2, 24 ft. wide, to McCree, Moos & Co., St. Paul, $2.72 per sq.yd. Noted July 31.

★**Mont., Red Lodge**—Carbon Co. let contract grading, draining and gravel surfacing Miller Dyke Rd., to Carlson Contg. Co., Red Lodge. About $27,500.

★**Arkansas**—State Highway Dept., Little Rock, let contract building 84.37 mi. state highway, bituminous concrete and macadam, to Southern Impvt. Co., 506 A. O. U. W. Bldg., Little Rock. About $2,500,000.

★**Ark., Marion**—Comrs. Crittenden Co. let contract to Newell Constr. Co., Birmingham, Ala., building 9 mi. Roads Nos. 10 and 11, Rd. Impvt. Dist. No. 8, involving 67 400 cu.yd. embankment, 11 acres clearing and grubbing, 28 cu.yd. plain concrete and 500 ft. 18-24 in. corrugated metal pipe. About $29,695.

★**Tex., Abilene**—Taylor Co. let contract gravel surfacing 7 mi. Highway No. 1, Rd. Dist. No. 2, and part of Rd. Dist. No. 1, 24 ft. wide, to Sanders Bros., Miami, $21,-013. Noted July 31.

★**Tex., San Antonio**—Bexar Co. let contract surfacing 7 mi. Culebra Rd., 16 ft. wide, in rock asphalt, to Chapin & Colglazier, Moore Bldg., 40,000 yd., $0.60 per yd. and 22,000 yd., $0.40.

★**Tex., Seymour**—Baylor Co. let contract caliche or clay surfacing and building concrete drainage structures on 4.31 mi. Highway No. 30, east and west of here, 16 ft. wide, to W. E. Stephens, Seymour, $22,401. Noted Aug. 21.

★**Okla., Sapulpa**—City let contract paving 27,000 yd. various streets, to E. C. McCormick, c/o Parker-Washington Co., 6161 Maple Ave., St. Louis, Mo. About $300,000.

★**Idaho, Cœur d'Alene**—City let contract to Weeks & Severson, Coeur d'Alene, $15,-910, paving 8th, 9th, Hastings, St. Maries, Penna., Foster, Boyd and Montana Sts., involving 10,800 ft. concrete curbing, 10,480 sq.yd. sidewalk, 4200 cu.yd. embankment, 680 lin.ft. concrete crosswalks, 360 lin.ft. concrete alley crosswalks and 250 lin.ft. concrete or galvanized drain pipes.

★**Wash., Mount Vernon**—Comrs. Skagit Co. let contract paving 2 mi. Clear Lake Rd., concrete, to Kaiser Paving Co., Everett, $55,687.

★**Wash., Seattle**—Bd. Pub. Wks. rejected bids received Aug. 15, paving 12th Ave. N. E., et al, involving 9275 sq.yd. 6 in. concrete, 5920 lin.ft. concrete curbing and 2100 cu.yd. earth excav. About $32,894. Work will be done by day labor. Noted Aug. 21.

★**Wash., Seattle**—Bd. Pub. Wks. let contract paving 36th Ave., S., asphaltic concrete, to J. L. Smith, 1475 20th St., $11,434. Noted Aug. 28.

★**Wash., Tacoma**—Comrs. Pierce Co. let contract paving 1 mi. Milton Ave., 16 ft. wide, concrete, to J. Warter, Tacoma, $22,-591; clearing and grading 2.55 mi. East Side Drive, 30 ft. wide, involving 72,206 cu.yd. earth excav., to E. M. Moal, Tacoma, $74,-935. Noted Aug. 7.

Ore., Portland—City received only bid Aug. 20, paving Harold Ave. from Milwaukee to East 24th Sts., asphaltic concrete, from Warren Constr. Co., Journal Bldg., $13,866.

★**Ore., St. Helens**—City Council let contract grading and laying concrete pavement in various streets, to L. O. Herrold, Salem. About $10,100.

★**California**—State Highway Comrs., 515 Forum Bldg., Sacramento, let contract paving 1.9 mi. road between Santa Clara River and Williams Ranch, Los Angeles Co., involving 21,000 cu.yd. excav., 2500 cu.yd. Class "A" Portland cement concrete, etc., to Prendergast Constr. Co., Los Angeles. About $38,000. Noted Aug. 14.

California—State Highway Comrs., 515 Forum Bldg., Sacramento, received only bid Aug. 18, paving 10.7 mi. road, Kern Co., involving 10,000 cu.yd. excav. and 14,600 cu.yd. Portland cement concrete, from Atkinson & Moncure Co., Sacramento, $327,-520. Noted Aug. 14.

★**Quebec**—Dept. Rds., Quebec, let contract macadamizing and graveling 7 mi. Provincial Highway, 18-22 ft. wide, St. Dorothy Twp., to O'Conners, Ltd., 232 St. James St., Montreal. About $13,000.

Railways

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—Worcester Consolidated Street Ry., 107 Main St., Worcester, will lay 3247 ft. new track on Belmont St., from Aitchinson St. to Lake Ave., and relocate 3247 ft. old track to follow center of Belmont St. About $22,000. Work will be done by day labor.

Excavation and Dredging

PROPOSED WORK

Minn., Buffalo—Ditch—Wright Co. having plans prepared by F. W. Van Krevelen, engr., building 4 mi. Ditch No. 36, cost, $14,000; 5 mi. Ditch No. 39, $14,000.

Minn., Faribault — Excavation — See "Streets and Roads."

Ariz., Congress—Irrigation—Alamas Land & Irrigation Co., plans to build 100 ft. dam, 20 mi. west of Congress Jct. About $250,000. Address W. F. Sawyer, Congress.

Wash., Prosser — Irrigation — Horse Heaven Irrigation Dist. plans to build 200 mi. canals, tunnels and siphons to carry water from Cascades, to irrigate 315,000 acres of land in Horse Heaven Dist. Bonds for $18,000,000 voted for project. L. M. Rice, L. C. Smith Bldg., Seattle, engr

Ore., Prineville—Irrigation—Land owners in Ochoco Dist. voted $150,000 bonds to build dam and distribuing system in Ochoco Irrigation Dist. B. A. Sordal, secy.

Cal., Paradise—Irrigation—Paradise Irrigation Dist. plans to issue $140,000 bonds to lay 36 in. pipe to replace main canal.

BIDS DESIRED

N. Y., Brooklyn—Dredging—Until Sept. 10, by E. Riegelmann, boro. pres., dredging Gowanus Canal from its head to Hamilton Ave. and Newtown Creek Canal at and in canal and basin included within boundaries of Johnson and Varick Aves. and in Stagg St. basin. No bids received Aug. 20. Noted Aug. 14.

Minn., Albert Lea—Ditch—Until Sept. 8, by F. Tavis, aud. Freeborn Co., building Ditch No. 31, Moscow and Oakland Twps., including main ditch, Sects. Nos. 30 and 31, 4 branches and 6 laterals. About $14,000.

Minn., Benson—Ditch—Until Sept. 16, by aud. Swift Co., installing main tile ditch and 41 branches, involving 17,800 ft. 5 in., 13,800 ft. 6 in., 6500 ft. 7 in., 2800 ft. 8 in., 5500 ft. 10 in., 6400 ft. 12 in., 1200 ft. 18 in. and 2800 ft. 20 in. tile. About $15,397. S. B. Gardner, Benson, engr.

Minn., Duluth—Dredging—Until Sept. 22, by W. H. Borgen, aud. St. Louis Co., dredging 2 rivers, involving 5000 ft. dredging, 5000 ft. pile protection and 27,911 cu.yd. excav. About $11,000

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—Dredging—M. Hurlburt, comr. docks, Pier A, Battery Pl., received bids Aug. 25, dredging 115,000 cu.yd. at north and south sides Pier 59, south side Pier 61, north and south sides pier at West 52nd St., north and south sides West 54th St. pier, south side West 58th St. pier, North River, Manhattan Boro., 29,000 cu.yd. east side Pier 36, north side Piers 50, 51, 52, East 4th St., and bulkhead foot East 14th St., East River, Manhattan Boro., Contr. 1625, from F. E. Jones, 17 Battery Pl., $67,975; New Jersey Shipbuilding & Dredging Co., 50 Broad St., $78,735; P. S. Ross, $82,450. Noted Aug. 21.

★**N. B., St. John**—Excavation—City let contract to Bedford Constr. Co., St. John, excavating and refilling sewer and water trenches in Brussels St., with rock, $3.50, earth, $0.98, City Road, rock, $7, earth, $0.96; King St., rock, $3.50, earth, $1.10; Duke St., rock, $6, earth, $0.90; Douglas Ave., rock, $7, earth $0.95

Industrial Works

PROPOSED WORK

Mass., Boston—Boston Wool & Merchandise Co., 575 Albany St., having plans prepared by G. L. Shepard, engr., 14 Kilby St., for 8 story rein.-con. and steel storage building, rein.-con. flooring, concrete foundation, on Summer St. About $800,000.

Mass., Springfield—Winchester Sq. Realty Co., Winchester Sq., soon receives bids building 1 story, 143 x 176 ft., brick, concrete and steel garage and service station, reincon. flooring, concrete foundation, on Mason St. About $40,000. Private plans.

R. I., Providence—Page & Page, archts., 87 Weybosset St., soon receive bids building 2 story, 45 x 106 ft brick garage, rein.-con. flooring, concrete foundation, on Broad St., for S. Bomes, 71 Farragut Ave. About $36,000.

Conn., Unionville—C. W. House Sons soon receive bids for 2 story, 50 x 100 ft. brick addition to plant, concrete foundation About $28,000. Private plans.

N. Y., Brooklyn—Zipkes, Wolff & Kudroff, archts. and engrs., 25 West 42nd St., New York City, preparing plans for 1 story, 50 x 100 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on 36th St. and 5th Ave. About $40,000. Owner's name withheld.

N. Y., Buffalo—Rich Ice Cream Co., 470 Spring St., having preliminary plans prepared by McCormick Co., archts. and engrs., Century Bldg., Pittsburgh, Pa., for addition to factory. Cost to exceed $55,000

N. Y., Canastota—Watson Products Co. plans to build 50 x 240 ft. addition to factory. About $25,000.

N. Y., New York—Butterick Publishing Co., Spring and MacDougal Sts., soon lets contract building 10 story, 116 x 273 ft. brick, steel and rein.-con. publishing house, rein.-con. flooring, concrete foundation, at 223-253 Spring St. About $1,300,000. Ballinger & Perrott, 1328 Bway., archts. and engrs.

N. Y., New York—S. Katz, 1411 Grand Concourse, having plans prepared by J. M. Felson, archt. and engr., 1133 Bway., for 2 story, 75 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 47th St. and 1st Ave. About $35,000.

N. Y., Niagara Falls—Carborundum Co., Buffalo Ave. and 14th St., soon receives bids building 3 story, 99 x 224 ft., rein.-con. addition to plant, rein.-con. flooring, concrete foundation. About $150,000. L. J. Call, c/o owner, ch. engr.

N. Y., Portchester—P. R. Mallory, Inc., Fox Island Rd., having plans prepared by Lockwood-Green, archt. and engr., 101 Park Ave., New York City, for 2 story, 40 x 112 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation. About $25,-000.

N. Y., Seneca Falls—A. Ford, 202 Fall St., purchased site on Fall and Walnut Sts., and plans to build 1 story, 68 x 100 ft., brick and concrete machine shop, garage and service station. Cost between $40,000 and $50,000.

N. Y., Syracuse—Onondaga Milk Producers' Co-operative Assn., S. A. & K. Bldg., receives bids about Oct. 1 building dairy plant. About $200,000. McCormick Co., Century Bldg., Pittsburgh, Pa., archts. Noted July 3.

N. Y., Syracuse—Onondaga Steel Co., Inc., East Water St., increased its capital stock to $1,000,000 and plans to construct additions to its plant on James St. and Thompson Rd. Plans include 40 x 160 ft. annealing plant, an 80 ft. extension to present mill building and several smaller service buildings. S. S. Buckley, pres.

N. Y., Tonowanda—Rand Co., 97 Goundry St., having plans prepared by R. J. Reidpath & Son, engrs. and archts., Builders' Exch., Buffalo, for 4 story, 66 x 154 ft., brick and rein.-con. factory and warehouse, concrete foundation.

N. J., Freehold—Bd. Freeholders Monmouth Co. having plans prepared by C. A. Slocum, engr., Long Branch, building new heating and light plant. About $25,000.

Md., Baltimore—Maryland Casualty Co., Baltimore and Fayette Sts. and Guilford Ave., acquired 25 acre site bounded by 37th and 40th Sts. and Cedar and Elm Aves., and plans to build plant containing more than 220,000 sq.ft. floor space. Plans include main or administration building, clubhouse, power plant, printing plant, etc., rein.-con., steel and brick construction, composition and rein.-con. flooring and concrete foundation. Project also includes improvement of grounds consisting of tennis courts, baseball field with stadium, flower beds, shrubbery, driveways, footpaths and lawns.

Industrial Works (Continued)

A portion of the land will be laid out in building lots which will be sold to officers and employees for erection of homes. Initial cost, $1,500,000. Total estimated cost, $3,000,000.

Md., Baltimore—Rice Motors Co., Madison and North Aves., soon receives bids building 2 story, 140 x 250 ft., rein.-con. and brick garage, rein.-con. flooring and concrete foundation, on Whitelock and McCulloch Sts. About $100,000. Smith & May, 1133 Calvert Bldg., archts.

Md., Baltimore—Thermopak Co., Omaha, Neb., seeking site here and plans to build plant. About $150,000.

Md., Cascade—Cascade Industries Co. plans to erect 2 factory buildings, one 40 x 100 ft. and one 25 x 35 ft., brick, rock and brick foundation. About $25,000. B. Janson, mgr. Private plans.

W. Va., Huntington—C. C. Hayward and others, Ironton, O., plan to build brick plant on 16th St. Rd., here, 100,000 brick daily capacity. About $200,000.

W. Va. Wellsburg—Wellsburg Light & Power Co. plans to rebuild plant destroyed by fire. About $100,000.

N. C., Charlotte—Coca-Cola Bottling Co., 50 West 5th St., plans to build 2 story brick plant on 60 x 180 ft. site. About $100,000.

N. C., Wilson—Barnes-Harrell Co. plans to build 3 story bottling plant. About $100,000.

Ky., Maysville—Caproni Bros. having plans prepared by C. E. and E. A. Weber, archts., Miller Bldg., Cincinnati, O., building 2 story, 74 x 156 ft. rein.-con., brick and steel garage.

O., Ansonia—See "Waterworks."

O., Cleveland—R. J. Coach, Leader-News Bldg., plans to build 2 story, 85 x 105 ft., rein.-con., steel and brick garage, on Wade Park and Crawford Rds. About $75,000. Architect not selected.

O., Columbus—Allen Motor Car Co. plans to build 1 story, 140 x 500 ft., steel and brick factory, on Dublin Ave. About $85,000. F. L. Packard, Hayden Bldg., archt.

O., Columbus—Oldsmobile Co., 177 East State St., having plans prepared by W. S. Ferguson, engrs., 1900 Euclid Ave., Cleveland, for 2 story, 63 x 187 ft., steel and concrete service station and salesroom on Broad St. About $115,000.

O., Dayton—Duck & Oakes, Kiser St., plans to build 2 story, 55 x 120 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Kiser and Wampum Sts. About $25,000.

O., Springfield—Ridgely Trimmer Co., Kenton St., soon lets contract building 2 story, 60 x 152 ft., concrete and steel factory. About $30,000. R. C. Gotwald, 54 Gotwald Bldg., archt.

Ind., Anderson—J. C. Kresch, 1109 Meridian St., having plans prepared by McCormick Co., archts., Century Bldg., Pittsburgh, Pa., for 2 story, 72 x 72 ft. rein.-con. factory, rein.-con. flooring, brick and concrete foundation. About $40,000.

Ill., Chicago—City having plans prepared by C. W. Kallal, archt., 1017 City Hall, for stone, concrete and steel engine room and transformer station, concrete foundation, on Chicago and Michigan Aves. About $300,000.

Ill., Chicago—L. G. Hallberg & Co., archts., 116 South Michigan Ave., prepared plans and soon receives bids for 2 story, 75 x 125 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Diversey Parkway and Western Ave., for Republic Flow Meters Co., 565 West Washington Blvd. About $130,000.

Ill., Moline—Crandall Transfer & Warehouse Co., 410 16th St., plans to build 6 story, 74 x 120 ft., rein.-con. warehouse, on 4th Ave. and 12th St. About $100,000. Whitsit & Schulzke, 610 People's Bank Bldg., archts.

Wis., Lomira—Lomira Furniture Co. plans to build 2 story, 85 x 150 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on Main St. About $40,000. Architect not selected.

Wis., Manitowoc — Church—Presbyterian Church plans to build 2 story, brick, rein.-con. and tile, brick foundation, on 24th St. About $60,000 Architect not selected.

Wis., Milwaukee—Downing Paper Box Co., 3rd St. and Vienna Ave., plans to build 120 x 300 ft. addition to factory. About $40,000.

Wis., Packwaukee—See "Buildings."

Wis., Rice Lake—Inderrieden Canning Co. plans to build 2 or 3 story, 36 x 160 ft. brick, rein.-con. and steel factory, brick foundation, on Main St. About $45,000. Architect not selected.

Wis., Sheboygan—Globe Co., 824 Pennsylvania Ave., plans to build 1 story, 90 x 150 ft. brick, rein.-con. and steel foundry, rein.-con. flooring, brick foundation, on Pennsylvania Ave. About $25,000. Architect and engineer not selected.

Wis., Sparta—Interstate Milk Products Co., Madison, having plans prepared by F. L. Kronenberg, archt., Carroll Blk., Madison, building 3 story, 50 x 75 ft., brick, condensory, hollow tile and steel, here. About $75,000.

Wis., Stanley—Big Four Canning Co. plans to build 2 story, 72 x 180 ft., brick, rein.-con. and steel, brick foundation, on Main St. About $40,000. J. Lange, pres. Architect not selected.

Minn., West Duluth — (Duluth P. O.)—Duluth Showcase Co., West Superior St., Duluth, having plans prepared by A. Puck, Torney Bldg., Duluth, for factory at 2300 West Superior St. About $150,000.

BRIDGE—JACKSONVILLE, FLA.

Bids were received by Commissioners of Duval Co., July 29, for constructing bridge over St. John's River, Contract No. 1, manufacture and delivery of superstructure metal work and machinery, from (A) Mt. Vernon Bridge Co., (B) Bethlehem Steel Bridge Corp., Bethlehem, Pa., (C) American Bridge Co., 30 Church St., New York City; Contract No. 2, main river substructure, approaches and embankments, (A) Missouri Valley Bridge & Iron Co., Leavenworth, Kan.; Contract No. 3, erection of metal work and concrete floors, (A) Phoenix Bridge Co., 49 William St., New York City, (B) McClintic-Marshall Constr. Co., 50 Church St., New York City, (C) Bethlehem Steel Bridge Corp. The contract for the manufacture and erection of the superstructure metal work was awarded to the Bethlhem Steel Bridge Corp. and for the substructure and approach to the Missouri Valley Bridge & Iron Co. The unit bids were as follows:

CONTRACT No. 1

	A	B	C
2,090,000 lb. deck span metal	$0.0525	$0.049	$0.051
1,780,000 lb. tower and through span metal	.0540	057	.057
1,360,000 lb. deck girder metal	.0520	.048	.0475
280,000 lb. south Wpproach metal	5.00	5.00	4.97
2,300 lb. sidewalk gates	25.00	25.00	17.25
9,400 lb. cast iron cwts.	5.70	5.00	6.85
193,000 lb. machinery	18.10	20.00	23.60
Motor, etc. (lump sum)	1,950.00	2,700.00	3,300.00
Switchboard, etc. (lump sum)	350.00	1,000.00	1,125.00
Gas engine, etc. (lump sum)	850.00	1,000.00	385.00
420,000 lb. street car rails	3.70	4.20	6.00
Special track work (lump sum)	3,650.00	4,000.00	3,725.00
Extended totals	$348,949	$349,135	$366,890
Extended totals main bridge and all rails, omitting item No. 4	$334,949	$335,135	$352,974
Extended totals south beam approach (item No. 4)	$14,000	$14,000	$13,916

CONTRACT No. 2

	A
Piers:	
7,000 cu.yd. pier bases	$31.00
2,500 cu.yd. pier shafts	20.50
Total	$268,250
Concrete north approach, portion south of bent 2.	
4,000 lin.ft. timber piles	$0.50
550 cu.yd. pedestals	23.00
1,680 cu yd. general concrete	31.25
880 lin ft. concrete hand rail	3.00
225,000 lb. reinforcing metal	.045
25,000 lb. miscellaneous metal	14.00
880 lin.ft. gas pipe rail	1.00
440 track ties	1.40
50,000 lb. laying track	1.10
1,210 sq yd. bitulithic	2.55
1,210 sq yd. pavement No. 2	2.30
Total with bitulithic (omitting item 14)	$88,547
Total with pavement No. 2 (omitting item 13)	$88,244
Concrete north approach, portion north of bent 2:	
600 lin ft. timber piles	$0.50
100 cu yd. pedestals	23.00
360 cu yd. general concrete	31.25
120 lin ft. concrete handrail	3.00
36,000 lb reinforcing metal	.045
6,000 lb. miscellaneous metal	14.00
80 lin ft gas pipe rail	1.00
110 track ties	1.40
Laying special track (lump sum)	500.00
310 sq yd bitulithic	2.55
310 sq yd pavement No. 2	2.30
Removal old viaduct (lump sum)	500.00
240 sq.yd. pavement on old viaduct	5.50
Total with bitulithic (omitting item 14)	$20,015
Total with pavement No. 2 (omitting item 13)	$19,937
Timber north approach, south of bent No. 2:	
11,000 lin ft. piles below caps	$0.46
210,000 ft b m general timber	100.00
50,000 lb laying car tracks	1.10
6,600 sq ft. sidewalk surfacing	.20
440 lin ft. concrete rail headings	2.05
1,210 sq yd. bitulithic pavement	3.45
1,210 sq.yd. pavement No. 2	3.20
Total with bitulithic (omitting item 23)	$33,007
Total with pavement No. 2 (omitting item 22)	32,704
South approach steel beams on concrete piles:	
3,300 lin ft. concrete piles	$2.80
230 cu.yd. concrete copings	24.00
Total	$14,76

South approach timber construction:	
5,200 lin ft piles below caps	$0 36
125,000 ft b m general timber	160 00
34,000 lb. laying car tracks	1 25
4,400 sq ft. sidewalk surfacing	20
290 lin ft. concrete rail headings	7 00
800 sq yd. bitulithic pavement	5 60
800 sq.yd. pavement No. 2	3 35
Total with bitulithic (omitting item 32)	$19,672
Total with pavement No. 2 (omitting item 31)	$19,472
Embankment of south approach:	
6,000 cu.yd. embankment	$1 10
830 track ties	1 35
11,000 sq.ft. sidewalk slabs	25
60 cu yd. curbs	20 00
950 cu yd. paving base	12 50
830 lin ft. concrete rail headings	2 05
2,300 sq yd. bitulithic pavement	2 55
2,400 sq yd. pavement No. 2	2 30
15,000 ft.b.m. handrails	82 00
9,000 lb. laying car tracks	1 25
Total with bitulithic (omitting item 40)	$33,505
Total with pavement No. 2 (omitting item 39)	$32,930
Extended grand totals using bitulithic pavement (permanent approaches)	$425,076
Extended grand totals, using bitulithic pavement (timber approaches)	374,447

CONTRACT No. 3

	A	B	C
Main bridge:			
2,090,000 lb. deck span metal	$1 80	$1 91	$1 65
1,790,000 lb. tow r and through span metal	1 60	2 09	2 60
1,360,000 lb deck girder metal	.80	1 01	1.20
195,000 lb machin ry	2 50	2.72	4 00
Motor, etc (lump sum)	400 00	315 00	500 00
Switchboard, etc. (lump sum)	12,000 00	7,950.00	14,800 00
Machinery house (lump sum)	2,800 00	4,015 00	3,300 00
365 cu yd counterweights	30 00	34.25	32 00
7,200 sq.yd. slabs and bitulithic	6 60	6 82	6.00
7,200 sq.yd. slabs and pavement No. 2.	5 70	6 48	5.75
3,100 sq yd. sidewalk slabs	4 00	4 18	3 80
242,000 lb rail's and accessories	1 00	1 02	2 00
Lighting system (lump sum)	6,600 00	7,010 00	3,800.00
Total with bitulithic (omitting item 11)	$173,785	$197,692	$199,045
Total with pavement No. 2 (omitting item 10)	$171,625	$190,244	$197,245
South steel beam approach:			
280,000 lb south approach metal	$1 00	$1 16	$1 35
1,000 sq yd. slabs and bitulithic	6 00	6 82	6 00
1,000 sq.yd. slabs and pavement No. 2	5.70	6 48	5 75
430 sq yd sidewalk slabs	4 00	4 18	3 80
34,000 lb. rail's and accessories	1 00	1 02	2 00
Total with bitulithic (omitting item 11)	$10,960	$12,212	$12,094
Total with pavement No. 2 (omitting item 10)	$10,560	$11,872	$11,844

Industrial Works (Continued)

Neb., Omaha—North Side Garage, 20th St. and Ames Ave., having plans prepared by J. P. Guth, archt., 516 Paxton Blk., for 1 story, 124 x 126 ft. concrete garage at 208 Ames Ave. About $25,000.

Mo., St. Louis—Garrett & Co., 1476 Bway., New York City, soon receives bids building 3 story addition to factory, on Natural Bridge Rd. and Union Blvd., here. About $500,000.

Mo., St. Louis—H. Pauk & Sons Mfg. Co., 1321 North 17th St., having plans prepared for 84 x 190 ft. factory and office, on 15th and O'Fallon Sts. About $100,000.

Colo., Denver—H. H. Heiser Co., 7th Ave. and Bway., soon receives bids building 2 story, 25 x 125 ft. rein.-con., steel and brick garage, rein.-con. flooring, concrete foundation. About $60,000.

Colo., Denver—MacFarland Auto Co., 25 East Colfax Ave., having plans prepared by Montjoy, French & Frewen, archts., Chamber Commerce Bldg., for 2 story, 125 x 125 ft. warehouse and garage, on 17th Ave. and Lincoln St. About $150,000.

N. M., Albuquerque—Rio Grande Light & Power Co., Sturges Hotel Bldg., having plans prepared by A. G. Hillberg, engr., Sturges Hotel Bldg., for hydro-electric power plant, 140 mi. transmission lines, auxiliary steam plant and large dam in White Rock Canyon, 40 mi. north of Albuquerque, over Rio Grande River. About $4,300,000. C. G. Wilfong, pres.

Ore., Albany—Pfeiffer Estate plans to build 2 story, 90 x 102 ft. brick garage, on Old Albany Livery Barn site. About $50,000. C. H. Murphy, mgr. Architect not selected. Day Motor Co., lessee.

Ore., Portland—Honeyman Hardware Co., 9th and Hoyt Sts., having plans prepared by D. L. Williams, archt., Chamber of Commerce Bldg., for 1 story, 100 x 100 ft. and 2 story, 100 x 100 ft. additions to hardware houses, brick. About $50,000 each.

Ore., Portland—J. Simon, Sandy Blvd., soon lets contract building 2 story, 100 x 140 ft. rein.-con. factory, with 60 x 75 ft. wing, rein.-con. flooring, concrete foundation. About $50,000. E. B. MacNaughton, Concord Bldg., archt.

Ore., St. Johns—West Cooperage Co. having plans prepared by DeYoung & Roald, archts., 609 Spaulding Bldg., Portland, for 1 story additions to plant, to include 50 ft. addition to 10 kilns, concrete and tile. About $90,000.

Cal., Los Angeles—Brownstein-Louis Co., 716 South Los Angeles St., plans to build 6 story, 200 x 220 ft., rein.-con. factory, on 8th and Figueroa Sts. Architect not selected.

Ont., Toronto—Canadian Express Co., 55 Yonge St., having plans prepared by J. M. Lyle, archt., Avondale Rd., for 2 story, 60 x 350 ft., brick and steel warehouse, rein.-con. flooring, on Front St. About $300,000.

Ont., Toronto—Farmers' Dairy Co., Walmer Rd., having plans prepared by James, Loudon & Hertzberg, engrs., 36 Toronto St., for 3 story, 55 x 105 ft. dairy, rein.-con., rein.-con. flooring, concrete foundation, on Christie St. About $60,000.

Ont., Toronto—L. Solman, Hanlons Pt., having plans prepared by Denison & Stephenson, archts., Confederation Life Bldg., for 1 story, 80 x 150 ft., steel and timber storage warehouse, rein.-con. flooring, concrete foundation. About $60,000.

BIDS DESIRED

Pa., Mont Alto—Until Sept. 17, by E. Martin, comr. health, Harrisburg, building additions to heating plant, constructing new heating plant, laundry, and installing heating and plumbing systems for latter.

O., Cleveland—Holam Mfg. Co., 4011 Clark Ave., receiving bids building 2 story, 80 x 116 ft., rein.-con., steel and brick factory at 3809 Clark Ave. About $40,000. Private plans.

Ill., Chicago—F. M. Barton Co., archts., 1510 Kimball Bldg., receiving bids building 4 story, 60 x 100 ft. rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, on Kostner Ave. and Taylor St., for Adams & Elting, 716 West Washington St. About $100,000.

Ill., Chicago—G. C. Nimmons & Co., archts., 122 South Michigan Ave., receiving bids for 5 story, 125 x 127 ft., rein.-con. and steel addition to factory, rein.-con. flooring, concrete foundation, for Sears, Roebuck & Co., Howard and Homan Aves. About $225,000. Noted July 17.

Wis., Chilton—Until Sept. 11, by Aluminum Specialty Co., 17th and Wollmer Sts., building 2 story, 60 x 200 ft. brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on Main St. About $60,000. Private plans.

Wis., Ft. Atkinson—Until Sept. 9, by Creamery Mfg. Co. building 2 story, 75 x 250 ft. brick, rein.-con. and steel factory, brick foundation, on Main St. About $200,000. Private plans.

Colo., Denver—Until Sept. 8, by Huntington Architect Co., archts., McPhee Bldg., for 4 story, 75 x 150 ft., concrete steel and brick factory, concrete foundation, on 13th St. and Bway., for Thomas Smith Motor Co., 1135 Bway. About $100,000.

Que., Montreal—Until Sept. 18, by Ross & MacDonald, archts., 1 Belmont Pl., building 3 story, 35 x 90 ft., concrete, steel and brick factory, concrete foundation, for Smardon Shoe Co., 533 Visitation St. About $65,000.

Ont., Niagara Falls—Until Sept. 9, by C. M. Borter, archt., 102 Main St., building 2 story, 60 x 120 ft., steel and brick bottling plant, rein.-con. flooring, concrete foundation, on Ferry St., for Spring Water Bottling Co. About $55,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Boston Storage Warehouse Co., Westland Ave., let contract building 8 story, 60 x 170 ft., rein.-con. and brick storage warehouse, concrete foundation, on Huntington St., to Evatt Constr. Co., 161 Devonshire St.

★**Mass., Boston**—Noyes Buick Co., 17 Lawton St., let contract building 5 story, 200 x 375 ft. rein.-con. storehouse, rein.-con. flooring, concrete foundation, on Commonwealth Ave., to F. T. Ley Co., 185 Devonshire St.; cost plus percentage basis. Noted June 26.

★**Mass., Boston**—M. Rudnick Co. will build 1 and 3 story, 175 x 175 ft. rein.-con. garage, rein.-con. flooring, concrete foundation, on Commonwealth Ave. About $200,000. Work will be done by day labor.

★**Mass., Boston**—Snider & Rudnick, 25 Gibbs St., Brookline, will build 2 story, 60 x 275 ft. rein.-con. garage, rein.-con. flooring, concrete foundation, on St. Marys Ave. About $175,000. Work will be done by day labor.

★**Mass., Chicopee** — Torrington Co., Springfield St., let contract building 4 story, 50 x 100 ft., brick and mill construction addition to factory, concrete foundation, to E. F. Carlson Co., 310 Main St., Springfield. About $50,000. Noted Aug. 28.

★**Mass., Holyoke**—Germania Mills, Race St., let contract building 4 story, 120 x 173 ft. brick and mill construction spinning mill, brick and concrete foundation, on Berkshire and Race Sts., to Casper Ranger Constr. Co., 20 Broad St. About $150,000.

★**R. I., Providence**—Z. Zawatsky, 142 Doyle Ave., let contract building 1 story, 50 x 100 ft. brick and concrete addition to service station and garage, rein.-con. flooring, concrete foundation, on Point and Eddy Sts., to E. Turgeon, 86 Weybosset St. About $25,000. Noted June 5.

★**Conn., East Berlin**—Connecticut Metal & Chemical Co., Grove Hill St., New Britain, let contract building 1 story, brick and steel factory addition, concrete foundation, to J. H. Grozier Co., 756 Main St., Hartford. About $25,000.

★**Conn., New Haven**—H. Puddicombe & Co., 87 Orange St., let contract building 1 story, 44 x 88 ft., brick, steel and concrete warehouse, rein.-con. flooring, concrete foundation, on Henry and County Sts., to Larkin-Carey Co., 166 Brewery St. About $28,000. Noted Aug. 21.

Industrial Works (Continued)

★**N. Y., Brooklyn**—H. Hurrell, 844 St. Johns Pl., will build 1 story, 50 x 170 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Stanhope St. and Myrtle Ave. About $30,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Kronenberg Auto Renting Co., 26 Bristol St., will build 1 story, 60 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 20-24 Bristol St. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Waterbury Co., 63 Park Row, New York City, let contract building 1 story, 25 x 140 ft., brick addition to factory, rein.-con. flooring, brick foundation, on Taaffe Pl., near Park Ave., to Jacob & Youngs, 116 West 32nd St., New York City.

★**N. Y., Brooklyn**—J. W. Welz, 1582 Myrtle Ave., will build 1 story, 100 x 250 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Troy Ave. and Carroll St. About $75,000. Work will be done by day labor.

★**N. Y., Long Island City**—S. Karpen & Bros., 68 West 34th St., New York City, let contract building 6 story, 135 x 489 ft. rein.-con. factory, rein.-con. flooring, concrete foundation, on Jackson Ave. between Hulst and Harold Aves., here, to Hegeman-Harris Co., 33 West 42nd St., New York City. About $750,000. Noted Mar. 13.

★**N. Y., Long Island City**—Van Brunt Iron Wks., 14th Ave., will build 300 x 310 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Borden Ave. Marsh and Fox Sts. Work will be done by day labor. Noted Aug. 21.

★**N. Y., Minetto**—Columbia Mills Co. let contract constructing two 4 story, 50 x 100 ft. factories, to J. J. Turner Contg. Co., 65 East Main St., Amsterdam.

★**N. Y., New York**—H. and R. Constr. Co., 1473 Wilkins Ave, will alter 1 story, 75 x 100 ft., brick and steel laundry, rein.-con. flooring. About $25,000. Work will be done by day labor.

★**N. Y., New York**—Magioni & Co., c/o Zipkes, Wolff & Kudroff, archts., 25 West 42nd St., will build 2 story, 25 x 100 ft., brick and steel warehouse, rein.-con. flooring, concrete foundation, on 37th St., between 8th and 9th Aves. About $40,000. Work will be done by day labor under supervision of architects.

★**N. Y., New York**—J. M. B. Realty Co., 30 East 42nd St., will build 1 story, 100 x 200 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on 158th St. and New York Central R.R. tracks. About $75,000. Work will be done by day labor. Noted Aug. 7.

★**Pa., Erie**—Continental Rubber Co., 19th and Liberty Sts, let contract building 2 story, 78 x 130 ft. power plant, brick and steel, to S. M. Stadler, Erie. About $75,000. Noted July 31.

★**Pa., Phila.**—Colonial Ice Cream Co., 1114 Ritner St., let contract building 3 story, 100 x 144 ft. rein.-con. factory, at 853 North 4th St., to F. A. Havens & Co., 845 North 19th St.

★**Pa., Pittsburgh**—C. D. Cooley, archt., Jones Law Bldg., let contracts building 2, 3 and 6 story, 112 x 123 ft. steel and brick addition to bakery, rein.-con. flooring, concrete foundation, for Liberty Baking Co., 6018 Houston St., to foundation, H. L. Kreusler, 3301 Penn Ave., $35,000; structural steel, W. M. Kratzer Co., 3212 Smallwood St., $60,000.

★**Md., Baltimore** — Baltimore Tube Co., Wicomico and Ostend Sts., let contract building 2 story, 77 x 146 ft., steel and brick factory, concrete foundation, to West Constr. Co., 907 Amer. Bldg. About $55,000.

★**Md., Baltimore**—Bentalou Garage Co., Bentalou St. and Lafayette Ave., let contract building 1 story, 40 x 680 ft., brick garage, cement flooring, brick and concrete foundation, to A. Tufts, 1401 Lexington St. About $50,000.

★**W. Va., Cedar Grove**—Travis Glass Co. let contract building 110 x 200 ft. warehouse, to Austin Co., 16112 Euclid Ave., Cleveland, O.

★**W. Va., Huntington**—Huntington Tobacco Warehouse Co., 26th St. and Charles Ave., let contract building 1 story, 140 x 424 ft. warehouse, concrete flooring and foundation, on 26th St. and 1st Ave., to F. P. Hines, Huntington. About $35,000; commission basis.

★**W. Va., Huntington**—Penn Table Co., 2nd Ave. and 21st St., let contract building three 3 story, 60 x 165 ft., 50 x 57 ft. and 22 x 150 ft. furniture factories, to F. P. Hines & Sons, Huntington. About $40,000; commission basis.

★**N. C., Charlotte**—Interstate Milling Co., West 10th St., let contract building 95 x 160 ft. warehouse, to J. A. Jones, Realty Bldg. About $30,000.

★**O., Akron**—Akron Baking Co., 178 South Forge St., let contract building 2 store, 69 x 132 ft., rein.-con. and steel addition, to Carmichael Constr. Co., 524 Hamilton Bldg. About $75,000. Noted Aug. 21.

★**O., Cleveland**—W. M. Pattison Co., 777 Rockwell Ave., let contract building 4 story, 161 x 192 ft., rein.-con., steel and brick addition to factory, at 9205 Detroit Ave., to Hunkin Conkey Co., Century Bldg. About $100,000. Noted Aug. 21.

★**O., Springfield**—Robbins & Myers Co., Lagonda Ave., let contract erecting 4 story factory and office buildings, one 60 x 140 ft. and one 50 x 125 ft., rein.-con. and brick, rein-con. flooring, concrete foundation, to Davis-Hunt Constr. Co., 1st and Webb Sts., Dayton. About $500,000.

★**O., Washington C. H.**—Sunlight Creamery Co., c/o Cudahy Packing Co., 111 West Monroe St., Chicago, let contract building 1½ story, 60 x 235 ft., creamery, rein.-con. and brick, rein.-con. flooring, concrete foundation, here, to W. Adams Co., 209 La Salle St., Chicago. About $100,000.

★**Ind., East Chicago**—G. B. Limbert & Co., 570 Fulton St., let contract to F. G. Wall, 1105 Beacon St., East Chicago, building 2 story, 50 x 80 ft.; also 1 and 2 story, 90 x 170 ft., rein.-con., steel and brick, machine shops, rein.-con. flooring, concrete foundation. About $80,000.

★**Ill., Chicago**—Broccolo Bros., 1010 Taylor St., let masonry contract for 4 story, 80 x 155 ft. rein.-con and brick factory, rein.-con. flooring, concrete foundation, at 1238 Harrison St. to J. L. Stella, 911 Bishop St. About $125,000.

★**Ill., Chicago**—H. G. Fischer & Co., 2341 Wabansia Ave., let contract building 3 story, 60 x 110 ft. brick and mill construction factory, concrete foundation, at 2339 Wabansia Ave., to R. L. Brockob, 5448 Flournoy St. About $70,000.

★**Ill., East St. Louis**—Zoder Mills Co. let contract building 4 story, 70 x 100 ft. brick, steel and concrete mill. rein.-con. flooring, concrete foundation, on river front, to Brown Constr. Co., East St. Louis, $150,000.

★**Ill., Kincaid**—O. Heineman Co., 1935 Fairfield Ave., Chicago, let contract building 1 story, 80 x 100 ft. mill construction mill, brick foundation, to Midland Eng. & Constr. Co., 332 South Michigan Ave., Chicago. About $60,000.

★**Wis., Barton**—Stevens Mfg. Co. let contract building 2 story, 80 x 128 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on Main St., to Hron & Wilkinson, West Bend. About $30,000.

★**Wis., Green Bay**—Gazett Candy Co., 622 Main St., let contract building 2 story, 30 x 90 ft. brick addition to factory, to E. H. Regal, 134 South Adams St. About $50,000.

★**Wis., Milwaukee**—Pabst Brewing Co., 9th and Chestnut Sts., will remodel and convert 5 story, 65 x 230 ft. brick brewery into knitting mill. About $100,000. Work will be done by day labor.

★**Wis., Sheboygan**—Wald Mfg. Co., 18th St. and Martin Ave., let contract building 3 story, 90 x 140 ft., brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on Martin Ave., to W. Freitag, Blocki Court. About $25,000. Noted July 24.

★**Wis., Two Rivers**—Hamilton Mfg. Co. let contract building 2 story, 40 x 150 ft. brick, rein.-con. and steel power house, on Main St., to W. W. Oeflein, 86 Michigan St., Milwaukee. About $50,000.

★**Neb., Lincoln**—Lincoln Hide & Fur Co. let contract building 3 story, 86 x 112 ft. brick and steel warehouse, rein.-con flooring, to C. Olson, 1405 South 16th St. About $115,000.

★**Neb., Omaha**—E. L. Means, Orleans, let contract building 5 story, 120 x 132 ft. warehouse, on 11th and Dodge Sts., here, to J. L. Carnegie & Son, 189 West Madison St., Chicago, Ill. About $175,000. Noted Mar. 27.

★**Mo., St. Louis**—H. J. Wise, engr., Post Dispatch Bldg., let contract to W. Voepel Co., 1113 Sidney St., building 2 story, 90 x 252 ft. addition to laundry and 1 story, boiler house, brick, concrete and steel, rein.-con. flooring, concrete foundation, for Superior Laundry Co., 1745 South 18th St. About $80,000. Noted Aug. 21.

★**Tex., Vernon**—Kell Milling Co. let contract building boiler house and power plant, to Burrell Eng. Co., Security Bldg., Kansas City, Mo. About $30,000.

★**Wash., Seattle**—S. A. Hull, 71 West Madison St., let contract building 4 story, 120 x 120 ft. warehouse, mill construction, on Western Ave. and University St., to A. W. Quist Constr. Co., Hoge Bldg. About $105,000. Noted July 24.

★**N. B., Fredericton**—See "Miscellaneous."

★**Que., Montreal**—C. Dufort, archt., 195 St. Catherine St., E., let contract to D. G. Loomis & Co., St. Patrick St., for 45 x 100 ft, concrete and brick garage, rein.-con. flooring, concrete foundation, for Bramson Auto Serv., Phillips Sq. About $51,500. Noted March 20.

★**Que., Montreal**—Montreal Abattoirs, Ltd., 139 Mill St., let contract building 4 story, 48 x 62 ft., steel and brick abattoir, rein.-con. flooring, concrete foundation, to Anglin Norcross Ltd., 65 Victoria St. About $50,000.

★**Que., St. Johns**—Belding, Paul, Corticelli Co., Shearer St., Montreal, let contract building 4 story, 50 x 50 ft. thread factory, rein.-con., concrete foundation, on River St., to Anglin, Norcross, Ltd., 65 Victoria St., Montreal. About $52,000.

Buildings

PROPOSED WORK

Mass., Boston—High School—Bd. Educ. receives bids about Jan. 1, building 39 room school on Fenway St., brick, concrete and steel, concrete foundation. About $650,000. Noted Aug. 21.

Mass., Chicopee—Office—Springfield Provision Co., Plainfield St., soon receives bids building 3 story steel and concrete, rein.-con. flooring, concrete foundation. About $50,000. Private plans.

R. I., Bristol—Theatre and Business—S. P. Colt, c/o Natl. India Rubber Co., having plans prepared by Clarke & Howe, archts., 1208 Turk Heads Bldg., Providence, for 4 story, 60 x 120 ft. brick and marble. About $85,000.

N. Y., Brooklyn—Synagogue—Congregation Tiefereth Israel, c/o Shampan & Shampan, archts., 50 Court St., having plans prepared for 2 story limestone and terra cotta, brick foundation, on 14th St. and 7th Ave. About $250,000. J. Bull, pres.

N. Y., Jamestown — Store — Peterson Bros., 100 East 2nd St., having plans prepared and soon receives bids building 5 story, 52 x 90 ft. concrete and steel, rein.-con. flooring, concrete foundation. About $60,000. C. C. Peterson, Jamestown, archt.

N. Y., New York—Office—Buchman & Kahn, archts. and engrs., 56 West 45th St., preparing plans for 16 story brick, steel and stone, brick foundation, on 36th St. and 7th Ave. About $1,200,000. Owner's name withheld.

N. Y., New York—School—Dept. Educ., 500 Park Ave., having plans prepared by C. B. J. Snyder, archt. and engr., Municipal Bldg., for 5 story brick and limestone addition, brick foundation, at 205 East 109th St. About $200,000.

Buildings (Continued)

N. Y., New York—Theatre—Consolidated Amusement Enterprises, 2139 8th Ave., having plans prepared by De Rosa & Pereira, archts. and engrs., 110 West 40th St., for brick and steel, brick foundation, (600 seating capacity) on 9th Ave. and 45th St. About $75,000.

N. Y., New York—Theatre—B. S. Moss, 112 West 42nd St., plans to build brick and steel, brick foundation on Dyckman St. About $200,000. De Rosa & Pereira, 110 West 40th St., archts. and engrs.

N. J., Toms River—Jail—E. R. Yoden, chn. bldg. com. Ocean Co., rejected bids, and having revised plans prepared altering and building 2 and 2½ story, 36 x 36 and 26 x 37 ft. rein.-con. addition to jail, here. About $50,000 T. Stephen, Temple Bldg., Camden, archt. Noted July 17.

Pa., Midland — Office — Crucible Steel Co. rejected bids building 5 story, 50 x 180 ft. rein-con. and brick, rein.-con. flooring, on Railroad Lane and 7th St. Project indefinitely postponed. Noted July 31.

Pa., Pittsburgh—E. B. Lee, archt., Chamber of Commerce Bldg., soon lets contract constructing 4 story, 81 x 120 ft. steel and brick building, concrete foundation, on Centre and Francis Sts., for Y. M. C. A. About $100,000. (Contracts will be awarded separately; no general contractor.) Noted May 29.

Md., Baltimore—Store—Williams, Belmont & Co., 8-10 South Howard St., seeking site and plans to build department store. About $250,000. H. Stein, mgr.

Md., Jessups — Correction House — Maryland State Bd. of Prison Control, 701 Union Trust Bldg., Baltimore, plans to alter and build additions to House of Correction, here, steel and brick, concrete foundation. About $150,000. R. D. Case, secy. T. W. Pietsch, 1210 Amer. Bldg., Baltimore, archt.

W. Va., Charleston—City Hall, etc.—City voted $1 000.000 bonds to build new city hall, central fire station and 3 sub-stations, also build sewers and pave various streets. E. Bruce, Charleston, engr.

W. Va., Charleston—Mercantile—Abney Barnes & Co., 812-18 Virginia St., having plans prepared by C H. Higgins, archt., 19 West 44th St, New York, for 7 story, 100 x 150 ft. rein.-con., steel and brick, on Virginia and McFarland Sts.

W. Va. Huntington—Store—Morrison Co., 831-833 4th Ave., plans to construct 4 story, 45 x 200 ft. fireproof store building. Cost between $60 000 and $80,000. F. B. Starcher, pres. Architect not selected.

Ga., Americus—School—School Bd. voted $60,000 bonds to build school in Thalean Dist.

Tenn., Dyersburg — Church — Methodist Episcopal congregation had plans prepared by Mahan & Broadwell, archts., Germania Bank Bldg., Memphis, for 1½ story, 75 x 200 ft., concrete and brick. About $150,000.

Ky., Ashland — Store—Field Furniture Co. soon lets contract building 6 story, 30 x 145 ft., concrete and brick, on Main St. About $175 000. E. L. Packard, Hayden Bldg., Columbus, O., archt. Noted July 24.

O., Canton—Store and Office—C. N. Vickary, 314 Market St., plans to build 12 story, 50 x 75 ft., steel and brick, brick foundation. Starrett & Van Vleck, 8 West 40th St., New York City, archts. and engrs.

O., Cleveland—Bank—Citizens Savings & Trust Co., East 9th St. and Euclid Ave., having plans prepared by Graham, Anderson, Probst & White, engrs., Ry. Exch. Bldg., Chicago for 11 story, 140 x 200 ft., rein.-con., steel and brick, here. About $8,000,000.

O., Cleveland—Chapel—Schauffler Training School, 5111 Fowler Ave., plans to build 1 story, 41 x 105 ft., rein.-con., steel and brick, on Bway. Ave. About $60,000. Architect not selected.

O., Cleveland—Commercial—F. A. Foyle, Schofield Bldg., plans to build 6 story, 88 x 100 ft., rein.-con., steel and brick, on East 13th St. and Chester Ave. About $50,000. Architect not selected.

O. Cleveland—Commercial—G. D Koch & Sons Co., 10300 Euclid Ave., having plans prepared by Serv. Constr. Co., archts., 6110 Euclid Ave., for 3 story, 90 x 200 ft., rein.-con., steel and brick, at 10007 Euclid Ave. About $100,000. Noted May 29.

O., Cleveland—Commercial—C. H Snearer Co., 72 Wymore St., having plans prepared by G. B. Post & Son, archts., 1109 Schofield Bldg., for 4 story, 80 x 279 ft., rein.-con., steel and brick, at 10022 Euclid Ave. About $150,000. Noted July 24.

O., Cleveland—Office—H. P. McIntosh, Euclid Ave., plans to build 3 story, 70 x 135 ft., rein.-con., steel and brick addition. About $150,000. Architect not selected.

Mich., Detroit — Clubhouse—Defteaptape Romane Society having revised plans prepared by P. J. Rosello, archt 406 Congress Bldg., for 2 story, 60 x 118 ft., brick and steel, on Farnsworth and Russell Sts. About $65,000. Noted July 17.

Mich., Detroit—Hotel—J. J. Barlum, 319 Lincoln Ave., had plans prepared by R. A. Bailey, archt., 47 Hendricks St., building 8 story, 30 x 36 ft., rein.-con., brick and steel, concrete foundation, on Farmer and John R. Sts. About $90,000.

Ill., Aledo — High School — City having plans prepared by Whitsitt & Schulzke, archts., 610 People's Bank Bldg., Moline, for high school here. About $150,000.

Wis., Packwaukee — Hospital—Creamer Memorial Institute, 200-204 Grand Ave., Milwaukee, having plans prepared by Kaches & Pfaller, archts. and engrs., 634 Merchants' and Manufacturers' Bank Bldg., Milwaukee, building 3 story, 80 x 100 ft., rein.-con. sanitarium and power plant, here. About $100,000.

Wis., Stitzer—Bank—Stitzer State Bank plans to build 2 story, brick, rein-con. and steel, brick foundation, on Main St. About $50,000.

Minn., Chisholm—Community and Recreation—J. Austin, mayor receives bids about Sept. 20, building 2 story, 200 x 200 ft. brick, rein.-con. and stone, rein.-con. flooring concrete foundation, on Main St. About $350 000. A. Puck, Torrey Bldg., Duluth, archt. and engr.

Minn., Cloquet — Theatre — O. W. Erickson having plans prepared by Kelly & Shefchik, archts., Alworth Bldg., Duluth, building 1 story, 67 x 119 ft. brick, rein.-con. and steel. About $75,000.

Minn., Deer Creek—High School—Bd Educ. having plans prepared by Foss & Foss, archts. St. Cloud, for 2 story, 70 x 120 ft., brick and Kasota stone. About $61,000.

Minn., Hopkins—Community—Town plans to build community house. About $60,000. W. Hamilton, c/o Northrup, King & Co., 15th Ave., N. E., interested C. S. Sedgwick, Lumber Exch., Minneapolis, archt.

Minn., Newport — Housing — Farmers Terminal Packing Co., 919 Commerce Bldg., St. Paul, having plans prepared by O N. Newstrom & Co., archts., 917 Andrus Bldg., Minneapolis, building twenty-five 1 and 1½ story, 20 x 22 ft. houses for workmen. About $2200 each. H. Edmunds, secy.

Minn., Willmar — Business — Willmar Tribune plans to build brick and concrete business block. About $70,000. W. L. Alban, Endicott Bldg., St. Paul, archt.

S. D., Clear Lake—Hotel—Clear Lake Bldg. Co. having plans prepared by U. L. Freed, archt., Watertown, for 3 story, 35 x 90 ft., brick and stone. About $60,000.

Wyo., Cheyenne—High School—Bd. Educ. plans to build high school. About $150,000. A. S. Jessup, supt. Architect not selected.

Wyo., Thermopolis—Theatre and Office—Bereleos & Brahos, soon receive bids for 3 story, 60 x 140 ft. About $87,000. Link & Haire, 317 Electric Bldg., Billings, Mont., archts.

Mont., Great Falls—School—School Dist receives bids in September building Roosevelt Grade School, on 2nd Ave., N., and 26th St. About $250,000. Bird & Van Tylingen, 814 1st Natl. Bank Bldg., archts.

Mo., Independence—Community—Latter Day Saints congregation, c/o B. R. McGuire, has acquired site and plans to build community center. About $70,000. Architect not selected.

Mo., St. Louis—Church—C. Archibald, pastor, Goodfellow Methodist congregation, 1800 Goodfellow Ave., soon receives bids building 90 x 150 ft., stone and brick, concrete foundation, on Goodfellow Ave. About $60,000. H. M. Gelding, Odd Fellows Bld., archt.

Mo., St. Louis—Hotel—LaBaume & Klein, archts., Chemical Bldg., soon receives bids altering and building brick, steel and rein.-con. addition to Planters Hotel, 4th and Pine Sts. About $200,000.

Mo., St. Louis—Music Hall and Store—Scruggs, Vandevoort & Barney, 9th and Olive Sts, plan to build 16 story music hall and alter present store. About $50,000.

Mo., Webster Groves (St. Louis P. O.)—Algonquin Golf Club had preliminary plans prepared building concrete and brick clubhouse. About $50,000 Architect not selected.

Tex., Ennis—Church—Tabernacle Baptist congregation plans to build new church. Cost between $50,000 and $75,000.

Tex., Stephenville—Church—First Baptist congregation plans to build church. About $75,000.

Okla., Duncan—Court House and Jail—Comrs Stephens Co. plan election to vote on $150,000 bonds to build court house and jail.

Okla., Fairfax—City Hall—City election Sept. 16 to vote on $50,000 bonds to build new city hall.

Okla., Pauls Valley — Hospital—Garvin Co. election Sept. 16 to vote on $95,000 bonds to build memorial hospital.

Okla., Tulsa—Hotel—Eastern capitalists of New York and Baltimore, had plans prepared by Schumacher & Atkinson, archts. and engrs., 816 Mayo Bldg., for 10 story, 75 x 140 ft., brick and rein.-con., on Main St. south of 4th St., here. About $1,000,000.

Okla., Tulsa—Temple—Tulsa Masons, c/o M. C. Hale, plan to build 3 story, 75 x 140 ft., brick on 7th and Boston Sts. About $250,000. Architect and engineer not selected.

Colo., Denver—Church—Church Trustees of Fourth Christian Science Church soon receive bids for 97 x 140 ft., brick, steel and stone, rein.-con. flooring, concrete foundation, on West Lake Pl. and Grove St. About $75,000. M. H. Hoyt, Colorado Natl. Bank Bldg., archt.

Colo., Denver—Synagogue—Beth Hamedrosh Hagodol Corp. having plans prepared by Montjoy, French & Frewen, archts., Chamber Commerce Bldg., for 2 story, 95 x 120 ft., steel, brick and timber, rein.-con. and maple flooring, concrete foundation, on 16th Ave. and Kaylord St. About $100,000.

Utah, Salt Lake City—School—School Bd. receives bids about Sept. 8, building 1 story, 66 x 100 ft., brick addition to Franklin School. About $60,000. Scott & Welch, Dooley Bldg., archts. and engrs.

Wash., Seattle—Hotel—M. Young, c/o Young & Young Real Estate Co., Lumber Exch. Bldg., having plans prepared by V. W. Voorhees, archt., Eitel Bldg., for 3 story, brick, concrete foundation, on Capital Hill, 11th Ave. and Federal St. About $80,000.

Wash., Yakima — Bank—Yakima Valley Bank having plans prepared by A. E. Doyle, archt., Worcester Bldg., Portland, Ore., for 2 story terra cotta and marble, concrete foundation. About $85,000.

Ore., Klamath Falls—Court House—Klamath Co. plans to remodel and build 2 story brick or stone addition, in Hot Spring addition. About $175,000. A. F. Heide, Klamath Falls, archt.

Cal., Los Angeles—Theatre—S. Grauman, c/o Grauman's Theatre, 307 South Bway., acquired 154 x 204 ft. site on 6th and Hill Sts., and plans to build theatre with 150 ft. tower, probably rein.-con. Architect and engineer not selected.

Cal., San Francisco — Office — Fireman's Fund Insurance Co., 401 California St., having plans prepared by L. P. Hobart, archt., Crocker Bldg., for 3 additional stories to office building, on California and Sansome Sts. About $250,000.

Ont., Hamilton—Office—Sun Life Assurance Co., Sun Life Bldg., Toronto, having plans prepared by Chadwick & Beckett, archts., 132 Church St., Toronto, for 3 story, 40 x 100 ft., steel and brick, rein.-con. flooring, concrete foundation, on St. James St N. About $70,000.

Buildings (Continued)

Ont., **Toronto**—Stores and Offices—W. Davies Co., Ltd, 521 Front St. E., retained Hynes, Feldman & Watson, archts., McKennon Bldg., to prepare plans for 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $150,000.

BIDS DESIRED

Mass., Framingham — Dormitory—Until Sept. 16, by State Bd. Educ., Boston, building 3 story brick, for State Normal School, here. C. Baker, 150 Devonshire St., Boston, archt. Noted Jan. 23.

N. Y., Norwich—Library, etc.—Until Sept. 15, by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, building brick, steel and stone, here, for city. About $125,000. Noted Aug. 21.

Pa., Bethlehem—School—Until Sept. 6, by Bd. Educ., building 3 story, 180 x 250 ft., reinforced con., stone and brick, on South Side. About $300,000. V. T. Ritter, North Amer. Bldg., Phila., archt.

O., Columbus—Salesroom—See "Industrial Works."

Wis., Sheboygan—Office—Until Sept. 6, by Brust & Philipp, archts., Free Press Bldg., Milwaukee, building 3 story, 60 x 145 ft. brick, rein.-con. and steel, rein.-con. flooring, brick foundation, on Michigan Ave., for Vollrath Co., West Michigan Ave. About $55,000. Noted Aug. 28.

Wis., Sheboygan—School—Until Sept. 10, by R. R. Kahn, archt., Bay Ross Bldg., building 2 story, 40 x 110 ft. brick, rein.-con. and steel, brick foundation, in Dist. No. 1.

Minn., Hibbing—Recreation—Until Sept. 9, by W. J. Power, mayor, building 2 story, 135 x 251 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 1st Ave. and Jackson St. About $150,000. Halstead & Sullivan, Palladio Bldg., Duluth, archts. and engrs.

Minn., Montevideo—Theatre and Office—Until Sept. 20 (change of date), by F. D. Lorene, secy. Home Bldg. Assn., Inc., building 3 story, 50 x 120 ft., concrete, brick and terra cotta. About $65,000. P. O. Moe, 616 New York Life Bldg., Minneapolis, archt. Noted Aug. 14.

Kan., Holton—Court House—Until Sept. 22, by Comrs. Jackson Co., furnishing labor and material building court house. T. W. Williamson & Co., 418 Central Bank Bldg., Topeka, engrs.

Kan., Manhattan — Engineering — Until Sept. 27, by J. A. Kimball, state business manager, State House, Topeka, building 2 story building for Kansas Agricultural College. About $190,000. Noted Aug. 14.

S. D., Madison—Hospital—R. S. Westaby and others, receiving bids for 3 story, 49 x 180 ft., rein.-con., tile and brick, tile flooring. About $80,000. P. O. Moe, New York Life Bldg., Minneapolis, Minn., archt.

Okla., Elk City—High School—Until Sept. 20, by Bd. Educ. and Hawk & Parr, archts., Security Bldg., Oklahoma, building 2 story, 60 x 195 ft. About $125,000. A. L. Richards, supt. Noted Apr. 3.

Utah, Salt Lake City—High School—Until Sept. 15, by Bd. Educ., building 2 story, 66 x 155 ft., rein.-con. and brick, to be known as West Junior High School. About $120,000. Scott & Welch, Dooley Bldg., engrs. and archts.

N. B., Moncton—Office—Until Sept. 25, by C. B. Brown, ch. engr., Canadian Natl. Rys., Moncton, building 2 story, 42 x 110 ft. concrete and timber, concrete foundation. About $62,000.

Que., Cap de la Madeline—Church—Until Sept. 20, by A. Candal, archt., 502 St. Catharine St., Montreal, building 50 x 80 ft., concrete, steel and brick, concrete foundation, on St. Famile St., for Parish Church congregation. About $60,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Vt., Bennington**—Nurses' Home—Bennington Hospital let contract building 2 story, brick, steel and stone, brick foundation, to C. M. Cruikshank, 103 Park Ave., New York City. About $100,000.

★**Mass., Athol**—Church—Polish Church, Main St., let contract building 1 story brick and stone, concrete foundation, to C. S. Hardy, 60 Northampton St., Springfield. About $50,000.

★**Mass., Boston**—Sales, etc.—J. Shapiro will construct 2 story, 60 x 220 ft. rein.-con. sales building and garage, rein.con. flooring, concrete foundation, on Commonwealth Ave. (pile driving) to, W. S. Rendle, East Boston. Balance of work will be done by day labor.

★**Mass., Boston**—Sales—Snider & Rudnick Co., 25 Gibbs St., Brookline, will build 4 story, 120 x 200 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, on Commonwealth Ave., here. Work will be done by day labor.

★**Mass., Boston**—School—Bd. Educ. let contract building 2 story, 61 x 70 ft. concrete foundation, in Wolcott Dist., to McGahey & O'Connor Co., 551 Columbia Rd. About $95,300.

★**R. I., Providence** — Office — Jackson, Robertson & Adams, archts., Turks Head Bldg., let contract to C. I. Bigney Constr. Co., 898 Westminster St., for 4 story, 58 x 123 ft. with 63 x 113 ft. ell, brick, concrete and steel, rein.-con. flooring, concrete foundation, on West Exchange St., for Genl. Fire Extinguisher Co. About $160,000. Noted July 31.

★**Conn., Hartford**—School—Art Society of Hartford, 904 Main St., let contract building 1 story, 35 x 121 ft., brick and steel, concrete flooring and foundation, on Collins St., to Porteus-Walker Co., 13 Forest St. About $50,000.

★**N. Y., Brooklyn** — Theatre — A. A. Schwartz, 815 Flatbush Ave., will build 1 story, 175 x 175 ft brick and steel, brick foundation, on Fulton St. and New York Ave. About $500,000. Work will be done by day labor.

N. Y., S. I., Dongan Hills—School—C. B. J. Snyder, supt. school bldgs., Municipal Bldg., New York City, received bids Aug. 25 building P. S. No. 11, on Jefferson Ave., between Garretson and Cromwell Aves., Richmond Boro., from J. MacArthur, $179,424; W. McKenzie, $208,000. Noted Aug. 21.

★**N. Y., New York**—Hotel—One Hundred Ten West 55th St., Inc., 19 West 44th St., let contract building 15 story brick stone and steel, brick foundation, at 110-120 West 55th St., to F. T. Ley, 19 West 44th St. About $560,000.

★**N. Y., New York**—Hotel—Starrett & Van Vleck, archts and engrs., 8 West 40th St., let contract to F. T. Ley, 19 West 44th St., for 15 story, 80 x 115 ft. brick, steel and stone, brick foundation, on 72nd St. and West End Ave. About $1,000,000. Owner's name withheld. Noted Aug. 21.

★**N. Y., New York**—Hotel—Thirty West 59th St., Incorporated, 120 Bway., will build 14 story, 50 x 79 ft., brick, steel and stone, brick foundation, at 30 West 59th St. About $450,000. Work will be done by day labor. Noted Aug. 21.

★**N. Y., New York**—Loft—E. A. Hoffman, Inc., 122-124 5th Ave., will alter 10 story brick and steel. About $50,000. Work will be done by day labor.

★**N. Y., New York**—Theatre—B. F. Keith, 1564 Bway., let contract building 3 story, 200 x 228 ft. brick stone and steel, brick foundation, on Fordham Rd. and Valentine Ave., to Fleischmann Constr. Co., 531 7th Ave. About $300,000. Noted Feb. 6.

★**N. J., Bloomfield**—Office and Salesroom—Lehn & Fink, 120 Williams St., New York City, let contract building 2 story, brick, steel and stone, here, to C. R. Hedden, Prudential Bldg., Newark.

★**Pa., Hazelton**—School—Bd. Educ. let general contract building 2 story, 60 x 300 ft., steel and brick, rein.-con. foundation, rock foundation, on Church to H. Mailander, 167 Barney St., Wilkes-Barre, $258,635, heating and ventilating, to Lewis & Capron, 910 South Michigan St., Chicago, Ill., $34,686. Noted Aug. 14.

★**Pa., Hazelwood**—Church—Hazelwood Presbyterian congregation let contract building 1 story, 70 x 100 ft. on Glenwood and Johnston Sts., to H. Busse, Main and Wabash Sts. About $50,000.

★**Pa., West Bethlehem**—(Bethlehem P. O.)—School—Bd. Educ. let contract building 2 story, 176 x 185 ft., rein.-con. and brick, to F. J. Groman & Son, Union St. between 8th and 9th Aves., Bethlehem, $128,137. Noted Aug. 14.

★**La., New Orleans**—Theatre—Orpheum Circuit, 1564 Bway., New York City, let contract building 3 story, 115 x 120 ft., rein.-con., steel and brick, rein.-con. flooring, pile foundation, on University St., to Murch Bros Constr. Co., Ry. Exch. Bldg., St. Louis, Mo. About $750,000. Noted Jan. 23.

★**Tenn., Memphis**—Theatre—M. Loew, 1492 Bway. New York City, let contract building 100 x 100 ft., brick, steel and stone, brick foundation, on Union Ave., here, to Fleischman Constr. Co., 531 7th Ave., New York City. About $300,000. Noted June 19.

★**O., Cleveland**—Bath House—City let contract building 2 story, 70 x 76 ft., rein.-con., tile, steel and brick, on East 63rd St. and St. Clair Ave., to Natl. Concrete Fireproofing Co., Citizens Bldg. About $50,000.

★**O., Cleveland**—Theatre and Office—A. M. Allen Co., engrs., 1900 Euclid Ave., let contract to J. Gill & Sons Co., Citizens' Bldg., for 10 story, 150 x 225 ft., rein.-con., steel and brick, on East 14th St. and Euclid Ave., here, for Allen Bros., Richmond St., Toronto, Ont. About $275,000. Noted Aug. 28.

★**O., Cleveland**—Theatre and Office—J. Laronge, 214 Williamson Bldg., let contract building 10 story, 160 x 188 ft., rein.-con., terra cotta, steel and brick, on East 14th St. and Euclid Ave., to Craig Curtiss Co., Guardian Bldg. About $3,000,000. Noted Aug. 14.

★**O., Cleveland**—Theatre—W. S. Ferguson Co., archts., 1900 Euclid Ave., let contract to Boldt Constr. Co., 6110 Euclid Ave., building 2 story, 60 x 140 ft., rein.-con., steel and brick, at 10705 Miles Ave., for Corlett Realty Co., 12613 Miles Ave. About $85,000. Noted July 17.

★**O., Columbus**—Office—Gasco Realty Co., Chestnut and High Sts., let contract remodeling Gasco Bldg., to Frankenberg Constr. Co., Columbus Savings and Trust Bldg. About $75,000.

★**O., South Euclid**—School—Bd. Educ. let contract building 1 story, 75 x 150 ft., rein.-con., steel and brick, to Kelly Demarest Co., Amer. Trust Bldg., Cleveland. About $150,000. Noted Aug. 14.

★**O., Springfield**—Office—See "Industrial Works."

★**Ill., Moline** — School — Whitsitt & Schulzke, archts., 610 People's Bank Bldg., let contract to Central Eng. Co., 711 Putnam Bldg., building 1 story, 100 x 128 ft. brick, on 16th Ave. and 25th St., for Bd. Educ. About $60,825. Noted July 17.

★**Wis., Kenosha**—Grade School—Bd. Educ. let contract building 2 story, 140 x 180 ft brick and stone, concrete foundation, on West Side, to Madsen & Peterson, 802 Plymouth Bldg., Minneapolis, Minn. About $200,000.

★**Wis., Montford**—School—Bd. Educ. let contract building 2 story, 75 x 104 ft., brick, rein.-con. and tile, brick foundation, on Main St., to W. J. Neidner, Madison. About $65,000. Noted June 5.

★**Minn., Bemidji**—School—Bd. Educ. let contract building 3 story, 38 x 58 ft., in Dist. No. 48, to Jackson & Winklesky, Bemidji. About $72,000. Noted July 31.

★**Minn., Minneapolis**—School—Bd. Educ. let contract building 3 story, 63 x 116 ft., brick and concrete addition to Willard School, on Queen St. and 16th Ave., N., to Madsen Constr. Co., Builders Exch., $84,111. Noted Aug. 14.

★**Minn., Winona**—Dormitory—State Bd. Control, Capitol, St. Paul, let contract building 3 story, 46 x 130 ft., at State Normal School, here, to H. W. Seidlitz, Winona, $93,500. Noted June 26.

★**Mont., Lewistown**—High Shcool—Fergus Co. let general contract building county high school, to Gagnon Co., 201 North 21st St., Billings, $144,000, plumbing and heating, to E. J. Kane, 201 West Bway., $27,598.

★**Mo., St. Louis**—Bank, Office and Clubhouse—W. R. Compton & Co., Merchants Laclede Bldg., let contract altering and constructing concrete, steel and brick addition to present 10 story, 125 x 200 ft. building, at 704 Locust Ave. to W. M. Sutherland Bldg. & Contg. Co., Syndicate Trust Bldg. About $250,000.

★**Mo., St. Louis**—Church—Oak Hill Pres-

Mo., St. Louis—Church—Oak Hill Presbyterian Congregation let contract building 2 story, 62 x 84 ft. stone and brick addition, on Connecticut Ave., to T. C. Reeves, Odd Fellows Bldg. About $50,000.

★**Mo., St. Louis** — Exchange — South western Bell Telephone Co., Boatmen's Bldg., let contract constructing 1 story, 60 x 120 ft. brick, steel and concrete addition to present building, on 10th and Olive Sts., to Murch Brothers Constr Co., Ry. Exch. Bldg. About $75,000

★**Mo., St. Louis**—Hospital—Bd. Pub. Serv. let general contract building 4 story, 54 x 125 ft., brick and concrete, to M. C. Bartels Constr. Co., 4224 Bingham Ave., cost $201,232; heating, to Peters-Eichler Heating Co., 1516 Pine St., $11,997; plumbing, to Tower Plumbing Co., 1305 Pine St., $56,-558. Noted July 31.

★**Mo., St. Louis**—Mercantile—Baker Investment Co., Odd Fellows Bldg., will build 5 story, 70 x 125 ft., brick and concrete. About $50,000. Work will be done by day labor.

★**Mo., St. Louis**—Office and Loft—G. D. Hall Realty Co., 823 Chestnut St., let contract building 5 story, 150 x 200 ft. brick steel and rein.-con., at 1409 Washington St., to Murch Bros. Constr. Co., Ry Exch. Bldg About $150,000.

★**Mo., St. Louis**—Stores and Office—Bell Realty Co., Wright Bldg., let contract building 3 story, 90 x 175 ft. brick and concrete, rein.-con. flooring, rock foundation, on Natural Bridge Rd., to J. J. Conkling, Kansas City. About $180,000

★**Mo., St. Louis**—Theatre and Office—Missouri Theatre Co., c/o Mercantile Trust Co., 8th and Locust Sts., let contract building 2 story brick, steel and stone, to Fleischmann Constr. Co., 531 7th Ave., New York City. About $350,000. Noted July 24

★**Okla., Oklahoma**—Bank — Tradesmens State Bank let contract building 10 story, 80 x 140 ft. concrete, steel, stone and terra cotta, on Main St. and Bway., to Reinhart & Donovan, 721 Insurance Bldg. About $400,000.

★**Utah, Salt Lake City**—Hospital—Salt Lake Co. let contract building 3 story, 200 x 200 ft. hospital on South State St., to T. J. Armstrong, 1343 McClelland St., $274,156.

★**Nev., Winnemucca**—Court House—Bd. Supervs. Humboldt Co. let contract building 2 story, rein.-con., granite and terra cotta, to H. S. Williams, Hearst Bldg., San Francisco, $134,821. Noted Aug. 28.

★**Cal., San Francisco**—Loft—See "Miscellaneous."

★**Que., Montreal** — Theatre, etc. — D. Peogantes, 303 Esplanades Ave., let contract building 50 x 84 ft., steel and brick, rein.-con. flooring, concrete foundation, on Notre Dame St., to T. Atsalinos, 105 Dorchester St. W. About $60,000

Federal Government Work

PROPOSED WORK

Mass., Boston—Dredging and Retaining Wall—Light House Supt., Boston, rejected bids received Aug. 1, dredging and building retaining wall at Chelsea Depot. Noted July 10.

Md., Annapolis—Paving—Spec. 4028—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans, here. About $25,000.

D. C., Wash.—Buildings—Constr. Div., War Dept., recommended following construction at Army Camps:

Additional buildings, Camp Holabird Md. About $313,000.

Purchase of real estate and new buildings, Camp Knox, Ky., $1,200,000 and $650,-000 respectively.

Purchase of real estate, Watervliet Arsenal N. Y., $300,000.

Additional buildings, Chanute Field, Ill., $208,000

Coast Artillery School, Camp Eustis, Va., $51,300

Additional buildings for Engineer School, Camp Humphreys, Va., $20,400.

D. C., Wash.—Quay Wall Extension—Spec. 4015—Bureau Yards & Docks, Navy Dept., plans to build at Navy Yard.

Va., Salem—Post Office—Treas. Dept., Wash., D. C., rejected bids received Aug. 14, building post office, here. Noted July 17

Wis., Milwaukee — Revetment Repairs — U. S. Engr. Office, Milwaukee, rejected bids received June 30, repairing pier, superstructure, etc. Noted June 12

Wyo., Wind River—Dam—Federal Government appropriated $50,000 to build concrete diversion dam across Big Wind River at intake of ditch No. 2, Old Wyoming Central Irrigation Project. W. P. Webber, engr.

Tex., Galveston — Jetty Repairs—U. S. Engr. Office, Galveston, rejected bids received June 18, repairing north jetty, Galveston Harbor. Noted May 29.

Cal., San Diego—Hospital—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct naval hospital buildings, at Balboa Park, here. About $1,000,000.

P. R., San Juan—Dredging and Filling—U. S. Engr. Office, San Juan, rejected bids received July 28, dredging San Juan Swamp and filling adjacent swamp lands with material dredged. Noted July 3

BIDS DESIRED

N. H., Portsmouth—Turbo Generator—Spec. 4017—Until Sept. 17, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing 1000 kw. turbo generator, here. Noted Aug. 14.

R. I., Newport—Dredging—Until Sept. 18, by U. S. Engr. Office, Newport, dredging entrance channel to Great Salt Pond, Block Island.

R. I., Newport—Structural Steel—Spec. 4023—Until Sept. 10, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing structural steel for Torpedo Repair Shop, here. About $10,000. Noted Aug. 21.

N. Y., Tompkinsville—Rip-rap—Until Sept. 8, by Lighthouse Supt., Tompkinsville, furnishing and placing 1500 tons rip-rap to protect Little Gull Island Light Sta., Long Island Sound

N. Y., Tompkinsville—Rip-rap—Until Sept. 9, by Lighthouse Supt., furnishing and placing 2300 tons rip-rap, to protect Colchester Reef Light Sta., on Lake Champlain, near Winooski, Vt.

Pa., Lock Haven—Post Office—Until Oct. 10, by Treas. Dept., Wash., D. C., building, here. J. A. Wetmore, superv. archt.

D. C., Wash. — Damp-Proofing — Until Sept. 9, by Treas. Dept., damp-proofing Northwest Storeroom in Sub-Basement of new Treasury Annex.

S. C., Charleston—Dock—Until Sept. 30, by Constr. Quartermaster, Charleston, building dock at Ft. Sumter.

S. C., Charleston—Turbo Alternator—Spec. 4011—Until Sept. 17 by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing 2500 kw. turbo alternator in Central Power Plant, here. About $50,000. Noted July 31.

Tenn., Memphis — Levee Work — Until Sept. 11, by Mississippi River Comn., 1st and 2nd Dists., Custom House, building 2,-270,000 cu.yd. earth work in Upper St. Francis, Lower St. Francis and White River Levee Dists.

O., Cleveland — Rubble Mound Breakwater—Until Sept. 30, by U. S. Engr. Office, Cleveland, building rubble mound extension of west breakwater, Lorain Harbor; advertised in this issue.

O., Cleveland — Rubble Mound Breakwater—Until Sept. 30, by U. S. Engr. Office, Cleveland, building rubble mound extension of wet breakwater, Ashtabula Harbor, advertised in this issue

Hawaii, Pearl Harbor—Hospital—Spec. 3931—Until Sept. 30, by Bureau Yards & Docks, Wash., D. C., by Local Navy Yard and by Navy Yard, Mare Island, Cal., building, here. About $300,000; $40 deposit required for plans and spec. Noted July 10

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Portland**—Dredging—U. S. Engr. Office, Portland, let contract dredging Georges River and Tenants Harbor, to Boston Dredging Co., 172 Condor St., East Boston, Mass., $30,000. Noted May 29.

★**Mass., Boston**—Wharf—Light House Supt., Boston, let contract removing old wharf and building new wharf, at Chelsea Depot to Aberthaw Constr. Co., 27 School St., $12,495. Noted July 10

★**N. Y., Buffalo**—Dredging—U. S. Engr. Office, 504 Federal Bldg., let contract dredging in harbor at Ogdensburg, to W. P. Dailey, Ogdensburg, $64,515. Noted July 17.

★**N. Y., Buffalo**—Rubble Mound Protection, etc.—U. S. Engr. Office, 349 Federal Bldg., let contract building rubble mound protection and sand fill protection on Presque Isle Peninsula, Erie Harbor, Pa., to Great Lakes Dredging & Dock Co., Wilkamson Bldg., $214,320. Noted July 10.

★**N. Y., New York**—Removing Wreck—U. S. Engr. Office, 39 Whitehall St., let contract removing wreck of steamship Port Philip in main entrance to New York Harbor, to Atlantic Ship Salvage Corp., 61 Bway., $5000. Noted June 26

★**N. J., Lakehurst**—Mechanical Equipment—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing mechanical equipment for dirigible hangar to Lord Constr. Co., 105 West 40th St., New York City, $317,247. Noted Aug. 19

★**Pa., Phila.**—Boat and Storage Building, Spec. 4012—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract, building here, to H. Foulkrod Co., 1406 Commonwealth Bldg., $284,078. (150 days) Noted Aug. 28

★**Pa., Phila.**—Cranes, Spec. 4013—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing overhead cranes in boat and general storage building, here, to Niles, Bement, Pond Co., 111 Bway., New York City, $25,500. Noted Aug. 28.

Pa., Phila.—Repairing Dike—U. S. Engr. Office, Phila., received bids Aug. 19, repairing dike at Artificial Island, Delaware River, (1) riprap stone per ton; (2) rubble masonry per cu.yd. of masonry; (3) deduction per cu.yd. for rubble masonry for old stone recovered and used in work, from Piel Constr. Co., 2546 Edmonson Ave., Baltimore, (1) $17.20, (2) $55.93; D. L. Taylor & Co., 409 Finance Bldg., (1) $5.92 (2) $34.60, (3) $4.10. Noted July 24.

★**D. C., Wash.**—Canal Wall—Dist. Comrs., Dist. Bldg., let contract rebuilding portion of canal wall west of Aqueduct Bridge, to Hyde & Baxter, Wash. Noted Aug. 28.

D. C., Wash.—Fuel Oil—A. L. Flint, gen. purch. agt. for Panama Canal, Wash., received bids furnishing fuel oil for period of Sept. 1, 1919, to June 30, 1920, (1) 300,000 bbls. domestic production fuel oil; (1a) 300,000 bbls. foreign production, (2) 700,000 domestic production fuel oil, (2a) 700,000 bbls. foreign production, from Mexican Petroleum Co., 120 Broad St., New York City, (1a) $337,500, (2a) $931,000 (40 days); West India Oil Co., 26 Broadway New York City, (1a) $336,000, (2a) $903,000, (30-45 days); Union Oil Co. of California, Compton Ave., Los Angeles, (2) $1,260,000, (60 days). Noted Aug. 14.

★**D. C., Wash.**—Grading—Dist. Comrs., Dist. Bldg., let contract grading and improving streets, roads and avenues, to Continental Contg. Co., 66 Knickerbocker Bldg., Baltimore Md., and to Corson & Gruman, Wash. Noted July 24.

★**Va., Norfolk**—Roofing—Spec. 5005—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract roofing emergency hospital buildings, here, to J. B. Davies, 129 South Bromley Ave., Scranton, Pa., $21,706. Noted Aug. 28.

★**W. Va., South Charleston**—Steel Sash—Spec. 3914—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing steel sash in various buildings, to Detroit Steel Products Co., 2250 East Grand Blvd., Detroit, Mich., $124,929. Noted Aug. 7.

★**Fla., Jacksonville**—Coal—U. S. Engr. Office, Jacksonville, let contract furnishing coal, to Warrior Black Creek Coal Co., Amer. Trust Bldg., Birmingham, Ala., $15,-440. Noted June 26

★**Fla., Jacksonville**—Jetty—U. S. Engr. Office, Jacksonville, let contract building jetty at entrance to St. John's River, to R. G. Ross, 204 East Bay St., $36,000. Noted June 26

★**Ala., Florence**—Air Compressors—U. S. Engr. Office, Florence, let contract furnishing air compressors, to Worthington Pump & Machinery Corp., 115 Bway., New York City, $24,200. Noted May 29

★**La., New Orleans** — Bulkhead—U. S. Engr. Office, Custom House, let contract building bulkhead at Southwest Pass, to L. E. Alexander, Audubon Bldg., $507,210. Noted May 29

Federal Government (Continued)

★**O., Cincinnati**—Stone—U. S. Engr. Office, Custom House, let contract furnishing stone at Dam No. 39, Ohio River, to Western Rivers Co., Point Pleasant, W. Va., $36,800. Noted July 3.

★**Mich., Detroit**—Pier—Supt. of Lighthouses, Detroit, let contract building rein.-con. pier, at Little Rapids Cut, to J. E. Doherty Sons & Co., Saulte Ste. Marie, $4775.

★**Mich., Saulte Ste. Marie**—Dredging—U. S. Engr. Office, Detroit, let contract dredging Grosse Point Channel, Lake St. Clair, to Great Lakes Dredge & Dock Co., 104 South Michigan Ave., Chicago, Ill., $231,250. Noted Aug. 14.

★**Ill., Chicago**—Crib—U. S. Engr. Office, Federal Bldg., let contract building concrete caisson breakwater and lighthouse crib at Indiana Harbor, to Great Lakes Dredging & Drydock Co., 104 South Michigan Ave., $105,857. Noted July 10.

Mo., Fayette—Post Office—Treas. Dept., Wash., D. C., received only bid building here, from W. D. Lovell, 1415 South East 8th St., Minneapolis, Minn., $61,847. Noted June 24.

★**Cal., Mare Island**—Completing Structural Shop—Spec. 3719—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract completing 300 x 600 ft. structural shop, here, to Clinton Constr. Co., 140 Townsend St., San Francisco, $491,000. Noted Aug. 28.

Miscellaneous

PROPOSED WORK

Lumber—Brooklyn, N. Y.—E. Riegelmann, boro. pres., rejected bids received Aug. 20, furnishing and delivering 105,400 ft lumber. Work will be readvertised. Noted Aug. 14.

Pier and Bulkheads—Perth Amboy, N. J.—City having plans prepared by Lockwood-Green, engrs., 101 Park Ave., New York City, building rein.-con. and steel piers and bulkheads. About $100,000.

Pier—Canton, Md. (Baltimore P. O.)—Canton Co., Commerce and Water Sts., Baltimore, plans to build 1700 ft., rein.-con. pier, 270 ft. wide, concrete piling and earth approach and fill. Plans also include railroad tracks down center and sides of pier and dredging of 35 ft. channels on both sides connecting with Patapsco River Channel. About $750,000. W. B. Brooks, pres.

Parks and Playgrounds—Dayton, O.—City plans election soon to vote on $283,000 bonds to purchase and improve various parks and playgrounds. O. E. Eichelberger, city engr.

Seawall—Detroit, Mich.—Dept. Parks and Blvds., 822 Farwell Bldg., soon lets contract furnishing labor and material, building rein.-con. seawall on west end Belle Isle. About $30,000.

Band Stand—St. Louis, Mo—L. R. Bowen, City Hall, soon lets contract building brick, timber and slate band stand, tile, slate shingle or asbestos roofing, in Soulard Park. About $15,000.

Transmission Lines, Dam, Etc.—Albuquerque, N. M.—See "Industrial Works."

Dock—Portland, Ore.—M. Barde & Son, Inc., 240 Front St., plan to remove old dock at foot of Main St. and build 62 x 124 ft. modern structure. About $20,000.

Retaining Wall, Etc.—Portland, Ore.—Meade Estate plans to build retaining wall of solid concrete, rebuild superstructure of dock recently damaged by fire, occupied by Lilly Seed Co., near Hawthorne Bridge, and install sprinkler system. About $50,000. F. W. Strong, Portland, and E. B. MacNaughton, 464 Boulevard, representatives.

BIDS DESIRED

Garbage Incinerator—Syracuse, N. Y.—Until Sept. 8, by Bd. Contr. & Supply, building garbage incinerating plant on Hiawatha St. Former bids rejected. Noted Aug. 14.

Drainage Equipment — Peoria, Ill.—Supervs. of an established Drainage District in eastern Missouri desire to get in touch with contractors who have equipment suitable for ditch cleanout work. Address Elliott & Harmon Eng. Co., 144 Fredonia Ave., Peoria; advertised in this issue.

Breakwater—White Point, N. S.—Until Sept. 17, by Dept. Pub. Wks., Ottawa, Ont.; building extension to breakwater here, crib work with stone fill, 50 ft. long, 30 ft. wide, involving 10,000 ft. timber. About $11,000. E. Lafleur, c/o Dept. Pub. Wks., engr.

Breakwater—Little Brook, N. S.—Until Sept. 25, by Dept. Pub. Wks., Ottawa, Ont., repairing breakwater here, crib work and stone fill, 123 ft. long, 12 ft. wide. About $12,000. E. Lafleur, c/o Dept. Pub. Wks., engr.

Wharf—Depot Harbor, Ont.—Until Sept. 12, by Dept. Pub. Wks., Ottawa, Ont., renewing wharf here, crib work and stone fill, concrete on face and part of top, 525 ft. long, 80 ft. wide. Work involves 1700 cu.yd. mass concrete. About $34,000. E. Lafleur, c/o Dept. Pub. Wks., engr.

Wharf—La Pas, Man.—Until Sept. 11, by Dept. Pub. Wks., Ottawa, Ont., building wharf here, 180 ft. long, 24 ft. wide, involving 4500 lin.ft. wood piling and 3000 ft. B. M. sheet wood piling. About $19,000. E. Lafleur, c/o Dept. Pub. Wks., engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Miscellaneous Supplies—Boston, Mass.—City received bids furnishing ten 16 in. ¼ curves, one hundred 6 in. sleeves, two hundred 12 in. sleeves, one hundred 6 in. gate tops and bottoms, one hundred 8 in. gate tops and bottoms, two hundred 12 in. gate tops and bottoms, eleven 16 in. gate tops, twenty-one 16 in. valves, 150 hydrant barrels, 250 hydrant pots, fifty 12 x 6 in.-3 way 2 bell branches, two 16 x 16 in.-3 way 2 bell branches, fifty 12 x 6 in.-3 way 2 bell branches, ten 16 x 6 in.-3 way 2 bell branches, twenty-five 6 in. caps, twenty 6-4 reducers, fifty 8-6 reducers, twenty 12-10 reducers, twenty 4 in. offsets, fifty 6 in. offsets, 500 sidewalk tops, all No. 1 castings, total weight, 200 ton, from Davis Fdry. Co., Waltham. @$0.05 per lb.; Davis & Farnum, Waltham, $0.525 per lb., Central Fdry. Co., Roxbury, 0.535 per lb.

★**Subway Station—Boston, Mass.**—Boston Elevated Ry., 101 Milk St., let contract building rein.-con. subway station with 350 ft. platform, to H. Nawn Constr. Co., 82 Savin St., Roxbury. About $400,000, cost plus percentage basis.

★**Asphalt—Brooklyn, N. Y.**—E. Riegelmann, boro. pres., let contracts furnishing and delivering 160,000 gal. refined asphalt in liquid form and 50 ton of 2000 lb. each in package, to Warner Quinlan Co., 79 Wall St., New York City, $9277; 3500 bbl. Portland cement, to D. A. Glober, $10,815; 100 ton limestone, to New York Trap Rock Co., 17 Battery Pl., New York City, $8950; 400 cu.yd. paving gravel, to C. A. Myers, Stagg St., $1263; 100 ton paving pitch, to T. B. Brett Co., 17 Battery Pl., $2000; 4000 cu.yd. asphalt sand, to J. J. Quinn, Gravesend Ave., $7600; 1200 cu.yd. binder stone, to G. Tompkins, $2728; regulating and grading Vermont Ave., to C. A. Myers, Stagg St., $2206. Noted Aug. 14.

★**Tracks—Brooklyn, N. Y.**—J. H. Delaney, comr. transit constr., 49 Lafayette St., New York City, let contract furnishing and installing tracks for portion of Culver Rapid Transit R. R. extending over and along Shell Rd. and West 6th St. from point near Ave. X to Sheepshead Bay Rd., to Slattery Eng. & Constr. Co., 7 East 42nd St., New York City, $58,829. Noted Aug. 28.

Heating and Ventilating—New York, N. Y.—Bd. Educ. received bids Aug. 29, installing heating and ventilating apparatus, from E. Ruetzler Co., 404 East 49th St., $115,712; Gillis & Goeghagen, 537 West Bway., $118,706; D. J. Rice, 405 Lexington Ave., $122,267; installing temperature regulating apparatus in P. S. 57, Bronx, from Natl. Regulator Co., 145 East 34th St., $5800; Johnson Serv. Co., 123 East 27th St., $6349; Powers Regulator Co., Park Ave. and 40th St., $7538.

Column Foundations, Etc.—Phila., Pa.—Dept. City Transit, Chestnut St., received bids building 47 concrete column foundations for Frankford Elevated Ry., in Front St. near Arch St. and in Frankford Ave. between Dyre and Bridge Sts., Contr. No. 504, (a) 10 cu.yd. excav., (b) 10 cu.yd. concrete masonry, (c) 100 lin.ft. rolled steel channels, (d) 100 lb. miscellaneous steel work, (e) 100 lb. iron casting, (f) 10 cu. yd. brick masonry, (g) 10 cu.yd. rubble stone masonry, (h) 1000 ft. B.M. yellow pine lumber, etc., from Brown King Constr. Co., Commercial Trust Bldg., (a) $3.50 per cu.yd., (b) $12, (c) $.50, (d) $.06, (e) $.06 (f) $20, (g) $9, (h) $80, total cost $25,300. Mundy Paving & Constr. Co., 228 Alden St., (a) $3, (b) $15, (c) $1, (d) $.10, (e) $.10, (f) $30, (g) $10, (h) $75, total cost, $32,000. E. H. Vare, 1120 Race St., (a) $3, (b) $15, (c) $1, (d) $.06, (e) $.06, (f) $20, (g) $15, (h) $100, total cost, $34,700; for station platforms and shelters above foundations, at York and Dauphin Sts. and Girard Ave., (a) 10,000 lb. structural steel, (b) 10,000 lb steel reinforcing rods, (c) 10,000 lb. miscellaneous castings, (d) 100 lb. sheet copper work, (e) 1000 lb. galvanized, wrought iron or steel pipe, (f) 100 sq.ft. glazed steel sash wire, (g) 100 sq.ft. galvanized wire mesh screen, (h) 100 lb. square drawn steel tubing, (i) 10 cu.yd. class B concrete, (j) 1000 ft. B.M. yellow pine lumber, Contr. No. 532, from W. Steele & Sons Co., 16th and Arch Sts., (a) $.15, (b) $.09, (c) $.15, (d) $.75, (e) $.50, (f) $1, (g) $1, (h) $.50, (i) $60, (j) $250, total cost, $132,731; F. J. Boas, 201 North Broad St., (a) $.10, (b) $.05, (c) $.10, (d) $.50, (e) $.10, (f) $.50, (g) $.50, (h) $.10, (i) $15, (j) $100, total $113,500. Noted Aug. 14.

★**Creosoted Wood Blocks—Baltimore, Md.**—Bd. Awards let contract furnishing 100,000 creosoted wood blocks, to Hudson Cement & Supply Co., Westwood and Whitmore Aves., $63 per 1000. Noted Aug. 14.

★**Piers—Seattle, Wash.**—Genl. Petroleum Corp., White Bldg., let contract building one 30 x 150 ft. and one 30 x 600 ft. loading piers, creosoted piling, extending into Elliott Bay, to J. A. McEachern Co., Bell St. Dock. About $60,000. This is a portion of oiling station to be built; four 55,000 gal., five 10,000 gal. and one 37,000 gal. steel tanks will be erected later.

★**Bulkheads, Piling, etc.—San Francisco, Cal.**—Paynes Boat Wks., 133 Howard St., let contract constructing bulkheads, piling, grading, etc., for 4 story, brick loft building, on Main and Howard Sts., to Healy-Tibbitts Constr. Co., 9 Main St., $79,217.

★**Dam—Fredericton, N. B.**—Nashwaak Pulp & Paper Co., St. John, let contract building concrete dam on Nashwaak River, about 4 mi. from here, to Ambursen Hydraulic Constr. Co., 10 Cathcart St., Montreal, Que., about $47,800. Plans are also being prepared for pulp mill on this site.

★**Valves, Pipes, etc.—St. John, N. B.**—City let contract to Drummond-McCall Co., 28 Victoria Sq., Montreal, Que., for twenty-five 16 in. Jenkins gate valves at $1.45 each, 522 corp. taps at $1.02 each, 522 curb taps, at $2.02 each and 522 curb boxes at $2.30 each; to Phoenix Fdry. & Locomotive Wks., Phoenixville Penn., 25 tons special castings at $0.07 per lb.; to Vroom & Arnold, St. John, 640 tons 16 in. 210 tons 12 in., 16 tons 10 in., 40 tons 8 in. and 13 tons 6 in. c. i. pipe at $65.50 per ton; to J. Robertson Co. Ltd., St. John, 16,650 lb. ¾ in. lead pipe at $0.11¼ per lb. and 11,200 lb. leadite at $0.15¾ per lb.

Read the Construction News Section for the latest, most complete and accurate developments in your field.

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ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, *Editor* — Charles Whiting Baker, *Consulting Editor*

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Engineers Again Honor Hoover

IT IS fitting that the engineers of New York City, on Mr. Hoover's return from abroad next week, should be among the first to receive him. Under the auspices of his own society, the American Institute of Mining and Metallurgical Engineers, his professional brethren will honor him at a dinner Sept. 17. However elaborate the affair, it cannot do adequate honor to the most outstanding engineer in the Great War. In fact, he compares not with engineers merely in this conflict, but with all the real leaders, whether statesmen like Lloyd George, or soldiers like Foch and Haig and Pershing or moral leaders like Cardinal Mercier. Before we entered the war he carried out a task of unheard-of delicacy—the provisioning of a conquered territory under a meticulous and merciless conqueror. On our entry into the war, he assumed a work of even greater proportions—the provisioning of the allies through the self-denial of the American people. Both tasks he carried out with singular success. Europe has gone to its utmost in expressing its appreciation and gratitude. Engineers and the public in America, through a variety of honors, have already given expression to their feelings toward him, but now that he returns, the major part of his great tasks completed, it is fitting that engineers should be among the first to welcome him.

Wind Pressures at Great Heights

SO FAR as wind effects at ordinary levels are concerned, the sane and well-judged review of the subject on p. 499 is a valuable summary of good practice in the design of engineering structures. Present-day methods produce safe structures, as witnessed by the fact that failures due to wind are almost unheard-of; but there is room for improvement in economy and also for fuller recognition of regional differences in maximum velocities, such as the difference between the Gulf coast and inland points mentioned in the text. The article should prove helpful, also, because in conjunction with companion articles yet to be published it clears up some points of difficulty in the practical application of wind calculations. It suggests a thought, however, which may have distinct future importance, though it lies outside the range of present practice in dealing with wind pressures. What we know about wind relates to a very narrow zone of height, two or three hundred feet above ground, perhaps; above this zone our data apply only by extension. Today many engineering structures rise far above the zone of established wind-pressure data, and heights are likely to increase further in the future. We have reason, then, to give heed to the possibility that greater wind velocities occur far above ground than in the lower zone. A worthwhile field for experimental study lies in this possibility.

The President's Industrial Conference

WHAT good may come from the conference which the President has called to discuss with all parties at issue the present industrial crisis, and particularly the problems between employer and employee? If it is to be a conference and nothing else, it may help in lending an added dignity to things we already know—nothing else. If it has leadership, if the President uses the presidential influence to initiate a program, something worthwhile may come of it. By the time of the conference, too, the President should have in hand pertinent data on the extent and means of profiteering in certain lines of business. The Department of Justice has various investigations in hand, regarding prices of leather, foodstuffs, etc., and if there be obtained indisputable evidence of profiteering the President will be in a position to hold up the wrongdoing of the employing interests to the country and to get the backing of the people for drastic measures that he, with the aid of Congress, may decide to adopt. On the other hand, he will have there the leaders of labor, and them he must bring to agreement regarding a propaganda in sound principles of production. This is no one-sided affair. Neither can the operator of industry profiteer by unfair high prices, nor can the employee profiteer by giving less than an honest day's work for his pay. The President has a great opportunity in the coming conference. He has shown in the past month appreciation of the fundamentals of the problem. Can he make action square with his theoretical conception of the issues?

Little Danger in Rich Concrete

THAT rich concrete cracks more readily than lean is probably the off-hand opinion of the majority of engineers. The explanation is not hard to find. Tests have shown an increasing expansion, due to temperature and moisture, with an increasing proportion of cement in a mortar. Observation is common that the rich cement-mortar finish of the concrete of a decade or so ago soon shows a multitude of map cracks and later more serious disintegration. On the basis of both tests and observation, the general deduction as to concrete work has been easy. In spite of this, the fact is, as pointed out by several engineers in the symposium on another page, that the application of the principle to commercial concrete work is not justified by any serious laboratory or service tests. Rich mortars do not necessarily act the same way as a commercial concrete, and the map cracking of the thin mortar coat is due to differential expansion. Within the limits of mixtures used in structures there is no reason to believe that cracking, either of the surface or of the body, is to be expected on account of the variation in the cement mixture, except as that variation affects the

actual strength of the concrete. Indeed, the richest concrete consistently used in any number of structures —the 1:2/3:4/3 mix of the recent Government concrete ships—is singularly free from cracking. In concrete road foundations and surfaces, where the subject today is especially pertinent, there does not seem to be any need for alarm, from the standpoint of cracking due to internal movement, in the use of mixtures even richer than the richest commonly used.

Highways and Shade Trees

ELOQUENT advocacy of reforestation by the planting of shade trees along the highways has recently appeared in the daily press. The French roads have been cited as examples of such use of the roadside, and the recommendations have extended even to obtaining revenue for the upkeep of the roads by selling the fruit which might be grown if apple, peach or cherry trees were planted. While the æsthetic features of highway shading are apparent to every one, it should not be forgotten that in many sections of the country soil conditions are such that shade trees are a positive detriment to the roads. The trees keep the heavier soil, such as clay, from drying out, and a decided tendency to disintegration is noted where shade is abundant, particularly in macadam roads. On wide thoroughfares, where the trees would be some distance from the pavement, they would be less detrimental, but on the narrow country highways, where shading has the most charm, and where the roads are largely of the lighter types of construction, such as water-bound and bituminous macadam, it seems doubtful whether the trees should be planted. On soil which may be thoroughly underdrained shade has little detrimental effect, unless the surfacing is made of ingredients that are directly affected by moisture. Its effect on the retention of water by heavy-soil subgrades, eliminating proper support of the base, and causing freezing and heaving of the pavement in winter, is worthy of careful attention. Tree planting certainly should not be inaugurated indiscriminately.

Timber Supply and Forest Protection

FOREST conservation or rigid restriction of timber exports are the alternative policies to provide against exhaustion of our timber resources. The first of these is the more logical policy. This summarizes the arguments presented by Henry S. Graves, of the United States Forest Service, in a pamphlet on "Lumber Export and Our Forests," issued by the United States Department of Agriculture. Other countries are regulating the cutting of timber and are developing forest plantations as a means of conserving their present supplies and providing a future permanent supply to meet conditions following the enormous use and destruction of timber during the war.

Reconstruction work will demand great quantities of timber, but to export this material without some policy of replacement would be ruinous. According to Mr. Graves, this is recognized by practically all the timber-exporting countries except the United States. He states that in this country there is no governing influence on the handling of forests in private ownership, and they are "mined" instead of being treated as a renewable resource. He says further: "There is no effort to secure replacement after cutting. In many parts there is not even any serious effort to keep out forest fires that consume the young growth and prevent reproduction. The owners are not interested in and do not assume the responsibility for replacing the forests, even by natural reproduction. Industries dependent upon wood are already going out of business. Local exhaustion of the forests is leaving great stretches of land in an unproductive condition."

This is a serious indictment, but it is supported by the history of the reckless use, abuse and destruction of our vast timber resources. The remedy, in Mr. Graves' opinion, is not the arbitrary restriction of timber exports but rather a national policy of forest protection and the use of such methods of cutting as will provide for reproduction. At one time, the idea of conservation was simply to forbid the cutting of timber, but more enlightened ideas regard the forests as crops capable of producing a permanent supply of timber sufficient for our own use and for export. It is high time that some definite action should be taken along these lines, but it will need an energetic and persistent campaign of education to bring it about.

What Will Engineers Pay To Improve Their Status?

ENGINEERING COUNCIL'S difficulty in obtaining funds for its Washington office prompts the query, How much is the individual engineer willing to pay to have his societies engage in civic and welfare work?

The question is all the more pertinent because Engineering Council once sounded members of the profession, but without encouraging response, on the proposal of contributions to Engineering Council of $1 per member. Are we to conclude that engineers will not pay $1 a year to have their status improved, or is the declination of funds to be assigned to other motives?

Engineering News-Record has no doubt as to the attitude of the profession; engineers *will* pay not merely $1 a year for civic and welfare work, but $3 and even $5. But they will not join a society or support a movement unless the objects are broad, the plans detailed and the execution guaranteed by real leaders, by men of action. Given these things, membership in an all-embracing federation of engineers would be forthcoming in large number, even though the dues be $3 or $5, instead of the $1 so generally proposed.

If this view be correct, why, then, the present financial difficulties of Engineering Council? The reason is that a dramatic presentation of its case has not been made persistently to the individual members of the profession. Had the members of the founder societies been enthused with the council's plans, their executive bodies, forced by that enthusiasm, would have taken steps to secure the needed funds. The treasuries of the founder societies have been strained, but an appeal to the membership for separate support would not have gone unheeded, had the council made a strong impression.

We feel certain that the refusal of the members of the American Society of Civil Engineers to vote the $5 assessment for the Washington office of the council as proposed by motion at the annual meeting last January was due to lack of a detailed plan and strong presentation.

But these are mere opinions, even though founded on

close contact with the profession. Is there not evidence of what engineers will pay for civic and welfare service? We think there is—and in abundance.

Approximately 40,000 engineers are paying an average of $15 a year for membership in the founder societies. Is it conceivable that with a virile program these men would not pay $3 additional for civic and welfare work? They get prestige, acquaintanceship, information, from their technical society membership, and deem this personal return worth $15 a year. Would not the result of a $3 annual investment in civic and welfare work, so well done that it would improve the status of the engineer, add to the individual's pocketbook many times that amount—a hundredfold or more?

But there is other evidence. Approximately 4000 men have joined the American Association of Engineers in the past five years and pay $10 a year for *civic and welfare work alone.* And they, on the whole, are from the ranks less able to contribute to society support. The growth in membership is evidence of a result-producing propaganda, kept up with admirable persistence.

Now come the architects of New York State with an organization into which the draftsmen as well as the leading architects are invited, with annual dues of $5 for the registered architects and $3 for the draftsmen. In other words, the architects believe that even their beginners are ready to pay $3 a year for the improvement of the professional status.

With these examples in mind, can we doubt whether engineers will pay $1 a year? Can we doubt that a strong program would succeed in building up a large membership at $3 or even at $5 per annum?

The signs have, for a year or more, pointed to a change in the basis of membership in Engineering Council. The report of the conference committee should deal with it. In any plan the problem of funds will come in for consideration. To our mind the problem is not a serious one so long as the plan is big and strong and is based on a correct conception of what the profession wants. That being furnished, the building up of membership depends on persistent education.

The need for persistent promotion must be clearly recognized. One neglects the inertia of human nature if he assumes that a good plan will be embraced by one announcement of it. Life insurance, a most beneficent institution, is taken by most men only after persistent efforts of salesmen. In this work, society promotion, we have much to learn from the A. A. E.

Essentials of the Railroad Problem

ONE is tempted, as new plans for the solution of our railroad problem are brought forward, to dismiss them in turn with a confused feeling that just another plan has come to becloud the atmosphere. Yet a multitude of plans is not to be deplored. Even though offered to bolster up a special interest, as many of them are, they help to sort out those elements on which there is agreement and to define the issues that are debatable.

Without reference to anything that may have been proposed, one can easily lay down certain essentials of the ultimate plan. It must (1) end corporate profiteering; (2) give the worker a more direct interest in the industry; (3) provide incentives for efficient management.

The first two requirements are beyond debate. The public has determined that they must be adopted; of that there is not room for reasonable doubt. There has been less general consideration of the third essential, but no thoughtful man would provide a settlement that did not encourage efficiency on the part of both worker and management.

The wide acceptance of these ideas is evidenced by their inclusion—in part, at least—in most of the plans presented. In some, provision for the workers is limited to profit-sharing; in others, directorate representation, a more important step, is included.

When we get beyond these three *sine qua non* provisions we are on debatable ground, the argument waging fiercest around the issue of Government vs. private ownership. To our mind, the ownership issue is really secondary; it rests on grounds of expediency. The question of Government vs. private *operation* is far more important. It is in operation that profits are made or losses incurred; it is operation that determines, largely, the amount of property (i.e., capital investment) required and the efficiency of its use and maintenance. The prejudice against public ownership, when analyzed, is found to be due to dissatisfaction with public *operation* rather than *ownership.* That which we must adhere to, and which becomes the *fourth essential* is *private operation.* Even the Plumb plan accepts this principle; it provides for lease of the roads to an operating corporation, in which the public (and hence the Government) would have minority representation (one-third of the directorate).

The issue of public vs. private *ownership* enters most largely, in our mind, in its relation to operation. If private operation could persist, unhampered in efficiency, under public ownership, we should have little quarrel with it. Under Government ownership, however, private operation would probably suffer much interference. Private ownership, it is true, would not insure the operators against hampering meddling, but the amount of it would probably be less than if the public owned the properties. Certainly, as a first step some scheme of private ownership under broad control should be tried. If the drift toward nationalization should continue, if, under a revised plan of private ownership, we should not achieve the ends we have in view in the present railroad reorganization, we should, at least, learn much to guide us in drafting the subsequent plan.

The details of the final scheme must flow, in large part, from the essentials above laid down. Here again the multiplicity of plans has helped to narrow the discussion. There must be Government control of financing, there must be limitation of return on the investment, there must be an efficiency incentive for both management and employee, there must be Government representation in the directorate. Efficiency, too, urges that there be competitive systems, rather than a single operating unit. On the other hand, there should be common use of terminals and other facilities that will conduce to efficiency of operation and to better service to the public.

Obviously, there are many ways in which these purposes may be accomplished. The details are important, but if the essentials be not included the results will be so far from satisfactory that the job will soon need re-doing. No profiteering, incentives to efficiency for management and employee, private operation—these, at least, are essentials of any satisfactory plan.

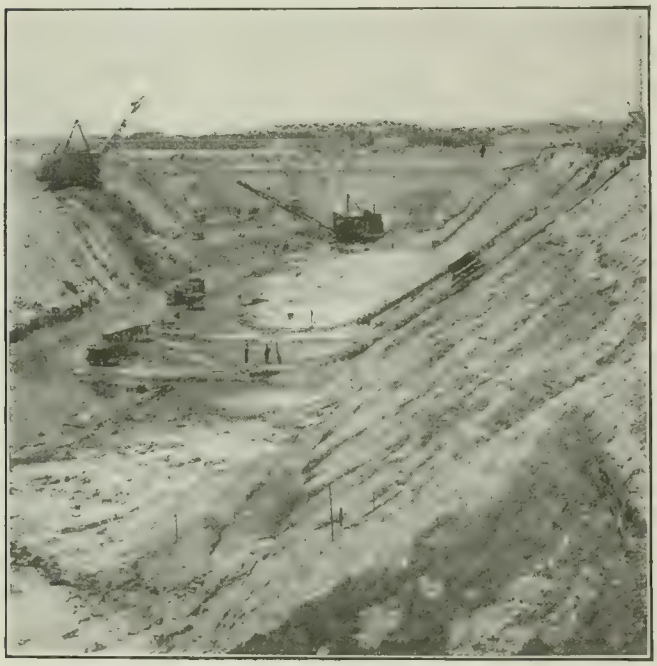
Rapid Concreting a Feature of Big Portsmouth Dry Dock

Installation of Duplicate Mixer Units of Large Size Makes Possible the Placing of 16,600 Cubic Yards in One Month—Total Concrete Yardage Was 185,000

EXCAVATING equipment which did not interfere with the early start and rapid progress of concreting, an organization capable of preparing forms, concreting equipment capable of placing a thousand yards a day, and favorable foundation conditions, were important factors in the construction at Portsmouth, Va., of the 1000-ft. Navy Yard dry dock.

The foundation conditions at the site were almost ideal. After penetrating an 18-ft. fill of rubbish and beach sand, 40 ft. of heavy blue clay was encountered. The bottom of the dock was in hard marl, fully capable of carrying the weight of the structure without piles, and almost water-tight. The pumping amounted to only 150 to 300 gal. per minute, and was taken care of with 6-in. motor-driven centrifugal pumps.

At least six months' time was saved in the completion of the contract by the use of 5-yd. dragline ex-



THE BULK OF THE EXCAVATION WAS DONE WITH FIVE-YARD DRAGLINES WORKING FROM THE SURFACE

cavators for digging out the site of the dock. This equipment was selected because with it work could be carried on from the surface of the ground, without blocking form construction and concrete work with tracks leading down into the hole. On account of the depth of the excavation the latter procedure would have been difficult and slow in any case. It was avoided on the last lift by using an inclined railway to elevate part of the spoil to the tracks above, as shown in one of the views. Cableways might have been employed, but their capacity would have been far below that of the two draglines used. The bank supported the weight of these machines without difficulty during the entire progress of the work.

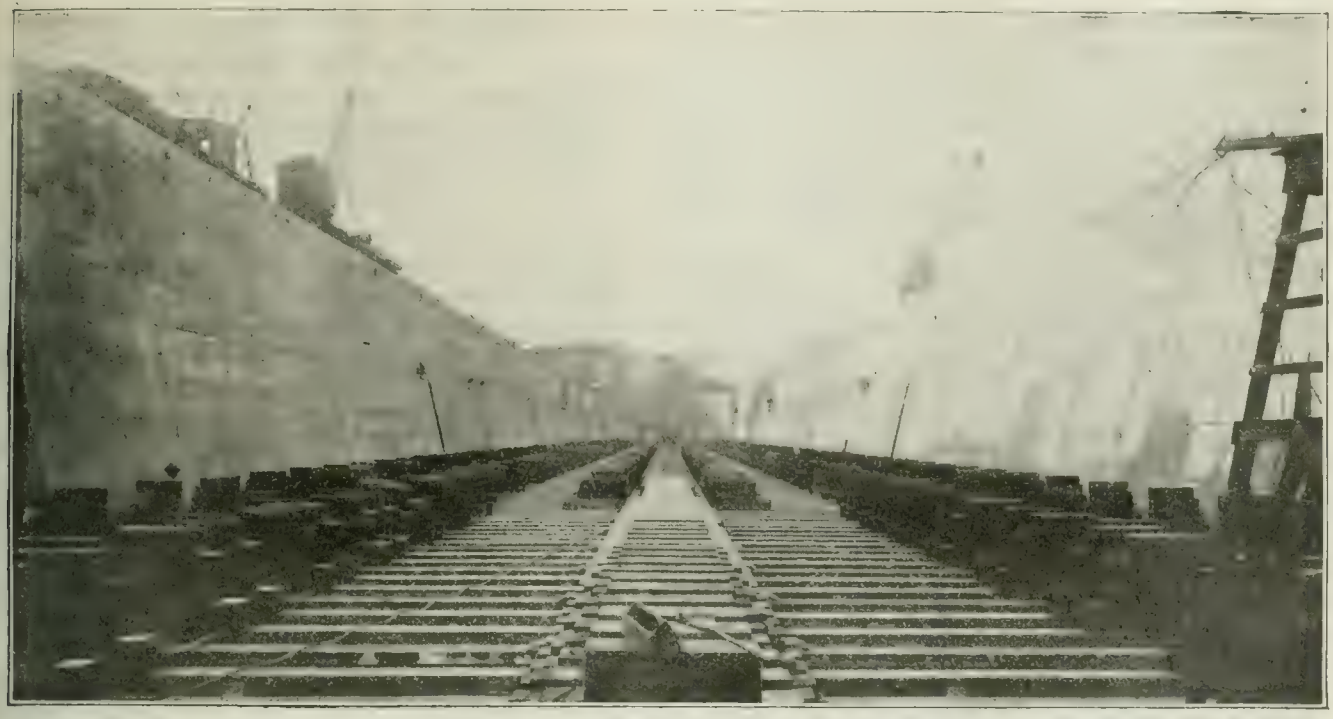
Excavation was started at the river end of the dock in the latter part of February, 1917. On Aug. 20, six months later and six months before the 625,000 yd. of excavation had been completed, the first concrete was placed in one of the floor monoliths of the dock near the river end. The excavation was closed off from the river by a clay embankment, down the center of which was a line of 45-ft. steel sheet piling driven with steam hammers handled by derricks. Behind this bank, excavation was carried down to the bottom of the dock floor, and a sheeted pit 68 ft. wide by 233 ft. long was dug below this elevation for the gate sills. The excavation was then carried back toward the head of the dock, two lifts being taken out at first and three toward the last. The draglines dumped into 12-yd. air dump cars hauled in four- and six-car trains by 30- and 40-ton locomotives. These trains were discharged into scows for about half of the spoil, which was hauled to sea and dumped. The remainder was used for fill in the Navy Yard and for backfilling around the dock.

After concreting was started, Aug. 20, 1917, an average of 12,000 yd. per month was maintained until all of the concrete had been placed by Jan. 15 of this year. On Nov. 15, 1918, however, 181,000 yd. had been placed, leaving only 4000 yd. to be handled in small amounts. The best record was made in May, 1918, when 16,600 yd. of concrete was placed. This performance was almost equaled in October, 1917, when 15,330 yd. was put in; more than 14,000 yd. was placed in March, 1918. The best single day's run was made by one 2-yd. mixer which placed 1150 yd. of concrete in 22 consecutive hours on Dec. 20-21, 1917. After concrete work had been started it was continued except for an eight-day interruption during the extremely cold weather in the early part of 1918, when the thermometer at Norfolk reached 6 deg. above zero, Fahrenheit.

Although this rapid concreting was facilitated by the large size of the monoliths, the form work for the dock walls was complicated and required careful planning. The floor was placed in alternate sections to full depth, the width of the sections ranging from 9 to 14 ft., and the yardage from 750 to 1200 per block. The side walls were poured in lifts varying with conditions, but for the most part from 3 to 4 ft. in height. Practically all known types of form were used on the walls, it finally being the conclusion of those in charge of the work that wooden forms were more economical than steel, on account of the many offsets, tunnels and passageways required.

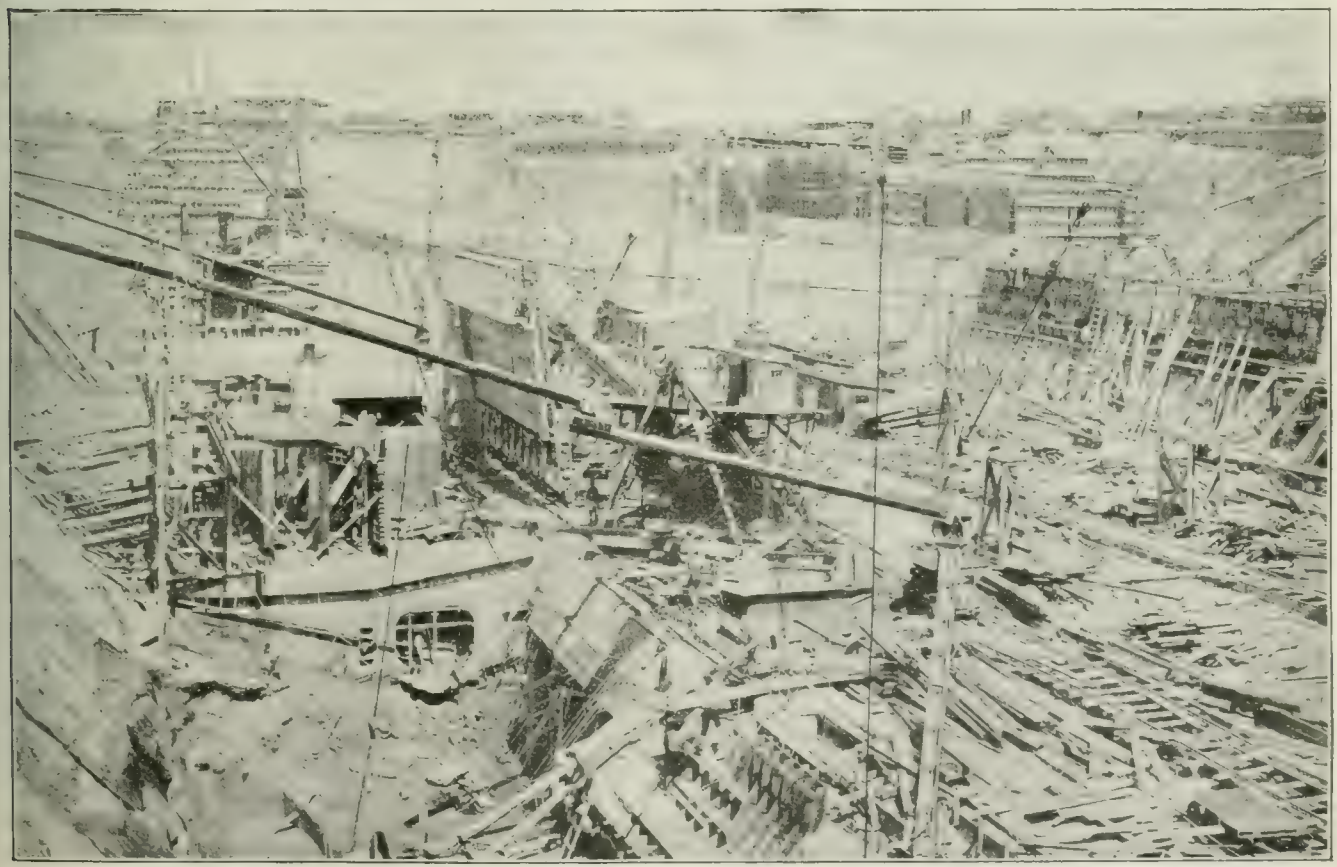
The design of the concrete plant which made this unusual performance possible was based on duplicate mixer units of large size, ample capacity for handling materials, and rail transportation to points at ground level, directly above the blocks being poured, from which concrete could be spouted to place. Cement was received in bulk in box cars at the dock, alongside which the sand and gravel lighters were unloaded. This work was done with three stiff-leg derricks, each handling a 1½-yd. clamshell. One of them unloaded into stock, for which space for 1400-yd. storage was available, while the other two reached the stock area and also discharged into two sets of bins, each of which held 80 yd. of sand and 160 yd. of gravel and which fed the pair of 2-yd. mixers by gravity. The mixers were placed just below the downstream corner of the dock and were connected by track with a belt line which circled the dock. The track was shifted from time to time and switches were put in or taken out as work progressed.

In addition to having two mixers ready to run, mak-



A TOTAL OF 185,000 YARDS OF CONCRETE WAS REQUIRED TO COMPLETE DRY DOCK

ing it certain that concreting could proceed at all times, a third mixer was purchased, so that when one of the large machines had to be overhauled it could be taken out and the work done at leisure without leaving the job dependent upon a single mixer. The mixers discharged into 2-yd. side-gate cars, of which 16 were purchased. It was at first intended to run them on their own wheels. However, side-gate cars of this size had not previously been used, and these turned out to be top-heavy and difficult to keep on the rails. The side-gate bodies were therefore removed from the running gears and set on standard flat-cars, two bodies to a car. All combinations up to the total number of cars in service on the longest hauls were used in



AFTER TRIAL OF MANY TYPES, WOODEN FORMS WERE SELECTED AS MOST ECONOMICAL BECAUSE OF MANY OFFSETS, TUNNELS AND PASSAGEWAYS REQUIRED

transportation, as many as five locomotives being employed. Three of these were small steam dinkies, and the other two were 6-ton gasoline locomotives. Until the dock walls reached about half height it was possible to chute all of the concrete from the track level. The side-gate cars were discharged into the chute lines, often as many as three chute lines being strung into the same monolith, so that three 2-yd. cars could be emptied simultaneously.

After the excavation was completed and the walls reached a height which precluded direct spouting, hoppers were set up over the forms being poured, and both line chute and drop chute were used to convey concrete from the hoppers into the forms. The side-gate bodies were lifted off the decks of the flat-cars one at a time by the dragline, swung out over the hoppers on the forms and emptied into them. This proved a very efficient arrangement, the concrete being dumped almost as fast as when the cars were discharging directly into the chute lines.

Labor Uncertain

Labor conditions on the work were bad on account of the war and also varied greatly, so that the size of crew necessary for different operations changed from time to time and no reliable conclusion can be drawn as to the number of men required for handling work in this way under stable conditions.

After the main dock was well along toward completion, it was decided to build adjacent to it on the downstream side two 600-ft. docks for the Shipping Board. As the concrete plant was on ground to be removed by dredging beyond the outer end of these docks and between them and the large dock, it was not necessary to disturb it before beginning excavation on the two smaller projects. One of the draglines was accordingly set to work on the excavation last winter, and at the present time the two smaller docks are practically excavated and the concrete work is well along in them. The same methods were used as for constructing the larger dock.

Except for the pumping machinery for unwatering the dry dock, which was installed by the Worthington Pump & Machinery Co. and the caisson gate, which was built at the Philadelphia Navy Yard and installed by the Norfolk Navy Yard, the entire work was handled by the George Leary Construction Co., New York City, under the direction of Paul Schomberg, vice-president of the company. The work at the site was in charge of H. L. Muchemore as manager, under whom was General Superintendent Taft. The contract has been carried out under the supervision of the Bureau of Yards and Docks of the Navy Department. Work was begun at the time when Rear Admiral Harris was chief of the bureau, and was completed under the administration of Rear Admiral Parks, and under the personal supervision of Rear Admiral Harris after he had assumed charge of all construction for the Navy Department in the Norfolk District.

Municipal Markets in the United States

Of 227 cities in the United States having estimated populations of more than 30,000 more than one-half (128) had municipal markets in 1918, according to a bulletin on the subject just issued by the Census Bureau. A large percentage of these are open markets, but some are housed in large, permanent buildings.

A Plan for Private Operation of Federalized Railways

Employees Would Have Voice in Management and Share Surplus With Operators and the Public—Roads To Be Operated in Regional Groups

By William J. Wilgus
Consulting Engineer, New York

In GIVING consideration to the various plans that have been made public for the solving of the country's pressing railroad problem, it is well to bear in mind the ills with which the railroads are now afflicted. They may be briefly summarized thus:

1. Uncertainty in the minds of investors as to the integrity of capital legitimately invested in the railroads and the yield of a fair return thereon, with the result that the holders of securities are selling, and the flow of capital into much-needed railroad extensions and improvements has entirely ceased.

2. Lack of confidence between managements, employees, shippers, and the general public, with resulting suspicion and friction.

3. Loss of incentive on the part of officers and men for practicing initiative, resourcefulness, economy, efficiency and courtesy, in consequence of which there is dry rot coupled with unchecked rising costs of operation.

4. Political control, which vests the party in power with prerogatives dangerous to our institutions and destructive of good service to the public.

Through what agencies may these evils best be cured? Government ownership is generally condemned, and yet what the public really fears is not so much Government ownership as the well known evils that flow from Government management and operation. In fact, it may be said that private ownership under Government regulation and control, coupled with a Government guarantee in one form or another, as proposed in the majority of the plans so far offered, is in effect Government ownership without its simplicity and freedom from bankers' domination.

Necessary Elements of Plan

Whether through direct or indirect Government ownership, the remedies which the writer feels should be embodied in the adopted plan are:

1. Governmental assurance of a permanent policy in respect to the integrity of the public's investment in railroads, and of a fair return thereon, either (a) by the purchase of the properties at their fair value, or (b) by guaranteeing a minimum rate of return on their existing fair value and on securities properly issued in the future for extensions and improvements—all in such manner as justly to treat both the public at large and the investors.

2. Management of railroads through boards of directors embracing equitable representation of all parties in interest, including investors, employees, shippers and the general public.

3. Revival of the spirit of emulation and creativeness in officers and employees, and stimulation of the interest and coöperation of shippers and the general public, through an equitable division among them of surplus earnings, to the winning of which they would all contribute in their joint effort to attract patronage through courteousness and superior service.

4. Abolition of political control in the selection and

promotion of officers and men, which functions should be exercised by the aforesaid boards of directors.

An analysis of the leading plans that have been offered indicates that some of them err in proposing a higher rate of guaranteed return than is in the public interest; others would take from the more prosperous roads, without due compensation, a portion of their surplus earnings, in order that less fortunate or less efficiently operated properties might benefit therefrom; and others make no provision for the sharing by all interests in the management and profits of the enterprise. In fact, none of the better known plans meets all these desiderata.

Plan Proposed

The following plan is offered as one which will assure (a) the investor, of the safety of his principal and the return thereon; (b) the management, of a minimum fixed reward and the promise of a further reward for superior service; (c) the employee, of a voice in the management, a minimum fair wage and a share in the reward of good service to which his efforts would contribute; (d) the shipper, of a voice in the fixing of fair rates from which he would reap the reward of moderation through a share in the surplus, and (e) the public, through the stabilizing of railroad finances, of the minimizing of evils flowing from political control, the eliminating of scandals too often associated with private ownership, and, above all, efficiency of service:

1. Acquisition, by the national Government, of the railroads of the country at their fair value.

2. Grouping of the railroads so acquired into regional operating units, with sufficient interlacings of trunk lines to insure competition of service between important centers, and with due attention to the arranging of joint terminals where demanded in the interest of all concerned.

3. Leasing of the regional groups to private companies, under the sole direction and supervision of a department of the Federal administration to be created for that purpose; and under terms that will yield to such companies a minimum reward for their management of the enterprises, and in addition thereto a substantial share, say three-quarters, of surplus earnings in excess of operating expenses, taxes, depreciation, interest charges and amortization.

4. Provision for representation on the boards of directors of the private companies of all parties in interest, including the management, employees, shippers and the general public in the localities traversed; and for the equitable sharing among such interests of the aforesaid surplus earnings.

5. Extensions, enlargements and improvements of the properties at the expense of the Government on the request of the lessees, upon proof of necessity to the above-mentioned new Federal department.

6. Purchase of equipment by the Government as from time to time required and its allocation among the regional companies, under the direction of the aforesaid new Federal department.

7. Settlement of questions that cannot be brought to a conclusion locally, through three general boards under the aforesaid new Federal department, viz., a *Wage Board*, on which there would be equal representation of the national Government, speaking for the general public, employees of the country at large, and the leasing company or companies involved in any particular wage question; a *Rate Board*, on which there would be equal representation of the national Government, shippers at large, and the leasing company or companies affected; and a *Service and Improvement Board*, on which there would be equal representation of the National Government, which would furnish the funds, and the leasing company or companies affected; the decisions of such boards to be subject to the review of the head of such new Federal department.

Dutch East Indies Offer Many Construction Opportunities

Developments Now Under Way or in Prospect in Sumatra and Java Include Port Works, Railroads and Water-Power

By J. W. Evans
New York City

THE Dutch East Indies are making a call on American engineers and on American manufacturers of construction material and equipment. It stands out, among the similar calls which are reaching us now from many quarters, as peculiarly inviting. It is not too much to say indeed, that the Dutch East Indies offer in this respect certain opportunities which fairly compel investigation.

The Dutch East is an agricultural region which the pressure of war has suddenly awakened to its own vast industrial possibilities. As a result, great engineering and construction projects are being planned. Many of them are definitely under way; others are in prospect; and their number is constantly increasing as committees appointed by the colonial Government go further and further with their investigations.

To specify some of the more outstanding results, the expansion of the tobacco and rubber trade in Sumatra has led the colonial Government to the construction of a $3,000,000 harbor at Belawan, with great quays and warehouses, and including the dredging of a suitable channel. That enterprise is under way at the present moment.

Its most immediate result is a call for iron and steel concrete reinforcements from the United States. Its later results will be an immensely accelerated development and improvement of towns, installation of plantation equipment, and the calling for engineering help which is fundamental in any growing, developing region.

Effect of Ocean Transportation

Sumatra has already shown a disposition toward rapid development, but the bringing of transoceanic steamships right to those coasts will hurdle at a single leap one of the island's greatest handicaps. While we are on the subject of Sumatra it is worth adding that the Department of Public Works of the Dutch East Indies proposes to irrigate nearly 67,000 acres of land at Assahan on the Sumatra east coast. The work will cost about 6,000,000 guilders, and will create a large area of arable land suitable for the cultivation of rice.

Facts of this kind are a promise of other, bigger prospects later, for Sumatra, one of the most luxuriant, fertile regions in the world, is as big as California. It produces many things well and two superlatively so—wrapper tobacco and rubber.

But perhaps the most picturesque engineering project on foot in the Dutch East is the development of the Island of Celebes, where a deposit of iron ore reckoned at a billion tons has recently been discovered. The ore comes very close to the surface. In the neighborhood are stocks of nickel alloys covering an area of about 400 square miles. There are yields of common iron ore, chrome iron, nickel and manganese ore. The outlets of three lakes will furnish power for the working of these deposits. Plans are now being considered for opening up not merely the mines, but the whole rich agricultural region around them and for inviting capital—American capital, if possible—to go in there and help.

From the viewpoint of the American engineer and the manufacturer of construction equipment and materials, this means certain things, or will mean them before long: First, the installation of a railroad from the coast to the interior, with a call for engineering services and material. Second, the development of a great hydro-electric enterprise for working the mines—chance number two for America, the engineer and manufacturer. Third, the almost inevitable building and equipping of industrial plants, either on the coast or in the interior, to handle the ore of those great mines. Fourth, the building of shipping and terminal facilities on the coast for the handling of these products, and for their distribution either in raw or manufactured form throughout the Far East. Fifth, the settlement of the country, wherever the railroad may go, by immigration from overcrowded Java. And because Celebes is fabulously rich in agricultural possibilities, the things that will come from that condition will tend in the same direction that they have in Java—roads, towns, buildings, and all that goes with the opening of rich, new country—the sort of condition on which enterprising Americans grew rich in our own developing West.

Population of 50,000,000 To Be Served

But that's still in the future. Turn now to Java, with its area a third that of California and its enormous population of 35,000,000, about 750 to the square mile. The proportionate importance of Java in the archipelago may be understood when it is explained that the total population of the Dutch East is about 50,000,000.

Java, commercially, is 75% of the Dutch East. It has not meant much to us in the past—at least, we didn't know it did. We have always used its products—rubber, tea, coffee, quinine, cocoanut oil, copra, fibers and the like—but we got them by way of European middlemen. The war, closing the trade routes between the archipelago and Europe, forced us to exchange our manufactured goods for their products direct. Before the war they used to get their manufactured goods from Europe; but under the new conditions they found the American article was the best they ever tried. Now they are clamoring for a continuance and an increase of this newly developed trade, pointing out that it will be a source of economy both to them and to us.

And they want everything from automobiles and locomotives to pins and tiddlywinks. Not only is the colonial Government encouraging every kind of construction work, and doing lots of it itself, but the native standard of living is going up by leaps and bounds. Where the natives used to be tickled to death with a string of beads or a pocket mirror, they are now beginning to want phonographs and modern conveniences. There are three cities in Java which are now calling for 47,000 tons of iron and steel pipe for water mains; and that means the big lines only. It takes no account of the further need for smaller sizes. And of course it takes engineers to put such things in.

Investigations are being made for new developments by hydro-electric power in Java. New railroads are being built. Only recently the colonial Government ordered 12 locomotives in the United States, at a total cost of $600,000.

They are even establishing shops of all kinds for making small machine parts and are calling for machine tools, a thing which machine-tool makers never expected from that part of the world. Certain engineering works in Surabaya have, for instance, begun the construction of all appliances necessary to secure the safety of railroad traffic. Other works are constructing iron frameworks for houses.

Engineering Congress Next May

The Government is making investigations now into what industries may be established to advantage, and the data will be presented at an engineering congress which is to meet next May, prior to the industrial fair which will be held at Weltevreden, a town near Batavia. The discussions at the congress will be in English; and it will afford an opportunity to American engineers and representatives of American manufacturers of construction material and equipment to be present in an advisory capacity and make clear what they have.

The area of the Dutch East Indies archipelago is 750,000 square miles. Of this total 500,000 is still to be developed. The length of the archipelago is 3000 miles. It is a great field for commerce; its future is as certain as is the world's need for the products of the Dutch East. It offers immediate opportunities in construction work and is bound to offer others enormously greater in a very short time.

No American construction man can afford not to give the Dutch East careful study and attention. The Netherlands Indian Government Intelligence Office at 11 William St., New York City, is always in touch with conditions and is glad to furnish information.

City Zoning Authorized in Oregon

Any incorporated city or town in Oregon is authorized by recent state legislation to enact a zoning ordinance. Such ordinances may place restrictions on the height and bulk of buildings and on the percentage of the lot which they may occupy, and may designate use areas or districts. Where city-planning commissions exist the council shall require the commission to recommend zone boundaries, after advertised public hearings, and the council may not fix such boundaries until after the commission has made its report and public hearings on the subject have been held. Where there is no planning commission, the council first proceeds as a commission would, then acts as it would do after a commission had reported to it.

Wind Pressure on Cylindrical Structures in Practice

Methods Applicable to Various Problems of the Structural Designer in Dealing With Chimneys, Stacks and Standpipes—Proportioning Anchor Bolts—Guyed Steel Stacks

By R. Fleming
American Bridge Company, New York City

THE object of this article is to present a sane and practical treatment of designing methods applicable to cylindrical structures such as stacks and standpipes. Gasholders are not considered, as the special questions of structural analysis which they involve would carry this article beyond its proper scope.

The fundamental formula for wind pressure is

$$P = kDSV^2 \qquad (1)$$

in which P is the total pressure on a plane surface of area S normal to the direction of the wind, k is a constant determined by experiment, D is the density of the air (varying with the altitude), and V is the wind velocity. The United States Weather Bureau uses 0.004 for the value of k when P is expressed in pounds, S in square feet and V in miles per hour. For heights not greater than those of steel structures D may be assumed as unity. The wind pressure, $p(= P/S)$, in pounds per square foot on a flat surface normal to the direction of the wind for any velocity, V, in miles per hour, is therefore given by the formula

$$p = 0.004\,V^2 \qquad (2)$$

For the intensity of wind pressure P_n on a plane surface inclined at an angle A to the direction of the wind, the formula generally accepted is that of Duchemin,

$$P_n = P\frac{2\sin A}{1+\sin^2 A} \qquad (3)$$

Duchemin's formula has been so well established that its correctness need not be questioned.

Wind Pressure on Cylindrical Surfaces

What is the wind pressure upon a cylindrical surface? Rankine, in his "Applied Mechanics," states, without giving reasons:

> The total pressure of the wind against the side of a cylinder is about one-half of the total pressure against a diametral plane of that cylinder.

Rankine's statement has been accepted without question by many writers, but few of them mention that he regarded 55 lb. per square foot as the correct pressure to be assumed for wind normal to flat surfaces. Most engineers think this figure excessive.

Spofford, in "The Theory of Structures," treats a cylinder as an infinite series of tangential planes, as did Fanning before him in "Water-Supply Engineering." He assumes that the intensity of wind pressure upon inclined surfaces varies as the square of the sine of the angle of incidence, and integrating between limits $-\frac{\pi}{2}$ and $+\frac{\pi}{2}$ he determines the pressure on a cylinder to be equal to two-thirds that on a plane, at right angles to the direction of the wind, whose area is the height of the cylinder multiplied by its diameter.

Both Fanning (who deduced the factor one-half in place of two-thirds) and Spofford are wrong in their underlying thought. As far as the summed effect of wind pressure is concerned the cylinder is not an infinite series of tangential planes. Incidentally, the Duchemin formula, when P_h equals the component of P_n parallel to the direction of the wind, becomes

$$P_h = P\frac{2\sin^2 A}{1+\sin^2 A}.$$

Integrating this equation between the limits $-\frac{1}{2}\pi$ and $+\frac{1}{2}\pi$ makes $P_h = 0.91\,P$, or, the wind pressure on a cylinder is equal to 0.91 that on a plane diametrical section, a result disproved by experiment. Moreover, it has long been demonstrated that the theory of the square of the sine of the angle of incidence is false; if it were true for slight inclinations, aviation would be impossible.

In Eiffel's "La Résistance de L'Air" and in the German "Hütte," values of the ratio of P_h to P are quoted from 0.45 to 0.785. Most German engineers use two-thirds. American specifications variously use values of one-half, six-tenths and two-thirds.

Loenig, in "Military Aëroplanes," is to be commended for giving k for all forms of profile instead of expressing their air resistance as a percentage of the resistance of a flat square normal surface under the same conditions. For cylinders with axis at right angles to the direction of the wind and one diameter long he gives k a value of 0.00092; four diameters long, 0.0017; seven diameters long, 0.002; 35 diameters long, 0.0025.

After considering the available data on the subject, the writer recommends that wind pressure on cylinders be determined by the formula

$$p = 0.0025\,V^2 \qquad (4)$$

in which p is the pressure in pounds per square foot of projected area (diameter multiplied by height) and V is the wind velocity in miles per hour. The velocity of wind increases with the height, but no satisfactory law stating this relation has yet been formulated.

Self-Supporting Steel Stacks

A common case of wind pressure on cylindrical surfaces is that of self-supporting steel stacks. The wind effect is the dominating factor in their design.

Wind velocities vary greatly. At Mobile, Ala., along the Gulf coast, the highest velocities recorded by the United States Weather Bureau in the year 1916 were 107 and 115 miles per hour. At Anniston, in the interior of the state, 250 miles distant, the highest velocity recorded during the same year was 32 miles per hour. The highest velocity in New York City during the period 1884-1917 inclusive was 96 miles per hour.

However, the recorded velocity is not the actual velocity. A recorded velocity of 90 miles per hour means, according to the United States Weather Bureau reduction formula, an actual velocity of 69.2; a recorded velocity of 100 miles per hour means an actual velocity of 76.1. But, as Bixby says in his monograph on wind pressure, reprinted in *Engineering News* of Mar. 14, 1895, p. 175:

> It is to be remembered that all high wind velocities may be subject to repeated oscillations of from 30 to 40% each way from the average at half-minute intervals for several minutes, and sometimes even to an increase of 60% for

nearly a whole minute; so that it is not unreasonable to assume the velocities of occasional gusts to be as high as those given by the records of the ordinary cup rotary anemometer.

Oscillations may be started easily in stacks and chimneys, though the wind pulses are relatively slow.

Wind velocities of 90 and 100 miles per hour correspond, by formula (4), to pressure intensities of 20 and 25 lb. per square foot, respectively. In his own specifications the writer requires:

> Circular steel stacks and tanks shall be designed to resist a wind pressure of not less than 20 lb. per square foot of projected area; that is, the diameter multiplied by the height.

For stacks of great height and in locations exposed to exceptionally high winds, 25 lb. should be used. This was done in the design of the largest self-supporting steel stack in the world—that at the plant of the United Verde Copper Co., Clarkdale, Ariz. The stack, built by the Chicago Bridge and Iron Works, has a height of 400 ft. and a diameter of 30 feet.

The wind stresses in a cylindrical steel stack may be determined by considering the cylinder above any assumed horizontal plane section as a cantilever beam. If the stack is H feet high above this plane, has an outer diameter of D feet, and is subjected to a pressure of p pounds per square foot of projected area, the bending movement is

$$M = HD \times p \times \frac{H}{2} = \frac{H^2 Dp}{2} \qquad (5)$$

from which the stress S in the extreme fiber may be determined by the fundamental formula for flexure, $S = Mc/I$, which is to be applied after multiplying M by 12 so as to reduce to inch-pounds, and with values of the moment of inertia I and distance c from neutral axis to extreme fiber also given in terms of inches. The moment of inertia, I, of the plane section or hollow circle about a diameter is

$$I = \frac{\pi (d^4 - d_1^4)}{64} = \frac{\pi (d^2 + d_1^2)(d + d_1)(d - d_1)}{64} \qquad (6)$$

in which d and d_1 are outer and inner diameters of shell in inches. Then, as $d - d_1$ is twice the thickness of shell in inches, and since the shell being thin there is no appreciable error in replacing $d + d_1$ by $2d$ or $4r$, and $d^2 + d_1^2$ by $2d^2$ or $8r^2$, we have $I = \pi r^3 t$, and as $c = r$ we then have $I/c = \pi r^2 t$. Using this value, and taking the bending moment M in foot-pounds, the diameter D in feet, and the shell thickness t in inches, we derive the formula

$$S = 0.106 \frac{M}{D^2 t} \qquad (7)$$

and the bending stress for each circumferential inch is

$$St = 0.106 \frac{M}{D^2} \qquad (8)$$

To this bending stress should be added the weight of the stack per circumferential inch, W/12πD, to obtain the total compressive stress (subtract for tensile stress). However, unless the masonry lining is carried by the shell this weight item is neglibible.

Tension is usually the governing factor with respect to plate thickness. The efficiency of horizontal riveted joints in regard to net section of plates ranges from 65 to 85%. For rivet shear and bearing the compressive stress governs.

Stacks are built for durability as well as strength, and to secure this many engineers use low working stresses. If the usual working stresses were followed plates would often be thin and rivets far apart. The writer recommends working stresses of 12,000 lb. per square inch net tension and 10,000 lb. per square inch gross compression. To the thicknesses of plate thus found he would add not less than $\frac{1}{16}$ in. for corrosion but would use no plate less than $\frac{3}{16}$ in. (preferably $\frac{1}{4}$ in.) thick.

The total horizontal shear on any section is HD_p. The maximum unit horizontal shear occurs at a point on the circumference 90° distant from the point of maximum tension or compression from bending moment. At the point of maximum moment in any horizontal section the unit horizontal shear is zero, and vice versa. Therefore, the maximum in the case of either stress is not increased by the other kind of stress.

A possibility that should not be overlooked in designing steel stacks is the collapse of the shell during windstorms. In stacks of only a few feet diameter this possibility is quite remote, but those of large diameter may require special provision to guard against it. The case is similar to that of empty standpipes, considered later.

Anchor Bolts—Fully a dozen methods have been proposed for determining stresses in anchor bolts. Textbooks differ widely on the subject. The problem is not one of pure mathematics, as the solution depends upon the physical conditions of the stack, base and bolts.[1] The most severe condition is when the bolts are screwed up with a high initial tension. The anchor-bolt ring may then be considered a ring of the cylinder and, in accordance with eq. (8), the maximum uplift per circumferential inch is $\frac{0.106\ M}{D^2}$, M being the bending moment in foot-pounds at the base of the stack from wind and $D = 2R$, the diameter in feet of the anchor-bolt ring. If b be the circumferential distance in inches between anchor bolts the maximum wind stress, S_w, in each anchor bolt is

$$\frac{0.106\ bM}{(2R)^2} \qquad (9)$$

From eq. (9) should be deducted the weight of that portion of the stack between adjacent anchor bolts, W/N, W being the total weight of the stack and N the number of anchor bolts. Therefore the maximum tensile stress in any anchor bolt may be expressed by

$$S_a = \frac{0.106\ bM}{2R^2} - \frac{W}{N} \qquad (10)$$

Since $b = 2R \times 12 \times \pi/N$, eq. (10) reduces to the simple form,

$$S_a = \frac{2M}{RN} - \frac{W}{N} \qquad (11)$$

In accordance with the previous notation M is in foot-pounds and R in feet, but the equation is true for M in inch-pounds if R is in inches.

With the above rather severe assumption of physical conditions in determining anchor-bolt stress, the tensile working stress may be taken at 18,000 lb. per square inch net section, from which the diameter of the bolt is easily obtained.

High Brick Chimneys—The brick chimney built by the Alphons Custodis Chimney Construction Co. for the

[1] See an able editorial discussion following an article, "Anchor Bolt Tension," in *Engineering News* of Apr. 30, 1914, p. 956.

Boston & Montana Consolidated Copper & Silver Mining Co. at Great Falls, Mont., in 1908, was for a time the highest chimney in the world. It is 506 ft. high above its foundation, and the inside diameter at the top is 50 ft. The cylindrical portion was designed to resist a wind pressure of 33½ lb. per square foot of projected area. The height of the chimney, its altitude above sea level and the severe winds prevalent in the region determined the choice of this unusual wind pressure. For a detailed description of this chimney, with calculation of wind stresses, see *Engineering Record* of Nov. 28, 1908, p. 600.

A taller chimney, 572 ft. 10 in. high and 25 ft. inside diameter at the top, was built by the Custodis company in 1917 at Tacoma, Wash., for the Tacoma Smelting Co. In 1918 the same company completed the present record chimney of the world at Anaconda, Mont., for the Anaconda Copper Co. This chimney is 585 ft. 1½ in. high above grade and 60 ft. in inside diameter at top. The same wind data were used for the Tacoma and Anaconda chimneys as for the Great Falls chimney.

Oscillations of Saganoseki Chimney

The reinforced-concrete chimney, 570 ft. high and 26 ft. 3 in. inside diameter at top, built in 1916 by the Weber Chimney Co. for a smelter plant at Saganoseki, Japan, held for a time the record as being the world's highest chimney. The design included provision for earthquake stresses as well as stresses due to wind. In determining the latter the wind pressure was assumed at 25 lb. per square foot of projected area.

Some observations made by Professor Omori on the movement of the top of this chimney when subject to wind pressure are worthy of note. (See "Vibration of Reinforced-Concrete Chimneys," by F. Omori, "Bulletin" of the Imperial Earthquake Investigations Committee, Vol. 9, No. 1, Tokyo, March, 1918.) During the five days throughout which the observations were continued, wind velocities were recorded ranging from less than one mile per hour to a hurricane velocity of 78 miles. The amplitude of vibration was found not to vary as the square of the velocity, for at a velocity of 50 miles per hour the complete range was less than 1 in., while at 78 miles per hour it was 7.32 in. Strange to say, for the velocity of 78 miles the maximum amplitude was in a direction at right angles to that of the wind. Professor Omori thinks that with the wind gusts of 110 miles an hour which they occasionally have in Japan the amplitude would be at least 15 in. The period of vibration was nearly constant for all velocities, varying only from 2.52 to 2.56 seconds.

An important conclusion reached by Professor Omori was that wind pressure on tall chimneys may be more disastrous in its effects than seismic motion. The observed motion of the Saganoseki chimney indicated a maximum acceleration of 22.2 in./sec.², while the maximum acceleration during the Tokyo earthquake of June 20, 1894, was 17.5 in./sec.². In his summary, Professor Omori says: "It thus appears that in a locality where the earthquake motion is not very violent and has an acceleration, say, of under 19.7 in./sec.² the effect of the wind pressure on a tall chimney becomes more important than that of seismic motion."

A common method of holding a steel stack in position is by securing guy wires to a band or ring around the stack and anchoring them to footings some distance from its base. By these cables the wind pressure on the stack is carried to the ground. This allows the stack to be built of lighter material than if self-sustaining. Theoretically, the guys should be adjusted so that the horizontal components due to initial tension are the same at all attachments. As the calculations for such adjustments are elaborate and physical conditions uncertain, approximate methods must be employed to determine tensile stresses in the guys.

Guyed Steel Stacks

Christie, in his "Chimney Design," quotes from "Engineering Mechanics" a rule of thumb for finding the diameter of guy wires for steel chimneys, but gives us no hint as to how this rule is obtained. Moreover, in the original article the rule is given as applying to wrought-iron rods. Rods are now seldom used for guys, their place being taken by wire cables. In Marks' "Mechanical Engineers' Handbook," under the subject "Guyed Steel Stacks," the wind pressure is assumed at 25 lb. per square foot of projected area. The author assumes that there are always two sets of three guys, that the guys make an angle of 60° with the vertical, that the wind pressure is 25 lb., and that the stress is equally divided among the guys. He further allows for an initial stress equal to half the wind stress. The resulting equation is very limited in its application. Guys are seldom placed at an angle of 60° with the vertical, and the stress may not be divided equally among the guys.

For stacks guyed with either three or four cables in a set the writer recommends the following method for determining the maximum tension in the guys:

Let D be the diameter and L the height of the stack, in feet; H_1, H_2, H_3, etc., the points of attachment of the guys; h_1, h_2, h_3, etc., the heights of these points; and A_1, A_2, A_3, etc., the angles which the guys make with the vertical. At 20 lb., the wind pressure between any two points of support, as H_2 and H_1, is $20\,D(h_2 - h_1)$. The horizontal reaction from this pressure is assumed to be $\frac{6}{10} \times 20\,D(h_2 - h_1)$ at each attachment. The factor $\frac{6}{10}$ is used instead of $\frac{1}{2}$ because the guys are liable to be unequally adjusted, thus bringing on one wire more than its share of pull.

The horizontal reaction at the upper point of support is the entire pressure above that point plus the $\frac{6}{10}$ pressure between that point and the nearest support below. These horizontal reactions multiplied by the cosecants of the respective angles made by the guys with the vertical gives the stresses in the guys due to the wind. To these values should be added the initial tension; from 2500 lb. for ½-in. cable to 5000 lb. for ⅞-in. cable is considered ample for initial tension.

The vertical components of the tensile stresses in the guys (consideration being given to eccentricity of connections) should be added to the weight of the stack for the total direct compression stress.

Bending stresses due to wind pressure may be determined by considering the stack as a series of uniformly loaded beams supported at the guy bands and base of the stack. The bending stress in any section may be determined by eq. (7), $S = 0.106\,M/D^2t$. The maximum value of M (except for the upper section when it is a cantilever) is $M = \frac{1}{8}pD(\frac{9}{8}h)^2$, in which h = distance in feet between supports of the section considered. The distance h between points of support is increased 20% for the reason given above in using

the factor $\frac{6}{10}$ instead of $\frac{1}{2}$ to get horizontal reactions.

The "Standard Dictionary" defines a standpipe as a tower-like pipe at a reservoir, or other source of water, into which the water is pumped to give it a head. Its height in most cases is considerably greater than its diameter; it has a flat bottom and rests directly on its foundation. The governing factor in the design of standpipes is the internal pressure of the water. But wind stresses should not be neglected.

Standpipes have largely ceased to be used as a part of the water-supply equipment of municipalities. Unless the location is sufficiently elevated for a standpipe of large diameter and shallow depth, it has been found that for the same cost more water can be stored at an effective height by a water tower than by a standpipe. A lengthy record of failures of standpipes of the old type, mostly due to faulty design, has created a feeling of distrust. As long ago as 1895, in his book, "Stand-Pipe Accidents and Failures," Professor Pence discussed 45 failures. Several of these were caused by wind, either the anchor bolts gave way or the shell collapsed when the tank was empty.

In reference to collapsing of the shell the Birch-Nord "General Specifications for Standpipes, Tanks and Towers"[2] has a clause:

"On large tanks, circular stiffening angles shall be provided in order to prevent the tank plates from buckling during windstorms. The distance between the angles shall be determined by the formula:

$$d = V\ t\frac{900}{D}$$

where d = approximate distance between angles, in feet; t = thickness of tank plates, in inches; D = diameter of tank, in feet."

The minimum thickness of plates forming the sides is specified as $\frac{1}{4}$ inch.

Water tanks of large diameter are often stiffened at the top by a lattice-girder ring.

Wynkoop Kiersted, in a paper read many years ago before the Rensselaer Society of Engineers[3] recommended as an approximation that the steel plate be regarded as a thin beam having a span of one-half the tank diameter, and loaded by the wind pressure. This method gives thicknesses greater than those used in ordinary practice. If the wind pressure be assumed as 20 lb. per square foot and the efficiency of a riveted joint as $\frac{5}{8}$ of the solid plate, so that the effective working stress is $\frac{5}{8}$ of 16,000 or 10,000 lb. per square inch, the required thickness of the plate in inches equals $\frac{1}{10}$ (nearly) of the tank diameter in feet. That is, for a tank of 25-ft. diameter the minimum thickness of shell is $\frac{1}{2}$ in. Such a requirement is needlessly severe. It is cheaper to use thinner plates and provide against buckling by means of circular stiffening angles.

Storage Tanks

There is no well defined line between the standpipe and the flat-bottom storage tank. When water is stored the terms are often used interchangeably. When oil, molasses or other liquids are stored the term "storage tank" is used exclusively.

As storage tanks are usually of comparatively low height and large diameter, it is permissible to assume a less wind pressure than for stacks and tanks of considerable height. For tanks resting on their own foundations, not more than 25 ft. high, and of diameter not less than one-half the height, a wind pressure of 15 lb. per square foot on the projected vertical area is ample.

[2] "Transactions," Am. Soc. C. E., Vol. LXIV, pp. 526-566, September, 1909.
[3] *Engineering Record*, Vol. XXIII, p. 366, May 2, 1891.

Arrangement of Equipment in Engineer's Office

Adjustable Table, Lights and Dictionary Stand—Special Cases to Protect Instruments—Generally Neat Appearance

By Hiram P. Farrow
Civil Engineer, Belfast, Me.

A set of photographs of my office which were recently taken are shown herewith. They may possibly be a basis of suggestion to some members of the profession. Taking them in their serial order, they afford a very good panorama of the inside of the room. No. 1 shows the case for field instruments, two transits and one level. It will be noticed that the base under the level is raised so that the level is above and projects over the transits, thus permitting the use of a much narrower case.

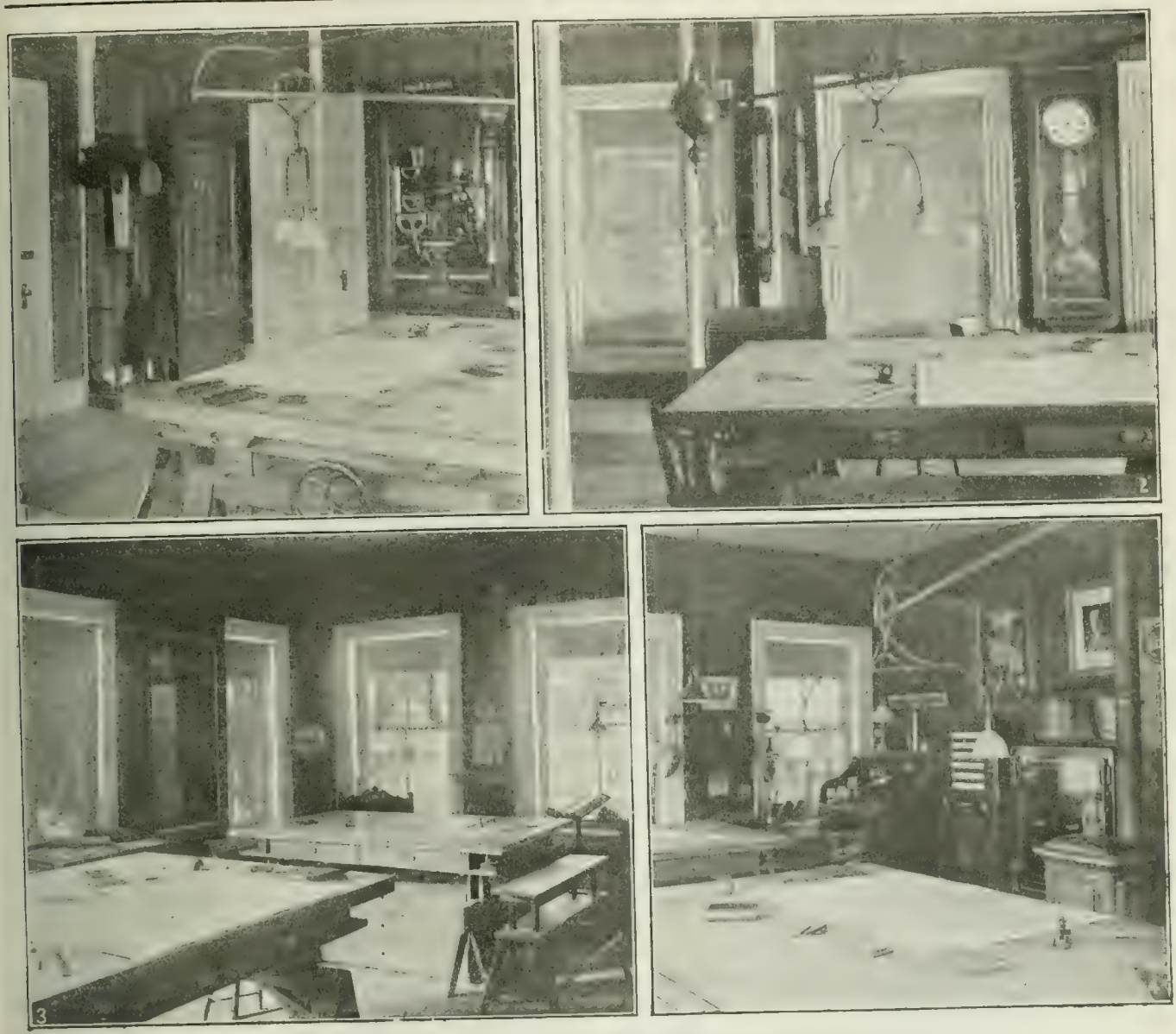
The case is joined together with lagbolts, which make a cheap, neat and solid fastening. This makes a convenient and effective protection for the instruments. This illustration also shows a showcase with glass front (formerly used for a banner) wherein are placed the table instruments. They are easily placed out of the way, always in sight and free as possible from damage. There is also shown the arrangement for changing the height of the table.

The fact that the clock case and thermometer as shown in No. 2 were home-made is of no special interest, but this picture gives the best idea of the adjustable lighting apparatus as designed and built by the writer. The crane adjusts for different heights by sliding up or down on the rod seen attached to the post, being balanced by the ball counterweight as shown (formerly the central part of a chandelier). The track or arm of the crane is of carriage-tire steel, and the swivel under the ball carriage is made of two double-light wall gas fixtures. Note that it carries two lights, thus eliminating shadow. If it is wished to change the distance between the lamps, it can be done easily by sliding the tubes in their sockets under the swivel.

As mentioned above, the lights are immediately adjustable as to height as the counterweight holds them at any point, and by means of the swinging crane, sliding carriage and swivel support the light can be brought to any point by a touch without anything resting or dragging upon the work.

The advisabilty of procuring a patent has been suggested to the writer, but he prefers giving the benefit of it to such members of the profession as may choose to avail themselves of the idea. He should not object, however, should they choose to recognize him by calling it by his name.

In No. 3 are shown the globe in the corner with its support—which is adjustable for height without effort—the little wall shelf to which is permanently attached



VIEWS OF ARRANGEMENT OF ENGINEERING OFFICE

1. Instrument cases drafting table and lighting arrangement; 2, counterweights for raising and lowering light, at left; 3, view of office from different angle; 4 clerical section of office

the paper fastening apparatus, the device arranged from a gas fixture for suspending the hanging light at other points where needed, the substitute for the usual high stool—by means of which one can change his position at work without getting down and which is easily changed as to height—and also the dictionary holder devised and built by the writer, using the top of the holder now in common use. It need not be told what an abomination the ordinary stand is about the floor, the height being such that it is never convenient for use when one is either standing or sitting, likely to be upset and always in the way of cleaning. As here shown it is supported by an iron pipe with an elbow and a flange at the bottom secured to the baseboard by lag-screws. As shown, it is drawn down to be used by a person in a sitting position, and it is balanced by the counterweight which, by means of the gears, does its work on the same side as the load, thus permitting the placing of the apparatus close to the wall; this could not be done were the counterweight on the end of a simple lever opposite the book. No. 4 shows the holder erect for use when one is standing, and shows also the cabinet for typewriter papers over the machine, also the cabinet for legal blanks, with drawers for card index.

If any of the readers of *Engineering News-Record* can obtain useful hints from the above I shall be repaid.

Light Railway Benefits Arabian Port

One of war's benefits to Arabia has been the completion of a narrow-gage railway, approximately 30 miles in length, from Aden, the seaport of Arabia, to Lahej capital of the Abdali tribe in southwest Arabia. The first eight miles were built in 1915 as a supply route for British forces operating against the Turks in that region. The remainder is an after-the-armistice development. All work was done by the Royal Engineers With the completion of the line to Lahej, its extension to the Yemen plateau, 200 miles north of Aden, where the world's supply of Mocha coffee is grown, becomes a matter of serious discussion, according to *Commerce Reports* of Aug. 14.

Plan to Finance Federal Purchase of Railroads

By Gustav Lindenthal
Consulting Engineer, New York

(Part of a letter addressed to Senator Albert B. Cummins, hairman of the Senate Committee on Interstate Commerce.)

YOUR plan for restoring the railroads to private ownership appears to offer on the whole the wisest and most practical method so far mentioned, but strong political forces and sentiment that cannot be ignored are clamoring for Government ownership of railroads and of public utilities, not so much, perhaps, because of any expected improvement in service over the best we now have, or cheapening of rates, but (as the formula runs) to remove such properties from the field of exploitation by private capital. There is evidence from day to day that this demand will become more insistent and if disregarded may lead to injustice in legislation, perhaps even to confiscation of property.

Therefore I suggest certain modifications of your plan, having for their object the gradual acquisition of all railroads in the United States through amortization. This latter is of course not a new idea except as to some details.

Bonds To Be Issued

Tax-Free Convertible Government Bonds—Create a sinking fund nucleus of $500,000,000 by gradual sale, as needed, of 3% tax-free 10-year convertible bonds at par (this is the same as selling bonds of 4½% interest with income tax of 33⅓% deducted). Such bonds will be very readily taken for reasons given below. The proceeds (or the bonds themselves) to be used for the gradual buying up in *the open market* of railroad securities, stocks and bonds. The interest and dividends from them to be used for interest on the Government bonds and the balance of income to be added to the sinking fund.

Improvements Financed by Government—As the railroads need about $1,000,000,000 annually for several years, to pay for necessary improvements and additions (especially for modern labor-saving terminals in which all railroads are deficient), the Government to make loans to the several railroads (or groups of railroads respectively) also in the form of 3% tax-free 10-year convertible bonds at par, but *only after* such improvements from time to time have been made. Their actual cost, including the legitimate item of higher interest which the railroad companies may have to pay for credit during construction, will then be accurately known in each instance from the accounts. Thus the bonds will be issued for *actual value produced.*

Avoiding Valuation

Securities Bought in Open Market—The railroads to be allowed to earn a surplus of at least ½% above the requirements for dividends and interest, including that on said tax-free 3% Government bonds. This surplus to be added to the sinking fund.

[In explanation of the term "requirements for dividends," Mr. Lindenthal informs us that this refers to the normal pre-war rates, not those of the best years nor those of the worst years. The "three-year test period" rates selected by Mr. McAdoo would determine them. Individual adjustments of these three-year rates would be necessary in order to deal fairly with all roads, and these would need to be fixed by separate study of particular cases. During the three-year test period some railroads were paying dividends less than their surplus earnings, and put the difference into betterments. Other roads were disbursing more than their surplus earnings. The plan is to maintain the earned pre-war surplus rather than the dividend rate that may have been fixed more or less by the company management; this with a view to avoiding any disturbance of the relative position of the several roads, and with a view to giving justice to the stockholder.—Editor.]

By buying in the open market, or if necessary through advertising for offers in the usual way, no one is wronged. Valuation of railroad property for that purpose is unnecessary and futile. It cannot be properly done on any basis that would be accepted as just by all the parties affected. For one thing, the money standard (the gold dollar) in which all valuations must be expressed is not a stable standard of value. Its purchasing power of labor, credit, material, land, etc., has differed very materially from one period to another during the 90-year era of railroad construction.

Before 1880 a dollar purchased 10 hours of common labor. In 1910 six hours. In 1918 only two hours. Take a recent instance: The construction work finished on the Pennsylvania R.R. two years ago costing $150,000,000 would cost at present prices over $300,000,000. The cost of cash capital (interest thereon) also varied greatly during the era of railroad construction, running from 10 to 20% and even much higher in emergencies.

Therefore, valuation of railroad property means in most cases controversy leading to long litigation, whereas there can be hardly any dispute over what the going market value is. It is at least the fairest method of compensation as far as the individual present holder of a railroad security is concerned, and it is he who has, like any other owner of property paid for, a primary right to be considered.

The railroad builders and the people, through its legislatures, in the past and gone generations, had at least equal responsibility for any shortcomings in the development of our railroad systems. They should therefore not be visited upon the present generation—upon the innocent investor, who put his savings in good faith in railroad securities and who has a right to expect that he will not be robbed of them through unjust legislation. On the other hand, the investor has no good reason to complain when he gets the price set in the open market; provided, of course, that it has not been impaired by unjust Government action nor manipulated by dishonest corporate management.

One of the great defects in the past was the granting of perpetual franchises. It was overlooked, or rather not understood by legislators unversed in national economics, that it might lead to the feudalization of railroad property, with all the attendant evils. This can be best corrected and abolished through amortization.

Rates Adjusted Annually—The transportation rates of the respective railroads should be adjusted each year on the equitable principle that as wages increase or decrease plus taxes, rentals, and other items of expenditures, so the rates shall also increase or decrease in like proportion. If the resulting net revenue applicable to dividends and interest plus the surplus (entirely applicable to amortization) is greater than

needed, then let the rates be either correspondingly reduced or let the surplus go in the sinking fund for faster amortization. This is a matter of administration policy, to be determined from year to year. A guarantee of net income under such just conditions is not necessary. The Government will get the benefit of any surplus and not the investor. That question, whether the railroads with ample income should support those with insufficient income, could be solved by amortizing, buying up first the weak railroads at market values.

Regulation

Each railroad should ascertain on that equitable principle its own rates and submit them at stated times with an analysis to the Interstate Service Commission for scrutiny and approval. That should not require more than a month's time. There has been much complaint of the unjustified delays in dealings with Governmental bodies and authorities. Long-drawn-out hearings on trivialities are a great and unnecessary waste of time and money, and a nuisance. They cloak imcompetence and unfitness in executive and administrative work. The railroads as well as the public should be protected against that abuse by a law requiring decision within one month after submission, or, failing that, to have permission to go ahead pending adjustment.

The present Federal regulative apparatus of the Interstate Commission might be retained during amortization—not because it could not be much improved, but to avoid confusion. In regard to state railroad commissions, the rule might be adopted that their orders and decisions shall be valid only when approved by a Federal court after examination of their bearing upon interstate commerce which must not be impaired by them.

The creation of new agencies would entail new regulations and much delay. Let us get along on present lines with a minimum of new legislation. Among these should be the repeal of clauses prohibiting pooling and combinations of railroads for purpose of economical administration.

Railroad Taxation—Through amortization as above indicated, the Government will acquire all railroads free from debt and without cost in less than 45 years. This gives plenty of time for evolution into a new order of things, and for the formation of a truly *national transportation system on land and water and in the air*, under a Secretary of Transportation who should be a cabinet officer. During this time, and also after amortization when title shall have passed to the Government, the railroads shall continue to pay all taxes, Federal, state and municipal. They form an indispensable income to the respective localities. The rates for transportation shall not be reduced after amortization. It would be an unwise policy of no benefit to the country at large. Let the entire net income ordinarily used for dividends and interest go into the United States Treasury toward reduction of general taxation. Freedom from taxes and the reduction of established rates after amortization would benefit comparatively only the noisy few—the shippers, at the expense of the masses. It is the whole people, the general taxpaying public, that should be considered and benefited.

It would be equally wrong and inequitable to distribute net earnings, as has been suggested by labor interests, among employees as a largess above their regular compensation. *The national property should be for the benefit of the whole people and not for any particular class, be it capitalist or wage-earner.*

Management

Present Boards of Directors to Manage—The management of the several railroads, or of the groups of railroads that would naturally form, if let alone, by gradual accretion, should remain during and after amortization in the boards of directors. The directors become simply trustees of the Government. It would be a wise provision to have them after amortization nominated by local chambers of commerce from among experienced railroad managers and local business men. The nominations should be acted upon, rejected or affirmed, by the Interstate Commerce Commission or by a Secretary of Transportation.

Directors thus appointed should serve for, say, three years, not so much for the salary, which should be adequate, but for the honor of the position. Being under the scrutiny of the Government and also of local bodies, knowing local conditions and needs, they would be keenly interested in obtaining good, competitive service at low rates and in keeping down general expense and taxation.

Salaries a Percentage of Net—The compensation of all executive officials, from the president of the company down, should be left, as now, to the respective boards of directors, but the aggregate sum of compensation for any railroad group should be fixed at a certain percentage of net earnings, to furnish an incentive to good management.

Justice to Investor—One of the greatest benefits of amortization will be the flowing back of the large yearly sums as new capital that must then find new investment. About thirty thousand millions would thus be set free from railroads alone during the next 45 years to stimulate new enterprises and new construction which will lead to the continuous creation of more wealth and comforts.

Through amortization the investor in railroad securities will be assured that he will get his money back automatically and without tedious costly proceedings. He may be disappointed in perhaps not getting the greater amount that he may have expected from his investment in the certain growth of the railroad business. But he will get no less than what the open market judges his security to be worth.

Operation for Benefit of Nation—The manufacturer finding his costs increasing adds them to his price. The wage earner finding cost of living steadily mounting insists upon and gets higher wages. But the millions of men and women who have invested their savings, either directly or through savings banks and insurance companies, in railroad securities, cannot increase their earnings from their investments. They must practice still greater self-denial to get along with the greatly reduced purchasing power of their fixed income, and be thankful if they are not accused, under the new tenets that are being preached upon property, as robbers who want to fatten upon the land without giving an equivalent. The assailants of corporations overlook that the old and helpless and the young, consuming and not yet producing, members of the community, who are sustained from such invest-

ments, have at least an equal, inalienable right to life with the greedy hunter and agitator for low fares and rates, and the egotistic agitator for higher and higher wages.

Sordid selfishness will be found on both sides of the fence of Government ownership. *National revenue-producing property should be run strictly as a business concern. The revenue should go to the United States Treasury for the benefit of the whole people, without favors or exceptions to any class.*

Postscript

Since writing the above letter I have received from Judge Lovett, president of the Union Pacific R.R., his paper on railroad reconstruction, of which no doubt you also have a copy. Judge Lovett's good judgment and eminence in the railroad world are so well known that any views from him on railroad affairs command deservedly the highest consideration and respect.

I do not agree with him that Government ownership is beyond discussion and that the public does not want it. I fear and can see the probable evils of Government ownership as well as anyone who wishes for the railroads the highest possible development. Many of his thoughts are excellent, and I see no difficulty in combining them with my plan.

But what the public in the United States wants, the public itself does not as yet know. The question is: To whose arguments and pressure will it yield? Those of labor or those of capital? I am inclined to think that the masses, rightly or wrongly, will go over to the views of the labor leaders. Such has been the tendency for many years, and it has become intensified by the war.

Because having this feeling, I have written you as above and as briefly as the weighty matter permitted. I believe it points to a solution that is just to every interest.

Curve Chart for Railway Resurvey

By J. G. Wetherell

Assistant Engineer, Chicago, Milwaukee & St. Paul Railroad, Chicago

A GRAPH or chart for quickly determining the degree of a curve when the intersection angle and the external are given was devised last winter by the writer for use in the resurvey of the Dubuque division of the Chicago, Milwaukee & St. Paul R.R. This chart, shown in the accompanying drawing, is plotted on standard cross-section paper. The externals are plotted vertically to a scale of 2 in. = 1 ft., making each small division represent 0.05 ft. The intersection angles are plotted horizontally to a scale of 3 in. = one degree, making each small division represent two minutes.

Curves were plotted as shown, extending to 7 ft. for the externals and to 9° for the angles. As a rule, this range covered the requirements, as curves with intersection angles of over 9° could seldom be intersected.

For any angle and external within these limits it is very easy to pick off the corresponding degree, interpolating if necessary between the plotted curves. Charts can be made considerably larger if larger sizes are desired.

On this resurvey work the alignment party consisted of an instrument man, a rodman and two chainmen, all of whom were fast workers. The best day's work in the field was 27 curves, 19 of which were intersected and eight traversed. The Dubuque division follows the west bank of the Mississippi River for 150 miles and is very crooked, on account of the steep bluffs and the course of the river.

Most of the curves, however, are sufficiently flat to allow their tangents to be intersected and their externals measured.

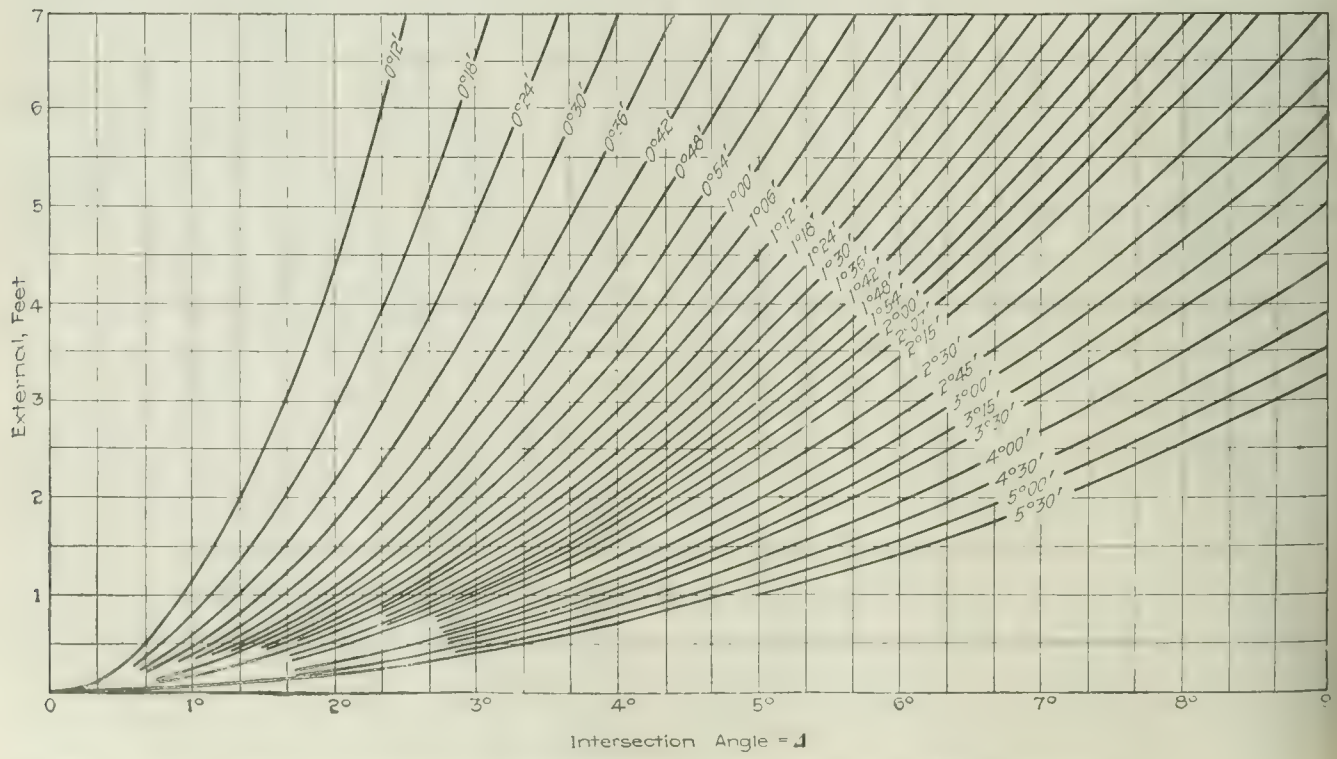


CHART SHOWS DEGREE OF CURVE HAVING GIVEN ANGLE AND EXTERNAL

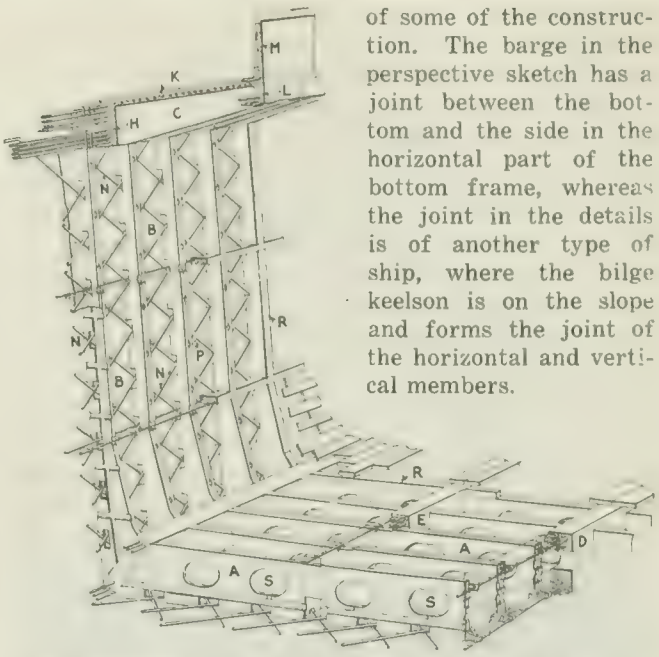
Precast Members Used for British Concrete Barges

Main Transverse Pieces of Trough Shape Forming Cross-Frames and Shell—Longitudinal Members Cast in Place

UNIT construction has been applied extensively to concrete ships in Great Britain, but statements have been made that more concrete ships of this type have been built there than of the cast-in-place type common in American practice, although the British ships are nowhere near as large as the largest of the American vessels. One of the most generally used systems is that originated by Harry C. Ritchie and adopted by a number of companies, most of which are building barges.

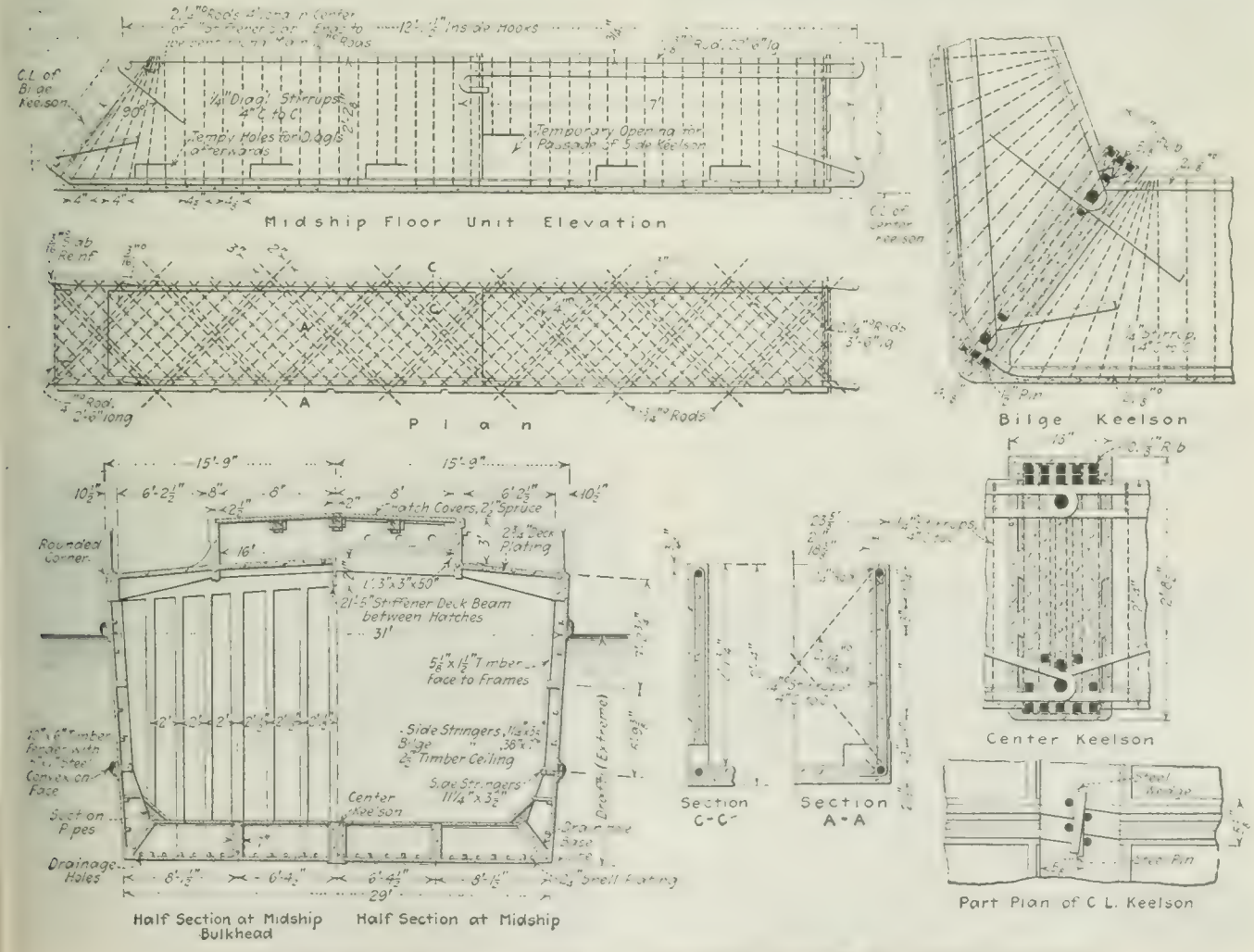
In the Ritchie system, which is described in London *Engineering* for June 27, 1919, the main transverse members are of trough-shape section and the longitudinals are cast in place. In this trough shape the upstanding legs form the cross-frames and the bottom plates the shell of the vessel. A further innovation is the leaving of openings at the bottom of the upstanding legs of the trough, through which are run, after the frames are placed, diagonal rods to form the reinforcement for concrete cross-bracing poured in place.

One of the accompanying drawings shows a perspective of a typical barge and the others the details of some of the construction. The barge in the perspective sketch has a joint between the bottom and the side in the horizontal part of the bottom frame, whereas the joint in the details is of another type of ship, where the bilge keelson is on the slope and forms the joint of the horizontal and vertical members.



PERSPECTIVE SHOWING PRECAST CONCRETE SHIP

The concrete frame units are shown in detail in this particular barge, which is of 1000-ton capacity. The troughs are in four lengths, two on each side and two in the bottom. One of the bottom units is shown in detail. It consists of the trough-shaped member



DETAILS OF SOME MEMBERS OF A PRECAST CONCRETE BARGE OF 1000-TON CAPACITY

about 13 ft. long, with 2⅝-in. walls and bottom, reinforced with longitudinal ¾-in. rods at the corners and with $\frac{3}{16}$-in. diagonal bars in the bottom and ¼-in. vertical stirrups in the sides. At either end the main reinforcing rods are set over in loops, reëntering the concrete, to permit the joining of adjacent frames. The sides and ends of each member, furthermore, are jogged as shown to insure better bond with the adjacent member. Temporary holes are left in the bottom of the sides of the trough, through which the diagonal reinforcing bars of the bottom and side are placed, wire stirrups protruding from the bottom to locate these rods and hold them in place.

The detail of the joint is illustrated by the bilge keelson section and by the center keelson section herewith. The protruding loops of the main reinforcement are placed in line and connected with a short steel pin wedged in, as shown in the plan of the center keelson. The forms are then placed and the longitudinal is poured, bonding the precast member in the jogs provided.

In construction, the bottom units are placed first in position, and the abutting flanges filled with cement grout in the joints provided. The units for the sides of the hull are similarly formed and jointed together. Each bottom unit extends from the bilge to the center keelson, so the two units make up the full span of the bottom. The side units extend from the bilge to the sheer strake, above which are the deck beam units of rectangular section, poured in place. The diagonal rods are then placed and the concrete diagonals poured. By this system that part of the shell of the boat which is exposed to water can always be cast bottom up and finished smooth and tight. It is stated that those vessels already in service have proved tight and seaworthy.

"Compression" Wood and Failure of Factory Roof-Beam

Cause of Sag in Roof Found To Be Yellow-Pine Beam With Wood of Peculiar, Abnormal Growth and Wide Annual Rings

By G. E. Heck
Engineer in Forest Products, Forest Products Laboratory, United States Forest Service, Madison, Wis.

Investigation of sag in the roof of the dry house of the American Car & Foundry Co., Jeffersonville, Ind., revealed a beam which had failed because of the presence of "compression" wood. An examination was made by the Forest Products Laboratory of the United States Forest Service, Madison, Wis., and the results are given in this article. Instances of "compression" wood are somewhat unusual, and this particular case of a Southern yellow-pine beam gave special opportunity for study.

"Compression" Wood—The term "compression" is one that is applied to wood of peculiar abnormal growth which is considerably heavier than normal wood and has much wider annual rings. Figs. 1 and 2 illustrate clearly the variation in timber in which "compression" wood exists. "Compression" wood may be distinguished by the lack of contrast between the spring and summer wood and its relatively darker color. The cause of this abnormal growth is not clearly understood. One theory is that it is caused by leaning of the tree during growth, the "compression" wood being formed on the lower or leaning side. (See article on gyrating tree in the *Literary Digest* of July 26, 1918.)



FIG. 1. CROSS-BREAKS FROM SHRINKAGE OF "COMPRESSION" WOOD

The "compression" wood in this particular beam showed numerous cross-breaks which extended from the middle of the beam to the top. The beam had been in the company's yard for some time before installation and was probably not thoroughly air-dried. When removed from the dry house the beam was 5 x 11 in. x 20 ft. in size, Fig. 3. A 12-ft. section, shipped to the Forest Products Laboratory, was found to have a sag of about 3 in. at the center. Nearly all of the upper half of the beam was "compression" wood.

Results of Tests—Mechanical tests were made on specimens cut from both "compression" wood and normal wood, to determine the difference in the mechanical properties of the two. The number of clear specimens tested was necessarily quite limited, on account of the numerous cross-breaks in the beam. Static bending test specimens were 2 x 2 x 30 in. in size. The specimens for compression parallel to the grain were 2 x 2 x 6 in. Tests were made in accordance with the standard practice for such tests, as outlined

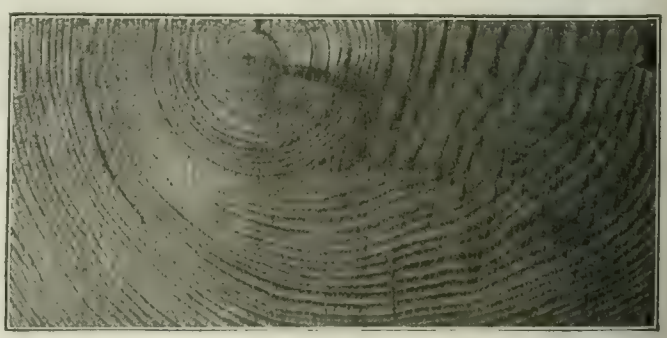


FIG. 2. CROSS-SECTION SHOWS NORMAL AND "COMPRESSION" WOOD

in Circular No. 38 of the United States Forest Service. Longitudinal, tangential and radial shrinkage specimens, 1 x 1 x 4 in. in size, were cut from both the center and end of the beam. The shrinkage from green to oven-dry condition was approximated by soaking

and then oven-drying the specimens, and measuring the shrinkage.

Table I is a summary of the shrinkage determinations from the center end of the original 20-ft. beam.

TABLE I—SHRINKAGE DETERMINATIONS

	Mid-section Per Cent	End-section Per Cent
"Compression" Wood		
Radial	2.15	4.60
Tangential	2.61	6.65
Longitudinal	2.46	0.91
Normal Wood		
Radial	4.63	3.23
Tangential	6.23	5.73
Longitudinal	0.41	0.62

The results of the mechanical tests are given in Table II. It will be noted that all the specimens from "compression" wood tested in static bending were brash, as shown in Fig. 4, while none of those taken from normal wood showed this characteristic. It will also be noted that the "compression" wood was low in all the strength properties measured, with the exception of compression parallel to the grain. The specific gravity of the "compression" wood was considerably higher than that of wood of normal characteristics. This has been found to be the case with all material of this character that the Forest Products Laboratory has examined.

TABLE II COMPARISON OF AVERAGE RESULTS OF MECHANICAL TESTS OF NORMAL AND "COMPRESSION" WOOD

	Normal Wood	"Compression" Wood	Ratio "Compression" to Normal Wood
Static Bending			
Number of tests	11.00	5	...
Specific gravity (oven-dry wt. and vol.)	0.57	0.66	1.16
Moisture, per cent	11.60	12.40	...
Stress at elastic limit, lb. per square inch	8,550	6,520	0.76
Modulus of rupture, lb. per square inch	11,730	9,000	0.77
Modulus of elasticity, lb. per square inch	1,495,000	994,000	0.66
Work to maximum load, in.-lb. per cubic inch	8.20	5.50	0.67
Deflection at maximum load, inches	0.67	0.62	0.93
Compression Parallel to Grain			
Number of tests	10.00	9	...
Specific gravity (oven-dry wt. and vol.)	0.55	0.68	1.24
Moisture, per cent	11.70	10.80	...
Maximum crushing strength, lb. per square inch	7,370	8,100	1.10

Discussion of Results and Conclusions—The longitudinal shrinkage of the "compression" wood was about six times that of the normal wood at the mid-section. At the end-section the shrinkage of the "compression" wood was about 1½ times that of the normal wood. The difference between the radial and tangential shrinkage of the "compression" wood at the end-section more nearly approaches that of normal wood. The greater longitudinal shrinkage of the "compression" wood over that of the normal wood indicates very strongly that this was the primary cause of the large deflection of the beam at the time of removal from the dry house. In the shrinking process, internal stresses were set up which were so large in comparison with any existing in the adjacent normal wood that failures in tension occurred which relieved the internal stresses and formed the breaks across the grain in the "compression" wood.

After these cross-breaks had opened up, most of the upper portion of the beam, composed principally of "compression" wood, became a dead load on the lower half of the beam, the latter being left to carry the roof load as well as the dead load of the beam. The effective depth was also reduced approximately one-half by the failure of the upper half. The greater shrinkage at the mid-section probably accounts for the fact that the cross-breaks in the middle third of the beam were more numerous and closer together than were those nearer the ends, as shown in Fig. 3.

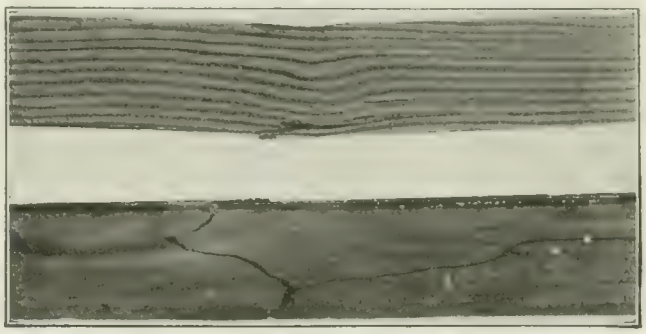


FIG. 4. FAILURES OF SMALL BEAMS; UPPER, "COMPRESSION" WOOD; LOWER, NORMAL WOOD

It should, of course, be recognized that "compression" wood from different trees may have entirely different properties, depending on such factors as conditions of growth and the amount of wood of this character present. Consequently, all timbers containing "compression" wood may not act the same as the one examined. However, timber containing this defect is not to be recommended for use where strength or ability to stay in place is essential.

Timber containing "compression" wood can readily be eliminated by adhering strictly to the specifications for the selection of dense Southern yellow-pine timber, and rejecting material having very wide rings and showing little or no contrast between the spring and the summer wood.

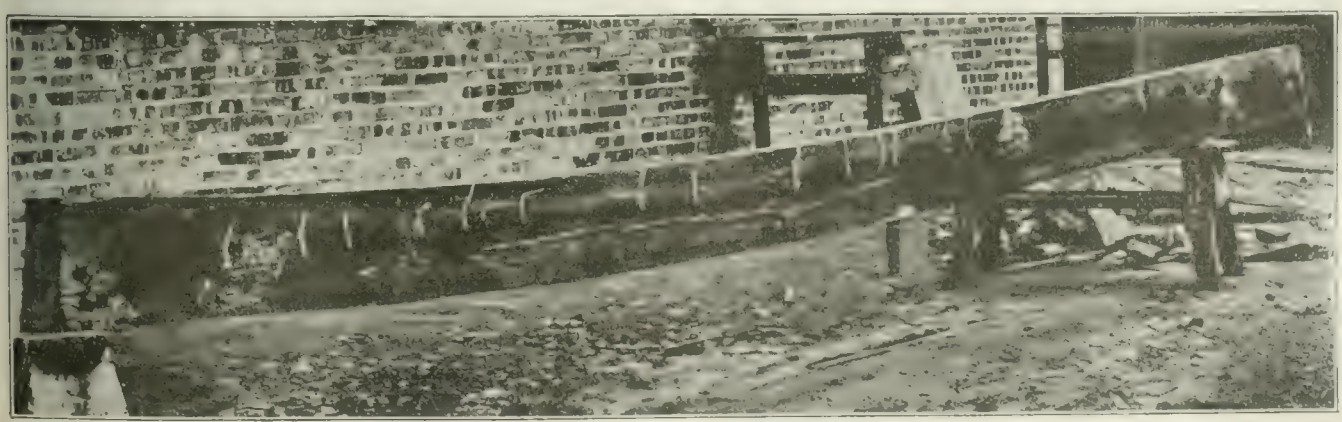


FIG. 3. CROSS-BREAKS IN "COMPRESSION" WOOD OF YELLOW-PINE BEAM

Sewage-Disposal Difficulties at Madison, Wisconsin

Sludge Handling Improved by Hoppers and New Pipe Connections for Flat-Bottom Tanks—History of Plant

MINOR troubles in operating the sewage-disposal plant at Madison, Wis., have followed departures from the original design and have resulted in local opinion charging the plant with inefficient operation and with the pollution of Lake Monona by its effluent, although the laboratory records indicate that the plant is efficient and is not proved to be the cause of odors attributed to such pollution.

This problem is discussed in a report made in June, 1919, by John W. Alvord, consulting engineer, Chicago. On the basis of complaints of the lake odors in 1918, an investigation was made by W. G. Kirchoffer, consulting engineer for the State Board of Health, who reported that the effluent of the sewage-disposal plant was a possible source of pollution and recommended certain changes at the plant. The city then called in Mr. Alvord, who reports that the plant appears to be generally efficient and is operating successfully, and that, in his opinion, it is not a direct cause of lake pollution or odors, but that there are marked odors caused by the present method of sludge disposal by lagooning. He approves of the changes suggested by Mr. Kirchoffer, which will eliminate some of the difficulties in operation and which will make the plant conform to the original recommendations made by Mr. Alvord prior to its construction. As to the chemical efficiency of the plant Mr. Alvord's report states:

"The plant is, generally speaking, in excellent condition, and continuous laboratory tests of the effluent show that it is doing nearly all the work which it was originally intended to do and, with some slight changes for ease in operation, will be one of the notably effective plants in this country in dealing with the sewage of so large a population as that of Madison. I know of no plant of its size in this country which will be found, even now, to be much more satisfactory in its working."

The relation of the plant to the odors from pollution of the lake was dealt with in *Engineering News-Record* of Sept. 4, 1919, page 469. As there stated, the city has engaged the firm of Alvord & Burdick, consulting engineers, to investigate these odors thoroughly.

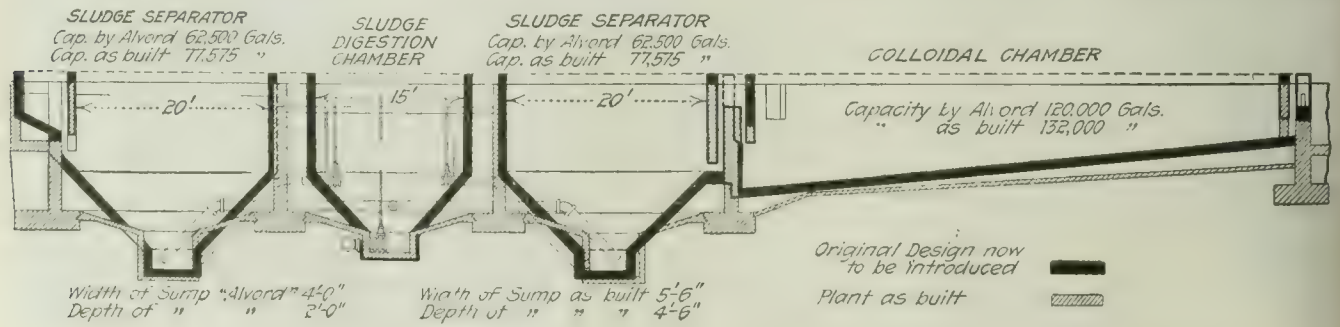
The Madison sewage-disposal plant was designed for a capacity of 5,000,000 gal. of sewage per day, or a population of about 35,000 or 40,000 to be reached in 1930. Its sedimentation tanks were put in service in 1914 and the percolating filter in 1916. Except for some complaints as to odors, no dissatisfaction with the plant was expressed until 1918. There are two rows of sludge-settling tanks with digesting tanks between them. Next come the colloidal chambers, and then the contact dosing chamber, which has a 6-ft. bed of 2- to 3-in. stone. The overflow passes to the siphon chamber of a percolating filter which has a 6-ft. bed of ¾- to 3-in. stone. From this the effluent is discharged into a narrow and shallow moat leading to an outfall sewer which discharges into the Yahara River just above its entrance into the lake.

It is the sludge-handling system necessitated by the present tanks, which are not of hopper shape, that appears to cause the most trouble, as both engineers agree. Other changes from Mr. Alvord's original design, which are noted by Mr. Kirchoffer, are the dosing apparatus, the use of three instead of five filter beds, and the substitution of the moat for a larger and deeper sedimentation basin surrounding the filter. The present method of handling sludge is not that intended by Mr. Alvord in his recommendations made before the plant was built, and he agrees with Mr. Kirchoffer that certain changes should be made to correct the present difficulty and to enable the plant to be operated according to the original intent.

Changes Made in Design

Departures from the design were introduced during construction, largely on account of trouble with deep excavation for tanks in wet soil. In the plan as recommended by Mr. Alvord in 1913 the settling tanks and sludge tanks were to have hopper-shaped bottoms with a slope of 45° ending in a small, shallow sump. As built, the bottom is almost flat and has a large, deep sump. This difference is shown in the accompanying drawing. The present shape prevents complete and frequent removal of the sludge from the separation tanks, with the result that there is a stale accumulation. The sludge pipes were to extend from below the bottom of the settling tank to mid-height of the sludge tank, but as built they lead from above the bottom of the former into the bottom of the latter. Furthermore, the outlets from the colloidal tanks are only 2 ft. above the bottom instead of being 2 ft. below the surface. Mr. Alvord's report states:

"In two instances, at least, the changes have resulted in operating difficulties, particularly in withdrawing the sludge from the separating tanks into the sludge-digestion chamber and keeping the sludge in this chamber at proper level. To overcome these difficulties, the operator has been compelled to withdraw more sludge and disturb the digestive operation more frequently than is really necessary, and liquid sewage as well as sludge has been lagooned on the adjacent land until, about 1918, the land could no longer receive it. Since that time it has developed odors which



SEWAGE SLUDGE TANKS AS PLANNED AND AS BUILT

are objectionable and which have impaired popular confidence in the plant. These difficulties should be corrected promptly. This will result in much less sludge being removed, and only that which is inert and inoffensive. There are already constructed at the plant four small sludge beds which it is believed from experience with the plant at Great Lakes, Ill., will be amply sufficient to take care of the sludge residue, properly handled."

Certain changes are considered vital to proper operation. In the first place, to improve the operation it is recommended that the tanks be provided with hopper bottoms, built inside of the present tanks, so that suspended matter can be removed from the separating chamber without manual labor. In the second place, the pipe connections should be changed so that by the operation of certain valves the sludge can be pumped from any separating chamber to any sludge-digestion chamber. These pipe changes also should provide for draining off the water standing between the top scum and the bottom sludge in the digestion chambers and passing it back into the initial separating chambers, so that the former will be at so low a level as to receive easily sludge or scum from the latter. Another suggestion is the placing of a roof over the sedimentation tanks to confine the inevitable "slight, musty odors" and to prevent cold winds from reducing the temperature of the sewage and thus reducing the activity of bacterial action. These changes should be made at once. Their cost has been estimated by Mr. Alvord and Mr. Parker, city engineer, at about $15,500.

History of Sewage Treatment at Madison

Since the plant in question is the third which Madison has had in 20 years, it may be useful to put on record a summary of the rather varied history of sewage disposal at that city. When the sewerage system was planned in 1886, with discharge into Lakes Mendota and Monona, treatment by chemical precipitation was recommended by Samuel Gray, the consulting engineer. In 1893 McClellan Dodge, city engineer, and other local engineers, were invited by the city to submit plans for diverting the sewage from the lakes and treating it by the above process. In 1894 George E. Waring, consulting engineer, recommended treatment by broad irrigation. In 1895 the city council adopted a plan for chemical precipitation and sand filtration of the effluent, as submitted by Mr. Dodge and Mr. Nader, but nothing was done toward carrying it into effect. In 1897, a committee appointed by the council and including Prof. F. E. Turneaure, of the engineering department of the University of Wisconsin, reported in favor of a filtration plant at a cost of $55,000 to $60,000, as noted in *Engineering News* of Sept. 2, 1897, p. 149.

A proposition for a plant operating on the patented International process was submitted in 1898 by the American Sanitary Engineering Co., which owned the patent rights for the United States. Although this process had not been applied in this country, the city adopted the plan, but required that the effluent should be equal in quality to the water of Lake Mendota. It also appears to have insisted on supplying the machinery equipment, which action led to future controversy as to responsibility for defective operation. The plant was in continuous operation in June, 1899, and was described fully in *Engineering News* of Dec. 28, 1899, p. 411. Lime (instead of ferrozone as intended) was used for the precipitant, and polarite for part of the filtering material. The company could not meet the requirement as to effluent, and after complaints as to cost and defects of operation the plant was abandoned Jan. 12, 1900, without notice to the city. On the same day Mr. Dodge and Mr. Nader, as engineers for the city, reported that defects had not been remedied as ordered. The city then adopted a resolution to the effect that the plant was not satisfactory and had not been built and operated according to the terms of the contract, but it took over the operation to prevent serious consequence. This chapter ended with abandonment of the plant by the city in January, 1902, and a suit against the company for $25,000, which the city recovered after years of litigation.

During the period of controversy, in 1900, Professor Turneaure, who had been made city engineer, advised that the plant should not be accepted and that it should be remodeled to comprise septic tanks and filter beds. This procedure was not followed, but plans submitted by him for a new plant were adopted in January, 1901, and the plant was completed late in that year. It included two septic tanks, an intermediate receiving chamber and then a set of cinder filter beds, as described in *Engineering News* of Oct. 17, 1901, p. 286.

Third Plant on Larger Scale

The capacity of this 1901 plant, however, was reached in 1903, while in 1911 it was handling twice the quantity of sewage for which it was designed, according to an article in *Engineering News* of Feb. 15, 1912, p. 289. The site was too small to permit of enlarging the plant, and as the city was being built up around it there were complaints of odors. A new plant was decided upon, therefore, in 1912, to be located in the northeastern part of the city and discharge the effluent into Lake Monona. The new force main and intercepting sewers in connection with the plant were described in *Engineering News* of April 13, 1916, p. 694.

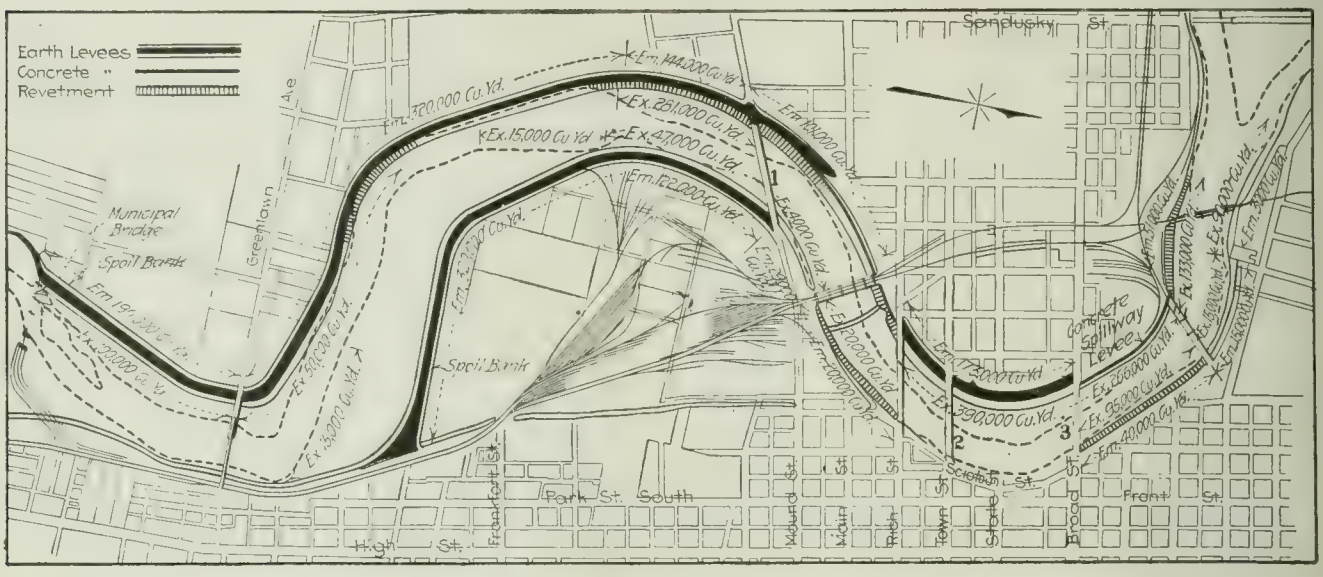
This third plant was designed originally by John F. Icke, then city engineer, and was similar to the second plant but on a larger scale and without the intermediate receiving chamber. The septic tank was to have five compartments, with a combined capacity of 2,000,000 gal. and the filter beds were to cover an area of nearly three acres. In 1912 E. E. Parker became city engineer and in 1913 he invited John W. Alvord, consulting engineer, Chicago, to examine and report on the plans. Mr. Alvord's report was made in May, 1913, and recommended several important changes. Some of these were not carried out, however, largely on account of construction difficulties, as noted above, but it is now recommended that changes be introduced.

In order to carry out the recommendations of Mr. Alvord and Mr. Kirchoffer, an ordinance is being prepared to authorize the issue of $20,000 in bonds for these alterations to the plant. These will include rebuilding the sludge and digesting tanks with hopper bottoms; rearranging the pipe system so that only inert sludge will be deposited on the sludge beds and the deposit of sludge on the surrounding marsh land will be unnecessary; constructing a well to collect the septic liquor from the sludge; installing an electrically operated sludge pump, and building a roof over the settling tanks. It has been decided also, as noted above, to have thorough investigation made into the cause of the odors from Lake Monona.

Widened Channel Reduces Flood Hazard at Columbus

Scioto River Set Between Earth Levees 580 Feet Apart — Over 200 Structures Wrecked for New $3,500,000 Floodway

FLOOD protection for Columbus, Ohio, was planned to fit an appropriation of $3,500,000. Channel widening and rectification and bridge construction were all that the sum permitted. Full safety from such maximum floods as of March, 1913, will not be secured. That flood measured 140,000 cu.ft. per second. The safe capacity of the planned channel is 100,000 sec.-ft. and the ultimate or calamity capacity is 125,000 sec.-ft. Very great and rare floods exceeding 125,000 sec.-ft. will escape from the channel. From all smaller floods the city will be fully protected. To reduce damage from overflow when it becomes inevitable, a spillway levee wall will deflect some 10,000 sec.-ft. to a path which endangers a minimum of property and life.



WIDENED AND RECTIFIED RIVER CHANNEL PROVIDES FLOODWAY AT COLUMBUS

This flood protection work now in progress is wholly a city enterprise, except as it involves participation, by agreement, of the county and of certain railways, in the nature of bridge extensions to accommodate the widened river. Other plans involving a conservancy district organization and a comprehensive scheme of flood protection for the Scioto River valley had received prior consideration, and the development of these plans to failure has been reported in *Engineering News* of Sept. 25, 1913, p. 631; Mar. 16, 1916, p. 490; Nov. 30, 1916, p. 1055; Jan. 4, 1917, p. 39, and Feb. 1, 1917, p. 205. Definite action on the present plan was taken by the Columbus City Council early in 1917 following a popular vote at the November, 1916, elections in favor of a $3,500,000 bond issue. Engineering studies were ordered by the council and one of these, outlining plans estimated to cost slightly under the amount of the bond issue, was adopted as a working scheme and the city's engineers were instructed to complete the plans and proceed with construction. Contracts were awarded late in 1917 and early in 1918. As a city enterprise the work is being directed by the Department of Public Service, Henry Maetzel, chief engineer, and R. H. Simpson, the engineer in charge of channel improvements.

At Columbus, the Scioto River takes a tortuous channel from north to south. The problem was to make the largest capacity flood channel of this crooked stream which could be created for $3,500,000, including land damages and all changes of existing structures. The preliminary studies had indicated that for the sum aavilable a minimum channel 580 ft. wide could be constructed by excavation and levees from the confluence of the two rivers at the north to a point a little south of the Mound St. bridge, and that south of this point ample floodway could be secured by a moderate amount of excavation and by levee construction and enlargement. In this floodway, excavation is to be carried to the depth of the bed of the old channel except on the west side between Broad and Rich Sts., where a bench averaging 150 ft. in width will be left from 2 to 3 ft. above normal low water.

Protection from maximum recorded flood is not provided by the channel planned. Assuming a roughness coefficient of 0.035 and slopes of 0.0045 to 0.0005 this channel is computed to have a safe capacity of 100,000 sec.-ft. and a capacity at the calamity point of 125,000 sec.-ft. The record of the March, 1913, flood at Columbus was 140,000 sec.-ft. In case of large floods overflow is inevitable. As a partial safety measure against this overflow up to 10,000 sec.-ft. beyond the channel capacity, a spillway levee wall is provided on the west side of the channel just north of Broad St. With the channel improved as planned, the lands along the Olentangy River will be flooded about as they have been in the past. When the flood reaches 125,000 sec.-ft. damage will result to the property on the east bank between Broad St. and Rich St. Overflow up to 10,000 sec.-ft. beyond 125,000 sec.-ft. will flood the section of the city south and west of the spillway levee. High floods may also produce damaging velocities which will necessitate channel repairs after each occurrence of such occasional floods. Floods exceeding the diversion capacity of the spillway will take their course as in the past. The plan, however, permits deepening the channel so as to increase the capacity some 20,000 sec.-ft. without further widening.

Construction of the widened channel, besides exca-

vation and levee building, is largely bridge construction. New reinforced-concrete arch bridges are being built at Town St., Broad St. and Mound St., and various other bridges are being extended two or more spans to embrace the widened channel. Bridge-construction methods are subjects for separate consideration. Channel construction involved wrecking and clearing, excavation and levee building, concrete spillway, retaining wall and weir, and concrete revetment.

Two Hundred Buildings Razed

Land damages are a very large proportion of the cost of the channel widening. On the west side the new channel between, say, Broad St. and Rich St., cuts into a closely built-up territory. Altogether, but mostly within the limits just named, about 250 parcels of land have been purchased and some 200 buildings ranging in size from one-story cottages to four-story brick factories have been wrecked. The wrecking contract netted the city a fair sum. Besides $20,000 paid by the wrecking contractor for the privilege of wrecking and salvage, the city reserved a considerable volume of lumber from the old buildings for temporary bridge and other construction uses. Land clearing is substantially completed.

Excavation is chiefly on the west side of the river, as is indicated by the map, which gives for the full length of channel the approximate volumes of excavation and of adjacent levee embankment. The large volume of excavation made heavy levees practicable and all are built with a top width of 80 ft. to provide for a future boulevard. North of Mound St., the volume of excavation exceeded the volume of embankment, while south of Mound St. the reverse was the condition. To build the southern levees, therefore, a fairly long haul from the northerly channel cuts was necessary. A standard-gage track along the fill meets the requirements. Dump-car trains are loaded by a dragline excavator and are run to the fill and dumped in the manner usual in railway work.

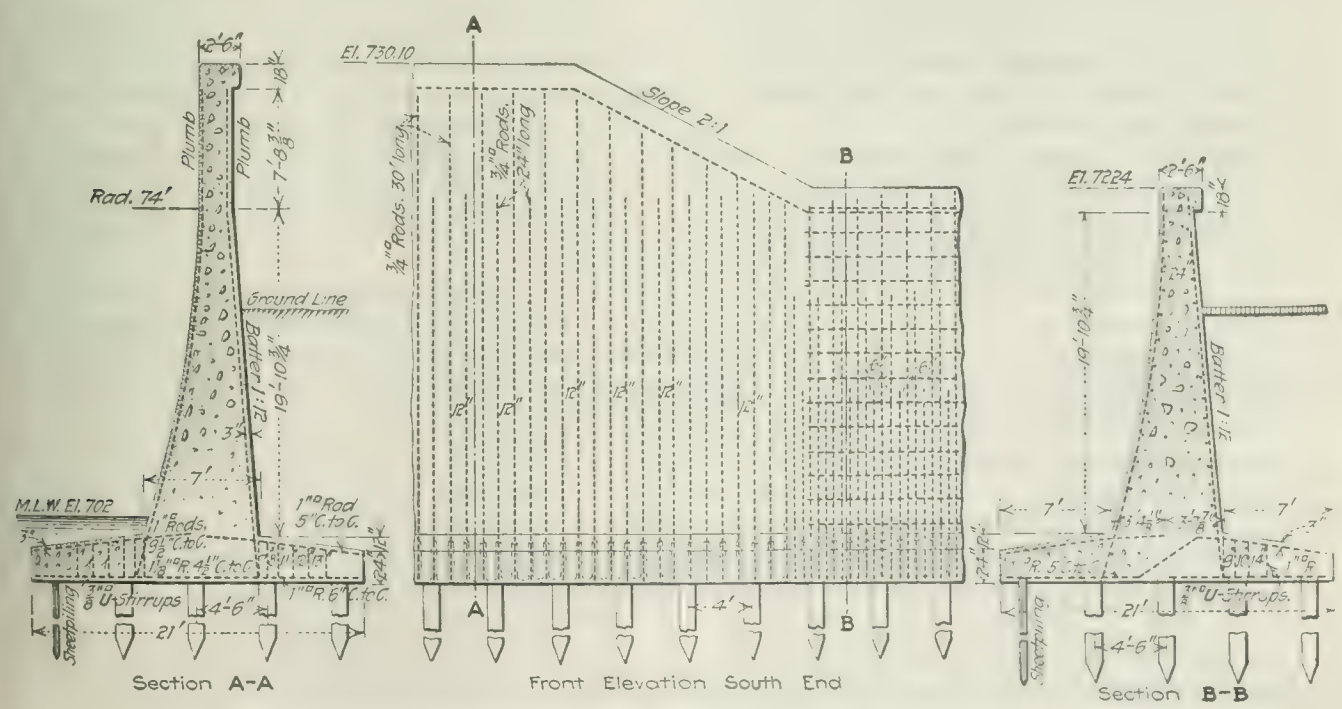
Where the excavation is handled directly to adjacent embankment, steam shovels are loading into wagons. In one place a cableway drag bucket is taking out cut and dumping directly into fill. The dragline excavator will also at places handle material directly from cut to embankment.

Concrete construction is made up chiefly of the levee spillway wall, which is 1200 ft. long and from 25 ft. to 33 ft. high; of a shorter retaining wall, of similar section to the levee spillway wall, running some 700 ft. north from the Hocking Valley R.R. bridge; of a concrete weir across the river at about the same point; of several stretches of concrete revetment, and of short retaining walls at various points.

All the concrete structures are of simple design. The weir has a solid ogee section with its crest about 12 ft. above the river bed. It is designed to pool the water, chiefly for sanitary reasons. Revetment is a 4-in. reinforced-concrete slab held by a curb at the top of the levee and by a toe wall at the bottom. Of the retaining walls the most important is that of the levee spillway, which is shown by the drawings. This wall was designed for full hydraulic pressure on either side alone Construction methods are subjects for succeeding articles.

Volumes of work are somewhat elastic, since money saved in securing real estate will be expended to increase the excavation and any savings which are realized in other ways will be similarly converted. Broadly, there are about 2,000,000 cu.yd. of excavation, not including between 100,000 and 200,000 cu.yd. of miscel laneous excavation of old structures. Of mass concrete in bridges and walls there are some 34,000 cu.yd. besides 72,000 sq.yd. of revetment and 9800 ft. of toe wall.

The general contractor for the excavation and levee is the W. E. Callahan Construction Co., Omaha, Neb. Contracts for the concrete work have been widely distributed. Construction is progressing actively on all portions of the improvements.



SPILLWAY LEVEE IMPORTANT FEATURE OF COLUMBUS FLOOD PROTECTION

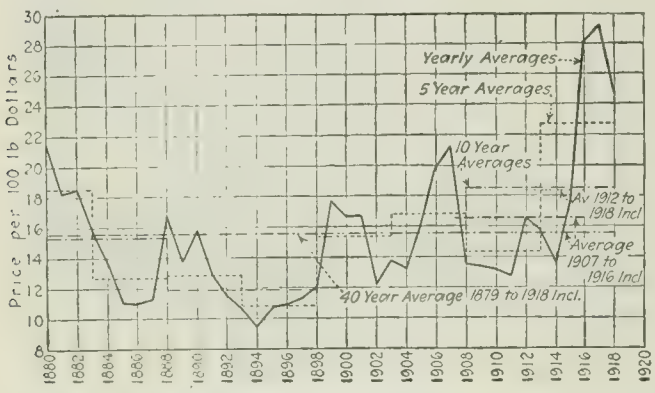
Unit Costs for Use in Public Utility Appraisals

Recent High Prices Increase Differences in Valuation Already so Divergent as To Confuse Courts—Effect of Choice of Periods if Average Prices Are Used Is Important

By R. L. Baldwin
of Burns & McDonnell, Consulting Engineers, Kansas City, Mo.

THE recent steady advance in the costs of labor and materials is unprecedented within the period since the adoption of modern methods of making public-utility appraisals. This has caused a wide difference in the values arrived at by various appraisers, who have used different bases for arriving at their unit costs. Such results confuse courts or commissions, and are not helpful in a settlement. Much criticism of the engineering profession has been aroused by the fact that different appraisers, having the same inventories, arrive at such different values.

The custom of most appraisers prior to 1916 was to use prices based upon a five-year average for the period preceding the date of the appraisal, but often prices as of the date of the appraisal were used. Averages



LAKE COPPER PRICE VARIATIONS BY YEARS AND BY AVERAGES FOR VARIOUS PERIODS

were generally used for items of property which were being continually added to, such as pipe and pole lines and other elements of distribution systems. Present prices or quotations were used for items of equipment. This method gave reasonable results, because there was no wide fluctuation in prices, and the custom or method became well established.

The application of average prices, based upon a short period of years even up to 10 years, if they include the past two years, gives abnormal results, and it is this that causes the wide difference between appraisals. A study of copper prices, taking lake copper in New York, shows the following averages for different periods (see illustration):

5-year average, 1914 to 1918, inclusive	$0.227
10-year average, 1909 to 1918, inclusive	.185
40-year average, 1879 to 1918, inclusive	.156
5-year average, 1912 to 1916, inclusive	.183
10-year average, 1907 to 1916, inclusive	.165

It is apparent that the period selected for the average makes a great difference—in this case from 20 to 45%—and the probabilities are that any two individuals selecting a period for such purpose would select different periods and obtain widely different results.

If an appraiser should, after due consideration, determine to use a 10-year average, say from 1907 to 1916, inclusive, for making an appraisal at this time, what would he do on the same appraisal five years from now? What is the test as to whether a unit cost is reasonable or unreasonable? Is not the actual cost, after all, the final test, if it can be ascertained?

The public service commissions of the various states are probably as directly interested in this question as the utilities whose rates they must regulate. These commissions not only maintain engineering departments for the purpose of making appraisals, but are constantly being confronted with all the various theories and practices of different appraisers, and for this reason their customs and practices should bear considerable weight in any study of this question. An investigation disclosed the following practices for 25 commissions from which data were received.

Thirteen commissions use or prefer unit costs based upon original costs. Eight commissions use unit costs based upon average prices for various selected periods, varying from three to 10 years, most of them excluding the war period. Four commissions could not be said to use or prefer either method.

The decisions of commissions as a whole seem to show a tendency toward the use of a value—for rate-making, at least—based upon original costs. This tendency has been vary evident in the past few years. This change has been brought about by the enormous advance in prices which rendered the old methods inadequate for use under present conditions.

It seems that some method of appraisal of value should be established that would not give a fluctuating value but that would give a stable value, one that the owners of the utility as well as the public served could depend upon. The property is constructed by the expenditure of money, usually derived from the sale of securities. These securities are often widely scattered and should be an attractive investment.

It would be greatly to the interest of all concerned if such securities could be owned by a large number of investors, and especially by those to whom the utility renders a service. A city or a state should take pride in a prosperous utility rendering efficient and excellent service. These utilities are often the largest single enterprise of the city or community, and the prosperity of the community is judged by outside cities, banks and investors from the condition of its local enterprises.

In order to maintain such conditions, it is necessary that the utility receive a fair return. The purpose of making the appraisal considered is to establish a value upon which this fair return shall be allowed. Such a return is necessary to attract capital to maintain and operate the utility. If the actual capital invested is given a fair return, it should accomplish this purpose.

It is argued that such a method would deprive a utility of appreciation in value, but it would likewise guard the utility against a decrease in value. This objection applies in the main to land, and on this item it seems to be the general, approved practice to use a price similar to that of adjoining and similar land, giving the utility the benefit of any appreciation in the value of the land. It is, however, not the intention to discuss this question in this paper.

Strict adherence to the common actual-cost method does not seem to be practicable, but the general method can be used in so far as it is useful. In following the reproduction theory, it has been necessary to depart from it and use a historically modified reproduction theory, and it is very probable that no hidebound theory can be recommended that would serve in all cases. Practically all utilities have some records of cost which may be readily obtained, especially for the past decade. Often utilities have changed owners, and the cost records, prior to the change of ownership, are not available.

A study can be made, however, of all the data available, and it can often be augmented by information obtained from old employees, especially as to the ages of equipment, dates of installation, etc.

Combination Method Employed by Many Commissions

The method actually employed at present by a large number of the commissions and appraisers is practically a combination of "reproduction cost with unit prices based upon average prices," and "actual cost from records." Using this method, actual costs of all the large items obtainable are used. Where the cost of large items is unknown, the age can generally be obtained with fair accuracy, and the estimate of cost can be based upon data as to prices at that time. If a large part of the property consists of pipe, rails, poles or wire and is being added to from year to year, the amount installed each year, either in material or dollars, can often be found, and from these data a unit approximating the average cost to the utility can be determined. The use of such a method eliminates the necessity for selecting some period to establish a unit price and removes the possibility of so wide a divergence in the final results as is often found; and after all, if an average must be taken, why is not one based upon such data more nearly correct than an average for some arbitrary period?

Those commissions which are now using unit costs based upon an average for a period of years preceding the war are allowing cost on extensions or additions which were made during the high-price period, and it is generally conceded to be fair treatment. This is probably the first step toward the adoption of the cost method. It has, however, been done for some time. Appraisals are often brought up to date by simply adding the cost of improvements, which certainly amounts to the adoption of the cost method for at least a portion of the property. If, therefore, it is a fair proposition for a part, why should it not be used as a general basis, thus eliminating one bone of contention that is continually arising whenever the value of a utility comes into question?

The present attitude of regulating commissions and their engineers is shown by the following quotations from correspondence or reports:

1. "The commission is principally interested, for all purposes, in actual cost, and where this is not shown by the records it is estimated as closely as possible."

2. "Our aim has been to find out as nearly as possible just what the legitimate and honest investment of the company has been, with a view to as complete recognition as possible of the actual conditions under which the particular property has been constructed."

3. "Our policy, with one exception, is upon the basis of original cost to date. This is determined where practicable from the records of the company; otherwise from prices applied to the inventoried quantities." The case excepted was because the state law made other provisions.

4. "It has been indicated several times in recent cases that actual cost, where it could be obtained, would be given the preference."

5. "Present methods of valuation are to ascertain as nearly as possible the original cost. The majority of commissions are in favor of a liberal valuation in so far as the actual cost of utilities was incurred under reasonably good judgment of planning and execution."

6. "Where there are available book costs that are capable of identification and verification, such costs are incorporated in the valuation."

7. "I am inclined to the opinion that where the law does not govern these matters, the weighted average unit prices obtainable from the company's vouchers are the most equitable that can be used."

8. "But what is a fair return? Is it not a return that will be sufficient to attract capital necessary to keep the utility prosperous? And if it is capital that is to be attracted, is it not a fact that it is the actual amount of capital invested that must be considered and allowed a fair return?"

9. "It seems to be recognized in the community that the actual investment is what is entitled to a return. I use as a basis, as near as may be ascertained, the actual cost of the properties to the utility."

10. "We are using actual costs, as far as practicable. When such costs cannot be obtained, we use average prices, depending upon the character of the material."

11. "The engineering staff of the ———— Commission, during the recent war period, has limited its valuations wholly to original-cost valuations."

12. "First take the actual cost, or estimated actual cost, of the larger units, such as buildings, turbines, boilers, etc., then for the minor items, for which it is impossible to obtain the actual cost, some average may be used which will approximate actual cost. The acid test of fairness and reasonableness of an evaluation depends upon actual cost of property now used and useful for the convenience of the public, and we resort in all cases to averages as a device for estimating approximately the actual cost."

13. "It is the policy of the engineering department of this commission to arrive at its unit costs from a study of the company's vouchers for labor and material covering the entire property in use."

It would appear from these quotations, taken as the methods followed by 13 of the foremost state commissions, scattered from coast to coast, that the commissions are almost uniformly basing their unit costs upon actual costs to the utility. The methods outlined may not give the strict actual cost, but give at least a close approximation thereto. This method does not give a value that may fluctuate each time an appraisal is made, nor does it leave the choice of unit prices to the personal selection of each appraiser who must select a period of years to arrive at an average price representing his opinion as to the correct units. It gives a stable value that is highly desirable both to the security holder and to the public which the utility serves. While it may deprive the utility of advances

in value, it in turn guarantees against declines in value. It also gives a utility an assurance at present that an investment made necessary to preserve service will be allowed at its cost when an appraisal is made. This is particularly important now, since a large amount of work is necessary, having been held up during the war period, and utilities in many cases hesitate to make improvements or extensions under the present high prices, not knowing how the courts or commissions will treat this investment.

Relation Between Water-Supply and Goiter

AN APPARENT connection between goiter and water-supply in various parts of the world is traced by Mayo Tolman, chief engineer, West Virginia State Department of Health, Charleston, W. Va., writing in the *American Journal of Public Health*, July, 1919.

Goiter, which manifests itself as an enlargement of the thyroid gland, shows high endemicity in Switzerland, parts of France, and in regions in every continent. In North America the main endemic centers are in parts of New Hampshire, New York, the Blue Ridge Mountains of Virginia, nearly all of West Virginia, the region about the Great Lakes, and Edmonton, Alberta. Recent studies by Mr. Tolman indicate that there are 12,000 cases in West Virginia, while in Broxton County a house-to-house survey showed 1148 cases, or 1 to every 20 inhabitants.

The cause of the disease is most generally attributed to the character of the drinking water. Efforts to connect the disease with various inorganic impurities in the waters of the region have not been successful, Mr. Tolman states. The relation seems to be with the geological ages of the rocks of the regions. "Apparently," Mr. Tolman says, "volcanic formations, the crystalline rocks of the Archaic period and all deposits laid down in fresh water are free from the goiter-producing characteristic." In the United States the greatest endemicity is found in paleozoic areas. In West Virginia water from the coal measures seems to cause the disease, while in the same valleys people taking water from higher in the mountains, above the coal measures, have less goiter as the elevation increases. Two paragraphs from the end of Mr. Tolman's paper may be quoted in conclusion:

> This association of goiter with certain geologic time would indicate that the disease is not caused by a living organism, but is due to some substance derived from marine animals in past time. What this substance is is not known, but experiments indicate that it is not retained by a Berkefeld and that its goiter-producing property is destroyed by heating to 70 deg. C. It is, of course, possible that goiter is a deficiency disease, that the marine animals of geologic time used up a certain substance in the water that is essential to animal economy. This theory is severely shaken, however, by the fact that heat evidently destroys the goiter-producing element, but nevertheless it should not be entirely abandoned at the present stage of our knowledge.
>
> Goiter presents phases that should be of interest to health offices in those areas in which it occurs, and it is to be hoped that the disease will be given more study in order that its cause may be definitely determined, for without accurate knowledge of the cause of a disease any measures to combat it may be hit-or-miss. There can be little doubt that the efficiency of a community is lowered by endemic goiter, and consequently the spread of the disease should be prevented.

Semi-Portal Dock Cranes at Boston Army Base Wharf

Four Hoists With 4-Ton Maximum Capacity Travel On Tracks Outside of Wharf Shed and Load Vessels in Dock

FREIGHT to and from ships lying alongside of the long wharf at the Boston Army supply base is to be handled by four large semi-portal bridge cranes traveling alongside the wharf shed. As described in *Engineering News-Record* of Sept. 19, 1918, p. 522, the Boston terminal includes a long eight-story warehouse separated by a wide street from the marginal two-story wharf house alongside the wharf where the ships dock. Between the wharf house and the water is a space 35 ft. wide with two standard-gage tracks on which freight cars are run in from main-line tracks. Spanning these tracks the handling cranes described here travel.

Each crane carries a lifting boom operated from a carriage, which in turn is mounted on a semi-portal bridge and arranged to rotate about a fixed axis. The bridge runs on two rails, one located near the face of the wharf and the other supported on brackets carried on the side of the wharf shed. The crane has four distinct motions: (1) Bridge travel along the wharf; (2) trolley slewing; (3) boom hoisting or luffing; (4) load hoisting. All of these motions are under the control of the operator located in the cab on the rotating carriages.

The crane is designed so that another drum can be added and a two-rope grab-bucket operated. It is rated to handle 8000 lb. at a distance of 29 ft. from the face of the capsill at the rate of 200 ft. per minute, and 5000 lb. at a distance of 52 ft. at 250 ft. per minute. It will, however, take care of occasional loads of 8000 lb. at 52 ft. from the center of rotation, without any undue stress in any part of the crane.

The principal dimensions of the crane are as follows: Horizontal span, c. to c. of runway rails, 25 ft. 5 in.; maximum reach of boom from face to capsill, 44 ft.; minimum radius of boom, 29 ft.; angle through which boom may be slewed equals 360 deg.; concrete counterweight required, about three cubic yards.

The various motions of the crane have approximately the following speeds under full load: Hoist, 5000 lb., 250 ft. per minute; 8000 lb., 200 ft. per minute; boom hoisting or luffing, 125 ft. per minute, and slewing, two rotations per minute with 5000 lb. load at a maximum radius. The rate of travel along the wharf is 200 ft. per minute. Either hoisting or luffing can be operated simultaneously with both rotating and traveling motions.

The semi-portal bridge supporting the operating mechanism was designed in accordance with the "General Specifications for Steel Railway Bridges" issued by the American Railway Engineering Association in 1910, 100% being added to all live loads to allow for impact. In designing this structure, ample allowance was made for the swaying of the load. To the deck of the semi-portal is bolted a steel casting for supporting the revolving superstructure. This casting has a track plate and, bolted to the outside, a circular rack for the slewing motion. Concentric with this casting is a hollow center pivot pin, the lower end of which is securely held by cross-framing between the main girders of the semi-portal.

The base frame is made up of rolled-steel shapes and plates well braced in all directions. The revolving superstructure is carried on six steel rollers or wheels, four in front where the heaviest load occurs, and two on the back. The front rollers are carried in a pair of steel equalizers. These rollers or wheels will be of steel of ample size arranged to rotate on roller bearings and placed so as to run properly on a circular track of about 5-ft. radius about a pivot pin. A babbitted casting free to rotate about the center pivot pin is attached to the base frame to hold the crane concentric with the center pivot pin and to transmit longitudinal and overturning loads from the revolving superstructure to the semi-portal.



FOUR-TON CRANES TO HANDLE FREIGHT AT BOSTON ARMY BASE

The center pivot pin is made of a hollow steel casting to permit the threading of conductors through its center to the collector rings on top. The crane is designed so that under normal operating conditions, with a 5000-lb. hook load at the maximum radius, no appreciable load will be thrown on the center pin. It is, however, designed to transmit any possible vertical or horizontal load from the revolving jib crane to the semi-portal bridge without cramping or binding in any part.

The hoisting and lowering mechanism includes a winding drum, driven through a jaw clutch and a train of spur gearing by a motor equipped with a solenoid brake, and necessary control apparatus and miscellaneous parts. The luffing of the boom is accomplished by a worm-driven drum operated by the hoisting motor through a jaw clutch and gearing so arranged that the boom can be raised or lowered at the convenience of the operator. The pitch of the worm is such that no mechanical brakes are required to prevent the load from lowering; but, as an additional safeguard, a pawl is provided to lock the luffing drum in any desired position.

The slewing is accomplished by means of a motor operated through a train of spur-and-bevel gearing and a pinion meshing with the master gear attached to the semi-portal bridge. A powerful foot brake is provided on this mechanism, having a latch by means of which the brake can be locked for any desired fixed position of the revolving superstructure.

A motor for traveling the bridge is mounted on one of the girders of the semi-portal bridge. This motor is connected to the driven track wheels through spur-and-bevel gearing and line shafting. One truck on the wharf rail is driven and one wheel on the shed rail. A solenoid brake is mounted on the armature shaft extension. Control apparatus for traveling is located in the operator's house. Electrical connections between the conductors on the semi-portal bridge and on the revolving superstructure are made through collector rings mounted on the center pivot pin or an extension of it. In addition to the solenoid brake, hand-operated rail clamps are provided which clamp the wharf rail to hold the bridge in any fixed position.

The electrical equipment is designed for a direct current of 230 volts, with the following motors: Main hoist and luffing, one 65-hp.; slewing, one 15-hp., and bridge travel, one 25-horsepower.

The cranes were furnished by the Wellman-Seaver-



FREIGHT-HANDLING CRANES CLAMPED TO TRACK

Morgan Co., from which this information has been received. The company has installed the cranes under the direction of the Army, Lieut. Col. Charles R. Gow being the constructing quartermaster in charge of the work. Fay, Spofford & Thorndike, of Boston, were the engineers on the base.

Swedish Timber Exports Large

Production of timber from Swedish forests, says the Swedish consul in Chicago, quoted in a recent bulletin issued by the National Lumber Manufacturers' Association, amounts to approximately 40,000,000 cu.m. a year. The total value of exports of wood and lumber, wood pulp, and manufactured goods of wood pulp, is approximately $160,000,000. For April, 1919, it amounted to almost $14,000,000.

Does Rich Concrete in Roads Crack More Than Lean?

It is not uncommon to hear it stated that rich concrete is more susceptible to cracking than lean concrete. The statement is one of those which has gained credence by repetition and for which the evidence is nowhere stated. It is one of considerable importance in the design of roads. With a view to getting more light on the subject, "Engineering News-Record" recently sent out a brief questionnaire to a few engineers who have been prominent in the use of road concrete. The questions submitted were as follows:

1. Does rich concrete crack more than lean concrete?

2. If so, is this particularly the case with concrete highway pavements and foundations?

3. What reason do you assign for the greater tendency to crack in rich mixtures?

4. Would you advocate leaner concrete in roads, to overcome this tendency?

5. What do you consider to be the principal causes of (1) transverse cracks in pavements; (2) longitudinal cracks in pavements?

While the answers to these questions showed the results of some experimentation upon the subject, there seemed to be no well developed foundation for the statement that there is a greater tendency to crack in the richer mixes; in fact, it is apparent that there is a great lack of experimental knowledge on the subjects of cracks in concrete. Several of the engineers to whom questions were sent frankly stated that they knew of no reliable data upon which to base conclusions as to the cracking of concrete either in foundations or in pavement surfaces. As to concrete roads, and road foundations, general agreement exists concerning the immediate cause of cracks, but there is vagueness concerning the contributory causes. It appears to be the general opinion that the mixtures for concrete road slabs should not be weakened in cement content.

Further comment on the subject appears on an editorial page.—EDITOR.

Volume Changes From Climatic Variation Greater in Rich Concrete

BY J. C. PEARSON
United States Bureau of Standards

MY ANSWER to your inquiry of June 19 in regard to highway concrete is based more on general considerations than on an intimate knowledge of the requirements of road construction. Referring specifically to your five questions, I beg to submit the following replies:

1 and 3. Rich concrete in itself has a greater tendency to crack than lean concrete, due to its greater volume change under varying conditions of moisture and temperature.

2. This is particularly the case with highway concrete, unless the design is such as to take care of the volume changes.

4. I would advocate the use of leaner concrete in roads if there were any assurance that the quality of the workmanship in mixing and placing could be controlled. For example, the use of a larger proportion of coarse aggregate in the commonly specified mixtures would undoubtedly result in better roads, provided the contractor were willing to do the necessary additional work in properly placing the leaner mixtures, and the builder were willing to pay for the additional work and the improvement in quality. As a general proposition, it would hardly be wise at the present time to recommend the use of leaner mixtures.

5. Transverse cracks are in many cases due to shrinkage; longitudinal cracks are more likely to be due to lack of uniformity in sub-base conditions.

Leaner Concrete in Roads Would Lead to Failures as Heretofore

BY WILLIAM D. UHLER
Chief Engineer, Pennsylvania State Highway Department, Harrisburg, Penn.

IN MY ESTIMATION there is no practical difference, as far as cracking is concerned, due to the difference in richness between 1:2:3 concrete as wearing surface and 1:3:6 concrete as base. I am conversant with the results of many laboratory tests which seem to tend toward proving that the use of rich concrete minimizes the tendency toward cracking due to the absorption of water.

I would most assuredly not recommend the use of leaner concrete in concrete roads. Such cracking as has occurred on our reinforced-concrete roads is easily taken care of by the use of asphalt or tars, at a very slight expense. I feel that the use of lean concrete would but lead to such failures as were experienced in the early history of concrete pavements.

We have made a survey of some of our reinforced-concrete roads in this state, and the cause of cracking is given in the percentage table herewith:

	Transverse, Per Cent	Longitudinal, Per Cent	Irregular, Per Cent
Drainage	43	30	44
Weak subgrade	8	63	42
Road entrance, etc	30	3	10
Ties	8	4	.
Culverts	8	..	
Trolley crossing	3	..	4
Total	100	100	100

The Stronger the Concrete the Fewer the Cracks

BY EDWARD N. HINES
Chairman, Board of Wayne County, Michigan, Road Commissioners. Detroit, Mich.

THE Board of County Road Commissioners of Wayne County, Michigan, has, during the past 11 years, constructed approximately 180 miles of concrete roads, which are giving excellent service at a very reasonable maintenance cost. I am impressed, first, by the fact that to me your questions imply that a crack in a concrete road necessarily constitutes a grave defect. In my opinion, this is far from being the case. When one can ride over these roads and cannot tell, with his eyes closed, of the existence of any cracks, they certainly cannot be considered as affecting seriously the service that the road renders to the public.

To answer specifically your question as to whether more cracks will occur with a rich concrete mixture

than with a lean mixture: I have never seen, or, from inquiries that I have made, can I learn of, any data of a scientific character which would give a definite answer to the question. My observation leads to the conclusion that the stronger the concrete the fewer the number of cracks; that is, a concrete of a rich mixture will develop fewer cracks than one of a leaner mixture.

The best evidence I can cite in support of this statement is gained from my knowledge of a considerable mileage of concrete roads in California. These roads were built, as I am informed, of 1:2½:5 mixture; considerably leaner than what we have used on our Wayne County roads, 1:1½:3.

On the California roads it is to be observed that transverse cracks occur at interva's of 12 to 18 ft., while on our roads in Wayne County the interval is much greater. On a number of miles of roads in Illinois, of which I have knowledge, the interval between cracks is 30 to 40 ft. To me, a layman, it is inconceivable to suppose that a weaker concrete road surface would have fewer cracks than one which was stronger, as your questions would imply.

The above will answer your first four inquiries. As to the fifth, concerning the cause of transverse and longitudinal cracks, my observation inclines me to the opinion that transverse cracks are caused primarily by the shrinkage or contraction of the concrete, while longitudinal cracks are mainly caused by unequal movements of the subgrade, doubtless due to imperfect drainage conditions.

Laboratory Experiments Indicate Rich Concretes Crack More

By P. St. James Wilson
Acting Director, United States Bureau of Public Roads

ANSWERING your questions in the order in which they were propounded, it is our belief that there is a tendency for rich concrete to show more frequent cracking than lean concrete, and this tendency is borne out by the results of laboratory experiments. Experiments were made in this office and the results were published in our department Bulletin No. 532, entitled "Expansion and Contraction of Concrete and Concrete Roads." In this bulletin it is shown that rich mortars shrink more when dried out than lean mortars, and it is reasonable to suppose that the same tendency exists in concretes but to a less marked degree. We believe that in view of the tendency for concrete bases to remain in a rather damp condition the shrinkage effect, due to the drying out of concrete, is generally quite small, and that the difference between the shrinkage of rich and lean concrete bases must also be quite small, due to this cause. We believe that temperature effects are about equal, whether the base is rich or lean.

It is our belief that in view of the tendency of concrete pavements and foundations to retain some moisture on account of their contact with the underlying subgrade, the tendency toward cracking should be less than in the case of constructions which are subjected to a more thorough drying.

It has been shown by a number of investigators that neat portland cement shows enormous shrinkage upon drying, and that as more sand is added the shrinkage is decreased. No attempt will be made to theorize on the reason for this action.

We believe that the use of leaner concrete on concrete bases is not likely to reduce the cracking of the concrete to any great extent. We can conceive, however, of a concrete being so lean and so porous that cracking may result from frost action. It is our belief that such action has occurred in many cement sidewalks in which an excessively lean base has been used.

Lean Concrete Pavements of No Value Whether They Crack or Not

By A. N. Johnson
Consulting Highway Engineer, Portland Cement Association

REGARDING the relative amount of cracking to be observed in lean and rich mixtures, I have never seen any results, compiled from any authentic source, that bear out the suggestion that a concrete pavement made of a lean mixture had fewer cracks than one of a richer mixture.

A lean concrete pavement is of no value whether it cracks or not, and it is beyond my comprehension how such a proposition could arise. The results of my own observation are exactly to the contrary—that the weaker the concrete the greater the number of cracks to be observed, other conditions being the same.

Your fifth question, as to the cause of transverse and longitudinal cracks, I believe has been fairly well discussed, transverse cracks being caused in by far a greater number of instances through contraction of the concrete slab due to both shrinkage of the concrete at the time of setting and to contraction due to drying out and the lowering of the temperature.

Longitudinal cracks are for the most part caused by movement of the subgrade which is not uniform throughout its extent. In general, the fact that a crack does appear in a concrete road by no means indicates that the road renders less effective service for the passage of traffic, and practical experience shows that the average crack which occurs occasionally is no serious defect to the road surface.

Within Limits of Allowable Proportions, No Difference in Cracking

By Clifford Older
Chief State Highway Engineer, Illinois

REPLYING to your recent letter propounding questions concerning concrete and concrete pavements, I wish to offer the following replies:

1, 2 and 3. Within the limits covered by the proportions usually used in mixing concrete, I do not believe that there is any appreciable variation in the tendency to crack.

4. I would not advocate using leaner concrete in roads with the idea of overcoming a tendency to crack, since I am not convinced that this procedure would accomplish the end desired. I personally feel that the proportions of the concrete should be determined to give the required strength to the pavement. In fact, my ideas along this line are fully stated in an article on pavement design, published in *Engineering News-Record* of May 8, 1919, p. 905.

5. (a) There has been a great deal of conjecture as to the causes of cracks in pavements, and I hardly feel that anyone can give an absolutely correct answer

to such a question. In my opinion, transverse cracks in pavements are formed due to the alternate expansion and contraction under temperature change. Also, the fact that a pavement occupies a greater volume at the time of its construction than it occupies after the concrete has attained its full set may have some tendency to produce the transverse cracks. I feel, however, that transverse cracks in pavements are of minor importance. We have experienced no difficulty in maintaining such cracks with bituminous material so that they are absolutely protected at a very nominal expense; (b) the cause of longitudinal cracks is also more or less problematical. However, I have observed that pavements 10 ft. in width or under have practically no tendency to crack longitudinally, whereas pavements having a width of 16 ft. and greater almost invariably develop longitudinal cracks. I feel that this is due largely to the difference in the saturation of the soil from the edges toward the center of the pavement. This, combined with freezing, will naturally cause a greater displacement at the edges than at the center, which results in a flexural stress along the center line, producing a tendency to crack. Also, this saturated condition without the action of freezing may cause the center of the subgrade to be more firm than the outside portions, which might produce flexural stress under traffic, resulting in a tendency to crack longitudinally.

I have also observed that longitudinal cracks almost invariably start at a joint or at a transverse crack. I have wondered if this is not due to eccentric application of the compressive stresses set up by expansion. It is well known that an eccentric application of a compressive stress on any concrete specimen tends to cause irregular stresses. In placing joints in a concrete pavement, it would seem almost impossible to get a uniform bearing of the ends of the slab against each other. Compressive stresses might then be applied very irregularly, resulting in a tendency to split the pavement longitudinally. The same theory might apply in the case of the transverse cracks tending to form longitudinal cracks.

This department has adopted the practice of building concrete roads and also brick roads without transverse joints, and, so far as we have been able to observe, there is less tendency to crack longitudinally in the case of the pavements built without transverse joints than with the pavements built with transverse joints.

No Reliable Evidence To Support Rich-Mix Cracking Theory

By Duff A. Abrams
Structural Materials Research Laboratory, Lewis Institute, Chicago

I KNOW of no reliable evidence which indicates that concrete pavements of lean mixtures crack less readily or frequently than rich concrete, particularly if the terms "lean" and "rich" are applied within the practicable range of concrete mixtures.

Past experience in several communities has shown that lean concrete mixtures do not give satisfactory results in concrete pavements. Entirely aside from the consideration of cracks, lean mixtures will not stand up under the extreme conditions of weather and traffic to which a modern road is subjected.

The principal cause of transverse cracks in pavements is the expansion and contraction due to variations in temperature and moisture. The earlier concrete-road builders attempted to counteract the opening of cracks by placing joints at intervals of 25 to 40 ft. However, experience has shown that these joints are unnecessary and that it is difficult to get the pavement at the sides of the joints at the same grade. Considerable expense is saved and better riding surfaces are, consequently, secured by reducing the joints to a minimum. The most modern practice is to place joints only at the end of each day's work. Ordinarily, this would mean one joint at each 200 to 500 ft. If transverse cracks open at other points they can be easily maintained by use of tar or some other bituminous filler. Such cracks are in no way detrimental to the structural efficiency or usefulness of the pavement.

Longitudinal cracks are generally due to inequality in the subgrade which results in nonuniform settlement of the slab. They are sometimes produced by frost action or in the unequal loading of the pavement. In the practice of constructing wide concrete roads over old macadam bases of narrow width, the unequal settlement of the paving slab, due to the newly formed subgrade, causes longitudinal cracks. Old macadam roads should be thoroughly broken up and rerolled before a concrete pavement is constructed. Experience has shown that reinforcement has little or no effect in preventing cracks.

Believes Rich Concretes Have Greater Tendency To Crack

By A. H. Hinkle
Deputy State Highway Commissioner, Bureau of Maintenance and Repair, Columbus, Ohio

YOUR questions are answered in the order in which they are given in your letter.

1. I have also thought that the rich concrete did crack more than the lean, although I nave not made sufficient tests to offer much proof of same.

2. This would be more apt to occur in thin slabs of concrete, such as a pavement foundation.

3. I think perhaps the cracking may be less in the leaner concrete due to it being less dense, which may possibly make it more elastic.

4. I would desire to make further investigations before recommending a leaner mix.

5. (a) The principal cause of transverse cracks is the contraction of the pavement; (b) the principal cause of longitudinal cracks is lack of stability of subsoil or too light a slab for the load which the pavement carries.

West Virginia Has World's Deepest Wells

The world's deepest two wells, penetrating to depths of 7579 ft. and 7386 ft., respectively, are the Lake, near Fairmont, W. Va., and the Goff, near Clarksburg. These wells were sunk by the Hope Natural Gas Co., of Pittsburgh, in an endeavor to reach the rich oil-bearing Clinton sand of Ohio, which it was hoped to encounter at depths between 7000 and 8000 ft. Another well, the Geary, was sunk near McDonald, Penn., to a depth of 7248 ft. by the People's Natural Gas Co. It is the fourth deepest, a well at Czuchow, Germany, according to the United States Geological Survey, exceeding the depth of the Geary by 100 ft.

Tests Yield Data on Concrete Columns Reinforced With Cast-Iron Tubes

DATA on the strength of concrete columns reinforced with cast iron have been obtained as the result of tests of 18 members at the Pittsburgh Laboratory of the United States Bureau of Standards. Although such columns have been in use abroad for several years, these tests are the first of this type which have been made in America.

The columns were 12 in. in diameter (inside 1½-in. pitch, 8-gage wire spiral) and were reinforced longitudinally with steel rods and cast-iron tubes. The cast-iron tubes located in the center of the columns varied in outside diameter from 5 to 7 in. with wall thickness of ⅝ to 1 in. The column lengths varied from 6 to 14 ft. Tests were made on samples of the cast iron; also on the concrete used which was proportioned by volumes and consisted of one part cement, one part sand, and two parts gravel, hand-mixed.

The behavior of these columns under loading was similar to that of the ordinary type of steel-reinforced columns. Incipient failure was in all cases accomplished by scaling of the outer shell, which finally spalled off at the surface of the spiral. This was followed by failure in tension of the spiral reinforcing at the maximum load sustained by the column. The protective shell outside the spiral fails at a strain of .00145 (ave.). This is the same strain as that at which the test cylinder failed.

The maximum strength of the column is not quite equal to the strength of the cast-iron reinforcement tested independently plus the strength of the usual type of spirally reinforced column. The cast-iron reinforced column has, however, a much less area of concrete.

The columns commenced to scale at 70.4% (ave.) of the maximum load. Two columns of the same series without cast iron commenced to scale at 89.9% (ave.) of the maximum. The average maximum total load sustained by the various types reinforced with cast iron and of the same length (10 ft.) as the two plain spiral-reinforced columns was 81.5% greater than was sustained by the plain spiral columns. Filling the hollow core of the cast-iron tubes apparently adds 6500 lb. for each square inch of cross-section thus filled. Varying the radius of gyration of the cast-iron tubes, the net cross-section area remaining constant, does not apparently affect the ultimate strength of the column. Cast-iron I-sections were used instead of tubes in two of the columns, the results comparing favorably with the tube columns having the same percentage of cast iron.

The following formula for variation of strength with length is derived from these tests:

$P/A = 12{,}150 - 20\ l$, in which

P = mean stress upon total area of column inside the spiral

A = total area as above

l = length of column in inches.

In view of the general behavior of spirally reinforced columns just preceding failure, it is suggested that a superior type might be developed if the protective shell outside the spiral were applied after the column has been cast and the forms removed. This shell should be of some material possessing the necessary heat-insulating qualities and the ability to withstand without failure a considerably greater strain than .0015 (the strain at which unreinforced concrete fails). This method of construction would also make possible a much greater accuracy in the placing of the spiral.

The complete report of these tests, in Technical Paper 122, United States Bureau of Standards, contains numerous tables, photographs and diagrams, with a discussion of the design of the columns and the results obtained.

Exposure Tests on Steel Sheeting

ACCORDING to a series of exposure tests covering a period of three years and made by Dr. Samuel L. Hoyt, associate professor of metallography, University of Minnesota, sheets of steel bearing 0.20 to 0.25% of copper showed a lower rate of corrosion than any of a number of other commercial products observed. Identical tests were made simultaneously upon copper-bearing steel, bessemer steel and pure open-hearth iron sheets. The results of these tests are given in an article in *Chemical and Metallurgical Engineering* of Aug. 1, 1919.

For test purposes Dr. Hoyt requested manufacturers to submit standard yard-square commercial sheets as specimens. Sheets were submitted in both 20-gage and 26-gage. Chemical analyses of the specimen sheets were then made.

From each sheet specimens 1½ x 3½ in. were cut, marked for identification and after being weighed placed in a rack on the roof of the School of Mines building, where they were continuously exposed to rain, snow and sunshine. Specimens were arranged in rows numbered from 1 to 10, and each row contained a sample from each sheet submitted for test. The rows were cleaned of rust and weighed periodically, the first row at the end of the first period, the second and first rows at the end of the second period, and so on. Thus, the tenth row was cleaned and weighed for the first time at the expiration of three years. These periods were at the end of 1, 3½, 5, 7, 9, 12, 15, 18, 24 and 36 months. Under this test all 20-gage specimens were still intact after three years' exposure. Of the 26-gage samples seven of the nine samples had failed completely before the end of the three years. The author does not define the term "complete failure," as applied to these tests.

The second test was made by weighing specimens after 36 months' continuous exposure. The 20-gage specimens again resisted failure and lost less weight than when periodically cleaned of rust. Only two of the 26-gage specimens completely failed under the second test.

After these tests were completed the relative resistances to corrosion of plain steel, pure iron, and copper-bearing steel were computed.

Iron Ore Output Decreases

Complete statistics of iron-ore mining in 1918, compiled by Ernest F. Burchard of the United States Geological Survey, show a decrease of 4.7% in output, but an increase of 2.6% in value, as compared with 1917 figures. The quantity of ore shipped from mines in 1918 was 72,021,202 gross tons, valued at $244,368,147, an average price at the mine for the whole United States of $3.39, as compared with an average price of $3.15 in 1917.

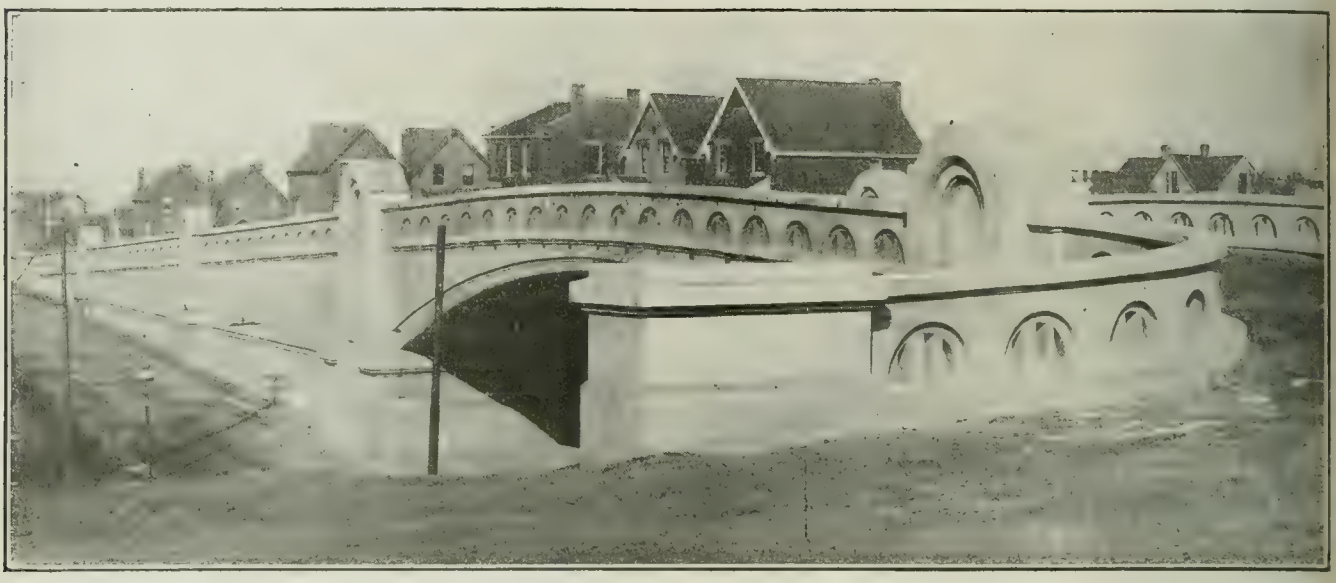
Concrete Ties Hold Together Walls of Bridge-Approach Fill

On Account of High Ground on Line of Bridge, Fill Was Not as Great as Showing Face of the Thin Outer Walls Used

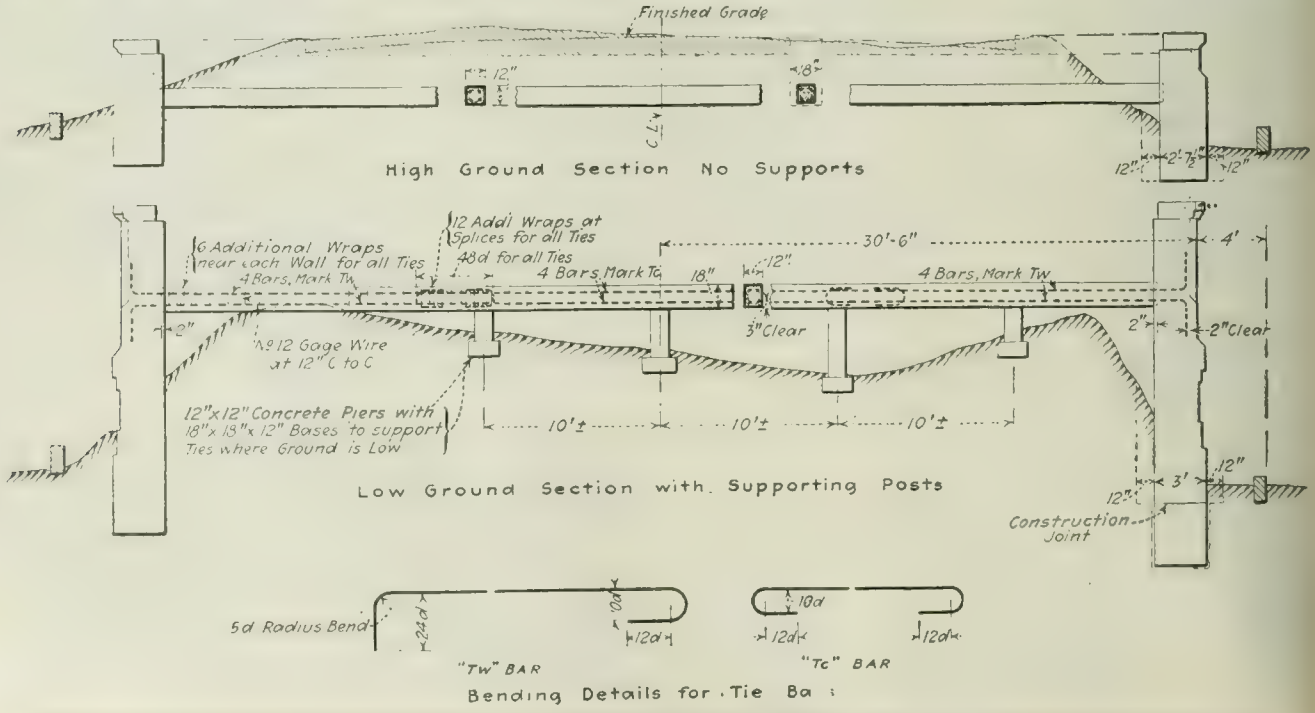
WALLS retaining the fill on the west approach of the new Bellerive Park reinforced-concrete arch bridge at St. Louis, recently completed, were made of fairly thin concrete sections which were held together across the 60-ft. width of the bridge by reinforced-concrete ties spaced about every 20 ft. This peculiar type of construction was available on this bridge because of the topography.

The bridge carries Kingshighway Park, a portion of the boulevard system of the City of St. Louis, over Broadway into Bellerive Park. The boulevard, which is 125 ft. wide, approaches Broadway from the west, and when a block distant from Broadway divides itself into a middle portion, 61 ft. wide, which is carried over Broadway on the new bridge, and two 32-ft. side streets which extend along each side of the new bridge with a descending grade to meet the grade of Broadway. The ground adjacent to Broadway lies about 10 ft. above it, so that when the side streets of the boulevard were cut down to meet the grade of Broadway a high bank of solid earth was left between them on the site of the new bridge.

Advantage was taken of this situation in building the west approach to the new bridge. This was done by building walls of comparatively thin sections along the sides of the embankment and tying them together with reinforced-concrete ties supported on the solid fill. In a few cases where the embankment was not high enough the ties were supported on concrete posts.



LONG APPROACH ON FAR SIDE RETAINED BY THIN WALLS CONNECTED TOGETHER WITH CONCRETE TIES



DETAILS OF REINFORCED-CONCRETE TIE RODS BETWEEN RETAINING WALLS OF BRIDGE-APPROACH FILL

The view herewith is taken from the short approach side looking across the bridge toward the tied retaining wall.

Details of the construction are shown on the accompanying drawing. The wall was 205 ft. long, and varied in height from a few feet to 20 ft. The surface of the original ground between the two walls was variable, but no fill was required greater than 8 ft. The wall itself was of solid concrete varying from 2 ft. 4 in. to 3 ft. at its maximum width, that width being reduced a few inches by oramental molding. The ties were of two sections, one 12 x 12 in., the other 12 x 18 in., the larger size being used where the tie had to span between posts. The 12 x 12-in. section, as shown, was used where the intermediate earth rose so high that a channel could be dug in it for the placing of the tie. Where the deeper tie was used, posts spaced about 10 ft. c. to c. were used between the walls. All ties were reinforced with four corner rods and splices were made by long bends, in which the length of bend was at least 12 times the diameter and the space between the upper and lower section of the bend at least 10 diameters. The bends were, in addition, wired at all splices.

The bridge was built by the Division of Bridges and Buildings of the City of St. Louis, L. R. Bowen being engineer of bridges and buildings.

State and Federal Control of Land Drainage Needed

Control by Districts Does Not Meet the Larger Problems—Systematic Study and High Engineering Ability Required

By Arthur M. Shaw
Consulting Engineer, New Orleans, La.

In DEALING with questions affecting or promising to affect the entire human race, the people of this country have given evidence of a most altruistic spirit, but in their own internal affairs they often follow the narrow lines of thought and action of tribal days, and this in matters which touch vitally the fundamental resources of the country. We have begun to realize the injustice to this generation and to succeeding generations that would follow the continual waste of natural deposits of oil, gas and coal, but little of real and general value has been done, either by the Federal Government or the state Governments, toward compelling and assisting in the conservation of our most valuable agricultural resources. Exception should be made to the foregoing as regards the educational and advisory assistance rendered by our various agricultural colleges and by the Federal and state departments of agriculture, and to some extent by the Department of the Interior.

With the exception of the work that was done by the Reclamation Service, which was done primarily for the purpose of marketing public lands, little assistance has been rendered or work done by the Federal Government which might not be classed as educational or advisory. The same is generally true of the various states of the Union.

The principal engineering questions involved in the conservation and development of our agricultural resources are connected with road building, irrigation and drainage, and it is in the last-named matter that, it is felt, the country, and its engineers as leaders, should now take an interest.

It may be urged that great progress has been made during the past generation by the enactment of state laws enabling the organization and operation of drainage districts which made possible the combination of interests of various owners. This is true, but such a step corresponds only to the social evolution from the family to the tribe, and does not square with our ideals as a nation.

District Control of Drainage Inadequate

To illustrate the fact that district control is not adequate, the following examples which have come to the writer's notice are cited:

1. In northern Illinois a glacial basin was reclaimed by cutting through the limestone rim which obstructed the natural but inadequate outlet and the construction of a system of main interior canals. The entire area is now under cultivation, and there can be no doubt that, in general, the works were well planned and the benefits derived have fully justified the expense. In the operation of the district, however, certain collateral interests were affected adversely, and the drainage district appears to be lacking in both the necessary machinery and in incentive to correct these conditions. Above the district, tributary streams have eroded excessively, destroying valuable farming land and cutting deep gullies which interfere with the conduct of farming operations.

Below the district, sand is deposited on farming lands which, before the improvement of the drainage above, were free from silt- or sand-bearing waters.

2. A recent article in *Engineering News-Record* (May 1, 1919, p. 876) describes the channel rectification of the south fork of the Forked Deer River. The author states that the new channel was purposely designed with a restricted area, with the idea that it would increase by erosion during each period of high water, thereby securing a channel of the required width without expense for the additional work. From the description given, it would appear that the expected process is going on, per schedule. While the writer confesses to only a superficial knowledge of the lands adjoining this stream, and especially those along the main Forked Deer River, it is assumed that the character of the country is not far different from that in other portions of the Mississippi Valley between Cairo and Baton Rouge.

If such is the case, it is quite possible that the net result of this method of dredging may not be all that may be desired. The residents of the lower flats may not take it kindly if they find that a recently planted field of corn or cotton has been covered over night by water that has left a layer of several inches of sand, gravel or clay on top of the infant plants. Some of the lands of the Yazoo delta country are occasionally treated to such unwelcome increments, and it is not an uncommon sight to see a fence more than half buried in silt, and railroad tracks which have been raised several times to keep them above the changing level of the ground.

These cases arise more particularly at or near

the entrance of the silt-bearing streams into the flat lands of the delta country.

3. In the reclamation of the marsh lands of southern Louisiana two problems are faced by the individual districts or owners. The problems might better be handled by a higher authority, having power to communize the interests of the entire section. These problems are those of the protection against storm tides, and the securing of adequate outlets for the discharge of the artificial drainage systems. Under present conditions, each individual drainage project must erect a protection levee of sufficient height to prevent the entrance of water resulting from storm tides, these levees being from 3 to 10 ft. high. Provision must also be made for a drainage outlet to the Gulf. In the past the tendency has naturally been to select for reclamation only those tracts that are most favorably situated so far as natural protection, outlets and transportation facilities are concerned.

An unnecessary handicap to the progress of the country has resulted, which might be avoided at a nominal cost per acre of lands benefited if a comprehensive plan of protection and system of outlets were perfected. Many of the existing pumping plants discharge into small bayous which are already becoming overtaxed. As the development of the section progresses, the question of adequate outlet will become acute.

Many Drainage Problems Interstate in Scope

Many drainage problems are interstate in their scope, and their development requires special legislation by the states interested, to make it possible to carry out a logical plan. The result is that a delayed and often unsatisfactory plan is finally reached, or an attempt is made to handle the work subject to the artificial limitations of the state line. The objections to the latter course are obvious.

Fortunately, we have few drainage problems which are international, such as that of the valley of the Red River of the North, and it is probable that each of these can best be handled by special diplomatic arrangement between the countries involved.

Those states with the conditions of which the writer is familiar have enacted laws making it possible for the people of a community to combine for the purpose of securing drainage of their lands, but the starting of a drainage project depends on the initial step being taken by some interested individual or group of individuals, usually entailing some considerable personal obligation to meet expenses until such time as a district may be organized. As the benefits to be derived apply only to comparatively few individuals within the district, and the money is to be spent by them, and as the drainage commissioners are frequently, if not usually, land owners of the district, it is not strange that methods are sometimes followed which do not give evidence of a desire for the promotion of the "greatest good to the greatest number."

They understand that a flagrant and obvious disregard of the rights of others will result in expensive litigation, but they are frequently adept at drawing the line just outside the courtroom. At least one state (Louisiana) has passed a law which requires the approval of plans by the Board of State Engineers before work may be undertaken by a drainage district, but this does not apply to private projects. Also, the board is so handicapped by lack of funds and personnel that it can give only superficial attention to the projects coming before it. But the law is a step in the right direction.

It is not urged that either Federal or state agencies interfere unnecessarily with private or district drainage enterprises, or that large amounts of public funds be appropriated for the improvement of private property. In other words, neither public ownership nor "pork-barrel" politics is advocated; but it is felt that present conditions justify action somewhat as follows:

1. A systematic study of the needs of each section. This can doubtless be done best by the extension of the present "drainage investigations" of the United States Department of Agriculture, assistance being rendered by the various state agencies.

2. The preparation of a comprehensive plan in detail for furnishing main outlets and flood protection for each section. This will require the employment of engineering ability of a high order.

3. The construction of main drainage canals and protective works as required.

4. Compulsory compliance of private owners or district officials with plans prepared or approved by proper authority.

The expense of the preliminary examinations should be borne by the Federal and state Governments, and the cost of the succeeding steps by the owners benefited, the projects being assisted by a suitable method of underwriting the bonds of properly organized districts.

To quiet the qualms of those who are fearful of too much interference by the Government with private matters, attention may be called to the fact that we are already supplied with ample precedent in the method of handling the railways of the country, stream control for purposes of navigation, eradication of the cattle tick, control of the citrous-fruit scale, etc., and, more recently, regulations concerning the conduct of the individual in certain matters of refreshments.

Wyoming Establishing Road-Patrol System

Maintenance on Wyoming roads is just being inaugurated on the patrol system. Two engineers are establishing patrol crews on the state roads and through routes, making the sections from 10 to 25 miles in length.

For a man with a team a section of 10 to 15 miles is given. He is equipped with a light grader drag and small tools, and is instructed in their use. Supervision of the patrolmen is then turned over to one of the five district engineers. For longer sections, two men are placed on one of the larger 3- and 3½-ton Army trucks, of which the state has already received 100. Improved road is about the only sort on which the larger trucks can be used, for the culverts on roads with less traffic, and the surface conditions in construction work, preclude their extensive use. Heretofore about $70 per mile per year has been spent on the improved state roads, mostly in grading. Now it is planned to put $200 or $300 per mile into them. The Yellowstone Trail and the Lincoln Highway were about 75% covered by patrolmen Aug. 8, according to Z. E. Sevison, state highway engineer.

D. S. McCalman, formerly a contractor on the Vermilion County roads, in Illinois, is superintendent in charge of maintenance.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

As Others See Us

Sir—Your issue of Aug. 21, 1919, contains two statements, both under the heading, "As Others See Us." One is made by Mr. Leighton (p. 387) quoting from "a great man and a high-minded politician," and the other is your editorial comment (p. 345) that "there is enough truth in them (the 'great man's' remarks) to shame our profession." Really, these statements do hurt and cut deeply. The "high-minded politician," when speaking of engineers, is reported to have said, "their aloofness and indifference to all matters outside of their own professional sphere are among the unexplainable things in our political life."

Let me ask with you, "Are these views correct?"

What is the difference between a successful professional engineer and a politician, in the highest sense—a man who devotes himself to the affairs and the art of government, who is a statesman, endeavoring to shape the ends of civil society as perfectly as possible, a leader in outlining the policies of the people and a guardian of their peace, safety and prosperity?

Both are supposed to be possessed at the outset of a good, broad and liberal education, including a general knowledge of affairs and a sincere desire to exercise their best abilities for the benefit of their communities. But here the equality ends and a different education and experience begin.

The politician studies the history of social evolution and the laws, if he can trace them, according to which, from the past to the present, the actual practical development of large and small communities takes place. He learns how these communities can best be organized and governed, how all the ways and means for a comfortable life and progress of the citizens can be procured and regulated. With this knowledge he then establishes legislative bodies, whose members, from the whole country down to its cities and villages, discuss and deliberate, and decide the multitudinous questions relating to their respective governmental requirements.

The elements with which the politician has to deal are: First, the people themselves, their average qualities, the degree of their development, the ways in which they desire to arrange their surroundings, earn their living, enjoy their surplus, and establish the best relations among the members of their own community and those of other communities, whether these are cities, states or countries. Second, the politician must study the possible future of his community, as determined from the geographical, climatical and physical conditions of the locality, so far as these control its becoming a manufacturing community, a trade or residential center, or possibly a seaport. Third, he must study and put into effect the numerous agencies required for establishing an organization to regulate, carry on and preserve most efficiently the economical life and growth of the community. Fourth, it is the work of a politician to cause the commercial development of a distributing system, relating to the transfer of people and goods within its own community and to and from other communities.

The engineer, on the other hand, studies the materials and forces of nature and their scientific laws which enable him to utilize them for the benefit of a community; makes the designs for building works required to accomplish a desired physical object, and directs their construction and proper operation.

The elements with which an engineer must deal are, therefore, quite different from those required by the politician, because, instead of dealing with social customs, relations and occupations, they deal chiefly with the well known and fixed scientific laws of nature and their application in designing and building up a city, its ways of communication by road, rail, water, telegraph and telephone, its means of lighting, supplying water and food, removing sewage and refuse, establishing factories, parks, etc. The engineer further deals with the ways and means of operating all these works in the most efficient and economical manner.

The politician, in the highest sense, is therefore the organizer, regulator, controller and director of a civilized community and of its people. But engineers, as well as physicians, merchants, teachers, judges, etc., are experts in special community activities, who must be consulted to the fullest extent and whose knowledge must be utilized for the benefit of the community at large. Not only Congress, legislatures and councils, but also every directorate of a corporation—say a railroad—should be made up of politicians in the above sense, of organizers, regulators and controllers, while the executive departments—relating, again as in the case of a railroad, to the design, construction and operation of all of its parts—should be made up of experts specially qualified therefor, as engineers, lawyers, business men, etc.

While these two different activities exist side by side, and each one may require a man's full time and his limit of efficiency, it occasionally occurs and is advantageous that both may be united in the same person. Therefore, engineers and physicians have been also organizers, directors and controllers of large bodies of men. A director of a railroad can often be aided in his judgment by knowledge and experience previously gained as a professional engineer, yet his new duties are no longer those of a designing, constructing or operating officer. The Pennsylvania R.R. directorate, for instance, has been greatly benefited by containing a number of engineers. A director or a member of a board of health can be aided in the exercise of his duties by knowledge and experience that he may have previously gained as a practicing physician or sanitary engineer, yet his new duty is regulative and controlling and covers the entire community.

The habits of a professional engineer, gained when dealing with fixed laws and applying them with absolute assurance of success, create a high degree of satisfaction and are not easily departed from when he changes over to the political profession, with its uncertainties, its unpreventable miscarriages of justice, and its efficiency, relying largely on individual experiences, assumptions and personal judgment. Therefore, such engineers, whose dispositions and character do not particularly fit them for directing and controlling activities, have not developed a special taste for political work, but have remained "indifferent" and have naturally

preferred to keep "aloof" from "all matters outside of their professional sphere." We can say the same of most physicians, manufacturers, merchants, etc. As the ability to carry a double professional load is given only to the strongest of men, only a few have actually attempted it and succeeded.

The above reasons seem to me to cover at least one "explanation" why enginers do not more frequently enter into political life. When they have entered it, on account of special fitness for it, their engineering training no doubt made them more successful as public leaders than they otherwise would have been, but their successful activity as professional engineers had to be sacrificed.

RUDOLPH HERING,
Consulting Engineer.

New York City.

Safe Loads on Steel and Wood Beams

Sir—In connection with the subject of simple methods for finding the safe load on steel beams, discussed in recent issues of *Engineering News-Record*, the rule given below is worth remembering. It requires a knowledge of the section moduli of different shapes, but it is equally exact for all shapes.

The safe uniform load W for any steel beam spanning 1 ft., at an extreme fiber stress of 16,000 lb. per square inch, will be $W = 10{,}670\ S$, in which S is the section modulus. For ease in memorizing use $W = 10{,}000\ S$, and, if it is desired to be exact, increase the result by 7%. To find the safe load for any span, divide the value W so found by the span in feet. Thus, the safe uniform load on a 20-ft. span of an 18-in. 55-lb. I-beam (section modulus 88.4) is $10{,}000 \times 88.4 \div 20 = 44{,}200$ lb.; adding 7% to make the result exact, 47,294 pounds.

For a load concentrated at the center of the span, one-half this value should be used. For a load divided between the two third-points, use three-fourths the uniform-load value. The rule given is, of course, readily derived from the ordinary equations for bending moments and resisting moments.

A similar rule for safe uniform loads on rectangular wooden beams is: For a fiber stress of 1600 lb. per square inch, the load for a span of 1 ft. is $W = 175\ bd^2$; for a fiber stress of 1200 lb. per square inch, $W = 135\ bd^2$, in which b is the width of the beam in inches and d is its depth.

HENRY F. BLOOD.

Portland, Ore.

The Sanitary Engineer as Health Officer

Sir—The number of articles favoring the sanitary engineer as a public health officer is increasing, and that fact means that sooner or later the engineer will be recognized as the logical executive to have charge of all public health work, with doctors of medicine as assistants or consultants acting solely in an advisory capacity. This is radical but perfectly logical. It follows that the United States Public Health Service should be in the control of engineers, and that its work would then fall within the proposed Department of Public Works, where it belongs.

The laws generally permit only practicing physicians to hold the office of county or city health officer. This is wrong, especially in view of the fact that there is an increasing number of very efficient health officers who are not medical men. At the present time a sanitary engineer may act as deputy health officer, doing all the work for which he is paid, while the doctor of medicine acts as his superior in the position of health officer and receives all the honor for accomplishing results. A district health officer of the State of California has stated in good faith that but 10% of the duties of health officer requires a medical training.

On every health board, state or city, there should be granted to the engineer equal representation. The doctor of medicine is interested primarily in the cure of disease and not in its prevention. The sanitary engineer practices preventive medicine and is logically the one to see that all things necessary are done to conserve the public health. Practically half of the diseases are due to constitutional causes, while the balance are brought about by bad environment. The engineer deals with environmental causes, while the doctor looks after the constitutional weaknesses. This would permit the engineer to take an active part in civic affairs in one of its phases. There is a crying need for men with engineering training in all board of health work which is universally headed by a physician. It is no reflection on the medical profession to state that not one physician in fifty knows the difference between an activated-sludge plant and an Imhoff tank.

Wider publicity should be given to the changing conditions. The engineer who is employed under unsatisfactory conditions dares not express his views, with the result that the public is not familiar with the sentiment of the men who are most vitally interested. The sanitary engineer in the United States Public Health Service is in no position to defend himself. A certain engineer writes that he was, some time ago, director of sanitation at a certain camp with a medical "officer in charge." He says: "The job was scarcely big enough for one man, and to be annoyed by one unfamiliar with the work but in authority over it, who would speak of 'my engineer' in a superior way and with assumed importance, was a bitter experience. The remedy, I think, lies in organization and publicity. Let the public know it is not getting a dollar's worth of public health-protective measures when it pays a dollar for it, when a top-heavy 'overhead' of inefficient medical officers direct or pretend to direct purely engineering matters, and it will be easier to have sanitary engineers placed in administrative positions. I believe, too, that an organization such as the American Society of Civil Engineers will never in a thousand years do us much good along these lines. It lacks the aggressiveness, is too conservative, and is for the leaders rather than for the rank and file. I am beginning to pin my faith to the American Association of Engineers and to preach organization and publicity for engineers." He adds the remark that all efforts in behalf of the sanitary engineers in the employ of the United States Public Health Service is much appreciated "by the many engineers who are still in the service but who must keep quiet or be disciplined."

EDWARD G. SHEIBLEY,
Hydraulic and Sanitary Engineer.

Riverside, Calif.

[As matters now stand, undoubtedly more engineers should be engaged in public health work, both as health officers and as members of health boards or commissioners of health.

It is only fair to say that the doctors are as likely to chafe at being under engineers as are engineers at being subject to the direction of doctors. The difficulty in either case lies largely in the confusion still existing as to what is the proper education and training for

health officers, but back of this is a lack of clear ideas and rational practice as to the proper function of health departments. From this confusion there are signs of emergence. Some years hence there will be a clearer conception of what falls to the doctor and what to the engineer. Meanwhile, schools may arise that will so shape their courses as to fit men to serve as public health officers, instead of first trying to make them either doctors or engineers.

Once the true function of a health department is generally recognized by the educators and the public, much of the engineering heretofore associated with public health will be turned over to engineering departments—local, state, Federal—and the man educated in public health rather than in private medicine will administer public health work. When that time comes, plumbing, garbage and refuse disposal, water-supply, sewerage and sewage treatment will be in the control of departments of sanitary engineering. Health departments will deal with health as centering in the individual and with communicable diseases as spread by infected persons through lack of proper control by doctors, nurses and responsible householders.—EDITOR.

Engineer Finds Both Direct and Indirect Advantages in Technical Writing

Sir—The following account of how one engineer learned to write may be of interest to your correspondent, J. W. Moulton, whose letter appeared in your issue of Aug. 28, 1919, p. 433:

The writer was present at one of the meetings of the American Society of Civil Engineers when a particularly dry and uninteresting paper was being read, and, turning to a friend, said: "Well, they certainly do have some pretty 'punk' papers up here." My friend replied, "Why don't you write one and show 'em how to do it?"

I was at that time one of the very large class of field engineers who either "don't have time to write," or don't have anything to write about, but who kick generally because all the books are written by college professors who don't know anything about practical work. However, my friend's remark rather stuck in my mind, and I finally decided to write a paper for the society which, when submitted, was promptly returned by the secretary as being of no interest, too long, and for various other reasons. I decided to have a talk with him, however, before dropping it, and after some modifications it was accepted and published.

It is to be noted that the new development committee of the society recognizes the need for encouraging the young engineer both to write and take part in the discussions. This the committee does, instead of taking the erstwhile passive attitude which has often appeared to be merely to endure the intrusion of the younger members.

To get back, however, to the question of writing: My own experience has been that writing articles or other matter for which direct remuneration is received seldom pays directly; the amount of money received being a very small compensation for the time and labor involved. If a writer's works become favorably known, however, his fame and reputation are thereby enhanced. But to my mind the chief value comes to the writer by reason of the fact that when he "takes his pen in hand" to write something for the critical perusal of others, he finds out there are many things he really does not know that he thought he did. If he sticks to it, he finally does get to know them in a way he never otherwise would.

As this touches on a more or less personal matter, I beg to be allowed to subscribe myself simply as

A WRITER.

Questions on Anchorage and Lateral Sway in Cumberland Suspension Bridge

Sir—Your issue of July 3, 1919, contains (p. 4) an interesting description of a suspension bridge over the Cumberland River near Nashville, Tenn., built for the du Pont Engineering Co. This bridge has several unusual features, especially the design of the concrete anchorages. It is stated that the bridge is designed for a live load of 400 lb. per lineal foot, which with 8-ft. roadway equals 50 lb. per square foot. Considering that a great crowd of people pass over it morning and evening, this can hardly be called excessive.

Assuming that the designer's computations are correct, this live load combined with the dead load causes an uplift on each anchor of 770,000 lb. To take care of this uplift the anchor rods are embedded in a concrete block 20 x 11 x 39 ft., containing 8580 cu.ft. of concrete weighing about 1,158,000 lb., or about 50% in excess of what is required.

This may be good enough, ordinarily. However, it is mentioned that high water overflows one bank regularly. The buoyancy of this concrete block amounts to 536,000 lb., leaving a dead weight of 622,000 lb. to take care of 770,000 lb. uplift. There may be some side friction and suction, but hardly sufficient to overcome a shortage of 148,000 lb., especially as it appears from the views that the anchorages are not even completely buried. May we hope that the dead load for this bridge was assumed heavy enough, and that it will never be tested to its full capacity, or it may provide an easy and convenient access to a point far beyond the powder plant for the 14,000 persons who pass this bridge daily.

The writer has tried to design some suspension bridges, and has found it no easy problem, especially to provide against the span swinging sideways. It would be interesting to know how this bridge acts in that respect, as it is built without wind cables. In spite of the facts that it has exceptionally heavy laterals and that the cables are slightly cradled, one should think there would be considerable swing sideways in a span with a ratio of length over width of 60.

D. ORDING,
Assistant Engineer, the Midland Bridge Company.
Kansas City, Mo.

Sir—The writer has had the privilege of reading the interesting discussion of Mr. Ording on the suspension bridge at Nashville, which brings out some of the conditions in engineering design calling for the best judgment on the part of the designing and field engineers.

In regard to the stability of the concrete anchorage, Mr. Ording assumes that when the river overflows the bank, full hydrostatic pressure will be exerted on the anchorage. The river does overflow the east bank in the high-water season, and for that reason very careful consideration was given to the design and construction of this anchorage. Three types of anchorages were submitted, and the type described in the issue of July 3 was finally selected.

The ground on the east bank was silt for a depth of about 3 ft. Then came some hard gravel, and finally hard clay was reached. Piles were driven under the east anchorage and also under the east tower foundation, these piles averaging about 25 ft. in length below the cutoff. The view of the concrete anchorage, Fig. 5 in the article, shows this anchorage during construction. Wherever any space existed between the concrete and the side of the excavation, this space was filled in and rammed hard so as to make it very unlikely that anything approaching full hydrostatic pressure would be exerted on the anchorage, as this filling was practically impervious.

Mr. Ording comments on 50 lb. per square foot not being an excessive live load. The bridge is 8 ft. wide, so that four men abreast is about the maximum that it will hold. Assuming the weight of the average man on the bridge to be 150 lb., the weight of a file of four men would be 600 lb., so that in order to get 400 lb. per lineal foot (50 lb. per square foot for a width of 8 ft.) the files would have to be 18 in. apart for a distance of 540 ft., or entirely too close for convenience in ordinary walking. The writer has often watched the crowds coming off the ferry-boats and in the subway and elevated entrances and exits, and, while the congestion is close around the gates, as soon as the crowd starts moving the distances between the individuals increase, and, except in case of a local congestion, the distance between files of people averages from 2½ to 3 feet.

For the suspension bridge, with a width of 8 ft., it is hardly likely that the men will average more than three abreast, which at 150 lb. per man will be 450 lb. per file; assuming the files to be 2½ ft. apart, we get a live load of 180 lb. per lineal foot, which seems a fair value considering that it extends over a distance of 540 feet.

Furthermore, the concrete was assumed to weigh 135 lb. per cubic foot. This is a low value, as from our experience concrete runs very close to 150 lb. per cubic foot.

The actual dead load of that part of the span producing a pull on the anchorage is 575 lb. per lineal foot, as against an assumed dead load of 550 lb. per lineal foot. This dead load will produce an uplift of 466,000 lb. A live load of 180 lb. per lineal foot will produce an uplift of 146,000 lb., making a total uplift of 612,000 lb. Assuming 8580 cu.ft. of concrete at 150 lb. per cubic foot, we get 1,287,000 lb. About 10,000 lb. of anchorage steel was embedded in the concrete, which, making allowance for the difference in weight between steel and concrete, will add 7000 lb., making the total weight of the anchorage 1,294,000 pounds.

The margin of safety, then, under normal conditions would be 682,000 lb. If under flood conditions, with the bridge fully loaded with 180 lb. per lineal foot, full hydrostatic pressure were exerted on the anchorage, this margin would be reduced by 535,000 lb., leaving a net of 147,000 lb. Should the concrete only weigh 135 lb. per cubic foot, the net margin would still be 18,000 lb., on the assumption that full hydrostatic pressure were exerted on the anchorage. It is the judgment of the engineers, however, that full hydrostatic pressure will never be realized.

Mr. Ording also comments on the absence of wind cables. This point also received careful consideration at the time when the bridge was designed. He calls attention to the fact that heavy laterals were used. It will also be noted that the chord members were extra-heavy.

The maximum live-load chord stress was ±108,000 lb., requiring an area of 7.8 sq.in. net for tension or 9.8 sq.in. gross for compression. The largest chord section used, two angles 6 x 6 x ¾ in., has 16.9 sq.in. gross and 13.9 sq.in. net area. This excess, together with the cradling of the cables, was assumed to take care of the 10 lb. per square foot wind on the partially loaded structure without too much swaying of the span. For either a 10-lb. wind on the fully loaded structure or a 25-lb. wind on the unloaded structure, the full gross and net areas of the chord angles are available, since the stiffening truss takes stress from neither dead load nor live load over the entire structure, but only from a partial live load.

To sum up, the writer believes that full hydrostatic pressure will never be exerted on the anchorage, and also that the amount of swaying of the bridge will not be excessive.

WILLIAM G. GROVE,
New York City. American Bridge Company.

Further Researches in Rodding Concrete

Sir—In *Engineering News-Record* of May 15, 1918, p. 957, there was published a preliminary report of some tests conducted at the University of Texas, tending to show the value of "rodding" concrete; that is, of agitating the new and wet mixture with a pointed iron rod. Since that time some further results have been reached which seem to be worth publishing.

Fig. 1 (next page) shows graphically the ultimate unit compressive strengths of fifty-four 6 x 12-in. cylinders. The concrete had the following composition:

Material	Percentage
Cement	14.40
Passing 35-mesh sieve	4.35
Passing 12-mesh sieve and retained on 35-mesh sieve	9.00
Passing ¼-inch sieve and retained on 12-mesh sieve	13.00
Passing ¾-inch sieve and retained on ¼-inch sieve	29.50
Passing 1½-inch sieve and retained on ¾-inch sieve	29.75
	100.00
Water	10.00

The 54 cylinders were divided into three groups of 18 each. In each group one cylinder was not rodded, the remaining 17 were rodded at stated intervals from 1 to 17 times. In one group a 10-min. interval was allowed between roddings; in another a 20-min. interval; and in the third group a 30-min. interval. The first rodding was applied soon after the molds were filled; i.e., without waiting for the full interval of time assigned the particular series to pass. By one rodding is to be understood the pushing of a pointed iron rod into the concrete, to the full depth of the concrete, once for every surface area of about 3 sq.in.; i.e., about ten times for a 6-in. cylinder.

It is interesting to note that the maximum strength is about 130% more than that of the unrodded specimens and that all three series acquired their maximum strength in about 2 or 2½ hours. It is probable that the length of time and the number of roddings necessary to secure the maximum strength vary with the temperature and with the percentages of cement and water.

Fig. 2 shows graphically in the upper part of the diagram the average ultimate unit compressive strengths of thirty-six 6 x 12-in. cylinders arranged in 12 groups

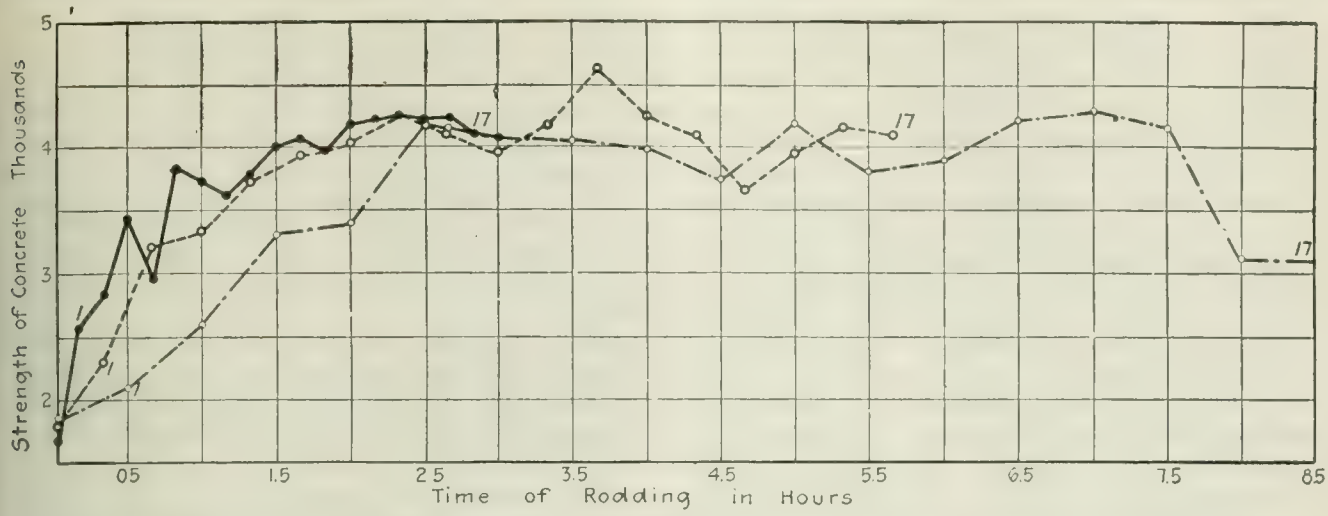


FIG. 1. VARIATION IN INCREASE OF STRENGTH OF CONCRETE WITH NUMBERS OF RODDINGS

of three cylinders each. The intermediate group was made of concrete having the same composition as that represented in Fig. 1; but the mixing water was 7% for three cylinders, 8% for three, 9% for three, and 10% for three. This concrete contains cement at the rate of about six sacks of cement per cubic yard of concrete.

The two other groups are of similar composition, but the cement content changed to about four and eight sacks, respectively, per cubic yard. The percentages of water for the lean mixes were the same as for the intermediate, but for the rich mixes they were increased, respectively, to 7½, 8½, 9½, and 10½ per cent.

To compare these results with the strength of plain concrete, the work of the Lewis Institute of Chicago, as reported by Prof. D. A. Abrams, was selected as being probably the latest and most reliable, and probably also the most appropriate, since it gave special attention to the effect of excess water on the strength of the resulting concrete.

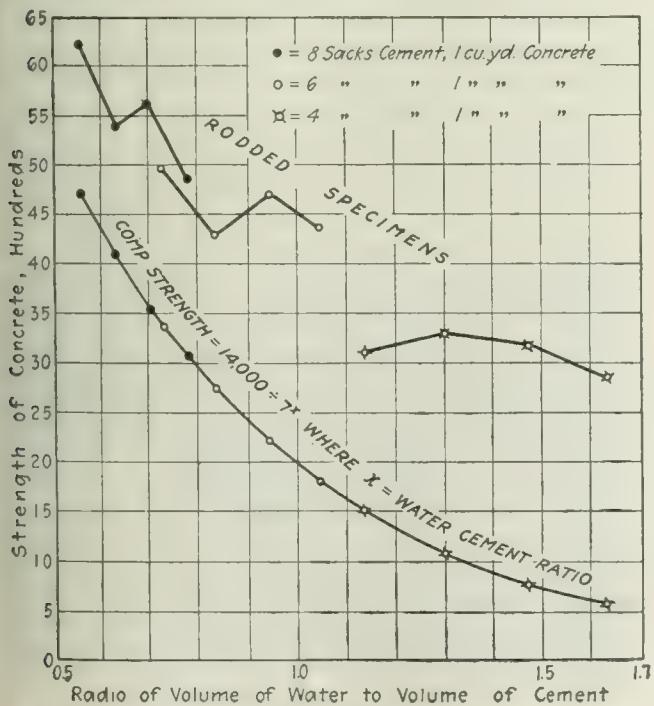


FIG. 2. INCREASE OF STRENGTH OF CONCRETE DUE TO RODDING

According to the Lewis Institute tests, the strength of concrete is a function of the ratio of the volume of water to that of the cement used in the production of the concrete, and is $1400 \div 7^x$ pounds per square inch for cement 28 days old, x being the ratio referred to and the weight of one cubic foot of cement being assumed as 94 lb. The lower curve (Fig. 2) shows the strength of the 12 groups of specimens as calculated by this formula.

An inspection of Fig. 2 shows that the effect of rodding concrete is more beneficial with lean than with rich mixes, that it is more beneficial with wet than with dry mixes and that the average strength of eight-sack concrete can be increased about 45% by rodding; that of six-sack about 60% and that of four-sack about 220 per cent.

To appreciate how well the values shown in Fig. 1 (determined by tests July 11, 1919) check with those shown by the broken line in Fig. 2 (determined by test Mar. 19, 1919) and with those shown by the curved line in Fig. 2 (calculated from the Lewis Institute formula) notice that the average strength of the unrodded specimens shown in Fig. 1 is about 1800 lb., and that this is almost exactly the same as that shown by the curved line in Fig. 2 for the six-sack concrete with 10% of water, also that the strength shown by Fig. 1 increases gradually with the rodding to about 4250 lb., which is only a trifle less than that shown by the broken line in Fig. 2 for the six-sack concrete with 10% of water.

Austin, Tex. F. E. GIESECKE,
Professor of Architectural Engineering and Head of the Division of Engineering, University of Texas.

Additional Data on Bolted Connections

Sir—The use of bolted connections in place of riveted connections is justified, according to the experience of the writer, to a far greater extent than is now permitted in most specifications, and consequently the article by R. Fleming in your issue of Aug. 14, p. 316, "Bolts in Field Connections of Steel-Frame Buildings," meets with hearty approval. The conclusion might well have been made more inclusive, and instead of being limited to building construction it might have been stated as follows: "Bolted connections have a place in *all types* of steel structures. *Each structure* should be considered by itself, etc." For example, in the

case of the most completely riveted form of structure, the railway bridge, could not stringer connections which are solidly embedded in concrete floor material be bolted most satisfactorily? Bridge railings and sidewalk brackets are frequently bolted.

The criterion for making the use of bolts questionable would be the occurrence of vibration, impact or reversal of live-load stress, or inaccessibility after erection (the latter on account of inability to inspect occasionally to test the tightness). Ordinary bolts, such as are under discussion, would become less desirable as the number of pieces and thickness of the material to be fastened is increased. The general use of bolts will undoubtedly increase as the cost of field labor increases and the quality of field work decreases, as the latter would affect field rivets more than field bolts.

The recommendation that for tower connections the allowable shearing stress for bolts be two-thirds the allowable stress in the tension members agrees with the writer's judgment. A slightly reduced ratio might naturally be used for building work, in order to give a higher factor of safety, but it would not seem that any distinction need be made between shop bolts and field bolts.

Allowable bearing values are usually made twice the shearing values, and this practice has been followed in the recommendations, although the tests cited show a ratio of 2.6. The above average bearing value should be termed "Bearing Value for One-sided Connections," as in getting this average Mr. Fleming has rejected the first group of tests, which, in the judgment of the writer, are the only tests shown that give the real bearing values. In this first group the test piece was held between two other pieces, and the bearing values of these six tests average 3.9 times the average shearing value.

The following comparison shows up very clearly the comparative weakness of the one-sided connections due to eccentricity, and the decrease in strength as the connecting bars increase in thickness. The ratio of bearing value to the average shearing value is interesting.

UNIT BEARING VALUE AT FAILURE

(From tests reported by R. Fleming, *Engineering News-Record*, Aug. 14, 1919)

Symmetrical Connections Group A			One-Sided Connections Groups B, C, D and E		
Thickness of Metal, In.	Average Ultimate Bearing Value, Lb. per Sq.In.	Ratio to Average Shear	Thickness of Metal, In.	Average Ultimate Bearing Value Lb. per Sq.In.	Ratio to Average Shear
(2 tests) $\frac{1}{2}$	163,000	4 5	(8 tests) $\frac{1}{2}$	117,175	3 3
(2 tests) $\frac{5}{8}$	148,550	4.1	(7 tests) $\frac{5}{8}$	87,107	2.4
(2 tests) $\frac{1}{4}$	117,600	3 3	(3 tests) $\frac{1}{4}$	70,767	2 0

It appears that actual bearing value is not a fixed quantity or ratio but is a complicated system of failure depending on many variable factors. Some of the ways in which failure can take place and be commonly reported as bearing failure would be: (1) By crushing the material in front of the bolt or rivet shank as cheese would be crushed; (2) by splitting or stretching the material in front of the shank and folding back the edges; (3) by shearing out a piece at the head of the shank as in the end of a wooden piece; (4) elongating the hole by stretching the material at both sides; (5) stretching the material on one side of the hole and bending the other side. Where the material is confined against sidewise deflection and the axis of the bolt is at right angles to the stress, bearing on the shank will be distributed instead of being concentrated at one edge. That is, a bolt with good stiff washers under head and nut should show greater bearing value than one without, and a piece gripped between two other pieces of opposite stress should develop the bearing value most fully. A clause like the following will still insure a greater factor of safety in bearing than in shear: "Allowable unit stress in bearing for rivets and bolts: (a) In general, twice the allowable unit shearing stress; (b) in members clamped between pieces of opposite stress, $2\frac{1}{2}$ *times* the unit shearing stress."

Some tests of bolts were made in 1914 by the testing staff of Milliken Brothers, Inc., using bolts whose material had an ultimate tensile strength of 73,000 lb. per square inch. Their results are summarized in the two following tables:

ONE-BOLT TESTS

Size of Bolt, In.	Load at Failure, Lb.	Unit Shear at Failure, Lb. per Sq.In	Ratio Tensile to Shearing	Unit Bearing at Failure, Lb. per Sq.In.	Ratio Bearing to Shearing
$\frac{1}{2}$	13,600	34,700	2 10	87,500	2.52
$\frac{5}{8}$	13,450	34,300	2 13	86,000	2.50
$\frac{3}{4}$	13,700	35,000	2.08	88,000	2.59
$\frac{7}{8}$	14,500	37,000	1.97	93,000	2.51

TWO-BOLT TESTS

Size of Bolt, In.	Load at Failure, Lb.	Unit Shear at Failure, Lb. per Sq In.	Ratio Tensile to Shearing	Unit Bearing at Failure, Lb. per Sq.In.	Ratio Bearing to Shearing
$2\frac{5}{8}$	22,550	36,700	1.98	96,000	2.61
$2\frac{5}{8}$	26,125	42,500	1.74	111,000	2.61

In the first set, the bolts were in double shear, with a center bar $\frac{5}{16}$ in. thick and two outside bars $\frac{1}{4}$ in. thick. All failures were by shearing; the bars had settled down to a good bearing pull without indication of bearing failure. In the second set the test pieces were angles $2\frac{1}{2}$ x $2\frac{1}{2}$ x $\frac{3}{16}$-in., connected to thicker gussets at each end by two $\frac{5}{8}$-in.-diameter bolts, spaced 2 in. apart, with 1-in. end distance to first bolt. Both failures occurred by splitting out the end of the angle after slightly elongating the holes, and after shearing had commenced.

The writer is acquainted with the details of a large one-story manufacturing building, originally designed for rivets but in the erection of which bolts were used, with $\frac{1}{4}$-in. washers under the nut to hold off the thread. The bolts were $\frac{1}{16}$ in. larger in diameter than the nominal rivet diameter; that is, $\frac{13}{16}$-in. bolts were used instead of $\frac{3}{4}$-in. rivets. Ten-ton transverse cranes run in alternate bays, hung from the trusses. During six years' use the building has not developed any weakness.

WALLACE E. BELCHER,
Engineer, American International Shipbuilding
Hog Island, Penn. Corporation.

What Causes This Water-Hammer?

Sir—What causes this hammer? I have a 16 x 12-in. double-acting piston pump driven by a motor running 50 r.p.m., lifting water 12 ft. from reservoir and elevating it through mains to a 90- or 100-ft. tower tank. At times there is a terrible hammer in the mains and service pipes—so bad, at times, that people have to close cut-off in order to sleep. Valves are in good order, and there is a 7 x 15-in. air-chamber check valve 3 ft. from the pump on the discharge line. Can some of your readers explain this trouble and suggest a remedy for it?

B. GIBSON,
Decatur Light & Water Company.
Decatur, Tex.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Keep Road Forms Clean for Tampers

IT IS as important that the tops of the side forms for concrete roads should be kept clean as that they should be set at proper grade and level. They form templets for the strike boards and mechanical tampers, in finishing the surface, so that obstructions will cause the board or tamper to rise above its proper position. Tamping machines usually have plows in advance of the front wheels for the purpose of cleaning the tops of the forms, but these are not always adjusted for close contact with the form, in which case they become inoperative. On road work recently visited, the forms were almost completely covered with concrete spilled over them, and on this the wheels of the tamping machine traveled with an irregular and jerky motion. Particles of aggregate were either crushed under the wheels or caused the machine to ride over them, with a perceptible lift. In some places the accumulation was nearly ¼ in. thick. Neither the machine operator nor the man in charge of the surfacing and edging paid any attention to this condition, and apparently it was not noticed by the inspector. Patches of this concrete would adhere to the surface of the steel forms, so that when they were shifted ahead and set in place they did not give a true surface, and fresh concrete would add to the obstruction.

Other Articles in This Issue of Interest to Contractors:

Rapid Concreting a Feature of Big Portsmouth Dry Dock — Page 494

Arrangement of Equipment in Engineer's Office — Page 502

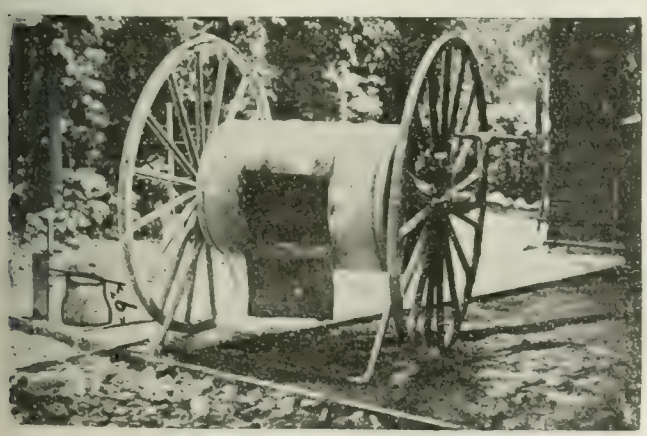
Dutch East Indies Offer Many Construction Opportunities — Page 497

Oil Drum Makes Portable Concrete Mixer

BY A. J. BECKWITH

Draftsman, United States Lighthouse Service, Milwaukee, Wis.

BY THE mounting of an old oil drum on a pair of concrete buggy wheels, the portable mixer shown in the accompanying view was devised on a recent job, and proved efficient and convenient in laying sidewalks and driveways. In operating it, materials are handled but once. The cart is filled at the gravel and stone pile, churned and pushed to the spot where the concrete is to be placed.



HAND-OPERATED CONCRETE MIXER

The outfit, with a capacity for a ⅓-bag batch, comprises an old oil drum, mounted on two old buggy wheels about 4 ft. in diameter, having 1-in. pipe axle and pipe fittings. The hinged door is made to close down tightly and is then clamped, and thereby any leakage of water is prevented. The interior of the drum is equipped with mixing blades properly arranged to throw the materials away from each end of the drum toward the center, as the drum revolves.

After the loading, the wheels are braced by the handle of the cart on one side and by blocks or a plank on the other, to prevent motion of the cart, for the drum is rotated by a hand crank. The latter, made up of pipes and fittings, has an extension pipe handle which slips freely into the outside crank handle, allowing it to be pushed in between the spokes of the wheel. Thereby the drum is held in any desired position, and the drum is allowed to revolve when the cart is in motion. If the haul is lengthy, mixing by pushing the cart will be found to work with surprising ease. As the wheels are free and work independently of each other, the cart may be turned around in a space no greater than its own width.

A slump test, as shown in the illustration, was made for one day's pouring on a 1:2 mix, using 9% water by volume, securing a 9-in. slump after the 12-in. cylinder was removed.

Simple Rack Files Many Prints

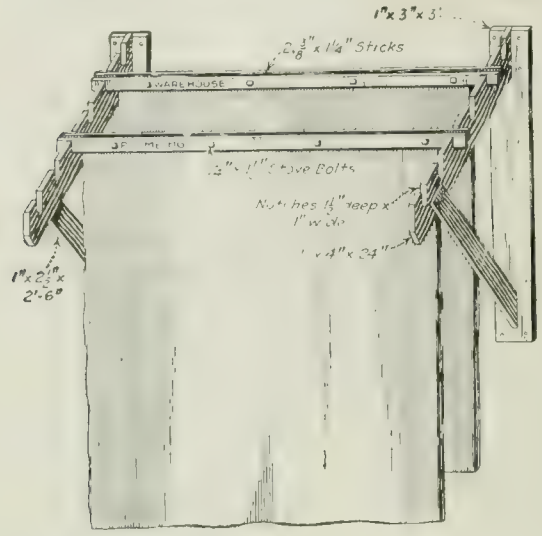
BY CHARLES P. RUMPF

Assistant Engineer, Snare & Triest Company, Philadelphia

ON A several million dollar contract, the following simple and concise method of filing and indexing plans, and keeping a record of their distribution, was adopted with success. Blueprints came from the drafting room to the plan file and distribution room, each plan having a descriptive title and a serial number. The plans were there divided into logical groups. On this contract, which happened to be a pier and warehouse job, 20 groupings were used, the following being characteristic: Pier substructure, warehouse, dredging, miscellaneous details, bills of material, plumbing, lighting.

Each group was filed on a separate binder, which was appropriately labeled and hung on a rack, as shown in the accompanying sketch. For every print a card was made out, giving the title of the plan and the group

under which it was filed. Such a card is reproduced herewith. These cards were filed in numerical order, and when a revised print was received the last date was noted on the card in the upper right-hand corner. The



SIMPLICITY AND UTILITY COMBINE IN THIS PLAN RACK

filing and indexing feature of the scheme directed a person looking for a plan to either the general group to which it pertained or to the number of the plan. In the first case he could look through the appropriate binder, and in the second case he would go to the card file and ascertain on which binder he would find the plan.

As noted above, the plans were not only filed but were distributed from this center, and the index cards further proved of much value as receipt cards. Anyone who has had to keep a field force supplied with con-

Print No. 423 Last Date 7-25-19

Binder:- Plumbing

Title:- Ship Water Supply

Pur. Dept.

Plumbers

Supt.

INDEX CARD IS ALSO RECEIPT FOR ISSUED PRINTS

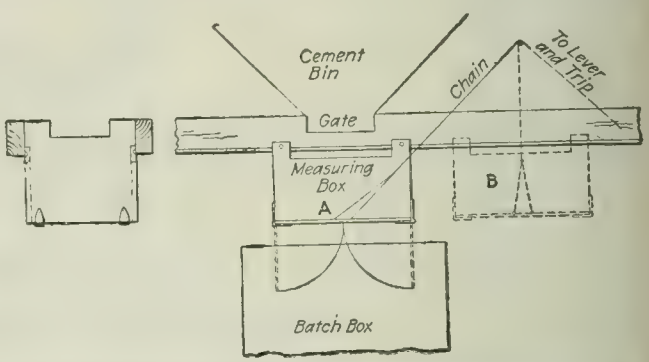
stantly revised plans will appreciate the value of a receipt card for outgoing plans. Upon receipt of either a new plan or a plan containing a revision, a request was made to the drafting room for enough additional prints to distribute to interested field and office parties. Date of delivery of the plan was noted in the lower left-hand corner of the card, and opposite this date the receiver was obliged to place his initials. The card was then filed.

The index card showed in complete form where a certain plan could be found, its last revised date, who had received copies of it, the date of the plan received, and the receipt therefor.

Measuring Box Reduces Clearance in Cement Bin

IN CHARGING batch boxes or car bodies with bulk cement from overhead bins, clearance is reduced by using the measuring-box arrangement illustrated by the accompanying diagram. Instead of measuring the cement in chutes integral with the bin and extending down 3 to 4 ft. from the bottom of the bin, separate measuring boxes, normally out of line of the locomotive or cars under the bin, are employed, and gates that are without chute extensions are placed in the bottoms of the bins.

As shown in the accompanying diagram, each box is hung so as to slide, barn-door fashion, between two beams; this allows it to be pulled to one side, B, to give headroom for the locomotive. The charging position, A, is shown by the full lines. In this position a chain to a lever and trip, arranged as the conditions make



MEASURING BOX ARRANGEMENT FOR OVERHEAD CEMENT BIN

most convenient, holds the double flap-door bottom closed; when the box has received the charge from the bin gate the lever is tripped and the weight of the cement swings the doors open, and the charge enters the batch box. With small clearances the dusting is insignificant in amount.

A measuring box of this type is used by the Mellon-Stuart-Nelson Co., Chicago, Ill., on concrete road work for Cook County, Illinois.

Gravel Deposits for Concrete Aggregate Explored by Suction Pumps

SUCTION pumps were used successfully for obtaining samples, at depths up to 20 ft., in exploring gravel beds for concrete aggregates at the flood-control dams of the Miami Conservancy District. Pits were first excavated to groundwater level, and then the pumps were installed for deeper explorations. These were simple suction pumps with 6-in. barrels 8 ft. long. An 8-in. casing was set upright on the pit bottom, and the pump barrel was inserted and let down into the gravel. A portable gas engine drew up the plunger by successive short jerks which filled the barrel with gravel; then the pump was withdrawn and the contents were put into 100-lb. sample bags, labeled according to their location in relation to surface and position.

As the gravel was pulled up into the pump barrel the 8-in. casing settled. By the addition of short lengths to the casing, depths of 20 ft. were reached.

NEWS OF THE WEEK

New York, September 11, 1919

American Water Works Body To Have New York Home

After many years of hoping and planning, the American Water Works Association will open headquarters in New York City, Oct. 15, on the first floor of 153 West 73rd Street, with John M. Diven, secretary, and Miss Charlotte S. Edgley, assistant secretary, in charge. Mr. Diven will devote his entire time to the association, having resigned as superintendent of waterworks at Troy, N. Y., effective Oct. 1.

Secretary Diven will begin his full-time service as secretary of the association Oct. 15. Before becoming superintendent of the water-works at Troy, in February, 1912, Mr. Diven was superintendent of the Charleston, S. C., Light & Water Co., for seven years, and prior to that time he was superintendent of the Elmira Water, Light & Railroad Co., and the Elmira Water-Works Co., for many years.

Would Name Permanent Body To Fix Railroad Wages

The creation by Congress of a permanent Governmental commission to fix and adjust the wages of all railroad employees was urged in the Senate Sept. 4 by Senator Oscar W. Underwood, of Alabama, as an immediate and permanent solution of the railroad-wage controversy.

"There is but one way out, in my judgment," said Senator Underwood, "and that is to appoint a tribunal that will have the power to adjust these matters, and will have the time to consider and the opportunity to know the facts. Such a tribunal must not only have the power and be prepared to do what is right and just by the labor employed on the railroads, but must have authority and power to see that property is not confiscated by its decisions."

Wilmington, Del., Authorizes Port Improvements

Bonds to the amount of $3,000,000 have been authorized by the council of Wilmington, Del., for the development of the harbor. Immediate construction will be begun on a $400,000 produce wharf for the local market, and the remainder is to be devoted to general port improvement. A report was made to the city some years ago by John Meigs, consulting engineer, Philadelphia, in which an elaborate port scheme sufficient for many years was developed, and presumably the new work will start according to lines laid down in this report. The work will be in charge of the Board of Harbor Commissioners, Wilmington, Del.

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago. Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 505 Pearl St.

To Support Jones-Reavis Bill

The American Association of Engineers has issued a request to each of its members to write to his Congressman requesting his support of the Jones-Reavis bill providing for a national department of Public Works. Instructions are being issued to each chapter and club, containing means of stimulating local interest in this bill and of obtaining the support of the voters in each community.

Oregon Board for Examination of Engineers Organized

In accordance with a law passed by the last session of the Oregon state legislature, the Oregon State Board of Engineering Examiners has been organized, with O. Laurgaard, city engineer of Portland, as president. The other officers are F. D. Weber, electrical engineer with the Oregon Insurance and Rating Bureau, vice-president; and A. B. Carter, civil and mining engineer, secretary. The board has established headquarters in Portland for receiving applications for registration of all professional engineers practicing in the state.

The bill, which became effective July 1, requires, for those properly qualified, registration without examination; or registration and examination of all professional engineers—mining, civil, mechanical, hydraulic or electrical—practicing in the state.

States May Get Army's Road-Building Plant

House Committee Begins Hearings on Transfer of Surplus War Department Property

A bill providing that motor vehicles and motor equipment which will be declared surplus by the War Department may be transferred to the Postoffice Department and the Department of Agriculture, for use in the building and maintenance of roads, was last week introduced in the House by Representative Julius Kahn of California. This bill was introduced with the intention of superseding the provision to the same effect in the Federal road-aid act and the Postoffice act and of obviating the difficulties which these provisions encountered in the actual transfer of surplus material from the War Department to the other Government departments.

By a ruling of the Judge Advocate General of the Army, it was decided that such transfers could not be made without transfer of funds, and the new bill specifically states that surplus motor vehicles and motor equipment may be transferred without a transfer of funds. The new bill, however, still leaves the transfer of any material to the discretion of the Secretary of War. The ruling of the Judge Advocate General explains why the Department of Agriculture, particularly the Forest Service and the Bureau of Public Roads and Rural Engineering, had not received the equipment for which they had petitioned. Despite this ruling, however, it was learned that the Forest Service this week was notified that some 230 sets of harness and a number of motorcycles, forges, and 13 concrete mixers were consigned to be delivered to the various districts of that department.

The House Committee on Military Affairs Sept. 9 opened hearings to thresh out the entire matter of the distribution of surplus War Department equipment for use in connection with road construction. The position of the War Department, as set forth by Guy Hutchinson, assistant director of sales, is that the expressions of Congress are conflicting, and that pending further Congressional action the War Department is making no transfers of materials. The department, he told the committee, is more than anxious to clear up its surplus property, and urges that Congress advise specifically what is to be transferred and to make clear the conditions of such transfers.

Chairman Kahn, of the committee, indicated that he is displeased because the Department of Agriculture has

requisitioned vast quantities of materials which are used only incidentally in the construction of roads. He mentioned under that head office supplies, mules, horses, forage and mess equipment.

At this writing no opportunity has been offered for the presentation to the committee of the attitude of the Bureau of Roads. Thomas H. MacDonald was on the stand for a short time, but simply to reply to questions of members of the committee concerning the manner in which the equipment is being distributed to the states. Members of the committee, however, expressed the opinion that the War Department had been obstructive in its general relation with the Bureau of Public Roads and had retarded road work thereby in every state. As a result of the technical delays and hair-splitting tactics, state highway commissions are in a condition of uncertainty, and much work has been held up which could have been done while there were plenty of cars for transporting materials.

War Department's Interpretation

The War Department's interpretation, according to Mr. Hutchinson, placed road rollers, concrete mixers, trucks, passenger cars, rock crushers and similar equipment for direct use in road building within the intent of Congress in its original legislation. There seems to be some doubt, however, as to requests for the delivery for road work of such materials as locomotives and cars, lumber, cement, hammers, blankets, draft animals, office furniture and supplies.

It was also pointed out that the uncertainty as to whether or not the trucks and other road-building equipment are to be sold to the public is producing an unsettled effect on industries. Members of the committee, however, expressed the belief that there is no reason for any one to expect that the actual road-building equipment will not be turned over to the states. They regard that as being too obvious to afford opportunity for any important unsteadying of the machinery or truck markets. It is expected that the hearings will continue several days.

The hearing, it is believed, was hastened by the introduction, Sept. 6, of a bill by Senator Hoke Smith, of Georgia. That bill, which has the approval of the Bureau of Public Roads, provides that nothing contained in Sec. 5, of the last sundry civil act, is to be construed as in any way affecting the transfer, free of charge, of motor-propelled vehicles and motor equipment and other war material, equipment and supplies, not needed by the War Department, as provided in Sec. 7 of the Postoffice appropriation act. Sec. 5 of the sundry civil act specifies that any executive department may buy surplus motor and other equipment, but it provides that no transfer of such equipment is to be made free of charge unless specific authorization is given by Congress. The War Department interprets that section as applying to the transfer of surplus equipment to the states through the agency of the Department of Agriculture. The Solicitor of the Department of Agriculture does not agree with the War Department's interpretation. He holds that the transfer is to the states and not to the Department of Agriculture, which simply acts as the agent for the states.

The Smith bill goes on to specify that it is the intent of Congress that Sec. 7 of the Postoffice appropriation act is meant to apply to all equipment and materials which can be used in the construction and maintenance of roads, and that the law prohibiting the expenditure of appropriations by any of the executive departments for the maintenance, repair or operation of passenger-carrying vehicles, in the absence of specified statutory authority, is not to apply to the vehicles transferred for road work. The Smith bill also specifies that the Secretary of War is authorized, in his discretion, to transfer, free of charge, to the Postoffice Department, such motor vehicles as may be found to be surplus.

Incidentally, the truck manufacturers are very much in favor of having all surplus War Department trucks turned over to the state highway commissions. They never before have had an opportunity, it is pointed out, to distribute 20,000 trucks throughout the 3000 counties of the United States. The truck manufacturers are confident that the general use of trucks which this distribution will bring about will make clear the superiority of motor equipment and will result in a large number of purchases from a class of customers who otherwise would have continued to use animal traction for many years.

Banquet to Hoover Will Be Held September 16

The banquet arranged by engineers in honor of Herbert C. Hover, upon his arrival in this country, as noted in *Engineering News-Record* of Sept. 4, 1919, p. 485, will be held at the Waldorf-Astoria Hotel in New York City Sept. 16. The arrangements have been made by the American Institute of Mining and Metallurgical Engineers through a committee headed by W. L. Saunders.

Contractors Refuse to Bid Save on Cost-Plus Basis

Work on the proposed 25,000,000-gal. reservoir to be constructed in connection with the water system at Walla Walla, Wash., will be postponed until next spring, owing to the impossibility of getting contractors to submit bids except on the cost-plus basis.

Montreal Aqueduct Arbitration Favorable to City

Contractor Must Pay Damages for Break in Water-Supply Conduit and Contract Delay

An award favorable to the City of Montreal has been made by the arbitrators appointed to consider the claims between the Cook Construction Co. and the city, growing out of the contract for the enlargement of the Montreal aqueduct, and also out of the break in the water-supply conduit. The arbitrators were Aimé Geoffrion, K. C., John M. R. Fairbairn, chief engineer of the Canadian Pacific Ry., and W. F. Tye, consulting engineer, all of Montreal.

In July, 1913, the city awarded to the company a contract for the enlargement of the Montreal aqueduct which amounted to about $2,323,000 and was subsequently increased by various additions to about $2,950,000. Work on this contract for the aqueduct enlargement was carried on intermittently from the autumn of 1913 to the autumn of 1917, and was attended with considerable controversy between the contractor and the city. On Dec. 26, 1917, both of the parties agreed to cancel the contract and submit their respective claims to the arbitrators for settlement. The value of the work completed at this time amounted to about 46% of the original tender price.

Break in Aqueduct

On Dec. 25, 1913, a break occurred in the water-supply conduit situated on the north side of and close to the aqueduct (see *Engineering News* of Jan. 1, 1914, p. 54, and *Engineering Record* of Mar. 7, 1914, p. 274 and p. 277). As this conduit was then the sole source of supply, the city was deprived of water until temporary repairs were made and service was restored on Jan. 2, 1914. The city maintained that the break was due to the failure of the contractor to adopt needed precautions in carrying on excavation work adjacent to the conduit, and originally claimed a total of $412,000, covering not only the amounts expended by the city at the time of the break, but also the cost of certain protection work done to safeguard the conduit, and the cost of installing a water-supply connection with the Lachine canal for emergency service. A majority of the arbitrators (Mr. Tye dissenting) held that the contractor was responsible for the break and awarded the city $82,000 damages, covering the amount expended by the city at the time of the break.

The claims of the Cook Construction Co. against the city for delays, damages, extra work, etc., originally amounted to $1,922,000, plus interest, and were subsequently reduced to $1,775,000, plus $75,000 interest up to Dec. 26, 1917. The three arbitrators awarded the contractor about $432,000, plus certain interest amounting to about $17,000 up to Dec. 26, 1917. Of the $432,000, about

$216,000 is awarded for damages on account of delays by the city for which the contractor orginially claimed $673,000.

The city also submitted claims against the contractor, principally for noncompletion of part of the work and for delays, amounting to about $259,000. On these claims the arbitrators awarded about $48,000 which, together with the award on the conduit break, makes a total of about $130,000 in favor of the city. Deducting this sum from the award of $432,000 to the contractor leaves a net payment of about $300,000, plus certain interest charges, to be paid by the city to the contractor.

Complete Valuation of Washington, D. C., Street Railways

The valuation, for purposes of ratemaking, of the properties of the Capital Traction Co. and the Washington Railway & Electric Co. of Washington, D. C., which was begun in May, 1914, has been completed by the Public Utilities Commission of Washington.

The findings of the commission declare a fair total value of the Capital Traction Co. as of June 30, 1919, to be $14,270,495, or approximately an increase of $1,000,000 over the value set by the commission for the company as of July 1, 1914. The company's claim for reproduction value, including expenditures as of June 30, 1919, was $25,951,679; while its historical-value estimate, including expenditures, as of the same date, is $19,418,298.

A fair total value for the Washington Railway & Electric Co. was fixed by the commission at $16,106,368 as of June 30, 1919, which allowed an increase of valuation of $1,500,000 since July 1, 1919. This company, estimating up to July 1, 1916, submitted claims of $30,778,083 for historical value, and $29,656,382 for reproductive value.

One of the commissioners rendered a dissenting vote and in view of this fact it is expected that an appeal will be taken by the companies. An appeal might delay the establishment of the valuation for several years, as an appeal taken by a subsidiary of the Washington Railway & Electric Co. against a valuation set by the commission in May, 1917, is still pending in the courts.

Sacramento to Have Municipal Filter Plant

The City of Sacramento, Calif., is to install a mechanical filter plant. Its nominal capacity will be 30,000,000 gal. per day, the source of supply being the Sacramento River.

Charles Gilman Hyde, professor of sanitary engineering at the University of California, is preparing the plans for the plant. The people of Sacramento authorized a $1,800,000 bond issue at the June, 1919, election, and it is expected that the filtration plant will be in operation early in 1921.

Program for New England Water Works Convention

Preliminary notice regarding the 38th annual convention of the New England Water Works Association, which will take place at Albany, N. Y., Sept. 30-Oct. 3, has just been issued by Secretary Willard Kent. In addition to a number of important committee reports, there will be presented a program of 15 or more technical papers, arrangements for which have been completed by Charles W. Sherman.

Norman J. Howard, bacteriologist in charge, will discuss the operation of the new drifting sand filter system at Toronto. The Schoharie development of New York City's water-supply will form the subject of an address by J. Waldo Smith, chief engineer, Board of Water Supply. Col. Francis F. Longley, of the firm of Hazen, Whipple & Fuller, consulting engineers, and until recently officer in charge of the water-supply section of the Division of Military Engineering and Engineer Supplies, under the Chief Engineer, A. E. F., will explain how water was supplied to the American Armies in France. For his work with the A. E. F., Colonel Longley received the Distinguished Service Medal. Another paper will be devoted to the 10,000,000-gal. covered reservoir at Dayton, Ohio; the authors are Leonard Metcalf and William T. Barnes, of the firm of Metcalf & Eddy, consulting engineers, Boston.

Two papers on pumping engines are scheduled. The first is by Creed W. Fulton of the Gould's Manufacturing Co., and the second by D. A. Decrow of the Worthington Pump & Machinery Corporation.

A program of entertainment has been arranged by the Water-works Manufacturers' Association, and a large participation is expected in the exhibition of water-works equipment and supplies.

The headquarters for the convention will be in the Hotel Ten Eyck.

Safety Council To Hold Congress in Cleveland Next Month

The eighth annual Safety Congress will be held at the Hotel Statler, Cleveland, Oct. 1-4. In addition to the general sessions, at which such subjects as employees' representation, Americanization, health, and safety education, will be discussed, there will be additional features in the form of round-table and sectional meetings. Among the latter are scheduled sessions devoted to construction, cement, steam railroads and public utilities.

Among the papers to be presented before the construction section are the following: "How the Small Contractor Can Reduce Accidents," by George A. Rutherford, of the George A. Rutherford Co., Cleveland, Ohio; "Protecting the Public Against Accident on New Buildings," by C. M. Talbert, director of the Department of Streets and Sewers, St. Louis, Mo.; "Plant and Machinery Layout," by Kenneth Moller, of Lockwood, Greene & Co., Boston, Mass.; "Safety in Steel Erection," by Col. E. A. Gibbs, of the McClintic-Marshall Co., Pittsburgh, Penn.; "Results of Safety Work in Shipbuilding," by Harry A. Schultz, of the American Steel & Wire Co., Cleveland, Ohio; "Coöperating on Safety," by F. J. Dresser, of the Austin Co., Cleveland, Ohio.

Missouri Valley Road Builders' Association Organized

At a meeting of contractors, representatives of material companies, and county, state, municipal and Federal engineers, held in Kansas City Sept. 2, it was decided to organize the Missouri Valley Road Builders' Association. The purpose of the organization is to establish closer coöperation and better understanding among contractors, engineers, material companies and highway officials in general.

The officers elected were as follows: Chairman, M. W. Watson, state highway engineer of Kansas; secretary-treasurer, M. R. Amerman, contractor, Salina, Kan., and an executive committee composed of the two above-named officers, with S. A. Fones of the Independent Gravel Co., Joplin, Mo.; A. W. Graham, state highway engineer of Missouri, and R. E. O'Brien of the Cook & O'Brien Construction Company.

Turkey Creek Sewer Contract for Canadian Contractor

The contract for the construction of the Turkey Creek sewer, Kansas City, Mo., amounting to about $2,500,000, has been awarded to Thomas Kelley & Sons, Ltd., Winnipeg, Canada, the only bidder. The work involves among other items, 1750 ft. of 17 x 18 ft. double-box reinforced-concrete sewer, and two pumping stations. Work will not be paid for until completed, and then with four years' special tax bills, bearing 7 per cent. interest, payable one-fourth each year. These tax bills are practically bonds against the benefited property.

The property to be benefited by the construction of the Turkey Creek sewer includes approximately 5000 acres. The principal item in the construction is a main reinforced-concrete sewer approximately 1½ miles long.

Utah Counties Unite in Water-Storage Study

The Utah Water Storage Association has engaged A. F. Parker, consulting engineer, Ogden, Utah, to investigate the storage possibilities in the eight counties which are adjacent to Salt Lake and which contribute to a fund for the purpose. Offices have been

opened in the state capitol, and an invitation has been extended to all counties to join the association. The executive committee includes George F. McGonagle, state engineer, and J. L. Lytel, project manager of the United States Reclamation Service at Provo. Two parties are now in the field, but Mr. Parker states that men of the experience needed are hard to obtain.

Civil Service Examinations

New York State. Bridge designer, office of Transit Construction Commissioner, $1500 to $2100, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

New York State. Junior assistant engineer, State Engineer and Highway Department, $1200 to $1440, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

New York State. Junior engineer, Transit Construction Commission, New York City, $1200 to $1500, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

New York State. Sanitary engineering inspector, State Department of Health, $1320, Sept. 27. Apply to Civil Service Commission at Albany for application forms, before Sept. 15.

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Chief metallurgist, $4500 to $5000 per year; assistant chief metallurgist, $3600 to $4500 per year, Ordnance Department. Applications must be filed before Sept. 16.

Computer, Ordnance, Navy Yard, Washington, D. C., $7.20 to $12 per diem, Sept. 17. File applications in time to arrange for examination at place selected by applicant.

Junior highway bridge engineer, Office of Public Roads and Rural Engineering, Department of Agriculture, $1200 to $1600 per year, Sept. 17. File applications with commission at Washington in time to arrange for examination at place selected by applicant.

Assistant examiner, Patent Office, Washington, D. C., $1500 to $1740 per year, Sept. 17 to 19 and Nov. 19 to 21. File applications in time to arrange for examination at place selected by applicant.

Engineer, $3000 per year; assistant engineer, $1800 to $2880 per year; junior engineer, $1200 to $1740 per year; engineering draftsman, $1200 to $3000 per year, Reclamation Service. Applications will be received until further notice.

ENGINEERING SOCIETIES

Calendar

Annual Meeting

NEW ENGLAND WATER WORKS ASSOCIATION; Tremont Temple, Boston, Sept. 30, Oct. 1-3, Albany, N. Y.

NATIONAL SAFETY COUNCIL, 168 Michigan Ave., Chicago; Oct. 1-4, Cleveland.

AMERICAN SOCIETY OF NAVAL ENGINEERS: Secretary, Lieut. Com. F. W. Sterling, U.S.N., Navy Department, Washington, D. C.; Oct. 7, Washington.

AMERICAN PUBLIC HEALTH ASSOCIATION: 169 Massachusetts Ave., Boston; Oct. 27-30, New Orleans.

AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS; 304 E. Walnut St., Bloomington, Ill.; Nov. 11-14, New Orleans.

SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS; 29 W. 39th St., New York City; Nov. 13, New York City.

The Cleveland Engineering Society and members of the four national engineering societies held a combination meeting Sept. 9. It was the opening meeting of the Cleveland Society, and the entire day was devoted to matters of interest to the engineer. Notable among the discussions were those of engineering problems of Cleveland's rapid-transit development, and hydroelectric developments in Italy and South America.

The Rochester Engineering Society, at its meeting Sept. 12, will listen to a discussion on building Army cantonments, and other military construction problems, by John F. Skinner, formerly a captain in the Construction Division. A representative of Engineering Council will address the society at its October meeting, and at its November meeting Dr. E. B. Rosa, chief physicist, Bureau of Standards, Washington, D. C., will be the speaker.

The Allied Engineering Association, Charleston, S. C., will hold its first meeting of the 1919-1920 season Sept. 15. The principal speaker will be Lieut. Col. Herbert A. Dargue, who will read a paper on aviation. Some phases of the patent situation will be covered by F. L. Lebby.

Mining engineers in and around Miami, Ariz., recently formed a temporary organization to apply for a charter in the American Association of Engineers. Approximately 100 engineers residing in the district were present, and enrolled as charter members of the new organization.

The Cleveland Chapter of the American Association of Engineers, at its regular meeting Sept. 4, listened to an address by F. N. Thatcher, district promotional secretary of the Pittsburgh district. The chapter membership committee has initiated a plan designed to add a thousand new members to the chapter before Jan. 1, 1920. A committee was appointed to seek for the employment of a full-time, paid secretary for the State of Ohio. More than 10 per cent. of the entire national membership is found in the four chapters and five clubs in that state.

PERSONAL NOTES

A. B. HARGIS, for the past two years in charge of the office at Camp McClellan of MORRIS KNOWLES, INC., supervising engineers, recently completed his work there and returned to the home office in Pittsburgh.

HARRY HODGMAN, for the past six years connected with Missouri River improvements as United States Assistant Engineer, with offices at Jefferson City, Mo., has beeen transferred to the Detroit River district. He will have charge, under the direction of Col. E. M. Markham, Corps of Engineers, U. S. A., of the widening of the Livingstone channel.

COL. E. H. ABADIE, U. S. A., recently supervising constructor, construction division, Quartermaster Corps, has been appointed comptroller of the Division of Operations, United States Shipping Board, according to a recent announcement made by the board. Colonel Abadie was commissioned a major of engineers in June, 1917, but later was transferred to the Quartermaster Corps, having under supervision the construction of Camps Funston, Dodge and Lee, as well as many small military installations.

CAPT. HOWARD J. COLE, upon his discharge from the service, has resumed his position as general superintendent for the P. J. Carlin Construction Co. He is in charge of the construction of the new prison buildings at Ossining, N. Y.

C. C. VAN ARNSDOLL and FRED OEHLER, of Clarkston, Wash., and E. M. BOOTH, of Lewiston, Idaho, have formed an engineering partnership to specialize in highway construction work. Mr. Booth was formerly state highway engineer of Idaho.

LIEUT. WALDO H. CHASE, U. S. A., recently discharged from service with the 115th Engineers after a year overseas, has resumed his position as engineer with the northern division of the state highway department, California.

W. L. DUGAN, Seattle, contractor, who recently returned from France with the 18th Engineers, has been discharged, and will reënter contracting work in Seattle.

CAPT. O. E. BROWNELL, Engineers, U. S. A., who recently received

his discharge from the service, has become associated with MORELL & NICHOLS, landscape architects and engineers, Minneapolis, Minn. He will take charge of civil and municipal work. Before entering the Army Captain Brownell was chief assistant city engineer of Duluth.

CAPT. E. D. HENDRICKS, Engineers, U. S. A., recently discharged from the service, has been appointed division engineer of the eastern division, New York State, with headquarters in Albany. Work on all canals and terminals east of Utica and including New York City will be under Captain Hendricks' supervision. Captain Hendricks was cited by General Pershing for distinguished service while he was with the 303rd Engineers in France.

JAMES H. MANNING has been appointed assistant engineering manager for STONE & WEBSTER. He joined the staff of Stone & Webster in 1910, and served as superintendent of construction on the Franklin, Verdi and White Salmon hydro-electric developments, besides preparing various engineering reports. He was later made head of the hydraulic division. In 1917 he became chief engineer of the American International Shipbuilding Corporation. Early in 1919 Mr. Manning was made consulting hydraulic engineer for Stone & Webster, and recently was appointed assistant engineering manager.

ELBERT G. ALLEN has been appointed advisory engineer for STONE & WEBSTER. Since his graduation from the Massachusetts Institute of Technology in 1901 Mr. Allen has been in the continuous employ of the company, having been engaged for the most part on work at Boston and in the Puget Sound district. In 1918 he was made assistant engineering manager.

CRESLEIGH GRAY has been appointed engineer in charge of the recently organized bureau of contracts, one of the five subdivisions of the division of construction, Indiana State Highway Commission. Mr. Gray is a graduate of Rose Polytechnic Institute and has been connected with the State Highway Commission since its organization several months ago. KARL EISENHARDT has been appointed assistant engineer of the Bureau of Contracts.

M. A. LONG, assistant to the chief engineer and architect of the Baltimore & Ohio R. R., for many years, has resigned and has entered the contracting engineering business. Under the name of the M. A. LONG Co. he has opened an office at 1523 Munsey Bldg., Baltimore, Md. During Mr. Long's association with the Baltimore & Ohio he handled a number of important pieces of building construction; among them were the large terminal warehouses of the railroad in Cincinnati, Baltimore, Pittsburgh and New York. He also superintended the construction of the Baltimore & Ohio general office building, Baltimore.

CAPT. JOHN L. BACON, U. S. A., formerly with the 602d Engineers in France, has received his discharge and has returned to San Diego, Calif. He has not announced his plans for the future.

COL. EARL I. BROWN, Engineer Corps, U. S. A., who returned recently from service overseas, has been assigned to Cincinnati Engineering District No. 1, and will be in charge of improvements along the Ohio River in this district. He succeeds ASSISTANT ENGINEER R. R. JONES, in charge of the Cincinnati office.

ARTHUR C. MARBLE, who has served the City of Lawrence, Mass., continuously since 1875, has resigned as city engineer, his resignation to become effective Sept. 15. Mr. Marble retires to private life. ROBERT W. PRIESTMAN, first assistant to Mr. Marble for a number of years, has been named city engineer.

CAPT. WILLIAM E. STANLEY, Engineers, U. S. A., who recently returned from 20 months' service in France, has received his discharge from the service and has accepted a position with PEARCE & GREELEY, consulting sanitary and hydraulic engineers, Chicago. Mr. Stanley will be resident engineer on the construction of a sewer system for South Charleston, W. Va. Before entering the service Captain Stanley was instructor in hydraulics at Purdue University.

E. ST. LAURENT, assistant harbor engineer of Port Arthur, Ont., has been appointed district harbor engineer, with headquarters at Fort William, in place of H. B. R. CRAIG.

MAJ. CHARLES GILMAN HYDE, U. S. A., until recently on duty at the office of the Surgeon General in Washington, D. C., has been discharged from the service and has resumed his position at the University of California as professor of sanitary engineering. He has been retained by the City of Sacramento, Calif., as consulting engineer in the construction of a water-filtration and pumping plant, for which bonds to the amount of $1,800,000 were voted in June, 1919.

CEDRIC B. SMITH has been appointed editor of *The Monad*, the official organ of the American Association of Engineers. Mr. Smith is a graduate in both arts and civil engineering from the University of Minnesota. His engineering experience has been with the Oregon Trunk Ry., the Great Northern Ry., the Chicago Great Western R.R., and the Pennsylvania Lines West of Pittsburgh. During the war he served as an officer with the 74th Artillery in the American Expeditionary Forces in France.

U. S. MARSHALL, senior highway engineer in the United States Bureau of Public Roads, until recently in charge of the Missoula branch office of the bureau, has resigned to accept the position of assistant chief engineer with the Montana State Highway Commission, at Helena.

E. C. GWILLIM has received the appointment as city engineer of Sheridan, Wyo., to fill the vacancy created by the resignation of H. M. HUNTINGTON. Mr. Gwillim was recently discharged from military service.

GEORGE B. MASSEY, who was engaged in mine-laying work in the North Sea during the war, has left the United States Navy and has resumed his work as consulting engineer on excavation, with offices in the People's Gas Bldg., Chicago.

H. A. BOWMAN, chief engineer of the Manitoba Department of Public Works, has been appointed head of a new branch of the department to be known as the reclamation branch, which will conduct the work of drainage in the province. It is estimated that there are 7,000,000 acres of swamp land in Manitoba to be drained under the supervision of the new reclamation branch.

GEORGE H. BRYANT, city engineer of Brockville, Ont., for the past seven years, is resigning that position to assume direction of the operations of the Brockville Highway Construction Co., which has secured the contract for the Brockville-Prescott section of the provincial highway.

T. M. KEENE, senior highway engineer in the United States Bureau of Public Roads, has been transferred from the Portland office to take charge of the Missoula, Mont., office of the same bureau to replace U. S. Marshall, resigned, as noted elsewhere in these columns.

FRED GEHBAUER, of the Chicago Pneumatic Tool Co., has been appointed special Navy Yard representative, with headquarters at the Philadelphia offices of the company.

CAPTS. JOHN MAHER, GEORGE B. FARLOW, JOSEPH M. LEWIS, PAUL W. ELMORE, and LIEUTS W. B. MAURER, J. W. PURDY and J. D. STEMM, U. S. A., have been discharged from military service and have reported for duty as assistant engineers, Baltimore & Ohio R.R., Western Lines, at Cincinnati, Ohio.

OBITUARY

THOMAS L. MORTON, principal assistant engineer of the Atlantic Coast Line R.R., died at the hospital at the University of Virginia, Charlottesville, Va., Aug. 27, 1919, after an illness of about three months. Mr. Morton was 65 years of age. He was born at Petersburg, Va., and received his education at McGate's School, Richmond, Va., and at Oxford University, England. In 1883 he entered the service of the Plant sys-

tem of railways as engineer in charge of location and construction of the line from Tampa, Fla., to Kissimmee, Fla. When the Plant system was purchased by the Atlantic Coast Line Railroad Co., Mr. Morton remained with the Coast Line, and after several years' service was promoted to the position which he held at the time of his death.

OTTO A. RUEMELIN, for the past 12 years works manager of Pawling & Harnischfeger, and the company's second vice-president, died at Milwaukee, Wis., Sept. 1. Mr. Ruemelin had been associated with the company during the past thirty years, entering its service as an apprentice.

A. C. MCKENZIE, of Winnipeg, vice-president of the Northern Construction Co., died recently of heart disease while on a trip of inspection to the power plant on the Winnipeg River that his company is building. Mr. McKenzie was 56 years of age. Besides his connection with the Northern Construction Co. he was president of the Winnipeg Aqueduct Company.

EBEN BRIGGS THOMAS, for 15 years president of the Lehigh Valley R.R., and more recently chairman of the executive committee of the board of directors, died at his home in Morristown, N. J., Sept. 4. He was 77 years of age. Prior to his identification with the Lehigh Valley R.R., Mr. Thomas was president of the Erie R.R. Other executive positions he held at various times were those of general manager of the Cleveland, Columbus, Cincinnati & Indianapolis Ry., second vice-president and general manager of the Richmond & Danville, Georgia & Pacific road; first vice-president of the New York, Lake Erie & Western, and president of the Chicago & Erie, until its reorganization as the Erie R.R., when he became its president.

Highway Industries Association Aids Road Promotion

Coöperation in highway-improvement campaigns through an editorial and news publicity service, under J. W. Brooks, director of the editorial department of the Highway Industries Association, is offered to all those interested in such promotion. The service mentioned also aims to assist in arranging expense budgets for road campaigns along the most effective lines, thus minimizing waste of funds through scattered and indirect publicity, and to suggest the best method of raising the funds.

Details of the coöperative plan are set forth in a circular recently issued by the association. It is stated that, inasmuch as the association represents all the factors interested in the use of the public highways, it is in a position to render free and impartial service which could not be given by a single interest.

The means to be used in promotion include press service, public speaking, motion-picture production, and suggestions for printed circular matter. Full particulars may be obtained by communicating with H. G. Shirley, secretary of the association, Washington, D. C.

BUSINESS NOTES

THE STEEL CONSTRUCTION CO., structural engineers and erectors, has discontinued its Salt Lake office and will make its headquarters in Denver, Colo.

THE AMERICAN STEEL EXPORT CO. has appointed A. A. Schneider, formerly with the raw materials department of the Midvale Steel & Ordnance Co. and the Cambria Steel Co., as manager of its newly created raw materials division. Mr. Schneider recently returned from military service. In his new position he will handle imports, exports and domestic sales of pig iron, manganese, chrome and low-phosphorus iron ores, ferro-alloys, coal and coke.

WILLIAM H. BAKER has resigned his position with the Atlas Portland Cement Co. and has joined the staff of the Hardinge Conical Mill Co., 120 Broadway, New York, as vice-president. Mr. Baker has been connected with the operation of cement plants for many years, and has recently been interested in adapting conical ball grinding machinery for grinding cement clinker. He will have executive supervision of the promotion of the machinery of the company for cement grinding.

THE LAKEWOOD ENGINEERING CO., Cleveland, Ohio, has appointed Harry W. Benkart as its representative in Buffalo, N. Y., with offices in the Ellicott Square Bldg. Mr. Benkart was previously associated with the Dravo Construction Co. as superintendent, and has had about ten years' experience in the construction field.

THE CHAIN BELT CO., Milwaukee, Wis., has appointed Russell E. Dean to take charge of its mixer business in the territory from Boston to Norfolk, Va. His office will be at 50 Church St., New York City, from which location he will coöperate with the various representatives of the company in his territory.

THE CHICAGO MICA CO. has recently appointed L. T. Frederick as consulting engineer and production manager. Mr. Frederick was formerly process engineer of the Westinghouse Electric & Manufacturing Co., Pittsburgh.

THE TEXAS CREOSOTE MANUFACTURING CO. has been organized at Forth Worth, Tex., with a capital of $500,000, to manufacture creosote and other coal-tar products, together with roofing and roofing materials. The present capacity of the company is 6000 gallons of creosote per hour, and it is planned to increase this ouput greatly. W. M. Babcock, president of the Home Oil & Refining Co., is president of the new organization and Dr. E. Morrill is managing director.

THE OSGOOD CO., Marion, Ohio, manufacturer of steam shovels, dredges and excavators, has opened a branch sales office in the Land Title Bldg., Philadelphia, Penn. W. W. Houston is local sales manager.

THE INTER-STATE MACHINERY CORPORATION, with offices in Philadelphia, Penn., has been formed to succeed the Ralph R. Lewis Co. of that city. The management and offices have been retained.

TRADE PUBLICATIONS

The following companies have issued trade publications:

THE QUANTITY SURVEY CO., INC., New York City; bulletin explaining the features of its method of analyzing contracts and specifications, and preparing lists of quantities of material for the use of prospective bidders.

THE CLARK EQUIPMENT CO., 1415 Railway Exchange, Chicago; booklet, 7 x 10¼ in., 31 pages, illustrated; describes the method used by the company in promoting *esprit de corps* among its employees; the title is "Putting Mettle into Metal." It also shows drills made by the company.

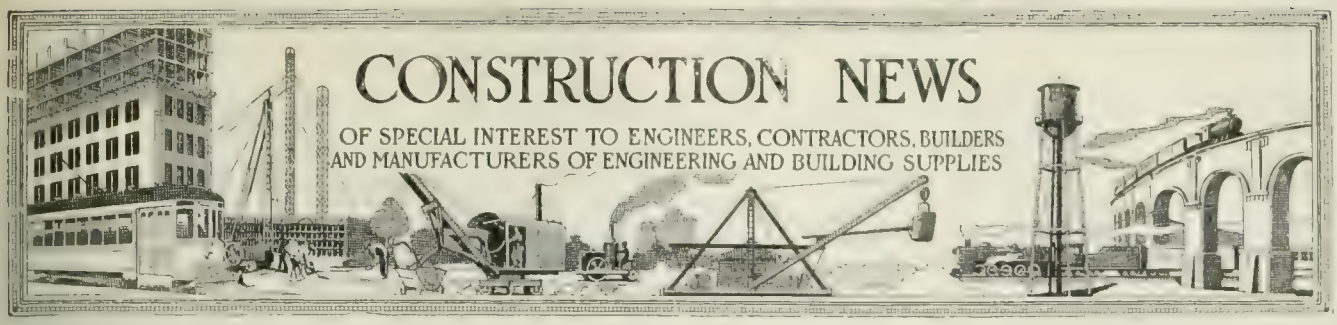
THE INTERNATIONAL NICKEL CO., 43 Exchange Place, New York; booklet, 4 x 9¼ in., 22 pages, illustrated; gives information regarding nickel and its products.

THE GUARANTY TRUST CO., of New York; booklet, 4½ x 7 in., eight pages; subject, "Federal Stamp Taxes on Drafts, Checks and Promissory Notes."

THE J. EDWARD OGDEN CO., INC., New York; catalog; 8 x 11 in., 36 pages, illustrated; describes turnover doors for piers, warehouses, garages, shops and industrial buildings.

THE DE LAVAL SEPARATOR CO., 165 Broadway, New York City; four bulletins, 8 x 11 in., with pages as follows: No. 100, 24; No. 101, 16; No. 102, 20; No. 103, 12; all illustrated; the bulletins describe, respectively, purifying and reclaiming oils, reclaiming cutting and hardening oils, reclaiming crank-case oils, and purifying and reclaiming oils used for marine purposes.

THE TRUSCON STEEL CO., Detroit, Mich.; catalog, 8½ x 11 in., 23 pages, illustrated; covers sections and uses of structural pressed steel for floors, roofs, walls and partitions.



PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Sept. 15	Pitman, N. J.	Sept. 4
	Adv. Sept. 4.	
Sept. 16	Statesville, N. C.	Aug. 28
Sept. 16	South Amboy, N. J.	Sept. 4
Sept. 17	Kansas City, Mo.	Aug. 21
Sept. 17	North Scituate, R. I.	Sept 11
Sept. 19	Winchester, Ky.	Sept. 11
Sept 22	Chadron, Neb.	Sept 11
Sept. 24	Marcy, N. Y.	Sept. 11
	Adv. Sept 11.	
Sept. 30	Detroit, Mich	Sept. 11
Oct. 2	East Hartford, Conn.	Sept. 11
	Adv. Sept. 11.	

SEWERS

Sept. 15	Alexandria, La.	Sept. 4
Sept. 15	Morgantown, W. Va.	Sept 11
Sept. 16	Lake City, S. C.	Sept. 4
	Adv. Sept 4	
Sept. 17	Scardsdale, N. Y.	Sept. 11
	Adv. Sept. 11.	
Sept. 18	Drew, Miss	Sept. 4
Sept. 19	Beloit, Wis.	Sept 11
Sept. 22	Wilbur, Neb.	Sept 11
Sept. 23	Broken Bow, Neb.	Sept. 11

BRIDGES

Sept. 15	Portsmouth, Va	Aug. 28
Sept. 15	St. Louis, Mo	Sept. 11
Sept. 16	Wayne, W. Va.	Aug. 21
Sept. 16	Dublin, Ga.	Sept. 4
Sept. 17	Pasco, Wash.	Aug. 28
Sept. 17	Central City, Neb.	Sept. 11
Sept. 22	Norristown, Pa.	Aug. 28
	Adv. Aug. 28.	
Sept. 22	Duluth, Minn.	Sept. 11
Sept. 23	Harrisburg, Pa.	Aug. 14
	Adv. Aug. 14.	
Sept. 23	Harrisburg, Pa.	Sept. 11
Sept. 24	Lexington, N. C.	Sept. 11
Sept. 29	New Jersey	Sept. 11
	Adv. Sept. 11.	

STREETS AND ROADS

Sept. 15	North Carolina	Sept. 4
Sept. 15	Clayton, Mo.	Aug. 28
Sept. 15	Sanford, Fla.	Aug. 28
Sept. 15	New Mexico	Aug. 28
Sept. 15	Belair, Md.	Sept. 4
	Adv. Sept. 4.	
Sept. 15	Washington	Sept. 4
Sept. 15	Manitowoc, Wis.	Sept. 11
Sept. 15	Duquesne, Pa.	Sept. 11
Sept. 15	Lakewood, O.	Sept. 11
Sept. 15	Muskegon, Mich.	Sept. 11
Sept. 15	Lincoln, Neb.	Sept. 11
Sept. 15	Richmond, Utah	Sept. 11
Sept. 15	St. Biuno, Que.	Sept. 11
Sept. 15	Ithaca, N. Y.	Sept. 11
Sept. 15	Union, N. J.	Sept. 11
Sept. 15	Crookston, Minn.	Sept. 11
Sept. 15	Tuscumbia, Ala	Sept 11
Sept. 16	Phoenix, N. Y.	Sept. 11
Sept. 16	St. Louis, Mo.	Sept. 11
Sept. 16	Michigan	Sept. 11
Sept. 16	Waseca Minn.	Sept. 11
Sept. 16	Massachusetts	Sept. 11
Sept. 16	Maryland	Sept. 4
	Adv. Sept. 4.	
Sept. 16	Lewisburg, W. Va.	Aug. 28
	Adv. Aug. 28.	
Sept. 16	Griffin, Ga.	Aug. 28
Sept. 16	New Mexico	Aug. 28
Sept. 16	Prosser, Wash	Aug. 21
Sept. 16	New Orleans, La.	Aug. 21
Sept. 16	Grafton, N. D.	Sept. 11
Sept. 17	Rockwall, Tex.	Sept. 4
Sept. 17	Illinois	Sept. 11
Sept. 18	San Antonio, Tex.	Sept 11
Sept. 18	Tennessee	Sept 11
Sept. 18	Marion, Ark.	Aug. 21
Sept. 18	Hawkisbury, Ont.	Sept 11
Sept 19	St George S. I., N. Y.	Sept. 11
Sept 20	Madill, Okla.	Aug 28
Sept. 20	Fayetteville, Ark.	Sept. 4
Sept. 20	Independence, Mo.	Sept 11
Sept. 20	Falfurrias, Tex.	Sept 11
Sept. 22	Lyons, Kan.	Aug. 28
Sept. 23	Keyser, W. Va.	Sept. 4
	Adv. Sept. 4.	
Sept. 23	Peru, Neb.	Sept. 11
Sept. 23	Beaver City, Neb.	Sept. 11
Sept. 23	Keyser, W. Va.	Sept. 11
Sept. 23	Athens, Ga.	Sept. 11
	Adv. Sept. 11.	
Sept. 23	Philadelphia, Pa.	Sept. 11
Sept. 23	Salisburg, Md.	Sept. 11
Sept. 24	Lexington, Neb.	Sept. 11
Sept. 24	Elwood, Neb	Sept 11
Sept. 24	Manitowoc, Wis.	Sept 11
Sept. 25	Kimbal, Neb.	Sept. 11
Sept. 25	North Bergen, N. J.	Sept 11
Sept. 26	Loup City, Neb.	Sept. 11
Sept. 27	Aitkin, Minn.	Sept. 11
Sept. 30	Pennsylvania	Sept 11
	Adv. Sept. 11.	
Sept. 30	Blackfoot, Idaho	Sept 11
Oct. 1	Faribault, Minn.	Sept 4
Oct. 2	Madison, W. Va.	Sept 11
Oct. 10	Tacoma, Wash	Aug 14
	Adv. Aug 14	
Oct. 13	Lancaster, Mo.	Sept. 11

EXCAVATION AND DREDGING

Sept 15	Denver, Colo.	Sept. 11
Sept 16	Wapello, Ia.	Sept 11
Sept. 16	Benson, Minn.	Sept. 4
Sept. 18	Montreal, Que.	Sept. 4
Sept. 18	Tishomingo Okla.	Sept 11
Sept 22	Tower Minn	Aug 21
Sept. 22	New York, N. Y.	Sept 11
Sept. 22	Duluth, Minn.	Sept 4
Sept. 29	Waseca, Minn.	Sept. 11

INDUSTRIAL WORKS

Sept. 13	New York, N. Y.	Sept. 11
Sept 15	New York, N. Y.	Aug 28
Sept. 15	Duluth, Minn.	Sept. 11
Sept. 17	Mont Alto, Pa.	Sept. 4
Sept. 20	New York, N. Y.	Sept. 11

BUILDINGS

Sept. 15	Salt Lake City, Utah	Sept. 4
Sept. 15	St. Louis, Mo.	Sept. 11
Sept. 15	Salt Lake City, Utah	Sept 11
Sept. 15	Timothy, Wis.	Sept. 11
Sept. 15	Bethlehem, Pa.	Sept. 4
Sept. 16	Framingham, Mass.	Sept. 4
Sept. 17	Norristown, Pa.	Sept. 11
Sept. 17	Toronto, Ont.	Sept. 11
Sept 19	Yorkton, Sask	Sept. 11
Sept. 20	Cap de la Madeleine, Que.	Sept. 4
Sept. 20	Montevideo, Minn.	Sept. 4
Sept. 20	Elk City, Okla.	Sept. 4
Sept. 20	Adrain, Mich.	Sept. 11
Sept 20	Arvada, Colo.	Sept 4
Sept. 20	Omaha, Neb.	Sept. 11
Sept 20	Butte, Mont	Sept 11
Sept 20	Rochester, Minn.	Sept 11
Sept. 20	Salt Lake City, Utah	Sept. 11
Sept. 22	Holton, Kan.	Sept. 4
Sept. 22	San Francisco, Cal.	Sept. 11
Sept. 22	Eldorado, Kan.	Sept. 11
Sept. 22	Toronto, Ont.	Sept. 11
Sept. 24	Selkirk, Man.	Sept 11
Sept. 25	Brooklyn, N. Y.	Sept 11
Sept. 25	Moncton, N. B.	Sept 4
Sept 29	Ankeny, Ia	Sept 11
Sept 30	Salt Lake City, Utah	Sept 11
Sept. 30	Biwabik, Minn	Sept 11
Oct. 1	St. Paul, Minn.	Aug 28
Oct. 1	Virginia, Minn.	Aug. 28
Oct. 1	Wichita, Kan.	Sept 11
Oct. 1	Fulton, Mo.	Sept 11
Oct. 1	Mt. Pleasant, Ia.	Sept 11
Nov. 23	Winner, S. D.	Sept 11

FEDERAL GOVERNMENT WORK

Sept 15	Earthwork St Louis, Mo.	Aug 21
	Adv Aug 21	
Sept 15	Post Office—Winnemucca Nev.	Aug. 21
	Adv. Aug. 21.	
Sept. 15	Kitchen and Mess Hall — Stapleton, N. Y.	Aug. 21
	Adv. Aug. 21.	
Sept 17	Development of Base — Spec. 3762 — Key West, Fla.	Aug. 28
Sept. 17	Turbo Generator — Spec. 4017—Portsmouth, N. H.	Sept. 4
Sept. 17	Turbo Alternator — Spec. 4011—Charleston, S. C.	Sept. 4
Sept. 17	Boilers and Power Plant—Spec. 4025—Annapolis, Md.	Sept. 11
Sept. 17	Heating System and Building—Spec. 4021—Rockaway, N. Y.	Sept 11
Sept 18	Dredging—Newport, R. I.	Sept. 4
Sept. 18	Sewerage System—Water Service Lines and Electric Lighting Plant—Washington, D. C.	Aug. 28
Sept. 18	Jetty Repair — Wilmington, Del.	Aug. 21
	Adv. Aug. 21.	
Sept. 18	Post Office—North Topeka, Kan.	Aug. 14
Sept 19	Grading — Washington, D. C.	Sept 11
Sept. 19	Rip Rap — Tompkinsville N. Y.	Sept. 11
Sept. 22	Material — Charles Town W. Va.	Aug. 21
Sept. 22	Post Office — Charleston, W. Va.	Aug. 21
Sept. 22	Storehouse — Watertown, Mass	Sept. 11
Sept. 23	Heating System—Tacoma Park, Washington, D. C.	Sept. 11
Sept 24	Building — Spec 4009 — Puget Sound, Wash	Sept 11
Sept. 24	Boat House—Reedy Island, Del.	Sept 11
	Adv. Sept. 11.	
Sept. 24	Laundry — Spec. 4006 — Annapolis, Md	Sept 11
Sept. 24	Mechanical Stokers—Spec 4010—Charleston, S. C.	Aug 28
Sept. 24	Reciprocating Air Compressor — Spec 3837 — Puget Sound, Wash	Aug 28
Sept. 26	Post Office and Custom House—Providence, R. I.	Aug 21
	Adv. Aug 21	
Sept. 29	Dredge, etc.—Wilmington, N. C.	Aug 28
	Adv. Aug. 28.	
Sept 29	Dredging Baltimore, Md	Sept 11
	Adv Sept 11	
Sept. 30	Remodeling Hospital—Boston, Mass	Aug 28
Sept. 30	Dock—Charleston, S. C.	Sept 4
Sept 30	Hospital — Spec 3931 — Pearl Harbor, Hawaii	Sept 4
Sept. 30	Rubble Mound Breakwater Cleveland, O.	Sept 4
Oct. 1	Valves, Gates, etc.—Denver, Colo.	Aug 21
	Adv. Aug. 21.	
Oct. 1	Electric Lighting and Power Systems -Spec 3942 Mare Island Cal	Aug 28
Oct. 2	Equipment—Denver, Colo.	Sept 11
Oct 3	Post Office—Midland, Mich.	Sept 11
Oct 3	Lock and Dam — Pittsburgh, Pa	Sept 11
	Adv. Sept. 11.	
Oct 4	Dredging — Wilmington, Del.	Sept 11
	Adv Sept 11	
Oct 6	Post Office -St Johnsbury, Vt.	Aug. 28
Oct. 6	Levee Work St Louis Mo.	Sept. 11
	Adv. Sept. 11.	
Oct. 6	Building—Marianna, Ark.	Sept 11
Oct. 8	Dredging—Detroit, Mich.	Sept 11
	Adv Sept 11, 18, 25 and Oct 2	

Bids Close		See Eng. News-Record
Oct. 10	Dredge—New York, N. Y. Adv. Aug. 28.	Aug. 28
Oct. 10	Post Office—Lock Haven, Pa.	Sept. 4
Oct. 14	Post Office—Pratt, Kan.	Sept. 11
Oct. 22	Power Plant Improvements —Spec 3956—Pearl Harbor, Hawaii	Sept. 11
Nov. 3	Post Office and Court House —Honolulu, H. T.	Aug. 21

MISCELLANEOUS

Sept. 15	Pier—New York, N. Y.	Sept. 11
Sept. 15	Levee—Alexandria, La.	Aug. 14
Sept. 16	Breakwater—Petit Rocher, N. B.	Aug. 28
Sept. 17	Wharf—Meteghan, N. S.	Aug. 28
Sept. 17	Breakwater—Quaco, N. B.	Aug. 28
Sept. 17	Breakwater — Whitepoint, N. S.	Sept. 4
Sept. 18	Heating, Ventilating, etc.—Union, N. J.	Sept. 11
Sept. 18	Retaining Wall — Grosse Pointe, Mich.	Sept. 11
Sept. 22	Wharf—Naramata, B. C.	Aug. 28
Sept. 22	Flood Gates—Pine Bluff, Ark.	Sept. 11
Sept 23	Land and River Borings—New York, N. Y.	Sept. 11
Sept. 23	Turbines, etc.—Saskatoon, Sask. Adv. July 24.	July 24

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. J., Bayonne—City soon receives bids building 48 in. steel water pipe line from Gate House of East Jersey Water Co., North Arlington, to here. About $1,125,000.

Md., Baltimore—City retained N. S. Hill, Jr., engr., c/o Hill & Ferguson, 112 East 19th St., New York City, to make survey of water supply situation, and to embody in report recommendations to be carried out that will insure the city an adequate supply of water for years to come.

N. C., Spring Hope—City receives bids about Sept. 15, improving waterworks, sewers, streets and sidewalks. About $85,000. J. H. Wells, Rocky Mount, engr.

Fla., Ft. Meyers—City voted $45,000 bonds to extend water mains and sewerage system. Property owners will appropriate like amount.

Ky., Carrollton—City election Nov. 4 to vote on $25,000 bonds to build waterworks and electric light systems. J. E. Gunnell, mayor.

O., Greenville—Town plans to build water system and light plant. Bonds for $45,000 voted for project.

O., Hamilton—City plans to extend water system, involving several c. i. or rein.-con. water mains and numerous laterals. About $150,000. W. Weaver, city engr.

Mich., Oakwood (Navarre P. O.)—H. L. Russell, engr., 505 Moffat Bldg., Detroit, soon lets contract trenching and laying 3000 ft. 12 in. vitr. pipe and 8 brick manholes, in Liberty Park Subdivision. About $13,000

Wis., Brillion—See "Sewers."

Neb., McCook—City Council soon lets contract extending waterworks system. About $15,000.

S. D., Spearfish—City election Sept. 16 to vote on $50,000 bonds to install waterworks system.

Tex., El Paso—City election Oct. 4 to vote on $200,000 bonds to improve waterworks system. J. N. Gladding, city engr.

Tex., Frankston—City voted $10,000 bonds to improve waterworks system.

Okla., Collinsville—City voted $40,000 bonds to build water filtration plant. Engineer not selected.

Okla., Henryetta—City plans election soon to vote on $75,000 bonds to extend water mains and build reservoir. Engineer not selected.

Okla., Nowata—City retained Burns & McDonald, engrs., Interstate Bldg., Kansas City, Mo., to prepare plans for improvements to waterworks and electric-light plant.

Okla., Ponca City—City voted $150,000 bonds to build waterworks system. Engineer not selected.

Nev., Winnemucca—Winnemucca Water & Light Co. plans to enlarge present system and relay feeder lines. About $25,000.

Ariz., Globe—City plans election to vote on $250,000 bonds to remodel present water pumping station and replace present water mains with c.i. pipe. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Wash., Walla Walla—Commercial Club and City Comrs. investigating and having surveys made extending water system into Wenaha Forest and establishing intake several miles beyond present site. About $10,000. F. Wills, city clk.

Cal., Los Angeles—Municipal Impvt. Dist. No. 10 voted $100,000 bonds as districts share of cost to build pipe line about 25 mi. long, to carry water from Los Angeles Aqueduct in San Fernando Valley to Sawtelle Dist., also build reservoir, distributing system for domestic and irrigation purposes, etc. About $700,000. J. P. Vroman, 645 South Olive St., secy. bd. pub. serv. comn. W. Mulholland, 645 South Olive St., engr.

Cal., Norwalk—See "Buildings."

Cal., Porterville—South Tule Independent Ditch Co. plans to build distributing system, cost $300,000; also dam to impound waters of South Tule River, cost between $30,000 and $50,000. H. H. Holly, Visalia, engr.

Ont., New Toronto—Town plans to build 4100 ft. 16 in. c.i. water mains in 6th St. from pumphouse to reservoir. About $31,000. James, Loudon & Hertzberg, 36 Toronto St., Toronto, engrs.

BIDS DESIRED

R. I., North Scituate—Until Sept 17, by Water Supply Bd., Providence, building outlet works at Moswansicut Pond, 9 mi. west of Providence near proposed Scituate reservoir, involving 1100 cu.yd. excav., 1000 cu.yd. embankment and 120 cu.yd. concrete. B. T. Potter, chn.

Conn., East Hartford (Hartford P. O.)—Until Oct. 2, by Fire Dist., at office of Dist. Comrs., Wells Hall, Main St., building extensions to waterworks system, including 2 concrete covered reservoirs, low dam, 16 in. c.i. pipe line, 6.6 mi. long with all connections and appurtenances. F. A. Harwood, clk.; advertised in this issue.

N. Y., Marcy—Until Sept. 24, by State Hospital Comn., Capitol, Albany, building concrete dam, gate house, reservoir and appurtenances for Marcy Division of Utica State Hospital, here. E. S. Elwood, secy.; advertised in this issue.

Md., Brunswick—Until Sept. 17, by Mayor and City Council, furnishing and laying 3600 ft. 8 in. wood stave pipe and building circular concrete-lined storage reservoir, 3,000,000 gal. capacity. About $30,000. Norton, Bird & Whitman, 616 Munsey Bldg., Baltimore, engrs. Noted Aug. 14.

Ky., Winchester—Until Sept. 19, by city, building waterworks system. S. B. Tracy, clk.

Mich., Detroit—Until Sept. 30, by Bd Water Comrs., 232 Jefferson Ave., building foundation and sub-structure of low lift pumping station. B. F. Guiney, pres.; advertised in this issue.

Neb., Chadron—Until Sept. 22, by City Clerk, laying new supply mains and replacing some old mains, also building 750,000 gal. concrete lined reservoir. Work involves 27,000 ft. 14 in. pipe, wood, c.i., steel or rein.-con. About $145,000. G. T. Prince, 532 Bee Bldg., Omaha, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—City let contract building pipe delivery line, to G. H. Byrne, 160 Devonshire St., $31,750. Work involves 300 ft. 12 in. c.i. pipe for land construction and 3400 ft. 12 in. submerged flexible pipe.

★**Cal., Harper**—Newport Mesa Irrigation Dist. let contract building circular concrete reservoir, 150 ft. diameter, 14 ft. deep, to J. L. Ackland, 818 South Kingsley, Los Angeles, $13,975. Contract subject to approval of W. J. McClure, state engr.

★**Cal., Wilmington**—Union Oil Co., Union Oil Bldg., Los Angeles, let contract building 60,000 bbl. circular earth and concrete reservoir, 340 ft. diameter, 15 ft. deep, at refinery, here, to Bent Bros., Central Bldg., Los Angeles, $11,700. Owner will furnish cement and do excavating and backfilling.

Sewers

PROPOSED WORK

Mass., Chicopee—City plans to lay 2200 ft. 12 in. vitr. sewer pipe in Meadow and Caroline Sts. About $11,500.

Pa., New Castle—See "Streets & Roads."

Md., St. Michaels—Bd. Comrs. had plans prepared for sewage disposal plant. About $35,000. H. C. Lieb, pres. L. J. Houston, Jr., Fredericksburg, Va., engr.

W. Va., Martinsburg—City rejected bids building sewers, mains, laterals and sewage disposal plant. Work will be readvertised. Noted Mar. 13.

N. C., Spring Hope—See "Waterworks."

Fla., Ft. Meyers—See "Waterworks."

O., Middletown—City will soon sell $20,000 bonds to build sanitary and storm sewers involving 8-24 in. vitr. or concrete pipe. M. Weber, city engr.

O., Springfield—City soon lets contract furnishing and laying 8-24 in. vitr. pipe sewers in Rubsam, Yellow Springs and Grant Sts. About $18,000. W. E. Lucas, city engr. Noted July 17.

Ind., Franklin—City having plans prepared by C. Brossman, engr., 1503 Merchants Bank Bldg., Indianapolis, for sewage disposal plant.

Mich., Grosse Point Farms (Detroit P. O.)—Village soon lets contract furnishing materials and building storm sewers and appurtenances in various streets, involving 8435 ft. 24-36 in. rein.-con. or 10-36 in. vitr. piping. R. H. Erley, Village Hall, Kerby Rd., engr.

Wis., Brillion—City having plans prepared building sewage disposal plant, also excavating and laying 4 mi. 10-12 in. vitr. pipe sewers and water mains in Main St. Cost between $20,000 and $40,000. J. Donohue, York Bldg., Sheboygan, engr.

Ia., Boone—City soon lets contract for 10,345 lin.ft. sanitary sewers. O. Hile, clk.

Ia., Sioux City—City receives bids about Sept. 20, building 76 blocks 8-10 in. sanitary sewers. About $25,000. P. J. Wells, clk.

Neb., Franklin—City receives bids in spring installing sanitary sewers in various streets. About $50,000. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

Neb., McCook—City Council soon lets contract building sewerage system in Dist. No. 2. About $14,500.

Neb., Ord—City plans to install 12-48 in. storm and sanitary sewers in various streets. About $80,000. Rohrbough Eng. Co., 929 City Natl. Bank Bldg., Omaha, engrs.

Mont., Billings—City receives bids in about 30 days building 32,000 ft. 8 in. sewer laterals in Yellowstone and Suburban Homes additions. E. M. Sneckenberger, city engr. Noted Mar. 27.

Tex., El Paso—City election Oct. 4, to vote on $100,000 bonds to install sewage disposal plant. J. N. Gladding, city engr.

Ore., Portland—City soon lets contract building 8 in. vitr. or cement pipe, manholes, catchbasins, sewer service branches, etc., in Grand Ave., from Alberta to Wygant Sts. About $10,000. Work to be completed in 60 days. O. Laurgaard, city engr.

Cal., Glendale—City having surveys and estimate prepared by Olmsted & Gillelen, engrs., 1112 Hollingsworth Bldg., Los Angeles, for sewerage system and sewage disposal plant. About $400,000. J. C. Sherer, clk.

Cal., Oakland—See "Streets and Roads."

Ont., London—City receives bids about Sept. 15, building 8, 10, 12 and 18 in. tile sewerage system in Knollwood Park Dist. About $88,000. H. A. Brazier, City Hall, engr.

Ont., Ottawa—Bd. Control soon receives bids building 15 and 18 in. tile pipe vitr. sewer in Emmett St. from Lewis to Lisgar Sts., cost, $18,100; also 9 in. tile pipe vitr. sewer in Julian Ave. from Wellington to Byron Sts., $2300. A. F. McCallum, City Hall, engr.

BIDS DESIRED

N. Y., Scarsdale—Until Sept. 17, by village, building 1600 lin.ft. 8 in. sewer pipe in Tompkins Rd., to include manohles and 700 cu.yd. rock excav. J. R. Ross, clk.; advertised in this issue.

W. Va., Morgantown—Until Sept. 15 by J. M. Cregg, clk. Monongalia Co., grading furnishing and placing tile drains in 1.6 mi. Dellslow-Greer Rd. from Hagedorn's Mill to Lime Kiln Run.

Sewers (Continued)

Ala., Tuscumbia — See "Streets and Roads".

Wis., Beloit—Until Sept. 19, by Dept. Pub. Wks., relaying 546 ft. 8 in. sewers and 290 ft. 6 in house drains in Portland Ave from 10th to Hackett Sts., Sewer Dist. "C."

Wis., Beloit—Until Sept 19, by Dept. Pub. Wks., installing 4189 ft. 8 in. sewers and 12 manholes in Gerald Ave. from Park to Union Aves., Partridge Ave. from Strong to White Aves., Strong Ave. from Prairie to Ashley Aves., Ashley Ave. from Strong to White Aves., Park Ave. from Henry to Bayliss Aves., Bayliss Ave. from Park Ave. to point west of Church Ave., Sewer Dist. "B," 660 ft. 8 in. sewers and 1 manhole in Middle St. from 4th to 5th Sts., and Roosevelt Ave. from 3d to 4th Sts., Sewer Dist. "C."

Neb., Broken Bow—Until Sept. 23, by F. M. Skillman, city clk., building sewage disposal plant, also sanitary sewers and laterals. Work involves 46,719 ft. 8-15 in. vitr. pipe and 240 ft. 8-16 in. c.i. pipe, also two 150 gal. per minute septic tanks. About $150,000. Grant, Fulton & Letton, 505 Bankers' Life Bldg., Lincoln, engrs.

[illegible]., Wilbur—Until Sept. 22, by W. Bohacek, city clk., installing 32,151 ft. main and lateral sanitary sewers in various streets, involving 23,481 ft. 8 in., 4966 ft. 10 in. and 3704 ft. 12 in. vitr. pipe. About $43,000. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Boston — See "Streets and Roads."

★Conn., Stamford—City let contract building brick and rein.-con. sewage disposal plant, rein.-con. flooring, concrete foundation, to include Imhoff tanks, sludge drying beds, storage basin and screen chamber and laboratory building, to F. Palmer, 131 Sound View Ave. About $225,000. Noted Aug. 7.

★N. C., Goldsboro — City let contract building 9 mi. sewers, to Sullivan, Long & Haggerty, Birmingham, Ala. About $100,000.

O., Bexley—L. S. Higgins, clk., received bids Sept. 5, laying 6000 ft. 36-60 in. main sewers with branches running in northerly direction, and 3200 ft. 15 in. and 4800 ft. 18 in. sanitary sewers in same trench with main sewers, from Sheets Constr. Co., $195,000, and Ames Constr. Co., $225,000, both contractors of Columbus. Noted Aug. 28.

★O., Toledo—D. H. Goodwillie, serv. dir., let contract building Sewer No. 1363, involving 4752 ft. 8 in. vitr. pipe, 16 manholes, etc., to Gessner Co., 616 Nicholas Bldg., $9241. Noted Aug. 14.

Mich., Detroit—Dept. Pub. Wks. received bids building lateral sewers (a) No. 3145, (b) No. 3146, (c) No. 3147, (d) No. 3148, (e) No. 3149, (f) No. 3151, (g) No. 3163, (h) No. 3172, (i) No. 3174, (j) No. 3178, from Western Constr. Co., 1208 Ford Bldg., (a) $956, (b) $8391, (c) $10,809, (d) $8976 (e) $19,891, (f) $8948, (h) $13,657; Detroit Contg. Co., 827 Ford Bldg., (a) $10,367, (b) $7990, (c) $10,990, (d) $8468, (e) $10,966, (f) $8120, (h) $13,850, (i) $9900, (j) $11,222; Lennane & McIlvenna, Book Bldg., (a) $8950, (b) $8250, (c) $10,800, (d) $8750, (e) $10,950, (f) $8750; N. Mancinci, 256 Hague Ave., (g) $4391, (j) $11,900; Walker-Teetaert Co., 530 North Dame St., Grosse Pointe, (g) $5017, (j) $11,976; Liberty Constr. Co., Penobscot Bldg., (h) $13,439, (i) $8400. Noted Aug. 28.

Mich., Detroit—City received bids building 5372 ft. brick or concrete sanitary sewer in Newport Ave., from J. A. Mercier, 216 Hammond Bldg., $75,208; Jeynes & Affeld, 1208 Ford Bldg., $86,987; G. B. Hoag Constr. Co., Commercial Bank Bldg., Cleveland, $94,018.

★Mich., Port Huron—City let contracts to C. Mugovero, Port Huron, furnishing labor and material building complete lateral sewers in alleys No. 11 and 12, cost $2375; Water St., from 14th to Bridge Sts., $6346; Nelson St., from 14th to 16th Sts., $3588; Carleton St. from 14th to Schoolcraft St., $16,649, involving 9732 ft. 8-15 in. vitr. pipe; to J. Kaumeier, Port Huron, Bancroft St. from 12th to 16th St., $9532 and Minnie St., from 12th to 16th St., $8123, involving 4152 ft. 8-15 in. vitr. pipe.

★Mich., Royal Oak—Town let contract building 4000 ft. 12-24 in. vitr. pipe sewers in Seven Mile Rd., Lincolnshire Land Co.'s Subdivision, involving earth trenching and 13 brick manholes, to Thorp & King, Royal Oak. About $15,000.

★Wis., Kenosha—City let contract installing sewers in Corcoran Drive and Fairview Ave., to C. Johnson, 812 Grover St. About $75,000.

★Wis., Port Washington—City let contract excavating and laying 10-12 in. vitr. pipe sewers, in Main St., to A. McGrane, Port Washington, $10,890.

★Wis., Sheboygan—City let contract excavating and laying 10 in vitr. pipe sewers in 16th and Georgia Aves., to C. Honold Co., 821 Pennsylvania Ave., $10,150.

★Neb., Alliance — See "Streets and Roads."

★Neb., Lincoln—City let contract building lateral sewers in various streets to G. L. Vlasnik, Lincoln. About $36,900.

★Neb., Spalding—City let contract building 12,802 ft. 8 in. and 3830 ft. 10 in. vitr. sewer pipe in various streets, involving 11,000 cu.yd. excav., to Katz Constr. Co., 409 Brandeis Theatre Bldg., Omaha, $22,714.

★Neb., Wayne—City let contract installing storm sewers in various strets, to Katz Constr. Co., 400 Brandeis Theatre Bldg., Omaha, $33,200. Work involves 7246 ft. 12-60 in. rein.-con. and segmental block pipe, 60,000 lbs. c.i. and 7000 cu.yd. earth trenching.

★Ore., Bend—See "Streets and Roads."

★Cal., Los Angeles—Bd. Pub Wks. let contract building concrete sewage pumping pit in Manchester Ave., to J. F. Blee, 501 Stimson Bldg., $12,000. Noted Aug. 28.

★Cal., Los Angeles—City let contract building cement pipe sewers in Homer St., et al, to W. Gosling, 3853 Montclair St., $24,888. Noted Aug. 21.

★Cal., Oakland—City let contract building sewer in Kingsland Ave., to Hutchinson Co., 444 17th St., $10,198. Work involves 1252 ft. 18-21 in. pipe, etc.

★Cal., Santa Barbara—See "Streets and Roads."

★Ont., Newmarket—City let contract supplying and laying 2875 ft. 8-18 in. vitr. sewers and 25 concrete manholes, to MacNamara Bros., Saulte Ste Marie. About $20,000. Noted Mar. 27.

Bridges

PROPOSED WORK

Pa., Pittsburgh—Dept. Pub. Wks. soon receives bids for repairs and reconstruction of floor system of Penn Ave. Bridge over Pennsylvania R.R. tracks, $12,500, general structural repairs to Millvale Ave. Bridge over Pennsylvania R.R. tracks, $1650, repairs to concrete floor of 28th St. Bridge over Pensylvania R.R. tracks, $1650, reconstruction of roadway floor on Wilmot St. Bridge over Cunliffe Hollow, $13,000, reconstruction of steps of Highland Ave. Bridge, $500; total cost, $33,650. N. S. Sprague, city engr.

Ill., Burton—Town soon lets contract building Coles Bridge, steel on rein.-con. abutments, 90 ft. span on center line of roadway, 16 ft. wide, involving 137 cu.yd. concrete, 7360 lb. reinforcing steel, cost $8670; also two 45 ft. spans on center of roadway, 16 ft. wide, 321 cu.yd. concrete, 36,860 lb. reinforcing steel, etc., $7750.

Minn., Blue Earth—Comrs. Faribault Co. rejected bids received Sept. 2, building Bridge No. 3130, 60 ft deck girder, 22 ft. roadway, No. 3131, 230 ft. span, 20 ft. roadway, No. 3132, 18 ft. slab span, 24 ft. roadway. About $11,500. R. J. Short, Blue Earth, engr Noted Aug. 21.

Okla., Pryor—Mayes Co. voted $200,000 bonds to build 6 bridges. Engineer not selected.

Utah, Fillmore—See "Streets and Roads."

Cal., Lompoc—See "Streets and Roads."

Ont., Finch—J. G. Cameron, engr., Finch, soon lets contract building 2 concrete culverts with 10 ft. span and necessary approaches for Dundas, Stormont and Glengarry counties. About $10,000.

BIDS DESIRED

New Jersey—Until Sept. 29, by State Highway Comn., Broad St. Bank Bldg., Trenton, building Bridge No. 46, 10 ft. span, 30 ft. wide, at Sta. 45+85, Route 3, Hamilton-Ancora Sect.; No. 172, 10 ft. span, 30 ft. wide, at Sta. 121+40, Route 3, Hammonton-Ancora Sect.; No. 174, 15 ft. span, 30 ft. wide, at Sta. 174+63, Route No. 3, Ancora-Atco Sect.; No. 16, 13 ft. span, 30 ft. wide, at Sta. 415+80, Route No. 3, Ancora-Atco Sect., all rein.-con. in Camden Co., A. L. Grover, ch. clk.; advertised in this issue. Noted Sept. 4.

Pa., Harrisburg—Until Sept. 23, by T. W. Templeton, supt. bd. comrs. pub. grounds and buildings, Capitol, furnishing labor and material for constructing bridge over Wapaseening Creek, on Pennsylvania State Highway, Route No. 15. L. W. Mitchell, secy.

N. C., Lexington—Until Sept. 24, by Comrs. Davidson Co., building 4 additional beam bridges. N. S. Mullican, Lexington, engr.

Minn., Duluth—Until Sept. 22, by W. H. Borgen, aud. St. Louis Co., building 30 rein.-con. and steel bridges. About $200,000. R. W. Acton, co. engr. Noted Aug. 14.

Neb., Central City—Until Sept. 17, by H. V. Nelson, clk., Hamilton Co. (Aurora) building bridge, here, 800 ft. long, 24 ft. wide, to have sixteen 50 ft. rein.-con. arch spans. Work involves 2500 cu.yd. rein.-con., 17,500 lin.ft. wooden piling and 40,000 cu.yd. earth approach and fill. About $125,000. G. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Mo., St. Louis—Until Sept. 15, by C. E. Smith, city engr., building 200 ft. rein.-con. and steel bridge over Missouri Pacific R.R. tracks, on Southwest Ave. About $40,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★R. I., Barrington—State Bd. Pub. Rds., State House, Providence, let contract building state bridges Nos. 72, 106, 108 and 122, known as Coventry Center Bridge, Coventry, Oak Valley and Branch River Bridge, Burrillville and Nyatt Bridges to R. Stoddard, Chelsea, $28,669. Noted Aug. 14.

★Pa., Washington—Controllers Washington and Westmoreland Counties let contract building repairs and replacements to inter county bridge over Monongahela River, connecting Donora and Webster, to Farris Eng. Co., Empire Bldg., Pittsburgh. Noted Aug. 21.

O., Toledo—See "Streets and Roads."

★O., Willoughby—Bd. Comrs. Lake Co. let contract building rein.-con. viaduct over Chagrin River and Valley, here, to King Bridge Co., East 69th St., Cleveland, $242,237; approaches, to Walsh Constr. Co., Citizens Bldg., Cleveland, $17,090. Noted Aug. 7.

★Michigan—State Highway Dept., Lansing, let contract building 316 ft. steel bridge, 34 ft. wide, with two 86 ft. fixed spans and 1 bascule span, involving 1960 cu.yd. concrete, 259 tons steel, etc., to A. B. Morrison, South Military St., Port Huron. About 160,000.

★Wis., West Bend—Parsons & Orbert, engrs., 627 M. & M. Bank Bldg., Milwaukee, let contract for city to J. Schneider Constr. Co., Main St., Menasha, building rein.-con. bridge over Milwaukee River on Division St. About $17,800. Noted Aug. 28.

★Minn., Minneapolis—Comrs. Hennepin Co. received bids building (a) 800 ft. rein.-con. and steel bridge on Lyndale Ave., having 100 ft. draw span, 24 ft. wide, (b) 840 ft. bridge over Minnesota River on Cedar Ave. to have 5 spans rein.-con. flooring, 20 ft. wide, from W. S. Hewett, Metropolitan Bank Bldg., (a) $193,878, (b) $116,998; Illinois Steel Bridge Co., Gilfillan Blk., St. Paul, (a) $219,947, (b) $114,940; Minneapolis Steel & Mchy. Co., Minnehaha Ave., (h) $115,973. Noted Aug. 14.

Cal., Carlsbad—Bd. Supervs. San Diego Co. (San Diego) received bids building rein.-con. girder bridge over Aqua Hedionda Creek near here, from De Waard Bros., 207 Granger Bldg., 19,496; B. B. Boyd, $20,160; Wright & Doran, San Diego, $20,522.

★B. C., Pritchard—Dept. Pub. Wks., Victoria, let contract building 132 ft. timber bridge over Thompson River, 16 ft. wide, with 1000 ft. approach, involving 1600 lin.ft. wooden piling, to W. Greenlees, 407 Cordova St., W., Vancouver. About $30,000. Noted Aug. 7.

Reinforced Concrete

PROPOSED WORK

Pa., McKeesport—See "Buildings."

Ill., Chicago—See "Buildings."

Ont., Finch—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Minn., Minneapolis—See "Bridges."

Streets and Roads

PROPOSED WORK

Conn., Hamden—Town plans to pave State St., Dixwell and Whitney Aves. as phalt and concrete. About $100,000. G. M Warner, Highwood, 1st selectman.

Streets and Roads (Continued)

N. J., Mays Landing—Bd. Freeholders Atlantic Co. soon lets contract building section White Horse Pike, Galloway Twp., involving 115,846 sq.yd. 1 course concrete pavement. A. H. Nelson, co. engr. Noted Apr. 17.

Pa., Emsworth (Pittsburgh P. O.)—Boro. rejected bids grading, paving and curbing Locust St. Project will be readvertised in spring. Noted Sept. 4.

Pa., New Castle—City Council plans to sell $100,000 bonds to repave streets and build sewers. C. H. Milholland, city engr.

Pa., Scranton—City Council plans to grade, pave and curb Columbia St. from Boulevard to Washington Aves., 1st and 2nd wards, Grandview St. from Boulevard to Wyoming Aves., 1st ward, sheet asphalt and stone blocks on concrete base, $29,561 and $16,724 respectively. W. Schunk, city engr.

W. Va., Charleston—Kanawha Co. having plans prepared grading, draining and surfacing 2.6 mi. Elk River Rd., involving 61,000 cu.yd. excav. and 24,000 sq.yd. cement concrete surfacing. About $138,500. F. G. Burdette, Charleston, engr.

W. Va., Grantsville—Calhoun Co. plans to grade 4½ mi. Arnoldsburg-Spencer Rd. D. W. Shock, Dodrill, engr.

W. Va., Lewisburg—Greenbrier Co. having plans prepared by F. K. Rader, engr., Lewisburg, grading 7.86 mi. and surfacing 2 mi. Midland Trail Rd., involving 32,000 cu.yd. excav., and 18,000 sq.yd. penetration macadam. About $66,500.

W. Va., Marlinton—Pocahontas Co. soon receives bids paving 5.87 mi. Edray-Marlinton-Huntersville Rd. bituminous macadam. About $84,370. H. Kramer, Barlow, engr. Noted May 22.

W. Va., Morgantown—Monongalia Co. Union Dist. voted $150,000 bonds to build 13½ mi. roads. L. M. Cox, Morgantown, engr. Noted Aug. 14.

W. Va., Moundsville—Marshall Co. soon receives bids paving ½ mi. Narrows Rd., vitr. brick. About $23,700. R. C. Yoho, co. engr.

W. Va., Parkersburg—City passed ordinance to pave Depot, Beaver, 18th, Park, Oak, 16th, 17th and 18th Sts., 23 ft. wide, concrete. Noted May 22.

W. Va., Romney—Hampshire Co. having plans prepared by H. D. Munroe, engr., Romney, grading, draining and surfacing 8.5 mi. Northwestern Turnpike, between Romney and Augusta, involving 32,000 cu. yd. excav. and 60,000 sq.yd. gravel surfacing. About $57,500.

W. Va., Weston—Lewis Co. plans to grade and pave 2½ mi. Pole Creek Rd., vitr. brick. About $108,390. W. K. Spaur. Weston, engr.

N. C., Andrews—City plans to pave various streets, probably asphalt. About $40,000.

N. C., Charlotte—Mecklenburg Co. rejected bids hard surfacing 6 mi. Charlotte Monroe Rd. About $150,000. W. S. Fallis, Raleigh, engr. Noted Aug. 28.

N. C., Jackson—Comrs. Northampton Co. plan to grade and surface roads in Gaston Twp. Cost between $75,000 and $100,000. Engineer not selected.

N. C., Lumberton—Comrs. Robeson Co. plan to build and improve various roads. About $1,000,000. Engineer not selected.

N. C., Spring Hope—See "Waterworks."

N. C., Yanceville—Yancey Co. plans to grade and surface roads. About $300,000. W. S. Fallis, Raleigh, engr.

Fla., Ft. Meyers—City voted $50,000 bonds to pave various streets. Property owners will appropriate like amount.

La., New Orleans—City plans to pave and install subsurface drains on 451 ft Canal St. from Louisville & Nashville Ry. depot to river, 37 ft. wide, wood block on 6 in. concrete base, $37,000; repave 3490 ft. St. Charles St from Canal St to Lee Circle, 40 ft wide, wood block, asphalt, bituminous concrete or bitulithic pavement on 6 in. concrete base, involving 11 623 ft vitr. brick gutter, 2000 cu.yd. concrete, 90 sq.yd. small granite block, 200 lin.ft. concrete curb, 70 lin.ft. concrete circular curb, etc. $84,600. T. L. Willis, city engr.

Ohio—State Highway Comm., Columbus, plans to grade, build bridges and culverts and pave .4 mi. Sect. "C," also grade and pave .48 mi. Sect. "D-1" of Bryan-Napoleon Rd., waterbound macadam, Henry Co., cost $57,940 and $27,123 respectively; grade and pave 10 mi Sect "P" Logan-New Lexington Rd., monolithic brick, Perry Co., $7513

Ohio—State Highway Comm., Columbus, plans to build following Federal Aid roads: 3.76 mi. Dennison-Cadiz Rd. and 2.27 mi. East Liverpool-Bellaire Rd., concrete, Harrison Co., cost $50,000 and $45,000 respectively; 2.02 mi. Woodburn Rd. and 2.02 mi. Hicksville Rd., concrete, Pauling Co., $20,200 each; 3.39 mi. Ohio River Rd., bituminous macadam, Lawrence Co., $60,000.

Ohio—State Highway Comm., Columbus, soon receives bids grading, building bridges and culverts and paving 5 mi. Youngstown-Conneaut Rd., monolithic brick, Ashtabula Co. About $155,601.

O., Hamilton—City soon receives bids paving 4200 ft. Sherman, Progress and Webster Sts., 30-40 ft. wide, involving 14,000 sq.yd. asphalt, concrete or brick block. About $70,000. W. Weaver, city engr.

Michigan—State Highway Dept., Lansing, soon lets contract shaping, draining and surfacing 7.459 mi State Trunk Line Rd. No. 22-2, Leelanau Co., involving 70,019 sq.yd. gravel, 212.8 cu.yd. concrete, and 20,774 cu.yd. earth excav.; also 3.759 mi. State Trunk Line Rd. No. 17-2-B, Jackson Co., involving 24,064 cu.yd. earth excav.

Michigan—State Highway Dept., Lansing, soon lets contract shaping, surfacing and draining 1.764 mi. State Trunk Line Rd., No. 47-6, Saginaw Co., involving 16,562 sq.yd. waterbound macadam or stone gravel and 5528 cu.yd. earth excav.; 2.829 mi. State Trunk Line Rd. No. 47-7, Saginaw Co., 39,829 sq.yd. bituminous concrete and 18,747 cu.yd. earth excav.; 2.538 mi. State Trunk Line Rd. No. 46-1, Montcalm Co., 23,828 sq.yd. gravel, 202.8 cu.yd. concrete and 11,380 cu.yd. earth excav.; 2.536 mi. State Trunk Line Rd. No. 63-1, Lake Co., 23,803 sq.yd. gravel and 3428 cu.yd. earth excav.

Mich., Detroit—Dept. Pub. Wks., soon lets contract paving with asphaltic concrete on 6 in. concrete foundation, Berea or Medina curbstone Blaine Ave. from Linwood Ave. to Dexter Blvd., Martindale Ave. from Grand River to Colfax Aves. and Newberry Ave. from Junction to Calvary Aves., 26 ft. wide, involving 11,298 cu.yd. excav., 11,881 lin.ft. curbstone, 17,939 sq.yd. paving, 356 cu.yd. concrete, 657 lin.ft. retaining stone; also paving with 1 course concrete, alleys No. 1068-1088 inclusive, involving 7911 cu.yd. excav., 27,438 sq.yd. 1 course concrete, 24,058 lin.ft. retaining plank, 335 lin.ft. retaining stone, 15 cu.yd. concrete and 25 lin.ft. curbstone.

Mich., Detroit—Dept. Pub. Wks. soon lets contract paving Bellevue, Hart and Sheridan Aves. from Kercheval to Mack Aves., involving 36,000 sq.yd. asphalt. C. W Hubbell, city engr.

Mich., Port Huron—St. Clair Co. Rd. Comn. soon lets contract grading, shaping, draining and surfacing, 90 mi Kimball Rd., 16 ft. wide. About $12,000. D. D. Worcester, Port Huron, engr.

Ill., East St. Louis—Street Comn. soon receives bids surfacing St. Louis Ave. from 10th to 20th Sts., 30 ft. wide, cost $75,340; also paving St. Louis Ave. from 10th St. to Collinsville Ave., 30 ft. wide, both asphalt, $54,000.

Ill., Edwardsville—Madison Co having plans prepared building 20 mi. Mississippi Scenic Highway Trail through county, to connect with Alton Twp. and Calhoun Co., 50 ft. wide. About $1,000,000. Work being backed by Alton Bd. Trade and A. A. Schultze, chn. Calhoun Co. bd. comrs.

Wisconsin—State Highway Comn., 601-602 Wilner Bldg., Green Bay, soon lets contract improving 1.17 mi. Lake Shore Rd., Manitowoc Co., Federal Aid Project No. 2, involving 9624 cu.yd. earth excav., 162 cu.yd. Class A concrete and 12,430 sq.yd concrete surfacing, etc.

Wisconsin—State Highway Comn., Madison, soon lets contract improving 3.53 mi. County Line Rd., Dodge and Jefferson Counties, Federal Aid Project No. 72, 3.47 mi. Dunbarton-Darlington Rd., Lafayette Co., Federal Aid Project No. 86. Noted July 17 and Aug. 7.

Wisconsin — State Highway Comn., Stephenson Bldg., Milwaukee, soon lets contract improving .93 mi. Sheridan Rd., Racine Co., Federal Aid Project No. 39, involving 2258 cu.yd. earth and 4556 cu.yd. borrow excav., 17 cu.yd. Class A concrete, etc.

Wis., Grand Rapids—Wood Co. voted $1,500,000 bonds to improve roads.

Wis., Jefferson—Jefferson Co. voted $2,000,000 bonds to improve roads. Noted June 19.

Wis., Manitowoc—City plans to grade and pave 3 mi. North 8th St., also Main St. from Calumet Rd. to city limits, 18-20 ft wide. Work involves concrete curbs and gutters and 18,500 sq.yd. 2 course rein.-con. About $40,000. Engineer not selected.

Wis., Sheboygan—City having plans prepared grading and paving 1 mi. Kentucky Ave., 20 ft. wide, 2 course rein.-con. or vitr. brick. Cost between $12,000 and $13,000. C. U. Boley, city engr.

Wis., West Bend—Washington Co. voted $2,000,000 bonds to improve roads.

Minn., Austin—City Council authorized $35,000 bond issue to improve streets. H. Lee, clk.

Minn., Bemidji—Comrs. Beltrami Co. rejected bids received Aug. 7, grading and graveling 30 mi. Federal Aid Project No. 57, 24 ft. wide. About $180,000. S. D. Snyder, Bemidji, engr. Noted Aug. 7.

Minn., Duluth—J. A. Farrell, city comr., rejected bids received Aug. 8, paving 54th Ave., E. from London Rd. to Glendale St. About $33,595. Noted Aug. 7.

Minn., Duluth—R. W. Acton, engr. St. Louis Co. receives bids about Nov. 1, straightening road, cutting down grade and hard surfacing with concrete 8 mi. highway from Duluth eastern limits to Knife River and town line 18 ft. wide. About $245,000.

Minn., Little Falls—Morrison & Co. voted $200,000 bonds to build roads. B. Y. McNairy, co. aud.

Neb., Broken Bow—City having plans prepared paving 140 blocks, 24-87 ft. wide. About $800,000. Grant, Fulton & Letton, 505 Bankers Life Bldg., Lincoln, engrs.

Neb., Hastings—City election Sept. 18, to vote on $50,000 bonds to pave various streets.

Neb., Neligh—City plans to pave 3 blocks 30-60 ft. wide, involving 29,156 sq.yd. 2 in. asphaltic concrete or 5 in. rein.-con. pavement and 13,312 lin.ft. curbing. About $109,370. Rohrbough Eng. Co., 929 City Natl. Bank Bldg., Omaha, engrs.

Mont., Billings — City plans to pave Broadwater, 7th and Miles Sts., 16 ft. wide. About $26,777. E. M. Sneckenberger, 27 Grand Ave., engr.

Mont., Billings—City plans to pave 98,400 sq.yd. various streets on southwest side. E. J. Strasburger, 614 Daly Bank Bldg., Butte, engr.

Mont., Whitefish—City plans to curb and build 5 ft. cement sidewalks on various streets. About $20,000. W. K. Triplett, Whitefish, engr.

Mo., Glendale (St. Louis P. O.)—J. C. Doyle, city clk., soon lets contract grading, laying drainpipe, inlets and other appurtenances at Sappington Rd. from Elliot south to Big Bend Rd. Cost to exceed $10,000. Noted July 31.

Mo., Kirkwood—E. O. Harper, city clk., soon receives bids paving Washington Ave. from Van Buren St. to western city limits. About $50,000.

Mo., St. Genevieve—R. Abernathy, engr., St. Genevieve, soon receives bids improving north and south sections of highway between St. Genevieve and St. Louis, also east and west sections between St. Genevieve and Farmington. About $325,000.

Tex., Bellville—Austin Co. election Oct. 7, to vote on $1,500,000 bonds to build roads.

Tex., Boerne—Kendall Co. plans to surface 5.788 mi. Highway No. 9 from here to Bexar Co. line, 16 ft. wide, gravel, ½ in. bituminous surface treatment, trap rock, coal tar and asphalt. Work involves 2 acres clearing and grubbing. About $40,930. A. C. Poncoast, Boerne, engr.

Tex., Centerville—Leon Co. plans to gravel surface and drain 30.74 mi. Highway No. 32 from Freestone Co. line to Madison Co. line, 16-24 ft. wide. About $420,850. Bryant & Huffman, 211-217 Littlefield Bldg., Austin, engrs.

Tex., Denton—City soon lets contract improving various streets, involving 64,260 sq.yd. paving, 33,850 lin.ft. concrete curbing, 27,000 cu.yd. earth excav and 10,900 lin.ft. 12-42 in. storm sewers. Koch & Fowler, 606 Sumpter Bldg., Dallas, consult. engrs.

Tex., El Paso—City election Oct. 4, to vote on $100,000 bonds to pave and repair streets. J. N. Gladding, city engr.

Tex., Gonzales—Gonzales Co. plans to grade, gravel surface and build concrete dips, trestle, abutments, etc., on 5.5 mi. Highway No. 29 from here to Dewitt Co. line, 24 ft. wide. About $43,000. Wilder & O'Neal, Chronicle Bldg., Houston, engrs. Noted Aug. 21.

Tex., Meridian—W. A. York, judge Bosque Co., soon lets contract gravel surfacing and building rein.-con. drainage structures on 51.42 mi. Meridian Highway from McClennan to Hill Co. lines, 16 ft.

Streets and Roads (Continued)

wide, involving 48.96 mi. machine grading, 28,847 mi. scarifying, 2745 cu.yd. ditching, 13,972 sq.yd. unclassified earth excav., 1244 sq.yd. concrete pavement, etc. About $235,000. C. H. Van Eman, Walnut Springs, engr. Noted May 29.

Tex., Seguin—Guadalupe Co. soon lets contract gravel surfacing with bituminous surface treatment and building rein.-con. drainage structures on 3.256 mi. Highway No. 2 from Comal Co. line to Bexar Co. line, 16 ft. wide, involving 15,892 lin.ft. grading and scarifying. About $27,720. Former bids rejected. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs. Noted Aug. 21.

Tex., Sulphur Springs—Hopkins Co. election Sept. 27, to vote on $2,000,000 bonds to build lateral roads. State Highways Nos. 1, 11 and 19.

Tex., Vernon—City voted $15,000 bonds to pave various streets. Noted Mar. 27.

Okla., Newkirk—Comrs. Kay Co. plan to pave, grade, build culverts, etc., on various roads. About $1,500,000. Federal Government will appropriate toward cost.

Okla., Tupelo—Coal Co. voted $50,000 bonds to hardsurface roads in Bryan Twp.

New Mexico—State Highway Comn., Santa Fe, having surveys made and will receive bids about Sept. 20 building 21 mi. Federal Aid Road Project No. 29, 16 ft. wide, Eddy Co. About $90,000. L. A. Gillett, state highway engr.

Idaho, Wallace—Clarkia Highway Dist., Shoshone Co., voted $175,000 bonds to improve roads. O. Avery, pres. Engineer not selected.

Utah, Fillmore—Millard Co. election Sept. 23, to vote on $310,000 bonds to hardsurface roads and build bridges and culverts. C. H. Day, co. clk.

Utah, Provo—City plans to pave 3560 ft. 5th West St., from Center to 5th North Sts., 20 ft. wide. About $40,000. C. A. Swan, city engr.

Utah, Salt Lake City—City plans to improve 7th St., W., from 9th St., S., to 4th St., W., involving 16,800 lin.ft. curbing and guttering; pave 1500 ft., Michigan Ave. from 13th to 15th Sts., E., 40 ft. wide, plain concrete on concrete base and bituminous topping; 4998 ft. 1st St., W., from Skult Temple to Wall St., and Wall St. from 1st St., W., to 2nd St., W., 30-40 ft. wide, 7 in. concrete or 2 in. topping on 6 in. concrete base.

Wash., Aberdeen—City rejected bids received replacing east end trestle with permanent highway, 3200 ft. long, 24 ft. wide, including 440 ft. concrete viaduct, 23,000 cu.yd. filling, 5000 sq.yd. riprap, etc., involving 650 cu.yd. concrete and 50,000 lb. steel. About $72,000. Work will be readvertised. Noted Aug. 14.

Wash., Everett—City Council plans to pave Baker and Friday Aves., concrete or asphaltic concrete. Cost to exceed $10,000.

Wash., Port Angeles—City Council plans to clear, grub, drain, grade and oil Cherry, Oak and Valley Sts., also alleys from 8th St. to Boulevard, and from Lincoln St. to Valley Gulch Ridge. Cost to exceed $10,000.

Ore., Oregon City—See "Miscellaneous Works."

Cal., Fresno—Bd. Supervs. Fresno Co. applied to U. S. Bureau of Good Rds. for funds to grade, gravel, oil and drain roads as follows: $30,000 for Trimmer Springs Rd., $80,000 for Tool House Rd., $60,000 for Sand Creek Rd., $30,000 for Millwood and Sand Creek cutoff and $100,000 for Auberry-Huntington Lake Rd. D. M. Barnwell, clk.

Cal., Lompoc—Fourth Supervisional Dist. election soon, to vote on $400,000 bonds to pave surface and build bridges on portion of road from here to Lompoc Jct., total length, 28 mi. Total cost, $500,000. Santa Barbara Co. will contribute $100,000 toward project.

Cal., Oakland—City soon lets contract improving East 10th St. from Fruitvale Ave. to High St., involving 146,948 sq.ft. grading, curbing, gutter and paving, 235 lin.ft. 6 in. sewer pipe, 5465 lin.ft. concrete curbing, 16,303 sq.ft. concrete gutter and 13,424 sq.yd. oil macadam, cost $27,000; Jefferson St. between 1st and 7th Sts., involving 73,458 sq.ft. grading, curbing, guttering and paving, 414 lin.ft. granite and 2282 lin.ft. concrete curbing, 3330 sq.ft. brick gutter and 7792 sq.yd. asphalt, $30,000. M. Campbell, city engr.

Cal., Oakland—City soon lets contract grading, paving, curbing and guttering 1730 ft. 47th Ave. from East 14th St. to Huntington tract, involving 5749 sq.yd. oil macadam, 3098 lin.ft. concrete curbing and 9368 sq.ft. concrete guttering. About $11,000. M. Campbell, City Hall, engr.

Cal., Ventura—Ventura Co. voted $500,000 bonds for concrete paving, grading and building concrete culverts, etc. on 35 mi. highways. Noted July 17.

Ont., Orillia—Town having plans prepared by James, Loudon & Hertzberg, engrs., 36 Toronto St., Toronto, paving Matchedash St., 28 and 34 ft. wide. Work involves 6500 sq.yd. bitulithic pavement on 5 in. concrete base and 3700 lin.ft. concrete curbing. About $33,000.

Ont., Toronto—City Council passed by-law for extension of Duplex Ave. and opening of Cleveland St., $119,212; building asphalt pavement on Danforth Ave., widening Morton Rd., also Kingston Rd., from Balsam to Silver Birch Aves., and construction of sewer on Queen St., from Pape to Leslie Sts., $84,559. R. C. Harris, City Hall, engr.

BIDS DESIRED

Massachusetts—Until Sept. 16, by State Highway Comn., Boston, for 3100 ft. road, 18-24 ft. wide, Sudbury Twp., 17,600 ft. road, 18-24 ft. wide, Cummington Twp., both bituminous macadam, 5200 ft. road, 18-24 ft. wide, concrete, Lanesborough Twp. A. W. Dean, state highway engr.

N. Y., Ithaca—Until Sept. 15, at office of Comptroller of Cornell University, grading, curbing, paving and draining Tower Rd., Agricultural Campus. C. E. Curtis, supt. bldgs. and grounds.

N. Y., Phoenix—Until Sept. 16, by Bd. Trustees, for 6000 sq.yd. concrete or asphaltic concrete pavement, 3350 sq.yd. asphaltic concrete resurfacing, 2650 lin.ft. curbing and guttering. G. W. Hackett, Fulton, engr.; advertised in this issue.

N. Y., S. I., St. George—Until Sept. 19, by C. D. Van Name, pres. Richmond Boro., repaving with sheet asphalt and 2nd hand napped granite blocks on concrete foundation, roadway of Manor Rd. between Richmond Turnpike and Willow Brook Rd.

N. J., North Bergen—Until Sept. 25, by town, improving Grant Ave., bituminous pavement. About $25,000. P. Daly, 31st St., engr. Noted Apr. 17.

N. J., Union—Until Sept. 15, by town, improving Main St., bituminous. About $10,000. E. Bautz, clk.

Pennsylvania—Until Sept. 30, by State Highway Dept., Harrisburg, rebuilding roads in Armstrong, Bucks, Cambria, Centre, Chester, Clinton, Delaware, Crawford, Erie, Fayette, Greene, Lancaster and Westmoreland Counties. L. S. Sadler, state highway comr.; advertised in this issue.

Pa., Duquesne—Until Sept. 15, by City Clerk, grading, paving and curbing sections of Viola Ave., South 6th St. and Poplar Alley, vitr. brick on slag foundation. Former bids rejected. R. B. Dell, city engr. Noted Aug. 28.

Pa., Monessen—Boro. receiving bids grading, paving and curbing East Donner, Ontario, South 4th, Chestnut, 10th, South 14th and Beatrice Sts., McMahon, Maple, Summit, Elsie, Dunlap and Lillian Aves. Work involves 23,300 sq.yd. vitr. brick on concrete base, 1100 ft. rough curb stone, 11,308 lin.ft. stone curbing, 2120 ft. reset and 1304 ft. radius stone curbing and 17,876 cu.yd. earth excav.

Pa., Phila.—Until Sept. 23, by city, grading and paving various streets, wood block, vitr. block asphalt, etc. About $750,000.

Md., Salisbury—Until Sept. 23, by Comrs. Wicomico Co., building state-aid roads as follows: 1.03 mi. Salisbury-Snow Hill Rd., 15 ft. wide, involving 9064 sq.yd. 6 in. concrete. Contr. No. 412; 1.07 mi. Salisbury-Nanticoke Rd., 15 ft. wide, 9418 sq.yd. 6 in. concrete. H. M. Clark, co. engr.

W. Va., Keyser—Until Sept. 23, by Comrs. Mineral Co. grading, draining and surfacing 12 mi. Cumberland-Romney Rd., 16 ft. wide, involving 50,000 cu.yd. excav. About $71,000. S. C. Lea, Keyser, engr.

W. Va., Madison—Until Oct. 2, by Comrs. Boone Co., grading and draining 5 mi. Danville-Peytona Rd., 20-26 ft. wide, involving 60,000 cu.yd. excav. About $66,000. S. E. Bradley, Madison, engr.

Ga., Athens—Until Sept. 23, by Comrs. Clarke Co., building 3.7 mi. concrete or bituminous roads. T. Wright, clk.; advertised in this issue. Noted July 17.

Ala., Tuscumbia—Until Sept. 15, at office of O. B. Clark, mayor, for 22,353 sq.yd. macadam paving, 13,317 lin.ft. concrete curb and gutter, 3157 lin.ft. concrete curb, 8650 cu.yd. grading, 18,997 sq.ft. concrete walks, 11,914 sq.yd. concrete, asphalt, asphaltic concrete, bituminous macadam or brick paving, 31 inlets, 2870 ft. 8-24 in. vitr. sewer. J. E. Ferguson, Tuscumbia, engr.

Tennessee—Until Sept. 18, by Dept. Highways, Nashville, building 13.7 mi. State Highway No. 1, between Clinch and Powell Rivers, Union and Claiborne Counties. Work involves 86,340 cu.yd. common, 47,350 cu.yd. solid rock and 4530 cu.yd. borrow excav., 21,448 cu.yd. broken stone base and shoulders, 7145 cu.yd. macadam surface course, 1303 cu.yd. concrete, 80,939 lb. deformed steel bars, furnishing and installing 1987 lin.ft. and cleaning and relaying 935 ft. culvert pipe, 130 cu.yd. rip-rap, etc. W. P. Moore, ch. engr.

O., Lakewood—Until Sept. 15, by city, paving Clifton Blvd., involving 72,000 sq.yd. wood block, sheet asphalt, bituminous concrete or bitulithic, cost $48,000; also resurfacing Grace St., 7350 sq.yd. asphalt. E. A. Fisher, city engr.

Michigan—Until Sept. 16, F. F. Rogers, state highway comr., Lansing, grading, shaping, draining and surfacing with 1 course concrete (Class F) 2.115 mi. Assessment Dist. Rd. No. 359, 18 ft. wide, Berrien and Cass Counties.

Mich., Muskegon—Until Sept. 15, by C. H. Tellman, 103 Pine St., grading, shaping and paving 1500 ft. Arthur St. from Ionia to Irwin Sts., and 5000 ft. 5th St. from Houston to Laketon Aves., 30 ft. wide, involving 22,000 sq.yd. 6 in. concrete.

Illinois—Until Sept. 17, by State Highway Comn., Springfield, improving roads in following counties:

Whiteside Co., 2900 ft. Sect. I-15d, Lincoln Highway, 16 ft. wide, involving 5156 sq.yd. pavement, 1561 cu.yd. excav., 340 lb. steel, 1790 bbl. cement, 16 cu.yd. Class A concrete, cost $13,269; 10,938 ft. Sect. 20, 16 ft. wide, 19,439 sq.yd. pavement, 11,619 cu.yd. excav., 6694 bbl. cement, 16 cu.yd. Class A concrete, $50,656;

Peoria Co., 8416 ft. Sect. L, Peoria-Springfield Highway, 20 ft. wide;

Bureau-La Salle Counties, 11,385 ft. Sect. T, Morris-Henry Highway, 16 ft. wide, 20,240 sq.yd. pavement, 14,846 cu.yd. excav., 8030 lb. steel, 7100 bbl. cement, 96 cu.yd. Class A concrete, $49,524; Madison Co., 32,424 ft. Sect. X, Springfield-East St. Louis Highway, 18 ft. wide, 65,214 sq.yd. pavement, 23,346 cu.yd. excav., 1130 lb. steel, 22,460 bbl. cement, 47 cu.yd. Class A concrete, $130,340; 11,394 ft. Sect. T, Natl. Highway, 30 ft. wide, 12,660 sq.yd. pavement, 25,876 cu.yd. excav., 1850 lb. steel, 31 bbl. cement, 20 cu.yd. Class A concrete, $54,350; alternate bids will be received for Portland cement concrete, 3 in. and 4 in. monolithic brick, bituminous concrete with or without binder course, (Spec. C1, C2, C3 or CT); cement will be furnished on all sections by Dept. of Pub. Wks. and Bldgs., or by county; also in Franklin Co., 2801 ft. Sect. G, Route 5, 10 ft. wide, 3664 sq.yd. concrete, 1340 cu.yd. excav., 930 bbl. cement, $9015; Mason Co., 3400 ft. Sect. B, Route 1, 16 ft. wide, 6044 sq.yd. concrete, 829 cu.yd. excav., 2074 bbl. cement, $12,790; except as noted, cement will be furnished by Dept. Pub. Wks. & Bldgs. C. Older, ch. highway engr.

Wis., Manitowoc—Until Sept. 16, by Manitowoc Co., grading, paving, building bridges and culverts on 3.2 mi. Lake Shore Rd., Federal Aid Project No. 2, 18 ft. wide, involving 14,430 sq.yd. concrete, 9624 cu.yd. dry earth excav., and 680 lin.ft. piles, etc. About $40,000. A. R. Hirst, 324 North Pinckney Ave., Madison, engr.

Wis., Manitowoc—Until Sept. 24, by Bd. Pub. Wks., furnishing labor and materials, improving South 21st St. from Hamilton to Madison Sts. and South 24th St. from Washington to Marshall Sts. A. H. Zander, clk.

Minn., Aitkin—Until Sept. 27, by A. E. Arndt, town clk., grading and graveling 5.6 mi. road, 24 ft. wide, Range 22, Duck Twp. About $33,000. Former bids rejected. F. J. O'Hara, Aitkin, engr.

Minn., Crookston—Until Sept. 15, by H. J. Wolfe, and Polk Co., building 10 mi. Federal Aid Project No. 94-4, Job No. 1910, 24 ft. wide, involving 78,106 cu.yd. excav., 81,862 cu.yd. hauling, 11,888 cu.yd. gravel surfacing, culverts, etc., cost $55,000; 12 mi. Federal Aid Project No. 80, Job No. 1904, 24 ft. wide, 87,993 cu.yd. excav., 33,431 cu.yd. hauling, 14,229 cu.yd. gravel surfacing, culverts, etc., $80,000; 11 mi. Federal Aid Project Job No. 1913, 18 ft. wide, 14,316 sq.yd. paving and 14,320 lin.ft. tile drain, $330,000. E. H. Harding, Crookston, engr.

Minn., Waseca—Until Sept. 16, by J. Madigan, city clk., for 13,800 sq.yd. concrete paving. About $100,000. J. W. Hruska, Waseca, engr.

Streets and Roads (Continued)

Neb., Beaver City—Until Sept. 23, by M. Disbrow, clk. Furnas Co., grading, paving and building culverts on 4.6 mi. Oxford-Bartley Rd., 24 ft. wide in Furnas and Red Willow Counties, involving 500 sq.yd. concrete, 270 lin.ft. 18 and 24 in. concrete pipe, 110 cu.yd. concrete and 36,722 cu.yd. excav. About $20,000. G. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., Elwood—Until Sept. 24, by J. M. Miles, clk. Gosper Co., grading and building culverts on 7 mi. Elwood-Smithfield Rd., 24 ft. wide, involving 944 lin.ft. 18-60 in. culverts, 75 cu.yd. concrete, 62,594 cu.yd. excav., etc. About $37,000. G. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., Kimball—Until Sept. 25, by D. T. Heyman, clk. Kimball Co., grading, paving and building culverts on 26.7 mi. Kimball-Harrisburg Rd., 24 ft. wide, involving 510 sq.yd. concrete, 143,645 cu.yd. earth excav., 1654 ft. 18-36 in. concrete pipe and 270 cu.yd. concrete, etc. About $85,000. G. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., Lexington—Until Sept. 24, by N. France, clk. Dawson Co., grading and building culverts on 27.5 mi. Overton-Cozad Rd., 24 ft. wide, involving 168,219 cu.yd. earth excav., 2269 lin.ft. 18-36 in. concrete pipes, 243 cu.yd. concrete, etc. About $85,000. E. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., Lincoln—Until Sept. 15, by T. H. Berg, city clk., paving 2600 ft. 33rd St., 30 ft. wide, involving 8300 sq.yd. asphaltic concrete on 5 in. concrete base, 300 sq.yd. concrete, 300 lin.ft. concrete curbing, 5000 lin.ft. concrete gutter and curb and 1027 cu.yd. earth excav. About $27,500. G. W. Bates, city engr.

Neb., Loup City—Until Sept. 26, by T. B. Polski, clk. Sherman Co., grading, paving and building culverts on 12 mi. Rockville-Loup City Rd., 24 ft. wide, involving 3040 sq.yd. concrete, 85,024 cu.yd. excav., 304 lin.ft 18 and 24 in. concrete pipe, and 130 cu.yd. concrete. About $50,000. G. E. Johnson, c/o State Highway Dept., Lincoln, engr.

Neb., Peru—Until Sept. 23, by R. W. Kelly, city clk., grading and paving 4700 ft. 5th St., 24 ft. wide. About $54,000. State will appropriate toward cost. No bids received Aug. 27. G. E. Johnson, c/o State Highway Dept., Lincoln, engr. Noted Aug. 7.

N. D., Grafton—Until Sept. 16, by Auditor Walsh Co. improving Dist. No. 1, involving 6850 sq.yd. street paving and guttering, 3743 lin.ft. concrete curbing, 1333 sq.yd. concrete alley paving, 3 combination manholes, 10 storm water inlets, with 80 in. vitr. pipe catch basins. About $100,000. C. L. Pillsburg, 805 Metropolitan Life Bldg., Minneapolis, Minn., engr.

Mo., Independence—Until Sept. 30, by Jackson Co., grading and surfacing with bituminous macadam 3.1 mi. Lone Jack East Rd., from Lone Jack to Jackson-Johnson Co. line, 16 ft. wide, including earth shoulders, ditches, culverts, etc. O. C. Sheley, co. highway engr.; advertised in this issue.

Mo., Lancaster—Until Oct. 13, by town paving and curbing Main St., involving 14,000 sq.yd. vitr. brick, 7500 lin.ft. concrete curbing and 3500 cu.yd. earth excav. Grist & Wiegner, Lancaster, engrs.

Mo., St. Louis—Until Sept. 23, by Bd. Pub. Serv., paving 2000 ft. Compton Ave. from Park to Chouteau Aves., 30 ft. wide, vitr. brick, cost $32,050; 1500 ft. Whittier St. from Labadie to Ashland Aves., 50 ft. wide, vitr. brick, asphalt or bituminous concrete, $16,400; 3000 ft. Morganford Rd. from Chippewa St. to Fyler Ave., 30 ft. wide, vitr. brick and asphalt, $65,050; surfacing 2500 ft. Taylor Ave. from Bway. to West Florissant Ave., 50 ft. wide, asphalt, concrete or bituminous concrete, $47,700; 6500 ft. Page Blvd., from Vandeventer to Taylor Aves., 60 ft., asphalt, $65,000; also rebuilding and resurfacing 3000 ft. Page Blvd., from Kings Highway to Union Blvd., 60 ft. wide, asphalt, $41,400; rebuilding 3000 ft. alleys, 30 ft. wide, vitr. brick, $15,500; 2400 ft. Page Blvd. from Taylor to Walton Aves., 60 ft. wide, asphalt or bituhinous concrete, $33,100 and 2000 ft. Page Blvd., from Walton Ave. to Kings Highway, 60 ft. wide, asphalt, $28,850. C. E. Smith, city engr.

Mo., St. Louis—Until Sept. 16, by Bd. Pub. Serv., paving and curbing 800 ft. Sacramento Ave., from Shreve to Marcus Aves., 50 ft. wide, involving bitulithic pavement and 1600 lin.ft. concrete curbing, cost $10,000; building and paving 4000 ft. alleys from Nebraska to Pennsylvania, Eads and Henrietta Aves., and Arsenal, Odell, Macklind and Sublette Aves., 30 ft. wide, vitr. brick, $15,040. C. E. Smith, city engr.

Tex., Falfurrias—Until Sept. 20, by S. A. Brooks, judge Brooks Co., excavating, grading, sub-grading, caliche surfacing, excavating and building concrete culverts on 10.75 mi. State Highway No. 12 from Encinal south to county line, 24 ft. wide. About $31,701. H. S. Bedell, Falfurrias, engr. Noted Sept. 4.

Tex., Rockwall—Until Sept. 17, by F. B. Vance, clk. Rockwall Co., paving, grading and draining 13.36 mi. roads involving 137,865 sq.yd. monolithic brick or concrete, 74,000 cu.yd. earth excav., 1396 ft. concrete pipe and 1274 ft. viaduct across east fork of Trinity River, etc. J. Montgomery, Rockwall, engr.

Tex., San Antonio—Until Sept 18, by R. Davis, judge Bexar Co., resurfacing 7459 ft. Encine, Mayflower, Kennedy, Cambridge, Dual, Estes, Patterson and Argyle Aves., 14 ft. wide, involving 10,000 lin.ft. concrete curbing and 11,603 sq.yd. bituminous topping; 28,423 ft. Bulverde Rd., North Loop and Mary D Aves., 16 ft. wide, 50,530 sq.yd. bituminous topping. C. E. Hoff, co. engr.

Utah, Richmond—Until Sept. 15, by Town Council, building 8000 sq.ft. sidewalks, 5 in thick. T. H. Humpheries, Logan, city engr.

Que., St. Bruno—Until Sept. 15, by F. Huet, secy.-treas., constructing gravel road to be known as Chemin des Vingt Rd., 12,363 ft. long.

Ont., Brampton—Until Sept. 18, by city, for 11,000 sq.yd. bitulithic or asphaltic concrete pavement, 24-32 ft. wide. About $60,000. W. Treadgold, Brampton, engr.

Ont., Hawkesbury—Until Sept. 18, by Town Council, paving various streets, 28-34 ft. wide, involving 22,000 sq.yd. asphaltic concrete on concrete base and 13,000 lin.ft. concrete curbing and guttering. About $85,000. V. E. A. Belanger, L'Original, engr. Noted June 26.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—City let contract paving West Roxbury Parkway, 24 ft. wide, Roxbury, involving 18,000 sq.yd. waterbound macadam, 510 lin.ft. concrete curbing, 300 sq.yd. sidewalk, 19 000 cu.yd. earth excav., 1820 ft. 6-12 in. vitr. pipe, to Rowe Constr. Co., 45 Milk St., $40,201; Charles River Reservation, 24 ft. wide, Newton, 7000 sq. yd. waterbound macadam, 2000 sq.yd. macadam sidewalk, 23,000 cu.yd. earth excav., 680 ft. 10-12 in vitr. pipe, to A. G. Tomasello, 69 Gibson St., Roxbury, $40,904.

★**Mass., Boston**—City let contract paving Lucerne St., 40 ft. wide, to Bermudez Co., 246 1st St., $11 357. Work involves 2420 sq.yd. asphalt on 6 in. concrete base and 1115 cu.yd. earth excav.

★**Mass., Chicopee**—City let contract paving Front St., vitr. brick, also Montgomery and East Main Sts., asphalt and concrete, to Adams & Ruxton Constr. Co., 33 Lyman St., Springfield, $90,000; East St., National asphalt, to Franklin Contg. Co., Warwick Ave., New Haven, Conn., $15,500. Noted June 19 and 26.

★**Connecticut** — State Highway Comn., Hartford, let contract improving Short Beach Rd., East Haven Twp., to C. W. Blakeslee & Sons, 58 Waverly St., New Haven, $26,792; Branchfield Rd., Ridgefield Twp., to J. P. McGuire, 5 Fairview St., New Britain, $78,640, both concrete; Silver Lane Rd., East Hartford Twp., trap macadam, to T. Kearney, 84 Alcove St., Meriden, $15,142; 4378 ft. Coventry Rd., Bolton Twp., to J. H. Grozier Co., 721 Main St., Hartford, $24,414; state highway, Fairfield Twp., to F. P. Hastings, 1200 Wood Ave., Bridgeport, $20,000, both bituminous macadam. Noted Aug. 28.

★**Conn., Milford**—City let contract building 5000 ft. asphalt roadway on Broad St., to C. W. Blakeslee & Sons, 58 Waverly St., New Haven. About $32,000.

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres., let contract to Sicilian Asphalt Paving Co., 41 Park Row, New York City, regulating and repaving Atlantic Ave. from Washington to Classon Aves., $40,547. Atlantic Ave. from Classon to Bedford Aves., $41,582, Bedford Ave., $10 220, Sprague Alley, $832; to Scott & Kurth, 411 Sackett St., Classon Ave., $131,145; to Grimm Constr. Co., 460 Herold Ave., East 18th St., $3633, Vermont Ave., $4611; Uvalde Asphalt Paving Co., 1 Bway., New York City, East 18th St. from Ave. O to Ave. P., $12,650; to Consolidated Asphalt Paving Co., 52 9th St., 83rd St., $11,614, 83rd St. from 19th to 20th Aves., $11,952. Noted Aug. 14.

N. Y., Brooklyn—E. Riegelmann, boro. pres., received bids Sept. 3, regulating and grading, (a) Cleveland St., from New Lots Rd. to Hegeman Ave., (b) curbing and laying sidewalks on Cleveland St. from New Lots Rd. to Hegeman Ave., (c) West 11th St. from Ave. S to Ave. T, (d) regulating, curbing and paving with permanent asphalt on 6 in. concrete foundation roadway on Colonial Rd., from 76th to 77th Sts., (e) regulating and paving with permanent asphalt on 6 in. concrete foundation, Colonial Rd. from 85th to 86th Sts., (f) 66th St. from 19th to 20th Aves., (g) regulating, grading, curbing, laying sidewalks and paving with permanent asphalt and Grade 1 granite on 6 in. concrete foundation, portion of roadway west of railroad tracks of New Utrecht Ave. from Ovington to Bay Ridge Aves., (h) regulating, grading, curbing and laying sidewalks on West 11th St. from Ave. R to Ave S, (i) 20th Ave. from 82nd to 83rd Sts., (j) regulating and paving with permanent asphalt on 6 in. concrete foundation, roadway of 66th St. from 19th to 20th Aves., from

C. A. Myers, foot of Stagg St., (a) $5960, (b) $3377;

J. Jennings, (a) $7612, (b) $3685, (c) $6395, (h) $4488;

F. Catapano, 256 Essex St., (a) $7785; Grimm Constr. Co., (b) $3447, (c) $7176;

Consolidated Asphalt Paving Co., 52 9th St., (d) $6089, (e) $7186, (g) $4603, (i) $6567, (j) $12,205;

Sicilian Asphalt Paving Co., 41 Park Row, New York City, (d) $6271, (e) $7336, (g) $5054, (i) $6604, (j) $12,450;

Uvalde Asphalt Paving Co., 1 Bway., New York City, (d) $6317, (e) $7336, (g) $4758, (i) $6664, (j) $12,584;

L. Mangieri, 190 31st St., (c) $5242, (f) $1480, (h) $4483;

C. Gallagher, (f) $1403, (h) $4047. Noted Aug. 28.

★**N. Y., New York**—F. L. Dowling, pres. Manhattan Boro., let contract regulating and repaving with granite blocks on concrete base intersection of Bway. to M. I. Sachs., $3101; with sheet asphalt on concrete base, roadway of Bway., from Morris to Vesey Sts., to Sicilian Asphalt Paving Co., 41 Park Row, $54,413; 28th St., to Cleveland Trinidad Paving Co., Flushing Ave., Brooklyn, $27,071; 110th St. to Uvalde Asphalt Paving Co., 1 Bway., $35,404; Lenox Ave., to J. L. Brusstar, Harlem River and 150th St., $47,799; Lexington Ave., sheet asphalt and wood block, to Asphalt Constr. Co., 2197 Madison Ave., $230,618. Noted Sept. 4.

★**N. Y., S. I., St. George**—C. D. Van Name, pres. Richmond Boro., let contract to J. E. Donovan, Port Richmond, repaving Richmond Terrace from Western Ave. to Elizabethport Ferry, $6300, Wadsworth Ave., $3750; to C. Vanderbilt, 24 Elizabeth St., West New Brighton, Richmond Terrace from Treadwell Ave. to Harbor Rd., $47,493; to Johnson Sons, Port Richmond, Castleton Ave., $3800, Bay St., $2825, Lindenwood Rd., $1170; to Leedecke & Sachs, Brook St., $11,680. Noted Sept. 4.

N. J., Carlstadt—Town received lowest bid building Hoboken Rd. from Van Roden Constr. Co., $34,750.

N. J., Jersey City—City received lowest bid for repairs to asphalt streets, here, from Crescent Constr. Co., 150 Nassau St., New York City, 125% of engineer's estimate. Cost to exceed $10,000. Noted Aug. 21.

Pennsylvania — State Highway Dept., Harrisburg, received lowest bids building roads in counties as follows:

Adams Co., 23,246 ft. rein.-con. and Hillside vitr. brick, Butler Twp., from G. Merdinger, Wilbut Trust Bldg., South Bethlehem, $179,156; 7857 ft. bituminous surface course on concrete foundation and Hillside vitr. brick or rein.-con., Gettysburg Boro., from W. P. McDonald Constr. Co., Phila., $109,769, P. F. Connelly, Koppel, $114,337, Warren Bros. Co., 142 Berkeley St., Boston, Mass., $114,339.

Butler Co., 16,579 ft. rein.-con., Slippery Rock Twp., from N. J. Boyer, Butler, $134,700, T. H. Gill Co., 2nd Mutual Bldg., Binghamton, N. Y., $139,442, D. W. Challis, 420 Centennial St., Sewickley, $144,817.

Centre Co., 12,355 ft. bituminous surfaced course on concrete foundation or rein.-con., from Warren Bros. Co., 142 Berkeley St., Boston, Mass., $121,796.

Chester Co., 10,509 ft. bituminous surface course (penetration method) on telford foundation, East and West Marlboro Twp., from E. M. Humphrey, Hackensack, N. J., $67,363, B. Foster Co., 20th and Venango Sts., Phila., $71,175, Dunleavy Bros., Coatesville, $75,381; 21,619 ft. bituminous surface course (penetration method) on telford foundation, Franklin and New London Twps., from Clifford Eng. Co., Farmingdale, N. J., $203,832.

Streets and Roads (Continued)

Clarion Co., 10,507 ft. rein.-con., Clarion Twp., from L. H. Hileman Constr. Co., 1st Natl. Bldg., New Kensington, $164,888.

Crawford Co., 18,619 ft. rein.-con. and Hillside vitr. brick or two-course rein-con. and Hillside vitr. brick, Vernon Twp., from J. H. De Carpentier & Sons, Youngstown, O., $212,198, P. F. Connolly, Koppel, $222,-010, M. Dolan, Jamestown, N. Y., $240,060.

Erie Co., 21,300 ft. rein.-con., Girard Twp. and Platea Boro., from H. Shenk Co., 12th and Sassafras Sts., Erie, $183,780; 10,600 ft. rein.-con., Mill Creek Twp., from H. Shenk Co., 12th and Sassafras Sts., Erie, $93,561; 7900 ft. bituminous surface course and Hillside vitr. brick on concrete foundation or rein.-con. and Hillside vitr. brick, from P. F. Connolly, Koppel, $72,611, E. M. Love & Son, Corry, $73,761.

Indiana Co., 3812 ft. rein.-con., Blairsville Boro., from M. Bennett & Sons, Indiana, $54,139, Waring & Lewis, Hillside, $54,795, McCrady Bros., Braddock, $64,839.

McKean Co., 31,268 ft. rein.-con. or vitr. brick, Bradford Twp. and Lewis Run Boro., from Adams Evans Co., New York City, $277,329.

Mifflin Co., 24,049 ft. bituminous surface course on concrete foundation and Hillside vitr. brick or rein.-con., Armagh Twp., from Bennett & Randall, Lebanon, $252,711, A. McMullen Co., Finance Bldg., Phila., $262,-468, Winston & Co., 240 Fair St., Kingston, N. Y., $266,442.

Northampton and Carbon Counties, 16,-129 ft. rein.-con., Lehigh and Lower Towamensing Twps., Bowmanstown Boro, from J. F. Shanley, Jr., Commercial Trust Bldg., Phila., $197,590, G. Merdinger, Wilbut Trust Bldg., South Bethlehem, $216,014.

Potter Co., 7915 ft. bituminous surface course on concrete foundation or rein.-con., Roulette Twp., from Coles-Englehart Co., Ebensburg, $84,356; 5020 ft. bituminous surface course on concrete foundation or rein.-con., Roulette Twp., from Horn & Devling, Main St., Galeton, $47,522, Tyne & Willey, Binghamton, N. Y., $51,904.

Snyder Co., 32,320 ft. bituminous surface course on concrete foundation or rein.-con., Union and Chapman Twps., from A. McMullen, Finance Bldg., Phila., $316,292, R. C. Fiss, Shamokin Dam, $346,566, Winston & Co., 240 Fair St., Kingston, N. Y., $366,311.

Susquehanna Co., 6191 ft. rein.-con. and vitr. brick, Forest City Boro, from Holt Lumber Co., Belmont St., Carbondale, $59,-462, J. Booth, 17 Salem Ave., Carbondale, $71,264.

Tioga Co., 24,113 ft. bituminous surface course on concrete foundation or rein.-con., Lawrence Twp. and Lawrenceville Boro., from Adams Evans Co., New York City, $191,287, J. C. Bradley & Co., Wellsboro, $192,685, T. H. Gill Co., 2nd Mutual Bldg., Binghamton, N. Y., $192,697.

Warren Co., 7936 ft. rein.-con., Sheffield Twp., from Ridelsperger & Savage, Warren, $60,690, F. C. Chiodo, Sheffield, $66,801, Anundson Bros., Sheffield, $74,006. Noted Aug. 14.

★**Pa., Beaver Falls**—City Council let contract paving 14th St. between 1st and 7th Aves., asphalt on concrete base, stone curbing, to Columbus Asphalt & Paving Co., Citizens Bank Bldg., Columbus, O., $34,875.

★**W. Va., Berkeley Springs**—Morgan Co. let contract to Sims & Terrington, 326 Commercial Trust Bldg., Phila., building 2 mi. Berkeley Springs-Hancock Rd., involving 9000 cu.yd. excav. at $1.47 per sq.yd. and 14,000 sq.yd. 6-8 in. cement concrete pavement, $2.47 per sq.yd. Total cost, $47,810. Noted Aug. 21.

★**W. Va., Huntington**—City let contract grading, curbing, guttering and paving portions 3rd and 4th Sts., also 12th Ave., between 3rd and 4th Sts., W., Carlisle brick block on gravel base, to Duncan & Griffeth, Huntington, $17,960.

★**W. Va., Princeton**—Mercer Co. let contract grading and draining 3.5 mi. road from Simmons Twp. to McDowell County line, 18 ft. wide, involving 27,000 cu.yd. excav., etc., to T. Towles & Co., Princeton, $25,663. Noted Aug. 21.

★**N. C., Asheville**—City let contract for 10,000 yd. asphaltic concrete pavement on 4-in. concrete base, to Asheville Paving Co., Asheville, at $2.68; 10,000 yd. concrete paving to E. T. Belote, Asheville, $2.43.

★**N. C., Oxford**—Comrs. Granville Co. let contract surfacing, widening, improving and relocating 5.5 mi. various roads, 20 ft. wide, involving 6200 cu.yd. excav., 2500 cu.yd. top soil, clearing, grubbing and laying culverts, etc., to T. F. Blair, Oxford. About $10,000.

★**Ala., Birmingham**—City let contract to Dunn Constr. Co., Chamber of Commerce Bldg., for paving, curbing and guttering 10th Ave. from Eleventh Pl. to 21st St., S., 30 and 36 ft. wide, involving 15,580 sq. yd. asphalt on 5 in. concrete base, and 1188 sq.yd. brick gutter, $47,811; to H. N. Bowdry, Empire Bldg., paving, curbing and guttering Pike Rd., involving 3300 sq.yd. asphalt on 5 in. concrete base and 350 ft. combined curb and gutter, $10,306.

Louisiana—State Highway Dept., Maison Blanche Bldg., New Orleans, received only bid paving 11.79 mi. Vinton-Orange Highway, Calcasieu Parish, from W. S. Bonner, New Orleans, $243,472. Noted Aug. 21.

★**Ohio**—State Highway Comn., Columbus, let contract grading, building bridges and culverts and paving 16.7 mi. Akron-Cleveland Rd., rein.-con., Summit Co., to Bates & Rogers Constr. Co., 241 Engineers' Bldg., Cleveland, $826,754.

O., Toledo—D. H. Goodwillie, serv. dir., received bids extending Summit St. by building 750 ft. timber revetment, 150 ft. rein.-con. viaduct, 400 ft. retaining wall and 2 bascule bridges, involving 90,000 cu.yd. earth excav., 5000 cu.yd. mass and rein.-con. and 70 tons reinforcing steel, from M. Rabbit & Sons, 115 Nasby Bldg., $496,530; J. C. Carland, 340 Spitzer Bldg., $501,985; Great Lakes Dredge & Dock Co., Williamson Bldg., Cleveland, $857,000. Noted Aug. 14.

★**Michigan**—State Highway Dept., Lansing, let contracts shaping, surfaceing and draining 1 mi. State Trunk Line Rd. No. 10-1, Iosco Co., involving 1169 cu.yd. concrete and 4624 sq.yd. gravel, to Banhagel Constr. Co., Ionia, cost plus percentage basis; 3.11 mi. State Trunk Line Rd. No. 26-2, Houghton Co., involving 27,368 sq.yd. 3 in. bituminous macadam to Bd. Houghton Co. Rd. Comrs., Dee Bldg., Houghton, $21,610; 3.094 mi. State Trunk Line Rd. No. 28-5, Ontonagon Co., involving 25,411 sq.yd. waterbound macadam, to J. C. Blomgren, Norway, $33,960.

★**Mich., Detroit**—Dept. Pub. Wks. let contracts to R. J. Powelson & Co., 1577 Iriquois Ave., paving Alley No. 1058, cost $4929, No. 1062, $1440, No. 1059, $1012; Lennane & McIlvenna, Book Bldg., No. 1060, $2634, No. 1063, $3582, No. 1066, $2504; Talbot Co., 400 Penobscot Bldg., No. 1061, $5421; Otis Cement Constr. Co., 806 Hammond Bldg., No. 1064, $3118; E. Meredith Co., 145 Harper Ave., No. 1065, $2717, No. 1067, $5190; all one course concrete. Noted Aug. 21.

Mich., Detroit—Dept. Pub. Wks. received bids from (1) W. B. Brady Constr. Co., 1972 Grand River Ave., (2) Detroit Asphalt Paving Co., 20 McGraw Bldg., (3) Cleveland Trinidad Paving Co., 2940 Woodward Ave., paving Epworth Blvd. from Tireman to Dailey Aves., (1) $58,759, (2) $58,913, (3) $60,501; Epworth Blvd. from Warren to Tireman Aves., (1) $52,395, (2) $50,016, (3) 52,866. Noted Aug. 21.

Mich., Detroit—Dept. Pub. Wks. received bids paving (1) Apple St. from St. John St. to Michigan Ave., (2) Central Ave. from McGraw to Radcliffe Aves., (3) Eastlawn Ave. from Kercheval to point 900 ft. north of Charlevoix Ave., (4) Fulton Ave. from Springfield Ave. to point 150 ft. west Wilkie Ave., (5) Helen Ave. from Strong Ave. to point 232 ft. south Miller Ave., (6) Helen Ave. from Harper to Strong Aves., (7) Homer Ave. from Springwell to Lawndale Aves., (8) Hazlett Ave. from Milford to Tireman Aves., (9) Marquette Ave. from 16th St. to Lawton Ave., (10) Parkdale Terrace from McGraw to Warren Aves., (11) Radcliffe Ave. from Central to Lonyo Aves., (12) Springwells Ave. from Malta to Michigan Aves., from Detroit Asphalt Paving Co., 20 McGraw Bldg., (1) $8583, (2) $28,-195, (3) $36,927, (4) $18,617, (5) $23,646, (6) $8245, (7) $21,569, (8) $18,631, (9) $24,923, (10) $7712, (11) $23,463, (12) $20,-362; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (1) $8937, (2) $29,300, (3) $35275, (4) $19,135, (5) $24,483, (6) $8473, (7) $22,337, (8) $19,157, (9) $25,-556, (10) $7975, (11) $24,346, (12) $20,946; W. B. Brady Constr. Co., 1972 Grand River Ave., (1) $8835, (2) $28,973, (3) $35,512, (4) $19,140, (5) $24,632, (6) $8522, (7) $22,308, (8) $19,025, (9) $25,116, (10) $7814, (11) $24,122, (12) $12,067; all asphaltic concrete on 6 in. base with Berea or Medina curbstone. Noted Sept. 4.

★**Ill., Decatur**—City let contract paving North Taylor Ave., brick, and Prairie Ave. from Water St. west to Pine St., creosoted wood blocks, to File & Alexander, 315 Milliken Bldg. Cost $8430 and $66,980 respectively.

★**Wis., Port Washington**—City let contract grading, curbing, guttering and paving 1.8 mi. Main St., 20 ft. wide, to W. Larg, Port Washington, $11,790. Work involves 10,500 sq.yd. 1 course rein.-con. 2500 lin.ft. sidewalk, etc.

★**Wis., Wausau**—Marathon Co. let contract paving Schofield and Rothschild Rds., to Garvey-Weinberg Constr. Co., 812 College St., Appleton. About $102,000.

Minn., Minneapolis—Comrs. Hennepin Co. received bids grading and graveling 1½ mi. approaches to Cedar Ave. Bridge, 24 ft. wide, from Nelson & Frederick, Temple Court, $12,373; Foley Bros., Gillilan Bldg., St. Paul, $14,792; S. J. Groves & Sons, Kasota Bldg., $48,671. Noted Aug. 14.

★**Kan., Atchison**—City let contract paving and curbing 10 blocks North 4th St. from Main to Degan Sts., 25 ft. wide, brick, to A. Schmeling, 603 North 11th St., $1.28 per sq.yd.

★**Neb., Alliance**—City let contract paving and installing storm sewers in Box Butte and Laramie Aves., 1st, 2nd, 3rd and 4th Sts., 40-72 ft. wide, to Sprague & Nicely, Beatrice, $190,163. Noted Aug. 7.

★**Neb., Alliance**—City let contract paving with brick and building storm sewers in 15 blocks of streets in Dist. No. 2, 25 ft. wide, to Sprague & Nisley, Beatrice. About $85,000.

★**Neb., Beaver City**—Furnace Co. let contract paving and building culverts on 19.4 mi. Beaver City, Arapahoe Rd., 24 ft. wide, to Western Bridge & Constr. Co., 648 Bee Bldg., Omaha, $22,278. Grading will be done by county forces, cost $57,160.

★**Neb., Fairmont**—City let contract paving 3500 ft. Lincoln St. and Fairmont Ave., 26-52 ft. wide, to Abel Constr. Co., 318 Terminal Bldg., Lincoln, $74,191. Noted Aug. 7.

★**Neb., Fairmont**—City let contract paving main streets, Dist. No. 1, asphaltic concrete, to Abel Constr. Co., 318-19 Terminal Bldg., Lincoln. About $65,000.

★**Neb., Hastings**—Adams Co. let contract grading 27.3 mi. Red Cloud-Ayr. Rd. and 11.3 mi. Hastings-Ayr Rd., to Cook-O'Brien Constr. Co., Kansas City, Mo., $20,052 and $39,376 respectively; culverts for same, to D. Quinton, Kearney, $8513 and $15,275 respectively. Noted July 21.

★**Neb., McCook**—Red Willow Co. let contract grading 17.1 mi. McCook-Bartley Rd., 24 ft. wide, to R. Condon, Omaha, $62,181 culverts for same, to Central Bridge & Constr. Co., Wahoo, $34,492. Noted July 31.

★**Neb., Red Cloud**—City let contract to Watts Constr. Co., Grand Island, $144,768, paving Cedar, Webster, Seward and Walnut Sts., 3rd, 4th, 5th, 6th, 7th and 9th Aves., 26-54 ft. wide, involving 40,000 sq. yd. asphaltic concrete on 5 in. concrete base, 27,000 lin.ft. concrete curbing and guttering and 150 cu.yd. excav. Noted Aug. 7.

★**Neb., Red Cloud**—City let contract paving 4 blocks Dists. Nos. 2 and 3, involving 40,338 sq.yd. asphaltic concrete, 27,427 sq. yd. concrete, concrete curbing and guttering to Watts Constr. Co., Concordia, Kan., $2.65 per yd. paving, and $1 per lin.ft. for curbing and guttering.

★**Neb., Stockville**—Frontier Co. let contract grading 12.1 mi. Curtis-Stockville Rd., 24 ft. wide, to Adamson & Walsh, Fullerton, $32,531; culverts, to Nebraska & Iowa Steel Tank Co., 1300 Willis Ave., Omaha, $2473. Noted Aug. 14.

★**Montana**—State Highway Comn., Helena, let contracts to State Highway Constr. Co., Helena, gravel surfacing 4.25 mi. Yellowstone Trail, Park Co., $23,743; 4 mi. Red Trail, from Dawson Co. line east, Wibaux Co., $21,608; 4.5 mi. Red Trail, Wibaux Twp., Wibaux Co., $22,020. Noted June 12.

★**Mont., Cut Bank**—City let contract building roads involving 2400 cu.yd. excav., 7271 lin.ft. concrete curb and 54,200 sq.ft. cement sidewalk, to Two Miracle Constr. Co., 437 Ford Bldg., Great Falls, $32,488.

★**Mo., Rockport**—City let contract paving Dists. 1, 2, 3 and 4, involving 21,800 sq.yd. vertical fibre brick, 40,232 sq.yd. 6 in. concrete, 2030 ft. 10-30 in. drainage pipe, 7 manholes and 12 catch basins, to Lynch & McDonald, Moberly, $255,632.

★**Mo., St. Louis**—Bd. Pub. Serv. let contract paving and rebuilding Neosho St. from Macklind St. east to city limits, to Granite Bituminous Paving Co., Ry. Exch. Bldg., $21,940. Noted June 26.

★**Texas**—State Highway Comn., Austin, let contract to Womack Constr. Co., Houston, gravel surfacing and draining on 2.998 mi. Highway No. 7, Federal Aid Project No. 90, 16 and 24 ft. wide, $14,181; 5.405 mi. Highway No. 7, State Aid Project No. 88, 16 and 24 ft. wide, $23,763; 10.84 mi. Highway No. 30, 16 and 24 ft. wide, $30,719; 20.661 mi. Highway No. 30, from Runnels Co. line northward, 16 and 24 ft. wide, $60,-117. Noted Aug. 21.

★**Tex., Dallas**—City let contracts to Texas Bitulithic Co., Praetorian Bldg., paving curbing and guttering Carroll Ave. from Parry to East Side Aves., 30 ft. wide, involving 7159 sq.yd. asphalt on 5 in. concrete base, 4073 lin.ft. curb and gutter.

Streets and Roads (Continued)

2332 cu.yd. earth excav., $26,303; Crockett St. from Bryan to San Jacinto Aves., 25 ft. wide, 1815 sq.yd. asphalt, on 5 in. concrete base, 572 lin.ft. concrete curb and 753 cu. yd. earth excav., $6788, Jackson St., from Houston St. to Bway., 50 ft. wide, 752 sq. yd. asphalt, on 5 in. concrete base, 140 lin. ft. concrete curb and gutter and 217 cu.yd. earth excav., $2596; to Uvalde Paving Co., Interurban Bldg., Ann St., from Santa Fe to Stonewall Aves., 26 ft. wide, 6687 sq.yd. asphalt, 4480 lin.ft. curb and gutter, and 1100 cu.yd. earth excav., $24,578. Noted March 6.

★**Tex., Montague**—Montague Co. let contract gravel surfacing and building rein.-con. bridges and culverts on 9.84 mi. Meridian Highway, from Bowie to Wise Co. lines, 16 ft. wide, to Harris & Powell, Tyler, $50,990. Noted Aug. 7.

Tex., Seguin—Comrs. Guadalupe Co. received bids improving 14.58 mi. Highway No. 3 from here to Gonzales Co. line, 24 ft. wide, (a) grading, scarifying, hauling, placing, gravel surfacing, (b) building rein.-con. drainage structures (exclusive of 3 bridges already contracted for), from W. T. Montgomery, Alamo Bank Bldg., San Antonio, (a) $39,475 (road work only, excluding concrete), J. F. Hamer, Stop 6, Int., Ft. Worth, (a) $52,734, (bid incomplete); McCall-Moore Co., 308-309 Amicable Bldg., Waco, (b) $16,053, J. W. Goodrum, Seguin, (b) $16,240, W. E. Dozier, Dam Blvd., Austin, (b) $18,500. Noted Sept. 4.

Utah—State Highway Comn., Salt Lake City, received bids paving 2.21 mi. various streets, 18-20 ft. wide, 7 in. concrete, in Farmington Twp., from Lynch Constr. Co. McIntyre Bldg., $76,231; Christianson, Jacobs & Gardiner, Salt Lake City, $76,834.

★**Utah**—State Highway Comn., Salt Lake City let contract to F. E. Phelps, Salt Lake City, paving 3.66 mi. state road from Ogden to Hot Springs, 18 ft. wide, 7 in. concrete, $100,413; 2.26 mi. road from Roy to south limits of Ogden, 18 ft. wide, $60,325. Noted July 10.

★**Utah, Brigham**—City let contract furnishing materials and paving various streets, to Gibbons & Reed, Kearns Bldg., Salt Lake City, $151,065.

★**Utah, Salt Lake City**—City let contract paving 7843 ft. 7th St. E. between 4th and 13th Sts. S., 66 ft. wide, 2 in. asphalt topping on 4 in. concrete base, to J. W. Mellen, Auditorium Bldg., $140,578.

Utah, Salt Lake City—Comrs. Salt Lake Co. received bids building and graveling 3.12 mi. road through Lambs Canyon on Alpine Scenic Highway, 16-24 ft. wide, from D. B. Brinton, Salt Lake City, $16,713; Pickering Bros. Salt Lake City, $26,879.

★**Utah, Spanish Fork**—City let contract paving Main and various other streets, to Wattis-Samuels Co., Newhouse Bldg., Salt Lake City, $153,014.

★**Arizona**—State Highway Comn., Phoenix, and Federal Government let contract building Tempe-Mesa Highway, Federal Aid Project No. 8, to McElrath & Shumway, $204,009. Noted May 8.

★**Wash., Winlock**—City Council let contract hardsurfacing 1.5 mi. roads, concrete, to Ford & White, Seattle, $24,712.

★**Ore., Bend**—City Council let contract clearing, grubbing, grading, cindering, building sidewalk and curbs and laying sewer pipes in Dists. Nos. 10, 11, 12, 13, 14, to J. Rock, Bend, $30,957. Work involves 7690 lin.ft. cement curbing, 24,430 lin.ft. cement sidewalk, 9504 cu.yd. earth and 1590 cu.yd. rock excav., 360 ft. 12 in. vitr. tile sewer pipe.

California—State Highway Comn., Forum Bldg., Sacramento, received bids building Sect. A, Route 16, Div. 1, Federal Aid Project No. 20, Lake Co., from Erickson & Petterson, Monadnock Bldg., San Francisco, $116,101, W. J. Schmidt, Berkeley, $123,721, A. J. Fairbanks, Willits, $123,905; Sect. A, Route 2, Div. 7, Federal Aid Project No. 23, Los Angeles Co., Bryant & Austin, Inc., 1540 Compton St., Los Angeles, $48,178, G. R. Curtis, 2440 East 26th St., $51,785, Fairchild-Gilmore-Wilton Co., 610 South Main St., Los Angeles, $54,711; Sect. A, Route 2, Div. 5, Federal Aid Project No. 25, Santa Barbara Co., F. C. McIntire, Farmers & Merchants Bank Bldg., Stockton, $38,116, J. L. Connor, 405 West 28th St., Los Angeles, $39,437. Noted Aug. 14.

★**Cal., Hanford**—City let contract improving 1¼ mi. various streets, 50 ft. wide, to Blanchard, Crocker & Howell, 593 Market St., San Francisco, $109,303. Work involves 4 in. bituminous base and 1½ in. bitulithic surface, concrete curbs and gutters. Noted Aug. 7.

★**Cal., Holtville**—City let contract for 497,000 sq.ft. concrete paving and 5000 lin. ft. cement curbing, to G. R. Daley, McNeece Bldg., San Diego. About $175,000.

★**Cal., Los Angeles**—Bd. Supervs. Los Angeles Co. let contract improving 14.19 mi. Sierra Madre Rd., near Lancaster, 18 ft. wide, to White & Gaskill, 356 Hermosa Ave., Long Beach, $218,000. Work involves 17,223 cu.yd. excav., 74,923 lin.ft. shaping roadbed, 21,460 tons oil macadam, 23,500 tons oil macadam (hauling and placing only), 1850 tons disintegrated granite (hauling and placing only) and 3500 bbls. oil, etc. Noted Aug. 28.

★**Cal., Santa Barbara**—City let contract paving Figueroa Sts. et al, to Fairchild, Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $22,485. Work involves 71,265 sq.ft. 4 in. concrete paving with 1½ in. Warrenite surface, $0.224 per sq.ft., 2192 lin.ft. combined cement curb and gutter, $1.35, 152 lin.ft. cement curb, $0.50, 4031 sq.ft. cement gutter, $0.24, sewer and 2 manholes, $465. Noted July 31.

★**Ont., Islington**—F. Barber, engr., 40 Jarvis St., Toronto, let contract to E. G. Law, 136 Hillsdale Ave., E., building 2¾ mi. Queen St., from Lake Shore Rd. to Kipling Ave., 20 ft. wide, waterbound macadam, for city. About $22,000. Noted May 29.

★**Ont., Ottawa**—City let contract paving Murray St. from Cumberland St. to King Edward Ave. and St. Patrick's St. from Sussex to McKinzie Aves., asphalt, to Ottawa Constr. Co., Elgin, $6753 and $3468 respectively; Booth St., from Somerset St. to Grand Trunk Ry. tracks, to O'Learys, Ltd., Elgin St., $36,622. Noted Aug. 28.

★**Ont., Owen Sound**—Town Council let contract for 8000 ft. paving, 28-36 ft. wide, to Warren Bituminous Co., McKinnon Bldg., Toronto, $180,000. Work involves 350,000 sq.yd. bitulithic asphalt on 5 in. concrete base and 15,000 lin.ft. concrete curbing. Noted July 10.

★**Ont., Toronto**—W. A. McLean, deputy minister highways, let contracts grading and building following roads with macadam: Sect. 1, 15.93 mi. from easterly limit of London to westerly limit of town of Ingersoll, to Frid Constr. Co., 61 Adelaide, E., cost $82,000; Sect. 2, 15.62 mi. from easterly limit of Brantford to village of Lancaster, to D. O. Johnston, Brantford, $81,000; Sect. 5, 7.72 mi. from westerly limit of Kingston to westerly limit of Kingston Twp., to J. G. Murphy, 28 Dominion St., $43,500; Sect. 6, 10.46 mi. from easterly limit of Brockville to westerly limit of town of Prescott, to Brockville Constr. Co., Brockville, $55,600. Noted Aug. 14.

★**B. C., Victoria**—Dept. Pub. Wks. let contract building 2½ mi. Rd. No. 3, Lulu Island, Richmond Co., 16 ft. wide, 2 in. asphaltic concrete on macadam base, to M. P. Cotton Co., Ltd., False Creek Yards, $20,000 and Harrison & Lamond, Pacific Bldg., $20,000. Noted Aug. 21.

Railways

PROPOSED WORK

Illinois—H. A. Balden, ch. engr., Southern Traction Co., 26th St. and Trendley Ave., East St. Louis, soon receives bids laying track and repairing road bed from eastern terminal of Free Bridge over Mississippi River from St. Louis to mines at Belleville. Cost, including rolling stock cars and tracks to coal mines, $2,400,000.

Mo., Wellsville—See "Excavation and Dredging."

Excavation and Dredging

PROPOSED WORK

Mont., Deer Lodge—Irrigation—Cooper's Lake Irrigation Dist., Powell Co., plans to build system to reclaim 11,610 acres. Cost to exceed $10,000. A. V. Mahon, c/o State Highway Dept., Helena, engr.

Mo., Wellsville—Excavation—W. K. Walker, engr., c/o Laclede Christy Clay Products Co., Ry. Exch. Bldg., St. Louis, soon receives bids for 46,000 cu.yd. earth excav., also building 2½ mi. spur track, here.

BIDS DESIRED

Ia., Wapello—Drainage—Until Sept. 16, by Bd. Supervs. Muscatine and Louisa Counties, furnishing material, labor, tools and appliances and constructing complete as a part drainage system of Muscatine-Louisa D. D. No. 13, (1) steam driven pumping plant, (2) motor driven pumping plant, to operate on electric current, (3) oil engine pumping plant, (4) combination plant with present plant (5) engineer's residence. C. H. Young, ch. engr.

Minn., Hastings—Excavation—State Bd. Control, St. Paul, receiving bids excavating tunnel about 600 lin.ft. long, at State Asylum for Insane, here. About $90,000. C. L. Pillsbury Co., Metropolitan Life Bldg., Minneapolis, engrs. Noted Aug. 28.

Minn. Waseca—Ditch—Until Sept. 29, by Auditor Waseca Co., building Main No. 2 of Ditch No. 15. Work involves 49,125 ft. 6-40 in. tile. About $74,627. G. Cox, Waseca, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., New York**—Dredging—M. Hurlburt, comr. docks, Pier A, Battery Pl., let contract dredging 115,000 cu.yd. at north and south sides Pier 59, south side of Pier 64, north and south sides Pier at West 52nd St., north and south sides West 54th St Pier, south side West 58th St. Pier, North River, 29,000 cu.yd. east side Pier 36, north side Piers 50, 51, 52, East 4th St. and bulkhead foot East 14th St., East River, Manhattan Boro., Contr. 1625, to F. E. Jones, 17 Battery Pl., $67,975. Noted Sept. 4.

★**O., Kenton**—Excavation—Upper Scioto Drainage & Conservancy Dist. reconsidered bids received Aug. 6, and let contract improving channel and building levees along Scioto River through here, to F. C. Morgan, Lemcke Bldg., Indianapolis, Ind. About $400,000. Noted Aug. 14.

Wis., Manitowoc—Dredging—City received bids dredging 50,000-55,000 cu.yd. Manitowoc River from Upper Soo Line Bridge to Lower Soo Line Bridge, from McMullen & Pitz, 915 Commercial St., $.31 per cu.yd., Grieling Bros., 124 North Adams St., Green Bay, $.32, Great Lakes Dredge Co., 216 West Water St., Milwaukee, $.34. Noted Aug. 7.

★**Neb., Bloomfield**—Ditch—City let contract dredging 6800 lin.ft. ditch, involving 70,000 cu.yd. excav., to S. O. Briggs Co., 925 Natl. Bank Bldg., Omaha. About $23,800.

Industrial Works

PROPOSED WORK

Mass., Holyoke—D. H. Barowsky, 78 Appleton St., plans to build 4 story warehouse on South St. About $50,000. Architect not selected.

Mass., Holyoke—Germania Mills, Race St., plans to build new factories. About $500,000. Architect not selected.

Mass., Millbury—J. F. Frazier plans to build 2 story, 64 x 78 ft. brick and rein.-con. garage, concrete foundation, on South Main St. About $25,000. J. P. Kingston & Son, 518 Main St., Worcester, archts.

Mass., Northboro—Framingham Forge Co., Framingham, plans to build forge shop, here. About $30,000. Architect not selected.

Mass., Thorndike—Leary & Walker, engrs., New Bedford, soon receive bids building 6 story, 75 x 163 ft., brick and concrete addition to factory, concrete foundation, for Thorndike Co. About $175,000.

Mass., Worcester—Arvidson Baking Co., 75 Ward St., having plans prepared by McCormick & Co., archts., 41 Park Row, New York City, for 2 story, 93 x 115 ft. bakery, brick and timber, concrete foundation, on Arwick Ave. About $75,000.

Mass., Worcester—C. R. Hoyle, archt. and engr., 390 Main St., soon lets contract building 2 story, 150 x 200 ft. rein.-con., brick and steel garage, concrete foundation, on Mechanic St., for B. L. Handelman, Portland St. About $100,000. Noted July 31.

R. I., Providence—Jenks & Ballou, engrs., 1035 Grosvenor Bldg., soon let contract building 2 story, 40 x 160 ft., brick, concrete, tile and steel warehouse, rein.-con. flooring, concrete foundation, on Canal St., for What-Cheer-Beef Co., 356 Canal St. About $30,000. Noted Aug. 7.

R. I., Providence—P. J. Naugle, Wood St., having plans prepared by W. G. Richards, arch., 17 Exchange St., for 1 story, brick and steel garage and service station, rein.-con. flooring, concrete foundation, on Sprague, Fuller and Westfield Sts. About $25,000.

R. I., Providence—W. R. Walker & Son, archts., 17 Custom House St., soon let contract building 2 story, 154 x 210 ft., brick and rein.-con garage and factory, rein.-con. flooring, concrete foundation, on Summer and Conduit Sts., for Fulford Mfg. Co. About $60,000. Noted May 8.

Conn., Bridgeport—Fletcher-Thompson, Inc., engrs., 1089 Broad St., receive bids about Sept. 20, building 7 story, 100 x 140 ft. brick and rein.-con. cold storage and ice making plant, rein.-con. flooring, concrete

Industrial Works (Continued)

foundation, on Seaview Ave., for People's Ice & Cold Storage Co., 1335 Seaview Ave. About $350,000. Noted May 22.

Conn., Bridgeport—Moloney & Krokstedt, archts., 925 Main St., soon receive bids building 1 story, 50 x 110 ft. brick and concrete garage and showroom, rein.-con. flooring, concrete foundation, on Stratford Ave. and 4th St., for D. J. Byrnes, 845 Connecticut Ave. About $25,000.

Conn., Danbury — Danbury Industrial Corp., Odd Fellows Bldg., plans to build factory. About $100,000. Architect not selected. Keystone Instant Food Co., Inc., lessee.

Conn., East Norwalk (South Norwalk P. O.)—Crofut & Knapp, Water St., South Norwalk, having plans prepared by Fletcher-Thompson, Inc., engrs., 1089 Broad St., Bridgeport, for two factories, one 5 story, 66 x 300 ft., and other 3 story, 210 x 300 ft., also building 1 story, 60 x 150 ft. power plant, rein.-con., rein.-con. flooring, concrete foundation, on Van Zandt Ave., here. About $500,000. Noted Aug. 28.

Conn., Hartford—B. A. Sellew, archt., 756 Main St., rejected bids received Aug. 15, building 1 story, 90 x 100 ft. garage with 30 x 30 ft. ell and 2 story, 40 x 60 ft. office and showroom, brick and terra cotta, concrete flooring and foundation, on Washington St., for Hartford Buick Co., 51 Elm St. About $50,000. Project postponed until next spring. Noted Aug. 7.

Conn., New Haven—S. Sessa, 380 Crown St., soon receives bids building 1 story, 65 x 135 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on George and Park Sts. About $28,000. Private plans.

Conn., South Manchester—G. E. Keith Furniture Co., 829 Main St., having plans prepared by A. E. Fiske, archt., 67 Bigelow St., for 3 story, 47 x 190 ft. furniture and business building with storehouse in rear, brick, rein.-con. flooring, concrete foundation, on Main and Bissell Sts. About $65,000. Noted May 15.

Conn., Thamesville (Norwich P. O.)—Cudworth & Thompson, archts., Thayer Bldg., Norwich, soon receive bids building 3 story, 40 x 80 ft. rein.-con. addition to plant, rein.-con. flooring, concrete foundation, for Norwich Woolen Co. About $25,000.

Conn., Waterbury—F. A. Webster, archt., 51 West Main St., soon receives bids building 1 story, 50 x 50 ft. shop, 2 story, 50 x 120 ft. foundry, and 1 story, 100 x 100 ft. storage plant, all brick, rein.-con. flooring, concrete foundation, on Railroad Hill, for Manufacturers Fdry. Co. About $60,000.

Conn., Winnipauk (Norwalk P. O.)—Monks & Johnson, engrs., 78 Devonshire St., Boston, Mass., receive bids about Sept. 15, building 6 story, 80 x 130 ft. addition to factory, near State Rd., brick and rein.-con., rein.-con. flooring, concrete foundation, for Norwalk Tire & Rubber Co. About $100,000. Noted Aug. 28.

N. Y., Brooklyn—Kahan & Feldman, 25 Madison Ave., New York City, had plans prepared by Buchman & Kahn, archts. and engrs., 56 West 45th St., New York City, for 5 story, 80 x 295 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Suydam St. between Wykoff and Irving Aves., here.

N. Y., Long Island City—Lehigh Silk Hosiery Co., 220-5th Ave., New York City, soon lets contract building 7 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here. About $1,000,000. Ballinger & Perrott, 47 West 34th St., New York City, archts. and engrs.

N. Y., New York—S. and C. Hyman, 2069-5th Ave., soon receives bids altering 4 story brick and steel factory, on Grand and Goerck Sts. About $25,000. S. Rosenblum, 51 Chambers St., archt. and engr.

N. Y., Rochester—General Ry. Signal Co., Lincoln Park, plans to build 43 x 120 x 240 ft. addition to foundry and 66 x 240 ft. rein.-con. loading platform. About $115,000.

N. Y., Walton—J. Kayser Co., 32nd St. and Madison Ave., New York City, had plans prepared by W. Higginson, archt. and engr., 18 East 41st St., New York City, for factory here, 1 story, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000.

Pa., Phila.—H. Ketcham, 239 Harvey St., having plans prepared by H. B. Weldon, archt., Fuller Bldg., for 1 and 3 story, 100 x 150 ft., 30 x 36 ft. and 16 x 40 ft. garage, office and lumber shed, fireproof construction.

Md., Baltimore—Columbia Graphophone Co., 16 South Howard St., negotiating for site and plans to build large manufacturing plant.

W. Va., Huntington—Huntington Brick Tile Co. having plans prepared by T. M. Davidson, archt. and engr., Huntington, for 1 story, 100 x 150 ft. main building, 80 x 100 ft. dry kiln, also 16 oval top kilns 50 ft in diameter, rein.-con., steel and brick. About $150,000.

W. Va., Huntington—Huntington Tumbler Co., Madison Ave., having plans prepared by A. F. Dickey, archt., Huntington, for factory on 15th St., W., 1 story, 82 x 272 ft., with 50 x 70 ft. wing, concrete, steel and brick. About $100,000.

O., Cleveland—Hubbell & Benes, archts. and engrs., 4500 Euclid Ave., preparing plans and soon receive bids building 6 story, 40 x 198 ft., rein.-con., steel and brick addition, on East 6th St. and Superior Ave., for Cleveland Plain Dealer Co., Plain Dealer Bldg. About $250,000. Noted Aug. 28.

O., Columbus—G. Sherman, Bexley, plans to raze present structure and build 2 story, 50 x 200 ft., fireproof garage and salesroom, on East Broad St., here. About $125,000. C. L. Inscho, Brunson Bldg., archt.

O., Greenville—See "Waterworks."

Ind., Indianapolis—J. D. Adams Co., 217 South Belmont Ave., having plans prepared by Bass, Knowlton & Graham, archts., 801 Hume-Mansur Bldg., Indianapolis, for 1 story, 162 x 175 ft. concrete and steel storage house, at 317 Belmont Ave. About $60,000.

Ind., Indianapolis—A. F. Bartel, 911 North East St., Richmond, having plans prepared by Trowbridge & Ackerman, archts., 19 West 44th St., New York City, for 3 story brick and steel factory, rein.-con. flooring, concrete foundation. About $50,000. P. J. Piatti, 47 West 34th St., New York City, engr.

Mich., Bay City—C. R. Wilson Body Co., 26th and Farragut Sts., having revised plans prepared by A. E. Munger, archt., 420 Shearer Blk., for 1 story, 100 x 316 ft., steel and brick factory, rein.-con. flooring, concrete foundation. Plans also include ten 50 x 150 ft., brick and hollow tile dry kilns.

Mich., Detroit—Detroit Edison Co., David Whitney Bldg., preparing plans for 2 story, 25 x 113 ft., rein.-con. and brick sub station, rein.-con. flooring, concrete foundation, on Conners Creek Rd. near Six-Mile Rd. About $40,000.

Mich., Detroit—Detroit Twist Drill Co., Fort St. and 14th Ave., soon lets contract building 3 story, 45 x 87 ft., rein.-con. factory, rein.-con. flooring, concrete foundation. Smith, Hinchman & Grylls, 710 Washington Arcade, archts.

Mich., Detroit—Garfield Cartage Co., Harper Ave., having plans prepared by A. G. Schutt, engr., 1333 Book Bldg., for 1 story, 30 x 70 ft., rein.-con. and steel garage, rein.-con. flooring, concrete foundation.

Mich., Detroit—Michigan Machine Co., 16th and Porter Sts., having plans prepared by Brown & Preston, archts., 406 Empire Bldg., for 3 story, 107 x 158 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation. About $150,000.

Mich., Detroit—Mills-Fox Baking Co., 4th and Merrick Aves., having plans prepared by Brown & Preston, archts., 406 Empire Bldg., for 2 story, 65 x 100 ft. bakery, rein.-con. flooring, cost $30,000, 1 story, 70 x 120 ft. storage building, $25,000 and 1 story, 65 x 140 ft. garage, $40,000, all steel and brick, concrete foundation.

Mich., Detroit—Monarch Fdry. Co., Greenwood Ave. and Grand Trunk Ry., having plans prepared by H. M. Lane Co., engrs., Owen Bldg., for 1 story, 100 x 200 ft. steel and concrete foundry, rein.-con. flooring, concrete foundation on Herrick St. and Vernoe Ave.

Mich., Hamtramck—Raseman & Freier, archts., 1302 Penobscot Bldg., Detroit, preparing plans for 4 story, 100 x 200 ft., rein.-con. steel and brick factory, rein.-con. flooring, concrete foundation here. About $200,000. Owner's name withheld.

Mich., Saginaw—Cooper & Beckbissinger, archts., 114 South Jefferson St., preparing plans for 4 story, 100 x 120 ft., rein.-con. steel and brick factory, concrete foundation. Owner's name withheld.

Ill., Chicago—L. G. Hallberg & Co., archts., 116 South Michigan Ave., soon receives bids building 2 story, 250 x 400 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Ohio St. and Spaulding Ave., for Wilson-Jones Loose Leaf Co., 3021 Carroll Ave. About $400,000. Noted Aug. 21.

Ill., Hardin—P. A. Robinson, engr., Syndicate Trust Bldg., St. Louis, soon receives bids building oil stations and other appurtenances also installing tanks and fillers, for Standard Oil Co. of Indiana, Syndicate Trust Bldg., St. Louis. About $30,000.

Ill., Quincy—F. H. Clark, Natl. Oil & Refining Co., et al, plan to build oil refinery. About $100,000.

Wis., Appleton—Outagamie Co. Equity Exch having preliminary plans prepared for warehouse. About $50,000.

Wis., Galesville—Pea Canning Co. plans to construct plant, to include 2 story, 60 x 80 ft., 1 story, 80 x 120 ft and 1 story, 40 x 44 ft. buildings. About $50,000. W. Bennett, Batavian Bank Bldg., La Crosse, archt.

Wis., Green Bay—Brown Co. Equity Milk Exch. having plans prepared by C. H. Williams, archt., 814 North Jefferson St., building 2 story, 60 x 120 ft., rein.-con. factory. About $35,000.

Wis., Kiel—Kiel Furniture Co. plans to build 2 story, 40 x 160 ft. brick, tile and steel factory, brick foundation, on Main St. About $25,000. Architect and engineer not selected.

Wis., Lake Mills—F. S. Roberts having plans prepared by J. R. & E. J. Law, archts., 620 Gay Bldg., Madison, building 2 and 3 story, 84 x 144 ft., brick and rein.-con. factory, rein.-con. flooring, brick foundation, on Main St. About $40,000.

Wis., Madison—State Bd. Control having plans prepared by A. Peabody, archt., Capitol Bldg., for 1 story 20 x 150 ft., brick and concrete engineering shop. About $40,000.

Wis., Milwaukee—Wallace & Smith, 70 West Water St., having plans prepared by Rosman & Wierdsman, archts., 424 Jefferson St., remodeling 5 story, brick and mill construction factory, at 70 West Water St. About $60,000.

Wis., Oshkosh—Bull Dog Tractor Co. having preliminary plans prepared building 200 x 200 ft. factory. About $750,000. A. H. Gruenwald, 24 Washington St., mgr.

Wis., Waupaca—Steward Tractor Co., 906 1st Natl. Bank Bldg., Milwaukee plans to build 1 story, 80 x 125 ft. rein.-con. and brick factory. About $60,000. A. Steward, mgr. Private plans.

Ia., Storm Lake—City voted $100,000 bonds to build electric light plant.

Minn., Minneapolis—Eagle Fdry. Co., 26th St., S. E., having plans prepared by H. L. Asleson, engr., 3055-15th Ave., S., for 1 story, 65 x 120 ft., brick and steel foundry. About 50,000.

Minn., Virginia—Barrett Bros. having plans prepared by A. W. Kerr & Co., archts., Virginia, for 2 story, 73 x 120 ft., concrete and brick warehouse. About $65,000.

Mo., St. Joseph—Roberts Cone Co., 709 North 3d St., having plans prepared by R. Meier, archt., 2526 Jule St., for 5 story, 80 x 140 ft., rein.-con., steel and brick factory, rein.-con. flooring, rock and concrete foundation. About $130,000. Noted June 17.

Mo., St. Louis—Duco Adding Machine Co., 1900 Morgan St., plans to build new factory. About $100,000. Architect not selected. Address R. L. Cruzon, c/o owner.

Mo., St. Louis—St. Louis Brass Mfg. Co., Washington and Jefferson Aves., had plans prepared for 6 story, 175 x 300 ft. brick, steel and concrete plant. About $500,000. Address E. S. Guth, pres. Architect not selected.

Tex., Ft. Worth—Crystal Ice Co., 301 East Magnolia Ave., plans to build 1 story storage house. About $40,000.

Tex., Ft. Worth—W. B. Fishburn, Stop Virginia, plans to build 1 story, 50 x 100 ft. garage. About $25,000.

Tex., Houston—J. J. Bonner, Goggan Bldg., plans to build brick garage and filling station on San Jacinto St. and McKinney Ave. About $30,000.

Tex., San Antonio—Fisk Co., 204 Ave. C, plans to build 2 story, 150 x 150 ft., rein.-con. factory. About $100,000. G. A. C. Halff, 505 Travis Club, pres.

Okla., McAlester—Oklahoma Storage Co. plans to build 3 story warehouse, to be capable of housing 5000 bales cotton. About $50,000. Architect and engineer not selected.

Okla., Ponca City—City voted $50,000 bonds to build electric light plant. Engineer not selected.

Okla., Sapulpa—Southern Ice & Utilities Co. plans to build a 2 story, 50 x 150 ft. cold storage plant on Main St. About $25,000. Architect and engineer not selected.

Industrial Works (Continued)

Ariz., Phoenix—Arizona Egyptian Cotton Co., 5th and Lincoln Sts., plans to build cotton seed oil refinery to have daily capacity of 10,000 gal. J. B. Atha, mgr.

Wash., Seattle — Pacific States Motor Truck Co., Securities Bldg., plans to build 2 story, 120 x 180 ft. factory, brick and mill construction, rein.-con. flooring, on 3rd and Wall Sts. About $45,000. Stephen & Stephen, New York Blk., archts.

Ore., Enterprise—Eastern Oregon Lumber Co. plans to rebuild 1 story sawmill recently destroyed by fire, 125,000 ft. daily capacity. Private plans. About $50,000. Address J. Ricker, saw filer.

Cal., Oakland—H. Jones & Co., Australia, having plans prepared by W. J. Miller, archt., 417 Market St., San Francisco, for 1 story, 250 x 450 ft. factory, 1 story, 50 x 250 ft. welfare building and 1 story, 50 x 100 ft. administration building, on 11th St. and 29th Ave. About $300,000.

Cal., San Francisco—Simmons Co., 198 Bay St., soon lets contract building 3 story, brick factory on Bay and Stockton Sts.

Cal., Torrance—Western Glass Products Co., 707 Hibernian Bldg., Los Angeles, purchased 10 acre site, here, and plans to construct factory to consist of group of buildings. A. LaCourse, Collingswood, N. J., archt. and engr.

N. S., Halifax—A. W. Robb, secy. Herald Newspaper, soon lets contract building 40 x 60 ft. concrete warehouse. About $28,000.

Que., Montreal — Bovril Co., Ltd., 27 St. Peter St., plans to build 4 story, 75 x 150 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Van Horne St. About $155,000. Architect not selected.

Ont., Brockville — Consolidated Iron & Steel Corp., Ltd., 20 King St., E., Toronto, plans to build iron smelter. About $8,000,000. Engineer not selected.

Ont., Hamilton—W. J. Westaway, engr., 73 James St., N., soon receives bids building 5 story, 80 x 200 ft., rein.-con. factory, here, rein.-con. flooring, concrete foundation, for Perritts & Spencer, Bury, England. About $600,000.

Ont., London—See "Miscellaneous."

Ont., Oshawa—Pedlar People, Ltd., Simcoe St. S., preparing plans for 3 or 4 story, concrete, steel and brick factory, rein.-con. flooring, concrete foundation. About $500,000.

Ont., Renfrew—Renfrew Refrigerator Co., Elizabeth St., soon receives bids building extension to present factory. About $60,000.

Ont., Toronto—Canadian General Electric Co., King and Simcoe Sts., soon receives bids building 6 story, 50 x 200 ft., steel and brick storehouse and office building, concrete foundation, on King St., W. About $200,000.

Ont , Toronto—L. Solman, King St. W., purchased site on King and Simcoe Sts. and plans to buid 5 story, 50 x 100 ft. manufacturing flats and showroom, probably steel and brick, concrete foundation. About $75,000. Engineer not selected.

Ont., Walkerville—Fisher Body Co., Edna St., having plans prepared by Smith, Hinchman & Grylls, archts., Washington Arcade, Detroit, Mich., for factory, probably 3 story, steel or rein.-con., rein.-con. flooring, concrete foundation. About $350,000.

Hawaii, Honolulu—Hawaiian Fertilizer Co. having structural plans prepared by T. Ronneberg, engr., Crocker Bldg., San Francisco, Cal., for 3 story, 60 x 130 ft., rein.-con. factory and 1 story, 130 x 180 ft rein.-con. warehouse, here. Dickey & Wood, Honolulu, archt.

BIDS DESIRED

N. Y., New York—Until Sept. 13, by Ballinger & Perrott, archts. and engrs., 17 West 34th St., for 6 story, 375 x 382 x 316 x 390 ft. rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 141st St. and Walton Ave., for Port Morris Holding Co., care of Winters & Co., 137th St. and Southern Blvd. About $500,000. Noted Aug. 14.

N. Y., New York—Until Sept. 22 (change of date), by Buchman & Kahn, archts. and engrs., 56 West 45th St., building 6 story, 75 x 200 ft., brick and steel factory addition, rein.-con. flooring, concrete foundation, on Ave. D between 13th and 14th Sts., for Eagle Pencil Co., 703 East 13th St. Noted Aug. 28.

N. Y., New York—Until Sept 20, by R. G. Corey, archt. and engr., 39 Cortlandt St., building 6 story, 75 x 150 ft., brick and steel factory, rein.-con. flooring, concrete foundation, for C. Corey Co., 290 Hudson St. About $200,000. Noted Aug. 28.

O., Cleveland—Christian, Schwartzenberg & Gaede, engrs., 1900 Euclid Ave., receiving bids building 3 story, 100 x 180 ft., rein.-con., steel and brick warehouse, for Brown Fence & Wire Co., 6532 Juniata Ave. About $125,000. Noted Aug. 21.

O., Cleveland—Christian, Schwartzenberg & Gaede, engrs., 1900 Euclid Ave., receiving bids building superstructure for 5 story, 100 x 150 ft., rein.-con., steel and brick factory, on East 30th St. and Superior Ave., for Schwartz, Forney & Hexter Co., West 6th St. and Lakeside Ave. About $250,000. Noted Aug. 14.

O., Cleveland—Christian, Schwartzenberg & Gaede, engrs., 1900 Euclid Ave., receiving bids building 2 story, 57 x 64 ft., rein.-con., steel and brick addition to bakery at 3335 Carnegie Ave., for Martin Baking Co. 3419 Carnegie Ave. About $50,000. Noted Aug. 21.

Ind., Valparaiso—T. L. Condran Co., engr., 53 West Jackson St., Chicago, receiving bids building 3 story, 65 x 260 ft. rein.-con. and brick factory, rein.-con. flooring, for McGill Mfg. Co. About $150,000.

Mich., Detroit—H. S. Angell, archt., Free Press Bldg., receiving bids building 3 story, 26 x 100 ft., brick, stone and steel factory, concrete foundation, for Michigan Cut Flower Exch., Randolph St. and Gratiot Ave. About $40,000.

Mich., Detroit—H. H. Lane, engr., Dime Bank Bldg., receiving bids for 2 story, 60 x 75 ft., rein.-con. and steel bakery, rein.-con. flooring, concrete foundation, on 4th and Labrosse Sts., for Detroit Baking Co., 4th St. and Michigan Ave. About $30,000.

Mich., Jackson—W. W. Bradfield, engr., and H. L. Mead, archt., Grand Rapids, receiving bids building 5 story, 133 x 265 ft., rein.-con. steel and brick factory, wood flooring, concrete foundation, for Michigan Seating Co., East Washington St.

Ill., Chicago—Westerlin & Campbell Co., 26 North Clinton St., receiving bids for 1 and 2 story, 50 x 125 ft. and 75 x 125 ft., brick and concrete factory, concrete foundation, on Seminary and Cornelia Aves. About $50,000. L. Lehle, 38 South Dearborn St., archt.

Minn., Duluth—Until Sept. 15, by R. A. Ostrom, mgr. Duluth Showcase Co., 2800 West Superior St., building 3 story, 75 x 280 ft., concrete, brick and steel factory, rein.-con. flooring, concrete foundation, on 49th Ave., W. About $75,000. A. Puck, Tarrey Bldg., archt. and engr. Noted July 24.

Minn., Minneapolis—Northwestern Catalogue Co., 800 Phoenix Bldg., receiving bids for 4 story, 100 x 100 ft., rein.-con. and brick warehouse. About $100,000. Long, Lamoreaux & Long, 1028 Andrus Bldg., archts. and engrs. Noted Aug. 7.

Okla., Tishomingo—Until Sept. 18, by C. H. Holland, town clk., building electric lighting plant and distribution system, to include power house, two 75 kv.-a. generators direct connected to semi-Diesel oil engines, switchboards, 15,000 lb. copper wire, 400 poles, line material, etc. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Colo., Denver—Until Sept. 15, by W. H. J. Edbrooke, archt., Tabor Opera House, building 4 story, 50 x 125 ft. rein.-con., steel and brick publishing house, rein.-con. flooring, concrete foundation, for Denver Post Printing & Publishing Co., 1544 Champa St. About $150,000. Noted Aug. 21.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Vt., Burlington**—Catamount Mfg. Co. let contract constructing 2 story brick and concrete mill building, concrete foundation, to F. T. Ley & Co., Inc., 499 Main St., Springfield, Mass. About $50,000.

★**Mass., Dalton**—H. O. Bates & Son let contract building 1 story, 68 x 125 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Main St., to H. J. Bridgeman, Nortn St., Pittsfield. About $25,000. Priyate plans.

★**Mass., Fall River**—New England Oil Refinery Co., Boston, let contract building oil refinery, storehouse, office, wharf and filling station, here, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Aberthaw Constr. Co., School St., Boston. About $300,000.

★**Mass., Framingham**—Dennison Mfg. Co. let contract building 4 story, 75 x 200 ft. concrete factory, rein.-con. flooring, on Howard St., to Aberthaw Constr. Co., School St., Boston. About $300,000.

★**Mass., Holyoke**—Fair Alpaca Co., Jackson St., let contract altering drying room, rein.-con. and brick, to S. M. Green Co., 293 Bridge St., Springfield. About $25,000.

★**Mass., Lowell**—Standard Oil Co., 50 Congress St., let contract building 1 story garage and 1 story warehouse, both rein.-con., rein.-con flooring, concrete foundation, on Main and Canada Sts., to H. D. Best, 949 Bway., New York City. About $100,000. Noted Feb. 27.

★**Mass., Springfield**—Duckworth Chain & Mfg. Co., 41 Mill St., let contract building 1 story, 92 x 146 ft. brick and concrete addition to factory, rein.-con. flooring, concrete foundation, on Pecousic Ave., to E. F. Carlson & Co., 310 Main St. About $35,000.

★**Mass., Springfield** — Winchester Sq. Realty Co., Winchester Sq., let contract building 1 story, 54 x 143 ft., brick and concrete garage with 42 x 121 ft. ell, rein.-con. flooring, concrete foundation, on Mason St., to L. S. Wood, 19 Stockbridge St. About $35,000. Noted Sept. 4.

★**Mass., Worcester** — Walden-Worcester, Inc., 72 Commercial St., let contract building 4 story, 60 x 333 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Shrewsbury St., to W. F. Kearns Co., 240 Albany St., Cambridgeport. About $250,000. Noted June 26.

★**Mass., Worcester** — Worcester Paper Box Co., 68 High St., will build 4 story, 40 x 110 ft., brick, steel and rein.-con. factory, rein.-con. flooring, brick and concrete foundation, on Houchin Ave. About 80,000. Work will be done by day labor.

★**R. I., Auburn** (Providence P. O.)—Genl. Fire Extinguisher Co., West Exchange St., Providence, let contract building 1 story, 55 x 120 ft., brick service station, rein.-con. flooring, concrete foundation, to C. I. Bigney Constr. Co., 898 Westminster St., Providence. About $25,000.

★**R. I., Providence**—J. Lockhart, Hope and 4th Sts., will build 1 story, 50 x 150 ft. and 50 x 50 ft. brick and concrete garage and salesroom, rein.-con. flooring, concrete foundation. About $30,000. Private plans. Work will be done by day labor. Noted June 12.

★**R. I., Westerly**—Bilderbeck & Langdon, engrs., Barrows Bldg., New London, Conn., let contract to R. A. Sherman & Sons Co., 137 Main St., for 1 story, 130 x 300 ft. brick and mill cohstruction factory and 1 story, 30 x 40 ft. brick and concrete power house, rein.-con. flooring, concrete foundation, for New England Silk Co. About $150,000. Noted July 31.

★**R. I., Woonsocket**—French Worsted Co., Hamlet Ave., let contract building 1 and 2 story, 50 x 200 ft., brick and mill construction addition to wool sorting plant, concrete foundation, to Eastern Constr. Co., Winter St. About $50,000. Noted Aug. 21.

★**Conn., Bridgeport** — Connecticut Mills Co., 1188 Main St., let contract building 2 story, 53 x 80 ft. brick and mill construction factory, concrete foundation, on North Washington and Housatonic Aves., to L. H. Cocozza, 1188 Main St. About $25,000.

★**Conn., Bridgeport**—Locke Steel Belt Co., 1085 Connecticut Ave., let contract building 1 story, 70 x 150 ft., concrete warehouse, rein.-con. flooring, concrete foundation, to J. F. Bradley & Son, 85 Gem Ave. About $30,000.

★**Conn., Danbury**—Doran Bros., River St., let contract building 1 story, 90 x 200 ft., brick and steel machine shop, rein.-con. flooring, concrete foundation, on South St., to L. F. Sweeney, 26 Montgomery St. About $55,000. Private plans.

★**Conn., Glenbrook**—C. H. Phillips Chemical Co. let contract building 3 story rein.-con. and brick storage plant, rein.-con. flooring, concrete foundation, to Thompson & Binger Co., 280 Madison Ave., New York City. About $50,000.

★**Conn., New Haven**—Atlantic Refining Co., 508 Turks Head Bldg., Providence, let contract building gas service station, 1 story, 26 x 26 ft., tile and concrete, rein.-con. flooring, concrete foundation, on Dixwell Ave. and Goffe St., to Metzger & Fisher Co., Otis Bldg., Phila. About $25,000.

★**Conn., New Haven**—New England Iron Wks., Inc., 96 Commerce St., let contract building 1 story, 62 x 150 ft. factory and 25 x 35 ft. office, brick, steel and concrete, rein.-con. flooring, concrete foundation, on Dixwell Ave., to J. H. Hogan, 138 Davenport Ave. About $40,000. Noted Aug. 14.

Industrial Works (Continued)

★**Conn., New Haven**—P. Sellers, engr., 207 Orange St., let contract to A. N. Sasso, 185 Church St., building 2 story, 60 x 94 ft. brick and steel factory, rein.-con. flooring, concrete foundation, on Kensington St., for J. G. Missirian, 102 Kensington St. About $30,000. Noted July 3.

★**Conn., West Haven** (New Haven P. O.)—Connecticut Fat Rendering & Fertilizer Co., Front Ave., let contract altering and remodeling plant, brick, steel and concrete, rein.-con. flooring, to Westcott & Mapes, Inc., 207 Orange St., New Haven. About $25,000.

★**N. Y., Brooklyn**—H. A. Beggett, Patchogue, let contract altering 4 story, 50 x 100 ft., brick and steel warehouse and store building, on Fulton St. and Elm Pl., to Leddy-Moore, 105 West 40th St., New York City. About $50,000.

★**N. Y., Brooklyn**—H. Fein, 626 Essex St., will build 1 story, 75 x 175 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Hillside and Jamaica Aves. About $35,000. Work will be done by day labor.

★**N. Y., Brooklyn**—C. Hutwelker, 655 5th Ave., let contract building 5 story, 63 x 100 ft. brick and steel packing house, rein.-con. flooring, concrete foundation, on Hall St. and Flushing Ave., to Lustbader Constr. Co., 103 Park Ave., New York City. About $100,000. Noted June 12.

★**N. Y., Brooklyn**—Rockwood & Co., 88 Washington Ave., will build 7 story, 50 x 100 ft. rein.-con. and steel garage, rein.-con. flooring, concrete foundation, on Waverly and Park Aves. About $100,000. Work will be done by day labor.

★**N. Y., Long Island City**—White Co., Park Ave. and 57th St., New York City, let contract building 200 x 400 ft. rein-con. service station, to Amer Concrete Steel Co., 27 Clinton St., Newark, N. J. About $400,000. Noted Jan. 9.

★**N. Y., New York**—Butterick Publishing Co., Spring and MacDougal Sts., will build 10 story, 116 x 273 ft. brick, steel and rein-con. publishing house, rein.-con. flooring, concrete foundation, at 223-253 Spring St. About $1,300,000. Work will be done by day labor under supervision of Ballinger & Perrott, archts. and engrs., 1328 Bway. Noted Sept. 4.

★**N. Y., New York**—C and P Realty Co., 2167 Belmont Ave., will build 1 story, 102 x 136 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on Southern Blvd. and Freeman St. About $35,000. Work will be done by day labor.

★**N. Y., New York**—R. S. Howard Piano Co., 485 East 133rd St., let contract building 3 story rein.-con. and steel factory, rein.-con. flooring, concrete foundation, to Ettinger Constr. Co., 44 Court St., Brooklyn. About $100,000.

★**N. Y., New York**—S. Katz, 1411 Grand Concourse, will build 2 story, 75 x 100 ft., rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation, on 47th St. and 1st Ave. About $35,000. Work will be done by day labor. Noted Sept. 4.

★**N. Y., New York**—M. Welte & Sons, Inc., 667 5th Ave., let contract building 4 story, 90 x 156 ft. brick and steel factory, rein.-con. flooring, concrete foundation, on 133rd St. and Lincoln Ave., to W. T. Murphy, 41 Union Sq. About $70,000.

★**N. Y., Yonkers**—Tidewater Oil Co., Bway., New York City, let contract building 3 story rein.-con. and steel distributing plant, rein.-con. flooring, concrete foundation, to H. D. Best, 949 Bway., New York City. About $75,000.

★**N. J., Camden**—Warren Webster Co., 21 South 12th St., Phila., let contract building 2 story, 56 x 123 ft., brick factory, here, to J. Simms Wilson & Co., 1125 Brown St., Phila.

★**N. J., Jersey City**—Arlington Co., 285 Newark Ave., let contract for masonry, iron and carpentry work for new plant on Sip Ave. and Hudson Blvd., to W. R. Whyte Co., 36 Oakland Ave., $57,632.

★**N. J., Newark**—Atlantic Smelting & Refining Co., Ave. R, let contract building plant, to Linde & Griffith, foot of 4th Ave. About $100,000.

★**N. J., Newark**—Prest-O-Lite Co., 786 Frelinghuysen Ave., let contract for concrete, brick and steel plant, consisting of 8 buildings ranging in size from 30 x 40 ft. to 60 x 400 ft., to J. Mitchell, Inc., 76 Montgomery St., Jersey City.

★**Pa., Hanover**—Sheffard & Myers let contract building 2 story, 60 x 210 ft. concrete and brick storage warehouse, concrete foundation, to O. H. Hostetter, Hanover. About $30,000.

★**Pa., Harrisburg**—Moorehead Knitting Co., Inc., 11th and Walnut Sts., will build 4 story, 50 x 150 ft. and 1 story, 60 x 150 ft. knitting mill, on North Cameron St. About $125,000. Work will be done by day labor.

★**Pa., Mifflinburg**—A. P. Villa & Bro., Inc., 95 Madison Ave., New York City, let contract building 1 and 2 story, 50 x 151 ft. and 45 x 50 ft. factory, slow burning construction, here, to I. O. Fetter, Sunbury. Noted Aug. 7.

★**Pa., Phila.**—Atlantic Motor Truck Co., 1211 Chestnut St., let contract building 4 story, 15 x 130 ft., brick garage and showroom on 24th and Brown Sts., to J. E. Dare, 17th and Chestnut Sts., Harrisburg.

★**Pa., Phila.**—Hale & Kilburn Corp., 18th and Lehigh Sts., let contract building 5 story, 196 x 260 ft., brick, steel and concrete factory on 16th and Glenwood Sts., to H. E. Baton, 1713 Sansom St. About $100,000.

★**Pa., Turbotville**—A. P. Villa & Bros., 95 Madison Ave., New York City, let contract building 1 story, 50 x 168 ft. and 50 x 70 ft. factory here, slow burning construction, to H. A. Moore Co., Bourse Bldg., Phila. Noted Aug. 7.

★**Md., Baltimore**—L. B. Rothschild, archt., 1225 Sansom St., Phila., let contract to West Constr. Co., 907 Amer. Bldg., for service and sales building, 3 story, 40 x 160 ft., steel, stone and brick, rein.-con. flooring, concrete foundation, on North Ave. and Oak St., for Reinhardt Motor Car Co., 128 West North Ave. About $60,000. Noted July 24.

★**Md., Cumberland**—Kelly Springfield Tire Co., Cook St., Akron, O., let contract building rein.-con. plant, concrete foundation, here, to Hunkin-Conkey Co., New Century Bldg., Cleveland. About $2,000,000. Noted Feb. 20.

★**Md., Curtis Bay** (Baltimore P. O.)—U. S. Industrial Alcohol Co. let contract building 1 and 2 story, rein.-con. addition to plant, rein.-con. flooring, concrete foundation, to G. A. Fuller Co., 410 Amer. Bldg., Baltimore. About $300,000.

★**W. Va., Huntington**—Liggett & Myers, 27th St. and Emmons Ave., let contract for 2 story, 80 x 210 ft., rein.-con. and steel factory, rein.-con. flooring, on 1st Ave. and 27th St., to Austin Co., Huntington. About $70,000.

★**N. C., Hillsboro**—Belle Vue Mfg. Co. let contract building 1 story, 100 x 300 ft., brick factory, to I. G. Lawrence, Durham. About $100,000.

★**La., New Orleans**—Dixie Brewing Co., 2401 Tulane St., let contract building 2 story, 60 x 110 ft. brewery, to G. E. and E. E. Reimann & Co., Lopez and Bandin Sts. About $65,000.

★**O., Cleveland**—Colburn Machine Tool Co., 1041 Ivanhoe Rd., let contract building 1 story, 192 x 238 ft., rein.-con., steel and brick factory, to Hunkin-Conkey Co., Century Bldg. About $100,000. Noted Aug. 28.

★**O., Cleveland**—Fulton Fdry. & Machine Co., 1209 Marquette Rd., let contract building 1 story, 100 x 111 ft., rein.-con., steel and brick addition to foundry, on East 75th St. and Morgan Rd., to Bolton & Pratt Co., Columbia Bldg. About $70,000. Noted Aug. 28.

★**O., Cleveland**—J. M. Miller, archt., Guardian Bldg., let contract to Minnick & Gibbons Co., 5309 Prospect Ave., building 2 story, 65 x 100 ft., rein.-con., steel and brick factory, on Prospect Ave., for Auto Equipment Co., Blackstone Bldg. About $60,000. Noted Aug. 28.

★**O., Cleveland**—Pompeian Mfg. Co., 2104 Superior Ave., let contract building 6 story, 75 x 150 ft., rein.-con., steel and brick factory and office, on East 24th St. and Wayne Ave., to W. Dunbar Co., 8201 Cedar Ave. About $250,000. Noted Aug. 28.

★**O., Cleveland**—Republic Stove Co., 1761 East 39th St., let contract building 3 story, 60 x 112 ft., rein.-con., steel and brick factory, to H. K. Ferguson Co., 6523 Euclid Ave. About $50,000. Noted Aug. 28.

★**O., Cleveland**—G. A. Schibble, archt. and engr., Cleveland Heights, let contract to Bolton & Pratt Co., Columbia Bldg., for 6 story, 150 x 200 ft., rein.-con., steel and brick factory, on Ontario St. and Fountain Court, for M. A. Bradley, Marion Bldg. About $100,000. Noted Aug. 28.

★**O., Dayton**—Hubbell & Williamson, 926 Reibold Bldg., let contract building 2 story, 40 x 125 ft., rein.-con. and brick garage and salesroom, rein.-con. flooring, concrete foundation, at 109 South Perry St., to Blanchard Bldg. Co., Chapel Rd. About $30,000

★**O., Dayton**—Master Tire & Rubber Co., 706 Schwind Bldg., let contract building 6 story, 60 x 200 ft., steel and brick factory, brick foundation, on Leo and Daller Sts., to J. Lowes, Schwind Bldg. About $85,000. Noted June 26.

★**Mich., Manistique**—R. G. Brown, Metropolitan Life Bldg., Minneapolis, Minn., let contract building several paper mills, here, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Siems, Helmers & Schaffer, foot of Market St., St. Paul, Minn. About $250,000.

★**Mich., Pontiac**—Genl. Motors Truck Co. let contract building 3 story, 80 x 300 ft., rein.-con., steel and brick warehouse, rein.-con. flooring, concrete foundation, to W. E. Wood & Co., Ford Bldg., Detroit. About $100,000.

★**Ill., Chicago**—Allbright-Nell Co., 5323 South Western Ave., let contract building 1 story, 140 x 200 ft., rein.-con. and brick addition to factory, concrete foundation, at 5319 South Western Ave., to E. L. Archibald Co., 111 West Washington St. About $75,000.

★**Ill., Chicago**—A. B. Coffin, archt., 39 West Adams St., let contract to C. W. Secord, 437 West 117th St., building 4 story, 90 x 115 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, at 4625 West Van Buren St., for Belden Mfg. Co., 2300 South Western Ave. About $100,000. Noted June 5.

★**Ill., Decatur**—Comet Automobile Co., 156 South Water St., let contract building 1 story, 47 x 72 ft. power house and 100 ft smoke stack, to L. N. Cope & Son, 116 Merchant St. About $25,000. Noted Feb. 20.

★**Ill., East Woodriver** (Woodriver P. O.)—International Shoe Co., 15th and Washington Aves., St. Louis, let contract building 4 story, 130 x 600 ft. tannery, here, brick, steel and concrete, rein.-con. flooring, rock foundation, to J. Black Masonry & Contg. Co., Wright Bldg., St. Louis. About $800,000.

★**Wis., Eau Clair**—Stacy Fruit Co., 317 Eau Claire St., let general contract building 2 story, 60 x 125 ft. warehouse and refrigerating plant, to Hoeppner & Bartlett Co., 414 Grand Ave., E. Total cost, $75,000.

★**Wis., La Crosse**—Matthews Mfg. Co., Citizens Bldg., Cleveland, O., let contract building 1 story, 100 x 330 ft. brick and stone factory, concrete foundation, on South West Ave., here, to E. Wallace, La Crosse. About $50,000.

★**Wis., Milwaukee**—Mansfield Ice Cream Co., 504 4th St., let general contract building 4 story, 50 x 150 ft. plant, to Dahlman Constr. Co., 221 Grand Ave. Total cost, $100,000.

★**Wis., Milwaukee**—Milwaukee Paper Box Co., 400 Florida St., let general contract building 5 story, 120 x 146 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on South Pierce St. and Muskegon Ave., to Dahlman Constr. Co., Majestic Bldg. Total cost, $225,000. Noted May 30.

★**Wis., Racine**—Ajax Rubber Co., Shattley Bldg., let contract building 4 story, 74 x 110 ft. factory on Asylum Ave., to Nelson & Co., Robinson Bldg. About $100,000.

★**Wis., Sparta**—Valecia Milk Co., 235-237 Washington Bldg., will build 2 story, 48 x 100 ft., brick, rein.-con. and steel condensory, rein.-con. flooring, concrete foundation. About $75,000. Work will be done by day labor.

★**Minn., Minneapolis**—Berman Bros., 227 North 1st St., let contract building 4 story, 84 x 105 ft. warehouse, on 9th Ave. and 3d St., to Pike & Cook, 415 South 5th St. About $82,000. Noted Aug. 21.

★**Minn., Minneaulis**—U. S. Cereal Co., 316 Corn Exch., let contract building 6 story, 64 x 108 ft. flour mill, to C. W. Lundquist & Co., 15th Ave., N. E. About $500,000. Noted June 26.

★**Neb., Omaha**—Hayden Bros., 16th and Dodge Sts., let general contract building 3 story, 22 x 133 ft. addition to warehouse, on 10th St. between Douglas and Dodge Sts., to M. P. Deverell, 435 Ry. Exch Bldg. About $420,000.

★**Mo., St. Louis**—Alligator Oil Clothing Co., 1118 South Grand Ave., let contract to Murch Bros. Constr. Co., Ry. Exchange Bldg., building 2 story, 60 x 80 ft., rein.-con. and brick factory, rein.-con. flooring, rock foundation, on Gravois Rd., also 2 story, 40 x 80 ft., rein.-con. and brick factory, rein.-con. flooring, rock foundation, on Bingham and Gravois Rds. Cost, $100,000 each.

Mo., St. Louis—Champion Shoe Machine Co., 3741 Forest Park Blvd., let contract

Industrial Works (Continued)

building 1 story addition to factory, at 3717 Forest Park Blvd., to J. Lawton, Jr., Overland. About $30,000.

★**Mo., St. Louis**—J. Flammang, 7250 Maryland Ave., let contract building 2 story, 65 x 100 ft. brick and concrete factory, rein.-con. flooring, to Murch Bros. Constr. Co., Ry. Exch. Bldg. About $100,000.

★**Mo., St. Louis**—Liberty System Corp., 2310 Locust St., let contract building 2 story, 65 x 450 ft. brick factory, to L. S. Callen, Clayton. About $145,000.

★**Mo., St. Louis**—St. Louis Basket & Box Co., Penrose and Buschmann Aves., let contract building 2 story, 92 x 235 ft., concrete, brick and steel factory, to Fruin-Colon Constr. Co., Merchants-Laclede Bldg. About $350,000.

★**Mo., St. Louis**—Sara Investment Co., 2611 Washington Ave., let contract building 5 story, concrete and brick factory, at 2625 Washington Ave., to J. Black Contg. Co., Wright Bldg. About $50,000.

★**Tex., Ft. Worth**—Chevrolet Motor Car Co., 1115 Throckmorten St., let contract building addition to plant, to Butcher, Sweeney & Friedman, 290½ West 8th St. About $500,000.

Tex., Ft. Worth—Ok-In Producing & Refining Co., Moore Bldg., will build brick and steel refinery. Work will be done by day labor under supervision of J. S. Blair, ch. engr., and J. T. Thompson, supt. of construction.

★**Tex., Houston**—Houston Lighting & Power Co., Capitol Ave. and San Jacinto St., let contract building extension to boiler house, to Horton & Horton, McKinney and Velasco Sts. About $75,000.

★**Ore., Portland**—Honeyman Hardware Co., 9th and Hoyt Sts., let contract building 1 story, 100 x 100 ft. and 2 story, 100 x 100 ft. addition to hardware houses, brick, to F. H. Miles, 420 Failing Bldg. About $100,000. Noted Sept. 4.

★**Ore., Portland**—Oregon Casket Co., 101 North 5th St., let contract to Dinwiddie Constr. Co., Yeon Bldg., building 2 story factory, brick and concrete, covering 2 blocks on 21st and Raleigh Sts., to include 4 dry kilns, boiler house and shed. First unit to cost $175,000, ultimate cost, $350,000.

★**Cal., Torrance** — Southern California Edison Co., Edison Bldg., Los Angeles, let contract building 3 story, 54 x 142 ft., rein.-con. electrical sub-station, to K. R. Bradley, 1925 East 16th St., Los Angeles, $60,000.

★**Que., Montreal**—Dominion Oil Cloth Co., 1192 St. Catherine St., let contract building 5 story, 42 x 100 ft., concrete, steel and brick warehouse, concrete foundation, on Parthenias St., to Church, Riess & Co., 10 Cathcart St. About $85,000.

★**Ont., Brantford**—Slingsby Mfg. Co., Ltd., 270 Mill St., let contract building 3 story, 60 x 100 ft. and 4 story, 50 x 80 ft., rein.-con. and brick woolen mill and dyehouse, rein.-con. flooring, concrete foundation, to P. H. Secord & Son, 133 Nelson St. About $200,000.

★**Ont., London**—Canadian Oil Co., Ltd., 2 Strachan Ave., Toronto, let contract building 3 story, 40 x 200 ft., brick and timber warehouse and stables, concrete foundation, to R. G. Wilson & Son, 193 College St., Toronto. About $60,000. Noted July 3.

★**Ont., Toronto**—Dale Furniture Co., 308 Yonge St., let contract building 3 story, 50 x 100 ft., rein-con. and brick warehouse, rein.-con. flooring, concrete foundation, to T. E. Essery, Confederation Life Bldg. About $60,000.

Buildings

PROPOSED WORK

Vt., Brattleboro—Theatre and Business—J. B. Manley, 28 High St., plans to build 3 story, 90 x 200 ft., on Main and High Sts. About $150,000. Architect not selected.

R. I., Olneyville (Providence P. O.)—Settlement—Polish Natl. Bldg. Assn. plans to build brick settlement house on Choffee and Appleton Sts. About $50,000. Architect not selected.

R. I., Providence—Bank—Citizens Savings Bank, 846 Westminster St., plans to build bank on Westminster and Cranston Sts. About $150,000. Clarke & Howe, 1208 Turks Head Bldg., archts.

Mass., Amherst — Memorial — Massachusetts Agricultural College having plans prepared by J. Ritchie, archt., 8 Beacon St., Boston, for 2 story, 60 x 100 ft. memorial building on campus here. About $150,000. Noted July 31.

Mass., Brookline—Hotel—D. Fineberg, Boston, having plans prepared by Desmond & Lord, archts., 15 Beacon St., Boston, for 8 story brick, rein.-con. flooring, concrete foundation, on Beacon St., here

Mass., Easthampton — Memorial — Town plans to erect victory building to include bowling alleys, billiards, basketball floor, gymnasium, reading and clubroms. About $100,000. Architect not selected.

Mass., Longmeadow (Springfield P. O.)—Church—St. Mary's congregation plans to build church on Longmeadow St. About $50,000. Architect not selected.

Mass., Springfield — Home — Salvation Army plans to build new home. About $60,000. Architect not selected. Address W. S. MacHoldt, 48 Bliss St.

★**Mass., Springfield**—Hospital—Hampden Hospital, 700 State St., plans to construct hospital ward building on State St. About $100,000. Architect not selected.

Conn., Ansonia — Armory — State purchased site on State St., here, and plans to build armory. About $150,000. Architect not selected.

Conn., Bridgeport—Church and School—First German-English Evangelical Lutheran Zion congregation, Grand St., having plans prepared by F. H. Beckwith, archt., Post Office Arcade, for altering and building addition to church and school, on Grand and Catherine Sts. About $50,000.

Conn., Bridgeport — Club — University Club, 232 Golden Hill St., plans to build clubhouse on Holden Hill St. About $100,000. Architect not selected.

Conn., Bristol—Club House—B. P. O. Elks, 126 South St., having plans prepared by E. H. Waterbury, archt., 60 Main St., Torrington, for 2 story brick and concrete addition, to include lodge room, social hall, bowling alleys and billiard room. About $50,000,

Conn., Milford — Dormitory—Rosenbaum School, Gulf St., plans to build brick dormitory on Gulf St. and New Haven Ave. About $75,000. Architect not selected.

Conn., New Britain—Church—C. C. Palmer, archt., 272 Main St., receives bids about Sept. 20, building 1 story, 70 x 120 ft. brick and steel, rein.-con. flooring, concrete foundation, on Franklin Sq., for Swedish Bethany congregation, Main and Walnut Sts. About $75,000. Noted June 19.

Conn., New Haven—Theatre—S. Landow & Co., 47 Commerce St., plans to build 55 x 60 x 150 ft. L shaped theatre, on Broadway and York St. About $200,000. Architect not selected.

Conn., New Haven—Y. M. C. A., 152 Temple St., having plans prepared by Murphy & Dana, archts., 311 Madison Ave., New York City, for 1 story brick, steel and concrete building on Chapel and Howe Sts., to include toilets, showers, lockers, gymnasium, etc. About $150,000. Noted May 29.

Conn., South Manchester—Business and Theatre—W. Rubinow, 997 Main St., plans to erect business and theatre building, on Main St. About $150,000. Architect not selected.

Conn., Storrs (Eagleville P. O.)—Dormitory—State Bd. Control, Hartford, plans to build temporary frame dormitory at Connecticut Agricultural College, here, to be used until permanent ones can be erected. About $50,000. Architect not selected.

Conn., Waterbury—Armory—State Legislature, Capitol, Hartford, plans to build armory on Field St., here. About $400,000. Address L. F. Burpee, State Capitol, Hartford. Architect not selected. Noted Apr. 24.

Conn., Waterbury—Bank and Office—Morris Plan Co., 68 Center St., having plans prepared by F. A. Webster, archt., 51 West Main St., for 3 story brick and concrete, rein.-con. flooring, concrete foundation, on Grand St. About $50,000.

Conn., Waterbury—Hospital—St. Mary's Hospital, Franklin St., had plans prepared by L. A. Walsh, archt., 51 Leavenworth St., for 2 story brick and steel addition, rein.-con. flooring, concrete foundation, on Cole St. About $60,000. Noted Feb. 27.

N. Y., Brooklyn—Memorial—Y. M. C. Assn., New York City, soon receives bids building 4 story, 50 x 80 ft. brick, steel and stone, brick foundation, at Erie Basin here. About $55,000. J. F. Jackson, 47 West 34th St., New York City, archt. P. J. Piatti, 47 West 34th St., New York City, engr.

N. Y., Brooklyn—Store and Office—Schulte Realty Co., 386 Bway., New York City, soon lets contract constructing 2 story, brick and steel, brick foundation, on Fulton, Pearl, Willoughby and Adams Sts. About $70,000. F. P. Platt & Bros., 1123 Bway., New York City, archts. and engrs.

N. Y., Brooklyn — Theatre — M. Loew Enterprise, 1492 Bway., New York City, plans to build brick, steel and stone, brick foundation, on Bway. and Gates Ave., here. About $300,000. T. W. Lamb, 644 8th Ave., New York City, archt.

N. Y., New York—Dormitories—R. D. Kohn, archt. and engr., 56 West 45th St., soon lets contract altering two 3 story, 50 x 75 ft., and building two 3 story, 27 x 56 ft. and 41 x 152 ft. additions, brick and steel, brick foundation, for United Odd Fellows Home, Havemeyer Ave. About $125,000.

N. Y., New York—Sales and Offices—H. Collins, 9 East 57th St., having plans prepared by Renwick, Aspinwall & Tucker, archts. and engrs., 8 West 40th St., altering 5 story brick and steel building, on Park Ave. and 57th St. About $50,000.

N. Y., New York—School—Bd. Educ., 500 Park Ave., having plans prepared by C. B. J. Snyder, archt. and engr., Muncipal Bldg., for 5 story, 59 x 112 ft., brick and steel, brick foundation, at 201-207 Hester St. About $375,000.

N. Y., New York—Theatre and Office—M. Loew Enterprise, 1492 Bway., having plans prepared by T. W. Lamb, archt., 644 8th Ave., for 16 story, 50 x 120 x 180 ft., brick, steel and stone, concrete foundation, on Bway. and 45th St. About $1,000,000.

N. Y., Syracuse—Stores and Offices—S. F. Hancock, Onondaga Co. Saving Bank Bldg., plans to build 3 or 4 story, 66 x 148 ft., brick and steel, on South Salina St. About $60,000. W. A. Schuyler, 647 South Warren St., agt.

N. J., Hoboken—High School—City having plans prepared for 4 story, on Hudson and 10th Sts. About $250,000. J. Lewis, clk. bd. educ.

N. J. Trenton—Club House—Knights of Columbus, 221 North Warren St., plans to build club house. About $150,000. J. J. Cleary, 510 West State St., chn. J. O. Hunt, 114 North Montgomery St., archt.

Pa., Chester—C. W. Brazer, archt., Crozer Bldg., soon receives bids constructing 3½ story, 60 x 60 ft., brick, stone and terra cotta building on 9th and Welsh St., for Knights of Columbus, care of archt. About $65,000.

Pa., Chester—Theatre and Stores—Nixon & Nirdlinger, 16th and Walnut Sts., Phila., having plans prepared by H. C. Hodgens, archt., 130 South 15th St., Phila., building 1 story, 150 x 180 ft., brick, here About $100,000.

Pa., Easton—Church and Sunday School—Second Methodist congregation having plans prepared by G. E. Savage, archt., Witherspoon Bldg., Phila., for 2 story, 69 x 115 ft., granite. Cost to exceed $50,000.

Pa., McKeesport—Y. M. C. A. having plans prepared by Jallade & Lindsey, archts., 37 Liberty St., New York City, constructing 4 story, 112 x 170 ft., rein.-con. building, rein.-con. flooring, concrete foundation, on Sinclair and Ringold Sts. About $300,000.

Pa., Phila.—Hospital—St. Luke's Hospital, Wingohocking and Broad Sts., having plans prepared by C. A. Zeigler, archt., 1518 Chestnut St., for 5 story, 40 x 90 ft., brick and stone addition. Cost to exceed $50,000.

Pa., Phila. — Theatre — Felt Bros., 140 South 52nd St., having sketches prepared by H. C. Hodgens, archt., 130 South 15th St., for 1 story, brick, on Market and 52nd Sts. Cost to exceed $50,000.

Pa., Williamsport—Bd. Dirs. Y. M. C. A. plans to construct 4 story, 170 x 200 ft., steel, rein.-con. and brick building on West 4th, Elmira and Neece Sts. About $100,000. J. B. Graham, pres. Architect not selected.

Md., Baltimore — Bank — Natl. Exch. Bank, Baltimore and Liberty Sts., having plans prepared by J. E. Spery, archt., 409 Calvert Bldg., remodeling and building 2 story, 40 x 80 x 80 ft., tile and marble addition. About $100,000.

Md., Baltimore — Store — Bernheimer Bros., 302-6 West Fayette St., plans to build 12 story, 40 x 70 ft., concrete and brick addition, concrete foundation. About $75,000. Architect to be announced later.

Md., Curtis Bay (Baltimore P. O.)—Bank—Industrial Bank of Baltimore, Munsey Bldg., Baltimore, and others, plan to build bank opposite Curtis Bay Hotel, here. About $50,000. J. H. Preston, pres.

W. Va., Romney—Dormitory—State Bd. Control, Charleston, having plans prepared by J. R. Warne, archt., Masonic Temple Bldg., Charleston, for 2 story, brick dormitory, at State School for Deaf and Blind, here. About $75,000.

Buildings (Continued)

O., Chillicothe—Office—T. E. Franklin plans to build 3 story, 45 x 62 ft., fireproof. About $55,000. C. L. Inschho, Brunson Bldg., Columbus, archt.

O., Cleveland—Chapel — Schauffler Missionary Training School, 5111 Fowler Ave., having plans prepared by C. W. Hopkinson, archt., 900 Rose Bldg., for 1 story, 41 x 105 ft., rein.-con., steel and brick, on Bway. Ave. About $60,000. Noted Sept. 4.

O., Cleveland—Hospital—St. Luke's Hospital, 6606 Carneigie Ave., plans to build 6 story, 160 x 200 ft., rein.-con., steel and brick, on Baldwin and Fairmount Rds. About $800,000. Architect not selected.

O., Cleveland—Office—C. W. Hopkinson, archt., 900 Rose Bldg., preparing plans and soon receives bids building 3 story, 70 x 135 ft., rein.-con., steel and brick addition, for H. P. McIntosh, Euclid Ave. About $150,000. Noted Sept. 4.

O., Columbus—Salesroom—See "Industrial Works."

O., Dayton—Theatre—J. Siefert plans to extend and remodel Majestic Theatre, 2 story, on South Jefferson St. About $60,000. Architect not selected.

O., Fairfield—School—City plans election in November to vote on $100,000 bonds to build 3 story, rein.-con. and brick, concrete foundation.

Mich., Bay City—High School—Bd. Educ. having plans prepared by Pratt, Bickel & Campbell, archts., 514 Crapo Blk., and Perkins, Fellows & Hamilton, 814 Tower Court, Chicago, archts., for 3 story, rein.-con., steel, brick and stone, rein.-con. flooring, concrete foundation, on Columbus Ave. About $1,000,000.

Mich., Grand Rapids—Hospital—Grand Rapids Tuberculosis Hospital having plans prepared by Robinson & Campbell, archts., Grand Rapids, for hospital group, consisting of 4 story, 50 x 170 ft. main building and 2 story, 50 x 100 ft. home for nurses, rein.-con., steel and brick, concrete foundation. About $400,000.

Mich., Oakwood—(Oxford P. O.)—School—Bd. Educ. rejected bids received Aug. 15, building 2 story, rein.-con., brick and steel. Work will be readvertised. About $230,000. Van Leyen, Schilling & Keough, Union Trust Bldg., Detroit, archts. Noted Aug. 7.

Ill., Alton—Courthouse, etc.—Bd. Pub. Serv. soon receives bids for brick and concrete courthouse and city hall building. About $588,000. Architect not selected.

Ill., Alton—Theatre and Hotel—Dickens Hotel & Bldg. Corp. plans to build 14 story brick, concrete and steel, rein.-con. flooring, rock foundation, on Main and High Sts. About $200,000. H. B. Wangelin, pres. Architect not selected.

Ill., Chicago—Theatre—Balaban & Katz, 3535 West 12th St., having preliminary plans prepared by C. W. and G. L. Rapp, archts., 190 North State St., for 2 story, 160 x 170 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation, on State and Lake Sts. About $1,500,000.

Ill., East St. Louis—Memorial—Soldiers, Sailors and Marines Memorial Assn. having plans prepared for memorial building. About $100,000. Address L. Browning, secy.

Wis., Ashland — Bank — Ashland Nat'l. Bank plans to remodel 3 story, 50 x 140 ft., brick and stone. About $60,000.

Wis., Fond du Lac—Club and Stores—Loyal Order of Moose having plans prepared by B. F. Mehner, archt., 6 East Division St., for 3 story, 80 x 102 ft., brick and stone. About $50,000. Noted June 12.

Wis., Lancaster—School—Bd. Educ. plans to build 2 story school. About $175,000. Architect not selected.

Wis., Manitowoc—Hospital—City plans to build 3 or 5 story, 60 x 180 ft., brick, rein.-con., tile and steel, brick foundation. About $60,000. Architect not selected.

Wis., Milwaukee—Hotel—J. G. La Vies, archt., 714 Merrill Bldg., preparing plans for 4 story, 80 x 150 ft., brick and concrete. About $200,000. Owner's name withheld.

Wis., Milwaukee — Office—Standard Oil Co., Brumder Bldg., having plans prepared by A. D. Koch, archt., 1045 Wells Bldg., building 4 story, 75 x 150 ft. steel and brick. About $300,000.

Wis., Milwaukee — School, Dormitory—Big Sisters Home, c/o J. G. La Vies, archt., 714 Merrill Bldg., having plans prepared for 3 story, 50 x 100 ft., rein.-con. and brick. About $80,000.

Wis., Shawano—Hospital—Shawano Hospital having sketches made by E. M. Kolsen, archt. Citizens' Bank Bldg., for 2 and 3 story, 80 x 153 ft., rein.-con., brick and tile. About $100,000.

Wis., Sheboygan—Store and Office—A. Imig, North 8th St., plans to build 3 story, 60 x 90 ft., brick, rein.-con and steel, brick foundation. Cost between $50,000 and $60,000. Architect not selected.

Wis., Union Grove — Institution—State Bd. Control, Capitol Bldg., Madison, having preliminary plans prepared by A. Peabody, Capitol Bldg., Madison, constructing brick and concrete institution buildings, here. About $644,000. M. J. Tappins, secy.

Wis., Waupun—Hospital—State Bd. Control, Capitol Bldg., Madison, having plans prepared by A. Peabody, state archt., for addition to state hospital, here. About $100,000. M. J. Toppins, secy.

Wis., Waupun—Prison—State Bd. Control, Madison, having plans prepared by A. Peabody, archt., Capitol Bldg., Madison, remodelling and building 2 story, brick and concrete addition to prison here. About $80,000. M. J. Toppins, secy.

Ia., Marshaltown—City Hall—City election Sept. 15, to vote on $50,000 bonds to build new city hall. O. A. Rosengren, city clk.

Minn., Nopeming — Infirmary — A. L. Laird, secy. St. Louis Co. Tuberculosis Comn., rejected bids building 4 story, 45 x 350 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $240,000. Holstead & Sullivan, Palladio Bldg., Duluth, archts. and engrs. Noted July 24.

Minn., Thief River Falls—Bank and Stores—First and Peoples State Bank rejected bids received Aug. 23, building 2 story bank and 1 story store, rein.con. and brick. About $52,000. Sund & Dunham, Esssex Bldg., Minneapolis, archts. Work indefinitely postponed. Noted Aug. 14.

Kan., Eldorado—Memorial—City c/o L. E. Foley, city clk., rejected bids building 2 story, 75 x 135 ft. rein.-con., steel and brick, rein.-con. flooring, rock foundation. About $100,000. G. P. Washburn & Sons, Ottawa, archts. Noted Aug. 7.

Kan., Haven—School—Bd. Educ. having plans prepared by Mann & Gerow, archts., Hutchinson, building 2 story, concrete, steel and brick, rock foundation. About $60,000. Noted Aug. 21.

Kan., Norwich —School—Bd. Educ. having plans prepared by Mann & Gerow, archts., Hutchinson, for 2 story, rein.-con. steel and brick, concrete foundation. About $60,000.

Kan., Ottawa —Auditorium —City rejected bids building 2 story, 75 x 130 ft. rein.-con., steel and brick, rein-con. flooring, rock and concrete foundation. About $90,000 G. P. Washburn & Sons, Ottawa, archts. Noted Aug. 7.

Neb., Omaha—Stores and Office—G. W. Smith, Warrenton Park, Glen Cove, Me., plans to build 10 story, 66 x 132 ft., rein.-con. and pressed brick, on 10th and Harney Sts., here. About $250,000. H. M. Christle, 1320 Farnam St., local representative. Architect and engineer not selected.

S. D., Rapid City—Court House—Pennington Co plans election soon to vote on $1,000,000 bonds to build court house.

Mo., St. Louis—Assembly Hall and Auditorium—Assembly Hall Co. having plans prepared building 2 story, brick, concrete and timber, to include stores and cafe, on Market St. About $200,000. Address R. D. Barrett, c/o Water License Division, City Hall, or W. H. King, c/o company.

Mo., St. Louis—Cathedral—W. B. Ittner, archt., Bd. Educ. Bldg., soon receives bids building 80 x 200 ft., rein.-con., stone, terra cotta, steel and brick, marble flooring, rock foundation, on Lindell Blvd., for Scottish Rite Assn., LaSalle Bldg. About $1,500,000. Noted July 10.

Mo., St. Louis—Hotel—C. H. Mills, archts., Chemical Bldg., soon receives bids building 12 story, 300 x 350 ft. brick, concrete and steel, marble and tile flooring, rock foundation on 18th and Locust Sts., for C. F. Levy, 4721 Westminster Pl. About $1,000,000.

Mo., St. Louis—Mercantile and Store—Olive Realty Co., 4166 Olive St. plans to build 2 story. About $50,000. Architect not selected.

Mo., St. Louis—School—St. Louis Anti-Tuberculosis Society, 9500 South Bway., has acquired site and plans to build school. About $50,000. Architect not selected.

Mo., St. Louis—School—J. J. Glennon, archbishop of St. Louis, plans to build parochial school on Belt and Maffitt Aves. About $50,000. J. S. Lee, 915 Olive St., engr.

Tex., Dallas—High School—School Bd. plans to build high school. About $100,000.

Tex., Dallas—Theatre—S. A. Lynch plans to build theatre on Elm and Akard Sts. About $500,000.

Tex., El Paso—Library, Schools, etc—City election Oct. 4 to vote on $895,000 bonds; $220,000 to be used to build schools, and $25,000 for library, etc. J. N. Gladding, city engr. Noted Aug. 14.

Tex., Junction City—Bank and Office—Junction State Bank having plans prepared by Adams & Adams, archts., Gibbs Bldg., San Antonio, building 2 story, 68 x 110 ft. W. P. Riley, pres.

Tex., Ranger—Business—Neal & Hodges plan to build 3 story, on Main St. About $175,000.

Okla., Muskogee — High School — City plans election to vote on $230,000 bonds to build high school, on Main St. Architect and engineer not selected.

Okla., Muskogee—Temple—Masonic Assn. plans to build masonic temple on Main St. About $200,000. Architect and engineer not selected.

Okla., Oklahoma — Hospital — Salvation Army plans to build 3 story, 80 x 130 ft., maternity hospital. About $75,000. Architect and engineer not selected.

Okla., Poteau —High School—City plans election to vote on $61,000 bonds to build high school. Architect and engineer not selected.

Okla., Tulsa—Armory—City has launched campaign to raise $150,000 to build 1 story, armory on Cincinnati St. between 4th and 5th Sts., for National Guard. F. W. Bryant, Central Natl. Bank, chn. of com.

Utah, Fillmore — Court House—Millard Co. election Sept. 23 to vote on $50,000 bonds to build court house.

Utah, Salt Lake City—Hospital—Mormon Church having plans prepared by Cannon & Fetzer, archts. and engrs., Templeton Bldg., for 6 story, 45 x 120 ft. hospital on 8th Ave. About $2,00,000.

Ariz., Chandler — High School—School Trustees soon receive bids building 2 story, brick, concrete foundation, to include administration, commercial, science and domestic science departments. About $125,000. Allison & Allison, Hibernian Bldg., Los Angeles, Cal., archts. Noted May 1.

Wash., Seattle — Hotel — Bowman Co., Biltmore Hotel, Madison Ave. and 43d St., New York City, plans to build steel, brick and stone, brick foundation, here. About $6,000,000. Warren & Wetmore, 16 East 47th St., New York City, archts. and engrs.

Wash., Seattle—Store—J. S. Graham & Co., 2nd and Spring Sts., having plans prepared by A. E. Doyle, Worcester Bldg., Portland, and A. Merriam, Seattle, archts., for 4 story, concrete, steel and terra cotta, concrete foundation. About $250,000. Noted May 29.

Wash., Seattle—Theatre—H. W. Bruen, c/o Majestic Theatre, 2044 Market St., plans to build 1 story, 60 x 103 ft., steel and brick, rein.-con. flooring, on University Ave. About $55,000. E. W. Houghton, Library Exch. Bldg., archt.

Wash., Tacoma—Theatre—R. R. Pratsch, 5830 South Lawrence St., having plans prepared by Lindberg & Mahon, archts., Provident Bldg., for 1 story, concrete and brick, concrete foundation. About $50,000.

Ore., Portland Home—Waverly Baby Home plans to build 2 story brick home, to include dormitory, glass inclosed sun porches, pavilion, reinforced record vault, detention wards, etc. About $70,000. F. S. Akin, Bway. Bldg., secy. Private plans.

Ore., Portland—Hospital—Emanuel Hospital, Commercial Ave., plans to build new 3 or 4 story brick hospital on Commercial Ave. between Graham and Stanton Sts., brick and concrete foundation. About $1,000,000. A. M. Green, 200 Graham St., supt. Architect not selected.

Cal., Long Beach—City Hall—City voted $400,000 bonds to build city hall. Architect not selected.

Cal., Long Beach—Austin & Mayberry, archts., 468 Pacific Electric Bldg., Los Angeles, receives bids about November constructing 3 story, 90 x 150 ft. brick building, concrete foundation on American Ave., here, for Y. M. C. A. About $150,000. Noted June 19.

Buildings (Continued)

Cal., Long Beach—Schools—City plans election to vote on $150,000 bonds to build addition to high school and $340,000 bonds to build two 10 room grade schools and 8 room additions to 2 grade schools, etc. G. W. Scott, secy. Architect not selected.

Cal., Norwalk—Hospital—State Bd. Control, Sacramento, having plans prepared for improvements at State Hospital, here, as follows: cottages for patients, $150,000, officers' quarters and dining room, $45,000, steel water tower and tank, $20,000. W. F. McClure, state engr. Noted May 8.

Cal., Oakland — Memorial — A. Davie, mayor, appointed War Memorial Com., and plans to build memorial building near Lake Merritt, for soldiers and sailors. Cost between $300,000 and $350,000.

Cal., Oakland—Welfare and Administration—See "Industrial Works."

Cal., Richmond—Bank—Mechanics Bank of Richmond plans to build 1 story, 45 x 80 ft. About $60,000. A. Downer, pres.

Cal., Santa Rosa—Bank and Store—Santa Rosa Savings Bank having plans prepared by Reed & Corlett, archts., Bank of Savings Bldg., Oakand, for 1 story rein.-con. and terra cotta. About $75,000.

Cal., Ventura—School—State Bd. Control, Sacramento, having plans prepared for improvements to California School for Girls, here, as follows: cottages, $110,000, farm buildings, $5000 and ground improvements, $5000. W. F. McClure, state engr. Noted May 8.

Cal., Whittier—School—State Bd. Control, Sacramento, having plans prepared for improvements to State School for Boys, here, as follows: buildings, $64,000, repairs and equipment, $28,500. W. F. McClure, state engr. Noted May 8

Que., Montreal — Theatre — Phillips Sq. Theatre Co., Ltd., plans to build 50 x 105 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Phillips Sq. About $300,000. Architect not selected.

Ont., Oshawa—School—Bd. Educ. having plans prepared by S. B. Coon & Son, archts., 36 Toronto St., Toronto, for 2 story, steel and brick addition, concrete foundation. About $60,000.

Ont., Toronto — Office — See "Industrial Works."

Ont., Toronto—Office—Imperial Bank of Canada, 32 Wellington St., E., having plans prepared by Darling & Pearson, archts., 2 Leader Lane, for 28 story, 40 x 110 ft., steel and brick, tile flooring, rock and concrete foundation, on King and Yonge Sts. About $2,000,000. Noted June 19.

Ont., Toronto — Restaurant—Fairweathers, Ltd., Yonge St., having plans prepared by Denison & Stephenson, archts. and engrs., Confederation Life Bldg., altering present 3 story, 80 x 150 ft. store building and converting same into restaurant. About $150,000.

Ont., Toronto—Show Room—See "Industrial Works".

Ont., Toronto—Theatre and Office—J. and J. Allen plan to build 7 story, brick and limestone, brick foundation. About $1,000,000. C. H. Crane, Toronto, archt. and engr.

Ont., Windsor—Bank and Office—Imperial Bank of Canada, 32 Wellington St. E., Toronto, having plans perpared by C. S. Cobb, archt., 71 Bay St., Toronto, building 3 story, 50 x 80 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, here. About $75,000. Noted May 1.

Sask., Moose Jaw—Hospital—City Council having plans prepared for 4 story, 80 x 162 ft., concrete, steel and brick, concrete foundation, on Main St. About $110,000.

Alta., Cardston—Hospital—Town voted $75,000 by-law to build memorial hospital, 4 story, 75 x 100 ft., steel and brick, concrete foundation, on King St. Architect not selected.

BIDS DESIRED

N. Y., Brooklyn—Hospital—Until Sept. 25, by Cohn Bros., archts. and engrs., 361 Stone Ave., building 2 story, 50 x 60 ft. brick, steel and stone, brick foundation, on Howard and Dumont Aves., for Maternity Hospital Society, 1666 Pitkin Ave. About $65,000. Noted May 8

Pa., New Brighton—School—Bd. Educ. receiving bids building 2 story, 82 x 98 ft. and 3 story, 91 x 135 ft., rein.-con., steel and brick high school, rein.-con. flooring, brick, rock or concrete foundation, on Pierce and East 4th Sts., to include gymnasium and auditorium. W. G. Eckles, Lawrence Savings & Trust Bldg., New Castle, archt.

Pa., Norristown — Hospital—Until Sept. 17, by H. G. McMurtrie, archt., 1012 Walnut St., Phila., building 3 story, 45 x 60 ft brick annex to State Hospital for Insane, here.

Pa., Phila.—Bank—W. C. Furber, archt., 418 Walnut St., receiving bids building 6 story, 16 x 80 x 33 x 100 ft. addition to bank for Central Trust Co., 4th and Market Sts., steel, stone and terra cotta. About $50,000. Noted Aug. 14.

Pa., Phila.—Stations—Until Sept. 16, by Dept. City Transit, 1211 Chestnut St., building stations of brick, steel and rein.-con. for Frankfort Elevated Railway at southeast corner of Kensington Ave. and Tioga St., and at northwest corner of Tioga and K Sts., including removal of existing building at northwest corner of Tioga and K Sts., Contr. No. 556; building brick, steel and rein.-con. at southeast corner Kensington Ave. and Huntingdon St. and at corner of Kensington Ave. and B St., including removal of existing buildings, Contr. No. 558. G. T. Atkinson, asst. dir.,

Mich., Adrian—School—Until Sept. 20, by P. Dederichs, archt., 501 Chamber of Commerce Bldg., for 3 story, 69 x 136 ft. brick, stone and frame, concrete foundation, for St. Josephs Academy.

Mich., St. Louis—School—Until Sept. 15, by M. E. Hull, secy. bd. educ., building 2 story, 80 x 107 ft. brick, stone and steel addition, concrete foundation. About $50,000. Cowles & Mutscheller, Chase Bldg., Saginaw, archts. Noted Aug. 28.

Ill., Rochelle—Temple—E. F. Roberts, archt., 105 North Clark St., Chicago, receiving bids for 2 story, 45 x 90 ft. brick and timber, concrete foundation, for Rochelle Masonic Temple Assn., c/o architects. About $50,000.

Wis., Timothy—School—Until Sept. 15, by Joint Dist. No. 5, building 2 story, 60 x 125 ft., rein.-con. and brick, rein.-con. flooring, brick foundation, on Main St. About $50,000. W. J. Raeuber, Teitgen Bldg., 8th and Jay Sts., Manitowoc, archt.

Ia., Mt. Pleasant—High School—Until Oct. 1, by C. Van Russell, secy. bd. educ., for remodeling Y. M. C. A. building into high school, brick and terra cotta. About $80,000. G. L. Lockhart, 391 Endicott Bldg., St. Paul, Minn., archt.

Minn., Biwabik—High School—Until Sept. 30, by L. R. Christensen, secy. bd. educ., building 2 story, 100 x 100 ft., rein.-con., brick and steel addition, rein.-con. flooring, concrete foundation, on Main St. About $100,000. C. C. Nystram, Palladio Bldg., Duluth, archt. and engr.

Minn., Bronson—School—Sund & Dunham, archts., Essex Bldg., Minneapolis, receiving bids for 2 story, 57 x 80 ft., rein.-con. and brick, for Bd. Educ. About $50,000.

Minn., Owatonna—Grade School—Bd. Educ., receiving bids for 2 story, 38 x 94 ft., rein.-con. and steel. About $60,000. Jacobson & Tustison, Auditorium Bldg., Minneapolis, archts.

Minn., Rochester—Clinic—Until Sept. 20, by A. C. Fawcett, building 5 story, 46 x 142 ft., dental clinic, rein.-con. and brick. About $300,000. F. M. Mann, Metropolitan Life Bldg., Minneapolis, archt. Noted July 24.

Kan., Eldorado—High School—Until Sept. 22, by School Bd., building 2 story, 100 x 170 ft. rein.-con., steel and brick, rein.-con. flooring, rock and concrete foundation. About $175,000. W. H. Simon, Eldorado, archt.

Neb., Omaha—Hospital—Until Sept. 20 (change of date), by J. Latenser & Sons, archts., 632 Bee Bldg., building 6 story, 106 x 120 ft., rein.-con., brick and terra cotta trimmings, on 26th St. and Dewey Ave., for E. C. Henry, c/o Lister Hospital, 14th St. and Capitol Ave. About $300,000. Noted July 10.

S. D., Winner—School—Until Nov. 23, by C. H. Virning, pastor, Immaculate Conception congregation, building 2 story, 60 x 60 ft. brick and stone. About $51,000. G. Isenhuth, Sauer Blk., Huron, archt.

Mont., Butte—Metallurgical—Until Sept. 20, by State Bd. of Examiners, Helena, constructing 2 story, 75 x 125 ft. building. About $200,000. F. Hamill, 409 Lewisohn Bldg., archt.

Mo., Fulton—Dormitory—Until Oct. 1, by M. F. Pell, associated archt., Fulton, building 3 story, brick, for W. Wood College. About $75,000. Holmes & Flinn, 5 Dearborn St., Chicago, Ill., archts.

Mo., St. Louis—Mercantile—Until Sept. 15, by P. J. Bradshaw, archt., International Life Bldg., building 7 story, 90 x 150 brick and concrete, rock foundation, for Blackwell-Wielandy Stationery Co., 16th and Locust Sts. About $350,000

Colo., Arvada—High School—Until Sept. 20, by H. W. J. Edbrooke, archt., Tabor Opera Bldg., Denver, building 2 story, 60 x 125 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $70,000. Noted Aug. 14.

Utah, Salt Lake City—School—Until Sept. 15, by Bd. Educ. building addition to Irving School. About $60,000. F. D. Rutherford, Vermont Bldg., archt. and engr.

Utah, Salt Lake City—Schools—Until Sept. 20, by Bd. Educ. building addition to Hamilton School, cost $60,000, and addition to Jackson School, $80,000. Ware & Treganza, Utah Saving & Trust Bldg., engrs. and archts.

Utah, Salt Lake City—School—Until Sept. 20, by Bd. Educ., building Grant School. About $80,000. Pope & Burton, New House Bldg., archts. and engrs.

Utah, Salt Lake City—School—Until Sept. 30, by Bd. Educ., building South Junior High School, 2 story, 66 x 20 ft., with 35 x 75 ft. wing, rein.-con. and brick, cost $175,000, also Jordan Junior High School, on Ontario and 6th Sts., W., 2 story, 66 x 135 ft., rein.-con. and brick, $100,000. Scott & Welch, Dooley Bldg., engrs. and archts.

Cal., San Francisco—Civic Centre—Until Sept. 22, by W. F. McClure, state engr., Forum Bldg., Sacramento, for (a) complete granite work and setting of same, (b) complete concrete work, brick work and ornamental terra cotta and rough carpentry work, (c) complete excav. work, (d) furnishing all materials and labor and doing work required for complete fabrication and delivery and erection of structural steel and iron work for Civic Centre building. Separate bids will be received on each section. About $1,000,000. Noted Aug. 21.

Ont., Toronto—Anatomy—Until Sept. 22, by Darling & Pearson, archts., 2 Leader Lane, for 2 story, 80 x 150 ft., concrete, steel, brick and stone, tile flooring, concrete foundation, at Queens Park, for University of Toronto. About $200,000.

Ont., Toronto—School—Until Sept. 17, by W. C. Wilkinson, 155 College St., building 2 story, concrete, steel and brick addition to school on Raleigh Ave., concrete foundation, for Bd. Educ. About $80,000. Page & Warrington, 199 Yonge St., archts.

Ont., Toronto—Store—Until Sept. 22, by W. Steele & Sons, archts. and engrs., Ryrie Bldg., building 7 story, 60 x 215 ft., rein.-con., steel and brick, rein.-con. and tile flooring, concrete foundation, on Yonge St., for Adams Furniture Co., 26 Queen St., E. About $250,000. Noted July 17.

Man., Selkirk—College—Until Sept. 24, by Secretary Bd. School Trustees, building 3 story, 50 x 70 ft., steel and brick, concrete foundation, on Church St. About $62,000. Architect not selected.

Sask., Yorkton—Hospital—Until Sept. 19, by Mayor, building 3 story, 50 x 54 ft. brick, concrete foundation, on John St. About $60,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston** — Office — Henderson & Ross, 148 State St., let contract building 11 story, rein.-con. and steel, rein.-con. and limestone flooring, concrete foundation, at Post Office Sq., to J. J. Prindeville, Framingham. About $750,000.

★**Mass., Boston**—Office—E. L. Snider, 18 Tremont St., will build 6 story, 100 x 150 ft., rein.-con. and brick, office and garage, rein.-con. flooring, tiles and concrete foundation, on Chardon St. About $200,000. Work will be done by day labor.

★**Mass., Fall River**—Office—See "Industrial Works."

Mass., Worcester — Hospital — City received bids Aug. 30, building 2 story, 33 x 149 ft., brick, concrete foundation, on Belmont St., from J. J. Roberts, 4 Wall St., $106,343; G. W. Carr Co., 518 Main St., $110,670; L. Rocheford & Son, 44 Front St., $112,000. Noted Aug. 14.

★**Conn., Groton**—School—Town let contract building 1 story, 65 x 100 ft. brick school, wood flooring, concrete foundation, to H. Wales Lines Co., 134 State St., Meriden. About $50,000. Noted July 24.

★**Conn., Hartford** — Church—F. W. Parsons, archt., 1133 Bway., New York City, let contract to R. F. Jones, 36 Pearl St. building 2 story brick church, concrete foundation, on Albany Ave., to include auditorium, gymnasium, bowling alleys, swimming pool, etc., for North Methodist congregation, Albany Ave. and Woodland St. About $65,000. Noted June 19.

Buildings (Continued)

★**Conn., Hartford**—Hotel—N. Carabillo, 5 Edwards St., will build 5 story, 120 x 130 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, to include restaurant, dance hall, etc., on Jewell Ct. About $225,000. Work will be done by day labor. Noted Aug. 14.

★**Conn., Litchfield** — Church—Rossiter & Muller, archts., 15 West 38th St., New York City, let contract to H. Wales Lines Co., 134 State St., Meriden, for 1 story stone and terra cotta, concrete foundation, on Main St., for St. Michael's Protestant Episcopal congregation. About $100,000. Noted Aug. 21.

★**Conn., Manchester**—Business—House & Hale, 955 Main St., let contract building 2 story, 34 x 108 ft., brick and steel addition, concrete foundation, on Main St., to Ellison Constr. Co., 60 Prospect St., Hartford. About $50,000.

★**Conn., New Haven**—Business—W. L. Lines, 840 Elm St., let contract building 3 story, 30 x 134 ft. brick and steel, concrete foundation, on Church St., to [illegible] Bussey-Kusterer Co., 116 Church St. About $50,000.

★**Conn., South Manchester**—Business—C. E. House & Sons, 955 Main St., let contract building 2 story, 34 x 108 ft., brick and steel addition, rein.-con. flooring, concrete foundation, on Main St., to Ellison Constr. Co., 96 Wellington Ave., Hartford. About $50,000.

★**N. Y., Brooklyn**—Bank—Greater New York Savings Bank, 5th Ave. and 12th St., let contract building 2 story, 60 x 100 ft. brick, steel and stone, brick foundation, on 5th Ave. and 9th St., to Caye Constr. Co., 299 Bway., New York City. Noted Aug. 21.

★**N. Y., Brooklyn**—Exchange—New York Telephone Co., 15 Dey St., New York City, let contract building 4 story, 60 x 120 ft., brick and limestone, brick foundation, on Liberty Ave. and Milford Pl., to Gillies-Campbell, 101 Park Ave., New York City. About $200,000.

★**N. Y., Brooklyn**—Store—See "Industrial Works."

★**N. Y., Brooklyn**—Theatre—Avondale Bldg. Corp., c/o Shampan & Shampan, archts., 50 Court St., will build 90 x 210 ft. brick and steel, brick foundation, (2500 seating capacity), on Kings Highway, Coney Island Ave. and East 12th St. About $250,000. Work will be done by day labor. Noted June 5.

★**N. Y., Corona** — Theatre — Sheer's Amusement Co. will build 1 story brick and terra cotta, brick foundation, on Continental and Queens Blvds. About $100,000. Work will be done by day labor.

★**N. Y., S. I., Dongan Hills**—School—C. B. J. Snyder, supt. school bldgs., Municipal Bldg., New York City, let contract to J. MacArthur, 120 Bway., New York City, building P. S. No. 11, on Jefferson Ave., between Garretson and Cromwell Aves., Richmond Boro., for Bd. Educ., $179,424. Noted Sept. 4.

★**N. Y., New Rochelle**—Studio—D. W. Griffith, 1476 Bway., New York City, will build 1 story, 150 x 200 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation, here. About $500,000. Work will be done by day labor under supervision of R. B. Smith, archt. and engr., 50 East 42nd St., New York City.

★**N. Y., New York**—Office—Lords Court Bldg. Co., Exch. Pl. and William St., let contract altering 19 story brick and steel, to J. O. Whitenack, 231 West 18th St. About $60,000.

★**N. Y., New York**—Stores—Gaines & Roberts, Morris Ave. and Fordham Rd., will build 1 story, 85 x 95 ft. and 45 x 95 ft. brick, brick foundation. About $50,000. Work will be done by day labor.

★**N. Y., New York**—Store and Loft—A. Levingson, archt. and engr., 405 Lexington Ave., let contract to Smith & Stone Contg. Co., 25 West 42nd St., for 3 story, 60 x 100 ft., brick and steel, brick foundation, at 42-46 West 33rd St., for St. Regis Lunch Co., c/o architect. About $80,000. Noted July 31.

★**N. J., Convent**—Club—Morris Co. Golf Club let contract building 3 story, brick, steel and stone, brick foundation, to Hegeman-Harris Co., 33 West 42nd St., New York City. About $75,000.

★**N. J., Newark**—Exchange—New York Telephone Co., 15 Dey St., New York City, let contract building 3 story, 100 x 200 ft., on South Orange and Morris Aves., to Union Bldg. Co., Union Bldg. About $100,000.

★**N. J., New Brunswick**—Theatre—Hyjel Co., 40 Paterson St., let contract building 2 story, 150 x 150 ft., brick, limestone and terra cotta, brick foundation, to Fleischmann Constr. Co., 531 7th Ave., New York City. About $250,000.

★**Pa., New Boston**—School—Bd. Educ. let contract building 2 story, 60 x 94 ft., brick, to A. Dreslin, Summit Hill. About $50,000.

★**Pa., Williamsport**—Schools—Bd. Educ. let contract building Curtin School, 3 story, 100 x 120 ft., concrete, brick, steel and stone, at Brandon Park, to Shamokin Lumber & Contg. Co., Shamokin, $189,271; 3 story, 100 x 120 ft., concrete, brick, steel and stone, on Wayne Ave. and Newberry St., to H. Mailander, Wilkes-Barre, $188,385; plumbing for both buildings, to H. W. Wood & Co., 1358 Main St., Buffalo, N. Y., $19,452; electrical work, to Kearney Bros., 39 North Main St., Pittston, $13,710; heating system, to E. Keeler, 238 West St., Williamsport, $49,534. Noted Aug. 21.

★**W. Va., Bluefield**—School—Beaver Pond School Dist. let contract building West End School, on Highland Ave., 2 story, brick, to W. T. Owens, Bluefield, $75,379.

★**N. C., Nashville**—Court House—Nash Co. let contract remodeling 2 story, brick, on Washington St., to H. Weldon Bldg. Co., Weldon, $106,885. Noted July 31.

★**Fla., Jacksonville**—School—Bd. Educ. let contract building school, to O. P. Woodcock, 403 Main St. About $62,000.

O., Canton—School—Bd. Educ. received bids building 3 story brick addition to McKinley School, from R. H. Evans & Co., 8 East Long St., Columbus, $946,000; J. Gill & Sons Co., Citizens Bldg., Cleveland, $965,000.

★**O., Cleveland**—Commercial—E. McGeorge, archt., 1900 Euclid Ave., let contract to J. H. Chaney Co., Hippodrome Annex, building 2 story, 83 x 183 ft., rein.-con., steel and brick, at 1900 Prospect Ave., for Kennedy Co., 1900 Euclid Ave. About $85,000. Noted Aug. 21.

O., Cleveland — Office — See "Industrial Works."

★**O., Cleveland**—Sales—W. S. Ferguson Co., archts., 1900 Euclid Bldg., let contract to E. Paulsen Co., Erie Bldg., for 2 story, 107 x 222 ft., rein.-con., steel and brick, on East 30th St. and Chester Ave., for H. T. Neighbors, 1900 Euclid Bldg. About $75,000. Noted Aug. 21.

★**O., Pittsburg**—School—Bd. Educ. let contract building 3 story, 100 x 130 ft., rein.-con and brick, concrete foundation, Monroe Twp., near here, to Knowlton & Knowlton, Greenville, $115,000.

★**O., West Park**—High School—Bd. Educ. let contract building 2 story, 90 x 90 ft., rein.-con., steel and brick addition, on Lorain Rd., to C. Peterson, Engineer's Bldg., Cleveland. About $50,000. Noted July 17.

★**O., West Park**—School—Bd. Educ. let contract building 2 story, 26 x 48 ft., concrete, steel and brick, on Settlement Rd., to C. Peterson, Engineer's Bldg., Cleveland. About $50,000. Noted July 17.

★**Mich., Detroit**—Hotel—Vinton Co., Vinton Bldg., let masonry contract building 3 story, 35 x 200 ft. brick, stone and steel, on Piquette Ave., to Lennane Bros., Union Trust Bldg., carpentry, to H. M. Martens Co., 221 Moffatt Bldg. About $100,000. Noted Aug. 28.

Mich., Detroit—Schools—Bd. Educ., 50 Bway., received bids building (a) Nichols School, (b) Ellis School, (c) Condon School, (1) masonry, (2) carpentry, (3) heating, ventilating and plumbing, from Corrick Bros., 507 Owen Bldg., (a1) $94,486, (c1) $126,375, Culbertson & Kelley, Book Bldg., (a1) $96,520, A. J. Smith Constr. Co., Campau Bldg., (a1) $97,500, (b1) $58,000, (c1) $124,900, W. H. Mueller, Ford Bldg., (b1) $58,400; H. M. Martens Co., 221 Moffat Bldg., (a2) $18,356, (b2) $14,730, (c2) $23,774, Harcus & Co., 771 Russell St., (a2) $19,257, (b2) $12,679, (c2) $24,329, E. Thiede, 287 Berlin St., (a2) $19,378, (b2) $13,353; M. B. O'Connor, Penobscot Bldg., (a3) $42,925, (c3) $48,996, R. L. Spitzley Heating Co., 403 Vinton Bldg., (a3) $51,777, A. W. Schultz Co., 815 Gratiot Ave., (a3) $54,605, (b3) $36,927, (c3) $58,608.

★**Mich., Flint**—Recreation—Gen. Motors Corp., 435 Woodward Ave., Detroit, let contract building 7 story, 214 x 280 ft. brick, steel and rein.-con., rein.-con. flooring, concrete foundation, including dormitory, swimming pool, etc., to Thompson-Starrett Co., Lincoln Bldg., Detroit. About $2,300,000.

★**Ill., Quincy**—School—Bd. Educ. let contract building Irving School, to Lange Bros., Quincy, $143,395. Noted Mar. 6.

★**Wis., Beloit**—Auditorium and Restaurant—Fairbanks-Morse Co. will build 2 story, 60 x 100 ft., brick and steel. About $75,000. Work will be done by day labor.

★**Wis., La Crosse**—Hospital—W. A. Henke, Newbury Bldg., let contract building 4 story, brick, stone and tile addition rein.-con. flooring, concrete foundation, on 17th and Main Sts., to F. Schwalbe & Son, La Crosse. About $50,000.

★**Wis., Sheboygan**—Office—Brust & Philipp, archts., Free Press Bldg., Milwaukee, let contract to Amer. Contg. Co., 198 Milwaukee St., Milwaukee, building 2 and 3 story, 60 x 145 ft., brick, rein.-con. and steel, rein.-con. flooring, brick foundation, on Michigan Ave., for Volrath Co., West Michigan Ave. About $72,500. Noted Sept. 4.

★**Minn., Crookston**—Dining Hall — State Bd. Control, Capitol, St. Paul, let contract building 3 story, 50 x 150 ft., at State Experimental Farm, here, to Carlsted Bros., Builders Exch., Minneapolis, $88,000. Noted July 3.

★**Kan., Wichita**—School—Bd. Educ. let contract building 3 story, 103 x 182 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, known as Mark Twain School, to H. J. Ellis Constr. Co., 927 North St. Francis Ave., $159,984. Noted Aug. 28.

★**Mont., Lewistown**—Grade School—School Dist. No. 1 let contract building 2 story school, to J. Aven, Lewistown. About $52,500. Noted Aug. 14.

★**Mo., St. Joseph** — Infirmary — Comrs. Buchanan Co. let contract building 2 story, 42 x 230 ft., 40 x 133 ft. and 55 x 86 ft., rein.-con., steel and brick addition, rein.-con. flooring, rock and concrete foundation, to Lehr Constr. Co., 1712 Frederick Ave., $168,495.

★**Mo., St. Louis**—Church—St. James Methodist Episcopal Church, St. Ferdinand and Pendelton Aves., let contract building 2 story church, to T. H. Ratz, 4333 Taft Ave. About $50,000

★**Mo., St. Louis**—Church—West Methodist congregation let contract building 80 x 150 ft., rock, brick and stone, to Reardon Constr. Co., 8th and Chestnut Sts. About $60,000.

★**Mo., St. Louis**—Home—Jewish Orthodox Old Folks Home let contract building 2 story, 36 x 153 ft. steel, brick and concrete, to E. P. Porter, 2407 North Bway. About $50,000.

★**Mo., St. Louis**—Hotel—Machmeho Investment Co., 402 Odd Fellows Bldg., let contract building 6 story, 97 x 120 ft., brick and terra cotta, rock foundation, at 5507 McPherson Ave., to McCarthy Constr. Co., Odd Fellows Bldg. About $200,000.

★**Mo., St. Louis** — Mercantile — Whittier Oliver Investment Co., Title Guarantee Bldg., let contract building 2 story, 75 x 154 ft., brick and concrete, to H. W. Herwick Bldg. Co., Title Guarantee Bldg. About $50,000.

★**Mo., St. Louis**—Mercantile—F. C. Woermann, 5893 Nina Pl., let contract building 2 story, 133 x 135 ft. to Woermann Constr. Co., Century Bldg. About $50,000.

★**Mo., St. Louis**—Theatre—Hamilton Bldg. Co., 110 West 45th St., New York City, let contract building 129 x 310 ft. steel, rein.-con. and brick, on Grand and Lucas Aves., here, to Fleischmann Constr. Co., 110 West 45th St., New York City. About $1,000,000.

★**Tex., Dallas**—Schools—School Bd. let general contract constructing buildings at Bryan High School, to G. W. Hewitt, 332 North Ervay St., $52,597.

★**Tex., Houston**—High School—City let contract building Central High School, to Amer. Constr. Co., 411 Gulf Bldg. About $360,800. Noted June 23.

★**Okla., Alva**—Gymnasium—State Bd. Affairs, Oklahoma, let contract building 2 story, 80 x 160 ft. rein.-con. and brick, rein.-con. flooring, at North Western State Normal School, Main St., here, to Kriepke & Schaffer, El Reno. About $50,000.

★**Colo., Denver**—Home and Service—Salvation Army, 503 Mercantile Bldg., let contract building 3 story, on Curtis St., between 18th and 19th Sts., to C. S. Lambie, Tramway Bldg. About $85,000. Noted Dec. 19.

Buildings (Continued)

Utah, Panguitch—Hotel—L. E. Church received bids building 3 story, 58 x 75 ft. hotel, from J. E. Snyder, Provo, $49,600; J. F. Halliday, Salt Lake City, $49,870; Campbell Bldg. Co., 71 South Main St., Salt Lake City, $55,430. Noted July 10.

★**Ariz., Miami**—School—School Trustees let contract building concrete and brick school, to J. J. Garfield, Miami, $79,841.

★**Ariz., Tucson**—Theatre, etc—Congress Realty Co. let general contract building 2 story, 110 x 185 ft., rein.-con. and brick theatre, store and apartment, to Edwards & Wildey, 515 Black Bldg., Los Angeles, $140,000.

★**Cal., San Francisco**—Office—G. E. Billings, c/o W. H. Ratcliff, archt., 1st Natl. Bank Bldg., Berkeley, let contract building 3 story, 90 x 100 ft., brick, on California St., to W. Sorenson, 3219 Ellis St., Berkeley. About $60,000.

★**Ont., Capreol**—Welfare—Canadian Natl. Rys., 27 Wellington St. E., Toronto, will construct 3 story, 72 x 120 ft., steel and brick buildings; concrete foundations, here, to include swimming pool, dormitories, etc. About $75,000. Work will be done by day labor.

★**Ont., Hamilton**—School—Bd. Educ. let contract building 2 story, concrete, brick and steel, concrete foundation, to W. H. Cooper, Cylde Bldg., $98,775.

★**Ont., Kemptville**—Agricultural College—Provincial Government, Toronto, let contract building 3 story, 60 x 120 ft., brick, wood and concrete flooring, here, to J. H. Holbrook, 19 Monkland Ave., Ottawa. About $125,000.

★**Ont., Ottawa**—Theatre—T. W. Lamb, archt., 644 8th Ave., New York City, let contract to Bate, McMahon Co., Ltd., Central Chambers, constructing 2 story, 100 x 175 ft., steel, brick and stone, brick foundation, here, for M. Loew, 1492 Bway., New York City. About $300,000. Noted July 31.

★**Ont., Sandwich** — School — Separate School Bd. let contract building 2 story, concrete, steel and brick, concrete foundation, to J. V. Gray Constr. Co., Confederation Life Bldg., Toronto. About $55,000.

★**Ont., Toronto**—Theatre—Loew Syndicate, 1492 Bway., New York City, let contract building 2 story, 140 x 225 ft., brick, steel and concrete, concrete foundation, on Yonge St., here, to P. H. Secord & Son, 133 Nelson St., Brantford. About $300,000. Cost plus 10 per cent. Noted Apr. 10.

★**Ont., Toronto**—Theatre—Pantages Theatres, Ltd., Adelaide St., let contract building 2 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on Victoria St., to Jackson, Lewis & Sons, Bell Telephone Bldg. About $500,000.

★**Hawaii, Honolulu**—Office—T. H. Davies & Co. let contract building 4 story, rein.-con. and terra cotta on Bishop and Queen Sts., to Pacific Constr. Co., Honolulu. About $500,000. This is first of group of 7 buildings to be erected. L. C. Mullgardt, Chronicle Bldg., San Francisco, archt.

Federal Government Work

PROPOSED WORK

Mass., Hingham—Dredging—Spec. 4031—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to dredge, here.

D. C., Wash.—Storage Plant—Spec. 4035—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to complete storage plant for fuel oil, here. About $12,000.

D. C., Wash.—Wharf Repairs—Spec. 4029—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon lets contract repairing Militia Wharf, here. About $2700.

W. Va., South Charleston—Motors and Controller—Spec. 4032—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install four cranes, here.

S. C., Charleston — Quay Wall — Spec. 3773—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received Aug 20, building quay wall at Navy Yard, here Noted Aug. 28.

Ky., Louisville—Lock and Abutment—U. S. Engr. Office, Louisville, received no bids Aug. 27, building lock and abutment for Dam No. 45, Ohio River, at Addison. Noted July 31

Ill., Great Lakes—Groins—Spec. 4004—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received Aug. 20, building groins for shore protection, here. Noted Aug. 21.

La., Carroll—Post Office—Treas. dept., Wash., D. C., received no bids building, here. J. A. Wetmore, superv. archt. Noted Aug. 14.

Cal., San Diego—Road Work—Spec. 4030—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build asphalt macadam roads, here. About $4000.

Cal., San Diego—Tank—Spec. 4033—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to complete fuel oil tank, here. About $1800.

Cal., San Diego — Water Supply and Sewerage System and Fuel Oil Storage Reservoir—Spec. 4007—Bureau Yards & Docks, Navy Dept., Wash., D. C., postponed building at Marine Corps, here, indefinitely. Noted Aug. 21.

P. I., Camp Stotsenburg—Air Service Hangars—W. A. Donaldson, Constr. Quartermaster, Manila, soon receives bids building 6 large hangars for small planes, 5 small hangars with cement floors to serve as machine shop, motor repair shop and power house, oil storage and reclamation, 2 large hangars with cement floors to serve as repair and car supply, 1 motor test building and 1 headquarters building and installing gas tank. About $115,000.

P. I., Manila—Aerial Defense Station—W. A. Donaldson, Constr. Quartermaster, Manila, soon receives bids building aerial defense station, here, including hangars, machine and engine repair shop, supply storehouse, barracks, administration building, guard house, etc.

BIDS DESIRED

Mass., Boston—Officers' Quarters, Pavilion, etc.—Until Sept. 30, by Treas. Dept., Wash., D. C., building medical officers', nurses' and pharmacists' and attendants' quarters, tuberculosis pavilion and approaches, pavements, etc., at U. S. Marine Hospital, here. J. A. Wetmore, superv. archt.

Mass., Watertown — Storehouse — Until Sept. 22, by Constr. engr., U. S. Army, c/o Arsenal, building 2 story, 100 x 455 ft. brick storehouse.

N. Y., Rockaway—Heating System and Building—Spec. 4021—Until Sept. 17, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing heating system and constructing building for hangar No. 2, here. About $7000; $10 deposit required for plans and spec. Noted Aug. 14.

N. Y., Tompkinsville—Rip Rap—Until Sept. 19, by Lighthouse Supt., 3rd Lighthouse Dist., Tompkinsville, furnishing rip rap for East River Light Sta.

Pa., Pittsburgh—Lock and Dam—Until Oct. 3, by U. S. Engr. Office, Pittsburgh, building lock and dam No. 4, Allegheny River, near Natrona; advertised in this issue.

Del., Reedy Island—Boat House—Until Sept. 24, by Treas. Dept., Wash., D. C., building boat house at Quarantine Sta., here. J. A. Wetmore, superv. archt.; advertised in this issue.

Del., Wilmington—Dredging—Until Oct. 4, by U. S. Engr. Office, Old Federal Bldg., dredging Copper River, N. J., and Chester River, Pa.; advertised in this issue.

Md., Annapolis — Boilers and Power Plant—Spec. 4025—Until Sept. 17, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing 3 boilers and building power plant at Naval Academy, here. About $45,000; $10 deposit required for plans and spec. Noted Aug. 28.

Md., Annapolis—Laundry—Spec. 4006—Until Sept. 24, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building addition to laundry, here. About $50,000; $10 deposit required for plans and spec. Noted July 24.

Md., Baltimore—Dredging—Until Sept. 29, by U. S. Engr. Office, Baltimore, dredging channel in Patapsco River from Fort McHenry Channel toward Ferry Bar; advertised in this issue.

D. C., Tacoma Park—Heating System—Until Sept. 22, by Constr. Quartermaster, Ward 62, Walter Reed Hospital, redistributing present heating line and installing new heating lines.

D. C., Wash.—Grading—Until Sept. 19, by Dist. Comrs., Dist. Bldg., grading certain streets, here, involving 24,000 cu.yd. excav.

Ala., Florence—Floating Plant—U. S. Engr. Office, Florence, wants 3 derrick boats with hull about 30 x 70 x 3 ft., boom 45 to 65 ft., equipped with 3 drum hoisting engines 8 x 10 in. or larger and separate swinging engines, on lease for several months; advertised in this issue.

Mich., Detroit—Dredging—Until Oct. 8, by U. S. Engr. Office, Detroit, dredging in St. Clair River, Port Huron; advertised in this issue.

Mich., Midland—Post Office—Until Oct. 3, by Treas. Dept., Wash., D. C., building post office, here. J. A. Wetmore, superv. archt. Noted May 15.

Kan., Pratt—Post Office—Until Oct. 14, by Treas. Dept., Wash., D. C., building post office, here. J. A. Wetmore, superv. archt.

Mo., St. Louis—Levee Work—Until Oct. 6, by Mississippi River Comn., 1311 International Life Bldg., constructing 145,000 cu.yd. earthwork by hydraulic method in Drury D. D., Ill.; advertised in this issue.

Mo., St. Louis—Levee Work—Until Oct. 6, by Mississippi River, Comn., 1311 International Bldg., constructing 150,000 cu. yd. earth work by hydraulic method in Muscatine-Louisa Island Levee Dist., Ia. Noted July 3; advertised in this issue.

Ark., Marianna—Building—Until Oct. 6, by treas. dept., Wash., D. C., furnishing labor and material for public building, here. J. A. Wetmore, superv. archt.

Colo., Denver—Equipment—Until Oct. 1, by U. S. Recl. Service, Denver, furnishing balance needle valves, high pressure emergency gates and sluice gates for north tunnel of Pathfinder Dam. North Platte Project, Neb.-Wyo.

Wash., Puget Sound — Building — Spec. 4009—Until Sept. 24, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing extension to Building No. 178, here. About $50,000; $10 deposit required for plans and spec. Noted Aug. 21.

Hawaii, Pearl Harbor—Power Plant Improvements—Spec. 3956—Until Oct. 22, by Bureal Yards & Docks, Navy Dept., Wash., D. C., improving power plant, here. About $130,000; $10 deposit required for plans and spec. Noted Apr. 10.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Buffalo**—Dredging—U. S. Engr. Office, 540 Federal Bldg., let contract dredging, here, to Great Lakes Dredge & Dock Co., Morgan Bldg., $153,260. Noted July 31.

★**N. Y., New York**—Dredging—U. S. Engr. Office 39 Whitehall St., let contract dredging in Shrewsbury River, N. J., to Amer. Pipe & Constr. Co., 112 North Broad St., Phila., Pa., $54,107. Noted Aug. 7.

★**N. Y., New York** — Sea Wall — U. S. engr. Office 39 Whitehall St., let contract repairing and enlarging seawall at Sandy Hook Reservation, N. J., to J. A. Howland, Sea Bright, N. J., $495,600. Noted July 31

N. Y., Stapleton—Boiler Plant—Treas. Dept., Wash., D. C., received only bid Sept. 4, building temporary boiler plant, here, from Austin Heating Corporation, 121 West 42nd St., New York City, $4375. Noted Aug. 21.

N. J., Lakehurst—Hangar—Spec. 4001—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Sept. 8, for steel work for dirigible hangar, (1) work complete, from

McClintic Marshall Co., 715 Munsey Building, Wash., D. C., (1) $2,422,173 (360 days); (2) $1,328,693, (360 days); (3) $1,128,480, (210 days); (4) $5.60; (5) add $15, deduct $10; (6) add $1.25, deduct $.85; (7) add $60, deduct $25; (8) add $30, deduct $15; (9) add $1.80, deduct $.80.

Irwin & Leighton, 126 North 12th St., Phila., Pa., (1) $2,433,000. (270 days); (2) $1,283,000. (210 days); (4) add $.065, deduct $.0375; (5) add $17.50, deduct $1; (6) add $2.50, deduct $1; (7) add $60, deduct $26; (8) add $22, deduct $8.50; (9) add $2, deduct $.85.

G. F. Pawling & Co., 1432 South Penn. Sq., Phila., Pa., (1) $2,548,500, (360 days); (2) $1,298,500, (360 days); (3) $1,250,000, (210 days); (4) add $.066, deduct $.055, steel; add $.13, deduct $.07, miscellaneous steel; (5) add $19, deduct $11; (6) add $1.75, deduct $.30; (7) add $65, deduct $23; (8) add $31, deduct $10; (9) add $2.40, deduct $.80.

Federal Government (Continued)

Warren Moore & Co., Colonial Trust Bldg., Phila., Pa., (2) $1,495,396, (time as specified); (5) add $20, deduct $12; (6) add $2, deduct $1; (7) add $53, deduct $15; (8) add $25, deduct $10; (9) add $2, deduct $.50.

Nugent Constr. Corp., 505 5th Ave., New York City, (1) $2,872,000, (270 days); (2) $1,490,000, (210 days); (5) add $27, deduct $11; (6) add $2.25, deduct $.70; (7) add $80, deduct $30; (8) add $35, deduct $10; (9) add $2.60, deduct $1.

Post & McCord, 101 Park Ave., New York City, (2) $1,526,370, (360 days); (5) add $18, deduct $7.50; (6) add $4, deduct $.50; (7) add $60, deduct $20; (8) add $30, deduct $8; (9) add $2, deduct $.50.

H. F. Friedstet Co., 327 South La Salle St., Chicago, Ill., (2) $1,641,863, (360 days); (5) $14; (6) $1.25; (7) add $32, deduct $10; (8) add $75, deduct $30; (9) add $2.50, deduct $1.

J. W. Cooper Co., Fidelity Bldg., Buffalo, N. Y., (1) $2,833,000, (330 days); (2) $1,483,000; (4) $.0625; (5) $11.55; (6) $.70; (7) $36; (8) $18; (9) add $1.15, deduct $.65.

Coleman Bros., 1 Marginal St., Chelsea, Mass., (2) $1,600,000, (350 days) (5) $15; (6) $1.20; (7) $2; (8) $2.50; (9) $2.25.

A. C. Moses Constr. Co., 916 New York Ave., Wash., D. C., (2) $1,531,962, (120 days after completion of steel work); (5) $10.67; (6) $1.11; (7) add $50.72, deduct $33; (8) add $28.45, deduct $18; (9) add $1.82, deduct $.65.

J. Gill & Sons, 1302 Citizens Bldg., Cleveland, O., (2) $1,437,000, (time as specified); (4) add $.10, deduct $.05; (5) add $20, deduct $8; (6) add $2.50, deduct $.50; (7) add $100, deduct $10; (8) add $50, deduct $5; (9) add $3, deduct $.50.

Bethlehem Steel Bridge Corp., Bethlehem, Pa., (3) $1,032,000, (210 days); (4) $.05.

Amer. Bridge Co., Wilkins Bldg., Wash., D. C., (3) $1,340,000 (210 days); (4) $.0675. Noted Aug. 21.

★Contract awarded, (2) to Irwin & Leighton; (3) Bethlehem Steel Co.

★**Pa., Fort Mifflin**—Fire Protection System—Spec. 3779—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building fire protection extension, here, to E. C. Fish, Real Estate Trust Bldg., Phila., $9900 (120 days). Noted Aug. 21.

★**Pa., Phila.** — Elevator Shafts—Local Navy Yard let contract building elevator shafts for ways Nos. 2 and 3, to Strang & Mitchell, Real Estate Trust Bldg., $5700 (90 days). Noted June 5.

D. C., Wash—Road Work—Zone Supply Officer received bid resurfacing upper and lower driveways through U. S. National Cemetery, Gettysburg, Pa., from A. C. Smith, 212 Keyser Bldg., Baltimore, $60,000. (45 days).

★**Va., Norfolk**—Dredging—U. S. Engr. Office, Custom House, let contract dredging in 40 ft. channel, to F. E. Jones, 1002 Bank of Commerce Bldg., $526,555. Noted July 31.

La., New Orleans — Equipment — Spec. 3882—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Sept. 3, furnishing mechanical and electrical equipment for power plant, here, (1) work complete, from Carroll Electric Co., 714 12th St., N. W., Wash., D. C., (1) $153,260 (180 days), (2) $141,600, (3) $970, (4) $5500, (5) $2100; W. G. Cornell Co., 923 12th St., N. W., Wash., D. C., (1) $154,880, (2) $10,990, (3) $1324, (4) $5100, (5) $3750; Shevlin Engr. Co., 110 West 34th St., New York City, (1) $162,900 (180 days), (2) $150,558, (3) $1425, (4) $5553, (5) $4875. Noted Aug. 28.

Minn., Montevideo—Post Office—Treas. dept., Wash., D. C., received only bid building post office, here, from W. D. Lovell, 1415 South East 8th St., Minneapolis, $64,830. Noted Aug. 14.

★**Ariz., Leupp**—Bridge—C. Sells, Comr Indian Affairs, let contract building 300 ft. highway bridge, 18 ft. roadway, over Little Colorado River, to Allied Contractors, Inc., 364 Bee Bldg., Omaha, Neb., $36,000. Noted July 31.

Miscellaneous

PROPOSED WORK

Swimming Pool, etc.—Woodmont, Conn.—W. H. Bradley, Center St., Meriden, soon lets contract building rein.-con. swimming pool, seawall and bathhouse at summer home on Hawley Ave., here. About $25,000. R. Williams, 185 Church St., New Haven, archt. Noted Aug. 21.

Wall—Weehawken, N. J.—Bd Freeholders Hudson Co., Jersey City, soon lets contract for repairs to wall of Hudson Co. Blvd. opposite Hudson Pl., here. About $10,000.

Paving Mixers—Phila., Pa.—L. T. Ward Co., 619 Filbert St., plans to purchase second-hand "Koehring" paving mixers in good workable condition.

Storage Tank—Lake City, Ia.—City voted $55,000 bonds and plans to build rein.-con. storage tank, with 200,000 gal. capacity. J. H. Mayne Eng. Co., 235 Merriam Blk., Council Bluffs, engrs.

Park—Belton, Tex.—City issued $25,000 bonds to build park.

Seawalls and Breakwaters—Galveston, Tex.—City and Galveston Co. election Nov. 4, to vote on $5,000,000 bonds to build seawalls and breakwaters

Levee—Kaufman, Tex.—Levee Dist No. 6, Kaufman and Rockwall Counties, plans to build 64,700 ft. levee on east fork of Trinity River, 19 ft. high, to reclaim 11,900 acres rich overflow lands. About $544,000. Plans submitted to State Reel Dept. for approval. B. F. Williams, Rosser, engr.

Pier—Canyon City, Ore.—Grant Co. soon lets contract building concrete piers for bridge over Canyon Creek and grading 2 mi. Canyon Creek-R. Danby Rd. County will issue $35,000 bonds to cover cost of project.

Harbor Improvement—Portland, Ore.—Port of Portland, Pub. Dock Comn. and Industrial Survey Com. plan to survey Portland Harbor, Columbia Slough and Swan Island, for extensive harbor development and improvement. About $20,000. R. G. Dieck, consult. engr.

Dam—Porterville, Cal. — See "Waterworks."

BIDS DESIRED

Land and River Borings—New York, N. Y.—Until Sept. 23, by G. R. Dyer, chn. New York State Bridge and Tunnel Comn. and W. H. Noyes, chn. New Jersey Interstate Bridge and Tunnel Comn., 115 Bway., for land and river borings from vicinity of Canal and Varick Sts. to vicinity of Grove and 12th Sts., Jersey City, involving 2200 ft. casing and 320 ft. core in land sections and 1800 ft. casing and 180 ft core in river sections.

Pier, etc.—New York, N. Y.—Until Sept. 15, by M. Hurlburt, comr. docks, Pier "A," Battery Pl., North River, furnishing all labor and materials for building pier and approach at foot of Dyckman St., North River, and depositing riprap thereat.

Tunnel—Jersey City, N. J.—Until Sept. 23, by New Jersey Interstate Bridge & Tunnel Comn., Room 1110-15 Bway., New York City, for land and river borings from vicinity of Varick and Canal Sts., New York City, along line of proposed vehicular tunnel under Hudson River to vicinity of Grove and 12th Sts., here.

Heating, Ventilating, etc.—Union Hill, N. J.—Until Sept. 18, by Bd. Educ., for heating, ventilating, plumbing, electrical work and vacuum cleaning for school on 1st St. and Hudson Ave. Cost to exceed $25,000

Paving Materials—Monessen, Pa.—Boro. receiving bids for 328,000 brick paving blocks, 1100 bbls. Portland cement, 1550 tons sand, 1900 tons gravel and 935 ft. Beaver Valley curbstone. A. W. Johns, boro. engr.

Retaining Wall—Grosse Pointe, Mich.—Until Sept. 18, by M. L. Brown & Son, engrs., 821 Chamber of Commerce Bldg., Detroit, building retaining wall consisting of 250 ft. 6 in. rein.-con. wall and 800 ft wood sheeting and piling wall, involving 3000 yd. dipper, dredge work About $30,000. Noted Aug. 14.

Ash Tower, etc.—Sheboygan, Wis.—E. A. Juul, engr., 905 North 8th St., receiving bids furnishing and building ash tower and steam steel ash chute system for Amer. Leather Co., 1102 Wisconsin Ave. Cost between $11,000 and $12,000.

Flood Gates—Pine Bluff, Ark. — Until Sept. 22, by J. B. Quinn, secy. Farelly Lake Levee Dist., at Hotel Pines, building concrete flood gates through levee at Little Bayou Mote, and Big Bayou Mote, Jefferson Co., and Broggins Branch and Bay Bayou, Arkansas Co. Ayres & Miller, Randolph Bldg., Memphis, Tenn., engrs; advertised in this issue

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Coal Trestle — Easthampton, Mass.** — Hampton Co., Hampton Mills, let contract building concrete and steel coal trestle, to F. T. Ley & Co., Inc., 499 Main St., Springfield. About $15,000. Noted Aug. 28.

★**Wharf—Fall River, Mass.**—See "Industrial Works."

★**Foundation—Providence, R. I.**—Kendall, Taylor & Co., engrs. and archts., 93 Federal St., Boston, let contract to E. F. Miner Bldg. Co., 82 Foster St., Worcester, Mass., building foundation for 5 story, 78 x 144 ft brick, steel and rein.-con. hospital, rein.-con. flooring, concrete foundation, for Rhode Island Hospital, Eddy St. About $150,000 Noted Aug. 28.

★**Heating and Ventilaitng—New York, N. Y.**—C. B. J. Snyder, supt school bldgs., Municipal Bldg., let contract to E. Reutzler Co., 404 East 49th St., for installing heating and ventilating apparatus in P. S. No. 77, Crotona and Belmont Aves., for Bd. Educ. Cost $115,712.

★**Pier—Newark, N. J.**—Corn Products Refining Co., 17 Battery Pl., New York City, let general contract building 40 x 900 ft pier, to Leonard Constr. Co., 6 Church St., New York City; for piling, etc., to Lindo & Griffith Co., foot of 4th Ave. About $100,000.

★**Water Machinery—Trenton, N. J.**—A. Bugbee, supt. city comn., let contract furnishing 25,000,000 and 20,000,000 gal. electrical driven centrifugal pump, generator motor, etc., for city pumping station, to H. F. Stahl, 275 Bellevue Ave., $108,941. Noted Aug. 21.

★**Incinerator—Monessen, Pa.**—Boro. let contract building 2 story, 38 x 42 ft. steel and brick garbage incinerating plant, concrete foundation, in Boyd Hollow, to Morse-Boulger Destruction Co., 39 Cortlandt St., New York City, $10,388. Noted July 24.

★**Column Foundations, etc.—Phila., Pa.**—Dept. City Transit, Chestnut St., let contracts building concrete column foundations for Frankford Elevated Ry., in Front St., near Arch St., and in Frankford Ave., between Dyre and Bridge Sts., to Brown King Constr. Co., Commercial Trust Bldg., $26,455; building platforms and connecting passages of stations on Front St. at York and Dauphin Sts. and Girard Ave., to F. J. Boas, 201 North Broad St., $118,010. Noted Sept. 4.

★**Tracks—Phila., Pa.**—Dept. City Transit, 1211 Chestnut St., let contract constructing tracks of Frankford Elevated Ry. on elevated railway, in Front St., Kensington Ave. and Frankford Ave. from Callowhill to Harrison Sts., to Snare & Triest Penn Bldg., $462,010. Noted Aug. 28.

★**Incinerator—Winston-Salem, N. C.**—City let contract building incinerator, to Southern Mach. & Equipment Co., 1114 People's Natl. Bank Bldg., Lynchburg, Va About $60,000.

★**Underpinning, etc.—Detroit, Mich.**—M. W. Sales & Co., 96 East Jefferson Ave., let contract to J. F. Dayton, 300 Holden Bldg., under pinning sidewalls and columns of 100 x 140 ft., steel frame building on West Baltimore Ave. Work consists of excavation to depth of 20 ft. below present foundations and placing mass concrete foundations. A. G. Schutt, 1333 Book Bldg., engr.

★**Coal Screenings—St. Louis, Mo.**—City let contract furnishing 70,000 tons coal screenings, for city waterworks, to Boehmer Coal Co., Wright Bldg., $2.82 per ton Total cost, $159,600

★**Levee—Bay City, Tex.**—Matagorda Co. Levee Dist. No. 1 let contract building 550,000 cu.yd. levee work, to J. Hardy, Bay City, $121,391

★**Wharf—Beaumont, Tex.**—City let contract building pile and timber platform wharf, to W. Moore, Texas City. About $250,000.

★**Heating Pipes—Ottawa, Ont.**—Dominion Government let contract installing heating pipes in Wellington St. heating tunnel, to W. G. Edge, Cambridge St., $18,121

OFFICIAL PROPOSALS

Bids: Sept. 12.

Canal Improvements

STATE OF NEW YORK
OFFICE OF SUPERINTENDENT OF PUBLIC WORKS
Albany, N. Y.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Friday, September 12th, 1919, at which place and hour they will be publicly opened and read, for improving the New York State canals pursuant to the provisions of Chapter 147 of the Laws of 1903, and amendatory and supplementary laws, and Chapter 735 of the Laws of 1917 and Chapter 634 of the Laws of 1919, as follows:

SCHENECTADY—SCOTIA BRIDGE ABUTMENTS AND APPROACHES

This contract will provide for constructing the abutments and approaches of a reinforced concrete bridge, to extend from the junction of State Street and Washington Avenue in the city of Schenectady, across the Barge Canal terminal channel, Van Slyck Island, the Barge Canal main channel, Hog Island and the Scotia channel, to a point about three hundred feet north of the junction of Schonowee Avenue and Mohawk Avenue in the village of Scotia.

The construction of all roadway pavements, concrete sidewalks and curbs supported on new fill, track work, trolley wires and feeders, lamps and wiring, drains and other incidental work, will not form a part of this contract; also, a gap will be left in the Scotia approach to provide for the maintenance of traffic for electric cars, vehicles and pedestrians.

Contract plans, sheets 1 to 7 inclusive.

All work must be completed before the expiration of fifteen months after the date of signing the contract.

Plans may be seen and detailed specifications, engineer's estimate of quantities, proposal blanks, forms of contract and bonds required, and other information for proposers, may be had at the office of the Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Eastern Division, Wedgeway building, Schenectady, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y., at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spaulding's exchange, Buffalo, N. Y.

Copies of detailed plans or drawings may be obtained from the State Eengineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or state bank in good credit within the state and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of the contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the State for doing the work, and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the state will be enhanced thereby.

EDWARD S. WALSH,
Superintendent of Public Works

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Official Proposals reaching our office in first mail Wednesday morning (9 o'clock) can usually be published in the issue out the next day. Special price for Official Proposals, $3.60 an inch.

Bids: Sept. 22.

Bridge Construction

Norristown, Pa

Sealed proposals for the construction of a reinforced concrete bridge of ten (10) arch spans, and nine (9) reinforced concrete girder spans with retained fill approaches, over the Schuylkill River, the Schuylkill Canal and the tracks of the Philadelphia & Reading Railway Company, between Conshohocken and West Conshohocken, Montgomery County, Pennsylvania, will be received by the Controller of Montgomery County, at the Court House in Norristown, Montgomery County, Pennsylvania, until 10 o'clock A. M., September 22nd, 1919, when said proposals, accompanied by the required certified checks and guarantees, will be publicly opened by the County Commissioners, at 11 o'clock A. M., in their office in the Court House, Norristown, Montgomery County, Pennsylvania.

Copies of the plans and specifications, including the form of proposal, may be seen and obtained by contractors at the offices of the County Commissioners, Norristown, Pa., and B. H. Davis, Engineer, 17 Battery Place, New York, N. Y., upon making a deposit of Fifty ($50) Dollars, which sum will be refunded upon the return, in good condition, of the plans and specifications, before date bids are received.

All details in reference to requirements of bidders are contained in form of proposal.

All regular proposals accompanied by the required certified checks and guarantees, received at 10 A. M., will be publicly opened and bids tabulated at 11 A. M., September 22nd, 1919, by the County Commissioners in their office, Norristown, Montgomery County, Pennsylvania. The right is reserved to reject any or all bids or parts thereof not deemed to be to the advantage of the County.

WM. D. HEEBNER,
Controller.

Bids: Sept. 23.

Road Construction

Keyser, W. Va.

Sealed proposals will be received by the County Clerk of Mineral County at Keyser, West Virginia, until 2 o'clock p. m. on the 23rd day of Sept., 1919 for the construction of the following road:

Ridgely-Alaska Road, 12 mi. 16 ft.
Gravel Surface Roadway.

Plans, specifications and estimate of quantities may be examined at the County Engineer's office, Keyser, West Virginia, the Division Engineer's office at Keyser, West Virginia, and at the office of the State Road Commission at Charleston, West Virginia.

Proposals will be received only upon State Standard forms, which can be obtained from the undersigned, or from the Division Engineer's office at Keyser, West Virginia.

All proposals must be accompanied by a certified check or draft equal to at least 5% of the total amount bid.

The right is reserved to reject any and all bids.

A. A. JORDAN, County Clerk.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—James H. McGraw, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, *Editor* — Charles Whiting Baker, *Consulting Editor*

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Constructors' versus Designers' Pay

SHOULD engineers engaged in construction be paid more than those engaged in design? That question is raised by a recent tentative schedule of salaries for highway engineers. Those in charge of construction were to be paid more than those who designed and maintained the selfsame roads and bridges. Is this as it should be? Does it require more ability and experience to build a given job than to design it? Can maintenance of a system of highways be left to men of lower caliber than those who build it? Is less talent required for bridge designing than for the construction of bridges and of highways? *What is the opinion of the profession on these questions?*

Order or Anarchy

IT WILL not require many demonstrations like that at Boston to bring the country to a sober realization of the dangers of radicalism. Remembering injustices of the past, few there are who have not rejoiced that a better day was coming for the worker. In our sympathy we have been apt to condone much, realizing that those newly come to a realization of power have not had the sobering influence of long responsibility. Our condonation has been weakened by the rise of unreasonableness, and our perspective is entirely restored by a shock such as that occasioned by the Boston policemen's strike. If the country were to condone that strike, we should be on the verge of Bolshevism. Fortunately, the reaction has been quick and positive. The country will have none of the excesses of Boston. The striking policemen have been branded as deserters, a term which alone fits the case, unless the affair be termed a mutiny. The issue fundamentally is whether class interest can be allowed to stand against that of the public. The answer is "No," and "No" will be the answer, we confidently believe, when any class seeks its personal ends to the detriment of the interests of all the rest of the people.

Federation of Labor on Trial

THE Boston policemen's desertion became, above all, a test of where America stood on the issue of orderly government versus anarchy. But it involves another test. It has put the American Federation of Labor on trial. That body, despite the excesses incident to continued contest, has had the confidence of a great many people, even among the managers of industry. It has, on the whole, tried to stay within sound lines, even though it indorsed and supported demands, by its subordinate bodies, which business men believed unreasonable. It has been counted on to stand for law and order, for the peaceful rather than the revolutionary method of arriving at its goal. The radicals have been making progress in the organization. Have they captured it? Will the federation stand for violence in future or adhere to the peaceful methods which have brought it to its present great power? The evidence is discouraging. Mr. Gompers could have scored a triumph for his organization and won for it countrywide approval and support had he taken a firm stand, had he declared the organization opposed to desertion by the legally constituted guardians of order. He has avoided the issue. He regrets the occurrence. He temporizes with the situation by counseling the policemen to return to their posts until the matter can be discussed at the President's coming industrial conference. He has made a mistake from the standpoint of the popular support which the federation needs in order to continue its progress. He has made a mistake from the standpoint of the public good. We hope that the federation may yet come to its senses and ally itself with order rather than anarchy.

Design Records for the Operating Force

DESIGNING engineers' functions too often cease with the making of the designs, though more and more it is being recognized that their work does not stop until the construction is finished; in some cases their field extends into the operating period. Fay, Spofford & Thorndike, of Boston, in their design of the Boston Army supply base have recognized their obligation to the operator by preparing information necessary for efficient operation, in the form of bound volumes, which are part of the equipment of the terminal. These books, which aim to include all pertinent data on the base as it was turned over to the operators, are entitled "Utility Atlases and Operating Plans," and cover the following subjects: Topographical plans, elevations of buildings, roads and railroads, water, sewers and drains, heating and electrical. On the drawings are included full dimensions; that is, clearances, distances, etc., but not the complete design dimensions. The location of all valves, pipes, wires, conduits, etc., and other hidden details which conceivably the operator may at some time want to reach are included. Too often such information is lost once the design is finished, and the operator of the plant must waste time and effort in trying to locate certain fixtures or to establish certain dimensions, the records of which could readily be preserved by such additional work as has been done in this case. The procedure is a useful extension of the designing engineer's work.

Coming Safety Congress

THERE has just come to hand the elaborate program of the eighth annual Safety Congress, to be held under the auspices of the National Safety Council in Cleveland, Oct. 1–4. The variety of subjects covered is a revelation to those who have not followed the progress of the safety movement. There will be no less than

twenty sessions at Cleveland. Four of them are general meetings, six are general round-tables, and the remainder are sectional sessions, devoted to special problems. The automotive, cement, chemical, electric-railway, metal-working and mining industries, to mention only a few, are to have special sessions. The construction section is to have two meetings, under the chairmanship of L. D. Woedtke, director of safety of Fred T. Ley & Co., Springfield, Mass. Such pertinent topics as whether accident prevention in construction is a source of profit, or a hobby, and how the small contractor can reduce accidents, will be taken up. Obviously, these sessions will be of primary interest to contractors and to construction engineers. Nevertheless, in their bearing upon the cost of work, they have an interest for the whole profession. Aside from the immediate bearing upon the work of the civil engineer, the meeting furnishes inspiration to those who follow progress in our industrial organization. It is a clear indication of the advance that has been made in the betterment of working conditions, and is an augury of still better conditions in the future. In addition to the sessions noted above, there will be an exhibit at which leading manufacturers of safety devices will be represented.

Germany Increasing Production

FROM various quarters comes word that Germany is settling down to its industrial work quicker than any other of the warring nations. Lieut.-Col. Fred H. Wagner, recently returned from a nitrate study for the Government, had this to say in a recent address in Baltimore: "Germany is today the sanest nation in Europe. Except in a few isolated places, there are no strikes. They are quietly preparing to flood the world with cheap goods. The German workmen are working 11 hours a day for eight hours' pay. In France the workmen are working three hours a day for eight hours' pay." This general view is borne out by a report from George Renwick, the English correspondent, on his return to Germany last week after an absence of two months. "The most striking change," he says in a cable message to the *New York Times*, "is undoubtedly the noteworthy evidence of greatly increased and increasing industrial productivity, while there is also, I believe, a much saner spirit throughout the country. . . . The country is getting busier every day. On all hands one sees evidence that Germany is putting her shoulder ever more determinedly to the deeply rutted wheel." He then describes the great quantity and variety of goods *at low cost* found for sale in the shops, and contrasts that condition with the scarcity of two months ago. We have no desire to go back to the popular pre-war habit of holding up Germany as a model, but just at present we can learn something from the way the Germans are increasing production.

Six-Hour Day, Five-Day Week

CONTRASTED with the spirit in Germany, alluded to above, is the action of the United Mine Workers of America. Last week they declared not merely for nationalization of the coal mines, but for a *six-hour day* and a *five-day* week. That way lie starvation and industrial wreckage, unless during the actual working period efficiency is tremendously increased. The spirit of the times, though, gives no hope for increased efficiency.

Freight Terminal Design a Traffic Problem

THANKS mainly to the efforts of the manufacturers of handling machinery, there has been a growing appreciation of the value of the rapid handling of material. Every phase of engineering work has had part in this revival, from the substitution of the concrete mixer for the man, shovel and board, to the development of the mammoth handlers of bulk material on the Great Lakes. Along with everything else, the freight terminal, either marine or rail, has been improved by the substitution of machines for men. In the development of the tractor trailer alone is the germ of a revolution in handling package freight.

In spite of this increase in mechanical efficiency, the freight terminal, especially the large marine terminal, has not increased proportionately in its freight-handling capacity. Some exceptions might be cited, but as a rule the loading and unloading from warehouse to ship or car is not today very far in advance of what it was two decades ago. The trouble seems to have been that the designers of these terminals and their machinery have not had sufficiently in mind the conception of the whole terminal as a freight-handling unit. Until the engineers connected with the Army supply bases started their designs, it is fair to say that the problem had not been confronted from what we may call the engineering viewpoint.

That problem is essentially one of traffic. The elements of the material handling are only incidental. Just as in a rapid-transit system the power house, the roadbed and the rolling stock must be of maximum efficiency, so in the freight terminal the machinery must be equal to any burden put upon it. But the success of a rapid-transit system depends on the manipulation of its trains so that there is a flow of passenger accommodation without interference and without stop. So in the freight terminal the big problem is to get the material out of the way so as to let the new material take its place, and to utilize the equipment to full capacity. This requires the visualizing of the terminal as a whole, and the working out of the design so that every item of freight to be moved proceeds on its appointed path from source to destination in the shortest possible time and with the least possible effort, and at the same time does not conflict with any similar unit on its appointed way.

To do this properly requires the engineering mind and engineering methods. The practical warehouse man is not apt to measure up to the task. Generally, he is too close to his job to see it as a whole. Too frequently his experience blinds his appreciation of methods with which he has not worked, and almost invariably he is more concerned with the rapid and efficient movement of small batches of goods than with the maximum efficiency of the whole plant. His value is in his knowledge of the various steps that go to make up terminal operation, and that knowledge the engineering designer must utilize as much as possible.

As pointed out in the article on another page, descriptive of the freight-handling methods proposed in the Brooklyn Army Base, there has as yet been no opportunity to test the designs of the great Army terminals. It should be obvious from the description of how the Brooklyn design was developed that success or failure depends as much on scientific operation as on effective design. The best the designer can do is to

prepare the plan so that a controlling head, with his finger on every detail of the huge plant, can dispose of various units so that each moves at its maximum capacity to its designed destination, without interference. This requires superior executive ability, the exercise of which it is hoped will be witnessed at some of the Army bases as soon as they are put into practical operation.

Increased production is beyond question the salvation of the future. Here is one way in which some engineers can bring it about, for in the lagging of freight in transit, and particularly in the wasted time of huge ships at docks, there has been an economic loss which scientific design and operation can much reduce in the future.

An Opportunity for Skillful Design

SOME weeks ago we spoke of the waste of highway-bridge investment chargeable to corrosion of the steel due to pocketing of dirt and moisture. Now that an engineer details a specific instance of repairs necessitated by such corrosion, the subject receives worthwhile emphasis. Attention is directed to certain conditions that particularly favor abnormal corrosion.

In a large measure the liability to pocketing has been overlooked heretofore, or, at least, its harmful results have not been clearly recognized. But, in addition, certain recognized corrosion troubles have not received adequate treatment. It has long been known, for example, that end bearings of highway bridges are favorite places for dirt accumulation and concentrated rusting, yet at no time was anything done in the way of improvement except in some cases providing more space around the bearings in order that the wind might keep them clear of litter. In the repair work now described, a determined attempt at cure has at last been made. The method used is radical and extremely suggestive: Incasing the bearings in concrete blocks with a thin parting at the plane of motion, and using a sliding plate in place of rollers. Critical study by other highway bridge engineers should soon develop the merits and weaknesses of this design.

Those opportunities for intensive corrosion that have been generally overlooked are more important, however. In the main, they depend on the floor construction. Plank floors, a type we shall doubtless long continue to use, are unfortunately very efficient devices for distributing moisture over the steelwork beneath them, and for filling the seams between metal and wood with water films. This fact has not been definitely realized in the past. Nor has the special likelihood of pocketing and rusting at the narrow clearances between truss web members and decking been appreciated. When the losses resulting from these conditions are fully realized, engineering skill can provide the means for preventing the damage; thus, a reasonably tight floor, provision of floor drainage, elimination of spiking strips, and the like, will go far toward eliminating the floor trouble. The first essential is that the seriousness of the present trouble should be appreciated.

What has been said does not apply unreservedly to bridges crossing railway tracks. Here the problem is more complicated, involving both moisture from above and corrosive gases from below. We have previously had occasion to refer to the possibility that complete concrete protection of the lower portions of the steelwork might ultimately be found necessary in such locations. But the simpler problem of the ordinary highway bridge is in more immediate need of attention, in view of the vast number of such structures and the absolute dependence of road traffic upon them.

Electrolytic Sewage Treatment Not Yet an Established Process

THIRTY years of experiments and demonstrations with only a few small working plants built and most of those abandoned—such in epitome is the record of the electrolytic process of sewage treatment. The story up to 1912 was told in detail in *Engineering News* of Mar. 21 of that year. In the same issue the first of the plants at Oklahoma City was described. Both plants have since been abandoned. Meanwhile two new processes have been brought forward and one of them—the "direct-oxidation" system, in which electrolysis is only one of a half-dozen elements—has been the subject of various demonstration tests, at Elmhurst, L. I., and Decatur, Ill., a number of reports and no little controversy. (On the Elmhurst plant, Borough of Queens, New York City, see *Engineering Record* of Sept. 12 and 19, 1914, pp. 292 and 315, and Oct. 17, 1914, p. 429; also *Engineering News* of July 13, 1916, p. 91. On the plant at Decatur, Ill., see *Engineering Record* of Oct. 17, 1916, p. 455, and Nov. 11, 1916, pp. 577 and 596.)

The direct-oxidation process has again been brought to the front by independent reports on a demonstration plant at Easton, Penn., both abstracted in this issue, and by pending proposals for permanent plants at Phillipsburg, N. J., and Allentown, Penn. Interest in the subject is heightened by the refusal of the New Jersey State Department of Health to approve the Phillipsburg plans last March and by a conditional approval on Aug. 12 (see news page). These current phases of the electrolytic process, together with the fact that, based on one of the Easton demonstration tests the Franklin Institute has awarded one of its gold medals to the promoter, make desirable a supplementary review of the electrolytic process, although no permanent plant of that type has yet been built.

In the review already mentioned it was shown that electrolytic treatment had not yet been established as a reliable and economic process of sewage treatment and that there was then no promise that it ever would be. At the same time, the possibility of success was recognized. Has this been realized to such an extent as to warrant its adoption by a city without farther investigation by wholly disinterested engineers? It seems not. Although both of the Easton reports declare that a satisfactory effluent was produced, they leave cost and the sludge problem in doubt and raise other questions that need to be answered. Until all these doubts have been removed by practical experience at several city-operated plants this particular method must be considered as being on probation.

The Pennsylvania State Department of Health report gives the direct-oxidation process more standing than it has had heretofore. The Franklin Institute report adds to the meager test data on the process. The test data of the two reports are printed elsewhere nearly in full, in order that readers of *Engineering News-Record* may draw their own conclusions from them, and the judicious conclusions of the Pennsylvania report are summarized.

It has been said that both reports leave the sludge problem in doubt. Of the Pennsylvania report this is true only to the extent that the test as made by the promoter seemed to take sludge disposal for granted. The report forcibly points out that the sludge problem is one to be reckoned with, that the bill will be high, and that the sludge might be a nuisance. The Franklin Institute report practically ignores sludge disposal.

It should be made plain, before going further, that the Landreth direct-oxidation process is not, strictly speaking, an electrolytic process, and that its promoter does not claim that it is such. It has been called a lime-electrolytic process. But that is not all. It is *a simultaneous combination of* (1) *lime precipitation,* (2) *electrolysis and* (3) *mechanical agitation, preceded at Easton by* (4) *coarse screening,* (5) *grit chamber action and* (6) *fine screening and followed by* (7) *sedimentation, after which the sludge remains for treatment and disposal.*

The last point is so important as to warrant first consideration in the further discussion. Every student of sanitary engineering knows that the sludge problem is the crux of sewage disposal, wherever what may be termed complete treatment is required. And every close student also knows that for twoscore years lime and other chemical precipitation methods have been avoided in new plants and abandoned where possible in old ones, because any efficient precipitant adds immensely to the volume of sludge. In the Pennsylvania tests, with the operation of the plant entirely in the control of the promoter, 3700 lb. of lime per 1,000,000 gal. of sewage was used. This is an excessively heavy dose and must produce an immense volume of sludge for treatment and disposal. In the Franklin Institute tests a much lower lime rate was used, but enough to add largely to the sludge volume—yet sludge disposal is practically ignored!

The vital question as regards the demonstration plant at Easton, or any other new process or combination of old processes, is What can it do that well proved systems of sewage treatment cannot do, and what is the comparative cost? Neither test shows that the Easton plant produced an effluent better than could be obtained by other methods or combinations of sewage treatment. An excessive cost is indicated in the Pennsylvania report, and no full cost estimates are given in the Franklin Institute report. The cost and most of the other test figures in the two reports are not directly comparable. The Franklin Institute's attempts to compare treatment results and costs for the Landreth process with those for other processes are not satisfactory, to say the least. The promoters use of 3700 lb. of lime per 1,000,000 gal. at Easton and heavy lime doses in some of his earlier tests to obtain maximum results, and his claims that much lower rates are sufficient and would reduce costs, do not go well when brought together. It is a case of high dosage for treatment results and low dosage for cost estimates.

The engineering division of the Pennsylvania Department of Health does well to advise that no city adopt the Landreth process without first making careful studies of its availability and cost compared with other processes. It also suggests that further investigations of the Landreth process might well be made. If the latter were to be done, not only should comparative tests of the Landreth and other processes be undertaken, but the elements and various combinations of the elements of the Landreth process should be compared with themselves, with the entire process and with other processes. Moreover, such tests should not be made in sequence, and then assembled for comparison, as was the case with the Franklin Institute tests to compare (1) lime and paddles (2) electrolysis and paddles, and (3) lime, electrolysis and paddles with one aonther. Instead, they should be made in parallel.

The process must still be regarded as in the experimental, or, at best, the demonstration stage. As such, one cannot help wondering why it should have received a gold medal of the Franklin Institute, if such a medal has real significance. It is to be hoped that no municipality will be misled into thinking that because a medal has been awarded for an "advance" in one of the arts any guarantee is afforded of efficiency and economy when the process comes into every-day use.

It should be remembered that the Webster process, tested as a pioneer in 1889 on London sewage, was abandoned by the City of Ipswich, England, after some years of use; that several Hermite plants, installed in Europe, have been given up; that the Woolf plant at Danbury, Conn., was shut down after a long fight in the courts; that the two Harris or Lautzenheiser plants at Oklahoma City have been abandoned. Apparently the only electrolytic plants treating municipal sewage at city expense are those at Santa Monica, Calif., and at Durant, Okla., of the same type as the abandoned plants at Oklahoma City. Reports from Santa Monica indicate that the plant there has little effect on the sewage and that more could be done with less expense by ordinary chlorination, especially as pumping would not then be necessary.

It is unfortunate but true that much of the history of attempts at sewage electrolysis in America affords unpleasant instances of vigorous promotion of unproved processes. Too many engineers, chemists and bacteriologists, for the most part quite unfamiliar with the nature and objects of sewage treatment, have lent themselves—it may be unwittingly, but, if so, perhaps all the more inexcusably—to aid unproved methods of sewage treatment. It is high time that all this mischief was stopped. It stands less chance of being attempted now than it did some years back because so many states now have efficient boards of health with engineers and laboratories to protect the municipalities but the temptation will doubtless persist and moral forces must be brought against it.

The unenlightened city official too often pins his faith to guarantees of the promoter-contractor. Such guarantees are generally drawn weakly from the municipal side. Rarely if ever do they extend beyond a short test period. Oklahoma City had guarantees on its first and presumably on its sewage-treatment contract, but to what avail?

Finally, it should not be inferred that opportunity is lacking for technically competent experimentation in the field of sewage disposal. Although there are a number of processes available to choose from, the cost of full sewage treatment is high, and there are many unsolved problems and hopeful possibilities. New methods and devices of proved or promising worth would be welcomed by engineers, state health officials and municipalities if presented solely on their technical and financial merits.

Drainage Works of the Rio Grande Irrigation Project

Elements of Design, Methods of Ditch Construction With Dragline Excavators on Caterpillar Tractors, and Details of Cost—Over 15,000,000 Cubic Yards of Excavation Involved at Cost of About $3,500,000

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SEEPAGE is a menace to the practice of irrigation farming. In recent years many of the larger projects have experienced serious seepage, and these problems have forced attention to this phase of irrigation.

Fortunately, many irrigation projects have excellent natural drainage, and the seepage or waterlogging has been confined to areas of limited extent. The Rio Grande project of the United States Reclamation Service furnishes a notable example of the opposite case. Approximately 70% of the gross area of this project had become either affected by seepage or was in immediate danger of becoming affected in 1917, prior to the beginning of drainage construction work. Extensive areas showed alkali incrustations. Many fields were too wet for cultivation and in many localities even the adobe homes of the native Mexicans were destroyed by caving of the overwet walls. Work is now progressing on an extensive drainage system comprising 316 miles of deep, open drains involving excavation estimated to aggregate 15,362,000 cu.yd. and to cost $3,374,000, or about $10,700 per mile, including both direct and indirect charges. The unit cost for excavation alone is assumed as 15c. per cubic yard. The work is being done by dragline excavators.

The seepage was caused by a general and rapid rise of the ground-water table, due to conditions over which the Reclamation Service had little or no control. Comprehensive measurements were made of this rise, and the resulting information was furnished to the water users, but little credence was given to early predictions made by the engineers that extensive areas would become waterlogged. Moreover, no extensive relief measures could be planned until the water users entered into contract for the repayment of the cost of drainage. Thus, with the actual appearance of seepage much preliminary work was necessary before the Reclamation Service could legally begin drainage construction.

The Rio Grande project is located on the Rio Grande River in New Mexico and Texas, as shown on the small sketch map forming a part of Fig. 1. It receives its water-supply from the river for which it is named, and the full supply depends on the storage water impounded by the Elephant Butte reservoir, which has a capacity of 2,600,000 acre-ft. of water. The project comprises a gross area of approximately 200,000 acres which lie in three valleys which are named, from north to south, the Rincon, the Mesilla and the El Paso. The El Paso and the Mesilla Valleys, wherein the principal area lies, are separated by a rocky pass and by the higher lands on which the City of El Paso, Tex., is located. The approximate average elevation of the irrigable area is 3600 ft. above sea level. Approximately 60% of the cultivated area is devoted to the production of alfalfa.

The irrigable area within these valleys is defined by the river bottom lands and lies in a strip from one to five miles in width skirted by rather abrupt bluffs and foothills. The threads of the valleys slope from 4 to 5 ft. per mile and the ground surface is generally flat, except where broken by small hills of blow sand or cut by old river washes.

The river meanders through the valley flood plains and has an average length almost double that of the valley itself. At intervals the channel pinches against the bluffs, forming the irrigable area into natural parcels or units. Such units control, in some measure, the general plan of both the irrigation system and the drainage system, by defining the necessary canal diversions and the outlet points for drains.

The river channel is very wide and shallow and is distinctly sandy. Previous to the construction of the Elephant Butte dam there were occasional torrential floods, carrying large quantities of silt, followed by reduced flow and periods of entire cessation of flow. In flood periods, tributary streams carried down quantities of heavy gravel and silt which lodged in the river channel and remained as a more or less permanent obstruction. These conditions brought about frequent shiftings of the channel, as is now witnessed by many old river beds and washes existing throughout the valleys.

The present river bed is usually from 4 to 8 ft. below the surface of the bordering lands. The slope of the ground surface normal to the general river course is quite variable, but always comparatively light. Often the land slopes away from the river bank, and in a few places the river bed is slightly elevated above portions of the valley lands. Frequently the lands near the foot of the bluffs are lowest, while in other instances the land surface has a distinct slope toward the river over areas of considerable extent.

The soil is sedimentary and shows great variation in character. Clays, fine

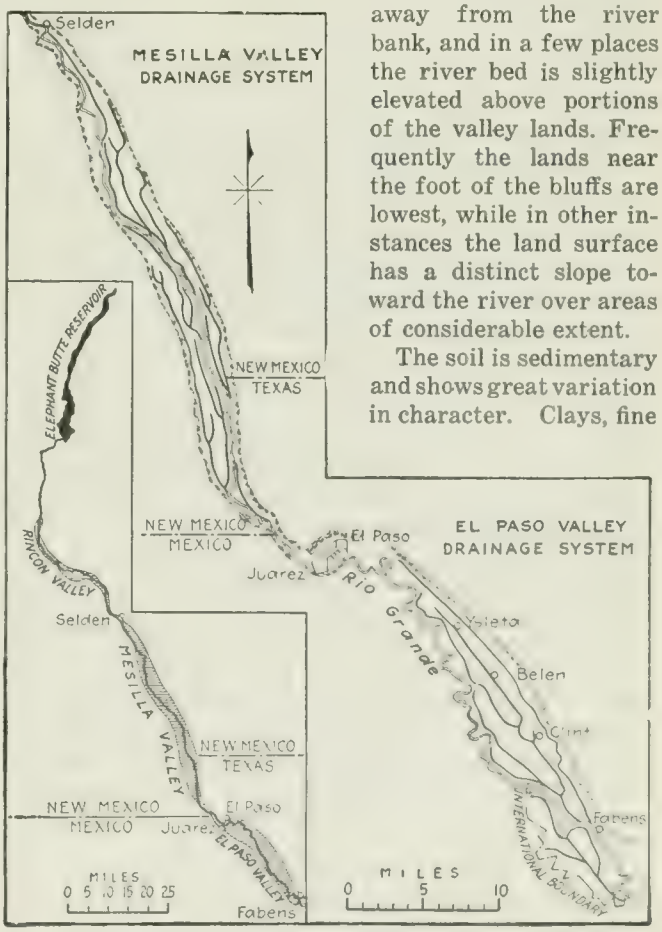


FIG. 1. IRRIGATED AREAS OF RIO GRANDE PROJECT, WITH MAIN DRAINAGE SYSTEMS FOR TWO OF THE THREE VALLEYS

sands and silts are the chief soil-forming elements, and these materials exist without uniformity in pockets and spots of small extent as laid down by flood waters. A distinct uniformity is noted in that sand, grading from "medium fine" to "quicksand," is encountered practically everywhere from 6 to 10 ft. below the surface.

Irrigation farming as practiced by native Spanish and Mexican inhabitants dates back over 300 years in portions of the project. Irrigation works were built and operated under the community system of control by these people until recent years. This early irrigation was dependent wholly upon natural river flow, and the available water was inadequate for the total valley area and frequently insufficient for any irrigation after July.

With the advent of American farmers, ditch systems were improved, and many small pumping plants were installed to supply late-season irrigation. These pumping plants drew their supply from the groundwater, and wells were usually from 40 to 60 ft. in depth, extending to the coarser sands and gravels.

The Elephant Butte reservoir construction began in 1912, and the first storage water was available during the irrigation season of 1915. The Reclamation Service had also constructed several diversion dams and the necessary main feeder canals prior to 1915. The various community ditches remained as part of the permanent irrigation system and were fed by the main Government-constructed canals. The increased water-supply resulted in no immediate increase in the area irrigated, but there was an immediate and considerable increase in the quantity of water applied to the land, and it is probable that water losses from the new canals were high for a period before the channels became silted.

Another result of the operation of the reservoir was the clarifying of the irrigation water which had formerly carried much silt. The use of clear water was responsible for an increase in the rate of loss of water by percolation, as the clear water was absorbed more readily by the soil. This was especially true in the case of field irrigation, because the farmers could not immediately prepare their lands to handle properly the large irrigation "heads" necessary for efficient irrigation with the comparatively clear water.

With the increase in the quantity of applied irrigation water, seepage troubles, which had previously been confined to areas of small extent, grew rapidly worse. The effect of the seepage is well illustrated by the acreage and unit production of alfalfa. In 1914, and prior to that year, over 40,000 acres were planted to alfalfa, and the average unit production, in years of average water-supply, was approximately 3.5 tons per acre. In 1917 the acreage in alfalfa had decreased to about 27,000 acres, and the average yield was estimated at 2.5 tons per acre.

The rise of the groundwater is well illustrated by the curves shown in Fig. 2, which represents the average depth below the surface of the groundwater in 20 test wells in the El Paso Valley. These curves also show the effect of the drains on the water-table. Two drains are now under construction in the area represented, and the maximum effect of the drains will not be apparent until later measurements are made.

Naturally, seepage first affected the deeper rooted crops such as alfalfa, but with the concentration of the alkali salts and the further rise of the groundwater, the shallow rooted crops were also damaged. In places the alkali incrustations resembled a light fall of snow. Large areas became incapable of profitable cultivation. Lower lying areas and river washes filled with stagnant water. Rushes and alkali weeds grew prolifically on fallow fields and along roadsides. The water of the shallow domestic wells became unpotable. Mosquitoes and flies increased, and the sanitation of the entire countryside became impaired. Highway maintenance was difficult; country roads were often impassable.

The extent of the damage is indicated by Table I of seeped areas, based on a survey of the groundwater table.

It was apparent that the alkali and waterlogging were rapidly spreading. If they remained unchecked, increasing areas would succumb to the menace, until sufficient land became swamped to provide drainage through surface evaporation for the remaining cultivated area. Reclamation difficulties increased with each succeeding year. Indeed, without drainage, the loss of the irrigation investment was imminent, as a majority of the farmers would have been forced to abandon their farms.

TABLE I. SEEPED AREAS, JUNE, 1917

Unit	Gross Area	Depth to ground water below surface: On Surface Area	On Surface Per Cent.	0 to 2 Ft. Area	0 to 2 Ft. Per Cent	2 to 4 Ft. Area	2 to 4 Ft. Per Cent.	Total Less than 4 Ft. Area	Total Less than 4 Ft. Per Cent.	More than 4 Ft. Area	More than 4 Ft. Per Cent.
Mesilla Valley	88,685	3,800	4 3	16,093	18 1	38,821	43 8	58,714	66 2	29,971	33.8
El Paso Valley	45.096	2,045	4.5	8,802	19.5	20,251	45 0	31,098	69 0	13,998	31.0

Drainage investigations were undertaken in order to find a remedy for this situation. Excellent topographical maps on a scale of 500 ft. to 1 in. with contour interval of 2 ft., already existed. Permanent test wells were installed in sections approximately normal to the river channel. The interval between test-well sections was usually one-half mile, but in some localities it was one mile. The interval between the individual test wells on each section was approximately one-quarter mile. These test wells were installed beginning in 1915, and groundwater measurements were thenceforth taken at bimonthly periods, so that there existed in 1917 considerable data on the movement and progressive rise of the groundwater.

The groundwater measurements taken in June, 1917, which represented average irrigation season conditions, were utilized in connection with the existing topographic maps to prepare drainage base maps. Water contours were developed at 2-ft. intervals from the plotted groundwater elevations, and from the intersection of water contours with those of the ground surface, the areas having groundwater on the surface, from 0 to 2 ft. below the surface, from 2 to 4 ft. below the surface and over 4 ft. below the surface, were marked out on the map. The seeped areas as thus defined were shown in color, so that the worst seeped areas would show strikingly. The acreages shown in Table I were determined by planimetering these areas.

These base maps, together with the plotted sections and boring logs of the permanent test wells, furnished the medium for studying the conditions affecting the

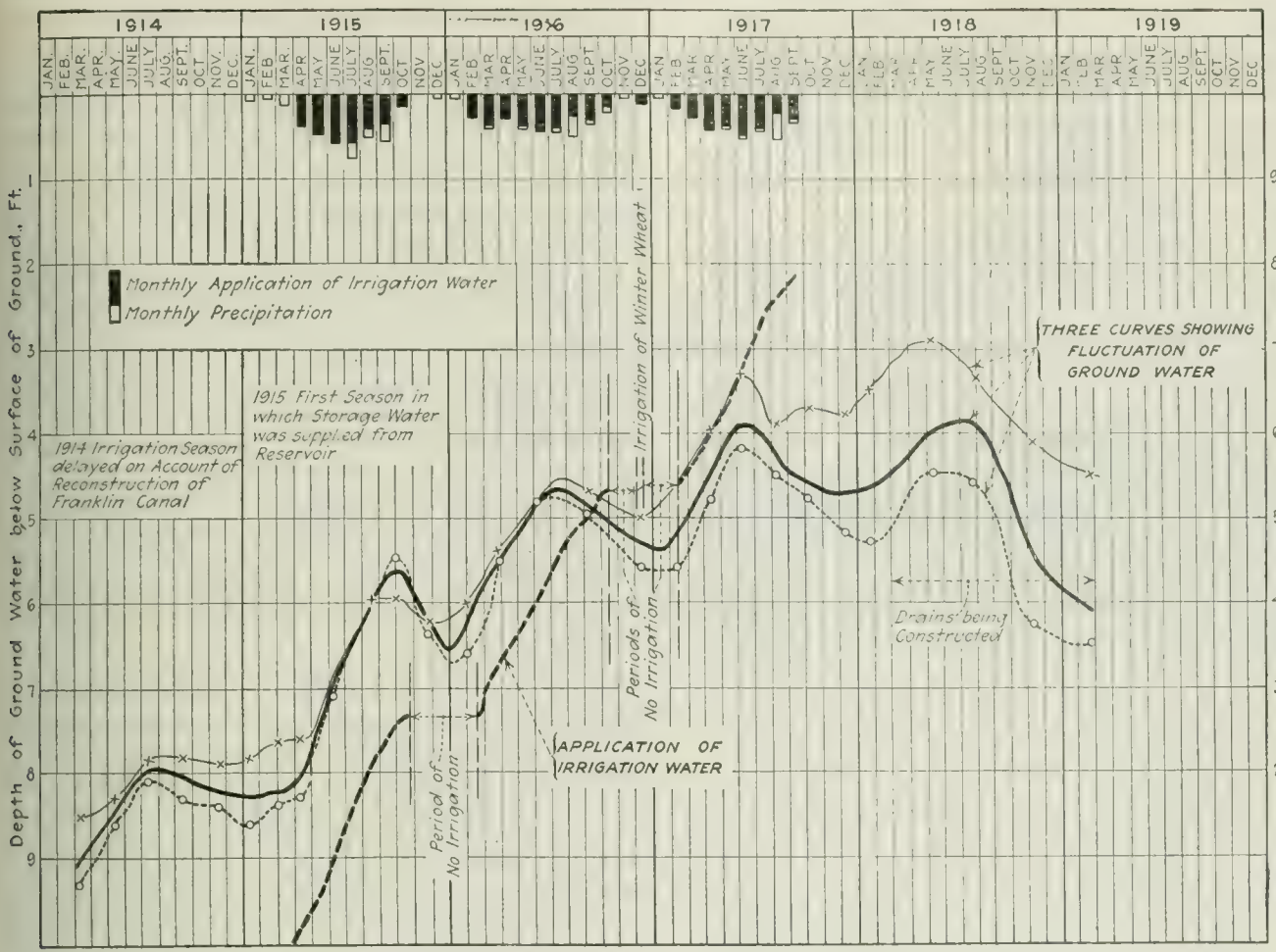


FIG. 2. FLUCTUATION OF GROUNDWATER AND APPLICATION OF IRRIGATION WATER ON RIO GRANDE PROJECT

The total area studied was 8500 acres, of which 5300 acres, net, were irrigated to an average seasonal depth of 4.3 feet, which would cover the 8500 acres to a depth of 2.7 feet. Of the three groundwater curves, the middle one (heavy plain line) is a composite or average of depth readings in 20 representative wells, scattered over the area; the light line with circles shows the average readings in 13 representative wells between Belen and Clint, Tex., and the line with Xs shows the average depth in seven representative wells at Ysleta, Tex. (See El Paso Valley sketch map in Fig. 1.)

planning of a drainage system. Other data considered were the records of water application on the land, the loss of water from canals by percolation, evaporation from free water and from seeped area, the methods of irrigation and the preparation of land for irrigation, and the probable structural formations of the valleys influencing the natural drainage.

The principal causes of seepage appeared to be as follows: (1) The water lost by percolation through all irrigation use; (2) the probable lack of any inconsiderable natural drainage; (3) the water lost from the river bed; (4) the low elevation of certain lands in respect to the position of water surface in the river.

The combined water losses through irrigation must be regarded as the primary cause of seepage. When storage water became available, many localities diverted as much as 8 acre-ft. of water for irrigation. This low duty was in part due to the fact that no control existed over water deliveries, and no direct measurements were made of the quantities delivered to the farms. Another cause for the low duty is found in the clarified storage water previously referred to. Larger farm litches were necessary and lands had to be prepared for shorter irrigation runs, in order to use clear water efficiently. As the water deliveries were supervised by the various communities themselves, no rearrangement of the existing system could be accomplished without first educating the individual farmer in the new problem. Much headway has been made in the educational program, but the reconstruction work will necessarily occupy a considerable period of time. However, such work is now under way in many parts of the project.

The natural drainage, considering the entire valley a unit, was concluded to be *nil*, as the valleys are regarded as closed basins without subterranean outlets other than through the rather tight material of the valley subsoil. The limited cross-section of the valley outlets, especially in the case of the Mesilla Valley, where Prof. Charles S. Slichter determined the subsurface outflow to be only about 6½ miner's inches in 1904, seemed to preclude the deep movement of any large quantities of water.

Conclusions as to the probabilities of loss of water from the river were reached from a study of the position of the groundwater contours, as developed on the base maps. In certain localities the tendency of water movement is outward from the river, while in other places the tendency of flow is inward from the land. Where the tendency of flow is outward on the lower side of sharp bends, it is thought that considerable river loss may take place, and that this flow of water outward and downward under the land may cause a serious accretion to the seepage condition.

Certain restricted areas have such low elevation compared with water surface in the river that their waterlogging was inevitable either as a direct result of river losses or, in the case of areas more remote from the river, from irrigation losses on higher lands. Some tracts of this character had been overwet for many years, and their reclamation was the cause of no immediate concern.

The drainage studies brought about a recognition of certain facts and conditions governing the general design of the drainage system, as briefly stated below:

1. The necessity for greater conservation in the use of water and the impracticability of providing drainage works designed on the basis of present use of water.

2. The flat surface slopes and the low river banks made essential as few drainage outlets as possible, with long drains paralleling the general river course.

3. The drains must cut below the bed of the river, and outlet drains will be partially ineffective at their lower ends while developing grade.

4. The position of drains in respect to the river should depend upon the apparent necessity of intercepting water losses from the river. In some localities, drains should be located as near the river channel as possible, considering maintenance difficulties, while in other places the desirable location is at distances of one-half to three-quarters of a mile from the bank.

5. Flat slopes and the necessity for handling large quantities of drainage water, coupled with known quicksand conditions which exist at grade depths, preclude the use of tile drains.

Location studies looking toward the adoption of a tentative plan for drainage and for estimating its cost were made on the base maps. These maps, as previously described, represented a compilation of all pertinent physical conditions and data governing the problem. They showed the seepage conditions, the land ownership, the ditches, roads and improvements, as well as the surface topography and the direction of groundwater flow.

Cost and Efficiency Estimates Made

Various drainage lines and systems were located on these maps and compared as to cost and probable efficiency, and thus by elimination the best locations were finally determined and a tentative system was adopted for the unit under consideration. The system adopted is termed the "tentative plan" because it is subject to change by reason of the information made available with the progress of work. Experience has shown that it is impossible either to correctly estimate the effectiveness of drains or to anticipate fully all the difficulties of construction in advance of actual work in any given locality. The desirability of having a flexible program is therefore obvious and is, indeed, essential for securing the best results.

The tentative drainage plan adopted for the Rio Grande project provided for the construction of 316 miles of open drains to serve approximately 175,000 acres in the Mesilla, El Paso and Rincon Valleys. The drains were designed with a minimum base width of 6 ft. and a maximum base width of 30 ft. The average depth of cutting was approximately 10 ft., except as the outlet drains approached the river, where grades were gradually raised to meet the river bed. Side slopes were 1½ to 1. The base width was afterward increased to 10 ft. because slopes would not stand.

The excavation was planned to be accomplished with dragline excavators, and designs provided for all excavated material to be deposited on one side of the ditch, except that a low levee was to be constructed on the opposite side of the drain for the purpose of keeping surface water from washing over the slopes. It was considered essential that one bank of the drain be free from large spoil deposits, in order to facilitate future cleaning work.

The allowable interval between drains was estimated on the assumption that drains excavated to the contemplated depth would develop an average accretion from the groundwater of about 1 sec.-ft. of water per mile of drain, and that approximately 1 acre-ft. of water per acre of irrigable area would have to be removed annually by the drains in order to provide adequate drainage. It was thus contemplated that reasonable improvement would be made in the use of irrigation water. This point was emphasized, and it was pointed out to the water users that drainage could not be fully successful unless the land was properly prepared for irrigation and the utmost economy was practiced in the use of water.

Ten-Foot Depth for Drains Considered Essential

An average grade depth of 10 ft. is deemed essential for the development of this estimated inflow of water and for the further purpose of keeping the water-table at sufficient depth below the ground surface to prevent the rise of water by capillarity. The high percentage of white alkali salts in the soil renders it necessary to stop surface evaporation from the groundwater supply in order to accomplish drainage and make possible the reclamation of alkalied areas. Local silt soils have great capillarity and from 4 to 6 ft. of unsaturated soil is necessary for diversified farming.

On the above basis, it was expected that drains would be effective from distances of from one-half to three-quarters of a mile, and locations were made on this assumption, and taking into consideration other local conditions, such as the shape of the particular area under consideration and the probable direction of groundwater movements. Surface irregularities also influenced locations, and it is expected that the river-side intercepting drains will drain a less area than other drains because they have the river on one side.

The results accomplished by constructed drains are quite encouraging. The test-well measurements indicate a consistent slope of the groundwater toward the drains of approximately 1 ft. to 1000 ft. under average irrigation-season conditions. A loss of head of about 1.5 ft. occurs very close to the drain section, as determined by numerous measurements. This loss of head seems somewhat comparable to an entrance head loss, and must be considered in estimating the effectiveness of drains and in planning their necessary depth.

The drainage discharge from groundwater development ranges from an approximate average of 1.17 cu. ft. per second per mile of drain during the nonirrigation season to an approximate average of 1.75 cu. ft. per second per mile of drain during the irrigation season. Basing a conclusion on the irrigated area tributary to the drains, this discharge corresponds to a development of 0.0019 sec.-ft. per acre for the nonirrigation season and 0.003 sec.-ft. per acre for the irrigation season.

The groundwater measurements indicate that drains

accomplish a lowering of the groundwater at a maximum normal distance of three-quarters of a mile. At one-half mile the lowering is usually marked and probably is sufficient to accomplish efficient drainage. The maximum benefit will not be felt in any particular unit until all drains proposed for construction are completed. In this connection it should be stated that the real test of the sufficiency of the drainage system will come only after all the described area is brought under irrigation.

It is noted that the drains are quickly effective, and it is estimated that some 30,000 acres have been fully drained by the works already constructed, while an additional area has been protected against the spread of seepage. Old alfalfa plants seem especially responsive to drainage, and their shallowed roots penetrate downward almost immediately after a lowering of the groundwater has been effected. All crops are noticeably healthier in the portions of the project now drained. The relief afforded by the drains now built indicates that the valleys will be fully reclaimed and that the drained lands will then have great and lasting fertility.

It was decided to accomplish the proposed work by Government forces, in order to permit more flexibility as regards necessary changes in plans. It was also thought that a saving in cost could be made under this method, as the Reclamation Service had at its disposal forces trained in this kind of work.

The poor quality of boiler water obtainable and the absence of sufficient electric power led to the choice of draglines driven by internal-combustion engines as the principal equipment for the work. Four machines of this type were received on the project in July, 1917. They were 1½-cu. yd. draglines with 50-ft. booms and were mounted on caterpillar traction. Each machine weighed approximately 55 tons. Power was provided



FIG. 3. RECUTTING DRAINAGE DITCH WITH DRAGLINE EXCAVATOR TO PROPER GRADE DEPTH

by 6-cylinder, 98-hp. kerosene-burning engines. Distillate was later substituted for kerosene because of lubrication difficulties caused by kerosene, and this fuel proved to be more efficient under the extremely variable load conditions.

Early experience with these machines, which were the first constructed of this specific type, showed the advisability of providing more powerful engines and of making other improvements necessary to develop a high-speed machine capable of continuous three-shift operation. The manufacturers coöperated in this development, which resulted in minor changes in design and a change in engines to 125-hp., 4-cylinder distillate-burning type. The changes were made in the field in August and September, 1918, and four new machines were also furnished in accordance with the new specifications and installed on the project in October and November, 1918.

The fleet of draglines now employed on the work consists of eight caterpillar-traction machines, as described above; two smaller machines equipped with 40-ft. booms, 1-cu.yd. buckets and walking traction; one 60-ft. boom, 2-cu.yd. walking traction machine and one 40-ft. boom, 1-yd. steam machine. The above equipment is owned and operated by the Reclamation Service. One contractor is also employed on the work, operating a land-dredge type of machine which spans the cut. This machine is equipped with a 60-ft. boom and a ¾-cu.yd. bucket.



FIG. 4. DRAGLINE EXCAVATOR LAYING ITS OWN TRACK-WAY ACROSS RIO GRANDE AT FABENS, TEXAS

The track-way is composed of timbers held together by wire cable so they may be picked up and lowered, as shown. The same general plan was used in moving the machine across soft ground

Dragline crews consist of one engineman and one laborer, in addition to the operator. Each machine is in charge of a chief operator who operates the day shift and is responsible for the upkeep of machinery and the general output of the machine. The mechanical features are in charge of the master mechanic, who also supervises the machine shop which is maintained to facilitate repair work. All machines are operated in three 8-hour shifts per day and general repair and cleaning-up work is accomplished by the chief operator and crew on Sunday.

Careful records are kept of the machine's time and the excavation accomplished by each shift. Standard report forms are provided, and daily reports are required from each operator. These reports form the basis of monthly efficiency reports which are prepared for the purpose of comparing the results accomplished by the various machines and by the individual operators. (See Table II.)

A comparative system of grading is used to show the standing of each operator for the month and also "to date." Grades are based on "cost" and "excavation per shift," equally weighed, and compared with the average results produced by the total number of operators working under comparable conditions. Grades indicate whether they are below or above average by being over or under 100%. These efficiency reports are posted monthly on each machine and in each field camp, and an attempt is made to recognize properly

TABLE II. SUMMARY OF OPERATION COST AND EFFICIENCY OF EIGHT CATERPILLAR DRAGLINE EXCAVATORS, WITH 50-FT. BOOM AND 1½-CU.YD. BUCKET

To Dec. 31, 1918

Machine Number	Period: Began Excavation	Began Changing Engines	Excavation: Months Operating	Linear Feet	Miles	Cubic Yards	Cost Distribution: Labor Machine and Ground Crews Total	Labor Machine and Ground Crews Per Cu.Yd.	Miscellaneous Labor and Minor Expense Total	Miscellaneous Labor and Minor Expense Per Cu.Yd.	Fuel Total	Fuel Per Cu.Yd.
4 Old Machines with Twin City Engines, 93 Hp												
3	July 25, '17	Aug 11, '18	12.5	51,446	9.75	413,479	$8,990.39	$0 021	$385 68	$0 001	$6,205.15	$0.015
4	July 24, '17	Aug 4, '18	12 3	39,320	7 45	331,199	9,404 30	028	314.34	001	6,245.85	.0126
5	Aug 25, '17	Aug 28, '18	12 1	43,065	8 15	344,528	7,815 48	023	982 58	003	5,315.15	.016
6	Aug. 24, '17	Sept 14, '18	12 6	56,950	10 80	378,216	8,606 32	.023	638.56	0017	5,567.43	.015
4 old machines Twin city engines			49 5	190,780	36.20	1,467,422	34,816.49	024	2,321 16	0016	23,333.58	.016
4 Old Machines with Atlas Engines, 125 Hp												
3	Sept 5, '18		3.8	14,185	2 8	130,217	3,291.80	025	71.54	.00054	2,824.99	.022
4	Aug 25, '18		4 2	14,875	2 8	142,654	3,505 67	025	159.56	.001	2,654.85	.0186
5	Oct 1, '18		3 0	13,365	2.5	134,993	2,283 87	017	467 60	.0034	1,681.61	.012
6	Oct 19, '18		2 3	9,930	1.9	87,554	2,760.47	.035	90.43	....	1,242.16	.0141
4 old machines Atlas engines			13 3	52,985	10 0	495,418	11,841 81	024	789 13	0016	8,403.61	.017
4 old machines to date			62 8	243,765	46.20	1,962,840	46,658.30	0237	3,110 29	0016	31,737.19	.016
4 New Machines with Atlas Engines, 125 Hp												
7	Sept. 13, '18		3 5	13,010	2 5	94,142	2,112.00	022	110.58	001	1,408.17	.015
8	Oct. 4, '18		2 9	17,080	3 2	170,542	2,347 47	014	390 80	002	17,984.49	.011
9	Oct 29, '18		2 1	10,770	2 0	105,113	1,712 56	.016	112.70	001	1,358.98	.013
10	Nov. 4, '18		1 9	11,200	2 1	19,313	1,215 30	.015	201.93	003	1,193.40	.015
4 new machines Atlas engines			10 4	52,060	9 8	449,110	7,387 33	016	816.01	0018	5,759.04	.013
8 Machines with Atlas Engines												
8 machines with Atlas engines			23 7	105,045	19 8	944,528	19,229.14	020	1,605.14	0017	14,162.65	.015
8 Bucyrus Machines to Date												
8 machines to date..			73.2	295,825	56.0	2,411,950	54,045.63	022	3,926.30	0016	37,496.23	.015

Cost Distribution

Machine Number	Hauling Fuel Total	Hauling Fuel Per Cu.Yd.	Water Total	Water Per Cu.Yd.	Wire Rope Total	Wire Rope Per Cu.Yd.	Lubricants Total	Lubricants Per Cu.Yd.	Minor E. R. & S. Total	Minor E. R. & S. Per Cu.Yd.	Total	Per Cu.Yd
4 Old Machines with Twin City Engines,												
3	$526.29	$0 001	$4 24		$792.20	$0 002	$2,192 05	$0.005	$5,086.09	$0.012	$1,338.71	$0.003
4	598 67	00066	6 67		770 11	.002	2,346.96	.007	6,352.56	0126	1,198.92	.0027
5	1,108 83	003	9.15		834.77	002	1,855.82	0054	4,635.06	.014	1,188.22	.003
6	600 80	002	6.59		508.00	002	1,941.09	.0051	5,071.50	.013	1,274.90	.003
4 old machines, Twin City engines	2,834.59	0019	26 65		2,905 08	00199	8335.92	0057	2,145.21	.0144	5,000.75	.0034
4 Old Machines with Atlas Engines, 125 Hp												
3	197 80	002			690 40	.005	592 50	005	1,143.58	.0087	593.34	.0045
4	210 39	001			308.20	.002	563.25	0039	1,267.25	.0088	548.25	.0038
5	249 39	0018	26 12		204 75	0015	264 30	0019	1,085.54	.0080	404.88	.0029
6	302 64	0034	108 22	0012	366.22	.0042	479 74	0054	1,193.00	.0136	304.11	.0034
4 old machines, Atlas engines	960 22	002	134.34	0003	1,569 57	003	1,899 79	.004	4,689.37	.009	1,850.58	.0037
4 old machines to date	3,794 81	0019	160 99		4,474.65	.0023	10,235 71	.005	21,834.58	.011	6,851.33	.0035
4 New Machines with Atlas Engines, 125 Hp												
7	125 90	001			175 00	002	424.10	.005	452.44	.005	568.37	.006
8	329 52	.002	52 50		342.26	002	383 01	.002	1,493.52	.009	511.63	.003
9	111 19	001	45 93		156 27	002	242 64	002	930.65	.009	320.99	.003
10	77 80	001			199.00	003	182.45	002	160.00	.002	569.86	.007
4 new machines, Atlas engines	644.31	001	98.43		872.53	002	1,232 20	.0027	3,036.61	.0067	1,970.85	.0039
8 Machines with Atlas Engines												
8 machines with Atlas engines	1,604 63	.0017	232.77	0002	2,442.10	.0026	3,131.99	0033	7,725.98	.008	3,821.43	.0038
8 Bucyrus Machines to Date												
8 machines to date	4,439.12	.0018	259.42		5,347 18	0023	11,467 91	.0045	24,870.69	.0112	8,822.18	.0036

Cost Distribution / Time Distribution / Performance / Cost of Operation

Machine Number	Equipment Total	Equipment Per Cu Yd.	Total	Per Cu.Yd.	Shifts Charged Operation	Operating %	Repairing %	Delays %	Mi. per Mo.	Lin. Ft. per Shift	Cu. Yd. per Shift	Total Cost	Cost per Cu.Yd.	Cost per Foot	Cost per Mile	Cost per Shift	Cost per Month
4 Old Machines with Twin City Engines,																	
3	$11,288 14	$0.028	$37,088 39	$0 090	927 0	45	37	18	0 78	55.5	446	$37,088.39	$0.090	$0.72	$3,805	$40.00	$2,965.00
4	10,281 10	031	37,520 22	1132	909.5	45	47	8	0 61	43.3	365	37,520.24	.113	.95	5,036	41.30	3,050.40
5	8,208 85	024	32,452 25	095	823 5	51	34	15	0 67	41 9	419	32,452.35	094	.94	4,980	39.40	2,682.00
6	9,143 56	024	33,507.30	0885	932 0	52	34	14	0.86	40.6	406	33,507.50	.089	.59	3,100	36.00	2,670.00
4 old machines, Twin City engines	38,951 65	.0265	140,568 16	0958	3,592 0	49	38	13	0.73	53.1	409	140,491.04	.096	.74	3,882	39.20	2,838.00
4 Old Machines with Atlas Engines, 125 Hp.																	
3	2,338 20	018	11,744 15	090	298.5	55	23	22	0 74	49.6	436	11,744.15	.090	83	4,195	39.30	3,090.00
4	2,399 63	0168	11,707 66	082	298 0	64	22	14	0 66	50.0	479	11,707 64	082	79	4,190	39.40	2,790.00
5	1,538 66	0113	8,425 09	0624	225.0	64	16	20	0 83	59.4	600	8,425.09	060	63	3,368	37.40	2,809 00
6	1,288 50	0147	6,545 91	0747	198.5	58	19	13	0 83	50 0	441	6,545.71	075	66	3,445	33.00	2,845 00
4 old machines, Atlas engines	7,564 99	015	38,422 81	07756	1,020 0	60	22	18	0.75	51.9	486	38,499 93	.078	73	3,850	37.75	2,894 00
4 old machines to date	46,516 64	023	178,990 97	0911	4,612 0	51		14	0 73	52.9	426	178,990 97	091	73	3,890	38.80	2,869 00
4 New Machines with Atlas Engines, 125 Hp.																	
7	1,743 27	018	7,326 93	078	169 0	62	17	21	0 71	77 0	556	7,326 93	.078	.56	2,932	43.35	2,093 00
8	3,410 84	020	11,060 04	065	229 0	67	15	18	1 10	74.6	744	11,060.04	.065	65	3,457	48.40	3,812 00
9	2,140 26	020	7,138 02	068	161 0	63	25	12	0.95	66.9	653	7,138 02	.068	66	3,400	44 30	3,398.00
10	1,596 80	020	5,396 54	068	108 0	62	19	19	1 10	103.7	480	5,396.54	.068	.48	2,568	50.00	2,839.00
4 new machines, Atlas engines	8,891 17	0198	30,921 53	069	679.0	64	19	17	0 94	76 7	661	30,921.53	.069	59	3,106	45.55	2,975.00
8 Machines with Atlas Engines																	
8 machines with Atlas engines	16,456 16	0174	69,344.34	0732	1,699.0	62	21	17	0 83	61 8	555	69,421.46	.0735	.66	3,506	40.85	2,930.00
8 Bucyrus Machines to Date																	
8 machines to date	55,407 81	0219	209,912 50	087	5,291 0	53	33	14	0 77	55.9	456	209,912.50	.087	.71	3,750	39.70	2,865.00

Machine Number		Fuel Consumption — Ave Cost per Gal.	Amount Used (Gal.) Total this Yr	Amount Used (Gal.) Per Shift	Yards per Gal	Cost per Yard	Gasoline — Ave Cost per Gal	Amount Used (Gal.) Total this Yr	Amount Used (Gal.) Per Shift	Cost per Yd for T. Exc.	Lubricating Oil — Ave Cost per Gal	Amount Used (Gal.) Total this Yr	Amount Used (Gal.) Per Shift	Cost Per Yd.
4 Old Machines with Twin City Engines														
3	Kerosene	$0 13	8,425	46 8	7 1	$0 0183	$0 25	637	3 5		$0 61	640	3.6	.....
	Distillate	144	16,230	38 4	13 9	0103	25	2,237	5 3		61	2,189	5.2	.....
4	Kerosene	13	7,390	44 0	7 2	0182	25	1,723	10 3		.61	510	3.0	.....
	Distillate	144	14,675	32 6	10 5	0137	.25	1,963	4 4		61	2,078	4.6	.....
5	Kerosene	.13	5,238	33 8	7 5	.0174	25	996	6 4		.61	409	2.6	
	Distillate	141	19,945	43 7	13 1	0108	25	2,089	4 6		.61	2,439	5.3	
6	Kerosene	13	4,806	37 5	7 9	.0164	25	683	5 3		61	307	2.4	
	Distillate	141	20,114	36.9	11 5	0122	25	2,318	4 2		61	2,243	4 1	
4 old machines Twin City engines	Kerosene	.13	25,859	41 0	7.3	0177	.25	4,039	6 4	0 00 9	61	1,866	3 0	0 0045
	Distillate	.143	70,964	37.9	12 3	0116	.25	8,607	4 6	.0028	61	8,949	4.8	0 0072
4 Old Machines with Atlas Engines, 125 Hp														
3	Distillate	$0 16	12,595	42 2	10 3	0155	.25	2,150	7 3		.62	825	2 8	
4	Distillate	16	12,610	42 3	11 3	0141	25	2,057	6 9		62	898	3 0	
5	Distillate	153	10,092	44 8	13.4	0114	25	640	2 8		.62	538	2 4	
6	Distillate	153	6,995	35.2	12 5	0122	25	538	2 7		.62	641	3 2	
4 old machines, Atlas engines	Distillate	156	42,292	41 5	11.7	0133	25	5,386	5 3	0037	.62	2,902	2 8	0036
4 old machines, to date	Distillate only	15	113,256	39 1	12 0	0125		13,993	4 8	.0028		11,851	4 1	.006
4 New Machines with Atlas Engines, 125 Hp														
7	Distillate	163	6,765	40 0	13 9	0117	25	1,090	6 5		62	660	3 9	
8	Distillate	154	12,069	52.7	14 1	0109	25	1,021	4 5		62	597	2 6	
9	Distillate	.154	8,504	52 8	12 4	0125	25	638	4 0		.62	159	1 0	
10	Distillate	163	5,830	53 9	13 6	0120	25	990	9 1		.62	275	2 5	
4 new machines, Atlas engines	Distillate	159	33,168	48 8	13 5	0117	25	3,739	5 5	0021	.62	1,691	2.5	.003
8 Machines with Atlas Engines														
8 machines with Atlas engines	Distillate	157	75,460	45.2	12.5	0121	.25	9,125	5 4	0024	.62	4,593	2 7	.003
8 Bucyrus Machines to Date														
8 machines to date	Distillate	.153	146,424	41.0	12.4	0123	.25	17,732	5 0	.0027	.618	13,542	3.8	.005

each meritorious record. In this manner a friendly rivalry is stimulated and the daily work becomes somewhat of a game, with keen interest centered on monthly results. Direct benefit accrues to both the individual and to the job, as mediocre operators frequently perfect themselves under the spur of ambition, while the hopelessly poor material may be readily spotted and removed from the work.

The work accomplished to June 1, 1919, consists of the excavation of 5,314,160 cu. yd. in 115 miles of drain. The eight caterpillar draglines are making especially gratifying records. The highest monthly machine's record to date has been 80,000 cu. yd. in 76 shifts, and the highest monthly average for the eight draglines has been 53,500 cu. yd. each in 72 average shifts. Detailed cost records of excavation work to Dec. 31, 1918, are shown in Table II, and the total cost to June 1, 1919, is summarized in Table III.

TABLE III. TOTAL COST OF DRAIN CONSTRUCTION ON THE RIO GRANDE PROJECT, NEW MEXICO–TEXAS, TO JUNE 1, 1919

Drains built by Government forces	112 miles
Drains built by contract	3 miles
Total length of drains	115 miles

Classification	Total Cost	Unit Cost — Per Mile	Unit Cost — Per Cu Yd	Per Cent.
Excavation:				
Govt. forces—5,149,500 cu.yd.	$452,816	$4,043 00	$0 087	51.2
Contract 164,760 cu.yd.	17,300	5,766.67	0.105	1.8
Structures—320	205,729	1,788.94	0.038	23.3
Examinations and surveys	63,460	55.18	0.011	7.2
*Right of way	34,312	298.36	0.006	3.9
**Overhead expense	110,850	963.91	0.028	12.6
Totals and averages	$884,467	$7,691.06	$0.166	100.0

* This item includes rebuilding of irrigation laterals.

** Overhead expense includes general expense, engineering, superintendence, and maintenance of field camps.

An equipment depreciation charge of 2c. per cubic yard is included in the excavation costs for Government forces.

Contract cost shown is contract price and not cost to the contractor.

Some changes in plans have been made since construction work started, notably in connection with location. It proved impossible to construct a 6-ft. width of base, because of the flat slope assumed by quicksand at grade depth, and a 10-ft. minimum base width is now used. Frequently it is necessary to reëxcavate the drain in order to maintain grade depth after a period of ten days or two weeks has elapsed and the soil water running into the drains has assumed a flatter slope.

Structure work constitutes about 25% of the cost of building the drains. The cost is materially increased by quicksand conditions which necessitate sheet piling for all foundation work.

Concrete is used for more important structures and timber for the many minor structures. Quantities of 36-in. reinforced-concrete tile are utilized for constructing culverts under canals and surfaced highways. The tile are manufactured in 6-ft. lengths in convenient yards near the work. They are hauled to the crossing site in trucks and placed in position with the draglines. The tile are embedded in sufficient concrete to insure alignment and render the joints tight, and are laid as one-, two- or three-barrel structures, as capacity demands. This type of culvert is cheaper and has the distinct advantage of being more quickly installed than the monolithic box type. This quick-installation feature is important in the case of canal crossings, because crops depend upon practically uninterrupted irrigation service.

The smaller lateral and farm-ditch crossings are made with metal fluming carried on a timber substructure, and the less important bridges, both highway and farm, are built of timber in either one or three spans, supported on piling.

Output of Electric Power Given

According to figures recently compiled by the Division of Power Resources, United States Geological Survey, electric power plants in the United States engaged in public service, including central stations, electric railways, and certain other plants, furnished, in March, a daily average of 101.400,000 kw.-hr. Forty-one per cent was produced by water-power. From figures furnished by those plants using coal, the average consumption per kilowatt-hour was found to be 3 lb. Figures were based on 3075 reports, estimated as coming from 89 per cent of public service plants.

New Data on Ship Stresses

Results of Strainagraph Measurements on Ships at Sea and During Launching—Stress-Distribution Accords With Design Assumptions—Beam Stresses in Cross-Section

EXPERIMENTAL data that will furnish new material for the structural design of ships have been obtained in extensometer measurements made on steel and concrete vessels, both at sea and during launching, by engineers of the Emergency Fleet Corporation. The work was begun for the purpose of giving exact knowledge on which to base the design and the improvement of concrete ships, but it has yielded at least equally important results in its application to steel ships. Its success is due to the reliability of the instrument devised for the measurements, and to the fact that the work was planned and carried out on so large a scale as to permit of using a great many instruments simultaneously and thereby obtaining stress results covering virtually the entire ship at once, in place of single figures applicable to one point only and not comparable with others.

Broadly considered, the results of the work up to the present may be summarized in two conclusions:

1. Concrete steamships as designed and built within the past two years are serviceable and safe from the structural standpoint and have but minor points of weakness that should be readily eliminated in future construction. Their stresses compare fairly with those existing (theoretically and practically) in steel ships.

2. Steel ships act as completely elastic structures in the same sense as a bridge, and are subject to a constant sine-wave reversal of stress. Their principal strength function, longitudinal beam action, is exercised in a manner closely similar to that assumed in current designing practice. The upper decks share somewhat less in the girder-flange action than expected. On account of the great excess of material in the double bottom, the neutral axis of the girder is very low, and the deck stresses are therefore the highest in the ship's structure. Superimposed stress waves amounting (in the deck) to at least 2000 lb. per square inch are set up by flexural vibrations due to pounding in heavy seas.

The Strainagraph for Recording Deformations

To make the work possible, it was necessary to construct a continuously recording extensometer, since rapidly varying strains had to be measured. Prof. F. R. McMillan, research engineer for the Fleet Corporation, worked out the design of the instrument. He succeeded in making a combination of a distance bar or gage bar with the recording element of a recording pressure gage manufactured by the American Steam Gage & Valve Manufacturing Co. for work on air-brake equipment. After some development work (carried out in less than three weeks) 24 "strainagraphs" were built. At the same time 13 water-pressure recorders were built, in order that the hydrostatic head at different points of the submerged hull surface could be measured, as it was desired to have knowledge of the applied moments when studying stress variations, and also to compare the actual pressures with those of the usual standard-wave assumptions. This pressure recorder is a modification of the air-pressure recorder mentioned.

The strainagraph registers the changes in the gage length by drawing a curve on a moving strip of paper. The latter travels from a supply roll over a record cylinder to a rewind roll and is driven by the record cylinder through sprocket teeth which engage holes punched in the edge of the strip. The rewind roll is driven from the record cylinder by friction contact, which gives a slight tension in the paper and at the same time takes up the inequalities of winding speed.

At first the record or driving cylinder was actuated by clockwork, but an electric motor (1/200-hp. motor for 12 to 24 volts) from which a coil-spring belt goes to a small train of gears driving the cylinder is now used. This gives more uniform paper speed and simplifies the simultaneous operation of a large number of instruments. Two pen arms write on the strip as it passes over the record cylinder, one being actuated by clock contact to mark 10-second intervals, while the other is the strain recorder. This latter pen moves with a multiplication of 140 as compared with the movement of the gage bar or distance bar, through two levers in series.

The large lever shown at the bottom of the case in the larger view in Fig. 1 receives the motion of the distance bar through a short plunger bearing against a knife-edge at the circumference of the lever shaft, forming the short arm of the lever. This gives a multiplication of 9; the remainder of the multiplication is secured through the lever ratio of the pen arm, which connects to the long end of the first lever.

The outer end of the contact plunger, in contact with

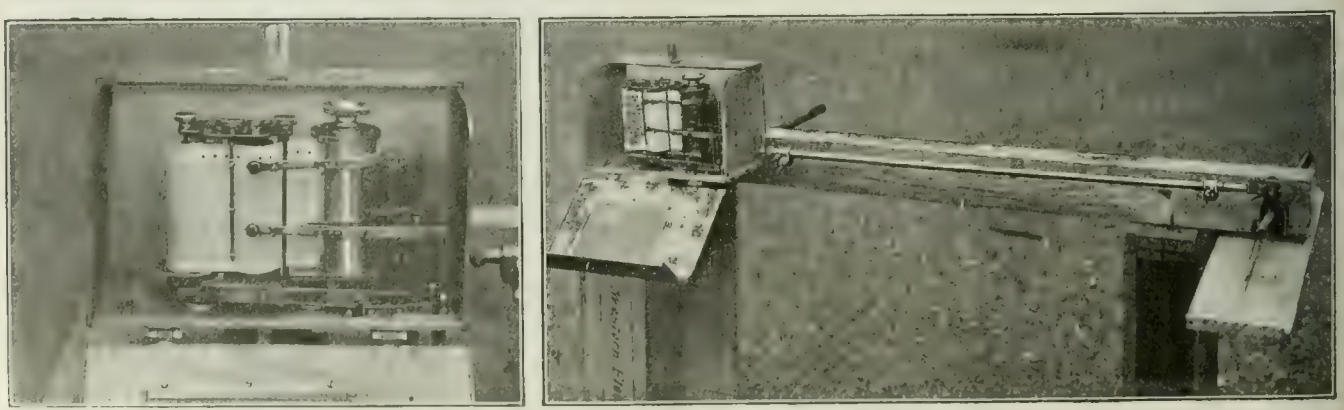


FIG. 1. THE "STRAINAGRAPH" AND ITS RECORDING GAGE BOX

the end of the gage bar, is spherical, which allows for adjustment in setting up the instrument and so avoids binding. In applying the instrument, the far end of the bar and the recording instrument are each clamped to a ¾-in. steel stud fastened to the ship; the methods of fastening the stud differed somewhat according to location.

As usually set up, the instrument produced records whose vertical scale was approximately 5000 lb. per square inch steel stress per inch of height, and whose horizontal scale (paper speed) ranged from 10 to 15 in. per minute.

The actual conduct of the experiments on board ship was in each instance a rather formidable undertaking. This is suggested by the photograph, Fig. 5, showing the assembled test equipment, piled in the hold of the "Atlantus"; besides the 25 strainagraphs and 12 pressuregraphs, the group includes 28 large boxes and switchboards, batteries, motors and pipe connections, and more than two miles of electric conductors. Correspondingly, the physical task of testing is large, and engages a group of observers sufficient to enable all the operating instruments to be kept under supervision simultaneously.

Its Applications

Four important applications of the strainagraph have been made up to the present. The objects of measurement were:

Sea-service stresses in the concrete ship "Faith" on its maiden voyage, San Francisco to Vancouver, May-June, 1918.

Launching stresses in the concrete ship "Atlantus," Brunswick, Ga., Dec. 4, 1918.

Service stresses in the steel ship "Westboro" (8800 tons d.w. capacity) during a transatlantic voyage, February-March, 1919.

Docking stresses in the concrete ship "Atlantus," June 10-11, 1919.

One of the curves obtained on the "Faith," the pioneer concrete steamship, is shown in Fig. 2, where a maximum range of stress corresponding to 7055 lb. per square inch stress in the steel is represented; this is the stress in a longitudinal deck-beam on a line along the port side of the hatches, about midway between hatches 2 and 3.

While the work on the "Faith" was of great value, it did not give a conclusive demonstration of the accuracy and sensitiveness of the strainagraph, but this was found later in tests made during the launching of the "Atlantus." A pair of representative curves from this test is reproduced in Fig. 3. This clearly pictures the rise in hogging stress as the ship moved down the ways and progressively lost stern support; the rapid but not abrupt change from hogging to sagging when the stern lifted off; and the final condition of slight hogging when the ship was afloat. It is noteworthy that the greatest stress recorded exceeded that measured in the "Faith" during a storm. As stated farther on, the "Atlantus" results agreed so closely with calculations as to prove the high accuracy of the strainagraph measurements. They also showed the instrument to be satisfactorily sensitive.

But on this latter point some of the rough-weather records obtained on the steel ship "Westboro" are more significant. That reproduced in Fig. 4 registers an elastic vibration of more than 1-min. duration, set up by the impact of the bow on the water after it had lifted clear.

Launching Test; Accuracy of Instrument

Fig. 5 gives a group of three sets of curves showing the distribution of upper and lower flange stresses in the "Atlantus" at three different periods in its launching, and summarizes most of the results of this experi- Curves derived from these are shown in the smaller diagram in the same figure, giving a comparison of the time-change of stress at Section 27, a little forward of amidships, both as measured and as computed from the drafts recorded by the pressure instruments.

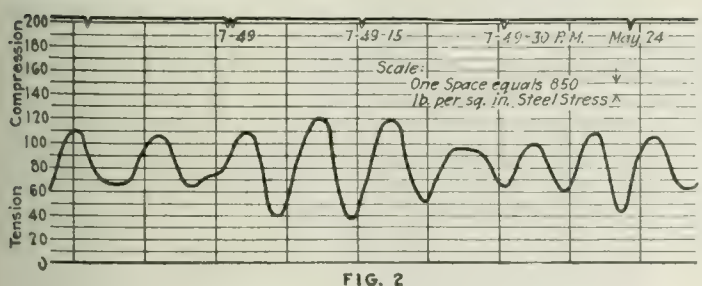


FIG. 2

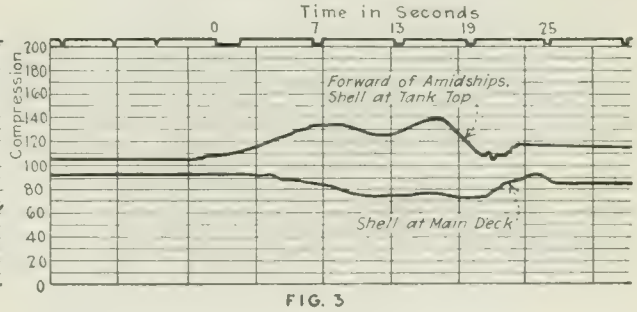


FIG. 3

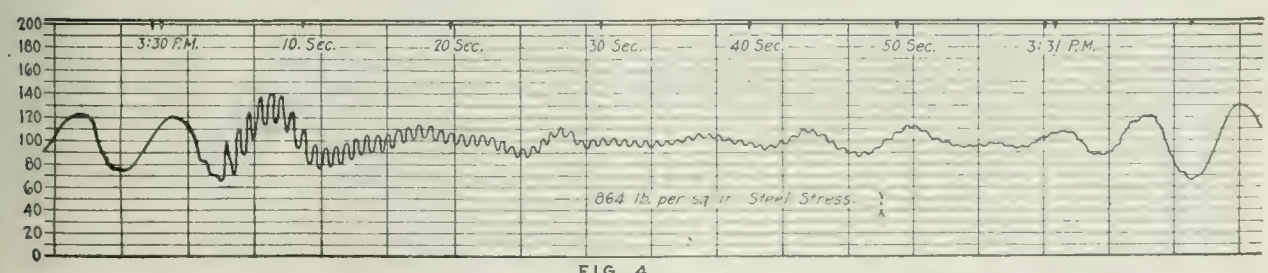


FIG. 4

FIGS. 2 TO 4. THREE "STRAINAGRAPH" RECORDS

Fig. 2—Record from concrete ship "Faith," May 24, 1918; stress in deck beam between hatches in line with port side hatch. Fig. 3—Longitudinal stress in concrete steamer "Atlantus" during launching, two simultaneous curves, made by separate instruments, shown superimposed; maximum stress in shell just above bilge and at main-deck level, about midships; maximum change of stress from high point to low point, about 5000 pounds per square inch steel stress, at extreme fiber. Fig. 4—Pounding record from steel ship "Westboro"; on shell plate one foot below bridge deck, bow of ship striking water, after lifting out, in heavy sea.



FIG. 5. EQUIPMENT FOR "ATLANTUS" TESTS PILED IN HOLD

It will be seen that an astonishingly close agreement prevails, which constitutes a reliable check on the accuracy of the measurements. No indications of inertia effects or lost motion could be detected.

For two other sections some distance forward and aft of this one, the agreement is somewhat less close. However, there are reasons for attributing this to inaccuracy in the computed curves. In the one case there is reason for believing that some error is involved in the assumptions concerning buoyancy. In the other case, uncertainty as to the distribution of cradle reaction affects the computations.

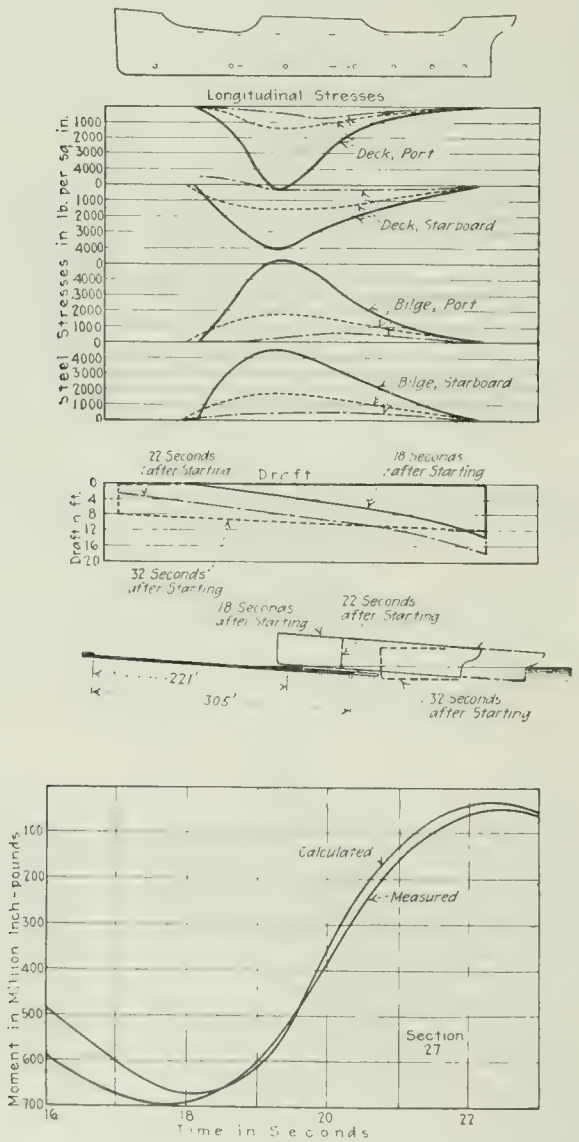


FIG. 6. LONGITUDINAL STRESSES IN "ATLANTUS" DURING LAUNCHING; ACCURACY OF MEASUREMENT SHOWN BY COMPARISON WITH CALCULATION

A valuable sidelight on the stress-measurement work was given by the occurrence of the first hump in the launching curve shown in Fig. 3, representing an abnormally high hogging stress. The groundways, it was found, departed 1½ in. from true profile at one point, and the passage of the cradles over this rise produced a tension of 4600 lb. per square inch in the deck steel at section 27. This stress was nearly as high as the maximum, which occurred a short time later just over the end of the ways, and both exceeded the greatest stresses observed in the "Faith" at the height of a heavy storm. Since even greater stresses might be produced by such irregularities in the ways, it is clear that scrupulous care must be taken in the preparations for launching a concrete ship endwise, in order to avoid abnormal stresses, a fact not previously appreciated.

Stresses in the "Faith"

With this evidence of the reliability and sensitiveness of the instruments at hand, the deductions from the measurements made on the "Faith" acquire special interest. They are stated as follows by Mr. McMillan: Even in a severe storm the maximum stresses in the critical sections showed margins of safety well exceeding those anticipated in the design. To those who were aboard the "Faith" it was most reassuring to note that as the storm developed, and steadily increased to unusual severity, the strainagraph records showed a constant increase in stress, yet with a very comfortable margin at all times. It is believed that without the knowledge supplied by the strainagraph a high degree of uncertainty would have been felt, and justifiably so, by those aboard who were competent to estimate the hazards of heavy weather at sea in the first concrete vessel of seagoing character. For the time at which they were taken and the necessities of that period, the records from the "Faith" are regarded as among the most important service given by the instrument, in spite of the facts that the various limitations imposed by the conditions of the service, and that only eight strainagraphs were available, made the data sufficiently scanty that no real analysis of the stresses can be made from the records.

The "Westboro" Results

During a complete round trip of the 8800-ton steel steamer "Westboro," built by J. F. Duthie & Co. at Seattle, simultaneous readings were taken at from 8 to 22 points of the cross-section of the ship, and rather complete data on the stress distribution in the ship acting as a longitudinal girder were derived. Typical results are shown in Figs. 7 to 10, of which Fig. 7 gives the essential dimensions and deck arrangement of the vessel, while Figs. 8 to 10 give stress-distribution curves.

Most of the measurements were made on a section about 10 ft. forward of the true midship point. The instruments were placed as marked in Fig. 8. Those on the bridge deck are denoted by the letters B; B_1 and B_2 were really attached to the shell about 15 in. below the deck, and similarly M_1 and M_2 were attached

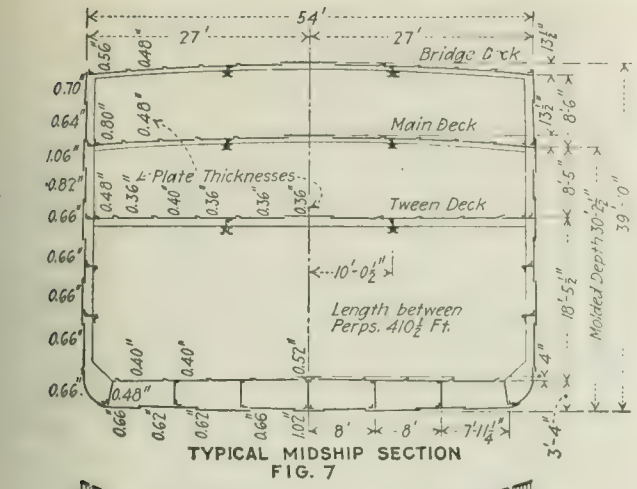


FIG. 7

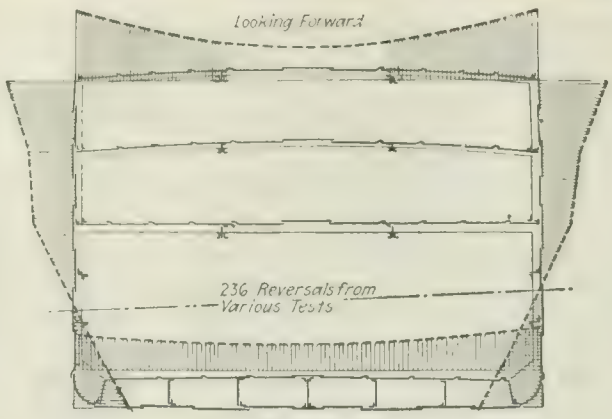


FIG. 9

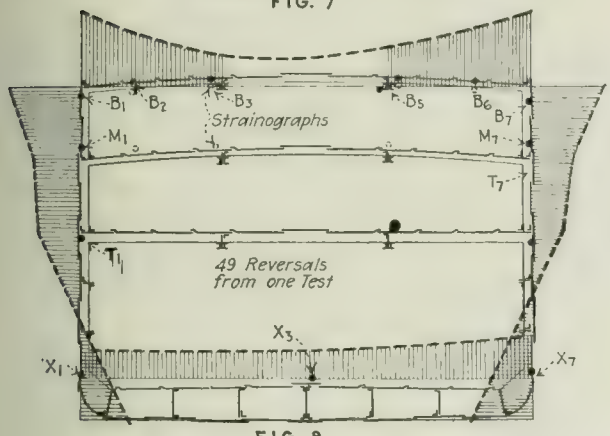


FIG. 8

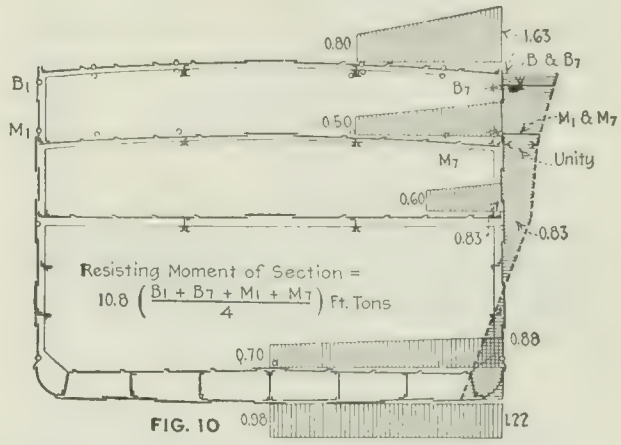


FIG. 10

FIGS. 7 TO 10. MEASURED STRESS DISTRIBUTION IN "WESTBORO"

Fig. 7—Dimensions and makeup of cross-section. Fig. 8—Stress distribution averaged from 49 reversals. Fig. 9—Composite of 236 stress reversals. Fig. 10—Characteristic stress distribution and moment formula

to the shell about 15 in. above the main deck, and T_1 and T_7 were on the shell just below the 'tween deck. Instruments X_1 and X_7 were on the shell slightly above the line of the tank top, but X_3 was attached to the tank itself, by a device that brought it about 8 in. above the plates.

Fig. 8 represents the stress distribution determined by averaging 49 reversals of stress from hogging to sagging. The position of the neutral axis agrees very closely with the calculated position. A further check on the data was obtained subsequently by placing two additional instruments, one between T_7 and X_7, and one farther around on the bilge, which agreed closely with the stresses indicated by the diagrams.

A large number of sheets similar to Fig. 8 were brought together for the figures plotted in Fig. 9. The curves here comprise the results of 236 reversals, taken from various tests and selected for a range of stress between 2000 and 8000 lb. per square inch, corner reading.

Because the stress distribution was found to be so uniform in character, a simple formula was worked out to represent the resisting moment in terms of the average reading from instruments at four principal points of the cross-section. The distribution by tests and the resulting formula are placed together in Fig. 10; the stress diagram here includes only those portions of the ship's cross-section which are assumed to act. In the curves of Figs. 8 and 9 a dotted line indicates that some stress was found in the deck plates between hatches, but as these plates were less effective at high stresses it is preferred to omit these areas in the stress distribution on which the formula is based, Fig. 10; an error of only 5% is involved by omitting the deck areas between hatches. The formula is simply the product of a constant and the mean of the stresses at the four corners of the main and bridge decks. It may be noted that the numerical values marked on the diagram in Fig. 10 indicate the stress at the bounding points of the various areas in terms of the stress at the main-deck line taken as unity; these fractions are derived from the measurements.

No instruments were directly placed on the 'tween deck, and it can only be estimated how much of its section was effective. Rather wide errors in estimating this, however, would affect the final resisting moment but slightly, on account of its nearness to the neutral axis.

It is clearly shown by the stress diagram, Figs. 8 and 9, that there is marked departure from a straight-line law of stress distribution in the shell of the ship. Furthermore, the stresses in the bottom plating are considerably below those in the decks, the neutral axis being only a short distance above the tank top. From a structural standpoint alone, therefore, the distribution of material in the structure of a ship according to present practice does not give equal utilization of the material throughout, but results in excessive deck stresses. Further tests now in progress and soon to be undertaken are expected to supplement these data and furnish confirmatory evidence concerning the relation between the shell stresses at different points.

Method of Constructing a Diagram To Show Probable Droughts

Illustrated by a Study of Rainfall During Ten-Day Periods, or Decades of Days, for 32 Years, at Kherson, European Russia

By V. V. Tchikoff
Consulting Civil Engineer, Berkeley, Calif.

IN THE studies of natural factors which decide the success or failure of agriculture, precise knowledge of precipitation and of its distribution is very important. The farmer of the semi-arid region, in particular, must adapt his farming to rainfall. On the basis of the most probable rainfall the farmer may select those plants whose maximum water requirements during their growth (the so-called "critical period") correspond with the sufficient amount of rainfall. For this purpose the farmer must first of all have a very simple and comprehensive idea of the probable drought during separate periods of vegetation. This need is satisfied by the diagram of drought which the writer applied

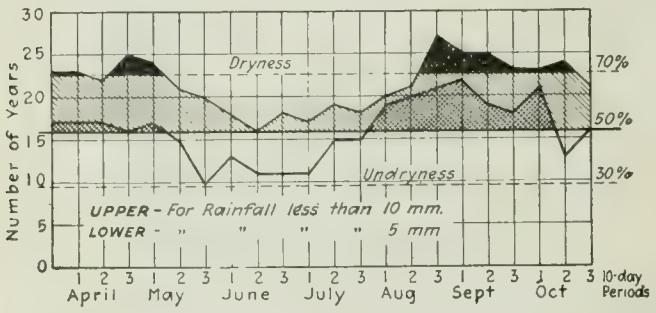


DIAGRAM OF DROUGHT FOR IRRIGATION STUDIES BASED ON RAINFALL AT KHERSON, RUSSIA

while studying irrigation problems in the lower region of the Dnieper River, near the City of Kherson, in the province of Taurida, Russia.

According to the observations of agricultural experiment stations, particularly in the black-soil belt of European Russia, it is established that a precipitation of 5 mm. (0.2 in.) does not in the least help vegetation, while in semi-tropical regions, such as Turkestan, it is even harmful.

For this reason Professor Brounoff, for a long time head of the agricultural-meteorological service in Russia, has applied the term "dry" to the 10-day periods during which precipitation does not exceed five millimeters.

For the southern section of European Russia, and particularly for the above-mentioned region about Kherson, where agricultural conditions are less favorable, because of warmer climate, winds and light soil, this amount may be raised to 10 mm. Such a decade of days (10-day period) we term "nonsatisfactory," to distinguish it from the one termed "dry." The accompanying table is based on observations made for 32 years (1883-1914) at Kherson, in view of the fact that the rainfall in that city presents the average for that region.

In the table is computed the probability of drought, in percentages, as the ratio of the dry and nonsatisfactory 10-day periods to the total number of 32. Only three norms are taken—30, 50 and 70%. The 50% norm designates equal probability of dryness and non-

TABLE OF DRY AND UNSATISFACTORY DECADES OF DAYS

Month	Decade	Dry Decades—Rainfall Less than 5 M.m. Number of Cases	Probability of Drought, Approximate per Cent.	Unsatisfactory Decades Rainfall Less than 10 M.m Number of Cases	Probability of Drought, Approximate, per Cent.
April	1st	17		23	
	2nd	17		22	
	3rd	16	About 50	25	About 70
May	1st	17		24	
	2nd	15		21	
	3rd	10		20	
June	1st	13		17	
	2nd	11	About 30	16	
	3rd	11		18	About 50
July	1st	11		17	
	2nd	15		19	
	3rd	15	About 50	18	
August	1st	19		20	
	2nd	20		21	
	3rd	21		27	
September	1st	22	About 70	25	
	2nd	19		25	About 70
	3rd	18		23	
October	1st	21		23	
	2nd	13	About 30	24	
	3rd	16	About 50	21	

dryness; the 30%, nondryness; and 70%, dryness. On the basis of this table one may easily construct a diagram of drought. The abscissas represent the 10-day periods, and the ordinates the number of cases with precipitation of less than 5 and 10 mm. The line parallel to the abscissa, through the points of 30% and 70%, limits the dry and nondry periods. The line through the point of 50% indicates the equal probability of dryness and nondryness. The shaded portions of the diagram represent the dry periods.

This diagram demonstrates the fact that the farmer of the region under discussion is placed under difficult conditions. In the spring he must adapt himself for the length of five 10-day periods, since each of these periods is indefinite—the probability of drought being 50 per cent.

Only toward the summer may the farmer know with certainty that the rainfall per 10 days will exceed 5 mm. However, his prospect for "satisfactory" rainfall diminishes greatly if he should count on more than 10 mm. per 10 days. As far as the autumn decades (August-October) are concerned, they will all be dry, whether we take as the norm 5 or 10 millimeters.

The method under discussion examines each decade of days independently of the consecutive one; in other words, the dry period may extend to two, three or more consecutive decades of days. As an illustration, we may take the year 1909 in Kherson, when out of 21 decades of vegetation 18 decades were either "dry" or "unsatisfactory." It goes without saying that such periods result in a considerable failure of crops in the region.

Unfortunately, the question of the relation between the age of the plant and its water requirement has not been sufficiently studied as yet. But whatever data we possess on this question emphasize the particular importance of the brief, critical period in the life of the plant from the point of view of large crops. It is significant that in regard to corn crops in particular the United States Department of Agriculture states, ("National Weather and Crop Bulletin, No. 12, 1918, page 3"):

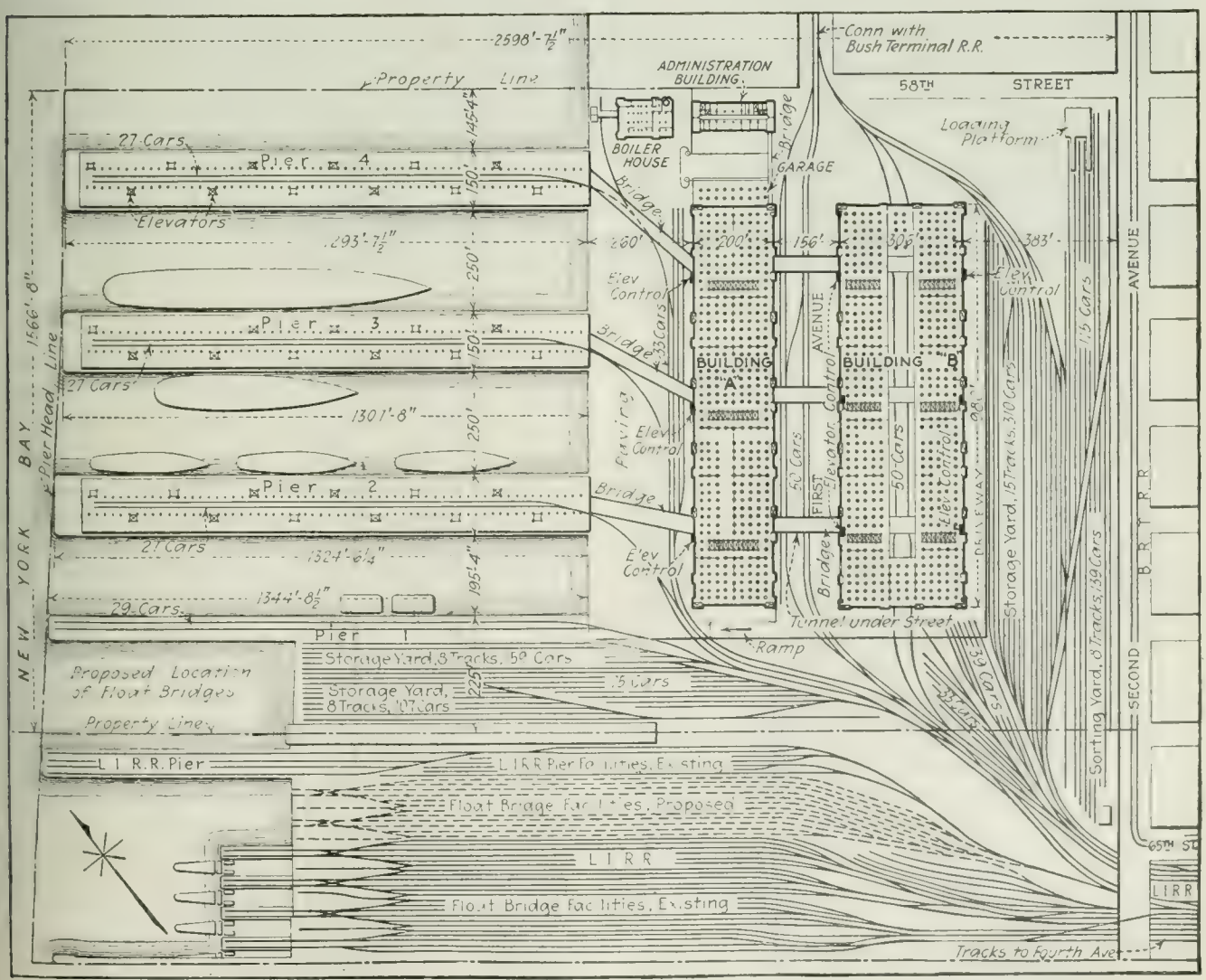
"The rainfall for the 10 days following the blossoming stage has an almost dominating effect upon the yield of corn, the yield varying directly with the amount of rainfall, provided the latter is not excessive. High temperature and dry weather during the 10 days after blossoming have a very unfavorable effect upon yield."

Freight Handling at the Brooklyn Army Base

Principles and Prospective Methods Which Controlled Design of the Huge Terminal Intended to Care for Army Overseas Business at the Port of New York

PORT terminals for the Army overseas were started in the spring of 1917, when there was every prospect of the war continuing for at least two years with the need of an ever-increasing stream of goods for the troops in France. The speeding up of outbound shipments was therefore the guiding consideration in design. Every effort was made to provide a freight-handling unit which would insure a maximum delivery of goods aboard a vessel, and the disposition of inbound freight, an important factor in a normal port terminal, was left to take care of itself. Before any of the terminals so built was complete, the war came to an end; the expeditionary force rapidly returned home, and the emergency need for the supply bases ceased.

Nevertheless, at seven ocean ports the Government had elaborate terminals, and at three of them, Boston, Brooklyn and New Orleans, permanent plants of a type easily convertible to commercial use. Just what disposition is to be made of these plants no one at the present time can say, but it is inconceivable that these terminals, developed so far in advance of any similar port development in the country, should not be utilized in commercial work. It is of interest to all concerned with freight-handling and port developments to set down the considerations which governed the design of one of these plants, that at Brooklyn, as an indication of how the unit may be operated as a two-way freight terminal that has ever been built. It was described in base has many novel features in the handling equipment, and it is, in addition, the largest-capacity freight terminal that has ever been built. It was described in *Engineering News-Record* of Feb. 13, 1919, p. 317. It comprises three double-deck ocean steamship piers, each 150 ft. wide and about 1300 ft. long, and one open pier 70 ft. wide, with two large warehouses and a freight-car storage yard. The piers are separated by slips 250 ft. wide and have two-story sheds with cargo hoists for ship-loading. Separated from the land end of the piers by an open space of about 260 ft. is warehouse A, and east of A on the farther side of a 150-ft. street is warehouse B. These buildings are the largest concrete structures ever put up, warehouse A being 200 x 980 ft. in plan, nine stories high, with a gross floor area of 1,764,000 sq.ft., and a storage capacity of 144,-



LAYOUT OF BROOKLYN ARMY SUPPLY BASE DESIGNED TO HANDLE OUTGOING FREIGHT AT RATE OF 1500 TONS PER HOUR

000 tons. Warehouse B is 306 x 980 ft. in plan, eight stories and basement high, and has a gross floor area of 2,130,000 sq.ft. and a storage capacity of 180,000 tons. The piers and warehouses are connected by bridges 40 ft. wide from the third floor of warehouse B to the third floor of warehouse A and from there to the second floor of the piers. The warehouses are further connected by tunnels running from the basement of warehouse B to the bulkhead level floor of warehouse A.

The car-storage yard in connection with the base has a capacity of 1295 cars, 179 of which can be unloaded at the piers or warehouses at the same time. Both warehouses are, in addition, approached by streets which permit 228 five-ton trucks to draw up to the warehouses at one time. The main piers have a gross dock floor of 1,220,000 sq.ft., or a storage capacity, assuming 80% of the first floor and 60% of the second floor for storage, of 180,000 tons, though in time of rapid movement through this terminal this would have to be reduced to very little, in order to allow space for the trailers and trucks. Further storage space for large and imperishable goods may be had on the bulkhead with an area of 350,000 sq.ft. It is a fair estimate that there is storage in the base for 15,000 carloads of goods, or, at the estimated outgoing movement of 1500 tons per hour, a 30-day storage.

The problem of freight handling at the terminal was to provide a flexible, reliable and rapid system whereby the maximum number of ships which could lay up at the piers could be loaded at the same time that the maximum number of freight cars and motor trucks could be unloaded, utilizing a part of the pier space and bulkhead level space and all of the warehouse space as a reservoir for freight. The design as evolved depended for its solution on the use of group elevators for vertical transmission and of tractors and trailers for horizontal transmission, and upon the use of the trailer as a bunching station. As a corollary to the system there was adopted a dispatching system from a central station with operatorless elevators provided with an automatic leveling device.

In the operation of the base, freight is received by motor truck and by train, both of which can draw up to the warehouse and go onto the bulkhead space and onto the first floor of the piers, and by lighters which can draw up to any of the piers or to the slip side of the ships at the main piers without blockading the slips. By far the greater part of this freight is stored in the great warehouses, there to be withdrawn as required to the ships at the piers. But it was also anticipated that some freight would be delivered direct to the piers by trucks and cars and to the side of the ships by lighters. This direct delivery, however, is assumed to be emergency or reservoir material.

The handling facilities in the warehouse are designed to take care of the maximum loading facilities at the piers. There were, therefore, two controlling elements in the handling equipment design: The maximum incoming freight transported from delivery doors to the various warehouse floors, and the maximum outgoing freight from these floors to the piers, mainly via the third-floor bridges but partly via the basement tunnels, and the street level of the bulkhead space or "farm," as it is called at the base. Since this movement might be simultaneous, provision had to be made for the sum of the two amounts to be handled.



SOME OF THE FREIGHT-HANDLING EQUIPMENT ON THE BULKHEAD SPACE BETWEEN PIERS AND WAREHOUSES

Emphasis must be laid on the fact that the design was made to take care of maximum operating conditions; that is, with every section of the great terminal working at once. On that basis the unit working capacities, as applied to the whole terminal, had necessarily to be decreased from what is possible for the unit itself. It is, for instance, possible to unload a five-ton truck in 30 min. without undue effort. As noted below, the unit time for unloading a truck was assumed to be 2½ hours, because that was thought to be a more probable *average* time of unloading for the motor trucks, more than 200 in number, which it was possible to bring to the platforms at once. So, too, an average four-man crew can unload four average railroad cars in eight hours, or 12½ tons per hour. For the entire base the average unloading speed of a 25-ton car was selected at five tons per hour. The computations given

below, therefore, are the design figures and give the assumptions of the designers. They do not necessarily represent working figures for the base as a commercial terminal, nor do they represent the peak possibilities of the base for a limited period.

As stated, it was assumed that the average loading of a freight car was 25 tons, and that the time of clearing that car would be five hours, giving five tons per hour as the unloading speed. At the same time it was assumed that the average load of a motor truck reaching the base would be five tons, and the time of clearing 2½ hours, or a speed of two tons per hour per truck. Although this latter figure is obviously high for the unloading speed of a single truck in the Army base computation, it was felt, taking into account the lack of storage space on the comparatively narrow platforms, the time required by the trucks in getting in and out the base and in spotting the incoming truck at the platform—and, above all, the doubt that there ever would be such an available supply of loaded freight trucks as to guarantee the simultaneous unloading of all which could possibly draw up to the base—that the more liberal figure of 2½ hours per truck would be justified.

Warehouse A has space on the First Ave. side for the unloading of 24 cars or 80 trucks, on the 59th St. side space for 20 trucks, and on the bulkhead side space for 19 cars, via whip-hoists which have not yet been installed but which can be put in if required. The nearest track on this side of warehouse A was spaced 70 ft. away from the building to provide proper working space for the whip hoists. Assuming the maximum delivery, therefore, for warehouse A, there would be 100 trucks at 200 tons per hour and 19 cars at 95 tons per hour, making a total of 295 tons per hour reaching that building; or 262 tons to be elevated to the other eight of the nine floors. In warehouse B there are unloading accommodations for 128 trucks and 50 cars, a total of 450 tons to the other eight of the nine floors.

Outgoing freight, as stated above, must be assumed to be equal to the capacity of the piers. These piers have accommodations for 12 ships, and it is assumed that there will be five hatches per ship. The best loading speed obtainable for general cargo, with the methods in vogue in New York harbor, is about 25 tons per hatch per hour, and it was assumed that even though this should be increased by better methods, the surplus above that could well be taken care of by the reservoir freight noted before to be held on the piers in the bulkhead space or on the lighters. In 60 hatches, 1500 tons per hour would be the outgoing-capacity demand of the two warehouses. It was then assumed that warehouse A, being nearer the piers, would take more than its capacity proportion of this demand, say one-third more than that amount. According to floor areas, of the 1500 tons warehouse A should take 450 and warehouse B should take 1050. In the design, however, it was assumed that 600 tons per hour would be shipped from warehouse A and 900 tons per hour from warehouse B. The elevator capacity required is only eight-ninths of the total amount, or 534 tons per hour for A and 800 for B.

	Warehouse A	Warehouse B
Incoming	262	450
Outgoing	534	800
	796	1250

These amounts and speeds are unprecedented in warehouse design. It was assumed as a basic principle in such layout as this that the only method of transferring the freight was by horizontal movement on trailers and trucks and vertical movement in elevators. With such a system, high speed has to be maintained throughout, and there must be no interference in the routing of the many-directioned freight, there must be as little rehandling as possible, and the whole layout must have a minimum of cost.

To facilitate the minimum rehandling and speed, it was decided that the freight must be transported on the same conveyor without rehandling from the point of original loading to the point of final disposition, which in this case was either from the loading platform to storage space or from storage space to the piers adjacent to the ship's hatches. This, then, established the trailer-and-truck idea. In order to maintain a satisfactory capacity it was necessary to have fairly large trains, and it was assumed that it would be possible to operate eight trailers with a truck. This, then, required large cars for the elevators, cars capable of holding at one time at least four of the trailers. In order to insure that there would be no interference in the routing, it was decided that the elevators, instead of being scattered over the building in small groups as is common in such warehouses, should be gathered together in large groups. This was a radical innovation and required the next step in the design; that is, that there be such a distribution of the freight in movement as to assure the absence of congestion in and about the elevator groups.



TRACTOR WITH TRAILER TRUCKS COMING FROM ELEVATOR

To insure this easy movement at the groups, the cars were designed as double-ended, with the tractor trains entering on one side and making their exit on the other, and, furthermore, it was necessary to establish a dispatch system, so that at some central point there could be supervision of the movement of the trains and the elevators, and control of that movement. As a final result of this dispatch-system idea, then, the elevators had to be automatically controlled from this system, and had to have an automatic leveling device whereby they would come to a stop level at each floor, to permit the trucks to be run on and off.

As a result of these successive deductions, the elevators were laid out as shown on the drawing; that

is, in three groups in building A and six groups or three twin groups on either side of the central court in building B. The elevators were designed to have a speed of 150 ft. per minute and an average running time of approximately 1 min. for the round trip. Allowing for loading and unloading, closing doors, and all other delays, the time of the round trip was assumed to be about 4 min., but as a wide margin of safety was desirable it was assumed that each elevator would make ten trips per hour and move four truckloads or 30 tons of freight per hour. The total number of elevators required is dependent on the maximum quantity of freight to be carried during any given period and the number of trips each elevator can make per hour, which is contrary to the practice, in designing many warehouses, of laying out the number of elevators to bear some fixed relation to the floor area.

As the maximum requirements of warehouse A were 796 tons per hour, at 30 tons per hour per elevator 27 elevators would be needed. For B the requirements of 1250 tons per hour would demand 42 elevators. These would be the elevator requirements were the elevators working all the time and with an equal distribution of traffic through the warehouse. On account, however, of maintenance necessity and to afford leeway in the distribution of the freight to various sections of the building, the requirements were changed so that in building A each group had 10 elevators; that is, three groups, making a total of 30, instead of the 27 theoretically demanded, or one extra elevator in each bank. In building B seven elevators are provided in each of six groups, giving a total of 42.

This layout provides one elevator for each 59,000 sq.ft. in building A and for each 50,500 sq.ft. in building B. In order to take care of four trailers at once each car was made 9 x 17 ft. in plan, an exceptionally large size for warehouses, and with a capacity of 10,000 lb. In addition, there are passenger elevators to take care of the office force. Further movement of freight in warehouse B is to be accelerated by five-ton traveling girder cranes, spanning the central court, which will pick up bulk freight from cars or platforms and drop it on trailers run out on the staggered balconies in the court.

The elevators were specially designed for the operations as laid out. The automatic leveling device is a feature of elevators of the Otis Elevator Co., which made the elevator installation. The distinctive feature of this machine is the addition of a small auxiliary motor known as a micro-drive mechanism, so geared to the main drum that it will turn at slow speed. When the car platform, going in either direction, is within 8 in. of the landing, the power of the main machine is automatically cut out and the brakes are applied on the drum shaft, and at the same time the "micro" machine is connected and completes the movement to the landing by turning the brake frame to which it is geared and so turning the drum shaft at a slow speed. From a point 8 in. above to 8 in. below the landing at which the car is to stop, the "micro" machine is operating, except only at the exact level of the landing, at which point it is disconnected. The contact points at the floor at which the car is not required to stop are moved by means of a solenoid. As the points of contact controlling the machine are on the wall of the shaft and the body of the car itself, there can be no change in adjustment due to stretching of cable or other changeable factors. If the car moves even very slightly, due to lightening or increasing the load, or other reasons after the stop is made, electrical contact is made and the motor brings the car back to the landing.



TRACTOR TRUCK TRAIN ON WAY INTO FIRST FLOOR AT ONE OF THE PIERS

Doors at either end of the elevators are automatically operated from a chain extending from top to bottom of the hatchway and return. These doors open when the elevator reaches the floor, but are closed by the pushing of a button at the floor. An interlocking switch is provided, which prevents the elevator leaving the floor until the door is closed. The doors open and close quickly and are checked and brought to a gradual stop without slamming. They are evenly counterweighted and operated by a friction clutch, with no more power than is necessary to overcome the friction, so that they will stop with little force at any obstruction, and

no serious harm could result if a person should be caught under the door. The doors are complete, closing from the top down and not split in the middle as in some types of warehouse elevator.

On account of the comparatively limited story heights, it is necessary to project an opening door far enough into the hatchway for it to pass between the car top and the sill above. This has been accompanied by an arrangement of rocker arms which, when the door has been lifted 18 in., shifts it from the vertical plane of the sill to a plane entirely within the clear elevator shaft, where it rises the full height of the opening.

The automatic leveling device has made practicable the application of push-button operation to the freight elevators here. On the third floor, which is the main operating floor, is a central dispatcher's desk located opposite each elevator group. On this desk are two buttons for each of the other floors, one to dispatch the car to that floor, the other to call the car from that floor. An interlocking switch prevents the car being called from the floor unless the elevator doors are closed at that floor. At each of the other floors there is one dispatch button only, to send the car to the dispatch floor. Each elevator is also equipped with car switches, for operation in the usual way by an operator on the elevator. When these switches are in operation the dispatch control is thrown out of gear.

These dispatch stations command a view of the front of the elevators and of the trailer trains coming off the bridge. Each dispatch board controls the whole group of elevators for all of the floors. The operator is in constant telephonic communication with each of the floors and with the piers as well as with the director of traffic; by means of the signal lights on his dispatch board he has before him at all times the position of all the elevators of his group, and by telephonic communication has information concerning the state of loading and the requirements for the load.

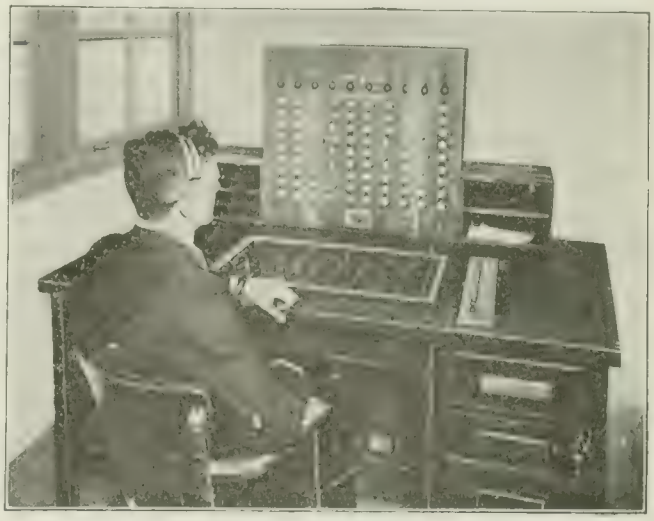
As stated, freight is to be carried on small trailers drawn by electric tractors. The average load of each trailer is about 1500 lb., and the trailers will be operated in trains of from four to eight. In addition, there are a number of minor freight-handling devices, such as portable cranes, tiering machines, etc., for transfer in the yards and warehouses. The list of portable equipment on Sept. 1 was given as follows:

EQUIPMENT

	Number
Tractors, Walker Model No. 7	2
Tractors, Walker Type, D.K.	10
Tractors, Type 64-L 4th Mercury	17
Tractors, Galion Dyn.	1
Tractors, Walker Elec., eight-ton	1
Tractors, Lansing, five-ton	1
Tractors, Walker Elec., 11-ton	6
Tractors, Hoist, Crane	1
Trailers, Four-Wheel, Dock	5
Trailers, Rey, Lansing	60
Trailers, Lansing, Equip. HRB.	100
Trailers, Four-Wheel	1
Trucks, Three-Wheel, dock	6
Trucks, Hand	[illegible]
Trucks, Large, hand	178
Trucks, Small, hand	[illegible]
Trucks, Four-Wheel, Tea	[illegible]
Trucks, Logwood	[illegible]
Trucks, Rey., Asst. Veh.	100
Trucks, Four-Wheel Fig. 736	[illegible]
Trucks, Lansing, Hand, Two-Wheel	[illegible]
Trucks, No. 9-48 Steubing, hand	[illegible]
Trucks, Seattle dock	[illegible]
Trucks, Three-Wheel, dock	81
Trucks, Walker elec., five-ton	17
Machines, Tiering	7

On each pier there are six 17 ft. x 9 ft. 4 in. elevators of the same type as those in the warehouses except that they have a speed of 100 ft. per minute, are not in groups but are spaced one by one down the pier, and are operated individually by means of buttons on each floor and in the car. Space is provided on the piers for other elevators or for chutes, etc., but the equipment is not installed. The goods will be lifted in and out of the hatches from cargo hoists. Consideration was taken of various other methods of handling the freight between ship and pier, but the conclusion was in favor of the cargo-hoist type practically universal at New York City piers. On the lighter pier traveling gantry cranes are provided.

At each floor, when receiving and discharging are in progress, there should be a continuous movement of loaded trailer trucks toward the elevators and empty trucks (or, in case of two-way movement, trucks with loads from the ships) from the elevators. The trucks are to be placed on the elevators, and make continuous trips from the point of loading to the point of unloading and return, as, for example, from the storage floor on the upper floor to the pier. The tractor moves only from point to point on the same floor. This results in three main circuits of travel for each group of elevators, proceeding simultaneously: (1) On the first



ELEVATOR CONTROL BOARD IN ONE OF THE WAREHOUSES

floor between unloading platforms and elevators; (2) on the third floor between elevators and piers; (3) on upper floors between storage spaces and the elevators.

Trailers after leaving the elevator are to be made up in trains ready to be taken away by one of the tractors on that floor, and trains of empty trailers will be broken up on the opposite side of the elevator and placed in a position to be moved onto the elevator as soon as it arrives at the floor. Space has been provided for this purpose on both sides of the elevators, and the traffic movement will always be counter-clockwise without interference between the paths of loaded and empty trains. At the third floor the loaded trucks will be removed from the elevator and made up of trains of from six to eight trailers and drawn to the pier by tractors. The train will be left on the pier for unloading, and a train of empties or of trucks loaded from incoming ships will be picked up by the same tractor and drawn back to the elevators.

For this service it was assumed that there had to be a traffic flow to each pier to supply four ships; that is, 500 tons per hour. From this it was assumed necessary to have 83 trains, of six tons each, pass over

the bridges in each direction per hour; in other words, trains are drawn at about ¾-min. intervals. The speed when loaded is about 3½ miles per hour, or approximately 300 ft. per minute, so that the headway would not greatly exceed ½ min. On account of the close running, the bridges have been designed wide enough for two trains to pass in each direction.

At present the two warehouses are practically full of Army supplies in dead storage, awaiting some disposition. This material reached the base mostly by train and not in any quantity taxing the resources of the equipment. At the same time there are a few ships unloading and loading. The operation at the base, however, has never approached capacity, nor have the methods of operation had to be developed beyond somewhat primitive details. In so far as the proposed operating system has been put into effect it has proved successful. For concentrated movements there have been several records far ahead of the design provisions.

For instance, in one 8-hour day there were received into building A 119 carloads, two lighter loads at 260 tons each, and 340 tons for motor trucks, a total of 3835 tons, or 479 tons per hour, as against the estimated 262 tons per hour for that building. At the same time there were loaded outgoing two 300-ton lighters, seven cars, and numerous miscellaneous small lots to motor trucks. This simultaneous movement of about 575 tons per hour was accomplished, it is stated, with about 60% of the elevator capacity. The elevators in A were designed for 796 tons per hour, so it will be seen the design capacity was exceeded that day.

It is the contention of some of the experts who have been operating the plant that its capacity is far in excess of that noted in the design. The increased capacity would be found, of course, in a more rapid unloading and loading of the cars and trucks, or, rather, in the application of the possible unit speed to the great number of cars and trucks which can be drawn up to the platforms. This would require a careful system of operation to avoid congestion and a constant vigilance of supervision to insure the carrying out of the plan of operation. The systematic operation, too, would be helped by the method of control of the handling through the centrally controlled elevators and dispatch system. There seems to be no doubt that the elevators could be speeded up somewhat above their design rate and the tractor-truck system inside the buildings manipulated at higher efficiency than provided for in the design. Then, too, the whip hoists and the girder cranes provide excess service.

On the other hand, there is a reasonable doubt whether the total ship-loading speed can be increased with the present layout, and as the pier end of the terminal is the controlling element in its operation, doubt is cast on the possibility of increasing the capacity of the terminal beyond its design limits. While it is possible that the estimated 25 tons per hour per hatch is a fair estimate of the loading capacity at any one hatch, fear has been expressed that with all the berth space filled, either with incoming or outgoing ships, the pier space itself would become so congested with freight moving by truck, tractor truck or train that it would be difficult to maintain the maximum loading in all hatches. In this event all of the speeding up possible in the warehouses themselves would not increase the capacity of the terminal as a unit, but would only increase the congestion on the piers. To maintain even the design rate of movement through the piers without congestion requires the most careful control of traffic, so that, after all, the operation of the terminal comes down to a question of supervision.

The Brooklyn Army Supply Base was built by the United States, under the direction of the Construction Division of the Army, Brig. Gen. R. C. Marshall, Jr., in charge. Lieut. Col. H. S. Crocker was the constructing quartermaster, Cass Gilbert was the architect, and the Turner Construction Co. the general contractors. The design of the freight handling was the joint product of the general contractor and the various equipment people concerned.

Empiric Formula for Strength of Wire Rope

AS A RESULT of extended tests of wire rope, reported by J. H. Griffith and J. G. Bragg in "Technologic Paper 121" of the United States Bureau of Standards, empirical formulas are proposed by which both the area of steel wire and the strength of wire rope may be ascertained. The tests were made upon 275 wire ropes varying from ¼-in. to 1½ in., with a few up to 3¼ in., submitted by manufacturers to fulfil the specifications framed by the Isthmian Canal Commission in 1912. Results of the tests of 2-in. to 3¼-in. ropes were published in *Engineering Record* of July 15, 1916, p. 81, where details of the method of testing and the socket bowl and grip piece are given.

The mean diameter of the wires, according to the measurements of these ropes, may be expressed:

$$d = K \frac{D}{N + 3}$$

in which d equals the diameter of the wires, D = the diameter of the rope, N = the number of wires in the outer ring of wires of a strand, and K = 1.0 for hoisting and guy rope, 0.8 for extra-flexible 8-9 hoisting rope and 0.33 for tiller rope.

The aggregate cross-sectional area of the wires may be expressed by $A = C D^2$, in which C = 0.41 for 6-19 plow-steel hoisting rope, 0.38 for 6-19 crucible steel hoisting rope and for 6-7 guy rope, 0.35 for 8-9 plow-steel rope, and 0.26 for 6.42 iron tiller rope.

The minimum strength found from this investigation may be expressed by the equation, $S = 75{,}000\ C\ D^2$, in which S equals total strength in pounds, and C averages 1.0 for 6-10 plow-steel cables, 0.9 for 8-19 plow-steel and 6-19 crucible cast-steel cables, and 0.35 for iron tiller and steel guy rope.

The modulus of elasticity, calculated from stress-strain measurements, was found to vary from 3,000,000 to 9,000,000 lb. per square inch, depending upon the diameter and class of cable.

There was a reasonable uniformity in the strengths and elongations of the wires from a particular cable, but a larger variation in the strengths of the wires from cables of different manufacturers.

The cables developed from 72 to 90% of the aggregate strengths of the wires. The upper limit of the ratio of the strength of a rope to the strengths of its wires was found from theoretical considerations to be 89.2% for 6-19 plow-steel cables. The differences between the results of the theoretical analyses and practical tests are attributed largely to different strengths and degrees of ductility of the wires, this causing an unequal distribution of the load among the strands, with overstressing near the point of failure.

National Public Works Department Versus Corps of Engineers

Passage of Jones-Reavis Bill Urged on Ground That Great Harm Would Result From Injection of Military System Into Activities of Civil Life

By Isham Randolph
Consulting Engineer, Chicago

THE United States Engineer Corps is a body of men justly proud of its record, but hostile to any movement which threatens its authority or reduces its field of action. It has on its roster the names of many men who deserve credit for high attainments. Their country had educated them and made them a class apart, invested with authority and clothed with dignity. They have been entrusted with vast responsibilities, and for the most part have discharged those responsibilities worthily, but not without the advice and help of untitled civilian engineers, who have paid for their education and gotten their experience without the aid of a paternal government. It is these men who have done the vast proportion of the work for which men who wear insignia of military rank have been accorded, and have graciously accepted, the credit.

Extent of Corps Operations

A statement of the vast area of the field of operation of the Corps of Engineers is a fitting preface to what I am about to say. Continental United States has an area of 3,742,583 square miles, within which are 26,410 miles of navigable rivers, 1,200,000 square miles of arid lands, and 75,000 square miles of swamp lands. Our continental and insular coast line is 48,881 miles long, not including our water-front on the Great Lakes. We have between 35 and 40 continental ports, besides all those in our insular possessions. There are 517 West Point engineers to care for this vast array of work, as shown by the "Statement Showing Rank, Duties and Addresses of the Officers of the Corps of Engineers," issued by the War Department Jan. 1, 1919. They are divided as follows:

	Active	Retired
Major Generals	1	2
Brigadier Generals		2
Colonels	23	6
Lieutenant Colonels	30	3
Majors	74	
Cpatains	151	1
First Lieutenants	148	
Second Lieutenants	76	

A large proportion of these captains and lieutenants were rushed through West Point without completing the course of study. We have, then, old and young, experienced and novices, 517 officers to do the vast work suggested by the citation previously made. There are in the United States over 100,000 engineers in the various lines coming within the term engineering. Thousands of these men responded to war's compelling need; the American Society of Civil Engineers supplied more than 1500; the Western Society of Engineers, 148; the American Society of Mechanical Engineers, 1497; the American Institute of Mining Engineers, 739; the American Society of Electrical Engineers, 1412; the American Society for Testing Materials, 575. The Architects sent hundreds.

These were not novices, but men who, when the need was presented, were able to meet it, and their record of achievement is a proud one. They know that they have earned recognition from the Government. They are so self-respecting that they are not willing, now that the piping days of peace have returned, to do the planning and the work which must be done along their several lines and submit their work to a military engineer who, as a matter of form, will attach his name to the plans and, as a matter of course, accept the credit which goes with the work.

Military engineers are educated to meet the constructive and destructive needs of war, and war has demonstrated to the United States its need for them. They do not fit into the every-day life of a democracy. Their training makes them autocratic. Most of them, however, have the instincts of gentlemen and they deport themselves as such, but the officer is a rare exception who can wholly divest himself of a superior attitude toward the civilian. The feeling may be successfully camouflaged, but it is only in concealment.

Civilians Deserve Credit

We think that no record will disclose a structure designed for the uses of peace and erected under military direction which has been designed, supervised, and completed wholly by the military engineer without aid or counsel from some civilian engineer. In support of this statement the Sault Ste. Marie locks and the Panama Canal are in evidence. Are not the skill and brains of Alfred Noble, Joseph Ripley, L. C. Sabin, David Molitor, Isaac De Young and many other civilians built into the Sault structures? Then take the Panama Canal. It is to the glory of the Corps of Engineers, U. S. A., that it was in charge of that tremendous project, and the names of Goethals, Sibert, the beloved Gaillard, and Hodges will always flash upon the screen of memory when that work is thought of, and *they* have had recognition and reward; but we, who know, will also remember Williamson, Goldmark, Schildhauer, Cornish, Zinn, Nichols and their civil associates. Alfred Noble, too, left his impress upon that great work.

The Pacific Division had as its chief S. B. Williamson, civilian, all of whose aids were civilian engineers. An examination of the Chief Engineer's report for 1913 ("Vol. VI, Statement of Construction Expenditures to June 30, 1913") shows that the military on the Atlantic Division built 2,265,415 cu.yd. of masonry for $16,993,254.33, or an average of $7.50 per cubic yard; and that the civilians on the Pacific Division built 2,453,320 cu.yd. for $13,646,113.96, or an average of $5.56 per cubic yard; showing a civil economy of $1.94 per cubic yard over the cost of the Military Division, or a saving of $4,745,515 on the job. Did Williamson ever receive any recognition from Congress? He did receive it from a business organization to which his achievement recommended him. Did any one of his civil associates receive commendation or reward from Congress? If so, when, and what was it?

Furthermore, we know that the Army Engineer officers did not plan the Panama Canal. The type and salient features of that canal were worked out by a minority of the International Commission for the Isthmian Canal. To the project thus prepared the Army Engineers fell heir—a project changed, except as to dimensions, in only one particular. The lake which the minority planned on the Panama side of the Culebra cut, with a dam across the Rio Grande and locks between Sosa and Ancon, was abandoned because locks in that location would be within range of gunfire from warships. The locks were moved back to Miraflores,

and a large item of cost was added to the work. The wisdom of this move from the military standpoint could not be questioned then, but the world war has shown such advance in the power of modern artillery, and indirect fire has reached such precision of aim, that the interposition of a hill and the withdrawal for a few miles count for but little as a means of defense.

I have grown old in engineering service, and I have been in touch with military engineers for forty-odd years. I have admired, valued and still value the friendship of many of them. But I have not learned to admire the system which environs them, and I believe that the injection of that system into the activities of our civil life is a harm so great that it needs to be abated, as it will be, by the passage of the bills providing for a national Department of Public Works introduced June 25, 1919, in the Senate by the Hon. Wesley L. Jones and in the House by the Hon. Frank G. Reavis. The 100,000 or more engineers of our country should use every honorable influence and means to secure that legislation.

Highway Bridge Floor Replaced After Corrosion

Pottstown Bridge Over Schuylkill River a Typical Case of Deteriorated Floor System—New Steel Protected—Lower Chords Open

TYPICAL of the defective design of many highway bridges in respect to protection from deterioration due to corrosion, particularly in the floor system, is the Pottstown bridge over the Schuylkill River in Montgomery County, Pennsylvania, the entire floor of which had to be replaced after an inspection in 1916. The bridge is situated in Pottstown. Several effective details were adopted to protect the new steel-concrete covering for the tops of transverse floor-beams, complete encasement of steel at abutments and over the piers; rearrangement of sidewalks to leave the lower chords and joints entirely open; roadway planking waterproofed and drain holes to control water. The wood-block pavement was laid directly on the plank without sand cushion, and the badly rusted end rollers were replaced by sliding plates of manganese bronze and steel.

This bridge consists of two through pin-connected Pratt-truss spans, each about 180 ft. long between end pins, with eight panels nearly 22½ ft. long. The roadway is about 18 ft. clear, and 5-ft. sidewalks are carried by brackets outside of the main trusses. The bridge was built by the Phoenix Bridge Co. in 1884; the top chords and compression web members consist of Phoenix columns, the bottom chords of eyebars, and the web members of eyebars and rods—all of wrought iron.

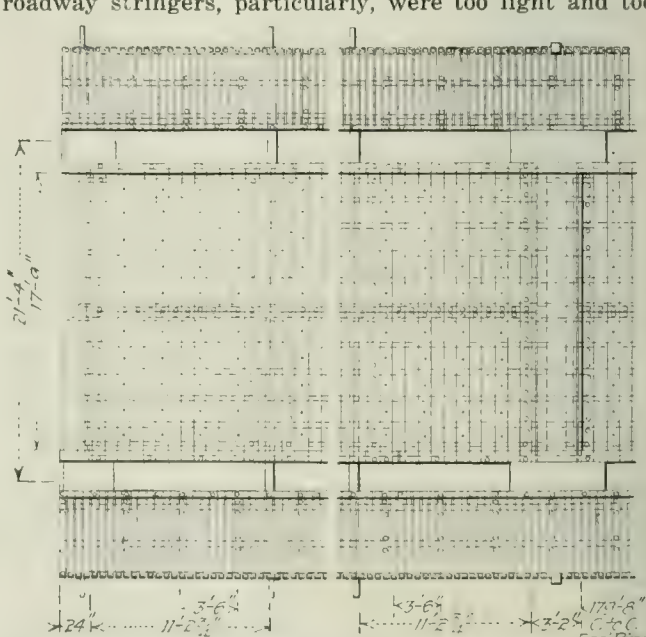
The old floor-beams were riveted girders suspended at the panel points from the truss pins, by rod hangers. These floor-beams carried two lines of riveted stringers adjacent to the trusses, which stringers supported the intermediate riveted floor-beams that subdivided the main panels of the bridge. The longitudinal stringers were six lines of 6-in. I-beams resting on the top flanges of the floor-beams. The footwalk planking was supported at one side by the roadway floor curb timbers, at the other by the hand railing, and in the middle by 5-in. I-beams, and consisted of 2-in. planking se cured to spiking pieces. The roadway floor consisted of one thickness of 3-in. oak planking similarly secured.

At the time of the inspection in 1916 typical evidences of deterioration were found. The roadway planking was worn and in bad condition, and the spiking pieces, both under the roadway and under the sidewalk, were badly rotted so that they did not hold the spikes; consequently, the planking was loose and springy. The riveted floor-beams and the main stringers were in fair condition, but some loss of section was found in the top flanges, due to rust. The I-beam stringers were very light and in bad condition, showing considerable loss from rust in the top flanges.

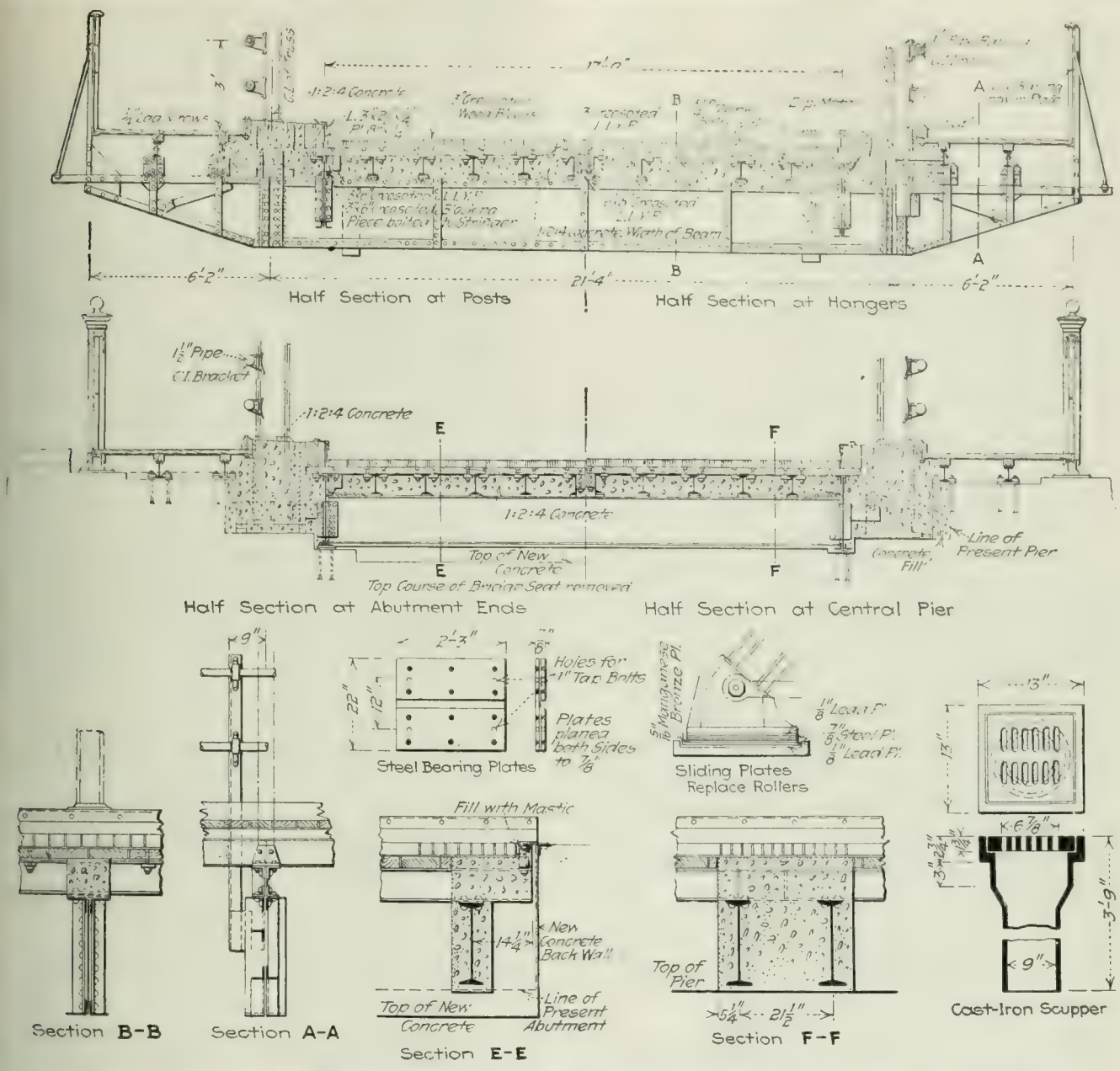
In general, the ironwork of the trusses and overhead bracing was in good condition, showing little signs of corrosion. The lower ends of some of the intermediate posts, where they rest on cast-iron joint boxes, and the lower ends of the main end diagonals at and below the floor, showed rust, but apparently the loss of section was not serious. Some of the counter rods in the trusses and the top and bottom lateral rods were found to be slack and needed tightening. The roller nests under the expansion ends of the spans on the end abutments were badly rusted, so as to prevent movement under temperature changes. The paint on the ironwork was in particularly bad condition.

Truss Strength Sufficient—The drawings from which the bridge was built showed that the trusses were designed for a live load of 2000 lb. per lineal foot of bridge. If this be considered for the 18-ft. roadway only, it would be equivalent to a live load of 111 lb. per square foot; if applied to the 18-ft. roadway and the two 5-ft. sidewalks, the loading would be equivalent to 71.4 lb. per square foot. Allowing for the additional weight of a new steel floor system and 3-in. wood-block-pavement laid on 3-in. planking, the live-load carrying capacity of the trusses would be as follows: Considering 18-ft. roadway, 75 lb. per square foot; considering 18-ft. roadway and two 5-ft. sidewalks, 50 lb. per square foot. These live-load carrying capacities were considered sufficient to meet traffic requirements in this vicinity for a long time.

The floor system, however, was so weakened by deterioration that it had to be completely replaced. The roadway stringers, particularly, were too light and too



PLAN OF FLOOR AT END PANELS, SHOWING LOCATION OF BOLTS



CROSS-SECTIONS AND DETAILS—FLOOR REPAIR AND PROTECTION AT POTTSTOWN BRIDGE

shallow for proper stiffness. The new floor system had to be designed along the same general lines as the old, but, instead of the six lines of 6-in. I-beams, eight lines of 8-in. stringers were used in the replacement. Many of these stringers were obtained from the Port Kennedy bridge, which was similarly rebuilt about the same time. The new floor was designed for loaded trucks weighing 15 tons, assuming 20,000 lb. on the rear axle and 10,000 lb. on the front axle, with axles placed 12 ft. apart. One concentrated wheel load was considered to be distributed over two stringers.

Wood Block Laid Direct on Planking—A new floor was designed with 3-in. creosoted yellow-pine planking laid directly on top of the steel stringers and bolted to the same with cast-iron clips and ¾-in. bolts, as indicated in the plan view, no spikes whatever being used to secure the roadway platform. This detail was selected in order to avoid the use of spiking pieces, which deteriorate rapidly, and also to reduce to a minimum the corrosion of top flanges of stringers which is a marked characteristic of deteriorated floor systems.

The floor planking was waterproofed by coal-tar pitch, carefully filling all the joints and covering the top surface. Crowning of the roadway was obtained by filler plates between the stringers and floor-beams. The planks immediately above transverse floor-beams were toenailed to the adjacent planks, the latter being bolted as shown. To prevent conditions so often met in wood-block flooring, where humps and hollows are seen, the creosoted wood blocks were laid directly upon a hot coating of coal-tar pitch applied to the top surface of the floor planks, which had been previously brought to a true surface.

The openings between the paving blocks, 3 in. deep, were filled with coal-tar pitch to a height of 2 in. above the bottom of the block, and the remaining 1 in. was filled with sand, with a view to preventing the pitch from coming out of the openings by expansion. As seen in the plan, drainage was provided by scuppers, details of which are also indicated, and by holes bored through the planking at points so as to take care of water that might work through the paving; this was

done to keep water away from the steelwork of the floor. It is stated that the roadway floor, after nearly three years' service, is now in first-class condition and shows a smooth surface. The method of attaching the wooden floor to the steelwork as shown increases greatly the lateral stiffness of the bridge, and assists in reducing vibration to a minimum.

Protection of Steelwork—In order to protect the steel stringers and the floor-beams, concrete was placed above the latter to fill completely the space between the steel and the bottom of the floor planking. Concrete was also placed around the bottom panel points and under the sidewalk, as indicated in the cross-section. This concrete, where necessary, was held in place by expanded metal reinforcement.

Owing to the fact that the bridge seats on piers and abutments were completely piled up with débris and trash around the end floor-beams and shoes, it was decided to incase completely the shoes and the transverse end floor-beams of the new steel floor; where necessary, expanded metal reinforcement was used. This is indicated in the drawings.

Lower Chords Open—Although this particular bridge was not badly affected by corrosion of the lower chord eyebars, mainly because these bars happened to be placed a considerable distance below the level of the sidewalk planking which extended over them, this is a prolific source of deterioration. Sidewalk planking is usually carried over the chords and around the web members with insufficient clearance spaces. One case is known where the lower chord bars were placed close to the sidewalk floor planking which rested upon the curb and also close against the curb timbers; a loss of 56% of cross-section was found in some of the bars.

In order to avoid possibility of such deterioration, the sidewalk planking was stopped outside of the trusses as shown, and a new intermediate hand railing was introduced, supported by cast-iron brackets on the vertical web members of the trusses. This leaves a completely clear open space around the eyebars for both the bottom chords and web diagonals, which are thus kept perfectly clean and always accessible.

Although these spans are nearly 200 ft. long, it was decided to replace the rusted end rollers by sliding plates, as indicated in one of the drawings. The space occupied by the old rollers was filled by two built-up steel bearing plates between which was placed a manganese bronze plate. Above and below the steel plates ½-in. plates took up any unevenness in the old masonry plates or the base plates of the pedestal shoes. The space indicated in the steel plates was provided to allow for the tongues in the old masonry and shoe plates. The end shoes were completely incased in concrete, with a single sliding paper joint at the level of the bronze plate.

All of the new steelwork received one shop coat of red-lead paint containing 20 lb. of lead to the gallon of oil, and, after being thoroughly cleaned, all exposed surfaces of the old ironwork received one good coat of the same paint. All of the exposed surfaces of the metal work below the floor level, and the web members of the trusses to a height about 3 ft. above the floor level, were finished with two additional coats of red-lead paint, tinted to a dark brown with lampblack. The remaining exposed surfaces of the trusses and bracing, as well as the outside hand railings, were finished with two additional coats of white-lead paint, tinted to a warm light gray to give a pleasing appearance and add to the visibility at night.

Port Kennedy Bridge—Another case of exactly similar deterioration of the floor system requiring entire replacement is the Port Kennedy bridge, also in Montgomery County, Pennsylvania. In this the longitudinal steel stringers were carried on brackets on the main floor-beams, the tops of the stringers being only about 1½ in. above the top flanges of the floor-beams. This space formed an ideal lodging place for dirt and caused corrosion of the steel. In this case, also, it was found that the stringers were too shallow for their length, and, instead of the 8-in. I-beams, 12-in. I-beams were substituted.

The Pottstown bridge was closed and the traffic detoured over another bridge during the repair operations, which gave the contractor uninterrupted opportunity to tear out the old work and place the new materials. With these repairs the bridge should give good service for a number of years, with practically no attention except painting.

The total cost of the replacement of the floor system and painting of the Pottstown bridge, including pavement concrete and all other work complete, was about $22,000. The design was made and the work supervised by S. P. Mitchell, consulting engineer, Philadelphia, Penn., and the work was done for Montgomery County, Pennsylvania, by the Pittsburgh Construction Co., Pittsburgh, Penn.

Deflection of Continuous Beams and Rigid Frames

Tabulated Factors Facilitate Computation of Maximum Deflection — Approximation for Unsymmetrical Loading

By F. E. Richart
Engineering Experiment Station, University of Illinois, Urbana

MAXIMUM deflections of continuous beams or rigidly connected frames, not ordinarily given in text or reference books, can be obtained from the following expressions for the deflections of a few common types of structures and loadings. They have been derived in terms of certain factors, which are tabulated, and may be found useful in facilitating rapid calculation.

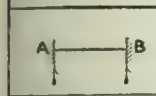
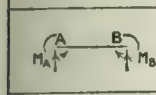
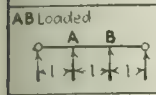
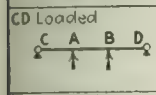
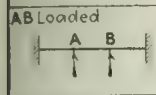
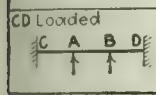
1. *Symmetrical Loading and Structure*—When the loading and structure are symmetrical about the vertical center line, the maximum deflection is at midspan and can be expressed quite simply. Let k be the ratio of the bending moment at the end of the loaded member to the moment which would exist there if the beam were completely fixed. The factor k may be termed the "degree of restraint" of the end of the member, varying from zero for a simple beam to unity for a fixed beam. Table I gives values of k for various cases of restraint which occur in continuous structures. These values have been found by use of the slope-deflection method, but they can be determined in other ways.

The deflection of the center of a beam may be expressed as

$$d = c\,\frac{P\,l^3}{EI},$$

in which c is a coefficient depending upon the value of k. Values of c may easily be determined by use of the theorem of area moments, from which it is

TABLE I—VALUES OF k AT END OF LOADED MEMBER AB

TYPE OF FRAME	VALUE OF K	TYPE OF FRAME	VALUE OF K
	0		$\frac{3}{2n+3}$
	1.0		$\frac{2}{n+2}$
	$k=\frac{M_A}{\text{Moment at end of fixed beam}}$		$\frac{2n+3}{(n+1)(n+3)}$
	$\frac{3}{5}$		$\frac{3n+6}{5n+6}$
	$\frac{6}{5}$		$\frac{6n+6}{5n+6}$
	$\frac{2}{3}$		$\frac{2n+4}{3n+4}$
	1.0		1.0

n = Ratio of I/l for horizontal members to I/h for vertical members

known that the deflection is equal to the statical moment of the M/EI diagram for one-half of the member, about the end. Table II gives values of c for various loadings.

As an example of the solution of a particular problem, consider the rectangular frame, Fig. 1, carrying the total uniform load P on the member AB. The deflection

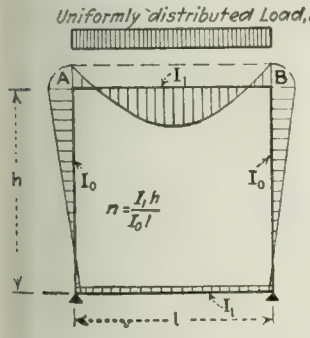


FIG. 1

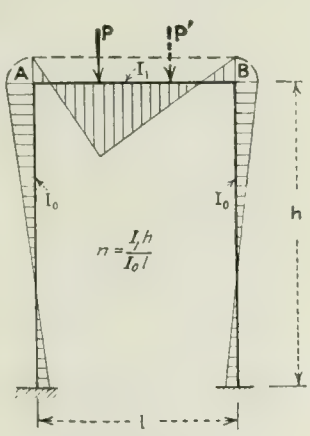


FIG. 3

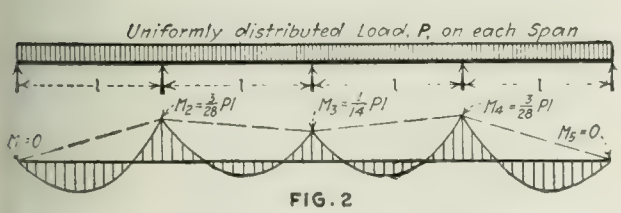


FIG. 2

FIGS. 1 TO 3. EXAMPLES, FACTOR METHOD FOR DEFLECTION

at the middle of the partially restrained member AB is desired. Assume the case in which the four sides of the frame are equal, or that the ratio I/l for horizontal members to I/h for vertical members, n, is unity. Hence, from Table I, $k = \frac{5}{8}$, and from Table II, $c = 5/768$. Hence, the deflection is $5Pl^3/768EI$, which is half the deflection of a simple beam and $2\frac{1}{2}$ times that of a fixed beam similarly loaded.

2. *Symmetrical Loading, Unequal Restraints at the Two Ends*—In a continuous beam carrying a uniform load, for example, the moments at the two ends of any particular span are not generally equal. Therefore, the maximum deflection is not exactly at the middle of the span, but it can be shown that the midspan deflection is always very nearly equal to the maximum deflection.

The midspan deflection can be found by using the expressions of Table II, letting k equal the *average* values of the ratio of the actual moments to the fixed beam moments at the two ends.

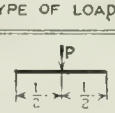
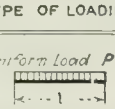
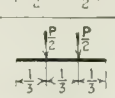
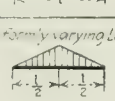
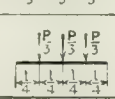
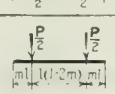
For example, in the continuous beam of Fig. 2, values of moments at each support have been determined, and the ratio of the moment at the support to the fixed beam moment for this loading is found to be zero at the first support, 9/7 at the second support and 6/7 at the middle support. Hence, the average degree of restraint k is 9/14 for the first span and 15/14 for the second span. The midspan deflection, from Table II, is

$$\frac{(5 - 4k)\, P l^3}{384\, EI},$$

which reduces to $17\, Pl^3/2688\, EI$ in the first span and $5Pl^3/2688\, EI$ in the second span.

As a matter of fact, the maximum deflection is at $0.440l$ in the first span and at $0.543l$ in the second span, and these deflections are 2.15% and 1.44%, re-

TABLE II—VALUES OF DEFLECTION

TYPE OF LOADING	VALUE OF C	TYPE OF LOADING	VALUE OF C
	$\frac{4-3k}{192}$		$\frac{5-4k}{384}$
	$\frac{23-18k}{1296}$		$\frac{32-25k}{1920}$
	$\frac{19-15k}{1152}$		$\frac{m}{48}\left[3-4m^2-3k(1-m)\right]$

Values of deflection coefficient "c" for various loadings

spectively, greater than those at the middle of the two spans.

3. *Unsymmetrical Loading, Symmetrical Structure*—The deflection due to a single load P unsymmetrically placed, Fig. 3, can be arrived at by adding a second equal load P' placed so that the two loads are equidistant from midspan. The deflection due to the two loads is found from Table II to be

$$d = \frac{2\, P l^3\, m}{48\, EI}\left[3 \quad 4\, m^2 \quad - 3\, k\, (1 \qquad m)\right].$$

Now removing the load P', the deflection at midspan due to the single load P is equal to one-half the deflection for the two loads, and is practically equal to the maximum deflection. The total deflection due to a number of loads will be found by adding the midspan deflections due to each load considered separately.

As an example, the deflection of the member AB, Fig. 3, due to the load P will be found. Suppose that $n = 2$, and $m = 1/3$. From Table I, k is $2/(n + 2)$ or $1/2$ for this frame, and the deflection at midspan,

$$d = \left[\frac{23 \quad 18k}{1296}\right]\frac{Pl^3}{EI} = \frac{7Pl^3}{648EI}$$

It is of interest to know that the maximum deflection of AB is at a distance of $0.438l$ from A and is 2% greater than that at midspan.

Groined Arches or Flat Roof for Concrete Reservoirs

Several Engineers and Builders Give Opinions as to Relative Economy and Safety, Based on Experience With Both Types Through a Number of Years

FOLLOWING the publication in *Engineering News-Record* of May 22, 1919, p. 1016, of the description of the Dayton reservoir, in which a saving was claimed in the substitution of a flat-slab concrete roof for the originally designed groined arch cover to a reservoir, some question arose as to the generality of such a claim. The subject has been controversial for some years; some engineers have maintained that the groined arch is the cheapest form of concrete reservoir cover; others have substituted with economy—and in some cases with claimed greater safety—a flat roof of either the girderless or beam-and-slab type. In order somewhat to crystallize opinions, a letter was addressed to several engineers and contractors experienced in such design and construction, asking for a statement on the subject. The answers so far received are printed below:

Allen Hazen, Consulting Engineer, New York—In one case in our experience, after the contract was let for reinforced vaulting we gave the contractors, who were one of the best known firms doing reinforced-concrete work, permission to substitute reinforced design for the groined arch. These contractors, after studying the matter to their full satisfaction, reported that they could not build a reinforced roof of any type that they knew about as cheaply as the groined arch, and they therefore built the groined arch as designed in preference to a reinforced roof. In Newton, Mass., bids were obtained on both plans for a covered reservoir, and the bids for the groined vaulting ran very much below the reinforced work, so the reservoir was actually built that way. In our studies, running through years, we have found that greatest economy in covers in the groined arch vaulting.

Centers for groined vaulting are as cheaply made, as easily moved forward, and can be used as many times as centers for slabs. Our cost records do not warrant the statement that the forms for the flat slab are cheaper. Taking it altogether, the groined roof, together with probably very much greater strength, has less concrete. The cost of the steel reinforcing is eliminated, the cost of placing is no greater, and the form cost is no greater. The reason that it is stronger and more economical is that all of the concrete is in compression, and that is the most advantageous way to use concrete.

L. C. Wason, President Aberthaw Construction Co., Boston, Mass.—About twenty years ago we were invited to bid upon groined arch and asked permission to make an alternative design in reinforced concrete, which permission was granted. After a very careful and thorough study we came to the conclusion that the groined arch was the cheaper of the two. Some five to ten years later, when we had more experience and thought that conditions might have changed, we made another study when the problem came up—with the same conclusion, that groined arch roofs are enough cheaper than reinforced concrete for storage reservoirs that there is no justification in using anything else.

My recollection is that the thickness of the groined arch was about 4 in. at the thinnest point and rather thicker at the haunches, and I believe that there was enough material in this design to allow for considerable carlessnesses and poor workmanship on the part of the contractor and yet give a strong enough structure to serve its purpose.

It is my opinion that a groined arch can be made satisfactory and plenty strong enough to do its work with no more concrete than is used in a reinforced design.

Nelson J. Bell, Engineer, Dayton, Ohio—My experience in this matter is limited to the Dayton reservoir, which was described in *Engineering News-Record* of May 22, 1919. My connection with the job was as designing engineer for a contractor who was endeavoring to get the contract, and the problem was to make an alternate design cheap enough to get the award, and at the same time comply with the general requirements which were established by the consulting engineers.

The result we obtained was a structure which was five or six times as strong as the groined-arch design, and which cost some $10,000 less than the lowest bid received on the groined-arch design. The flat slab, which was finally built, was much stronger than ordinary building practice would dictate. If we had been allowed to design this slab as ordinary factory building slabs are designed, we could have cut the cost some $20,000 more.

However, the economies in the alternate design of the Dayton reservoir were not confined to the roof slab only, as we reduced the excavation and wall sections by sloping up the floor at the sides, maintaining the capacity of the reservoir by increasing its area.

I cannot conceive how groined arch centering can be made as cheaply as flat-slab centering, or that concrete can be poured in groined-arch construction as cheaply as flat slab. In Dayton the difference in cost of these two items was more than sufficient to pay for all of the extra reinforcing steel which was required in the flat-slab design.

It is, therefore, my opinion that on a basis of equal strength groined arches will always cost more than flat slab.

J. R. McClintock, Fuller & McClintock, Engineers, New York—There is little question that the groined type of arch for reservoir roofs is the cheapest form of concrete cover. Under favorable conditions, also, the groined arch, properly designed, is capable of carrying any reasonable loads which are distributed with fair uniformity. Nevertheless, we prefer, under certain conditions, to use the roofs of reinforced concrete, usually of the slab-and-girder type.

The stresses in the groined arch cannot, of course, be accurately determined, but approximate methods are available, based partly upon theory and partly upon lessons learned from existing structures, which are close enough for all practical purposes, provided the arches remain substantially in the shape and condition in which they were constructed. Groined arches are, however, in many cases affected to a considerable extent by expansion and contraction or shrinkage of the concrete and by settlement of the foundations. If the area covered by the arches is relatively small, the effect of expansion and contraction may not be sufficient to

effect the arch action; but it is true that in most groined-arch structures some of the arches open at the crown, thus destroying action altogether along certain lines. Even then the arches seldom fail, but act as cantilevers over the piers. Clearly, however, the theory upon which such arches were designed does not apply in these cases.

Expansion and contraction movements are also taken up by the barrel arches along the outside walls of the reservoir, resulting in cracks in these barrel arches and the possibility of failure. If any settlement of foundations occurs, the stresses in the arches are affected and will not correspond with those assumed in the design.

Complete failures of groined arches have usually only occurred during the construction and as a result of unequal loading or failure to provide adequately for the thrust in the uncompleted series. Cracks, however, generally do occur in completed structures, and may be sufficiently serious to necessitate the supporting of some part of the roof at the crack, or they may interfere with the use for which the structure was designed. A case of the latter kind is that of the sand filters at Wilmington, Del., where the groined arches supporting the filters opened at the crown to such an extent that expensive repairs were necessary in order to prevent the filtered water from passing through the cracks into the filtered water basin beneath instead of passing through the piping. It has been our practice in a number of cases where groined arches were used to support filters, substantially to reinforce such arches to prevent expansion and contraction cracks.

As between the slab-and-beam type and the girderless type, we prefer the former on account of the possibility of more accurate analyses of the stresses and on account of greater safety where there are openings in the roof. It is possible, however, that the girderless type may be slightly cheaper. In the Rodney St. reservoir at Wilmington, Del., we made use of the beam-and-slab construction on the grounds of greater safety. This reservoir roof has on top of it a skating rink which is used by large numbers of children, so that the hazard in event of failure of the roof would be very large. Also the fact that the asphalt skating rink is directly on the concrete slab means that the structure would be subject to great variation of temperature.

Charles B. Burdick of Alvord & Burdick, Engineers, Chicago.—For about fifteen years we have been using reinforced-concrete reservoir construction, and where roofs were required—as they usually are—we have employed the flat-slab design exclusively, usually covered with earth. The basins included a large number of water reservoirs and sedimentation basins not exceeding 5,000,000-gal. capacity.

For structures such as these we have not been able to figure any advantage in the groined-arch type of construction. So far as lower cost is concerned and in ordinary circumstances, it is our opinion that the completely reinforced reservoir is a much better and more dependable structure.

In the above conclusion it should be particularly noted that we take into consideration not only the roof but the remainder of the reservoir structure, which is largely influenced by the type of roof, particularly the groined arch, and our conclusions have been somewhat influenced by the gradual tendency, as a result of our experience, to get away from nonreinforced concrete entirely, and thus to avoid cracks which are most troublesome in structures to contain water. It has been our tendency in recent designs, referring to reservoirs with vertical sides, to place no dependence upon the exterior earth pressure as resisting the pressure of the water, but to transmit the water pressures through the sides to the roof and floor, thus making the reservoir entirely self-contained and avoiding unequal settlement or large cracks. It is our practice to reinforce amply for temperature in both the floor and roof, and as we have worked out our designs the comparatively small side-wall forces are carried with but small addition to the roof and floor bars that would be needed anyway to insure freedom from cracking.

It must not be understood that we have, in writing the above, made an attempt to prove the superiority of the flat-slab construction in general as compared with the groined arch. We merely stae a conclusion of observations upon our own work. I have no doubt that there are situations where the groined arch can be profitably employed, and some important works designed by very capable engineers would indicate this.

C. A. P. Turner, Consulting Engineer, Minneapolis, Minn.—In all cases where we have bid on reinforced-concrete reservoir roofs the flat-slab design has proved more economical than the groined arch. There is, too, the added advantage that flat slabs are not subjected to the uncertainty of the groined arch under unbalanced loads. This uncertainty has caused the collapse of many groined arches and renders their construction, in the writer's judgment, more or less a hazard.

John M. Rice, Morris Knowles, Incorporated, Engineers, Pittsburgh, Penn.—We have had occasion to make computations regarding the comparative cost and advantages of groined-arch and flat-slab roofs for reservoirs, and after making such studies have always come to the conclusion that in all except exceptional cases the groined arch is preferable because of its cheaper cost of production.

In considering the covers to the Pittsburgh filters and the filtered-water reservoir, careful studies were made of the cost of reinforced-concrete flat-slab and beam roofs and groined-arch roofs, taking into account the experience and detailed knowledge of the cost of the groined-arch system which had been previously used in Philadelphia, Albany and Washington filter plants. The conclusion was reached that the groined-arch system was less costly than the other. In this instance the area of the filters is 56 acres and that of the filtered-water reservoir a little over six acres.

In 1907 it became necessary to increase the filter area at Lawrence, Mass., and there again similar studies of cost were made, resulting in the same conclusions. In connection with this plant, it may be of interest to note that one of the instances of failure of groined-arch roofs occurred there in the spring of 1907, when a considerable portion of the unfinished roof fell, overturning several of the piers. A report on the collapse of this roof was made by Sanford E. Thompson and may be found in the *Journal of the New England Water Works Association* for 1908. In this account, however, he does not blame the failure on the design, but says it was probably due to three causes:

First, the unbalanced thrust in the arches, due to the fact that the roof was incomplete and that the centers had been removed.

Second, the frozen concrete caused by low temperature immediately after its placing.

Third, improper screening of the aggregate and dirty gravel.

In our design of a small slow sand filter plant made during the past year, our studies again led to the conclusion that the groined-arch type of cover for filters was preferable to the flat-slab roof of the girderless type.

We would not like, however, to place ourselves on record as saying that the groined-arch type of cover for reservoirs and filters is preferable in all cases, since each design must be made a separate study, and the availability and prices of the materials making up the different types of roof will of course be the determining factors. The increasing use of the girderless system of roof is also cutting down the economical superiority of the groined-arch type, due to introduction of less expensive methods of construction. As the art of proportioning concrete so as to increase its strength is improved, the reinforced-concrete type of roof may possibly be constructed more cheaply than at present. Unless the methods of determining the stresses in the groined arch are greatly improved, the economical superiority of the groined-arch type of roof will be difficult to prove, owing to the uncertainty of the safety factor.

However, enough examples now exist in practice to show that the groined arch as now designed will carry the loads ordinarily imposed and the extra loads sometimes carried during construction. Where the loads can be decreased, as for instance by the use of a smaller depth of earth cover or its entire omission, then the advantage may be with the reinforced-concrete designs; as it will not be possible for practical construction reasons to reduce greatly the dimensions of the groined arch.

Two Home-Made Bridges in a Catskill Village

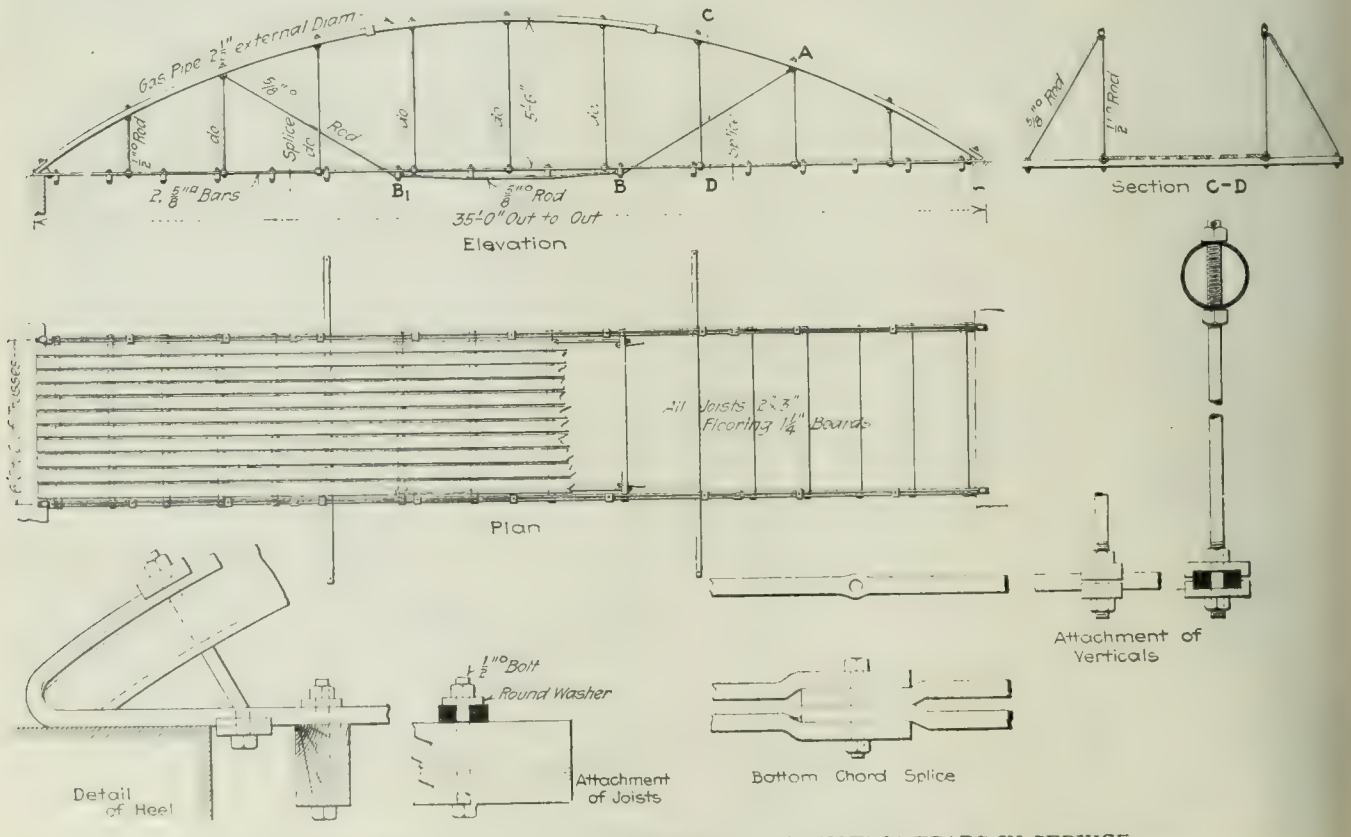
Blacksmith's Gaspipe Arch Bridge Nearing Half Century of Service—Truss Rod Distributes Unsymmetrical Loads

By R. Fleming
American Bridge Company, New York

THE village of Windham, in the heart of the Catskill Mountains, New York State, has within its confines two sidewalk bridges which are somewhat unusual. They were both built by Henry Bagley, a blacksmith of the village. According to the best information available the one was erected about 1875 and its neighbor about 1885. The accompanying sketches were made from the later bridge. Note the diagonal from the top-chord joint A. It runs into the wooden joist at B. A similar rod extends from B to B_1. These rods act as ties in transmitting stress due to moving loads. No lateral bracing is used in the plane of the bottom chord.

The older bridge is of the same dimensions as the later one and differs from it in only a few particulars. The bottom chord is continuous. Evidently the stock of square bars for the bottom chord gave out, for a piece of rod iron 10 or 12 ft. long is welded into the middle of one bar.

Decided vibration, both vertically and laterally, is noted every time the bridges are crossed. The village official under whose authority the later bridge was built said the school-children have a habit of jumping up and down to feel the bridges shake, and he expressed an opinion that some time there would be an accident. The writer concurred in this opinion, but when bridges have stood up more than thirty and forty years in spite of theory, what can be said?



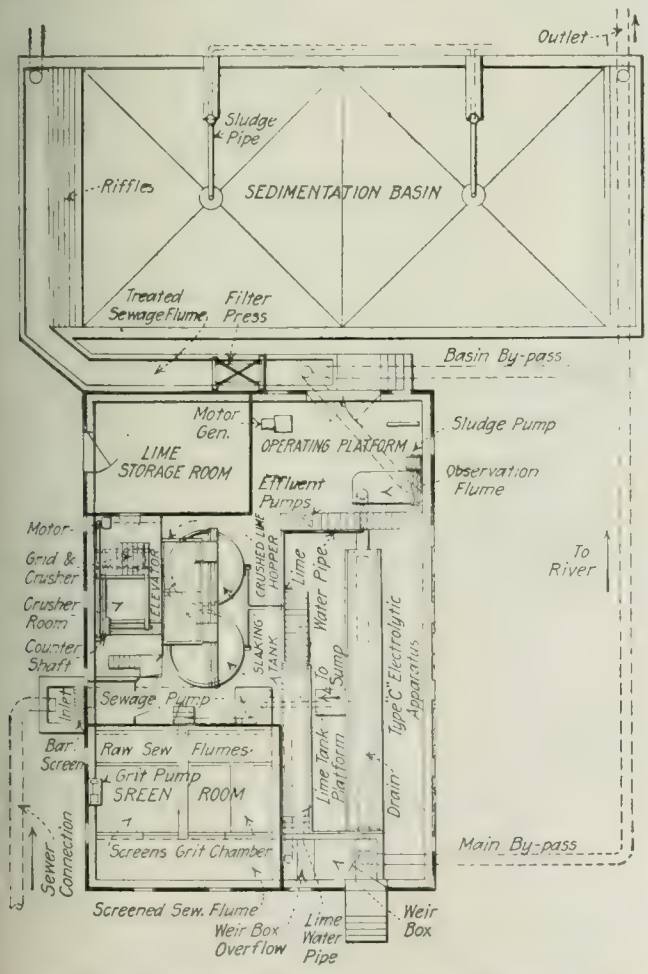
PUBLIC FOOTBRIDGE BUILT BY BLACKSMITH, AND NOW 34 YEARS IN SERVICE

Another bridge ten years older, but of practically the same construction, is near this one. There is no lateral bracing. Schoolchildren jump up and down on the bridges to make them shake

Tests of Lime-Electrolytic-Agitation Sewage-Treatment Process at Easton, Pennsylvania

Landreth "Direct-Oxidation" System Studied by Engineering Division of Pennsylvania State Department of Health and for Committee of the Franklin Institute

COARSE bar screens, fine plate screens, a grit chamber, lime treatment at the rate of 3720 lb. per 1,000,000 gal. simultaneously with electrolysis and with mechanical agitation by 2068 paddles running between the electrode plates, and finally 4½ hours of sedimentation, produced a satisfactory effluent during an 8- and a 24-hour run of a 1,000,000-gal. Landreth "direct-oxidation" sewage-treatment plant built for demonstration purposes at Easton, Penn., according to an official report recently made public. The plant was operated by the promoter. The tests were conducted and the report was made by the engineering division of the Pensylvania State Department of Health. Where a high constant degree of bacterial reduction is required, disinfection of the cell effluent "would be on the side of safety," the report states. The cost of operating the plant during these tests (at much less than full nominal capacity and with what the promotor states is an excessive rate of lime application, although the rate was set by himself) is figured in the report at $66 per 1,000,000 gal. This includes pumping the sewage to an elevation of 14½ ft., but makes no allowance for sludge disposal. If the same plant were operated at its full 1,000,000-gal. rated capacity the operating cost would be $39.08 per 1,000,000 gal., with sludge disposal probably $7.50 additional. Capital charges are not included in either the $66 or the $37.08 estimate. The cost of installing a plant of this type "should not be excessive," the report states, "but the cost of operation would appear to be higher than for other methods of sewage treatment in general use to produce an equal quality of effluent." The lime-electrolytic-paddle apparatus should be in duplicate and, since the plates would undoubtedly have to be renewed from time to time, a "type of cell should be adopted which admits of such renewals in place and at a minimum cost of labor."



GENERAL LAYOUT OF DEMONSTRATION SEWAGE-TREATMENT PLANT AT EASTON

Investigators for the Franklin Institute, reporting on later, independent and uncorrelated tests made in five runs of 3 to 14.5 hours each, totaling 35.5 hours, also report a satisfactory effluent. In addition, they present test data and conclusions designed to show that the lime-electrolytic treatment gives a much better effluent than either lime or electrolysis alone. These conclusions are based on average results of the five runs aggregating 35.5 hours, compared with a one-hour run with lime alone and a one-hour run with electrolysis alone, made on the following day. For a 2,000,000-gal. and a 10,000,000-gal. plant, the Franklin Institute report estimates the cost of treatment at $15.98 and $9.28 per 1,000,000 gal., but this appears to include nothing except lime, electrolysis and paddle treatment. The nearest comparable figure in the report by the State Department of Health is $36.06 for operating the Easton plant at its full rated capacity of 1,000,000 gal. a day. The Franklin Institute report states that, owing to the necessity of housing in an electrolytic plant and of providing skilled labor, the Landreth process is not "economical if the population tributary to the plant is very small," unless it is possible to put the sewage-works, a water-pumping plant and an electric lighting plant under one roof, thus reducing the cost of housing and of operation. In dealing with chemical and bacterial results, as with costs, the Franklin Institute report omits all consideration of preparatory as well as of final treatment, although the fine screens and the settling basins are included in the description of the plant.

This article will take up in some detail both reports. For convenience, the tests made by the engineering division of the Pennsylvania State Department of Health will generally be called the Pennsylvania tests and those of the Franklin Institute the Franklin tests.

The Pennsylvania Tests

The experimental plant was installed at the expense of C. P. Landreth, Philadelphia, under permission granted by the city. It was put in operation shortly after May 1, 1918, but from then until the date of the Pennsylvania tests it appears to have been run a total of only about 18 days. The Pennsylvania tests consisted of an eight-hour run on Dec. 4, 1918, and a 24-hour run Dec. 6-7, 1918. During these tests the operation of the plant was entirely in the hands of the patentee. Observations were made under the direc-

tion of C. A. Emerson, Jr., chief engineer, State Department of Health, by A. L. Reeder and R. B. Styer, assistant engineers, W. R. Crall and J. L. Sullivan, inspectors.

The fresh, rather dilute domestic sewage is first passed through a coarse bar screen, then lifted 14½ ft. by a centrifugal pump to a flume from which the flow is by gravity through the rest of the plant. From the flume the sewage discharges onto a flat plate screen with closely spaced ¼-in. round holes, from which it drops into a hopper-bottomed grit chamber. The cell effluent passes through a flume, over concentric riffles and into two settling reservoirs having a combined holding capacity of 88,740 gal. This gives a detention period of about 2⅛ hours when the tanks are free from sludge and the flow is at the rate of 1,000,000 gal. a day. Provision is made for drawing the sludge from the bottom of the tanks to small sludge-drying beds. A sheet-iron building 35½ x 48¾ ft. in plan houses the plant, except the cell-effluent flume, the settling reservoirs and the sludge beds. Nine electric motors and one motor generator are provided, as follows:

	No.	Hp.
For pumping raw sewage	1	7½
For lime treatment, lime crusher	1	5
Lime pump	2	1
Feeding and agitation	2	1
For electrolytic cell, paddles	1	3
Electrolysis	1	5-kw. generator set
For grit and sludge, grit pump	1	2
Sludge pump	1	1

The fine screen and grit chamber are in duplicate, only one side being used at a time.

The grit chamber effluent discharges into a second flume, passes over a 3-ft. weir, is treated with lime in suspension, and then goes to the electrolytic cell.

The electrolytic apparatus is placed in a closed wooden tank, 3 ft. wide, 2¾ ft. high and 27½ ft. long (outside), provided with two 2-in. wrought-iron vent pipes at the top and clean-outs in the bottom. The electrodes consist of 22 banks of plates, 11 above and 11 below. In each bank there are 48 steel plates, 16 in. long, 10 in. high and $\frac{3}{16}$ in. thick, placed parallel to the sides of the tank and spaced ⅜ in. apart. In each space between plates there are two straight paddles of Bakelite, or 2068 in all, driven at a speed of 20 revolutions per minute.

At the normal, or 1,000,000-gal., rate of the plant, the sewage would pass through the cell in 70 sec., but would be in contact with the electrodes only 17.4 sec., as their combined length is only 14⅔ ft. The theoretical velocity of the sewage as it passes between the plates is 0.84 ft. per second. The patentee claims that in his process lime treatment prior to electrolytic action is essential "to insure positive alkalinity" and prevent "attack of the electrodes." The agitation by the paddles revolving between the electrodes, the report states, "in addition to its well-known effect in inducing precipitation, brings the sewage into intimate contact with the products of electrolysis," so that "chemical reaction is thereby stimulated while the gases (oxygen and hydrogen) are in their nascent state and before they have an opportunity to escape." A further effect of the paddles is "to mechanically clear the plates and prevent polarization." Such polarization as does occur from time to time "is overcome by a reversal of the polarity which quickly decreases the necessary voltage and increases the current." For satisfactory cell operation, an alkalinity of 30 p.p.m. is said to be necessary. This was always exceeded during the test.

Table I gives a summary of the results of the test:

TABLE I RESULTS OF SEWAGE-WORKS TESTS AT EASTON, PENN BY PENNSYLVANIA DEPARTMENT OF HEALTH

Power Consumption	8-Hour Test	24-Hour Test
Lights and electric heaters	11 kw.-hours	47 kw.-hours
Pump motor	30 kw.-hours	90 kw.-hours
All other power	50 kw.-hours	130 kw.-hours
Total	91 kw.-hours	267 kw.-hours
Total water consumption (this includes toilet, lavatory and the stuffing boxes of the centrifugal pump)	66 cu.ft.	166 cu.ft.
Quantity of lime		1,712 lb.
CaO content		61.52%
Average voltage for electrolysis	56.3	57.5
Average current for electrolysis, amperes	37.8	33.8
Average wattage for electrolysis	2,125	1,944
Average wattage for paddles	1,388	1,355
Sewage flow, in gallons per 24 hours	482,700	460,000
Average sewage flow, in gallons per hour	20,110	19,190
Electrolytic hydrogen liberated, in grams per hour	31.04	27.82
Electrolytic oxygen liberated, in grams per hour	247.73	222.03
Ratio of electrolytic hydrogen to sewage by weight	0.4 p.p.m.	0.4 p.p.m.
Ratio of electrolytic oxygen to sewage by weight	3.2 p.p.m.	3.0 p.p.m.

Bacteriological Results—Bacteria per Cubic Centimeter; Eight-Hour Test

	Time	Raw Sewage	Screened Sewage	Cell Effluent	Basin Effluent
Total bacteria	2:30 p.m.	800,000	200,000	38,000	2,000
B. coli	2:30 p.m.	36,000	24,000	0	0
24-Hour Test					
Dec. 6-7					
Total bacteria	8:00 a.m.	920,000	680,000	24,000	65
B. coli	8:00 a.m.	100,000	20,000	0	0
Total bacteria	4:00 p.m.	240,000	216,000	2,500	1,500
B. coli	4:00 p.m.	12,000	50,000	0	0
Total bacteria	12 midnight	48,000	16,000	190,000	18,000
B. coli	12 midnight	15,000	18,000	0	0
Total bacteria	8:00 a.m.	1,200,000	1,800,000	24,000	30,000
B. coli	8:00 a.m.	45,000	30,000	0	0

Physical and Chemical Results, Eight-Hour Test

	Time	Screened Sewage	Basin Effluent
Total alkalinity	12:15 p.m.	106	193
Total alkalinity	4:00 p.m.	103	326
24-Hour Test			
Dec. 6			
Total alkalinity	8:00 a.m.	98	380
Total alkalinity	12:00 m.	89	276
Total alkalinity	4:00 p.m.	88	252
Total alkalinity	8:00 p.m.	98	282
Dec. 7			
Total alkalinity	12:00 midnight	85	288
Total alkalinity	4:00 a.m.	86	341

Screenings removed, 24-Hour Test

Bar screen	117 lb.	Plate screen.	379 lb.

Results Expressed in Parts per Million, 24-Hour Test

	Raw Sewage	Screened Sewage	Cell Effluent	Basin Effluent
Total solids	217	248	608	640
Volatile solids	114	140	196	94
Fixed solids	103	108	412	546
Suspended solids	74	69	215	26
Nitrogen as				
Organic	34.5	34.2	21.5	21.6
Free ammonia	11.3	11.5	9.2	9.3
Nitrites	0.045	0.05	0.06	0.06
Nitrates	0.46	0.45	0.93	0.90
Oxygen consumed	53	52	44	44

Raw sewage samples were collected from the discharge pipe of the pump after sewage had passed the bar screen. Screened sewage samples were collected after the sewage had passed the bar screen, the pump, the plate screen and the grit chamber. The samples of the cell effluent were taken from the observation flume. This sewage had passed the bar screen, the pump, the plate screen, the grit chamber and the electrolytic cell, and had also received the lime treatment.

Dissolved Oxygen

	Time	Temperature, Degrees C.	Content, p.p.m.	Saturation Per cent.
Cell influent	10 a.m.	12.0	3.7	34
Cell effluent	10 a.m.	11.0	5.2	47
Cell influent	6 p.m.	12.0	6.8	63
Cell effluent	6 p.m.	11.0	7.0	63
Cell influent	2 a.m.	12.5	6.7	62
Cell effluent	2 a.m.	12.5	8.3	77

Putrescibility: Using Methylene Blue at 20° C., Eight-Hour Test

	Raw Sewage	Screened Sewage	Cell Effluent	Basin Effluent
1:45 p.m.	1 day	1½ days	4½ days	9½ days
24-Hour Test				
Dec. 6				
9:00 a.m.	1 day	1 day	14 days	14 days
3:00 p.m.	1½ days	1½ days	14 days	14 days
11:00 p.m.	1½ days	1½ days	14 days	14 days
Dec. 7				
7:00 a.m.	1½ days	1½ days	14 days	14 days

Putrescibility of Sludge From Receiving Basins

	100% Sludge	75% Sludge 25% River Water	50% Sludge 50% River Water	75% Sludge 25% River Water	100% River Water
Standard quantity methylene blue solution	3 hrs.	3 hrs.	3 hrs.	3 hrs.	14 days
Three times standard quantity methylene blue solution	3 days	14 days	1 day	3 days	14 days

The entries signify the period during which the samples retained a blue color excepting in cases where the entry reads 14 days, which signifies that the color was still present when the samples were thrown away at the end of the 14-day period.

At the end of the test an examination of the cell plates showed that after removal of the coating from the plates the latter were bright and apparently in good condition. On analysis the coating was found to contain 1.73% of iron. The report states, "there was no evidence during the test that under operating conditions there is a rapid deterioration of the plates to form a chemical coagulant, which was purposely intended in the early processes for the electric treatment of sewage."

A rough indication of the cost of operating a 1,000,000-gal. plant under Easton conditions, with the dosage there used, but which is stated by the owner of the plant to be greatly in excess of that needed for satisfactory results, is given in Table II.

TABLE II. ESTIMATED COST OF OPERATING 1,000,000-GALLON SEWAGE WORKS LIKE THAT AT EASTON

Without Pumpage	
Hydrated lime, 3720 lbs. at $6 75 a ton	$12 56
Water, 20 cu.ft. at $0 003 per cubic foot	06
Electric power, 185.5 kw.h., at $0.0226	4 19
Electric lights, 6¼ kw.h., at $0.0805	.50
Heating	1 25
Labor and superintendence	15 00
Electrode renewals	1 00
Maintenance and repairs	1.50
	$36.06
Add for Pumpage	
Electric power, 117 7 kw h., at $0 0226	2 66
Water, 120 cu.ft., at $0 003	36
Total	$39 08

The Franklin Tests

The Franklin Institute tests were made Feb. 18-21, 1919. They fall into two parts: (1) Six runs of 3 to 14.5 hours each, totaling 35.5 hours, made Feb. 18-20, "operated in the manner recommended by the inventor"; and (2) two runs of one hour each Feb. 21, prompted by assertions "that the efficiency of the process was due primarily to the action of the lime" and that electricity played "but a minor part."

The report on the Franklin tests is published in the *Journal of the Franklin Institute* for August, 1919, as a "Communication" by Henry Jermain Maude Creighton, Department of Chemistry, Swarthmore College, and Benjamin Franklin, civil engineer, members of the institute. A footnote states that "this paper embodies the results of an investigation of the Landreth direct-oxidation process by the Committee of Science and the Arts of the Franklin Institute." Elsewhere in the *Journal* is an official notice that the committee just named "proposes to award the Howard N. Potts gold medal to Clarence P. Landreth, Philadelphia, Penn., for his electrolytic sewage process."

The Franklin report describes the experimental plant in much the same terms as the Pennsylvania report, but gives some additional details. The most notable of these are that the fine screen is cleaned by brushes "arranged on a traveler"; that the total positive and negative electrode area in electrolysis apparatus is 124,287 sq.in.; that each steel plate composing the electrodes weighs 8.33 lb. and all of them together 8797 lb.; and that the assertion of the inventor that "the total amount of iron removed by the current amounts to 1.41 lb. in 24 hours, and is not in any way influenced by the volume of sewage treated" has been "substantiated by tests made by the writers"—from which it is computed that the electrodes would last 11.4 years, assuming that two-thirds of the metal "can pass into solution without rendering them useless."

During the Franklin tests "the plant was operated under the direction and constant supervision of one of the writers (which one is not stated) and his two assistants, O. R. Quale and J. D. Ballard." Most of the chemical analyses noted were made at the plant immediately on the taking of the composite samples. Albuminoid-ammonia and free-ammonia determinations were made by James De Long at Lafayette College, Easton (close at hand). Determinations of suspended matter and dissolved oxygen after five days were made at the Swarthmore chemical laboratories. Bacterial counts were entrusted to Dr. E. R. St. John, Philadelphia.

Unlike the Pennsylvania tests, those made for the Franklin Institute did not show the progressive results of (1) fine screening; (2) the combination of lime-electrolytic treatment and mechanical agitation, and (3) sedimentation. In the Pennsylvania tests the "raw sewage" had passed the bar screens and the centrifugal pump, while in the Franklin tests the "raw sewage" appears to have been made up of some samples collected after fine screening and of others after they passed through both the fine screens and the grit chamber. The collection of raw and treated samples was timed in accordance with observations of the time required for dyestuffs to pass in the sewage between the sampling points.

As to the rate of lime dosing in the Franklin tests, the only information given in the report is that "the hydrated lime was fed into the mixing vat at the rate of 856 lb. per 24 hours, or an equivalent of 670 lb. 90% CaO lump lime. The milk of lime so formed was added to the raw sewage at the spillway weir at the rate of 30 gal. per minute." Analysis showed the lime used to contain 71 36% of CaO.

A summary of the results of the first or main tests is given in Table III. The "power consumed" appears to include only that used for electrolysis, for mixing and feeding the lime (including pumping effluent to mix the lime) and that for driving the paddles. In the Pennsylvania report all the power used at the plant is taken into account. This fact should be remembered in considering the cost estimates given in Table VI.

The second test, made to show whether there is any special efficacy in combining lime and electrolytic treatment, was confined to two 1-hour runs, because "the inventor was of the opinion that the electrode would be damaged by allowing the lime-containing sewage to flow through it in the absence of the electric current, or by operating it with the electricity in the absence of lime, for periods longer than one hour." This test, therefore, consisted of treating sewage with lime for one hour and (separate test) with electrolysis for one hour, mechanical agitation by the paddles being maintained in each case. The report does not say whether the sewage thus treated had been passed through both the fine screens and the grit chamber, but the presumption is that it had. Table IV shows results of this test.

TABLE III. FRANKLIN INSTITUTE TESTS OF SEWAGE-TREATMENT PLANT AT EASTON

R, denotes raw sewage samples; E, effluent. (The tests are designed to show the effect of lime, electrolytic and paddle treatment, only.—Editor)

No. of Composite Sample		1	2	3	4	5	6	7	8	Average	Change P.p.m.	Change Per Cent.
Chlorine, p.p.m.	R	55.5	65.6	64.6	60.5	70.3	64.5	56.5	58.1	61.9		
	E	63.0	77.6	65.2	44.6	60.3	61.8	64.8	67.9	63.1	+ 1.2	+ 1.9
Nitrogen as Nitrite, p.p.m.	R	0.009	0.025	0.030	0.035	0.025	0.019	0.033	0.028	0.024		
	E	0.028	0.043	0.036	0.050	0.030	0.028	0.023	0.040	0.038	+ 0.014	+58.3
Nitrate, p.p.m.	R	0.62	0.52	0.50	0.46	0.75	0.67	0.50	0.41	0.55		
	E	0.77	0.64	0.60	0.50	0.63	0.85	0.83	0.63	0.68	+ 0.13	+23.6
Free Ammonia, p.p.m.	R	17.2			17.0		17.8	19.8		18.0		
	E	15.6			13.9		14.4	14.8		14.7	— 3.3	—18.3
Albuminoid NH_3, p.p.m.	R	27.9			32.2		29.3	29.6		29.8		
	E	26.3			28.1		25.2	25.3		26.2	— 3.6	—12.1
Required oxygen, p.p.m	R	51.4	71.2	65.8	61.9	74.9	64.5	59.0	59.5	63.5		
	E	43.0	54.1	58.6	43.6	55.4	51.2	52.0	46.2	50.5	—13.0	—20.5
Dissolved Oxygen— Determined immediately, p.p.m.	R	3.88	3.90	(6.55)	4.26	5.09	5.22	3.98	4.14	4.35		
	E	7.39	5.92	5.76	5.76	6.40	6.20	5.14	6.22	6.13	+ 1.78	+40.9
Determined after 5 days (10-15), p.p.m.	R	0.21	0.19	0.26	0.15	0.22	0.28	0.09	0.05	0.18	Absorption of oxygen on standing: in p.p.m. R=4.17, E=0.77; in % R=95.9, E=12.6	
	E	6.70	5.64	5.57	4.11	6.14	5.75	4.06	4.98	5.36		
Suspended solids, p.p.m.	E	256	268	169	293	271	193	251	182	235		
Temperature, degrees C.	R	7.4	7.5	7.5	7.7	7.9	7.9	8.9	9.1	8.0		
	E	8.1	8.3	8.4	8.6	8.8	8.8	9.7	9.9	8.8		
Bacteria— Total count per c.c., at 37°	R	215,000	155,000	250,000	312,000	475,000	425,000	527,000	603,000	370,000		
	E	28,000	6,000	27,400	25,000	37,000	20,300	32,300	37,300	26,800	—343,200	—92.7
Total count per c.c., at 20°	R	500,000	455,000	625,000	530,000	550,000	757,000	1,017,000	1,533,000	746,000		
	E	82,000	40,000	42,000	91,000	62,000	47,000	47,000	51,000	58,000	—688,000	—92.2
B. coli per c.c.	R	100,000	100,000	55,000	100,000	55,000	70,000	100,000	40,000	78,000		
	E	<10	<10	<10	250	<10	<10	670	0	120	— 77,880	—99.85
Period in hours		4.5	5	5	5	5	3	5	3	.....		
No. half-hour samples in composite		9	10	10	10	10	6	10	6	..		
Average flow of sewage in 1000 gal. per 24 hr.		543	446	358	468	481	388	532	496	464		
Power consumed, kw. hours.		29	26	29	28	33	21	33	24	..	213 kw.-hr. for 686,000 gals.	
Kw.-hr. per hour		6.4	5.2	5.8	5.6	6.6	7.0	6.6	8.0	6.4		
Kw.-hr. per 1000 gal. sewage		0.29	0.28	0.39	0.29	0.33	0.43	0.29	0.38	0.335		

TABLE IV. RESULTS WITH LIME TREATMENT ONLY AND WITH ELECTROLYTIC TREATMENT ONLY; PADDLES USED IN EACH CASE

		Lime Treatment Only— P.p.m.	Change, P.p.m.	Change, Per Cent.	Electrical Treatment Only— P.p.m.	Change, P.p.m.	Change Per Cent
Chlorine	R	67.7			70.8		
	E	80.0	+ 12.3	+ 18.2	72.4	+ 1.6	+ 2.2
Nitrogen as— Nitrite	R	0.050			0.050		
	E	0.045	— 0.005	—10.0	0.040	—0.01	—20.0
Nitrate	R	0.62			0.75		
	E	0.625	+ 0.005	+ 0.8	0.60	—0.15	—20.0
Free NH_3	R	15.6			13.5		
	E	15.8	+ 0.2	+ 1.3	14.4	+ 0.9	+ 6.6
Albuminoid NH_3	R	23.8			22.2		
	E	23.4	— 0.4	— 1.7	21.7	—0.5	— 2.3
Required oxygen	R	84.6			64.5		
	E	76.9	— 7.7	— 8.9	58.0	—6.5	—10.0
Dissolved oxygen— Determined immediately	R	4.88			4.01		
	E	3.95	— 0.93	—19.1	5.62	+ 1.61	+ 40.1
Determined at end of 5 days	R	0.03	Absorption of oxygen on standing: in p.p.m. R=4.85, E=3.82; in % R=99.4, E=96.7		0.08	Absorption of oxygen on standing: in p.p.m. R=3.93, E=5.17; in % R=98.0, E=92.0	
	E	0.03			0.45		
Bacteria* Total count per c.c., at 37° C.	R	1,180,000			437,000		
	E	453,000		—82.4	272,000		—37.8
Total count per c.c., at 20° C.	R	1,192,000			908,000		
	E	118,000		—90.1	273,000		—70.0
B. coli per c.c.	R	100,000			55,000		
	E	3,700		—92.3	10,000		—81.80

*Bacteria values are the average of six samples taken every 10 minutes during an hour.

To compare the two methods of partial treatment with the full treatment, the "changes," expressed as percentages, between raw and partly treated sewage effected in the one-hour tests summarized in Table IV are contrasted with the averages of the "changes" shown by the complete process in the five runs, totaling 35.5 hours, made on the three previous days, the whole composing Table V.

Variations in the strength of the sewage passing through the plant when the three sets of tests compared in Table V were made are shown by the analyses of raw-sewage samples given in Tables III and IV.

The conclusions drawn from Table V by the authors of the Franklin Institute report are that the electrolytic-lime treatment produces a higher degree of oxidation and of bacterial removal than either lime treatment or electrical treatment alone.

In passing, the authors remark that the effluent produced by the electrolytic-lime treatment may be still further improved by final sedimentation, which would

TABLE V. CHANGES PRODUCED IN LANDRETH APPARATUS OPERATED AS STATED

	Lime and Electricity p.p.m.	Lime and Electricity Per cent	Lime Alone p.p.m.	Lime Alone Per cent	Electricity Alone p.p.m.	Electricity Alone Per cent
Chlorine	+ 1.2	+ 1.9	+12.3	+18.2	+1.6	+ 2.2
Nitrite	+ 0.014	+58.3	— 0.005	—10.0	—0.01	—20.0
Nitrate	+ 0.13	+23.6	+ 0.005	+ 0.8	—0.15	—20.0
Free ammonia	— 3.3	—18.3	+ 0.2	+ 1.3	+0.9	+ 6.6
Album. NH_3	— 3.6	—12.1	— 0.4	— 1.7	—0.5	— 2.3
Required oxygen	—13.0	—20.5	— 7.7	— 8.9	—6.5	—10.0
Dissolved O_2	+ 1.78	+40.9	— 0.93	—19.1	+1.61	+40.1
Dissolved R =	4.17	95.9	4.85	99.4	3.93	98.0
O_2 absorbed in 5 days E =	0.77	12.6	3.82	96.7	5.17	92.0
Bacteria Reduction— Total count at 37° C., per c.c.	—343,200	—92.7	—373,000	—82.4	—165,000	—37.8
Total count at 20° C., per c.c.	—688,000	—92.2	—1,074,000	—90.1	—635,000	—70.0
B. coli at 37° C., per c.c.	— 77,880	—99.85	—96,300	—92.3	—45,000	—81.8

reduce suspended matter, albuminoid ammonia, required oxygen and bacteria. As to suspended matter, the reader will note that none of the Franklin tables shows its content in the raw sewage, but that it is given throughout in the Pennsylvania report.

The Franklin report contains tables comparing the per capita costs of the Landreth direct-oxidation process with other methods of sewage treatment, but the authors' apologies for these tables, combined with a paucity of details as to methods of computations, are sufficient reason for not reprinting the tables here.

The Franklin report does go into some detail to illustrate the diminution in unit operating costs with the increase in size of a Landreth plant, but here also it is uncertain just how many of the elements essential to operating a plant, such as was tested at Easton, are included. Apparently everything is omitted that does not pertain to the combination of lime, electrolytic and mechanical agitation treatment; that is, pumping and

TABLE VI. COMPARATIVE COSTS OF OPERATING A 2,000,000- AND A 10,000,000-GALLON LANDRETH SEWAGE-TREATMENT PLANT

Capacity, 2,000,000 gal. per day. Population, 20,000.

The operation cost is based upon the following daily items:	
1600 lb. 90% lime per day at $6 per ton	$5 33
Current, 282 kw.-hr. per day at 2c	5 64
Heat and light per day	2 00
Renewals	2 00
Maintenance and repairs	1 00
Labor:	
3 men—8-hour shifts, at $5, $4, $4.	
1 laborer at $3	16.00
Total	$31.97

This is 58c. per capita per year for operation, of which about 51% is for labor alone

Capacity, 10,000,000 gal. per day. Population, 100,000.

The operation cost is based upon the following daily items:	
8000 lb. 90% lime per day at $6 per ton	$26 75
Current, 1410 kw.-hr. per day at 2c	28 00
Heat and light per day (estimated)	2 00
Renewals	10 00
Maintenance and repairs	6 00
Labor:	
1 superintendent	5 00
3 operators at $4	12 00
1 laborer	3 00
	$92.75

This is 34c. per capita per year for operation, of which about 22% is for labor

screening before and sedimentation and sludge treatment after the Landreth process appear to be left out of account, although in at least some of the cost tables already mentioned everything chargeable to sewage treatment, and some things that are not, seem to have been included by the engineers or authors whose figures are cited. With these words of caution, attention is directed to the Franklin Institute cost estimates for a 2,000,000-gal. and a 10,000,000-gal. plant shown in Table VI. These figures, converted to a 1,000,000-gal. rate of treatment, were compared with the Pennsylvania figures at the beginning of this article.

Avoiding the Ban on Special Legislation

How some state legislatures avoid constitutional prohibitions of special legislation affecting cities is well illustrated by the following summary of a recent Kansas statute apparently designed to affect one city only. The summary is taken from *Kansas Municipalities:* "Authorizing any city of the first class, from 20,000 to 25,000, in a county having a population not exceeding 60,000, with an assessed valuation of not less than $48,000,000, and containing two divisions of the district court, to request the county commissioners to improve permanently any main public road not exceeding four in number from the principal business center of such city.—S. B. 461."

Motor-Truck Impact on Roads Five Times Dead Load

Experiments of Bureau of Public Roads Indicate That Force Is Dependent on Speed, Power and Condition of Truck

IMPACT of motor-truck wheels upon pavement surfaces, reduced to equivalent static loads, is as much as five times the total dead load under certain conditions. This result is shown in tests being made by the Bureau of Public Roads at the Arlington Experimental Farm. The force of impact is found to be dependent on: (1) Height of drop; (2) total load; (3) condition of tires; (4) characteristics of springs, and (5) speed. It is also found to be greater when the power is on than when the truck is coasting. An abstract of a preliminary report made by E. B. Smith, senior assistant testing engineer, and J. T. Pauls, highway engineer, and published in the July issue of *Public Roads*, follows:

Realizing the destructive effect of the pounding of heavily loaded auto trucks on highways, the Bureau of Public Roads through its research department devised a system for testing impact. The general character of the apparatus used is shown in the accompanying illustration. Briefly, the device consists of a plunger fitted in

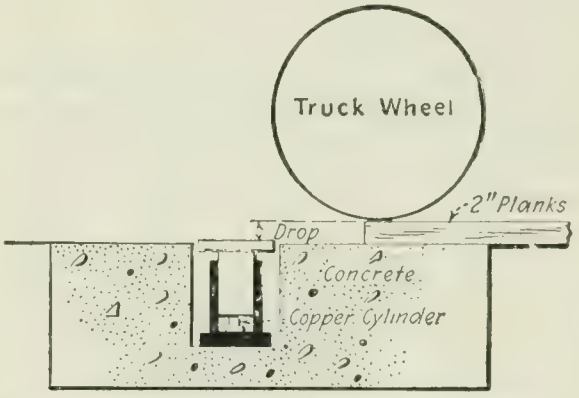


DIAGRAM OF APPARATUS FOR TESTING IMPACT

a casing and resting upon a small copper cylinder. These cylinders are carefully standardized and the impact is measured by the deformation of the copper when the truck wheel strikes the surface plate. A hole is left in the bottom of the casing so that there will be no cushioning effect of air. Various heights of drop are arranged for, by the use of different thicknesses of plank.

Only the rear wheels have been tested thus far, a steel bridge, which is automatically tripped as the front wheel passes, being used to protect the surface plate. The planks are moved back and forth so that the wheel lands directly in the center of the plunger at the different speeds.

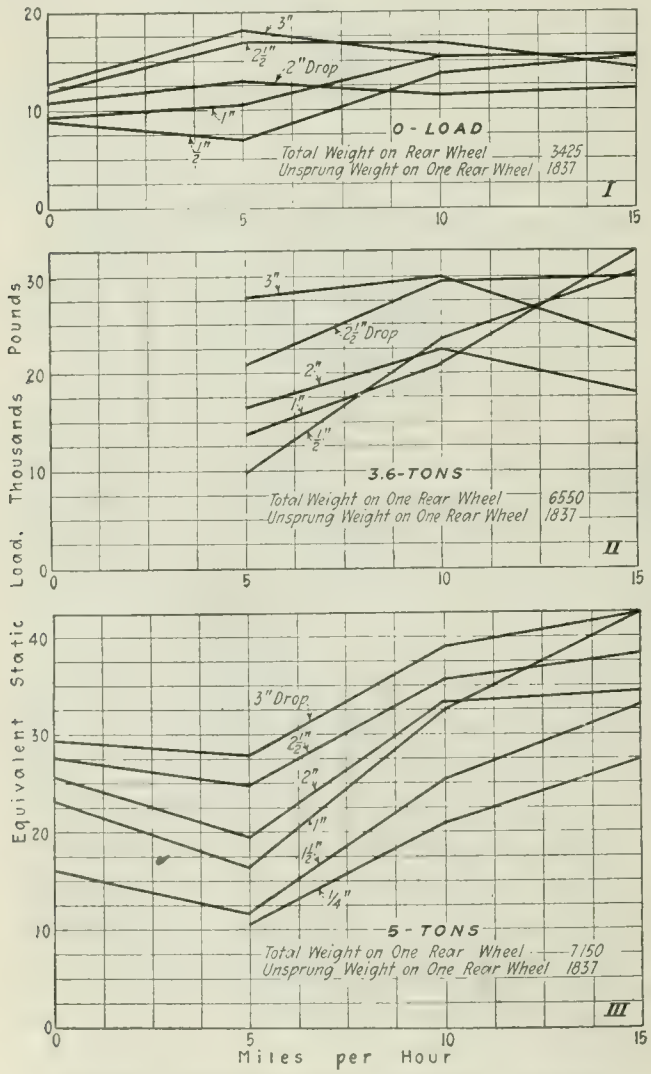
To obtain accuracy, the copper cylinders are accurately machined to ½ in. in diameter and carefully annealed. Five cylinders from each heat are tested in a machine under a pressure of 6000 lb., to determine the relation between static load and deformation for the heat. The variation from the mean deformation has been only 1.3% which is considered less than other experimental errors.

A three-ton United States Army, class-B truck with

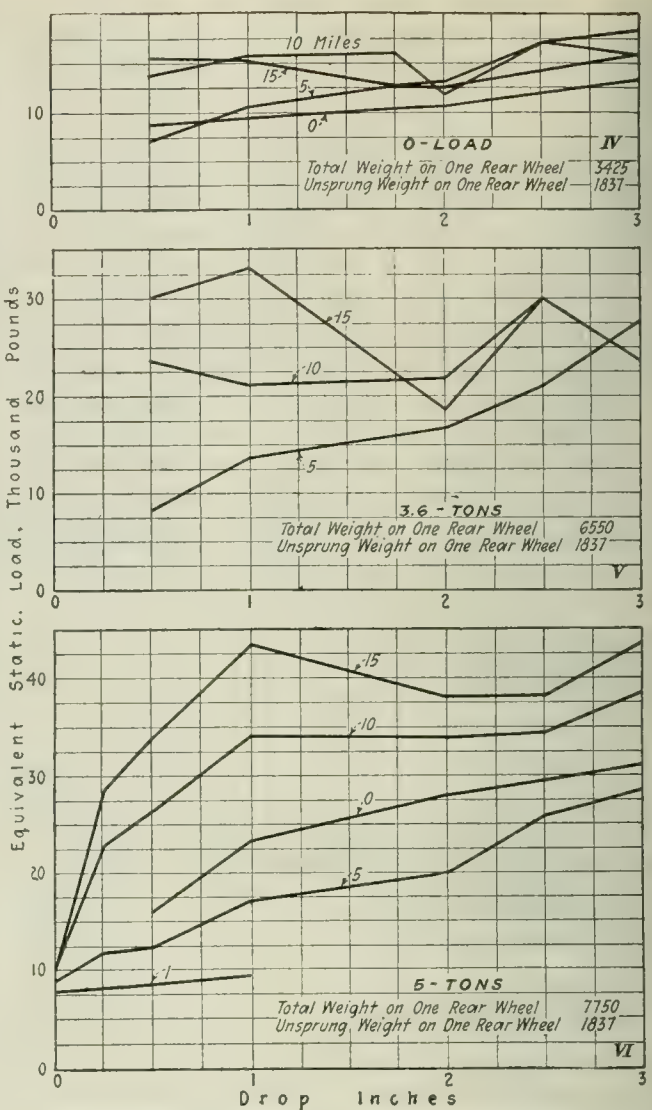
solid rubber tires is being used for these experiments. The truck weights are as follows: Empty, 11,400 lb.; on front wheels, 4550 lb., on rear wheels, 6850 lb., and of unsprung rear parts, 3675 lb. The tests were made with zero load, 3.6 tons and 5 tons. The weight on the rear wheels when loaded is 13,100 lb. for the former load and 15,500 lb. for the latter. The rear wheels of the truck are 40 in. in diameter, having two solid rubber tires which are 6 in. wide at the rim.

Only the effects of the simple falling of the truck from various heights were considered in the preliminary tests. Other conditions of impact will be investigated later. The deformations of the copper cylinders were reduced to equivalent static loads and plotted as shown in the accompanying curves. This may not be a perfect comparison of impact load, as such loads will probably produce a localized shattering effect which does not result from the application of a static load. For this reason the present methods of comparison are considered tentative, and subject to possible revision as the tests proceed. No attempt was made to determine the effect of the blows upon various pavement surfaces, but machinery and apparatus for making such tests are now under construction.

Curves 1, 2 and 3 indicate the general tendency of impact to increase as the speed increases, the loads being plotted with respect to the speed in miles per hour.



RELATION OF IMPACT TO SPEED OF TRUCK



RELATION OF IMPACT TO HEIGHT OF DROP

Curves 4, 5 and 6 show the same data plotted with heights of drop as abscissas. These curves indicate a general increase of impact with the increase in drop.

In conducting the experiments it was discovered that the action of the truck springs had a great influence on the impact results. Spring action is responsible for the relatively high values at zero speed in curves No. 3 and for the irregularities in 4, 5 and 6, plotted with respect to height of drop. When the wheel leaves the plank, the spring snaps open and produces a greater downward acceleration of the unsprung parts than that due to the action of gravity alone. Within the time of one vibration of the spring, the magnitude of impact at the landing point will depend upon the height of drop, whether it is less, equal to, or greater than the compression of the spring. If the period of vibration is such that the spring has acquired its maximum acceleration in opening and at this instant also lands at the point of application, the impact value will be at maximum. It will be at a minimum when conditions are such that the spring is returning to its closed position and is at the point of maximum acceleration in that direction as the impact occurs.

It was also noticed that the impact is appreciably affected by the condition of power, whether on or off.

If the impact occurs when the truck is coasting, it is less than when the power is on. This difference amounted in some cases to as much as 30 per cent.

The results of the preliminary tests are presented at this time to show the general tendency of impact values. It will be noted that under certain conditions the impact is as much as five times the total dead load. It is hoped that as the tests proceed they will give road-design data and lead to the establishment of rules and laws for the allowable load and speed of motor trucks.

Engineering Standards Committee Proposes New Constitution

New Draft Provides for Taking in Other Societies on Equal Basis—Association Plan for Outside Financing Dropped

A NEW constitution for the Engineering Standards Committee has been submitted for approval to the governing boards of the five societies which originally joined in forming that committee. The draft was prepared by representatives of the five societies in conferences held during July and August, and was finally adopted by the committee Aug. 16. It is a substitute for the constitution of an American Engineering Standards Association which was drafted by the committee in May and presented to the societies for approval; so much opposition developed in the societies that the association plan was subsequently reconsidered by the committee.

In the new draft, printed below, provision is made for admitting to membership in the committee other societies than the original five, just as was done in the associations' constitution. However, the plan of financing the work partly by outside contributions finds no representation in the present draft. With respect to ultimate control, the form of organization now proposed is identical with that of the association in that the committee will be controlled by all the bodies having representation in it, rather than by the five original societies alone. Another point of identity between the present constitution and the preceding draft is the omission of any definition of the scope of work contemplated, this work being described only by the general term "engineering standardization."

Present indications are that the governing boards of the societies will not be in a position to take final action on the proposed constitution before October.

Revised Constitution of American Engineering Standards Committee

Article I. Name

Sec. 1. The name of this committee shall be the American Engineering Standards Committee, hereinafter referred to as the committee.

Article II. Objects

The objects of the committee shall be:

Sec. 2. To provide means by which various organizations engaged in formulating engineering standards may coöperate with one another, thus avoiding the duplication of standardization work and the promulgation of conflicting standards.

Sec. 3. To collect and make accessible to organizations and individuals information concerning standardization work in the United States and foreign countries.

Sec. 4. To receive and pass upon recommendations for standards submitted to it by other organizations in accordance with its rules of procedure, with the object of establishing American engineering standards; but not to formulate standards.

Sec. 5. To promote in foreign countries the knowledge of recognized American engineering standards

Sec. 6. To act as the authoritative channel of coöperation in international engineering standardization.

Article III. Membership

Sec. 7. The committee shall be composed of not more than three representatives from the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Society for Testing Materials, the Government departments of War, Navy, and Commerce, and from each of such other organization (or groups of organizations) of national scope as may be approved as hereinafter provided. The vote of the committee shall lie with these representatives, who shall be termed members.

Sec. 8. The number of representatives any organization or group of organizations may appoint shall be determined by such considerations as the volume, character and importance of its standardization work, if any, together with its standing and total membership.

Sec. 9. Any organization or group of organizations desiring representation on the committee shall make formal application therefor in writing, setting forth the scope of its standardization interests and activities and the number of its members. This application shall be considered by the committee, and, if approved by three-fourths of those present and voting, shall be submitted with recommendations to each organization represented on the committee. These recommendations shall stand approved unless formal objection from more than one-fourth of the organization or groups of organizations represented is received within 90 days from the date on which such recommendations were mailed.

Sec. 10. Any organization or group of organizations appointing representatives to the committee shall agree to assume the financial obligations herein set forth and to abide by the constitution, by-laws, and rules of the committee. In case of members appointed by Government departments or bureaus, it is understood that financial support is not required until such time as proper authorization therefor can be obtained.

Sec. 11. Initially, each organization or group of organizations shall appoint its first representative to serve three years, the second to serve two years, and the third to serve one year. After the first year all appointments shall be for three years.

Sec. 12. A member whose term of office has expired may be reappointed. A vacancy shall be filled by the organization or group of organizations from which the retiring member was originally appointed, such appointment to be for the unexpired term.

Sec. 13. Any organization or group of organizations may withdraw its representatives from the committee upon notice in writing, provided the dues for the current calendar half year have been paid.

Article IV. Officers

Sec. 14. At its annual meeting the committee shall elect from its membership a chairman and vice-chairman, who shall not be representatives of the same organization or group of organizations. Officers so elected shall assume office on Jan. 1 and serve for one year, or until their successors are elected. These officers shall not serve for more than three consecutive terms. Vacancies may be filled by election at any regular or special meeting, provided notice has been given in the call for the meeting.

Sec. 15. The chairman shall be the executive officer of the committee, shall approve all expenditures, and countersign all vouchers. He shall preside at meetings of the committee. He shall be chairman of the executive committee, on which he shall be the representative of the

organization or group of organizations appointing him, and shall be ex-officio member of all other committees

Sec. 16. In the absence of the chairman, his duties shall be performed by the vice-chairman. The vice-chairman shall be vice-chairman of the executive committee, on which he shall be the representative of the organization or group of organizations appointing him.

Sec. 17. In the absence of both chairman and vice-chairman, the duties of chairman shall be performed by a member of the executive committee.

Sec. 18. A secretary, who shall not be a member of the committee, shall be engaged by the executive committee.

ARTICLE V. EXECUTIVE COMMITTEE

Sec. 19. At its annual meeting the committee shall elect from its membership an executive committee, consisting of one representative of each organization or group of organizations represented on the committee, and may delegate to it any of its powers except that of approving "Recommended Practices," "Tentative Standards," or "American Standards."

Sec. 20. Members elected to the executive committee shall assume office on Jan. 1 and serve for one year or until their successors are elected. Vacancies may be filled for the unexpired term by vote of the executive committee, the new member to be a representative of the organization or group of organizations by which the retiring member was appointed.

Sec. 21. A quorum of the executive committee shall consist of a majority of its members.

ARTICLE VI. MEETINGS

Sec. 22. The committee shall hold at least four regular meetings each year, the last of which shall be the annual meeting. It may hold additional meetings at any time at the call of the chairman on not less than 10 days' notice.

Sec. 23. A quorum of the committee shall consist of a majority of its members.

ARTICLE VII. APPROVAL OF STANDARDS

Sec. 24. The committee shall formulate rules under which committees to create standards shall be constituted and organized and shall receive and pass upon recommendations for standards which may be submitted by any competent body, to be known as the Sponsor.

Sec. 25. Any proposed standard submitted to and approved by the committee shall be known either as a "Recommended Practice" or as a "Tentative Standard," and when, in the opinion of this committee after approval by the Sponsor it has proved its suitability, it shall be known as an "American Standard."

Sec. 26. The approval as "Recommended Practice" or as "Tentative Standard" of any standard submitted to the committee shall require the affimative vote of three-fourths of the committee; the advance of status to "American Standard" shall require an affirmative vote of 90% of the committee. Such vote shall be by letter ballot. Letter ballots may be ordered at any regular or special meeting of the committee.

Sec. 27. A "Recommended Practice" or "Tentative Standard" may be revised at intervals of not less than one year, by the same procedure as that required for its original approval. A period of not less than one year shall intervene between the last revision and the admission to "American Standard."

Sec. 28. An "American Standard" may be revised at intervals of not less than three years by the same procedure as required for its original approval.

ARTICLE VIII. FINANCES

Sec. 29. Each organization appointing representatives on the committee shall pay annual dues of $500 for each representative. These dues shall be paid semi-annually. Any organization or group of organizations in arrears for dues for more than one year will thereby lose its right to representation on the committee.

Sec. 30. Funds of the committee shall be in the custody of the secretary, who shall be placed under suitable bond, and they shall be disbursed by him upon vouchers countersigned by the chairman or vice-chairman.

Sec. 31. The fiscal year of the committee shall terminate with the 31st day of December.

ARTICLE IX. BY-LAWS

Sec. 32. The committee may adopt by-laws in accordance with this constitution.

ARTICLE X. AMENDMENTS

Sec. 33. Amendments to this constitution must be proposed in writing at least 30 days before the meeting of the committee at which they are to be voted upon, this vote to be upon the amendments as originally proposed or as further amended at the meeting. If approved by three-fourths of those present they shall be referred to the organization or groups of organizations represented on the committee, and shall become operative only when they have been approved by three-fourths of such organization or groups of organizations.

A Water-Works Profit-and-Loss Account

AMONG the few municipally-owned water-works that keep a profit-and-loss account is that of Springfield, Mass. A summary of this account for the year which ended Nov. 30, 1918, taken from the annual report of A. R. Hathaway, water registrar, follows:

OPERATING REVENUE		
I. Earnings from sales of water to private consumers	$474,439.47	
II. Less abatements, refunds, etc.	1,312.01	$473,127.46
III. Earnings from sales of water to City of Springfield: Earnings based on prescribed rates for water supplied were $71,000.10, but no payments were made therefor, as per city ordinance		.....
III-A. Water used by municipal water-works and included in its operating expenses		84.85
Total operating revenues (water)		$473,212.31
OPERATING EXPENSES		
IV. Source of supply	$43,844.94	
V. Transmission expense	3,880.88	
VI. Distribution expense	48,031.28	
VII. Commercial expense	13,031.99	
VIII. General expense	31,015.97	
IX. Undistributed expense	8,556.78	
	$148,361.84	
IX-A. Public-safety expense	15,202.13	
	$163,563.97	
X. Depreciation reserve charge (for distribution system)	36,000.00	
Total operating expenses		203,563.97
Operating profit		$269,648.34
XI. Noncperating income (sundry sales, not water)		4,596.52
Gross income		$274,244.86
DEDUCTIONS FROM GROSS INCOME		
XII. Interest on bonded debt (net)	$69,452.95	69,452.95
Net income (carried to surplus)		$204,791.91

Engineer Casualties Third Highest

Only the infantry and the Signal Corps suffered heavier battle casualties in the war than the Engineer Corps, according to recent figures compiled by the War Department. Among each 1000 enlisted men in the infantry reaching France there were 270 killed or wounded. Among each 1000 in the Signal Corps the casualties were 50, and in the Engineer Corps 43. The percentage of casualties in the Tank Corps, artillery and air service, among enlisted personnel, were 3.8, 3.3 and 0.2%, respectively. It is also announced that among all enlisted men battle deaths were 8 in each thousand; among emergency officers 1.1% and among regular Army officers 1.4 per cent.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Much Valuable Matter Well Presented

REVIEWED BY F. W. DEAN
Consulting Engineer, Lexington, Mass.

TIMBER: Its Strength, Seasoning, and Grading—By Harold S. Betts, M.E., Forest Service, U. S. Department of Agriculture. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 234; illustrated.

It is a pleasure for a reviewer to be able to compliment a book without reservation. Such is the feeling of the present writer, for he can state that the book on "Timber" by Mr. Betts contains much valuable matter well presented. The book fills a long-felt need, for it contains most useful information, with reference to aspects of timber, that is of interest and value to anybody who uses it, or seeks information concerning it, whether he is an engineer, an architect, a vehicle builder, a furniture maker, a lumber dealer, or what not.

Up to this time nobody has known where to find printed information about timber in general—whether concerning physical qualities, distribution, methods of piling or prevention of decay, and, it may be added, the breaking down of certain superstitions concerning timber. The Associated Factory Mutual Insurance Companies issued, a few years ago, a pamphlet on the decay and preservation of timber which engineers and architects have found of great value, but in the book under review similar matter as well as much other of equal importance may be found, and users of timber are to be congratulated upon the availability of a book in which most questions that are likely to arise concerning timber are answered.

The book first considers the timber resources of the country and the distribution of different kinds. This is followed by six extensive tables which alone are worth the price of the book. These give the physical properties of all kinds of timber—chiefly those grown in the United States, such as weights, shrinkage, modulus of rupture, crushing strength, stiffness, hardness, shock-resisting ability, and shearing strength, all referred to being white oak from Hendricks County, Indiana, as a standard. It is interesting and surprising that so many woods are superior to oak in most properties. It is to be regretted that more information is not given concerning eucalyptus, which has such remarkable qualities, and which is being somewhat exploited in California, to say nothing of its natural habitat, Australia. It is mentioned only once in the tables, and somewhat obscured under the "Gum" headings. The *Eucalyptus globulus* from Alameda County, California it appears, has a modulus of rupture of 130, a longitudinal crushing strength of 149, transverse 140, a modulus of elasticity in transverse bending of 153, hardness of 128, shock resistance of 105, and longitudinal shearing strength of 118, all referred to oak as 100. The banner wood for all of these properties is greenheart from Demerara, South America, which has qualities nearly double those just given—except the last three—and, singularly, a shock-resisting quality of only 90. The methods of determining the various properties already named are described and are illustrated by diagrams. A chapter is devoted to the effect of moisture on timber.

Under the heading "Strength," 82 pages are allotted to the strength of timber in its larger aspects as used in structures such as buildings, wagon spokes, axles, telegraph poles, cross-arms and packing boxes. This chapter includes matter on the structure of wood—growth, grain, knots, checks, shakes—and all kinds of defects, sap wood, spring wood, summer wood, decay, insect attacks, grading, effect of seasoning and working stresses in wet, moist and dry places (but not hot places). It is shown that white hickory buggy spokes are no better, contrary to the general opinion, than red and mixed colors, and that the strength is a factor of the weight. It was found that oak buggy shafts are as good as hickory except that after breaking they are weaker. Similarly, tests of maple and hickory wagon axles show the latter to be stronger, better able to stand shocks and to support more load after breaking. Trussing wooden axles in the usual way is of little value.

One of the most important chapters is that devoted to the seasoning of wood. Here are considered moisture in per cent. of dry weight, direction and amount of shrinkage, prevention of injury in seasoning, methods of piling lumber, infection of good lumber from bad, kiln-drying and types of kilns.

In the description of methods of preserving lumber it is not observed that anything is said about boring and ventilating columns, which is now generally abandoned, or whether in bolting beams together an open space between is of any value (which is now abandoned on account of fire risk) or of the value of coating the ends of columns and beams with preservatives, which is important.

It has always been difficult for engineers and architects to know just how to specify the timber they want. They have not usually known, but much light will be afforded them upon the subject if they will read the chapter devoted to the grading of lumber, and the extracts from the specifications of various companies given in an earlier chapter.

Handbook on Employment Management

EMPLOYMENT MANAGEMENT: (The Handbook Series) Compiled and Edited by Daniel Bloomfield, Author of "Labor Maintenance," Partner in Bloomfield & Bloomfield, Boston, Consultants in Employment Management and Industrial Relations; With an Introduction by Meyer Bloomfield, Author of "Labor and Compensation," "Youth, School and Vocation," etc. New York: The H. W. Wilson Co. Cloth; 5 x 8 in.; pp. 507.

One of a handbook series on various social movements, this collection of articles treats the relatively new subject of employment management. An extensive bibliography, which shows the rapid development in this field, is included. The articles are selected from widely distributed sources, and cover all the essential divisions of the subject, including the aims of the new science, the problems of labor maintenance, the employment manager, the employment department, the cost of labor turnover, the medical examination of

workers, coöperation in management and service features. The appendix, although not satisfying from a typographical standpoint, contains typical forms, used in employment departments, which may prove suggestive.

United States Housing Corporation

HOUSES, SITE PLANNING, UTILITIES: Report of the U. S. Housing Corporation, U. S. Department of Labor, Vol. II—Washington, D. C.: The Department. Cloth; 9 x 12 in.; pp. 524; illustrated. $1.50 from Superintendent of Documents.

Certain Congressmen, secure in the knowledge that the war has been won, are satisfying the reactionary real-estate interests in their respective constituencies by attacking the Government's housing operations during the war. So far they have confined themselves to indirect attacks and have not seen fit to call any of the officials of the two Government housing bureaus to direct examination as to the proprieties or efficiencies of their respective organizations. However, until these officials have had a chance to defend themselves, those of them connected with the United States Housing Corporation, at least, will have an admirable defense in the second volume of the report of that corporation, just issued, which is by far the most elaborate and valuable practical compendium on housing ever published.

This second volume is devoted, according to its title, to "housing, site planning, and utilities." The larger part of the book, which is a big one, is filled with illustrations of the plan, layout and detailed house design for the many projects designed, started, or completed, under the direction of the Corporation. These are of inestimable value to the housing operator of the future. They bring together, as have nowhere else been brought together before, the best ideas of our town-building engineers and architects all over the country, for, as is probably well known, each project was the work of an individual engineer and architect. The central office at Washington only viséd the designs and laid down certain fundamental broad principles.

Preceding the general plans and descriptions are a number of paragraphs expository of the whole science of town planning and building. In them are laid down the principles on which the housing corporation went about its development of any particular project, the method of investigating the needs of the community, the report on the facilities required, the methods of design, and, finally, of construction. In the latter are included the details of municipal utilities, surface improvements and other engineering matters which have been described fully in previous issues of *Engineering News-Record*, and which were developed under the efficient direction of John W. Alvord, the chief engineer of the Corporation. Finally, there are in this part of the book chapters by the Corporation's experts critical of the work which the Corporation did. It is particularly gratifying in a Government report to see this frank acknowledgment of the obvious fact that during the speed and clamor of war many things had to be done which in calmer times could, obviously, be improved.

The final part of the book is given over to tabular records of the work of the Corporation. Here are contained all the statistics of performance which, while valuable as a record of what the Corporation did, are not particularly useful for future workers in similar projects. For such workers, however, there are a multitude of cost records arranged, under the heads of all the details of a housing project, per family accommodated and per unit of material used. These tabulations are among the most valuable records of the work of the Corporation. Finally, the book contains the various forms, instructions to investigators, designers, surveyors, engineers, etc., estimating suggestions, and various drawings giving the standard details of construction.

Democracy, Industry and Government

DEMOCRACY IN RECONSTRUCTION—Edited by Frederick A. Cleveland, Formerly Chairman of President Taft's Commission on Economy and Efficiency, and Joseph Schafer, Professor of History in the University of Oregon and Vice-Chairman of the National Board for Historical Service. New York: Houghton Mifflin Co. Cloth; 5 x 8 in.; pp. 506.

Among the changes wrought by the war none has been more swift and profound than the democratization of government and industry. Dozens of books have had these changes as their theme; notable among these is the one comprising the series of essays on a plan formulated by the editors of this volume and executed by nearly twoscore writers of their selection. Much of the volume is devoted to questions of government, industry or society that have a more or less direct appeal to the engineer.

The six main divisions of the bok deals with the ideals and the institutions of democracy, and with after-war social, labor, transportation and political problems. The titles and authors of some of the separate chapters are as follows: "The Underlying Concepts of Democracy" and "Democratization of Institutions of Public Service," by W. W. Willoughby; "Democracy and Health," by Dr. Esther Lovejoy; "The Educational Lessons of the War," by S. P. Capen and C. R. Mann; "Military Motor Transport—Its Lessons for Peace," by F. A. Cleveland; "Motorized Highways the Bases of a National Transport System," by R. C. Hargreaves; "Need for Readjustment of Relation Between Executive and Legislatve Branches of Government," by F. A. Cleveland; and "The Evolution of Democracy—A Summary," by C. A. Beard.

In the chapter on "Public Service" Mr. Willoughby comes out strongly for a Federal Board of Public Works. Both Mr. Willoughby and Mr. Cleveland bring out many strong points concerning the executive branches of government. In his final summary Mr. Beard says: "Having conquered political institutions of royal and aristocratic origin, democracy is now at work on economic institutions . . . the supreme test of the power of the people to conduct government for themselves is now at hand."

Publications Received

Under a Postoffice Department ruling made applicable to *Engineering News-Record* in July, 1919, it is no longer possible to give the prices of new publications announced under this head or of books reviewed in the preceding columns. Readers will therefore have to obtain this information as best they can. Most of the public documents and of the pamphlet announced may be obtained free on application, or at least by paying postage. So far as possible, the name and address of the publisher of each book and pamphlet are given in each entry.

THE BOOK OF THE NATIONAL PARKS—By Robert Sterling Yard, Chief of the Educational Division, National Park Service, Department of the Interior; Author of "The National Parks Portfolio," "The Top of the Continent," etc. New York: Charles Scribner's Sons. Cloth; 6 x 9 in.; pp. 420; illustrated

CONSERVATION IN 1918—By James White, F.R.G.S., M.E.I.C., Assistant to Chairman, Deputy Head, Commissioner of Conservation. Ottawa, Can.: The Commission. Paper; 7 x 10 in.; pp. 88.

DISTILLED WATER—By William M. Booth, Syracuse, N. Y. Reprinted from Vol. X, 1917, *Transactions* of the American Institute of Chemical Engineers. New York: D. Van Nostrand Co. Paper; 6 x 9 in.; pp. 83; illustrated.
Deals with history and development of water stills; gives bibliography; presents many letters from laboratories, manufacturers, etc., describing stills used.

ENGINEERING EDUCATION: Essays for English Selected and Edited by Ray Palmer Baker, M.A., Ph.D., Professor of English in the Rensselaer Polytechnic Institute. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 5 x 8 in.; pp. 185.

HOURS OF WORK AS RELATED TO OUTPUT AND HEALTH of Workers: Research Report No. 18, July, 1919. Metal Manufacturing Industries. Boston, Mass.: National Industrial Conference Board. Paper; 6 x 9 in.; pp. 62.

INCIDENTS IN THE LIFE OF A MINING ENGINEER—By E. T. McCarthy, M.I.M.E., M.Am., I.M.E. London: George Routledge and Sons, Ltd. New York: E. P. Dutton & Co. Cloth; 6 x 9 in.; pp. 384.

LES METHODES MODERNES DE LA RESISTANCE DES Materiaux—By M. Bertrand de Fontviolant, Professeur à l'Ecole Centrale des Arts et Manufactures. Paris, France: Gauthier-Villars & Cie. Paper; 7 x 10 in.; pp. 82.

MINERAL RESOURCES OF THE UNITED STATES: Preliminary Report, 1918; Introduction by Edson S. Bastin; Statistics Assembled by Martha B. Clark from Data Furnished by Specialists of the Division of Mineral Resources. Washington, D. C.: United States Geological Survey. Paper; 6 x 9 in.; pp. 106.

MUNICIPAL MARKETS IN CITIES HAVING A POPULATION of Over 30,000, 1918—Washington, D. C.: Bureau of the Census. Paper; 9 x 11 in.; pp. 56.

NEW TOWNS AFTER THE WAR: An Argument for Garden Cities—By New Townsmen. London, Eng.: J. M. Dent & Sons, Ltd. Paper; 5 x 7 in.; pp. 84.

NEW YORK STATE DEPARTMENT OF LABOR: Labor Laws Enacted 1919—Issued Under the Direction of the Industrial Commission, John Mitchell, Chairman; Prepared by The Bureau of Statistics and Information. Albany, N. Y.: The Department. Paper; 6 x 9 in.; pp. 72.

NEW YORK STATE ENGINEER AND SURVEYOR'S REPORT, 1918—Albany, N. Y. Office of the State Engineer and Surveyor. Cloth; 6 x 9 in.; pp. 303; illustrated.

THE NILE PROJECTS—By Sir William Willcocks, K. C. M. G., Late Director General of Reservoir Projects, Cairo, and Director General of Irrigation Projects, Bagdad. Cairo, Egypt; The Author. Paper; 7 x 10 in.; pp. 179; illustrated.

ONE THOUSAND TECHNICAL BOOKS: A Selected List with Annotations Emphasizing Especially Elementary Practical Books—Compiled by Herbert L. Cowing. Washington, D. C.: American Library Association. Paper; 6 x 9 in.; pp. 123.
Designed primarily as a selection of "elementary practical books," but also includes "many books of a more advanced type, and aims to provide A. L. A. representatives and public libraries with a fairly adequate basis for strengthening their technical collections in accordance with local needs." The books are classified under basic engineering subjects: Civil, mechanical and electrical engineering; building; mining and metallurgy; chemical technology; and miscellaneous. There is a subject index.

PETROLEUM IN 1917—By John D. Northrop. Washington D. C. U. S. Geological Survey. Paper; 6 x 9 in.; pp. 218.

POTASH RECOVERY AT CEMENT PLANTS—By Alfred W. G. Wilson, Ph.D., Special Investigator for the War Trade Board. Ottawa, Can.: Department of Mines. Paper; 7 x 10 in.; pp. 34; illustrated.

PRICES OF COAL AND COKE, 1913-18—By C. E. Lesher; Prepared in Coöperation with the U. S. Fuel Administration and War Industries Board. Washington, D. C.: U. S. Geological Survey. Paper; 6 x 9 in.; pp. 115; illustrated.

PRICES OF LUMBER: History of Prices During the War—By R. C. Bryant, Industrial Examiner, Forest Service. Published in Coöperation with the Forest Service Department of Agriculture. Washington, D. C.: War Industries Board. Paper; 6 x 9 in.; pp. 108; illustrated.

THE RELATION OF DEPRECIATION TO INVESTMENT—By C. W. Hawley, C.E., Wilkinsburg, Penn. Paper Read at the Twenty-third Annual Convention of the Pennsylvania Water Works Association, Atlantic City, N. J., Oct. 18, 1918. Paper; 6 x 9 in.; pp. 16.

ROAD MATERIALS IN THE VICINITY OF REGINA, Saskatchewan—By L. Reinecke. Ottawa, Can.: Geological Survey. Paper; 7 x 10 in.; pp. 28; illustrated.

SOCIALISM AND AMERICAN IDEALS—By William Starr Meyers, Ph.D. Professor of Politics. Princeton University, Princeton, N. J.: Princeton University Press. London: Humphrey Milford, Oxford University Press. Cloth; 5 x 8 in.; pp. 89.

STANDARDIZATION OF SHIP MATERIALS—By Fred T. Llewellyn, Federal Shipbuilding Co., Kearny, N. J., Chickasaw Shipbuilding Co., Mobile, Ala. New York: The Author, 71 Broadway. Paper; 6 x 9 in.: pp. 70.

STEAM TURBINES: A Practical and Theoretical Treatise for Engineers and Students; Including a Discussion of the Gas Turbine—By James Ambrose Moyer, S.B., A.M., M. Am. Soc. M.E., Etc. Fourth Edition, Revised and Enlarged. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6 x 9 in.; pp. 495; illustrated.

STUDIES IN THE CONSTRUCTION OF DAMS: Earthen and Masonry; Arranged on the Principle of Question and Answer for Engineering Students and Others—By Prof. E. R. Matthews, B.Sc. (Eng.) Assoc. M. Inst. C. E., etc. London, Eng.: Charles Griffin & Co., Ltd. Philadelphia, Penn.: J. B. Lippincott Co. Paper; 6 x 9 in.; pp. 43; illustrated.
An elementary exposition, by the question and answer method, of the design and, less fully, the construction of dams and reservoirs. Intended for students who have to pass examinations to the British technical socictics.

TELEGRAPHS AND MUNICIPAL ELECTRIC FIRE-ALARM and Police-Patrol Signaling Systems: Census of Electrical Industries, 1917—Washington, D. C.: Bureau of the Census Paper; 9 x 12 in.; pp. 61.

TOWN IMPROVEMENT: A Review of the Principles by which Physical Improvement in the Town or City may be Accomplished, With Observations as to the Effect of Such Improvement Upon the Life of the Community—By Frederick Noble Evans, M. L. A., Assistant Professor of Landscape Gardening in the University of Illinois, etc. New York and London: D. Appleton & Co. Cloth; 5 x 7 in.; pp. 261; illustrated.

ZONING AND CITY PLANNING FOR PORTLAND, OREGON—City Planning Commission, Charles H. Cheney, Consultant. Portland, Ore.: The Commission. Paper; 6 x 9 in.; pp. 55; illustrated.
A preliminary review, designed to show need for zoning and presenting various local data, together with Oregon State Zoning Act of 1919.

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

A. A. E. Chapter to Start Business Courses for Members

One of the activities of the Chicago Chapter of the American Association of Engineers during the coming months will be a series of business courses for the members of the chapter. The courses will be started soon. The four which are to begin in September are in business administration, to be taught by Prof. Henry Post Dutton, an industrial engineer who is at present acting in an advisory capacity to the Canadian commission engaged in redrafting compensation schedules of civil service employes; in industrial management, by D. T. Ham, formerly an instructor in Harvard University and now connected with La Salle Extension University; civics, by V. Yarros, senior instructor under Graham Taylor, president of the Chicago School of Civics and Philanthropy; and public speaking, by Prof. Benjamin F. Bills, formerly of the University of Chicago. The course in business administration will include functions, standards of efficiency and evolution of organization and management; the organization of a business; efficiency systems; selection of employees; training of men; and other subdivisions of the general subject. The cource in industrial management will include such subjects as locating the indsutry, organization for operation, factory layout and equipment, control of production and control of labor. The civics will embrace the usual subjects, and the course in public speaking will develop impromptu talking, the extempore speech and the formal address. More than a hundred members of the Chicago Chapter have signified their intention of enrolling in one or more of these courses.

Colorado Society of Engineers Keeps Its Members In Employment

Not many engineers in Colorado need be idle more than a few days at a time if they are members of the Colorado Society of Engineers. This organization handles the employment question so efficiently that not a single man of the 300 members lacked a position when a representative of *Engineering News-Record* looked over the files recently.

C. R. Daniels, the secretary, has educated employers to come to him with their requests. His method of introduction is to send two to three engineers whose qualifications fit the requirements most nearly. The applicant takes with him to the prospective employer a stamped postcard introduction. The employer is requested to sign and return the post-card, which is ad-

dressed to the society, answering the single question as to whether or not the man was employed. Receipt of this card immediately clears the secretary's record and obviates the great difficulty, which practically all free employment bureaus have, of knowing what results have been obtained from their efforts in bringing the man and the position together. It is notoriously true that few engineers who have been helped in this way are sufficiently grateful to the organization set up by their brother engineers, to notify headquarters as to their success or failure in obtaining work. Mr. Daniels' stamped post-card introduction puts the burden on the employer, and that burden is so slight that he rarely fails to assume it.

A weekly employment letter is sent out indicating positions open and applicants for employment, the idea being to get the aid of members in obtaining jobs (they call them jobs in Colorado) for members out of work, and better jobs for those already employed. The list is kept more or less blind, for obvious reasons.

The paid employment agencies watch the activities of the organization closely. Their engineering business is reported to have dwindled since the engineers established the free bureau. In the Aug. 5 letter 11 positions were open: Three in Wyoming, two in Colorado; one each in Idaho, Montana, Ohio, Old Mexico and Utah. The salaries ranged from $135 for an assistant computor to $200 for mechanical draftsmen. Ten experienced engineers had sent in applications. Most of these were nonmembers or members wanting something better than positions held.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Omission of Prices From Book Reviews

Sir—I notice in your September 4 issue a communication from C. J. Tilden relating to the omission of prices from your book review. I consider this communication very much to the point. Where one is obliged to purchase a considerable number of books each year to keep posted and up to date in his work, especially at the present Government salaries, it is very essential that the price should be given, and without this information at hand undoubtedly a considerable amount of correspondence is caused which would otherwise be unnecessary. W. A. E. DOYING,

Inspecting Engineer, The Panama Canal.

Washington, D. C.

Suggested Course in Highway Engineering

Sir—The writer has followed with keen interest the discussions and articles bearing on engineering education which have appeared in *Engineering News-Record* during the past three years. I am taking the liberty to submit the outline inclosed, which seems to me to cover the essential subjects as fully as possible in a four years' course.

Prerequisites: Required number of units in English, history, mathematics, languages and science.

FIRST YEAR:
- Trigonometry
- Drawing
- Introductory course in elementary mechanics
- Plane surveying
- History of science of engineering
- Reading of current topics related to engineering and the economic development of natural resources—selected modern language.

SECOND YEAR:
- Analytics
- Descriptive geometry
- Perspective and structural details
- Higher surveying, reviewing work on first year in leveling, cross-sections, volumes, etc.
- Elementary calculus
- Elementary chemistry
- Technical English
- Modern language
- Collateral reading—selected

THIRD YEAR:
- Advanced calculus—applied mechanics
- Comprehensive course in materials of construction, including testing
- Structural geology—field and laboratory work in classification of rocks and rock minerals
- Design of bridges—beam and simple truss, bridge floors, preservatives
- Design of simple concrete structures—field and laboratory work in mixing, placing, inspecting, and testing road construction—elementary course.
- Technical report writing—reviews on current articles—selected

FOURTH YEAR:
- Engineering law
- Specification writing
- Economics, banking, administration, cost-keeping
- Complete location, design and estimate of a road with the various types of surface, including bridges, culverts, guard railing and signs
- History, constitution, and codes of ethics of the leading architectural and engineering societies
- Collateral reading and analyses of same
- Use of tables, charts and graphs in engineering computations and reports
- The location and design of highway to stand in lieu of a thesis.

Nothing is indicated as to the number of terms required for the various courses, but the nature of each subject will determine that.

I should like very much to have through your columns the criticisms of other highway engineers on this outline. R. T. BROWN, Chief of Surveys,

South Carolina Highway Department.

Columbia, S. C.

Thirty-five Minute-Angle Method of Traversing Held Inaccurate

Sir—Referring to the article, "Traversing by a Thirty-Five-Minute-Angle Method" by John H. Sawkins in *Engineering News-Record* of Aug. 21, 1919, p. 373, I would like to state that such procedure should not be attempted, at least in cases where more or less accuracy is required. Emphatically, I protest against the author's statement, "it gives results as close as the stadia and perhaps superior to it, since the computation is so simple." A good instrumentman who has had considerable practice in stadia surveying is able to read the rod at a distance of 100 ft. within 1 ft. correctly, at 200 ft. within 2 ft., etc. Considering the author's method, and referring to his sketch, a mistake of $\frac{1}{10}$ ft. (practically 1 in.) in the set-off D and D′ which the flagman has to lay off, will cause a mistake of 1 ft. in the required distance. How easily such mistakes must occur can be readily seen if one considers how hard it is to

lay off an angle of 90° by approximation. If the angle is more or less than 90° the distance D and D′ will increase or decrease in proportion, sometimes for several inches, and when multiplied by 100 will affect the required distance by that many feet. In case the flagpoles are not in line with the vertical wire of the telescope or the flagpoles are inclined either to the right or left, mistakes in measuring the distance D and D′ will occur again.

A similar case was experienced by me once and convinced me that such methods look very good in theory but are incorrect in practice. Working on a topographic survey in California, I underestimated the distance from my instrument to a certain hill to which I sent the rodman, and when he arrived there and put up his rod it fell short within the two wires of the telescope. The rod was 20 ft. with extension. To save time I tried the following experiment, which theoretically is without fault: I took a "shot" at the foot of the rod, which was plainly visible, recorded the reading of the vertical arc of the instrument, then sighted to the top of the rod, recording the reading again. The difference between the second and first readings gave me the angle included between the two rays. The cot of this angle, multiplied by the length of the rod, gave me the required distance—only it was far from being correct, as I found out later. Subsequent experiments with this method convinced me that I could not obtain a correct distance within 75 to 100 ft. Theoretically, this method can only be applied to long distances, for the smaller the angle between the two rays the more will the angle between the stadia board and the rays approach 90°. I also tried this method at short distances, being especially careful to have the telescope and the foot of stadia board at the same elevation; nevertheless the results were not correct. Mr. Sawkins' and the above-mentioned methods are alike, only the triangles lie in different planes.

Finally, I would like to state that it is just as convenient to carry one stadia board as two flagpoles; that it shifts the responsibility for correct distance reading to the proper person, namely, the instrumentman; and that the stadia method saves time, eliminating the location of D′ and measuring the distance D and D′. Running a correct traverse with Mr. Sawkins' method is, in my estimation, impossible, although it might prove useful for long-distance side shots where little accuracy is required. However, why not use intersection in such a case, either using the rod as intersecting point, or, if available, prominent points?

K. F. JAEGER,
Fort Douglas, Utah. Engineer Depot.

More Against Mortar Test for Concrete

Sir—In *Engineering News-Record* of May 22, 1919, p. 1006, there appeared an article by Prof. C. C. Williams entitled "Mortar Test Does not Insure Good Concrete Aggregate." There is a point in connection with this to which I wish to call attention.

These experiments were carried on at the United States Government Explosives Plant C, Nitro, W. Va., by myself as engineer of tests, assisted by Cary P. Butcher. Professor Williams was in nominal charge of this work as supervising engineer, and his article was based on data abstracted from my report to him on the work of the testing laboratory. One point which seems vital to me in the light of recent research was overlooked by Professor Williams. The point in question did not appear in my report, but was noted in the records of the tests which were on file in the office and are now in my possession. I refer to the amount of water used in making the mortar for the tensile strength tests.

To give comparative results, it appears from recent experiments that the water-cement ratio should be constant. However, in the study made at Nitro, the several aggregates were quite different in character, and although the same amount of water (10.5%) was used in each case, the consistencies of the several mortars were quite different. For instance, the mortar made from limestone screenings was quite dry, due to the fact that there was a large amount of rock dust present (often as high as 15% passing a No. 100 sieve) and the further fact that the limestone itself absorbed a considerable part of the water. On the other hand, the mortar made from the fine river sand was of a very wet consistency. This sand was a fine quartz sand (100% passing a No. 20 sieve, and 82% retained on a No. 50 sieve, voids 41%, sp.gr. 2.66, and no silt). No appreciable amount of the water was taken up by the particles of sand themselves in this case.

It is my opinion that the major premise in Professor Williams' article is correct, that "the mortar test does not insure good concrete aggregate." My conclusion is drawn not from the results of our experiments, but from my experience with the technique of the mortar test itself. To be comparable, several mortars tested should be of the same consistency, and herein lies the difficulty. It is entirely a matter of judgment—or it is even more nearly true to say, a matter of guesswork—as to when a mortar is of the right consistency.

W. Purves Taylor proposes the formula

$$X = (3N + Sn + 1)/(4n + 4)$$

in which X = per cent of water for the sand-cement mixture, N = predetermined percentage of water to bring neat cement to normal consistency, n = parts of sand to one cement by weight, and S = a constant depending on the character of the sand and the consistency desired. The value of S for normal consistency for standard Ottawa sand is 25, and for bar and bank sands is from 27 to 33.

Applying this formula, using $N = 25\%$ and $n = 3$, we have

$S = 25$	$X = 9.43\%$
$= 27$	$= 9.81\%$
$= 33$	$= 10.9\%$

The extreme range of values of S for bar and bank sands here gives a difference of only 1.1% in the amount of water to use in the 1:3 mortar. In my opinion, the range of values of S requisite to a succesful application of this formula should be much greater. The use of the formula then would depend upon the selection of the proper value of S, which would not be any simpler than judging the consistency from the appearance of the mortar in the first place. It does not seem to me that it would be possible to devise a formula that would give correct results for sands of all characters. Therefore it seems to me that the test is a dangerous one and will lead to erroneous conclusions, except in the hands of a very highly skilled expert.

J. O. JONES,
Lawrence, Kan. University of Kansas.

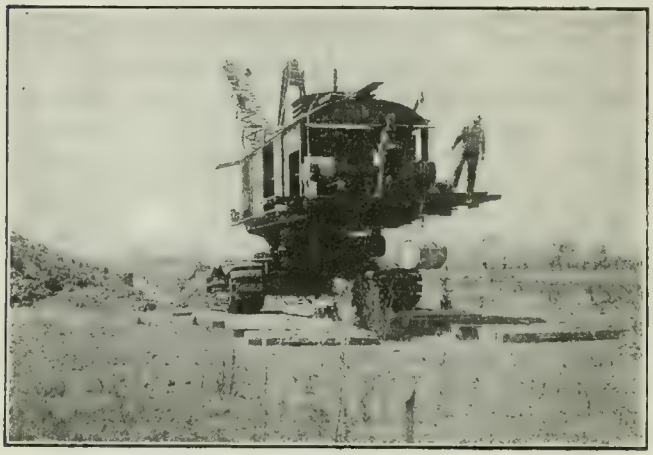
HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Dragline Excavator Helps Itself to Fuel and Lays Track Over Soft Ground

BY J. E. BURKHOLDER
Drainage Engineer, United States Reclamation Service, Denver, Colo.

ON THE big drainage job of the Rio Grande irrigation project, described elsewhere in this issue, a number of caterpillar dragline excavators are used. The accompanying view shows the dragline helping itself to fuel. The machine stops its regular work just long enough to lift the oil drum and place it in a cradle. The drum is emptied into the fuel reservoir while the machine is in operation.



FUEL-OIL RESERVOIR FILLED WHILE DRAGLINE WORKS

Besides helping itself to fuel, the dragline lays its own track where needed over soft ground. The track is composed of 8 x 10-in. x 8-ft. timbers, strung on old wire cable. The same method of track-laying was used for crossing the Rio Grande River in shallow water, as shown in the view on the front cover and also on p. 547 of this issue.

Other Articles in This Issue of Interest to Contractors:

Drainage Works of the Rio Grande Irrigation Project — Page 543
National Public-Works Department Versus Corps of Engineers — Page 561
Two Home-Made Bridges in a Catskill Village — Page 568

Charging Off Depreciation on Contractors' Equipment

INSTEAD of the straight-line method of estimating depreciation on equipment, whereby a constant percentage of the first cost, dependent upon the probable length of life of the machine, is charged off each year, another plan of estimating depreciation is contained in a recent news letter of the Associated General Contractors of America. This plan was submitted by one of the association's members.

According to this contractor's method, the percentage charged off annually is based on the book value of the piece of equipment, so that normally the depreciation becomes less and less year by year, and the machine is always valued at some figure, until scrapped. However, the percentage adopted for any particular year will vary with the usage to which the equipment has been subjected, and one year it may be 30% and the next 20%. For example, a concrete mixer worth $3000 new might be carried on the contractor's books at $2100 after a year of hard service, and $1680 a year later if it was not used extensively the second year. By this method the greatest depreciation is considered to occur during the first year if the rate of usage of the mixer be constant.

This is consistent with the fact that when a new machine is used it immediately becomes second-hand equipment and usually loses considerable value if put up for sale.

There are advocates of this method of handling depreciation, on the ground that the depreciation charge plus the cost of repairs should be a constant value for each year that the equipment is in use, and, since repairs become heavier as the equipment becomes older, depreciation should decrease correspondingly. For the purpose of computing rental charges, however, difficulties are brought in by the assumption of a variable depreciation rate, since it is the average annual depreciation, after all, that would ordinarily be considered in fixing rentals.

In most cases where equipment is rented, the work is on a cost-plus basis and the fixed fee or percentage paid the contractor does not depend upon the rental of the equipment.

However, on some cost-plus work the rental charges are included in the sum on which the percentage is paid, and in such cases the rental rates quoted are reduced sufficiently to bring in approximately the same sum as when the profit fee is independent of the charges for use of equipment.

On lump-sum contracts, no attempt is made to carry equipment rentals on the payroll for the job. All charges against plant are handled in a separate account, and the proper share of the annual depreciation is charged to each contract.

Rental of equipment is paid for each calendar day between the date when the equipment is loaded at the storehouse of the contractor and the date that it is loaded for return. Transportation charges both ways and all current repairs are also included in the sum paid to the contractor for the use of equipment. Small tools, when new, are charged to the job and then taken back at a fair valuation when the contract has been completed.

NEWS OF THE WEEK

New York, September 18, 1919

New Standards for Materials Adopted

Ten new standards have been adopted by the American Society for Testing Materials after letter-ballot vote, according to announcement from the society's office, 1315 Spruce St., Philadelphia, Penn. They include four specifications for brass (malleable castings, cartridge brass, cartridge-brass disks, and naval brass rods); two new standard tests (for flash point of volatile paint thinners and for apparent specific gravity of fine aggregate); three methods of test procedure (analysis of manganese bronze, analysis of gun metal, determination of softening point of bituminous materials); and recommended practice for laying sewer pipe. Two constitutional amendments voted upon at the same time were also carried.

Huge Oil Tank Fire Menaces Brooklyn

Starting Saturday, Sept. 13, and continuing well into Monday of the following week, a fire among the tanks of the Standard Oil Co.'s Kings County Refinery in Greenpoint, on the banks of Newtown Creek, just off the East River in New York City, for a time threatened serious extension into the adjoining Boroughs of Queens and Brooklyn. The origin of the fire has not yet been determined, but it was among a number of steel tanks which successively ignited with more or less explosion. At the time of going to press with this issue the plant was still in such condition as to prevent a thorough investigation of the origin or extent of the fire.

Bureau of Mines To Dedicate New Pittsburgh Laboratories

The Bureau of Mines, Department of the Interior, in coöperation with the Pittsburgh Chamber of Commerce, will dedicate its new $1,000,000 laboratories in Pittsburgh, Sept. 29-30 and Oct. 1. Dedication exercises will be held at 10:30 a.m., Sept. 29.

In the afternoon of Sept. 29 a special train will leave for the experimental mine near Bruceton. On the second day, contests will be held in mine rescue and first aid.

Duplicate Water-Works Refused in Pennsylvania

Permission to build a water-works plant that would duplicate the works of the Armstrong Water Co. has been refused the Borough of Kittaning, Penn., by the State Public Service Commission. The commission holds that a duplicate plant would be an "economic loss" as well as affording "more or less inadequate service" until one or the other works succumbed. The commission also declares that the company has not "performed its duty" and should immediately improve its works.

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago. Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 505 Pearl St.

Hearings Continued on Disposal of Army's Road-Building Plant

After listening to both sides of the controversy with regard to the use of the Army's surplus motor and other equipment for the building of state roads, the House Military Affairs Committee, in effect, told representatives of the War Department and of the Agriculture Department to harmonize their differences promptly and bring to the committee the draft of a bill to which each department would agree. There was no mistaking the temper of the committee in its instructions to the officials concerned to unite on a policy and express it in legislative form. It was also made clear that the draft of the legislation was expected soon.

Guy Hutchinson, representing the Director of Sales of the War Department, admitted frankly that the War Department preferred selling its equipment, at the highest possible price, to transferring it. It is safe to say that the majority of the members of the committee would not agree to such a policy. They are of the opinion that it would be better to turn this material over to the states than to sell it at bargain prices.

Senate Committee Reports Water-Power Bill

Changes From House Bill Mainly in Manner of Determining Reasonable Charge

(Washington Correspondence)

Admitting that some of the provisions of the water-power bill do not meet with its approval, the Senate Committee on Commerce, nevertheless, on Sept. 11, reported the bill favorably and urged that it be passed. The committee feels that the bill as reported is by far preferable to no legislation. The main changes made in the bill as it passed the House are thought to be ones with which the House conferees will agree, but it is not improbable that the opposition will be able to force various modifications of the measure as it now stands.

The most important amendment made by the Senate committee was that in which principles to govern the commission are laid down. The House bill simply provides that the licensee is to pay a reasonable annual charge such as may be fixed by the commission. The Senate committee believes that it is the duty of Congress to lay down these principles. This is especially necessary, it is declared, because the commission will be partisan and subject to frequent changes. For those reasons it was thought principles must be prescribed by Congress so as to insure at all times a stable public policy.

Fear that there might be interference with the rights of the states led some members of the committee to object to the provision of the bill requiring joint approval by the commission and by the state of contracts extending beyond the date of the termination of the license. The bill as amended leaves approval of such contracts entirely in the hands of the state.

The text of the amendment laying down principles for the commission reads as follows:

That the licensee shall pay for the license herein granted such reasonable annual charges as may be fixed by the commission, for the purpose of reimbursing the United States for the cost of administration of the act in relation to water powers developed under its jurisdiction, in the proportion that the water power developed by the project covered by said license bears to the total water power developed by all projects licensed under the act, and for that purpose such charges may be readjusted from time to time, not oftener than once in two years; the licensee shall also pay for the use and occupation of any public lands and lands in reservations except tribal lands embraced within Indian reservations necessary for the development of the project covered by the licence such reasonable annual charges based upon the actual value of the Government lands used as may be fixed by the commission; but in no event shall the annual charge for the foregoing exceed 25 cents per developed horsepower: Provided, that when licenses are issued involving the use of Government dams or other structures owned by the United States or tribal lands embraced within Indian reservations the commission shall fix a rea[illegible]

able annual charge for the use thereof, and such charges may be readjusted at the end of twenty years after the beginning of operations and at periods of not less than ten years thereafter in a manner to be described in each license.

Sewage-Works Conditionally Authorized for Phillipsburg, N. J.

Having previously disapproved plans for the Landreth "direct-oxidation" process of sewage treatment for Phillipsburg, N. J., the Pennsylvania State Department of Health, after remonstrance and special request by the town authorities, has passed a resolution stating that it will interpose no objection to the construction of a plant so long as it is considered experimental and the town agrees to make application for the approval of the plant and method of treatment stated after a year of operation. The original action was taken in March, 1919, the town then proposing that the sludge from the plant be discharged into the Delaware River.

The department disapproved of the application made by the town on Mar. 18, 1919, expressing the belief that "the same degree of purification can be secured at less expense by other established methods."

After several hearings at which representatives of the town urged that they had observed the operations of a demonstration plant of the proposed type at Easton, were satisfied that the process was the most economical method for the town to adopt, and urged that the town be allowed to assume responsibility for selecting a method of disposal, especially in view of the fact that the department always reserves the right to require additional treatment if a plan adopted for the treatment of sewage is not satisfactory, the department, Aug. 18, 1919, adopted the following resolution which is reprinted here in full:

Whereas, The State Department of Health has been unable to secure sufficient information regarding the efficiency of the direct-oxidation or "Landreth" method for the treatment of sewage to enable it to definitely determine at this time whether this process can be depended upon to treat sewage successfully at a reasonable cost, but from the information now available, however, the department is of the opinion that substantially the same results can be secured by the use of lime alone at a lesser cost, be it therefore

Resolved, that if the inhabitants of the Town of Phillipsburg are desirous of installing a plant for the treatment of sewage by this method, this department will interpose no objection for the construction of such a plant as an experimental installation and its operation for a period of one year, provided:

1. That no sludge from said plant be discharged into the Delaware River or its tributaries at any time, and that a settling period of six hours, based upon the average sewage flow, shall be provided for the lime-electric treated sewage.
2. That adequate laboratory facilities be provided and that a sufficient number of routine chemical and bacterial tests be made by the Town of Phillipsburg under the supervision of this department; and that at the expiration of one year from the date when the plant is put into operation the inhabitants of the Town of Phillipsburg may make application for the approval of this method of sewage treatment.

Under the resolution new plans will have to be filed with the Pennsylvania Department of Health.

C. M. Jacobs, Tunnel Engineer, Dead

Charles M. Jacobs, an engineer of wide note in the field of subaqueous tunnel construction and member of the New York firm of Jacobs & Davies, consulting engineers, died in London, England, Sept. 7, at the age of 69 years. An Englishman by birth, Mr. Jacobs, after extensive practice in England, came to the United States at the request of the late Austin Corbin, president of the Philadelphia & Reading R.R., to advise on designs for rapid-transit tunnels between Brooklyn, New York and Jersey City. He maintained a practice as consulting engineer in New York City for several years, being at first retained by the Long Island R.R., the New York & New England Railroad Co., and the Elmira, Cortlandt &



CHARLES M. JACOBS

Northern Railroad Co. In 1892 and 1893, as chief engineer, he designed and built the tunnel under the East River for the East River Gas Co., a project which presented formidable construction difficulties. Later, as chief engineer for the New York & Long Island Construction Co., he designed and constructed foundations for the piers of the bridge over Blackwell's Island, and as chief engineer for the New York-New Jersey Railroad Co. carried on construction of the tubes between Jersey City and Morton St., New York City.

Later he was engaged by the Pennsylvania R.R. as chief engineer of the North River division; by the Pennsylvania, New York & Long Island Railroad Co., and as a member of the board of engineers of the Pennsylvania and New York Tunnel Lines.

Mr. Jacobs was born in Hull, Yorkshire, in 1850. After studying at Cambridge University he obtained his practical knowledge of engineering in the shop of Charles and William Earle, engineers and shipbuilders of Hull. After being with his employers five years, Mr. Jacobs saw service at sea for the next two years, and then acted as the superintending engineer in charge of construction of two steel steamships for the Florio Co. and Moran Steamship Line. He then embarked in private practice as a consulting engineer in Cardiff, South Wales, engaging in marine work, construction of dry docks and subaqueous construction work. Prior to his coming to the United States Mr. Jacobs was in consulting work in London, being a member of the firm of Jacobs & Barringer.

When Mr. Jacobs severed his connection with the Pennsylvania R.R. as chief engineer of the North River division, he had attained the record of building six tunnels under the Hudson River, the North River tunnel and the Berger Hill tunnel being practically complete at the time he left. Perhaps most notable in his tunnel construction work here was the pioneer project built for the East River Gas Co. That tunnel was built between Ravenswood, L. I., and E. 71st St., New York City. The tunnel was driven simultaneously from both sides of the East River, and the headings met July 11, 1894.

Besides his work in New York City and London, Mr. Jacobs served, on several occasions, the French Government and French private concerns, designing tunnels for the Metropolitan Ry. under the Seine at Paris.

House Passes Bill to Limit Height of Washington Buildings

Without a dissenting vote or an important amendment, the House of Representatives passed the bill to regulate the height, area and use of buildings in the District of Columbia. The bill also provides for the creation of a zoning commission. The chief objection to the measure was that the bill pays too much attention to the interests of the builder and too little attention to the interests of the public. In presenting the bill for discussion Representative Mapes, chairman of the District of Columbia Committee, pointed out that the bill is patterned after the New York and the St. Louis zone laws.

The zoning commission in Washington is to consist of the three Commissioners of the District of Columbia, the officer in charge of public buildings and grounds of the District of Columbia, and the superintendent of the capitol building and grounds.

Additional Appropriation for the Alaska Railroad

The House of Representatives has voted an additional appropriation of $17,000,000 to complete the construction of the Alaska Government R.R. between Seward and Fairbanks, for which the original appropriation was $35,000,000. The road is now completed for a distance of approximately 227 miles on one end and 100 miles on the other end, with a gap of 144 miles.

Status of Railroad Technical Engineers' Salaries

Following the hearing, before the Board of Wages and Working Conditions, of representatives of Engineering Council and the American Association of Engineers, in regard to the matter of raising the compensation of technical engineers employed by the United States Railroad Administration, which hearing was held in Washington, Mar. 31—Apr. 1-2, 1919, as reported in *Engineering News-Record* of Apr. 10, 1919, p. 742, progress has been made towards adjustment, but as yet no final settlement has been reached.

The case was taken out of the hands of the Wage Board by the director of the Division of Operation, and transferred to the regional directors. As last reported the situation was:

Northwestern Region (R. H. Aishton, regional director)—Matter referred to committee of three of the chief engineers after the regional director had called a conference of all of the chief engineers. Committee made recommendations to the regional director, which, on the whole, were satisfactory to the engineers. Recommendations approved by regional director and increases granted.

Central Western Region (Hale Holden, regional director)—Position taken by regional director that matter is one for individual action by the Federal managers; engineers have protested to the Division of Operation.

Southwestern Region (B. F. Bush, regional director)—Only minor adjustments in engineers' salaries have been made, some as a result of the general order for increases in railroad wages; engineers have presented additional data to the Regional Director, renewing request for further attention to matter.

Allegheny Region (C. H. Markham, regional director)—Engineers do not find that any action has been taken in this region and have appealed to the Division of Operation.

Southern Region (B. L. Winchell, regional director)—Adjustments satisfactory to engineers have been made on several of the roads in this region, and in general only isolated cases are now being taken up.

Eastern Region (A. T. Hardin, regional director)—Matter has been taken up in conference with chief engineers, but as yet only small increases in individual cases have been granted. Engineers are appealing personally to the chief engineers, in addition to formal action being taken.

San Francisco Drops 77 Engineers From City's Payroll

The appropriations for carrying on the work of the Engineering Department of San Francisco in the coming fiscal year has been so curtailed by the Board of Supervisors that the City Engineer found it necessary to dismiss 77 employees. Notification of dismissal, which was made Sept. 8 to take effect at the close of the day, went to 12 assistant civil engineers, one supervising assistant civil engineer, 15 engineering draftsmen, four surveyors, 18 field assistants and 27 inspectors of streets and sewers.

In reply to an appeal made directly to the Supervisors on behalf of the men affected, the chairman of the finance committee said: "We have made our appropriations and the tax levy is to all intents passed, so we cannot now revise it. We have allowed the engineer's staff money for all regular work and provided for the union scale of wages." He also pointed out that no funds were available for pioneering work, for surveys and studies of new projects.

High Water Again Floods North Side of Galveston

For the second time since the flood of 1900 which practically destroyed the city, a part of Galveston, Tex., was flooded Sept. 14 by the rising water in the Gulf, driven northward by a tropical hurricane. Fortunately for the city, the sea wall, built after the 1900 disaster, and the accompanying grade elevation on the south side of the island, prevented a repetition of the catastrophe, but the north side of the island, which is still at the low level, was flooded to the depth of 3 to 6 ft. The flood was slow-rising and not violent, so that what damage was done was due to water soaking. It soon passed off.

The flood, however, makes timely a reference to the proposed grade-elevation work on the north side of the island. Up to about the east and west center line of the city, the grade has been raised to some 21 ft. above the sea level, but the north side still is low, as may be inferred from the present flood. A municipal grade-raising committee last spring employed J. B. Lippincott, consulting engineer, Los Angeles, to study the subject of grade raising. He presented various reports, recommending a graduated scheme of improvement. The amount of work involved depends on the area covered by the improvement. If all that section of the city roughly described as lying north and west of the sea wall south of the bay and east of 40th Street, excluding the railway yards, is considered as being raised as recommended to an elevation of 15½ ft., the present elevation being about 6½ ft., at the north or bay front, rising with a grade of 1 ft. in 1600 to the south, to an elevation of approximately 21 ft. at the sea wall, it would involve the placing of about 20,000,000 cu.yd. of fill. It is thought that the present flood may hasten the consideration of the grade-elevation scheme.

The same hurricane apparently entered west of Galveston, approximately at Corpus Christi. Here the damage was very serious, though full reports are not yet available. It is reported, however, that the deaths in the district total 25 and property loss is $4,000,000.

Contributions From Engineers, Architects and Constructors' Conference on National Public Works

M. O. LEIGHTON, Chairman

PUBLISHER'S NOTE: *The space occupied under this caption is donated to serve as a means of frequent and intimate communication between the Engineers, Architects and Constructors' Conference on National Public Works, and the members of the profession. The contributor takes full authority for the statements made.*

It appears desirable to explain certain points in the Jones-Reavis bill, providing for the creation of a national Department of Public Works, which have puzzled readers who are not in touch with the present legislative and departmental situation in Washington.

Why do we propose to transform the Department of the Interior instead of creating a new one?

Because (a) there are already enough executive departments to perform Government business if the functions were properly correlated; (b) because there is a natural reluctance on the part of Congress to create new departments, which of itself would be an enormous handicap to any public-works legislation.

Why do we propose that the present Secretary of the Interior shall continue as Secretary of Public Works until he shall go out of office?

Because the present Secretary is a very able man and he has had more than seven years of intensive training in the administration of the office of Secretary of the Interior.

Why do we propose to maintain in the present organization of the Interior Department and its bureaus, except those designated for separation, and transfer other bureaus from other departments thereto without change of organization?

Because (a) no one is wise enough at present to make a decision as to the best reoganization plan; (b) because the best reorganization will be that achieved gradually as the result of experience within the new department; (c) because a large degree of reorganization can lawfully be made by executive order; (d) because when, after experience has been secured, special reorganization legislation becomes necessary, a bill can be presented to Congress reinforced by such experience and have the prestige of a going department behind it.

What remains in the Department of the Interior as a nucleus of the Department of Public Works after the six bureaus designated in Sec. 3 of the bill have been removed?

The General Land Office, the Geological Survey, the Reclamation Service, the Bureau of Mines, the National Park Service, and the Alaskan Engineering Commission.

Why do we propose to assign the various nonengineering bureaus of the Interior Department to the places designated in the bill?

We do not claim any particular qualifications that enable us to choose the wisest assignments of these bureaus. We were obliged to put them somewhere in order to round out the bill, and we used our best judgment. Others, better qualified than we, will undoubtedly have something to say when the bill comes to consideration in committee of Congress.

Why do we propose to transfer the jurisdiction over rivers and harbors from the War Department?

Because, entirely aside from the decidedly adverse opinions that the great body of engineers entertains as to the fitness of the Corps of Engineers, U. S. A., and its past performances, rivers and harbors improvements for navigation constitute a purely civil function which is merely one phase of our rivers and harbors development and utilization, and the whole cannot go forward effectively, considerately and economically without thorough coördination. Navigation improvements are public works and are so defined world over, and the fact that in an early day in the history of our republic they were placed under the Corps of Engineers, as a purely emergency measure, which has since been continued by well directed influence and legislative inertia, constitutes not the slightest reason why an illogical arrangement should be perpetuated.

Why do we propose that members of the Corps of Engineers, U. S. A., should be detailed to duty under the Department of Public Works?

Because the members of the Corps of Engineers rightfully contend (and this is the only substantial argument so far brought forward by the corps against a Department of Public Works) that the Army must maintain an Engineer Corps on a basis suitable for war emergency; that so large a corps will not be required on purely military duties in peace time and that in the absence of some engineering assignments of another character the Corps of Engineers will "rust out." The provision in the bill, therefore, provides for this contingency. It places the engineers in the Army under assignments suitable to their training and experience, and makes no change in their professional status, except that it establishes the principle, which appears to be good American doctrine, that because a certain group of men is educated at public expense and accorded military titles, it does not follow that they must become hereditary superiors to other men in engineering life. The members of the Corps of Engineers in their civilian work would, under the provisions of this bill, stand on a common footing with civilian engineers and indulge in a very healthful competition for relative position in the engineer work of the Government, and attain such by reason of actual performance rather than by seniority of military grade.

Why do we propose to include the Construction Division of the Army in the Department of Public Works?

Because (a) this division is made up almost entirely of civilian engineers highly experienced in construction work, who have, in connection with the war emergency, performed the most extensive and remarkable achievements in engineering construction ever performed by any one organization in the history of the country; (b) because it has worked out a most effective plan of organization and operation which is in a large degree responsible for the results achieved and which could be amalgamated most efficiently with many of the peace-time construction operations of the Government; (c) because the War Department has not provided for the perpetuation of this organization, as such, in its plan for a new military establishment, which is now the subject of investigation by Congress, and, at least by inference, proposes to allow the Construction Division to lapse or to merge its functions with certain old-line military departments where it will be in an environment entirely foreign to the spirit and practice which have caused it to be so unqualified a success; (d) because the construction work which this division has accomplished is for the most part not military engineering at all, and the only military significance which it has is derived from the subsequent utilization thereof for military purposes. There is no more reason why the construction of a warehouse, a depôt or a dock for the Army cannot be executed by an established construction organization not connected with the Army than there is for the contention that a Federal courthouse should be constructed by the Department of Justice instead of, as in the past, by the Supervising Architect's Office of the Treasury; (e) because when the United States entered the great war it was necessary to organize the Construction Division in an extreme emergency attended by costly delay, and there should be an active, going construction organization in the service of the Government, which in the case of a future war could be made to function at an instant's notice as a construction branch of the military establishment. The only way by which this can be accomplished is to have such an organization in active practice in peace-time work.

Street Car Subway Project Held Up

No progress has been made in working out the street-car subway project in Pittsburgh, Penn., since its authorization by a favorable bond-issue vote of the citizens two months ago. The city administration is delaying further study of the construction and operating plans until the present receivership of the street-railway company is settled.

Civil Service Examinations

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Assistant examiner, Patent Office, Washington, D. C., $1500 to $1740 per year, Sept. 17 to 19 and Nov. 19 to 21. File applications in time to arrange for examination at place selected by applicant.

Senior highway engineer, Bureau of Public Roads, Department of Agriculture, $2220 to $4000 per year, Oct. 21, File applications before Oct. 21.

Engineer, $3000 per year; assistant engineer, $1800 to $2880 per year; junior engineer, $1200 to $1740 per year; engineering draftsman, $1200 to $3000 per year, Reclamation Service. Applications will be received until further notice.

ENGINEERING SOCIETIES

Calendar

Annual Meeting

NEW ENGLAND WATER WORKS ASSOCIATION; Tremont Temple, Boston, Sept. 30, Oct. 1-3, Albany, N. Y.

NATIONAL SAFETY COUNCIL, 168 Michigan Ave., Chicago; Oct. 1-4, Cleveland.

AMERICAN SOCIETY OF NAVAL ENGINEERS: Secretary, Lieut. Com. F. W. Sterling, U S.N., Navy Department, Washington, D. C.; Oct. 7, Washington.

AMERICAN PUBLIC HEALTH ASSOCIATION: 169 Massachusetts Ave., Boston; Oct. 27-30, New Orleans.

CITY MANAGERS' ASSOCIATION, 1812 Tribune Bldg., New York City; Oct. 29-31, Indianapolis.

AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS; 304 E. Walnut St., Bloomington, Ill.; Nov. 11-14, New Orleans.

SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS; 29 W. 39th St., New York City; Nov. 13, New York City.

The Sacramento Chapter of the American Association of Engineers was formally installed by F. H. Newell, president of the association, on Aug. 25. Threescore of Sacramento's engineers joined in the banquet and listened with interest to President Newell's story of the American Association of Engineers. Action was taken urging upon Governor Stephens the appointment of an engineer to fill the vacancy in the State Water Service Commission.

The Twin City Chapter, American Association of Engineers, has appointed

a committee to investigate and recommend salary schedules for employees of city departments in Minneapolis and St. Paul. Legislation in which the society is interested includes the Townsend bill, now before Congress, and that affecting the United States Patent Office. At the regular meeting Sept. 5 members listened to a talk on the construction of the Gièvres depot, built by A. E. F. engineers.

The Spokane Engineering and Technical Association has recently changed its name to the **Associated Engineers of Spokane, Wash.**

The Globe-Miami Chapter of the American Association of Engineers recently entertained President Newell of the association, on his return through Arizona from his visit to Pacific Coast chapters.

The Washington Chapter of the American Association of Engineers has undertaken the distribution of questionnaires among technical engineers in the Government service, with the idea of obtaining information of value to the Joint Congressional Commission on the Reclassification of Salaries in the District of Columbia. A special committee from the Washington Chapter is cooperating with the reclassification commission in drawing up definitions of the various classes of engineering jobs in the Government service.

The Indianapolis Chapter of the American Association of Engineers has adopted a resolution asking that in the future county highway inspectors receive all of their compensation from the state, instead of half from the county and half from the Portland Cement Association. The resolution states that it is contrary to public policy for county employees to receive a part of their compensation from outside sources.

The North Carolina Society of Civil Engineers has voted to proceed with consolidation with the American Association of Engineers and to carry out the affiliation as soon as the committee appointed to conduct the negotiations has completed its work. The president of the society is Dr. W. C. Riddick, president of North Carolina State College.

The Colorado Chapter of the American Society of Civil Engineers held its 105th regular meeting Sept. 13. An application of the methods of draining and sealing porous foundations and abutments of high dams by means of cement under high pressure, as applied to the Beaver Park dam on the Rio Grande River, was the subject of the discussion that was led by M. C. Hinderlider.

The Engineers' Society of Milwaukee, at its regular monthly meeting, Sept. 17, listened to an illustrated talk on "The Physics of Boiler Circulation," by Dr. Edgar Kidwell, author of "Sterling." Dr. Kidwell is an authority on steam production.

Personal Notes

COL. ELBERT A. GIBBS, recently returned from more than two years' service in France with the American Expeditionary Forces, has been promoted to be general manager of the McClintic-Marshall Co., Pittsburgh. Prior to his entry into the Army, Colonel Gibbs was manager of erection of the company's Western district. He was commissioned Captain, Engineers, in 1917, and was among the first engineer officers to arrive in France. He quickly demonstrated his capacity for large responsibilities and was promoted successively to the rank of colonel, being among the comparatively few engineer officers who entered the service from civil life to reach that grade. Colonel Gibbs was the chief of the general construction section of the Division of Construction and Forestry, Office of the Chief Engineer, A. E. F., reporting directly to Brig. Gen. Edgar Jadwin. In this capacity he was responsible for the large programs of barracks, hospital and warehouse construction throughout the Services of Supply, in addition to having supervision over the subsections handling gasoline and oil storage, refrigeration, water-supply and sewerage, and electric installations. Among other forms of recognition of his services in the A. E. F., Colonel Gibbs received the decoration of Officer of the Legion of Honor from the French Government.

A. J. CLEARY, formerly second assistant city engineer of San Francisco, has been appointed first assistant to M. M. O'Shaughnessy, city engineer, by the Board of Public Works, which accepted the resignation of H. W. SHIMER. C. E. HEALY has been promoted to second assistant city engineer.

H. FRED STARKS, county engineer of Nassau County, New York, has been reappointed for another four-year term by the county board of supervisors.

W. H. LOWTHER has been appointed division engineer on the Kansas division of the Union Pacific R.R., with office at Marysville, Kan. He was formerly division engineer on the Oregon Short Line Railroad.

MAJ. GILBERT G. JACOBOSKY, Engineers, U. S. A., has been discharged from the service after more than a year in France, and has resumed his practice as consulting civil engineer in Wilkes-Barre, Penn. Major Jacobosky expects to open a New York office in the near future.

CLINTON COWEN, for the past four and a half years state highway commissioner of Ohio, resigned Sept. 9, and has accepted a position as consulting engineer for the National Sand and Gravel Association. He will assume his new duties Jan. 1. A. R. TAYLOR, former county surveyor of Hancock County, has been appointed to fill the vacancy caused by Mr. Cowen's resignation.

D. W. WEBSTER, for several years highway engineer of Lyon County, Minnesota, has resigned to accept a position with the state as division engineer of the northwest section. ARTHUR BLADHOLM succeeds him.

COL. H. A. ALLEN, U. S. A., Chicago, a former member of the Panama Canal Commission, who recently returned from service overseas, has been retained as engineer by the Dixie Power Co. in the development of the resources of White River, Arkansas, where the company plans to develop from 80,000 to 100,000 horsepower.

RODMAN WILEY, formerly commissioner of public roads of Kentucky, has resigned to become chief engineer of the Kentucky Rock Asphalt Co., Louisville, Ky. He has been connected with the Public Roads Department since 1914, and was appointed commissioner in 1916.

MAYO TOLMAN, former director and chief engineer of the West Virginia State Department of Health, has resigned. His resignation became effective Sept. 1.

E. A. VAN DEUSEN, after seven years with the Southern Power Co. and affiliated interests in New York and Charlotte, N. C., has resigned to accept a position as structural and hydraulic designer with the Fargo Engineering Co., Jackson, Mich.

CAPT. E. C. DOHM, U. S. A., who served with the United States engineers overseas, has resumed his position as chief engineer of the land commissioner's office at Olympia, Wash.

MAJ. CARL H. REEVES, U. S. A., for 23 months in the Engineer Corps, has announced his return to private practice Oct. 1, and will open offices in the Henry Bldg., Seattle. For several months he has been connected with Parker, Gould & Company.

ELLIS S. TISDALE has been appointed director and ANDREW N. WARDLE chief engineer, respectively, of the West Virginia State Department of Health, both of which positions were filled by MAYO TOLMAN, resigned, as noted elsewhere in these columns. Both Mr. Tisdale and Mr. Wardle have served three years as assistant engineers in the State Department of Health.

W. M. STRONG, hydro-electric and mining engineer of Denver, Colo., has located his office in the Alaska Bldg., Seattle, for private practice.

H. A. ROBERTS has been appointed division engineer on the Idaho division of the Oregon Short Line R.R., with office at Pocatello, Idaho. He succeeds W. H. LOWTHER, resigned.

WALTER M. SMITH, formerly designing engineer of the Miami Conservancy District, has resigned that position to become chief designing en-

gineer of the Illinois Waterway, Department of Public Works and Buildings, State of Illinois. In his new position Mr. Smith will have charge of design of all structures on the Illinois Waterway, which is to connect the lower end of the Chicago Drainage Canal with the head of navigation on the Illinois River at Utica.

F. B. COPE, formerly of Pittsburgh, Penn., has entered the private practice of general engineering and construction work, with office at Salem, Ohio.

FRANK B. ROTH, Philadelphia, has accepted the position of chief engineer of the Lehigh Structural Steel Co., Allentown, Penn. He was formerly president of the Philadelphia Chapter of the American Association of Engineers.

H. W. HOUGHTON has resigned from the engineer department of the Kansas City Southern R.R., at Pittsburg, Kan., to become associated with the Nebraska State Highway Engineering Department as designer. His headquarters will be at Lincoln.

GLENN I. VOYLES, former county engineer of Phillips County, Kansas, has been appointed county engineer of York County, Nebraska.

A. M. SCHOTT has been appointed city engineer of Sioux City, Iowa, vice T. H. JOHNSON, who resigned recently to enter private practice as noted in *Engineering News-Record* of Aug. 21, 1919.

PROF. W. K. HATT, head of the School of Civil Engineering, Purdue University, who has been on leave of absence since Jan. 1, 1919, has resumed his former duties.

G. A. MANEY, who, before becoming affiliated with the Emergency Fleet Corporation, was a member of the faculty of the University of Minnesota, has severed his connection with the Corporation and returns to Minnesota to become assistant professor of structural engineering.

CAPT. LOUIS R. JOHNSON, U. S. A., who has been serving overseas with the Army Engineer Corps, has returned to his home in San Diego, Calif., to resume his practice.

OBITUARY

GEORGE F. LEAVENWORTH, for some years a mining engineer with the Tennessee Copper Co., died recently at Ducktown, Tenn. Mr. Leavenworth was a graduate of the University of Vermont, and had been engaged during the greater part of his professional career in railroad location and construction work and the location and construction of street railways. Several years ago he engaged in mining operations in the South.

BUSINESS NOTES

H. K. DAVIES, formerly with Wallace & Tiernan Co., Inc., New York City, recently entered the employ of the Pennsylvania Salt Manufacturing Co., Philadelphia, Penn. Mr. Davies will be concerned with the development of the uses of liquid chlorine.

THE NITZBERG & WEITZNER CO., INC., engineer, builder and contractor, has recently been incorporated for the purpose of planning and executing all forms of engineering and general building construction work. Offices have been opened in the Woolworth Bldg., New York City.

THE DUNBAR MFG. CO., 5133 W. Lake St., Chicago, manufacturer of railway and automobile supplies, has appointed W. C. Irwin as district sales representative in St. Louis and the Southwest, with offices in the Frisco Bldg., St. Louis, Mo. Mr. Irwin has represented several railway supply companies. During the war he was a captain in the Engineer Corps, United States Army.

THE BUCYRUS CO., South Milwaukee, Wis., has opened a Cleveland, Ohio, office at 808 American Trust Bldg., is in charge of E. G. Lewis, formerly of the New York office of the company and more recently president of the New Jersey Slag Products Co., Dover, N. J.

THE WORTHINGTON PUMP & MACHINERY CORPORATION, 115 Broadway, New York City, has purchased the plant and other assets of the Epping-Carpenter Pump Co., of Pittsburgh, Penn., and will operate the same as the Epping-Carpenter Works. Orders and contracts now in hand will be completed, and the regular business of the company will be continued. All correspondence should be addressed to the Worthington Pump & Machinery Corporation at the Epping-Carpenter Works, 10 Forty-third St., Pittsburgh, Penn.

THE WILLIAMSPORT WIRE ROPE CO., Williamsport, Penn., has established a branch office and warehouse in Chicago, Ill., under the direction of C. M. Ballard, formerly connected with the organization, in Cleveland, Ohio. The office is located at 122 S. Michigan Ave., from which location the business in the Middle West will be handled. A complete line of the wire rope of various sizes manufactured by the company will be carried at the warehouse.

THE AMERICAN SEWER PIPE CO., 15 Broad St., Akron, Ohio, announces a change of its corporate name to the AMERICAN VITRIFIED PRODUCTS CO. This was thought advisable, as the company is now manufacturing a varied line of vitrified-clay products other than sewer pipe. The management and the location of the general and the branch offices remain unchanged.

TRADE PUBLICATIONS

The following companies have issued trade publications:

THE BLAW-KNOX CO., manufacturer of steel products, Pittsburgh, Penn.; Bulletin No. 200, 6 x 9 in., 16 pages, illustrated; contains information regarding the use of automatic single-rope cableways.

THE GEORGE C. VIDETTO MACHINERY CO., Bessemer Bldg., Pittsburgh, Penn.; folder, 9 x 12¼ in., eight pages, illustrated, and leaflet, 8½ x 11 in., two pages, illustrated; the folder describes concrete mixers, belt conveyors, elevating loaders, stone crushers, revolving screens, etc., and the leafllet pertains to the subject of standard bucket elevators.

THE O. K. CLUTCH & MACHINERY CO., Columbia, Penn.; Catalog No. 19, 8 x 11 in., 24 pages, illustrated; describes and gives ratings of hoisting machinery.

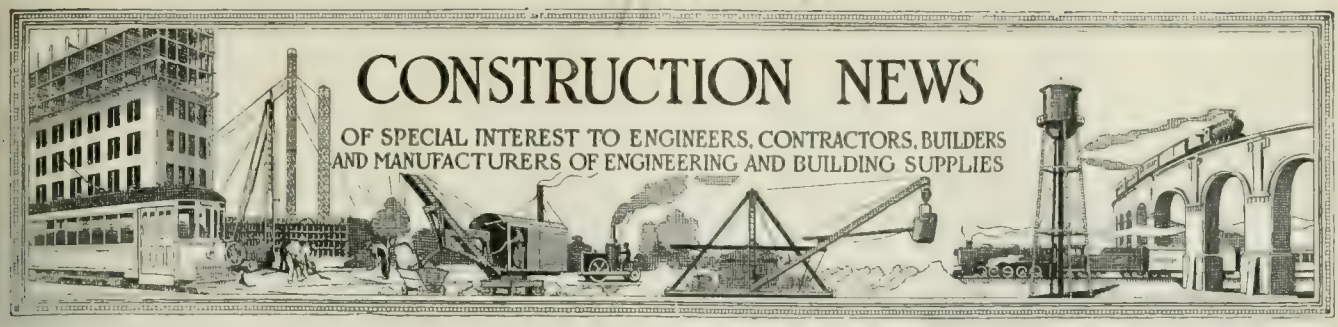
THE AMERICAN STEAM CONVEYOR CORPORATION, Chicago and New York; folder, 9½ x 16 in., four pages, illustrated; describes method of ash disposal by means of a steam ash conveyor.

"ASBESTOS" is the name of a new monthly trade publication, issued in the interests of the asbestos and magnesia industries, by Secretarial Service, 721 Bulletin Bldg., Philadelphia, Penn. It is in booklet form, 5 x 7½ in., and contains about 28 pages, including advertisements. It aims to furnish common ground where those interested in asbestos and magnesia may meet for discussion of their common interests and problems.

THE JEFFREY MANUFACTURING CO., manufacturer of coal-mining machinery, electric locomotives, etc., Columbus, Ohio; Bulletin No. 270, 7½ x 10½ in., eight pages, illustrated; descriptive of ventilating fans, giving tables of dimensions and capacities; particular emphasis is put on the subject of mine ventilation.

THE ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.; Bulletin No. 1456, 7¾ x 10½ in., 19 pages, illustrated; descriptive of revolving roll rock crushers with both removable and fixed teeth.

THE MONIGHAN MACHINE CO., 2016 Carroll Ave., Chicago; Catalog No. 19, 8½ x 11 in., 46 pages, illustrated; pertains to walking dragline excavators, and dragline machines mounted on rollers and skids; the illustrations show the mechanical construction and numerous views of the machines at work.



PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Sept. 22	Chadron, Neb.	Sept. 11
Sept 22	Judith Gap, Mont.	Sept. 18
Sept. 24	Marcy, N. Y. Adv. Sept. 11.	Sept. 11
Sept. 25	Hamtramck, Mich.	Sept. 18
Sept. 29	Flagley, Colo	Sept. 18
Sept. 30	Detroit, Mich.	Sept. 11
Oct. 2	East Hartford, Conn. Adv. Sept. 11.	Sept. 11

SEWERS

Sept. 22	Wilbur, Neb.	Sept. 11
Sept. 22	Judith Gap, Mont.	Sept. 18
Sept. 22	London, Ont.	Sept 18
Sept 23	Broken Bow, Neb.	Sept 18
Sept. 24	Elkhorn, Wis.	Sept 18
Sept. 24	Phillipsburg N. J. Adv Sept. 18.	Sept. 18
Sept. 26	Viroqua, Wis.	Sept. 18
Oct. 1	Baldiwn, Pa.	Sept. 18

BRIDGES

Sept. 22	Norristown, Pa. Adv. Aug. 28.	Aug. 28
Sept. 22	Duluth, Minn.	Sept. 11
Sept. 23	Harrisburg, Pa. Adv Aug. 14.	Aug. 14
Sept. 23	Harrisburg, Pa.	Sept. 11
Sept. 24	Lexington N. C.	Sept. 11
Sept. 24	Fredericton, N. B.	Sept. 18
Sept. 24	Fbensburg, Pa.	Sept. 18
Sept. 26	Kenosha, Wis. Adv. Sept. 18.	Sept. 18
Sept. 29	Birmingham, Ala.	Sept. 18
Sept 29	Iola, Kan.	Sept 18
Sept. 29	New Jersey Adv. Sept. 11.	Sept. 11

STREETS AND ROADS

Sept. 22	Chicago, Ill.	Sept. 18
Sept. 22	Lyons, Kan.	Aug. 28
Sept. 22	New York, N. Y.	Sept. 18
Sept 22	California	Sept. 18
Sept. 23	Keyser, W. Va. Adv. Sept. 4.	Sept. 4
Sept. 23	Peru, Neb.	Sept. 11
Sept. 23	Beaver City, Neb.	Sept. 11
Sept. 23	Keyser, W. Va.	Sept. 11
Sept. 23	Athens, Ga Adv. Sept. 11.	Sept. 11
Sept. 23	Philadelphia, Pa.	Sept. 11
Sept. 23	Salisburg, Md.	Sept. 11
Sept 23	Massachusetts	Sept 18
Sept. 23	Ralston, Neb.	Sept. 18
Sept. 24	Lexington, Neb.	Sept. 11
Sept. 24	Elwood, Neb.	Sept. 11
Sept 24	Fbensburg, Pa.	Sept. 18
Sept. 24	Manitowoc, Wis.	Sept. 11
Sept. 24	Brooklyn, N. Y.	Sept. 18
Sept. 24	Marcy, N. Y.	Sept 18
Sept 25	Kimbal, Neb.	Sept 11
Sept. 25	North Bergen, N. J.	Sept. 11
Sept 25	St. George, S. I. N. Y.	Sept. 18
Sept. 25	Mt Clemens, Mich.	Sept 18
Sept. 25	Duluth, Minn.	Sept. 18
Sept. 25	Louisiana	Sept 18
Sept 25	Concord N C	Sept 18
Sept 26	North Carolina	Sept. 18
Sept. 26	Loup City Neb.	Sept. 11
Sept 27	Aitkin, Minn.	Sept. 11
Sept. 30	Pennsylvania Adv Sept. 11	Sept. 11
Sept. 30	Blackfoot, Idaho	Sept. 11
Sept. 30	Montgomery, Ala. Adv Sept 18.	Sept. 18
Oct. 1	Faribault, Minn.	Sept. 4
Oct. 2	Madison W. Va.	Sept 11
Oct. 2	Trenton Ga	Sept. 18
Oct. 6	Ridgeway Mo	Sept 18
Oct. 6	Ft. Scott, Kan.	Sept. 18
Oct. 6	Fayetteville, W. Va. Adv. Sept. 18.	Sept. 18
Oct. 7	Montevideo Minn.	Sept. 18
Oct. 7	Billings, Mont.	Sept 18
Oct. 10	Tacoma, Wash. Adv. Aug. 14.	Aug. 14
Oct. 11	Brainerd, Minn.	Sept. 18
Oct. 13	Lancaster, Mo.	Sept. 11

EXCAVATION AND DREDGING

Sept. 21	Sheboygan, Wis.	Sept 18
Sept. 22	Tower Minn.	Aug. 21
Sept. 22	New York, N. Y.	Sept. 11
Sept 22	Duluth, Minn.	Sept 4
Sept. 23	Marianna Ark	Sept 18
Sept. 23	St John, N. B.	Sept 18
Sept. 26	Colusa, Cal.	Sept 18
Sept. 29	Waseca, Minn.	Sept. 11
Oct. 4	Greenfield, Ind.	Sept 18
Oct. 7	Olivia, Minn.	Sept. 18

INDUSTRIAL WORKS

Sept. 20	New York, N. Y.	Sept. 11
Sept 24	Melville Sask	Sept. 18
Sept. 27	Cap de la Madeleine, Que.	Sept. 18
Sept. 27	Edgerton, Wis.	Sept. 18
Oct. 7	Marcy, N Y. Adv. Sept. 18.	Sept. 18

BUILDINGS

Sept. 22	Holton, Kan.	Sept. 4
Sept. 22	San Francisco, Cal.	Sept. 11
Sept. 22	Eldorado, Kan.	Sept 11
Sept. 22	Toronto, Ont.	Sept. 11
Sept. 22	New York, N. Y.	Sept. 18
Sept. 22	Bridgeport, Conn.	Sept. 18
Sept. 22	Balaton, Minn.	Sept. 18
Sept. 22	Willimantic, Conn.	Sept. 18
Sept. 22	Hartford, Wis.	Sept. 18
Sept. 23	Bessemer, Ala.	Sept. 18
Sept. 24	Selkirk Man.	Sept 11
Sept. 25	Brooklyn, N. Y.	Sept. 11
Sept. 25	Moncton, N. B.	Sept. 4
Sept. 25	Charlevoix, Mich.	Sept. 18
Sept. 25	Redding, Conn.	Sept. 18
Sept. 26	Worcester, Mass.	Sept. 18
Sept. 27	Clintonville, Wis.	Sept. 18
Sept. 29	Ankeny, Ia.	Sept 18
Sept. 30	Salt Lake City, Utah	Sept 11
Sept. 30	Biwabik, Minn.	Sept. 11
Oct. 1	St. Paul, Minn.	Aug. 28
Oct. 1	Virginia, Minn.	Aug. 28
Oct. 1	Wichita, Kan.	Sept. 11
Oct. 1	Fulton, Mo.	Sept. 11
Oct. 1	Mt. Pleasant, Ia.	Sept. 11
Oct. 3	Brevard, N. C.	Sept 18
Oct. 10	Cherokee, Okla.	Sept. 18
Oct. 17	Ashley, N. D.	Sept. 18
Nov. 23	Winner, S. D.	Sept. 11

FEDERAL GOVERNMENT WORK

Sept. 22	Material — Charles Town, W. Va.	Aug. 21
Sept. 22	Post Office — Charleston, W. Va.	Aug. 21
Sept. 22	Storehouse — Watertown, Mass	Sept. 11
Sept. 22	Rip Rap—Baltimore, Md	Sept. 18
Sept. 23	Heating System—Tacoma Park, Washington, D. C.	Sept. 11
Sept. 24	Building — Spec 4009 — Puget Sound, Wash.	Sept. 11
Sept. 24	Boat House—Reedy Island, Del. Adv. Sept. 11.	Sept. 11
Sept. 24	Laundry — Spec. 4006 — Annapolis Md.	Sept. 11
Sept. 24	Mechanical Stokers—Spec. 4010—Charleston, S. C.	Aug. 28
Sept. 24	Reciprocating Air Compressor — Spec 3837 — Puget Sound, Wash	Aug. 28
Sept. 25	Dredging — New London, Conn.	Sept. 18
Sept. 26	Post Office and Custom House—Providence, R. I. Adv. Aug. 21.	Aug. 21
Sept. 29	Dredge, etc —Wilmington, N. C. Adv. Aug. 28.	Aug. 28
Sept. 29	Dredging—Baltimore, Md. Adv. Sept. 11.	Sept. 11
Sept. 30	Remodeling Hospital—Boston, Mass.	Aug 28
Sept. 30	Dock—Charleston, S. C.	Sept. 4
Sept. 30	Hospital — Spec 3931 — Pearl Harbor, Hawaii	Sept. 4
Sept. 30	Rubble Mound Breakwater Cleveland, O.	Sept. 4
Sept. 30	Sprinkler System—Philadelphia, Pa. Adv. Sept. 18.	Sept. 18
Oct. 1	Valves, Gates, etc.—Denver, Colo. Adv. Aug. 21.	Aug. 21
Oct. 1	Electric Lighting and Power Systems—Spec 3982—Mare Island, Cal.	Aug. 28
Oct. 1	Electric Lighting, Water Supply and Fire Protection System — Spec. 3977A — Charleston, S. C.	Sept. 18
Oct. 1	Dredging — Spec. 4031 — Hingham Mass	Sept 18
Oct. 2	Equipment—Denver, Colo.	Sept. 11
Oct. 3	Post Office—Midland, Mich	Sept. 11
Oct. 3	Lock and Dam — Pittsburgh, Pa. Adv. Sept. 11.	Sept. 11
Oct. 4	Dredging — Wilmington, Del. Adv. Sept. 11.	Sept. 11
Oct. 6	Post Office—St. Johnsburg, Vt.	Aug. 28
Oct. 6	Levee Work — St. Louis, Mo. Adv. Sept. 11.	Sept. 11
Oct. 6	Dredging — New York, N. Y. Adv. Sept. 18.	Sept. 18
Oct. 6	Building—Marianna, Ark.	Sept. 11
Oct. 8	Dredging—Detroit, Mich. Adv. Sept. 11. 18.	Sept. 11
Oct. 10	Dredge—New York, N. Y. Adv. Aug. 28.	Aug. 28
Oct. 10	Post Office—Lock Haven, Pa.	Sept. 4
Oct. 14	Post Office—Pratt, Kan.	Sept 11
Oct. 15	Derricks—Florence, Ala. Adv. Sept. 18.	Sept. 18
Oct. 15	Repairing Dyke—Philadelphia, Pa. Adv. Sept. 18.	Sept. 18
Oct. 15	Quarters and Mess Hall—Bismarck N. D	Sept. 18
Oct. 22	Power Plant Improvements —Spec 3956—Pearl Harbor, Hawaii	Sept. 11
Nov. 3	Post Office and Court House —Honolulu, H. T.	Aug. 21

MISCELLANEOUS

Sept. 22	Wharf—Naramata, B. C.	Aug 28
Sept. 22	Flood Gates—Pine Bluff Ark.	Sept. 11
Sept 23	Land and River Borings—New York, N Y.	Sept 11
Sept. 23	Turbines, etc.—Saskatoon, Sask Adv July 24	July 24
Sept. 25	Garbage Incinerator — Monessen, Pa.	Sept. 18
Sept. 29	Lock, Dam, etc.—Bobcaygen, Ont.	Sept. 18
Oct 2	Wharf — St Laurent de Orlean, Que	Sept 18
Oct. 2	Wharf—Quebec	Sept 18
Oct. 6	Pumping Equipment—Los Angeles, Cal.	Sept. 18

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

Conn., Groton—Bilderbeck & Langdon engrs., 253 State St., New London, receive bids about Oct. 1, extending water system for Boro. Work involves 12,000 ft. 12 in and 1000 ft. 6 in c.i. pipe. About $50,000. E. R. Gorman, supt. Noted July 24.

Waterworks (Continued)

N. C., Greensboro—City plans to build addition to waterworks plant. About $50,000. W. B. Bandy, Greensboro, engr.

Fla., St. Augustine—See "Sewers."

Mich., Caro—Caro Water Co. plans to build pumping plant and rein.-con. storage reservoir. About $25,000. Private plans.

Mich., Marysville—Wills-Lee Co. plans to lay pipe line from here to Port Huron city limits to connect with Port Huron water mains, one line to connect at 24th and Moak Sts., Port Huron, and other at Military and Ravenswood Sts., Port Huron, to supply water for construction purposes at plant here. Work involves 25,000 ft. 10-12 in. c.i. pipe. W. H. Watkins, Marysville, engr.

Mich., Port Huron—City having plans prepared for rein.-con. intake well with gate valves to provide for pure water supply, while intake pipe is being repaired or cleaned. About $10,000. E. R. Whitmore, city engr.

Kan., Girard—City plans to improve waterworks system. About $44,000. W. B. Rollins & Co., 209 Ry. Exch. Bldg., Kansas City, Mo., engrs.

Neb., Lincoln—T. H. Berg, city clk., soon lets contract laying water mains and fire hydrants in Fire Dist. No. 2, involving 18,660 ft. 4 8-in. c.i. piping, 6300 cu.yd. earth excav. and 22 hydrants. About $30,000. G. W. Bates, city engr.

Mont., Musselshell—City plans to install complete waterworks system. About $28,000. R. Bushnell, Roundup, engr.

Mo., Kirksville—City plans to improve waterworks system. About $30,000. W. B. Rollins & Co., Ry Exch. Bldg., Kansas City, engrs.

Okla., Altus—City voted $45,000 bonds to extend waterworks. Johnson & Benham, Kansas City, Mo., engrs.

Okla., Enid—City soon lets contract building waterworks, involving 100,090 ft. 6-14 in. c.i. pipe, 40,560 lb. standard castings, 77 ft. 4-14 in. valves and valve boxes and six 6 in. fire hydrants. Black & Veatch, Interstate Bldg., Kansas City, Mo., engrs.

Okla., Minco—City voted $20,000 bonds to replace steam engine with oil engine, deepen wells and build extensions to watermains. Engineer not selected.

Cal., Brawley—City plans election to vote on $125,000 bonds to extend and improve waterworks system. G. R. Wade, city engr.

Cal., Fillmore—City Trustees plan election to vote on $20,000 bonds to build additional pumping plant and extend distributing system.

BIDS DESIRED.

Mich., Hamtramck—Until Sept. 25, by J. C. Schultheiss, village clk., furnishing materials and labor laying water mains and appurtenances in Yemens, Evaline, Christopher and McDougal Aves., involving 2805 ft. 6-8 in. pipe, 4 fire hydrants, gates, etc. G. Jerome, 1331 Majestic Bldg., Detroit, engr.

Mont., Judith Gap—Until Sept. 22, by Town Council, building 6 in. water mains in Impvt. Dist. No. 7. About $15,000. Gerharz-Jacqueth Co., 514 1st Natl. Bank Bldg., Great Falls, engrs. Noted Aug. 7.

Colo., Flagler—Until Sept. 29, by Town Council, building waterworks system, involving 16,950 ft. 4-10 in. c.i. pipe, 28 fire hydrants, 5 tons specials, twenty-two 4-10 in gate valves and boxes, etc. About $60,000. R. S. Salisbury, 1415 East Colfax Ave., engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mich., Detroit—City let contract to U. S. Cast Iron Water Pipe Co., 122 South Michigan Blvd., Chicago, for 1500 tons Class "B," 6 and 8 in. pipe at $55.50 per ton; Amer. Cast Iron Pipe Co., 512 1st Natl. Bank Bldg., Chicago, 1500 tons Class "B" 6 and 8 in. pipe, $0.96 per lin.ft. for 6 in. pipe in 18 ft. lengths and $1.36 per lin.ft. for 8 in. pipe in 18 ft. lengths; Flower Mfg. Co., Clayton and Parkinson Ave., five 30 in. gate valves at $1350 each, total, $6750.

★Mich., Ecorse—City let contract to T. C. Brooks & Son, West Grand Blvd., Detroit, furnishing and installing 8000 ft. water mains with hydrants, valves and 2 motor driven centrifugal pumps, 500 gal. capacity per minute, etc., $24,000; Pitt Constr. Co., Wyandotte, 500,000 gal. rein.-con. reservoir, $19,000; Pittsburgh-Des Moines Steel Co., 801 Curry Bldg., Pittsburgh, elevated steel tank with 150,000 gal. capacity. Noted Aug. 21.

★Kan., Lawrence—Haskell Institute let contract building 40,000 gal. steel tank and tower, to Pittsburg-Des Moines Steel Co., Des Moines, Ia., $7485.

★Mo., Marysville—City let contract building 2 reservoirs, rein.-con. coagulatory plant, rein.-con. storage plant, two 600 g. p. m. motor driven pumps, and one 7000 g. p. m. low service pump, to Randall Constr. Co., Kansas City, $35,500. Noted Aug. 21.

★Mo., Weston—City let contract extending pipe line and building well and concrete reservoir, to C. P. Breen, Parkville, $13,400. Noted Aug. 14.

★Okla., Altus—City let contract improving waterworks system, to Maney Brothers, 304 Empire Bldg., Oklahoma. About $62,500. Noted Aug. 28.

★Wash., Seattle—Bd. Pub. Wks. let contract laying 2636 ft. 8 in. and 256 ft. 12 in. c.i. water mains in 12th Ave. N. E., et al, to G. Alfonzo, 6th N. W. and West 88th Sts., $12,483. Noted Aug. 21.

Sewers

PROPOSED WORK

W. Va., Parkersburg—City plans to build 8-in. sanitary sewers in Oak St. from 15th to 19th Sts. and Beaver St. from alley south of 18th to 19th Sts., etc. Bonds for $300,000 voted for project. L. G. Merril, city engr.

N. C., Greensboro—City plans to build sewer extension. About $25,000. W. B. Bandy, Greensboro, engr.

Fla., Clearwater—City voted $15,000 bonds to build sanitary and storm sewers in various streets.

Fla., St. Augustine—City plans election soon to vote on $500,000 bonds to install sewerage system, extend water service, build auditorium and pave streets.

Mich., Mt. Clemens—J. H. Mathews, city clk., soon lets contract laying 24 in. vitr. crock rein.-con. sewer with 6 in. concrete shell on outside in Crocker Ave. About $25,000.

Ill., Nokomis—City soon lets contract building sanitary sewerage system to include 20,000 ft. 8-12 in. pipe. Imhoff tank and sludge bed, also 10,000 ft. 8-10 in. pipe, ejector and compressor station. About $43,000 and $25,000 respectively. J. J. Woltmann, city engr.

Mont., Billings—City election Sept. 30, to vote on $400,000 bonds to build storm sewers in various streets. E. M. Sneckenberger, city engr.

Wash., Spokane—City having preliminary plans prepared building 5.5 mi. laterals and sectional sewers in Sewer Dist. No. 13. About $100,000. A. D. Butler, city engr.

Okla., Garber—City Council soon lets contract building lateral sewers in various streets, involving 28,864 ft. 8-10-in. vitr. clay pipe, 500 cu.yd. excav., 120 cu.yd. concrete, 59 manholes and 187 flush tanks. Black & Veatch, Interstate Bldg., Kansas City, Mo., engrs.

Okla., Nowata—See "Streets and Roads."

Ont., Orillia—City having plans prepared by James, Loudon & Hertzberg, engrs., 36 Toronto St., Toronto, laying 3200 ft. 15-28-in. vitr. sewer in Neywash St. About $11,800.

BIDS DESIRED

N. J., Phillipsburg—Until Sept. 24, by town, building sewage disposal plant. C. E. Tilton, town engr.; advertised in this issue.

Pa., Baldwin—Until Oct. 1, by Bd. Comrs. Baldwin Twp., building 2 mi. sanitary sewers in drainage area No. 1, Fairhaven. T. J. McGovern, twp. engr.

Wis., Elkhorn—Until Sept. 24, by A. C. Olson, city engr., excavating and laying 9610 ft. 8 in. sewers, 1240 ft. 4 in. c.i. pipe, 19 manholes and 4 flush tanks in Main St. About $30,000.

Wis., Viroqua—Until Sept. 26, by E. J. Older, city clk., furnishing and laying 1362 ft. 10 in. and 1209 ft. 8 in. vitr. pipe sewers, 1863 ft. 6 in. sewer connections, 8 manholes, etc., also laying 1300 ft. 8 in., 18 ft. 6 in. and 1800 ft. 4 in. water pipe, etc.

Minn., Breckenridge—City receiving bids building sewers in various streets, involving 5728 ft. 8-36 in. sanitary sewers and 10,594 ft. 8-24 in. storm sewers, 42 manholes and 2 flush tanks. About $26,000. R. R. Waite, clk.

Neb., Scribner—Until Oct. 3, by City Clerk, laying 5 mi. 8-12 in. vitr. clay pipe sewers in various streets. About $42,000. J. A. Bruce, 204 Bee Bldg., Omaha, engr.

Mont., Billings—Until Oct. 7, by city, building 32,000 ft. 8 in. sanitary sewers in various streets. E. M. Sneckenberger, city engr.

Mont., Judith Gap—Until Sept. 22, by Town Council, building 1 mi. 6 in. pipe sewer and sewage disposal plant. About $20,000. Gerharz-Jacqueth Co., 514-1st Natl. Bank Bldg., Great Falls, engrs. Noted Aug. 7.

Ont., London—Until Sept. 22, by S. Baker, city clk., laying 11,300 ft. 8-15 in. vitr. sewers. About $30,000. H. A. Brazier, City Hall, engr. Noted Sept. 4.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Dedham—Metropolitan Water & Sewer Bd., Boston, let contract laying 1550 ft. 33 x 36 ft. rein.-con. sewer pipe, Wellesley Extension, to J. C. Cavanagh, 25 Medway St., Dorchester, $47,675. Work involves 2500 cu. yd. earth and 400 cu. yd. rock trenching, 20 cu. yd. brick and 900 cu. yd. concrete.

★Mass., Longmeadow (Springfield P. O.)—City let contract laying 36,788 ft. 8-18 in. vitr. tile drain sewers and 12,773 sq. yd. macadam in various streets, to Yacovone & Tozzoli, 52 Market St., Hartford, Conn.

★Mass., Needham—Metropolitan Water & Sewer Bd., Boston, let contract laying 3840 ft. 27 x 30 ft. concrete and 33 x 36 ft. rein.-con. sewer, in Wellesley Extension, to Rendle Stoddard Co., Chelsea, $72,046. Work involves 4000 cu. yd. earth and 500 cu. yd. rock trenching and 2250 cu. yd. concrete.

★Mass., Stoneham (Boston P. O.)—Metropolitan Water & Sewer Bd., Boston, let contract laying 3650 ft. 15-20 in. vitr. sewer pipes, in Reading Extension, to Rendle Stoddard Co., Chelsea, $26,016. Work involves 3000 cu.yd. earth and 100 cu.yd. rock excav., 30 cu.yd. brick and 100 cu.yd. concrete.

★N. Y., New York—H. Bruckner, pres. Bronx Boro., let contract to Fenlack Constr. Co., building storm water drain and appurtenances in East 233rd St., cost $132,213, combined sewers and appurtenances in Eden Terrace, $122,534. Noted Sept. 4.

★N. J., Somerville—Town let contract building sewer in Main St., to A. H. Conyne, Somerville, $29,703.

★Pa., Pittsburgh—City let contract laying 100 ft. 9-in. vitr. and 750 ft. 12-in. rein.-con. sewer pipe in Fallowfield Ave., to F. and F. Diulus, 40 Boundary St., $2429; 941 ft. 15 in. rein.-con. sewer pipe in Grandview Ave., to Critelli, Ricca & Zapp, 218 13th St., Sharpsburg, $3982; 204 ft. 10-in. rein.-con. and 2130 ft. 8-in. vitr. sewer pipe in Richmond St. and 1400 ft. 15-in. rein.-con. sewer pipe in McCandless St., to Manella & Lucenti, 6610 Rowan Ave., $5326 and $5024 respectively. Noted Aug. 28.

★W. Va., South Charleston—City let contract installing complete sewerage system, to McNichols Co., 924 South Kilbourn Ave., Chicago, Ill. About $140,000. Noted May 8.

★Fla., Leesburg—City let contract installing 5 mi. sewers and 1 septic tank, to Owens & Harwell, Tampa, $38,771. Noted Aug. 28.

★O., Bexley—L. S. Higgins, clk., let contract laying 6000 ft. 36-60 in. main sewers with branches, running in northerly direction, and 3200 ft. 15 in. and 4800 ft. 18 in. sanitary sewers in same trench with main sewers, to Sheets Constr. Co., Columbus, $195,000. Noted Sept. 11.

★O., Lima—A. L. Metheany, dir. pub. serv., let contract building Collett St. Relief Sewer, Contr. No. 1, to J. W. Farley, 118 North LaSalle St., Chicago, $523,000. Noted Aug. 7.

★Mich., Detroit—City let contract furnishing labor and material (except manhole rings and covers) building 5372 ft. 2 ft. 9 in. x 4 ft. 3 in. brick sewer in Newport Ave. from Waterloo to Forest Aves., to J. A. Mercier, 216 Hammond Bldg., $75,208. Noted Sept. 11.

★Mich., Detroit—Dickinson Real Estate Exch., 205 Old Whitney Bldg., rejected bids building 12,226 ft. vitr. crock lateral sewerage system, Avon Park Subdivision. About $20,000. Work will be done by day labor. Noted Aug. 28.

★Mich., Royal Oak—Baker Land Co. let contract furnishing labor and material building lateral sewerage system, Bronx Subdivision, involving 15,000 ft. 8-12 vitr. sewer pipe, etc., to Thorp & King, Royal Oak. Noted Aug. 14.

★Minn., Walnut Grove—City let contract building 4465 ft. 80 in., 2977 ft. 8 in. and 1122 ft. 10 in. vitr. sewer tile, including 12 lampholes 62 manholes and disposal tank with septic tank, to O'Neil & Preston, 606 6th St., St. Paul, $41,275. Noted Aug. 28

Sewers (Continued)

★**Kan., Belle Plaine**—City let contract building sewage disposal plant and 6½ mi. sewers in various streets, to E. M. Eby, Wellington, $38,033. Noted Sept. 4.

Kan., Stafford—City let contract building 5260 ft. rein.-con. storm sewers, to Amerman & Snyder, Salina, $23,403.

★**Neb., Newman Grove**—City let contract building sanitary sewer in various streets, involving 22,070 ft. 8-15 in. vitr. pipe, to A. A. Dobson, Lincoln. About $29,500. Noted July 3.

★**Neb., Osceola**—City let contract building sanitary sewers and disposal plant, involving 9800 ft. 8-12 in. vitr. pipe, and 27 x 60 ft. cameron tank, to H. J. Peterson & Co., Farnam Bldg., Omaha, $61,299.

★**Wyo., Lusk**—City let contract laying 6270 ft. 6 and 8 in. sewer pipes, to Cordon Constr. Co., 334 Century Bldg., Denver, Colo. About $17,000. Noted July 10.

★**Tex., Seguin**—Comrs. Guadalupe Co. let contract building rein.-con. drainage structures on Highway No. 3 from here to Gonzales Co. line, to J. W. Goodrum, Seguin, $16,240. Noted Sept. 11, under "Streets and Roads."

★**Cal., Willows**—City let contracts building sewers in Dist. No. 2 as follows: digging and laying pipe, to J. Heafey, 22 Mesa St., Oakland, $16,066; furnishing pipe, to H. C. Muddox, $9622; motor and pump, to California Hydraulic Eng. Co., 70 Fremont St., San Francisco, $914; furnishing cement, to D. C. Church, 798 10th St., San Francisco, $981. Noted July 31.

★**Ont., Walkerville**—Essex Border Utilities Comn., Windsor, let contract building brick and concrete sewage pumping station here, to R. Westcott & Co., 39 Ouellette Ave., Windsor. About $13,000.

Bridges

PROPOSED WORK

Pa., Daguscahonda—Bd. Supervs. Ridgway Twp., Elk Co., soon lets contract building iron bridge over Elk Creek on present stone abutments, 52 ft. span, rein.-con. flooring. B. H. Rhinesmith, Ridgway, Secy.

Ga., Chatsworth—Bd. Supervs. Murray Co. soon lets contract building 60 ft. span bridge, 10 ft. roadway, over Holly Creek, on Teasleys Pl., 80 ft. span, 10 ft. roadway, over Conasauga River, to be known as Alaculsey Bridge, 25 ft. span, 16 ft. roadway, on old federal road, three 20 ft. spans, 12 ft. roadway, 20 ft. span, 16 ft. roadway, over Pole Cat Creek 50 ft. span, 12 ft. roadway, over Mill Creek, 50 ft. span, 12 ft. roadway, over Holly Creek, near Hasslers Mill, 20 ft. span, 12 ft. roadway, over Pin Hook Creek, on Fashion Rd., 20 ft. span, 16 ft. roadway over Pin Hook Creek, on Cleveland and Spring Place Rd., all rein.-con. Alternate bids will be received on steel frames, with concrete floors and concrete abutments to be built of same general dimensions as to length, width, height and length of wings and same carrying capacity. J. M. Campbell, chn.

Wis., Mukwonago—Wisconsin Highway Comn., Madison, having surveys made for Mill Race Bridge, here, rein.-con., two 30 ft. spans, baluster railings and concrete abutments.

Neb., Henry—V. B. Kirkham, clk. Scotts Bluff Co. (Gering), soon lets contract building 600 ft. rein.-con. bridge, 16 ft. wide, to have twelve 50 ft. arches. Work involves 1100 cu. yd. rein.-con., 10,000 lin. ft. wooden piling and 30,000 cu. yd. earth approach and fill. About $70,000. Noted Aug. 14.

Neb., Minatare—V. B. Kirkham, clk. Scotts Bluff Co. (Gering), soon lets contract building 600 ft. rein.-con. bridge, 16 ft. wide, to have twelve 50 ft. arches. Work involves 1100 cu. yd. rein.-con., 10,000 lin. ft. wooden piling and 30,000 cu. yd. earth approach and fill. Noted Aug. 14.

Neb., Morrill—V. B. Kirkham, clk. Scotts Bluff Co. (Gering), soon lets contract building 600 ft. rein.-con. bridge, 16 ft. wide, to have twelve 50 ft. arches. Work involves 1100 cu. yd. rein.-con., 10,000 lin. ft. wooden piling and 30,000 cu. yd. earth approach and fill. About $70,000. Noted Aug. 14.

Neb., Scotts Bluff—V. B. Kirkham, clk. Scotts Bluff Co. (Gering), soon lets contract building 600 ft. rein.-con. bridge, 24 ft. wide, to have twelve 50 ft. arches. Work involves 1820 cu. yd. rein.-con., 13,200 lin. ft. wooden piling, 41,289 cu. yd. earth approach and fill, 3332 cu. yd. clay and 1003 cu. yd. gravel surfacing. About $100,000. Noted Aug. 14.

Mo., Charleston—See "Streets and Roads."

Wash., Yakima—Comrs. Yakima Co. plan to raise and repair Piland Bridge, steel span, which recently collapsed in Sunnyside Canal. About $10,000. W. C. Marion, co. engr.

Oregon—State Highway Comn., Portland, soon lets contract building bridge on West Side Highway, Yamhill Co., involving 300 cu.yd. class A concrete in bridge, 60 cu.yd. class A concrete in culvert, 50,000 lb. reinforcing steel, 300 lin.ft. concrete handrail, 600 lin.ft. wooden piling, cost to exceed $10,000; 40 ft. bridge over Crow Creek, Lane Co., 118 cu.ft. concrete handrail and 160 lin.ft. wooden piling, $10,000. H. Nunn, Salem, state highway engr.

Oregon—State Highway Comn., Portland, soon lets contract building bridge over Sand Creek, Douglas Co., involving 35,000 lb. reinforcing steel, 223 cu.yd. Class "A" concrete and 226 lin.ft. concrete handrail. Cost to exceed $10,000. H. Nunn, state highway engr.

Ont., Pembroke—See "Streets and Roads."

BIDS DESIRED

Pennsylvania—Until Oct. 3, by State Highway Dept., Harrisburg, building 12 and 14 ft. span bridges in Boggs and Bethel Twps., Armstrong Co., 12 ft. span, Summerhill Twp., Crawford Co., 8 and 12 ft. spans, Oakland and Harmony Twps., Susquehanna Co., 10 ft. span, Chanberry Twp., Venango Co., 10 ft. span, Lemon Twp., Wyoming Co.; also superstructure for one 42 ft. clear span through rein.-con. girder bridge, Vanderbilt Boro., Fayette Co., and for fabrication and erection complete of superstructure for one through plate girder highway bridge, 52 ft. centre to centre bearings, 25 ft. 8 in. centre to centre web plates, Davidson Twp., Sullivan Co. L. S. Sadler, state highway comr.

Pa., Conshohocken—Until Sept. 22, by city, building rein.-con. and steel bridge over Schuylkill River. About $175,000. B. H. Davis, 17 Battery Pl., New York City, engr. Noted Dec. 19.

Pa., Ebensburg—See "Streets and Roads."

Pa., Ebensburg—Until Sept. 24, by Comrs. Cambria Co., building rein.-con. girder bridge over Elk Run on road leading from Morrellville to Southmont, Lower Yoder Twp., 35 ft. long, 30 ft. wide. About $25,000. Owen & Plummer, Otto Bldg., Johnstown, engrs.

Ga., Trenton—See "Streets and Roads."

Ala., Birmingham—Until Sept. 29, by Bd. Revenue Jefferson Co., building 100 ft. rein.-con. bridge on Birmingham and Warrior Rds., State Rd. No. 1. Work involves 326 cu. yd. class A and 151 cu. yd. class C concrete, 110 cu. yd. stone masonry, taken down and rebuilt, 48,500 lb. reinforcing steel, 940 cu. yd. earth and 20 cu. yd. solid excav. Alternate bids will be considered on 100 ft. arch span and 100 ft. girder bridge of several spans. W. S. Keller, c/o State Highway Dept., Montgomery, engr.

Wis., Kenosha—Until Sept. 26, by Street Assessment Com., City Hall, building rein.-con. and bascule bridge on Main St. over harbor, here, consisting of 4 arch approach spans from 40-46 ft., 2 girder spans, 30 and 19 ft., 230 lin.ft. approaches and Strauss trunnion bascule span, 167 ft. center to center of trunnions, also for dismantling and removing present substructure and remove present superstructure into a substructure to be furnished by city at Middle St. crossing of north branch of the harbor on Washington Island; advertised in this issue.

N. B., Fredericton—Until Sept. 24, by P. J. Veniot, minister dept. pub. wks., building bridge over Little River mouth, Hamfield Parish, Queens Co. About $25,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Schenectady**—E. S. Walsh, supt. pub. wks., Capitol, Albany, let contract building abutments and approaches on Schenectady-Scotia bridge, rein.-con., extending from junction of State St. and Washington Ave. across Barge Canal Terminal channel, Van Slyck Island, Barge Canal main channel, Hog Island and the Scotia channel, to point about 300 ft. north of junction of Schonowee and Mohawk Aves., Scotia Village, to Walsh Constr. Co., Herald Bldg., Syracuse, $198,570. Noted Aug. 21.

★**N. Y., Watertown**—City let contract building rein.-con. and steel bridge over Black River on Court St., to Peckham Constr. Co., Niagara Life Bldg., Buffalo, $335,815. Noted July 17.

★**N. Y., Watertown**—Bd. Pub. Wks. let contract building 2 span rein.-con. and steel bridge, 200 ft. long, 39 ft. wide, over Black River on Factory St., to Walsh Constr. Co., Herald Bldg., Syracuse, $53,900. Noted Aug. 21.

Pa., Sunbury—Comrs. Northumberland Co. received lowest bid building rein.-con. girder bridge over Chillisquaque Creek in West Chillisquaque Twp., near here, from Whittaker & Diehl, Union Trust Bldg., Harrisburg. About $18,000. Noted Aug. 21.

★**Ala., Birmingham**—Bd. Revenue Jefferson Co. let contract building 100 ft. span rein.-con. bridge over Rock Creek, on Taylors Ferry Rd., to A. F. Bearden. About $19,000. Noted July 24.

★**Illinois**—State Highway Comn., Springfield, let contract building Keller Bridge, Johnson Twp., Christian Co., to A. Culberson. About $17,000.

★**Kan., Bonner Springs**—Comrs.-Wyandotte Co. (Kansas City), let contract building 100 ft. steel pony truss bridge, 22 ft. wide, concrete flooring and abutments, to A. J. Kopler, 700 West 12th St., Kansas City, $10,800. Noted Aug. 28.

★**Mont., Great Falls**—State Highway Comn., Helena, let contracts building 970 ft. concrete bridge, 42 ft. wide, on 1st Ave and 1200 ft. concrete bridge, 44 ft. wide, on 10th St., both over Missouri River, to Porter Bros., Bway and Hardesty Rd., Seattle, Wash. About $242,000 and $232,000 respectively; 3% deduction on both bridges. Noted Aug. 7.

★**Washington**—State Highway Bd., Olympia, let contracts building 300 ft. steel bridge approaches over Quinault River, Grays Harbor Co., involving 200 cu.yd. concrete, 258,599 lbs. structural steel and 7400 lbs. reinforcing steel, to R. E. Meith, Portland, $44,181; 75 ft. rein.-con. arch bridge over Samish River, near Allen, Skagit Co., involving 580 cu.yd. concrete, 3700 lin.ft. wooden piling, 14,000 lb. steel reinforcing bars and 600 cu.yd. earth approach and fill for abutments and footings, to Norris Bros., Burlington, $15,980.

★**Wash., Olympia**—Comrs. Thurston Co. let contract building concrete bridge with wooden approaches, on West Side, to Union Bridge Co., Olympia, $132,000.

★**Wash., Underwood**—State Highway Comn., Olympia, let contract building 190 ft. steel bridge with approaches over White Salmon River, here, Skamania and Klickitat Counties, to Illinois Steel Bridge Co., Hutton Bldg., Spokane. Work involves 445 cu.yd. concrete, 4500 lbs. reinforcing bars and 1300 lin.ft. wood piling. Cost $35,960. Noted Aug. 14.

★**Ore., Astoria**—Port of Astoria Comn. let contract building 1100 ft. timber trestle and extending belt line railway to Astoria Paper Co. plant, to J. A. McEachern Co., foot of Kellogg St., Portland. About $18,000.

Cal., Hanford—Bd. Supervs. King Co. received bids building rein-con. bridge over Kings River, south of Kingsburg, from Cotton & McCauley, 55 Jessie St., San Francisco, $31,512; Frederickson & Shannon, Cary Bldg., Fresno, $31,730; A. Johnson, Kingsburg, $33,621. Noted Aug. 7.

★**Cal., Modesto**—Bd. Supervs. Modesto Co. let contract building 1400 ft. concrete girder bridge over Merced River, having 31 spans with rein.-con. pile foundation, to E. Green, Modesto, $112,600.

★**Cal., Redwood City**—City let contract building 3 bridges over Redwood Creek, on Maple Ave., Bway. Ave. and on Webster St., to C. J. Lindgren, Burlingame, $26,547.

★**Cal., Woodland**—Conaway Ranch let contract building one 84 ft. and one 400 ft. timber bridge on ranch, to M. P. Holmes, Capitol Natl. Bank Bldg., Sacramento, $24,800.

Structural Steel

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Pa., Phila.—See "Miscellaneous."

★ **Mich., Ypsilanti**—See "Miscellaneous."

Reinforced Concrete

PROPOSED WORK

Ga., Chatsworth—See "Bridges."

BIDS DESIRED

Pennsylvania—See "Bridges."

Pa., Conshohocken—See "Bridges."

Pa., Ebensburg—See "Bridges."

Ala., Birmingham—See "Bridges."

Ont., Bobcaygeon—See "Miscellaneous."

PRICES AND CONTRACTS AWARDED

(★Indiactes award of contract)

★**Ala., Birmingham**—See "Bridges."

★**Ont., Port Arthur**—See "Industrial Works."

Streets and Roads

PROPOSED WORK

R. I., Woonsocket—City appropriated $16,800 to pave and curb North Main St. from Winter St. to city line; $49,400 to pave Social St. from George St. to city line; $67,000 to pave Cumberland St. from Cass Ave. to Cumberland Hill Rd.; also $49,000 to pave with granite blocks South St. from South Main St. to top of hill and from top of hill to Center St. with macadam.

New Jersey—State Highway Comn., Broad St. Bank Bldg., Trenton, rejected bids received Sept. 10, repairing State Highway Route No. 1, from Trenton to New Brunswick and Elizabeth and State Highway Route No. 4, from Rahway to Betsey Ross Farm, near Middleton, 18 ft. wide. A. L. Clover, ch. clk. Noted Aug. 28.

W. Va., Elkins—Randolph Co. plans to pave and build 50 ft. bridge and drainage structures on 5.75 mi. Staunton-Parkersburg Pike Rd., 16 ft. wide, involving 17,000 cu.yd. excav. and 53,955 sq.yd. 9 in. bituminous macadam (using local stone). About $103,700. F. A. Parsons, Elkins, engr.

W. Va., Grantsville—Calhoun Co. having plans prepared grading and draining 4.5 mi. Arnoldsburg-Spencer Pike Rd., 24 ft. wide, involving 27,500 cu.yd. excav. and 500 cu.yd. concrete. About $39,050. E. Starcher, Grantsvill, engr. Noted Sept. 11.

W. Va., Moundsville—Marshall Co. plans to pave and drain .48 mi. Narrow Rd., 16 ft. wide, involving 2000 cu.yd. excav., 3535 sq.yd. brick and 850 cu.yd. concrete base. About $32,700. R. C. Yoho, Moundsville, engr.

W. Va., St. Mary—City soon lets contract paving Clay St., involving 3960 sq.ft. 1 course concrete, 25,000 sq.ft. brick, 800 lin.ft. concrete curb and one 6 x 8 ft. culvert containing 60 yd. concrete. L. V. Carpenter, highway engr.

W. Va., Wellsburg—Brooke Co. plans to pave and drain 1 mi. River Rd., involving 6000 cu.yd. excav., 6200 sq.yd. concrete and 3188 sq.yd. bituminous macadam. About $28,800. G. W. Stenrod, Wellsburg, engr.

North Carolina—State Highway Comn., Raleigh, rejected bids received Aug. 28, hard surfacing 8 mi. roads, Graham Twp., Alamance Co. About $200,000. W. S. Fallis, c/o State Highway Dept., Raleigh, engr. Noted Aug. 21.

N. C., Burgaw—Pender Co. soon lets contract building 25 mi. gravel roads, Caswell Twp. Cost between $75,000 and $100,000. W. K. Allen, Odd Fellows' Bldg., Wilmington, engr.

N. C., Burgaw—Comrs. Pender Co. plan to build gravel roads. About $400,000. W. S. Fallis, care of State Highway Dept., Raleigh, engr.

N. C., Burnsville—Comrs. Yancey Co. plan to surface 27 mi. Marion-Micaville Rd. About $10,000. Engr. not selected.

N. C., Elizabethtown—Comrs. Bladen Co. plan to gravel roads. About $500,000. Address S. P. McNair, Tar Heel, chn. co. highway comn.

Fla., Clearwater—City voted $30,000 bonds as its share toward paving various streets. Total cost, $90,000.

Fla., Daytona—City voted $450,000 bonds to pave various streets.

Fla., Ft. Pierce—Comrs. St. Lucie Co. voted $20,000 bonds to build road from here to White City and $34,000 bonds for Okeechobee Rd. to Ten Mile Creek.

Fla., St. Augustine—See "Sewers."

Louisiana—State Highway Dept., New Orleans, soon lets contract gravel surfacing and draining 19.8 mi. Alexandria-Oberlin Highway, and 14.5 mi. Alexandria-Melville Highway, Rapides Parish. Former bids rejected. Noted Sept. 4.

La., Arcadia—Bienville Parish voted $1,000,000 bonds to build roads.

O., Bellaire—City election Nov. 4, to vote on $150,000 bonds to pave various streets, vitr. brick. H. Althar, city engr.

O., Columbus—City Council plans to grade, drain, curb, lay water mains and pave Ebner St., from Whittier to Siebert Sts., West Broad St. from Hague Ave. to west corporation line, and 11th Ave. from Cleveland to St. Clair Aves., also alley west of 17th St. from Bryden Rd. to Main St., alley west of Kellogg Ave. from Grove St. to second alley north, second alley north of Grove St. from Cleveland to Kellogg Aves., and alley north of Grove St. from alley west of and to Kellogg Ave., asphalt or brick. H. A. Maetzel, city engr.

O., Springfield—City plans to grade 1800 ft. Garfield Ave., 1st, 2nd, 3rd and 4th Sts., 30 ft. wide, involving 40,000 cu.yd. grading. About $21,000. W. E. Lucas, city engr.

Michigan—State Highway Comn., Lansing, soon lets contract grading, shaping, draining and surfacing 2 mi. State Trunk Line Rd. No. 24-8, Sects. A and B and 9.996 mi. No. 14-4, both 16 ft. wide, gravel, Isabella Co.; 1.716 mi. No. 10-9, Sect. B, 16 ft. wide, gravel, Alpena Co.; 0.994 mi. No. 33-1 and 1.006 mi. No. 32-2. 16 ft. wide, gravel, Oscoda Co.; 1.764 mi. No. 47-6, 16 ft. wide, gravel, Saginaw Co.; 2.343 mi. No. 13-1 and 3.072 mi. No. 17-3, 16 ft. wide, concrete, Kalamazoo Co.; 2.538 mi. No. 46-1, 16 ft. wide, gravel, Montcalm Co.; 3.759 mi. (shaping and draining only), No. 17-2, Sect. B, Jackson Co.; 0.979 mi. No. 11-15, 16 ft. wide, gravel, Grand Traverse Co.; 7.45 mi. No. 22-2, 16 ft. wide, gravel, Leelenau Co.; 2.536 mi. No. 16-1, 16 ft. wide, gravel, Lake Co.; 1.254 mi. No. 49-1, 16 ft. wide, gravel, Ingham Co.; 3.407 mi. (shaping and draining only) No. 13-11, Sect. B. Charlevoix Co.; 5.085 mi. Assessment Dist. Rd. No. 168, 12 ft. wide, Class "B" gravel, Midland Co.; 6.631 mi. No. 237, 12 ft. wide, Class "C" stone bottom, gravel top, Kalamazoo and St. Joseph Counties; 4.465 mi. road, 16 ft. wide, gravel, Sanilac Co. F. F. Rogers, comr.

Michigan—State Highway Comn., Lansing, soon lets contract shaping, grading and surfacing 5.848 mi. State Trunk Line Rd. No. 43-3, 16 ft. wide, involving 54,889 sq.yd. waterbound macadam; 5.025 mi. State Trunk Line Rd. No. 67-1, 16 ft. wide, 47,168 sq.yd. waterbound macadam and 13,468 cu.yd. earth excav., both Alger Co. F. F. Rogers, com.

Mich., Detroit—City soon receives bids grading, paving with asphaltic concrete on 6 in. concrete base and curbing with Medina stone, 1800 ft. Garland Ave. from Shoemaker to Harper Aves., 26 ft. wide, cost $26,750; 2300 ft. Marquette Dr. from Marquette Park to Jefferson Ave., 24 ft. wide, $30,720. C. W. Hubbell, city engr.

Ill., Chicago—Sanitary Dist. soon lets contract paving 8 mi. highway along North Shore Channel of district from Lawrence Ave., here to Sheridan Rd., Wilmette, 30 ft. wide, involving 170,000 sq.yd. 1 course concrete pavement, 2200 cu.yd. class A concrete, 160,000 cu.yd. excav. and filling, 20,000 ft. concrete curbing, 170,000 sq.yd. wire mesh reinforcing, 300 ton steel bar reinforcement, 32,000 sq.yd. broken stone shoulders, 12,800 ft. 12-18 in. vitr. pipe drains, 7 stone chimneys, 1800 ft. 12 in. clay tile drains, 27,500 ft. guard fence and 73 catchbasins. G. L. Wisner, ch. engr.

Wis., De Pere—City having plans prepared for 32,000 sq.yd. pavement and 20,000 lin.ft. curb and gutter. H. R. Albert, city engr.

Wis., Kiel—City plans to grade and pave 2.1 mi. Fremont St., between 1st St. and city limits, 18 ft. wide, involving 12,000 sq.yd. asphalt or concrete pavement and concrete curb and gutter. About $25,000. F. Muth, city engr.

Minn., East Grand Fork—City plans to build asphalt or concrete roads in Dist. No. 1. About $250,000. A. Briggs, clk.

Kan., Bonner Springs—City soon lets contract repairing 6700 sq.yd. and oiling 41,000 sq.yd. macadam pavement, constructing 1700 sq.yd. concrete pavement, 600 cu.yd. grading and 1400 cu.yd. curbing. Shockley Eng. Co., 740 Reserve Bank Bldg., Kansas City, Mo., engrs.

Kan., Kansas City—Comrs. Wyandotte Co. rejected bids received Aug. 30, grading, paving and building culverts 1¼ mi. road, 16 ft. wide, concrete. O. K. Williamson, Kansas City, engr. Noted Aug. 28.

Kan., Winfield—City plans to pave 18 blocks Bway, Ann and East 6th Sts., asphaltic concrete, concrete curbing and guttering. Engr. not selected.

N. D., Minot—City plans to pave ¾ mi. various streets, 30 ft. wide. About $20,000. E. J. Thomas, city engr.

Mont., Deer Lodge—Powell Co. voted $100,000 bonds to build roads. L. Williams, Deer Lodge, engr. Noted Jan. 26.

Mont., Great Falls—Cascade Co. voted $500,000 bonds to build Park-Park Highway and other roads. Noted June 26.

Mont., Hamilton—Ravalli Co. voted $100,000 bonds to build roads. L. Pertli, Hamilton, engr. Noted June 26.

Mont., Virginia City—Madison Co. voted $150,000 bonds to build roads. C. O. Adams, Virginia City, engr. Noted July 10.

Mo., Charleston—Mississippi Co. receives bids about Oct. 1, grading, draining, paving and building culverts on 15.3 mi. road from Charleston to Birds Point, 16 ft. wide, earth shoulders, involving 142,666 cu.yd. 2 course concrete on concrete base, 8 in. center and 6 in. sides. Plans also include one 70 ft. and one 60 ft. steel span bridges, concrete abutments, etc. About $475,000. Noted June 12.

Mo., St. Louis—See "Industrial Works."

Mo., St. Louis—Bd. Pub. Serv. soon receives bids resurfacing 2000 ft. Compton Ave. from Park to Choteau Aves., 35 ft. wide, involving 7333 sq. yd. vitr. brick; also 5250 ft. Page Blvd. from Vandeventer to Taylor Aves., 40 ft. wide, 22,150 sq. yd. asphalt, cost $62,150. C. M. Talbert, engr.

Tex., Ft. Worth—Tarrant Co. plans to grade, pave and build culverts on 5.8 mi. Ft. Worth and Dallas Rds., 20 ft. wide, concrete. About $245,982.

Tex., Lufkin—City plans to issue $75,000 bonds to improve various streets.

Oklahoma—State Highway Dept., Oklahoma, soon lets contract building 15 mi. road from Bortlesville south, 18 ft. wide, Federal Aid Project No. 15.

Okla., Ada—City having plans prepared by Johnson & Benham, engrs., Firestone Bldg., Kansas City, Mo., paving and guttering 65 blocks Main St. About $350,000.

Okla., Collinsville—City having plans prepared by Johnson & Benham, engrs., Firestone Bldg., Kansas City, Mo., paving 25 blocks, 25 ft. wide, brick or concrete. About $125,000.

Okla., Nowata—City soon lets contract paving various streets involving 63,000 sq. yd. brick, 41,580 cu.yd. excav., 41,950 combined curbing and guttering, 2380 ft. curbing, 840 ft. double guttering, 5000 ft. 10-24 in. storm sewers, 17 manholes and 51 catch basins. Archer & Stevens, New England Bldg., Kansas City, Mo., engrs.

Colo., Denver—City soon lets contract paving 7 blocks Acoma Dist. No. 1, asphaltic concrete, cost $43,431; 9760 sq.yd. concrete paving, Alley Paving Dist. No. 51, $20,831; 11,770 sq.yd. Alley Paving Dist. No. 50, $23,720. J. B. Hunter, city engr. Noted July 10.

Idaho, Lewiston—City plans to grade and pave new district, in eastern part of city. About $52,000.

Ariz., Mesa—City soon receives bids building 10 mi. cement walks. About $25,000.

Wash., Everett—City Comrs. rejected bids paving Baker Ave. from 23rd to 24th Sts., concrete, cost $11,205; also grading and building cement sidewalks on Virginia Ave. from Hewitt Ave. to 25th St., $13,506. Noted Sept. 11.

Wash., Port Orchard—City having estimates, plans and specifications prepared paving Bay St. from Harrison to Port Sts. Cost to exceed $10,000. W. A. McLeod, clk.

Wash., Tacoma—Comrs. Pierce Co. plan to pave 2 mi. Kapowsin Highway No. 23, concrete. About $40,000. E. A. White, co. engr.

Wash., Washtucna—City plans to build 21,864 sq.ft. concrete sidewalks and 2840 lin.ft. concrete curbs in Local Impvt. Dist. No. 1. Cost to exceed $10,000. A. J. Johnson, clk.

Wash., Yakima—Naches, Nob Hill, Cowiche and Tieton Rd. Dists. having preliminary plans prepared paving 7 mi. Harwood-Summitview Rd., concrete, also graveling 13 mi. roads leading from Harwood to Cowiche, Tieton and Naches Dists. About $140,000. W. C. Marion, co. engr. Noted Aug. 21.

Oregon—State Highway Comn., Salem, plans to grade and gravel 14 mi. road between Remote and Camas Valley, Coos Co. About $75,000. H. Nunn, state highway engr.

Ore., Forest City—City Council passed ordinance to drain, curb and pave Main St.; also 4th Ave. from 3rd to A Sts. Cost to exceed $10,000. W. P. Dyke, city recdr.

Cal., Marysville—G. W. Richards, city clk., receives bids about Nov. 1, improving 5th, 6th and D Sts. Work includes grading, 3 in. bituminous macadam pavement with 2 in. bitulithic surface, concrete curbs and gutters, 2 catchbasins, etc.

Cal., San Diego—City Council receives bids in November improving Granada St., involving 143,312 sq.ft. 5 in. concrete paving with oil and screenings top, 14,550 sq.ft. cement sidewalks, 2816 lin.ft. cement curb, etc. F. Rhodes, city engr.

Streets and Roads (Continued)

Ont., Pembroke—City plans to pave Sussex St. from McKay to Commercial Sts., McAllister St. from McKay to Commercial Sts., Pembroke St. from Commercial to Arnold Sts., and from K Hunts St. to Moffat's Crossing, Isabella St. from Maiden Lane to Doran St., 24 ft. wide, widening Lake St. and building concrete bridge over Muskrat River. Work involves 28,000 sq. yd. asphalt on concrete base and 16,000 lin.ft. concrete curbing. About $150,000. W. J. Moore, Pembroke, engr.

Ont., York—Town having plans prepared by F. Barber, engr., 40 Jarvis St., Toronto, for 15,850 ft. concrete sidewalks, 4 to 5 ft. wide. About $35,000.

Sask., Langham — Municipal Council passed by-law to expend $20,000 to improve roads and granolithic sidewalks.

Sask., Moosomin—Municipal Council soon receives bids building granolithic sidewalks; $28,000 has been appropriated for project. G. Polse, clk.

BIDS DESIRED

Massachusetts—Until Sept. 23, by State Highway Comn., Boston, building 5300 ft. road, 18 ft. wide, Wareham Twp., involving 10,000 sq.yd. asphalt macadam. A. W. Dean, state highway engr.

N. Y., Brooklyn—Until Sept. 24, by E. Riegelmann, boro. pres., regulating and repaving with permanent asphalt on 6 in. concrete foundation, roadway of High St. from Washington to Jay Sts., 4th Ave. from Bay Ridge to 5th Aves., with permanent Grade 1 old granite blocks on concrete foundation, Liberty St. from High to Fulton Sts.

N. Y., New York—Until Sept. 22, by F. L. Dowling, pres. Manhattan Boro., repairing asphalt pavements in railroad area, when and where directed by chief engineer, Bureau of Eng.

N. Y., S. I., St. George—Until Sept. 25, by C. D. Van Name, pres. Richmond Boro., regulating and repaving with bituminous concrete pavement and vitr. brick gutters on concrete foundation, roadway of North Burgher Ave. from Castleton Ave. to point 450 ft. south, with bituminous concrete pavement on concrete foundation, Sharpe Ave. from Richmond Terrace to Staten Island Rapid Transit R.R.

Pa., Ebensburg—Until Sept. 24, by Supervs. Summerhill Twp., c/o Comrs. Cambria Co., rebuilding 1.37 mi. road from Beaverdale to Wilmore, Summerhill Twp., also building concrete bridge over Laurel Run. About $100,000. Owen & Plummer, Otto Bldg., Johnstown, engr. Noted Aug. 21.

W. Va., Fayetteville—Until Oct. 6, by R. J. Stegall, clk. Fayette Co., paving 7 mi. highway, known as Beckman-Kanawha Falls Rd., 9 ft. wide, and building two 60 ft., one 24 ft. and one 18 ft. span bridges. Alternate bids will be received on asphaltic concrete, cement concrete, penetration macadam and other improved types of paving; advertised in this issue.

North Carolina—Until Sept. 28, by State Highway Comn., care of Division office, Greensboro, grading and gravel surfacing 8.2 mi. road, Person Co., cost $30,000; hard surfacing 4.6 mi. road, Guilford Co., $50,000. W. B. Fallis, Raleigh, state highway engr.

N. C., Concord—Until Sept. 25, by city, paving McGill, Church, Crowell, Marsh and Franklin Sts., involving 19,000 sq. yd. concrete. About $50,000. R. J. Long, city engr.

Ga., Trenton—Until Oct. 2, by Comrs. Roads and Revenues, Dade Co., building 9.8 mi. Federal Aid road, located 3 mi. south of here and Alabama state line known as Chattanooga-Birmingham Highway, involving 12 acres clearing and grubbing, 44,000 cu.yd. excav., 1050 cu.yd. concrete in headwalls, bridges, etc., 18,300 lb. steel reinforcing, in bridges, etc., 1400 lin.ft. vitr. clay pipe culverts, 25,500 cu.yd. sand clay surfacing; 2.4 mi. Federal aid road 4 mi. south of Wildwood and Tennessee state line, on Chattanooga-Birmingham Highway, involving 1 acre clearing and grubbing, 26,000 cu.yd. common and 6000 cu.yd. rock excav., 120 cu.yd. concrete in headwalls, bridges, etc., 1050 lb. steel reinforcing, in bridges, etc., 6250 cu.yd. sand clay surfacing and 450 lin.ft. vitr. clay pipe culverts. I. H. Wheeler, chn. Noted Sept. 4.

Ala., Montgomery—Until Sept. 30, by G. W. Barnett, city treas., paving 9150 sq.yd. High St. from Hull to Jackson Sts., brick, asphalt, bitulithic, mineral rubber, wood block, concrete, vibrolithic concrete or asphaltic concrete; advertised in this issue.

Louisiana—Until Sept. 25, by State Highway Dept., Maison Blanche Annex, New Orleans, ditching and surfacing 11.3 mi. Melville-Palmetto Highway, St. Landry Parish, 20 ft. wide, gravel. D. Buie, state highway engr.

Mich., Mt. Clemens—Until Sept. 25, by J. H. Mathews, city clk., grading, curbing and paving Grand Ave. and Leander St. from Washington St. to Cass Ave., brick, asphalt or concrete. About $40,000.

Ill., Chicago—Until Sept 22, by Bd. Local Impvts. paving Ave. G from East 106th to East 108th Sts., involving 2580 ft. concrete curbing, 5000 cu.yd. filling, 4870 sq.yd. paving with 8 in. blast furnace slag or limestone on 2½ in. granite or traprock, 9 catchbasins, cost $21,000.

South Park Ave. from East 77th to East 91st., 19,540 ft. concrete curbing, 21,000 cu.yd. excav., 41,400 sq.yd. paving with 8 in. blast furnace or slag or limestone on 2½ in. granite or traprock, 21 catchbasins, $137,500.

North California Ave. from Devon to Albion Aves., 2470 ft. concrete curbing, 2800 cu.yd. grading, 5800 sq.yd. paving with asphalt on 6 in. concrete, 8 catchbasins, $24,000.

Higgins Ave from Edmunds St. to Austin Ave., 6340 ft. concrete curbing, 9000 cu.yd. grading, 11,600 sq.yd. paving with asphalt on 6 in. concrete, 13 catchbasins, $56,000.

East 106th St. from Ave. H to Indianapolis Ave., 4710 ft. sandstone curbing, 15,500 cu.yd. filling, 7540 sq.yd. paving with 8 in. blast furnace slag or limestone on 2½ in. granite or traprock, 16 catchbasins, $30,000.

West 37th Pl. from Kedzie Ave. to point 299 ft. west, 640 ft. concrete curbing, 450 cu.yd. grading, 980 sq.yd. asphalt paving on 6 in. concrete, $4500.

Altgelt St. from Long to Central Aves., Lotus Ave from Fullerton to Wrightwood Aves., Linder Ave. from Fullerton to Wrightwood Aves., Luna Ave. from Fullerton to Wrightwood Aves., 10,550 ft. concrete curbing, 5000 cu.yd. grading, 14,450 sq.yd. paving with asphalt on 6 in. concrete, 12 catchbasins, $58,500.

Alley between East 63d and East 64th Sts., Langley and Champlain Aves., 410 cu. yd. grading, 1260 sq.yd paving with 7 in. concrete, $4300.

Alley between West 65th Pl., West 66th St., Stewart and Normal Aves., 196 cu.yd. grading, 1220 sq.yd. paving with 7 in. concrete surfaced with asphalt, $3900. C. D. Hill, ch. engr.

Minn., Brainerd—Until Oct. 11, by Comrs. Crow Wing Co., improving 3.5 mi. State Rd. No. 6, 24 ft. wide, involving 20 acres clearing and grubbing, 43,600 cu. yd. grading, 20,000 cu. yd. overhaul, etc. About $19,000. C. L. Motl, Brainerd, engr.

Minn., Duluth—Until Sept. 25, by J. A. Farrell, city comr., paving 2500 ft. 22nd Ave. W., from Superior to 7th Sts., 20-34 ft. wide, involving 3700 sq.yd. vitr. brick, 4190 sq.yd. concrete, 400 cu.yd. earth and 820 cu.yd. rock excav. About $50,000. E. K. Cae, city engr.

Minn., Montevideo—Until Oct. 7, by Comrs. Chippewa Co., improving 5 mi. Federal Aid Project No. 88, State Rd. No. 1, 24 ft. wide, involving 40,931 cu. yd. grading, 89,783 cu. yd. overhaul, 6000 cu. yd. graveling, etc. About $30,000. F. P. Nelson, Montevideo, engr.

Kan., Ft. Scott—Until Oct. 6, by Comrs. Bourbon Co., macadamizing 43,207 ft. Jefferson Highway, 16 ft. wide. About 125,000. B. Boyle, engr.

Kan., Iola—Until Sept. 29, by Comrs. Allen Co., building 17,110 ft. Sect. A and B, Project No. 21, macadam base with gravel top, also one 27 ft. span arch bridge, 20 ft. roadway, involving 17 cu.yd. concrete and 130 lin.ft. piling. About $125,000.

Kan., Lawrence—Until Sept. 27, by Comrs. Douglas Co., paving with concrete 39,307 ft. Sects. E and F, Federal Aid Project No. 7, 18 ft. wide, also building bridges and walls. L. Dufee, engr.

Neb., Lincoln—Until Sept. 29, by W. L. Minor, clk., Lancaster Co., paving 5½ mi. Park Blvd., Asylum-Penitentiary Rd. and 14th St., involving 48,300 sq.yd. vertical fibre, 18,600 sq.yd. asphaltic concrete or 66,900 sq.yd. concrete on 5 in. concrete base, 55,300 lin.ft. concrete curbing, 520 lin.ft. guttering and curbing, 20,000 cu.yd. earth excav., 270 ft. 18 in. and 850 ft 24 in. pipe, etc. About $290,000. A. H. Edgren co. engr.

Neb., Ralston—Until Sept. 23, by city clk., paving Burlington and 75th Sts., 20 ft. wide. Work involves 4700 yd. 6 in. concrete, 4200 lin.ft. curbing, 1000 yd. excav. and park guttering. About $17,500. H. A. Nelson Eng. Co., 424 Bee Bldg., Omaha, engrs. Noted Aug. 28.

Mo., Ridgeway—Until Oct. 6, by city, improving various streets, involving 24,700 sq.yd. concrete paving and 2500 cu.yd. concrete curbing and guttering. C. A. Stone, Ridgeway, engr.

California—Until Sept 22, by State Highway Comn., 515 Forum Bldg., Sacramento, paving 4.7 mi. road between Houston School and northerly boundary, San Joaquin Co., involving 20,000 cu.yd. excav., 4065 cu.yd Class "A" Portland cement concrete pavement, 150 cu.yd. Class "A" Portland cement concrete for culverts and monuments, etc.; 8.6 mi. road between 2 mi. north Acton and Palmdale, Los Angeles Co., 44,700 cu.yd. excav., 11,700 cu.yd Class "A" Portland cement concrete pavement, 260 cu.yd Class "A" Portland cement concrete for culverts and monuments etc., 1.3 mi. road between Russel Ranch and former easterly boundary, 1600 cu.yd. Portland cement concrete pavement; 5.2 mi. road between southerly boundary and Conejo Grade, 1500 cu.yd. excav. and 7000 cu.yd. Portland cement concrete, Ventura Co. A. B. Fletcher, state highway engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Maine—State Highway Comn., Augusta received only bid paving .21 mi. bituminous macadam road, Brunswick Twp., from Small & Ingalls, Bar Harbor, $9246. Noted Aug. 21.

★**Maine**—State Highway Comn., Augusta, let contract to A. D. Bridges Sons, Inc., Hazardville, grading, draining and surfacing 9.35 mi. Riverside Drive, 16 ft. wide Vassalboro Twp., involving 80,890 sq.yd bituminous macadam, 23,593 cu.yd earth and 570 cu.yd. rock excav., $253,273. Noted Aug. 12.

★**Massachusetts**—State Highway Comn., Boston, let contract building 9900 ft. road, 22 ft. wide, Norwell Twp., to W. F. Loud & Sons, Quincy, $21,093. Work involves 8250 gal. bituminous macadam surfacing, 3750 ton broken stone and 9900 cu.yd. earth excav. Noted Sept. 4.

★**Mass., Boston**—City let contract paving Conant, Parker Sts., et al, 40 ft. wide, involving 3600 sq.yd. asphalt on scarified macadam surface, to Bermudez Co., 246 1st St., $24,445; Harvard St. (Dorchester), 40 ft. wide, 2490 sq.yd. asphalt on 4 in. concrete base and 1280 cu.yd. earth excav., to Rowe Constr. Co., Brighton, $19,683.

New York—State Highway Comn., Capitol, Albany, received bids Sept. 9, improving roads in following counties: (a) Chautauqua Co., 4.29 mi. Fredonia-Silver Creek, Part 2, Rd. No. 8003; completing roads in following counties:

(b) Chautauqua Co., 4.94 mi. Silver Creek-Forestville, Rd. No. 1469,

(c1) Columbia Co., 7.14 mi. Hollowville-Craryville, Rd. No. 763, (c2) 7.77 mi. Claverack-Chatham, Part 2, Rd. No. 1332;

(d) Chenango and Madison Counties, 6.18 mi. Earlville-Hamilton, Rd. No. 5585,

(e1) Delaware Co., 5.84 mi. Colchester Delancey, Rd. No. 1272, (e2) 3.39 mi Franklin-Unadilla, Part 1, Rd. No. 1440, (e3) 4.31 mi. Delancey-Delhi, Rd. No. 1441-A.

(f1) Erie Co. 9.14 mi. Collins Center-Springfield, Rd. No 1333, (f2) 3.18 mi Transit, part 4, Rd No. 1334—A-1. (f3) 0.59 mi. Transit, Part 4, Rd. No. 1334—B-1.

(f4) 1.06 mi. Marilla-Marilla Sta., Rd. No. 1491-A, (f5) 3.02 mi. Transit-Wolcottsburg, Rd. No. 1493.

(g1) Fulton Co., 5.13 mi. Ephratahn-Kecks Center, Part 2, Rd. No. 620, (g2) 2.9 mi. St. Johnsville-Oppenhemin, Part 2, Rd. No. 621.

(h) Hamilton Co., 1.97 mi. Eagle Bay-Sixth Lake, Rd. No. 1098-A,

(i) Madison Co., 4.89 mi. DeRuyter-New Woodstock, Rd. No 5586-A.

(j) Ontario Co., 8.63 mi. Canandaigua Orleans, Rd. No 1278.

(k) Orange Co., 1.17 mi. Cornwall-West Point, Part 3, Rd. No. 5573,

(l) Otsego Co., 12.66 mi. Morris-Oneonta, Rd No. 1302.

(m) Tioga Co., 5.5 mi. Richford-Hartford Mills, Rd. No. 1452,

(n1) Tompkins Co., 3.38 mi. Brookton-Speedsville, Part 1 and Slatersville Springs-Caroline, Parts 3 and 4, Rd. No 1431, (n2) 5.86 mi. Cortland-Croton, Parts 3 and 4, Rd No. 1433, from

Constantine Constr. Co., 240 Dewey Ave. Buffalo, (a) $130,517, (f2) $106,253, (f3) $30,043;

E. J. Bailey, Brockton, (a) $132,326;

Felton Constr. Co., 1450 Michigan Ave., Buffalo, (a) $132,613, (b) $107,902;

Town Bd., Hanover, (b) $109,450;

A. Colarusso, Hudson, (c1) $74,698, (c2) $127,158;

Streets and Roads (Continued)

S. Beskin, Beacon, (c1) $76,803;
Belmar Contg. Co., Inc., Troy, (c1) $78,-661;
J. Walker, 19 Steuben St., Albany, (c2) $124,299;
H. W. Roberts & Co., 610 Lansing St., Utica, (d) $88,579, (g1) $134,186, (i) $119,080;
Paddelford & King, Sherburne, (d) $88,-658;
Lane Constr. Co., 37 Colony St., Meriden, Conn., (e2) $80,778;
Universal Steel Export Co., Inc., 26 Cortlandt St., New York City, (e3) $203,-499;
Rosoff Eng. Co., 15 Park Row, New York City, (e3) $210,149, (h) $52,036,
R. Hopkins, Troy, (e3) $213,777, (h) $53,467, (l) $228,988;
H. C. Schroeder, Mercantile Bldg., Rochester, (f1) $217,503, (f2) $112,378; (f3) $29,721;
E. J. Hessell, West Falls, (f1) $219,287;
Myer & Myer Corp., Depew, (f2) $112,-267, (f3) $30,918, (f4) $24,317, (f5) $64,-053;
Greenfield Constr. Co., 89 Main St., Hornell, (f4) $23,195, (j) $31,853;
F. W. Knickenberg Contg. Co., 702 Michigan Ave., Buffalo, (f4) $24,552;
P. H. Murray, Cutler Bldg., Rochester, (f5) $59,884,
Rossney Contg. Co., Buffalo, (f5) $60,-405.
Dale Eng. Co., Mann Bldg., Utica, (f5) $63,697, (g2) $35,873;
E. J. Anderson & Co., Albany, (g1) $133,-060;
H. A. Schaupp, Inc., Albany, (g2) $34,-950;
D. I. Snell, Canajoharie, (g2) $36,333;
D. J. Phelan & Co., Utica, (h) $52,315;
Conroy & Nixdorf, Oneida, (i) $109 052;
Monroe Rds. Co., Pittsford, (j) $31,271;
Troup & Sherwood Co., Haverstraw, (k) $29,199;
J. L. Hayes Constr. Co., Inc., 53 South Bway, Yonkers, (k) $30,243;
D. W. Robbins, Inc., Utica, (m) $98,290;
P. D. Conley, Ithaca, (n1) $70,314;
F. J. Foote Co., Inc., Nunda, (f5) $65,-041, (n2) $131,440;
DeGraff & Hogeboom, Inc., Kingston, (e1) $44,742. Noted Aug. 21.

★**N. Y., New York**—H. Bruckner, pres. Bronx Boro., let contract paving East 239th St., to Uvalde Asphalt Paving Co., 1 Bway, $7089; East 170th St., to Asphalt Constr. Co., 2197 Madison Ave., $11,673. Noted Sept. 4.

New Jersey—State Highway Comn., Broad St. Bank Bldg., Trenton, received bids building 3865 sq.yd. State Highway Route No. 1, Sect. 1A, Metuchen Twp., Middlesex Co., concrete, from M. I. Demarest, Seawarren, $34,466; J. F. Burke, Plainfield, $38,602. Noted Aug. 28.

★**N. J., Bridgeton**—Comrs. Cumberland Co. let contract building 2 mi. Bridgeton-Fairton Rd., 20 ft. wide, to A. H. Lupton, Bridgeton, $17,213.

★**N. J., Trenton**—Bd. Freeholders Mercer Co. let contract repaving East State St. and Whitehead's Rd., sheet asphalt and vitr. brick on Portland cement concrete base, to J. J. Barrett, 147 Lafayette Ave., $53,099. Noted Aug. 28.

★**Pa., Pittsburgh**—City let contract grading, paving and curbing McCandless Ave. from 53rd to 56th Sts., to F. and F. Diulus, 40 Boundary St., $28,951. Work involves 2273 sq.yd. vitr. brick and 1592 sq.yd. stone block on 6 in. concrete base, 3000 lin.ft. concrete curbing and 11,006 cu.yd. earth excav. Noted Aug. 28.

★**Pa., Waynesburg**—Comrs. Greene Co. let contract building concrete and vitr. brick road from Dry Tavern on Waynesburg Rd., to E. E. Morris, Waynesburg, $319.732.

★**W. Va., Beckley**—Raleigh Co. let contract paving 8.5 mi. Giles, Fayette and Kanawha Turnpike, 9 ft. wide, penetration macadam with 3 ft. broken stone shoulder, to Vaughn Constr. Co., Williamson. About $90,000. County will furnish asphalt. Noted July 31.

★**W. Va., Harrisville**—Ritchie Co. will grade and drain 4 mi. Harrisville-Smithville Rd., 26 ft. wide. About $35,000. Work will be done by day labor. About July 17.

★**W. Va., Keyser**—Comrs. Mineral Co. let contract building Elk Dist. Rd., to H. W. Kaylor & Co., 106 Arcade Bldg., Hagerstown, Md. Work involves 48,000 cu.yd. unclassified excav., $1.10 per cu.yd., 1000 cu.yd. borrow excav., $1.00, 40,553 cu.yd. concrete pavement, $2.55, 40,553 cu.yd. bituminous surface, $1.95, etc., total cost, $247,626. Noted Aug. 21.

★**W. Va., Martinsburg**—Berkeley Co. let contract grading and surfacing 8 mi. Winchester-Martinsburg Turnpike, to R. R. Feller, Martinsburg. About $83,000. Noted Aug. 14.

★**W. Va., Moundsville**—City let contract improving Cedar Ave. from 1st to 3rd Sts., to Stringer & Springer, Wheeling, $11,000.

★**W. Va., Ft. Marys**—Pleasants Co. will improve 5.4 mi. River Rd., 22 ft. wide, involving 32,400 cu.yd. excav. About $30,-800. Work will be done by day labor.

★**W. Va., Wheeling**—City let contract paving Eoff St., to C. B. Kimberly Co., 909 Natl. Bank of West Virginia Bldg., $21,-896; 16th St., to Stringer & Springer, Wheeling, $33,207; North Huron St., to Jacovetti & Savage, Wheeling, $26,639. Noted Sept. 4.

★**Fla., Leesburg**—City Council let contract paving various streets 2 in. asphaltic concrete on 4 in. concrete, to Southern Road Bldg. Co., Tampa. About $134,000. Noted June 19.

Louisiana—State Highway Dept. received bids building 13.35 mi. Port Allen-New Roads Highway, West Baton Rouge Parish, from Pelican Constr. Co., $110,546, W. S. Bonner, $111,255, G. W. Prutsman, $111,-274; contractors all of New Orleans. Noted Sept. 4.

Ohio—State Highway Comn., Columbus, received bids Sept. 12, building roads in following counties:

Ashtabula Co., Sect. "B" Cleveland-Meadville Rd., 1.44 mi., smoothing present roadway and resurfacing with brick, Dorsey Constr. Co., Findlay, $41,674.

Columbiana Co., Sect. "E-1" Lisbon-Canton Southern Rd., .51 mi., grading and paving with waterbound macadam, Jones Constr. Co., Salem, and W. F. Payne, Springfield, $19,765 each.

Gallia Co., Sect. "E-2" Gallapolis-Ironton Rd., 1.015 mi., garding, constructing bridges and culverts and paving with bituminous macadam, Miller & Miller, Gallapolis, $23,168.

Harrison Co., Sect. "N-1" Cadiz-Carrollton Rd., 2.40 mi., grading, constructing bridges and culverts and paving with bituminous macadam, R. L. Timmons, Cadiz, $63,581; L. B. Wilson, Newark, $63,074.

Sect. "N-2" Cadiz-Carrollton Rd., .48 mi., grading, constructing bridges and culverts and paving with bituminous macadam, R. L. Timmons, $12,046; L. B. Wilson, $12,045.

Lawrence Co., Sect. "L" Ohio River Rd., 4.386 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Mahl Bros., Ironton, $39,274.

Lorain Co., Sect. "Q" Milan-Elyria Rd., 1.21 mi., grading, building drainage structures and paving with rein.-con., Ohio Contg. Co., Elyria, $47,195; Elyria Constr. Co., Elyria, $45,511.

Mercer Co., Sect. "G" St. Marys-Celina Rd., 5.49 mi., grading, building drainage structures and paving with plain concrete, J. Lynn, Paulding, $153,478; John Wroe, 605 U. B. Bldg., Dayton, $154,120.

Sect. St. Marys-Celina Rd., .25 mi., grading and paving with plain concrete, Joseph Lynn, and Studebaker & Sons, Greenville, $6,870 each.

Sect. "D-2" Celina-Wabash Rd., 1.672 mi., grading, constructing drainage structures and paving with plain concrete, M. L. Hinton, Celina, $51,709; G. H. Heffner & Sons, Celina, $52,098.

Montgomery Co., Sect. "P" Dayton-Indianapolis Rd., .39 mi., grading, building drainage structures and paving with semi-monolithic brick, Foster Reighert Constr. Co., Dayton, $24,595; Fink Eng. Co. 1533 Germantown St., Dayton, $24,859.

Sect. "C" Dayton-Germantown Rd., 3.35 mi., grading, building drainage structures and paving with rein.-con, Williams & Little Co., 2365 Euclid Heights Bldg., Cleveland, $83,842; E. Kemmerer, Dayton, $92,-717; bituminous macadam, C. W. Conley, Eaton, $94 910; J. C. McCann, 262 Midland Ave., Columbus, $99,868.

Noble Co., Sect. "D" Caldwell-Woodsfield Rd., 3.929 mi., grading, constructing bridges and culverts and paving with waterbound macadam, W. M. Gray, Bowling Green, $92,440.

Sect. "E" Caldwell-Woodsfield Rd., 2.814 mi., grading, constructing bridges and culverts and paving with waterbound macadam, W. M. Gray, $57,898.

Sect. "F" Caldwell-Woodsfield Rd., 2.719 mi., grading, constructing bridges and culverts and paving with waterbound macadam, W. M. Gray, $59,833.

Perry Co., Sect. "Q" Newark-New Lexington Rd., 1.73 mi., grading, constructing bridges and culverts and paving with bituminous macadam, W. M. Gray, $48,522.

Sect. "R" Newark-New Lexington Rd., 3.068 mi., grading, constructing bridges and culverts and paving with bituminous macadam. W. M. Gray, $77,204.

Pickaway Co.; Sect. "T-1" Columbus-Portsmouth Rd., .44 mi., grading and paving with semi-monolithic brick, Winchell & McDaniel, Columbus, $15,606; J. F. Perry & Son, Chillicothe, $15,996.

Ross County, Sect. "B-1" Dayton-Chillicothe Rd., 1 mi. grading, constructing bridges and culverts and paving with concrete, O. M. Junk, Chillicothe, $25,876; J. F. Perry & Son, $25,953; monolithic brick, O. M. Junk, $15,902; J. F. Perry & Son, $16,928.

Sect. "A-1" Dayton-Chillicothe Rd., grading, constructing bridges and culverts and paving with concrete, O. M. Junk, $22,785; Brewer & Brewer Sons, Chillicothe, $23,622; brick, O. M. Junk, $15,417; Brewer & Brewer Sons, $16,609.

Scioto Co., Sect. "A-2" Portsmouth-Jackson Rd., 2 mi. grading, constructing bridges and culverts and paving with monolithic brick, S. Monroe & Sons Co., Portsmouth, $57,770; Harper & Ruel, Portsmouth, $53,562.

Shelby Co., Sect. "F" Sidney-Wapakoneta Rd., 3.521 mi., grading, constructing bridges and culverts and paving with plain concrete, F. E. Milligan, Mt. Victory, $99,265; John Wroe, $100,918.

Sect. "G" Piqua-Sidney Rd., 3.065 mi., grading, constructing bridges and culverts and paving with plain concrete, F. E. Milligan, $91,990; C. W. Conley, Eaton, $92,854.

Tuscarawas Co., Sect. "F" Canton-Canal-Dover Rd., 1.47 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Seipel & Wolfe Constr. Co., Youngstown, $38,579; J. C. McCann, $41,062.

Vinton Co., Sect. "D" McArthur-Gallapolis Rd., 3.62 mi., grading, constructing bridges and culverts, Ryan & Stone Constr. Co., Maumee, $22,822.

Warren Co., Sect. "D" Cincinnati-Columbus Rd., 4.05 mi., grading, constructing bridges and culverts and paving with waterbound macadam, Wilson Constr. Co., Xenia, and J. L. Raudebaugh, Montgomery, $64,590 each.

Wood Co., Sect. "A" Fremont-Perrysburg Rd., 3.48 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Muldoon & Bergman, Genoa, $71,871; Wire Bros. & Berman, Elmore, $72,513; bituminous macadam (A-1). Muldoon & Bergman, $69,921; Wire Bros. & Berman. $71,954.

Sect. "B" Fremont-Perrysburg Rd., 3.25 mi., grading, constructing bridges and culverts and paving with bituminous macadam, W. M. Gray, $62,933; Muldoon & Bergman, $61,582. Noted Aug. 28.

★**O., Cleveland**—City let contracts to Freshwater Paving Co., 11712 Detroit Ave., paving Henley Ave. from West 92nd to 99th Sts., cost $10,199. Nordica Ave. from West 73rd to 80th Sts., involving 18,950 sq.ft. 5 in. brick paving, $10,558. Noted Aug. 28.

★**O., Columbus**—G. A. Borden, dir. pub. serv., let contract resurfacing 2860 ft. St. Clair Ave. from Mt. Vernon Ave. to south end of viaduct, 30 ft. wide, asphalt, to A. G. Pugh, Columbus, $36,920. Noted July 31.

★**Mich., Detroit**—City let contract paving with sheet asphalt on 6 in. concrete foundation Medina curbstone, Epworth Blvd. from Tireman to Dailey Aves., 46 ft. wide, less double track space, to W. B. Brady Constr. Co., 1972 Grand River Ave., $58,759; Epworth Blvd. from Warren to Tireman Aves., 46 ft. wide less double track space, Detroit Asphalt Paving Co., 20 McGraw Bldg., $50,-016. Noted May 29.

Wisconsin—State Highway Comn., Madison, received bids improving County Line Rd., Dodge and Jefferson Counties, Federal Aid Project No. 72, involving (a) 15,474 cu.yd. earth excav., (b) 286 cu.yd. borrow excav., (c) 129 cu.yd. concrete in culverts, etc., from J. Finley, Janesville, (a) $.87 per cu.yd., (b) $.87, (c) $25, total cost, $20,344; P. W. Ryan & Sons, 214 Cherry St., Janesville, (a) $.85, (b) no bid, (c) $26, total, $21,355. Noted Sept. 11.

★**Wisconsin**—State Highway Comn., 601-602 Wilner Bldg., Green Bay, let contract improving Lake Shore Rd., Federal Aid Project No. 2, Manitowoc Co., to J. Young, Oconto, $52,189. Work involves 9624 cu.yd. earth excav., $.99 per cu.yd., 62 cu.yd. concrete in culverts, $24. 100 cu.yd. concrete bridges, $26. Noted Sept. 11.

★**Wisconsin**—State Highway Comn., La Crosse, let contract improving Fountain City, Winona Rd., Federal Aid Project No. 87, Buffalo Co., to Funk & Rasmussen, La Crosse, $42,890. Work involves 38,000 cu.yd. earth excav., $.54 per cu.yd., 2619 cu.yd. rock excav., $1.65. 133 sq.yd. concrete paving, $3. 227 cu.yd. concrete culverts, $27. Noted Sept. 4.

Streets and Roads (Continued)

★**Wisconsin** — State Highway Comn., Spooner, let contract improving Barron-Turtle Lake Rd., Federal Aid Project No. 101, Barron Co., to Swanson & Johnson, 5816 Oakes Ave., Superior, $48 797. Work involves 28,997 cu.yd. earth excav., $.70 per cu.yd., 5582 cu.yd. rock excav., $2, 476 cu yd. concrete culverts, $26, 12 acres clearing and grubbing, $100. Noted Sept. 4.

★**Ia., Davenport**—Comrs. Scott Co. let contract to R Condon, Omaha, Neb., paving Davenport-Durant Rd., $20,202; to Littig Constr. Co., 50 1st Natl. Bank Bldg., for 7514 cu.yd. earth excav., $4884, 335 cu.yd. macadam excav., $251 and 3200 yd. crushed rock, $4800.

★**Minn., Faribault**—Comrs. Rice Co. let contract to A. A. Guthrie & Co., 366 Jackson St., St. Paul, improving 5.5 mi. Federal Aid Project No. 77, 24 ft. wide, involving 48,732 cu.yd. excav., 6650 cu.yd. gravel surfacing, culverts, etc., $44,817, 4.3 mi. Federal Aid Project No. 69, 24 ft. wide, 15,824 cu yd. excav., 5157 cu.yd. gravel surfacing, culverts, etc., $19,318; to J. E. McKillip, Faribault, 4.6 mi. Federal Aid Project No. 68, 24 ft. wide, 33,483 cu.yd. excav., 5600 cu.yd. gravel surfacing, culverts, etc., $22,746. Noted July 31.

★**Minn., Spring Valley**—City let contract paving 6655 sq.yd. road, creosote wood block, to Campbell Constr. Co., 3050 Hennepin Ave., Minneapolis, $40,000.

★**Montana**—State Highway Comn., Helena, let contract gravel surfacing 5 mi. Manhattan-No. 1 Ranch Rd., Gallatin Co., to N. Story, Bozeman, $47,115. Noted Aug. 14.

★**Mont., Billings**—City let contract building 44,000 sq.ft. sidewalk, to McElroy & Holmden, 105 North Bway., $10,405.

★**Ark., Ashdown**—Comrs. Little River Co. let contract building 8 mi. road, 8 ft. wide, in Dist. No. 7, involving 19,000 sq.yd. gravel, to J. G. Sanderson, Pine Bluff. About $126,000.

★**Ark., Helena**—Comrs. Phillips Co. let contract building 63 mi. Helena-Ferguson Rd., 6 in. concrete, 14 ft. wide, to J. A. Burt, Gunnison, Miss. About $1,900,000.

★**Ark., Little Rock**—Comrs. Northern Rd. Impvt. Dist., Arkansas Co., let contract building 75.9 mi. road to Miller-Butterworth Co., 621 South Trust Bldg., for Warrenite, cost $1,140,000; to Gregory & Wilson, Newport, for gravel, $414,000; Vincennes Bridge Co., Vincennes, Ind., for bridges, $83 000. Noted Aug. 21.

★**Okla., Bartlesville**—Comrs. Washington Co. let contract hard surfacing 15 mi. Bartlesville Highway, 18 ft wide, concrete, to Western Paving Co., Terminal Bldg., Oklahoma. About $500,000.

★**Colorado**—State Highway Comn., Denver, let contracts paving 8.1 mi. Greeley-Denver Rd., Weld Co., 18 ft. wide, concrete, to Engineers Constr. Co., 807 7th St., Greeley, $22 000; 1.7 mi. Santa Fe Trail, Pueblo Co., 18 ft. wide concrete, Orman Constr. Co., Pueblo, $55,000; ½ mi. Longmont-Denver Rd., 18 ft. wide concrete, and ½ mi. Boulder Rd., 18 ft. wide, concrete, Boulder Co., to Colorado Bridge & Constr. Co., 306 Gas & Electric Bldg., Denver, $22 000 and $10,800 respectively. Noted Jan. 9.

★**Colo., Denver**—City let contract grading curbing and surfacing Harmon Impvt. Dist. No. 1, to J. V. Stryker, 2030 Welton Ave., cost $110,699; for sidewalks to R. M. Larson, 1309 Kalawath Ave., $45,023. Noted Sept. 3.

★**Ariz., Mesa**—City let contract paving Sect. 1 Tempe-Mesa Highway, 5 in. concrete pavement with 1½ in. bitulithic surface, to Southwestern Constr. Co 13th Ave. and Lincoln St., Phoenix, $34,706; Sect. 2, 6 in concrete pavement, near Mesa, to McElrath & Shumway, Mesa, $115,201. State will furnish cement.

★**Washington** — State Highway Bd., Olympia, let contract clearing, grading and draining 5.5 mi Pacific Highway from Blanchard to Allen, Skagit Co., to Knutzen Bros., Burlington $44,170; 1.9 mi. Pacific Highway from Marysville to Silvana, Snohomish Co., E. J. MacQuaid, 6556 3rd St., N. W., Seattle, $15,182; clearing, grading, draining and surfacing 6.7 mi. Pacific Highway from Castle Rock north, gravel, Cowlitz Co., H. McFee, Seattle, $241,318; 4 mi. North Bank Highway from Camas west, concrete, Clarke Co., Pacific Bridge Co., Salmon St., Portland, $142,874; 21.9 mi. Inland Empire Highway from Colfax to Central Ferry, crushed rock, Whitman Co., Ristvedt, Bragg Co., Colfax, $215,760; 7.8 mi Central Washington Highway, from Cheney to Tyler, crushed rock, Spokane Co., Genl. Constr. Co., 1324 Elm St., Spokane, $82,505. Noted Aug. 14.

★**Wash., Colville**—Town Council let contract paving 4 blocks and building 8 mi. cement sidewalks on Main and 1st Sts., to W. J. Doust, 1034 Indiana St., Spokane, $22,787.

★**Wash., Ritzville**—Comrs. Adam Co. let contract grading, draining and surfacing 12½ mi. Donohue Rd. No. 3, involving 109,139 cu. yd. earth and 4599 cu. yd. rock excav., and 22,304 cu. yd. crushed rock, to R. A. Sloan, Seattle, $131,274; 8½ mi. Donohue Rd. No. 4, 70 cu. yd. concrete, 18,058 cu. yd. earth excav. and 15,162 cu. yd. crushed gravel, to W. J. Smith & Co., Ritzville, $45,510. Noted Aug. 28.

★**Wash., Waterville**—Comrs. Douglas Co. let contract grading, draining and graveling 16 mi. L. I. D. Rd. No. 4, Sect. 2, near Withrow, to Mohr Constr. Co., Spokane, $91,000; 7½ mi. L. I. D. Rd No. 4, near Waterville, to S. G. Kinder, Spokane, $56,000. Noted Aug. 21.

★**Ore., North Powder**—City let contract building new concrete crossings and sidewalks, to Newton Bros. Cost to exceed $10,000.

Ore., Portland—Comrs. Multnomah Co. received bids Aug. 25, clearing, grubbing, grading, laying drainage pipes and building 5100 ft. Hospital Rd. No. 938, (1) iron pipe, (2) concrete pipe, from Western Constr. Co., Portland, (1) $31,620, (2) $31,681; Baker Bros., Portland, (1) $37,731, (2) $37,863; R. L. Ray, Portland, (1) $38,321, (2) $38,178. Noted Aug. 21.

California—State Highway Comn., Forum Bldg., Sacramento, received bids building Sect. B, Route 13, Div. 3, Federal Aid Project No. 27, Stanislaus Co., from Palmer & McBryde, Hooker-Lent Bldg., San Francisco, $157,943, Bates & Borland, Oakland Bank of Savings Bldg., Oakland, $196,119, G. S. Benson & Son, Stimson Bldg., Los Angeles, $198,325; Sect. B, Route 2, Div. 7, Federal Aid Project No. 24, Orange Co., G. R. Curtis, 2440 East 26th St., Los Angeles, $86 551; Fairchild-Gilmore, Wilton Co., 610 South Main St., Los Angeles, $101,949; Los Angeles Paving Co., Inc., 2900 Santa Fe St., Los Angeles, $105,243; Sect. G, Route 1, Div. 1, Federal Aid Project No. 18, Humboldt Co., Mercer-Fraser Co., Eureka, $150,476. Noted Aug 28.

★**California**—State Highway Comn., Sacramento, rejected bids paving 10.7 mi. road through Tejon Pass, near Rose Station, Kern Co. About $214,400. Work will be done by day labor. J. B. Woodson, Fresno, div. engr.

★**Cal., Bakersfield**—City let contract improving 17th, Q, Cedar, K Sts. et al, to Federal Constr. Co., Call Bldg., San Francisco, $100,000. Work involves surfacing at $.01 per sq.ft., 3 in asphaltic concrete base with 1½ in. bitulithic surface, $.19 sq.ft., concrete gutters, $.25 per sq.ft., cement sidewalks, $.17 sq.ft. and concrete curbs, $.40 per lin.ft. Noted Apr. 24.

Cal., Los Angeles—City received bids grading and paving with 4 in. concrete 2600 ft. Coast Blvd., 20 ft. wide, from W. D. McCray, 424 Amer. Bank Bldg., $24,340; W. Liddington, 460 West 68th St., $24,730; Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., $33,100.

★**Cal., Martinez**—Bd. Supervs. Contra. Costa Co. let contract paving 3 mi. Div. 14 county highways between Knightsen and Oakley, concrete, to Blanchard, Crocker & Howell, 58 2nd St., San Francisco, $83,616. Noted Aug. 21.

★**Cal., Porterville**—See "Railways" under California.

Railways

PROPOSED WORK

Ohio—Cleveland Ry., Leader News Bldg., Cleveland, receives bids about Sept. 30, building 3 mi. single track electric line on Ridge Rd. from Dennison Ave. to Big Creek. About $200,000. A. McKay, ch. engr.

Nevada—Tonopah-Divide & Goldfield Electric Ry. Co., Tonopah, organized by C. Stout, Reno, and others, plans to build 6 mi electric railroad from Pevert claim to Tonopah. R. W. Cattermole, Goldfield, ch. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**California**—Atchison, Topeka & Santa Fe Ry., Kerckhoff Bldg., Los Angeles, let contract building 15 mi. line from Porterville to Lucor to Sharp & Fellows Contg. Co., Central Bldg., Los Angeles. Work involves heavy grading, pile trestles, concrete culverts, etc.

Excavation and Dredging

PROPOSED WORK

Wash., Woodland — Irrigation — Comrs. Cowlitz Co. plan to build irrigation system to reclaim 1200 acres between Lewis River and railway, in Diking Dist. No. 11 About $50,000. G. J. Poysky, Kelso, engr.

Cal., Oxnard—Ditches—Oxnard D. D. voted $200,000 bonds to build open ditches and pipe drains. Olmsted & Gillelen, 1112 Hollingsworth Bldg., Los Angeles, engrs Work will probably be done by day labor Noted Aug. 14.

BIDS DESIRED

N. Y., Marcy—Excavation—Until Sept 24, by State Hospital Comn., Capitol, Albany, preparing subgrade of spur track involving 22,000 cu.yd. excav., 35 cu.yd. 2nd Class concrete, 15,000 lb. c.i. pipe laid, 1000 lb metal reinforcement, etc., for Marcy Hospital, here. About $23,155.

Ind., Greenfield—Drainage—Until Oct 4 by C. Hoskett, supt. construction, Hancock Co., building John T. Collins Drain, involving 29,789 ft. 10-30 in. tile drain. C. Boone, Greenfield, engr.

Wis., Sheboygan — Excavation — Until Sept 21, by J. Donohue, engr., York Bldg., excavating and installing 7500 ft. 8-10 and 12 in. tile drain, for Sheboygan Co. About $15,000.

Minn., Benson—Ditch—D. P. Carney, aud. Swift Co., receiving bids building Ditch No. 19, involving 53,600 ft. 5-20 in tile. About $15,397.

Minn., Ivanhoe—Ditches—A. L. Swenson, aud. Lincoln Co., receiving bids building Co. Ditch No. 40, involving 13,453 yd. open ditching, No. 42, 32,405 yd. open ditching, cleaning Job No. 7, 7638 yd. open ditching and 2000 ft. tile. About $67,000. E. Haygun, Ivanhoe, engr.

Minn., Olivia—Until Oct. 7, by A. O. Schmidt, aud. Renville Co., building Ditch No. 75. About $115,889. F. M. Shepherd, Olivia, engr.

Ark., Marianna — Dredging—Until Sept. 23, by Daggett & Daggett, engrs., Marianna, building 22 mi. floating dredge work in Black Swamp D. D., Lee Co., involving 650,000 cu.yd. excav.

Ark., Marianna—Dredging—Until Sept. 23, by Comrs. Larkin Creek D. D., at office of Daggett & Daggett, Marianna, building 8½ mi. floating dredge work, involving 214,000 yd. excav.

Ark., Marianna—Dredging—Until Sept. 23, by Comrs. Lee-Phillips D. D., at office of Daggett & Daggett, Marianna, building 30 mi. floating dredge work, involving 1,905,000 cu.yd. excav.

Cal., Colusa—Levee—Until Sept. 26, by Trustees Sacramento River West Side Levee Dist., 858 Mills Bldg., San Francisco, building and raising levee, (floating dredgework). About $50,000. F. H. Tibbetts, Alaska Commercial Bldg., San Francisco, engr.

N. B., St. John—Dredging—Until Sept. 23, by Dept. Pub. Wks., Ottawa, Ont., dredging here. About $125 000. K. M. Cameron, c/o Dept. Pub. Wks., engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract

★**Conn., Bridgeport** — Excavation — See "Miscellaneous."

★**Iowa, Avoca**—Drainage—D. D. No. 15 let contract building 5 mi. drainage ditches involving 400,000 yd. dry excav., to S. O. Briggs Co., 925-7 City Natl. Bank Bldg., Omaha, Neb., $.11 per yd. Total cost, $44,000.

★**Minn., Faribault** — Excavation — See "Streets and Roads."

Utah, Fillmore—Drainage—Bd. Supervs. Millard Co. received bids furnishing labor and matarials building (a) system in D. D. No 1, (b) D. D. No 4, from C. Thompson, Omaha, Neb., (a) $208,067, (b) $381,023; Heussen & Packard, Atlas Bldg., Salt Lake City, (a) $241,432, (b) $164,105 Noted Aug. 14, under Hinckley.

Utah, Salt Lake City—Drainage—Brighton D. D. No. 1, Salt Lake Co., received bids furnishing labor and materials improving system, from Heussen & Packard, Atlas Bldg., $150,115; C. Thompson, Omaha, Neb., $175,065. Noted July 24.

Industrial Works

PROPOSED WORK

Vt. Swanton—Park & Pollard Co. plans to build brick and concrete grain elevator to replace one recently destroyed by fire. About $60,000. Architect not selected.

Indusrial Works (Continued)

Mass., Great Barrington—Stanley Insulating Co. plans to build 2 story brick and mill construction addition to factory. About $35,000. Private plans.

Mass., Worcester—J. N. Maguire Co., 745 Boylston St., Boston, having plans prepared by Appleton & Stearns, archts., 53 State St., Boston, for brick and rein.-con. garage, sales and service building, on Park Ave. About $60,000.

Mich., Filer City—Manistee Drop Forge Co., Manistee, purchased site and plans to build rein.-con., brick and steel plant, here, C. G. Briggs, secy. Architect not selected.

R. I., Providence—Arpin, Avila & Adolh, 33 Appleton St., having plans prepared for 1 story brick, concrete and steel garage, rein.-con. flooring, concrete foundation, on Manton Ave. and Cyril St. About $25,000. Private plans.

R. I., Providence—General Baking Co., 207 Brook St., having plans prepared by J. E. Byrne, archt., 45 East 17th St., New York City, for brick and rein.-con. bakery, on John and William Sts. About $150,000. Noted July 31.

R. I., Riverpoint—Royal Mills plans to build 3 story, 150 x 500 ft. weave shed and rebuild old spinning mill. About $500,000.

Conn., Hartford—H. Dragat, 340 Windsor Ave., having plans prepared by G. Zunner, archt., 756 Main St., for 2 story, 50 x 72 ft. mill construction warehouse, rein.-con. flooring.

Conn., New Haven—Alper, Krall & Co., 44 Crown St., soon lets contract building 4 story, 83 x 100 ft. brick and mill construction factory, concrete foundation, on Greene and Olive Sts. About $75,000. Brown & Von Beren, 185 Church St., archts. Noted July 31.

Conn., West Haven (New Haven P. O.)—New Haven Machine Co., 179 Milford Turnpike, Allingtown, soon receives bids building 2 story, 44 x 100 ft. brick and mill construction shop, concrete foundation on Milford Turnpike. About $25,000. Private plans.

N. Y., New York—M. Hausle, engr. and archt., 3307 3rd Ave., preparing plans for asphalt plant, 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $100,000. Owner's name withheld.

N. Y., New York—Hoover Letter Serv., Inc., 387 4th Ave., having plans prepared by V. C. Farrar, archt. and engr., 4 East 39th St., for altering 5 story, brick and steel garage, rein.-con. flooring, at 117 West 46th St. About $25,000

N. Y., Watertown—Watertown Silk Mfg. Co., 35 Fairbanks St., plans to build 2 story, 60 x 180 ft. brick factory, concrete foundation, on Hamilton and Central Sts. About $50,000. Engineer not selected.

Pa., Phila.—Amer. Preserve Co., 946 Beach St., having plans prepared by Peuchert & Wunder, archts. and engrs., 310 Chestnut St., building 5 story, 80 x 250 ft. brick factory and 1 story, 50 x 70 ft. boiler house, on 3rd and Lehigh Sts.

Pa., Phila.—W. F. Koelle & Co., archts., 26th and Oxford Sts., rejected bids building 7 story, 49 x 186 ft., rein.-con. and brick ice cream plant on 8th and Cumberland Sts., for Breyer Ice Cream Co. Noted Aug. 14.

Pa., Phila.—J. W. Vandergrift, care of Clark & Dudnick, archts., Drexel Bldg., soon receives bids building 2 story, 57 x 175 ft., brick garage on 12th and Cambria Sts. About $50,000.

Md., Frederick—Fiber Co. of North America, McLachlen Bldg., Wash., D. C., plans to build linen fiber factory, here. Address J. M. Thomas, Frederick.

N. C., Southport—Cape Fear Fish Fertilizer Co., plans to build 1 story, 125 x 300 ft. plant. About $250,000.

La., Winnfield—Winn Parish Lumber Co. plans to build mill. About $500,000. J. S. Welsh, Shreveport, secy.

O., Cleveland—Cleveland & Sandusky Brewing Co., Amer. Trust Bldg., plans to build 2 story, 100 x 170 ft. rein.-con., steel and brick addition to bottling plant, on East 55th St. About $100,000. Architect not selected.

O., Cleveland—Federal Packing Co., East 4th St., plans to build 4 story, 40 x 115 ft. rein.-con., steel and brick cold storage plant. About $100,000. Architect not selected.

O., Cleveland—Fink Body & Fender Co., 2075 East 65th St., preparing plans for 2 story, 62 x 101 ft., rein.-con., steel and brick factory and repair shop. About $60,000.

O., Cleveland—F. A. Foyer, Schofield Bldg., having plans prepared by G. S. King, archt., Permanent Bldg., for 6 story, 88 x 95 ft., rein.-con., steel and brick garage and sales room, at 1341 Chestnut St. About $50,000.

O., Cleveland—S. Levin, 2407 East 46th St., plans to build 2 story, 116 x 139 ft., rein.-con., steel and brick garage, on Warren Rd. About $50,000. Architect not selected.

O., Cleveland—Pioneer Mfg. Co., East 103rd St. and Harvard Ave., plans to build 2 story, 170 x 200 ft., rein.-con., steel and brick factory, at 3053 East 82nd St. About $50,000. Architect not selected.

O., Cleveland—Western Electric Co., 413 Huron Rd., plans to build 6 story, 100 x 100 ft., rein.-con., steel and brick, warehouse and office, on Carnegie Ave. About $125,000. Architect not selected.

O., Cleveland—White Motor Car Co., East 79th St., preparing plans for 1 story, 200 x 600 ft., rein.-con., steel and brick addition to factory. About $600,000.

O., Cleveland—Zenith Tire & Rubber Co., Schofield Bldg., having preliminary plans prepared by A. W. Harris, archt., Schofield Bldg., for plant on Euclid Ave., to include several 1 story, rein.-con., steel and brick buildings. About $10,000,000.

O., Dayton—Sun Co., Woodville St. and Belt Ry., Toledo, plans to build 2 story, 100 x 130 ft., brick warehouse, brick foundation, on Wampum St., here. About $60,000. Architect not selected.

O., Delphos—Amer. Road & Mchy. Co had plans prepared for large addition to plant. Cost including equipment, $300,000.

O., Mount Vernon—Knox Tire & Rubber Co. having plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., Cleveland, for 2 story, 90 x 200 ft., rein.-con., steel and brick factory and office. About $100,000.

O., Wooster—Buckeye Aluminum Co. having preliminary plans prepared for factory. About $125,000.

Mich., Bay City—J. P. Beck, 201 South 2nd St., Saginaw, having plans prepared by R. E. Bickell, archt., Bay City, for 3 story, 100 x 100 ft., rein. con., brick and steel garage, store room and office, rein. con. flooring, concrete foundation, on Washington St., here. About $60,000. Noted Aug. 21.

Mich., Detroit—H. S. Angell, archt., 722 Free Press Bldg., preparing plans for 2 story, 31 x 132 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Jones St. About $30,000. Owner's name withheld.

Mich., Detroit—General Ice Delivery Co., Grand River Ave., having plans prepared by D. R. Wells, archt., 435 Woodward Ave., for 1 story, 36 x 322 ft. brick, frame and tile storage plant, rein.-con. flooring, concrete foundation on Warren Ave.

Mich., Detroit—H. M. Lane Co., engrs., 701 Owen Bldg., receives bids about Sept. 25 building 1 story, 100 x 200 ft., concrete and steel foundry, rein. con. flooring, concrete foundation, on Herrick St. and Vernor Ave., for Monarch Fdry. Co., 895 Greenwood Ave. Noted Sept. 11.

Mich., Detroit—Mildner & Eisen, archts., 924 Hammond Bldg., receives bids about Sept. 20, for 2 story, 60 x 100 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on Mack Ave., for Tivoli Brewing Co., 1555 Mack Ave.

Mich., Detroit—J. L. Miller, archt., 15 Goeble Bldg., preparing plans for 2 story, 43 x 100 ft., brick, steel and stone factory, rein. con. flooring, concrete foundation, on Milwaukee Ave. and Orleans St. About $35,000. Owner's name withheld.

Mich., Filer City—Manistee Drop Forge Co., Manistee, purchased site here, and plans to build rein.-con., brick and steel plant. C. G. Briggs, secy. Architect not selected.

Mich., Flint—Champion Ignition Co. soon lets contract building 3 story, 108 x 178 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on Industrial Ave. and Harriet St.

Mich., Port Huron—Chief Motor Co. purchased 10 acre site on Elmwood St. and plans to build large plant. H. S. Erd, mgr. Architect not selected.

Mich., Saginaw—Cooper & Beckbissinger, archts., 114 South Jefferson St. receive bids about Sept. 20, building 4 story, 100 x 120 ft. brick, steel and concrete factory, concrete foundation. Owner's name withheld. Noted Sept. 11.

Ill., Chicago—P. Gerhardt, archt., 64 West Randolph St., soon receives bids building 2 story, 25 x 180 ft. rein.-con., steel and terra cotta addition to press room and offices, rein.-con. flooring, concrete foundation, at 316 West Madison St., for Illinois Publishing Co., Hearst Bldg. About $100,000.

Ill., Chicago—W. R. Johnston Mfg. Co., 359 East Ohio St., acquired 150 x 750 ft. site on Schubert and Fullerton Aves. and plans to build factory. About $100,000. Architect not announced.

Wis., Fairchild—Wisconsin Canned Food Co. plans to build 4 story, 90 x 150 ft. rein.-con. and brick factory, rein.-con. flooring, brick foundation, on Main St. About $40,000. Architect and engineer not selected.

Wis., Ft. Atkinson—James Mfg. Co. plans to build 1 story, 400 x 500 ft. brick, tile and steel factory, rein.-con. flooring, brick foundation. About $100,000. J. G. Shodron, Ft. Atkinson, archt. and engr.

Wis., Hartford—City having plans prepared by Cahill-Douglas, archts., Gross Bldg., Milwaukee, for 1 story, 60 x 110 ft., brick, rein.-con. and steel power plant, rein.-con. flooring, brick foundation. Cost between $50,000 and $60,000.

Wis., Sheboygan—Globe Fdry. Co., 9th St., plans to build 2 or 4 story, 60 x 250 ft. brick, rein.-con. and steel foundry, rein.-con flooring, brick foundation, on Wildwood Ave. and 18th St. About $60,000. Architect and engineer not selected.

Ia., Waverly—Iowa Sugar Co. plans to build warehouse and pulp mill, both 3 story, 50 x 100 ft., concrete and steel, concrete foundation. About $700,000. Architect and engineer not selected.

Neb., Omaha—Omaha Flour Mills Co., 820 1st Nat'l. Bank Bldg., plans to build 7 story mill. About $600,000. Architect not selected.

Mo., St. Louis—Certain-t-eed Products Corp., Boatmen's Bank Bldg., soon receives bids building 4 story, concrete and brick factory on Union Ave. About $100,000. E. C. Taxis, engr., and Klipstein & Rathman, archts., both in Chemical Bldg.

Mo., St. Louis—Genl. Motors Co., Union and Natural Bridge Rds., plans to build storage houses, sheds and railway tracks at $3,000,000 factory now under construction, also vitr. brick and concrete driveway and road section on Natural Bridge Rd. near Union Rd. About $75,000. W. H. Kilpatrick, c/o owner, engr.

Tex., Wichita Falls—Ft. Worth & Denver R. R., Ft. Worth, plans to build 2 story, concrete, freight station. About $200,000. R. C. Gowdy, 1420 Washington Ave., Ft. Worth, ch. engr.

Ariz., Phoenix—Arizona Fruit & Storage Co. having plans prepared by Shepard & Hamm, archts. and engrs., Central Bldg., Pasadena, Cal., for 90 x 160 ft., rein.-con and brick packing plant, concrete foundation. About $50,000.

Wash., Chelan Station (Chelan P. O.)—Orchard Co. plans to build warehouse, 3 story, 60 x 100 ft., brick and hollow tile, concrete foundation, to include packing rooms, storage and shipping facilities, etc. About $50,000. Private plans.

Wash., Fairview (Seattle P. O.)—A. Kristoferson Co., Eastlake Ave., plans to build milk plant 2 story, 100 x 100 ft., concrete, concrete foundation, to include refrigerating plant, mechanical carriers, elevators, power and compressed air plants, etc. About $50,000, exclusive of equipment. E. Story, New York Blk., Seattle, archt.

Wash., Leavenworth—Pelshastin Lumber Co. plans to rebuild box factory and saw mill, concrete and frame. About $75,000. Private plans

Ore., Bend—Bend Water, Light & Power Co. plans to build 1000 k.w. steam plant to double present power output. About $100,000. T. H. Foley, Bend, mgr.

Ore., Corvallis—Whiteside & Locke Hardware & Implement Co., purchased site on 3rd and Madison Sts. and plans to build 2 story, 50 x 100 ft. brick addition to plant. About $50,000. Private plans.

Ore., Myrtle Point—L. H. Pearce purchased site east of present property and plans to build 1 story, 90 x 100 ft. cement addition to garage. About $55,000. Architect not selected.

Ont., Cornwall—Firestone Tire & Rubber Co. South Main St., Akron, O., plans to build 3 story, factory here, probably concrete or steel. About $200,000. Engineer not selected.

Indusrial Works (Continued)

Cal., Chino—Libby, McNeil & Libby, 38 South Dearborn St., Chicago, purchased cannery here and plans to build 2 or 3 story rein.-con. addition, cost, $100,000 also spend $250,000 for other buildings and machinery.

Cal., Long Beach—Trident Packing Co. plans to take over plant of Pacific Packing Co. and build refrigeration and cold storage plants. About $50,000.

Cal., Oakland—Pacific Coast Shredded Wheat Co. 14th and Union Sts., having plans prepared by J. S. Bogart, archt., Mills Bldg., San Francisco, for 8 rein. con. wheat elevators with 100,000 bu. capacity. About $100,000.

Cal., Pasadena—Warnerlite Co., 45 South Raymond Ave., having plans prepared by Shepherd & Hamm, archts. and engrs., Central Bldg., for 1 story, 260 x 300 ft. factory and 1 story, 80 x 100 ft. administration building with two 60 x 80 ft. wings, rein.-con. and brick, concrete foundation, on Marengo Ave. About $100,000. Noted Aug. 21.

Sask., Melville—Grand Trunk Pacific Ry., McGill St., Montreal, Que., plans to build electric power plant here. About $110,000. H. R. Safford, ch. engr.

BIDS DESIRED

Conn., Bridgeport—See "Buildings."

N. Y., Marcy—Until Oct. 7, by State Hospital Comn., Capitol, Albany, for 1 story, 65 x 280 ft. central heating plant and 1 story, 80 x 120 ft. boiler room, brick and steel, concrete foundation, for Utica State Hospital, Marcy Division, here. Equipment includes three 500 hp. boilers, 2 fan blowers, one 125 kw. and one 75 kw. generators, pumps, meters, complete coal and ash handling equipment, motors, etc. About $500,000; advertised in this issue.

Pa., Pittsburgh—S. A. Maxwell & Co. receiving bids constructing 9 story, 52 x 88 ft. rein.-con. wholesale building, concrete foundation, on Isabella and Sandusky Sts. Hunting-Davis Co., Century Bldg., archts. Noted Aug. 21.

O., Canton—Canton Ice Delivery Co., Massillon, receiving bids building 1 story, 80 x 90 ft., rein.-con., steel and brick storage plant, on Navarre St., here. About $100,000. A. C. Bishop, Guardian Bldg., Cleveland, archt.

O., Cleveland—City Ice Delivery Co., 1935 Euclid Ave., receiving bids constructing 1 story, 100 x 140 ft., rein.-con., steel and brick storage building, on Euclid Ave. About $60,000. Private plans.

O., Cleveland—Cleveland Ry., Leader-News Bldg., receiving bids building 5 story, 49 x 80 ft., rein.-con., steel, terra cotta and brick sub-station at 13006 Woodland Ave. About $50,000. C. H. Clark, engr.

O., Cleveland—Cream Cone Mchy. Co., 5454 Hough Ave., receiving bids building 2 story, 54 x 54 ft., rein.-con., steel and brick factory, at 5808 Hough Ave. About $30,000. Private plans.

O., Cleveland—Cross Candy Co., 1966 East 66th St., receiving bids building 1 story, 47 x 140 ft., rein.-con., steel and brick factory, at 6509 Hough Ave. About $75,000. Private plans.

O., Cleveland—G. S. Rider, archt., Century Bldg., receiving bids building 1 story, 91 x 161 ft., rein.-con., steel and brick addition to factory, for Par Brook Co., Brook Park Rd. About $25,000.

O., Cleveland—White Motor Car Co., East 79th St., receiving bids building 2 story, 210 x 884 ft., rein.-con., steel and brick machine shop. About $175,000. Private plans.

O., Columbus—W. S. Ferguson Co., archts., 1900 Euclid Ave., Cleveland, receiving bids building 2 story, 63 x 183 ft. rein.-con., steel and brick garage, on Gay St., for Columbus Oldsmobile Co., 134 Gay St. About $60,000.

Mich., Detroit—Brown & Preston, archts., 406 Empire Bldg., receiving bids for 2 story, 65 x 100 ft., brick and steel addition to bakery, rein.-con. flooring, concrete foundation, on 4th St. and Merrick Ave., for Mills-Fox Baking Co., 4th St. and Merrick Ave. About $30,000. Noted Sept. 11.

Mich., Detroit—A. Kahn, archt., Marquette Bldg., receiving bids for 1 story, 275 x 528 ft., rein. con., brick and steel factory, rein. con. flooring, concrete foundation, for Paige Detroit Motor Car Co., McKinstry and Fort Sts., W.

Wis., Edgarton—Until Sept. 27, by Continental Axle Co., building 2 story, 60 x 275 ft. brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on Main St. About $50,000. Private plans.

Minn., West Duluth (Duluth P. O.)—Duluth Showcase Co., West Superior St., Duluth, receiving bids for 3 story, 75 x 285 ft., concrete and steel factory at 2800 West Superior St. About $150,000. A. Puck, Torrey Bldg., Duluth, archt. Noted Sept. 4.

Okla., Muskogee—O. T. Grahm, 16th St. and Emporia Ave., receiving bids building 1 story, 100 x 100 ft., rein.-con. steel and brick garage, rein.-con. flooring, concrete foundation. About $50,000. H. O. Valeur & Co., 705 Phoenix Bldg., archts.

Que., Cap de la Madeleine—Until Sept. 27, by Tidewater Shipbuilders Ltd., Three Rivers, building 2 story, 40 x 62 ft., steel and brick machine shop, concrete foundation, on river front here. About $50,000 M. Mapes, Canadian Pacific Ry. Bldg., Windsor Sta., Montreal, archt.

Sask., Melville—Until Sept. 24, by Sask. Co-operative Creamery Co., Regina, building 3 story, 47 x 50 ft., concrete, brick and steel creamery. About $60,000. Poole Constr. Co., Smith St., archts.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract

★**Mass., Boston**—E. N. Weyner let contract building 3 story, 60 x 175 ft. rein.-con. garage, at 1001 Commonwealth Ave., to N. Hurwitz. About $100,000.

★**Mass., Lowell**—Massachusetts Cotton Mills Canal St., let contract building rein.-con. and brick power plant, rein.-con. flooring, concrete foundation, to H. P. Cummings Constr. Co., 14 Prospect St., Ware. About $200,000.

★**Mass., New Bedford**—Natl. Spun Silk Co., Bullard St., let contract building 1 story rein.-con. power house., rein.-con. flooring, concete foundation, to J. G. White Eng. Co., 43 Exchange Pl., New York City. About $100,000.

★**Mass., New Bedford**—New Bedford Storage Warehouse Co., School and Water Sts., will build 6 story rein.-con. addition to warehouse, rein.-con. flooring, concrete foundation, on School St. About $75,000. Work will be done by day labor.

★**Mass., Thorndike**—Leary & Walker, engrs., Purchase St., New Bedford, let contract to J. J. Prindiville Co., 59 Concord St., Framingham, building 6 story, 75 x 163 ft. brick and concrete mill, rein.-con. flooring, concrete foundation, for Thorndike Co. About $175,000. Noted Sept. 11.

★**Mass., Worcester**—Coppus Eng. & Equipment Co., Inc., Park Ave., let contract building 1 story, brick, concrete and steel addition to foundry, rein.-con. flooring, concrete foundation, to G. W. Carr Co., 518 Main St. About $80,000. Noted Aug. 28.

★**Mass., Worcester**—Worcester Paper Box Co., 68 High St., will build 2 and 4 story, brick and rein.-con. garage, rein.-con. flooring, concrete foundation, on Austin St. About $100,000. Work will be done by day labor. Noted Aug. 14.

★**R. I., Pawtucket**—Darlington Textile Co., 48 Hughes Ave., let contract building 1 story, 50 x 100 ft. brick and mill construction weave shed, rein.-con. flooring, concrete foundation, to F. G. Rowley Co., 260 Central Ave. About $25,000.

★**R. I., Pawtucket**—Ervma Weaving Co., 30 Bayley St., let contract building 1 story, 90 x 114 ft. brick and mill construction weave shed, rein.-con. flooring, concrete foundation, on Privet St., to F. G. Rowley Co., 260 Central Ave. About $30,000.

★**Conn., New Haven**—New Haven Stove Repair Co., 488 State St., will build 1 story, 60 x 105 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on State St. About $25,000. Work will be done by day labor under supervision of J. Weinstein, archt., 6 Church St. Noted Aug. 21.

★**Conn., New Haven**—Texas Oil Co., 17 Battery Pl., New York City, will build 1 and 2 story, 38 x 100 ft. storage and office and 1 story, 40 x 56 ft. garage, rein.-con., rein.-con. flooring, concrete foundation, on Forbes Ave. About $35,000. Work will be done by day labor. Noted Aug. 14.

★**Conn., Waterbury**—F. A. Webster, archt., 51 West Main St., let contract to Tidewater Bldg. Co., 16 East 33rd St., New York City, constructing 1 story, 50 x 50 ft. shop, 2 story, 50 x 120 ft. foundry and 1 story, 100 x 100 ft. storage building, brick, rein.-con. flooring, concrete foundation, on Railroad Hill, for Manufacturers Fdry. Co. About $60,000. Noted Sept. 11.

★**N. Y., Hempstead**—Borden Farm Products Co., Main St., let contract building 1 story, 30 x 180 ft., brick and steel distributing plant, rein.-con. flooring, concrete foundation, to Miller-Reed Co., 103 Park Ave., New York City.

★**N. Y., New York**—J. Cohen, 243 Penn St., Brooklyn, will build 1 story, 80 x 98 ft. brick and steel garage, rein.-con. flooring, brick foundation, at 233 West 25th St., here. About $40,000. Work will be done by day labor.

★**N. Y., New York**—A. M. Fleming, 612 5th Ave., will build 2 story, 100 x 100 ft. brick and steel garage, rein.-con. flooring, brick foundation at 236 East 55th St. About $35,000. Work will be done by day labor.

★**N. Y., New York**—J. P. Stanley, 30th St. and North River, let contract altering and building 3 story, 100 x 175 ft. brick and steel addition to warehouse, to Fanning-Quinn, 105 West 40th St. About $100,000.

★**Pa., Carbondale**—Carbondale Machine Shop, Simpson St., let contract building 1 story, 80 x 220 ft., steel and hollow tile, machine shop, to Hughes-Foulkard Co., Commonwealth Trust Bldg., Phila. About $60,000.

★**Pa., Sharon**—N. Rosenblum, 83 Shenango St., let contract building 2 story warehouse on Pitt St., to Wallis & Carley, Bank St. About $100,000.

★**Md., Baltimore**—G. R. Callis, Jr., archt. Melvin Ave., Cantonville, let contract to West Constr. Co., 907 Amer. Bldg., for 5 story, 83 x 197 ft., rein.-con. and brick warehouse, concrete foundation, for Genl. Coffee & Tea Co., Light and Lee Sts. About $140,000. Noted Aug. 28.

★**D. C., Washington**—Hill & Tibbits, 1407 H St., N. W., let contract building 3 story, 100 x 100 ft., rein.-con. and brick garage and show room, on 14th and Ohio Sts., N. W., to R. P. Whitty, Union Trust Bldg. About $50,000.

★**N. C., Greensboro**—McGlanery Auto Co. let contract building 2 story, 85 x 200 ft. concrete garage, on Ashe St., to J. B. Couse, Greensboro. About $140,000.

★**N. C., Statesville**—Statesville Coco Cola Co. let contract building 2 story, 50 x 90 ft. brick plant, to F. Lawrence, Statesville. About $200,000.

★**Ala., Opelika**—Opelika Cotton Co. let contract building addition to mill, to Fiske-Carter Co., Greenville, S. C. About $100,000.

★**O., Cleveland**—Holam Mfg. Co., 4011 Clark Ave., let contract building 2 story, 80 x 116 ft., rein.-con., steel and brick factory, at 3809 Clark Ave., to F. J. Kuka, 4216 Warner Rd., Lakewood. About $40,000.

★**O., Cleveland**—G. W. Worder Co., 6530 Carnegie Ave., let contract building 2 story, 47 x 120 ft., concrete, steel and brick addition to factory, to H. G. Slatmeyer Co., Lakeside Ave. About $25,000. Noted Aug. 21.

★**O., Dayton**—Dayton Pipe Coupling Co. let contract building 1 story, 90 x 120 ft. rein.-con. and steel forge and machine shop, rein.-con. flooring, concrete foundation, on Edmund St. to J. Lowes, Schwind Bldg. About $50,000.

★**O., Kent**—Mason Tire & Rubber Co. let contract building 2 story, 80 x 120 ft., rein.-con., steel and brick addition to factory, on Erie St., to Cummins Blair Co., Leader News Bldg., Cleveland. About $60,000. Noted July 24.

★**O., Urbana**—Urbana Packing Co. let contract building 2 story, 30 x 75 ft. power house and 2 story, 30 x 60 ft. storage plant, rein.-con. and brick, rein.-con. flooring, concrete foundation, to J. A. Poss, Springfield. About $30,000.

★**Ind., Ft. Wayne**—Thieme Bros. Co., Park Ave., let contract building rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Rynnion and Morrison Aves., to Indiana Eng. & Constr. Co., 528 Lincoln Life Bldg. About $185,000.

★**Mich., Detroit**—A. Kahn, archt., Marquette Bldg., let contract to Bryan & Detwiler, Dime Bank Bldg., for 1 story, 241 x 446 ft. addition and 3 story, 80 x 225 ft. extension to factory, rein.-con. and steel, in West Grand Blvd. and Belt Line Ry., for Packard Motor Car Co., West Grand Blvd. Noted July 3

Industrial Works (Continued)

★**Mich., Detroit**—Young Bros., Franklin St., let masonry contract building 1 and 2 story, 105 x 161 ft., concrete, brick and steel factory, rein.-con. flooring, concrete foundation on Beufait Ave., to Krieghoff Co., 1187 Bellevue Ave.; carpentry, to C. Reisdorf, 753 Greenwood Ave. Noted Aug. 28.

★**Ill., Chicago**—Knight Light & Soda Fountain Co., 351 West Chicago Ave., let contract building 3 story, 77 x 210 ft. and 1 story, 160 x 200 ft. mill construction factory, concrete foundation, on Kildare and Schubert Aves., to W. F Peterson, 127 North Dearborn St. About $200,000.

★**Ill., Moline**—Moline Iron Wks. let contract building 1 story, 110 x 360 ft. and 110 x 400 ft. fireproof factories, to P. H. Lorenz, 413 Peoples Bank Bldg. About $200,000.

★**Wis., Chilton**—Aluminum Specialty Co., 17th and Wollmer Sts., let contract building 2 story, 60 x 200 ft. brick, and steel factory, rein.-con. flooring, brick foundation, on Main St., to Blake Constr. Co., Appleton, $71,020. Noted Sept. 4.

★**Wis., Milwaukee**—Edmonds Realty Co., let contract building 1 story 135 x 475 ft. brick and steel factory, concrete foundation, to H. J. Kusel, 35 South Dearborn St., Chicago. About $275,000.

★**Kan., Emporia**—McCord & Kistler Mercantile Co., 201 Kansas Ave., let contract building 2 story, 75 x 150 ft., rein.-con., steel and brick warehouse, rein.-con. flooring, rock and concrete foundation, to J. M. Leeper, State House, Topeka. About $71,000. Noted Aug. 28.

★**Neb., Omaha**—Item Biscuit Co., 202 Capitol Ave., let contract building 7 story, 118 x 132 ft., rein.-con., brick and steel addition to factory, rein.-con. flooring, concrete foundation, to C. F. Haglin & Son, 2706 10th Ave., Minneapolis, Minn. About $200,000.

★**Mo., St. Louis**—Landis Machine Co., 1515 North 25th St., let contract building 4 story, concrete and brick factory on 2nd and Gano Sts., to J. H. Bright Bldg. Co., Title Guarantee Bldg., $245,000.

★**Okla., Oklahoma**—Mideke Supply Co., 200 West 1st St., let contract constructing 1 story, 75 x 140 ft. warehouse and 3 story, 80 x 140 ft. main building, rein.-con and brick, rein.-con. flooring concrete foundation, at 200 East Main St., to Reinhart & Donovan, Insurance Bldg., cost plus percentage basis.

★**Ore., Portland**—Royal Bakery Co., 441 Everett St., let contract building 1 story, 70 x 90 ft. and 2 story, 16 x 44 ft additions to bakery, brick and concrete, concrete foundation, on Vancouver Ave and Ivy St., to R. O. Powers, 214 Ry. Exch. Bldg. About $50,000.

★**Cal., Los Angeles**—Standard Oil Co., 1727 North Spring St., let contract building 1 story, 30 x 284 ft. garage and 80 x 198 ft. machine shop, concrete, concrete foundation, at 1726 North Spring St., to E. F. Low, 343 Wilcox Bldg., $63,000.

★**Cal., San Francisco**—Simmons Co., 198 Bay St., let contract building 135 x 278 ft. brick and timber factory, on Bay and Stockton Sts., to F. B. Peake, 1247 2nd Ave. About $100,000. Noted Sept. 11.

★**Que., Montreal**—W. C. M. Rees, Ontario St., let contract building 4 story, 50 x 75 ft. steel and brick factory, concrete foundation, to Atlas Co., 37 Belmont St. About $70,000.

★**Ont., Port Arthur**—Canadian Natl Rys., 27 Wellington St., E. Toronto, let contract building rein.-con. grain elevator. 700 000 bu. capacity, here, rein.-con. flooring rock and concrete foundation, to Barnett & McQueen, Port Arthur. About $600,000, cost plus 10% basis.

Buildings

PROPOSED WORK

Mass., Amherst—Dormitory, etc.—Massachusetts Agricultural College having plans prepared by J. H. Ritchie, archt., 8 Beacon St., Boston, for 3 story, 60 x 155 ft., brick, steel and concrete dormitory and dining room, concrete foundation, on campus About $150,000. Noted May 15.

Mass., Framingham—School—Town having plans prepared by C. M. Baker, archt., 70 Equitable Bldg., Boston, for 2½ story, 16 room, brick, concrete and steel, on Hollis St. About $170,000. E. E. Bowers, clk. Noted May 22.

Mass., Framingham—School—Town having plans prepared by Kilham & Hopkins, archts., 9 Park St., Boston, for 2 story, 16 room, brick and steel, on Lincoln St. About $160,000. E. E. Bowers, clk.

Mass., Springfield—Home and Lodge—Knights of Columbus, 292 Worthington St., plans to build, brick, on Elm St. About $150,000. Architect not selected.

Mass., Worcester—Sales—See "Industrial Works."

R. I., Providence—Theatre and Business—S. Bomes, 71 Farragut Ave., having plans prepared by T. J. H. Pierce, archt., 230 Industrial Trust Bldg., for 1 and 2 story, 100 x 114 ft., brick and terra cotta, rein.-con. flooring, concrete foundation, on Broad and Gallatin Sts. About $50,000.

R. I., Woonsocket—Church—St. Michaels Greek Church, Blackstone St., having plans prepared by W. F. Fontaine, archt., Federal Bldg., for 1 story, brick. About $50,000.

Conn., Bridgeport—Church—L. A. Walsh, engr., 51 Leavenworth St., Waterbury, rejected bids building 50 x 130 ft., brick and steel, on Park Ave., for St. George Lithuanian congregation, Park Ave. and Johnson St. About $50,000. Project postponed until next spring. Noted Aug. 14.

Conn., Bridgeport—Theatre and Business—S. Z. Poli, 24 Church St., New Haven, plans to build brick, concrete and steel, on Main, Congress and Arch Sts., here. About $1,000,000. T. W. Lamb, 644-8th Ave., New York City, archt.

Conn., Bristol—School—City plans to build brick and steel, on Burlington Ave. About $125,000. Architect not selected.

Conn., Meriden—Cottages — Connecticut School for Boys having plans prepared by Ford, Buck & Sheldon, Inc., engrs., 60 Prospect St., Hartford, for 2 dormitory cottages. About $82,000.

Conn., Orange—School—Town plans to build 2 story, 8 room, brick and steel, school, on 1st Ave. and Lamson St. About $100,000. J. A. McLaughlin, 241 Spring St., West Haven, chn. Architect not selected.

Conn., South Manchester—Business—J. Mamacos, 785 Main St., plans to build 3 story brick and steel, on Main St. About $70,000. A. E. Fiske, 67 Bigelow St., archt.

Conn., Trumbull—Schools—Town having plans prepared by F. A. Cooper, archt., 1024 Main St., Bridgeport, for school, in Long Hill Dist and 2 story school in Nichols Dist., both brick. About $50,000 each. H. F. Randall, selectman. Noted Aug. 14.

Conn., Vernon—School—Town plans to remodel high school on School St. About $85,000. Architect not selected.

N. Y., Buffalo — Theatre — Famous Players-Lasky Corp., 485 5th Ave., New York City, plans to build brick, steel and stone, brick foundation, here. About $600,000. De Rosa & Pereira, 110 West 40th St., New York City, archts. and engrs.

N. Y., Lockport—Bank—P. A. Davis, archt., 1713 Sansom St., Phila., soon receives bids building 1 story, 50 x 60 ft. steel and stone, for Natl. Exch. Bank, 45 Main St. About $150,000. Noted July 17.

N. Y., New York—School—Bd. Educ. having plans prepared by C. B. J. Snyder, archt. and engr., Municipal Bldg., for 4 story, 92 x 194 ft. brick and steel, brick foundation, on Bathgate Ave. and 182nd St. About $420,000.

N. Y., New York—Theatre and Office—Famous Players—Lasky Corp., 485 5th Ave., plans to build 200 x 207 ft. brick, steel and stone, brick foundation, on Bway. between 43rd and 44th Sts. About $3.000,000. Architect or engineer not selected

N. J., Asbury Park—Theatre—T. W. Lamb, archt., 644 8th Ave., New York City, receives bids about Sept. 23, for alterations to brick, steel and stone, on Cookman Ave. and St. James Pl., for W. Rosenberg. About $100,000.

N. J., East Paterson—School—A. W. Gall, dist. clk. bd. educ., receives bids about November, building 8 room school in Dundee Lake Sect. About $75,000. Noted Sept. 12, 1918.

N. J., Trenton—Hotel—Stacy-Trent Co., Broad St. Bank Bldg., rejected bids received Sept. 3, building 10 story, rein.-con., brick and steel on West State St. About $1,000,000. Work will be readvertised. Noted Aug. 14.

N. J., Trenton—Theatre—W. J. Vernon, St. Regis Bldg, plans to build 2 story, 100 x 175 ft, brick and steel, on South Broad St. About $150,000. W. W. Slack & Son, St. Regis Bldg., archt.

Pa., Phila.—Bank—J. T. Brugger, archt., 505 Chestnut St., soon lets contract building 3 story, 60 x 75 ft., concrete and stone, on 3rd and Arch Sts., for Union Natl. Bank. About $100,000. Noted July 17.

Pa., Phila.—Store and Office—Marcus Felt Realty Co, 1303 Market St., plans to build 20 story, 75 x 150 ft. brick, steel and terra cotta, on Market and 13th Sts. About $2 500 000. Graham, Anderson, Probst & White, Ry. Exch. Bldg., Chicago, archts.

Pa., Phila.—Theatre—W. H. Lee, archt., 32 South 17th St., soon receives bids building 2 story, 75 x 120 ft. concrete and brick, on 5th and Rockland Sts., for Green & Altman, 2132 Germantown Ave. Cost to exceed $50,000.

Md., Baltimore—Office—G. Ober & Sons Co., U. S. Fidelity & Guaranty Co. Bldg., plans to build 3 story, 30 x 60 ft., brick and stone, stone and concrete foundation, on Lombard and Grant Sts. About $50 000. Parker, Thomas & Rice, 1109 Union Trust Bldg., archts

Md., Baltimore — Sales — Backus Motor Co., 10-20 East North Ave., plans to build 2 story, 100 x 200 ft., brick addition. About $50,000. E. T. Backus, pres.

Md., Baltimore—Sales—I. Silberstein, 607 Equitable Bldg., plans to build 10 story, 140 x 181 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on St Paul and Pleasant Sts. About $1,000,000. G. R. Callis, Jr., Mellville Ave., Catonsville, archt.

Md., Baltimore—Synagogue—Har Zion congregation plans to build synagogue on West North Ave. near Payson St., probably stone with stone foundation. About $75 000. L. Setten, 4195 Hanover St., and S. B. Waxman, 2410 Elsinor Ave., members bldg. com Architect not selected.

N. C., Hendersonville—Hotel—J. O. Bell and others plan to build hotel. About $100,000. Architect not selected.

Fla., Miami—Depot—Florida East Coast Ry., 10th St., plans to build 40 x 60 ft. depot, here. About $75,000. E. B. Carter, St. Augustine, ch. engr.

Fla., St. Augustine—Auditorium—See "Sewers".

O., Akron—Church—St. Paul's Evangelical congregation having plans prepared by R. H. Hinsdale, archt., Bangor Bldg., Cleveland, for 1 story, steel, stone and brick. About $75,000.

O., Cleveland—Bank—Natl. City Bank, Leader-News Bldg., having plans prepared by Graham, Anderson, Probst & White, engrs., Ry. Exch. Bldg., Chicago, altering 10 story, concrete, steel and brick, on East 6th St. and Euclid Ave. About $75,000.

O., Cleveland—Club and Office—Cleveland Athletic Club, Euclid Ave., plans to build 11 story, 150 x 250 ft., rein.-con., steel, limestone and brick, on Superior Ave. About $500,000. Architect not selected.

O., Cleveland — Commercial—Greenlawn Realty Co., Society for Savings Bldg., plans to build 8 story, 100 x 200 ft., rein.-con., steel and brick, at 3208 Prospect Ave. About $500,000. Architect not selected.

O., Cleveland—Commercial—G. W. Hale, Leader News Bldg., plans to build 6 story, 95 x 300 ft., rein.-con., steel and brick, on East 9th St. and Prospect Ave. About $125,000. Architect not selected.

O., Cleveland — Commercial — Hampton Keller Co., Swetland Bldg., plans to build 9 story, 100 x 100 ft., rein.-con., steel and brick, at 10017 Euclid Ave. About $125,000. Architect not selected.

O., Cleveland—Commercial—Hinning Furniture Co., St. Clair Ave., plans to build 3 story, 79 x 84 ft., rein.-con., steel and brick. About $75,000. Architect not selected.

O., Cleveland—Commercial—L. W. Kelley, Hickox Bldg., plans to build 10 story, 148 x 220 ft., rein.-con., steel, terra cotta and brick, at 2425 Euclid Ave. About $300,000. Architect not selected.

O., Cleveland—Commercial—E. D. Latimer, 12037 Lake Ave., plans to build 7 story, 120 x 200 ft., rein.-con., steel and brick, on East 50th St. and Prospect Ave. About $200,000. Architect not selected.

O., Cleveland—Commercial—F. C. Newcomer, Citizens Bldg., plans to build 6 story, 100 x 125 ft., rein.-con., steel and brick, on 86th St. and Euclid Ave. About $100,000. Architect not selected.

O., Cleveland — Commercial — Petrequin Paper Co., West 3rd St., plans to build 4 story, 120 x 200 ft., rein.-con., steel and brick, on East 48th St. and Prospect Ave. About $120,000. Architect not selected.

Buildings (Continued)

O., Cleveland — Commercial — Prame Realty Co., Williamson Bldg., plans to build 8 story, 100 x 200 ft., rein.-con., steel and brick, on Prospect Ave. About $500,000. Architect not selected.

O., Cleveland — Hospital — Huron Rd. Hospital Assn., Huron Rd., plans to build 5 story, 150 x 190 ft., rein.-con., steel and brick, on Ansel Rd. About $500,000. Architect not selected.

O., Cleveland—Hospital—Lakeside Hospital Assn., East 12th St. and Lakeside Ave. plans to build 12 story, 200 x 350 ft., rein.-con., steel and brick, on University Circle. About $2,000,000. Architect not selected.

O., Cleveland—Hotel—L. W. Kelley, Hickox Bldg., plans to build 6 story, 80 x 200 ft., rein.-con., steel and brick, on Euclid Ave. About $100,000. Architect not selected.

O., Cleveland—Loft—Paudett Investment Co., Citizens Bldg., plans to build 6 story, x 122 ft., rein.-con., steel and brick, at 1825 East 18th St. About $125,000. Architect not selected.

O., Cleveland—Office—Altamont Realty Co., Williamson Bldg., plans to build 6 story, 99 x 125 ft., rein.-con., steel, terra cotta and brick, at 1730 East 12th St. About $350,000. Architect not selected.

O., Cleveland — Office—See "Industrial Works."

O., Cleveland—Office—A. L. Newman, 647 Euclid Ave., plans to build 1 story, 70 x 100 ft., rein.-con., steel and brick addition, at 1126 Euclid Ave. About $60,000. Architect not selected.

O., Cleveland—Office—Willard Storage Battery Co., 246 East 131st St., having plans prepared by H. H. Aldrich, archt., c/o owner, for 2 story, 50 x 104 ft., rein.-con., steel and brick addition. About $60,000.

O., Cleveland—Sales Room—See "Industrial Works."

O., Cleveland—Sales—Kelley Springfield Tire Co., Prospect Ave., leased 90 x 200 ft. site on East 46th St. and Prospect Ave., and plans to build 5 story, rein.-con., steel and brick. About $100,000. Architect not selected.

O., Cleveland—Studio—J. N. Ackerman, Engineer's Bldg., plans to build 1 story, 100 x 500 ft., rein.-con., steel and brick, on West 25th St. About $500,000. Architect not selected.

O., Cleveland Heights (Warrensville P. O.)—Theatre—Israel & Makoff, 3533 Woodland Ave., plans to build 6 story, 100 x 150 ft., rein.-con., steel and brick, on Euclid Blvd. About $175,000. Architect not selected.

O., Massillon — Commercial—Bloomberg Clothing Co. having plans prepared by Albrecht, Wilhelm & Kelley, archts., 1836 Euclid Ave., Cleveland, for 3 story, 46 x 167 ft., rein.-con., steel and brick, on East Main St. About $75,000.

O., Mount Vernon—Office—See "Industrial Works."

O., Norwalk—Bank and Office—Citizens Natl. Bank plans to raze present structure and build 5 story, 50 x 115 ft., rein.-con., brick and stone concrete foundation. About $175,000. Mills & Millspaugh, 67 East Long St., Columbus, archts.

O., Richwood—Church—Baptist Church Society plans to build 64 x 82 ft., rein.-con. and brick, concrete foundation. About $50,000, cost plus percentage basis. E. E. Pruitt, Comstock Bldg., Columbus, archt.

O., Wilmington—Bank—First Natl. Bank plans to construct modern banking building. About $85,000.

Ind., Indianapolis—Theatre and Office—Loew's Enterprises, 1492 Bway., New York City, having preliminary plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, building 2 story, 100 x 175 ft., brick, steel and stone, brick foundation, here. About $300,000.

Mich., Bay City—Office and Store Room—See "Industrial Works."

Mich., Detroit—Schools—Bd. Educ. soon lets contracts building Angell School, 2 story, 83 x 93 ft., rein.-con., brick and steel rein.-con. flooring, concrete foundation on Holmer Ave., between Maidstone and Euclid Aves.; Trowbridge School 2 story, 58 x 112 ft. rein.-con., brick and steel, rein.-con.-flooring, concrete foundation on Forest Ave. near St. Antoine St., cost, $200,000; Carstens School, 2 story, 44 x 168 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Coplin Ave. near Charlevoix Ave.; Davison Annex, 2 story, 80 x 80 ft. frame, concrete foundation, on Davison and Joseph Campau Aves. $25,000; Clippert School, 1 and 2 story, 34 x 102 ft., frame, concrete foundation, on Martin St. near Michigan Ave., $25,000. Malcolmson & Higginbotham, 404 Moffat Bldg., archts.

Ill., Chicago — Office — Reliance State Bank, 1551 West Madison St., having plans prepared by Weary & Alford, archts., 1732 South Michigan Ave., for altering 1st floor of 50 x 165 ft. building, on Ogden Ave. and Madison St. About $100,000.

Ill., Chicago—Offices — See "Industrial Works."

Ill., Chicago—Club—E. P. Rupert, archt., 154 West Randolph St., soon receives bids building 4 story, 60 x 120 ft., on south side, for B. P. O. Elks, c/o architect. About $125,000.

Ill., Joliet—Synagogue—D. S. Klafter, archt., 64 West Randolph St., Chicago, soon receives bids building 1 story, 60 x 100 ft. brick and timber, concrete foundation, on Lincoln St., for Bnai Jacob congregation. About $100,000.

Wis., Holy Hill (Hartford)—Monastery—Carmelite Brothers having plans prepared by Brust & Philipp, archts. and engrs., Free Press Bldg., Milwaukee, for 3 story, 60 x 210 ft. brick, steel, rein.-con. and tile, brick foundation. About $60,000.

Wis., Marshfield — Bank — First Natl. Bank plans to build 2 story, 50 x 100 ft. brick and stone. About $100,000. Architect not selected.

Wis., Thorpe—School—Bd. Educ. having plans prepared by W. L. Alban, archt., 347 Endicott Bldg., St. Paul, Minn., for 2 story, 63 x 82 ft. About $50,000.

Ia., Creston—School—Bd. Educ. having plans prepared by W. Gordon, archt., Hubbell Bldg., Des Moines, for 2 story, 52 x 81 ft., concrete, steel and brick, concrete foundation. About $50,000.

Ia., Davenport—Temple—Masonic Lodge plans to build 8 story, 150 x 200 ft., on 7th and Main Sts. About $800,000. Clausen & Kruse, 316 Central Office Bldg., archts.

Ia., Glidden—School—Bd. Educ. having plans prepared by W. Gordon, archt., 319 Hubbell Bldg., Des Moines, for 2 story, 52 x 81 ft. concrete, steel and brick, concrete foundation. About $50,000.

Ia., Spencer—School—Bd. Educ. Lake Twp. having plans prepared by W. Gordon, archt., 319 Hubbell Bldg., Des Moines, for 2 story, concrete, steel and brick. About $50,000.

Kan., Atchison—School—Bd. Educ. having plans prepared by W. H. Saylor & Co., Kansas City, Mo., for 3 story, 78 x 121 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, to be known as Roosevelt School. About $75,000.

Kan., Caney—Church—First Methodist Episcopal Church having plans prepared by F. F. Fletcher, archt., Independence, Mo., building 1 story concrete, steel and brick, concrete foundation. About $55,000.

Kan., Lyndon—Court House—Osage Co. rejected bids received Sept. 4, building 3 story, 84 x 100 ft. rein.-con., steel and brick, rein.-con. flooring, rock and concrete foundation. Work will be readvertised. W. E. Hulse & Co., Hutchinson, archts. Noted Aug. 21.

N. D., Grand Forks—Hotel—F. Parsons, 825 Belmont Ave., L. J. Bemis and E. J. Stuart, plan to build hotel here. About $500,000.

Mont., Deer Lodge—Court House—Powell Co. voted $10,000 bonds to build court house. H. B. Hertz, Jr., co. clk. Architect not selected. Noted June 26.

Mo., Rockport—Memorial—Atchison Co. having revised plans prepared and soon receives bids building 2 story, 68 x 110 ft., rein.-con., steel and brick, concrete foundation, here. About $60,000. J. O. Hogg, New York Life Bldg., Kansas City, archt.

Mo., St. Louis—Church—Labadie Presbyterian congregation acquired 80 x 150 ft. site on Labadia Ave. and plans to build rock and brick church. About $60,000. Architect not selected.

Mo., St. Louis—High School—Blessed Sacrament congregation plans to build high school. About $75,000 available for project. P. H. Bradley, King's Highway and Northland Ave., pastor. Architect not selected.

Mo., St. Louis—Hotel—C. Levy Realty & Bldg. Co., c/o C. Levy, Hub Furniture Co., 9th and Washington Sts., plans to build 12 story concrete, steel and brick, to be known as Hotel Claridge. About $1,000,000. Architect to be announced later.

Tex., San Angelo—Hotel—J. W. White, Mason, plans to build 8 story hotel, on Chadbourne and Concho Sts., here. About $300,000.

Tex., San Antonio — Home — Salvation Army, 805 Ave. D., plans to build rescue home, brick. About $100,000.

Okla., Ardmore — Post — Salvation Army plans to construct army post building on Main St. About $50,000.

HIGHWAY—ARIZONA

Bids were received by State Highway Department, Phoenix, (lowest 3) for constructing Tempe-Mesa Highway, Federal Aid Project No. 8, from (A) McElrath & Shumway, Mesa; (B) G. R. Curtis, 2440 East 26th St., Los Angeles, Cal.; (C) Southwestern Contg. Co., 13th and Lincoln Aves. The unit bids were as follows:

	A	B	C
1,654 cu.yd. excavation (unclassified)	$2.00	$0.90	$2.00
15,936 sq.yd. concrete pavement	1 54	1.65	1 56 *a*=$24,860 16
15,936 sq.yd. bitulithic pavement on concrete base: Informal { 5-in. concrete base—2-in. bituhthic top			1 95 *b*= 34,705 70
Informal { 4-in. concrete base—2-in. bituhthic top			1 85 *c*= 33,112 10
15,936 sq.yd. bitulithic pavement on asphaltic concrete base			
20 cu.yd. Class "A" concrete (headwalls, etc.)	17 00	12.00	15 00
750 lb. reinforcing steel	.03	.05	03
Cost of cement and reinforcing steel (to be furnished by State)			*a*=$13,043 25—Concrete *b*= 7,012 15—5-2 *c*= 5,628 50—4-2
Totals—Informal			*a*=$41,533 91—Concrete *b*= 45,397 10—5-2 *c*= 42,419 95—4-2
18,750 cu.yd. excavation (unclassified)	1 00	90	.98
990 cu.yd. caliche (for shoulders)	2 00	1.00	2 40
58,744 sq.yd. concrete pavement	1.54	1.65	1 56 *a*=$91,640 64
58,744 sq.yd. bitulithic pavement on concrete base: Informal { 5-in. concrete base—2-in. bitulithic top			2 22 *b*=130,411 68
Informal { 4-in. concrete base—2-in. bitulithic top			2.12 *c*=124,537 28
58,744 sq.yd. bitulithic pavement on asphaltic concrete base			
238 lin.ft. 18-in. concrete pipe culvert, standard sec. "B"	1 30	2.00	2.88
52 lin.ft. 24-in. concrete pipe culvert, standard Sec. "B"	2 00	3.00	5 04
169 lin.ft. 30 in. concrete pipe culvert, standard Sec. "B"	3 40	3.60	6.78
114 lin.ft., 36-in. concrete pipe culvert, standard Sec. "B"	4 00	4 00	8 16
16 lin. ft. 48-in. concrete pipe culvert, standard Sec. "B"	4.50	5.00	10 00
55 lin.ft. 24-in. corrugated metal pipe culvert (R.R. crossing)	6 00	3.00	5.04
127 cu.yd. Class "A" concrete (headwalls, etc.)	17 00	12 00	20 00
Cost of cement (to be furnished by State)			*a*=$47,556 95—Concrete *b*= 26,567 70—5-2 *c*= 21,467.15—4-2
Extended totals	$162,757	$165,815	*a*=$165,949.37—Concrete *b*= 183,731 16—5-2 *c*= 172,756.21—4-2

Buildings (Continued)

Okla., Bristow –Church and Parsonage—Christain congregation has acquired site on 6th St. and plans to build church and parsonage. About $120,000. R. V. Vesey, pastor.

Okla., Cherokee—School—Bd. Educ. having plans prepared by Mann & Gerow, archts., Hutchinson, Kan., building 2 story concrete, steel and brick, concrete foundation. About $60,000.

Okla., Muskogee—High School—Bd. of Educ. having plans prepared by H. O Valeur & Co., archts., 705 Phoenix Bldg., building 3 story, 100 x 120 ft., rein.-con., steel and brick Junior High School, rein.-con. flooring, concrete foundation. About $230,-000.

Okla., Oklahoma—High Schools—City had plans prepared by Layton, Smith & Forsyth, archts. and engrs., 701 Major Bldg., for one 3 story and two 2 story, 140 x 358 ft., brick and stone high schools. About $165,-000 each.

Okla., Oklahoma—Home—Elks plan to build new home. About $125,000. Architect not selected.

Okla., Tecumseh—School—State Bd. Pub. Affairs, Oklahoma, plans to build industrial school here for girls. About $185,000. Architect not selected.

Okla., Tulsa—High School—Bd. Educ. having plans prepared by G. Winkler, archt., 414 Palace Bldg., 3 story, 125 x 260 ft., rein.-con., steel and brick, rein.-con. flooring, rock foundation. About $350,000. Hedrick & Huff, Kansas City, Mo., engrs.

Idaho, Boise—Capitol—State Comn. Pub. Wks. soon lets contract building east and west wings to Capitol, 2 story, cut stone. About $900,000 available. Tourtellotte & Hummel, 215 Overland Bldg., archts.

Idaho, Lewistown—Business—J. A. Johnson plans to build 3 story, 76 x 20 ft., brick, brick and concrete foundation, on Main St. About $135,000. Architect not selected.

Idaho, Nampa—Dormitory and Sanitorium—Nazarene College plans to build 2 or 3 story brick. About $50,000. Architect not selected.

Ariz., Phoenix — Hotel — J. W. Walker having plans prepared by L. M. Fitzhugh, archt., 210 Noll Bldg., for 4 story, 56 x 138 ft., rein.-con.

Wash., Chehalis—Store—L. Proffitt plans to build 2 or 3 story, 40 x 58 ft., brick, brick foundation, on Chehalis Ave. About $50,000. Architect not selected.

Wash., Seattle—School—Bd. Educ. plans to build 2 story, 42 x 162 ft., concrete and brick addition to Greenwood School, on 3rd Ave. N. W. and 80th St. About $125,000. F. A. Naramore, care of School Bd., archt.

Wash., Toppenish — Church — Methodist congregation having plans prepared by J. Vogel, archt., Seattle, for 2 story, brick or stone, concrete foundation, to include gymnasium, etc. About $50,000.

Wash., Yakima—Theatre—J. C. Von Herberg and associates, Seattle, plan to build 1 story, concrete or stone, here. About $200,000. Archt. to be announced later.

Ore., Baker — Mercantile — Basche-Sage Hardware Co. having plans prepared by H. W. Bond, archt., Baker, for 2 story, 100 x 200 ft. brick or concrete, concrete foundation, on Main and Center Sts. About $125,000.

Ore., Condon—School—School Dist. No. 25 having preliminary plans prepared for 2 story brick or stone. Special election soon to vote on $55,000 bonds for project.

Ore., Freewater—Bank—First Natl. Bank plans to build 1 story, 50 x 70 ft., brick and terra cotta. About $50,000. P. T. Ainge, Freewater, designer.

Ore., Portland—Natatorium—J. M. Rieg Gerlinger Bldg., plans to build 1 story brick or concrete, concrete foundation, on Columbia Beach, to include 75 x 150 ft. tank, 1000 lockers, convertible floors auditorium, glass sun room, etc. About $55,000. Private plans.

Ore., Portland—Office—M. Pallay, Garden Home, plans to build 2 or 3 story, 100 x 120 ft. brick or concrete, on 15th and Alder Sts. About $50,000. Archt. not selected.

Cal., Bakersfield—Store—Conklin-Brodek Estate, care of O. Clark, archt., Bakersfield, having plans prepared for 3 story, 115 x 132 ft., rein-con., brick and terra cotta, rein.-con. flooring, concrete foundation, on 20th and Chester Sts. About $100,000. Hochheimer & Co., lessee.

Cal., Fullerton—Lodge—Masonic Temple Assn. having plans prepared by F. Benchley, archt., Fullerton, for brick, on Spadra and Chapman Aves. About $60,000. Noted Aug. 14.

Cal., Los Angeles—Sales—J. A. Graves, care of Morgan, Wal's & Morgan, archts., 1124 Van Nuys Bldg., plans to build 2 story, 100 x 150 ft., rein.-con., rein.-con. flooring, concrete foundation, on Figueroa St. Maxwell-Hoffman Co., 10th St. and Grand Ave., lessee.

Cal., Pasadena—Administration—See "Industrial Work."

Cal., San Francisco—Store and Loft—Rousseau & Rousseau, archts., 110 Sutter St., soon receive bids building 2 story, 60 x 135 ft., brick, concrete foundation, on Sutter St., for Dunn, Williams & Co., Crocker Bldg. About $65,000. E. Curtiss, 314 Sutter St., lessee.

Que., Granby—Hospice—Sisters of Congregation of Grey Nuns, Marieville, having plans prepared and soon receive bids building 3 story, 40 x 100 ft., on Notre Dame St. here. About $62,000. Private plans.

Ont., Windsor—School—Bd. Educ. La Belle Bldg., receives bids about Sept. 24, building 3 story, 215 x 230 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, on Giles Blvd. About $200 000. A. H. McPhail, Bd. Trade Bldg., archt. Noted July 10.

BIDS DESIRED

Mass., Belchertown — Dormitory — Until Sept. 29, by Massachusetts Comn. on Mental Diseases, Boston, building 2 story, 64 x 89 ft. dormitory and 3 story, 88 x 103 ft. power house, rein.-con. and terra cotta, rein.-con. flooring, concrete foundation, on State grounds, also 1325 ft. concrete tunnels, for Massachusetts State Hospital, here. Noted Feb. 6.

Mass., Worcester—School—Until Sept. 26, by Trustees of Independent Industrial Schools, c/o Frost & Chamberlain, archts., 390 Main St., building trade school for girls, on High St., 3 story, 90 x 145 ft., brick, concrete foundation. About $175,000. Noted Aug. 28.

Conn., Bridgeport—Police Station—Until Sept. 22, by Bd. Police Comrs., building station and garage, on Barnum Ave. and Caroline St., 2 story, 55 x 75 ft. brick, steel and concrete, rein.-con. flooring, concrete foundation. About $60,000. W. J. Skinner, 1188 Main St., archt. Noted July 24.

Conn., Manchester—Fire Station—Until Sept. 20, by town, building 2 story, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Main and Hillard Sts. About $50 000. A. E. Fiske, 67 Bigelow St., archt. Noted June 26.

Conn., Redding—Museum—Until Sept. 25, by Sunderland & Watson, archts., 248 Main St., Danbury, for 1 story brick and concrete building, rein-con. flooring, concrete foundation, on Putnam Park, for Israel Putnam Memorial Camp Ground Comn. About $50,000.

Conn., Willimantic — Dormitory — Until Sept. 22, by State Bd. Educ., and W. H. Brooks, archt., Lewis and Gold Sts., both of Hartford, building 3 story, 46 x 114 ft. with 30 x 46 ft. ell, brick, steel and concrete, rein.-con. flooring, concrete and brick foundation, on Valley St., for State Normal School, here. About $150,000. Noted July 24.

N. Y., New York—Theatre—Until Sept. 22, by De Rosa & Pereira, archts. and engrs., 110 West 40th St., building brick and steel, brick foundation, on 9th Ave. and 45th St., for Consolidated Amusement Enterprises, 2139 8th Ave. About $75,000. Noted Sept. 4.

Pa., Phila.—Bank—P. A. Davis, archt., 1713 Sansom St., receiving bids building 1 story, 37 x 65 ft., brick and marble, on Diamond and Broad Sts., for Broad St. Bank. Cost to exceed $50,000.

N. C., Brevard—Jail and Court House—Until Oct. 3, by C. K. Osborne, clk. Transylvania Co., building new 3 story, jail and addition to court house. About $150,000 T. E. Davis, Asheville, archt.

Ala., Bessemer—Exchange—Until Sept. 23, by Southern Bell Telephone & Telegraph Co., 78 South Pryor St., Atlanta, building 2 story, 50 x 50 ft., concrete, steel and stone, on 4th Ave. between 18th and 19th Sts., here. About $75,000.

O., Akron—School—J. R. Graham, archt., 422 Union Bldg., Cleveland, receiving bids building 1 story, 78 x 180 ft., rein.-con., steel, terra cotta and brick, on East Talmadge Ave., for St. Martha's. About $75,000.

O., Cleveland—Church—H. W. Maurer, archt., Schofield Bldg., receiving bids building 3 story, 38 x 95 ft., rein.-con., steel and brick, on Hayden Ave., for 6th United Church. About $50,000.

O., Cleveland—Library—Cleveland Pub. Library Assn., 1375 Euclid Ave., receiving bids building 8 story, 200 x 400 ft., rein.-con., steel, brick, stone and granite, on East 3rd St. and Superior Ave. About $ 000,000. Walker & Weeks, 1900 Euclid Ave., archts.

O., Cleveland—Observatory—Walker & weeks, engrs., 1900 Euclid Ave., receiving bids building 3 story, 45 x 60 ft., rein.-con., steel and brick for Warner & Swasey Co., Taylor Rd. About $50,000.

O., Hudson—School—J. W. Corbusier, archt., Lenox Bldg., Cleveland, receiving bids building 2 story, 40 x 56 ft., brick and timber, on Elk St., for Hudson Congregational Church. About $50,000.

O., Independence– School—W. H. Nicklas, archt., 1900 Euclid Ave., Cleveland, receiving bids building 2 story, 90 x 100 ft., rein.-con., steel and brick, on Broadview Rd., for Bd. Educ. About $75,000.

O., Steubenville—Bank—Walker & Weeks, archts., 1900 Euclid Ave., Cleveland, receiving bids building 12 story, 56 x 60 ft., rein.-con., steel and brick, on 4th and Market Sts., for Steubenville Bank & Trust Co. About $75,000. Noted Aug. 14.

O., Tiffin — Bank — Walker & Weeks, archts., 1900 Euclid Ave., Cleveland, receiving bids building 2 story, 50 x 100 ft., rein.-con., steel, stone and brick, on Washington St., for Tiffin Natl. Bank. About $60,000. Noted Aug. 7.

Mich., Charlevoix—Jail—Until Sept 25, by Bd. Supervrs. Charlevoix Co., building 2 story, 38 x 62 ft., rein. con., brick and steel, concrete foundation. About $50,000. A. E. Munger, Bay City, archt.

Mich., Detroit—Administration—A Kahn, archt., Marquette Bldg., receiving bids building 2 story, 60 x 100 ft., rein.-con. brick and steel, rein.-con. flooring, concrete foundation, on Wyoming and West Warren Aves., for Detroit Seamless Steel Tube Co., 841 Jefferson Ave., W. About $70,000.

Mich., Detroit—Home—A. Kahn, archt., Marquette Bldg., receiving bids building nurses home, 6 story, 115 x 154 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, at Harper Hospital, on John R St. About $350,000. Noted June 12.

Mich., Detroit—Office—A. Kahn, archt., Marquette Bldg., receiving bids for 1 and 2 story, 50 x 123 and 23 x 30 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation, on Vancouver Ave., for Holley Carburetor Co., Vancouver Ave. About $50,000.

Wis., Clintonville—Bank—Until Sept. 27, by Foeller & Schober, archts., 123 North Washington St., Green Bay, building 2 story, 60 x 120 ft., brick, rein.-con. and steel, brick foundation, for 1st Nat'l Bank. About $50,000.

Wis., Hartford—Hospital—Until Sept. 22, by Hartford General Hospital, building 3 story 38 x 150 ft. brick and rein.-con., rein.-con. flooring, brick foundation, on Main St. About $50,000. Private plans.

Ia., Ankeny—High School—Until Sept 29, by Bd. Educ., building 2 story, 75 x 118 ft., rein.-con. and timber, rock and concrete foundation. About $60,000. W. Gordon, 319 Hubbell Bldg., Des Moines, archt.

Minn., Balaton—School—Until Sept. 22, by Bd. Educ., building 2 story, 64 x 86 ft., brick. About $75,000. J. W. Carlaw, clk. C. H. Parson, 600 Builders Exch., Minneapolis, archts. Noted Aug. 28.

Minn., Minneapolis—Hotel and Business—B. N. Schneider, 232 Plymouth Bldg., receiving bids building 6 story, 122 x 178 ft., concrete, hollow tile and brick, on Franklin and Colfax Sts. About $800,000. F. Van Antwerp, 240 La Salle Bldg., archt. and engr.

Kan., Wichita—Auditorium, Dormitory, etc—Until Oct. 1, by Sisters of Charity, building 2 story, 47 x 90 ft. auditorium, 1 story 36 x 144 ft dormitory and 2 story, 47 x 90 ft. chapel, rein.-con. and brick, rein.-con. flooring, concrete foundation. About $250,000. White & Dean, 301 Bellefontaine Ave., Kansas City, Mo., archts.

N. D., Ashley—Courthouse—Until Oct. 17, by J. Hildenbrand, aud. McIntosh Co., building 2 story, 56 x 75 ft., rein.-con. About $75,000. Buechner & Orth, 500 Shubert Bldg., St. Paul, Minn., archts.

Mo., Brookfield—School—Until Sept. 25, by Bd. Educ., building 2 story, rein.-con., steel and brick rein.-con. flooring, rock foundation. About $80,000. M. S. Martin, Hannibal, archt.

Buildings (Continued)

Mo., St. Joseph—Sunday School—First Presbyterian congregation receiving bids building 3 story, 42 x 55 ft., rein.-con., steel and brick, rein.-con. flooring, concrete and rock foundation, on 7th and Faron Sts. About $60,000. Echel & Aldrich, Corby Bldg., archts. Noted Aug. 7.

Okla., Cherokee—High School—Until Oct. 10, by Comrs. Alfalfa Co., building 3 story, 60 x 140 ft., on Main St. About $60,000. Mann & Gerow, Hutchinson, Kan., archts. and engrs.

Ont., Windsor—Mercantile—A. H. McPhail, archt., Bd. Trade Bldgs., receiving bids building 6 story 30 x 120 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Ouelette Ave. for C. H. Smith Co., Pitt St. About $100,000.

PRCIES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Waterbury**—Bank and Office—Morris Plan Co., 68 Center St., let contract building 3 story, brick and concrete, rein.-con. flooring, concrete foundation, on Grand St., to Tracy Bros. Co., 52 Benedict St. About $50,000. Noted Sept. 11.

★**Conn., West Hartford** (Hartford P. O.)—Hotel—Sleeper & Parisi, 26 State St., Hartford, will build two 6 story, 70 x 180 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation, on Whiting Lane and Arnoldale Rd. About $325,000. Work will be done by day labor.

N. Y., Kings Park—Hospital—State Hospital Comn., Capitol, Albany, received bids Sept. 10, building hospital for acute patients, at Kings Park State Hospital here, (general contract) from M. Kantrowitz, 20½ Market St, Albany, $277,700, P. J. Carlin Constr. Co., 1123 Bway., New York City, $330,000, W. Moore & Co., 347 Madison Ave., New York City, $357,646; heating, from A. B. Barr & Co., 6 River St., Yonkers, $21,800, Adams-Britz & Co., Inc., 1769 Park Ave., New York City, $21,900. E. Rutzler Co., 404 East 49th St., New York City, $22,327; plumbing, from W. B. Armstrong Co., 3 Fulton St., Albany, $31,600, C. H. Darmstadt, 352 West 43rd St., New York City, $31,942, T. E. O'Brien, 6311-5th Ave., Brooklyn, $37,447. Noted Aug. 28.

★**N. Y., New York**—Clubhouse—Chinese Merchants Assn., c/o W. Rahmans Sons, archts. and engrs., 126 Cedar St., will build 6 story, 25 x 84 ft. brick, steel and stone, brick foundation, at 41 Mott St. About $70 000. Work will be done by day labor under supervision of architects.

N. Y., Troy—Armory—W. W. Ward, secy. state bd. armory comrs., 158 State St., Albany, received bids Sept. 4 furnishing labor and materials for building state armory here, from C. Crowley Co., 114 3rd St., $339,400; P. Keeler Bldg. Co., 425 Orange St., Albany, $379,140; M. Kantrowitz, 20½ Market St., Albany, $367,800. Noted Aug. 21.

★**Md., Baltimore**—Dormitory and Swimming Pool—St. Mary's Industrial School, Wilkens and Caton Aves., let contract building 4 story, 63 x 131 ft., rein.-con., stone and brick dormitory, stone and concrete foundation, and 30 x 75 ft., concrete swimming pool, to Price Constr. Co., 210 Maryland Trust Bldg. About $200,000. Noted July 10.

★**Va., Richmond** — Bank — First Natl. Bank, 9th and Main Sts., let contract building 4 story, brick, steel and stone, brick foundation, to J. T. Wilson, Mutual Bldg. About $75,000. Noted July 3.

★**Fla., Jacksonville**—Office—E. L. Hill Realty Co., 221 West Forsyth Ave., let contract building 6 or 7 story, 78 x 105 ft. rein.-con. and brick, to W. D. Gerbrich Co., 221 West Forsyth Ave. About $75,000.

★**O., Cleveland**—Office—Paul Bros., Citizens Bldg., let contract building 11 story, 56 x 134 ft., rein.-con., steel and brick, on East 6th St. and Vincent Ave., to Minnick Gibbons Co., Prospect Ave. About $750,000. Noted May 1.

★**O., Dayton**—Theatre—J. Seifert, South Jefferson St., let contract extending and remodeling Majestic Theatre, 2 story, to Nolan & Lester, City Natl. Bank. About $50,000. Noted Sept. 11.

★**O., Fletcher**—School—Bd. Educ., Brown Twp., let contract building 2 story, 70 x 110 ft., rein.-con. and brick, concrete foundation, to Knowlton Bros., Phillipsburg. About $70,000. Noted Aug. 21.

★**O., Lima**—Hotel—Cooperative Hotel Co. will build 10 story, 54 x 100 ft., steel, concrete, stone, terra cotta and brick. About $250,000. Work will be done by day labor.

★**O., West Park**—High School—Bd. Educ. let contract building 2 story, 90 x 90 ft., rein.-con., steel and brick, on Riverside Ave., to C. Peterson, Engineer's Bldg., Cleveland. About $60,000. Noted July 17.

★**Mich., Detroit**—Hospital—Grace Hospital, 277 West Grand Blvd., let contract building 3 story, 35 x 70 ft., rein.-con., brick and steel, rein.-con. and wood flooring, concrete foundation, on West Grand Blvd. and Lafayette St., to O. Misch Co., 831 Chamber of Commerce. About $60,000.

★**Mich., Pontiac**—Schools—Bd. Educ. let contract to W. H. Isgrigg & Son, Pontiac, building 10 room additions to McConnell and Baldwin Schools, rein.-con., brick and steel, concrete foundations, $119,000 and $110,000 respectively.

★**Ill., Chicago**—Bank—C. Hatzfield, archt., South Dearborn St., let masonry contract to A. V. Dacgling, 9000 Houston Ave., for 2 story, 35 x 90 ft. brick and terra cotta, concrete foundation, on 101st St. and Ewing Ave., for East Side Trust & Savings Bank, c/o architect. About $60,000. Noted Aug. 28.

★**Kan., Lorraine**—School—Bd. Educ. let contract building 2 story, 68 x 87 ft. rein.-con., steel and brick, concrete foundation, to Wichita Constr. Co., Wichita. About $51,000. Noted July 19.

★**Kan., Manhattan**—Engineering — State Bd. of Administration, Topeka, let contract building 3 story, 22 x 56 ft., and 50 x 112 ft., rein.-con., rein.-con. flooring, rock and concrete foundation, to J. M. Leeper, State House, Topeka, $168,662. Noted Sept. 4.

★**Neb., Valparaiso**—School—Bd. Educ. let contract building 1 story, 85 x 155 ft. rein. con., steel and brick, rein con. flooring, concrete foundation, to H. Ohlson & Sons Co., David City, $60,682. Noted Aug. 7.

★**Mo., St. Louis**—Store—Gubinsky Bros., Arcade Bldg., let contract building 2 story, 60 x 120 ft., also 3 story 75 x 120 ft., brick, steel and concrete, on Biddle St., to Herman Bldg. Co., 3800 Hartford St. About $50,000.

★**Okla., Alva**—Gymnasium—State Bd. Affairs, Oklahoma, let contract building 1 story, 71 x 180 ft., rein.-con., steel and brick, rein.-con. flooring, rock and concrete foundation, here, to Kreipke-Schaffer, El Reno, 15,600.

★**Okla., Claremore**—High School—City let contract building 3 story, 70 x 135 ft., brick and concrete, on Main St., to R. D. Pollard, Main St. About $95,000.

★**Okla., Oklahoma**—Church—First Church Christ, Scientist, let contract building 2 story, 90 x 100 ft., rein.-con., steel and brick, rock and concrete foundation, to E. P. Boyd, 1509 North McKinley St. Cost plus percentage basis. Noted Aug. 21.

★**Okla., Okmulgee**—Theatre—S. H. D. Cook let contract building 3 story, 52 x 141 ft., rein.-con., steel and brick, concrete foundation, to R. P. McClure Constr. Co., Kansas City, Mo. About $92,500. Noted Aug. 21.

★**Ore., Oregon City**—Hotel—J. Supple, 331 6th St., Portland, let contract building 3 story, 25 x 100 ft. rein.-con., concrete foundation, on Main and 4th Sts., to F. McIntosh, Oregon City. About $75,000.

Cal., Long Beach—School—Bd. Educ. received bids building 2 story, brick, concrete foundation, on American Ave., from J. D. Scherer, 1400 Elm St., $206,647; C. T. McGrew, 1340 Ocean Ave., $220,806; E. C. English, Long Beach, $232,500. Noted Jan. 30.

★**Cal., Los Angeles**—Studio—J. D. Hampton Productions Co., Hollywood, let contract to Milwaukee Bldg. Co., 316 Wright & Callender Bldg., building motion picture studio, on La Brea Ave. and Santa Monica Blvd., to consist of 50 x 220 ft. property room, 40 x 150 ft. office and three 120 x 120 ft. stages. About $250,000.

★**Cal., Los Angeles** — Studio — Paul Studios, Inc., Hollywood, let contract to E. Fossler, 6434 Hollywood Blvd., building motion picture studio on 20 acre site on Melrose and Crescent Aves. to consist of group of buildings to accommodate 30 producing companies, and central plant to serve all companies, including laboratories, one 100 x 480 ft. stage and three 100 x 350 ft. stages, etc. About $1,500,000 including equipment.

★**Cal., Los Angeles**—Studio—W. N. Selig let contract building picture producing plant to include offices, laboratory, dressing rooms, stages, etc., to Milwaukee Bldg. Co., 316 Wright and Callender Bldg. About $150,000. L. B. Mayer, lessee.

★**Cal., Pasadena** — Theatre — Pasadena Theatre Co., 67 North Raymond Ave., let contract building, 103 x 175 ft., rein.-con., on Raymond Ave., to W. C. Crowell, 440 Chamber of Commerce Bldg. About $200,000.

★**Cal., San Francisco**—Store—Imperial Realty Co., 709 Mission St., let contract building 6 story, rein.-con., on Geary St., to Barrett & Hilp, Sharon Bldg., about $150,000. Livingston Co., lessees.

★**N. B., St. John**—Nurses Home—Municipal Council let general contract building 3 story, 62 x 110 ft. addition to nurses home, at Genl. Pub. Hospital, to B. Mooney & Son, St. John, $143,368; plumbing and heating, to R. E. Fitzgerald, St. John, $15,780.

★**Ont., St. Catharines** — Schools — Bd. Educ. let contracts building two 2 story, brick, steel and concrete, concrete foundations, to W. W. Park, 49 Queen St., and F. C. Monk, Glen Ridge Ave., $58,510 each. Noted Aug. 21.

★**Sask., Saskatoon** — School — Bd. Educ. let contract building 3 story, concrete and steel, concrete foundation, to A. W. Cassidy, 1st St. About $90,000.

Federal Government Work

PROPOSED WORK

Md., Annapolis — Waterproofing — Spec. 4036—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to waterproof Terrace Roof and Bancroft Hall. About $60,000.

Ga., Douglas—Post Office—Treas. Dept., Wash., D. C., received no bids Sept. 10, building post office, here. J. A. Wetmore, supervising archt. Noted July 31.

O., Cincinnati—Lock and Abutment—U. S. Engr. Office, 1st Dist., Cincinnati, rejected bid received Aug. 1, building lock and abutment for Dam No. 24, Ohio River, near Chilo. Noted July 10.

BIDS DESIRED

Mass., Hingham—Dredging—Spec. 4031—Until Oct. 1, by Bureau Yards & Docks, Navy Dept., Wash., D. C., dredging at Naval Ammunition Depot, here. About $30,000; $10 deposit required for plans and spec. Noted Sept. 11.

Conn., New London — Dredging — Until Sept. 25, by U. S. Engr. Office, New London, dredging in Bridgeport Harbor.

N. Y., New York—Dredging—Until Oct. 6, by U. S. Engr Office, 39 Whitehall St., dredging and removing rocks in East River; advertised in this issue.

Pa., Phila.—Repairing Dyke—Until Oct. 15, by U. S. Engr. Office, repairing dyke at Bulkhead Bar in Delaware River; advertised in this issue.

Pa., Phila. — Sprinkler System — Until Sept. 30, by Officer in Charge of Constr., Frankford Arsenal, installing sprinkler system in Small Arms Ammunition Storehouse; advertised in this issue.

Md., Baltimore—Rip Rap—Until Sept. 22, by Lighthouse Supt., Baltimore, furnishing and placing rip rap around Wade Point Light Sta., N. C.

S. C., Charleston—Electric Lighting, Water Supply and Fire Protection Systems—Spec. 3977-A—Until Oct. 1, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing, here. About $30,000; $10 deposit required for plans and spec.

Ala., Florence—Derricks—Until Oct. 15, by U. S. Engr. Office, furnishing and erecting 3 steel traveling tower derricks; advertised in this issue.

N. D., Bismarck—Quarters and Mess Hall—Until Oct. 15, by Dept. Interior, Office of Indian Affairs, Wash., D. C., building brick employees' quarters and brick mess hall, here. C. Sells, comr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Wharf—U. S. Engr. Office, Boston, let contract building pile wharf at Hog Island, to Lawler Bros., Charlestown, $22,815. Noted July 31.

R. I., Newport—Structural Steel—Spec. 4023—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Sept. 10, furnishing structural steel for Emergency Torpedo Repair Shop, here, from Amer. Bridge Co., Wilkins Bldg., Wash., D. C., $12,850 (90 days); J. Eichleay, Jr. Co., South 20th and Horton Sts., Pittsburgh, Pa., $12,610 (120 days); J. E. Ogden, 147 Cedar St., New York City, $18,634 (90 days). Noted Sept. 4.

Federal Government (Continued)

Conn., New Haven—Pumps—Superv. Archt., Treas. Dept., Wash., D.C., received bids Sept. 12, installing motor driven triplex pumps in Post Office, here, from J. R. Proctor, 74 Courtlandt St., New York City, $1465; J. D. Kelly, 93 Meadow St., $1861; E. S. Downs Co., 756 Broad St., $2414. Noted Aug. 21.

★**Md., Aberdeen**—Road Work—J. D. Moon, constr. officer, Aberdeen Proving Ground, let contract building 5 mi. concrete roads, 16 and 20 ft. wide, in Aberdeen Reservation, to Claiborne, Johnston & Co., 910 Garrett Bldg., Baltimore. Noted Aug. 21.

D. C., Wash. — Damp-Proofing — Treas. Dept. received bid Sept. 9, damp-proofing Northwest Storeroom in Sub-Basement of new Treasury Annex, from W. B. Avery, 632 G St., N. W., $2369 (90 days). Noted Sept. 4.

S. C., Charleston—Mechanical Stokers—Spec. 4010—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Sept. 10, installing in Power Plant, here, (1) work complete, from Westinghouse Electric & Mfg. Co., Hibbs Bldg., Wash., (1) $10,391 (time as specified); Sanford Riley Stoker Co., 25 Foster St., Worcester, Mass., (1) $14,520 (75 days); Amer. Engr. Co., Aramingo and Cumberland Sts., Phila., (1) $15,450; (2) $15,755 (75 days). Noted Aug. 28.

Fla., Pensacola—Removal of Pier—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids removing seaplane pier No. 186, (1) work complete, from Southern Constr. Co., Brent Bldg., (1) $5366, (2) $4995 (27 days); C. H. Turner, Pensacola, (1) $5793, (2) $4993, (45 days). Noted Aug. 14.

★**Miss., Vicksburg**—Levee Work—U. S. Engr. Office, 3rd Dist., Vicksburg, let contract building levee work, here, to Roach, Stansell Lawrence Bros., North Memphis Savings Bank Bldg., Memphis, Tenn., $67,500. Noted July 24.

Montana—Road Work—Bureau Pub. Rds., U. S. Dept. of Agriculture, Missoula, received bids Aug. 30, grading 3.6 mi. Glacier Park National Forest Rd., 12 ft. wide, from L. Callison, Cut Bank, $16,998; White, Brown & Leahy, Great Falls, $20,452; Rich & Markhus, Prosser, Wash., $20,799. Noted Aug. 21.

Wash., Newport — Road Work — Bureau Pub. Rds., Missoula, Mont., received bids Aug. 30, grading 11.91 mi Mataline National Forest Rd., 12 ft wide, Pend O'Reille Co., from Rich & Markhus, Prosser, $76,111; A. Clifton, Applegate & Toole, Hutton Bldg., Spokane, $88,169. Noted Aug. 14.

Miscellaneous

PROPOSED WORK

Coal Bunkers—Waterbury Conn.—Waterbury Clock Co., 31 Cherry Ave., soon receives bids building brick and concrete coal bunker. About $10,000. Private plans.

Garbage Incinerating Plant—Paterson, N. J.—City plans to build addition or build new garbage incinerating plant. H. J. Harder, city engr.

Park—Trenton, N. J.—City plans to lay out park on Commercial Ave., along Delaware River, 18 ft. wide various lengths. J. W. Thompson, Broad St. Bank Bldg., engr.

Coal Breaker—Carbondale, Pa.—Murrin Coal Co., Fallbrook St., having sketches prepared by G. A. Westcott 119 Wyoming Ave., Scranton, for 500 ton capacity coal breaker, 85 ft. high About $35,000.

Swimming Pool—Phila., Pa.—Nicetown Boys' Club, Clarissa St and Hunting Park, plans to build 30 x 100 ft. About $50,000. Archt. not selected.

River Front Improvement—Shreveport, La.—City plans to improve river front preparatory to installing river rail terminals Plans have been prepared for revetment by use of mattress and bank paving of about 3000 lin ft of river front and pumping about 500,000 yd river sand behind revetment for land reclamation; revetment of at least 1000 ft. river front requiring 60,000 sq ft. mattress work and 60,000 sq. ft riprap bank paving will probably be done in fall. C. E. Smith & Co., 2071-2074 Ry Exch. Bldg., St. Louis, Mo., engrs.

Cast Iron Pipe — Detroit, Mich. — City soon lets contract furnishing f.o.b. Detroit, 1500 tons 24 in., 500 tons 16 in., 1500 tons 6 in. and 1500 tons 8 in. c.i. water pipe, also special castings for c.i. pipe, tapping sleeves and gates. T. H. Leisen, 232 Jefferson Ave., engr.

Gate Valves—Detroit, Mich.—J. A. Martin, comr. purchases and supplies, Municipal Courts Bldg., soon lets contract furnishing three hundred 6 in., two hundred fifty 8 in., twenty-five 10 in., one hundred 12 in., thirty 16 in., twenty 24 in., five 30 in., five 36 in., five 42 in. and four 48 in. gate valves for Bd. Water Comrs. G. H. Ferbell, 232 Jefferson Ave., engr.

Railway Tracks, etc.—St. Louis, Mo.—See "Industrial Works."

Pavement—Belton, Tex.—City soon lets contract for 22,500 sq yd. pavement. Alternate bids on bitulithic asphaltic concrete, Toneka ton, 1 and 2 course concrete. H. R. Smith, Belton, engr.

Park—Billings, Mont.—City election Sept. 30, to vote on $75,000 bonds to improve park. E. M. Sneckenberger, city engr.

BIDS DESIRED

Miscellaneous Supplies—New York, N. Y.—M. Housle, engr. 3307 3rd Ave., is in the market for heaters, mixers, tanks, conveyors, motors, boilers, cranes, elevators dust collectors and derricks, to be installed in asphalt plant. Owner's name withheld.

Garbage Incinerator, etc.—Monessen Pa.—Until Sept. 24 by J. E. Pittman, boro. secy., constructing brick building, chimney foundations concrete foundations, coal house, concrete culvert and wooden trestle for garbage incinerating plant. Chester & Fleming, Union Bank Bldg., Pittsburgh, engrs.

Pumping Equipment—Los Angeles, Cal.—Until Oct. 6, by H. B. Ferris, secy. Bd. Pub. Wks., furnishing pumping equipment for Manchester Ave. sewage pumping plant. A. C. Hansen, city engr.

Lock, Dam, etc.—Robeaygeon, Ont.—Until Sept. 29, by Dept. Rys & Canals, Ottawa, building lock rein.-con. dam, swing bridge, rein.-con. drydock, wheel pit, tail race, long wing wall, slopes and macadam roads, in connection with Trent Canal here. About $350,000 W. A. Bowden, care of Dept. Rys. & Canals, engr.

Wharf—Quebec—Until Oct. 2 by Dept. Pub. Wks., Ottawa, Ont., building extension to wharf at Notre Dame des Sept Douleurs, 30 x 80 ft. About $11,000. E. Lafleur, care of Dept. Pub. Wks., engr.

Wharf—St. Laurent de Orleon, Que.—Until Oct. 2, by Dept. Pub. Wks., Ottawa, Ont., repairing wharf here, timber with stone fill, concrete roadway, 180 ft. long, 36 ft. wide and 60 x 70 ft. Work involves 170 cu. yd. concrete. About $15,000. E. Lafleur, care of Dept. Pub. Wks., engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Foundations, etc.—Bridgeport, Conn.**—Fletcher-Thompson, Inc., engrs., 1089 Broad St., let foundation and excavation contracts for proposed 7 story, 100 x 150 ft., cold storage plant and 1 story, 65 x 100 ft. and 60 x 65 ft. warehouse, brick and rein.-con., rein.-con. flooring, concrete foundation, for Peoples Ice & Cold Storage Co., 1335 Seaview Ave., to T. J. Pardy Constr. Co., 1487 Seaview Ave. About $25,000. Noted Sept. 11, under "Buildings."

★**Retaining Wall—Thompsonville, Conn.**—Bigelow-Hartford Carpet Co., 58 Main St. let contract building 700 ft. concrete and stone retaining wall along power house and Connecticut River, to D. O'Connell Son, 480 Hampden St., Holyoke, Mass. About $40,000.

★**Drilling — Harrisburg, Pa.** — State Bd. Control let contract drilling foundation of new capitol building, to Acker Drilling Co., Mears Bldg., Scranton. About $12,000.

Superstructure, etc.—Phila., Pa.—Dept. City Transit received bids for completion of steel superstructure and appurtenance work of Frankford Elevated Ry., in Front St. near Arch St., Contr. No. 509, including (a) whole work as shown on plans, (b) 100,000 lb. riveted steel girders, (c) 1000 lb. rolled steel beams, (d) 10,000 lb. steel columns, (e) 100 lb. steel reinforcing rods, (f) 1000 lb. iron castings, from McClintock Marsall Co., Morris Bldg., (a) $21,535, (b) $.069, (c) $.053, (d) $.0715, (e) $.056, (f) $.105; Phoenix Bridge Co., Phoenixville, (a) $31,626, (b) $.0674, (c) $.0574, (d) $.07, (e) $.06, (f) $.085.

★**Reconstruction of Flooring—Pittsburgh, Pa.**,—Dept. Pub. Wks. let contract reconstructing wood roadway flooring of Wilmont St. Bridge over Cunliffe Hollow, to J. T. Barr, Walsh Bldg., $11,977. Noted Sept. 11 under "Bridges."

★**Pier — Baltimore, Md.** — Weyerhauser Timber Co., 1015 Lexington Bldg., let contract building one 40 x 680 ft., wood pile and timber pier on water front near Curtis Bay, to Empire Eng. Co., Inc., 103 Bourse Bldg. Cost between $25,000 and $30,000. Noted Aug. 14.

★**Water Pipe—Dayton, O.**—City let contract furnishing 233 tons c.i. water pipe, to Moraine Development Co., Moraine City, $11,020.

★**Roof and Trusses—Detroit, Mich.**—City Water Comrs., 232 Jefferson Ave., let contract building, 67 x 307 ft., roof with 76 ft. steel roof trusses over engine room in pumping station, to Wisconsin Bridge & Iron Co., 1362 Penobscot Bldg. About $62,000. Noted Aug. 21.

Charging Platform, etc.—Ypsilanti, Mich.—Central Specialty Co. let contract for steel work, 40 x 50 ft., concrete and steel charging platform, and 5 ton yard crane with runway, 45 ft. span 100 ft. length, to Amer. Bridge Co., Beecher and Michigan Central Ry., Detroit; electric mono rail equipment, to Sprague Electric Co., 40 Larned St., Detroit. Platform and footings to be built by owner.

★**Steel-Barton, Wis.**—Stevens Mfg. Co. let contract furnishing reinforcing steel, structural steel and Class "A" concrete for proposed factory, to P. J. Kalman Co., 425 East Water Street., Milwaukee. About $11,900. Noted Aug. 21 under "Industrial Works."

★**Foundation—St. Louis, Mo.**—United Drug Bldg. Co., 3rd Natl. Bank, let contract building concrete foundation for 8 story, 60 x 235 ft. factory, at 3908-45 Kingshighway, to Westlake Constr. Co., 717 Locust St. About $40,000.

★**Stages—Los Angeles, Ca.**—See "Buildings."

TRACK WORK—PHILADELPHIA, PA.

Bids were received by Department of City Transit, 1211 Chestnut St., for track work for Frankford Elevated Ry., from (A) Snare & Triest, Penn. Bldg.; (B) M. & J. B. McHugh, 892 North Markoe St.; (C) North Amer. Ry. Contg. Co., 1320 Monadnock Bldg., Chicago. The unit bids were as follows:

	A	B	C
20,400 lin ft unballasted track straight or curved to radius of 500 ft. or over	$7.30	$9.10	$8.72
36,900 lin ft. ballasted track, straight or curved to radius of 500 ft. or over	4.90	4.95	5.55
16,000 tons ballast (per ton of 2000 lb.)	4.40	5.50	5.19
Crossovers No. 8 in place complete (lump sum)	5,200.00	5,000.00	6,499.00
Reinforced-concrete floor and curve between bents 228 and 238 (lump sum)	18,000.00	22,000.00	20,829.00
Track between bents 503 and 512, except ballast (lump sum)	8,300.00	7,500.00	10,392.00
Track between bents 526 and 532, except ballast (lump sum)	5,000.00	5,000.00	5,964.00
Filling all bolt cup recesses in footwalk slabs over fastening bolts (lump sum)	2,000.00	2,000.00	1,113.00
500 ft. single track 90 lb. rail with all appurtenances	1.30	1.55	2.00
100 tie blocks for 2 ft. 10 in. creosoted tie blocks	1.50	1.98	2.21
8 in. creosoted ties for ballasted track	3.20	3.90	5.86
For cast iron rail braces, per lb.	.20	.10	.10
For 1:2:4 concrete per cu.yd.	25.00	25.00	15.00
For steel imbedded in concrete, per lb.	.05	.08	.10
For substituting continuous T rail joints 24 in. long	1.90	2.25	2.79
For substituting continuous T rail joints 38 in. long	5.00	4.00	5.60
For bumping posts	450.00	250.00	350.00
For force account labor and material	10%	10%	10%
Extended totals	$462,010	$521,828	$539,339

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—James H. McGraw, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, *Editor* — Charles Whiting Baker, *Consulting Editor*

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New England Water Works Association

LOCAL only in name, the New England Water Works Association meets every second or third years outside New England. Next week it goes to Albany, which because of its convenient location and other attractions should bring a large attendance. In honor of this convention a large part of this issue of *Engineering News-Record* is filled with material of strong appeal to waterworks men. These articles range over a wide technical field and a broad geographical area, the latter including a pipe line constructed in Chile under adverse conditions.

Court of Last Resort

INTERESTING in the extreme are the developments in the industrial situation during the past week. The Boston policemen's strike, the refusal of the unions in the steel trade to postpone their proposed strike at the President's request, the unreasonable demands being made by the printers in New York, and other incidents, indicate clearly that radicalism is pressing for a test. As a result, the conviction has become general that the situation has reached the pass where temporizing is futile—that employers must refuse to go beyond reasonable concessions and bear the burden of strikes. Concessions to unreasonableness only prepare the way for future and more unreasonable demands. Until recently the plea was for wage increases to meet the cost of living. That is now thrown aside and the demands are made merely because of belief in the power to enforce them. Strikes must be allowed to come, and that will carry the case to the court of last resort, the public. Does it stand for radicalism or sanity? We do not doubt the answer. The public's attitude at Boston was a certain indication of what it will be.

The Hopeful Features

IN THE ranks of labor itself the contest between the radicals and the sane men never showed itself more plainly. In debating the proposed steel strike the presidents of the international unions wished to abide by President Wilson's request; the organizing committee stood for quick action. In New York the printers' unions loyal to the American Federation of Labor have come out openly against those whose charters have been forfeited and who are making unreasonable demands, while anyone who comes in contact with the workers knows how widespread has grown the feeling in union ranks against the radicals. Even those who acquiesced before see now that the hot-heads are carrying our industries pell-mell to destruction. Reaction is always certain to come against extreme measures. It has set in in full force in labor's ranks. That fact and the certainty of sanity on the part of the public are the hopeful elements of the situation.

Values Versus Capitalization

MR. PLUMB, in advocating employee operation of the railways, has declared that the Government's valuations were disclosing large overcapitalization. He believes that some $6,000,000,000 could be squeezed out of the eighteen billions of the railroad capitalization—or, in other words, that the Government should properly pay only $12,000,000,000 if it should decide to acquire the roads. It is interesting, therefore, to learn that the Interstate Commerce Commission is reported to have placed its tentative valuation of the Chicago, Rock Island & Pacific Ry. at $410,000,000, which is $64,000,000 in excess of the par value of its outstanding bonds and stock. The valuation is made as of June 30, 1915, since which there have been additional conceded capital expenditures. In the case of the Central of Georgia Ry., which has $57,000,000 of bonds and stocks outstanding, the Government's tentative valuation is $88,000,000 for reproduction new and $72,000,000 for reproduction less depreciation. Of the other tentative valuations completed by the Bureau of Valuation, three out of four do show reproduction cost less than the capitalization, but the total mileage of roads on which tentative figures have been set is only 1840 miles. In the valuation of the railroads of New Jersey in 1911 the value new was reported to be $351,000,000, the present value $343,000,000 and the capitalization $357,000,000. In these figures one fails to find justification of Mr. Plumb's prediction.

The Bankruptcy of Socialism

FROM various sources we are learning of the change in point of view of the Russian Bolshevist leaders. Pure democracy having broken down, they are rapidly putting into effect the despised methods of the system that they destroyed. Mr. Hoover, in his thoughtful address in New York last week, told of the change. They have abandoned the socialization of land, they have reëstablished a differential wage in order to stimulate men to do their best, they are willing to pay handsomely those who can direct enterprise, they are restoring individual ownership and protecting the individual in the fruits of his labor. The same story is told in more detail in a letter from the Stockholm correspondent of the New York *Evening Post*, published Sept. 6. All these things were, of course, foretold. As Mr. Hoover points out, our industrial system is not perfect, but its main features—private ownership, freedom for initiative and remuneration proportionate to performance—are the results of a thousand years of experience and social experiment. Moreover, they rest on the unfailing human characteristic of doing well consistently only when one's own interest is at stake. The pertinent question, as Mr. Hoover points out, is whether we can learn from the bankruptcy of socialism in Russia

and Hungary or whether we will be plunged into the same abyss, and, after sorrows and disaster, painfully reconstruct that which we now have. Some changes in the machinery are needed here and there, but by and large the system is good. It is our duty to see that the hot-heads do not relegate it to the scrap heap.

The Social Theorist

MR. HOOVER'S reference to the *dilettante* leaders of Russia reminds us of an engineer with whom we recently have had contact. We cite him, not because he is an engineer, nor because as an individual he is important (for he is not), but because he is of the type of citizen who is causing much trouble. This engineer is notorious among his associates for his inability to reach a decision. His work piles up until someone goes over the heap with him and gives the final word on each item. He is seeking "a big job at big pay," though he has demonstrated his incapacity as an executive. He has never handled men, nor has he ever been responsible for a payroll. Yet he has very positive ideas on how industry should be reorganized and *socialized*. Unable to make decisions on his own little job, he does not hesitate to decide the future of all industry and to give free expression to his views. How lame many of us would appear if before we pressed our opinions on the multitude we were obliged to present evidence of competence! There would be less talk and more sound, humble thinking.

Reclassification of Federal Salaries

ENGINEERS and engineering societies should be keenly interested in the reclassification of Government salaries being made by a Congressional commission. Inadequate salaries of engineers and scientific men in Government employ have always been used as evidence by those who desire to hold down the compensation of their own engineering employees. Consequently, each member of the profession has a personal, as well as a citizen's, interest in seeing that the Government pays its technical employees adequately. For that reason we commend to the consideration of engineers the article in this issue regarding the classification of the engineering employees of the Dominion of Canada made by Arthur Young & Co., an accounting firm which was retained by the Canadian Government and is now engaged in making the reclassification for our own Congressional joint committee. The Young report has met with much protest from the engineers of the Dominion. Presuming that the firm will proceed on the same basis here, it is the duty of engineers to become interested in the question now, while the reclassification is under way, rather than to wait until a finished document, carrying much weight with members of Congress, shall have been produced. Prevention is better than cure. With the inadequacy of the Canadian report as a text, engineering societies should place before their Congressmen the view that in the present reclassification of salaries engineers should be compensated in accordance with the importance of their service and the educational and experience requirements needed for the discharge of their duties. The Congressional commission, we have no doubt, is determined to be fair. We should regret to see it misled by the advice of those who, judging by their Canadian report, have an inadequate appreciation of technical services.

A Great Ideal of Public Service Realized

THE dinner given by the engineering profession in New York City last week in honor of Herbert Hoover was, as W. L. Saunders, the toastmaster, said, an occasion without precedent in the world's history. The organization of which Mr. Hoover has been the executive head has saved from starvation since the armistice a hundred million persons. Even more it has been an important factor in starting new governments on their way. This second intervention has saved Europe as truly as did our intervention in the war.

The engineers of America may well be proud that one of their number, a graduate of an American engineering school, one who by his talents alone won international professional eminence, has rendered a service to humanity whose magnitude dwarfs anything ever before recorded. The profession may well bestow honor on Mr. Hoover, for he has attained the noble ideal, that has long animated the minds of many members of the profession, of the great service which engineers of the requisite ability might render the public. The fact that a few partisan critics have barked at his heels is all the more reason why engineers should honor him.

And the bestowal of such honors means much more than merely paying a deserved tribute to the man himself. The great end to be sought is to educate the public to the value of expert nonpartisan service when rendered with the ability and the patriotic spirit that Mr. Hoover has so marvelously displayed. The solution of many of our most pressing social problems is to be sought through the service of such men, who have the ability to organize not only things but men and who have the breadth of vision and broad sympathies that are effective to disarm opposition and end controversy.

The Plight of the Colleges

DURING the first week of October, Harvard graduates with an elaborate international organization will undertake an intensive drive for $11,000,000 or more for an unrestricted endowment fund for the university. At the same time Massachusetts Institute of Technology is instituting a $7,000,000 and Cornell a $5,000,000 campaign.

In support of the Harvard drive is a statement of the conditions that obtain in the oldest and perhaps the richest university of America. It is full of importance not only to Harvard men but to all who are interested in higher education in America. Harvard has today an endowment of upward of $33,700,000, and yet of this amount only $2,600,000 is unrestricted. With this large total in hand, Harvard has been for some time unable to make both ends meet.

The scale of salaries paid to professors and instructors has proved to be so inadequate that Harvard is no longer able to hold many men of unusual scholarship and teaching ability on its faculties. This scale of salaries, established in 1906, runs from $1000 to $1200 a year for instructors, up to $4000 to $5500 a year for full professors. The scale is probably higher than that of all but a few of the higher institutions of learning in this country, and yet it has proved inadequate, and with all her resources Harvard has been unable to grant increases.

A large portion of the new endowment will therefore be devoted to increasing the salaries of the instructional staff in all departments of the university.

Beyond this, large funds are to be established for increased activities of the various graduate schools.

If Harvard and "Tech," with their huge endowments, and their large alumni lists, find their situation serious, what must it be for the various engineering schools and smaller endowed institutions of learning throughout the country? If these great schools find it difficult to retain the services of suitable men on the faculty, what must be the struggle in institutions where the professors have the possibility of getting not $5500 but $2500 and even less as a reward for a lifetime of devoted service? In engineering schools particularly the war developed a serious situation. Men who had determined upon a career of teaching found that it was difficult to provide even the bare necessities of life on their salaries, unless they were fortunate enough to have private means or outside income. Besides this, many found for the first time opportunities to render service to large manufacturing or engineering companies where the prospects of greater comfort in life and secure old age lured them from their chosen profession. Obviously, if the standards of our colleges are to be maintained and improved additional resources are necessary. Industrially we are headed toward a loss of our position if the ranks of science and engineering are not supplied with capable men.

Not only should the drives now being undertaken have full support, but college alumni generally owe a duty to their respective institutions to assist in bringing about financial conditions that will insure the retention and building up of teaching staffs fully adequate to the demands which the country is making on our higher institutions of learning.

Gas and Aircraft Warfare

ENGINEERS have an especial interest in two phases of the proposed Army reorganization, aside from the subordination of all technical officers, discussed in these columns Aug. 21. These two phases are the inadequate provision for air service and chemical warfare. In previous wars there were, leaving out the Navy, three combat branches of the military machine—infantry, cavalry and artillery. The cavalry ceased to function in this war, but two new services, aircraft and gas warfare, with a technique setting them apart from the other combat arms, assumed major importance. In aircraft we barely had a beginning when we entered the war; in gas warfare we were totally unprepared. Despite our previous unpreparedness and the rise of these branches to first importance, the General Staff proposes to emasculate them. If their plans are adopted we shall find ourselves in another conflict no better prepared than we were at the beginning of this war.

It is alleged that gas warfare is inhuman, and for that reason is barred from future wars by the League of Nations pact. The evidence, however, does not support the contention. The proportion of fatal to total gas casualties is lower than the percentage of fatal to total bullet and artillery casualties. But, beyond that, it is certain that, despite the spirit of the League of Nations pact, other nations will continue to prepare for gas warfare. both in offense and defense. If we could be certain that gas would never again be used, we could, with clear minds, discontinue all gas-warfare study. No sane man, though, will place complete reliance on any peace pact. Laboratory experimental work, it is true, is to be permitted, but not the full-scale experiments and drill in gas attack and defense which alone are effective in military preparedness.

Regarding the air service, nothing need be said as to the need for aggressive experimentation and the maintenance of effective air forces and equipment. Today, while England is arranging to maintain an air force of some 50,000, the United States, despite its big war development, could not put a single effective squadron in the field. The machine built up under stress of war should very properly have been scaled down to a peace basis. But it should not have been reduced to impotency, demobilized to its weak pre-war position.

Both services are scientific to the last degree, and therefore of special concern to engineers. Engineering societies owe a duty to the country to protest against the inadequate provision for these arms of the service.

The Albany Waterworks: 1800-1919

GLIMPSES of the doings of the Albany Water-Works Co., a century and more ago, afforded by official minutes, show the trustees trying to solve some of the same problems that confront water-works men today. In particular, the demand for water outran the capacity of the works, "wanton waste" prevailed and rates had to be readjusted to make income equal outgo. Much the same difficulties are experienced in Albany under municipal ownership a hundred years later and to them are added the later problem of so treating a highly contaminated water as to render it safe for human consumption.

The basis of charging for water in Albany in 1802 (see page 605 of this issue) seems absurd enough now but it was no more unsound than those in force in many cities today. The amount paid for water by citizens of Albany when the works were started depended on the number of fireplaces in the house—which at best was a measure of ability to pay rather than of service received. A little later a more rational basis, the size of aperture, was adopted, but in 1815 the size and character of dwellings, and in some cases the number of front windows, governed the water-service charge.

Progress has been made in framing water-rate schedules in Albany in a hundred years, but as only 45% of the services are metered flat rates are still paid by most of the consumers. Such rates at best are arbitrary, are likely to be unfair, and encourage water waste. It is not surprising, therefore, to find the Albany water expense and income in a constant race with each other, with expense sometimes in the lead—always, perhaps, if capital charges on the entire cost of the works instead of only on the unredeemed bonds were taken into account.

A hundred years after Albany joined the small number of cities—less than a score—provided with public water-supplies it again put itself in the pioneer class. This was by adopting sedimentation and slow-sand filtration, which resulted in a heavy reduction of typhoid in Albany. Water consumption and waste at that time was about 200 gal. per capita and despite the earnest efforts of some of the city officials it has remained substantially at that figure ever since, reaching 232 gal. last year. Had consumption been reduced to the figures obtained by other cities that have metered all their consumers the original filters would have been adequate

for many years, although perhaps seriously handicapped in times of freshet and high turbidity.

Whatever might have been, the fact is that Albany has successively adopted preliminary filtration, chlorination and coagulation in conjunction with the original sedimentation and slow-sand filtration plant, as stated more fully on p. 604. At times, some of the water from the preliminary (or mechanical) filters is bypassed around the slow-sand filters lest these be overburdened. Coagulation, for reasons of economy or in deference to remnants of the old prejudice against it, is not practiced the year around. Chlorination, the great water-insurance agency, is used on all the water. The purification works as a whole interpose a barrier against typhoid from the sewage-laden Hudson, but the water supplied is sometimes high in color.

Need for rigid economy probably explains some of the steps taken at the purification plant, both as regards new construction and daily operation. If the prejudice against full metering could be overcome and the objections to coagulation be broken down or ignored, Albany might be insured an ample, safe supply of water from the Hudson River at least until conditions warranted going as far afield as may be necessary for a relatively pure all-gravity supply. Metering would not only reduce consumption and waste; it would also distribute the burden of the supply equitably among consumers and make it easier than now to readjust rates to meet expenses. The water-works officials realize all this, but the water consumers do not. The campaign of education should be continued with unceasing vigor.

Private Versus Government Ownership of Railroads

PROBABLY to most engineers the presentation by Colonel Wilgus and Mr. Lindenthal, in our issue of Sept. 11, 1919, of railroad plans predicated on Government ownership came as a great surprise. Both men are noted for the soundness of their views, both have long acted as advisers of great railroad systems. As we understand it, neither of them is personally in favor of Government ownership. They believe, however, that it is inevitable; and, so believing, they hold that it is the part of wisdom to help guide the inevitable into the best channels. Nor are they alone among eminent engineers in holding this belief; we could name half a dozen engineers, all nationally known, all with railroad-service records, who hold similar views.

Engineering News-Record believes that the railroad question would be solved best for the public by the retention of private ownership, but we appreciate the reasons that have led many to acquiesce in the acquirement of the roads by the public.

The regulatory efforts of recent years have placed the railroads—and, in fact, all public utilities—in a class apart from other industries. The independence of action usually associated with private ownership has been severely curtailed. Income is fixed by rate regulation; outgo by full-crew and safety laws and, latterly, by wage increases. From another quarter, the brotherhoods, have come further restrictions, through the weakening of the disciplinary power of earlier days. The railroads, in fact, for years before the Government assumed control, were under a quasi-public form of operation. Under that control their financial condition constantly grew worse.

Into this situation the war has injected no really new element, but certain factors previously operating to curtail the initiative, freedom and financial stability of private operation have been intensified. Quasi-public operation has given way to full Government control; labor's strength is much greater than it was. Railroad credit, weak before the war, is nonexistent today. The Government has the roads and cannot turn them back without facing widespread railroad receivership and wreckage, or giving assurance that revenues adequate for the restoration of credit will be allowed.

Under these circumstances the cry for Government purchase has naturally been strong. In fact, its strength is such that many believe it will prevail.

No one is able to say positively what the sentiment of the country is on the subject. We know where the railroad brotherhoods stand, and there is reason to believe that the entire membership of the American Federation of Labor will stand with them. At the other end of the scale, we have the recorded vote of the United States Chamber of Commerce, the business managers of the nation's industries, in favor of the continuance of private ownership. We know that the farmers are opposed to Government purchase. But where the great middle class of the cities stands, the salaried people, who in this instance probably hold the balance of power, no one can predict. We are inclined to believe that this group would at least split even, throwing the preponderance toward private ownership. Yet no one can say definitely what the result of a plebiscite would be.

The highest hurdle that private ownership finds before it is the guarantee. Many argue—and that argument has great popular weight—that rather than guarantee the securities of others the Government would better issue its own obligations; moreover, assurance of adequate rates is but an indirect guarantee. Will the public permit such a guarantee to be given? An adequate-rate guarantee would meet with the less objection.

In connection with guarantees, it must be remembered that in the end the people must pay their transportation bill—either through rates or taxation. This being so, the critical question is, Under what plan can transportation be manufactured most cheaply and satisfactorily? All available records force us to throw out the alternative of Government operation in such an inquiry; there would be left private operation under Government ownership and private operation under private ownership. With the money market as it is and under ordinary methods of financing, the one plan offers no greater economy than the other. Mr. Lindenthal proposes, though, a scheme that would reduce the cost of capital to the Government. That would tend to make the Government-ownership plan the more economical. Offsetting that, however, would be the inevitably greater interference in operation, an interference that would likely more than offset the 1 or 2% saving in the interest rate.

Whether such considerations can be effectively put before the public, though, is problematical. The mass of the people act on feeling rather than reason. The strike of the patrolmen at Boston and the threatened strike some weeks ago of the railroad shopmen have done more to bring sober thinking than could a large amount of oratory and printer's ink. Possibly such radical extravagances may help to stay the drift which Colonel Wilgus and Mr. Lindenthal feel is sweeping us to Government railroad ownership.

Constructing a 98-Kilometer Water Conduit in Chile

Wrought-Iron Pipe for Toconce Line Carted and Dollied and Supplies Moved by Carts and Pack Mules Through Mountainous Desert—Much Pipe Laid by Machine—Camp and Conduit Costs

By George H. Bayles
Assistant Resident Engineer in Charge of Construction; now at Morgantown, West Virginia

Most of the ordinary problems of construction have been met and conquered by engineers of experience, and the young engineer can turn to their records for guidance; but occasionally new conditions present new problems that have to be met in new and untried ways. On the pipe-line job described in this article several unusual problems presented themselves, and an idea is given of how they were solved. The work was in a strange and unusual location and most of the men connected with it were new to the work in hand and possibly did not meet the emergencies in the best way. But it is not likely that soon again will there be such difficulty of obtaining materials and equipment as was experienced on this job; in fact, they could not have been procured at all except as a war measure, to aid in the rapid and economical production of copper. Even at that, delays were annoying and often very expensive.

It is probable that American capital will in the near future be invested more largely than ever in South American developments and that the American engineer will have many unusual situations to meet. A short description of this job, with some record of the cost and amount of work the ordinary laborer can accomplish under the conditions may therefore prove of some value. The climatic and weather conditions here described are not far different from what may be expected anywhere on the great tablelands of Bolivia and Peru and the highlands of northern Chile, which, taken together, comprise the principal South American mineral region.

DESERT and mountainous country combined in making unusually difficult the construction of a wrought-iron pipe line 6 and 9 in. in diameter and nearly 100 km., or about 60 miles, in length, for the water-supply of a copper mine and camp in Chile. Provision of water for use on construction, getting in camp and other supplies and moving pipe to place, all over poor roads and trails, were included in the difficulties. Most of the pipe was laid by machine. Careful records of cost were kept. The mine is five miles from the nearest point on the main line of the Antofagasta to Bolivia Railroad, and is in latitude 23° S., on a mountain side 12 miles from and 2000 ft. above the nearest stream, at an elevation of more than 9000 ft. above the sea and in the midst of an absolute desert.

Before the new pipe was laid, slightly brackish water, suitable for most uses in the plant operation, was obtained through a gravity pipe line from San Pedro, about 37 miles to the northeast, and fresh water for domestic boilers and other necessary uses was purchased from the A. to B. Railroad Co. and pumped five miles from San Salvador to the mine and plant. By the time the plant was in full operation, reducing 10,000 tons of ore a day, the daily cost of buying and pumping fresh water was nearly $300, corresponding to an investment of approximately $2,000,000. An investigation by the company's chief civil engineer disclosed only two possible sources of supply, and the final decision was in favor of getting the water from the Toconce Springs.

The Toconce Springs are situated 60 miles east of Chuquicamata, and are a group of several good-sized springs of fresh water running out close together from under the toe of an ancient broken lava flow (Fig. 1), which comes down from the great central ridge of the Andes ten miles east. The springs have a practically constant flow of 12 sec.-ft. They are at El. 13,435 ft., near the head of the Salado River basin, which has an elevation of 8000 ft. at the lowest point on the pipe line and is bounded on two sides by ranges of snow-capped mountains running up to 22,160 ft. (Cerros de Tocorpuri). The general direction of the valley is westward from Toconce Springs for 40 miles to the Loa River. The Loa here is separated from Chuquicamata by a valley eight miles wide and a range of hills through which there is a pass above the mine at El. 10,165 feet.

The combination of latitude, altitude, mountain ranges and air currents produces peculiar weather conditions which profoundly affected the cost of the work.

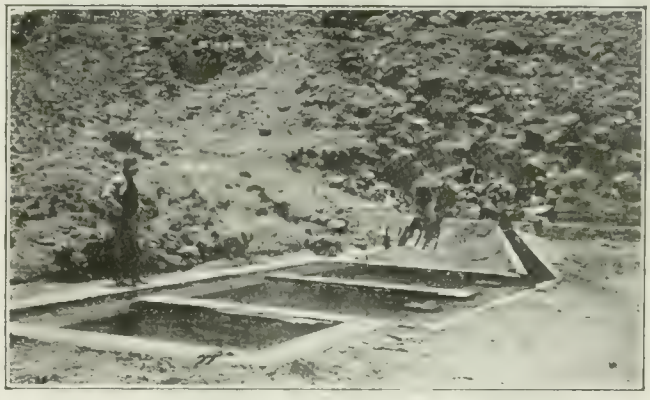


FIG. 1. BEGINNING OF PIPE LINE AT TOCONCE SPRINGS

The springs flow from the lava toe into a pool formed by a low dam; thence to a settling chamber; the pipe line leads from the bottom of the chamber in the foreground

Midday was generally unpleasantly warm; the nights were always cold (frost six months in the year in the lower parts and every month near the springs); it was seldom cloudy and there was no rain except on the upper 10 miles near the springs, where rain and snow were not uncommon in January, February and March. Practically every afternoon high winds swept across the region from the northwest, carrying along all the loose sand and dust of the desert, and making work very unpleasant and at times quite difficult. Rain and snow fall on the high surrounding peaks during the summer months, and in the upper end of the valley there is sparse, coarse, brown grass and some sagebrush and giant cactus. In moist places above El. 13,000 ft. there is a peculiar plant called "yareta" which is the only fuel of the region. It is practically solid wood, grows

to 3 ft. high and 10 ft. across (averages 2 ft. high and 5 ft. across), has the appearance of rounded moss-covered boulders, and is very resinous. It burns readily when dry.

The sides of the valley are formed of volcanic flow from the big peaks of the surrounding mountain ranges, several of which are still smoking. These flows range from loose, gravelly earth to very hard, black traprock, and are from 100 ft. to 2000 ft. in thickness. The floor of the valley is composed of wash from the steep, surrounding mountain sides; this looks as fresh in some places as if it had been deposited last week; while other parts are covered with flat strata of limestone, rock salt or gypsum. The whole Salado River Valley has an area of about 1500 square miles and, outside of the village of Chiu Chiu, has a population of some four hundred, all native Indians, in five villages.

There are several small springs and one large one, besides Toconce, in the valley. The large one, Turi, is at the foot of Mt. Paniri, near the pipe line at K65; has a flow of about 10 sec.-ft. of gaseous mineral water, good to drink while fresh, and well liked by the thousands of llamas, burros and sheep that live on the flat Turi plain watered by it. The Toconce River, flowing from Toconce and other nearby springs, and the ooze from beneath contiguous volcanic rock, are potable. The Loa River, crossing the pipe line at K32, is the principal stream of that part of Chile. It has an average low-water flow, including the Salado, of 90 sec.-ft., is only slightly salty, is used by the natives and on this job was used for all domestic purposes. The A. to B. Railroad Co.'s line was tapped at Cere, and the job near Chuquicamata was supplied from the plant. From these four sources of supply all the water for use on the job was carted or packed. Water-supply was one of the most expensive and difficult items in the construction of the pipe line.

It was determined that 3000 metric tons of water a day (1.225 sec.-ft.) would be ample for all purposes for several years, and a concession was obtained for that amount. With the springs at El. 13,435 ft. (see plan and profile, Fig. 2), the tank above the mine at El. 10,165 ft., and a long distance between, running from below 9000 down to 8000 ft., it was desirable to use as low a hydraulic gradient as possible without making the cost prohibitive. An investigation indicated 9-in. pipe for the larger part of the way with 6-in. pipe down the two principal slopes, near the springs and near the plant. It was planned to put in a short, temporary section of 2½-in. pipe down the mountain near the springs to throttle the flow and keep the pipe full everywhere until the roughening interior of the pipe should bring the hydraulic gradient to the slope used in the calculations for final flow, when the 2½-in. pipe would be removed and replaced by 6-in.; but on account of delayed delivery the job was completed without it.

There is only a short section of the line (on the Turi plain) where the ground is ever wet, and this is always wet. It was therefore decided to use regular rolled-steel pipe, the 6-in. of standard weight and the 9-in. of two weights, 42 and 34.612 lb. per foot, to work at 900 and 600 lb. and tested to 1600- and 1000-lb. hydraulic pressure per square inch. The final location profile indicated that some of the lighter weight 9-in. pipe may have to sustain pressures slightly in excess of 600 lb. per square inch but not high enough to cause concern.

The zero station of the location was taken at the service tank immediately above the camp and plant. Passing from that point towards the springs the line runs down a steep grade, crosses through a divide and climbs into the gap in the range of hills above and east of the mine, where two reinforced-concrete storage tanks of 1500 metric tons capacity each (61½ ft. in diameter by 18 ft. net and 20 ft. gross depth) were located at K6.211 and K6.303 (Fig. 3). From the tanks the conduit passes down a narrow, winding, steep, little hollow for 3 km., then across a fairly even surface continuing down grade to K19.655, east of and beyond the A. to B. R.R., to the lowest point on the line. Thence it runs over an apparently level but gradually rising plain across the valley to the Loa River cañon at K32.058. It there drops into a gorge more than 300

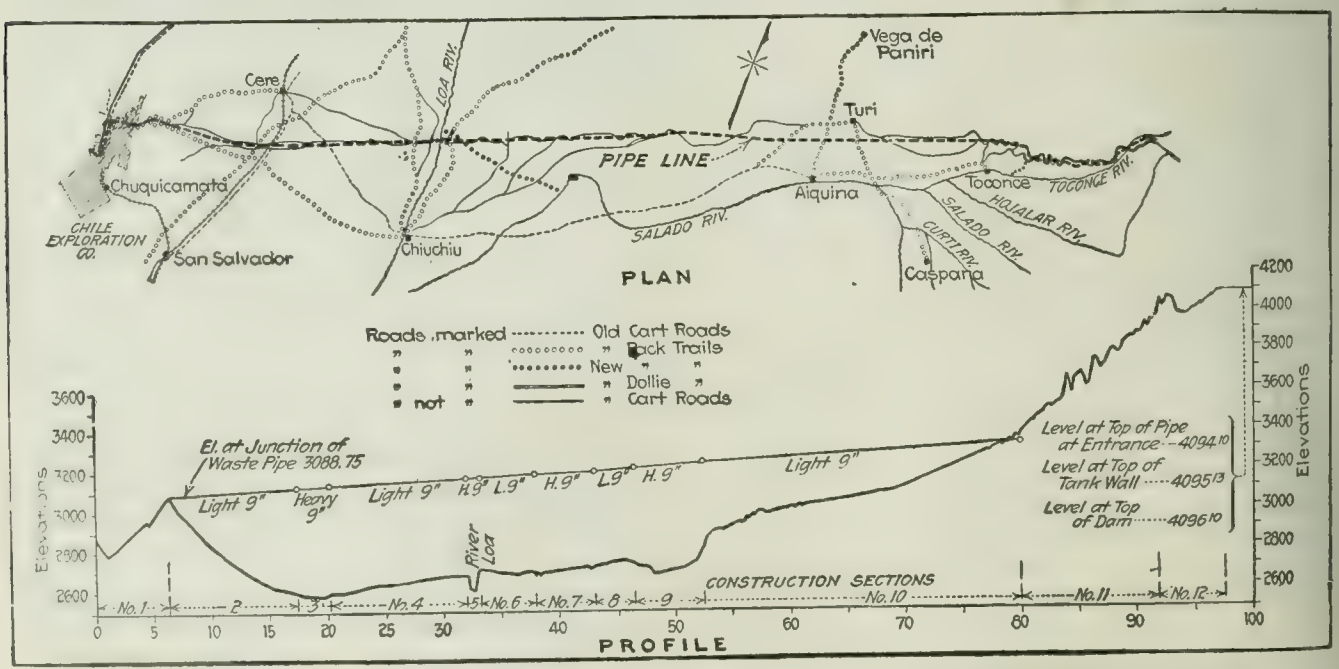


FIG. 2. PLAN AND PROFILE OF PIPE LINE SHOWING ROADS, TRAILS AND CONTRACT SECTIONS



FIG. 3. CONCRETE TANKS AT LOWER END OF PIPE LINE

ft. deep to the greatest hydraulic head on the line, crosses the river and climbs the steep eastern slope to another comparatively flat plain that extends to K78, broken here and there by gullies ranging from a few feet in width and depth to four miles in width and 500 ft. in depth, this largest gully, an ancient watercourse, being known locally as the "sink." The whole floor of the sink is covered with apparently bottomless sand, providing the most difficult hauling problem on the job. From K78 to K84 there is a gradually increasing slope up over deep gullies and steep, sharp ridges. From K84 to the end of the line at K97.569 the conduit runs through country that is extremely rough and variable.

The superintendent of the pipe-line construction reported directly to the resident engineer, and had charge of all work connected with the job except the technical work of the telephone line and calibrations of flow in the pipe, which were done by the mechanical and electrical superintendent. The executive staff consisted of a business manager, two material clerks and forwarding agents, necessary engineers sent out from Chuquicamata when needed and several foremen as the work required. The maximum number of employees was a little over 500. On account of the severe living conditions only the roughest labor element, most of it part Indian, was attracted to the work. The Government authorities coöperated with the superintendent and the resident engineer to prevent the sale of intoxicants along the line, and the job was completed with no serious difficulties among the men and no deaths from violence. The apparent labor turnover ran as high as 100% a month, but much of this was due to men quitting and spending their pay and going back to work within a few days.

The superintendent established headquarters at Chiu Chiu, a village of about 200 inhabitants, at the only practicable crossing of the Loa River, four miles south of the pipe line and 20 miles from Chuquicamata, but the most convenient location from which to reach all parts of the line quickly. The business manager lived with him and had charge of all local business matters connected with the job; smaller contracts, payrolls, supplies, etc. One material clerk was located at Cere, a water station on the A. to B. R.R., which was made the receiving and despatching station for practically all pipe-line material. The other material clerk was located at Chuquicamata and had charge of obtaining and despatching all supplies from the plant.

At the beginning of the job there were so-called cart roads from Chuquicamata to Chiu Chiu via Cere and San Salvador and a semblance of one from Chiu Chiu to Aiquina. On the rest of the line there were only pack trails, and for the last 10 miles the trail was of the most elementary sort. Before other work could be started, then, it was necessary to build passable roads. Up to K77 the only difficulties encountered were (1) making the first Salado River crossing fordable and building a road up both banks; (2) building a road up onto the Turi plain opposite K60; (3) building a road down into and up out of the sink at K52 and K48; (4) building a road from K52 to K62, thereby avoiding a detour of two days for carts, and (5) building a road from K74 to K77 over comparatively easy country. From K77 to the Enganche at K83 a cart road was built over very difficult country made up of deep gullies and steep hills, and all at as steep an ascending grade as practicable, rising 1150 ft. in four miles in spite of the many down grades necessary in crossing the gullies. From the Enganche to the end of the line the cost of a cart road would have been prohibitive, so a narrow road was cut in the mountain side (Fig. 4) and pipe dollies



FIG. 4. NARROW ROAD CUT IN MOUNTAINSIDE

The pipe line and dolly road are at the left and the main cordillera in the background

were designed and built suitable for use there (Fig. 5). This completed the roads along the line, but four miles of pack trail was built to reach water for some sections. These were not first-class roads in any sense (except the local conception of a cart road) and three repair gangs were employed regularly for four months during the heavy hauling period. Many more miles of cart road and trail were used regularly, but they were on even ground where no work was required to prepare them for use.



FIG. 5. SIX-MULE CART LOADED WITH 9-INCH PIPE

On the longer trips an extra mule was led to "take turns"; some round trips required six days—for these food and forage were carried on the carts. Dust was an ever-present annoyance

The intention was to do the heavy hauling with tractors. Two 120-hp. Holt tractors and twelve 5-ton trailers were ordered. Owing to war conditions, delivery was delayed, and the machines were not exactly according to specifications, so that they were tried out only near the end of the job and too late to make the changes necessary to adapt them to the country. The low-wheeled trailer, properly designed for use on hard roads or paved streets, sank to the axles in the sand of the sinks, and it took two tractors to haul one trailer with a seven-ton load there. Trailers with 5-ft. wheels having narrow tires and tractors with the slow speed of a mile an hour might have worked. Auto trucks were tried out for the general hauling (there were not enough available for all hauling) and one trip eliminated all but the "quads" which were used throughout the job on a regular twice-a-week provision service from Chuquicamata to Cere and on many special trips for camp moving, quick delivery of special parts, etc. The superintendent used a Ford and in it easily and quickly reached all parts of the line up to K83, beyond which point a mule was necessary. The local cart of the native is a heavy, two-wheeled vehicle, usually drawn by six mules working three abreast and capable of carrying a load of five or six tons over roads impossible for other classes of vehicles. This was the conveyance that had to be adopted for all regular hauling, and from all tests it appeared perhaps the best in any case.

Several local native contractors, each with a few carts, were employed for as much work as they could do but, in spite of the comparatively low daily rates which they could make because they were at home and produced their own forage, they proved expensive; and when working on contract at fixed prices their slowness made other work expensive. The principal carting contractor, Hutcheon & Weiss, was a Scotch-American firm which had had 18 years' experience in similar work on the highlands of Bolivia and Chile and whose scientific management not only made money for its members but reduced cost to the employer.

Pipe and other materials were carted to all points up to K83, except across the Loa gorge, about four tons to a load. (See Fig. 5.) Beyond that point all pipe was hauled one at a time on dollies (Fig. 6) and other supplies were packed on mules. Some of the dollies were improvised from wheeled scrapers; others were made entire in the company's shops at Chuquicamata. Transportation of water was by cart where possible, each cart carrying 8 bbl. of 40 gal each; elsewhere it was by pack mules, carrying four 5-gal. cans each.

Because of the practically uninhabited and unwatered nature of the region, the company boarded all employees on pipe-line work, a practice not used at the plant, where there was a large commissary. The company furnished tents, all food supplies, cooks, water, etc. The employees furnished only their bedding. It might have been better for the company to have furnished bedding also, maintaining a proper renovating plant, as sometimes the men did not (often could not afford to) provide sufficient bedding and consequently suffered with the cold and discomfort and were less efficient. All supplies were taken at first from the company's store at the plant, hauling them in trucks to Cere; but later it was found advantageous to buy from merchants in Calama and Antofagasta, shipping by rail to Cere, taking from the company store only fresh meat and such other articles of less importance as could not be obtained elsewhere. This saved some freight, all the trucking, delay and store overhead, which, in the total, were considerable.



FIG. 6. PIPE DOLLY USED IN MOST MOUNTAINOUS SECTION

The wheel gage is narrow and the pipe is slung high to save road-building work

The superintendent had a permanent camp in a rented house at Chiu Chiu; one material clerk lived in a permanent camp built for the purpose at Cere; the engineers had a movable tent camp that was set up near the work in hand, and each foreman had his own tent camp which was moved about every three miles as the work progressed.

The telephone-line construction was begun at the same time as the first grading for the pipe line and pushed to completion as rapidly as possible. Wooden poles had often failed in this region from a sort of dry rot at the ground surface. They were practically unobtainable, and when they could be got the price was excessive—above $14 each. It was therefore decided to use concrete poles where possible. They were used throughout except for 200 old pipes and two old rails which were on the roughest part of the upper end of the line. The concrete poles were 6 x 6 in. at the bottom, 5 x 5 in. at the top, and 18 ft. long, with corners beveled 1 in. They were reinforced with four ½-in. square deformed steel bars, one near each corner, tied together with iron hoops from used cement barrels. The concrete was composed of 1 cement to 4 ore tailings (voids averaged 22% in tailings) and were cast at the plant on a concrete platform built for the purpose, using wooden side forms. The cost was $10.25 per pole. The concrete was mixed in a 6-ft. mixer, and the poles were strong enough to handle in three weeks.



FIG. 7. LAYING PIPE BY MACHINE

An average gang of 26 men laid an average of 60 lengths of pipe a day with a 50-horsepower machine

They were shipped to Cere by rail and carted from there, like the pipe. They sustained very few breaks and seem to be standing up to their work perfectly. A few 24- and 30-ft. poles were made for special cases. They were of the same materials and dimensions as the 18-ft. poles except in length. Poles were set an average of 3 ft. in the ground, 16 to the kilometer (205 ft. apart, average) and across the Loa cañon the wires were suspended from a ⅜-in. wire cable. Much repair work during the progress of the job and a general over-



FIG. 8. LAYING PIPE WITH CHAIN TONGS BY HAND
An average gang of 19 men laid an average of 25 lengths of pipe a day

hauling at the end were made necessary by breaks caused by shooting on the grade, but the construction of the telephone line ahead of the other work was justified by the assistance which it rendered to the other work.

Uninterrupted flow through the pipe line is very desirable, as the whole plant operation depends on this water and the storage tanks hold only one day's flow (two days' requirements at present). Great care was taken, therefore, to eliminate all humps that might contain air, and thus obstruct the flow. Where they could not be eliminated, air valves were installed on the line. All low points were provided with scour valves for removing sediment from the line. The great daily range of temperature (as much as 70° F.) would overstress an exposed empty pipe. Careful experiments showed serious strain when the pipe was buried 18 in., and that minimum depth of cover was adopted. Grading was expensive on account of the hard limestone on the surface of the plains and the black trap or "nigger-head" rock found on much of the mountain slopes. In covering the pipe no attempt was made to fill the deeper ditches—only to get a minimum covering. Where there had been no excavation earth for covering, the pipe was scraped up from the surface of the ground nearby. In some places it was necessary to build stone terraces for considerable distances to hold the pipe on the mountain sides; in others stone walls were built across short, deep gullies to save the bends that would have been necessary in following the profile of the ground. The deeper and wider gullies were crossed on wooden trestles, the smallest of which had two 3-m. and two 2-m. bents; the largest, one 2-, one 3- and seven 7-m. bents. The Loa River was spanned by a steel truss bridge 60 ft. long, the interesting feature of which was its erection ahead of its foundations, the bridge being suspended complete on tripods at the ends, the anchor bolts and tie-rods placed and the concrete foundations poured.

A pipe-laying machine was used on the smoother parts of the line, and the pipe in the rougher country was laid by hand, using chain tongs. Laying pipe by machine required an average gang of 26 men, which averaged laying 60 joints of pipe a day, with a maximum of 150. A hand-laying gang of 19 men averaged laying 25 joints of pipe a day, with a maximum of 40 on 9-in. and 45 on 6-in. pipe. These figures could have been very materially increased if experienced pipe men had been available. The men employed, including the foremen, were without any previous training in pipe work.

When the line was put into service, trouble developed in the machine-laid pipe, 14 joints pulling out, apparently due to crossed threads which stripped in laying. One pipe split. No leaks of importance occurred in the hand-laid pipe. Preparations had been made for these emergencies, and 2-ft. sections of pipe, flanged both ends with an extra pair of flanges each, were on hand. In every case, the damaged end of pipe was cut out, the cut end threaded and flanged and the flanged section inserted. A few small leaks were calked with a chisel. In spite of painstaking precautions, a number of foreign objects were discovered in the pipe when water was turned in—small stones and pieces of wood up to 4 x 6 in., several feet long. They were removed at the scour valves, the pieces of wood by splitting up with a chisel and hammer into pieces that could be taken out.

Measurements of flow through the whole length of the line were not completed, but a fairly satisfactory set of measurements was taken on the 9-in. section immediately below the springs. A venturi meter, required by the Government of Chile, was installed near the intake where the head would be 12 ft. at ordinary flow; a gate valve, the only one on the line, was placed just below the meter; the intake and settling chambers were carefully measured; a weir was built in the intake, and pressure gages were attached at suitable places along the line. The measured flow did not follow any known formula exactly. The observed variation of the hydraulic gradient with the velocity, compared with the computed variations, is shown in Fig. 9. The original computations were based on Kutter's formula, which indicated a hydraulic gradient of 0.5% in the 9-in. pipe, and the observed slope at 3000 metric tons per day was 0.325 per cent.

Owing to the low hydraulic grade, some air valves

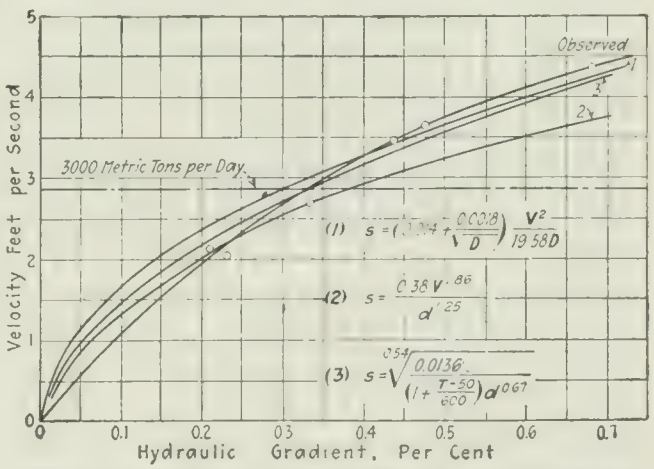


FIG. 9. COMPUTED AND OBSERVED VELOCITIES OF HYDRAULIC GRADE LINES FROM K92 TO K97

were left above the gradient, to admit air to the line. The velocity of the water is sufficient to entrain this air, and it is carried along to be discharged—small amounts at air valves, but principally at the tanks. Possibly due to reduced volume of entrained air under high pressure, as well as the dips into deep gullies, the hydraulic gradient of the inverted siphon between K6.303 and K79.900 does not appear from the incomplete pressure-gage readings to be a straight line.

To provide a cutout so that work might be done on the tanks, or for other reasons, without shutting off the flow through the pipe line, the overflow shown in Fig. 10 was devised. The friction head used in the design was the same as calculated for the pipe, 0.5%, but the expanding entrained air, acting as an air lift, caused water to overflow here when the surface of the water in the tank was 4 ft. below the overflow pipe. To correct this, the arrangement shown in the same figure was installed and worked perfectly, the air-lifted water never getting higher than 6 in. from the top of the little tank.

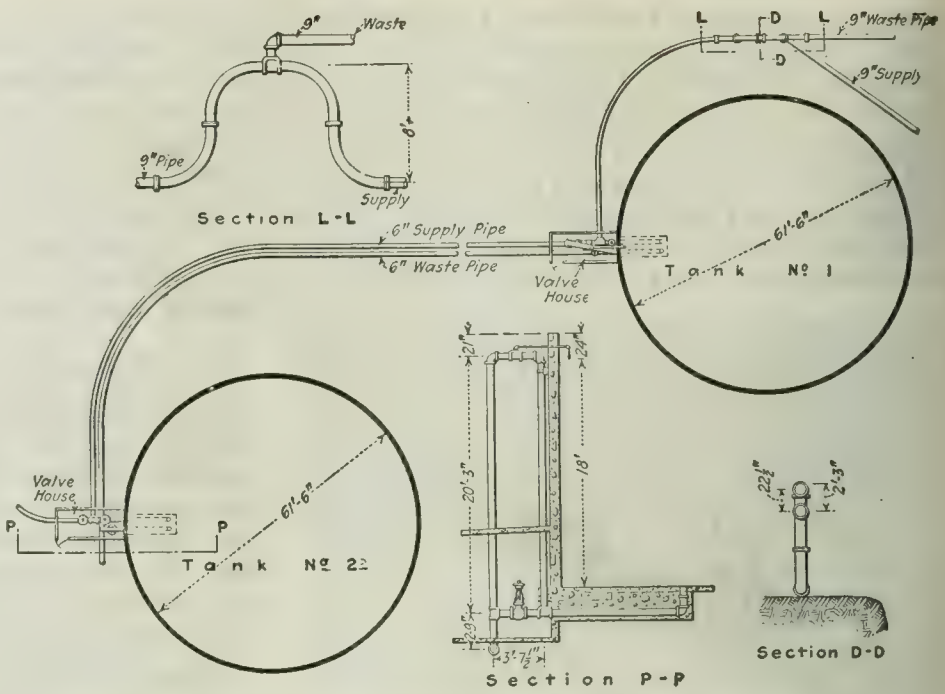


FIG. 10. DETAILS OF PIPE CONNECTIONS FOR WATER-SUPPLY TANKS

It was the intention of the tank design to have the tank at K6.303 serve as a reservoir and that at K6.211 serve as a buffer; that is, the former would always stand full of water and the latter would deliver water to the line when the plant demand was in excess of the delivery to the tank or receive water from the line when the demand was less than the supply, the excess overflowing and wasting from the latter tank. The siphon overflow shown in Fig. 10 was devised to give close control of the water level, without using large pipe or giving opportunity for foreign bodies to enter the pipe. It also saved any opening through the tank ring. The connection, closed with a valve, at the bottom, permitted this same pipe to be used as a wash-out. Water commenced to overflow when its elevation in the tank was 18 ft. At about 18 ft. 2 in. the overflow was greater than the inflow, and the overflow continued until the water level in the tank was about 3 in. below the end of the air inlet. This can be prevented by using a 1½-in. pipe instead of the 1-in. pipe now in service.

Some of the most important costs on the job, and those that would be most valuable in estimating on another similar job in a similar country, are given in the accompanying tables:

SALARIES, WAGES, CAMP COSTS, CARTING COSTS, WORK DONE PER MAN-DAY, AND COST DISTRIBUTION BY PERCENTAGES ON TOCONCE PIPE LINE, CHILE

Standard Rates of Wages and Salaries

Laborer, $6 m/c equal, at average exchange for 1918	$1.68 U. S.
Foreman, $10 to $18 m/c	$2.80 to $5.05
Mess cooks, $8 to $10 m/c	2.25 to 2.80
Gold roll foremen	$150 to $225 per month

Camp and Maintenance Costs

	m/c	U.S. Currency	%
1. Labor—cooks, helpers and odd men	$0.5518	$0.1552	10.2
2. Miscellaneous mess supplies—candles, utensils, etc	.0437	.0123	0.8
3. Food cost at supply base	3.3340	.9365	61.6
4. Fuel—yareta and oil	.2385	.0674	4.3
5. Carting, including water and forage	1.0780	.3033	20.0
6. Overhead—Chuquicamata only	.1673	.0470	3.1
Total mess charges	5.4133	1.5217	100.0

Of item 5 above, 55%, or $0.17 United States currency, per man-day, was for water transportation alone.

Officers' messes averaged	$7.35	$2.06 per man-day
Work camp messes averaged in the seven main camps.	3.97	1.11 per man-day

Average Daily Ration—Work Camp

(Based on a close analysis of the foodstuffs supplied, as shown in item 3, above)

No.	Item	Price, m/c	Amount	Cost, m/c
1.	Beef	$0.807 lb.	14 oz.	$0.706
2.	Charqui (dried beef)	987 lb.	11-12 oz.	.056
3.	Potatoes	183 lb.	1½ lb.	.017
4.	Sugar	396 lb.	9 7/16 oz.	.240
5.	Rice	.527 lb.	5¼ oz.	.173
6.	Onions	.186 lb.	3 7/16 oz.	.043
7.	Canned vegetables, tomatoes, string beans, peas	.051 each	1/16 can	.095
8.	Garlic	.051 each	⅛ each 010	
9.	Cereals; trigo mote, semola, chuchoca, frangolla, pea flour	.312 lb.	10 1/16 oz.	.213
10.	Fideos (spaghetti)	.528 lb.	3¾ oz.	.110
11.	Quaker and gavilla oats	916 lb.	1¾ oz.	.095
12.	Lentils and beans	.533 lb.	5¼ oz.	.175
13.	Salt cod and shrimp	1.740 lb.	¼ oz.	.018
14.	Canned salmon and sardines	1.089 can	1/16 can	.109
15.	Dried peaches and figs	.264 lb.	3 1/16 oz.	.064
16.	Lard and grease	1.061 lb.	1 1/16 oz.	.125
17.	Olive oil	.310 liter	3/16 liter	.003
18.	Coffee	1.140 lb.	1 oz.	.071
19.	Tea	3.236 lb.	¼ oz.	.076
20.	Milk	1.337 can	¼ can	.167
21.	Pepper and spices	1.606 lb.	1/16 oz.	.070
22.	Salt	.097 lb.	1¼ oz.	.010
23.	Bread, three marquettes	.100 each	3 each	.300
Total cost of daily ration				$2.947 m/c

Total cost of daily ration	$0.829 United States currency
The officers' messes cost per daily ration	6.980 m/c
The officers' messes cost per daily ration	$1.960 United States currency
Average for the whole job was	3.334 m/c
Average for the whole job was	$0.938 United States currency

It must be understood that this was not a fixed ration, or what was believed to be ideal, but what could be had at the time; that all the items enumerated were never present at any one time in any camp; that local market limitations and transportation often left the camps with very meager supplies of any kind, and

that the object was to give the men substantial and fairly palatable food that would keep them in condition to do the hard work and withstand the rigorous climate.

Of the above ration, items 8, 11, 13, 14, 19 and 23, totaling $0.693 m/c, were bought largely from foreign markets, and the cost was high, though not particularly variable. The remainder of the ration was from local markets and consequently its cost in United States currency was affected by the temporary low value of the American dollar, which normally is worth near five Chilean pesos instead of the 3.56 average used in this statement. The average amount of water requirement per man-day was 2½ gallons.

Pipe Carting Costs, in United States Currency

Section	Per Metric Ton-Mile	Per Short Ton-Mile	
1.	$10.44	$5.23	Near camp and mine; no road
2.	7.85	1.38	
3	8.56	3.04	No roads.
4	7.28	1.18	
5	12.88	1.06	
6.	14.02	.75	
7.	16.30	.74	
8	16.85	.68	
9.	24.20	1.85	Sink.
10	40.00	1.19	
11.	63.20	1.17	
12.	74.20	1.26	
Average.	28.22	1.18	

Total Quantities of Work Done and Amounts per Man-Day

Owing to the varying rates of exchange it would be difficult to prepare a table of cost of labor on different classes of work, but the following statement of amount done per man-day should serve the same purpose.

Grading:	Lineal Meters	Cubic Meters	Cubic Yards
Total	97,306.00	95,949.00	112,478.00
Per man-day	2.34	2.07	2.72
Covering pipe:			
Total	97,306.00	61,788.00	80,780.00
Per man-day	4.84	3.07	4.02
Laying pipe by hand:			
Total	36,149.000		(17,920 of 6 in.; 664 of 8 in.; 17,565 of 9 in.)
Per man-day	693		
Laying pipe by machine	61,328.00		
Per man-day	906		

Making telephone poles; all labor, including making concrete casting platform cutting and placing reinforcement, mixing and placing concrete; making, placing and removing forms, and removing from the platform and stacking up 1,444 18-ft. poles, 1.52 poles per man-day.

Division of Cost Items by Percentages for Entire Job

	Per Cent		Per Cent
Labor	13.26	Superintendence and Engineering	2.81
Materials	49.91	Overhead (Chuquicamata)	6.83
Plant and tools	1.88	Other expenses	4.56
Camp and maintenance	10.54		
Carting	10.21		
Total			100.00

Construction, except preliminary work, was begun in November, 1917, and completed in March, 1919. S. B. Williamson, now consulting construction engineer for the Chile Exploration Co., New York City, was construction engineer until he went to France as colonel and section engineer, A. E. F., when he was succeeded by H. O. Cole. H. C. Bellinger was general manager; H. Harvey, resident engineer; L. A. Greenley, assistant engineer on preliminary investigations; George S. Witmer, mechanical and electrical engineer; T. N. Mize, superintendent; Louis H. Mohr, business manager of the pipe line; and the writer was assistant resident engineer in charge of construction.

Lack of Foresight in Municipal Water-Supplies

Planning for the Future and Even Provision for Current Needs Are Safeguards Against Emergencies Often Neglected

By Morris Knowles
Consulting Engineer, Pittsburgh, Penn.

IN CONNECTION with his work as supervising engineer for Camps Meade and McClellan, and later as Chief Engineer of the Housing Department of the Emergency Fleet Corporation, the writer had occasion to investigate a considerable number of existing municipal water-supply systems, and was impressed with the general lack of forehandedness in planning such work, judging by reasonable engineering standards.

The standards adopted by the Cantonment Construction Division and the Housing Department of the Emergency Fleet Corporation were based on sound engineering principles and practice, applied with reason and moderation, for the emergency of the situation required that many of the finer points of good design should be neglected. Nevertheless, it was strikingly true that a large number of the municipal systems investigated fell far short of the requirements of these moderate standards. This was even true in many cases in considering the adequacy of the system to meet existing demands, without any allowance whatever for the additional demands proposed to be put upon them by the developments of the Army and the Fleet Corporation.

As an example, at a town adjacent to one of the Army cantonments it was found that the entire community was being served by a single motor-driven centrifugal pump operating 24 hours a day, without any provision whatever for spare equipment in case of a breakdown. In a city where one of the Fleet Corporation's developments was carried out, a grossly polluted river supply was found in use, and the influence of the Shipping Board was necessary in order to prevail upon the city to pass a bond issue for installing a purification system.

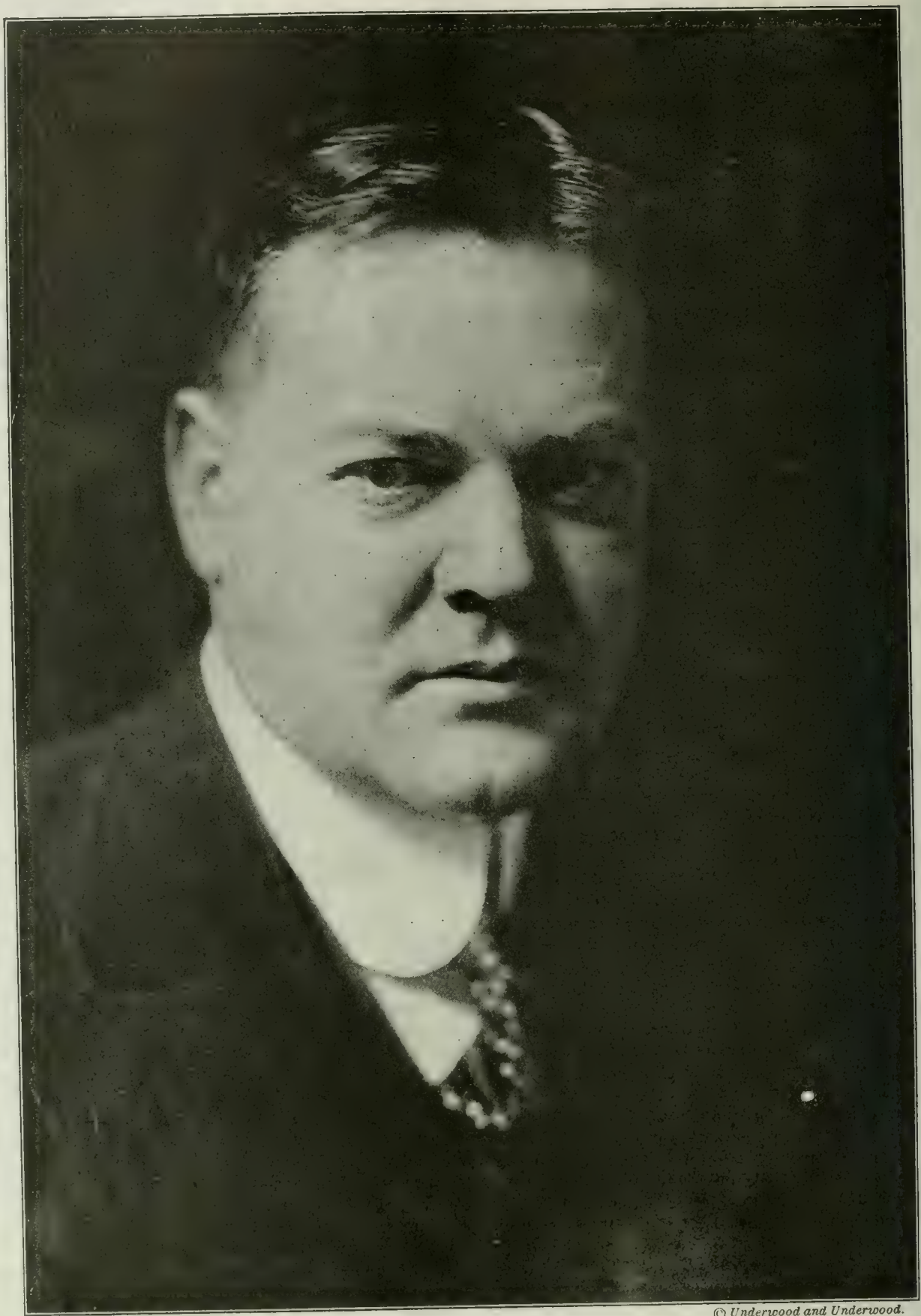
Examples of this sort might be multiplied almost indefinitely, but they would serve only to give additional emphasis to the necessity for planning in advance and for good engineering advice even in the development of small water-works systems. An adequate supply of wholesome water is as essential to a small community as to a large one.

The small community of today is the large one of tomorrow. Conformity to the standards of good practice and provision for growth of population and increased consumption per capita require careful study. At the same time, true economy is subserved by foresight, as could be illustrated in many instances by the excessive cost of obtaining right to additional supplies or of securing property to guard against contamination because of failure to make proper provision in the first place; or by the great expense involved in rebuilding an entire plant because of failure to leave sufficient space for the installation of purification systems and of additional pumping units when required.

It should be remarked, however, that this lack of foresight in planning municipal water-works systems is but one phase of the large problem resulting from the general lack of foresight in planning city and town developments. A water main of inadequate diameter is often accompanied by congested traffic in the street above; lack of sufficient water is frequently only one phase of bad housing conditions. The problems are related and analogous, and careful study, farsighted comprehension and definite planning are essential to the solution of both.

Grants Made for British Roads

The highway authorities of Great Britain, according to a report received by the Bureau of Foreign and Domestic Commerce, has made grants, to July 31, 1919, amounting to $45,500,000 for the repair of roads and bridges in the British Isles. This grant was divided as follows: England, $39,240,000; Scotland, $2,640,000; Ireland, $645,000; Wales, $2,975,000.



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Herbert Clark Hoover

Hoover Acclaimed as Genius of Constructive Administration by Fellow Engineers

Food Administrator, at Testimonial Dinner by American Institute of Mining and Metallurgical Engineers, Discusses Present European Conditions

HAILED as one of the outstanding figures of the war and as the man whose achievements best typify the definition of engineering as "the art of organizing and directing men and controlling forces and materials of nature for the benefit of the human race," Herbert C. Hoover, back in this country after five years' direction of American relief overseas, received an enthusiastic welcome from 1200 fellow members of the American Institute of Mining and Metallurgical Engineers, at a dinner given in his honor Sept. 16, 1919, in New York City. The assembly of engineers, according to W. L. Saunders, past president of the institute, who served as chairman of the committee on arrangements and as toastmaster, had been arranged to "extend the welcome due an eminent American citizen, a successful engineer, a genius of constructive administration, a practical economist and a statesman of worldwide vision."

Mr. Hoover, Discussing European Conditions, Says, "Socialism Is Bankrupt"

The social ferment in Europe, the extraordinary lowering of productivity in industry, and the economic chaos created by the struggles of a score of new democracies to establish themselves, formed the opening theme of Mr. Hoover's address. His problem was not a relief problem in the ordinary acceptance of the term. Foodstuffs and other supplies had to be found, not merely for the starving populations of the ravaged regions, but for the whole of Europe, and at the same time Bolshevism had to be warded off in order that newly-born democracies could grow. The consummation of these aims involved the organization of the economic strength of the United States and its coördination with the remaining economic strength of Europe and, in large areas, the imposition of absolute dictatorship over economic forces.

Many of the new governments, Mr. Hoover pointed out, were without experience or even without the existence of departments for the conduct of either the transportation or the distribution of supplies. Thus, it was necessary to secure the erection within their governments of actual departments, to furnish them advisers, to take over the actual operation of thousands of miles of disintegrated railway systems, to open rivers and canals for traffic, to stimulate the production of coal and other primary commodities, to control their distribution through large areas, to find a basis for exchange of surplus commodities from one state to another, to exercise the strongest political pressure to obtain the disgorgement of surpluses into areas of famine, to resort to barter on a national scale where currencies had broken down, to stimulate peoples discouraged and disheartened to efforts in their own salvation, and finally, but not least, to intervene a charitable hand in the saving of their children and the stamping out of contagious diseases; and through all of this economic disorganization to inspire the maintenance of order on one hand, and the defeat of reaction on the other. Beyond this again, the necessity of constant friendly intervention in frontier quarrels to prevent the starting of more wars.

"These things," said Mr. Hoover, "have not been solved by the service or direction of any one man. They have been accomplished through coördination of the men of good will in twenty governments of Europe and throughout by creation of a thread of American personnel, directed from a single center. The proof of their performance lies in the fact that Europe has come through the most terrible period of its history with no loss of life from economic causes, with a stronger democracy and a glow in its heart for the United States. From the armistice to this year's harvest there has been furnished over $2,250,000,000 worth of supplies, the majority of which has been given freely upon the undertaking of the assisted governments of repayment at some future date.

"We require only a superficial survey to see that the outstanding and startling economic phenomenon of Europe today is its demoralized industrial production. Of the 450,000,000 people in Europe, a rough estimate would indicate that they are at least 100,000,000 greater than could be supported on the basis of production, which has never before reached so low an ebb.

"It is true that some of this diminution in production has been contributed to by the other factors; but in the larger degree the cause of this steady decrease of productivity, with its shortage of necessary supplies and its rising cost of living, must be sought in the social ferment, with its continuous imposition of Socialist ideas. In this ferment the advocates of Socialism or communism have claimed alone to speak for the downtrodden, alone to bespeak human sympathy, and alone to present remedies, to be the single voice of liberalism.

What Happened in Russia

"We may examine these phenomena a little more closely. In Russia we have a great country in which the population, with the exception of a small minority, were comparatively well fed, warmly clothed and warmly housed. They were subject to the worst of political tyranny, were deliberately steeped in ignorance and superstition, yet their productivity was sufficient to enable them to provide these primary comforts and to export more foodstuffs than the United States. Socialism was brought in over night at the hands of a small minority of intellectual *dilettante* and criminals, and this tyranny of minority, more terrible even than the old, has now had nearly two years in which to effect the conversion of the wicked competitive system into the elysium of communism. Two-thirds of the railways and three-fourths of the rolling stock that they control are out of operation. The whole population is without any normal comforts of life and plunged into the most grievous famine of centuries. Its people are dying at the rate of hundreds of thousands monthly from starvation and disease. Its capital city has diminished in population from nearly 2,000,000 inhabitants to less than 600,000.

"If we examine the recent proclamations of this group

of mixed idealists and murderers, we find a radical change in their economic and social ideas. They have abandoned the socialization of the land, for they find the farmer will not produce for payment in high-flown and altruistic phrases. They have reëstablished a differential wage, in an attempt to stimulate exertion and ambition of skilled labor. They have established a state savings bank, in order to stimulate production through making provision for family and old age. They are offering fabulous salaries for men capable of directing the large agencies of production. In fact, while in the midst of flowery verbal endeavor to maintain that they are still Socialists, they are endeavoring to restore individual ownership of property and of the results of labor. The very high priest of Socialism is today vainly endeavoring to save his people from their total destruction by summoning back the forces of production. The apologists of this *débâcle* are telling us that it is due to the allied blockade, and to various other oppositions, but anyone with a rudimentary knowledge of Russia knows that they did have within their borders ample supplies of food, coal, oil, wool, flax, cotton and metals and the factories with which to work them in abundance, and that their sole deficiency is human effort.

"We could take another example of Bolshevism in the efforts of Bela Kun and his colleagues in Budapest. The distinction between this situation and the one in Russia is that they were dealing with a population of much higher intelligence, of much higher average education, and it required but three months for the working people of Budapest to realize the fearful abyss into which they had been plunged. It was solely due to the efforts of the trade unions in Budapest that the Bolshevists were thrown out of Hungary.

Tide Turning Against Socialism

"These are the extreme points where Socialism has had its opportunity for immediate and wholesale application, according to all of the precepts of its advocates. Elsewhere in Europe Socialism has proceeded through established institutions, and we may shortly examine the results here also. During the war large measures were taken on both sides of the front to secure the mobilization of production and distribution to its maximum use in the struggle. There was effective socialization of vast sections of industry. These measures are being continued and extended today in many places by governments anxious to maintain the stability of institutions even at the sacrifice of economic safety, but under the threat of minorities of revolutionary action. Yet here again the same prime weakness has proved itself. The only partial success of these measures in war was due to the great, patriotic impulse of war. Those who conducted these large operations were men whose initiative and capacity had been selected by the competitive system. These war impulses have been lost, and these organizations with constantly decreasing efficiency even in war now face disaster from further reduced productivity. All these decreases have immediate results in a rising cost of living or the necessity of governments to subsidize commodities—such as bread. There is no better example of this than the coal industry of Europe, and—even omitting Russia—this production has fallen from a rate of 600,000,000 tons per annum at the armistice to a rate of 450,000,000 tons recently.

"The whole of these various sorts of Socialism are based on one primary conception, and that is that the productivity of the human being can be maintained under the impulse of altruism and that the selection of the particular human for his most productive performance can be made by some superimposed bureaucracy. Their weakness is the disregard of the normal day-to-day primary impulse of the human animal—that is, self-interest for himself or for his family and home, with a certain addition of altruism varying with his racial instinct and his degree of intelligence. They fail to take into account, also, that there is but one sufficiently selective agent for human abilities in that infinite specialization of mind and body necessary to maintain the output of the intricate machinery of production, and that is the primary school of competition.

"My emphatic conclusion is, therefore, that Socialism as a philosophy of possible human application is bankrupt.

"Bankruptcy of the Socialist idea, however, does not relieve us from the necessity of finding a solution to the primary question which underlies all this discontent, and that primary question is the better division of the products of industry and the steady development of higher productivity. This bankruptcy of the Socialist idea should, if reaction is to be prevented, return the guardianship of this problem from the radical world to the liberal world of moderate men, working upon the safe foundations of experience.

Solution Must Be American

"The paramount business of every American today is this business of finding a solution to these issues, but this solution must be found by Americans, in a practical American way, based upon American ideas, on American philosophy of life. We can well see a vivid confirmation in Europe of the fundamental economic principle that the standard of living and the cost of living is the direct quotient of the amount of commodities produced; that we must secure a maximum production of the industrial machine if we wish to keep our population alive or see an increase in the standard of living of our people.

"If I were thinking aloud I would say at once that this maximum production cannot be obtained without giving a voice in the administration of production to all sections of the community concerned in the specific problem; that it cannot be obtained by the domination of any one element. I would say that the human race had increased its standards of productivity and therefore of living, through the growth of extraordinarily intricate organization of production and distribution based upon stimulation of the individual by the reward it offers. I would also say that it cannot be obtained from the destruction or sudden disturbance of this delicate and intricate organization of production and distribution or extravagance in its products. I would say the road lies along the better division of the more exorbitant profits that arise from these processes and that have accumulated from them. By better division of profits, I do not refer particularly to profit-sharing schemes but to the broad issue of the whole social product. Some are comparatively overpaid and many are comparatively underpaid for the service they render to the community. Our organization in many aspects is not all that we could desire, but it is the best we have been able to evolve over thousands of years, and the destruction of these processes or of the organization which conducts them has been demonstrated to be the sure road to destitution and fearful loss of life.

"Observation of the forces in Europe has reinforced my Americanism. It has revealed to me the distance of our departure from the political, social and economic ideals of Europe. There has grown in this United States a higher sense of justice, of neighborly service, of self-sacrifice and, above all, a willingness to abide by the will of the majority in every section of the community. This Americanism is the guarantee of the ability of our people to solve this most momentous internal problem confronting our generation. But these very ideals, this very sense of justice and service for our own people give us still further opportunities. Our sister civilization in Europe is today recovering from a great illness. The many new democracies that we have inspired are striving for our ideals. We alone have the economic and moral reserve with which to carry our neighbor back to strength. To do this is also true Americanism."

W. L. Saunders Pays Tribute to Hoover and His Work

From Mr. Saunders' address, introducing Mr. Hoover, the following extracts are taken:

"Never before have men gathered to pay a just tribute of admiration to one who has done the things that this man has done. His work was not built upon precedent; there was no experience, no guide. It was in fact a creation. In the words of the Prime Minister of England, his work in Belgium was nothing less than a miracle. Yet it is a fact that those who have been in close touch with the situation say that his greatest work has been done since the armistice was signed.

"Truly, this is a period of new things, new changes, new times; a period of agitation which brings to the front new men of true worth. You who are mining engineers know what a good thing the flotation process is—how, by violent stirring up of things, the metallic values are separated from the gangue and float off at the top. This process has been in action all over the world during the past five years, and it has revealed out of the chaos an engineer of the value of pure gold.

"Here, at last, we have the example of an engineer who typifies the modern definition of engineering: 'Engineering, the art of organizing and directing men, and controlling forces and materials of nature for the benefit of the human race.' How well this modest mining engineer has shown that he has the art of 'organizing and directing men!' Of the many thousands working for him, here and abroad, it is said that not only have they given him loyal support, not only are they glad to work for him, but every man of them would take off his coat and fight for him. How well he has shown his capacity for 'controlling forces and materials of nature for the benefit of the human race!'

"The engineer is at last coming into his own. We see the dawn of a new day; truly, there is a new order of things. The great centers of the world are now industrial centers. The prosperity and strength of nations in peace and war rest now upon the factory system, the shops, the railways and steamships, the mines, the smelters and the public works. And who is responsible for this? Who plans and executes these things? It is the engineer—civil, mining, electrical, mechanical, chemical and automotive. Such captains of industry are by education and experience best fitted to steer the ship of state. The place for the engineer is not in the dark confines of the hold below, but on the upper deck—yes, on the bridge. We are told that practically all the executive heads of the organization for the relief of Belgium were engineers.

"It was Mr. Hoover who took care that there should be no food shortage. He did more—he taught thrift to millions of people in all walks of life and in all parts of the world. But it is not only in food that our guest stands as an example of achievement; he typifies the engineer, the executive, the man behind the gun.

"Little has been said of Mr. Hoover's capacity to think straight in advance, but this is really one of his strongest characteristics. It was first shown when he took charge of the work of sending Americans over when the great war broke out. His plans were made and negotiations completed with shippers before the organization was made up and before he had any knowledge of how many persons were to go or where the money was to come from. While forming the Commission for the Relief of Belgium, and before he knew who was to pay the bills, he had ordered millions of dollars' worth of food and had chartered ships. When asked why he took such chances he said that it was impossible to believe that the people of the world would not stand behind so wholesome a measure in the interest of humanity, and they did stand behind it nobly and to the end.

"I have said that there was no precedent for the work done by Mr. Hoover. He has established a precedent for engineers, and for us this is one of his greatest acts.

What Hoover Did

"Herbert Hoover is a graduate of Stanford University. He first served with the United States Geological Survey, then went to West Australia and China, in mining activities. His work in London up to the beginning of the world war was notable in that he departed from the usual share-promotion schemes of the mining market, developing the properties in which he was interested purely on technical lines. He began war work the morning after England declared war on Germany, taking charge of the relief of American refugees, advancing funds out of his own pocket, and, through his friends, furnishing 45,000 persons with money and steamer tickets to get home. In October, 1914, he organized the Commission for the Relief of Belgium. Through this source 9,000,000 persons were continually supplied with food, nearly half of them being entirely dependent upon this relief. There were 35,000 Belgians and French engaged with him in this work. He provided 70 steamers in regular service, delivering 4,500,000 metric tons of foodstuffs. The total overhead expenses of this commission were less than one-half of one per cent. He was responsible for the expenditure of $650,000,000.

"Shortly after America entered the war Mr. Hoover was summoned to Washington to take charge of the food situation here. His organization in every state and county comprised 8500 men and women, giving their whole time to the Food Administration. In addition to this there were half a million persons registered and ready to be called upon for emergency work. It has been estimated that this administration carried out its functions, 92% by voluntary effort, 7% by persuasion and 1% by legal authority. A conservative esti-

mate of the advertising voluntarily contributed in this work approximates the sum of $18,000,000.

"Immediately after the armistice was signed Mr. Hoover was directed to proceed to Europe to investigate the part that America could play in the relief of the civilian population. Though he had but four days before sailing he arranged for the purchase and shipment of 250,000 tons of food. It was not until February of the following year that Congress appropriated $100,000,000 for European relief. At that time several hundred thousand tons of foodstuffs had been actually distributed. Up to a recent date over 3,000,000 tons of foodstuffs, valued at over $770,000,000, have been distributed.

"Certain things stand out with striking prominence. Mr. Hoover was more than a food administrator. He was a general, was an organizer in action. He got men to do things. His faith in the moral support of the people was sublime yet practical. He seemed to know the right methods to follow and the psychological moment to act in order to secure the full measure of support."

Purification-Plant Methods and Results at Albany

Sedimentation, Double Filtration, Coagulation and Chlorination Employed—Typhoid Cases Reduced—Unit Cost $12.32

DOUBLE filtration of settled water, with the use of alum at times in connection with the preliminary filters, followed by chlorination with hypochlorite and liquid chlorine used jointly, is the method employed to render the badly polluted and sometimes turbid Hudson River water fit for the supply of Albany, N. Y. The original slow-sand filtration plant, a pioneer of its kind in this country, was built in 1898-9 with Allen Hazen as engineer. Preliminary filters were put in use in 1908, chlorination in 1909 and alum coagulation in 1912.

About 90% of the supply is Hudson River water, filtered and pumped, and 10% is delivered by gravity from small streams west of the city. The amount of filtered water supplied during the year which ended Sept. 30, 1918, averaged just under 20,000,000 gal. a day. The consumption and waste of filtered and unfiltered water for the year, assuming a population of 110,000, was 213 gal. per capita, compared with 192 gal. the previous year. The extreme cold weather early in 1918 is held responsible for the increase. Only about 45% of the taps are metered.

The river water is pumped against 19-ft. head to a sedimentation basin and against 9 ft. from this basin to the preliminary filters. The treated water passes by gravity to the main pumping station some two miles distant.

The sedimentation basin affords from 12- to 18-hour detention. It is not baffled. Alum was applied 34 days in 1917 and 182 days in 1918 to the water before it went to the preliminary filters. Alum is used in times of high turbidity when the water is bypassed around the slow-sand filters. It is also used at times when bypassing in winter, when the amount of required chlorine is larger than can be used at low temperatures. The alum rate ranges from two grains in winter to 4½ grains in summer.

All water passes through the sedimentation basin and the preliminary filters and is chlorinated. From May 1 to Nov. 1, from 5 to 50% of the prefiltered water is bypassed around the slow-sand filters.

As a matter of safety, both hypochlorite and liquid chlorine are used for disinfection, the range in terms of available chlorine being from 0.25 p.p.m. in winter to 1.5 p.p.m. in summer for the two combined. Hypochlorite is applied up to the working capacity of the mixing and dosing equipment, and liquid chlorine to make up the remainder of the demand. The chlorination apparatus is in duplicate.

The 16 preliminary filters have a total area of 0.3 acres and a rated capacity of 70,000,000 to 80,000,000 gal. per acre per day. The eight slow-sand filters have a combined area of 5.6 acres and a rated capacity of 3,000,000 gal. per acre. All the sand in each type of filter is washed by Nichols washers once in two years—half each year. The average length of run of the preliminary filters between ordinary washings in 1917-18 was 34; the average rate of filtration, 76,200,000 gal. a day and the wash water averages 2.7% of the total amount filtered. The slow-sand filters were scraped an average of 6⅛ times per year in 1917-18.

The cost of operating the entire water treatment plant for the year which ended Sept. 30, 1918, including extra pumping, is shown by Table I, while Table II summarizes the bacterial, physical and chemical results for the same year.

TABLE I. COST OF WATER TREATMENT AT ALBANY, 1917–18

	Per 1,000,000 Gal.
Pumping	$5.76
Sedimentation basin	.02
Pr liminary filt rs	.54
Slow-sand filters	1.21
Laboratory	.90
Sterilization	.83
Alum plant	2.84
Superintendence	.22
Total cost	$12.32

Typhoid fever in Albany from 1891 to 1899, before the purification works were put in use, averaged 426 cases and 71 deaths a year, while from 1900 to 1918 the corresponding figures were 163 cases and 18 deaths, reductions of 76 and 74 per cent.

Wallace Greenalch is commissioner of public works of Albany and J. B. Kilbourn is superintendent of water-works. George E. Willcomb has been chemist and bacteriologist since 1906 except for a year and a half when he was in war service.

TABLE II. BACTERIAL, PHYSICAL AND CHEMICAL RESULTS AT ALBANY WATER-PURIFICATION PLANT, 1917–18

Water	Bacteria per Cubic Centimeter: Gelatine	Agar	Neutral Red Total	Neutral Red Coli.	Turbidity	Color	Total Hardness	Alkalinity	Oxygen Consumed	Ammonia — Free	Ammonia — Alb
Raw Hudson River water	46,000	1,030	89	24	20	42	73	78	19.1	0.083	0.116
Settled water from basin	37,000	805	...	...	13	39	...	...	17.6	0.072	0.101
Effluent primary filters	10,500	169	...	...	2.9	32	...	...	15.2	0.046	0.050
Effluent secondary filters	1,190	34	4	1	0.1	25	...	...	14.4	0.026	0.031
Water from pure well	52	5	0	0	0.1	25	75	78	14.4	0.026	0.031

The Albany Water-Works a Hundred Years and More Ago

Private Company Formed in 1800 Based First Rates on Number of Fireplaces, but Soon Changed—Pipe Priced at $100 a Ton

AN OLD leather-bound volume in the possession of Wallace Greenalch, commissioner of public works of Albany, N. Y., contains the minutes of the Albany Water-Works Co. for the half century beginning in March, 1800. The company was incorporated in 1802 and continued in existence until the city bought the works for $114,600 in 1851. The following notes and quotations were recently taken from the minute book by a member of the editorial staff of *Engineering News-Record*. The minutes are written in a clear hand, for the most part in concise and forcible English.

Naturally enough, one of the earliest of the meetings recorded was devoted to fixing water rates. This was a meeting of trustees held in August, 1800, at Lewis Inn. It was then provided that for "every house or building containing not more than four fireplaces there shall be paid [sum defaced] per annum," but that the charge against any one private house should not exceed $10 a year. In addition, water rates were to contribute their proportionate part "forever thereafter" toward maintaining the works, except that portion "intended for the use of the city," the costs of which were to be a charge against the two-fifths ownership of Benjamin Prescott and his heirs. This plan was not long followed, for on July 30, 1801, it was resolved that the city should pay $7 a year for the use of water at the city hall, in addition to the usual rates for dwelling houses.

Water-Closets Used But Not Favored in 1803

On Sept. 8, 1803, it was "Resolved, that no aperture conveying the water into any water-closet heretofore constructed shall be larger than ¼ in., and that the water shall not be permitted to run into said closets for more than two hours in every 24 hours, and that only in the night, and no water from the said works shall be permitted to be discharged into any water-closet hereafter to be constructed."

Apparently, the water rates generally were based on apertures at this time, for at a meeting of stockholders held at the city hall Sept. 15, 1803, it was resolved that the rates previously established should be continued for three years for apertures exceeding ⅜-in. diameter with $1 additional for each ⅛ in. additional size. It was also resolved to charge $2 additional for water from any aperture into any water-closet heretofore connected—"it being the opinion of the stockholders that no water be taken for the use of any water-closet hereafter to be constructed."

A printed broadside pasted into the volume of minutes contains a resolution of the trustees dated Sept. 30, 1815. This was addressed to both stockholders in the company and subscribers for water, and appears to have had the double purpose of reassuring the former as to dividends and stimulating the latter to contribute to them, besides establishing a new schedule of rates. The document recites:

"That the Company was chartered on the 17th day of February 1802, with capital stock of $40,000, and a train of Wooden Conduits then laid from the Fountain-head into and throughout different parts of the City, which from the increasing expense necessary to keep the whole in repair Dividends to the stockholders have been irregular, and from the lowness of the rates totally inadequate to the advance."

Reference is made to a "General Meeting of the Stockholders," held Jan. 26, 1813, at which the trustees reported "that the wooden conduits were in many situations in a decayed state" . . . and that legislative authority had accordingly been secured for an increase in the capital stock of the company. With money so raised, a 6-in. cast-iron conduit had been laid to the reservoir at the head of Steuben St., "affording, without a wanton waste, an abundant supply, and from thence to every part of the city; and the highly essential object of furnishing this City with an ample supply of Water, remarkably soft and pure, and of a cold temperature, perpetuated in all probability for centuries to come, is now fully and completely effected." Because of this, the broadside declared, the stockholders have a right to look to the trustees "for a competent Dividend" and citizens for a supply of water for both domestic and fire purposes. To this end, rates from Nov. 1, 1815, were thereby established "which will, without the least hesitation, be punctually and cheerfully paid by every subscriber to the water who shall choose to continue taking it." These rates, in part, were as follows:

		Per Annum
1st Class dwelling houses,	Every 3 story double house	$16
2nd Class dwelling houses,	Every 3 story house with three windows in front on the lower floor, or two front rooms, with an L	14
3rd Class dwelling houses,	Every 3 story single house and 2 story double house	12
4th Class dwelling houses,	Every 2 story house with two front rooms and an L	10
5th Class dwelling houses,	Every 2 story single house (of two rooms on first floor) of brick, or fronted with brick	8
6th Class dwelling houses,	Every other dwelling house of whatever description	6
Every additional one family in any house, to $3 (or the house to be debarred water)		3
If more than one additional family in any house, each such additional family to pay		2
Every store, or store house, not otherwise rated		6

In addition, rates were given for various special purposes.

Interesting light on prices of cast-iron pipe and the lengths in which it was then offered is afforded by the minutes for May 1, 1813, when the trustees opened sealed bids for "cast-iron conduits," as follows:

1. From Thomas Trenor of Bennington, $128 per ton, of 3-ft. length.

2. Eliphalet Sturtevant, New York, $140 per ton of 3-ft. length or $120 for two-foot.

3. Holly & Hoffing, of Salisbury, Conn., $100 per ton "in joints of one length of 2 ft. each."

The contract was awarded the same day to the last named and lowest bidder, but with the proviso that the bidder supply 200 joints, "carefully cast, as a fair sample of the work, agreeably to a description laid down on paper by the superintendent and enclosed to them [the bidder] in order that a fair experiment may be made of the strength of the pipes according to the proposed dimensions, and that this Board will be ready to enter into a contract on the subject at any day when the parties will attend." Apparently the low bidder gave satisfaction, for on Oct. 4, 1813, the trustees resolved to contract with Holly & Hoffing for 150 to 170 tons additional of cast-iron conduit delivered on the dock in Hudson by Nov. 1, 1814, at $100 a ton.

Computation of the Coefficient of Discharge of Venturi Meters

Tests at University of Pennsylvania Indicate that Coefficients May Be Computed Within 0.5 Per Cent. of Experimental Values

By W. S. Pardoe
Assistant Professor of Civil Engineering, University of Pennsylvania, Philadelphia

FOR some time the writer has considered it possible to compute the coefficient of the centuri meter within 0.5% of experimental values, but has not, until a recent date, had sufficient data to check these computations. A large number of tests conducted by the writer in the hydraulic laboratory of the civil engineering department of the University of Pennsylvania on the Simplex meters ranging in diameters from 0.625 x 0.405 in. to 16 x 8 in., provided these data. Space does not permit of the publication of all these results, but the writer will give his method of computing the coefficients and some results, both experimental and computed, hoping that others may be led to publish experimental coefficients to check further the proposed formula.

Writing Bernoulli's theorem between points 1 and 2 (Fig. 1), the main and the throat, respectively,

$$e_1 + h_1 + \frac{v_1^2}{2g} = e_2 + h_2 + \frac{v_2^2}{2g} + hr_{1\text{-}2}$$

$$e_1 = e_2$$

$$h_1 + \frac{v_1^2}{2g} = h_2 + \frac{v_2^2}{2g} + hr_{1\text{-}2}$$

Express $hr_{1\text{-}2}$ the resistance loss in terms of v_2 then

$$h_{r_1} = f_1 \frac{l_1}{d_1} \frac{v_1^2}{2g} = f_1 \frac{l_1}{d_1} \left(\frac{d_2}{d_1}\right)^4 \frac{v_2^2}{2g} \quad \text{as } v_1 d_1^2 = v_2 d_2^2$$

The formula for the loss of head in the conical section (h_c) may be computed by means of the calculus, as follows

$$dh_c = f \frac{dx}{d} \frac{v^2}{2g} = f \frac{dx}{d} \left(\frac{d_2}{d}\right)^4 \frac{v_2^2}{2g}$$

$$= f \frac{v_2^2}{2g} \frac{m^5}{d_2} \frac{dx}{x^5} \quad \text{as } \frac{d}{x} = \frac{d_2}{m} \text{ or } d = x\frac{d_2}{m}$$

$$\therefore h_c = k \int_m^{m+l} \frac{dx}{x^5} = -\frac{k}{4}\left[\frac{1}{x^4}\right]_m^{m+l}$$

$$= f \frac{m^5}{4\,d_2}\left[\frac{1}{m^4} - \frac{1}{(m+l)^4}\right]\frac{v_2^2}{2g}$$

Select f for mean values of velocities and diameters

$$\text{also } h_{r_2} \quad f_2 \frac{l_2}{d_2} \frac{v_2^2}{2g}$$

Substituting these values for $hr_{1\text{-}2}$ in Bernoulli's theorem

$$\frac{v_2^2}{2g}\left[1 - \left(\frac{d_2}{d_1}\right)^4 \cdot f_1 \frac{l_1}{d_1}\left(\frac{d_2}{d_1}\right)^4 + f \frac{m^5}{4 d_2}\left[\frac{1}{m^4} - \frac{1}{(m+l)^4}\right] + f_2 \frac{l_2}{d_2}\right] = h_1 - h_2$$

The loss of head in a straight pipe is due to skin friction, the movement of one filament of water over another and to impact between moving particles.

The loss of head in a conical pipe will be due to all of the foregoing causes, but the effect of the latter two will be much increased by the shape of the pipe. The writer has assumed that this condition extends down stream to the throat connection and that no serious error will be introduced by assuming it extends from the main to the throat connection.

To determine the relation between the actual coefficient of loss (C_{ra}) and the computed coefficient of

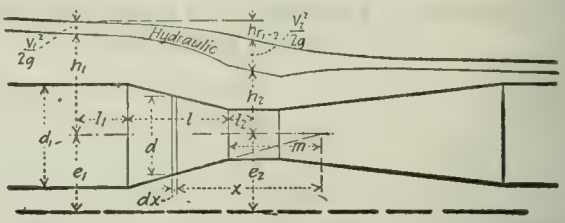


FIG. 1. SKETCH ILLUSTRATING DERIVATION OF FORMULA [Diameter of throat (not shown) = d_2]

loss (C_{rc}), a large number of tests were made on various sizes of venturi meters, and on a large conical brass nozzle. The results of these tests and computed coefficients of loss, plotted on logarithmic paper, gave the following relation

$$C_{ra} = 5.75\ C_{rc}^{1.26}$$

solving the foregoing expression for v_2

$$v_2 = \sqrt{2g(h_1 - h_2)} \Big/ \sqrt{1 - \left(\frac{d_2}{d_1}\right)^4 \cdot 5.75\left[f_1 \frac{l_1}{d_1}\left(\frac{d_2}{d_1}\right)^4 + f \frac{m^5}{4 d_2}\left(\frac{1}{m^4} - \frac{1}{(m+l)^4}\right) \cdot f_2 \frac{l_2}{d_2}\right]^{1.26}}$$

$$\text{also } v_2 = C\sqrt{\frac{2g(h_1 - h_2)}{1 - \left(\frac{d_2}{d_1}\right)^4}} \text{ as ordinarily used.}$$

Equating these values for v_2 and solving for C.

$$\therefore C = \frac{\sqrt{1 - \left(\frac{d_2}{d_1}\right)^4}}{\sqrt{1 - \left(\frac{d_2}{d_1}\right)^4 + 5.75\left[f_1 \frac{l_1}{d_1}\left(\frac{d_2}{d_1}\right)^4 + f \frac{m^5}{4 d_2}\left[\frac{1}{m^4} - \frac{1}{(m+l)^4}\right] + f_2 \frac{l_2}{d_2}\right]^{1.26}}}$$

The dimensions of 3.971 x 2.00-in. venturi meter tested are:

$d_1 = 3.971$ in. $= 0.331$ ft. $d_2 = 2.0$ in. $= 0.1667$ ft.
$l_1 = 0.125$ ft. $l = 0.42$ ft. $l_2 = 0.085$ ft.

computations

$$\left[1 - \left(\frac{d_2}{d_1}\right)^4\right] = 0.9354$$

$$C_{r_1} = f_1 \frac{l_1}{d_1}\left(\frac{d_2}{d_1}\right)^4 = 0.0242\, f_1$$

$$C_r = f \frac{m^5}{4\,d_2}\left[\frac{1}{m^4} - \frac{1}{(m+l)^4}\right] = 0.668\, f$$

$$C_{r_2} = f_2 \frac{l_2}{d_3} = 0.51\, f_2$$

Values of f_1, f, and f_2 are taken from Fig. 2, which was plotted from Hamilton Smith's "Hydraulics," but has not, to the knowledge of the writer, been previously published in this most convenient form.

The values of C as computed in Table I are plotted in Fig. 3. The values of C obtained by actual test are plotted in Fig. 4. The discharge was obtained by the use of large weighing tanks and a split-second stopwatch. A very precise oil differential hook-gage was used for measuring low values of h_1—h_2 and an air and a mercury differential gage for higher values.

The writer is well aware of published data of coefficients which show a decrease in C as the throat

TABLE I

V_2	1	2	4	6	8	10	12	16	20	24
$Cr_1 = .0242\, f_1$	0.0011	0.00097	0.00087	0.00079	0.00074	0.00068	0.00065	0.00061	0.00058	0.00056
$Cr = 668\, f$	0.0268	0.0228	0.0194	0.0176	0.0165	0.0158	0.0153	0.0146	0.0146	0.0145
$Cr_2 = 51\, f_2$	0.0255	0.0162	0.0137	0.0125	0.0122	0.0116	0.0114	0.0112	0.0111	0.0110
Total Cr_c	0.0534	0.03997	0.03397	0.03089	0.02944	0.02808	0.02735	0.02641	0.02628	0.02606
$C_a = 5.75\, Cr_c^{1.20}$	0.1450	0.1005	0.0820	0.0728	0.0684	0.0642	0.0622	0.0596	0.0591	0.0585
$\left[1 - \left(\frac{d_2}{d_1}\right)^4\right]$	0.9354	0.9354	0.9354	0.9354	0.9354	0.9354	0.9354	0.9354	0.9354	0.9354
$C = \sqrt{\frac{0.9354}{0.9354 + Cr_a}}$	0.930	0.950	0.958	0.963	0.965	0.967	0.968	0.969	0.970	0.970

velocities increase, or the direct opposite of the variation shown in Fig. 4. Tests of at least twenty meters of various size, under the most favorable conditions, have failed to show curves differing in form from Fig. 4 also, it is well established that the friction factors (f) decrease as the velocity in a pipe increases. From the expression for C it is evident that if the velocity increases f_1, f, and f_2 will decrease and C will increase.

Table II and Fig. 5 have been prepared to show the variations in the coefficient with the diameter and with ratios of diameters of the main and throat, for a throat velocity of 15 ft. per second.

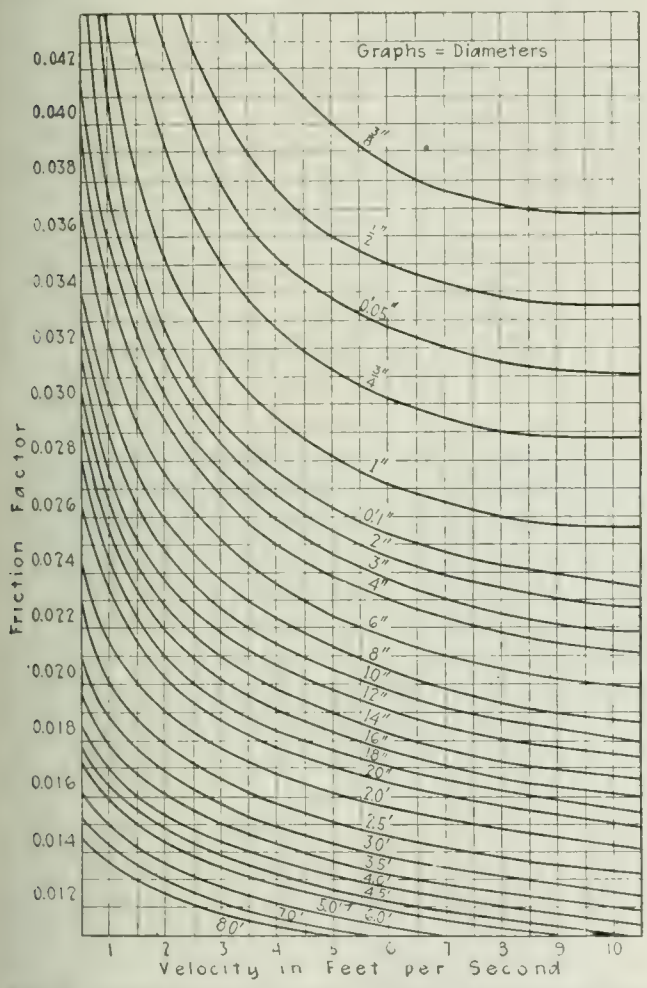


FIG. 2. FRICTION FACTORS FOR CLEAN CAST-IRON PIPE
Based on Hamilton Smith's "Hydraulics," $h = f\,(lv^2 \div d^2a)$

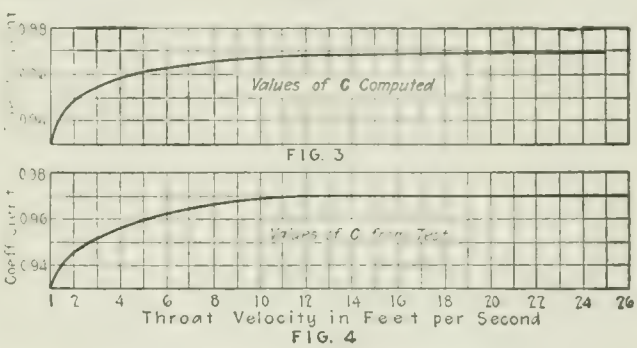


FIG. 3

FIG. 4

FIGS. 3 AND 4. COMPUTED AND TEST VALUES OF C FOR 3.971 × 2-INCH METER

In Table II the first seven meters are Simplex Standards. As the length of the cylindrical throat is equal to its diameter then $l_2 = \frac{d_2}{2}$ also $l_1 = 1$ ft. for meters of diameter above 4 in. The last three are special short meters which, along with meters Nos. 3 and 4, indicate that changes in the ratio of main to throat diameter do not materially affect the coefficients. A comparison of meters Nos. 5 and 9 shows an increase in the coefficient of the latter on account of the reduced ratio of $\frac{l_2}{d_2}$ and the consequent reduction in friction loss.

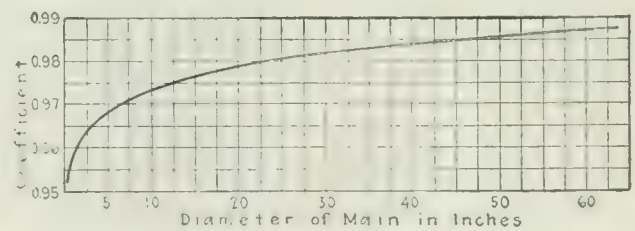


FIG. 5 VARIATIONS OF COEFFICIENT WITH DIAMETER OF MAIN
Throat velocity 15 feet per second; ratio of diameters, 2 to 1

TABLE II

Number	1	2	3	4	5	6	7	8	9	10
Main d_1	60 in	16 in.	8 in	8 in.	6 in.	2 in.	0.628 in	6 in.	6 in.	6 in.
Throat d_2	30 in	8 in	4 in	2.667 in.	3 in	1 in	0.409 in.	4 in.	3 in	2 in.
Ratio d_1/d_2	2/1	2/1	2/1	3/1	2/1	2/1	3/2	3/2	2/1	3/1
l_1	1.0 ft	1.0 ft	1.0 ft	1.0 ft	1.0 ft.	0.25 ft.	0.0052 ft.	0.2 ft	0.2 ft.	0.2 ft.[a]
l	6.75 ft	1.8 ft	0.9 ft	1.2 ft	0.674 ft.	0.225 ft.	0.0049 ft.	0.45 ft	0.675 ft	0.9 ft.
l_2	1.25	0.333	0.1667	0.111	0.125	0.0416	0.0017	0.0833	0.0625	0.0416
M	6.75	1.8	0.9	0.6	0.674	0.225	0.0092	0.9	0.675	0.45
Cr_1	0.000163	0.00093	0.00212	0.000503	0.00298	0.00247	0.00560	0.00166	0.00064	0.00014
Cr	0.00760	0.01115	0.01275	0.01405	0.01310	0.0163	0.0201	0.01113	0.01390	0.01460
Cr_2	0.00525	0.00905	0.01000	0.01065	0.01065	0.01275	0.00913	0.00505	0.00530	0.00555
Total Cr_c	0.01301	0.02113	0.02487	0.02510	0.02673	0.03152	0.03483	0.01884	0.01984	0.02029
$C_{ra} = 5.75\, C_{rc}^{1.20}$	0.0245	0.0448	0.0552	0.0555	0.0603	0.0746	0.0846	0.0388	0.0415	0.0422
$\left[1 - \left(\frac{d_2}{d_1}\right)^4\right]$	0.9375	0.9375	0.9375	0.98764	0.9375	0.9375	0.8197	0.8025	0.9375	0.98764
C	0.987	0.977	0.972	0.974	0.970	0.962	0.952	0.946	0.977	0.978
C from test		0.978	0.972	0.976	0.973	0.964	0.958			

The writer believes that the most important constructional feature of venturi meters is a perfect brass or noncorrosive throat-piece with proper piezometer connections, and a constant ratio of l_2/d_2, preferably $\frac{1}{2}$.

Fig. 6 shows a series of computed coefficient curves

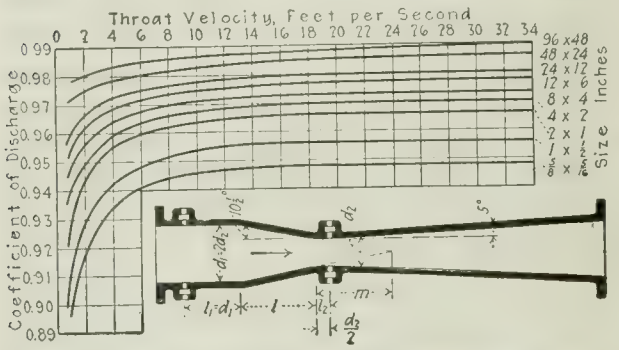


FIG. 6. VENTURI METER DISCHARGE COEFFICIENT

From formula

$$Q = \frac{C}{\sqrt{1 - \left(\frac{d_2}{d_1}\right)^4}} \cdot \sqrt{2gh}$$

$$C = \frac{\sqrt{1 - \left(\frac{d_2}{d_1}\right)^4}}{\sqrt{1 - \left(\frac{d_2}{d_1}\right)^4 + 5.75 \left[f_1 \frac{l}{d_1}\left(\frac{d_2}{d_1}\right)^4 + f \frac{m^6}{4 d_2}\left\{\frac{1}{m^4} - \frac{1}{(m+1)^4}\right\} + f_2 \frac{l_2}{d_2}\right]^{1.26}}}$$

which the writer believes will be found to be correct within 0.5%, and probably less.

Extensive Improvements to Akron Water-Works

Owing to the rapid growth of Akron, Ohio, from a population of about 69,000 in 1910 to one estimated at over 175,000 at the present time, it has been necessary to begin extensive improvements to the water-works. This has been required notwithstanding the extensions made between 1911 and 1915, with F. A. Barbour and E. G. Bradbury as consulting engineers. The extensions consist of a storage reservoir, rapid sand filters, a pumping station and an 11-mile force main. *Engineering News-Record* is informed by G. Gale Dixon, chief engineer of the Bureau of Water-Works Improvement, that the city has just completed additions to the filter plant, increasing its capacity from 20,000,000 to 30,000,000 gal. daily; a 10,000,000-gal. turbo-centrifugal pump, to supplement the two existing 15,000,000-gal. vertical triple-expansion pumping engines; increase in boiler capacity from 600 to 1200 hp.; and high service for a residential district, including automatically controlled motor-driven centrifugal pumps and a 350,000-gal. elevated steel tank. Work is in progress to parallel the existing 36-in. steel force main with a 48-in. lock-bar steel pipe line. About two miles of this main will be laid in 1919, and it is expected to build the other nine miles in 1920 and 1921. In addition, provision is being made for high service in another residential district and plans are under way for similar improvements in a third district next year. Distribution main extensions are being made by contract at the rate of about 25 miles a year. About two-thirds of the street mileage and three-fourths of the houses within the city limits have water service.

Improvements during the past two years have been made at the rate of about $1,000,000 yearly, but this rate will have to be doubled. The submission of a $5,000,000 bond issue in November is considered.

Permanent Plants for Chloramine Installed at Denver

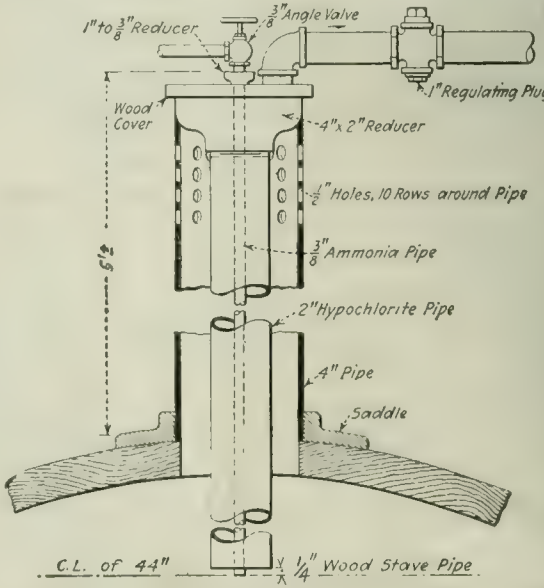
Simple Wood-Tank Outfit for Feeding Both Chemicals in Weak Solution—Ventilated Ammonia Tanks — Asphaltic Paint Used

SO SUCCESSFUL has been chloramine treatment of the water-supply of Denver, not only in holding down the immediate bacterial count, but also aftergrowths, that permanent plants have been installed at both outlets of Marston Lake. On the south side the hypochlorite and ammonia are applied to the effluent from rapid filters in service 26 years and now operated at double their rated capacity, a sand of 0.6 mm. being used to pass the water. The north-side plant consists of a rotary screening outfit described in *Engineering Record* of Sept. 4, 1915, p. 291. The original battery of four screens has recently been duplicated, and a chloramine plant similar to the one at the south side is in operation in a temporary location outside of the screen-house building.

Marston Lake has a range in turbidity varying from 0 to 35 and a bacterial content usually low, but varying from 250 to 1000. B. coli are generally present, but no chances are taken because of the high rate of filtration necessary and the absence of anything but 60-mesh screens on the north side. Algæ growths cause the greatest difficulty. Natural organisms and the treatment for their elimination, often, not always, have caused bacterial aftergrowths of enormous proportions. None has been experienced in the water treated with chloramine, although other supplies still show growths.

The plant consists of two hypochlorite-solution tanks, 5 ft. in diameter and 6¾ ft. high; two ammonia solution tanks, 4 ft. in diameter and 6¾ ft. high; a float-controlled constant-head barrel of 52-gal. capacity for each chemical, both delivering through plug cocks to a central point for introduction together into the 44-in. wood-stave effluent pipe.

For the ammonia side the chemical is stored as it comes in 800-lb. drums, a dose for making up a tankful of solution being forced into a section of 8-in. cast-iron pipe 5 ft. high, by the pumping of air into the ammonia drum with a Bishop & Babcock double-acting 3¼ x 5-in.

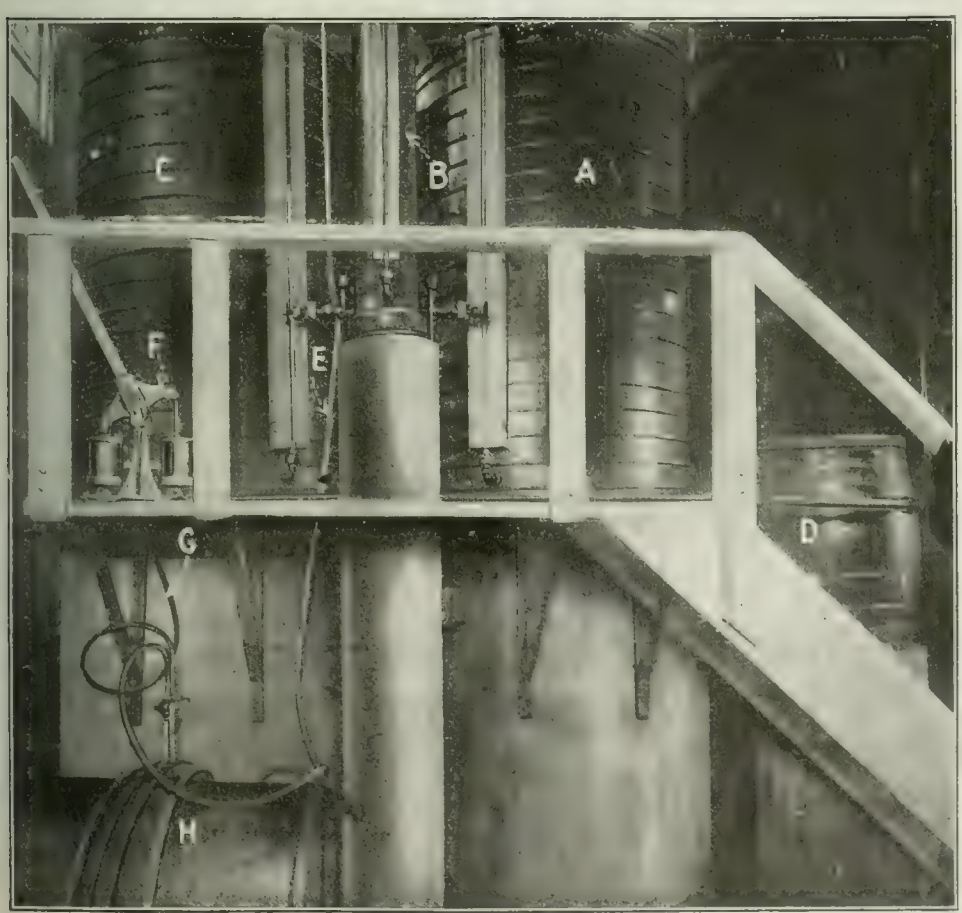


DETAIL OF CHLORAMINE INLET ARRANGEMENT

hand pump. All fittings for ammonia are of iron. A cast-iron line to the drain extends in a straight run directly under the center of the solution tanks and constant-head barrels. Crosses are used to permit cleansing with a boiler-flue cleanser. The gage on the small cast-iron tank reads in pounds of aqua ammonia, 29% anhydrous, and those on the solution tanks in pounds of available ammonia. Measurement is controlled by reading the drop in the solution tanks.

Of special importance is the arrangement for introducing the two chemicals simultaneously into the supply, experience having shown that unless this is done properly lime deposits occur, clogging the pipes. As finally worked out, a ⅜-in. pipe carrying ammonia extends down the center of a 2-in. hypochlorite pipe and ¼ in. beyond the end of the 2-in. pipe. Both pipes extend to the center of the 44-in. effluent pipe, being inclosed in a 4-in. pipe, the latter being attached by a saddle to the wood-stave effluent pipe and having 10 rows of ½-in. holes near the top for vent. Other features are the ventilating system, consisting of ¾-in. pipe from near the top of each ammonia tank, leading through the roof; also the coating of the wood tanks inside and out with ½ lb. of paraffin to 3 gal. of mineral pitch paint, applied hot. Wood covers sealed on with this paint retain all odors from the chemicals. All tanks rest on substantial, concrete foundation pedestals. Wood platforms give the operators easy access to valves and gages.

The design was made and the work installed last fall under the supervision of D. G. Thomas, former chief engineer of the Denver Union Water Co. C. L. Adams, superintendent of the Bear Creek division, has charge of the operation. By him and the principal filter operator, W. D. Jones, many of the details gained from experience with chloramine were suggested. Burton Lowther has been chief engineer and general superintendent since the plant was taken over by the city.



ARRANGEMENT OF AMMONIA ELEMENT OF CHLORAMINE PLANT

A. Solution tank; B, cast-iron measuring pipe; C, solution tank; D, constant-head barrel; E, ammonia tube; F, air pump; G, air tube; H, ammonia drum

Cement Joints for Cast-iron Water Mains at Shipbuilding Plant

By A. J. Newman
Engineer in Charge, San Pedro, Calif.

CEMENT joints for 6- and 8-in. cast-iron pipe are being used on automatic sprinkler and salt-water fire protection systems at San Pedro, Calif., by the Los Angeles Shipbuilding & Dry Dock Co. Up to July 29, 1919, a total of 3975 ft. of 6-in. and 6250 ft. of 8-in. pipe had been laid. Only three defective joints had to be cut out and remade. An average of 5% had a slight sweat which disappeared in a few hours.

Riverside portland cement is used with soft yarn entirely free from grease. The joints are spaced by using just enough yarn with which to keep the cement from going inside—the less cement the better. The yarn is soaked in liquid cement before using. Neat cement only is used. It should be rather dry, and the ideal condition will be found to be when it is moistened just sufficiently to ball when pressed with the hand. Hallet, from the Spring Valley Water Co., San Francisco, is foreman of pipe laying. This is tamped in solidly against the packing yarn by hand with a large calking iron. Calking with cement is continued until the bell is entirely filled and the calking iron will hardly make an impression on the cement and the bell rings. The joint is then wiped with a cement paste to a 45 deg. angle.

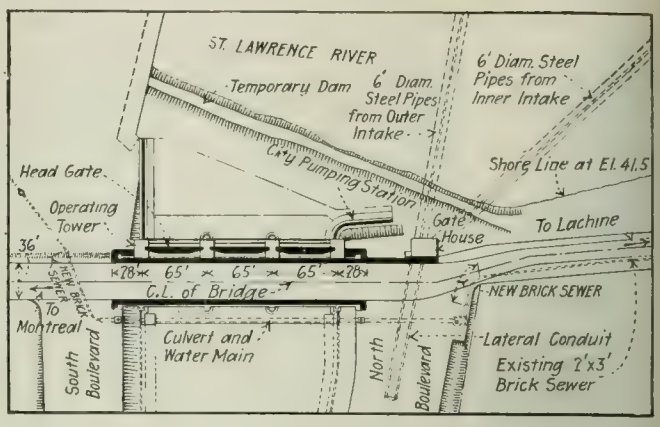
In making cement joints the pipe must be on a solid bed. If the trench has been made a trifle too deep, the pipe joints are blocked up on wood, so that they have a firm foundation. The trench is water-filled so that when the blocks rot, the dirt will become solid and the pipe well bedded. Tests are not made until 48 hours after the last joint has been calked. The trench is filled between joints. Each joint after being made is kept covered with pieces of wet sacks during the 48-hour period, after which a pressure of 180 lb. per sq. in. is kept on the line for two hours. About 600 ft. of pipe was tested at a time. T. J. Allan is superintendent of the plant. A. W. Hallet, from the Spring Valley Water Co., is foreman of pipe laying.

Headgates Combined With Bridge Over Aqueduct Canal

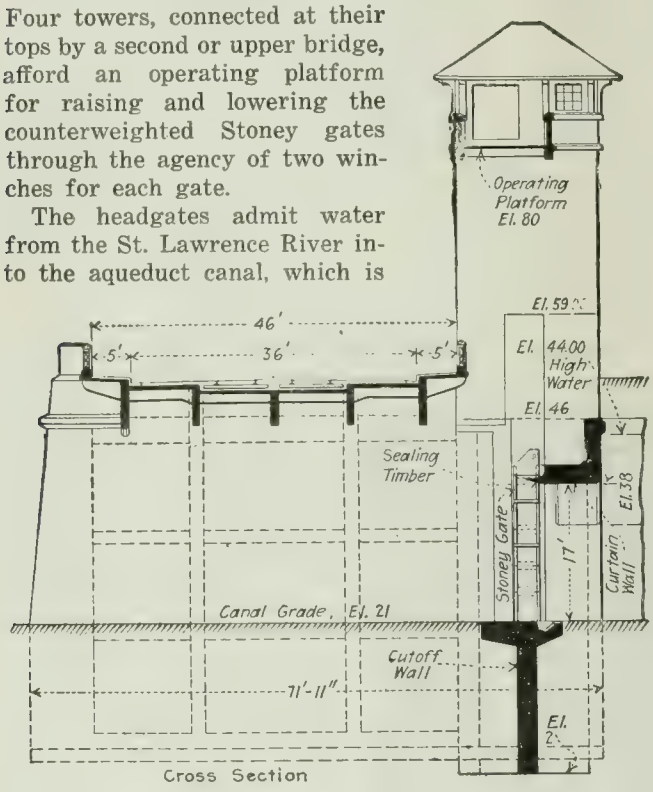
Heavy Reinforced-Concrete Structure in Three Spans With Stoney Gates Closing Waterways 57 Feet Wide and 17 Feet High

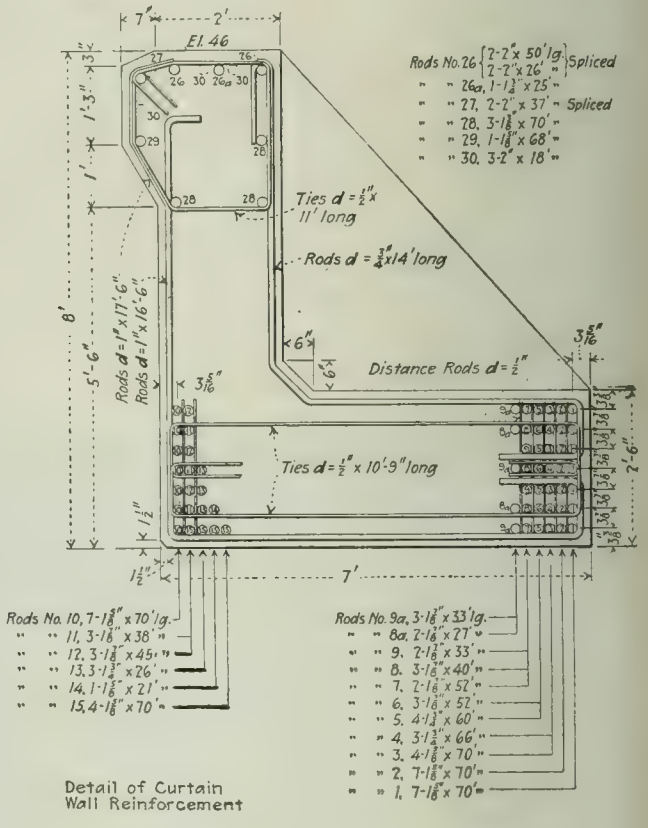
COMBINED in a single structure now well toward completion are the headgates for the Montreal aqueduct enlargement and the bridge carrying the Montreal-Lachine road over the new aqueduct or canal. With the exception of the Stoney gates, the structure is of reinforced concrete of the Hennebique system. Some of the reinforcement is heavy and intricate, especially that in the curtain wall. The bridge includes two sidewalks and a roadway, with provision for a future double line of street-railway tracks. Projections upstream of the bridge piers and abutments provide for towers and guides for the three Stoney gates. Four towers, connected at their tops by a second or upper bridge, afford an operating platform for raising and lowering the counterweighted Stoney gates through the agency of two winches for each gate.

The headgates admit water from the St. Lawrence River into the aqueduct canal, which is

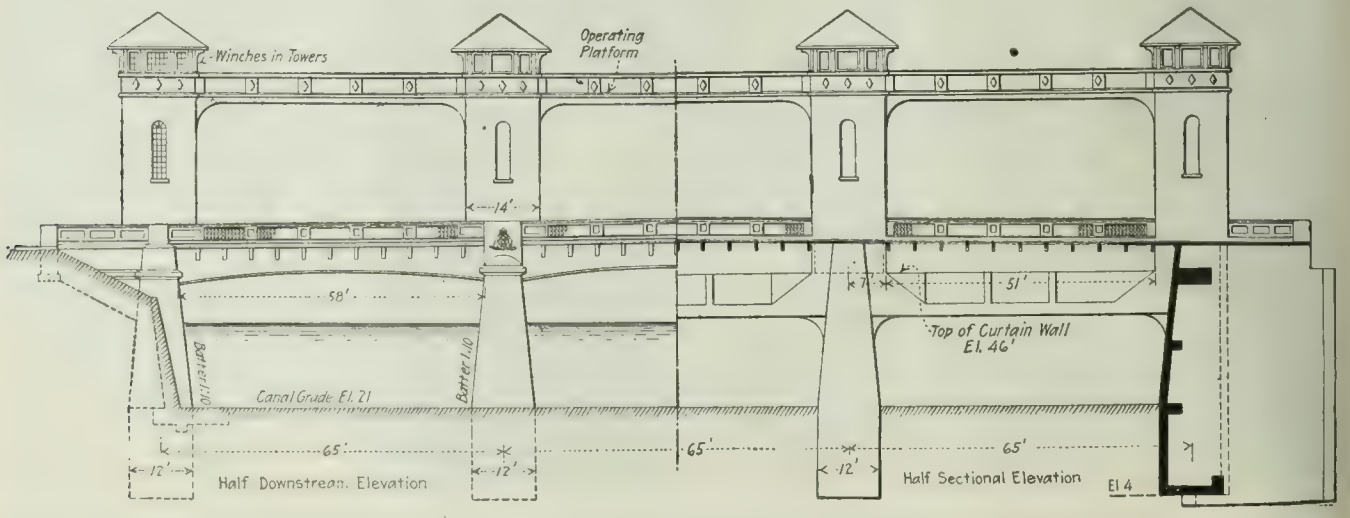


GENERAL LAYOUT OF BRIDGE AND HEADGATES

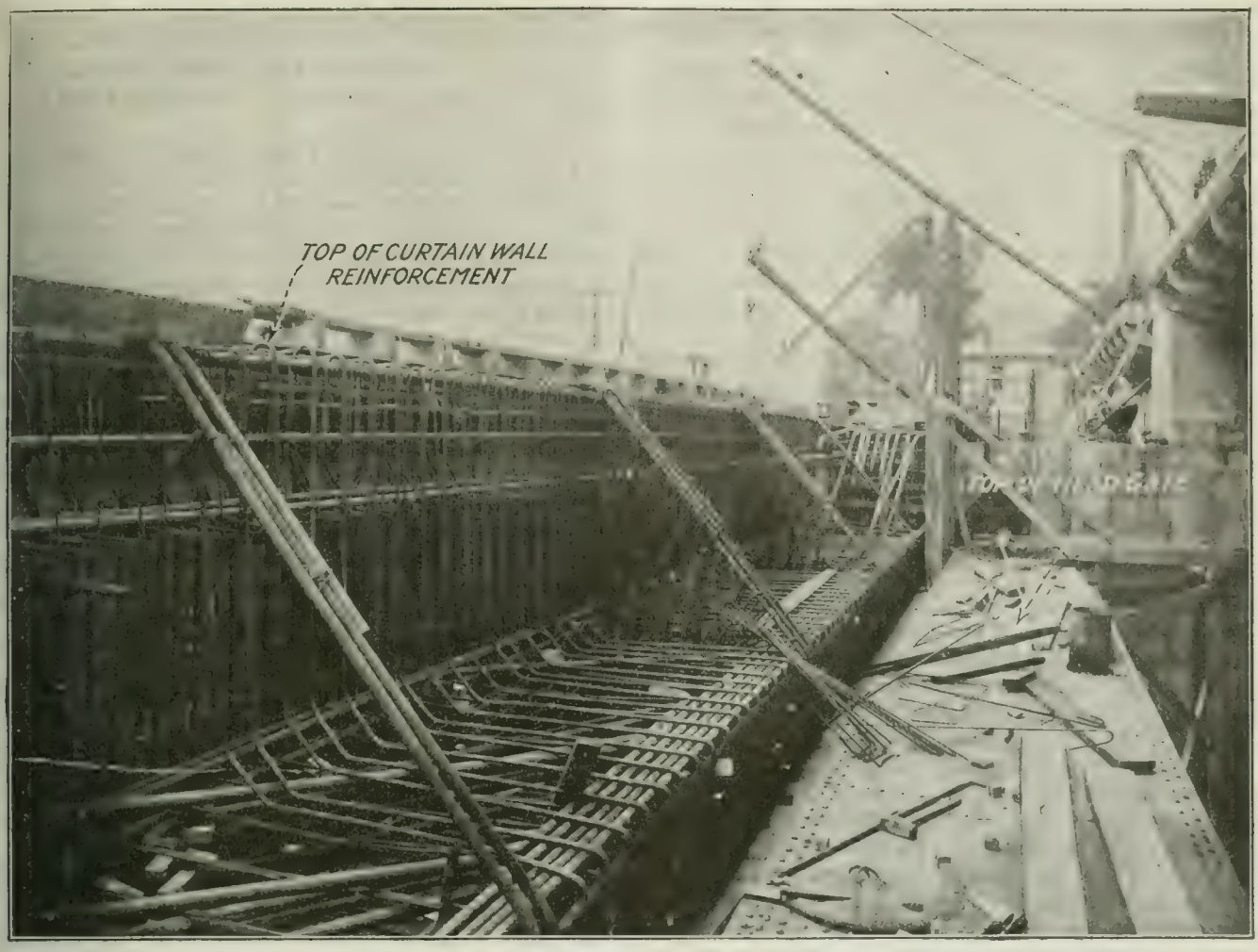




Detail of Curtain Wall Reinforcement



LONGITUDINAL SECTION OF COMBINED BRIDGE AND STONEY HEADGATES; ABOVE, CROSS-SECTION OF STRUCTURE AND DETAIL OF CURTAIN WALL



VIEW SHOWING THE REINFORCEMENT OF THE CURTAIN WALL

designed for water-supply and power. The canal at this point is about 185 ft. wide.

The three bridge piers are 65 ft. on centers. The gates are 58½ ft. long and 18 ft. high, and give a clear waterway 57 ft. wide and 17 ft. high. The maximum head of water is 23 ft. and the average about 16 feet.

The piers and the cutoff wall are carried to bedrock, from which point to the top of the towers is about 90 feet.

The curtain wall and Stoney gates have been so designed as to prevent obstruction of the river view from the bridge by the gates when lifted. Without the curtain wall the height and lift of the gates would be increased by 8 ft. When the gate is shut a sealing timber rests on a steel plate which projects from the bottom of the curtain wall.

Each gate weighs about 60 tons and is nearly balanced by counterweights. For the present the gates will be operated by hand, but provision has been made for the possible future installation of motors.

In the combined structure, not including wing walls, there are about 6000 cu.yd. of concrete and 400 tons of steel reinforcement. In the curtain wall there are about 230 cu.yd. of concrete and 80 tons of steel, or 670 lb. per yard of concrete.

The reinforced-concrete work was designed by L. G. Mouchel & Partners, Toronto, Ont., Canadian representatives for the Hennebique system. The designs for the Stoney gates were made by the Dominion Bridge Co., Montreal, which subsequently received the contract for making and placing the gates. The original contractors for the remainder of the work having relinquished their contract, the work is now being completed by Fraser Brace & Co., Montreal, on a cost-plus-a-fixed-fee basis. A. E. Doucet is director of public works of Montreal. T. W. Lesage is engineer-superintendent of the Montreal water-works. Frederick E. Field, the assistant superintendent of water-works, is engineer for the city.

Meters Prevented Water Famine at Pocatello

Except for a metering program entered into by Pocatello, Idaho, three years ago, the summer of 1919 would have seen the city practically without water. At present this town of 18,000 persons has 2100 of 4000 consumers metered, and the consumption has been cut from 350 gal. per capita daily to 110 gal. The supply is a mountain stream, with the low-water flow a constant after it dropped to about the 2,000,000-gal. consumption of the city. Restrictions on sprinkling to one hour per day per 30-ft. lot had to be strictly enforced, but the lawns came through in good shape, people learning that much less water than the usual drenching served the purpose as well or better. The drought which was broken Sept. 1 had lasted nearly five months. An investigation for a well supply is under way, but E. S Anderson, consulting engineer, states that water from a spring five miles below the city or irrigation ditch water, filtered, is more feasible.

Plans for Earth-Dam Construction Involve Large Use of Machinery

Designs for Structure 100 Feet High at Providence, Rhode Island, Completed and Specifications Well Advanced

By Frank E. Winsor
Chief Engineer, Water Supply Board, Providence, R. I.

WORK on the proposed Scituate reservoir of the new gravity water-supply of Providence, R. I., was resumed this spring by the letting of several small one-season contracts for highway relocation and for preliminary work at the main dam. These contracts are now in full swing. The designs of the main dam and dike have been adopted, and contract drawings and specifications are well advanced. The date of advertising for bids has not yet been decided upon, owing mainly to the persistence of unsatisfactory conditions in the labor and material markets. A general description of this project, by the writer, was given in *Engineering News-Record* of May 3, 1917, p. 233.

The main dam and dike will be built of earth, mainly local sand and gravel, with a cutoff or core of compacted soil about 80 ft. thick at the maximum, rolled in 6-in. layers, carried down to rock about 80 ft. below the surface in the bottom of the valley. The maximum height of the dam above the surface of the ground is about 100 ft., the main dam being about 3200 ft. long on top and the dike, adjacent to its east end, being about 4000 ft. long. About 2,500,000 cu.yd. of embankment will be required. To handle this amount of material in the four seasons now being considered for this work, allowing the necessary time for excavating and refilling the deep core trench at the start, will require a plant capable of delivering regularly not less than 8000 cu.yd. of embankment materials during a working day.

The core trench will be excavated as an open ditch with stable side slopes which will, it is believed, vary from 1 on 1 to 1 on 2, with bottom widths at the exposed rock surface from about 60 ft. in the lower portion of the gorge to 40 ft. in the upper portions near the ends of the dam. A concrete apron about 1 ft. in thickness and 30 ft. in width, with two cutoff walls about 2 ft. high near either edge, extending longitudinally the entire length of the cutoff trench, will be built on top of the rock. Holes will be drilled into the rock, at whatever depth may be deemed necessary, and the rock foundation thoroughly grouted. It is believed that it will not be necessary to excavate any considerable quantity of ledge rock for a foundation for the concrete apron above described.

The excavation in the cutoff trench involves about 500,000 cu.yd., practically all of which will be sand and gravel suitable for filling either side of the core, and the work will be so laid out that this material can be placed directly from the excavation into the finished embankment. Soil and subsoil for the impervious core, of which about 600,000 cu.yd. are required, will be obtained from cleared areas below the reservoir flow line upstream from the dam and will involve a maximum haul of about three miles. Borrow areas for obtaining the bulk of the sand and gravel filling are located conveniently to the dam.

The use of the steam shovels, dragline scrapers, etc., for excavating, and long trains of narrow-gage power-dump cars for transporting materials, is now considered the most promising method of building the dam, and the topography in the vicinity is particularly adapted to the economical location of tracks with easy grades and moderate curvature.

Careful consideration is being given in the design and in the specifications to the use of machine methods in construction operations and to the reduction of hand labor to a minimum. The consolidation of the sand and gravel filling either side of the soil core by the use of adequate quantities of water may be permitted in lieu of the rolling in layers which will be required in the core itself.

The slopes of the dam will be protected on the upstream side by placing coarse materials on the lower portion and riprap on the upper portions exposed to the action of waves. The downstream side of the dam will be protected by soil dressing, draining and grassing.

The construction of the dike is similar to the construction of the dam, the details being dependent upon the depth of the water against the structure and the character of the material upon which it is founded. The gatehouse, foundations for which are already provided, is located over the stream-control conduit and will be provided with passages permitting regulation of the flow of water to the city and to the river below the dam. The spillway from the reservoir is located at the west end of the main dam and is a masonry structure nearly all founded upon rock, the rock foundation being prepared as in the case of the core trench. After flowing over the spillway, the water is conducted into an open channel excavated in the rock, back to the river.

It is expected that at the time the work is advertised the diversion of the river will have been completed through a diversion conduit already built through the dam, and that a portion of the cutoff trench west of the diversion conduit will be so far finished as to permit the placing of material excavated from other portions of the cutoff trench directly in place in the finished embankment.

The new water-supply project is being carried on by the Water Supply Board, composed of B. Thomas Potter, chairman; William A. Schofield, Henry A. Grimwood, William P. Vaughn, John Kelso, Joseph H. Gainer and Walter F. Slade, with Samuel N. Grammont, secretary. The engineering work is under the direction of the writer, as chief engineer, with William W. Peabody, deputy chief engineer, in charge also of the dam and aqueduct division, Frank E. Waterman in charge of the reservoir division and Francis B. Marsh in charge of the designing division.

Enough Timber for 150 Years' Exploitation

According to figures recently compiled by the National Lumber Manufacturers' Association, there is in the United States enough standing timber, with the addition of the present growth of new timber at the annual rate of approximately 20,000,000,000 ft., to supply raw material to the lumber industry for at least 150 years. This information is given by the secretary-manager of the association, who says also that despite the fact that the excess of exports over imports may somewhat increase the annual drain, the total domestic consumption will not greatly exceed the current figure of approximately 33,000,000,000 ft. per year.

Metering Renders Additional Water-Supply Unnecessary

Master Meter and Consumers' Meters Installed at Middletown, Connecticut, Are Followed by a Material Reduction in Consumption

THE 1917 report of the Board of Water Commissioners of Middletown, Conn., summarizes the water consumption experience of that city in 1915, 1916 and 1917, within which time the water-works have been transformed from an unmetered to a fully metered system. The 1918 report gives figures for that year. The case is a particularly interesting one, since the installation of meters was accomplished within a very short time and the forecasts of the engineers were justified in every particular.

During the winter of 1913 Metcalf & Eddy, consulting engineers, Boston, were employed to advise the Middletown water commissioners on the needs and most suitable sources of additional water-supply. Their report, which was published in full in the water commissioners' report for 1913, stated in brief that the present supply should be adequate for many years, if properly conserved, and recommended against obtaining an additional supply, as it would be folly to supply additional water only to have it wasted.

There were no trustworthy statistics of water consumption, the supply being obtained by gravity from two sources, but estimates based on the rate of depletion of the reservoirs at times when there was no rain, indicated that in 1891 the per capita consumption was about 90 gal. daily, in 1908 it was 110, and in 1913 it was 133 gal. Substantially all the increase appeared to be due to waste. The manufacturing services were metered, and the manufacturing consumption was equivalent to approximately 25 gal. per capita daily. It was estimated that under the local conditions the consumption in excess of 90 gal. was certainly wasted.

The safe capacity of the sources of supply was estimated at 2,300,000 gal. per day. The 1913 consumption was approximately at the rate of 2,000,000 gal. per day, and the reservoirs had been very nearly exhausted several times in the preceding years. The engineers estimated, however, that with reasonable per capita consumption the present sources should be adequate at least until 1940. They recommended, accordingly, that control meters be installed on the main supply pipe and that the services be metered as rapidly as possible, and in the meantime that waste and leakage be eliminated by house-to-house inspection.

The water commissioners were convinced that the course recommended was the correct one for the city to pursue, and succeeded in obtaining an appropriation from the common council for the purchase of meters. They immediately bought a venturi meter for the principal supply pipe, and commenced the installation of meters on domestic services. The first meters were installed on the services where it was believed that waste was the greatest. To quote from the report: The commissioners "immediately brought upon themselves the severest criticism. They persevered in the work, however, although by so doing they incurred much odium and were roundly abused. But experience now shows that their course was fully justified. There has been an enormous reduction in the consumption, and the almost total absence of complaints about water bills, during the recent collection, indicates that the people are satisfied with the present system."

The delays in obtaining the venturi meter made it impracticable to obtain accurate measurements of the total consumption prior to commencing the installation of domestic meters. The average daily consumption from the time the venturi meter was installed decreased as the number of meters increased, as shown by the accompanying table:

AVERAGE DAILY CONSUMPTION IN MILLIONS OF GALLONS

	1916	1917	1918
January		1.449	1.321
February		1.535	1.624
March		1.492	1.624
April		1.414	1.349
May		1.357	1.332
June		1.226	1.331
July	1.614	1.143	1.355
August	1.676	1.475	1.253
September	1.619	1.240	1.226
October	1.688	1.230	1.243
November	1.602	1.195	1.258
December	1.556	1.335	1.249
Average		1.341	1.338

The water commissioners estimate that this decrease represents a reduction in the per capita consumption from 133 to 78 gal. per person daily. They say in their 1917 report:

> It was not the purpose of the meters to compel consumers to stint themselves in the use of water, but to compel the careless consumers to stop avoidable waste and leakage. The discovery and stoppage of hundreds of leaks by the consumers, in coöperation with the water department, has shown that the metering of the services has had the desired effect. . . . Statistics of the November collections from metered services within the city show that 18% of the consumers are paying more than on the flat-rate basis, 80% are paying less and 2% are paying the same as before.

Diaphragms Damp Water-Gage Fluctuations

Fluctuations of water in a glass gage showing the head over a weir in the flume leading to the Marston Lake filters of the Denver water-works are damped so that reading is easily made by interposing, in the line to the bottom of the glass tube, a short piece of 2½-in. pipe with flanges on either end, securing a thin sheet of rubber gasket. The rubber inlet and outlet tubes connect to metal tubes (old automobile tire tube valves) secured to the center of the rubber diaphragms. The whole device was made on the job. Previously the fluctuations varied 4 in. at high flows and so rapidly that it was impossible to read the scale within 1 in., which represented a daily rate of about 2,500,000 gal. There is a slight variation now, but it is slow, and the scale can be read to less than ⅛ in. and easily to a 200,000-gal. rate.

The rubber tubing that is used is of about ⅛-in. inside diameter. The weir-box supply rises from a pipe line leading from the lake underground to a point above the filters, so as to give a gravity flow through them. At the high rates prevailing during the past summer, when more than twice the designed capacity was cared for, the pulsations and disturbances were particularly troublesome. The device was worked out by C. S. Adams, superintendent of the Bear Creek division, under the general supervision of Burton Lowther, chief engineer and general superintendent of the Denver Municipal Water-Works Commission.

New Features in Indiana's Concrete Road Specifications

Recent Draft Includes Some of the Latest Ideas in Highway Work—Materials and Methods Covered in Detail

A RICH concrete, the cylinder test for consistency, combined hand-roller and belt finish, canvas covering and 15-day ponding, and the use of free steel dowels at construction joints, are among the features of the new concrete-road specifications of the Indiana State Highway Commission. These specifications include both one- and two-course construction, with and without reinforcement, but the conditions determining the use of these alternative designs are not stated. The concrete slab is 18 ft. wide, with a thickness of 8 in. at the center and 6 in. at the sides.

Proportioning of Concrete

For one-course paving, either crushed stone or screened and washed gravel may be used as the coarse aggregate, ranging from ¼ in. up to a maximum size of 2 in. as determined with laboratory screens, with not more than 5% by weight passing a screen having ¼-in. circular holes. The stone must have a French coefficient of wear of 8 and a crushing strength of 16,000 lb. Sand for the fine aggregate must pass a ¼-in. screen, with not more than 28% and 10% by weight passing the No. 50 and No. 100 screens, respectively, and not more than 3% by weight removed by the elutriation test. A mix of 1 cement, 1½ fine aggregate and not more than three parts of coarse aggregate is specified, but it is required that the total aggregates shall not exceed 4½ parts and shall be in such proportions as the engineer may direct.

Stress is laid upon the cement proportion, with a penalty for skimping. The specified proportion is 1.91 barrels of cement per cubic yard of concrete in place. The engineer is to compare the calculated amount of cement as required by the plans and specifications with the amount actually used each day, this being determined by counting the number of sacks used. If the amount of cement used on any day is 2% less than that specified, the contractor must remove the concrete and rebuild this section of the work.

Concrete mixing is to be done in a batch machine specified to be "of the boom-and-bucket type," the time for each batch being not less than 1 min. after all the materials are in the drum, and, during that period, the drum must make not less than 14 or more than 20 revolutions. Measuring boxes, timing devices and a water measuring and discharging device are to be provided. Concrete is not to be mixed when the temperature is at or below 35° F. Both steel and wood forms are permitted, and must be cleaned and soaped or oiled before concrete is placed against them. For the consistency test, a cylinder 6 in. in diameter and 12 in. high is filled with concrete which is tamped until a film of mortar appears upon the surface. Upon raising the cylinder, the vertical settlement or "slump" of the concrete must not exceed 2 in. when a mechanical finisher is being used or 4 in. when the finishing is being done by other methods permitted in the specifications. This is similar to the test requirements of the Illinois specifications noted in *Engineering News-Record* of Apr. 10, 1919, p. 735.

For finishing the concrete, the surface is to be struck off or leveled with a steel templet weighing not less than 400 lb. for a length of 19 ft. This templet is to consist of an 8-in. channel, crowned to the required cross-section and reinforced by an I-beam, T-rail or angle, so as to give it sufficient strength to retain its shape. The concrete is to be rolled transversely with a hand roller having a long handle and operated from one side of the paving. This roller is to be of metal, 6 in. in diameter, 6 ft. long and weighing 100 lb. It must be passed over the entire width of the paving at each movement, and the rolling is to be continued until free water ceases to come to the surface. The rolling will be followed by a belt finish. The use of a finishing machine is permitted, but no instructions or requirements for this are included in the specifications.

A canvas covering suspended about 12 in. above the surface is to be spread over the concrete as soon as the finishing operations are completed. In addition to this the engineer may require that the surface of the concrete be sprinkled. When the concrete has "hardened sufficiently" this covering is to be removed and the sides of the paving banked with earth. The pavement is then to be covered with water to a depth of at least 2 in., and this ponding is to be maintained for 15 days.

Earth cover at least 1½ in. thick is permitted on grades over 2%, where the ponding is impracticable, the concrete being wetted thoroughly in advance and the material kept continually moist. This cover is to remain at least 18 days, and precautions must be taken to prevent foot traffic for at least three days. Other methods of curing may be permitted. After the concrete has been cleared and swept clean, three days must be allowed for final curing. In no case is traffic to be allowed upon the road until 21 days after the laying of the concrete, while in cold weather the road will be kept closed for such longer period as the engineer may require.

Free Steel Dowels Used at Construction Joints

Expansion joints are not specified, but a plain butt joint is to be made at the end of each day's work by the use of a heavy plank, having its top cut to the proper crown. Steel dowels across the joint are provided to prevent independent movement of the adjacent slabs. These are ¾-in. bars, 4 ft. long, spaced 4 in. on centers and placed 3 in. below the finished surface. They are cased in paper so as to prevent a bond between the steel and the concrete; apparently they are intended to be free for their entire length. Special care is demanded in the making of these transverse joints, in order that the concrete may be true and level on both sides.

Any unevenness amounting to ¼ in. above or below the true surface of the concrete, whether at joints or other parts, must be remedied. Depressions must not be filled with concrete unless the slab has been cut to insure a thickness of 4 in. of new material. Where such a patch would have an area of more than 2 sq.ft., the concrete must be cut through to the foundation, for the full width of the slab, and a new strip of concrete placed.

Where reinforcement is used in one-course construction, it is to consist of steel fabric weighing at least 40 lb. per square foot. This is to be in flat sheets of a length 4 in. less than the width of the paving, the sheets being so constructed as to retain their shape during

the necessary handling. The transverse laps are 12 in., and if sheets are allowed to be lapped parallel with the center line of the road the lap must be not less than 4 in. The reinforcement is placed 2 in. below the finished surface of the concrete.

For two-course concrete roads, the stone for the coarse aggregate of the top course is to range from ½ in to 1 in., with not more than 5% by weight of the minimum size. If screened and washed gravel is used, it must contain at least 25% of stone and pebbles. For the bottom course, a 1:6 mixture of cement and aggregates is specified, approximating a 1:2:4 mix and having not less than 1.57 barrels of cement per cubic yard. For the top course the proportions are 1:3½, approximating a mix of 1:1½:2, with not less than 2.1 barrels of cement per cubic yard. In all cases the proportioning of the aggregates is subject to the requirements of the engineer.

Concrete for the top course must be placed as soon as possible after the surface of the bottom course has been struck, this interval being not more than 30 min. Where the bottom course has not been covered within this time it must be taken up. When reinforcement is required, it will be similar to that for one-course paving, but will be laid upon the bottom course immediately after it has been shaped in readiness for the top course.

Grading and Contracts

When the subgrade has been shaped to the required cross-section, it is to be rolled with a three-wheel power-operated roller, weighing not less than 10 tons. Loose rock, boulders and soft or yielding material which will not compact readily when rolled must be removed to a depth of at least 6 in. and replaced with suitable material. Where the surface of an old roadbed conforms approximately to the subgrade, it must be scarified to a depth of 8 in., while if the old surface is of telford or other construction made with large stones, the projections must be broken off, and crushed stone added to obtain the required cross-section.

The shoulders must be made of suitable material (not specified more particularly) and rolled as above. Embankments are to be built in layers not more than 12 in. thick, each layer being compacted by a roller as specified for the subgrade. Material containing sand in such proportions as to prevent it from compacting readily when rolled dry is not to be used, except by special written permission.

Provision is made for agreements with contractors as to payment for extra work, and for cases where alterations in plans or construction affect the amount or cost of the work. For construction done on a force-account basis the contractor will be paid the current local wages for labor, teams and foremen, and the actual cost of materials, including freight rates, with an addition of 15% to both wages and costs. When power-operated machinery is used, rental will be paid on the basis of hours of work.

No bonus is provided for rapid progress, but the penalty for delay in completing work beyond the contract time ranges from $10 per day, for contracts up to $500, to $30 per day for contracts of $50,000 and over. Monthly payments of 80% of the estimates are provided. Continual inspection is implied, it being specified that work done or materials used without supervision or inspection by a representative of the state highway commission may be ordered removed and replaced at the contractor's expense.

In addition to concrete roads, the specifications cover vitrified-block and bituminous-concrete pavements, particulars of which will be noted in a separate article. The specifications were prepared under the direction of H. K. Bishop, chief engineer of the Indiana State Highway Commission.

Federal Railroad Operation and Betterments Policy

Deficit Would Not Have Occurred Under Railway War Board—Betterments Abandoned During Remainder of Federal Control

By a Railroad Executive

A—Policy During the War

THE policy of the United States Railroad Administration respecting additions and betterments, on taking over the railways during the early part of 1918, was one of almost unlimited expenditure in all directions for the purpose of expanding the transportation facilities to the greatest possible extent in the shortest possible time to meet the war emergencies.

The railway facilities had previous to Federal control been operated practically as a unit under the Railway War Board, and, it can be stated, were operated successfully by this board. It was not that the railway facilities were inadequate or that they were not efficiently operated that they were taken over by the Government, but it was because they were not used efficiently by the various Governmental departments and it was necessary to place them under Government control in order to control their use. If the Railway War Board had been given the same powers as were given to the Director General of Railroads, and the railways had been guaranteed the same standard return as provided for in the Federal-control act, there would have been no deficit in the operation of the railroads as there has been under Federal control, and the country would have saved millions of money and the operation would have been more efficient than under Government control.

The reasons for these things are plain to the railway man, and can be readily made plain to anyone who is familiar with the processes under Governmental operation.

If the railways had remained under the operation of the Railway War Board with the same powers as were granted the Director General, the following results would have been secured:

1. There would have been no disturbance in the organization of the railways. The corporations would have remained in charge of the operation of their respective properties, reporting to the War Board as a central, controlling body, but the details of operation would have remained in practical hands, thus saving the demoralization of the forces incident to the centralization of operation as has been done under Federal control. This, alone, has cost the railways large sums and reduced the operating efficiency.

2. Under the centralization of control in Washington, the former well settled policies respecting operation, which vary on different systems, were changed, and attempts were made to make uniform, on 260,000 miles

of line and in all parts of the country, methods which in many cases were impracticable and occasioned much disturbance and consequent expense. An instance is the attempt to establish a uniform practice regarding repairs and renewals to freight-car equipment, as though the railways were one system. With the many types of equipment in use in various parts of the country this was manifestly impossible, but cost much in the attempt to carry it out.

3. The unification of facilities and equipment has also had its economical limits, but in the early stages of Federal control it was attempted to extend this policy, and in some instances expensive changes were made which must be abandoned at the end of Federal control. While the common use of freight cars has been useful, it has a disadvantage in that cars which are usually used to handle grain in the grain territory are now in the East or Southeast and the cars belonging to those regions are in the grain territory and not in all cases suitable to handle grain.

The difficulty has been that there were too many commissions appointed to handle practical questions. These questions were decided by the departments located in Washington instead of permitting the practical men in the field the necessary authority to work out and decide such problems on the ground.

The corporations have heretofore been accused of operating the railways from Wall Street, but it can be said that the *practical operation* has always been left to the local officers instead of such control being centralized, as was the case under Federal control, at Washington.

4. The handling of railway labor was likewise centralized in Washington, and uniform schedules of wages and working conditions were put into effect governing all the roads under Federal control. The same wages, for example, were paid to the Mexican track laborer working on the roads just inside the border on the Rio Grande as was paid in Oregon or Maine. The conditions surrounding railway labor differ in various parts of the country, but this distinction was leveled to one uniform rate and basis over the country and over 260,000 miles of road.

The relation of the wages of one class of employees to another, which relation has been in effect on American railroads for 50 years, was destroyed, and this caused much dissatisfaction among various grades of employees. A minimum wage was established, which made it obligatory to pay such wage regardless of ability or competency of the employee. The retroactive pay, which in many cases was wholly unexpected, cost millions of dollars. If those questions had been left in the hands of qualified railway men in the various sections of the country, an adjustment more satisfactory and less expensive would have been made.

Wage increases were justified and should have been made, but they should have been made with due regard to the necessities of each case; in some cases more would have been granted than was given, but it would have been done with due regard to the relationship between the various classes of employees and the value of their services.

5. The additions and betterment work authorized during 1918 was largely done without the previous consent of the corporations. It is nevertheless a fact that all that was done as war emergency work would have been carried out as promptly—and, it is believed, more efficiently—if the roads had been operated under the Railway War Board and through it by the former organizations.

The corporations, before Federal control, did not stand in the way of any improvements needed for the emergency, and did not do so after Federal control, but were not consulted in many important matters when their valuable aid would have enhanced the results.

The dismissal of men long connected with railway properties, who, by their experience and ability, were absolutely necessary to successful operation did not tend to improve the situation as far as economical and efficient operation was concerned.

B—Policy Since Signing of Armistice

The policy of the Railroad Administration regarding expenditures for additions and betterments during 1918, up to the signing of the armistice, was to increase railway facilities wherever necessary to help win the war—a very commendable policy, except in the method of carrying it into effect, as already set forth. The policy, however, has been radically changed since the signing of the armistice, and the year 1919 finds a very small program for additions and betterments, and much of the work started in 1918, though not completed, has been stopped.

It is a curious fact that with all the expenditures made on the railways under Federal control, there is less transportation capacity now than at the beginning of that period. The policy now in effect, to curtail in every possible way the expenditures on additions and betterments during the remainder of Government operation, means that there will be still less of transportation facilities at the end of Federal control. This is a remarkable situation, from which the country must necessarily suffer. Moreover, as pointed out in an article in *Engineering News-Record* of Sept. 4, 1919, page 457, the regular maintenance program of the railways is not being carried out, so that the roads at the end of Federal control will not be in as good condition physically as when taken over by the Government.

The country needs increased transportation facilities to handle the business which will offer in the immediate future. The program of 1918, which was carried out only to the extent of about 40% (the total program calling for a $1,250,000,000 expenditure) should have been continued in 1919, and the maintenance program of the test period, at least, carried out, in order that the roads might have been returned "in as good condition and complete equipment as when taken over by the Government."

The public is of the belief, unfortunately, that because millions have been expended on the railroads and that there is a deficit of many millions, the roads are in better condition physically than when taken over by the administration. This is not the case, and in addition to the financial deficit already existing there will be a large deficit in physical condition that must be made good.

Los Angeles Building Permits Show Increase

Statistics from the Department of Buildings, Los Angeles, Calif., show the following increase in the number of building permits issued: In August of this year there were recorded 1074 permits, with a total valuation of $2,402,444; during the same month in 1918 the number of permits was only 569 and their value $763,579.

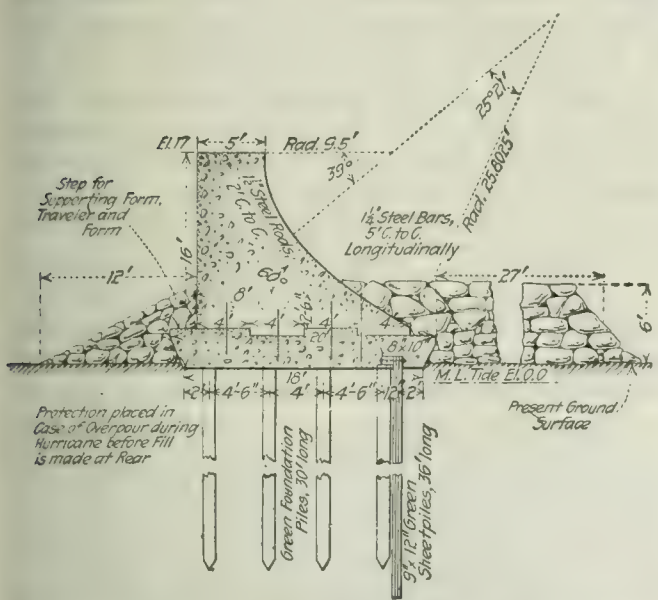
Extending The Galveston Sea Wall

Two-Mile Addition to Famous Concrete Protecting Wall Is Being Built With Maximum Use of Mechanical Aid

By J. B. Lippincott
Consulting Engineer, Los Angeles, Calif.

GALVESTON, as is well known, is protected against the waters of the Gulf of Mexico by a long, concrete sea wall built in 1903-4, after the hurricane of 1900 nearly destroyed the city. Under a recent appropriation of Congress and with additional money furnished by the county, there is now being built an addition to this wall nearly two miles long, the construction of which is distinguished by the very extensive use of machinery.

The original Galveston sea wall, designed by a board of engineers, appointed after the great storm of 1900 and composed of Gen. H. M. Robert, formerly chief



SECTION OF NEW GALVESTON SEA WALL NOW BEING BUILT A DISTANCE OF 10,300 FEET

of engineers of the United States Army, Alfred Noble and H. C. Ripley, was 3⅓ miles long (it was afterwards lengthened to nearly five miles) and of a section approximately the same as the new wall illustrated in this article. This section of solid concrete was founded on wood piling cut off about 1 ft. above low tide, with a base width of 16 ft. and a height of 16 ft., the top elevation being 17 ft. above low water. It was backed with a paved surface rising inland to a crest elevation of 19 ft., 100 ft. back from the face. The board recommended the raising of the street on the north or bay side of the island to 8 ft. and of the boulevard running longitudinally down the center of the island to 10 ft., but this filling was never carried out completely.

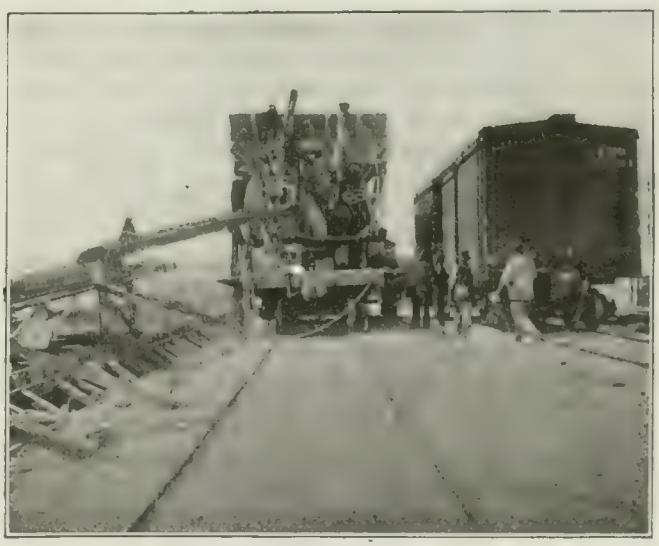
The original wall has now stood intact for about 15 years. The great flood of 1915 drove considerable water over its top, destroying in places the brick pavement that was laid on the sand, for a width of about 100 ft. from the shore side, and eroding some of the sand from the rear of the wall also. The wall did not fail; indeed, it saved the city from serious encroachment from the sea. Following this 1915 storm General Robert was again called into consultation by the city. It was then decided to make the slope rise inland from the top of the sea wall 4 ft. in 200, with a curtain wall at the new crest at an elevation of 21 ft. and with a depth of 5 ft. An intermediate curtain



COMPLETED FOUNDATION FOR NEW SEA WALL, WITH CONSTRUCTION TRACKS ON THE LEFT

wall of concrete sheet piles was driven 100 ft. back from the sea wall to a depth of 14 ft., and the space of 100 ft. back of the sea wall was paved with brick on edge in cement mortar.

The 1904 wall extended along the south side of the City of Galveston next to the gulf, and continued across a narrow neck of the island in a northerly direction across the east side of the city. From its easterly extremity the five-mile wall is now being extended a distance of 10,300 ft. The County of Galveston is to pay for 3300 ft. of this wall, and the United States for 7000 ft. To complete the protection to the Federal



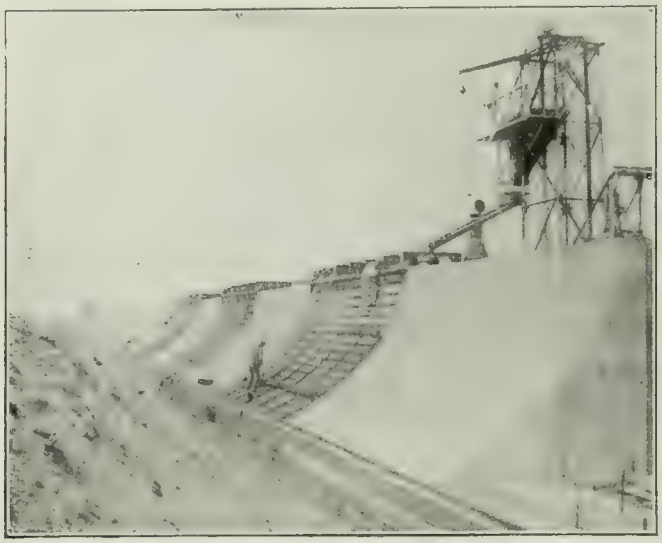
PLACING CONCRETE IN FOUNDATIONS FROM CONCRETING CAR—SUPPLY CAR ON RIGHT

fort at the extreme easterly end of the island will require 10,800 more ft. of wall.

The construction of the new wall is under the charge of the Corps of Engineers of the United States Army, and is being done by day labor. The design of the new wall, shown in the accompanying section, is approximately the same as the old wall, with some varia-

tions made necessary for special construction features.

Before construction was begun, a double-track railroad was extended along the rear of the new wall, with portable passing tracks farther in the rear. This track was used for all the construction machinery. The first operation in the construction was the placing



CONCRETING INTERMEDIATE SECTIONS OF THE NEW GALVESTON SEA WALL

of the pile footings. As shown in the views, piledrivers, traveling on the construction tracks, put down both foundation and protection piles; then followed the concrete mixers, making concrete for the footings, and, finally, the locomotive cranes and concrete mixers used in the construction of the main section of the wall.

Four round piles with 10-in. points and 30 ft. long are driven under the wall every 4 ft. The material through which the piles are driven is sand, and while a steam hammer weighing 7000 lb. is used, the work of putting down the piles is greatly facilitated by a water jet working through a 2-in. pipe that is slipped down next to the pile as required. The outer toe of the sea wall is protected against scour by Wakefield piling built up of 3-in. planks, making a stick 9 x 12 x 36 ft. These also are driven by 10,000-lb. steam hammers with water jets as required.

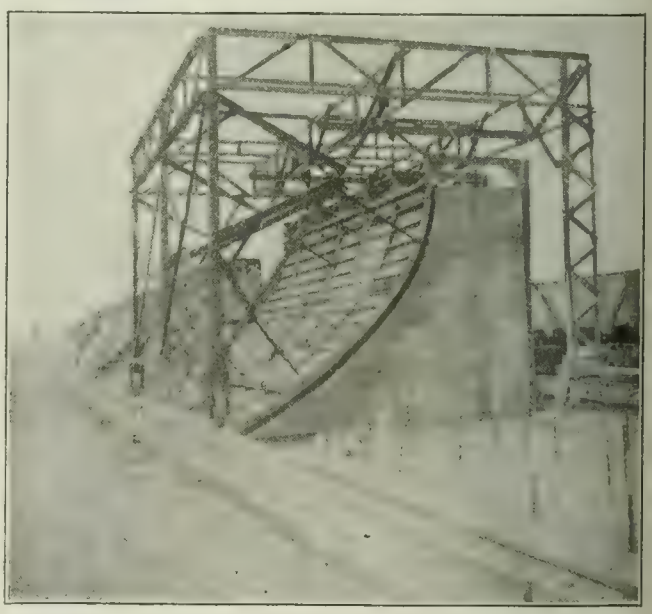
Concreting is carried on from a mixing plant built on flat-cars carrying the bins on one car and the engine and mixer on another. A locomotive crane with a clamshell bucket is used in putting the aggregate into the bins from the cars. From the 1-cu.yd. mixer the material is run through its chute to the foundation. The plant puts in about 260 cu.yd. per day in the main wall and 120 yd. in the foundation, or a total of 380 yd. per eight-hour day.

The footing is built with an overhang on the shore side, giving space for the traveler which is used in setting the forms for the superstructure. The foundation has a top width of 20 ft. and a bottom width of 18 ft. to provide the 2-ft. overhang noted. There is placed in the wall every 2 ft. a 1½-in. bar, 10 ft. long. This bar, set into the wall about 6 in., lies tangent to the curved surface of the wall on the side toward the sea and extends through the middle two-thirds thereof. The foundation is stepped to a 6-in. trough, as shown in a view, to prevent sliding of the wall.

When the foundation is completed, the next step is the erection of the steel forms for the main section of the wall. The forms are placed in alternate 30-ft. sections and are moved by an overhead traveler running on rails on the overhang described above. After alternate sections are completed the forms are moved back to concrete the sections left open. Details of the forms and the traveler are given in the accompanying drawing. The forms were designed to stand alone, after the traveler which places them has been removed. The main frame is of steel sections, with steel plate lagging and wooden-end bulkheads, the steel form itself being handled by the traveler and the wooden bulkheads swung into position by the locomotive crane.

It will be noted from the views and the drawings that the forms may be moved away from the concrete and suspended by turnbuckles on the traveler after the channel tying together the tops has been unbolted. These turnbuckles are attached to the forms by pins to permit of easy removal. The forms themselves are so constructed that when the steel sides are swung in on the traveler they will pass another form in place. The toe of the curved sides of the forms is anchored to the base by threaded bolts set in the concrete and connected to the form by short, threaded ¾-in. rods, which are unscrewed when the form is removed, 3-in. bar couplings joining them. The forms were designed by the engineers on the work, and were built by the Blaw-Knox Co., Pittsburgh, Penn.

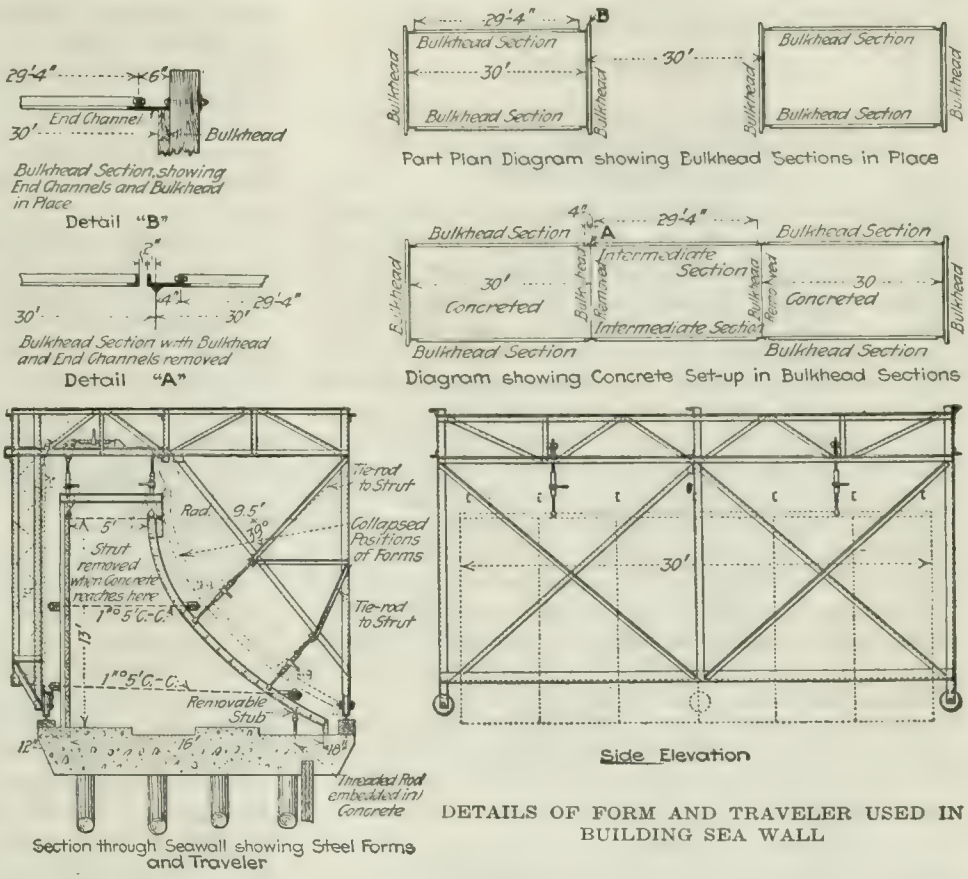
The final operation in the progressive construction is the placing of the riprap on the sea side of the wall. As shown in one of the views, a trussed platform is supported on one side by the wall itself and on the other by cribbing built up from a flat-car running on



TRAVELER ABOUT TO MOVE STEEL FORMS

the construction track. On this improvised traveler is rigged a derrick which slings the riprap from flat-cars traveling on the other construction track over the wall to its final location in layers 21 ft. wide and 4 ft. thick next the wall and 4½ ft. on the outer side. This riprap is made up of 20% small stones ranging from 15 to 200 lb., 40% blocks from 200 to 1000 lb. and 40% in pieces of from 1000 lb. to five tons. It weighs about one ton per cubic foot as placed and costs $2.70 per ton delivered.

The base price for labor on the work is $3 for an eight-hour day, and the total number of men on the work, including those engaged in transportation, pile-driving, etc., is about 120. Concrete is used in proportions of 1:3:6, cement costing $2.07 per barrel delivered or $1.80 f.o.b. factory. Stone costs about $2.75 per ton delivered, sand about $1.75 per ton delivered. The lumber used was long-leaf yellow pine costing $42 per 1000 delivered. The wall contains 6.2 cu.yd. of concrete per lineal foot and the concrete is cost-in place, without distribution of equipment charge, about $9 per cubic yard. The sea wall built in 1904 cost about $100 per foot. At that time Mexicans were used for common labor at about $1.25 for a 10-hour day. As stated, the original Galveston sea wall is backed by sand fill, the top of which slopes toward the sea and is paved for a width of 100 ft. For the extension no arrangement has yet been made for backfilling or for pavement on the inner side, but the approved



DETAILS OF FORM AND TRAVELER USED IN BUILDING SEA WALL



PLACING RIPRAP ON SEA WALL FROM TRAVELER ON OUTSIDE TRACK AND ON WALL

project calls for such work. The wall will be subject to severe blows from the rushing waves, and it is an interesting engineering problem whether this backfill should not be placed as a necessary part of the construction.

The work is under the direction of Col. Spencer Cosby, Corps of Engineers, U. S. A., the officer in charge of this portion of the coast, assisted by Col. P. S. Reinecke, U. S. A. The assistant engineer in charge of the work is John W. Henderson.

[Since the above article was written, Galveston, Sept. 14, 1919, was subjected to another tropical hurricane. As noted in the news pages of this issue, the old sea wall once more effectively served to stop the rising water, and, furthermore, the construction work on the new addition was not damaged. Apparently, the query put by the author as to the necessity for backfilling at the new wall was answered in the negative—for such service, at least, as was imposed by the latest storm—for there was no backing in place at the time the storm occurred.—EDITOR.]

Pay for Estimates, Say Contractors

In an effort to reduce their overhead costs general contractors, according to the September news letter of the Associated General Contractors of America, have been asking: If an owner is willing to pay for plans and specifications in order that he may see how his ideas work out on paper, why should he not also pay contractors for the benefit of their experience and efforts in determining what it would cost to transfer these ideas on paper into a concrete structure? Since "the owner reserves the right to reject any and all bids," contractors frequently submit bids where the work does not proceed, and where no remuneration is thus paid anyone for the expense of bidding. On the other hand, while it is true that the cost of estimating is a legitimate overhead expense, it is likewise true that modern business methods teach the segregation of general overhead expense as closely as possible and charge as many items as possible directly against the account where they belong.

Applied to the expense of estimating, this means, according to the contractors, that each job should bear its full share of such cost.

Steel-Plate Drip Floor for Niagara Railway Arch

Repairs Necessitated by Corrosion of Floor-Beams and Stringers Due to Refrigerator Drip and Locomotive Blowoff

FLOOR protection of novel character is being applied to the lower Niagara arch bridge, by which the Grand Trunk and five other railway lines cross the Niagara gorge. Corrosion of the floor system by salt-water drippings from refrigerator cars has become serious here, as it has on many other bridges, especially near terminals, where the blowoff, from switching locomotives, of water carrying various boiler compounds seems to add to the trouble. The effect of this action was one of the elements that led to a general overhauling and detail examination of the structure a year ago, as a result of which extensive repairs and reinforcement of the structure are now being carried out to bring it into condition for the heaviest modern loading. In connection with renewal of the corroded portions of the floor system it was desired to provide protection against further corrosion. To this end Charles E. Fowler, consulting engineer for the work, designed a special drip-protective floor which is now being installed by the Terry & Tench Co., New York, contractors for the repair and reinforcement work, under direction of Mr. Fowler and H. B. Dickinson, superintendent of the bridge for the owners.

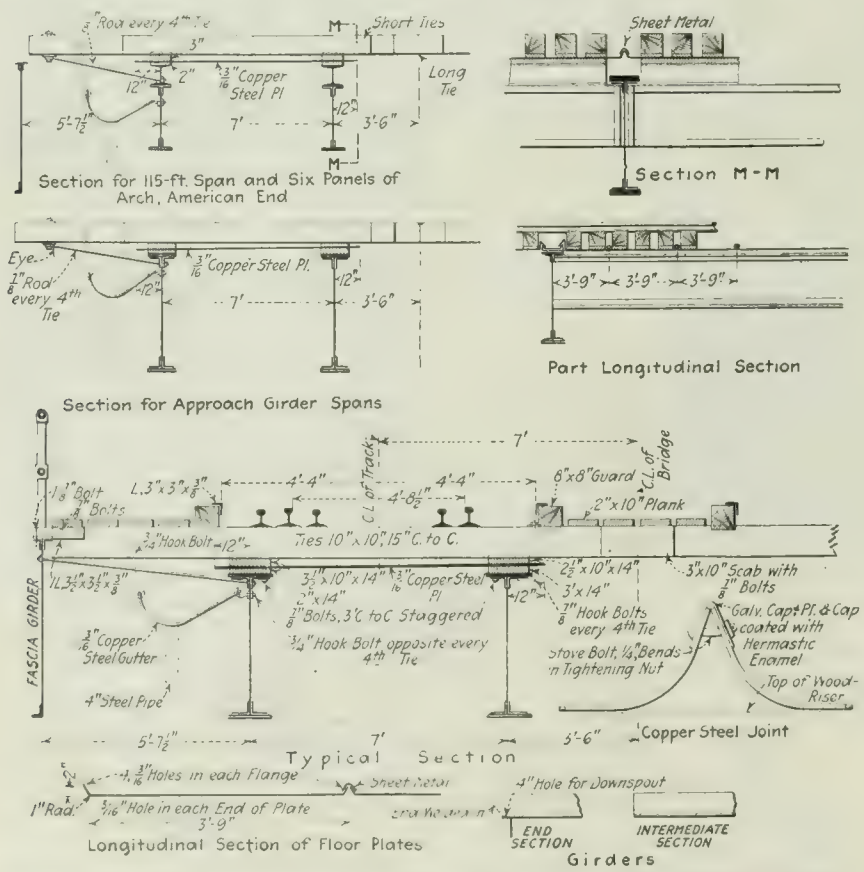
At the examination of the bridge the main structure was found to be in splendid condition, but the top flanges of floor-beams and stringers and the stringer laterals showed losses of 25 to over 50% in thickness from corrosion. Reinforcement of the weakened members was imperative, and as it was desired also to bring all parts of the bridge up to E 60 capacity the two pieces of work were taken in hand at the same time. The bridge was originally designed for about E37, although the principal members of the 550-ft. arch span are of much higher capacity and require no reinforcement.

The oridge is a double-deck structure 1080 ft. long. The upper deck, at the level of the top chord of the arch, is the double-track railway floor. Below this is a highway floor, framed between the trusses. The railway deck has always had a tie floor, with wooden troughs, so that the highway traffic was more or less exposed to rain and drip. Brine drip and locomotive blowoff, especially in case of standing trains, were the most troublesome feature of the situation so far as the condition of highway traffic was concerned. The new drainage floor for the railway deck was designed with protection for the highway deck as one of its objects.

In carrying out the floor-system repairs and reinforcement, the cover plates and in some cases the flange angles of the stringers were cut off, traffic being restricted to one track while work was going on in the width of the other track. About 65,000 rivets had to be cut out. Where injury to the metal from heating was not to be feared, rivet heads were cut off by oxyacetylene torches fitted with special tips; such a torch cut off 500 to 700 heads of $\frac{7}{8}$-in. rivets per day, or four times as many as one hand crew could do. New and heavier flange material was then riveted in place with countersunk rivets, so as to leave a flat surface as a seat for the drainage floor. All old metal was cleaned with sandblast and then painted with "Tockolith," with a view to counteracting the influence of any remaining rust.

As this strengthening work was completed the drainage floor was set in place. This, as fully shown by the drawing, consists of plates of copper-steel $\frac{3}{16}$ in. thick, resting on maple raising strips bolted to the top flanges every 3 ft. by countersunk bolts. By making the strips on the inner stringer thicker than those on the outer stringer a drainage slope outward was given to the plate; a longitudinal gutter of copper-steel under its outer edge takes the drainage to downspouts. The plate floor under each track is 9 ft. wide.

The track ties, 10 x 10 in., are dapped to 9½-in. depth for a length of 14 in., to receive 10 x 14-in. raiser blocks of hardwood in order to raise the ties clear of the drip plate. The thicknesses of the blocks over the inner and outer stringers differ by 1 in., as shown, so as to make up for the difference in thickness of the raising strips under the drip plate and thus bring the ties level. The blocks are spiked to the ties. All the timber is treated with hot carbolineum. The copper-steel floor plates are flanged sections 3 ft. 9 in.



NEW FLOOR OF NIAGARA RAILWAY ARCH BRIDGE, WITH DRIP PLATE AND GUTTER

wide, their length of 9 ft. extending crosswise of the track. The ends of the sheets are left plain. The side flanges, which form the joint between abutting sections, are 2 in. high, flaring, with fillet of 1-in. radius at the junction of flange and plate. Each flanged edge is punched with four $\frac{5}{16}$-in. holes; the two joining flanges are covered for protection by a channel of No. 16 galvanized sheet steel fastened by stove bolts, which also hold the adjoining sections together.

As the track structure rests on these plates without any bedding or through-bolting, attention had to be given to anchoring the track firmly. The ties are held down by hook bolts at the inner edge of the inner stringer only, the holes for these bolts through the drainage plate having no special significance because they are near the upper end of the slope of the plate. These bolts are spaced at every fourth tie, which is equivalent to one bolt per plate section. At the low side of the plate it was not considered advisable to have holes through the plate, on account of the opportunity this would give for the start of corrosion. However, every fourth tie was extended out to provide anchorage as well as to carry a footwalk; it is anchored back to the web of the outer stringer by a steel rod, either through the fascia girder or (on the approach spans) directly by a bolt attaching the rod to the tie. The inner ends of the long ties are fastened together at the middle of the deck by 3 x 10-in. scabs, three bolts in each tie.

Ties are spaced $4\frac{3}{4}$ in. in the clear, to allow room for coating the drainage plate with enamel. Borden tie spacers are used throughout. The rail joints are of the bridge type, and, although the grade of the track is only 0.1%, the track is equipped with anti-creepers, partly because it is desired to maintain tight joints at the expansion points at each end of the structure, where 5 in. of expansion must be taken care of. Expansion joints of Quebec Bridge type are provided at these points.

In addition to the inner guard rails and outer guard timbers faced with steel angles, with which the deck was equipped, an outer guard rail has been added, as extra safeguard in derailment. This was done on account of the great height of the deck above the Whirlpool Rapids, 200 feet.

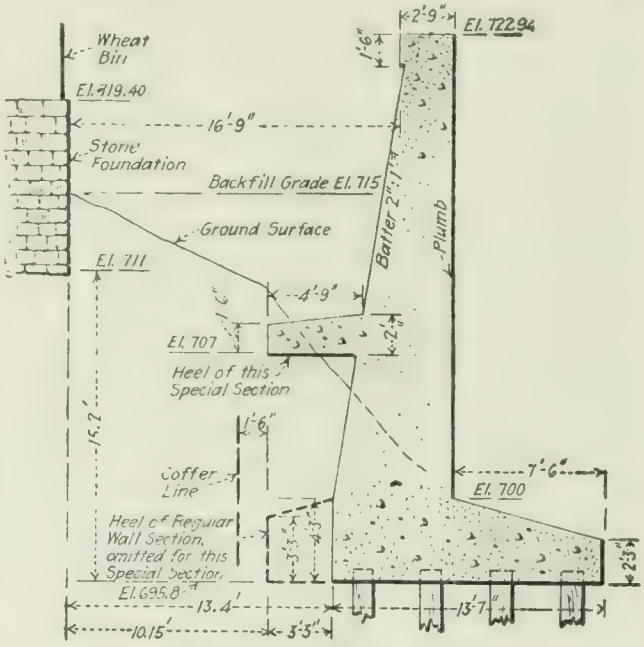
While some reliance was placed on the resistance to corrosion of copper steel as compared with ordinary steel, the whole upper surface of the drainage floor is painted with a special priming paint followed by a $\frac{3}{16}$-in. coat of "hermastic enamel," applied hot. The same coating is applied to the copper-steel gutter trough at the outer side of each drainage floor. The leaders from this trough are 4-in. steel pipes carried down clear of the bottom rib of the arch. With a view to facilitating recoating, the trough is attached by hooks so that it can be let down against the side of the stringer for cleaning and recoating. Similarly, the floor plates can be freed by slightly jacking up the track and (after removing the bolts which connect it to the adjoining plate) sliding a plate out like a drawer. When the plate is cleaned and recoated, it can be replaced in the same way. It is expected that the cost of recoating the portions of the floor subject to abrasion will be slight. The whole floor can be washed off with a hose, making it simple to clean it frequently.

Reinforcing the floor system of the bridge has been completed at a cost of about $30,000. The drainage floor or "salt-water floor" will cost about $25,000.

Unusual Concrete Retaining Wall Section Has Raised Heel

By R. C. Chaney
Construction Engineer, River Channel Improvement, Columbus, Ohio

Local conditions dictated the use of a rather unusual type of reinforced-concrete cantilever retaining wall on a section of the Columbus, Ohio, flood protection work. As shown by a drawing, a circular bin containing 25,000 bu. of wheat was located within



RETAINING WALL WITH RAISED HEEL

17 ft. of the back of the wall, which was to be placed in excavation extending to 15.2 ft. below the foundation of the bin. It was considered unwise to continue the planned heel of the wall past the bin, as the excavation of a trench within less than 9 ft. of the bin might result in its collapse.

Accordingly, the heel was raised 11 ft. up the back of the wall, and placed on solid earth at that point, where it will act as the toe of the wall under high-water conditions and as the heel under low-water conditions.

This resulted in economy of excavation and was of advantage to the contractors, Hickey Bros., of St. Louis, Mo., in simplifying the construction problem. This particular piece of retaining wall was part of a levee wall which has a maximum height of 32 ft. and is 633 ft. long.

A Labor-Cost Increase of 540 Per Cent

In sewer work with 42-in. concrete pipe at Oklahoma City, Okla., during the present year, each section of pipe was rolled into position by nine men who were paid $4.50 per day, making a labor cost of $40.50 per day for handling pipe. On this same work in 1916 three men at $2.50 per day did the work, making the labor cost only $7.50 per day. These figures are given by the contractors, Bent Bros., Los Angeles, Calif. If the two groups did equal work the labor cost was increased 540% while the efficiency was reduced to 33% that of 1916.

Young Co. Classification of Dominion Employees Criticised

American Engineers Protest Against Low Salaries in Proposed Canadian Schedules, Fixed by Firm Retained to Classify Civil Service Here

ADVERSE criticism has been offered by individuals and organizations representing the engineering profession in the United States to the recommendations for the classification of employees in the Canadian civil service made by the accounting firm of Arthur Young & Co., of Chicago, Toronto and New York. Because this firm, which made the classification for the Dominion Government of Canada under authorization of the Canadian Parliament and under the supervision of the Civil Service Commission, has been retained to make a similar classification for the United States Congressional Joint Committee on Reclassification of Salaries, an analysis of the Canadian report is particularly pertinent.

Copies of the Canadian report have reached various individuals and engineering organizations, and numerous analyses of it have been made. A number of letters have been received from professional men by Engineering Council, and the chief objection to the recommendation made by Arthur Young & Co. is that compensations indicated or proposed are inadequate, particularly for higher grades of service. Of the analyses made of the Canadian report, perhaps the most studied is that offered by a member of the Federal Government Section of the Engineering Council Committee on Classification and Compensation of Engineers. Not only has this engineer singled out what he considers essential objections to the proposed classification, but in each case has suggested a remedy.

Four Criticisms Offered

The Canadian report is published in two parts. The first part, a volume of 82 pages, describes the principles and the methods underlying the classification, and the second, a volume of 678 pages, contains what is called the "classification." In general, and particularly as applied to conditions in the United States, the Canadian report is objected to on the following grounds:

1. Considered as a whole, it is only the first step in a real classification.

2. Unnecessary "classes" have been provided.

3. There is no apparent systematic basis for the salary schedules recommended, such schedules have been fixed by classes rather than by groups of comparable classes, and there is no necessity for the multiplicity of grades provided.

4. The fundamental principle on which salary schedules have been fixed is unsound in theory and unsatisfactory in practice, and the provisions for promotion in salary within the various classes are inadequate.

The Canadian report bases salaries, not upon living costs at the time the classification was made, but upon what would have been normal conditions for 1918 had the tendencies of the period prior to the war continued and had the war not occurred. Under the heading, "The Principles and Policies Adopted as a Basis for the Recommended Schedules of Compensation," in Part I of the Canadian classification, is the following:

"5. That the salaries proposed should not be based on the depreciated value of the dollar of the present time as measured by the abnormally high costs of the necessities of life that have developed as a result of the war. Conditions are now not stable. Economic conditions the world over are in an unsettled and uncertain state, and to found a salary revision on what may prove to be temporary conditions might involve the necessity of a downward revision when conditions return toward the normal. On the strength of these considerations it was decided to base the general level of the salary schedules on what would have been normal conditions for 1918 had the tendencies of the period prior to the war continued and had the war not occurred."

Under the same heading occurs the statement that "fairness to the employee requires that the compensation should permit him to maintain a standard of living such as to make for the good of society and posterity. In the case of the lowest ranks of service, the compensation should be adequate to attract into the service young men and women without family responsibilities but of a training and capacity that will enable them to become of future value to the service and to themselves." To determine what may be a living wage under present high costs, the following paragraph from the monthly Labor Review of January, 1919, which is an extract from a report submitted by the Bureau of Labor Statistics for the District of Columbia, is cited:

"In 1916 the typical white family, consisting of father, mother, and three children below the age of 15 years, was not able to make both ends meet with an income of less than $1150 per annum. This would indicate that a minimum-of-comfort budget, according to the practices and standards of domestic economy prevailing in Washington in 1916, must be about $1200. Since 1916 the cost of the necessities of decen living, weighed according to importance in the family budget, has advanced approximately 50%. This indicates that an identical standard of decency cannot be purchased for less than $1800 today."

Commenting upon this report, an engineer said:

"No data are available for comparing living costs in Canada and here. Presumably they are somewhat less there. However this may be, in the Canadian classification 700 classes and subclasses, or 35%, have a minimum salary rating of $1200 or less, and 500, or over 25%, have $1000 or less. Even if we assume that a reasonable living wage in Canada in 1916 was $1000, as compared with $1200 in the District of Columbia, the rise in price levels would make $1540 the living wage in Canada in these years. Of the 1970 classes and subclasses, nearly 1,100, or 56%, have a minimum salary rating of less than $1540 per year—that is, in 1918 and 1919 would not have paid a living wage to a family of five. While undoubtedly many of the lowest grades carry subsistence or other perquisites in addition to the salary, such a provision is not likely to affect many grades above $1000, or materially to change the proportion of classes which, all compensation included, receive less than $1540 per annum.

"Even if the opinion of the expert employed could be substantiated—namely, that the high scale of prices is only temporary and will soon return to the normal represented by the projected curve—it is apparent that the recommendations made propose to throw upon the employees themselves the entire burden during the

readjustment period of meeting the difference between the actual and the assumed purchasing power of a dollar, notwithstanding the fact that at the very time the recommendations were made the actual purchasing power was only 53 per cent of the assumed purchasing power upon which salary schedules were based.

"The opinion of the experts that the present price level is merely temporary is directly contrary to the considered judgment of such of our Government agencies as the Department of Labor and the Federal Reserve Board, and of such economic experts as Prof. Irving Fisher. All the evidence of past price history points to a permanently higher price level. There can be no sound or satisfactory basis of salary adjustment that does not take this evidence into account. The only basis, therefore, for salary adjustments which is fair to the employer and to the employee, is one based upon the varying index numbers of those commodities which enter into the cost of living. Base salaries for the various services and grades should be fixed on an index of 100. This having been done, each bureau or department in making up its annual budget estimate should determine its salary requirements by multiplying the base salaries by the index number of the preceding year, such number to be annually prepared and submitted by some standard authority, as the Bureau of Labor Statistics. It probably would not be advisable to change salaries for fractional variations in the index number, or by increments of less than $60 a year. The important consideration, however, is that such a scheme would provide for real rather than apparent salaries, and would be fair both to the Government and to the employee."

Objections to Proposed Classification

The first objection to the proposed classification is based on the fact that the various classes are not arranged according to the alphabetical position of the substantive part of the class designation, but by the alphabetical position of the first word in the name of the class, which is ordinarily a descriptive adjective. Thus, "chief engineer" would be found under "C"; "assistant engineer" would be found under "A"; "junior engineer" under "J"; etc. The classification contains approximately 1750 "classes" and 200 subclasses, arranged according to this order. There are 184 different "classes" of technical engineering positions, not including certain positions carrying the word "engineer" in the title, such as marine engineer, engineer (life-saving service), engineer master, etc. With this classification, it would be a work of months to determine the relation between corresponding classes in all the various vocations or groups of vocations. Classification is simpler if differentiation is made between classes of services instead of grades. It is simpler to determine whether a particular individual shall be classed as a "chemist" or as an "engineer," than to determine whether he should be classed as an "organic chemist" or a "structural engineer," and this in turn than to determine whether he should be classed as an "assistant organic chemist" or an "assistant structural engineer." Classification should proceed from the major division, downward, rather than from the minor division upward.

A revision of the classification which has been suggested would provide for a grouping of Government services in descriptive classes, such as scientific, professional, engineering, clerical, etc. Further divisions indicative of vocations, as civil engineering, mechanical engineering, electrical engineering, with a further division into grades differentiated by the amount of training and experience required and the degree of responsibility involved, are suggested. Finally, these divisions would contain provisions of approximately equal requirements, responsibilities and duties.

Unnecessary Classes Provided

As evidence that unnecessary classes are provided in the Canadian classification, the fact may be cited that out of 184 engineering classes listed there are 12 classes of junior engineers, as follows: Junior engineer, junior electrical engineer, junior electrical engineer (wireless), junior geodetic engineer, junior hydrographic engineer, junior hydrometric engineer, junior irrigation engineer, junior mechanical engineer, junior mechanical engineer (dredge design), junior power-development engineer, junior structural engineer and junior topographical engineer.

These are the lowest grade of positions carrying the designation of engineer, have a salary range of $1680 to $2040 per annum, with the exception of the topographic engineer, and require either a high-school education with four years' practical experience, or "graduation in engineering from a school of applied science" with two years' experience. Such positions would be filled by young men just entering upon their engineering profession, who are likely to have had a general engineering education and hardly likely to have had a character of experience justifying the extreme specialization for which these classes provide.

Differentiation between civil, mechanical and electrical engineering may be desirable, but further differentiation than this is hardly necessary.

The third objection, that is, that there is no apparent systematic basis for the salary schedules recommended, and that there is no necessity for the multiplicity of grades provided, is found in the fact that though through the greater part of the scale minimum limits vary by $60 a year, there are in many cases several different maxima for each minimum grade. As an example of this, there are 29 classes having the common minimum salary of $2700 a year, but with 11 different maxima. These maxima range from $2700 to $3600 annually. In the 184 engineering classes listed there are 77 salary grades actually prescribed.

Had the various classes been segregated, as has been suggested, into groups and services, it would have been a comparatively simple matter to have established grades containing all those classes within a given service in which requirements and duties were comparable and to have fixed salary limits to such grades, with results far different and far more satisfactory than were actually reached.

The range between the minimum and maximum limits, at least within the engineering service, is generally inadequate. Within reasonable time limits the value of the services of an individual in an organization increases in proportion to the experience in his position. This is particularly true of new employees. In order

to recompense this increase in value of service without the necessity of constantly moving individuals into new classes, the salary limits should be wider than prescribed in the Canadian classification. This matter also would be greatly simplified if salaries were fixed by few and well defined grades, rather than by a multitude of nonrelated classes.

As regards promotion within classes, the Canadian report contains the following:

"That an employee in a position of a given class may be advanced from the minimum salary to the next higher salary rate or from any intermediate salary rate to the next salary rate, provided he has served at his present rate for such period as may be specified for the class or all classes by the law or by the regulations of the Civil Service Commission, and provided that the advance is recommended by the deputy head and approved by the commission after the commission has satisfied itself by any method that it may deem adequate that the employee has attained and maintained a satisfactory standard of efficiency and has increased his usefulness to the service."

As to this provision, the following comment is quoted:

"If the services of an employee when appointed, or when advanced to a new class or grade are at that time worth the prescribed entrance salary, and if the employee is a person who should be retained at all, it is self-evident that his services are worth more after he has had experience in his new position than before he had the experience. A certain amount of promotion in salary, based upon the very fact of experience in the position held, should be automatically accorded to employees. To leave such matters solely to the discretion of the head of the organization means much inequality throughout the civil service."

It has been suggested that an efficiency rating system among civil-service employees similar to that used by the United States Army in rating its officers be adopted. Thus, in any body of employees, the rating would be more relative than positive.

After the employees in a single group have been rated relatively, the division of that group into three equal parts could be made. Provision could be made for all employees in the upper third to be automatically given the standard annual promotion of their grade, unless the right to receive it is for some good reason withheld by affirmative action of the appropriate authority. This scheme would grant to individuals in the middle third one-half of the standard annual promotion under similar conditions; and, finally, no promotion would be received by those in the lower third, except upon the affirmative action of the appropriate authority.

Arthur S. Tuttle, chairman of Engineering Council's Committee on Classification and Compensation of Engineers, in a recent letter to Secretary Flinn finds that the Canadian report "is open to serious criticism on the ground that it fails to group engineering service along orderly lines, that it provides too narrow limits for promotions within a grade, and that the compensation proposed for all grades is inadequate for the service rendered."

"The report," continues Mr. Tuttle, "appears to cover every position in the civil service. It is arranged alphabetically and, in the absence of grouping, a complete analysis of the engineering service involves a task of magnitude greater than I have found time for. I have attempted, however, to make such examination as time permitted and am impressed with a belief that the objections raised are well found. No attempt seems to have been made to standardize titles. Consequently there are in the engineering service at least 157 independent titles as compared with the 13 titles proposed by our committee. It is recognized that qualification of a general title to show the nature of the service rendered is quite proper, but in the judgment of the writer there is no reason for treating similar positions as entirely unrelated and as warranting entirely independent specifications.

"The report states that the compensation proposed are intended for 'normal times' and that, pending restoration of such time, the rates recommended should be 'supplemented by a bonus,' but no information appears as to the magnitude of the bonus.

"From my study of the report it would appear that the groups and ranges of compensation, tabulated as far as practicable under the classification tentatively proposed by Engineering Council's Committee, are about as indicated in the accompanying table."

TABULATION OF TITLES AND SALARIES FOR ENGINEERS IN CANADIAN CIVIL SERVICE REPORT UNDER CLASSIFICATION PROPOSED BY COMMITTEE OF ENGINEERING COUNCIL

Tentative Classification of Positions in State and Municipal Service Proposed by Engineering Council's Committee on State and Municipal Service	*	Salary Range Proposed for Canadian Service — Usual — Min.	Max.	— Extreme — Min.	Max.	Qualifications Proposed for Canadian Service
Consulting engineer...	1	$6,000	....	.....	....	Professional Engr. 12 yrs. exper. (7 in charge)
Chief engineer (major work).....	5	6,000	....	$4,800	....	Professional Engr. 7-12 yrs. exper. (3 to 7 in charge)
Chief engineer (minor work).....	7	3,900	4,800	3,600	6,000	Professional Engr. 7-12 yrs exper. (3 to 7 in charge)
Chief engineer—deputy	8	3 900.	4,800	3,600	5,700	Professional Engr. 7-12 yrs. exper. (3 to 7 in charge)
Engineer	37	3,300	4,020	3,000	4,500	Professional Engr. 5-10 yrs. exper. (2 to 5 in charge)
Senior assistant engineer.....	40	2,640	3,000	2,400	3,480	Professional Engr. 3 yrs. exper. (2 to 3 in charge)
Assistant engineer.....	23	2,100	2,580	2,040	3,120	Professional Engr. 3 years' experience
Junior assistant.....	15	1,680	2,040	1 680	2,160	Professional Engr. 2 years' experience
Senior draftsman.....	..	Included in professional service				
Draftsman	8	1 260	1,560	..	..	3 years' experience
Junior draftsman.....	4	900	1,200	..	..	2 years' experience
Chief instrument man	..	Included in professional service				
Instrument man	5	1,260	1,560	..	..	3 years' experience
Rodman.	4	900	1,200	.	.	2 years' experience

* No. of Titles Provided in Proposed Canadian Classification.

Cribbing Protects Banks of Yakima River

Prevention of bank erosion at sharp curves during high-water stages of the Yakima River in Yakima County, Washington, has been effected in several cases by the construction of cribs placed nearly at right angles to the current. These cribs are 20 ft. wide and are of various lengths. They are built of 8 x 10-in. timbers and are filled with river gravel or rock, the filling being placed usually by a dragline plant of the Bagley type, operated by a small hoisting engine. Where it is necessary to prevent the filling from dropping out, the cribs have a bottom of wire netting reinforced by ½-in. cable. Work of this kind is done under the direction of J. O. Greenway, county drainage engineer, Yakima, Wash.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

"Three Openings to One Graduate"

Sir—The letter from Dean Cooley of the University of Michigan, entitled "Three Openings to One Graduate," which you print on p. 433 of your Aug. 28 issue is a most excellent example of the "half truths" used to draw students to our engineering schools. There *was* a shortage of young engineers while the country was at war. Recent graduates had left active practice to go into the Army. The older undergraduates had left schools for the same reason, and the demand for cheap help was greater than ever.

Will the dean state how far back his "several years" goes? Does he pretend his letter to be a true statement of conditions through 1913-16, when men of several years' experience were eager to go to work for from $50 to $90 a month, because nothing better was available? Does he believe it to be true even today when engineers, coming back from Army service, are faced by the kind of advertisements for technical help that fill the pages of all our technical journals? Will he give us a few figures instead of a general statement, so that we may know what percentage of his students, upon graduation, took $200 jobs in the past five years as contrasted with those who went to work for less than $100? Will he further tell us what percentage of his graduates of the past five years are making $200 per month today? In the office where I am employed (a railroad office) about 70% of the engineers are college graduates, several being Michigan men, and with the exception of the chief draftsman they receive from $125 to $150 per month, while the chief draftsman and assistant bridge engineer receive from $160 to $185. These men are all men of from 6 to 15 years' experience.

If Dean Cooley has more requests for engineers at $200 than he can supply, I will put him in touch with great numbers of graduates with from 6 to 15 years' experience who will gladly accept these jobs paying $200 per month.

The deplorable condition of the financial side of an engineer's life in 1915 resulted in the formation of that great body of engineers known as the American Association of Engineers, whose objects include licensing of engineers and the dissemination to the general public of the truth concerning the compensation of the engineering profession, in order that young men contemplating the study of engineering will know the meager financial returns to expect upon their graduation.

The fact that this organization has voiced the sentiment of the rank and file of the profession is evidenced by its phenomenal growth in four years' time to a present membership of about 7000 active and militant members.

These vague, general statements made by men such as Dean Cooley are a shame and disgrace to the engineering schools of the country. They are the visible result of a frantic but vain effort to avoid a decrease in the student body. No great success can be built on an untruth, and until our schools see that and act accordingly, they will be a big hindrance to all efforts to gain respect and recognition for the profession.

Cleveland, Ohio. T. J. BRENNAN,
Assistant Engineer, New York, Chicago & St. Louis Railroad.

[Mr. Brennan's letter was submitted to Dean Cooley, who replied as follows:—EDITOR.]

Sir—I am glad of the opportunity to comment on Mr. Brennan's letter. I think myself that my statement (*Engineering News-Record* of Aug. 28, 1919, p. 433) purporting to answer Mr. Harris' letter headed "Stop College Supply of Graduate Engineers" (July 17, 1919, p. 141) was loose. I should have been more exact. But it did not occur to me that there was—and I do not believe there is—any very general ignorance of the fact that the demand for engineer graduates has been greater than the supply.

In view of Mr. Brennan's criticism, let me tighten up a bit. First let me say that I had no thought of advertising. With the exception of the *Michigan Engineer* published annually, and the *Michigan Technic* published quarterly, we carry no advertisement, and have not carried any since our card was cut out of *Engineering News* fifteen or twenty years ago. On the contrary, our regents, or some of them, because of the difficulty of supplying the necessary funds, have favored discouraging the growth of the College of Engineering. But it would grow in spite of them. Let me give some figures. What is true here at Michigan is, I believe, true of engineering schools in general.

In 1898-99 our attendance in engineering was 245. Ten years later it was 1373 (including summer session), and in 1918-19 it was 4033. But this number includes 2258 students taking special war courses, so that the regular students numbered 1775 (architectural students are excluded). From 1907-08 our engineering attendance fell gradually to 1248 in 1911-12, and then rose gradually to 1534 in 1914-15. Interestingly, this depression period, while it precedes, corresponds to the years 1913-16 referred to by Mr. Brennan. It apparently shows that the attendance in colleges is some index of the demand for engineers.

It is a fact that the demand for our graduating engineers has for several years been greater than the supply. By *several years* I mean fifteen at least, and I think twenty would be nearer. It embraced the dull years referred to by Mr. Brennan. The increased demand started soon after the Spanish-American War (1898); and at no time since have we ever had more than enough graduates to meet it.

Where I think Mr. Brennan makes his mistake is in assuming that the conditions in railroad engineering apply generally to all engineering fields. It is notorious that professional railroad engineers have always been underpaid. Had the engineers now engaged in railroad engineering sought employment in other fields for which they might have fitted themselves they would no doubt be now receiving much larger salaries—several times as large, in many instances.

In 1907-08 the engineering graduates of this university were asked to report their salaries and other earnings. At that time there were 1289 living graduates. In the exchange of annual letters no replies had for

several years been received from 55 of them. Of the 1234 who had been replying regularly 980 answered with respect to their salaries. A large proportion of those who did not answer were recent graduates. Approximately, the salary varied the first year, from $0 to $2000, mean $900; second year, from $500 to $4500, mean $1300; third year, from $0 to $2400, mean $1300; fourth year, from $900 to $5500, mean $1700; fifth year, from $1200 to $4000, mean $1900; tenth year, from $1100 to $9000, mean $2500; fifteenth year, from $800 to $20,000, mean $4100; twentieth year, from $1400 to $15,000, mean $6400. After twenty years the maximum salary varied from $2400 to $12,000, the average maximum being $7600. The minimum salary varied from $1200 to $5000, the average minimum being $2400. The average salary after twenty years was $3600.

The full particulars of this investigation were published in the *Michigan Alumnus* for March, 1910, and include a classification as to occupations—42 in number; also in the *Proceedings* of the Society for the Promotion of Engineering Education, 1909. Similar and more recent information has, I believe, been published by other engineering colleges.

It should be borne in mind that not all students pursuing engineering courses intend to go into engineering. An engineering education is considered a good training for business, and many go directly into business. Our statistics for 1907-08 show that only about two-thirds of our graduates go into engineering and closely allied pursuits. I should expect even a less percentage today.

Engineers are not wholly blameless for the position in which they find themselves—a responsibility which the engineering colleges must share. They have devoted altogether too much time to professional subjects. In their zeal to fit themselves for work in the field of their choice, nontechnical subjects which make for breadth have been sacrificed. Thus they are narrow, are fenced in so that neither can they look out nor can others look in.

Now a word on Mr. Brennan's last paragraph. He indulges himself in accusations that are unworthy of him. He should know that in making such statements, when untruthful, he but accuses himself in the same way. Engineering colleges are *not* engaged in a frantic effort to avoid decrease in student body. They *are* engaged, and very seriously, on plans to take care of what promises to be the largest attendance in the history of engineering education. The accepted applications from new men for admission to our engineering college is today almost precisely double what it was at the same date of any previous year. Already there are 465 admissions as against a total freshman class of 430 last year. And the opening of college, at this writing, is yet three weeks off.

M. E. COOLEY,
Dean, Colleges of Engineering and Architecture, University of Michigan.

Ann Arbor, Mich.

[With his letter Dean Cooley incloses the following communications from the heads of engineering departments of the University of Michigan:—EDITOR.]

We could easily have placed two to three times the number of graduates granted degrees June last, conditions being the same as in any previous year since I have been at the university. We were unable to supply a single man to the telephone industry, in any of its branches. The telegraph industry asked for three men for one division of its work. We were able to supply but one man. One large power company has a standing order for six men per year. We sent them three. We supplied men to but two of the machinery manufacturers and were unable to supply a half dozen other concerns, all good ones.

These conditions are typical. The initial wage is usually but $95 a month, although the telephone industry is now making the initial wage $100. The low wage and slow progress of many engineers is about what they deserve. Our men do not complain of slow progress. I have been unable to place any of our graduates during the past three years in positions which seek men of two or three years' experience. Our men do not care to quit their jobs.

It is significant that even at a decent wage schedule, we have difficulty in persuading men of the sort we desire to leave industrial jobs, to go into teaching work. Men of the right sort earn in the neighborhood of $2500, within four or five years of graduation.

J. C. PARKER.
Professor of Electrical Engineering.

The writer has had the responsibility of placing the civil engineers of the last eight graduating classes in positions. Since 1912 every American male graduate has been placed in a position at once. Four of the five women who have graduated were assisted to positions, and several foreign students, including four or five Chinese, seven or eight South Americans, an Austrian and a Persian, have been placed in positions.

It is interesting to note that one of these women graduates is receiving over $2000 per year, one is receiving $1800 and one $1600. They have been out three and four years. One South American of the class of 1913 is receiving between $3500 and $4000 per year, and the other foreigners are receiving from $100 to $200 per month.

Considerable work was involved in placing all of the members of the classes of 1913 and 1914, but by commencement day practically every one had been placed. In those years salaries ranged from $60 to $85 on graduation. The 1915 and 1916 classes were all placed without difficulty, while the small classes of 1917, 1918 and 1919 have been in great demand and I could have placed a much larger number.

Every year since I have been here some of the more mature men who have had two or three years' experience prior to graduation have been placed at salaries well over $100 a month, one member of this year's class returning to a former employer at $200 per month, and the average for this year's class is probably $160 per month.

Since I have been connected with the university we have given well over 500 bachelor's degrees in civil engineering. I have been in touch with perhaps 150 of these men. So far as I know, most of them are doing well. Several are receiving over $3000 per year and I know of at least 100 who are receiving from $2000 to $3000 per year with less than ten years of practice since graduation.

There is considerable difference from year to year in the demand for men in different fields of work. The calls for structural engineers are always far beyond our

ability to furnish men. In general, the initial salary in this field is low, but many of our men have risen to the front and are receiving large salaries in sales and administrative positions with structural and contracting firms. The demand for highway engineers and for men trained in municipal work, in this section of the country, is in excess of the supply, while high-class men thoroughly trained in sanitary engineering have had little difficulty in finding good positions.

I do not encourage our students to specialize in railroad engineering courses which I am teaching. Michigan is one of the few schools which require no work in railroad engineering. My own experience of a number of years as a railroad engineer and my touch with conditions in railroad engineering through wide acquaintance and through membership in the American Railway Engineering Association have convinced me that the managing officials of the railways have in general failed to appreciate the high quality of service that is being rendered by the railway engineers of the country. It is a regrettable fact that other fields are more attractive. For example, six or eight counties in Michigan are paying from $4000 to $10,000 per year for county highway engineers. Within the past few years similar salaries are being paid to several city engineers and assistant city engineers in this state. Aside from a few chief engineers of the larger railroads, I presume it is safe to say that there are very few men in the engineering department receiving over $4000 per year.

Within the past six weeks we have had calls for men in teaching positions, one at $1800, one at $2000, and two at higher figures; a call from a firm of architects for three men on sewer and water-works design at $2000 to $2400; a call from a consulting engineer in Ohio for two men with two or three years' experience at $1800 to $2400 per year; a call from a large manufacturing concern in Detroit for three men, one with knowledge of reinforced concrete, one with knowledge of steel work, and one with all-round building experience, salary ranging from $2400 to $3600; one position in highway engineering offering $175 per month, and standing orders from two of the largest cities in the state for engineers with from one to five years' experience. Not one of these places could be filled.

Last week a Government engineer called me up and asked for a draftsman with seven to ten years experience, salary $150 per month. His office is located in a city which is paying axmen and rodmen $1600 a year minimum.

It must be borne in mind that not all of the men who graduate from the colleges in engineering courses have the personal qualifications which will enable them to reach high places in the profession. A large number of men in each of our classes will remain in the ranks of employees throughout their lives. During my professional experience of nearly 35 years I have never seen a time when there was not a goodly number of dissatisfied engineers railing against the limited opportunities of the profession. This condition will always prevail, because men are but human and a large percentage of them will fail to reach the goal of their ambition. Nevertheless, my own experience and that of many of my friends who started as I did at the bottom, convinces me that the profession of engineering offers greater reward than any of the other learned professions. With the demand for trained engineers which the University of Michigan cannot begin to fill at the present time, it would be folly for us to limit our work in the training of men for engineering positions.

H. E. RIGGS,
Professor of Civil Engineering.

In the mechanical engineering department there were about 160 requests for men and we had approximately 50 graduates this year. This 160 is a very conservative count, as many of the larger concerns, instead of giving the exact number of men, requested that we send them a number or several, and in making the count I have assumed that they would take two or three or four men. One of the larger manufacturing concerns requested outright 10 men. I was also advised orally by one of the very large automobile manufacturing concerns that it would take all the men that we could send it. Long before this year's class completed its work in June every man was located.

The salaries paid this year's graduates range from $95 per month to $150 per month. A few of them obtained positions paying as high as $175 per month, with the stipulation that if they showed promise their salaries would be increased within three months to one year.

We have a number of men who graduated in mechanical engineering eight or nine years ago and are now getting anywhere from $10,000 to $25,000 and $30,000 a year, and very few of them are getting under $4000 a year. I fully believe that their average would be over $5000 per year.

H. C. ANDERSON,
Professor of Mechanical Engineering.

The demand for chemical engineers, during the twenty years of our department's history, has always been much greater than we could supply, and I believe that with but few exceptions the demand has been triple all that we could supply.

So far as I can learn, we have not a single graduate who is out of a position. I do not have figures as to the average salary of our men who graduated last June, but the employment manager of one of our very large corporations told me recently that $125 a month was his average salary for a chemical engineer just out of college. This has been confirmed by others.

A. H. WHITE,
Professor of Chemical Engineering.

The demand for our graduates in naval architecture has been steadily increasing during the past five years, I have no figures at hand for the years preceding 1919, but I know that the Government departments doing naval work have tried for a number of years to get all of our graduates into the service. In addition, we have had opportunities for placing with private yards a greater number of men than we graduated. This last year the demand has been exceptionally great. We had specific requests for more men than were available and, in addition, requests from three concerns for "several" men. I believe that any one of these three would have gladly taken all the men we graduated and that we could have found places for four times as many men.

These men went to work at rates which ranged from $130 to $150 a month, with promises of an increase in a few months.

E. M. BRAGG,
Professor of Naval Architecture and Marine Engineering.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

CONTRIBUTIONS *to this section are solicited, and if found available will be paid for. They must be* SHORT, *and should be accompanied, if possible, by photographs or sketches.*

Pipe Is Taken Up Without Uncoupling

IN REMOVING an old 6-in. screw-joint heating main extending across the grounds of the University of Wisconsin, at Madison, the work was facilitated by the taking up of the main in lengths of 120 to 160 ft., so that only a few of the joints had to be disconnected in the trench. Most of the separations were made at the bolted expansion joints. For hoisting each long stretch of pipe, two differential chain hoists were used, the blocks being hitched to trees or telegraph poles some 6 ft. from the trench, while the chains were attached to rope slings on the pipe. In this way two men could remove a stretch of main, pulling it up out of the trench and over the spoil bank.

Flanging Machine, for Thin Steel Plates, Built on the Job

PLACING a steel-plate drip floor on the 550-ft. arch bridge by which the Grand Trunk Ry. crosses the Niagara River gorge at Niagara Falls, N. Y., required a large number of sheets of $\frac{3}{16}$-in. steel plate to be flanged on both edges. These sheets are about 4 ft. wide by 9 ft. long, and are placed transverse to the bridge, over the stringers, the ties resting on them by means of wooden shim blocks. The joint between successive sheets is made by stove bolts passing through the upstanding flanged edges of the plates and a cover strip of sheet metal bent down over the joined flanges. As the sheets were received on the job plain, it was necessary to flange them in the field. The contractor, the Terry & Tench Co., of New York, built a flanging machine according to a suggestion of C. E. Fowler, consulting engineer, and it has done the work very successfully.

As described by Mr. Fowler, the machine is somewhat similar to the ordinary tin-shop bender, but is made of 12 x 12 timbers driftbolted together. The working edges of the two main bending timbers are faced with old steel angles. The hinge timber is trussed by a hog-rod, and is turned by a pair of handles about 8 ft. long, actuated by lines running to the niggerhead of a small hoisting engine. The plates are clamped in position in the machine by a counterweighted timber held down by two levers similar to the end-raising levers of an old-fashioned swing bridge. A stop near the back end of the table on which the plate is entered enables the plate to be set so that the flanges are made at the correct spacing. The angles of the working faces of the bending timbers were determined by trial, so as to allow for the spring of the plate when pressure is released.

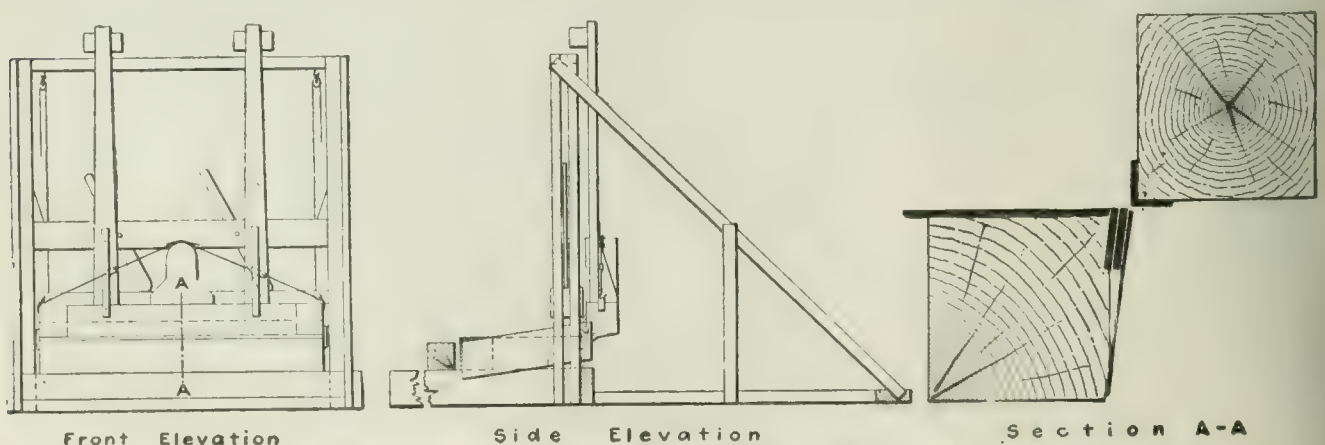
Three men work the machine. From 40 to 50 plates are flanged on both edges per day, and the machine has operated without hitch or delay.

Other Articles in This Issue of Interest to Contractors:

Constructing a 98-Kilometer Water Conduit in Chile — Page 593
Plans for Earth-Dam Construction Involve Large Use of Machinery — Page 612
New Features in Indiana's Concrete-Road Specifications — Page 614
Extending the Galveston Sea Wall — Page 617

Curb Protects Stock Pile in Street

STOCK piles of concrete materials in city streets, for building or other work, may be subject to considerable loss by wheels and hoofs passing over the edges of the piles. The dispersion of material over the street may cause an unsightly appearance. A simple method of preventing this, employed by a Chicago contractor, was to build a curb of heavy timbers which were being used on the work, thus avoiding a spreading of material and keeping vehicles for encroaching upon the stock pile.



FLANGING RIG FOR $\frac{3}{16}$-INCH STEEL FLOOR PLATES OF NIAGARA ARCH BRIDGE

We Must Have a Homogeneous People

The Postal Zone Law Is a Menace to Our Nation

By Congressman Frank W. Mondell
of Montana
Floor Leader of the Majority Party in Congress

I AM opposed to the zone system for the dissemination of news, ideas and information because I am of the opinion that the establishment and maintenance of such a policy would, in the long run, have a most unfortunate, harmful and regrettable effect upon the American people.

If we are to maintain peace, order and justice under the institutions of free government, within our borders, we must have a homogeneous people guided by the same principles and inspired by the same ideals. This condition essential to the maintenance of free government can only be secured by the widest possible circulation of those instruments and instrumentalities which inform, mould and affect public opinion.

Any policy which tends to make us provincial or parochial as a people, which tends to build up zones of influence and information, is a policy not only harmful but one that long continued and widely extended would prove fatal to free institutions. On the other hand, a policy which makes equally available to the people in all parts of the country the journals and magazines which convey information, carry current argument, analysis and entertainment, tends to maintain those conditions essential to our institutions.

Those whose views or arguments for the zone system are based primarily or largely on its effect, or alleged effect, on postal revenues, or the profits of the publishing business, fail utterly to grasp or realize the larger and infinitely more important aspects of postal systems as they affect the national life. If it be a fact that the flat postal rate on newspapers and magazines has been unduly low, that is a matter for consideration by the Post Office Committee, having in view the traditional policy of the American people. The fact that some people have been able to make a considerable amount of money in the newspaper and magazine business is, of course, one of the matters that a committee would consider in this connection, but it is by no means conclusive that a policy is wrong because some people have been able to make money under it—many having the same opportunities and privileges failed utterly.

The demand for the establishment and maintenance of a zone system is particularly lame and illogical when it is made by those who are urging a flat rate of one cent on letters. Such people to be logical should insist upon a zone rate for letters as well as papers and periodicals. Neither is the argument for a zone system strengthened by exaggerated statements of losses to the postal revenues under a flat rate. Undoubtedly the former flat rate did not wholly reimburse the postal revenues, but the most superficial examination of the matter renders ridiculous exaggerated statements of alleged losses. To the argument that publications enjoying the second-class rates are devoted more or less to advertisement, I offer the suggestion that a national dissemination of attractive advertisements is not without its educational benefits.

I have neither urged nor considered this as a party question. It involves a national principle affecting every man, woman and child in the Republic, and has never been considered in a partisan way by anyone so far as I know. I urged this repeal before the previous Democratic Congress, as I shall before the present Republican Congress—not on party or partisan grounds, but on the broad platform that such a policy tends to circumscribe and provincialize our national life to our great harm as a people.

F. W. MONDELL.

NEWS OF THE WEEK

New York, September 25, 1919

Baltimore Water-Works Enlargement Recommended

New Dams, Duplication of Conduit and of Mechanical Filters and Other Additions to Cost $25,000,000

By Walter E. Lee
Water Engineer, Baltimore, Md.

A program for increasing the water-supply of Baltimore to an ultimate capacity of 200,000,000 gal. a day has just been submitted by the writer to Mayor William F. Broening and the Board of Estimate. The program calls for an outlay of $8,000,000 to meet the immediate needs of the city and to avoid the impending water shortage, with an ultimate outlay of $25,000,000 to place the water-supply of Baltimore in a condition to prevent the question of sufficient water from recurring every 10 years, as in the past, and to avoid further consideration of the subject for at least 30 years.

The Gunpowder River now constitutes the sole source of the water-supply for Baltimore, by an impounding reservoir of 2,000,000,000-gal. storage, none of which, however, is available in times of drought because of the head required to overcome the frictional losses in a 12-ft. tunnel 7.5 miles long between the source of supply and the city.

The daily consumption by the city now exceeds the average yield of the Gunpowder River, and an additional storage of 23,000,000,000 gal. is to be obtained at an estimated cost of $2,031,000, by constructing a dam 123 ft. high on the Upper Gunpowder Falls, a tributary of the main Gunpowder River. No connecting conduit is necessary, as the total storage of this reservoir is available by opening the outlet gates and allowing the water to flow down the river to the present tunnel intake.

The report recommends that when the natural flow of the Gunpowder River and the additional storage to be immediately provided do not meet the city's requirements, a dam creating a 12,000,000,000-gal. reservoir be built on an adjacent stream, Deer Creek, at an estimated cost of $5,293,500.

As the "peak" demand on the present mechanical filtration plant of 128,000,000 gal. per day capacity overloads the plant by 32%, an additional mechanical filtration plant is recommended of 128,000,000 gal. per day capacity, at an estimated cost of $2,700,000, whose clear-water reservoir would connect with that of the existing filters at the same level.

Frictional losses in the existing tunnel between the source of supply and

(*Concluded on page* 632)

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago. Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 505 Pearl St.

American Society Members at New York Discuss Public-Works Bill

Discussion of the Jones-Reavis bill proposing a national Department of Public Works was the main business of the meeting of the American Society of Civil Engineers at the Engineering Societies' Building, New York City, Sept. 17. George W. Fuller, consulting engineer, opened the session by explaining the contents of the bill and pointing out the principal advantages which would result from the creation of a Federal public-works department. At the present time, Mr. Fuller said, thirty different bureaus are engaged in engineer functions. Such diversity of effort and lack of coördination were pointed to as one reason for the creation of the Federal department. Mr. Fuller also touched upon the matter of competition among existing bureaus as an objectionable feature of the present scheme of distributing among the different departments the work that should, from its engineering nature, be controlled by a single head. Particularly is this competition apparent in the matter of securing appropriations.

The benefits to be derived from the passage of the bill, Mr. Fuller explained, were efficiency, economy and businesslike methods in the administration of our public-works construction.

(*Concluded on page* 633)

Galveston Suffers No Storm Damage

City Engineer C. A. Holt, Jr., Tells How All Engineering Structures Resisted Hurricane's Force

Galveston's engineering works are none the worse for last week's severe storm. All structures stood the test, and public utilities continued to function. At the request of *Engineering News-Record*, C. A. Holt, Jr., city engineer of Galveston, has supplied the following facts as to the effects of the storm:

"The outer edge of the tropical hurricane which passed Galveston to the southwest Sept. 13 made no impression on the various engineering works now under construction or completed in and around Galveston. Approximately 3300 lin.ft. of the seawall extension east of 6th St., now under construction by the Government, was injured in no way by the very heavy sea coming in from the Gulf, although the structure was unsupported by fill. The arch work now under construction on the causeway, together with the old original arch structure, remains intact.

"The temporary wagon bridge, a county structure erected in 1916 to carry vehicular traffic across Galveston Bay during the reconstruction of the causeway, suffered no damage; not a timber in the entire structure became displaced. The fill back of the Galveston County portion of the seawall, which originally had an elevation of 19 ft. above mean low tide at the crest 100 ft. from the wall, and which after the 1915 storm was raised to El. 21 at 200 ft. from the wall, fulfilled every service expected from it. That good old seawall designed by Noble, Robert and Ripley, standing like the Rock of Gibraltar, has been tried again and not found wanting.

"The City of Galveston suffered no loss whatever, and all public-service corporations continued to give efficient service uninterruptedly."

Theodore P. Shonts Dies in New York

Theodore P. Shonts, president of the Interborough Rapid Transit Co., New York City, and former chairman of the Isthmian Canal Commission, died in New York Sept. 21 at the age of 63, following an illness of several months.

In 1905 Mr. Shonts was appointed chairman of the Canal Commission by President Roosevelt. He had already become prominent as a railroad constructor and operator, having been in charge of the building of portions of

the Iowa Central R.R. and other lines, and having served as president of the Minneapolis & St. Louis R.R., the Toledo, St. Louis & Western R.R., and the Chicago & Alton Railroad.

After his graduation from Monmouth College, Monmouth, Ill., he became a bookkeeper and later studied law, becoming a member of a law firm in Centerville, Iowa, of which the head was Gen. F. M. Drake, who was also vice-president of the Iowa Construction Co., organized to carry out large railroad-building contracts. Mr. Shonts was placed in charge of construction on the new line of the Iowa Central, by the Iowa Construction Co. In 1882 he became general superintendent of the Illinois & Iowa R.R., and later became president, having acquired control.

As chairman of the Canal Commission from 1905-1907, he built up the organization that carried through the construction of the Panama Canal. He was then appointed president of the Interborough company to undertake the coördination of New York City's rapid-transit facilities.

Canadian Engineers Hold Fifth Professional Meeting

What is considered to have been one of the most important gatherings of technical men in eastern Canada was the three-day session of the fifth general professional meeting of the Engineering Institute of Canada, held at St. John, New Brunswick, Sept. 10-12.

One of the papers was read by C. O. Foss, chairman of the New Brunswick Water-Powers Commission, who outlined in a comprehensive manner the possibilities for hydro-electric development in New Brunswick. As the City of St. John is lighted by electricity generated in steam plants, and in view of the increased cost of labor and coal, Mr. Foss pointed to the necessity for increased rates or additional electrical development.

Other discussions included those on highway construction and bridge work, experimentation with high-tension, high-frequency electric current, engineering problems connected with the use of telephone cables, and heating problems produced by some of the modern methods of building construction. During the three-day session trips were made to manufacturing plants and points of general engineering interest.

The sessions were presided over by the President of the Engineering Institute of Canada, Lieut. Col. R. W. Leonard.

Iowa Governor Appoints Board to Examine Engineers

Governor Harding has announced the appointment of the Board of Examiners required to put into effect the Iowa Engineers' license law, as follows: Seth Dean, Glenwood, chairman; Karl C. Kastberg, Des Moines, secretary; Alvin LeVan, Fort Dodge; L. M. Martin, Atlantic, and F. W. Stubbs, Oelwein, vice-chairman.

Movement To Unionize All New York Municipal Employees

A movement to organize all employees of the City of New York, including firemen and policemen, into one great union affiliated with the American Federation of Labor, to obtain wage increases to meet the increased cost of living, was started at a meeting Sept. 18, presided over by Burt L. Schneider, president of the Union of Technical Men. Mr. Schneider outlined the purpose of the conference and informed the delegates that they should receive a wage increase of 65% to meet the high cost of necessaries.

Thirty members of the executive councils of 15 city employees' unions or associations, having a total membership in excess of 100,000, attended. They unanimously ratified the proposal to form the Central Union, as it was tentatively named, and were instructed to put the proposal before the full membership of their respective organizations. If the plan is adopted at the meetings of the organizations two delegates from each union will report back, and the actual work of forming the big union will be undertaken.

The following organizations were represented at the conference: The Uniformed Firemen's Union, Police Benevolent Association, Teachers' Union, Union of Technical Men, County and City Public Service Clerks, Stenographers and Bookkeepers' Union, Water Meter Inspectors' Union, Health Inspectors' Union, Building Inspectors' Union, Tenement House Inspectors' Union, Street Cleaners' Union, Teamsters' Union, Keepers' Union and Matrons' Union. These organizations, as was pointed out at the meeting, include practically all of the workers under salary to the city.

Another step decided upon by the meeting was the organization of city employees as yet not members of any union. This, too, however, was left to wait upon the ratification of the Central Union by the organizations represented at the meeting.

A mass meeting of the Union of Technical Men will be held Oct. 7, according to a current announcement.

Mayor Hylan has demanded of the heads of all city departments that "agitators" be eliminated from the payrolls by the abolition of provisions for their positions in next year's budget.

State Registration of Engineers Begins in Oregon

A state board of engineering examiners has been established in Oregon in accordance with an act for the registration of "professional engineers" passed at the last session of the legislature. The board has held several meetings, has adopted rules and regulations for conducting examinations, and announces itself "fully organized and prepared to receive applications for registration of the professional engineers and others who expect to practice engineering in Oregon." [An abstract of the act and an important amendment to it were published in *Engineering News-Record* of Mar. 27, 1919, p. 617, and May 8, 1919, p. 911.]

Members of the board appointed by the Governor to serve for the two years which will end July 1, 1921, are as follows: F. S. Baillie and W. B. Dennis, mining engineers; R. R. Bartlett and O. Laurgaard, civil engineers; G. A. Covell and F. Hesse, mechanical engineers; E. G. Hopson and J. H. Lewis, hydraulic engineers, and F. D. Weber, electrical engineer. The officers elected by the board are: O. Laurgaard, president; F. D. Weber, vice-president; A. B. Carter, secretary. Headquarters are at 520 Corbett Bldg., Portland.

Under the terms of the act all who desire to practice in any branch of professional engineering in Oregon after Jan. 1, 1920, must register before that date with the newly created board. A statement of experience must accompany the application for registration. Engineers with six years' experience in the practice of "professional engineering" who apply before Jan. 1, 1920, will be registered without examination. Thereafter all applicants will be subject to examination.

Seattle Engineers Protest Against City's Pay

The Associated Engineering Societies of Seattle recently sent to the Mayor and the City Council a protest against what is alleged to be inadequate compensation in five grades of the city's engineering service. The association is backing a movement to secure adequate pay for all classes of technical men in public service, city, county, port and state.

Railway Maintenance Convention

Both the economic and the practical sides of maintenance work were covered at the annual convention of the Roadmasters' and Maintenance-of-Way Association, held in Chicago Sept. 16-18. The labor question was prominent. "Methods of Improving the Efficiency of Track Labor" was the subject of a paper by C. A. Morse, chief engineer of the Chicago, Rock Island & Pacific R.R., while labor supply was discussed by Hugh Reid, of the United States Department of Labor, and two reports showed the economic value of labor-saving appliances under present conditions. Besides a paper on "The Equation of Track Values," by W. R. Wiltsee, principal assistant engineer of the Norfolk & Western R.R., the other subjects included maintenance work at passenger and freight terminals, roadway drainage and ditching, and the use of stone and bituminous paving instead of planks at road crossings. The war work of the American railway engineer regiments in France was reviewed by Samuel M. Felton, president of the Chicago Great Western R.R., who was director general of military railways.

Ketchum Head of Civil Engineering College, Pennsylvania University

Milo S. Ketchum, dean of the College of Engineering University of Colorado, structural engineer of national prominence, member of Crocker & Ketchum, consulting engineers, Denver, Colo., author of several engineering treatises and engineer handbooks, and recently in charge of the construction of important explosive plants at Nitro, W. Va., has been appointed to the position of Professor-in-Charge of the Civil Engineering Department of the University of Pennsylvania.

Mr. Ketchum has always been a leading figure in the advancement of tech-



MILO S. KETCHUM

nical education since his appointment as assistant professor of civil engineering at the University of Illinois in September, 1899. His pursuit of technical instruction has been interrupted by periods of professional practice. In February, 1918, he received a leave of absence from the University of Colorado to become assistant director of munitions in charge of the Nitro, W. Va., plant. His appointment was made by D. C. Jackling, director of munitions, the Nitro plant being one of a series of such plants then being built under the direction of Mr. Jackling.

Mr. Ketchum was graduated from the University of Illinois with a B.S. degree in civil engineering in 1895, receiving his C.E. degree five years later from the same institution. Even while an undergraduate at the Illinois institution, he served as an instructor in summer surveying at the School of Mines at Houghton, Mich. From September, 1895, to June, 1897, he served as assistant instructor in civil engineering at the University of Illinois, devoting his summer to the actual practice of his profession in Urbana, Peoria and Charleston, Ill. From June, 1897, to June, 1899, he was designing engineer and construction agent for the Gillette-Herzog Manufacturing Co., Minneapolis, Minn., and in that capacity designed and erected highway and electric-railway bridges and mine and smelter buildings amounting in cost to over $150,000. He also superintended the erection of the Franklin steel stamp mill, at Grosse Point, Mich.

From September, 1899, to September, 1903, he was assistant professor of civil engineering, University of Illinois. At the same time he did consulting work, designing numerous highway bridges for Champaign and Platt Counties, Illinois, reported on bridges at Danville and La Salle, Ill., and for Vermilion County, Illinois, and from April, 1902, to March, 1903, was consulting engineer with the Illinois Valley Traction Co., while that company was constructing the electric railway from La Salle to Ladd, Ill. In that work he revised the location of a part of the land and designed and superintended the erection of bridges. He was contracting manager for the American Bridge Co. during 1903 and 1904, making his headquarters at Kansas City, though he spent part of the time at Butte, Mont. He left that company to become professor of civil engineering, University of Colorado, being made dean of the College of Engineering, University of Colorado, in 1905.

His publications include a surveying manual, of which he was co-editor with W. D. Pence; "Design of Steel Mill Buildings and the Calculation of Stresses in Framed Structures," "Design of Walls, Bins and Grain Elevators," "Design of Highway Bridges," "Design of Mine Structures" and "Structural Engineers' Handbook."

He is a director of the American Society of Civil Engineers, a fellow of the American Association for the Advancement of Science, a past president of the Society for the Promotion of Engineering Education, and a member of the American Society for Testing Materials and of the American Railway Engineering Association.

Hugh M. Wilson Dead

Hugh M. Wilson, for six years first vice-president of the McGraw Publishing Co., until his resignation in January, 1917, died suddenly Sept. 19 at his home in Stockbridge, Mass. To the McGraw organization Mr. Wilson brought a rich experience in the field of technical journal publication, and he was an important factor in shaping and putting into effect the company's policies.

Mr. Wilson's first journalistic work was as a reporter for the daily press of the Middle West. In 1889, however, he joined the staff of the *Mississippi Valley Lumberman*, and since that time he devoted his great energy and ability to the development of magazines in the trade and technical field. It was through the medium of the *Northwestern Railroader* that he entered the railway field in which he was to become a great leader. That journal was soon consolidated with the *Railway Age*, Mr. Wilson becoming secretary-treasurer of the new organization. His dual training in editorial and business affairs proved so valuable that he subsequently undertook, in addition to his former duties, those of manager of *Railway Age*. He was elected president of the company in 1899. In 1906 the Wilson Co. was organized and took over the publication of *Railway Age* and the *Electric Railway Review*. Two years later, however, Mr. Wilson sold both papers. The *Railway Age* was consolidated with the *Railway Gazette* while the *Electric Railway Review* was purchased by the McGraw Publishing Co., and combined with the *Electric Railway Journal*. After a year as vice-president of the Barney & Smith Car Co., of Dayton, Ohio, Mr. Wilson joined the McGraw Publishing Company.

His marked success as a publisher was due to his ability to sense the trend of events, to keep before him certain clear ideals as to the place of the magazine in its industry or profession, and to enlist the wholehearted support and loyalty of those who worked with him. His influence, not only on the journals with which he was connected, but on the whole field of trade and technical journalism, will be a lasting one.

Baltimore Water-Works Enlargement Recommended

(*Continued from page* 630)

the city will so grow, with any additional flow through it under heavier demands in the next few years, that the lift of the centrifugal pumps taking water from it will be so increased as to cause an interruption in pumping service. To meet this condition by reducing frictional losses, an additional 12-ft. tunnel, costing approximately $3,600,000, is recommended for immediate construction.

It is also recommended that when the capitalization of the annual pumping charges for lifting the water from the Gunpowder tunnel to the mixing basin at the filtration plant exceeds $2,641,700, the existing dam on the Gunpowder River at Loch Raven be increased from El. 192 ft. to El. 234 ft., to provide sufficient head to deliver the water to the mixing basin of the filters without pumping.

This higher dam would impose a greater pressure on the existing tunnel from the river to the city, and as portions of the ground above it are considerably below the hydraulic grade line, it is recommended that the existing tunnel be reinforced and strengthened, at an estimated cost of $593,000.

The area of Baltimore was increased from 31.3 to 81.2 square miles by a legislative act passed in 1918. Several private water companies now serve a part of the population thus added to Baltimore, but requests for extensions of the city service are steadily growing.

Three new equalizing reservoirs and one pumping station to supply this additional territory are recommended at a total cost of $7,893,000.

Death of E. O. Sachs, British Fire Prevention Expert

Edwin O. Sachs, chairman of the Executive of the British Fire Prevention Committee, and one of the world leaders in the work of fire prevention, died at his home in London, Sept. 9, at the age of 49 years. At the request of this journal Ira H. Woolson, consulting engineer of the National Board of Fire Underwriters, and a co-worker with Mr. Sachs in many international fire-prevention campaigns, prepared the following note:

"A gentleman of culture and an architect by profession, Mr. Sachs early recognized the tremendous fire hazards existing in English cities due to the prevalence of combustible construction and to defects in coöperation and equipment in the fire-fighting forces. His intelligent grasp of the subject and forceful methods of presenting the facts soon won to his support many of the clear-thinking public officials of London and other prominent English cities, as well as representatives of the technical professions and chiefs of fire brigades. Taking advantage of the state of public mind following the great Cripplegate fire in 1897, this group of fire-prevention enthusiasts founded the British Fire-Prevention Committee in 1898, and immediately proceeded to establish a testing station in which to determine the fire-resisting merits of building materials and construction. Mr. Sachs was the head of the committee's activities from its organization until his death. He was ably assisted by the group of officials and technical men who gave unselfishly of their time and money in support of the enterprise.

"Immediately after organization, the committee began the publication of its well known series of little 'Red Books.' The first issues were devoted to discussion of fire-prevention and fire-fighting problems and reports upon great fires which occurred in Europe and America. In all this Mr. Sachs took the 'laboring oar' and wielded his pen indefatigably. Later the reports of fire tests conducted by the committee were published, and the 'Red Books' now comprise over 200 numbers, and constitute a valuable library upon the subjects of fire prevention and fire protection.

"While Mr. Sachs was jealous of the reputation and accomplishments of his committee, he was at the same time generous in his recognition of competent and reliable work done by others. Numerous reports of notable fires, and investigations conducted in this and other countries, have been published in full in the 'Red Books.' One book gives a full, illustrated description of the New York fire department, written by the late Chief Bonner.

"During the four desperate years of the war the committee devoted itself with untiring zeal to solving for the Government many of the vital fire-protection problems which confronted England. Among these were protection of life and property from aërial bombardment; the safeguarding of hospitals and cantonments from fire; and many others of varying character. Letters from Mr. Sachs to a friend in this city during this period tell of the high pressure under which the committee was working, and its exhausting character. It is not unlikely that the severe strain was too much for his not over-strong constitution.

"Mr. Sachs was the author of several books, of which perhaps the best known are 'Modern Opera Houses and Theaters' and 'Fires and Public Entertainment.' The former is in two large volumes profusely illustrated. He was always a strong advocate of generous and properly protected exits from public amusement buildings."

Highway Bond Issue Authorized in Maine

Maine has now been added to the large number of states which are inaugurating extensive highway construction campaigns. At a recent election the voters authorized the issuing of an additional sum of $8,000,000 for highway construction purposes, making the total legal bonded indebtedness for this purpose $10,000,000. The sentiment for good roads is shown by the vote of 5 to 1 in favor of the proposal.

Public Utilities Commissioners to Meet in Indianapolis

The 31st annual convention of the National Association of Railway and Utilities Commissioners will be held in Indianapolis, beginning Oct. 14. Headquarters will be at the Claypool Hotel. It is expected that the convention will last for four or five days. The opening address will be delivered by Clyde B. Aitchison, chairman of the Interstate Commerce Commission, formerly of the Oregon Commission.

Minneapolis Will Have Right To Buy Street Railways

Under the service-at-cost street-railway franchise settlement just agreed upon in Minneapolis (subject to referendum vote in December) the city has the option of buying the property of the Twin City Rapid Transit Co. at stated intervals. The valuation fixed for purchase and rate purposes is $24,000,000 as of Jan. 1, 1919, against nearly $26,000,000 as of Jan. 1, 1916, estimated by F. W. Cappelen, city engineer, and nearly $31,000,000 formerly claimed by the company. The company is to be allowed a 7% return on the valuation. The initial fare will be 5c., with variations of 1c. up or down with rises or declines in earnings. The city council will have control over capital increases and purchases. A reserve fund must be created for repairs, maintenance, renewals and depreciation. A street-railway supervisor will be appointed by the city council.

Discuss Public Works Bill

(*Concluded from page* 630)

Under the proposed system, it was believed, the taxpayers would get more for their money and with a single executive head a comprehensive and logical program of construction could be planned and carried out for the best interest of the nation. As a war-preparedness measure the bill was commended by Mr. Fuller, who spoke at some length of the organization and the results accomplished by the Army's Construction Division, where modern business methods were employed. With respect to the effect of the Jones-Reavis bill on the Corps of Engineers, U. S. A., Mr. Fuller argued for a considerate treatment of the military engineer and greater coöperation among the military and civilian members of the profession.

Speaking for the American Institute of Architects, W. D. Blair indorsed the proposal for the national public-works department, pointing out that it would be of benefit to architects in the establishment of a national building policy, something which we do not possess at present.

Representing Marshall O. Leighton, of the Engineers, Architects and Constructors' Conference, C. T. Chenery pointed out some of the advantages of the bill and gave details of the illogical distribution of functions in the existing Federal departments.

From the viewpoint of the contractor, F. J. MacIsaac, president of the General Contractors' Association of New York, indorsed the proposed legislation, pointing out that the retention in the new department of the existing Construction Division of the Army was a desirable feature, particularly as a measure of American military preparedness.

Opposition to the bill was voiced by John A. Bensel, former New York state engineer, who believed that the public is better served by the present organization of our Federal departments. Roger D. Black, until recently Colonel, Corps of Engineers, U. S. A., and a member of the General Staff Corps, opposed the bill, particularly that portion of it which would take away from the Corps of Engineers its river and harbor work. This work, he maintained, furnishes the members of the corps the only practical training in engineering construction which they receive.

The discussion was closed by Alfred D. Flinn, secretary of Engineering Council, who made the point that engineers are apt to regard the benefits to be derived from a national Department of Public Works as too obvious for discussion. Every opportunity should be utilized, he argued, for convincing those outside of the engineering profession of the soundness of the proposed legislation.

It is planned to raise a fund of $100,000 to be used in publicity and educational work in favor of the bill.

Form Connecticut Association of Members of American Society

The Connecticut Association of Members of the American Society of Civil Engineers has been formed, with the following officers: President, Caleb Mills Saville, Hartford; vice-president, Clarence Blakeslee, New Haven; secretary-treasurer, Robert J. Ross, Hartford. These officers, together with Edward W. Bush, Hartford, and William R. Dunham, Jr., New Haven, constitute the board of directors.

Society Activities in Chicago

Active coöperation between the Western Society of Engineers and the Illinois Association of Members of the American Society of Civil Engineers is foreshadowed by steps taken at a meeting of the latter Sept. 16 to discuss this matter. General discussion was preceded by addresses by the following: A. J. Hammond (Am. Soc. C. E. only), J. H. Libberton (Western Society only), C. F. Loweth (member of both societies). One resolution that was passed provided for the appointment of a committee to consider plans for coöperation and to report at a later meeting, while a second authorized the officers to coöperate with other engineering societies of Chicago pending the presentation of this report.

An organized campaign for increased membership, carried out by teams working under the direction of a central committee, has been begun by the Western Society of Engineers.

Ohio Technical Societies To Hold Convention Next Month

A state convention of the engineers and architects of Ohio will be held in Columbus, Ohio, Oct. 14-15, under the auspices of the Association of Ohio Technical Societies. Four principal subjects will be discussed. M. O. Leighton, chairman of the Engineers, Architects and Constructors' Conference, will speak on "The National Department of Public Works"; Dr. F. H. Newell, of the American Association of Engineers, will speak on "Closer Cooperation in the Engineering Profession"; Charles Whiting Baker, consulting editor of *Engineering News-Record*, will address the convention on the "Compensation of Engineers and Architects," and Prof. Gardner S. Williams, of the University of Michigan, will discuss the "Registration of Engineers and Architects."

Civil Service Examinations

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Assistant examiner, Patent Office, Washington, D. C., $1500 to $1740 per year, Sept. 17 to 19 and Nov. 19 to 21. File applications in time to arrange for examination at place selected by applicant.

Senior highway engineer, Bureau of Public Roads, Department of Agriculture, $2220 to $4000 per year, Oct. 21, File applications before Oct. 21.

Engineer, $3000 per year; assistant engineer, $1800 to $2880 per year; junior engineer, $1200 to $1740 per year; engineering draftsman, $1200 to $3000 per year, Reclamation Service. Applications will be received until further notice.

ENGINEERING SOCIETIES

Calendar

Annual Meeting

NEW ENGLAND WATER WORKS ASSOCIATION; Tremont Temple, Boston, Sept. 30, Oct. 1-3, Albany, N. Y.

NATIONAL SAFETY COUNCIL, 168 Michigan Ave., Chicago; Oct. 1-4, Cleveland.

AMERICAN SOCIETY OF NAVAL ENGINEERS: Secretary, Lieut. Com. F. W. Sterling, U S.N., Navy Department, Washington, D. C.; Oct. 7, Washington.

AMERICAN PUBLIC HEALTH ASSOCIATION: 169 Massachusetts Ave., Boston; Oct. 27-30, New Orleans.

CITY MANAGERS' ASSOCIATION, 1812 Tribune Bldg., New York City; Oct. 29-31, Indianapolis.

AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS; 304 E. Walnut St., Bloomington, Ill.; Nov. 11-14, New Orleans.

SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS; 29 W. 39th St., New York City; Nov. 13, New York City.

The American Association of Engineers announces that chapters have recently been organized at Springfield, Mo., and Fresno, Calif. E. T. Bond is president of the Springfield Chapter and L. E. Smith is president of the Fresno Chapter.

The Detroit Engineering Society, at its meeting Sept. 19, listened to a talk on the new Detroit building code and the organization of the building department, given by John C. McCabe, commissioner of buildings for the City of Detroit.

The Rochester Engineering Society, Sept. 20, went in a body to inspect the gypsum mines of the Empire Gypsum Co., Garbutt, N. Y.

The New Jersey County Engineers' Association, in a recent meeting, decided to coöperate with the State Highway Department in the collection of traffic census figures in all sections of the state, in order that the tremendous increase in traffic may be met by more substantial construction of roads. Another question discussed was the influence exerted upon property owners in attempting to have governing bodies adopt one particular form of pavement, regardless of the advice of engineers.

The Pittsburgh and Lake Erie Railroad Section of the American Association of Engineers was organized Sept. 15, with the following officers: President, D. F. Harvey; vice-president, Samuel Baker; secretary, M. Z. Balph; treasurer, Benjamin Aires. The section will affiliate with the Pennsylvania R.R. section. The organization meeting was attended by 35 engineers, some of whom represented the Monongahela Railroad.

The Cleveland Chapter of the American Association of Engineers recently adopted a resolution favoring a canvass of political candidates to secure an expression of opinion on the desirability of appointing engineers to engineering positions in the public service.

The New York Chapter of the American Association of Engineers will have as principal speaker at the meeting Sept. 24 Maj. Gen. John F. O'Ryan, U. S. A., former commanding officer of the 27th Division. The subject chosen was "Compulsory Military Training in the Scheme of National Defense."

The Indianapolis Chapter of the American Association of Engineers is devoting some study to the question that has been carried before the Federal Trade Commission of making Pittsburgh a single basing point for steel. Steel consumers have protested against the practice of paying a set price for steel plus the freight rate from Pittsburgh, which may be considerably more than the actual rates from the point of shipment to the consumer. The question has been discussed by the Indianapolis Chapter, and a committee has been appointed to make recommendations upon which action will be based.

The Cleveland Engineering Society had as its speaker at the meeting Sept. 23, 1919, M. T. Harrington, consulting engineer. Mr. Harrington's subject was the relationship existing between the engineer and salesman. L. A. De Blois, engineer, the du Pont Co., Wilmington, Del., will be the speaker at the meeting Sept. 30. His subject will be "The Engineer's Place in Safety Work."

The Western Society of Engineers at its meeting Sept. 15 listened to two bridge papers presented in abstract by Dr. J. A. L. Waddell. The first was on economic span lengths for simple truss bridges on various types of foundations, while the second was on the comparative economies of cantilever and suspension bridges. Announcement was made of a campaign for new members and of arrangements for coöperation with the local members of the American Society of Civil Engineers.

PERSONAL NOTES

LIEUT.-COL. ARTHUR J. SLADE, U. S. A., having recently received his discharge from the service, has resumed his practice as a consulting engineer at 1790 Broadway, New York City. Colonel Slade's service in the United States Army involved the engineering work in connection with the design and production of motor transport vehicles for the air service, and in the training of operating and maintenance personnel. While in the American Expeditionary Forces he organized and directed the engineering division of the Motor Transport Corps, was a member of the International Armistice Commission, and while in the Army of Occupation made a collection of German military trucks of all types for the purpose of engineering research by the War Department. While in France he received the Distinguished Service Order from the British, and the Legion of Honor from the French Government. Before entering the service, Colonel Slade was engaged in mechanical, electrical, civil and automotive engineering, specializing in the design, manufacture, installation, operation and maintenance of commercial motor vehicles.

CARLOS LOBO, formerly borough engineer, Department of Water-Supply, Gas and Electricity, Borough of Brooklyn, New York City, has resigned to become affiliated with the Kelvin Engineering Company, Inc. He is to take charge of a new department of general engineering and contracting work that will operate in Latin America as well as carry on work in this country.

J. W. KAERTH, former county surveyor of Colusa County, California, has opened private offices in Colusa and is specializing in reclamation and irrigation work. Associated with Mr. Kaerth is GEORGE H. MECK, formerly connected with various reclamation projects in the Sacramento Valley.

ROY D. COLEMAN, county engineer for Atchison County, Kansas, for several years, has been appointed Government resident engineer for the Atchison district in the construction of hard-surface roads. ROBERT KERR has been appointed county engineer.

CAPT. G. L. MCLAIN, U. S. A., former city engineer of Hutchinson, Kans., has been appointed assistant engineer, Bureau of Public Roads, and has been assigned to the Omaha district, in charge of Kansas work. Captain McLain organized Co. A., 110th Engineers, and has just returned from 16 months' service in France.

E. V. R. PAYNE, senior assistant engineer of the New York State Engineers' Department, and former lieutenant colonel of engineers, U. S. A., has been decorated by the French Government for services in France in connection with construction work he carried on at Brest. He has been made a Chevalier of the Legion of Honor. Mr. Payne has been connected with the Engineer's Department of New York State since 1896.

PAUL HARTUNG, deputy county engineer of Jackson County, Missouri, has been appointed engineer of sewers, vice A. D. LUDLOW, who recently resigned the former office.

HAROLD F. GRAY, former district health officer, Chico, Calif., has been appointed State Sanitary Engineer of New Mexico, with headquarters at Santa Fé.

CAPT. E. S. CHASE of Eaglesmere, Penn., has been made engineer for the Williamsport Water Co. He was engineer at the Eaglesmere resort for thirty years. Captain Chase was the engineer selected to make the investigation of the water-supply for the new Rockview State Penitentiary near Bellefonte, Penn.

S. E. COLONY, Renovo, Penn., has been made borough engineer of Ridgway, Penn., being elected at a recent special meeting of the town council. He was formerly borough engineer for Renovo.

R. W. CREUZBAUR, after two years with the Emergency Fleet Corporation as consulting engineer, will resume private practice in his New York office Oct. 15. His work with the Government has been as consulting engineer in direct charge of the three well known plants at Hog Island, Bristol, Penn., and Newark, N. J. The cost of work included in these three projects aggregated approximately the sum of $90,000,000.

JOSEPH A. WHELAN, Trenton, N. J., has been appointed assistant superintendent of the Michigan State Highway Department, with headquarters at Ann Arbor. He was engaged in road-building in Trenton for some time.

CHARLES A. BROWNE, of Orlando, Fla., division engineer for the state road department, has been appointed State Highway Engineer of Florida, vice WILLIAM F. COCKE, resigned.

ALLEN P. RICHMOND, JR., graduate of Dartmouth College and the Thayer School of Civil Engineering, has been appointed assistant professor of civil engineering in the Thayer School.

LIEUT.-COL. F. W. SCHEIDENHELM, Engineers, U. S. A., has been discharged from the service and has returned to New York to resume his consulting practice, in association with DANIEL W. MEAD, specializing in hydroelectric work. Colonel Scheidenhelm went to France in October, 1917, and was engaged chiefly in water-supply work, having command of the 26th Engineers and acting as water-supply officer of the First Army. For his work in that capacity he was cited by General Pershing "for exceptionally meritorious and conspicuous service."

A. M. VANCE, late of the Kaw Paving Co., has accepted a position in the paving department of the Henry Exall Elrod Co., Dallas, Tex.

MAJ. WILBUR M. WILSON, U. S. A., who, since receiving his discharge from the service, has been engaged in general engineering work in Chicago, is again to become associate professor of structural engineering, University of Illinois, a position he held before he entered the service as a captain of engineers.

W. E. ARNETT has been elected director of streets and CLYDE MORRIS, director of the water department of Fairmont, W. Va., in a recent organization of the new city government.

R. W. THOROUGHGOOD has resigned as professor of civil engineering, University of Florida, Gainesville.

LINN BROWN, who is shortly to be released from military service, has been appointed city engineer of Jefferson City, Mo.

OBITUARY

RICHARD HELSON, Detroit, for 10 years president of the Carpenter Contractors' Association, and president of the Builders and Traders' Exchange for five years, died in Detroit recently at the age of 80 years. Mr. Helson started in the contracting business in 1862, being employed by his uncle, William Gibbings. Mr. Helson was associated in business for 20 years with W. G. Vinton, leaving his employ only when he entered the contracting business for himself.

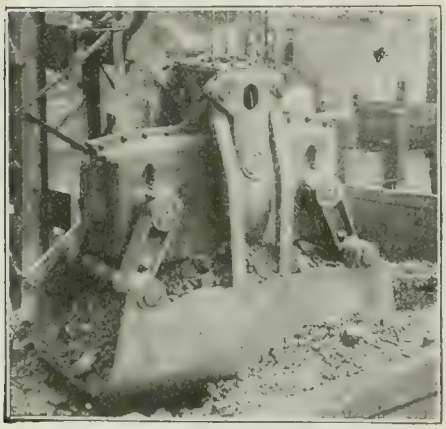
ROBERT WEDDELL, founder of the Weddell Bridge & Engine Works, of Trenton, Ont., which executed many contracts for the Dominion Department of Railways and Canals and the Department of Public Works, died at Trenton recently. Mr. Weddell was born in Edinburgh, Scotland, in 1850. He went to Canada in the early '80's, working for a time at Oshawa, shortly afterward moving to Trenton and establishing himself in business. Projects in which Mr. Weddell was professionally interested extended from Lake St. Louis in Quebec, to the Soo, including the Toronto harbor western entrance, the Trent canal, and other works.

THOMAS H. COLLINS, brick highway engineer of the Denny Renton Clay Co., Seattle, since 1912, died recently at his Seattle residence after an illness of two years. Mr. Collins went to Seattle from Cleveland, Ohio. While in the East he represented brick-manufacturing interests on various highway projects in Eastern and Southern states.

Clamshell Bucket Is Operated by Gears Completely Inclosed

A clamshell bucket operated by gears completely inclosed in a casing, instead of by open parts with which the material handled comes in contact, is shown in the accompanying illustration. By means of this arrangement, it is claimed, the many delays due to the necessity of removing and replacing worn parts are eliminated.

Ordinary clamshell buckets are so constructed that a large quantity of the materials handled comes in contact with the operating parts, the inevitable result being excessive wear. The bucket described is operated by gears which are incased in a securely bolted gear



BUCKET CLOSES BY GEARS

box, so constructed that the gears operate in what is practically an oil bath. They are thus constantly lubricated. The power for operation is transmitted by two wire ropes and can be handled by almost any type of two-drum hoist.

Having a minimum number of parts, with no extended chains or ropes reeved on small sheaves, the bucket is simple, compact and efficient. It is especially designed for handling coal, sand, gravel and cinders. For this work the buckets are so hung that they will dig very thin depths of material. On account of the small diameter of the closing pinion, the bucket requires a very small amount of rope either for opening or closing.

The bucket is manufactured by the Wellman-Seaver-Morgan Co., Cleveland, Ohio.

Will Burn Houses To Prove Fire Resistance of Metal Lath

During the week of Oct. 6-11, and coincident with Fire Prevention Week, (held under the auspices of the National Fire Protection Association, the United States Department of Commerce, the Board of Fire Underwriters and other national organizations) the Associated Metal Lath Manufacturers plan to give exhibitions of the fire-resistant qualities of metal-lath construction, by constructing composite houses of fire-resisting and non-fire-resisting construction and burning them, in as many places as possible.

The houses are designed according to a plan arranged by the Society for Fire Resistance Frame Construction, so that one-half is built with the usual wood-lath construction and the other half with fire-resisting frame construction using metal lath on the inside and metal lath with stucco on the outside. Copies of the design are to be distributed in various sections of the country, and it is planned to construct the houses and burn them on Fire Prevention Day, Oct. 9.

Business Notes

THE STEWART MOTOR CORPORATION, Buffalo, N. Y., is about to enter its new plant, which will have a yearly production capacity of 10,000 motor trucks. The new factory covers approximately nine acres. The plant now occupied by the company will be operated in conjunction with the new factory.

THE SERVICE CONSTRUCTION CO., Cleveland, Ohio, has been organized, and is preparing to enter the construction field for large buildings and commercial and industrial structures. Horatio Ford is president of the new company. Headquarters will be at 6110 Euclid Ave., Cleveland, Ohio.

THE BARBER-GREENE CO., Aurora, Ill., is making another extensive addition to its factory, this being the second one made during the year. The new area will be used in the manufacture of standardized material-handling machinery, belt conveyors and self-feeding bucket loaders.

THE PRATT & CADY CO., INC., Hartford, Conn., has appointed E. Coit Magens, formerly with the H. Belfield Co., as director of sales.

CHARLES L. PERRIN, until recently associated with PATRICK MCGOVERN under the firm name of P. MCGOVERN & Co., has retired. Mr. McGovern will continue the contracting business at the same offices, 50 E. 42nd St., New York City, and in Boston, Mass.

R. S. GILDEN, having been relieved from Government service, has again organized a contracting and construction company, being associated with S. Herzig. The new firm will be located at 188 Montague St., Brooklyn, N. Y. Mr. Herzig will continue his practice as consulting engineer.

THE ATLAS MINERAL PRODUCTS CO., Lincoln, N. J., has informed its clientele that, beginning Oct. 1, the main office of the company will be at Mertztown, Penn.

THE LANCASTER STRUCTURAL & FOUNDRY WORKS, Lancaster, Penn., has purchased the property of the Lancaster Machine & Structural Works. W. Edward Lindsay has been made engineer, and Edgar G. Hess, formerly connected with the Lancaster Foundry Co., is the works manager of the Lancaster Structural & Foundry Works.

THE CONSTRUCTION CO. has been organized as an auxiliary of the Minneapolis Steel & Machinery Co. to carry on the company's construction business, formerly handled by the Twin City Co. The Construction Co. will handle all steel erection, construction of buildings, bridges, water towers and tanks, barges, boats, elevators, etc. The Twin City Co. is to be used as a sales company only and will take care of the sale of all products of the Minneapolis Steel & Machinery Co. The officers of The Construction Co. are A. M. Burch, president, and Guy P. Johnson, secretary-treasurer.

THE DERRICK & HOIST CONSTRUCTION CO. is the firm name of a new organization formed by Harry Hyman, formerly designing engineer with the Edward F. Terry Mfg. Co. and J. Obstler. The offices are located at 150 Nassau St., New York City.

THE TWIN CITY CO., through its reorganization due to the establishment of the Construction Co., as noted elsewhere in these columns, announces the following new officers: President, George L. Gillette; vice-president, N. B Nelson; secretary, E. A. Merrill; treasurer, Cal Sivright.

Trade Publications

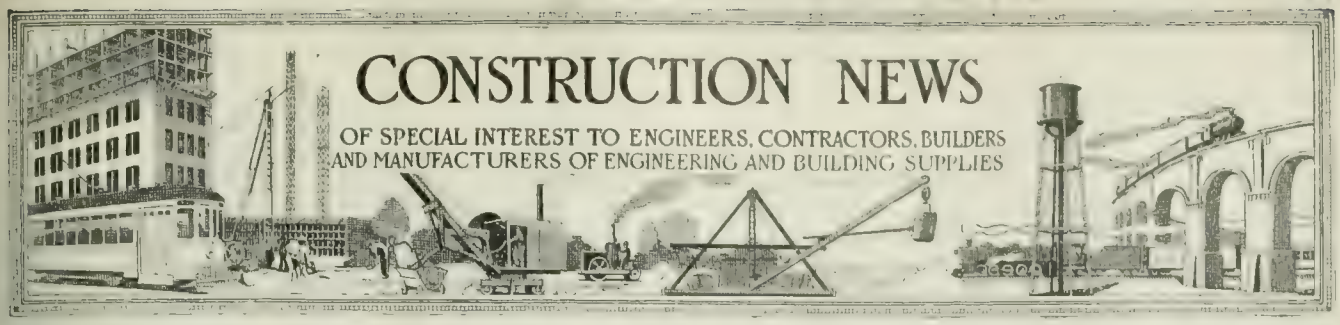
The following companies have issued trade publications:

THE AMERICAN MOTOR TRUCK CO., Newark, Ohio; folder, 9 x 12 in., four pages, illustrated; describes plant and product of the company.

THE NATIONAL TUBE CO., Frick Building, Pittsburgh, Penn.; Bulletin No. 7, 8½ x 11 in., 16 pages, illustrated; describes the process of manufacturing welded scale-free pipe, and gives information regarding friction velocities, etc.

THE BLAW-KNOX CO., Pittsburgh, Penn.; Catalog No. 18, 7½ x 10½ in., 40 pages, illustrated; describes Blaw system of building construction; also folder, 8½ x 11 in., four pages, illustrated; gives information regarding the acquisition of patents, personnel and equipment of the Uniform Company.

THE MILLIKEN BROTHERS MANUFACTURING COMPANY, INC., Woolworth Building, New York City; two catalogs, Nos. 10 and 11, 11 x 8½ in., 44 and 31 pages, respectively, both illustrated; No. 10 describes standard buildings of the company, with prices, tables of shipping weight and other information; No. 11 is a handbook on the erection of the buildings.



PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Sept. 29	Flagley, Colo	Sept. 18
Sept 29	Pipestone, Minn.	Sept. 25
Sept 30	Adrian, Minn.	Sept. 25
Sept 30	Detroit, Mich	Sept 11
Oct. 2	East Hartford, Conn Adv Sept 11	Sept. 11

SEWERS

Oct. 1	Baldwin, Pa.	Sept. 18

BRIDGES

Sept. 29	Birmingham, Ala.	Sept. 18
Sept 29	Goldsboro, N. C.	Sept. 25
Sept. 29	Iola, Kan	Sept 18
Sept. 29	New Jersey	Sept 11
Oct. 1	Moorehead, Minn Adv Sept 11	Sept. 25
Oct. 6	Kinston, N. C.	Sept. 25
Oct 6	Gainesville, Ga	Sept. 25
Oct. 15	Appleton, Wis.	Sept 25

STREETS AND ROADS

Sept. 29	Batesville, Ark	Sept. 25
Sept. 30	Morristown, Tenn.	Sept. 25
Sept. 30	Pennsylvania Adv Sept 11	Sept 11
Sept. 30	Blackfoot, Idaho	Sept. 11
Sept. 30	Montgomery, Ala Adv Sept 18	Sept. 18
Sept. 30	Trenton, N. J	Sept. 25
Sept. 30	Maryland Adv. Sept 25	Sept. 25
Sept 30	Long Island City, N Y	Sept. 25
Oct 1	Brooklyn, N Y	Sept. 25
Oct. 1	Charleston, Mo	Sept. 25
Oct 1	Monroe, Ga	Sept. 25
Oct. 1	Arkansas	Sept 25
Oct. 1	Clayton, Mo.	Sept. 25
Oct. 1	Faribault, Minn	Sept 1
Oct. 2	Madison, W Va	Sept. 11
Oct 2	Trenton, Ga	Sept 18
Oct. 2	Ranger, Tex Adv. Sept 25	Sept. 25
Oct. 2	San Antonio, Tex	Sept 25
Oct. 3	Petersburg, Va	Sept 25
Oct. 3	Three Rivers, Que	Sept 25
Oct. 3	Ebensburg, Pa	Sept 25
Oct. 4	Kansas City, Kan	Sept 25
Oct 4	Waynesburg, Pa	Sept 25
Oct 6	Ridgeway, Mo	Sept 18
Oct 6	Ft Scott, Kan	Sept 18
Oct 6	Fayetteville W Va.	Sept 18
Oct 6	Dallas, Tex	Sept 25
Oct 7	Le Sueur Center, Minn	Sept 25
Oct 7	St Louis, Mo	Sept 25
Oct 7	Montevideo, Minn	Sept 18
Oct 7	Billings, Mont	Sept 18
Oct 9	Goldsboro, N C	Sept 25
Oct 10	Tacoma, Wash Adv Aug 14	Aug 14
Oct 11	Brainerd, Minn	Sept 18
Oct 13	Lancaster, Mo	Sept 11
Oct 13	Collinville, Okla	Sept 25
Feb. 1	Duluth, Minn Adv Sept 18	Sept 25

EXCAVATION AND DREDGING

Oct. 4	Greenfield, Ind	Sept 18
Oct 7	Olivia, Minn	Sept 18

INDUSTRIAL WORKS

Oct. 1	Chicago, Ill	Sept 25
Oct. 3	Oshawa, Ont	Sept. 25
Oct. 7	Marcy, N Y Adv. Sept 18	Sept. 18

BUILDINGS

Bids Close		See Eng. News-Record
Sept. 29	Toronto, Ont.	Sept. 25
Sept. 29	Union Grove, Wis	Sept. 25
Sept 30	McKeesport, Pa.	Sept. 25
Sept. 30	Salt Lake City, Utah	Sept 11
Sept. 30	Biwabik, Minn	Sept 11
Oct. 1	Sun Prairie, Wis.	Sept 25
Oct. 1	St. Paul, Minn	Aug. 28
Oct. 1	Virginia, Minn.	Aug. 28
Oct. 1	Wichita, Kan.	Sept. 11
Oct. 1	Fulton, Mo.	Sept. 11
Oct. 1	Mt Pleasant, Ia.	Sept 11
Oct 1	Emporia, Kan.	Sept. 25
Oct 3	Brevard, N C.	Sept 18
Oct. 6	Eakaton, Minn	Sept 25
Oct. 10	Cherokee, Okla	Sept 18
Oct. 11	Minneapolis, Minn.	Sept. 25
Oct 15	Biggar, Sask	Sept. 25
Oct. 17	Ashley, N D.	Sept. 18
Nov 23	Winner, S D.	Sept 11

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
Sept 29	Rip Rap — Tompkinsville, N. Y.	Sept. 25
Sept. 29	Dredge, etc. Wilmington, N. C. Adv. Aug. 28.	Aug. 28
Sept 29	Dredging—Baltimore, Md Adv. Sept. 11.	Sept 11
Sept 30	Remodeling Hospital—Boston, Mass	Aug 28
Sept. 30	Dock—Charleston, S. C.	Sept. 4
Sept. 30	Hospital Spec 3931 — Pearl Harbor, Hawaii	Sept. 4
Sept 30	Rubble Mound Breakwater —Cleveland, O.	Sept. 4
Sept. 30	Sprinkler System—Philadelphia, Pa Adv. Sept. 18.	Sept 18
Sept 30	Levee Work — Memphis, Tenn Adv. Sept. 25	Sept 25
Oct. 1	Dredging-Spec. 1031-Hingham, Mass	Sept 18
Oct. 1	Valves, Gates etc —Denver, Colo. Adv. Aug. 21	Aug. 21
Oct 1	Electric Lighting and Power Systems -Spec 3982 Mare Island, Cal	Aug 28
Oct 1	Electric Lighting, Water Supply and Fire Protection Systems — Spec 3977A — Charleston, S C	Sept 18
Oct 2	Equipment—Denver, Colo	Sept. 11
Oct 3	Post Office Midland Mich	Sept 11
Oct 3	Lock and Dam Pittsburgh, Pa. Adv Sept 11	Sept 11
Oct 4	Dredging Wilmington, Del Adv Sept 11	Sept 11
Oct 6	Post Office St Johnsbury, Vt	Aug 28
Oct. 6	Levee Work St Louis Mo Adv. Sept 11	Sept 11
Oct 6	Dredging New York, N Y Adv Sept 18	Sept 18
Oct 6	Building Marianna Ark	Sept 11
Oct 6	Dredging New York, N Y Adv Sept 18	Sept 18
Oct. 8	Dredging Detroit Mich Adv Sept 11 18	Sept 11
Oct 10	Dredge New York, N Y Adv Aug 28	Aug 28
Oct. 10	Post Office—Lock Haven, Pa	Sept 4
Oct 14	Post Office Pratt Kan	Sept 11
Oct 15	Derricks Florence Ala Adv. Sept 18	Sept 18
Oct 15	Repairing Dyke—Philadelphia, Pa Adv Sept 18	Sept 18
Oct. 15	Quarters and Mess Hall—Bismarck N D	Sept 18
Oct. 16	Sewers and Excavating—Washington, D C Adv Sept. 25	Sept. 25
Oct 16	Dredging — Charleston, S. C.	Sept. 25
Oct 20	Dredging Jacksonville, Fla Adv Sept 25	Sept. 25
Oct 22	Power Plant Improvements Spec 3956 -Pearl Harbor, Hawaii	Sept. 11
Nov. 3	Post Office and Court House —Honolulu, H. T.	Aug 21

MISCELLANEOUS

Sept. 29	Equipment Pittsburgh, Pa	Sept. 25
Sept 30	Station Brooklyn, N. Y.	Sept. 25
Oct 1	Sewerage Screenings Press Baltimore Md Adv Sept 25	Sept. 25
Oct. 1	Granite Paving Blocks Baltimore, Md. Adv. Sept 25	Sept. 25
Oct 2	Wharf St Laurent de Orleans, Que	Sept 18
Oct 2	Wharf—Quebec	Sept 18
Oct 6	Pumping Equipment —Los Angeles, Cal	Sept. 18
Oct. 6	Pipe, etc Alexandria, La. Adv. Sept 25.	Sept. 25

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Fla., West Palm Beach—City plans to improve waterworks, sewerage system and streets. About $10,000,000.

O., Elyria—City retained M. Knowles, engr., Jones Law Bldg., Pittsburgh, to make study and submit sketches for water system to include filtration plant, pumping station and 7 mi. force mains.

Kan., Burns—City having plans prepared by F. E. Devlin, engr., El Dorado, building new waterworks system. About $27,500.

Kan., Canton—City plans to build waterworks plant. About $40,000.

Kan., Hillsboro—City plans to build waterworks and install sewers in various streets. About $150,000.

Kan., Hugoton—City plans election to vote on $60,000 bonds to build waterworks and electric light plant. Ruckel Engr. Co., Garden City, engrs.

Kan., Peabody—City plans to build new waterworks system. About $25,000.

N. D., Hankinson—City plans to build waterworks system. About $10,000.

Tex., Palestine—City voted $250,000 bonds to improve waterworks.

Tex., Tyler—See "Sewers."

Okla., Collinsville—City having plans prepared by Johnson & Benham, engrs., Firestone Bldg., Kansas City, Mo., for water purification plant. About $40,000.

Okla., Hartshorne—City having plans prepared by V. V. Long & Co., archts., 605 Capitol Bldg., Oklahoma, improving waterworks system. Bonds for $25,000 voted for project.

Ark., Paragould—City retained W. R. Heagler & Sons, engrs., Paragould, to prepare plans for waterworks system.

Waterworks (Continued)

Colo., Raymer—City having plans prepared by Rohrough Eng. Co., engrs., 929 City National Bang Bldg., Omaha, building new water works plant. About $28,000.

Idaho, Moscow—State having preliminary plans prepared diverting from 800,000 to 1,000,000 ft. waste water in Yellowstone Lake district, to upper Snake River Valley reservoirs, for irrigation. About $100,000. W. G. Swendsen, Boise, comr. recl.

Ore., Stanfield—City receives bids about Oct. 1, building water system, to include deep wells, steel tower, laying water mains and side pipes. Bonds for $30,000 voted for project.

Cal., Davis—City plans election to vote on $71,000 bonds to build waterworks system.

Cal., Lancaster—Los Angeles Co. Water Dist. No. 4, voted $30,250 bonds to build 75,000 gal steel tank on steel tower, pipe lines, pumping plant, wells and distributing system. Address A. M. McPherrin, clk. bd. supervs. Noted June 19.

Ont., London—City having plans prepared by H. A. Brazier, engr., City Hall, for 4,000,000 gal. reservoir, either rein.-con. covered or open earthen walled lined with concrete. About $200,000. Noted July 17.

Ont., Peterborough—City plans to build slow sand filters, on old Carnegie property, to have 4,000,000 gal. daily capacity. W. Parsons, City Hall, engr.

Ont., Windsor—City plans election to vote on $100,000 bylaw to lay 14,000 ft. 6-10 in. c.i. watermains in sections of Howard, Moy, Hall, Windsor and Shepherd Aves., Martin, Brant and Ottawa Sts. M. A. Brian, Windsor, engr.

BIDS DESIRED

Minn., Pipestone—Until Sept. 29, by W. Funk, city clk., extending water mains, building 150,000 gal. tank on 90 ft. tower, rein.-con. reservoir, 500,000 gal. capacity and pumping plant. About $76,000. L. P. Wolff, Guardian Life Bldg., St Paul, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Quincy**—See "Streets and Roads."

★**R. I., North Scituate**—Water Supply Bd., Providence, let contract building outlet works at Moswansicut Pond, 9 mi. west of Providence, near proposed Scituate reservoir, to G. T. Seabury, Inc., 44 Washington St., Providence, $6987. Noted Sept. 11.

N. Y., Wingdale—C. F. Rattigan, supt. prisons, Capitol, Albany, received bids Sept. 4, building dam, gate house, pipe line and filter plant, at Wingdale Prison, here from S. Deskin, Beacon, $202,691; Lupfer & Renick, Ellicott Sq., Buffalo, $234,962; Smith, Hauser & MacIsaac, 18 East 41st St., New York City, $243,500. Work involves 200 cu.yd. grubbing, 17,900 cu.yd. excav., 2300 cu.yd. embankment, 11,300 cu.yd. 2nd class concrete, 225 cu.yd. 1st class rein.-con., 9000 lb. structural steel, 14,200 lb. metal reinforcement, 135 ton c.i. pipe and specials, 3360 lin.ft. 6-24 in. c.i. pipe and specials, etc. Noted Aug. 28.

★**N. C., Wendell**—City let contract building deep well, steel tower and tank also laying 4 mi. 6 in watermains and 5 mi. 8-15 in. sewers, to Tucker & Laxton, Realty Bldg., Charlotte. About $90,000. Noted Aug. 28.

★**Minn., Duluth**—City let contract building rein.-con. reservoir, to G. H. Lounsberry, 322 East Superior St., $13,570. Noted Sept. 4.

★**Minn., Foley**—City let contract for 60,000 gal. steel tank pump, 1000 gal. per minute motor, to Pastoret Constr. Co., Lyceum Bldg., Duluth. About $40,000. Noted Feb. 20.

★**Okla., Covington**—City let contract building waterworks and sewerage systems, to Mackintosh Walton Co., 1022 State Nat'l. Bank Bldg., Oklahoma, cost plus percentage basis.

★**Ont., York**—Town let contracts laying 22,000 ft. 6 in. c.i. water mains in Mt. Dennis, Swansea and Oakwood Dists., to P. Iles, Toronto, $28,000; A. Cavotti, Toronto, $33,500. Murphy Contg. Co., 146 Shuler St., Toronto, $46,200.

Sewers

PROPOSED WORK

N. J., North Bergen—City having plans prepared by R. Gaw, engr., West Hoboken, for sewer in Paterson Turnpike. About $40,000.

Fla., West Palm Beach—See "Waterworks."

O., Dayton—See "Streets and Roads."

Wis., Ft. Atkinson—City soon lets contract excavating and laying 1.9 mi. sewers in Jackson St., involving 2625 ft. 8-12. in. vitr. pipe. Cost between $15,000 and $20,000. Private plans.

Wis., Janesville—Bd. Pub. Wks. soon lets contract furnishing labor and materials for laying sewers in Jackson St., Dist. No. 4, involving 460 lin.ft. 8 in. sewers, etc.; Mineral Point Ave., Center and Jackson Sts., Dist. No. 5, 1461 lin.ft. 8 in. sewers; Franklin St., Dist. No. 6, 1860 lin.ft. 8 in. sewers; Caroline St., Dist. No. 11, 450 lin ft. 8 in. sewers; East St. and Milwaukee Ave., Dist. No. 14, 1075 lin.ft. 8 in. sewers; Fremont St., Dist. No. 15, 700 lin ft. 8 in. sewers.

Kan., Emporia—City plans to build sewers in various streets. About $150,000.

Kan., Hillsboro—See "Waterworks."

Mont., Anaconda—Deerlodge Co. plans to build sanitary sewerage system. About $12,000.

Mont., Park City—City plans to install sewers in various streets. About $20,000. P. Hastings, Billings, engr.

Ark., Batesville — See "Streets and Roads."

Tex., San Antonio—City voted $500,000 bonds to build sanitary sewers in various streets. H. Helland, city engr. Noted July 10.

Tex., Tyler—City plans to extend sewerage and waterworks systems. About $20,000.

Ore., Portland—City Council adopted resolution to construct sewers, cement or vitr. pipe, lampholes, catchbasins, sewer service pipes and branches, 33 ft. east of Oregon and California R.R. near Lowell, cost, $1487; Lambert Ave., $2453; 51st St. S. E., from point 120 ft. south of Division St. to 27th Ave. S. E., $978; East 78th St. from Oregon to East Gilsan Sts., $1304; Malden Ave. from point 325 ft. east of East 39th St., $2332; East 2nd St., $2771. O. Laurgaard, city engr.

Cal., Oakland—See "Streets & Roads."

Ont., Belleville—City plans to build 4150 ft. vitr. tile sanitary sewers in Bridge St. About $13,900. J. G. Mill, Belleville, engr. Noted May 29.

Ont., Oxford Centre—City soon lets contract laying 5080 ft. 8-24 in. tile sewer drain in various streets. About $15,000. F. Ure, Woodstock, engr.

Sask., Lloydminster—Hospital Bd. plans to build sewage disposal plant. About $25,000.

BIDS DESIRED

Minn., Adrian—Until Sept. 30, by town building sewerage system, involving 23,243 lin.ft. tile, septic tank, sludge basin and accessories. About $40,000. Druar & Smith, Globe Bldg., St. Paul, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Chicopee**—City let contract laying vitr. pipe sewer in Exchange St., to Cordner & Montague, 373 Bay St., Springfield. About $37,500.

★**Pa., Hanover**—City let contract building sewer in East Washington St., to C. Rees, James St., $26,879.

★**W. Va., Martinsburg**—City let contract building sewage disposal plant and sewerage system in John King and cross streets, to H. C. Brooks Co., East Washington St., $50,331. Noted Sept. 11.

★**N. C., Wendell**—See "Waterworks."

★**Mich., Detroit**—City let contract to Lennane & McIlvenna, Book Bldg., building lateral sewer No. 3145, cost, $8950, No. 3147 $10,800; Detroit Contg. Co., 827 Ford Bldg., No. 3146, $7990; No. 3148, $8468; No. 3151, $8120; No. 3178, $11,220; N. Mancini, 256 Hague Ave., No. 3163, $4391; Liberty Constr. Co., Penobscot Bldg., No. 3172, $13,439; No. 3174, $8400. Noted Sept. 11.

★**Mich., Royal Oak**—Vinsetta Land Co. let contract furnishing labor and material building sewerage system and disposal plant, involving 2200 ft. 8-12 in. vitr. crock sewer, Imhoff tank ejectors, sprinkling filter, etc., to C. Tackels, 918 Dickenson Ave., Detroit. Noted Aug. 21.

★**Wis., Appleton**—City let contract laying sewers in College Ave., to H. L. Wilson, 861 Drew St., involving 660 ft. 15 in. pipe, $2.12 per ft., 663 ft. 12 in. pipe, $1.86, and 667 ft. 10 in. pipe, $1.69.

★**Neb., Omaha**—City let contract to J. Jensen, 2407 Wirt St., building 1075 ft. storm sewers in Railroad St. from Washington to Gilmore Sts., involving 75 ft. 12-24 in. vitr. clay pipe, and 1584 lb. c.i. pipe, etc., cost $17,920; 32,216 ft. storm sewers in Florence Twp., involving 28,386 ft. 8-24 in. vitr. clay pipe, 3920 ft. 2-3 ft. segment block, 102 manholes, 5 flush tanks, 58,976 lb. c.i. pipe, etc., $82,229. Noted Sept. 4.

★**Okla., Claremore**—City let contract building 1400 ft. 8 in. sewer in Main St., to Orings & Shoner, Miami. About $62,000.

★**Okla., Covington**—See "Waterworks."

★**Utah, Salt Lake City**—City let contract laying 5500 ft. 8 in. sewers in various streets in Gilmer Park, to J. L. Griffith, 2138 South 10th St. E., $23.884. Noted July 24.

Wash., Seattle—Bd. Pub. Wks. received bids Aug. 29, building sewer in 50th Ave. S., et al, involving manholes, flush tanks and 6762 ft. 8-15 in. sewer pipe, (a) clay (b) concrete, from S. A. Moceri, 1515 West Barrett St., (a) and (b), $27,667 each; Scalzo & Co., (a) $31,025, (b) $30,011; C. Christofaro Co., (a) $33,452, (b) $33,114. Contractors all of Seattle. Noted July 31.

Ore., Portland—City received bids building cement sewer, manholes, lampholes, catch-basins, sewer service pipes in (a) Bybee Ave. from 41st Ave. S. E. to Eastmoreland Ave., (b) Grand Ave. from Alberta St. to Wygant Ave., (c) Ogden Ave. from 41st St. S. E. to Eastmoreland Ave., (d) Glenwood Ave. and East 7th St., (e) East 63rd and Halsey Sts., (f) building concrete sidewalks and curbs on portions of 83rd and 84th Sts., 67th and 70th Aves., S. E., (1) vitr., (2) cement, from E. Sandberg, 74 East 24th St., N., (a) $2533, (c2) $2719, (d2) $1506; C. B. Braley, Portland, (a) $2766, (b1) $1179, (d2) $1654; Jacobsen-Jensen, 407 Stanton St., (a) $2830, (c) $2806, (e2) $187,038; S. Dyoub, (b1) $1157; J. Keating, Portland, (b1) $1120, (c2) $2820, (d2) 1780; J. F. Shea, 6 North 2nd St., (e1) $186,327; J. Babman, (f) $9718. Noted July 31 and Sept. 11.

★**Ont., Dundas**—City Council let contracts building sewers, also brick, concrete and steel sewage disposal plant, pumphouse, etc., to F. F. Fry, Toronto, $126,757 and $49,677 respectively; ejectors and piping, to J. Bertram & Sons Co., Dundas, $1500; air compressors, motors and air tank, to Smart-Turner Co., 191 Barton St. E., Hamilton, $2659; c.i. pipes and specials, to Gartshore Pipe & Fdry. Co., Stuart St. W., Hamilton, $2445; sprinkler equipment, valves, etc., in connection with sewage disposal plant, to F. Hankin Co., 20 St. Nicholas St., Montreal, Que., $6888; sewer pipe, to Hamilton & Toronto Sewer Pipe Co., Ltd., Wentworth St. N., Hamilton, $23,867; 3000 ft. 30 in. segmental block, to Toronto Pottery Co., Dominion Bank Bldg., Toronto, $10,175.

★**Ont., Oshawa**—Town let contract supplying and installing 20,000 ft. 8-24 in. vitr. tile sewers in various streets, to McKnight Constr. Co., 88 St. David St., Toronto., $27,880. Noted July 31.

Bridges

PROPOSED WORK

W. Va., Fayetteville—Fayette Co. rejected bids received Sept. 8, building four bridges, two 25 ft. spans over Laurel Creek and two 60 ft. spans over Paint Creek. About $13,000. Work will be readvertised. J. K. McGrath, Fayetteville, engr. Noted Sept. 4.

Wis., Green Bay—See "Streets & Roads."

B. C., Vancouver—City plans to submit by law to authorize expenditure of $160,000 bonds to reconstruct part of Connaught Bridge destroyed by fire, to include steel girders and wood decking, involving 100 tons steel. F. L. Fellowes, City Hall, engr.

Bridges (Continued)

BIDS DESIRED

N. C., Goldsboro—Until Sept. 29, by State Highway Comn., Raleigh, building 350 ft. rein.-con. bridge over Neuse River, here. About $40,000. W. S. Fallis, state highway engr.

N. C., Kinston—Until Oct. 6, by Comrs Lenoir Co., building 348 ft. steel bridge over Neuse River. About $20,000. R. R Eagle, Newbern, engr

Ga., Gainesville—Until Oct. 6, by Comrs. Rds. & Revenues, Hall Co., building steel bridge over Chattahoochee River, 4½ mi. west of Lula. T. L. Adderholdt, clk bd. Noted Sept. 4.

Wis., Appleton—Until Oct. 15, by City Clerk, building 515 ft. rein.-con. bridge with deck girder span and columns terminating in two abutments, over Fox River, 20 ft. wide with 6 ft. sidewalk Harrington. Howard & Ash, Orear-Leslie Bldg., Kansas City, Mo., engrs.

Minn., Moorhead—Until Oct. 1, by A. O. Houghum, aud. Clay Co., building Bridge No 3013 over South Buffalo River near Sabin on State Rd. No. 4, having five 30 ft. I-beam spans and rein.-con. approaches, also one 80 ft truss span with concrete floor, 5 rein.-con. piers and 2 rein.-con abutments including piles. About $14,000 E. Martinson, Moorhead, engr

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Quincy**—See "Streets and Roads."

★**N. J., Newark**—Erie R. R., 50 Church St., New York City, let contract building sub-structure for bascule bridge over Passaic River, to Linde & Griffith Co., 4th Ave.; super-structure, to A. McMullen, Doremus Ave. About $100,000.

★**Pa., Stewartstown**—York Co., (York) let contract building 178 ft. rein.-con arch bridge, 17 ft. wide, stone pier, to G. A. Wagman Bros., Dallastown. About $16,000.

★**Pa., Wilkes-Barre**—Comrs. Luzerne Co. let contract building 174 ft. steel bridge with 3 piers over Black Creek, 18 ft. wide, to G. W. Rockwell, Sunbury, $49,100.

★**O., Columbus**—Bd. Comrs. Franklin Co., let contracts to E. M. Scully, 1431 Eastwood Ave., building superstructure for Hayden Run Bridge over Hayden Run on Dublin Rd., 66 ft. long and 21 ft wide, cost $4700, bridge over North Fork of Indian Run on Brand Rd., 32 ft long 16 ft wide, $1600, bridge over North Fork of Indian Run, Washington Twp., 43 ft long 16 ft. wide, $2400, bridge over North Fork of Indian Run on Jerome Rd., 38 ft long 16 ft. wide, $1900; Columbus Sheet Metal Co., 75-77 West Lynn St., Taylor Bridge over Rocky Fork Creek on Taylor Pike, 45 ft. long, 18 ft. wide, $2595, bridge over Rocky Fork Creek, on Boehm Rd., 42 ft long, 18 ft. wide, $2515, Taylor Bridge over Rocky Fork Creek, at Lorenzo Taylor Farm 38 ft long, 18 ft wide, $2345, creosoted lumber and block floor on bridge over Black Lick Creek, on Reynoldsburg Pike, 106 ft long, 18 ft wide, $4790 Noted Aug. 28

★**Illinois**—Dept Pub Wks & Bldgs., Springfield, let contract building Mackinaw River Bridge, on Peoria Springfield Highway, Tazewell Co seven 50 ft concrete spans and one 170 ft steel span, 20 ft roadway, to Porter-McCully Constr. Co. About $63,800. Noted Sept 4

★**Ill., Burton**—Town, let contract building Coles Bridge, 16 ft wide, to Joliet Bridge & Constr Co., $8750 Noted Sept 11

★**Ill., Carlinville**—Macoupin Co. let contract to W. R. Cole, building Armor, Sauerwine, Sanders and Corbin bridges, Polk Twp. $13,859; to J. F. Miller, Loveless Bridge, South Otter Twp $640; to B Woolfolk, Edminston, Goshen No. 1, No 2 and Haven Bridges, Barr Twp $3398, Cline Bridge, Scottville Twp., $852; to Herrick Constr. Co., Kahn Bridge, Shipman Twp., $2367, Chiles and Rhodes Bridges, Polk Twp., $1867 Noted Aug. 21

★**Ill., Springfield**—E. White, Sangamon Co. Supt. of Highways, let contract to Miller & Husband, 302-3 Workman Bldg., building Glasser Bridge over Sugar Creek at Cotton Hill, one 63-ft. rein.-con. girder span, 16 ft. roadway, involving 221 ½ cu yd class "A" concrete, 32,350 lb reinforcing steel, 1106 lb. rockers and plates; also Crows Mill Bridge over Sugar Creek, three 55-ft. rein.-con. girder spans, 20 ft. roadway, Ball Twp., 627 cu yd. class "A" and 271.6 cu.yd. class "B" concrete, 108,080 lb. reinforcing steel and 3318 lb. rockers and plates. About $22,550.

★**Minn., Fergus Falls**—City let contract building 2 concrete bridges over Red River, one on Court St., other on Union Ave., to Iowa Bridge Co., 317 McKnight Bldg., Minneapolis, $99,150.

★**Minn., Minneapolis**—Comrs. Hennepin Co let contract building 800 ft. rein.-con and steel bridge, 24 ft wide, on Lyndale Ave., to W. S. Hewett, Metropolitan Bank Bldg., $193,878; 840 ft. bridge, 24 ft wide, over Minnesota River, on Cedar Ave., to Illinois Bridge Co., Gilfillan Blk., St. Paul, $144,940 Noted Sept. 11.

★**Tex., Clarksville**—Red River Co. let contracts furnishing structural and reinforcing steel for bridges on State Highway No. 35, known as "Choctaw Trail" involving 190,736 lbs. structural steel, $.0575 per lb. and 34,934 lbs. reinforcing steel $.045, to Austin Bros., 1815 Coombs St., Dallas, total cost, $12,515; 40,396 B. M and Oak flooring, to Norris & Smith, Dallas, $.0425 ft. B. M., $177. Work will be done by day labor with county forces

★**Okla., Inola**—Comrs. Rogers Co. (Claremore) let contract building steel bridge over Verdigris River, here, to Sullivan & Beecher, Wagoner. About $30,000

★**Okla., Sageeyah**—Comrs. Rogers Co (Claremore) let contract building steel bridge over Verdigris River, here, to Missouri Valley Bridge & Iron Wks., 4th and Walnut Sts., Leavenworth, Kan About $34,000.

★**Wash., Richmond** — State Highway Comn., Olympia, let contract building 190 ft. steel span bridge over Yakima River, between here and Kennewick, Benton Co., to Union Bridge Co., foot of Fenwick and Kenton Sts., Portland. About $45,000 Noted July 10

★**Wash., Spokane**—City let contract building 180 ft. concrete bridge, 35 ft. wide, with 5 ft. sidewalks, over Hangman Creek on West Riverside Ave., to C. A. McClung, Spokane, $23,499. Noted July 17

Oregon—State Highway Comn., Portland, received bids Sept. 9, building 3 bridges and 2 culverts on Amity-Holmes Gap Sect West Side Highway, Polk and Yamhill Counties, from A. D. Kern, foot of Mill St., Portland, $18,180; one 40 ft. rein con bridge over Crow Creek near Junction City, from Union Bridge Co., foot of Fenwick-Kenton Sts., Portland $6659 Noted Sept 18.

Oregon—State Highway Comn., Portland, received bids building rein.-con bridge over Sand Creek, Douglas Co., from Union Bridge Co., foot of Fenwick-Kenton Sts., $11,954, C. Gardner, $12,277; Baker Bros. $12,880. Contractors all of Portland Noted Sept 18.

Structural Steel

PROPOSED WORK

Pa., Wilkes-Barre—See "Buildings"

B. C., Vancouver—See "Bridges"

BIDS DESIRED

Ga., Gainesville—See "Bridges"

Ont., Oshawa—See "Industrial Works"

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Wilkes-Barre**—See "Bridges"

★**Ont., Kitchener**—See "Industrial Works."

Reinforced Concrete

PROPOSED WORK

Mich., Menominee—See "Industrial Works"

Ont., Ft. William—See "Industrial Works."

B. C., Vancouver—See "Buildings"

PRICES AND CONTRACTS AWARDED

★**Mass., New Bedford**—See "Industrial Works"

★**Ia., Manning**—See "Industrial Works"

Minn., Minneapolis—See "Bridges."

★**Ont., Hamilton** — See "Industrial Works."

Streets and Roads

PROPOSED WORK

N. Y., Eastwood—Village voted $75,000 bonds to pave principal streets

N. J., Bayonne—City soon lets contract improving Ave A from West 22nd to West 24th Sts., involving 3000 sq.yd. asphalt, 1200 cu.ft bluestone, curbing, 1500 cu yd. earth and 10 cu.yd. rock excav., cost, $110,000, Ave A from City Park to West 22nd St., 4000 sq.yd asphalt, 8000 sq.ft. new concrete flagging, 1300 cu.yd. earth and 20 cu.yd. rock excav., 1500 lin.ft. bluestone curbing, 10 sq.ft bluestone flag relaid, 100 lin.ft bluestone header, etc. $10,000.

N. J., Edgewater—Town having plans prepared improving River Rd by laying cushion of sand and granite blocks on 8 in. concrete base About $.00,000.

N. J., Newark—Bd. Freeholders Essex Co. soon receives bids repairing Center St., Avondale Rd., and East Passaic Ave., Nutley, also Bloomfield, Gregory and Central Aves., West Orange About $200,000.

Pa., Pittsburgh—City plans to grade, pave and curb McGinnis Ave., 24 ft. wide. Work involves 1,850 sq.yd vitr. brick, 1330 lin.ft. stone curbing and 2000 cu.yd. earth embankment About $12,000. Harrop & Hopkins, Home Trust Bldg., engrs.

W. Va., Grafton—Comrs. Taylor Co. plan to surface and drain 1.5 mi. Northwestern Turnpike, involving 6000 cu.yd. excav. and 11,733 sq.yd. concrete. About $40,360. J. A. Sincell, Grafton, engr.

W. Va., Warwood City voted $150,000 bonds to pave various streets. Kollar & Conrad, Schmulbach Bldg., Wheeling, engrs Noted July 24

W. Va., Webster Springs—Comrs. Webster Co. having plans prepared by J. W Hancock, engr., Webster Springs, building and draining 3 mi. Webster Springs-Point Mountain Rd., involving 27,000 cu.yd. excav. About $32,500. Federal Government has been asked to appropriate ½ of cost.

W. Va., Wheeling—See "Miscellaneous."

North Carolina—State Highway Comn., Raleigh, plans to gravel 28 mi. road between Craven Co. and Lenoir Co. lines, via Pollocksville and Trenton, Jones Co., cost $100,000, 12 mi road between Jones Co. and Pender Co lines, via Jacksonville, Onslow Co., $150,000, 25¼ mi. road from Pender Co. to New Hanover Co lines, Pender Co., $100,000, 5¼ mi. road, Yancey Co., $20,000; 29 mi road between Martin Co and Tyrrell Co. lines, via Plymouth, Washington Co., $100,000; 20 mi. road between Leechville bridge and Swan Quarter, Hyde Co., $75,000; 31 mi road between Virginia line and Alamance Co Caswell Co., $100,000; hard surface 1 mi. Smithfield Rd., Wake Co., $32,000, 6 mi. road, Davidson Co., $100,000, and 18 mi road between Edenton and Gates Co. line, Chowan Co., $500,000. W. S. Fallis, state highway engr.

N. C., Clinton—City plans to pave various city streets with asphalt Abount $150,000 Engineer not selected

Fla., West Palm Beach—See "Waterworks."

La., Crowley—Acadia Parish voted $300,000 bonds to build gravel roads in 4th and 7th wards.

O., Dayton—City plans election soon to vote on $1,750,000 bonds to improve section of 1st, 4th, Jefferson, Ludlow, Monument, Perry, St. Clair and Stratford, Wilkinson, Belmont Pass, Delaware, Grafton, East and West Harvard, Homewood, Marathon, River, Riverside, Drive, Richmond, Brandt, Troy, Webster, Valley, Dakota, Keowee, Germantown, Hopeland, Western, Cincinnati, 5th, 3rd, Washington, Brown, North and South, Main, 6th, East 3rd, St Paul, Wayne, Wesley, Xenia, Garland, Holly, Johnson, Kiser Court and Wilmington Sts. and Home Ave., also building sewers, Sewer Dist Nos. 8 and 10—Dayton View Relief Sewer Dist No. 9—Riverside Relief Sewer Dist No. 3—North Dayton Relief Sewer, Dist A—East Dayton Relief Sewer, C. E. Ekelberger, city engr.

Mich., Detroit—City soon lets contract paving Harper Ave from Van Dyke Ave to Gratiot Ct., 46 ft. wide, less double track, sprce sheet asphalt on concrete foundation Berea or Medina curbstone, involving 7918 cu.yd excav. 7,304 lin.ft curbstone, 13,828 sq.yd paving, 801 sq.yd granite, etc.; also paving 20 ft. 1 course concrete Alley No.

Streets and Roads (Continued)

1089 between Chene, Adele and Thombley Sts., 18 ft. wide, No. 1090 between Wilson, Byron and Longfellow Aves. and Chicago Blvd., 20 ft. wide, No. 1091 between Military, Cavalry, Cadet and Dix Aves., 20 ft. wide, No. 1092 between St. Aubin, Dubois, Forest and Hancock Aves., 18-20 ft. wide, No. 1093 between Woodward Ave., John R St., Marston Ct. and Mt. Vernon Ave. 20 ft. wide, No. 1094 between Grand Blvd., Field Ave., Theodore and Frederick Sts., 18 ft. wide, No. 1095 between Hamilton Blvd., 3rd St., Blaine and Gladstone Aves., 18 ft. wide, No. 1096 between Firwood, Allendale, Grand River and Pacific Aves., 20 ft. wide, No. 1097 between Pennsylvania, Cadillac, Kercheval and Waterloo Aves., 20 ft. wide, No. 1098 between Woodward Ave., John R St., Arden Park and Boston Blvd., 20 ft. wide, involving 4433 cu.yd. excav., 15,510 sq.yd. paving, 363 cu.yd. concrete, etc. C. W. Hubbell, city engr.

Illinois—D. O. Thomas, supt. highways, Springfield, receives bids about Oct. 15, paving and reconstructing Belleville-Freeburg Rd. between Belleville and Illinois Central R.R. tracks, 24 ft. wide, bituminous concrete and bituminous macadam. About $40,000.

Wis., Green Bay—Bd. Supervs. Brown Co. adopted $290,000 bond issue to build highways and three concrete bridges.

Wis., Madison—Dane Co. plans to issue $10,000,000 bonds to build and improve new highways, preferably concrete. A. R. Hirst, c/o State Highway Dept., engr.

Wis., Racine—Racine Co. voted $2,350,000 bonds to build concrete roads.

Wis., Shorewood—City plans to grade and pave 2.1 mi. Larkin St. and Shorewood Ave., 16-18 ft. wide, involving 7500 sq.yd. concrete. About $15,000. F. W. Ullins, 1228 Murray Ave. engr.

Minn., Bemidji—Comrs. Beltrami Co. rejected bids received Sept. 2, clearing, grubbing, grading, ditching and improving 4½ mi. State Rd. No. 11, Job No. 1903, Co. Rd. No. 123, Job No. 1907, Co. Rd. No. 16 and 24, Job No. 1914, Co. Rd. No. 15, Job No. 1904, Co. Rd. No. 113, Job No. 1905. Work will be readvertised in spring. About $26,000. S. D. Snyder, Bemidji, engr. Noted Aug. 28.

Minn., Duluth—City soon receives bids paving 52 blocks London Rd. from 8th Ave. E. to 60th Ave. E., 18 ft. wide, asphalt or bithulitic, cost, $152,460; 5 blocks Raleigh St. from Central to Grand Ave., 42 ft. wide, asphalt or concrete, $78,941. J. A. Farreh, comr.

Minn., Fairmont—L. Mischke, city clk., soon lets contract for 2200 ft. earth road in Sect. 24 at Rose Lake bridge, involving 2552 yd. excav., 612 ft. overhaul and 466 yd. turnpike. About $20,000. G. A. Taber, Fairmont, engr.

Kan., Anthony—City having plans prepared by C. C. Eastham, engr., Anthony, paving 10 blocks North and South Kansas, South Bluff and North Franklin Sts.

Montana—State Highway Comn., Helena, plans to gravel surface 29 mi. Sun River-Choteau Rd. (continuation of Sun River Rd.), Teton Co., cost $116,000; grade 19 mi. Great Falls-Lewiston Rd., Fergus Co., $65,000; pave 11 mi. Anaconda-Butte Rd., Deer Lodge Co., $300,000; grade 23 mi. Hilger-Roy Rd., Fergus Co., $80,000. Federal Government has been asked to appropriate toward cost. J. N. Edy, Helena, engr.

Mont., Missoula—Missoula Co. voted $250,000 bonds to build roads.

Mo., Bloomfield—Stoddard Co. soon receives bids building 6 mi. hardsurfaced roads, 15 ft. wide, Castor Twp. About $95,000.

Mo., Maplewood (St. Louis P. O.)—G. D. Komar, city clk., soon lets contract paving, grading and improving St. Elmo St. from Commonwealth to Manhattan Aves. and from Cambridge to Greenwood Aves. About $50,000. W. Elbring, Clayton engr.

Mo., Potosi—H. C. Bell, city clk., soon receives bids building Potosi Highway through Belgrade Twp. About $25,000. J. P. Townsend Potosi, engr.

Mo., St. Louis—Bd. Pub. Serv. soon receives bids building alley from Colorado St. to Louisiana Ave. between Wilmington Ave. and Dover Pl., alley from Rebecca to Kookuk Aves. between Grand and Giles Aves., and alley from Geyer to Lafayette Aves. between Jefferson and Texas Aves. About $100,000. C. E. Smith, city engr.

Mo., Webster Groves (St. Louis P. O.)—City soon receives bids paving 2200 ft. Clark Ave. from Summit to Yeatman Aves. Former bids rejected. R. L. Wilson, clk. Noted July 24.

Ark., Batesville—City having plans prepared by W. R. Heagler & Sons, engrs., Paragould, grading, paving, building curbs, gutters and storm sewers in 9 mi. various streets.

Tex., Beaumont—Jefferson Co. plans to pave and drain 3.99 mi. Highway No. 8, known as Beaumont-Pt. Arthur Rd., 16 ft. wide, concrete with 2 in. asphalt top. About $150,480. D. R. Thornton, Beaumont, engr.

Tex., Caldwell—Burleson Co. election Oct. 18, to vote on $1,000,000 bonds to build State Highways Nos. 3 B, 21 and 36. W. M. Hilliard, co. judge.

Tex., Ft. Worth—Tarrant Co. plans to gravel surface and build 300 mi. roads, 17 mi. concrete and 200 mi. gravel, 16-20 ft. wide. About $3,650,000. Noted Aug. 7.

Tex., Granbury—Hood Co. plans to build 30 mi. sand gravel surfaced roads, also bridges and culverts. About $210,000. H. E. Firman, Granbury, engr.

Tex., Hemphill—Sabine Co. plans to iron ore gravel surface and build rein.-con. drainage structures on 13.69 mi. Highway No. 8A from here to Geneva, 15 ft. wide. About $119,088. L. Acker, Nacogdoches, engr.

Tex., Karnes City—Karnes Co. plans election to vote on $300,000 bonds to build 12 mi. King Trail Highway, Kenedy Rd. Dist.

Tex., Menard—Menard Co. plans election to vote on $100,000 bonds to build roads. J. D. Scruggs, co. judge.

Tex., Paducah—Cottle Co. voted $200,000 bonds to build roads. W. J. Arrington, co. judge.

Tex., Waco—McLennan Co. plans to surface 5.3 mi. Highway No. 7 from here to Tehuacana, bituminous topping, involving 23,320 gal. material, 46,640 sq.yd. cover material, 4000 cu.yd. excav. and 2000 cu. yd. shoulder gravel. About $17,500. M. Hannah, Waco, engr.

Okla., Bristow—City having plans prepared by D. W. Tatershall, engr., Bristow, paving 1800 sq.yd. Main St., concrete. About $60,000.

Oregon—State Highway Comn., Salem, plans to macadamize 7 mi. Redmond-Bend Sect. The Dalles-California Highway, providing Deschutes Co. does the grading. About $175,000 and $60,000 respectively. H. Nunn, state highway engr.

Ore., Albany—City plans to grade and pave roadway of Salem Rd., also grade, drain and pave 1st St. About $10,000. L. G. Lewelling recdr.

Ore., Astoria—City Council adopted resolution to pave, grade and build sidewalks on Floral Ave. from Columbia to Alameda Sts., 24 ft. wide concrete, grading and paving 14th St. from Duane to Commercial Sts., Exchange St. from 10th to 13th Sts., 13th St. from Exchange to Duane Sts. and Duane St. from 13th to 14th Sts. Cost to exceed $20,000. E. G. Gearhart, city aud.

Ore., Pendleton—City Council adopted resolution to pave, drain, level and curb, Garfield St. from Jackson to Martin Sts. and Lincoln St. from Riley to Jackson Sts., concrete or asphaltic concrete. Cost to exceed $10,000. F. B. Hays, city engr.

Ore., Pendleton—Umatilla Co., plans to grade, drain and gravel 6 mi. Freewater-Umapine Rd., cost $35,000; 11 mi. Pendleton-Pilot Rock Rd., $70,000; 10 mi. Havana-Helix Rd., $90,000. R. E. Phelps, co. engr.

Ore., Portland—City having preliminary plans made for eliminating curve in Fairmount Blvd. near Portland Ry., Light & Power Co.'s track, and making straight course by placing roadway under track. Work will consist of grading, paving and tunneling. Cost to be borne by city, Multonomah Co. and Portland Ry. Light & Power Co. About $25,000. O. Laurgaard, city engr.

Ore., Portland—City Council adopted resolution to grade, pave, drain, build sidewalks and curbs on Hodge St., et al, cost $5911 and East 53rd St. from East Stark to East Gilsan Sts., $5924. O. Laurgaard, city engr.

Ore., Prineville—Crook Co. plans election to vote on $120,000 bonds to build and surface road connecting with State Highways and links between roads receiving Federal aid.

Ore., The Dalles—City Council soon lets separate contracts paving East Link Dalles City-Columbia River Highway, standard bitulithic redress on macadam base requiring 4000 sq. yd. bitulithic and 4200 cu.yd. excav.; East Link Dalles City-Columbia River Highway, engineers station 0 plus 00 to 4 plus 00, requiring 1008 cu.yd. rubble masonry, 150 sq.yd. slope walls and 425 cu.yd. excav. P. W. Marx, city engr.

Cal., Oakland—City having plans prepared by M. Campbell, engr., City Hall, improving Hopkins, Kanning and Kansas Sts., 35th and 38th Aves., involving 73,120 sq.ft. grading, 3354 sq.ft. regrading, 3428 lin.ft. concrete curbing, 9919 sq.ft. concrete gutter, 7395 sq.yd. oil macadam paving, 1057 lin.ft. 10-18 in. sewer pipe, culverts, etc.

Ont., Belleville—City having plans prepared by J. G. Mill, engr., Belleville, for 2100 sq.yd. asphaltic concrete and 1600 lin.ft. concrete curbing and guttering. About $13,000.

Ont., Ft. William—Dept. Pub. Wks., Ottawa, plans to improve 130 mi. trunk roads in Thunder Bay Dist. and from here to Nipigon, 16-20 ft. wide, macadam. About $115,000. R. De B. Corriveau, c/o Dept. Pub. Wks., engr.

Ont., Windsor—City Council plans to build 22,000 ft. concrete sidewalks, 4-6 ft. wide on sections of Dufferin Pl., Gladstone, Moy, Hall, Langlois, Janet, Louis, Cameron and McKay Aves., Benjamin, Huron, Ottawa, Goyeau, Pine and Ontario Sts. About $30,000. M. A. Brian, Windsor, engr.

BIDS DESIRED

N. Y., Brooklyn—Until Oct. 1, by E. Riegelmann, boro pres., regulating and paving with permanent asphalt on 6 in. concrete foundation, roadway of 86th St. from 22nd Ave. to Bay 37th St.

N. Y., Long Island City—Until Sept 30, by M. E. Connolly, pres. Queens Boro., regulating and repaving with sheet asphalt on concrete foundation between curbs and outside rail, on Jackson Ave. from Bridge Plaza to 2nd Ave., 1st Ward, regulating and grading sidewalks and gutter spaces and laying sidewalks on Chaffee St. from Hughes St. to Chaffe Pl., 2nd Ward, east side 149th St. from Sanford to Beach Aves., 3rd Ward, northerly side of Wayne St. from Griffith to Morton Aves., 2nd Ward, regulating, grading and laying gutters from Queens Blvd. to Skillman Ave. and curbing and flagging, from Queens Blvd. to Skillman Ave. on westerly side and to Foster Ave. on easterly side, Lowery St., 1st Ward, regulating, grading, curbing and laying sidewalks and gutters on Broad St. from Clinton Ave. to Grand St., 2nd Ward.

N. J., Trenton—Until Sept. 30, by Bd. Freeholders Mercer Co., repairing 8211 sq.yd. East Clinton Ave. or Norringham Way from Pennsylvania R. R. to Greenwood Ave., involving 8211 sq.yd. sheet asphalt, and 1078 sq.yd. Hillside brick. About $50,000. H. F. Harris, co. engr.

Pa., Ebensburg—Until Oct 3, by Supervs. Barr. Twp., c/o Cambria Co., furnishing labor and materials for building 1.5 mi. Barr Twp. Rd., 20 ft. wide, concrete on 5 in. base. About $70,000. C. E. Schlicher, Spanger, engr.

Pa., Waynesburg—Until Oct. 4, by Comrs. Greene Co., laying 5280 lin.ft. rein.-con. and vitr. brick pavement, 16 ft. wide, in Franklin and Center Twps. Address D. Six, G. Moore and J. S. Johnson, co. comrs.

Pa., Wilkinsburg—City receiving bids repaving Hill Ave. from Swissvale Ave. to Montier St., Ross Ave. from Wood St. to Centre Ave., Hay St. to end of present pavement. Work involves 3704 sq.yd. vitr. brick, 2733 sq.yd. wood block or vitr. brick on 8 in. concrete base, 3500 lin.ft. stone curbing and 1000 cu.yd. old brick and foundation; also building rein.-con. arched culvert to cover portion of Nine Mile Run from Coal to Ross Sts., 70 lin.ft. in 7 ft. section and 196 lin.ft. in 10 ft. section Frease & Sperling, Wilkinsburg, engrs.

Maryland—Until Sept. 30, by State Rds. Comn., 601 Garrett Bldg., Baltimore, building .75 mi. Defense Highway between Camp Parole and Chesterfield, Federal Aid Project No. 28, Contr. AA-12, and .59

Streets and Roads (Continued)

mi. highway between Benfield and Seven Cross Rds., Federal Aid No. 36, Contr. AA-16, concrete, Anne Arundel Co.; 2 mi. highway from Boonsboro to Keedysville, Federal Aid Project No. 35, Contr. W-17, concrete or asphalt, Washington Co.; 5.86 mi. highway from Great Mills to Millstone Landing, Federal Aid Project No. 32, Contr. SM-12, gravel, St. Mary's Co. F. H. Zouck, chn.; advertised in this issue.

Va., Petersburg—Until Oct. 3, by Street Comn., improving Boilingbrook St., involving 5000 sq.yd. concrete paving, 2200 ft. steel bound concrete curb and 1800 sq.yd. concrete sidewalk. R. D. Budd, city engr.

W. Va., Wayne—Until Oct 6, by Comrs. Wayne Co., grading and draining 1 mi. Wayne-Kenova Rd., 24 ft. wide, near Kenova. About $14,000. H. A. Levering, Ceredo, engr.

N. C., Goldsboro—Until Oct. 9, by city, improving Main St., involving 100,000 sq.yd. pavement, 55,000 lin.ft. combined curb and gutter and 5000 sq.yd. sidewalks. About $300,000. J. L. Ludlow, Winston-Salem, engrs. Noted July 31.

Ga., Monroe—Until Oct. 1, by Comrs. Rds. & Revenues Walton Co., building 8.2 mi. top soil road from here to Jersey. Work involves 3.5 acres clearing and grubbing, 730 lin.ft. 12-24 in. culvert, 132 lin.ft. 30-36 in. segment block culvert, 270 lin.ft. 12-18 in. galvanized corrugated iron culvert, 59 cu.yd. class A concrete box culvert, 117 cu.yd. Class B concrete headwalls, 51,600 cu.yd. excav., 3500 cu.yd overhaul, 17,500 cu.yd. top soil surfacing and 5600 lb. rein. steel. T. C. Aycock, chm.

Fla., Sanford—Until Oct. 6, by Comrs. Seminole Co., grading, paving, building bridges and culverts on 6200 ft. Roadway No. 1, Rands Siding; 5420 ft. Roadway No. 2, Orange Blvd.; 35,000 ft. Roadway No. 3, Chuluota Rd.; 6954 ft. Roadway No. 4, Geneva Rd.; 40,000 ft. Roadway No. 5, Paola Rd.; 13,530 ft. Roadway No. 6, Cameron Ave. and Moore's Rd.; 2160 ft. Roadway No. 7, road along west limits of city; 8600 ft. Roadway No. 8, Sanford Ave.; 1590 ft. Roadway No. 9, Richmond Ave.; 1300 ft. Roadway No. 10, Brisson Ave.; 1300 ft. Roadway No. 11, Sipes Ave.; 44,970 ft. Roadway No. 12, Geneva-Oviedo Rd. and 9775 Roadway No. 13, French Ave. and Cemetery; alternate bids will be received on brick, concrete, asphalt, bituminous, surface treated or waterbound macadam or shell. Williams & Collier, of Sanford, and G. R. Ramsey, Orlando, engrs.

Tenn., Morristown—Until Sept. 30, by city, paving, draining, excavating and building sidewalks on 40,000 sq.yd. main streets. About $175,000.

Minn., Duluth—Until Feb. 1, by J. A. Farrell, city comr., paving 3350 ft. Raleigh St. from Central to Grand Aves., 42 ft. wide, involving 168,000 sq.yd. concrete paving, cost, $78,941; 9500 ft. Grand Ave. from 59th to 84th Aves., W., 18 and 42 ft. wide, 37,150 sq.yd. concrete, 19,000 lin.ft. concrete curbing and 12,000 cu.yd. earth excav., $157,580; 25,700 ft. London Rd. from 8th Ave., E., to 60th Ave., 18 ft. wide, 10,000 sq.yd. concrete and 4300 cu.yd. earth excav., $152,460. E. K. Coe, city engr.

Minn., Le Sueur Center—Until Oct. 7, by S. McMillan, aud. Le Sueur Co., improving State Rd. No. 5, Federal Aid Project No. 89, involving 10 acres clearing, 95,000 cu.yd. grading, 175,000 cu.yd. overhaul, 52,020 lin.ft. tile drain, 237,000 sq.yd. paving, culverts etc. About $100,000. R. F. Nichols, Le Sueur Center, engr.

Kan., Kansas City—Until Oct. 4, by Comrs. Wyandotte Co. grading, paving and building culverts on 1¼ mi. road, 16 ft. wide. O. K. Williamson, co. engr.

Mo., Charleston—Until Oct. 1, by Mississippi County Court, grading, draining, paving and building culverts on 15.3 mi. Poplar Bluff-Cairo Rd. from Charleston to Bird's Point, 16 ft. wide, earth shoulders, involving 142,666 cu.yd. 2 course concrete on concrete base, 8 in. center and 6 in. sides, cost $462,603, also one 10 ft. and one 60 ft. steel span bridge, concrete abutments, etc., $14,096, total cost, $476,788. Noted Sept. 18.

Mo., Clayton—Until Oct. 1, by St. Louis Co., grading and paving Kirkham Rd. from Berry to Collins Rds., waterbound macadam on Telford base. W. Elbring, Clayton, engr.

SEWERAGE SYSTEM—SOUTH CHARLESTON, W. VA.

Bids were received by city, Aug. 15th for constructing sewerage system, from (A) H. J. McNichols Co., 924 South Kilbourne Ave., Chicago, (awarded contract); (B) W. J. Weakland, Charleston; (C) Reed, Lapsley & Hurley, South Charleston. The unit bids were as follows:

	A	B	C
970 ft. 8-in. vitrified sewer in 2 to 4 ft. cut	$1.30	$0.85	$0.96
1,980 ft. 8-in. vitrified sewer in 4 to 6 ft. cut	1.30	1.10	1.14
18,350 ft. 8-in. vitrified sewer in 6 to 8 ft. cut	1.30	1.20	1.36
4,940 ft. 8-in. vitrified sewer in 8 to 10 ft. cut	1.30	1.47	1.75
700 ft. 8-in. vitrified sewer in 10 to 12 ft. cut	1.30	1.70	2.02
365 ft. 8-in. vitrified sewer in 12 to 14 ft. cut	1.40	2.50	2.29
620 ft. 8-in. vitrified sewer in 14 to 16 ft. cut	1.40	3.25	2.62
600 ft. 10-in. vitrified sewer in 2 to 4 ft. cut	1.25	1.15	1.14
100 ft. 10-in. vitrified sewer in 4 to 6 ft. cut	1.25	1.30	1.42
2,800 ft. 8-in. vitrified sewer in 6 to 8 ft. cut	1.25	1.50	1.58
1,980 ft. 8-in. vitrified sewer in 8 to 10 ft. cut	1.25	1.90	2.02
280 ft. 8-in. vitrified sewer in 10 to 12 ft. cut	1.25	2.20	2.20
160 ft. 8-in. vitrified sewer in 12 to 14 ft. cut	1.75	2.70	2.35
100 ft. 8-in. vitrified sewer in 14 to 16 ft. cut	1.75	3.00	2.67
130 ft. 8-in. vitrified sewer in 16 to 18 ft. cut	1.75	3.50	3.20
130 ft. 8-in. vitrified sewer in 18 to 20 ft. cut	2.25	4.00	4.64
60 ft. 8-in. vitrified sewer in 20 to 22 ft. cut	2.25	6.00	7.17
200 ft. 12-in. vitrified sewer in 4 to 6 ft. cut	1.50	1.25	1.42
2,125 ft. 12-in. vitrified sewer in 6 to 8 ft. cut	1.50	1.90	1.97
1,010 ft. 12-in. vitrified sewer in 8 to 10 ft. cut	1.50	2.25	2.29
430 ft. 12-in. vitrified sewer in 10 to 12 ft. cut	1.50	2.55	2.57
30 ft. 15-in. vitrified sewer in 4 to 6 ft. cut	1.75	1.70	1.75
360 ft. 15-in. vitrified sewer in 6 to 8 ft. cut	1.75	2.10	2.14
340 ft. 15-in. vitrified sewer in 8 to 10 ft. cut	1.75	2.40	2.41
270 ft. 15-in. vitrified sewer in 10 to 12 ft. cut	1.75	2.80	2.74
70 ft. 18-in. vitrified sewer in 6 to 8 ft. cut	2.50	2.75	2.65
910 ft. 18-in. vitrified sewer in 8 to 10 ft. cut	2.50	3.20	2.75
20 ft. 18-in. vitrified sewer in 10 to 12 ft. cut	2.50	3.50	2.90
150 ft. 18-in. vitrified sewer in 12 to 14 ft. cut	2.50	4.00	3.15
130 ft. 18-in. vitrified sewer in 14 to 16 ft. cut	3.65	4.15	3.50
190 ft. 18-in. vitrified sewer in 16 to 18 ft. cut	3.65	4.25	3.90
250 ft. 18-in. vitrified sewer in 18 to 20 ft. cut	3.65	4.50	4.40
190 ft. 18-in. vitrified sewer in 20 to 22 ft. cut	3.65	5.75	5.95
80 ft. 20-in. vitrified sewer in 4 to 6 ft. cut	3.00	2.50	2.29
130 ft. 20-in. vitrified sewer in 6 to 8 ft. cut	3.00	2.75	2.68
180 ft. 20-in. vitrified sewer in 8 to 10 ft. cut	3.00	3.00	2.96
140 ft. 20-in. vitrified sewer in 10 to 12 ft. cut	3.00	3.25	3.29
80 ft. 20-in. vitrified sewer in 12 to 14 ft. cut	3.00	3.50	3.86
405 ft. 20-in. vitrified sewer in 14 to 16 ft. cut	3.00	4.30	4.52
160 ft. 24-in. vitrified sewer in 6 to 8 ft. cut	3.75	3.50	3.67
170 ft. 24-in. vitrified sewer in 8 to 10 ft. cut	3.75	3.80	3.9
20 ft. 24-in. vitrified sewer in 10 to 12 ft. cut	3.75	4.15	4.2
310 ft. 27-in. vitrified sewer in 6 to 8 ft. cut	5.00	4.75	4.85
20 ft. 27-in. vitrified sewer in 8 to 10 ft. cut	5.00	5.00	5.16
40 ft. 30-in. vitrified pipe sewer in 2 to 4 ft. cut	5.50	3.75	4.00
340 ft. 30-in. vitrified pipe sewer in 4 to 6 ft. cut	5.50	3.75	4.25
140 ft. 30-in. vitrified pipe sewer in 6 to 8 ft. cut	5.50	4.00	4.65
200 ft. 30-in. vitrified pipe sewer in 8 to 10 ft. cut	5.50	4.50	4.90
20 ft. 33-in. segmental tile sewer in 6 to 8 ft. cut	8.00	7.25	7.27
90 ft. 33-in. segmental tile sewer in 8 to 10 ft. cut	8.00	7.50	7.66
560 ft. 33-in. segmental tile sewer in 10 to 12 ft. cut	8.00	7.80	7.93
170 ft. 33-in. segmental tile sewer in 12 to 14 ft. cut	8.00	8.00	8.21
230 ft. 33-in. segmental tile sewer in 14 to 16 ft. cut	9.00	8.60	8.70
410 ft. 33-in. segmental tile sewer in 16 to 18 ft. cut	9.00	10.00	10.15
200 ft. 33-in. segmental tile sewer in 18 to 20 ft. cut	9.00	10.50	10.70
120 ft. 42-in. segmental tile sewer in 8 to 10 ft. cut	12.00	9.00	8.86
1,020 ft. 42-in. segmental tile sewer in 10 to 12 ft. cut	12.00	9.15	9.14
100 ft. 42-in. segmental tile sewer in 12 to 14 ft. cut	12.00	9.25	9.42
200 ft. 42-in. segmental tile sewer in 14 to 16 ft. cut	12.00	9.50	9.69
375 6-in. house inlets on 8-in. sewer	1.00	2.20	2.22
70 6-in. house inlets on 10-in. sewer	1.50	2.50	2.49
20 6-in. house inlets on 12-in. sewer	1.90	2.65	2.92
5 6-in. house inlets on 15-in. sewer	2.90	3.35	3.47
15 6-in. house inlets on 18-in. sewer	4.00	4.50	4.47
15 6-in. house inlets on 20-in. sewer	4.80	5.00	5.11
2 6-in. house inlets on 24-in. sewer	7.25	7.00	6.76
2 6-in. house inlets on 27-in. sewer	13.00	17.50	17.85
2 6-in. house inlets on 30-in. sewer	14.50	18.00	18.50
5 6-in. house inlets on 33-in. sewer	1.00	5.00	1.25
5 6-in. house inlets on 42-in. sewer	1.00	5.00	1.25
500 cu.yd. rock excavation	5.00	7.00	7.00
1,000 lb. reinforcing steel	.10	.05	.05
East River outlet, material and construction (lump sum)	3,500.00	4,000.00	3,875.80
West River outlet, material and construction (lump sum)	6,000.00	4,500.00	5,450.00
3 crossings under C. O. R. R. tracks (lump sum)	1,750.00	1,500.00	1,109.60
50M. ft. sheeting, left in place	50.00	50.00	50.00
5M. ft. plank foundation, left in place	50.00	50.00	75.00
1,500 ft. brick or concrete manhole construction	10.00	10.00	10.50
200 cu.yd. earth excavation	.75	.75	.75
5 cu.yd. Class A concrete	12.00	17.50	12.00
20 cu.yd. Class B concrete	10.00	15.00	10.00
5 cu.yd. brick work	12.00	15.00	15.00
Extended totals	$135,276	$140,628	$141,831

Mo., St. Louis—Until Oct. 7, by Bd. Pub. Serv., building granitoid sidewalks on both sides of California St. from Osceola to Chariton St. from Bway. to Nebraska St., Grand Ave. from Eichelberger to Neosho Aves., 6 ft. wide; California St. from Chariton to Meramec Sts., Beethoven St. from Gravois to Morganford Rds., Delor Ave. from Alaska to Grand Aves., Austria Ave. from Helvetia Ave. to Gravois Rd., 5 ft. wide; one side Nagel Ave. from Gravois Rd. to Brunswick Ave., 4 ft. wide. C. E. Smith, city engr.

Arkansas—Until Oct. 1, by State Highway Dept., Little Rock, paving 25 mi. road in Morrillton Special Rd. Dist., involving 125,000 sq.yd. pavement. About $500,000. Harrington, Howard & Ash, Orear-Leslie Bldg., Kansas City, Mo., engrs.

Ark., Batesville—Until Sept. 29, by Comrs. Road Improv. Dist. No. 2, Independence Co., building 36.7 mi. waterbound macadam and gravel roads, involving 51 acres clearing and grubbing, 31,400 cu.yd. excav., 2427 lin.ft. 12-36 in. pipe culverts, 1020 cu.yd. concrete bridges, piers, abutments, etc. Dickinson & Watkins, Batesville, engrs.

Ark., Batesville—Until Sept. 29, by Comrs. Road Improv. Dist. No. 1, Independence Co., building 29 mi. gravel road, involving 10 acres clearing and grubbing, 2740 lin.ft. 12-36 in. pipe, 35,168 cu.yd. excav., 262 cu.yd. concrete, 61 lin.ft. 1 beam and 315 lin.ft. timber bridges. Dickinson & Watkins, Batesville, engrs.

Tex., Dallas—Until Oct. 6, by C. E. Gross, aud. Dallas Co., grading 11.5 Dal-

Streets and Roads (Continued)

las-Denton Rd., State Highway No. 40, from here to Carrollton.

Tex., Ranger—Until Oct. 2, by M. A. Turner, city mgr., furnishing labor and material for construction of 1400 sq.yd. pavement, 26,000 cu.yd. excav. and 37,000 lin.ft. combined curb and gutter. Elrod Co., 209½ Lane St., Dallas, engrs.

Tex., San Antonio—Until Oct. 2, by F. Fries, city clk., paving 10th St. from Ave. C. to Austin St., bitulithic, bituminous trap rock or asphalt.

Okla., Collinsville—Until Oct. 13, Bd. City Comrs., paving 25 blocks with asphaltic concrete, brick blocks or rein.-con About $150,000. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs. Noted Sept. 18.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—State Highway Comn., Boston, let contract building 5½ mi. Shelburne Mountain Highway, 18 ft. wide, Greenfield Twp., to Coleman Bros., Chelsea, $253,808. Work involves 9400 cu.yd. concrete, 43,510 cu.yd. earth and 9560 cu.yd. rock excav.

★**Mass., Quincy** — Metropolitan Park Comn., Boston, let contract building Furnace Brook Parkway, here, 18-22 ft. wide, to Coleman Bros., Chelsea, $33,399. Work involves 265 lin.ft. stone guttering, 15,000 cu.yd. rock excav., 2030 ft. 10-12 in. vitr. pipe, 2 rein.-con. culverts. Noted Jan. 16.

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres., let contract to C. A. Meyers, foot of Stagg St., regulating and grading Cleveland St. from New Lots Rd. to Hegeman Ave., $5960, regulating, curbing and laying sidewalks on Cleveland St. from New Lots Rd. to Hegeman Ave., $3377; to L. Mangieri, 190-31st St., West 11th St., $5242; to Consolidated Asphalt. Paving Co., 52-9th St., regulating, curbing and paving, Colonial Rd. from 76th to 77th Sts., $6089, regulating and paving Colonial Rd. from 85th to 86th Sts., $7186, New Utrecht Ave., $4603, 20th Ave., $6567; to C. Gallagher, 66th St., $1403, West 11th St., $4047; to Sicilian Asphalt Paving Co., 41 Park Row, New York City, 66th St. from 19th to 20th Aves., $12,450. Noted Sept. 11.

★**N. Y., Brooklyn**—Park Bd., Municipal Bldg., New York City, let contract furnishing material and labor for improving Park Circle, to Uvalde Asphalt Paving Co., 1 Bway., New York City, $27,603; East Drive, to Consolidated Asphalt Paving Co., 59-9th St., $127,195; sidewalks, to M. J. Rooney, 126 West 90th St., New York City, $1411. Noted Sept. 4.

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contract regulating and repaving Hillside Ave. sheet asphalt on broken stone macadam base, to Union Paving Co., Bway. and 112th St., New York City, $151,376. Noted Sept. 4.

★**N. Y., Phoenix**—Bd. Trustees let contract paving Bridge St., involving 3350 sq.yd. asphaltic concrete surfacing, 6000 sq.yd. concrete or asphaltic concrete pavement, 2650 lin.ft. curbing and guttering to Lane Constr. Co., 37 Colony St., Meriden, Conn. Noted Sept. 11.

★**New Jersey**—State Highway Comn., Broad St. Bank Bldg., Trenton, let contract to M. I. Demarest, Seawarren, building 3865 sq.yd. State Highway Route No. 1, Sect. 1A, Metuchen Twp., Middlesex Co., $34,996; to Sampson & Reuter, Elizabeth, 11 mi. Absecon-Egg Harbor Rd., Route 8, 18 ft. wide, Atlantic Co., both concrete, $404,000. Noted Sept. 18.

★**N. J., Jersey City**—Bd. Freeholders Hudson Co. let contract repaving part of Belleville Turnpike, to Osborn-Marselles Co., Upper Montclair. About $25,000. Noted Aug. 21.

N. J., Trenton Junction (Trenton P. O.)—City received bids Sept. 15, building gutters, sidewalks and curbs on 1 mi. Grand Ave., from Natl. Constr. Co., Trenton, $10,784; A. Gibbs, 411 Liberty St., $12,310; R. B. Newton, 1239 Greenwood Ave., $14,172.

★**Pennsylvania** — State Highway Dept., Harrisburg, let contracts building 23,246 ft. rein.-con. and Hillside vitr. brick road in Adams Co., to G. Merdinger, Wilbut Trust Bldg., South Bethlehem, $179,156; 16,129 ft. rein.-con., Lehigh and Lower Towamensing Twps., Bowmanstown Boro., Northampton and Carbon Counties, to J. E. Sheridan, Jr., Commercial Trust Bldg., Phila., $197,590; 12,355 ft. bituminous surfaced course on concrete foundation or rein.-con., Center Co., to Warren Bros., 142 Berkeley St., Boston, $121,796. Noted Sept. 11.

★**Pennsylvania** — State Highway Dept., Harrisburg, let contracts building roads in counties as follows:

Chester Co., 29,586 ft. bituminous macadam (Pennsylvania method) on Telford foundation, Westtown, East Goshen and East Whiteland Twps., to R. H. Johnson, Wayne, $190,578.

Delaware Co., 7314 ft. bituminous macadam (Pennsylvania method) on Telford foundation, Upper Darby Twp., to V. Di Franceson, Llanerch, $44,389.

Mercer Co., 2431 ft. rein.-con., Mercer Boro, to Burns Bros., 525 South Mill St., New Castle, $26,794.

Northampton Co., 8226 ft. rein.-con., Nazareth and Palmer Twps., to R. S. Rathbun Constr. Co., 409 Vine St., Bethlehem, $67,769.

Westmoreland Co., 31,227 ft. rein.-con. and Hillside vitr. brick, Hempfield and Sewickley Twps., to J. J. Dick, Scotdale, $305,502. Noted Aug. 28.

★**Delaware**—State Highway Dept., Dover, let contract building 6.7 mi. road from Frederica to Milford, Constr. No. 18, to Piel Constr. Co., 2519 Edmondson Ave., Baltimore, cost $267,429; 3.75 mi. road from Harrington to Felton, Constr. No. 20, to McNichol Paving & Constr. Co., 1923 Cherry St., Phila., $145,563; .15 mi. road from city line to 33rd St., Wilmington, Constr. 21, D. E. O'Connell & Son, Norway, Pa., $29,950; .65 mi. road from Market St. Bridge to city line, Wilmington, Constr. No. 22, to Union Paving Co., Union and Market Sts., Wilmington, $77,442. Noted Aug. 21.

★**W. Va., Huntington**—Comrs. Cabell Co. let contract paving ¾ mi. road from here to Konova, to Hunt-Forbes Constr. Co., Ashland, Ky., $18,057.

★**W. Va., Keyser**—Comrs. Mineral Co. let contract grading 7.66 mi. concrete road, in Elk District, to H. W. Kaylor, 106 Arcade Bldg., Hagerstown, Md., $1.10 per cu.yd.

★**W. Va., Lewisburg**—Comrs. Greenbier Co. let contract grading 25 mi. road, Meadow Bluff Dist., to Patrick Constr. Co., Clarksburg, W. Va. Work involves 125,000 cu.yd. excav. 90c. per cu.yd., 120 cu.yd. class B masonry, $18.75, 306 cu.yd. class C masonry, $17.50, 3200 ft. 12 in. v.c. pipe, $2.10, 210 ft. 15 in. v.c. pipe $2.90, 390 ft. 18 in. v.c. pipe, $3.80, 210 ft. 24 in. pipe, $5.70, 20 acres clearing, $65, and 15 acres grubbing, $100. Total cost, $133,713. Noted Aug. 28.

★**W. Va., Moundsville**—City let contract paving 1000 ft. various streets, 24 ft. wide, to R. J. McFadden, Parkersburg. Work involves 2,666 sq.yd. 6-8 in. cement concrete paving and 5000 ft. curbing. About $14,000.

★**W. Va., Moundsville**—City let contract paving 2 blocks Tomlinson Ave., 7½ in. concrete, to R. J. McFadden, Moundsville, $2.70 per sq.yd. About $11,000.

★**W. Va., Wayne**—Comrs. Wayne Co. let contract grading and draining 5 mi. Wayne-Kenova Rd., involving 57,380 cu. yd. excav., 286 cu.yd. class A and 182 cu.yd. class B concrete, to Smith & Quinn, Parkersburg, cost $66,072; paving ¾ mi. Huntington-Kenova Rd., 16 ft. wide, vitr. brick, to Hunt-Forbes Constr. Co., Ashland, Ky., $18,057. Noted Sept. 4.

★**N. C., Kenansville**—Comrs. Duphin Co. will build 15 mi. sand clay road from Kenansville to Pender Co. line. About $60,000. Work will be done by day labor.

★**N. C., Wentworth**—Comrs. Rockingham Co. will build 11 mi. road. Work will be done by day labor under direction of G. W. Estes, co. road supt. About $30,000.

★**Ga., Monroe**—City Council let contract paving and draining 24,000 sq.yd. Main St., concrete, to Crump Constr. Co., Macon, $2.43 per sq.yd. Noted Aug. 21.

★**Indiana**—State Highway Comn., Indianapolis, let contracts paving 10.2 mi. concrete road from Orange Co. line to Bedford, Lawrence Co., to Wabash Constr. Co., Vincennes, $503,257; 10.2 mi. concrete road from west line Warrick Co. to Boonville, S. R. Adams, Princeton, $432,497; 8.4 mi. concrete road from north line Franklin to south line Greenwood, Johnson Co., Morris & McTernau, Fairmont, $288,397; 4.6 mi. concrete road from Illinois state line to West Terre Haute, Vigo Co., A. J. Yawger & Co., 450 North Belmont Ave., Indianapolis, $147,908; 7 mi. concrete road, Tipton and Howard Counties, L. B. Hodgin, 208 East Mulberry St., Kokomo, $242,943; 11.283 mi. Lincoln Highway from Schererville to Porter Co. line, Federal Paving Co., 133 West Washington St., Chicago, $373,156. Noted Sept. 4.

Mich., Detroit—City received bids paving with asphaltic concrete on 6 in. concrete foundation, Berea or Medina curbstone (a) Blaine Ave., (b) Martindale Ave., (c) Alley No. 1068, (d) No. 1069, (e) No. 1070, (f) No. 1071, (g) No. 1072, (h) No. 1073, (i) No. 1074, (j) No. 1075, (k) No. 1076, (l) No. 1077, from W. B. Brady Constr. Co., 1372 Grand River Ave., (a) $39,421, (b) $33,768; Detroit Asphalt Paving Co., 20 McGraw Bldg., (a) $40,594, (b) $34,539; Cleveland Trinidad Paving Co., 2940 Woodward Ave., (a) $40,362, (b) $34,426; Otis Cement Constr. Co., 806 Hammond Bldg., (c) $4157, (d) $5968, (e) $8827, (g) $2306, (h) $2181, (i) $4586, (j) $4214, (k) $1531, (l) $5769; R. J. Powelson Co., 1577 Iroquois Ave., (c) $4063, (d) $6167, (e) $9158, (f) $5400, (g) $2157, (h) $2047, (i) $4610, (j) $4123, (k) $1499, (l) $6132; T. E. Currie, 20 McGraw Bldg., (d) $6056, (e) $8710, (f) $5640, (g) $2131, (i) $4492; Talbot Co., 400 Penobscot Bldg., (f) $5411; E. Meredith & Co., 145 Harper Ave., (h) $2006, (k) $1546, (l) $6049. Noted Sept. 11.

★**Ill., Grayville**—City let contract building and graveling 4000 ft. road, 10 ft. wide, to P. R. Blood, Grayville. About $10,000

★**Ill., Monticello**—Piatt Co. let contract building 2600 ft. 10 ft. brick pavement on Sect. F-15d, Route 8, to W. F. Lodge, Monticello. Noted Aug. 28.

★**Wisconsin** — State Highway Comn., Madison, let contract improving Beloit-Janesville Rd., Rock Co., Federal Aid Project No. 96, to McCollough & Cheney, 440 Temple Court, Minneapolis. Work involves 18,028 cu.yd. earth excav., $.72 per cu.yd., 63,312 sq.yd. concrete surfacing, $2.235 and 277 cu.yd. concrete in culverts, $25, total cost, $162,426. Noted Sept. 11.

Wisconsin — State Highway Comn., Stephenson Bldg., Milwaukee, received bids improving .93 mi. Sheridan Rd., Racine Co., Federal Aid Project No. 39, involving (a) 2258 cu.yd. earth excav., (b) 17 cu.yd. concrete in culverts, (c) 9831 sq.yd. concrete surfacing, etc., from Michie Constr. Co., 82 Wisconsin St., Milwaukee, (a) $1.10 per cu.yd., (b) $22., (c) $2.25, total cost $34,241; J. R. Griffith Co., Racine, (a) $0.80, (b) $25, (c) $2.43, $34,415. Noted Sept. 11.

Wis., Manitowoc—Manitowoc Co. received bids Sept. 15, grading and paving also building bridges, culverts, etc., on 2.1 mi. Lake Shore Rd. from Sheboygan to Green Bay, 18 ft. wide, from Murphy Constr. Co., 826 South 8th St., Manitowoc, $2.60 per sq.yd.; T. Young & Bros. Co., Oconto, $2.65. Noted Sept. 11.

Minn., Duluth—City received bids Aug. 2 paving 54th St., E., from London Rd. to Glendale St., from C. R. McLean & Son, Duluth, $39,468; J. McDonnell, Duluth, $42,227. Noted Sept. 11.

★**Minn., Minneapolis**—Comrs. Hennepin Co. let contract grading and graveling 1½ mi. approaches to Cedar Ave. bridge, to Nelson & Frederick, Temple Ct., $42,373. Noted Sept. 11.

★**Minn., Thief River Falls**—Comrs. Pennington Co. let contract building Federal Aid Project No. 67, State Rd. No. 1, State Aid Job No. 1907, to P. W. Roark, Thief River Falls, $10,554. Noted Aug. 28.

★**Kan., Seneca**—City let contract improving Main St., involving 50,000 sq.yd. vertical fibre and 25,000 sq.yd. asphaltic pavement, to J. Stanton, 6th and Kiowha Sts., Leavenworth. About $150,000.

★**Kan., Washington**—City let contract paving 8 blocks various streets, fibre brick, to J. Stanton, 6th and Kiowha Sts., Leavenworth, $89,822.

★**Tex., Clarksville**—Red River Co. will clear, grub, gravel surface and drain 16 mi. State Highway No. 35, known as "Choctaw Trial," 14 ft. wide. About $46,391. Work will be done by day labor under county forces. Noted Aug. 21.

★**New Mexico**—State Highway Comn., Santa Fe, let contract building 5.4 mi. Federal Aid Project No. 11 between Capitan and Ford Stanton, Lincoln Co., to Burgess & La Roe, Palestine, Tex., $42,661. Noted Aug. 28.

Streets and Roads (Continued)

★**New Mexico**—State Highway Comn., Santa Fe, let contract building 5.4 mi., Federal Aid Project No. 16, Lea Co., to Lea Co. Constr. Co., Lovington, $39,517. Noted Aug. 28.

Idaho—State Dept. Pub. Wks., Boise, received bids building, grading, graveling and draining 30.5 mi. New Meadows-Whitebird Rd., also building bridge across Salmon River, from Grant, Smith & Co., St. Johns Ave., Portland, Ore., $779,758; H. H. Boomer, Ziegler Bldg., Spokane, Wash., $1,149,290, Porter & Conley, Ry. Exch. Bldg., Portland, Ore., $1,158,872.

★**Oregon**—State Highway Comn., Portland, let contract grading 14 mi. Columbia River Highway across Sherman Co., involving 250,000 cu.yd. excav., to Porter & Conley, Ry. Exch. Bldg., Portland, $207,115; paving 10.8 mi. Scappoose-Dear Island Sect. Columbia River Highway standard bitulithic, type E, using gravel on 5 mi. of road, to Warren Constr. Co., Journal Bldg., Portland, $229,515.

Oregon—State Highway Comn., Portland recived bids Sept. 9 grading and macadamizing (a) 12 mi. Klamath Falls-Algoma Sect of The Dalles-California Highway, Klamath Co., involving 3700 cu.yd. rock surfacing, 6500 cu.yd. cinder surfacing, (b) grading 15 mi. John Day River-Blalock Sect., Columbia River Highway, Gilliam Co., 110,000 cu.yd. excav., (c) 5 mi. McMinnville-West Dayton Sect. West Side Pacific Highway, Yamhill Co., 60,000 cu.yd. mixed excav., (d) macadamizing 6.4 mi. Hood River-Mosier Sect. Columbia River Highway, Wasco and Hood River Counties, 12,800 cu.yd. surfacing, (e) 3 mi. Cottage Grove-Walker Rd., 6500 cu.yd. macadam, (1) iron pipe, (2) concrete pipe, (3) special surfacing, (4) waterbound macadam, (5) broken stone macadam, (6) gravel macadam, from Klamath Co. Court, Klamath Falls, (a2) $146,062, (a1) $144,958; W. H. Mason, Klamath Falls, percentage basis; Elliott Scoggins & Wolf, Portland, (b1) $231,987, (b2) $232,636; A. Guthrie Co., Sherlock Bldg., Portland, (b1) $211,116, (b2) $211,339; O. Huber, Sherlock Bldg., Portland, $194,264; Palmer & Young, McMinnville, (c1) $67,930, (c2) $67,975; W. N. Trent, McMinnville, (c) $71,855; V. R. Dennis, McMinnville, (c) $70,415; A. D. Kern, foot of Mill St., Portland, (d3) $31,020, (d4) $86,720; Pacific Bridge Co., foot of Salmon St., Portland, (d3) $31,920, (d4) $75,120; Porter & Yett, Portland, (d3) $32,760, (d4) $78,200; Western Constr. Co., Portland, (e5) $29,985; Haakenson & Thorsen, Cottage Grove, (e5) $29,045, (e6) $28,415. Noted Aug. 7.

★**Ore., Astoria**—City let contract filling and draining Duane St. from 16th to 17th Sts. and filling, leveling and draining preparatory to planking, 17th St. from Commercial to Exchange Sts., to Miller & Bauer, Astoria, $17,904 and $21,283 respectively.

★**Ore., Helix**—City let contract leveling, draining and paving 8 blocks with concrete, to J. A. Gudgel, Kalispell, Mont., $18,742.

Ore., Portland—City received bids paving (a) 46th Ave. from 67th St. S. E. to Kern Park, (b) East 30th St. from Ainsworth Ave. to Holman St., (c) Killingsworth Ave. from East 30th to East 42nd Sts., (d) Linn Ave. from East 9th to East 11th Sts., (e) Elliott Ave. from Hawthorne Ave. to Division St., (f) East 60th St. from Oregon to East Glisan Sts., (g) macadamizing Vernon Ave. from Killingsworth Ave. to Alberta St., (h) grading and building sidewalks on portions of 45th St. S. E. and 53rd Ave. S. E., (i) Olin St. from Lombard St. to Willamette Blvd., from J. Keating, Portland, (a) 8 in. macdam, $6 per cu.yd., total cost, $3625, (d) concrete No. 1 in track, $2.35 per sq.yd., concrete No. 1 in roadway, $2.35 per sq.yd. $5741, (g) $5.75 per cu.yd., $7459; Warren Constr. Co., Journal Bldg., (b) asphaltic concrete No. 1, $1.43 per sq.yd., $7902, (c) No. 1 concrete in roadway, $1.43 per sq.yd., $20,046, (d) concrete No. 1 in track, $2.15 per sq.yd., asphaltic concrete No. 1, 2 in top in roadway, $1.57 per sq.yd., $5822, (e) asphaltic concrete No. 1, 2 in top, 8 in. redress binder roadway, $1.59 per sq.yd., $25,147, (f) concrete No. 1 in track, $2 per sq.yd., No. 1, 2 in. redress in roadway, $1.53 per sq.yd., $4115; Municipal Paving Plant, Portland, (c) asphaltic concrete in roadway, 2 in. top, $1 per sq.yd., $15,609; Star Sand Co., foot of Randolph St., (h) $4129; J. Hahn, Portland, (i) $7142; Cochran Bros., Portland, $7644; J. Rebman, Portland, $7325. Noted Aug. 28.

California—State Highway Comn., 515 Forum Bldg., Sacramento, received bids building (a) Sect. C, Route 17, Div. 3, Federal Aid Project No. 28, Placer Co., (b) Sects B and D, Routes 10 and 1, Div. 6, Tulare Co., (c) Sect. B, Route 34, Div. 3, Federal Aid Project No. 29, Amador Co., from Federal Constr. Co., Call Bldg., San Francisco, (b) $21,876; A. J. Fairbanks, Twillits, (a) $104,256, (c) $110,748; T. M. Olney, Oakland, (c) $66,169. W. A. Schmidt, Berkeley, (c) $95,385.

★**California**—State Highway Comn., 515 Forum Bldg., Sacramento, let contract building Sect. B, Route 13, Div. 3 State Highway between Oakdale and easterly boundary, Stanislaus Co., to Palmer & McBryde, Hooker Lent Bldg., San Francisco; Sect. A, Route 16, Div. 1 State Highway, between westerly boundary and Lakeport, Lake Co., to Erickson & Petterson, Monadnock Bldg., San Francisco; Sect. B, Route 2, Div. 7 State Highway between Galivan and Irvine, Orange Co., C. R. Curtis, 2440 East 26th St., Los Angeles; Sect. A, Route 2, Div. 5 State Highway between Divide and Orcutt, Santa Barbara Co., F. C. McIntire, Farmers & Merchants Bank Bldg., Stockton; Sect. A, Route 2, Div. 7, State Highway between Lankershim Blvd. and South Sherman Way, Los Angeles Co., Bryant & Austin, Inc., 1650 Los Angeles. Noted Sept. 18.

Cal., Oakland—City received bids improving 1730 ft. 47th Ave. between East 14th St. and Huntington Tract, from Bates & Borland, Bway and 12th Sts., $16,084; Hutchinson Co., 444-17th St., $16,497; Oakland Paving Co., 5000 Bway., $17,065. Noted Sept. 11.

★**Que., Montreal**—City Council let contracts to D. Vocisano, Montreal, building sidewalks on portions of Addington St., $1750, G. E. Carter, $953, St. Maria St., $1871, Walnut St., $450, Cote des Neiges St., $1350; to Quinlan & Robertson; 260 St. James St., for walks on Royal St., $5174, Addington St., $4696; to Chagbon & Filion, for walks on Melrose St., $6734, Monkland St., $3436; Oxford St., $2413; Northcliffe St., $10,274; Prudhomme St., $1553; to Duranceau & Duranceau, for walks on Lenoir St., $1738; Desnoyers St., $6287; St. Emelie St., $6032; Orchard St., $6500; to DeKeyser Wanters Co., for sidewalks on Drolet St., $9910; to E. T. Verbanise, 2069 D. Chatberd Ave., for walks on Wilson St., $2282.

★**Ont., Oshawa**—Town let contract building 17,000 ft. concrete sidewalks, 4 and 5 ft. wide, to T. B. Mothersill, Oshawa. About $23,000

Railways

PROPOSED WORK

Illinois—Davenport Springfield & Southern R. R., Chicago, recently incorporated, plans to build railroad from East St. Louis through Belleville and Coulterville to Pinckneyville, and spur from Decatur to Litchfield and Edwardsville, from Rock Island to Moline through Mercer and Henry Counties to Galesburg, Lewiston, Havana, Petersburg and Springfield, through Christian Co. to Hillsboro, Greenville, Carlyle, Nashville and Clancyville, through Jackson Co. to Carterville, Vienna and Metropolis; also build passenger and freight depots, sidetracks and other necessary appurtenances, bridges, etc. About $800,000. H. Leak, Chicago, ch. engr.

Ontario—City of Toronto has plans prepared by R. C. Harris, city engr., for 3 mi. electric extension from St. Clair Ave. via Mt. Pleasant, to Glen Echo, to include all track work, track material, power lines, etc. About $1,000,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Oregon**—Alsea River Lumber Co., Eugene, let contract building 8 mi. standard gauge logging railroad from Southern Pacific Terminus to Glenbrook, west of Monroe, to Bosche, Miller & Grier, Portland. About $30,000.

Excavation and Dredging

PROPOSED WORK

Wash., Vancouver — Irrigation — Bd. Comrs. Clark Co. having preliminary surveys made of land in Vancouver Lake Diking Dist. preparatory to reclamation. Cost to exceed $10,000. J. L. Garrett, clk.

Ore., The Dalles—Canal-Wapinitia Irrigation Co. plans to build canal from Frog Creek to main headgate, 1 mi., cost $35,000, also build lateral canals and gates to farms on lower Wapinitia Plains extending to O. Chastain ranch, 1000. N. G. Hodin, The Dalles, project mgr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Wis., Sheboygan** — Excavation — M. Friedhammer, R.F.D. 5, let contract excavating and laying 52,000 ft. 5-10 in. tile drain, Wilson Twp., Sheboygan Co., to Koeppe & Rouwerdink, Cedar Grove. About $19,500

★**Minn., Granite Falls**—Ditch—Comrs. Yellow Medicine Co. let contract building Co. Ditch No. 1 to Redwing Sewer Pipe Co., Redwing, $11,200. Noted Aug. 28.

Industrial Works

PROPOSED WORK

Vt., Westminster Station—Abenaquet Machine Wks. had plans prepared by Cooley & Marvin Co., engrs., 711 Tremont Bldg., Boston, for 1 story, 150 x 500 ft. rein.-con. and steel machine shop. About $200,000

Mass., East Springfield (Springfield P. O.) —N. E. Westinghouse Co., Chicopee Falls, plans to build large addition to factory here. About $150,000. Architect not selected.

Mass., Holyoke—Affleck Ruling & Stationery Co., 18 Bridge St., having plans prepared for brick addition to factory, concrete foundation, on North Bridge St. About $25,000. Private plans.

Mass., Holyoke—H. L. Gendreau, engr., 755 Gratton St., Williamsett, prepared plans for 3 story rein.-con. and brick garage, rein.-con. flooring, concrete foundation on Race and Appleton Sts. About $125,000. Owners name withheld.

Conn., Meriden—New Departure Mfg. Co., 269 North Main St., Bristol, purchased old woolen mill property here and plans to remodel present buildings and construct 2 new rein.-con. factories. About $400,000. Lockwood, Greene & Co., 60 Federal St., Boston, engrs.

N. Y., Albany—Witherbee, Sherman & Co., 2 Rector St., New York City, having plans prepared for 1 story rein.-con. and steel fertilizer plant, rein.-con. flooring, concrete foundation, on Westerloo Isle. About $1,000,000. Private plans.

N. Y., Brooklyn—A. Ullrich, archt. and engr., 371 Fulton St., preparing plans for brick and steel factory, concrete foundation. About $70,000. Owner's name withheld

N. Y., New York—J. Bothwell, 30 West 130th St., having plans prepared by E. Wilbur, archt. and engr., 507 5th Ave., for 1 story 100 x 115 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on Sherman Ave. and 162nd St. About $35,000

Pa., Nicholson—Nicholson Silk Co. plans to build silk mill on Main St., 2 story, 50 x 85 ft. steel and brick, rock foundation. About $50,000. Architect not selected.

Pa., Phila.—Bernstein Mfg. Co., American and Alleghany Sts., having plans prepared by A. J. Sauer & Co., archts. and engrs., Denckla Bldg., for 3 story 52 x 152 ft. factory, slow burning construction. Noted July 31

Pa., Plains (Wilkes Barre P. O.)—Magagna Bros. plan to build silk mill on Monroe St., 1 story, 68 x 150 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation. About $54,000. G. F. Schroeder, Weitzenkorn Bldg., Wilkes Barre, archt.

Pa., Scranton—Delaware & Hudson Coal Co. plans to build 100 x 120 ft. rein.-con. and steel coal breaker, rein.-con. flooring, rock and concrete foundation, on Maurine St. About $600,000. Architect not selected.

Pa., Scranton—Kelly Silk Co. having plans prepared by F. L. Brown, archt., Real Estate Exch. Bldg., for 1 story, 50 x 80 ft. steel and brick mill, rein.-con. flooring, concrete foundation, on Mulberry St. About $90,000.

Pa., Scranton—Williams Ice Cream Co., Cliff St., having plans prepared by F. A. Nelson, archt., Connell Bldg., for 3 story, 82 x 120 ft., steel and brick plant, rein.-con. flooring, concrete foundation, on Locust St. About $100,000.

Industrial Works (Continued)

Pa., Wilkes Barre—G. R. Goebel Silk Co. plans to build silk mill on Lehigh St., 2 story, 49 x 105 ft. steel and brick, rein.-con. flooring, concrete foundation. About $50,000. Architect not selected.

Pa., Wilkes Barre—Jenkins-Kirby Packing Co., Rutter Ave., plans to build 2 story, 56 x 65 ft., steel and brick ware house, rein.-con. flooring, concrete foundation. About $50,000. McCormick & French, 2nd Natl. Bank Bldg., archts.

Pa., Wyoming (Pittston P. O.)—Wyoming Shovel Co. soon lets contract building 2 story, 50 x 50 ft. warehouse and 1 story, 120 x 450 ft. shovel plant, both rein.-con. and steel, rein.-con flooring, concrete foundation, on 8th St. About $50,000 and $259,000 respectively.

Md., Westport—A. S. Lorzeaux, engr. for Consolidated Gas, Electric Light & Power Co., Lexington Bldg., Baltimore, soon lets contract constructing service building, here, 2 story, 53 x 58 ft. rein.-con., rein.-con. flooring, concrete foundation. About $80,000.

Va., Richmond—Forbes Motor Co. soon lets contract building 2 story, 100 x 120 ft., rein.-con. garage, on Schaefer and Broad Sts. About $85,000. Hallett & Pratt, Mutual Bldg., archts.

Ala., Birmingham—Preston Motors Corp., 321 First Natl. Bank Bldg., has been organized with $1,000,000 capital stock and had plans prepared for plant to consist of several buildings; main building to be 60 x 420 ft. with 60 x 150 ft wings. About $100,000. R. A. Skinner, pres. and ch. engr.

O., Cleveland—Amer. Auto Trimming Co., 864 East 72nd St., plans to build 5 story, 104 x 328 ft., rein.-con., steel and brick factory, on Taft Ave. About $100,000. Architect not selected.

O., Cleveland—F. H. Boltman Co., 10271 Berea Rd., plans to build 1 story, 84 x 112 ft., rein.-con., steel and brick machine shop. About $30,000. Architect not selected.

O., Cleveland—Brown Body Corp., East 32nd St. and Superior Ave., plans to build 5 story, 100 x 140 ft., rein.-con., steel and brick factory, on Maywood Ave. About $500,000. Architect not selected.

O., Cleveland—Great Lakes Copper Co., Trumbull Ave., plans to build 1 story, 80 x 130 ft., rein.-con., steel and brick factory. About $40,000. Architect not selected.

O., Cleveland—M. Hinkle, 817 Prospect Ave., plans to build 2 story, 120 x 125 ft., rein.-con., steel and brick garage and sales room, on East 20th St. About $75,000. Architect not selected.

O., Cleveland—Lang Body Co., 3088 West 106th St., plans to build 4 story, 180 x 190 ft., rein.-con., steel and brick factory. About $100,000. Architect not selected.

O., Cleveland—L. Malewitz, Waterloo Rd., plans to build 2 story, 75 x 90 ft., steel and brick factory. About $30,000. Architect not selected.

O., Cleveland—Martin Barris Co., 2048 West 3rd St., having plans prepared by G. S. Rider, engr., Century Bldg., for 2 story, 36 x 165 ft., rein.-con., steel and brick saw mill and power house. About $100,000. Noted Aug. 28.

O., Columbus—Cole Motor Sales Co., 630 North High St., plans to build 2 story, 50 x 265 ft., steel and brick garage and salesroom, rein.-con. flooring, concrete foundation, on East Broad St. About $100,000. C. L. Inscho, Brunson Bldg., archt.

Ind., Indianapolis—Indianapolis Concrete & Tile Roofing Co. soon lets contract building 2 story, 60 x 150 ft. rein.-con. factory, on 52nd St. About $50,000. Kopf & Wooling, Indianapolis, archts.

Mich., Menominee—Lloyd Mfg. Co. had plans prepared for 3 story, 100 x 400 ft., rein.-con. factory, rein.-con. flooring, concrete foundation.

Mich., Muskegon—Continental Motors Corp., Jefferson Ave., E., Detroit, having plans prepared by Robinson & Campau, archts., Grand Rapids, for 2 story, 80 x 140 ft., rein.-con., brick and steel assembly plant, rein.-con. flooring, concrete foundation. About $75,000. Noted June 17.

Ill., Chicago—A. Jones Electrical Co., 2837 South State St., having plans prepared by F. M. Barton & Co., archts., 1510 Kimball Bldg., for 1 and 2 story, 125 x 125 ft. rein.-con. and brick factory, concrete foundation, on 29th Pl. and Calumet Ave. About $60,000.

Wis., Rice Lake—F. Mackinnon Mfg. Co., Grand Rapids, plans to build 4 story, 60 x 150 ft. brick, steel and tile factory, rein.-con. flooring, brick foundation, here. About $25,000. Architect not selected.

Wis., Sauk City—J. Dresen and A. Teros plan to build 2 story, 40 x 210 ft. brick, rein.-con., tile and steel factory, rein.-con flooring, brick foundation, on Main St. About $25,000. Architect not selected.

Wis., Spencer—A. Wendell plans to build 4 story, 50 x 52 ft. brick, rein.-con and steel factory, rein.-con. flooring, brick foundation, on Main St. About $25,000. Architect not selected.

Kan., Hugoton—See "Waterworks."

Neb., Omaha—A. Y. McDonald Mfg. Co., 305 South 10th St., having plans prepared by G. B. Prinz, archt., 1037 Omaha Natl. Bank Bldg., for 8 story, 66 x 132 ft. rein.-con. and brick warehouse, concrete foundation, on 12th and Dodge Sts. About $175,000.

Mont., Wolf Point—Motor Sales Co. purchased site and plans to build garage. About $25,000. H. C. Ditmarson, mgr.

Mo., St. Louis—Bowersox Milling Co., Lawrence, Kan., plans to build 1,000,000 bu. floor elevator, foot of Stein St., here. About $700,000. R. C. Jackman, Lawrence, Kan., representative.

Mo., St. Louis—Inland Piston Ring Co., 17th and Washington Aves., plan to build 2 story, 80 x 100 ft., rein.-con., steel and brick factory, rein.-con. flooring, rock foundation, on Geraldine Ave. About $60,000. Address O. G. Stark, c/o owner. Architect not selected.

Tex., Mexia—City Council plans to build electric light and power plant. About $100,000.

Tex., Ripley—City voted $150,000 bonds to build light and ice plant.

Tex., Texarkana—Southwestern Gas & Electric Co. plans to build 125 x 300 ft. brick, steel and concrete car barn, cost $65,000, also 50 x 80 ft. wood-working plant and 50 x 101 ft. garage, paint shop, etc.

Ore., Bandon—City Council having preliminary plans made and investigating along Elk Rivtr, Curry Co. for site upon which it plans to build electric power plant. About $25,000. D. Topping, mayor.

Ore., Portland—E. Schact, archt., Commonwealth Bldg., soon lets contract building 2 story, 100 x 100 ft. and 1 story, 100 x 150 ft. rein.-con. automobile houses, on 15th and Washington Sts., for W. H. Wallingford Co., 522 Alder St., and Laher Auto Spring Co., 34 North 15th St. About $100,000.

Cal., San Francisco—See "Miscellaneous."

Que., Three Rivers—Baldwins Ltd., Swansea, Great Britain, having plans prepared by R. Russell & Sons, Ltd., 2 Place d'Armas, Montreal, building forge machine and erection shops, office, furnace room and house for manager, on Tidewater St. About $1,000,000.

Ont., Cobalt—Wendigo Power Co., Guelph, purchased power rights on upper Blanche River, here, and plans to construct power development capable of developing 4000 hp. Project includes dam, power house and lines, turbines, etc. About $125,000. Engineer not selected.

Ont., Ft. William—A. Snelgrove purchased site and plans to build 400,000 bu. rein.-con. grain elevator. About $300,000. Engineer not selected.

Ont., Guelph—Brown & Little, 23 Cork St., having sketches made and estimates prepared by P. H. Secord & Sons, Ltd., engrs., 133 Nelson St., Brantford, for 2 story, 82 x 160 ft. rein.-con. garage, rein.-con. flooring, concrete foundation, on Eramosa St. About $60,000.

Ont., Hamilton—T. Eaton & Co., Ltd., 190 Yonge St., Toronto having estimates prepared for 5 story, 50 x 60 ft. steel, brick and concrete, addition to factory on King and William Sts., rein.-con. flooring, concrete foundation. About $100,000. W. Steele & Sons, Ryrie Bldg., Toronto, engrs.

Ont., Welland—City Council passed by-law to expend $35,000 for extension and additions to hydro power system.

Ont., Wiarton—City plans to build electric light plant. About $60,000. Engineer not selected.

B. C., New Westminster—Western Bondage Co., 402 Pender St. W., Vancouver, plans to construct 1 story, mill construction factory, concrete foundation, near Brunette River here, to consist of several buildings. About $80,000. O. B. Eller, 622 Columbia St., engr. Sharp & Thompson, 905 London Bldg., Vancouver, archts.

BIDS DESIRED

Pa., Phila.—Fieldstein & Scharf, archts., Penfield Bldg., receiving bids building 2 story, 26 x 82 ft. brick factory, on Erie Ave. and Amber St., for M. I. Davidson Co., Shackamaxon and Wildey Sts.

Pa., Phila.—C. C. Nimmons & Co., archts., 120 South Michigan Ave., Chicago, receiving bids constructing power house also 9 story, 360 x 442 ft. and 6 story, 80 x 420 ft. rein.-con., brick and stone, mail order buildings, rein.-con. flooring, concrete foundation, here, for Sears Roebuck & Co., Arthington and Homan Aves., Chicago. About $4,500,000

O., Cleveland—Cleveland Hardware Co., 3840 East 79th St., receiving bids building 1 story, 40 x 100 ft., steel and brick factory. About $25,000. Private plans.

O., Cleveland—E. McGeorge, archt., 1900 Euclid Ave., receiving bids building 3 story, 80 x 400 ft., rein.-con., steel and brick addition to machine shop, on East 131st St. and St. Clair Ave., for Chandler Motor Car Co., St. Clair Ave. About $200,000. Noted Aug. 28.

O., Cleveland—Torbenson Axle Co., 1115 East 152nd St., receiving bids building 2 story, 60 x 109 ft., rein.-con., steel and brick. About $30,000. Private plans.

O., Cleveland—Vita Mfg. Co., Williamson Bldg., receiving bids building 1 story, 132 x 252 ft., rein.-con., steel and brick factory, on Madison Ave. About $100,000. Private plans.

O., Cleveland—Witworth & Johnson, archts. and engrs., Engineer's Bldg., receiving bids constructing 2 story, 125 x 131 ft., rein.-con., steel and brick service and sales building, on East 67th St. and Carnegie Ave., for M. Hinkel, Huron Rd. About $150,000.

O., Columbus—Bassett & Tresselt, archts., Central Natl. Bank Bldg., receiving bids building 6 story, 50 x 150 ft., brick and concrete addition to cold storage plant of Natl. Ice and Storage Co., 5th and Naghten Sts. About $200,000.

Ill., Chicago—Until Oct. 1, by G. C. Nimmons & Co., archts., 122 South Michigan Ave., for 1 and 2 story, 250 x 350 ft. rein.-con. and brick factory, concrete foundation, on 87th and State Sts., for Walker Vehicle Co., 39th and Wallace Sts. About $260,000.

Neb., Ralston—Nelson-Evans Paint Co. receiving bids building 5 story, 50 x 140 ft. rein.-con. warehouse. About $75,000. G. L. Fisher, 1529 City Nat'l Bank Bldg., Omaha, Archt.

Ont., Oshawa—Until Oct. 3 by B. H. Prock, engr., Lumsden Bldg., Toronto, constructing plant, to consist of three 2 story, 80 x 360 ft., 80 x 365 ft. and 70 x 285 ft. and two 1 story, 60 x 285 ft. and 70 x 250 ft. structural steel buildings, rein.-con. flooring, concrete foundation, for Pedlar People, Ltd., Simcoe Sts. S. About $500,000 Noted Sept. 11.

Ont., Toronto—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., New Bedford**—Natl. Spun Silk Co., c/o Lockwood-Greene Co., archts. and engrs., 101 Park Ave., New York City, let contract building 4 story, 120 x 400 ft. rein.-con. and steel factory, rein.-con flooring, concrete foundation, to Turner Constr. Co., 244 Madison Ave., New York City. About $750,000. Noted June 26

★**N. Y., Brooklyn**—Kahan & Feldman, 25 Madison Ave., New York City, let contract building 5 story, 80 x 295 ft. rein.-con and steel factory, rein.-con. flooring, concrete foundation, on Wykoff & Irving Aves., here, to Rosenthal Eng. Contg. Co., 226 Jackson Ave. Noted Sept. 11.

Industrial Works (Continued)

★**N. Y., Long Island City**—Gehnrich Indirect Heat Oven Co., 60 Franklin Ave., let contract building 2 story, brick and steel factory, rein.-con. flooring, concrete foundation, on Skillman Ave., to L. Gold, 44 Court St., Brooklyn. About $300,000.

★**N. Y., New York**—L. A. Sheinart, archt., 192 Bowery, let contract to F. Hagen, 35 East 169th St., for 2 story, brick and steel garage, rein.-con. flooring, concrete foundation, at 361-365 South St., for J. Kennedy, 378 Front St. About $60,000. Noted Aug. 14.

★**N. J., Harrison**—Driver-Harris, c/o Lockwood-Greene, archts. and engrs., 101 Park Ave., New York City, let contract constructing 3 story, 50 x 100 ft., rein.-con., brick and steel shipping building, rein.-con. flooring, concrete foundation, to E. M. Waldron, Broad St., Newark. About $50,000. Noted July 24.

★**Pa., Phila.**—G. and H. Barrett, 1076 Frankfort Ave., let contract building 1 story, 105 x 170 ft. steel and brick storage warehouse, on Frankfort and Wildey Sts., to M. W. Easby, 1420 Chestnut St. About $50,000.

★**Pa., Phila.**—Boger & Crawford, Janney and Ontario Sts., let contract building 1 and 3 story, 60 x 150 ft., 60 x 200 ft., 70 x 200 ft. and 40 x 50 ft. brick factory, warehouse, and boiler plant, on Janney and Venango Sts., to W. Steele & Sons Co., 16th and Arch Sts.

★**Pa., Phila.**—J. Maneely, 309 Arch St., let contract building 1 story, 127 x 195 ft. and 268 x 280 ft., steel and brick warehouse, on Erie and D Sts., to M. W. Easby, 1420 Chestnut St. About $50,000.

★**Pa., Phila.**—Notaseam Hosiery Co., Mascher and Oxford Sts., let contract building 1 story, 55 x 250 ft. and 4 story, 48 x 250 ft., rein.-con., steel and brick factory, on Atlantic and I Sts., to Turner Constr. Co. 1713 Sansom St.

★**Tenn., Memphis**—Buckeye Cotton Oil Mills, New Raleigh Rd., let contract building paper pulp mill, to include warehouses, factory, storage and railway facilities, etc., to F. B. Young & Son, Bank of Commerce & Trust Bldg. About $250,000, including equipment.

★**O., Akron**—Firestone Steel Products Co., Miller and Sweitzer Sts., let contract building 1 story, 100 x 200 ft., rein.-con., steel and brick factory, to Hunkin Conkey Co., Century Bldg., Cleveland. About $500,000.

★**O., Cleveland**—Christain, Schwartzenberg & Gaede, engrs., 1900 Euclid Ave., let contract to Bolton & Pratt, Columbia Bldg., for 2 story, 57 x 64 ft., rein.-con., steel and brick addition to bakery, at 3335 Carnegie Ave., for Martin Baking Co., 3409 Carnegie Ave. About $50,000. Noted Sept. 11.

★**O., Cleveland**—Christain, Schwartzenberg & Gaede, engrs., 1900 Euclid Ave., let contract to J. H. Chaney & Son, Hippodrome Bldg., for 3 story, 100 x 180 ft., rein.-con., steel and brick warehouse, at 6532 Juaniata Ave., for Brown Fence & Wire Co. About $125,000. Noted Sept. 11.

★**O., Cleveland**—Christain, Schwartzenberg & Gaede, engrs., 1900 Euclid Ave., let contract to S. W. Emerson, 1900 Euclid Ave., building 5 story, 100 x 150 ft., rein.-con., steel and brick factory, on East 30th St. and Superior Ave., for Schwartz, Forney & Hexter Co., West 6th St. and Lakeside Ave. About $250,000. Noted Sept. 11.

★**O., Cleveland**—F. A. Foyer, 1341 Chestnut Ave., let contract building 2 story, 88 x 93 ft., rein.-con., steel and brick garage and sales room, to Priopo Bros., Cornell Rd. About $50,000. Noted Sept. 18.

★**O., Cleveland**—Standard Equipment Co., West 106th St. and Lorain Ave., let contract building 2 story, 75 x 100 ft., concrete, steel and brick addition to factory, on Lorain Ave. and West 110th St., to Republic Structural Iron Wks., 1290 East 53rd St. About $25,000. Noted Aug. 21.

★**O., Columbus**—Kroger Grocery & Bakery Co., Florence Ave. and Eden Park, Cincinnati, let contract building 3 story, 43 x 100 x 140 ft., rein.-con. bakery and warehouse, on West Broad St., here, to E. Elford, 104 North 3rd St. About $70,000.

ROAD WORK—NEWPORT, WASH.

Bids were received by Bureau Public Roads, Missoula, Mont., for grading 11.91 mi. Metaline-National Forest Rd., 12 ft. wide, Pend O'Reille Co., from (A) Engineer's Estimate; (B) Rich & Markhus, Prosser, (C) Clifton, Applegate & Toole, Hutton Bldg., Spokane. The unit bids were as follows:

	A	B	C
50½ acres clearing	$200.00	$250.00	$175.00
5,722 cu.yd rock excavation	2.00	2.35	3.00
39,440 cu.yd common excavation	.75	.75	.95
9,400 sta. cu yd. overhaul	.05	.05	.05
11.91 mi. finishing earth road	150.00	200.00	200.00
6 cu.yd class "C" concrete bent footings	25.00	40.00	60.00
90 M ft.b.m. substructure trestle bridge	50.00	60.00	90.00
30 acres grubbing	300.00	300.00	140.00
30 acres grubbing (explos. furnished)	.....	200.00	300.00
5,722 cu.yd. rock excavation (explos. furnished)	.....	2.00	2.75
1,296 lin.ft. 2x1 ft log culvert	2.00	1.50	2.15
164 lin.ft. 2x2 ft. log culvert	2.50	2.00	2.50
112 lin.ft. 2x3 ft log culvert	3.50	2.50	3.00
86 lin ft. 3x3 ft. log culvert	3.75	3.00	4.00
270 lin.ft. bridge superstructure	10.00	8.00	12.00
2,000 sq.ft. log cribbing	.90	1.50	1.75
Extended totals	$71,197	$76,111	$88,169

★**O., Columbus**—Natl. Ice & Storage Co., 5th and Naghten Sts., let contract constructing 70 x 90 ft., rein.-con. storage building, 60 ft. high at Plant No. 2, 11th and Grant Sts., to M. J. Delaney, 231 Sycamore St. About $50,000.

★**O., Columbus**—G. Sherman, Bexley, let contract building 2 story, 50 x 200 ft., rein.-con., steel and brick garage and sales-room, rein.-con. flooring, concrete foundation, on East Broad St., here, to Bebb Bros., Columbus. About $60,000. Noted Sept. 11.

★**O., Niles**—Republic Iron & Steel Co., Republic Bldg., Youngstown, will build sheet and tin plate mill here, concrete and steel, rein.-con. flooring, concrete foundation. About $2,500,000. Work will be done by day labor.

★**Mich., Allegan**—Overton Creamery Co. let contract building creamery and dairy, to include 40 x 50 ft. power house, to D. T. Top, Grand Rapids. About $100,000. Noted Aug. 21.

★**Ill., Chicago**—Boye Needle Co., 4343 Ravenswood Ave., let contract building 2 and 3 story, 40 x 160 ft. rein.-con. and brick factory, concrete foundation, at 4339 Ravenswood Ave., to Strandberg Bros. Co., 19 South La Salle St. About $45,000.

★**Wis., Kohler**—Kohler Co. let contract building 4 story, 60 x 250 ft. brick, rein.-con. and steel factory, rein.-con. flooring, brick foundation, on Main St., to Worden-Allen Co., 208 South La Salle St., Chicago, $47,950. Noted Aug. 28.

★**Wis., Port Washington**—Gilson Gas Engine Mfg., Co. let contract building 1 story, 160 x 300 ft., brick and steel factory, rein.-con. flooring, brick foundation, on Main St. About $40,000. Private plans.

★**Wis., Sheboygan**—W. C. Weeks, archt., 730 Ontario Ave., let contract to F. Geib, South 15th St., building 2 story, 60 x 185 ft. brick, rein.-con. and steel garage, rein.-con. flooring, brick foundation, on Wisconsin Ave., for H. C. Prange Co., 731 North 8th St. About $50,000. Noted Aug. 28.

★**Ia., Manning**—F. D. Ross & Co., let contract building 1 story, 90 x 150 ft., rein.-con. garage, rein.-con. flooring, concrete foundation, to C. J. Haas, Manning, $65,000.

★**N. D., Fargo**—J. McCormick Transfer Co. let contract building 3 story concrete and brick warehouse and office, on 4th Ave. and 5th St. N., to T. F. Powers & Co., 419 8th St. About $60,000.

★**Mo., St. Louis**—Amer. Brake Co., 1926 North 2nd St., let contract building 4 story, 130 x 150 ft., rein.-con., steel and brick factory, rein.-con. flooring, rock foundation, on North 2nd St., to Selden Brecht Constr. Co., Fullerton Bldg. About $225,000.

★**Mo., St. Louis**—Booth Fisheries Co., 409 Franklin Ave., will construct 3 story, 40 x 130 ft., rein.-con. and brick cold storage plant and mercantile store building, rein.-con. flooring, rock foundation, at 411 Franklin Ave. About $50,000. Work will be done by day labor.

★**Mo., Springfield**—Springfield Furniture Co., Pine St. and Blvd., let contract building 5 story, 80 x 150 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, to Springfield Constr. Co., Springfield. About $100,000.

★**Tex., Houston**—City let contract building frame cotton shed on Wharf No. 2, Turning Basin, Port Houston, to Horton & Horton, McKinney and Velasco Sts. About $40,000.

★**Tex., Houston**—H. House let contract building 2 story, brick warehouse on Nance and Maffit Sts., to H. F. Bailey, 2208 McLelland St. About $43,000.

★**Ore., Astoria**—Pacific Power & Light Co. let contract building power plant on 50 acre site on east side of Youngs Bay, to Phoenix Utility Co., Portland. About $175,000.

★**Ont., Hamilton**—T. Eaton Co., Ltd., 190 Yonge St., Toronto, let contract building 4 story, 150 x 200 ft. rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation, on Fergus Ave. and King William St., to Wood, Alexander & James, King St. E. About $280,000; cost plus 10%.

★**Ont., Kitchener**—Ames Holden Co. let contract building 2 story, 100 x 115 ft. structural steel factory, rein.-con. flooring, concrete foundation, on King St., to Dunker Bros., Kitchener. About $150,000. Noted June 26.

Buildings

PROPOSED WORK

Me., Auburn—Y. M. C. A., 2 West 45th St., New York City, having plans prepared by Jallade & Lindsey, archts. and engrs., 37 Liberty St., New York City, for 3 story, brick, steel and stone building, brick foundation, here. About $150,000.

Me., Lewiston—Theatre—Hamilton Theatre Corp., 112 West 42nd St., New York City, having plans prepared by DeRosa & Pereira, archts. and engrs., 110 West 40th St., New York City, for 100 x 150 ft. brick, steel and stone, brick foundation, on Main St., here. About $250,000.

Mass., Boston—Theatre—M. Spiegel, Strand Theatre Bldg., New York City, plans to build brick, steel and stone, brick foundation, here. About $350,000. Architect not selected.

Mass., Boston—Theatre and Office—S. J. Krapp, archt. and engr., 116 East 16th St., New York City, preparing preliminary plans for 3 story, 100 x 100 ft. brick and steel, brick foundation, on Tremont and Elliott Sts., here. About $250,000. Owner's name withheld.

Conn., Naugatuck—Jallade & Lindsey, archts. and engrs., 37 Liberty St., New York City, soon let contract constructing 3 story brick, steel and stone building, brick foundation, on Church St., here, for Y. M. C. A. About $250,000. Noted Feb. 20.

Conn., New Haven—Library—Yale University plans to build library in memory of late J. W. Sterling. About $5,000,000. Architect not selected.

Conn., Rockville—High School—Bd. Educ. having plans prepared by W. Potter, archt., 22 East 17th St., New York City, for altering brick and steel high school. About $85,000.

N. Y., Buffalo—Theatre—M. Spiegel, Strand Theatre Bldg., New York City, plans to build brick, steel and stone, brick foundation, here. About $450,000. Architect not selected.

Buildings (Continued)

N. Y., Rochester—Theatre—M. Spiegel, Strand Theatre Bldg., New York City, plans to build brick, steel and stone, brick foundation, here. About $350,000. Architect not selected.

N. Y., Utica—Theatre—M. Spiegel, Strand Theatre Bldg., New York City, plans to build brick, steel and stone, brick foundation, here. About $350,000. Architect not selected.

N. J., Bayonne—Hospital—Bd. Dirs. Bayonne City Hospital having preliminary sketches prepared by Crow, Lewis & Wick, archts. and engrs., 200 5th Ave., New York City, for concrete and steel addition, rein.-con. flooring, concrete and brick foundation. About $250,000. Noted Aug. 21.

N. J., Newark—Office—United Cigar Stores Co., 44 West 18th St., New York City, plans to build 1 story, 25 x 26 x 125 ft., stone, steel and brick, brick foundation, on Broad and Center Sts. L. E. Denslow, 44 West 18th St., New York City, archt. and engr.

N. J., Roselle—School—Bd. Educ. having plans prepared by Rasmussen & Wayland, archts., 1133 Bway., New York City, for 2 story, brick and terra cotta, brick foundation. About $60,000

N. J., Westfield Church and Sunday School—Ludlow & Peabody, archts and engrs., 101 Park Ave., New York City, receives bids about Oct. 10, building 1 story, brick and terra cotta, brick foundation, on Elm St., for 1st Baptist Church, Westfield. E. J. Holder, pastor. About $50,000. Noted Apr. 3.

Pa., Bethlehem—Church—Simon & Jude Church, West Bethlehem, plans to build 2 story, 40 x 70 ft. steel and brick, rock foundation. About $62,000. Architect not selected.

Pa., Johnstown—Schools—City plans election to vote on $2,000,000 bonds to extend and improve various schools. Plans include new high school and other buildings. J. D. Meyer, secy. bd. Architect not selected.

Pa., Lee Park—Club—Boro. plans to build 2 story, 30 x 48 ft. brick and steel, rein.-con. flooring, rock and concrete foundation, on Lee Park Ave. About $50,000. Architect not selected.

Pa., Luzerne—Clubhouse—Duplan Silk Co. plans to build 3 story, 50 x 50 ft. brick, rock and concrete foundation, on Luzerne St. About $54,000.

Pa., Munhall (Homestead P. O.)—School—Bd. Educ. retained W. G. Eckles, archt., Lawrence Savings & Trust Bldg., New Castle, to prepare plans for high school. About $200,000.

Pa., Nanticoke—Nurses Home—Nanticoke State Hospital plans to build 3 story, 40 x 50 ft., steel and brick, rein.-con. flooring, concrete foundation, on Elm St. About $75,000.

Pa., Phila.—Office—Phila. Evening Bulletin, Bulletin Bldg., plans to build 5 story, concrete and steel addition, on Juniper and Arch Sts. Cost to exceed $50,000. E. V. Seeler, 101 South Juniper St., archt.

Pa., Phila.—Stations—Dept City Transit, 1211 Chestnut St., postponed date indefinitely for receiving bids (which were to be opened Sept. 16) for stations for Frankfort Elevated Ry. Noted Sept. 11.

Pa., Pittsburgh—Hospital—Montifiore Hospital, 3000 Center Ave., having preliminary sketches prepared by E. S. Otz archt., Monongahela Bank Bldg., for 3 story brick addition to present building, concrete foundation. About $75,000.

Pa., Wilkes Barre—Theatre—M. E. Comerford Amusement Co., 303 Lackawanna Ave., Scranton, plans to build 2 story, 80 x 156 ft., on Public Sq., here. About $260,000. L. H. Lempert, Cutler Bldg., Rochester, N. Y., archt. Noted Jan. 30.

Pa., Wilkes Barre—Theatre—Lewith Amusement Co. plans to build 3 story, 100 x 175 ft. steel and brick, rein.-con. flooring, rock foundation, on Northampton St. About $500,000. Architect not selected.

Va., Petersburg—Bank—Amer. Bank & Trust Co. had plans prepared for 10 story, 70 x 90 ft., brick and granite, on Sycamore St. About $450,000, including site. W. B. McIlwaine, pres.

N. C., Wayneville—Hotel—J. R. Boyd and others plan to build 250 room hotel. About $250,000. Architect not selected.

N. C., Wilson—Hotel—R. A. Cherry plans to build 7 story, 90 x 147 ft. on Nash St. About $250,000. Benton & Benton, Wilson, archts.

Ala., Birmingham—Church—Norwood Methodist Church had plans prepared for brick church. About $100,000. W. F. Price, pastor.

O., Alliance—Auditorium and Gymnasium—Mt. Union College having preliminary plans prepared for memorial auditorium and gymnasium, on campus. About $200,000.

O., Cleveland—Auditorium—Slovenski Narodin Dorn, 2563 East 80th St., plans to build 2 story, 44 x 103 ft., rein.-con., steel and brick. About $50,000. Architect not selected.

O., Cleveland—Commercial—J. Babin, 13661 Euclid Ave., plans to build 5 story, 85 x 286 ft., rein.-con., steel and brick, on Euclid Ave. About $100,000. Architect not selected.

O., Cleveland—Office—Euclid Windsor Co., Citizens Bldg., plans to build 2 story, 90 x 200 ft., rein-con., steel and brick, on East 46th St. and Windsor Ave. About $250,000. Architect not selected.

O., Cleveland—Sales Room—See "Industrial Works."

O., Cleveland—Theatre—M. Spiegel, 1579 Bway., New York City, plans to build brick, steel and stone, here. About $450,000. Architect not selected.

O., Columbus—Sales Room—Armleder Sales Co., 304 West Broad St., plans to build 2 story, 60 x 80 ft., on East Broad St. About $50,000. Architect not selected.

O., Columbus—Sales Room—See "Industrial Works."

O., Dayton—Office and Exchange—Bell Telephone Co. plans to build 4 to 6 story, 70 x 150 ft., rein.-con., steel and terra cotta, rein.-con. flooring, concrete foundation, at 117 West 2nd St. About $150,000. Architect not selected.

Mich., Detroit—Bank—Dime Bank, Griswold St., had plans prepared by G. M. Lindsey, archt., 2201 Dime Bank Bldg., for 2 story, 30 x 60 ft., granite and steel, rein.-con. flooring, concrete foundation, on Chene St. About $50,000.

Mich., Ferndale (Royal Oak P. O.)—Commercial—C. D. Bader, 3302 Woodward Ave., Detroit, preparing plans for 2 story, 80 x 100 ft., brick, steel and frame, concrete foundation, on Woodward Ave. and Nine Mile Rd. About $60,000.

Mich., Pontiac—Administration and Office—Oakland Motor Car Co. had plans prepared for 4 story, 52 x 284 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation.

Wis., Eau Claire—Church—St. Ann's Church plans to build church on 36th and Wright Sts. About $100,000.

Wis., Hartford—Church—St. Kilnan's Church plans to build 2 story, 100 x 250 ft. brick, stone and tile, brick foundation. Cost between $50,000 and $75,000. J. Hartman, pastor. Architect not selected.

Wis., Holland (Oostburg, P. O.)—School—School Dist. No. 1, Oostburg soon lets contract building 2 story, 90 x 110 ft. brick, rein.-con. and tile, brick and concrete foundation, here. J. Houwers, Jr., Sheboygan Falls, engr.

Wis., Madison—Hospital—Western Wisconsin Methodist Churches, 203 Wisconsin Ave., plan to build hospital. About $50,000.

Ia., Ottumwa—High School—Bd. Educ. plans election to vote on bonds to build high school. Architect not selected.

Ia., Richland—High School—City voted $80,000 bonds to build high school. Architect not selected.

Minn., Cloquet City—City Hall—City plans to build 2 story, 46 x 76 ft., brick and rein.-con., wood flooring. About $50,000. Holstead & Sullivan, Palladio Bldg., Duluth, archts.

Kan., Wichita—Bank—Kansas Nat'l Bank, Main and Douglas Sts., plans to build 6 story, 75 x 150 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, at 5 Market St. About $200,000. Architect not selected.

S. D., Sioux Falls—Exchange—Northwestern Telephone Co., 10th and Dakota Aves., soon receive bids building 3 story, 31 x 76 ft. steel, brick and tile addition. About $125,000. A. H. Stem, 601 Endicott Bldg., St. Paul, Minn., archt.

N. D., Fargo—School—St. Mary's Church plans to build 3 story, on 7th St. N. About $65,000. Braseth & Rosatti, Fargo, archts.

Mont., Missoula—High School—Missoula Co. voted $100,000 bonds to purchase site and build high school.

Mo., St. Louis—Bank and Office—A. Heman, c/o Heman Constr. Co., Title Guaranty Trust Bldg., plans to build 2 story 70 x 100 ft., brick, concrete and stucco, on Delmar and Laurel Aves. About $100,000. Angela Realty Co., St. Louis, engrs. Architect not selected.

Mo., St. Louis—Club—Young Men's Hebrew Assn. plans to remodel and build 5 story, 100 x 150 ft., concrete and brick addition, rock foundation, on Delmar St. near Grand St. About $50,000. W. Freund, pres. Architect not selected.

Mo., Springfield—Temple—Abon Ben Adhem Shrine having plans prepared by Heckenlively & Mark, archts., Landers Bldg., for 3 story, concrete, steel and brick, rein.-con. flooring, rock and concrete foundation. About $300,000.

Mo., University City (St. Louis P. O.)—School—W. Heunbuettner, engr., University City, soon receives bids building 3 story, 175 x 225 ft., concrete and brick, concrete and rock foundation, for Bd. Educ. About $200,000. Architect not selected.

Tex., Ft. Worth—Bank and Office—Farmers & Mechanics Natl. Bank, 712-714 Main St., plans to build 24 story, 100 x 100 ft. steel, concrete and terra cotta, rein.-con. flooring, concrete foundation. Sanguinett & Staats, 1st Natl. Bank Bldg., and Mauran, Russell, Crowell, Chemical Bldg., St. Louis, archts.

Tex., McKinney—Hospital—City voted $100,000 bonds to build hospital. H. A. Finch, mayor.

Wash., Seattle—Theatre—H. W. Bruen, c/o Majestic Theatre, 2044 Market St., and F. Fohr, having plans prepared by E. W. Houghton, archt., Lumber Exch. Bldg., for 1 story, 60 x 103 ft., steel and brick, rein.-con balcony, in University Dist. About $75,000. Noted Sept. 11.

Wash., Vancouver — City Hall — City plans election soon to vote on $75,000 bonds to build 2 or 3 story, concrete, brick or stone. R. E. Brady, city clk. Architect not selected.

Ore., Forest Grove—Home—East Star Lodge purchased 31 acre site ½ mi. east of city, and plans to build 2 or 3 story brick. About $75,000. E. C. Bronaugh, Forest Grove, grand master. Architect to be named later.

Ore., Portland — Chautauqua — Ellison-White Chautauqua System, Bway Bldg., purchased 100 x 100 ft. site on West Park and Taylor Sts. and plans to build 2 story, brick. About $50,000. Architect not selected.

Ore., Portland—Club—Knights of Columbus, Park and Taylor Sts., having plans prepared by J. Jacobberger, archt., Bd. Trade Bldg., for 4 story, 50 x 100 ft. mill construction, to include bowling alleys, swimming pools, gymnasium, etc. About $100,000.

Cal., Anaheim—Schools—School Trustees having plans prepared by Jeffery & Schaefer, archts., 1106 Kerckhoff Bldg., Los Angeles for 2 schools, one 1 story 8 room, other 1 story, 4 room. Bonds for $117,000 voted for project. Noted May 8.

Cal., Modesto—Schools—City voted $350,000 bonds to build additions to 5 grammar schools and 1 high school. Noted Aug. 21.

Ont., Kingston—Library—Kingston Pub. Library Bd. plans to build public library. About $50,000; cost will be raised by public subscription. A. Kennedy, librarian.

Ont., Windsor—Theatre and Office—J. and J. J. Allen, Richmond St., Toronto, having plans prepared by C. H. Crane, archt., 2325 Dime Bank Bldg., Detroit, Mich., for 7 story, 60 x 120 ft., steel, brick and rein.-con., rein.-con. flooring, concrete foundation, here. About $400,000.

Ont., York—Schools—Town having plans prepared building two 2 story schools, steel and brick, rein.-con. flooring, concrete foundation. About $200,000. Engineer not selected.

Buildings (Continued)

Sask., Dodsland—Hall—Union of Local Fraternities having plans prepared for 2 story, 50 x 55 ft., steel and brick, concrete foundation, on Main St. About $50,000.

B. C., Prince Rupert—High School—School Bd. passed bylaw to authorize expenditure of $150,000 bonds to build 3 story high school. J. W. Potter, Prince Rupert, archt.

B. C., Vancouver—School—Bd. School Trustees plans election Sept 30 to vote on $75,000 bylaw to build addition to Dawson School, on Nelson and Barnard Sts., 3 story rein.-con., rein.-con. flooring, concrete foundation P. P. Brown, 410 London Bldg., engr., A. A. Barns, School Bd. Offices, archt.

BIDS DESIRED

Pa., McKeesport—Until Sept. 30, by Jallade & Lindsey, archts. and engrs., 37 Liberty St., New York City, constructing 4 story, 112 x 170 ft. brick, steel and stone building on Sinclair and Ringold Sts., for Y. M. C. A. About $300,00. Noted Sept 11.

O., Cleveland—Bank—C. B. Post & Son, archts., Schofield Bldg., receiving bids building 4 story, 87 x 100 ft., rein.-con., steel and brick addition, for Cleveland Trust Co., East 9th St. and Euclid Ave. About $75,000.

O., Cleveland—Bank and Office—F. Hronek, archt., 3655 Bway. Ave., receiving bids building 2 story, 40 x 96 ft., rein.-con., steel and brick, on Bway. Ave., for Voela Bldg. & Loan Assn., 5733 Bway. About $50,000. Noted July 3.

O., Cleveland—Sales—See "Industrial Works."

O., Cleveland—School—Bd. Educ. receiving bids building 1 story, 100 x 160 ft., rein.-con., steel and brick, on Miles Ave. About $100,000. W. R. McCormack, East 6th St. and Rockwell Ave., archt. Noted June 26.

Wis., Sun Prairie—Church—Until Oct. 1, by Sacred Heart of Jesus Church, and J. Paulu, archt., St. Francis, Route 1, Sta. D. Milwaukee, building 1 story, 64 x 173 ft. brick, steel and tile, brick foundation, on Main St. About $70,000.

Wis., Union Grove—School—Until Sept. 29, by J. Chandler, archt., 400 Main St., Racine, building 1 story, 75 x 116 ft. brick, rein.-con. and tile, brick foundation, on Main St., for Job Dist. No. 1. About $50,000. W. E. Stone, clk.

Minn., Balaton—School—Until Oct. 6, by Bd. Educ., building 2 story, 60 x 90 ft., brick and rein.-con. grade and high school. About $75,000. C. H. Parson, Bldrs. Exch., Minneapolis, archts. Noted Aug. 28.

Minn., Minneapolis—School—Until Oct 11, by Bd. Educ., building 1 story, 60 x 140 ft., on 19th Ave., N. E. and Pierce St. About $52,000. Bureau Bldgs., c/o Bd Educ. archts.

Kan., Emporia—Bank—Until Oct. 1, by Citizens Nat'l Bank, building 7 story, 62 x 130 ft. rein.-con., steel and brick, rein.-con. flooring, rock and concrete foundation. About $350,000. Weary & Alford, 1907 South Michigan Ave., Chicago, archts. Noted Aug 21.

Ont., Toronto—Office, etc.—Until Sept 29, by Canadian Genl. Electric Co. 212 King St. W., building 6 story, 50 x 200 ft. mill construction office and warehouse, concrete foundation. About $200,000. V. Chadwick, 132 Church St., archt.

Sask., Biggar—Hospital—Until Oct 15, by J. M. Morrison, archt., 285 Drinkle Bldg., Saskatoon, building 3 story, 75 x 100 ft., steel and brick, concrete foundation, on Broad St., for Hospital Bd. About $75,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Springfield**—Church and School—St. George Greek Orthodox Society let contract building 1 story, 78 x 89 ft. brick and steel, concrete flooring, concrete foundation, on Patton St., to C. S. Hardy, 60 Northampton Ave. About $50,000. Noted Aug. 28.

★**Mass., Worcester**—Hospital—City let contract building 2 story, 33 x 149 ft. brick, concrete foundation, on Belmont St., to J. J. Roberts, 4 Wall St., $106,343. Noted Sept. 11.

★**N. Y., Brooklyn**—Synagogue—Congregation Tiefereth Israel, c/o Shampan & Shampan, archts., 50 Court St., will build 2 story brick and terra cotta, brick foundation, on 11th St. and 7th Ave. About $250,000. Work will be done by day labor. Noted Sept. 4

★**N. Y., Brooklyn**—Store and Office—Schulte Realty Co., 386 Bway., New York City, let contract building 2 story, brick, steel and stone, brick foundation, on Fulton, Pearl, Willoughby and Adams Sts., to Blot & Baust, 403 West 34th St., New York City. About $70,000. Noted Sept. 11.

★**N. Y., Brooklyn**—Theatre—J. Manheimer, 1694 49th St., will build 3 story, 203 x 302 ft. brick, steel and stone, brick foundation on Flatbush Ave. and Albemarle Rd. About $150,000. Work will be done by day labor. Noted Aug. 21.

★**N. Y., Hartsdale**—School—Tooker & Marsh, archts., 101 Park Ave., New York City, let contract to Faillace Bros., 7 East 42nd St., New York City, for 1 story brick and terra cotta, brick foundation, here, for Bd. Educ. About $75,000. Noted Aug. 21.

★**N. Y., New York**—Hotel—Beadleston Realty Co., c/o Wallis & Goodwilbie, archts., 56 West 45th St., let contract building 7 story brick and steel, brick foundation, on East 58th St. and 5th Ave., to D. Morrison, 119 West 33rd St. About $75,000. Noted May 8.

★**N. Y., New York**—Nurses Home—C. P. H. Gilbert, archt. and engr., 1123 Bway., let contract to C. A. Cowan, 30 East 42nd St., building 5 story, 40 x 50 x 100 ft. brick, steel and stone, brick foundation, at 407 West 24th St., for St. Marys Free Hospital, 405 West 34th St. About $75,000. Noted July 31

★**N. Y., New York**—Office—Buchman & Kahn, archts. and engrs., 56 West 45th St., let contract to G. R. Davis, 30 East 42nd St., New York City, for 16 story brick steel and stone, brick foundation, on 36th St. and 7th Ave. About $1,200,000. Owners name withheld. Noted Sept. 4.

★**N. Y., New York**—Office—Munson Steamship Line, 82 Beaver St., let contract altering 15 story brick and steel, to J. Downey, Inc., 410 West 34th St. About $60,000. Noted Aug. 14.

★**N. Y., New York**—Post Office—N. C. Partos, c/o L. A. Sheinart, archt., 192 Bowery, will build 3 story, 75 x 197 ft. brick and steel, brick foundation, at 122 East 23rd St. U. S. Government, lessee. About $150,000. Work will be done by day labor. Noted June 19.

N. J., Bayonne—School—Bd. Educ. received bids Sept. 4 building P. S. No. 1 on Ave. C. and P. S. No. 4 on East 5th St., both 2 story, brick, from De Kimji Constr. Co., New York Ave., Union Hill, $260,000 each. Noted July 31.

★**N. J., Newark**—Theatre—W. A. Swasey, archt., 101 Park Ave., New York City, let contract building 150 x 150 ft., brick, steel and terra cotta, brick foundation, on Broad and Rector Sts., here, to Norton, Bird & Whitman, 501 5th Ave., New York City. About $500,000. Owner's name withheld.

★**N. J., Union Hill**—Store—A. Holthausen, 113 Bline Ave., let contract building 2 story, 75 x 117 ft. brick and steel department store, brick foundation, on Bergenline Ave., to DeRiso Bros., 17 Bline Ave. About $250,000.

★**Pa., Burgettstown**—Bank—Washington Natl. Bank let contract building 1 story, 40 x 75 ft. steel and stone, concrete foundation, to J. A. Romana, Burgettstown. About $80,000

☆**Pa., Danville**—Hospital etc.—C. F. Geisinger, let contracts to Shepherd Constr. Co., Main St., Wilkes-Barre, building 4 story, 42 x 158 ft., concrete steel and brick hospital, rein.-con. flooring, brick foundation, cost $154,000; 1 story, 58 x 80 ft. concrete, steel and brick operating building rein.-con. flooring, concrete foundation, $61,000; 1 story, 34 x 86 ft. laboratory, concrete, rock foundation, $49,000. Noted May 29.

★**Pa., Hazleton**—School—City let contract building 2 story 50 x 50 ft. steel and brick, rein.-con. flooring, rock foundation, in Hazleton Heights, to H. L. Campbell, Poplar and Noble Sts. About $67,000. Noted Aug. 14.

★**Pa., St. Johns**—School—St. Johns Church let contract building 3 story, 40 x 200 ft. with 50 x 50 ft. wing, concrete, steel and brick, rein.-con. flooring, rock and concrete foundation, on William St., to J. Curtis & Co., 1 Hickory St., Wilkes-Barre. About $251,000

★**Pa., Scranton**—Store—New Wall Paper Co., 98 South Main St., Wilkes-Barre, let contract building 4 story, 60 x 120 ft. steel and brick, rein.-con. flooring, concrete foundation, on Wyoming Ave., to E. A. Fuller Co., 1616 Dickson Ave. About $210,000.

★**Pa., Scranton**—Store—M. Silverberg 209 Lackawanna Ave., let contract building 4 story, 35 x 75 ft. stone, steel and brick, rein.-con flooring, rock foundation, on Penn and Lackawana Aves., to E. A. Fuller, 1616 Dickson Ave. About $110,000

Va., Richmond—Store—Richmond Art Co., 5 East Broad St., received bids Sept. 15, building 4 story, 34 x 152 ft., on 1st and Grace Sts., from W. P. Thurston Co., 11th and Main Sts., $64,000; J. C. Beazley Co., Real Estate Exch. Bldg., $66,000; A. F. Perrin, 808 Greenwood Ave., $72,000.

★**O., Canton**—School—Bd. Educ. let contract building 2 story, 114 x 200 ft., rein.-con., steel and brick, on 16th and Vine Sts., to S. H. Evans, 8 East Long St., Columbus. About $200,000. Noted Aug. 21.

★**O., Cleveland**—Chapel—Schauffler Missionary Training School, 5111 Fowler Ave., let contract building 1 story, 41 x 105 ft., rein.-con., steel and brick, on Bway. Ave., to J. Grant, 4500 Euclid Ave. About $60,000. Noted Sept. 11.

★**O., Cleveland**—Commercial—Snearer Furniture Co., 72 Wymore St., let contract building 4 story, 80 x 279 ft., rein.-con., steel and brick, at 10022 Euclid Ave., to McMillan Co., 1794 East 55th St. About $150,000. Noted Sept. 4.

★**O., Cleveland**—Sales Room—See "Industrial Works."

★**O., Columbus**—Sales Room—See "Industrial Works."

★**O., Delaware**—Sanitarium—C. L. Insco archt., Brunson Bldg., Columbus, let contract to R. Hopper, Delaware, building 4 story, 40 x 154 ft., brick and stone, rein.-con. foundation, for Delaware Springs Sanitarium Co. About $120,000. Noted May 15

★**O., London**—Administration—State Bd. Administration, Columbus, will build 2 story, 64 x 200 x 275 ft., brick and stone, at State Farm Penitentiary, here. Work will be done by day labor.

★**Mich., Detroit**—Mercantile—A. Y. Malcolmson, 610 Congress Bldg., let contract building 6 story, 20 x 100 ft., brick and steel, wood flooring, concrete foundation on Griswold St., to G. D. Nutt, 632 Farwell Bldg. About $90,000.

★**Mich., Detroit**—School—Bd. Educ. let contract building (a) addition to Nichols School, (b) Ellis School, (c) Condon School, (1) masonry, (2) carpentry, (3) heating, ventilating and plumbing, to Corrick Bros., 507 Owen Bldg., (a1) $94,486; H. M. Martens Co., 221 Moffat Bldg., (a2) $18,356, (c2) $23,774; M. B. O'Connor, Penobscot Bldg., (a3) $42,025, (c3) $48,996; A. J. Smith Constr Co., Campau Bldg., (b1) $58,000, (c1) $124,900; Harcus & Co., 774 Russell St., (b2) $12,679; A. W. Schultz & Co., Penobscot Bldg., (b3) $36,927. Noted Sept. 11.

Mich., Detroit—School—Bd. Educ., 50 Bway. Ave., received bids building (a) Angell School, (b) addition to Carstens School, (c) addition to Throwbridge School, (d) open air school on Clipoert site, (e) open air school, Davison Annex, (1) masonry, (2) carpentry, (3) heating, ventilating and plumbing, (4) general specifications, from J. Bollin Co., 906 Bellevue Ave., (a1) $79,000, (b1) $103,800, (c1) $69,800; W. H. Mueller, Ford Bldg., (a1) $82,000, (b1) $99,700; A. J. Smith Constr. Co., Campau Bldg. (a1) $93,500, (b1) $104,800, (c1) $74,500; E. Thiede, 287 Berlin St., (a2) $20,900, (b2) $25,359, (c2) $15,550; J. W. Partlan, 51 Park Pl., (a3) $43,890, (c3) $36,833; Irvine & Meier, 2289 Woodward Ave., (a3) $48,599, (b3) $52,051, (d3) $6512, (e3) $7393; Drake Avery Co., 40 State St., (a3) $49,217, (c3) $40,715; H. M. Martens Co., 221 Moffat Bldg., (b2) $25,380, (d4) $25,780, (e4) $28,740; W. J. Renoldt, 506 Owen Bldg., (b3) $51,051, (e3) $40,325, (d3) $8397, (e3) $8603; R. L. Spitzley Heating Co., Vinton Bldg., (b3) $58,177; M. A. Mahoney, Penobscot Bldg., (e1) $68,800; A. W. Schultz & Co., 815 Gratiot Ave., (d3) $12,789, (e3) $12,289. Noted Sept. 18

★**Mich., Grand Rapids**—Seminary—St. Joseph Seminary, Boston St., let contract building 3 story, 90 x 200 ft. with 104 x 117 ft. wings, rein.-con. brick and stone, rein.-con. and wood flooring, concrete foundation, on Boston St. and Union Ave., to J. McNabb & Son, 203 Murray Bldg. About $200,000. Noted Aug. 28

Buildings (Continued)

★**Ill., Chicago**—Club—Quadrangle Club, Chicago University Campus, let contract building 4 story, 60 x 140 ft. rein.-con., and stone, rein.-con. flooring, concrete foundation, to C. E. Clark Co., 69 West Washington St. About $225,000.

★**Wis., Augusta**—School—Bd. Educ. let contract building 2 story, 34 x 62 ft. and 46 x 52 ft. concrete, brick and steel additions, concrete foundations, to Hoeppner & Bartlett, 414 Grand Ave. E., Eau Claire. About $50,000.

Wis., Superior—Auditorium—City received bids Sept. 11, building 3 story, 102 x 140 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, on 14th St. and Ogden Ave., from Fleischer Constr. Co., Builders' Exch. Bldg., Minneapolis, $166,000; H. D. Crassweller, Columbia Bldg., Duluth, $168,200; McLeod & Smith, Sellwood Bldg., Duluth, $170,387. Noted Aug. 21.

★**Minn., Mountain Lake**—Hospital—City let contract building 3 story, rein.-con and brick, to J. R. Nelson, Mankato. About $75,000; cost plus percentage basis. Noted June 26.

★**Kan., Arkansas City**—Church—Roman Catholic Church let contract building 2 story concrete, steel and brick, rock and concrete foundation, to H. N. Fowler, Arkansas City. Cost plus percentage basis.

★**Neb., Hickman**—School—Bd. Educ. let contract building 2 story, 60 x 100 ft. rein.-con., steel and brick, concrete foundation, to R. O. Stake, Lincoln. About $62,800. Noted Aug. 14.

★**Neb., Omaha**—Sales—Nebraska & Wyoming Investment Co., Brandeis Theatre Bldg., let contract building 3 story, 108 x 183 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, to J. E. Wakefield, 750 Brandeis Theatre Bldg. About $250,000.

★**S. D., Madison**—Hospital—R. S. Westaby let contract building 3 story, 49 x 180 ft. rein.-con. and brick, to R. S. Billingsley, 547 Plymouth Bldg., Minneapolis, Minn., $78,940. Noted Sept. 4.

★**N. D., Fargo**—Office—See "Industrial Works."

★**Mo., St. Louis**—Mercantile—Bircher Realty Co., 3950 Westminster St., let contract building 5 story, 80 x 125 ft., concrete and brick, rein.-con. flooring, concrete foundation, on Bircher St., to J. J. Bowling, c/o owner. About $60,000.

★**Tex., Cameron**—High School—School Bd. Trustees let contract building 2 story, brick, rein.-con. and steel, to J. Wattinger, Austin. About $97,500. Noted Aug. 14.

★**Wash., Hoquiam**—School—St. Marys Catholic School let contract building 2 story, 46 x 82 ft., brick veneer, on 2nd St., to L. P. Cyewski, Aberdeen. About $50,000.

★**Cal., Merced**—High School—Union High School Dist. let contracts erecting group of concrete and brick high school buildngs as follows: excavation, concrete, masonry, terra cotta and carpentry, to E. E. Etherton Co., Monadnock Bldg., San Francisco, $90,788; wiring, to Golden State Electric Co., 745 West 7th St., Los Angeles, $5750; plumbing, heating and ventilating, to Hateley & Hateley, Mitan Bldg., Sacramento, $16,220. Noted Aug. 21.

★**Ont., Hamilton**—Theatre—G. Stroud Savoy Theatre, let contract remodeling and altering 2 story, 80 x 150 ft. brick and steel, rein.-con. flooring, concrete foundation, to A. Bressette, 58 Peter St. About $60,000.

★**Ont., St. Catharines** — Theatre and Offices—J. and J. J. Allen, Richmond and Victoria Sts., Toronto, let contract building 2 story, 100 x 150 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, here, to N. McLeod, Kent Bldg., Toronto. Cost plus $15,000.

★**Ont., Toronto**—Hotel—United Hotels Co., King Edward Hotel, let contract building 15 story, 500 room addition to King Edward Hotel, on King St. E., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, to Dickie Constr. Co., Ryrie Bldg. About $200,000; cost plus 10%. Noted Aug. 28.

★**Sask., Candiac Sta.**—School—School Bd. let contract building 3 story, 40 x 60 ft. steel and brick, concrete foundation, on Riverdale Ave., to Waterman & Co., Donahua Blk., Rosina. About $53,000.

Federal Government Work

PROPOSED WORK

Conn., Mystic—Post Office—Treas. Dept., Wash., D. C., rejected bids received Aug. 25, furnishing labor and material for post office, here. J. A. Wetmore, superv. archt. Noted Aug. 28.

N. Y., New York—Dredging—U. S. Engr. Office, 39 Whitehall St., rejected bids received Aug. 23, dredging in Newtown Creek. Noted July 31.

N. Y., Staten Island—Aerial Defense Station—Constr. Div., War Dept., Wash., D. C., soon receives bids building aerial defense station, to include three 60 x 140 ft. hangars, 100 x 150 ft. machine and engine repair shop, 75 x 100 ft. supply storehouse, 75 x 100 ft. barracks, administration building, guard house, photographic laboratory, officers quarters and 20 cottages, brick, hollow tile, terra cotta, etc. About $1,000,000.

Pa., Phila.—Magazine—Spec. 4037—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build magazine No. 352, here. About $16,000.

Pa., Phila.—Repairing Dike—U. S. Engr. Office, Phila., rejected bids received Aug. 19, repairing dike at Artificial Island. Noted Sept. 4.

Va., Hampton Roads—Grading and Seeding—Spec. 4040—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to grade and seed streets here.

Va., Norfolk—Dredging—U. S. Engr. Office, Custom House, rejected bids received Aug. 27, dredging in waterway from Norfolk to Sounds of North Carolina. Noted July 31.

Wash., Puget Sound—Garage—Spec. 4038—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $7000.

Wash., Puget Sound—Storehouse—Spec. 4039—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build storehouse for pyrotechnics, here. About $6500.

BIDS DESIRED

N. Y., Tompkinsville—Rip Rap—Until Sept. 29, by Lighthouse Supt. 3rd Dist., furnishing and placing rip rap at Plumb Beach Light Sta.

Md., Hyattsville — Water-Works — Until Oct. 6, by Wash. Suburban Sanitary Comn., 611 F. St., N. W., building concrete tanks and substructure in Hyattsville Dist., for water purification works and pumping station with 1,000 000 gal. capacity per 24 hours; advertised in this issue.

D. C., Wash.—Sewer and Excavating—Until Oct. 16, by Office Pub. Bldgs. and Grounds, constructing drainage sewer and excavating 130,000 cu.yd. material for reflecting pool in West Potomac Park; advertised in this issue.

S. C., Charleston—Dredging—Until Oct. 16, by U. S. Engr. Office, Charleston, dredging in proposed 40 ft. channel in Cooper River, near here.

Fla., Jacksonville—Dredging—Until Oct. 20, by U. S. Engr. Office, Jacksonville, dredging in Hillsboro Bay; advertised in this issue.

Tenn., Memphis — Levee Work — Until Sept. 30, by Mississippi River Comn., 1st and 2nd Dists., Custom House, building 2,270,000 cu.yd. earthwork in Upper St. Francis, Lower St. Francis and White River Levee Dists. Noted Sept. 4; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. H., Portsmouth—Turbo Generator—Spec. 4017—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Sept. 17, installing 1000 kw. turbo generator, at Navy Yard, here, from Rideout, Chandler & Joyce, 178 High St., Boston, Mass., $9066 (130 days); Shevlin Engr. Co., 110 West 34th St., New York City, $10,540 (120 days); R. R. Bill & Co., 55 Fort St., Springfield, Mass., $11,868, (120 days). Noted Sept. 4.

★**R. I., Newport**—Structural Steel—Spec. 4023—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing structural steel for Emergency Repair Shop, here, to Donnell Zane Co., 298 Bway., New York City, $9879. Noted Sept. 18.

N. Y., Rockaway—Heating System and Fan Room—Spec. 4021—Bureau Yards & Docks, Navy Dept., Wash. D. C., received bids Sept. 17, installing heating system for Hangar No. 2 and building fan room, from E. Rutzler, 404 East 49th St., $7592, (60 days) (late bid); Austin Heating Corp., 121 West 42nd St., $7945 (60 days); Adams, Britz & Co., 1759 Park Ave., $8872 (time as specified); W. H. McKiever, 1123 Bway., $10,239, (time as specified). Contractors all of New York City. Noted Sept. 11.

N. Y., Stapleton—Kitchen and Mess Hall—Treas. Dept., Wash., D. C., received bids Sept. 15, building at U. S. Marine Hospital, here, from North Eastern Constr. Co., 101 Park Ave., $178,381; W. Werner Engr. Co., 50 Court St., $219,199. Contractors both of New York City. Noted Aug. 21.

★**N. Y., Tompkinsville**—Rip Rap—Lighthouse Supt., Tompkinsville, let contract furnishing and placing 500 tons rip rap, to L. J. Sieling, 150 Nassau St., New York City, $7150. Noted Sept. 4.

Md., Annapolis—Boilers—Spec. 4025—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Sept. 17, installing 3 boilers in power plant, here, from H. E. Crook Co., 28 Light St., Baltimore, $40,325 (120 days); Heine Safety Boiler Co., 1120 Pennsylvania Bldg., Phila., $41,290 (120 days); Babcock & Wilcox Co., 11 North Amer Bldg., Phila., $54,338, (120 days); late bid, stokers omitted, from E. Keeler Co., 238 West St., Williamsport, Pa., $37,249, (100 days). Noted Sept. 11.

D. C., Wash.—Wharf Repairs—Spec. 4029—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids repairing wharf at Naval Militia Barracks, (1) work complete, from Boyle Robertson Const. Co., 601 Evans Bldg., (1) $4109, (50 days), (2) add $.60, deduct $.10; Hyde & Baxter, 711 13th St., (1) $6680, (2) add $1, deduct $.25. Noted Sept. 11.

★**S. C., Charleston**—Mechanical Stokers—Spec. 4010—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing in power plant, here, to Westinghouse Electric & Mfg. Co., Hibbs Bldg., Wash., D. C., $10,679, (75 days). Noted Sept. 18.

S. C., Charleston—Turbo Alternator—Spec. 4011—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Sept. 17, installing 2500 kva. turbo alterantor, at Navy Yard, here, from Shevlin Engr. Co., 110 West 34th St., New York City, $25,680, (120 days); Carroll Electric Co., 714 12th St., N. W., Wash., D. C., $27,335 (150 days); Almiral & Co., 1 Dominic St., New York City, $37,526, (150 days). Noted Sept. 4.

★**Fla., Pensacola**—Removal of Pier—Spec. 4019—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract removing pier at Center Ave., to Southern Constr. Co., Brent Bldg., $5366, (27 days). Noted Sept. 18.

★**La., New Orleans**—Equipment—Spec. 3882—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing mechanical equipment for power plant, here, to Carroll Electric Co., 714 12th St., N. W., Wash., D. C., $139,500 (180 days). Noted Sept. 11.

★**Ill., Chicago**—Breakwater—U. S. Engr. Office, 508 Federal Bldg., let contract building rubble mound breakwater at Indiana Harbor, Ind., to Great Lakes Dredge & Dock Co., 104 South Michigan Ave., $455,020. Noted Aug. 7.

Kan., North Topeka — Post Office — Treas. Dept., Wash., D. C., received only bid Sept. 18, building, here, from W. D. Lovell, 1415 South East 8th St., Minneapolis, Minn., $53,800. Noted Aug. 14.

Nev., Winnemucca—Post Office—Treas. Dept., Wash., D. C., received bids Sept. 15, building, here, (1) wood columns, (2) steel columns, from F. Gallagher, San Francisco, Cal., (1) $40,850, (2) $41,280; A. Motschman, Chicago, Ill., (1) $44,330; W. D. Lovell, 1415 South East 8th St., Minneapolis, Minn., (1) $45,576, (2) $46,400. Noted Aug. 21.

★**Cal., Los Angeles** — Silt Diversion Works—U. S. Engr. Office, 725 Central Bldg., let contract building near Los Angeles and Long Beach Harbors, to United Dredging Co., 325 Central Bldg., $806,750. Noted July 31.

Federal Government (Continued)

★**Hawaii, Honolulu**—Dredging—U. S. Engr. Office, War Dept., Wash., D. C., let contract dredging (1) reserve channel, (2) main basin, to Hawaiian Dredging Co., Ltd. Honolulu, (1) $57,225, (2) $140,790.

★**Hawaii, Pearl Harbor** (Kauhua)—Spec. 4008—Torpedo Rack, Electric Trolley and Hoist and Gyro—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building here, to Wooley & Berton, c/o Pub. Eks. Office, Naval Hospital, Pearl Harbor, $24,771 (150 days). Noted Aug. 28.

Miscellaneous

PROPOSED WORK

Pier and Approach—Brooklyn, N. Y.—M. Hurlburt, comr. docks, Pier A, North River, New York City, rejected bids received Aug. 8, furnishing all labor and materials for building pier and approach north of Barren Island, Jamaica Bay, Contr. No. 1609. Work will be readvertised later. Noted July 31.

Wall—West Albany, N. Y.—G. Ford, Albany, soon receives bids building concrete wall on Schenectady Rd., here. About $10,000. T. L. Gleason, 45 Maiden Lane, Albany, archt.

Pier—Port Covington, Md. (Baltimore P. O.)—Western Maryland Ry., Hillen Sta., Baltimore, plans to rebuild coal pier recently destroyed by fire, rein.-con. and steel. About $750,000. H. A. Lane, 1st Natl. Bank Bldg., Hagerstown, engr.

Flood Control—Wheeling, W. Va.—City retained M. Knowles, engr., Jones Law Bldg., Pittsburgh, Pa., to make study of flood control in connection with Wheeling Creek. Work includes land reclamation, extension of various highways, new park site and site for new town for housing development.

Park—West Palm Beach, Fla.—City having plans prepared improving park at Lake Front. About $35,000.

Portland Cement—Evanston, Ill.—L. F. King, clk. sanitary dist., Karpen Bldg., 910 South Michigan Ave., Chicago, soon lets contract furnishing about 125,000 bbl. Portland cement in sacks or bulk delivered on board barges in North Shore Channel or on board cars on tracks of Chicago & Northwestern R. R. or other contiguous railroads, here, and of Chicago & West Ridge R. R., Chicago and Niles Twp.

Electric and Heating Systems—Sheboygan, Wis.—Vollrath Co., West Michigan Ave., plans to install generating electric power system for private use and rebuild heating system. About $50,000. Cahill-Douglas Co., 128 Grand Ave., Milwaukee, engrs.

Park—Butte, Mont.—City plans to expend $35,000 to improve Thompson Park. C. H. Treacy, city clk.

Playgrounds—St. Louis, Mo.—Bd. Pub. Serv. plans to build playgrounds for Juvenile Court Wards. Work involves clearing grounds, erecting necessary buildings, etc. About $10,000.

Dock—Vancouver, Wash.—Port of Vancouver Comn. have preliminary plans prepared building dock on portion of site used by Standifer Shipbuilding Co. About $100,000. G. R. Percival, mayor.

Park—Wenatchee, Wash.—City voted $15,000 bonds to establish and improve park.

Telephone Cable, etc.—Yakima, Wash.—Pacific Telephone & Telegraph Co. plans to install 12,000 ft. cable, extend areal line 5.42 mi., also build 4600-ft. underground trench. About $62,900. C. E. Jelly, mgr.

Swimming Pool—Portland, Ore.—See "Buildings."

Harbor—Monterey, Cal.—City having plans prepared by F. H. Tibbets engr., 1320 Alaska Commercial Bldg., San Francisco, for inner harbor. About $300,000.

Ferry Lines—San Francisco, Cal.—Ellis Landing & Dock Co., 717 Market St., applied to Bd. Supervs. Contra Costa Co., for permission to build ferry line between here and Richmond. F. K. Holland, archt., preparing plans for depots and concrete warehouses in connection with same. Company also plans to build ferry boat to cost $500,000. F. H. Tibbets, 1320 Alaska Commercial Bldg., engr.

Skating Rink—Ft. William, Ont.—C. Burkett purchased site and plans to build 1 story, 160 x 320 ft., steel and brick, concrete foundation. About $90,000. Engineer not selected.

Street Flushers—Windsor, Ont.—City plans to submit bylaw to authorize expenditure of $20,000 to purchase 2 street flushers.

BRIDGE—SCHENECTADY, N. Y.

Bids were received by E. S. Walsh, supt. pub. wks., Capitol, Albany, for constructing abutments and approaches of Schenectady-Scotia Bridge, extending from junction of State St. and Washington Ave., Schenectady, to Schonowee and Mohawk Aves., Scotia Village, from (A) Walsh Constr. Co., Herald Bldg., Syracuse, (awarded contract); (B) American Pipe & Constr. Co., 112 North Broad St., Phila.; (C) Lupfer & Remick, Ellicott Sq., Buffalo. The unit bids were as follows

	A	B	C
Schenectady Abutment and Appr. ach Cofferdams, pumping, bailing and draining (lump sum)	$600.50	$600.00	$5,000.00
3,080 cu.yd. foundation excavation	.77	.95	2.00
2,600 cu.yd. borrow excavation	.63	1.10	.60
5,450 cu.yd. forming embankment	.15	.20	.20
336 concrete piles furnished and placed	36.00	55.00	40 00
8 concrete piles tested	100.00	100.00	100.00
8.3 M ft.b.m. sheeting and bracing	50.00	72.00	80.00
78 cu.yd. balustrade concrete	40.00	45.00	60 00
560 cu.yd. first-class concrete	21.00	20.65	25.00
2,610 cu.yd. second-class concrete	13.00	12.55	14.00
88,000 lb. metal reinforcement	.04	.05	.05
84 cu.yd. lining	1.20	1.75	1.75
880 sq.ft. bush hammered surface	.10	.10	.10
15,700 sq.ft. carborundum rubbed surface	.05	.05	.05
6,400 sq.ft. sidewalk finish	.15	.15	.10
230 lin.ft. metal curb bar	.30	.30	.30
4,000 sq.ft. waterproofing membrane	.15	.15	.20
Sub-total	$73,671	$82,232	$90,863
Deduct amount to be paid to State for materials in building removed	100	100	100
Total	$73,571	$82,132	$90,763
Scotia Abutment:			
Cofferdams, pumping, bailing and draining (lump sum)	$600 00	$600 00	$5,000.00
2,670 cu.yd. foundation excavation	.77	.95	2.00
2,600 cu.yd. forming embankment	.63	.20	.20
370 per pile concrete piles furnished and placed	40 00	55.00	40 00
8 per pile concrete piles tested	100 00	100.00	100 00
25 cu.yd. balustrade concrete	40 00	45.00	60 00
1,360 cu.yd. first-class concrete	21.00	20.35	25.00
2,030 cu.yd. second-class concrete	13 00	12.35	13.00
93,000 lb. metal reinforcement	.04	.05	.05
400 cu.yd. first-class rip-rap	3.50	4.00	4.00
900 sq.ft. bush hammered surface	.10	.10	.10
5,400 sq.ft. carborundum rubbed surface	.05	.05	.04½
1,000 sq.ft. sidewalk finish	.15	.15	.10
150 lin.ft. metal curb bar	.30	.30	.30
Total	$80,271	$85,467	$95,078
Scotia Approach:			
60,500 cu.yd. borrow excavation	$0 60	$0.875	$0.70
5,500 cu.yd. forming embankment	.10	.20	.20
1,740 sq.yd. second-class stone paving	3 20	3.50	2.50
300 cu.yd. lining	1 20	1.65	1.50
Sub-total	$47,728	$70,523	$58,150
Deduct amount to be paid to State for materials in buildings removed	3,000	2,400	4,000
Total	$44,728	$68,123	$54,150
Extended grand totals	$198,570	$235,722	$239,991

BIDS DESIRED

Station—Brooklyn, N. Y.—Until Sept. 30, by J. H. Delaney, comr. transit constr., 49 Lafayette St., New York City, constructing station finish for part of Culver Rapid Transit R.R. extending over and along Shell Rd. and West 6th St. from near Ave. X to Sheepshead Bay Rd.

Mechanical Draft Equipment—Pittsburgh, Pa.—Until Sept. 29, by J. Swan, dir. dept. pub. wks., furnishing and delivering mechanical draft equipment (fan, engine and appurtenances) at Herron Hill Pumping Sta., N. S. Sprague, city engr.

Granite Paving Blocks—Baltimore, Md.—Until Oct. 1, by Bd. Awards, furnishing to G. F. Weighardt, highways engr., F. O. B. cars, Baltimore, granite paving blocks; advertised in this issue.

Sewerage Screening Press—Baltimore, Md.—Until Oct. 1, by Bd. Awards, furnishing and delivering complete to G. F. Weighardt, highway engr., F. O. B. cars at any freight terminal here, 1 sewerage screening press; advertised in this issue.

Pipe, etc.—Alexandria, La.—Until Oct. 6, by C. N. Adams, mayor and City Council, furnishing 84, 500 ft. 2 in. genuine w. i. pipe, 44, 100 ft. $\frac{3}{16}$ in. class A, c. i. pipe, and 54, 900 ft. $\frac{1}{16}$ in. class B, c. i. pipe, together with valves, crosses, tees, etc. W. H. Sylvester, city engr.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Garbage Incinerator—Syracuse, N. Y.**—Bd. Contr. & Supply let contract building garbage incinerating plant on Hiawatha st., to Caswell Constr. Co., 130 Dickerson St. About $110,000. Noted Sept. 4.

★**Wall—Weehauken, N. J.**—Bd. Freeholders Hudson Co., Jersey City, let contract repairing wall of Hudson Co. Blvd. opposite Hudson Ave., here, to M. Curley, 500 Pavonia Ave., Jersey City, $9.76 per cu.yd. Noted Sept. 11.

Foundation—Detroit, Mich.—City received bids for foundation for Scott Memorial Fountain on Belle Isle, (a) double line of piling, (b) filling with earth and debris between piling, (c) triple line of piling, (d) extra double line piling, (e) single sheet piling, (f) for shorter piles, deduct per ft. of pile, (g) for shorter sheeting, deduct per ft. of sheeting, (h) for longer piles, add per ft. of pile, (i) for longer sheet piling add per ft. of sheet piling, (j) stone dykes, (1) 1000-30,000 tons, (2) 30,000-40 000 tons, (3) 40,000-50,000 tons, (4) 50,000-60,000 tons, (k) additional rock fill (l) rock fill after earth, from Chandler Dock & Dredge Co., Penobscot Bldg., (a) $152.000, (c) $41.39 per ft., (d) $50.68, (e) $12.12 per ft., (f) $.31 per ft., (g) $ 36, (h) $.51, (i) $ 49; A. J. Dupuis, 1022 Ford Bldg., (a) $155.000, (c) $45.20, (d) $52.75, (e) $13.30, (f) $.33, (g) $.38, (h) $.48, (i) $.53; Dunbar-Sullivan Dredging Co., 2211Dime Bank Bldg., (j1) $2.25, (j2) $1.90, (j3) $1.60, (j4) $1.42, (k) $1.90, (l) same as (j); J. D. Kennedy Co., 723 Dime Bank Bldg., (j1 and 2) $3.20, (j3 and 4) $2.20

★**Roof—Grand Forks, N. D.**—City Council let contract repairing roof over clear water basin on 3rd St. and Minnesota Ave., concrete, to J. A. Dinnie Co. 314 International Ave., $14,450 Noted Sept. 4 under "Waterworks."

Tunnel—Quinton, Ore.—State Highway Comn., Portland, received bids Sept. 9, building 552 ft. tunnel on John Day-Blalock Sect., Columbia River Highway, Gilliam Co., from A. Guthrie & Co., Sherlock Bldg., $40,814; O. Huber, Sherlock Bldg., $45,898; Johnson Constr. Co., Lumber Exch. Bldg., $46,964. Contractors all of Portland. Noted July 31.

★**Hydraulic Equipment, etc.—Parry Sound, Ont.**—Municipal Council let contract for hydraulic equipment and turbines in connection with new power plant, to consist of 6500 hp. turbines in 3 units to Boving Hydraulic Co., Peterborough. $19,270.

OFFICIAL PROPOSALS

Bids: Sept. 29.

Bridge Construction

STATE OF NEW JERSEY

STATE HIGHWAY COMMISSION
TRENTON

Trenton, N. J.

Notice is hereby given that sealed bids will be received by the State Highway Commission of New Jersey for the construction of the following:

Reinforced concrete bridge No. 46, span 10 feet, width 30 feet, located at Station 45 + 83, Route No. 3, Hammondton-Ancora Section, Camden County.

Reinforced concrete bridge No. 172, span 10 feet, width 30 feet, located at Station 121 + 40, Route No. 3, Hammonton-Ancora Section, Camden County.

Reinforced concrete bridge No. 174, span 15 feet, width 30 feet, located at Station 174 + 63, Route No. 3, Ancora-Atco Section, Camden County.

Reinforced concrete bridge No. 46, span 13 feet, width 30 feet, located at Station 415 + 80, Route No. 3, Ancora-Atco Section, Camden County.

Bids for the above will be opened and read in public at the office of the State Highway Commission, Broad Street Bank Bldg., Trenton, N. J., on Monday, September 29, 1919, at 10:30 A.M.

Drawings, specifications and form of bid, contract and bond for the proposed work will be on file in the office of the State Highway Department at Trenton, the office of C. A. Mead, Bridge Engineer, 790 Broad St., Newark, and the office of J. A. Williams, Division Engineer, 503 Market St., Camden, and may be inspected by prospective bidders. Plans and specifications will be furnished on deposit of ten dollars ($10) upon application to the Division Engineer, 503 Market St., Camden. Bids must be made on the standard proposal forms in the manner designated therein and as required by the specifications, same to be inclosed in sealed envelopes, bearing the name and address of bidder and number and location of bridge on the outside, addressed to

STATE HIGHWAY COMMISSION,
Broad Street Bank Bldg.,
Trenton, New Jersey.

and must be accompanied by a certified check for not less than ten per cent (10%) of the amount of the bid, and be delivered at the above place on or before the hour named. Copies of standard proposal form will be furnished on application.

Each bidder must accompany his bid with a certificate from a surety company, duly authorized to do business in this State, stating that such surety company will provide said bidder with a bond in such sum as is required in, and in accordance with the provisions of said specifications, conditioned for the faithful performance of the provisions of the contract and specifications.

By order of the State Highway Commission.

A. LEE GROVER,
Chief Clerk.

The publication of an advertisement on this page is an official notice that bids are wanted from other than local bidders.

It is also a guarantee that maximum competition is invited because Engineering News-Record is the *one* nationally recognized medium for Proposal advertising. Its Searchlight Section is read each week by nearly every worth-while contractor in this country who bids on public work outside his own city.

Bids: Oct. 7

State Highway and Bridge Construction

Anderson, S. C.

Sealed proposals, on blank forms attached to specifications, will be received by the Anderson County Highway Commission, at their office, Anderson, South Carolina, for the construction of improved Highways and Bridges in Anderson County, S. C.

Said proposals will be received until 12 o'clock, October 7th, 1919, at which time they will be opened and read publicly. Said proposals will be considered by the Commission and awards made as soon as practicable thereafter.

Bids will be asked for as follows:

Approximately:

75,000 sq.yd All Classes Permanent.
60,000 cu.yd. Excavation.
50,000 lin.ft. Concrete Curb.
10,000 lin.ft. Wood Curb.
5,000 lin.ft. Storm Water Drains.
2,000 cu.yd. Concrete Class "A".
5,000 cu.yd. Concrete Class "B".
2,000 cu.yd. Concrete Class "C".

Each bid must be accompanied by a certified check on an approved Bank for 5 per cent of the amount bid, except if such should exceed Ten Thousand ($10,000.00) dollars; then said check may be drawn for said Ten Thousand ($10,000.00) dollars, drawn to the order of the Secretary W. C. Austin.

Plans and specifications may be seen at the office of the Highway Commission, Anderson, S. C. Copies of specifications may be obtained from the above stated office upon application.

The right is reserved by the Board of Highway Commissioners to reject any, or all or any portion of bids or accept any bid that may appear to be to the best interest of Anderson County.

$290,000.00 Dollars immediately available of the $1,450,000.00 Bond issue all of which has been approved.

ANDERSON COUNTY HIGHWAY COMMISSION
Anderson County, S. C.
J. MACK KING, Chairman
W. C. AUSTIN, Secretary
W. A. SANDERS, Engineer.

Bids: Sept. 30.

State Road Construction

Independence, Mo.

Sealed proposals, addressed to the County Court of Jackson, Missouri, and endorsed "Proposal for constructing (or improving) State Road, Project No. 18," will be received by the County Court until 10 o'clock A.M., on the 30th day of September, 1919, and at that time will be publicly opened and read at the Jackson County Court House in Independence.

The proposed work includes grading, surfacing with bituminous macadam 16 feet in width, constructing earth shoulders, ditches and culverts, together with other work incidental thereto on the State Road in Jackson County known as the Lone Jack East Road from Lone Jack to the Jackson-Johnson County line, a distance of 3.1 miles.

Plans and specifications are on file and may be inspected at the office of the undersigned, or at the offices of the State Highway Department, Jefferson City, Mo.

A set of plans and specifications may be obtained from the undersignded upon deposit of ten dollars ($10), which amount will be refunded if both plans and specifications are returned in good condition within ten days after date of awarding the contract.

Proposals shall be submitted upon blank forms provided for the purpose by the undersigned, and shall be accompanied by a certified check, cash deposit or proposal bond for six thousand six hundred dollars ($6,600).

The right is reserved by the County Court to reject any or all bids.

County Court of Jackson County, Missouri.

By O. C. SHELEY,
County Highway Engineer.
Jackson County Court House,
Independence, Mo.

Bids: Sept. 30.

Paving

Montgomery, Ala.

Sealed proposals in duplicate will be received by the City Treasurer until 11:00 o'clock A.M. Tuesday, September 30th, 1919, at his office in the City Hall for the paving of the roadway of High Street from the East side of Hull Street to the East side of Jackson Street with brick, asphalt, bitulithic, mineral rubber, wood block, concrete, vibrolithic concrete or asphaltic concrete pavement (approximately 9150 square yards).

All of the above mentioned work to be done in accordance with the plans, specifications, profiles and estimates on file at the office of the City Engineer. Address all communications to S. E. Washburn, City Engineer.

A certified check in an amount as set forth in the specifications must accompany each bid.

The City reserves the right to reject any or all bids.

G. W. Barnett,
City Treasurer.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—JAMES H. McGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. MEHREN, *Editor* — CHARLES WHITING BAKER, *Consulting Editor*

Volume 83 — NEW YORK, THURSDAY, OCTOBER 2, 1919 — Number 14

Delayed in Publication

Publication Resumed

The presses of the McGraw-Hill printing plant are again running. The strike is not over, but a few of the sane men, tired of the four weeks of bickering in union ranks, have returned to work. The Engineering News-Record has the honor of being the first paper put on the presses.

The issue, dated October 2nd, actually comes out October 30th. It is our expectation to make up all of the issues missed, but the pick-up at the start is likely to be slow.

When the presses stopped September 30th, the entire issue of October 2nd had been set up and electrotyped, ready for the press. Thus far, only pressmen have returned to work. We are, therefore, using the pages as prepared for the issue, with the exception of this page which is photoengraved directly from typewritten manuscript. We should like to have revised the News section, but, time forbidding, we are printing it as originally prepared. Some of the items are out of date, but most of them have value for record purposes.

Lack of time, too, forces us to omit entirely the Construction News Section, but the most important item—Bids Desired - are going out in an emergency bulletin, as they have in the past three weeks.

Next week we hope to get out an issue more nearly normal. We expect at least that it will be up to the minute in both construction and general news.

A Word of Thanks

Upon resumption of publication, we desire to express formally our heartfelt appreciation of the patience of our readers during the suspension. Two classes in particular have been seriously inconvenienced-- engineers who have had contracts to let, and contractors who are seeking work. One and all, they have tolerated the inconvenience and the financial loss without complaint. More than that, they have encouraged us to stand firm in our resistance to radicalism.

For all of which we are most sincerely grateful.

Big Contractors in Road Work

In the spring C. S. Hill, associate editor of Engineering News-Record (see issue of June 12, page 1156) reported the views of large contracting organizations on taking highway contracts. The attitude was unfavorable. Therefore, it is all the more interesting to note that a goodly number of large contractors, hitherto engaged in other lines of work, have taken road contracts. The comment is all the more pertinent because of the awarding late last month of an $826,000 contract, in Ohio, to the Bates & Rogers Construction Co., the well known Chicago firm. Obviously, the scarcity of other work accounts to some extent for the entry of those large organizations into road work. Undoubtedly, too, they realized the coming volume of highway construction, and have considered it worth while "to try it out." The results of their experience will be interesting. Will they find that their objections have been removed? Will they find the relations so satisfactory that they will be permanent additions to the roll of highway builders? By the coming of winter we should know. The answer is one of great importance to the highway field.

Highway Work Limitations

What the attitude of large contracting organizations will be toward highway contracts may determine the volume of work to be done in the next few years. Indications are that funds will not be the limiting factor. The supply of stone and gravel, however, may set a limit on the work. In some Eastern states there is great difficulty in getting deliveries. The situation is likely to be more acute when other forms of construction get under way. Another critical factor is the future supply of competent engineers. A scarcity seems to be indicated. These are all serious problems, none of them easy of solution. Probably the least difficulty of all will be the supply of contractors, provided the work is made attractive by the same fair dealing that large organizations have been accustomed to on private work. The material situation can be investigated in each state and encouragement offered by surveys that will locate quarry and gravel-bank sites. The most difficult of the problems will be to secure men. The colleges cannot rush them through in a single year. Young men can fill only the subordinate jobs. The scarcity, therefore, will lie in men of experience. Undoubtedly, the salary scale will go up with the demand and some relief will be found in the transfer of engineers, though without highway experience, from less lucrative employment. The whole situation is one that invites the interchange of views at engineering society meetings during the coming fall.

State Highway Department Standards

THE objections alleged by contracting organizations against taking up highway work were undoubtedly based to a large extent on the experiences of these organizations with the work of municipalities and counties. That has often been notoriously unsatisfactory. The reasons are various and need not be detailed here. It is pertinent to remark, however, that much better conditions obtain in work let by state highway departments. In general, these bodies are well organized, are sufficiently manned and are conducted on high standards, with little political interference. Undoubtedly the true situation was not realized by large contracting organizations, and for that reason alone, a considerable change in attitude is to be expected on the part of those who formerly objected but who nevertheless took highway contracts this year.

Breaking Down Distance Barriers

THE new Pacific fleet recently arrived at San Francisco, which is to be its future headquarters. The fact that we are to maintain a representative fleet in the Pacific has a bearing on Western industrial development; it cannot but promote a feeling of security and greater confidence on the part of capital. More than this, however, significance attaches to the short space of time in which this armada was transferred from Atlantic to Pacific waters. The result is more than a historical landmark, because it calls for a readjustment of our habit of thought and our attitude toward industrial prospects in and political relations between widely separated territories. During the war with Spain in 1898, the battleship Oregon made history in a record breaking dash from San Francisco to Key West, but that trip required more than nine weeks. In contrast with this, the entire Pacific fleet passed through the Panama Canal between dawn and sundown, while the entire trip can be made from New York to San Francisco under three weeks. To carry the thought further, there is in the rapid development of aërial transport, probability of still closer contact—a further reduction of the old geographical barriers. As the world, in effect, becomes smaller, the situation in each political or commercial unit has an increasing influence on the situation in every other unit. Barriers are disappearing rapidly. To keep abreast of modern advances commercially it is becoming more and more necessary to think in terms of broader fields of operation.

Airplane Service Progress

SOME weeks ago we commented upon the progress that was made in airplane development during the war and the probability of rapid growth of the new transport agency in civil life. Except for our air-mail service between New York and Washington, we have had to point to achievements abroad as evidence of progress. We are not, however, to be without results here. Last week, for example, after a successful flight from Milwaukee to New York, the airplane designed by Alfred W Lawson carried 14 persons from New York to Washington, the time being four hours and fifteen minutes. A passenger airplane service between New York and Atlantic City has been carried on for some months, while the New York-Cleveland mail service can now be counted with the Washington service as an established success. In fact, the trip made in this service, Sept. 25, deserves special record. The 430 miles (changing planes at Bellefonte, Penn., and carrying 335 lb. of mail) were flown in 179 min. or at the rate of 144 miles per hour On the very same day a Martin bomber made a non-stop flight between Cleveland and New York with four passengers, guiding itself entirely by compass. As this sort of evidence of the stability and reliability of airplanes increases in volume, the confidence of the public in this mode of travel will increase, as will the faith of those who are seeking an outlet for investment. An overnight popularity of airplane travel is not to be looked for, but the development is nevertheless definite.

Sand for Winter Use

IN MOST parts of the United States it is extremely difficult to get sand in the winter months. Particularly where such sand comes from underwater or in water-bearing deposits, deliveries stop as soon as winter sets in. Contractors who contemplate or expect concreting work this winter should bear this in mind and should get into storage as soon as possible as much sand as they will need until spring. Winter concreting is a common thing now that we have learned to do it safely, and there are indications that there will be much of it next season. By being prepared, much worry and delay will be avoided.

Letting Next Year's Road Contracts This Year

OF ALL public and semi-public construction, none resumed operations more quickly or on a larger scale than highway work. Yet, in spite of this seeming good record, no one who has been in contact with highway work can help observing that there has been a loss, due to delays in starting many of the larger projects, of not less than two and possibly three months of the actual construction season. With the regrettable examples before us, there should be no repetition of these conditions next year.

At the beginning of the year there were large sums immediately available for construction purposes, but public officials, with many others controlling private entreprises, hesitated to award contracts. In spite of the prediction of many business men that prices would not go lower, many public officials deemed it wiser to delay action. As a matter of fact, contracts awarded later have averaged from 10% to 15% higher than those let in the early summer.

Contractors looking for prospective work had no means of knowing what the construction program would be. Many of the highway offerings evidently would be of such extent as to require contractors with large organizations and large plants. But while matters were held in abeyance contractors were not in a position to arrange for the needed plant. Consequently, equipment orders piled up as the season progressed, and the builders were not able to make deliveries. Likewise, there was no opportunity for contractors to accumulate materials, and now the car shortage theratens further serious curtailment of the construction program.

The prospective highway program for next year is even larger than that of a year ago. If the work is to be handled to the best advantage, it is necessary that

more time be given contractors to organize. This done, the public will secure lower prices and quicker work.

If such conditions are to be brought about, highway officials should ask for bids in November or December of this year on as great an amount of work as can be prepared, provided, of course, the funds are available, which, fortunately, is the case in many states. Contractors will then know what to provide for next year, will lay in stocks of materials and place orders at once for machinery for delivery before the season opens. The costly delays experienced this year would be eliminated, to a great extent.

Railway Bridge Floors

LONG paneling as used in the Coal Valley bridge is in harmony with progressive views in modern railroad-bridge design. The reason for using 43-ft. panels, clearly stated in our article, is the same that controls or should control other cases where long panels may come into question; namely, that the truss is improved by simplification. This means reduction of secondaries and reduction of field connections, two important advantages. They may be gained at the cost of some added metal, but there is at least one auxiliary advantage that helps to counterbalance the loss. The mere increase in weight of the floor is an advantage, by no means negligible, as it produces a solidity very favorable to the suppression of live-load impacts. Since experience has shown plate girders to possess a higher degree of reliability and reserve of strength than is credited to trusses, ultimate economy, doubtless, is on the side of long panels as compared with short panels, even though weight comparison of design may point the other way. On this account it is not impossible, we think, that the same reasons which argue for a moderate increase in panel lengths would also hold for the use of much longer panels, which would involve going to bridge proportions of quite unusual kind. Useful results in this direction, however, are more likely to be reached by progressive development than by a single radical step away from recognized practice.

Important Records of Engineering—Data on Repairs

THERE is a special art in the work of repair and rebuilding of engineering structures. Schools do not teach methods of doing such work. Nor do texts give any help. The work depends on original resource, and brings into play the engineer's most highly developed skill. The art of repair must be learned through practice, and through study of the work of others. Because of this, technical accounts of such work have a place of peculiar importance in our engineering literature.

Yet the truth of the matter is that such accounts are rare indeed—almost as rare, perhaps, as records of operating experience. It would seem that technical writers prefer to deal with descriptions of new construction. Perhaps the glamour of new design conception, and the finished impression of a structure just built, make mere patching and revamping seem trivial. Whatever the cause, the result is beyond doubt: Far too rarely are adequate accounts of reconstruction operations made public.

A double loss is involved, for, besides carrying the teaching and inspiration of skilfully exercised engineering resource, the descriptions of repair have a separate and still more important element of value. They embody service records and thereby supply data upon which engineering progress is more or less directly dependent.

This is because repair tells of existing faults of engineering method. Every replacement or strengthening means a prior failure. It is true that the failure may not have been premature but may have occurred in the fullness of time; it may have been a justifiable or natural failure, or the opposite, and the mere fact that a failure occurred is not discreditable to the original design and construction. Nevertheless, the facts of the failure, when taken in conjunction with the time of service, throw light on the merits of the engineering methods originally applied. They are the results of the service test.

Let it be recalled that the larger part of engineering, as it has been developed through generations and centuries, rests on empirical foundations. Nearly every single step of advance was made by virtue of the knowledge gained by the service of prior construction. A design is, even today, at least a prediction, a promise of efficient service; the facts themselves can be found only in the subsequent service record. Is there, then, much exaggeration if we assert that one service record is worth a dozen designs? Regarded from this standpoint, there need be no question as to the value of accounts of repair work; for such work, when based on thorough analysis of the defective conditions found, is a service record of truest kind.

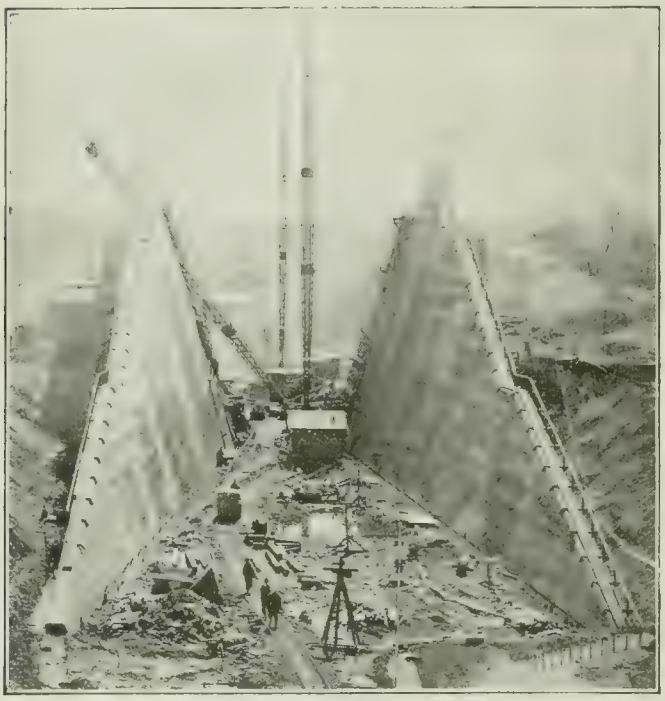
At least three elements are included in the scope of properly executed repair work. There must, first, be a diagnosis of the existing conditions which make the repair necessary. Following this, the various reconstruction procedures must be studied and the best ones selected. Finally, there is the execution of the work itself. Instructional value resides in all of these, but particular interest attaches to the first, the diagnosis. Not only does it demand keen observation and highly skilled judgment concerning both tangible and intangible facts, but it alone supplies the service data just referred to. It should be obvious, then, that, more than all other parts of a repair undertaking, the diagnosis is worth the engineer's careful attention when he sets down a record of the work. The ultimate analysis of the entire job centers in clear and thorough study of the conditions precedent; and so also the excellence or lack of excellence of the report of these findings will determine whether or not the record is to be a lasting contribution to the world's engineering progress.

Recently the pages of *Engineering News-Record*, within the space of three weeks, contained accounts of two remarkable repair operations. The two articles, one describing the restoration of a large swing bridge, the other a well studied repair of a fixed structure, constitute an exception to our statement that such articles are rare; but this very exception emphasizes, by contrast, the dearth of such records in current engineering literature. This dearth, we feel certain, is not chargeable to the scarcity of engineering repair work in itself, nor to the lack of thorough analysis of the conditions which call for such work. Were the importance of such records fully appreciated by engineers, many other accounts of repair work having high instructional value would be published, and our stock of engineering data would be significantly increased.

Concreting Procedure on Miami Flood-Control Dams

Equipment and Methods Standardized for Five Separate Jobs—Standard Product Secured by Test Control of Varying Aggregates

STANDARDIZED procedure, based on tests of materials and product, maintained concreting operations at consistently high speed, uninterrupted by winter weather, on the outlets for the retarding-basin dams of the Miami Valley flood-control works. For all principal operations identical equipment and methods were employed in procuring and preparing concrete materials and in mixing and distributing concrete. For placing concrete, substantially identical equipment was



LOCKINGTON RETAINING WALLS COMPLETED TO HIGHEST POINT 84 FEET ABOVE BASE

employed for each of the two types of outlet structure.

About 173,000 cu.yd. of concrete is required for the five outlet structures. This is distributed as follows: Lockington, 38,000; Taylorsville, 47,000; Englewood, 38,000; Huffman, 40,000 and Germantown, 20,000. At Englewood and Germantown the outlets consist of twin conduits through the dam embankments for normal river and ordinary flood discharge, and of separate safety spillways around the ends of the dam for extraordinary floods. At the three other locations, the spillways and conduits are combined in single structures. These consist each of a retaining-wall channel through the dam embankment; across this channel is a weir, the crest of which forms the safety spillway and through the base of which conduits provide for the normal discharge.

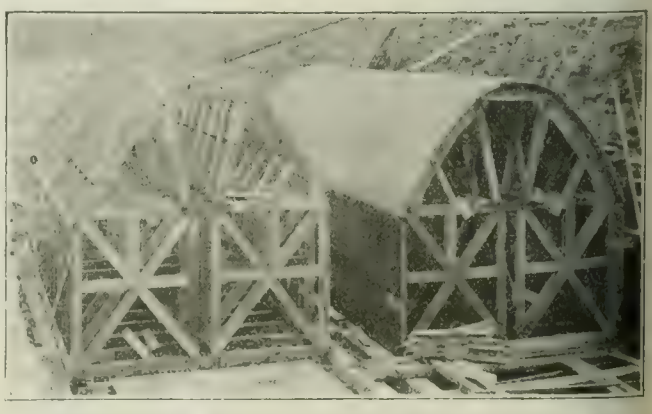
A feature of the construction of both types of outlet is that they are first built to provide a larger waterway than is finally required and will, therefore, be constricted by additional construction to be performed later. The purpose of this was to provide as large an escape for floods as was possible during construction, when the [illegible] was not ready to impound water. In the case of the twin conduits, the sections were built nearly twice as high as they will be finally. These sections will be reduced by filling the bottom halves with gravel and constructing concrete cross-floors. In the retaining-wall outlets the cross-dams are not built at first; thus unrestricted open channels are left for flood discharge.

Completion of the outlets as considered at this time does not mean placing the total volumes of concrete enumerated above. The records of concreting to be given relate to only four dams. At Taylorsville embankment construction was not required to await the outlet work and other conditions placed the concreting at a later period in the construction schedule. The equipment and methods there will, however, be exactly like those at other outlets of the same type. The four outlets on which construction is substantially completed involve 90,000 cu.yd. of concrete.

Dam construction operations were: (1) Concreting outlet structures, and (2) hydraulicking embankment. The major task was embankment construction. Other operations, therefore, had to clear the way as rapidly as possible for hydraulicking. At all the dams except Taylorsville the locations of the outlets and the job topography were such that the beginning of embankment had to await substantial completion of the outlets. Finally, since the dams were units of a single system of flood protection, their construction had to be so scheduled that completion would be simultaneous.

These conditions determined (1) that outlet construction must go ahead at the same time on at least four of the dams; (2) that it must precede embankment construction; and (3) that it must proceed with speed. At all dams local deposits of gravel were used as aggregate.

Structures from 20,000 to 47,000 cu.yd. in volume, including retaining walls 80 ft. high and twin conduits 1000 ft. long, set in deep pits to be excavated just ahead of the concreting operations, called for separate and highly concentrated assemblages of equipment. To simplify the problems of assembling, interchanging, maintaining and operating this equipment, standardization was considered essential. Six main operations were involved in this task: (1) Mining and delivering



ARCH FORMS IN PLACE FOR TWIN CONDUITS AT ENGLEWOOD

gravel; (2) preparing aggregates; (3) proportioning and mixing concrete; (4) transporting concrete, (5) distributing concrete; (6) excavating rock emplacements.

The following plant was adopted for each outlet operation: At the pit a dragline excavator loading cars; dump-car and dinky-locomotive haulage to the gravel plant; a gravel-washing and screening and a materials-storage and concrete-mixing plant identical for the five dams; gasoline-operated industrial railways for delivering concrete; either derrick or chuting outfits for placing concrete; and drilling, blasting and dragline excavators for preparing emplacements. The two types of outlet structure, but more directly the outlet locations and the job topography, necessitated different concrete-placing outfits, but otherwise there was for all dams close similarity in the procedure and equipment for each process, and for most processes absolute identity of equipment.

Aggregates for concrete were obtained by washing and screening gravel from local deposits. At each dam site the deposit was carefully explored and analyzed for quality and granulometric composition. The exploration was conducted by digging test pits to groundwater level and using sand pumps for deeper exploration. The samples obtained were analyzed for density of component stone, gradation in size of grains, proportion of voids, and content of silt. Using the sand and pebbles of the samples, 2-in. cubes of 1:3 mortar and 6 x 6-in. cylinders of virtually 1:2:4 concrete were molded and crushed, with results that showed the gravel deposits at all dams to be entirely suitable for concrete aggregates.

Granulometric variation was the chief problem disclosed by the analyses of the gravel deposits. At Germantown and Huffman the deposits were uniform and the material was naturally well graded. At Lockington the natural material had an excess of small sizes, but lacked in very fine sizes. At Englewood the deposit was streaky.

Standard washing and screening provided for two sizes of coarse aggregates, 3 to 1½ in. and 1½ to ⅜ in.,



BELT CONVEYOR DELIVERS PIT GRAVEL TO SCREENS AND WASHER

delivered into separate bin compartments, and of sand delivered into a third compartment between the other two. The purpose of separating the coarse aggregate into two sizes was to overcome pit variations in the aggregate content of the concrete. Where the gravel in the pit ran first coarse and then finer, these variations, it was reasoned, would appear in the gravel in the bin if all sizes were screened into one bin, and the concrete would be now heavy in coarse aggregate and again heavy in fine aggregate. By screening into two sizes and drawing equally from both bins for each batch, this was avoided, and the operation required no greater screen length or bin capacity.

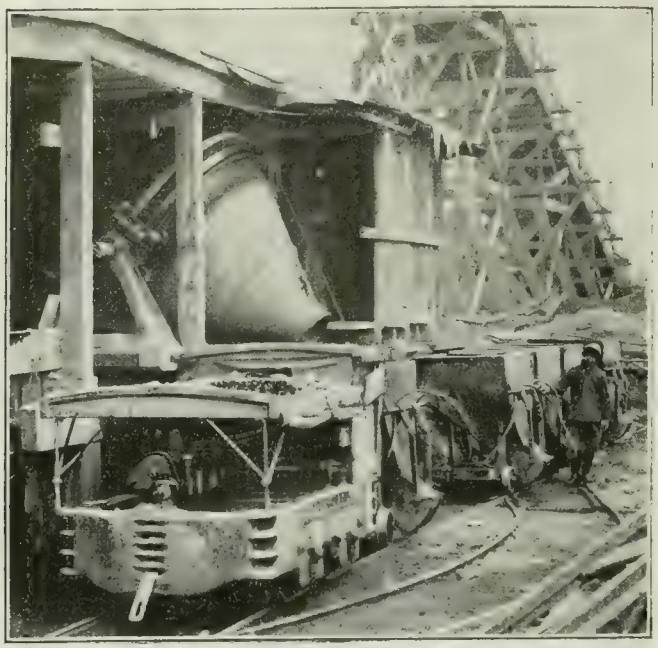
Modifications in standard plant and processes were principally in connection with handling the sand, and have been described in *Engineering News-Record* of Feb. 27 and Mar. 6, 1919, pp. 445 and 492. In general, the sand hoppers at all the plants retained an excess of water in the sand. These hoppers are vertical inverted cones into which the washed sand is discharged from the sand screen. Most of the wash water in the sand overflows through a spout which is notched into the upper edge of the cone, while the sand is periodically discharged to the bin through a counterweighted valve in the bottom of the cone. In operation too much of the wash water remained in the cone and was discharged into the sand bin. At each plant, therefore, a supplementary device had to be installed to take the cone discharge, drain out the excess water and transfer the sand to the bin.

At Lockington dam the pit gravel ran small, about 90% being under 1½-in. size, and contained an excess of grapeseed grains and a scarcity of finer grains. The standard ⅜-, 1½- and ⅜ in. screens being used, the ⅜-in. screen, having most of the work, became clogged, and much of the material finer than ⅜ in. was carried over



LOCOMOTIVE CRANE LIFTS CONCRETE CAR OVER CHUTE HOPPER

into the stone bins. A set of auxiliary sand screens had to be installed underneath the ⅜-in. screen, and in addition flow through this screen was retarded by the riveting on of inside baffle plates, and additional washing water was introduced to keep the openings flushed. To make up the deficiency of fine sand, the wash water



MIXERS DISCHARGE DIRECTLY INTO INDUSTRIAL RAILWAY CARS

which ordinarily carried away much of this material was passed through settling tanks from which the fine sand was salvaged and placed in the sand bin.

Except in respect to the modifications noted, the operations of preparing aggregate were alike at each dam. Pit gravel excavated by dragline excavators was loaded into 12-yd. dump cars which were hauled by locomotives to the gravel plants and there dumped into hoppers feeding belt conveyors to the screens on the top of the stock bins. Very large stones were picked out by hand at the bottom of the conveyors, but otherwise every process from pits to stock bins was mechanical.

The problem of concrete proportioning and mixing involved these principal factors: (1) Preparing four qualities of mixture according to the place of concrete in the outlet structure; (2) maintaining each quality of mixture at approximately the same strength standard; (3) keeping each mixture workable to the highest degree practicable without overburdening the concrete with water. As in preparing aggregates, the solution was to adopt a basic procedure determined by tests and to modify this procedure in detail when necessary.

For each of the four qualities of concrete, the cement content was constant, being 5, 6, 7 or 8 bags per batch of a 1-cu.yd. mixer, but the aggregate proportions varied with the material at the different pits. As examples of this variation, the exact proportions at two dams were:

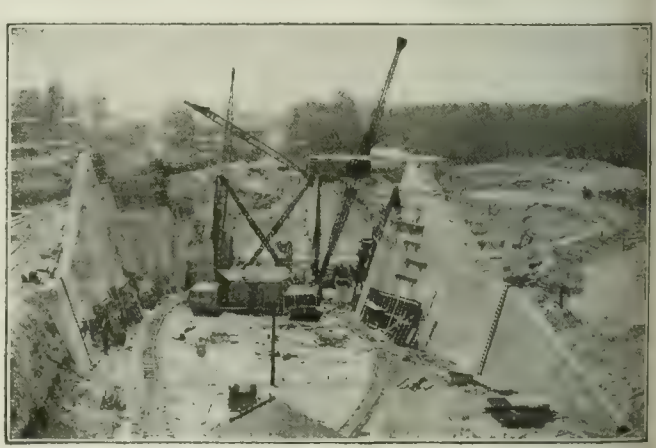
Bags Cement	Lockington	Germantown
5	1:2.7 :6.6	1:2.66:5.96
6	1:2.25:5.5	1:2.22:4.97
7	1:1.93:4.7	1:1.90:4.26
8	1:1.5 :2.5	1:1.66:3.32

The two intermediate mixtures were used for the bulk of the work; the leanest mixture for portions of the footing and backing concrete, and the richest mixture for lining the conduits.

As a mixing problem, therefore, concrete production was not a task of adhering to fixed measures, but, as previously stated, a task of producing by proper manipulation of materials and mixer action four workable mixtures of standard qualities. Based on analyses of the aggregates available at each dam and on workability tests of mixtures of these aggregates, basic volumes of aggregates per batch were determined and the measuring chutes were set to these volumes. These chutes were, however, adjustable so that quick change in aggregate proportions could be made when occasion demanded a change. At Lockington, for example, the basic volumes determined were, for each batch, 13½ cu.ft. of sand under ¼ in., 11 cu.ft. of gravel between ¼ and ⅜ in., and 22 cu.ft. of gravel larger than ⅜ in. At Germantown the quantity of sand was set at 12½ cu.ft., but the coarse aggregate varied from 14 cu. ft. small and 11 cu.ft. large for arches, to 16 cu.ft. small and 12 cu.ft. large for floors and walls. These variations at two locations exemplify the practice followed at each dam in aggregate adjustment.

At each dam there was a similar adjustment of mixer operation to meet the requirements. The mixers ran normally at about 10 r.p.m., but the number of revolutions for which the batch was held in the mixer was varied up to 25 as was necessary to secure the required perfection of mixture. Similarly, the volume of mixing water was varied by observation, accordingly as the sand came wet or dry from the bins and as the flow was sluggish or rapid in the distributing chutes.

Output capacity and reliability of operation were especially essential in the concrete haulage methods. To clear the way for hydraulic filling, the outlet concreting was scheduled to continue through the winter and to maintain a rapid rate of progress. The lengths of concrete haul from mixer to place were from 600 ft. to 1600 ft., maximum. Distribution by chuting without hoisting was made possible by the topography at Englewood and Germantown, while at the other dams the outlet location and the type of structure made derricks, as explained later, the logical equipment for distribu-



DRAGLINE EXCAVATES EMPLACEMENT JUST IN ADVANCE OF CONCRETING AT HUFFMAN

tion. All these conditions appeared to be best satisfied by industrial-railway haulage. The equipment selected was 30-in.-gage track and friction-drive gasoline locomotives. Flat-cars carrying buckets were used for



OUTFIT FOR DIRECT CHUTING FROM CARS AT ENGLEWOOD

derrick distribution, and side-gate hopper-body cars where the concrete was chuted.

Two- and three-car trains were operated by single locomotives, each car carrying a batch of more than 1 cu.yd. On interrupted work an outfit of three locomotives and six to eight cars regularly handled 300 cu.yd. a day, and on occasions a single locomotive handled 200 cu.yd. a day. Weather conditions such as prevailed during the mild winter of 1918-19 did not materially affect the haulage operations.

At Englewood and Germantown the twin outlet conduits, about 1000 ft. long, were located in trenches parallel to and at the bottom of bluffs. By placing the mixing plants on the bluffs and laying the industrial tracks along the sides above the conduits, provision was made for direct chuting from cars by means of the simple chute traveler outfits described in *Engineering News-Record* of Mar. 20, 1919, p. 588. At Germantown practically all of the 15,368 cu. yd. in the conduits were placed by direct chuting from cars standing on the track. Near the upstream ends of the Englewood conduits, where the bluff was not high enough for direct car delivery to the chute traveler, a locomotive crane lifted the cars from the rails and swung them into discharging position over the chute hopper. Also, where the very upper ends of the conduits came to a point nearly opposite the mixer, a hoist tower and chute were installed in place of cars and chute travelers.

Instead of building twin conduits low on the valley bottom, as just described, the concreting problem at Lockington, Taylorsville and Huffman was to build parallel retaining walls 70 to 80 ft. high from the valley bottoms to the crests of the earth dams. Topography did not permit direct chute delivery from cars. Since derricks were necessary to handle the wall-form units and would serve other useful purposes in preparing the emplacements, decision was made to place the concrete by derricks. The outfit at Lockington was described in *Engineering News-Record* of Feb. 13, 1919, p. 327; that at Huffman was substantially similar.

Similar procedures were followed in concreting outlets of corresponding types. The twin conduits were built in sections, first sections of the lower half of the conduits closely followed by corresponding sections of the upper arch portions using knockdown forms of wood. Both walls of the open channel outlets were concreted at the same time, proceeding from one end to the other by successive sections and using wood-form panels. Placing methods followed usual good practice.

Progress of concreting at the four dams is comparable only in the most general way, owing to differences in the types of structures and in the outfits employed. and particularly to differences in the conditions and the necessities of the work. Winter concreting was continuous at all of the dams except Huffman, which was not begun until March, 1919, but, owing to the mildness of the season, only very ordinary cold-weather precautions, as described in *Engineering News-Record* of Mar. 27, 1919, p. 618, were necessary.

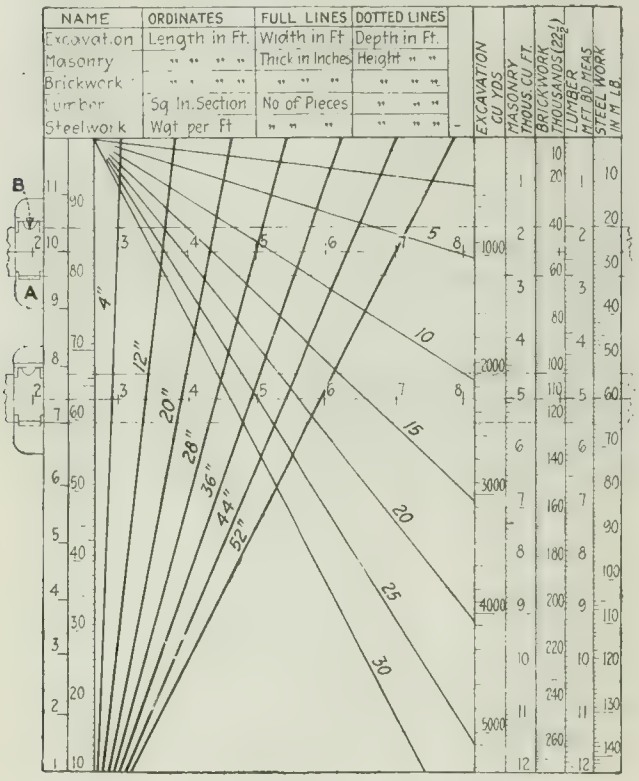
Considering the four dams separately, the significant progress data are as follows: Concrete placing was begun on the same date, Aug. 10, 1918, at Englewood and at Lockington, and the dates of completion were, respectively, June 7, 1919, and May 27, 1919. At Englewood between the dates named 19,000 cu.yd. were placed, or about 2000 cu.yd. per month, mostly in arch conduits. The Lockington work required 206 actual working days for 28,223 cu.yd. in retaining walls and floors, or an average of 3000 cu.yd. per calendar month. The best day's record was 367 cu.yd., and the best record for one week was 1570 cu. yd. At Germantown 15,368 cu.yd. were placed in a little over seven months between Oct. 5, 1918, and May 10, 1919, or about 2200 cu.yd. per month. At Huffman, from Mar. 7 to July 16, 1919, 20,700 cu. yd. were placed, or about 5000 cu.yd. per month. In June the output was 6000 cubic yards.

The outlet construction was under the general direction of Arthur E. Morgan, chief engineer, Charles H. Paul, assistant chief engineer, and C. H. Locher, construction manager, of the Miami Conservancy District. Direction of the operations at the various dams came under the division engineers: Arthur L. Pauls at Germantown; H. S. R. McCurdy at Englewood; Barton M. Jones at Lockington; O. N. Floyd at Taylorsville, and C. C. Chambers at Huffman.

Mechanical Device for Reading Curves and Tables

Simplifies Determination When Charts Require Simultaneous Readings of Several Elements—Charts Cleared

COMPUTATION of quantities by the use of curve charts and taking figures from tables, is simplified by the use of the device shown herewith. The principle utilized is the mechanical setting and transferring of one or more of the elements by T-square. This not only



METHOD OF USING MECHANICAL DEVICE FOR READING COMPLICATED CHARTS

eliminates the necessity for keeping two or three elements in mind at once and tracing the various ordinate and curve lines with the eye, but also clears up the sheet by the omission of the generally used squared ruling.

It is well known that curves are a superior form of aid to the engineer, but the difficulty encountered in reading two and often three elements, found in different directions, has limited their use to simple forms consisting of one series. If two or more series of interdependent curves could be easily read, often a great deal of tedious labor could be saved.

A chart of the complicated character mentioned is shown in the accompanying illustration, with a mechanical T-square device for reading placed thereon. This device consists of a cross-head A, made of metal or wood, about 2½ in. long, a metal holder B containing a spring, and a transparent arm C about 12 in. long, made preferably of celluloid. The arm has a numbered horizontal line through the center, which may be made to cover any desired abscissa of the chart. This arm slips freely through the head, so that when the instrument is used the index points may be moved to coincide with any desired point of the chart.

In using the instrument, it is convenient to pin the curve sheet to a drawing table or have it glued upon a small board made for the purpose. It will be noted that the chart shown in the illustration may be used to estimate excavation, earthwork, brickwork, lumber and steel, after the necessary dimensions are taken off. Thus, if a 28-in. brick wall is 84 ft. long and 25 ft. high, the number of brick would be found by bringing the horizontal line of the arm to cover 84 in the second left-hand column, sliding the arm until any numbered point covers the solid-radial line 28 and then dropping the T-square to the second dotted position, so that the same number covers the dotted-radial line 25. The number of brick may then be read at the right under brickwork as 110,000. To perform the same operation by the eye, it would be necessary to have the sheet closely cross-ruled in both directions and to follow carefully the cross-lining around the circuit.

Laying out curves may also easily be accomplished by having a pin-hole through the arm at one of the numbered points, such as 7, so that by knowing the ordinates of the point the square may be set and a hole punched.

A continuous type of instrument arranged on the principles stated above, but in cylindrical form, mounted on a shaft and turned by end knobs, has been devised by Samuel N. Polis, a consulting engineer of New York City. The cylinder is 8 in. in diameter and 18 in. long, and is designed to take charts 18 x 24 in. in size, thus giving greater accuracy. Various curve sheets of this size can be easily clamped down on the cylinder when needed. Patents have been filed covering this construction.

Assessment for Water Main Extensions in Los Angeles, California

FRONTAGE assessments for water-main extension in Los Angeles, Calif., are charged against property owners at the rate of 40c. per front foot whereever the extension is not more than 200 ft. in length for each permanent consumer. For all pipe on a given extension in excess of 200 ft. per consumer a deposit of 80c. per lineal foot is required, the deposit to be refunded in equal annual installments as the frontage charge first described is paid. No pipe across a street intersection is included in the measurement for assessments.

In case of extensions made solely for irrigation (there being large irrigated areas supplied from the Los Angeles water-works) a different rule prevails. Where the extensions are into districts which issued bonds for trunk lines, lateral extensions for irrigation only will be made on payment of deposits equal to the full cost of the proposed mains, based on estimates made by the Department of Public Service. These deposits are returnable in five-year payments. Persons other than the original depositors may obtain connections by depositing a sum in the same proportion to the amount of the original deposit as the area they desire to have served bears to the total area served by the extension. These deposits also are subsequently returned by the city in five-year installments.

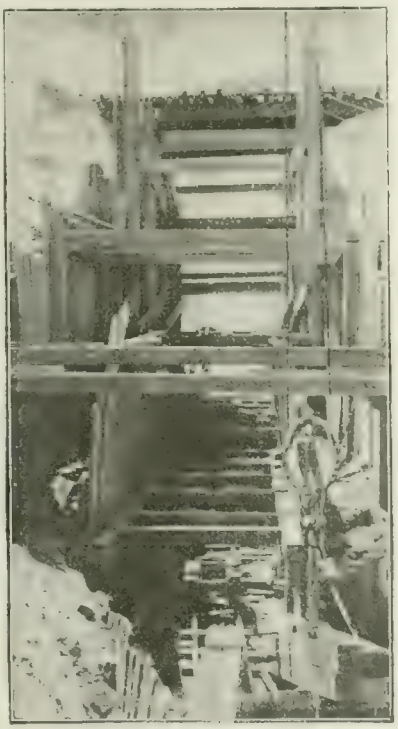
Lands not assessable for irrigation service provided by district bonds may obtain water for irrigation by agreeing to pay $35 per acre of land to be served, not less than 10% down and the remainder in not over

nine equal annual installments, with interest at 6% on deferred payments; or if the payments are made in advance, either for the total or any deferred sums, a discount at 5% is allowed. This class of assessments is in addition to the usual charges for water-main extensions and service installations.

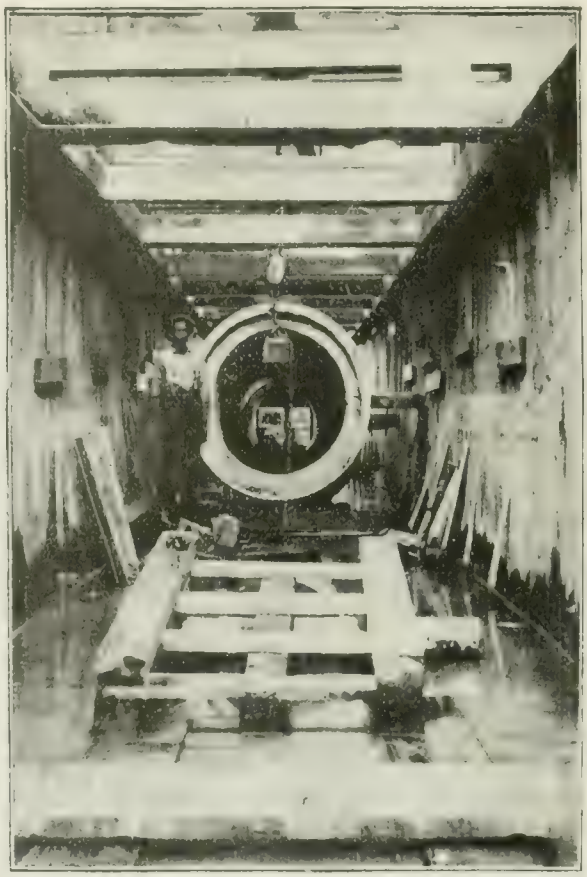
Drainage Culvert Built Through High Railway Fill

Small Cars Operate in 41-Foot Trench—Concrete Pipe Laid on Concrete Floor—Piles Carry Track—Cost of Work

TO PROVIDE an outlet for a drainage system serving 10,000 acres of land in Yakima County a 48-in. pipe culvert had to be built in a cut 41 ft. deep through a high embankment of the Union Pacific R. R. near Granger, Wash. The first step was to drive 65-ft. piles in the center of the fill on each side of the proposed cut. This was done with a railway piledriver, after which caps and stringers were laid to carry the track. Sheeting was placed behind the piles to hold the material as excavation progressed. Beyond the piling, through the slopes of the fill, cribs were built at the sides of the cut, the piles and cuts being braced by 8 x 8-in. timbers 14 ft. long. This method was used to carry the excavation down to within 8 ft. of the grade of the culvert, at which stage a new set of timbering and sheeting was started through the entire length, reducing the width to 8 ft. For the upper lift the sheeting was driven by hand. In the lower lift the material consisted of volcanic ash in solution, which is practically the same as quicksand. Here the work was expedited by using a water jet, and the sheeting was pushed into place by hand. The excavated material was shoveled into steel dump cars having removable hopper-shaped bodies of ¾-yd. capacity. These cars were run out to one end of the cut, where the bodies were raised and swung by the 60-ft. boom of a dragline excavator, the material being dumped on the right-of-way.



CULVERT TRENCH FINISHED FOR FIRST LIFT, 14 FEET WIDE



METHOD OF INSTALLING PIPE

During the construction of the drainage culvert, a stream of 6 cu.ft. of water per second was diverted through an old culvert 25 ft. distant from and 6 ft. above the bottom of the new structure. This necessitated the use of double sheeting to prevent the water from breaking through into the new excavation. A 5-in. and a 4-in. pump, both electrically operated, were used during excavation of the lower 8-ft. lift. A heavy bed of gravel was placed in the bottom of the trench, and on this was laid a 12-in. slab of concrete. The 4-ft. reinforced-concrete pipes were laid on this slab, the joints being cemented and a cradle of concrete built around the pipe. Finally, the trench was backfilled, the timbering being removed during this operation. The cost of the work is shown in the accompanying table.

This culvert was built under the direction of J. O. Greenway, drainage engineer of Yakima County, Yakima, Wash., with Carl E. Beam as engineer in charge of construction. The contractors were Carson, Chindahl & Co., Spokane, Wash.

COST OF BUILDING CONCRETE PIPE CULVERT THROUGH RAILWAY FILL

Excavation, 2065 yd.	$0.89	$1,895.13
Bulkheading, lagging and piling, including cost of railway labor and equipment, 58,989 ft b m in place	42.20	2,491.22
Concrete, 122½ yd.	9.35	1,048.54
Pumping, 74 shifts	5.34	397.07
Concrete pipe, 48 in., 100 ft.	9.33	933.51
Removing lumber, backfilling and puddling, 1200 cu.yd.	.56	677.29
Total		$7,442.75

Vermont Organized Into Health Districts

Under legislation effective July 1, 1919, the State of Vermont has been organized into 10 health districts, each in charge of a full-time health officer. These men receive $2500 a year and are allowed $800 additional for traveling and other expenses. They work in collaboration with the United States Public Health Service, having in that capacity the title of assistant collaborating epidemiologist, United States Public Health Service.

The Public and the Engineer

A Discussion Regarding Insufficient Compensation of Engineers, Their Relation to Public Affairs, and the Oversupply of Engineer Graduates

By Charles Hansel
Advisory Engineer and Investigator, New York City

THAT the worth of the engineer is not recognized, is the main theme of the complaints which have been appearing in the technical press and elsewhere. The last article of this nature appearing in *Engineering News-Record* of July 17, 1919, p. 125, under the title, "Why Engineers Are Not Appreciated," attempts to give seven reasons as follows: (1) Inadequate compensation; (2) lack of organization; (3) lack of initiative in public affairs; (4) lack of publicity concerning the engineer and his worth, and his relation to the better health, comfort and welfare of the community; (5) lack of proper regulation in the form of licensing; (6) improper application of the definition of the term "engineer"; (7) lack of general education and inability to speak well.

Other Professions Overcome Handicaps

The writer is firmly of the opinion that specifications 1, 2 and 4 bear alike on all professions, but that other professions rise above any handicap which may attach to the three specifications named. It has not been demonstrated that the compensation of ministers of the gospel, medical doctors, teachers in schools or colleges or even the average lawyer is greater than that of the average trained engineer, and certainly the engineering organizations are as strong in the advancement of technical knowledge as are those of any of the other professions.

If specification 2 is intended to refer to "organization" for the purpose of obtaining higher pay for the engineer, then the engineering profession, other than the American Association of Engineers, is in the same position as *all other* technical professions, for none of such has organized to insure higher compensation. The writer is as desirous as any other engineer to see his elected calling ranked with the highest, but he realizes that technical knowledge is far from being sufficient to warrant the highest award in the supreme court of public opinion. To obtain this high award of merit, the engineer must equip himself with knowledge of public affairs and material progress, and, having thus fitted himself for creative work, he must give of his thought and of his time to looking upward and doing his share toward public service. This thought is glimpsed in the third specification, but it is the cogent reason of all, and, like drainage to a railroad, it is the first, the second, the third and all-important specification which, if fully carried out, will lift the engineer into the class of leaders in the business of developing the materials and forces of nature for the use of men. Unless the engineer thinks and works beyond the technique of his profession and does not leave to others the creative thought, he becomes no more than any other machine which the man who does create finds it necessary to bring to his assistance and discards when the work is finished.

The public has decided that all technical professions shall receive less remuneration than nontechnical business men, brokers, bankers, managers and the like are able to obtain. Many engineers deem it unprofessional to apply their time to other than purely technical subjects, and many such have achieved a high place in public esteem and have won a reasonable compensation. Compared with the total number of practising engineers, these few successful technical engineers rather prove the exception to the general achievement.

The lawyer, when graduated from a university, has probably expended about the same amount of time and money as the engineer who receives a university degree, but the lawyer who achieves *marked success* generally broadens his training, by dealing with business and public affairs, more than does the engineer. Thus the lawyer merits and wins the highest places in Federal, state and city government, because he has demonstrated his knowledge of affairs, both public and private. Thus we find the legal profession dominating the affairs of the world. The successful lawyer omits no field of study, no proper advantage is lost to him; to his granary flows the knowledge of all classes of technical and business students. Practically all of our statesmen, high-class politicians (and some low-class), business men, doctors, many bankers and men of large affairs are lawyers.

The doctors, dealing with the human side, and the minister of the gospel dealing with the highest and best thoughts of man, do not "lack appreciation" in the sense of receiving the loving respect of their fellows, though they are often poorly rewarded in material things. The doctor serves many without price; the minister serves all without thought of the world's reward.

Where Does the Engineer Stand?

Where does the engineer now stand in the affairs of the world? It is true that every step of material progress demands his direction else it falter and fail. All other professions require the technical knowledge in order to carry on the world's work, and it appears that the engineering profession, generally speaking, has until lately been content to design and construct works which have been conceived and financed by others, and so long as the engineer remains content to be merely the aid, tool or machine used to carry forward the material progress of the world, he will surely be left in the unnoticed niche where he has chosen to stand.

It would be interesting to know what per cent. of the total membership of the civic organizations and chambers of commerce were engineers, or, put another way, how many members of the four national engineering societies are active in public affairs.

These national engineering organizations appear to have realized that they have lagged, and the committee on development, created by the American Society of Civil Engineers, in its progress report made in June directs attention to the need of engineers becoming active in civic work. The report says:

> The engineering profession owes a duty to the public which it is believed can best be discharged by the active participation of every engineer in the civic work of his locality. To this end it is urged that the engineer join the civic body of his community, and if there be no such organization, that he should then endeavor to organize the community for civic work in sympathetic coöperation with the governing body. The engineer's duty to the public also requires that he give his best efforts to matters of state, interstate and national character, calling upon the various engineering bodies for assistance and coöperation when necessary.

One difficulty attendant upon the work of the engineer is that his work requires the expenditure of money and offers little opportunity for demonstrating that it directly increases earnings. This is particularly true of railroad and city engineers and in most cases of bridge, tunnel and waterworks engineers.

Without desiring to pursue the many angles of the matter further, it seems evident that, considered as members of a profession, some engineers should receive as much as or more than members of other professions. It also seems evident that in order to bring the engineering profession more intimately into the big affairs of the world, engineers as a class must enlarge their training beyond technical matters, and give of their time at least as much as others do to the public affairs of the community, state and country.

The American Association of Engineers and the Union of Technical Men are urging upon the railroads, the municipal authorities, and others, the necessity for increasing the pay of engineers, and it is to be hoped that their efforts will be successful. It does not appear, however, that any success which may attend the efforts of these organizations and others in respect to increase of pay will necessarily advance the status of the engineering profession, and it is not unlikely that the result will tend further to classify the members of such organizations more as artisans than technically trained engineers.

The use of the title "engineer" is open to any person desiring to use it, even though engineers may be licensed to operate in certain states under the title of "licensed engineer." Experience has proved that it is practically impossible to define the title "engineer," and in the opinion of the writer this will not be accomplished unless the four national technical organizations are empowered by state or Federal authority to determine who is authorized to use the term engineer.

It is probable that universities and other seats of learning would take issue with the suggestion that the output of engineers be reduced, and yet it appears that the most potent factor influencing the compensation of the engineer is the generous outpouring from our universities of young men bearing the title. The law of supply and demand applies with the same force to the output of our universities as it does to the output of our factories and other productive sources, and if it is a fact that trained engineers generally throughout the country are receiving a compensation so meager as to be insufficient to cover reasonable living expenses, as compared with other callings, or the pay of artisans, mechanics, etc., then it seems obvious that we should curtail the output. In so far as the universities are concerned, any reduction in the output of engineers can be accomplished in two ways; one by advising the students as to the economic situation affecting the pay of engineers, and the other by making the requirements of the course more severe.

Cost of Maintaining Horses per Day

The cost of maintaining horses is shown in the annual report of the Department of Streets, Sewer and Highway Cleaning of the City of Cincinnati for the year 1919. The average cost of feed per horse per day for all stables was 63.3c. This was divided as follows: Hay, 23.9c.; oats, 30.3c.; Nutritia, 8.4c., and oil meal, 0.7c. The total stable cost per horse, for all horses, averaged $1.10 per day.

Sextant and Stadia-Rod Method for Measuring Distance

Topographic Mapping of Alaska Coast Line Facilitated by Special Stadia—Accuracy Tested With Good Results

By B. A. Baird
San Francisco, Calif.

BY MEANS of a unique method developed during the work of mapping portions of the Alaska coast line, results comparing favorably with plane-table mapping have been obtained by the use of sextant and stadia rod. By readings taken so as to eliminate the errors due to index error of sextant and to parallax, it was found by numerous checks and by tests that accuracy entirely sufficient for the purpose can be attained. Furthermore, there are many advantages of the use of the sextant for mapping by this method.

During the season of 1901 (April to October) the writer was employed in making a topographical map of the shore-line of a portion of Prince William Sound, Alaska, for the United States Coast and Geodetic Survey. The method employed was that of taking all the angles with a sextant, and plotting the positions upon a sheet tacked to a board about 1 ft. square, which it was very convenient to carry around. For positions plotted from distant signals a three-armed metal protractor was used, but for all other cases a small celluloid protractor and tracing paper were carried along in the recorder's field book. The work, thus done in sections, was afterward to be transferred to the main topographical sheet. Some of the drawings were made to a scale of 1:20,000, and some 1:40,000, but in all cases prominent points or other features were located, and the shore-line between was sketched, the points determined being from 50 to 200 or 300 m. apart, according to the regularity of the shore.

Special Stadia Rod Devised

While successive positions could usually be plotted directly from horizontal angles, there were many cases where they could not or, if they could, only with the greatest difficulty. For this reason, a stadia rod was devised by which a position could be plotted by a direction and a distance.

Owing to the mechanism of the sextant, it was necessary to have the targets fixed upon the rod, and then, the distance between them being known, to construct a table giving the distances corresponding to the angles measured. By a simple computation it was found that with the targets 9.544 ft. apart an angle of 10′ of arc would represent 1000 m.; of 20′, 500 m.; of 100′, 100 m., etc. In other words, a distance of 10,000 m. was represented by 1′ of arc, and any other distance could be found in meters by dividing 10,000 by the number of minutes. By simple consultation of a table of reciprocals, a table of distances with the angle as an argument was made out.

Owing to the mechanism of the sextant, the image of one target must be exactly superimposed upon the other in an observation, and in order to get good results the two targets were made exactly alike and perfectly symmetrical. Moreover, when the direct image is clear, there is a tendency for the reflected one to be faint, and vice versa; and so it was found that a fairly long target, crossing well the line of division between the clear glass

and the mirror in the horizon glass, was essential.

By a little experimenting, it was found that a rod having two exactly similar 5 x 10-in. targets, with a strip of white in the center 1¼ in. wide, gave very satisfactory results, the greatest distance read during the season being 541 meters.

The sextant used was United States Coast and Geodetic Survey No. 108, reading to 10″ of arc. The field telescope was used for both horizontal and stadia angles.

Advantages of the Method

While it is not claimed that this method can compare favorably under ordinary circumstances with that of the plane-table, and most certainly not for inland topography, yet it possesses several advantages which in some circumstances make it highly efficient. Most of the shore-line surveyed by this method during the season consisted of bluffs, many of them entirely inaccessible, especially at high water, and affording few places where a plane-table could be set up without great difficulty. However, by this method, if either the observer or the rodman could get any foothold whatever, the work could be done. Observations were made from the boat if the rodman could get a standing place, and vice versa.

If neither could get a standing place, and if much of the shore-line were of such character, both observer and rodman could use boats, care being taken to make allowance for the distance from the bluffs in plotting the work, these distances usually being not over 1 or 2 m., however. Also, tangent lines and directions to various objects could be obtained from the boats almost as readily as from the land, except when the water was rough. In such cases the observer could, if convenient, plot his position from horizontal angles.

Another advantage that this method possesses over that of the plane-table is that the rod need not be held in a vertical position, but may be held horizontally, or in any inclined position whatever, provided only that it is held normal to the line of sight. On account of trees, bushes or other obstructions, it often happened that the rod had to be held in some such position. Again if the rodman is in the direction of the sun, and the sun is at any appreciable height, the rod may be held horizontally and the faces of the targets inclined so as to reflect the rays of light, making the observation easy, when otherwise it would be difficult. However, the work was usually planned so as to observe away from the sun as much as possible.

Sometimes, owing to the nature of the shore-line or the positions of signals, a traverse had to be carried a considerable distance before a check could be obtained. A notable instance of this was the traversing of the south side of Goose Island, where no land was visible within 20 miles, and where the bluffs and woods shut off everything from the other side. Some of the larger angles had to be divided into two parts by means of a distant mountain peak. In this work, although tangent and other direction lines were taken as far ahead as possible, the traverse was not made to depend upon the longest stadia distances obtainable; but, rather, the longer distances were made up of two parts, by having the rodman remain at an intermediate station while the observer occupied each of the terminal points.

Suppose, for instance, along a comparatively straight shore a distance of 400 m. is desired, and the seeing is not very good. For 400 m. the arc subtended would be 25′, and an error of 1′ would mean an error in distance of 16 m. By dividing it into two 200-m. readings, the subtended arc would be 50′, so that an error of 1′ would represent only 4 m. By addition of the two parts, the most unfavorable case would be an error of only one-half that of the one reading, and the probability is that it would be much less. Furthermore, to avoid accumulation of error due to plotting in such cases, the sum of the two distances could be first taken if the points were approximately in a straight line.

The accuracy of the sextant stadia method was put to many rigorous tests in the course of the work, in tying up to triangulation stations and other points determined in various ways. The author has since executed about the same amount of plane-table work, and considers the two methods roughly equal in accuracy, if done with like care. Careful tests up to 300 m. were made upon the Valdez base-line stakes. Using the average of sextant readings "on arc" and "off arc"—that is, sighting direct first at one of the two targets on the rod and then at the other—the results showed exact agreement at the 200-and 250-m. stakes, a distance by stadia of 50.1 m. at the 50-m. stake, of 99.8 m. at the 100-m. stake, of 149.5-m. at the 150-m. stake, and of 298.9 m. at the 300-m. stake. The average of the reading "on arc" and "off arc" eliminates the index error and the parallax, and the results are seen to be quite satisfactory.

Another Diagram for Solving the Manning Hydraulic Formula

By R. D. Goodrich

Engineer in Charge of Works, Commission for the Improvement of the River System of the Province of Chihli, Tientsin, China.

THE writer was much interested in the diagram for the solution of the Manning hydraulic formula which appeared in a letter from Prof. M. F. Sayre in your issue of June 5, 1919, p. 1126.

This formula is especially useful for certain classes of work, such as preliminary computations, on account of the ease with which the solution can be made with some of the standard slide rules. Other advantages are the large range of conditions which can be covered in one diagram, the ease with which a diagram can be constructed, and the accuracy and rapidity with which more extended computations can be made by the use of logarithms and the tables which are now available.

While the Kutter formula, on account of its long standing, will doubtless continue to be the accepted formula for many purposes, such as final reports and legal work, the Manning formula should find a large field of usefulness as engineers become more familiar with it. It has been discussed and compared with other formulas in Parker's "Hydraulics," in King's "Handbook of Hydraulics," where tables are given for its solution, and also in Part IV of the Miami Conservancy District Technical Reports.

It is especially simple and useful when reduced to metric units. It then becomes $V = r^{\frac{2}{3}} s^{\frac{1}{2}} \div n$, in which the terms all have their usual significance. By writing it in the form $nv = r^{\frac{2}{3}} s^{\frac{1}{2}}$ it is an easy matter to construct a logarithmic diagram which will cover any required range of conditions.

The accompanying diagram was prepared to facilitate the hydraulic computations involved in the investigation of river and flood channels preliminary to the

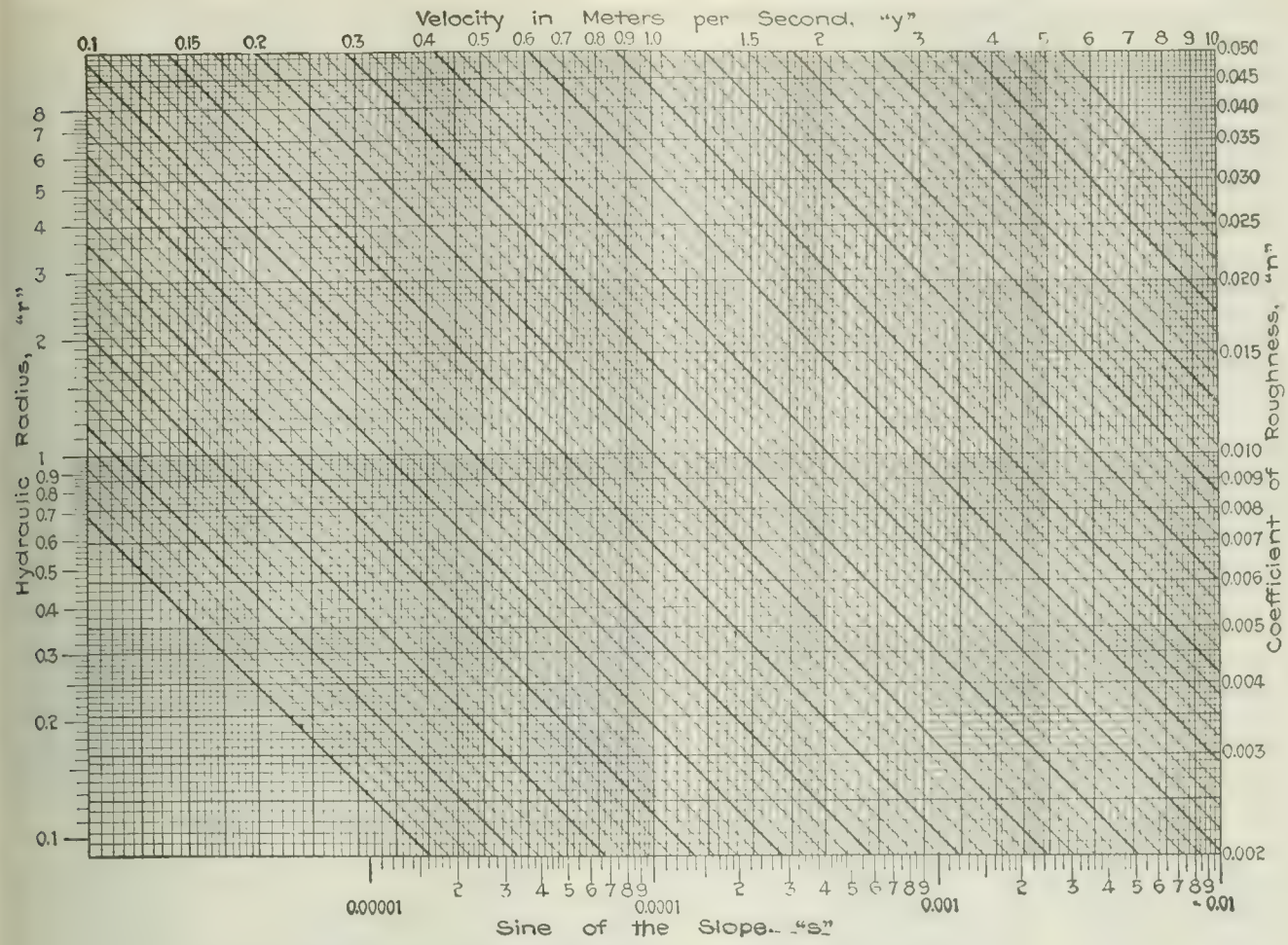


DIAGRAM FOR SOLVING THE MANNING HYDRAULIC FORMULA

design of the regulation of the river system of the Province of Chihli, China. To use the diagram, find the diagonal passing through the point of intersection of the ordinates through any given pair of values of r and s, interpolating as required. Any pair of ordinates for the other two factors, n and v, which meet on the same diagonal, will satisfy the equation. Hence, with any three of the factors given, the fourth can be found at once. It will be seen that the diagonal guide lines are all parallel at an angle of 45°, giving the best intersection with both horizontal and vertical axes, and that they are simply guides which may be drawn anywhere if the slope is always 45 degrees.

By shifting the r and v scales so that 1.00 comes at 0.305 on the scale, as shown, the diagram will give results in feet, or scales for both English and metric units can be included on the same diagram if required.

In some irrigation and drainage problems a certain slope is available, depending upon topographic conditions, and a value of n can be selected according to the material and alignment of a proposed artificial channel. It is then required to select the cross-section to fit the condition. For example, given a slope of 0.0004, with r 0.20: By drawing a diagonal through the point of intersection of the ordinates through these quantities, at right angles to the guide lines on the chart, any pair of values of r and v whose ordinates intersect on this new diagonal will satisfy the conditions. By assuming the average depth of the channel equal to r as a first approximation, three or four trials will enable one to select a suitable cross-section for the proposed channel. If one has many such problems, a separate diagram can be prepared with diagonals running in the opposite direction to those in the figure, to solve the equation in the form $v \div r^{\frac{2}{3}} = s^{\frac{1}{2}} \div n$, or the other diagonals may be dotted in on the same diagram.

The diagonal running from the lower left-hand corner to the upper right-hand corner of the diagram has the slope required for the solution of the equation $y = r^{\frac{2}{3}}$ and is used in plotting the scale for r at the left of the diagram. The scale for s at the bottom was plotted in a similar manner; the ordinary 10-in. logarithmic paper, with scales in both directions running from 1 to 100, was used as the basis for the diagram.

The discrepancy between velocities taken from the diagram and those obtained by computation will average about 1%—seldom exceeding 2%—which is believed to be close enough for most work.

For hydraulic radii between 0.4 and 3 m., with slopes from 0.0001 to 0.01, this diagram will give practically the same results for all values of n as diagrams for the Kutter formula. It will also check very closely for flatter slopes when n does not exceed 0.015, and may therefore be useful in the design of sewers, aqueducts or irrigation flumes.

Federal and Provincial Housing Aid in Canada

Housing acts have been passed by a number of Canadian provinces to take advantage of a $25,000,000 Dominion appropriation. Nova Scotia, Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia are included in the list. The applications for loans made by 47 municipalities aggregated $10,000,000.

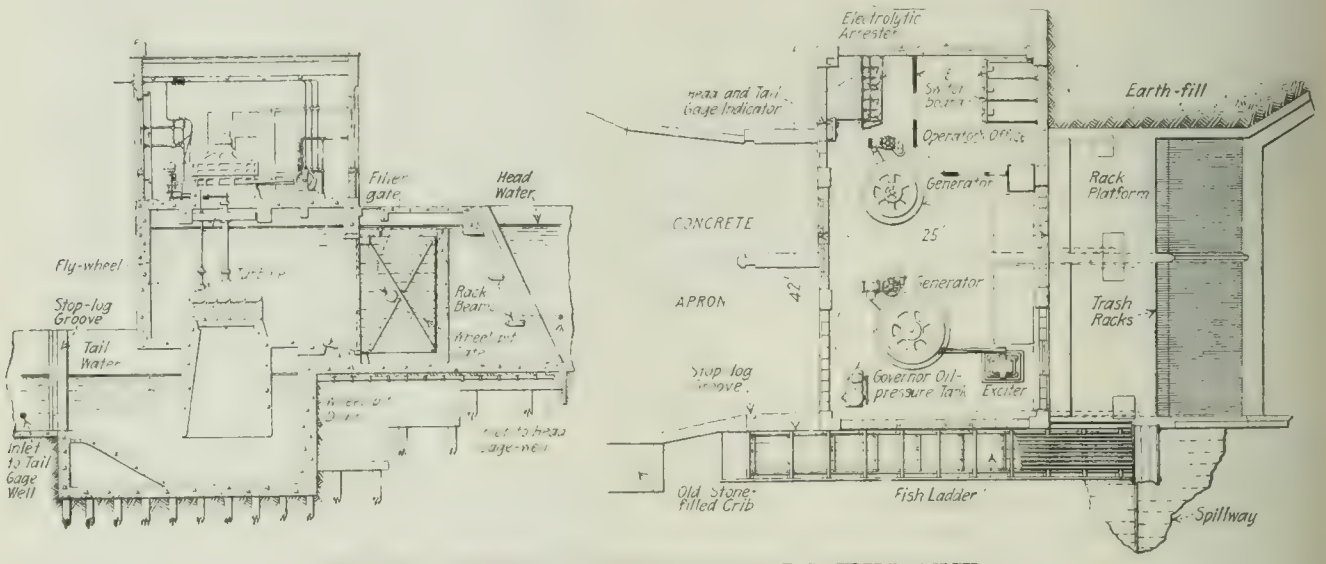
Solving Hydro-Electric Problems of a Small Town

Stable Unit Secured After Two Failures—Advantage Taken of Deep, Washed-Out Draft Pit To Use Vertical Cone Tube

EXPERIENCES of the Village of Lowell, Mich., with a small low-head hydro-electric plant—since, in 1896, it voted $23,000, purchased a power site on the Flat River nine miles above the town and built a plant and distribution system—cover two failures and a final high-grade installation recently completely costing $80 per installed horsepower. Features in the latest construction include a vertical cone draft tube dropping into a deep hole washed out when the old structure failed, and special sheet-pile connections between the concrete power house and a timber spillway as a protection in case the latter fails.

In the original plant a wooden power house on masonry walls was built over a timber flume adjacent to a wasteway and 200 ft. of timber spillway. The 13-ft. available head in the 50-acre pond was augmented by 2 ft. gained in excavating a 100-ft. tailrace parallel with the river channel. The equipment consisted of two units: one rated at 368 hp., owned by the village of Lowell, and the other, of 144 hp., owned by a private company in the Village of Belding. Lowell and the company shared the expenses of the operation and assumed the responsibility of the upkeep of their respective equipments. This arrangement as a whole was not particularly satisfactory, since the failure of one to keep its equipment in first-class condition resulted generally in waste of water, making the other insufficient to carry the load, although the stream should have yielded sufficient power under all conditions.

High water in 1901 washed out the spillway, but it was replaced immediately by a timber spillway of 200-ft. crest length, a reinforced-concrete flume and wheel pits, and a reinforced-concrete wasteway with steel Tainter gate 20 ft. long and 15 ft. high. In 1914 the wooden power-house superstructure was replaced with fire-resisting tile construction and a corrugated galvanized-iron roof. Two years later, without warning, the concrete substructure of the power house started to settle, and within a short time collapsed completely. The apparent cause was the undermining of the foundation walls, due possibly to the failure of the timber floor of the draft pit, resulting in an initial settlement permitting the final destruction by the escape of water from the flume under the foundations. Emergency service from the Consumers' Power Co. was arranged for, and the equipment, including generator, belts, governors, electrical equipment and superstructure building materials, was salvaged. An examination early in 1917 indicated 2-ft. concrete substructure walls heavily reinforced, but with the rods and I-beams not so placed as to develop maximum strength. The escaping water from the pond washed out a hole 8 ft. deep below the bottom of the original draft-pit floor. The concrete floor at the rack section at the upstream end of the flume was intact. It connected to the top of a 4- or 5-ft. length of wooden sheet piling, forming a cutoff along the upstream edge of the spillway and power house. Apparently this was the only sheet piling used in the reconstruction of 1901.



DETAILS OF HYDRO-ELECTRIC UNIT AT LOWELL, MICH.

In January, 1917, the village approved a $40,000 bond issue for reconstruction, providing for two generating units, the Belding interests to furnish one of them. Before the completion of the work the company was unable to raise funds for its unit, and the village purchased it with funds from plant earnings and tax receipts, entering into an agreement with the company by which the latter would purchase energy without a demand charge. But Lowell needs would take perference in case of a shortage of water. On account of the labor shortage and high prices, the contract was let on a basis of cost plus a fixed sum to the Hauser, Owen & Ames Co., Grand Rapids, Mich. This was in April, 1917.

Design of the power house was governed by the use of the site of the old construction in order to take advantage of the existing tailrace excavation. Preliminary studies of the stream flow and local conditions, to determine the probable economic development, indicated a plant capacity of 475 cu. ft. per sec. per square mile of drainage area. The normal head is 15 ft. To carry the probable load to the best advantage, one turbine was selected at twice the capacity of the other,

thereby obtaining high operating efficiency from one-sixth to full plant capacity. A 400-hp. vertical-shaft turbine drives a 280-kva. generator, and a similar 200-hp. unit drives a 165-kva. generator. Automatic oil-pressure governors control the speed.

Particular care was given to the design to prevent possible damage to the structure in the event of a failure of the timber spillway, the end of which connects with the substructure. The new structure rests on an 18-in. reinforced-concrete mat, 33 x 57½ ft. Under all bearing walls 30-ft. round oak piles were driven on 3-ft. centers. Along the side adjacent to the spill-



NEW POWER HOUSE FOR MUNICIPAL HYDRO-ELECTRIC PLANT, LOWELL, MICHIGAN

way are 20-ft. steel piles with the tops embedded in the concrete mat. Tongued-and-grooved 6-in. wood sheet piles of the same length were driven along the upstream edge to insure a cutoff of the water from the pond.

Reinforcing rods were placed in the draft-pit floor to withstand the upward pressure from the unwatering of the draft pit, and in the flume floor so that this will carry the load without the help of the backfill below it. As a precaution against upward pressure on the bottom of flume when empty, tile drains were laid in gravel beneath this floor; they discharge into the draft pit.

The location of the draft-pit floor at the elevation of the bottom of the washout resulted in its being 8 ft. below the normal tailrace bottom, and at least 6 ft. below the grade of an economical tailrace excavation. Advantage was taken of this rather deep draft pit to use a vertical cone draft tube. The water from the turbine rises in the pit around the tube to the tailrace level. Satisfactory results are reported, with power output very close to the Holyoke test of the type model.

Due to a marked increase in the efficiency of the units and from the method of operation, the plant has carried almost twice the load that the old one handled, and has not yet experienced trouble from shortage of water, which was formerly of yearly occurrence in the later summer and in the winter months.

For a total cost of $47,364 the itemized costs were as follows: Test pits and borings, $142; clearing site, $2836; cofferdams, $97; taking care of water, $2244; excavation, $1695; earth fill, $535; piling, $4553; concrete, $7382; reinforced steel, $2381; structural steel $314; wheel pit gates, gage, etc., $1248; superstructure, $1643; equipment, $18,562; engineering and supervision, $2732.

The plant and distribution system are operated by Frank J. McMahon; Holland, Ackerman & Holland, Ann Arbor, Mich., were consulting engineers in charge of the reconstruction. The village trustees have been, in general, progressive business men, and as the results of a broad policy the citizens have enjoyed service at reasonable rates, and during the period have had consistently a low village tax rate.

Concrete I-Beams Used To Make Crib Retaining Wall

Combines Flexibility of Wood Crib With Permanence of Concrete—Developed on Cleveland Railroad for Soft Ground

PRECAST concrete I-beams of special section have been succesfully used in much of the grade-crossing work of the Cleveland & Youngstown R. R. for retaining and wing walls. The beams are interlocking, and they can be fitted together to combine the known flexibilty of wood cribbing with the permanence of concrete. The design was worked out by W. E. Pease, chief engineer of the railroad, in conjunction with N. H. Suloff, engineer in charge of construction, and W. H. Evers, president of the R. C. Products Co., of Cleveland, which made the units.

The Cleveland & Youngstown R.R. required the frequent use of retaining walls on fills and against banks containing springs. In one of the earlier grade separations, walls had to be built upon a fill over 20 ft. in height. To avoid either deep foundations or concrete piling, a wall was required that would be of sufficient flexibility not to rupture under settlement, and at the same time be economical in construction. To meet this condition, and also the situation where a wall would have to be moved to provide for future expansion, reinforced I-beams of a standard manufacture were used, and the joint shown in Fig. 3 was developed, this joint



FIG. 1. LONG CONCRETE CRIB WALL AT PITTSBURGH AVENUE, CLEVELAND, OHIO

being accomplished by casting a locking lug on the bottom of the I-beam and placing stretchers on the edge. Lugs were cast on all members, the lugs being turned to the back where members were used for stretchers, thus permitting the use of any I-beam members as either a header or a stretcher, and the concrete members formed a flexible locking joint in themselves without the use of dowel pins or similar devices. To provide an even bearing, there was used a weak cement mortar which was not depended upon in any way for strength through adhesion to the members.

In the autumn of 1918 the structure shown in Fig. 1

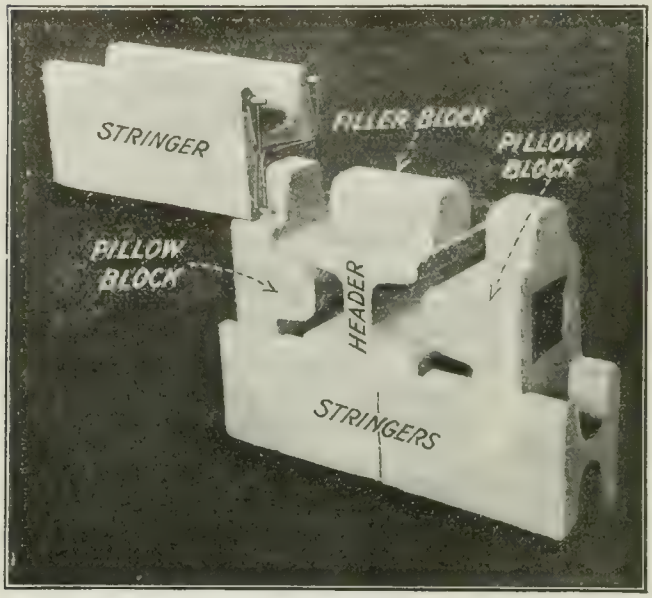


FIG. 2. MODEL OF CONCRETE I-BEAM FOR CRIB WALL

was erected. As some difficulty developed from the slight crushing of the headers along the bottom part of the face of the crib wall, the pillow block shown in Fig. 3 was developed, this not only reinforcing the header against crushing but also forming a lock be-

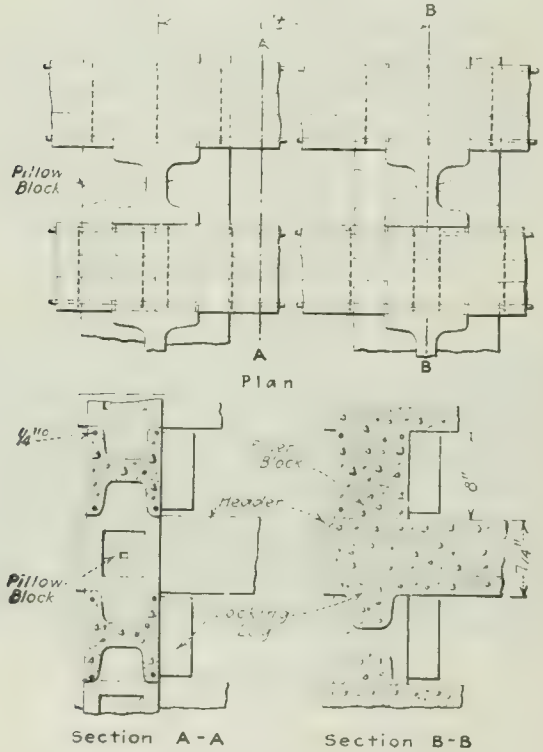


FIG. 3. DETAIL OF CONCRETE I-BEAM CRIBS DEVISED BY W. E. PEASE

tween adjacent stretchers. Together with the filler block placed on top of the headers, it formed a column 14 in. in width, which not only added to the strength of the structure but greatly improved its appearance.

The cost for the same heights of structure, exclusive of excavation, sheeting, backfilling and overhead charges, of the concrete crib was $25.01 per linear foot, while [illegible] concrete wall cost $55.11 per linear foot. As this construction proved so satisfactory both as to strength and cost, it was used in a later wall. Though this structure was constructed partly on a fill 40 ft. in depth, any movement is only detected by a close examination.

At the time when this work was going forward, the wall shown in Fig. 4 was erected. This structure was to act as a wing wall for the East 55th St. bridge in Cleveland, and is 35 ft. in height at the highest point. Attention is called to the top finish, along which it is very easy to cast a concrete coping if desirable. While this structure has been finished for several months, a recent examination showed no rupture or distortion.

The section can readily be altered to provide for local conditions. Headers may be spaced at any desired distance, and can also be extended back into the embankment from the back line of stretchers. At the critical points in the wall shown in Fig. 4 the headers were

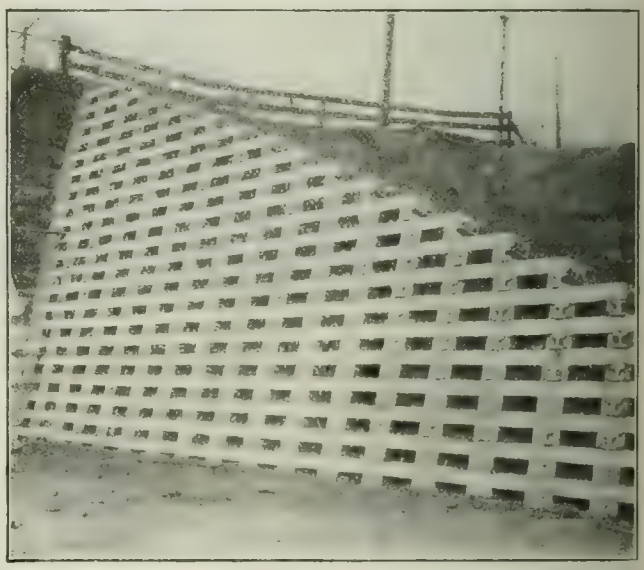


FIG. 4. CONCRETE CRIB WING WALL, EAST 55TH STREET BRIDGE, CLEVELAND

carried back 36 ft. While it is possible to cut these I-beams to any lengths in the field, it has been found well to have them cast in lengths of 6, 9 and 12 ft. As the beams used weigh only about 30 lb. per linear foot, the longest members can be readily handled by four men. In the walls erected no derricks have been used nor have they been considered desirable, as it is found that common labor takes a great deal of interest in these structures and much prefers working on them to working on ordinary concrete jobs.

Girder Expansion Bearing Fails to Slide

Expansion trouble with a small plate-girder footbridge is reported by the bridge division of the Department of Public Works of Pittsburgh. A footbridge of 70-ft. span on the line of Graham St. is flanked by a small concrete jack arch at each end, forming a short approach, intended apparently as an aesthetic feature of the design. These jack arches and the steps leading from them have been pulled away from their connections to the abutments, opening up cracks an inch wide. This was caused by the girder failing to slide on its expansion bearing, according to J. D. Stevenson, division engineer of bridges for the city. The expansion bearing plates are now rusted tight together. It is intended in the near future to remove them and substitute effective expansion bearings.

Notes on Army's Light-Railway Practice in France

Experience Indicates Field for Improvement in Certain Details of Construction and Equipment of Narrow-Gage Lines

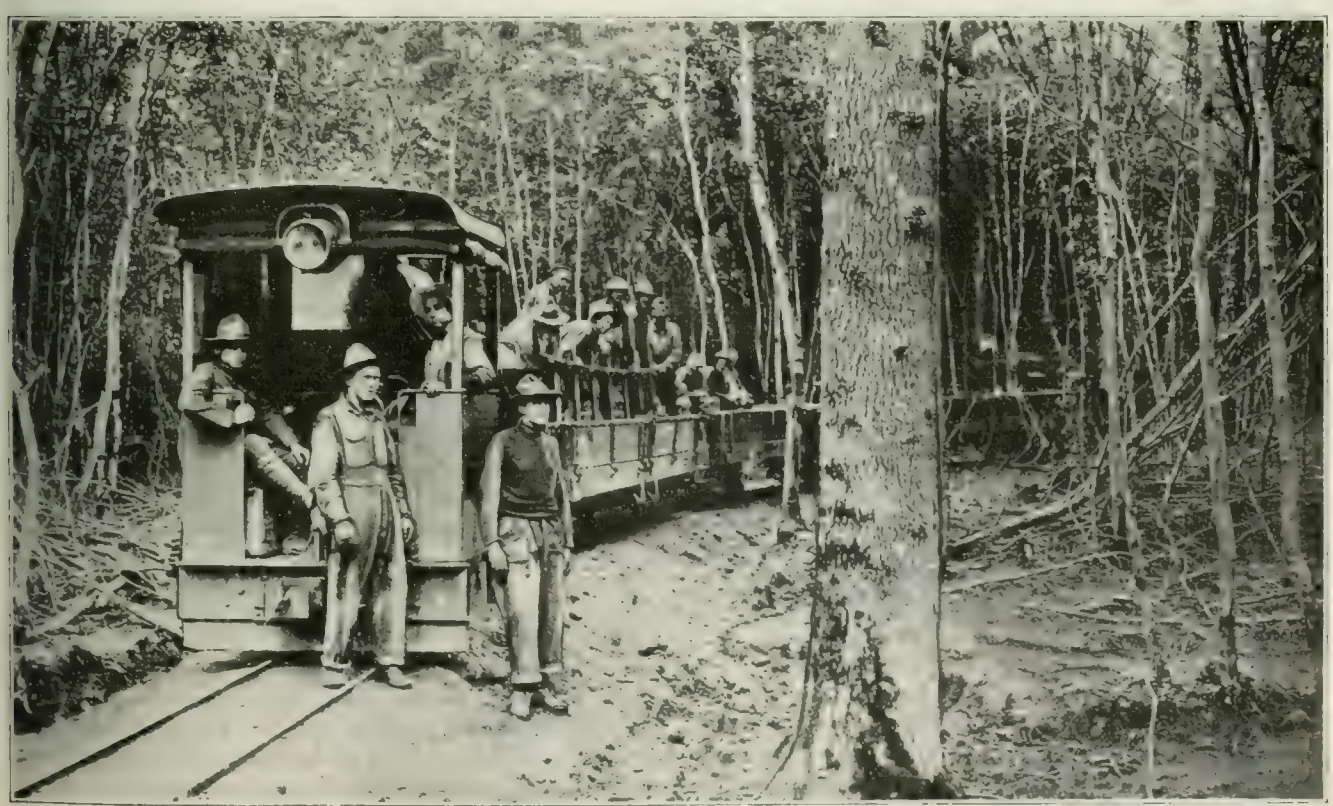
By Paul McGeehan
Captain, Engineers, United States Army

The writer belonged to the 12th Engineers, one of the light-railway (60-cm. gage) regiments of the A. E. F., throughout its 21 months on the fronts of the various allied armies in France. The regiment first served with the British Army in Picardy and took part in the battle of Cambrai in November, 1917, and in the great retreat of March, 1918, when all of the tracks and railway equipment of the Third and Fifth British Armies fell into German hands. Later, the regiment operated with both the French and American Armies and took part in the battle of Saint Mihiel. The armistice found the regiment in charge of all the light railways in the Second Army area, using, besides its own personnel, about 4500 auxiliary troops in the various phases of operation, maintenance and construction. The criticisms found in this paper are intended to be constructive, and it is hoped that expressions of opinion from others will be elicited which will make for the improvement of this very important branch of military transportation.—Editor.

MOST of the troubles of light-railway operation have resulted from the lack of careful design of the railway system as a whole, and from the careless working out of the engineering details. A light railway is a particularly tender "plant," and unless the engineering problems are properly studied one is likely to find after the job is finished that he has built something that is almost useless. For instance, on the Toul front much light railway was built after the Saint Mihiel push, to connect the American system with the light railways captured from the Germans. In the hurry to make these connections, much of the engineering was apparently hastily done with the idea of getting immediate results. One line above the Pont de Metz had a 5% grade for about 300 ft. at a place where a longer and much lighter grade could have been used just as easily. At another place a "Y" connection was built on so steep a grade that it could not be used on account of the extra resistance of the sharp curvature which had not been compensated for. The grades at these two places so reduced the size of the trains as to make the line practically useless. Another connection had a short stretch on a very steep grade, rendering the whole track useless without reconstruction—and the men for the reconstruction were not available at the time.

Much of this line appeared to have been located by eye, without the use of instruments, and without the other careful methods of railway location found necessary in civil life. These connections had been built in record-breaking time, but the months of unsatisfactory operation that followed showed how much better it would have been to allow more time for the engineering details. As it turned out there was plenty of time, for these tracks could not be operated for more than a month on account of the lack of ballast.

There is no way to beat the careful methods developed in peace time for the location of railways, and the multitude of curves which are possible on the light railways make their careful location almost as slow and just as important as the location of standard-gage lines. Curves ought to be carefully run and profiles carefully studied with the idea of obtaining the best possible



A PETROL-ELECTRIC TRACTOR AND LIGHT-RAILWAY TRAIN SERVING THE A. E. F. IN FRANCE

grades. To the civilian engineer these suggestions seem too obvious to be worth mentioning; but entirely too many lines in France were laid out entirely by eye with the idea of "getting the boys to work."

Grades Should Be Compensated

All maximum grades should be compensated for curvature. It would probably be advisable to have some experiments made to arrive at a fair approximation of what this compensation should be. The curves of light railways are so sharp that the rules obtained from standard-gage practice are probably not applicable. Experiments to show the resistance to rolling friction on straight track should be made at the same time. Quite definite information about this resistance on straight, level track in average maintenance is necessary in order to approximate the pulling capacity of the various types of locomotives on the different grades.

There is one fundamental difference between the location of military and civil railways. In civil practice it is desirable to get as much of the line located on embankments as possible, in order to avoid the bad drainage conditions prevalent in railway cuttings. With light military railways you want to get a roadbed fit for operation at the earliest possible moment. This means that your embankments, thrown up usually by hand, will require a long time to settle and solidify. Your cuts, on the other hand, will be hard at once, so it is an axiom on such work to avoid fills and put as much of your track in light cutting as possible. This precedure is especially necessary on side-hill work.

The writer is familiar with a piece of track several miles in length built along the side of a rather steep cañon. On account of the necessity for haste in making the connection, the officer in charge yielded to the temptation of reducing his quantities by using the waste material from the cutting as part of the roadbed, thereby reducing the size of the notch in the hillside by more than half. In this manner the grade point came under the center of the tie, and when the trains came over, one end of the tie rested on the hard foundation of the notch in the hillside and the other on the soft, yielding material of the embankment. As a result the operation over this track was not at all satisfactory until long after the military necessity for this track had ceased to exist. The trouble with soft embankments, of course, would be partially eliminated if some method of rolling or tamping could be devised which would be available when needed and which would be practicable for use at the front.

Ballast

With steel ties a good quality of ballast is imperative. Their sharp edges cut in so that ordinary dirt ballast, so prevalent on the earlier railways of the United States, is out of the question. Cinder ballast is open to almost the same objection because not enough resistance is offered to the sharp cutting edges of the steel ties.

On the Second Army front before Toul most of the ballast was made up of cinders from a French manufacturing plant. The inutility of this material is illustrated by a condition which arose when some of these lines had become very inactive on account of the advance of the fighting front. On account of the material stored in the various dumps, it was necessary to keep these lines open, and to have working parties and station agents along them. This personnel had to be fed, and ration trains were run at intervals of several days. In order to get these trains through, it was necessary to feed ballast continually into the line. Ballast, even, had to be put under this track to keep the ballast trains themselves running. The fault lay principally with the steel ties, for wooden ties would not have had the sharp flanges to cut into the cinder ballast.

In this same area the Germans had all of their tracks ballasted with very hard crushed rock. After the Saint Mihiel push and later, after the armistice, great quantities of this ballast rock were found piled behind the enemy's lines. On account of the better ballast, we usually found their tracks better than ours.

The British used the local white chalk of Picardy for ballast. It was inferior on account of its softness, but it made a fine foundation when a thin coat of harder material could be provided for a top layer. This chalk, being pure white, made the tracks fairly shine in an airplane photograph. Most of the British tracks were protected from direct observation, but all of them were in the open where they were easily photographed.

It seems that the ease of construction of the light railways is their greatest protection. The cost of destroying them by shell-fire is much greater than the cost of repairing the resulting damage. During the terrible bombardment that preceded the German advance north of Saint Quentin Mar. 21, 1918, comparatively few shells were thrown at the light railways—except in yards—while the standard-gage tracks were hit enough to be put out of commission. From my observation, the light railways were fairly safe, unless under direct observation, even quite close to the front lines.

Rail

The light railways operated on rails varying in size from 8 lb., the lightest French rail, to 100-lb. rail taken from unused standard-gage tracks. The Germans had a 20-lb. rail with a high, narrow section. This rail probably made a good beam, but it was often criticised for having too narrow a head to engage the drivers. Either a 20- or 25-lb. rail with the American section seemed to be satisfactory. Both the French and the American rail came attached to the metal ties made up in 5-m. lengths.

Curves

The curves were all made with 100-m., 50-m. or 30-m. radius. Thirty-meter was the ordinary allowable maximum curvature, although it was said that the trains would go around a curve with a 20-m. radius. The writer saw some 20-m.-radius curves that had to be replaced. In order to construct the curved sections, half- and quarter-rail lengths were furnished to piece out the ends; in other words, to make the curves meet the tangents. In the hurry of tracklaying, these pieces were seldom available, so these sharp curves were usually several feet too long or too short. If they were too short, a sharp kink resulted at the end of the curve, and if they were too long a slight reverse curve had to be sprung into the tangent to get it to join up with the curve. Then, again, it often happened that curves of the radius desired were not available, and sharper curves had to be used. The same conditions were to be seen in French tracks after many months of operation.

With the British, where the use of wooden ties was almost universal, no such trouble was encountered. Rails were furnished bent to these same radii, but the use of wooden ties, loose rail and spike made possible the location of curves of any radius.

With conditions prevailing on the battlefield, which make imperative the use of such material as is available, wooden ties with separate rails allow much greater flexibility of construction, and, in my opinion, they should be adopted as American Army standards. The steel tie cuts the ballast too badly, and the built-up track sections are unsatisfactory on curves. Furthermore, you never have the sections of the exact size on hand when you are in a hurry to get a track built.

Track Laying

The probable reason for the existence of the built-up section is its apparent aid toward speed in track laying. If you have all the required sizes on hand and properly arranged, they undoubtedly lead to speed in this particular. But it is my observation that the main cause of delay in light-railway construction is the ballasting. It was impossible to use in France a track made of steel ties without considerable ballast, and this will be the rule throughout the world.

I have seen branches lie idle, literally, for months for the lack of ballast. The wood ties would require less ballast and would make a better track with an inferior quality of ballast. In dry climate or during ordinary dry weather, tracks laid with wood ties might get along with only dirt ballast; but with steel ties you could not get along without a good quality of ballast in any climate.

Tactical Considerations

Light railways are best adapted to short hauls. On account of the frequency of derailments and the slow speed of trains, they are unsuited to long hauls. In the Second Army area the light railways, including those captured from the enemy, extended for a distance of 50 km. north and south, and it was usually considered that several days were required to go from one end of the area to the other. For if your train itself were not wrecked it would be delayed by other trains wrecked in front of it. The long hauls should be made by the broad-gage trains, and the short hauls from the railheads, four to eight miles in the rear of the battle front, should be made by the light railways. Their comparative immunity from drawing fire is their excuse for existence in this zone.

The light railway is not adapted to open warfare. It was, however, an ideal method of transportation behind the lines in France during the period of trench warfare. During the German offensive of March, 1918, the lines behind the British Armies went out of business as soon as the retreat began and all of the energy of the light-railway forces was used in saving the equipment.

For stationary battle conditions, light railways were practically ideal. A single-track line handled 2100 tons of ammunition in a day while preparing for the Cambrai offensive of 1917, thereby taking 700 three-ton motor trucks from the already crowded roads. In this offensive the number of troops engaged was limited by the carrying capacity of the roads.

If the light railways were so useful in France, with the prevalence of macadam roads, how much more useful would they be in a country like America, where good roads are so few? Under these conditions of bad roads in this country, the use of light railways would increase enormously the number of troops and guns that could be concentrated on a given sector, and would give an enormous advantage to the belligerent employing them.

Gage

In the opinion of many officers and men, the gage of 60 cm. is too narrow. This gage had been adopted in the early part of the war, when the rolling stock was much lighter than that finally used; but when the larger Baldwin locomotives came into use with cars of 10-ton capacity it was obvious that a wider gage would have been better. The opinion was often expressed that 4 or 6 in. wider gage, with no increase in the weight of the rolling stock, should have been used. As it was, the number of derailments was almost a scandal. On one classic occasion at Tincourt, on the British front, all of the steam locomotives in the service were on the ground at the same time. Derailments were so numerous and the cause of so much loss of time that orders had to be issued to reduce speed to not more than eight miles per hour.

The narrow track was undoubtedly one of the causes of the excessive cutting of the steel ties into the ballast, on account of the leverage from the swaying of the high locomotives. With a slightly wider gage and greater speed, and, thereby, greater capacity of the railway system, fewer delays on account of derailments would undoubtedly have resulted.

Conclusions

1. Light railway systems should be designed and located with great care. Sharp curvature should be eliminated as much as possible, and limiting grades should be kept as light as possible.

2. Earth fills should be avoided in constructions under battle conditions.

3. Nothing but hard ballast should be used when steel ties are used.

4. Wooden ties are preferable to steel ties, because they allow of more flexibility in laying track on curves, cut into the ballast less and allow the use of poorer ballast. Nobody ever expects a war to last long enough for the ties to rot out.

5. Light railways are adapted to short hauls only.

6. Their principal value lies in their immunity from destruction from shell fire, for they can be replaced cheaper than they can be destroyed.

7. They are useful in "siege" warfare only. They are not useful in either advance or retreat.

8. The principal cause of delay in light-railway construction is the ballasting.

9. The gage is too narrow. It should be increased to 28 or 30 in., without any corresponding increase in the wheel loads of the rolling stock.

10. Light railways would be exceedingly valuable in a campaign in country where good roads were scarce, and would facilitate greater troop concentrations for offensive operations.

Water and Sewage Treatment in Vermont

The water-supply of Burlington is filtered and chlorinated, and that of Rutland is chlorinated. No other municipal water-supplies in the state are treated, and there is no municipal sewage-works in Vermont.

Unusual Design and Joint Details of 430-Foot Bridge

Heat-Treated Steel Eyebars and High-Carbon Steel Built-Up Members Used in Warren-Type Truss for Economy in Material

ECONOMY in the use of material was attained in the design of the Monongahela Southern Railroad Co.'s bridge at Coal Valley, Penn., by the adoption of built-up members of high-carbon steel in conjunction with heat-treated eyebars for end diagonals and lower chords, requiring special joint detailing at the lower chord pins. Exceptionally long panels of 43 ft., with deep stringers and floor-beams, made it possible to avoid the use of subdivided panels, a Warren single-intersection type of truss being selected. Expansion joints are provided in the floor steel by double floor-beams at two intermediate panel points, and in each panel of the solid concrete ballasted floor. An increase of 15.6% above the usual allowable unit stresses was permitted in the high-carbon steel, furnished under specifications similar to those for the steel in the Hell Gate arch.

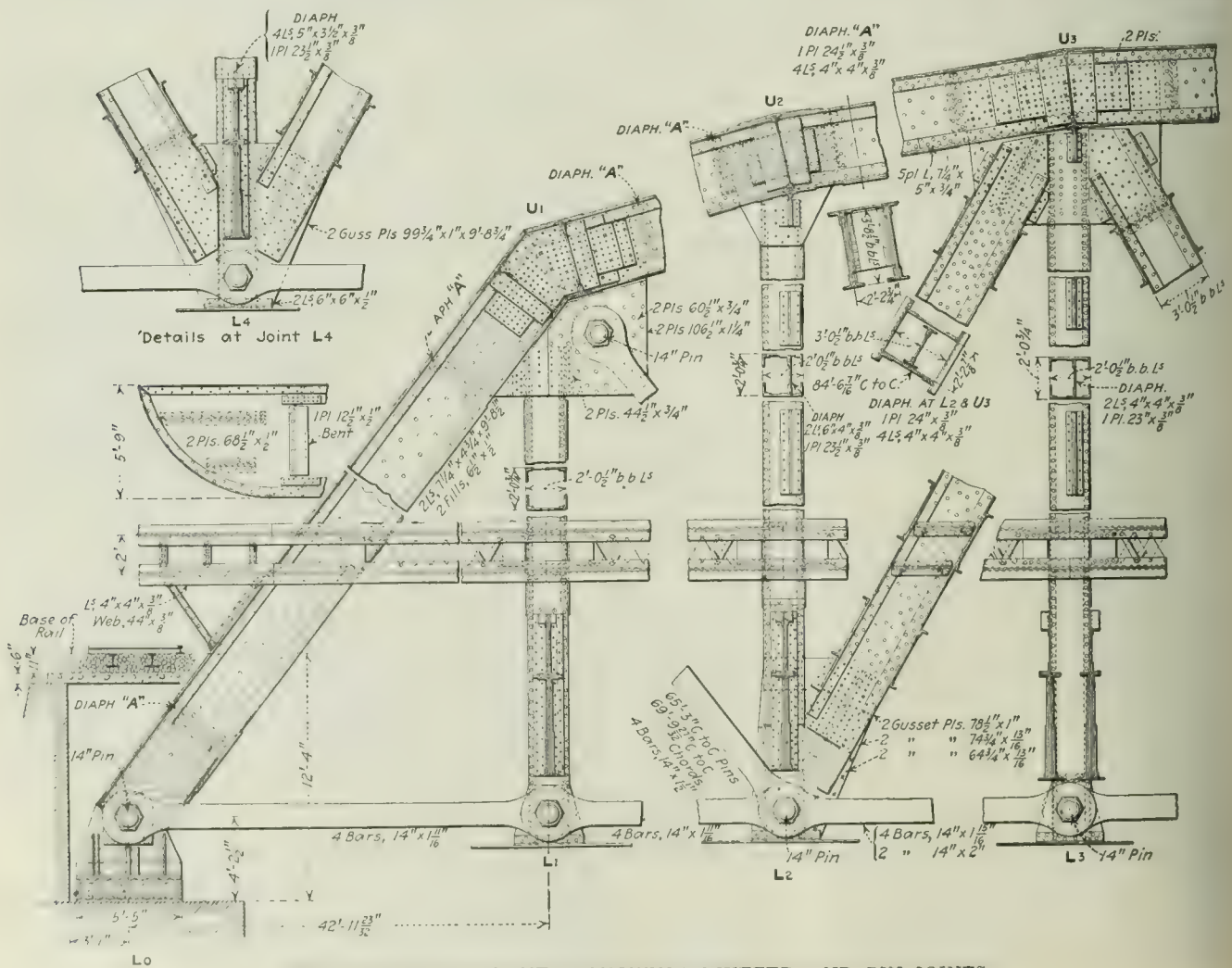
Loads and Unit Stresses—The dead load includes not only the solid concrete floor and ballasted track with steel ties, but footways on each side of the structure carried on cantilever brackets, and also two 40-in. gas mains. The live load specified is Cooper's standard E60 loading. The unit stress allowed in the special heat-treated steel eyebars is 27,000 lb. per square inch, with 30,000 lb. per square inch bearing on the carbon-steel pins. In general, a 15.6% increase over the usual A. R. E. A. specifications was used for working stress in the high-carbon steel. For combined stresses including wind the allowable units were increased 25 per cent.

On account of the high-unit stress in the lower chords, which produces excessive distortion in the floor system, the lower laterals were designed on a basis of 10,000 lb. per square inch unit stress, with a corresponding increase in the number of rivets, in order to give increased stiffness.

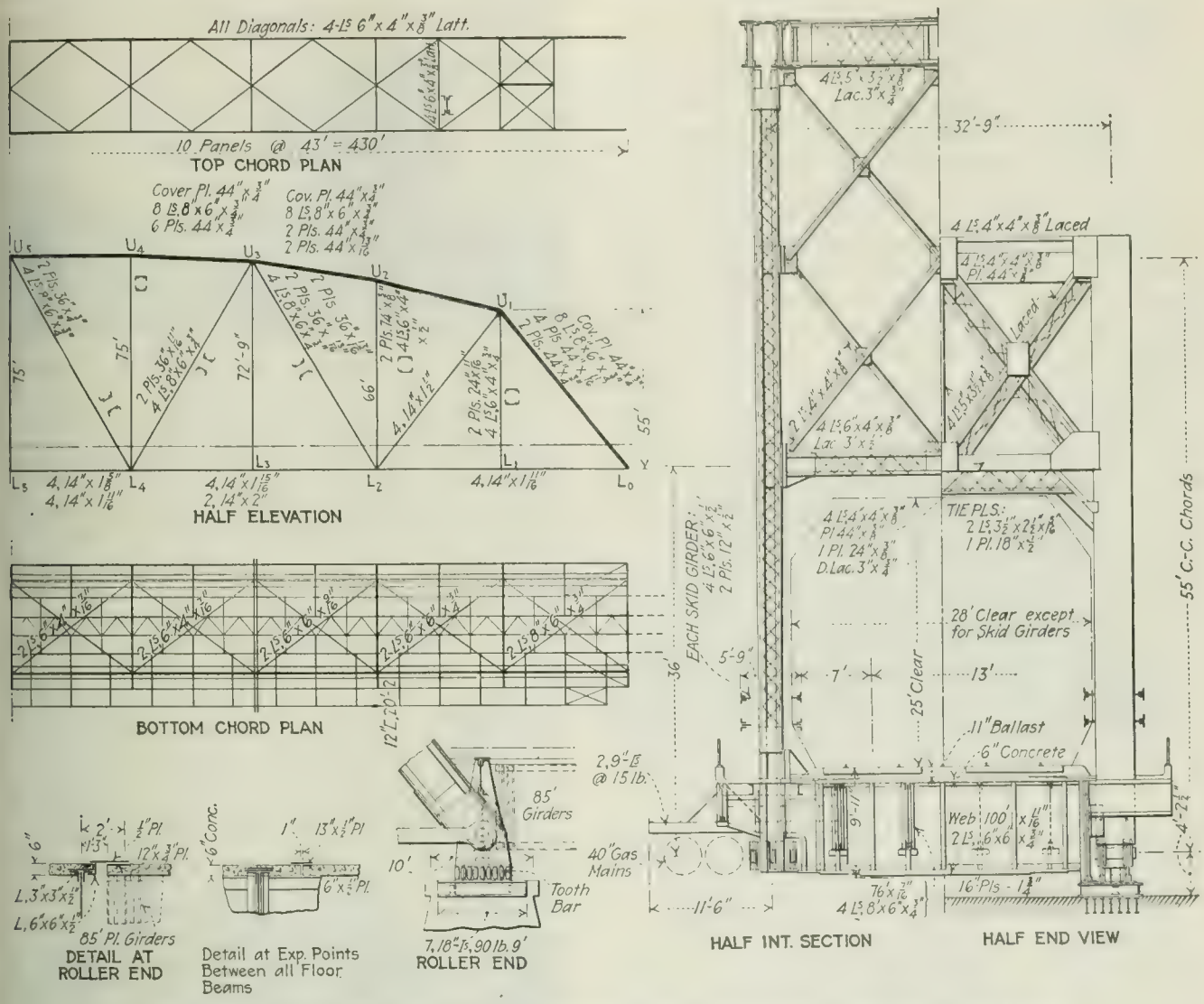
The special heat-treated carbon steel was required to satisfy the following specified limits: Phosphorus—basic steel, 0.04; acid steel, 0.06; sulphur, 0.05; ultimate tensile strength, 66,000 to 76,000; yield point, 38,000.

Special Joint Details—The use of eyebars and built-up riveted diagonals resulted in special joint details, as indicated on the typical details here reproduced; eyebars and the gusset plates for built-up web members had to be packed on the lower chord pins. Intermediate floor-beams are framed into the vertical posts as usual, except the double floor-beams at the two intermediate points L3, which are framed into the sides of the vertical posts.

The double floor-beams were introduced in order to allow expansion at these points, and also to prevent undue racking of the floor system from the elastic action of the lower chords under high unit stresses.



DETAILS OF END PANEL, SHOWING RIVETED AND PIN JOINTS



HALF ELEVATION AND SECTIONS OF COMBINATION RIVETED AND EYEBAR TRUSS SPAN

The details of the expansion joint in the concrete floor are also indicated.

All main material was subpunched and reamed, and the main gusset plate edges were planed. The size of the field rivets in the main truss members was 1¼ inch.

In the top chords, built up of eight angles and web plates, it was necessary to insert the connection gusset plates between the inside flange and web, using filler bars between angle and web, with splice angles 7½ x 5 x ¾ in. cut from 8 x 6-in. angles. Transverse stiffening diaphragms were placed on each side of the chord joints, as indicated; also short longitudinal diaphragms at the ends of the built-up web members.

Design of Floor System—The solid reinforced-concrete floor, with ballasted track and steel ties, is supported on deep stringers and floor-beams. The 43-ft. stringers are made up of 76 x $\frac{7}{16}$-in. web plate and four angles 8 x 6 x ¾ in. and the intermediate floor-beams of 100 x $\frac{11}{16}$ web plate with four angles 6 x 6 x ¾ in. and four cover plates 16 x ½ in. Footways are provided outside the trusses by cantilever steel I-beams, as shown in plan, using a 4-in. concrete slab. The 40-in. gas mains on one side are supported by channel cantilever beams with hanger plates and U rods.

Another exceptional feature of this bridge is the horizontal skid girders which are placed just above the floor system and are connected to the diagonal web members.

The object of these girders is to protect the main trusses in case a collision or other train accident should occur on the bridge.

The bridge was designed under the supervision of the chief engineer of the railroad company, and was fabricated and erected by the American Bridge Co., Ambridge plant.

Tests on Heartwood and Sapwood

No effect upon the mechanical properties of wood due to its change from sapwood into heartwood was noticed as a result of 300,000 tests which have been made at the Forest Products Laboratory, Madison, Wis. What differences there are in the strength between heartwood and sapwood can usually be explained by the growth and density of the wood. Differences between heartwood and sapwood, other than mechanical properties, are due chiefly to the fact that the sapwood of most American species is considerably less resistant to decay than heartwood, and, used without preservative treatment in situations favoring decay sapwood is likely to have much shorter life than heartwood.

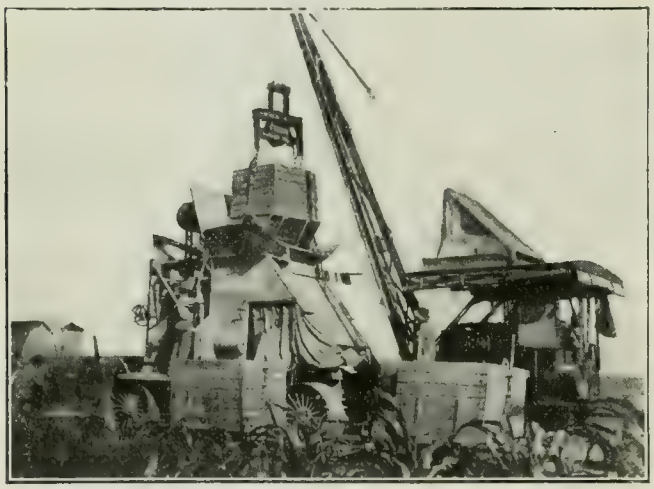
Large Paving Mixer Puts in 180-Yard Slab Every Hour

Bulk Cement Is Clamshelled From Gondola Cars to Bins — Boxes Carrying Proportioned Batches Crane-Charged Into Mixer

TEN-BAG batches were mixed and deposited at the rate of 47 cu.yd. per hour, in paving the Coldwater-Batavia concrete road in Michigan. Bulk cement, machine unloading, industrial-railway haulage of proportioned batches and crane charging, contributed to keep the big mixer supplied with material. A road-building outfit capable of quantity production was the object sought. With railway deliveries being made uninterruptedly, two 50-ft. sections of 5- to 8-in. slab, 16 ft. wide, were concreted every hour with a 12-man crew at the mixer. The construction of one mile of road a week, with continuous fair weather and a constant supply of materials, was demonstrated to be practicable with the outfit employed.

Approximately 6½ miles of 16-ft. pavement, 5 in. thick at the edges and 8 in. thick at the center, was built. The construction followed the Michigan state specifications, using a 1 : 1½ : 3 cement, sand and pebble concrete, and placing a ½-in. bituminous filler expansion joint every 50 feet.

Materials were delivered at Batavia, and placed on the contractor's private siding. There they were unloaded by a home-made locomotive crane consisting of a steam shovel, with a boom and clam-shell attachment, from which a ¾ cu.yd. clamshell bucket was operated. The shovel was mounted on a flat-car, with chains connecting the axle of the shovel to the axle of the car to furnish power to move the machine when required.



LOCOMOTIVE CRANE DISCHARGES BATCH BOXES INTO MIXER

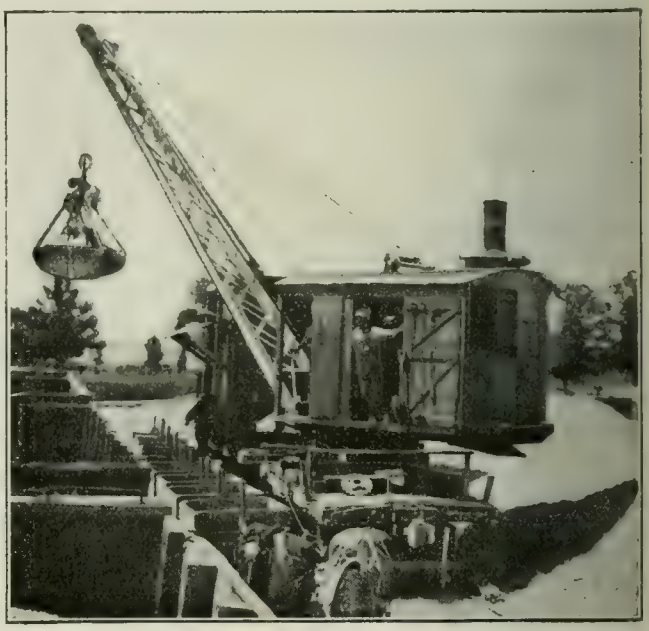
The unloading yard consisted of two standard-gage tracks 400 ft. long. On one track the cars of material were placed, and on the other the sand and stone hoppers, on railroad cars, with the crane operating between them on the same track. Placing of the storage bins on flat-cars so that they could be moved with the locomotive crane to any point where the aggregate was being unloaded proved very advantageous, as it was impracticable to get a switch engine to do switching sufficiently often to make possible the unloading of 500 cu. yd. of material a day. The 2-ft. industrial railroad connecting the unloading yard with the mixer



BULK-CEMENT BIN STRADDLES INDUSTRIAL TRACK

ran between the two tracks. The crane unloaded the sand and gravel from the standard-gage equipment into the bins or to a stock pile paralleling the crane track.

The cement was received in flat-bottom gondola cars, protected from the weather by tarpaulins. The clamshell bucket that was used for unloading the aggregate picked up the cement and dumped it into the cement-loading hopper. This hopper was stationary and was set up between the two standard-gage tracks and astride



STEAM SHOVEL ON FLAT-CAR FITTED WITH BOOM AND CLAMSHELL FOR UNLOADING

the industrial railroad. At first, question was raised as to the loss of cement by wind and of the danger of loss by rain, but experience proved that of the cement unloaded for about three miles of the work, the greatest variation between the quantity delivered to the work and the invoice quantity of the cement company was six sacks per car; the average was considerably less. No difficulty was encountered from wet cement or from storms, as the tarpaulins were lashed securely to the cars, and in case a car was not entirely unloaded in one day the tarpaulin covering was thrown over it at night. Two teams were used at the unloading yard for switching the industrial cars, and because of their ability to go to either end of a string of cars without loss of time, this method was considered preferable to the use of a locomotive.

The equipment used was standard 2-ft.-gage track,

100 cars, and three- and six-ton gasoline locomotives. The cars each carried a one-batch box, with a capacity of approximately 55 cu. ft. They were handled in 15-car trains, when the three- and six-ton locomotives were doubleheaded, and in ten-car trains when the six-ton locomotive operated alone.

At the loading plant the proper quantity of stone was first put into the boxes, then the cement was measured by being passed through a cylinder holding 5 cu. ft. This cylinder was a 12-in. sheet-metal pipe, with a gate near the top and another near the bottom. The operator closed the bottom gate and opened the top gate, allowing the cement to run into the cylinder, and then closed the top gate and opened the bottom gate. This operation was repeated in order to get the right quantity of cement per batch. A piece of canvas attached to the bottom of the cylindrical chute and to a hoop on the other end, which could be lowered into the car and raised in order to let the car pass, did away with loss of cement by blowing. (As mentioned above, the loss in handling cement in this way proved to be less than one-half of 1%.) The car was then shunted to the sand hopper, where the proper amount of sand was added. The quantities used in the batch were 10 cu.ft. of cement, 15 cu.ft. of sand and 30 cu.ft. of stone. The trains were then made up preparatory to being taken to the mixer.

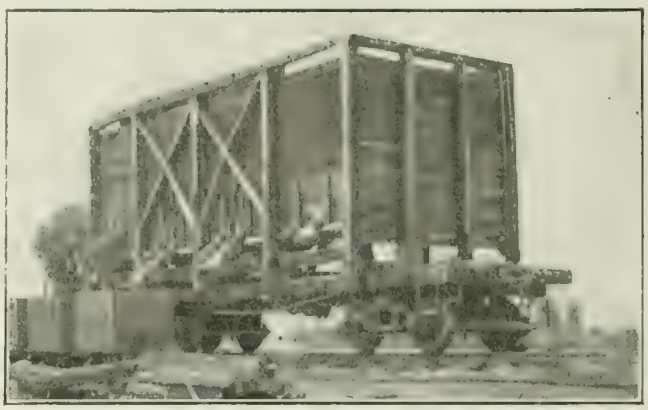
By the use of two locomotives double-headed, it was possible for the smaller one to handle the empties back to the loading plant, while the heavier locomotive did the switching around the mixer. Prior to the arrival of the locomotive, however, such handling of loads and empties as was necessary at the mixer was done by team. The usual procedure was for the locomotive to drop the loads at the siding, take out the empties and put in the loads. The boxes, which were designed with two bottom-dump doors, were picked up by a two-drum power crane. A steel bridle of channels and I-beams made it possible to pick up the boxes by irons attached to the door and swing them into place, and then, by releasing this line and picking up the line attached to the side of the box, to dump the box. (See illustration.) The crane, operating on "caterpillars" moving under its own power, furnished the traction for the mixer. By attaching the mixer rigidly to the crane, a constant distance between the two pieces of equipment was insured, overcoming the necessity of raising or lowering the boom. Experience showed that it was possible, with a minute mix, to put 25 to 30 batches per hour through the mixer.



SPECIAL YOKE LIFTS AND UNLATCHES BATCH BOXES

One drum hoists box by lifting on yoke A; to discharge the box a lift is taken by the other drum on yoke B and the line to yoke A is slacked off

The mixer was of unusual size, built especially for the contractor, and with several features of his personal choice, by the Koehring Machine Co., Milwaukee, Wis. It is mounted on 4-ft. wheels with 20-in. treads, bringing the height of the charging hopper to 16 ft. and the height of discharge to 6 ft. With a 4-ft. 10 in. x 5 ft. 8 in. drum, taking a batch of 55 cu.ft. of dry materials, this mixer is nearly double the size of those commonly employed on road work. The mixer and placing crew consisted, as observed on June 21, of 12 men, as follows: One man operating the mixer; one man operating the hoist; two men handling boxes; one man handling empty cars with a team; one man operating the chute; two men distributing concrete; two men routing, and two men belting and rolling.



AGGREGATE BINS MOUNTED ON FLAT-CARS

The contractor for the work was G. L. Schart, Milwaukee, Wis.

Typographical Error Corrected

In the formula for stress in anchor bolts of steel stacks, given by R. Fleming in his article "Wind Pressures on Cylindrical Structures in Practice," in *Engineering News-Record* of Sept. 11, 1919, p. 499, the omission of parentheses in the denominator of the first term of eq. (10), p. 500, makes this term twice as large as it should be. The first term of the right-hand number of this formula should be identical with the right-hand side of eq. (9). In other words, the maximum stress in an anchor bolt is

$$S_a = \frac{0.106\, b\, M}{(2R)^2} - \frac{W}{N}$$

The reduction to eq. (11), however, is free from this error, and eq. (11) as given is correct, namely:

$$S_a = \frac{2M}{RN} - \frac{W}{N}$$

Wind Pressures and Wind Stresses in Tower Design

Towers for Water Tanks, Viaducts, Wireless Aërials and Power-Transmission Lines—Six- and Eight-Post Towers—Wind Pressures for Design—Working Stresses for Three Classes of Transmission Towers

By R. Fleming
American Bridge Company, New York City

IT IS proposed in this article to give methods for determining stresses in towers due to wind. Towers as built for various purposes will be considered separately.

Water Towers

A water tower is an elevated tank and the posts or columns with bracing supporting it. The tank is cylindrical with a flat, conical, hemispherical or semi-ellipsoidal bottom. At present most tanks are being built with hemispherical bottoms. The tower may have three or more posts, usually placed at the corners of a regular polygon. The great majority of towers have four posts, though the number of posts largely depends upon the diameter of the tank. One well known builder of water towers uses six posts when the diameter of the tank reaches 35 ft. and eight posts when it reaches 50 ft. The 1,200,000-gal. tank of the Louisville Water Co., the largest of its type yet built, is 50 ft. in diameter, 90 ft. high, and 130 ft. from the hemispherical bottom to the ground; it is supported by eight posts.

The "Specifications for Gravity Tanks and Towers" of the mutual fire insurance companies contains a clause:

> Towers for supporting tanks of sizes up to and including 150,000 gallons capacity must have four posts. In those few cases where larger tanks are used, the towers may have six posts. Short towers for tanks on buildings may have three posts.

It is recommended that wind pressure on the tank portion be assumed at 20 lb. per square foot on the projected area of cylinder and 12 lb. per square foot on the projected area of roof and curved bottom. The 150,000-gal. tank of the New York Shipbuilding Co., at Camden, N. J., built in 1903 by the Chicago Bridge and Iron Works, is 209 ft. from the lowest point of the hemispherical bottom to the ground. The specifications for that structure provided for a wind pressure of 30 lb. per square foot "over half the diametral plane of the tank," and 200 lb. for each vertical foot of the tower; wind forces to be assumed in any direction, and members proportioned for the maximum stresses.

Wind stresses in the tank portion of a tower may be determined by the methods used for determining stresses in circular stacks.[1] The wind may be assumed to act at the centers of gravity of the respective areas. A vertical section through the axis of a tank with conical roof and hemispherical bottom shows a triangle for the roof, a rectangle for the cylindrical portion and a semicircle for the bottom. The center of gravity of the triangle is at one-third the height, of the rectangle at the center and of the semicircle at $0.424r$ below its top.

Where specifications require that towers be designed for a given pressure per square foot of exposed surface, the question arises, How much surface shall be considered exposed? The members of the windward face give but little protection to those behind them beyond breaking and dividing the air currents that pass through the tower. Furthermore, what is the amount of pressure when the wind is blowing in directions other than normal to the sides? An ample assumption for wind blowing in *any* direction is 30 lb. per square foot on $1\frac{1}{2}$ times the projected area of the windward members on a vertical plane passing through the center of the tower and at right angles to the direction of the wind.

Because of the variation of members as to type and inclination to direction of wind, theoretical accuracy in the determination of pressure is impracticable. The writer in his practice assumes for ordinary water towers a total wind pressure (wind blowing in any direction) on the posts, bracing and riser pipe of 60 lb. $\times$ n, per lineal foot of height, n being the number of sides.

Wind stresses in any post are maximum when the wind is blowing in the direction of the diagonal which passes through that post and the center of the tower. This can be shown by passing a horizontal plane through the posts of any regular polygonal tower and treating the structure above that plane as a cantilever beam which tends to rotate about a center of gravity line (the neutral axis). The maximum fiber stresses are in the posts most remote from the neutral axis, and the distance is greatest when the neutral axis is at right angles to the diagonal.

Wind stresses in the side bracing of three- and six-post towers are maximum when the wind is blowing in the same direction as for maximum post stress. In four- and eight-post towers the stresses in the side bracing are maximum when the wind is blowing at right angles to a side. In all cases, the maximum stresses are in the bracing cut by the vertical plane passing through the axis of rotation.

Wind stresses are, preferably, determined analytically. This can be done by taking horizontal sections at panel points and in turn considering the resultant bending moment at each section of all the wind forces acting above it.

The maximum vertical component of wind stress in the posts directly above the section considered equals the following:

Three-post	tower, M ÷	0.75D
Four-post	tower, M ÷	1.00D
Six-post	tower, M ÷	1.50D
Eight-post	tower, M ÷	2.00D

where M is the wind moment about the neutral axis of the horizontal section passing through the panel point at the bottom of the post member considered, and D is the diameter of the tower at this panel point; that is, the diameter of the circumscribing circle of the polygon. The post stress equals the vertical component multiplied by the secant of the angle of inclination of the post to the vertical.

The maximum wind stress in diagonals (acting in tension only) equals the following:

Three-post	tower, 0.500	$(V - V')$ sec θ
Four-post	tower, 0.707	$(V - V')$ sec θ
Six-post	tower, 1.000	$(V - V')$ sec θ
Eight-post	tower, 1.307	$(V - V')$ sec θ

[1] "Pressure on Cylindrical Structures in Practice," *Engineering News-Record*, Sept. 11, 1919, p. 499.

where V is the vertical component of maximum post stress in the same panel as the diagonal, V' the corresponding value in the panel above the diagonal, and θ the angle which the diagonal makes with the vertical. The wind stress in any strut is approximately the horizontal component of the stress in the diagonal below that strut.

To illustrate the foregoing, refer to Fig. 1. Note

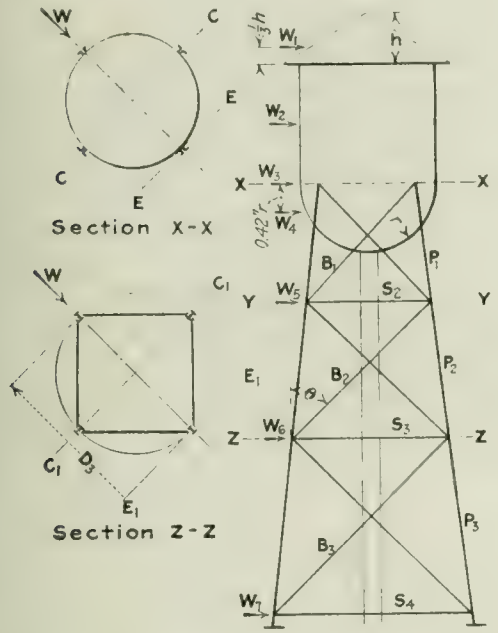


FIG. 1. FOUR-POST TANK TOWER

that the wind is assumed acting from the left in the direction of a diagonal of the tower.

Vertical component V_2 of stress in P_2 equals moment of W_1, W_2, W_3, W_4 and W_5 about axis CC in section ZZ divided by D_2.

Vertical component V_1 of stress in P_1 equals moment of W_1, W_2, W_3 and W_4 about axis through center of section yy divided by D_1.

Stress in diagonal B_2 equals $(V_2 - V_1) \times 0.707 \times \sec \theta$. (This is the *maximum* stress in the diagonal. The stress due to wind in direction W equals $(V_2 - V_1) \times 0.5 \times \sec \theta$.)

Stress in strut S_2 equals horizontal component of B_2.

The uplift should be determined similarly, the maximum occurring when the tank is empty. This method is not equivalent to equating moments about the tangent to the edge of the circumscribing circle (EE).

In designing the tank portion, the same working stresses should be used for wind loads as for other loads. In designing the tower portion, the specified working stresses may be increased 25% for combined wind and other loads, provided the section thus obtained is not less than that required if wind forces be neglected. The same result is reached in the Birch-Nord "General Specifications for Standpipes, Tanks and Towers," which uses 12,000 lb. for tension in tank plates, 16,000 lb. tension in other parts of the structure, and 16,000 — $70l/r$ for compression throughout, by the provision that stresses due to wind may be neglected if they do not exceed 25% of the combined dead- and live-load stresses.

Viaduct towers are usually made of four columns, braced transversely and longitudinally. The "General Specifications for Steel Railway Bridges" of the American Railway Engineering Association specifies transverse tower loads that represent a high wind pressure for unloaded condition and more moderate wind pressure for loaded condition, as has long been customary, but it adds for loaded condition a transverse force corresponding to the lateral impulses of the train:

> Viaduct towers shall be designed for that one of the following loads, considered as moving, which gives the greater stress: (a) A force of 50 lb. per square foot applied on 1½ times the vertical projection of the tower and the portion of the structure which it supports.
>
> (b) A force of 30 lb. per square foot, applied on the same surface, plus 400 lb. per linear foot of structure applied 7 ft. above the top of the rail, for assumed wind force on train, when the structure is loaded, on either one or both tracks, with empty cars weighing 1200 lb. per linear foot.

Wind stresses from the wind blowing in any direction other than at right angles to the longitudinal axis of the tower need not be considered. The dominant factor in designing the transverse bracing—for high towers, at any rate—is the amount of surface presented to the wind when the structure is loaded. The tractive force, usually assumed at 20% of the live load applied at top of rail, determines the longitudinal bracing.

The wind loads are assumed to be concentrated at the panel points. The diagonals are usually assumed to act in tension only. The chapter, "Stresses in Viaduct Towers" in Marburg's "Framed Structures and Girders," is exceptionally complete. It is believed these comments represent the best modern practice.

Radio Towers

The sole function of a radio tower (three such towers are shown in Fig. 2) is to provide a support for

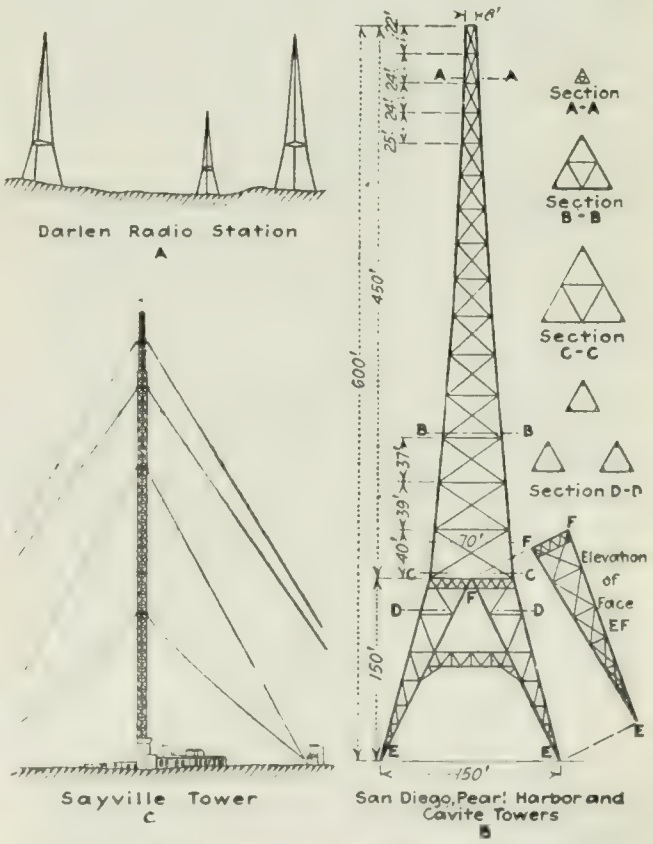


FIG. 2. THREE TYPES OF RADIO TOWER

an antenna or aërial of as large electrical capacity as possible and with its center of gravity as high as possible. The stresses from wind loads are greater than those from the dead load and are the dominating factor in designing the structure.

United States Government specifications for a 200-ft. wireless tower built in 1911 called for a structure capable of withstanding a wind load of 50 lb. per square foot of exposed surface. The tower is 26 ft. square at the base and 4 ft. square at the top. It is not clear what exposed surface is intended, whether that of two or of four columns and one, two or more sets of bracing. The working stresses specified are: 20,000 lb. per square inch for tension and 20,000 — $87l/r$ for compression.

The 300-ft. towers of the station at Key West, Fla., built in 1914, are of triangular cross-section. A wind pressure of 30 lb. per square foot tower surface is used. The working stresses are 18,000 lb. per square inch for tension and 18,000 — $70\,l/r$ for compression.

The specifications for the station at Guam required that the following, with other data, be inscribed on the name plate: "Wind, 30 pounds per square foot."

The first of a series of high-power radio stations was built at Arlington, Va., in 1912. When finished it was the largest and most powerful of the 48 stations of the Navy's coast system. The height of one of the towers is 600 ft., the base is 150 ft. square; the height of each of the other two towers is 450 ft. The arrangement of the towers is such as to support a triangular inclined aërial. A description by an officer of the Navy is given in the *Journal of the American Society of Naval Engineers* (Vol. XXV, 1913, p. 60), but nothing is said about wind loads. The Arlington station was followed by the Darien Station, A in Fig. 2, completed in 1915[2]. The three triangular towers are each 600 ft. high, with a spread of legs at the base of 150 ft. A wind pressure, normal to the direction of the wind, of 30 lb. per square foot of surface is assumed on the antenna and towers. The working stresses used for combined dead and wind loads are the same as those for the Key West station, cited above. Still more recent are the San Diego, Pearl Harbor and Cavite stations (B, Fig. 2), with towers of the same base and height as those of the Darien station. The design was modified from that of the latter, evidently to facilitate ease in erection.

The standard 820-ft. towers for the proposed station at Monroe, N. C., are triangular, with a spread at the base of 220 ft. The specifications call for a pull at the top of 22,000 lb. and wind on the tower equal to 30 lb. multiplied by 1½ times the exposed area of one face. The working stresses used are 16,000 lb. per square inch in tension and 18,000 — $70\,l/r$ in compression.

The Tuckerton, N. J., and the Sayville, L. I., stations, which came into such prominence at the beginning of the war, were built after German designs. The Sayville tower, sketched at C in Fig. 3, is 150 m. (492 ft.) high. The Tuckerton tower is 250 m. (820 ft.) high, but is of similar design. In both, the structure is of triangular cross-section and its bottom, brought almost to a point, rests upon an insulated ball and socket joint. The Tuckerton tower has a second joint 145 m. above the first; below this joint the triangular section is 5 m. (16.4 ft.) on a side, and above the joint 4 m. (13.1 ft.). The vertical element of the tower, on account of the joints, has only vertical rigidity, and is held in place laterally by 12 guys arranged in four groups of three each. It is to be regretted that the data and calculations of wind stresses for these towers are not available.

Radio towers, usually erected near the coast, are exposed to high wind velocities. According to the United States Government reduction formula, the actual wind velocities corresponding to recorded velocities of 110 and 100 miles per hour, respectively, are 82.9 and 76.1. Using these actual velocities in the wind-pressure formula $P = 0.004\ V^2$, the pressure for a recorded velocity of 100 miles per hour is 23 lb. per square foot, and for 110 miles it is 27.5 lb. The writer believes that with the assumption of 30 lb. per square foot, on 1½ times the exposed area of one face, working stresses of 18,000 lb. in tension and 18,000 — $70\,l/r$ in compression are permissible for all loadings. His preference, however, is for 30 lb. on 1¾ times the exposed area of one face and working stresses of 20,000 lb. per square inch in tension and 20,000 — $90\,l/r$ in compression.

Guy-Supported Radio Towers

Marconi towers are guyed masts or poles rather than towers. The 10 stations built by the J. G. White Engineering Corporation in 1914-15 comprise 79 masts ranging in height from 300 to 500 ft. The mast sections are built up of half- or quarter-cylinders made from steel plates. The diameter of a 300-ft. tower is 30 in. for the lower and 24 in. for the upper portion; of a 400-ft. tower, 42 in. for the lower and 30 in. for the upper portion. The steel tubes are stayed laterally by sets of guys at different elevations, four guys per set. In this design a wind pressure of 30 lb. per square foot of projected area was used.

The mast of a Marconi tower may be treated as a series of uniformly loaded beams supported at the guy bands. As in guyed stacks, the bending stress in pounds per square inch in any section is expressed by the equation $S = 0.106\,M/D^2t$, in which M is moment in foot-pounds, D diameter in feet, and t thickness of shell in inches. It is recommended that the maximum value of M (except for the upper section when it is a cantilever) be taken as $\frac{1}{8}\,pD(\frac{5}{6}\,h)^2$, in which p is the wind pressure per square foot of projected area and h is the distance in feet between supports (h is increased 20% to allow for unequal adjustment of guys).

For determining guy tension and compressive stresses, the methods used for guyed steel stacks need not be resorted to. An excellent treatment of the subject is given in a paper "Design and Construction of Guy-Supported Towers for Radio-Telegraphy," by Roy A. Weagant, published in *Proceedings of the Institute of Radio Engineers*, Vol. III, p. 135 (June, 1915), from which the following is quoted:

> Obviously, the vertical stresses acting on the tower are composed of those due to the weight of the tower itself, and those due to the vertical component of the tensions in the guys. We must, therefore, determine these latter as accurately as possible. Let us, therefore, consider the condition of affairs when the tower is erected, but when no wind pressure is acting. We see that the tower must be vertical, that the guys on opposite sides must be drawn up with equal tightness, and that they must be drawn up

[2] "Design of Darien Radio Towers," by C. A. Carlson, in *Engineering News*, Mar. 23, 1916, p. 546.

with sufficient tightness so that the tower and the guys will not move unduly when the wind pressure acts. Next suppose that the wind pressure is acting. Obviously, readjustments in the stresses in the guys take place. The windward sets have to sustain the full effect of the wind pressure. Therefore, on account of this added load they must stretch, and the tower will incline to leeward. It is also apparent that, to avoid weakening the tower, it must maintain a straight line. In order that this condition may be realized, it is necessary that each windward guy span must increase an amount proportionate to the movement of its point of attachment, which condition can only be realized when each set of guys is stressed initially to a definite amount. When a guy is stretched between two points, it forms the curve known as the catenary, and the tensile stress produced is given by the following equation . . .

The reader is referred to the paper for the method of calculation, which is rather involved. The author gives the numerical calculations and design of a mast 625 ft. high, 3 ft. in diameter, stayed by six sets of four guys each. Wind pressures are assumed as 15 lb. per square foot of projected area for the first 100 ft. from the ground, 16 lb. for the next 100 ft., 21 lb. for the third 100 ft., and 25 lb. for the remaining portion. If the pressures at any time are differently distributed, the computed adjustment of guy stresses will not be realized and the vertical member will be subjected to bending in addition to that expressed by the formula given two paragraphs above.

Towers for High-Tension Transmission Lines

The first high-tension line for the transmission of power in which steel towers were used exclusively was a line in Mexico 101 miles long built in 1903. Since that time such lines have been built by the score and towers by the thousand.

The lateral wind pressure on transmission lines has been much discussed. Well known engineers have arrived at widely different conclusions. The author of the article on electrical power transmission in the "Encyclopedia Britannica" writes, "the actual possibility of wind pressure is very generally overestimated, and has resulted in much needlessly costly construction." But another writer (Joseph Mayer, in *Engineering News* of Jan. 4, 1906, p. 2) says, "such lines should, therefore, be built strong enough to resist not only the commonly occurring, but also the exceptionally violent local storms."

Many experiments have been made during late years in the interest of aëronautics on the resistance of wires to air currents. Those made in the English National Physical Laboratory[3] seem to show that in the fundamental equation for force, F, per unit of length, $F = kDV^2$, k is not a constant but a function of the product of the diameter, D, of the wire and of the velocity, V, of the wind. According to Loenig, "Military Aëroplanes," for smooth wires $k = 0.0026$. The writer assumes for transmission line wires $k = 0.0025$.

Wires in sleet regions are sometimes coated with ice, and the question arises whether provision should be made for heavy winds occurring at the same time.

Basing on a considerable amount of data, the writer recommends that the following wind pressures be assumed:[4] (1) On the tower itself, 30 lb. per square foot on $1\frac{1}{2}$ times the exposed surface of one face; (2) on bare wires 15 lb. per square foot projected area; (3) on ice-covered wires, up to $\frac{1}{2}$-in. radial thickness of ice, 10 lb. per square foot; (4) on ice-covered wires with more than $\frac{1}{2}$-in. ice, 8 lb. per square foot.[5]

In the "flexible" type of tower the assumed wind pressure controls the design. In the more common "windmill" and kindred types, the assumed pull on the wires from unbalanced loading largely determines the design. This pull acts longitudinally with the line while the main force of the wind acts transversely to the line, but it is common practice to make all sides of the tower alike.

Assumed working stresses are as important as assumed loadings. Here again there is wide variation in practice. It might be well to divide proposed towers into three classes, A, B and C, and to assume working stresses in accordance with the classification, thus:

Class A—Towers for a line whose customers insist upon uninterrupted service and penalty clauses, and towers where failure would mean danger to life and property, as in thickly populated regions: 20,000 lb. per square inch in tension and $20{,}000 - 90\,l/r$ in compression.

Class B—Towers for a line where interruptions under certain limitations are permissible, through sparsely settled country: 24,000 lb. per square inch in tension and $24{,}000 - 100\,l/r$ in compression.

Class C—Towers where cost is the primary feature to be considered and the question becomes, What are the least requirements which will enable the line to do its work?: 30,000 lb. per square inch in tension and $30{,}000 - 120\,l/r$ in compression.

At present the majority of towers are of Class C. The engineer often finds it a commercial impossibility to have towers built as he would like to design them. The situation is similar to that of highway bridges forty years ago; and just as the bridges of that day would not be tolerated now, many towers of today will not be tolerated a generation or two hence.

Headframes

A mine headframe, the structure over a shaft which supports the hoisting gear and the like, is a tower and will be treated as such.

Ketchum, in a paper on "Design of Mine Structures," specifies for wind loads on headframes:

> Where the headframe or tipple is inclosed, the wind load shall be assumed at 30 lb. per square foot of exposed surface acting horizontally. Where the framework is open the wind load shall be taken at 50 lb. per square foot acting on the projection of the members of the headframe or tipple. In calculating the stresses due to wind, the wind loads may be assumed as applied at the joints of the structure. Where one side of the structure is open so that a deep cut or pocket is formed the wind load shall be taken as not less than 60 lb. per square foot on the projection of the cup-like surface.

For wind-load stresses his specifications read:

> The allowable unit stresses when the wind-load stress is combined with the dead-load stress plus twice the working-load and machinery-load stresses shall not exceed the allowable unit stresses for dead loads by more than 25%. If the sum of the wind-load unit stress, the dead-load unit stress, and twice the working-load and machinery-load unit stresses

[3] "Technical Report," of the Advisory Committee for Aeronautics for the year 1912-13, p. 126.

[4] The recommendations following are taken mainly from a paper by the writer, "Structural Steel Poles and Towers," reprinted in *Engineering News* of Nov. 28, 1912, p. 988.
See also Thomson, "High Tension Transmission Lines, Poles and Towers," *Transactions*, Can. Soc. C. E. Vol. XXX (1916) p. 159.

[5] In the south $\frac{1}{4}$ to $\frac{1}{2}$ in. of ice coating is sufficient, but in northern countries like Canada more allowance must be made. The Montreal Light, Heat & Power Co. assumes $\frac{3}{4}$ in. on each side, making the diameter of the cable $1\frac{1}{2}$ in. plus its own thickness.—Thomson.

exceed the allowable unit stress for dead loads by more than 25%, the area of the section shall be increased to reduce the actual stresses to within the prescribed limit. Wind-load stresses need not be combined with breaking-load stresses.

While the stresses specified are conservative, the load of 50 lb. seems excessive, even for headframes in locations subject to high winds. Specifications of some coal companies call for a wind pressure of 40 lb. The writer has designed a number of headframes using a wind pressure of 30 lb. on 1½ times the exposed area of one face. He does not hesitate to use 25 lb. per square foot of exposed surface if the structure is inclosed. For a cup-shaped section the pressure is uncertain, but 60 lb. is well on the side of safety.

The stresses in headframes other than those of the A-type are usually statically indeterminate, but for wind stresses it is seldom necessary to resort to other than approximate methods. In a headframe with longitudinal bents of two posts and back brace, they may be determined by considering the back brace redundant and the tower portion as transmitting all wind loads to the ground; or, the tower portion may be considered as a lattice girder supported at the top and bottom with the reaction at the top carried to the ground by the back brace. In a headframe with transverse bents of three posts the middle post may be considered redundant and wind stresses carried by the outer posts and bracing between them.

Machines Take the Place of Men on 20-Mile Concrete Road

Grading, Subgrading and Slab Construction Are Machine Operations on Lincoln Highway From DeKalb to Geneva, Illinois

TWIN outfits of grading machines, mixers and tampers are putting in 18-ft. slab at the rate of 900 ft. a day on the Lincoln Highway between DeKalb and Geneva, Ill. Both outfits operate from a single loading plant and track system which are to be set up three times for the 20-mile stretch of road. All processes are mechanical, from loading the cars and making the grade ready to placing the concrete slab. Except trackmen and a few shovelers to clean up after the grading machines, to spade behind the mixer and to cover and dike the completed slab for ponding, the workmen are machine attendants. A complete car-camp outfit houses and boards the working force.

The operation comprises 20½ miles of 18-ft. concrete road to be constructed according to the specifications of the Division of Highways of Illinois. Grading runs about 3000 cu. yd. a mile, with cuts seldom over 1½ ft., all on old gravel-surface road. There are four towns of size, all with railway connections, on the section, but the bulk of the work is not close enough to any town to make it a convenient place for housing the working forces, nor did any have the facilities free for handling the contractor's shipments. This determined the location of the loading plants outside the towns at strategical points with respect to the operations.

Dividing the road into four-mile sections, as indicated by Fig. 1, the loading plant with its track system will be set up successively at the points marked by the Roman numerals. One concreting and grading outfit starts at A and the other at B, both working in the

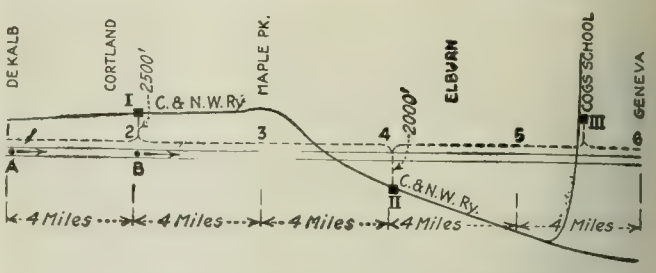


FIG. 1. SUCCESSIVE POSITIONS OF LOADING-PLANT AND SERVICE-TRACK SYSTEM

same direction. When A reaches point 2, B will have reached point 3. Then the loading outfit will be shifted to II and outfit A will be shifted from point 2 to point 4, when it will proceed to point 5, while B outfit continues from point 3 to point 4. The shift to set up III will be conducted in the same manner, except that from here each outfit will have a two-mile section to build.

At each set-up of the loading plant the track arrangement and procedure are as indicated by the diagram, Fig. 2. There are five miles of 2-ft.-gage track

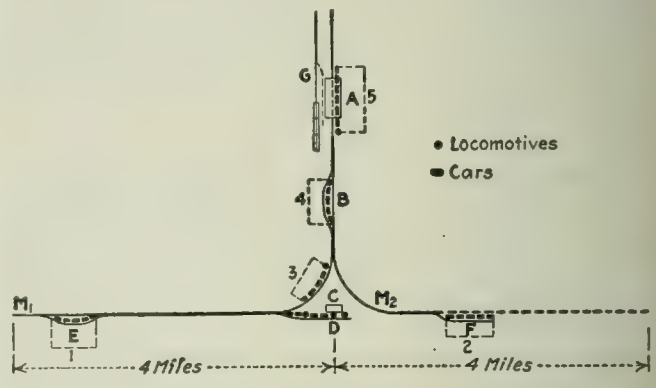


FIG. 2. SERVICE-TRACK DIAGRAM OF OPERATING PROCEDURE

made up in 15-ft. sections of 25-lb. rail and seven steel ties to a section. At A are the loading bins to which materials are brought on the switch G, on the extension of which stand the camp cars. At B, E, D and F are industrial-track sidings, and at C is the blacksmith shop. One outfit M1 starts at the end of the eight-mile section to which the industrial track is carried. The other outfit M2 starts near the center of the eight-mile section. As M1 moves ahead the track is taken up from behind, carried forward on cars, and put down ahead of M2. When the eight-mile section is completed there is, as stated previously, another set-up of the loading plant.

Essentially, the loading plant is a three-compartment bin, A, straddling the industrial track, a siding for material cars, and a crane track, with two locomotive cranes. The cranes unload from cars into the bins with clamshell buckets or, in case of gravel or sand, when the bins are full, into stock piles from which, when cars are not in, the material is rehandled into the bins. Rectangular flat-bottomed bins are employed, one for each material, but all forming one continuous structure. They discharge to batch-boxes on cars through vertical chutes so spaced that a number of cars receive their charges simultaneously. The bin construction and the details of car loading, particularly in the apparatus and procedure for handling cement in bulk, received careful consideration.

Rectangular flat-bottomed bins were chosen instead

of hopper-bottom bins because they cost less to build and could be built, knocked down and rebuilt more quickly. The fact that material pyramided itself on the flat bottom between chutes and remained in dead storage was, in comparison, considered to present no great disadvantage, for when the time came to empty the bins finally a few men with shovels could quickly remove the remaining material into the chutes. In fact, the dead storage was held to be an advantage on occasion. When materials' deliveries—and, more particularly, cement shipments—fail at a critical stage of the work and only a little more material is needed to carry the work beyond this stage, the dead-storage reserve will often save the situation from disaster.

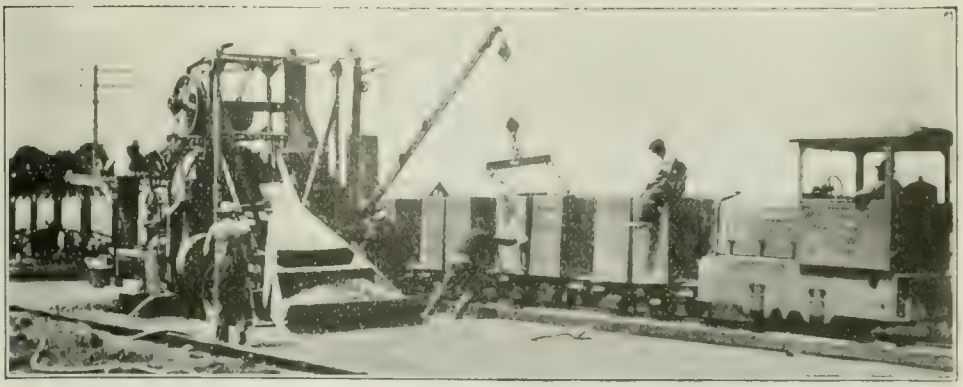


FIG. 5. CARS DRAWN BY GASOLINE LOCOMOTIVES DELIVERING TWO FOUR-BAG BATCHES EACH

Bulk cement is received in flat-bottom gondola cars and is unloaded into the open-top bin by a locomotive crane with a clamshell bucket. Tarpaulin covers for cars and bin protect their contents from rain. Chute construction and operation present the only unusual features. The chutes are vertical, sheet-steel boxes 15

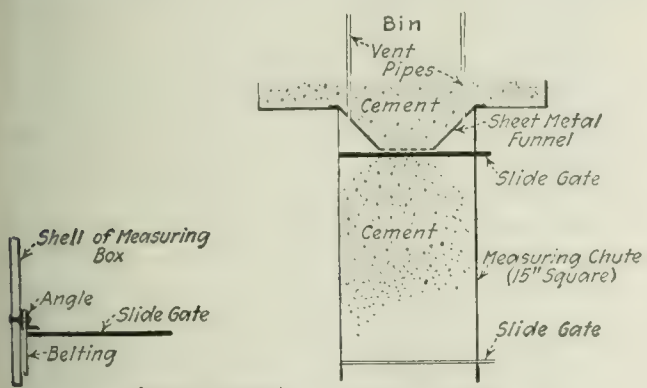


FIG. 3

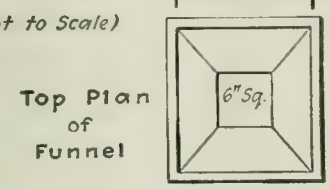


FIG. 4

FIG. 3. LEAKAGE OF BOTTOM-CHUTE GATE ELIMINATED BY BELT PACKING; FIG. 4. FUNNEL IN TOP OF CEMENT CHUTE FACILITATES CLOSING TOP GATE

in. square inside and of 4 cu.ft. capacity between top and bottom horizontal slide gates. Dusting at the joints, leakage at the bottom gate, and difficulty in closing the top gate through the column of cement, caused trouble at the start. Dusting was eliminated by painting the joints with cement paint. Leakage between the closing edge of the bottom gate and the side of the chute was remedied by the arrangement shown by the sketch Fig. 3. The strip of belting suspended as shown formed a cement-tight packing for the gate to close against. To facilitate closing the top gate, a sheet-iron funnel, as shown by the sketch Fig. 4, was set into the top of each chute. This reduced, to small dimensions, the column of cement which had to be cut through in closing the gate, and made the closing easy. The vent pipes extending to the top of the bin prevent any trouble arising from compression of the air in the angular space between the funnel and the chute sides.

Scheduled train service maintains coördination between the loading plant and the twin subgrading and paving outfits. With 100 cars and five locomotives, five 20-car trains are so operated that there is always one train taking load at the bins, two trains en route to the mixers and two trains at the mixers being unloaded. Each car carries two batch-boxes, each holding four-bag batch. Fig. 5 shows train equipment.

The boxes are charged first with sand to mark, then with the measured chute of cement, and last to the top with gravel. Since the boxes are bottom-dump, this sequence of sand, cement and gravel is a little objectionable at the mixer because the sand sticks and the charging skip does not always clear itself readily. This objection is considered to be overbalanced by advantages in handling the cement. Were the stone put in first, which would be preferable in charging the mixer, the cement would shake down into the voids to an objectionable degree. The more important disadvantage, however, is considered to be the seepage from wet sand which, if the sand were on top, would be down through the cement. This, in case of any delay in handling the boxes, might start the cement to set and endanger the quality of the mix. Since stone seldom contains free water to any amount, there is little danger of seepage into the cement when the stone is loaded last, and the water in the sand underneath the cement sinks to the bottom of the box, where it causes no trouble.

When the trains are laid up for the night they stand as indicated by the diagram Fig. 2, in which the circles represent locomotives and the rectangles represent cars. At quitting time train 5 is run under the loading bins; train 4 is laid up in siding B and its locomotive run to siding D; train 3 with its locomotive stands on the main line; train 2 lays up 18 cars in siding F and the locomotive with two cars takes the men on outfit M2 to camp and runs to siding D; train 1 lays up 18 cars at siding E and the locomotive with two cars takes the men of outfit M1 to camp and then goes to siding D. With this arrangement train 3 has a free main line for track shifting or other night work and is ready to run in and take the place of train 5 in the morning. Two locomotives with two cars each are ready to take out the two construction crews and connect up with their trains at E and F. The other locomotive on siding D connects up with train 4, and the day schedule goes into operation.

At the mixers the batch boxes are picked off the cars one at a time by a crane mounted on the mixer, are dumped into the charging skip, and are returned to the car. The mixer has the regulation elevating charging skip, except that the rear end of the skip is closed instead of being open as for charging by wheelbarrows. The batch boxes are of wood, 2 x 3½ x 4 ft., with single-bottom flap doors controlled by a hand latch, and two side irons, with eye-holes for the crane yoke to hook into.

Sequence of Operations

On beginning work (Set-up I, Fig. 1), the grading outfit was started early enough to complete the work ahead of and between mixers M1 and M2, Fig. 2. Thereafter the grading has been kept about three miles ahead of the mixers. The grading outfit consists of an elevating grader hauled by 12 horses and loading into dump wagons which take the material to the shoulders; a scarifier to root up parts of the old gravel road too hard for easy elevating grader excavation; drag scrapers for miscellaneous operations, and a portable camping outfit for men and teams. The camp is moved two miles at a shift, the gang working one mile each way from camp.

The two subgrading and paving outfits are duplicates, and each consists of a 10-ton roller, a blade scraper, a subgrader, a paving mixer and a tamping and finishing machine, besides canvas, steel side forms and the usual small tools. The procedure is the same with both outfits. The roller hitches onto the blade grader, which shapes the grade and ditches close to cross-section. The grade is then rolled down and the steel side forms are set. The subgrade finishing machine rides on wheels on the side forms, and, hauled by the roller, planes the grade down to exact form and elevation. Finally, the subgrade is finished by rolling. All grading operations are machine operations except setting the forms and cleaning up with shovels behind the subgrader.

At the mixer the operations are of the usual order except that the slab is compacted and finished by machine tamping and belting. The paver is a four-bag batch mixer on caterpillar tractions and with boom-and-bucket distribution. The concreting crew consists of two men handling the batch-boxes, one on the crane, one operator, one dump man, two spaders, one operator on the tamping and finishing machine, and two men covering the slab with canvas, building dikes and ponding. When the slab has cured, the earth covering will be removed direct to the shoulders by blade scrapers. About 350 ft. of finished slab has been the output for each outfit with the crews being organized; 450 ft. a day is expected when the crews have settled down and all operations are coördinated.

Contrary to road work, usually, the workmen are housed and boarded in construction camps. At the unloading plant the camp consists of an office car, a kitchen car and a mess car and several bunk tents. This camp provides for the concreting, subgrading, unloading plant and train crews. For each grading crew there are a kitchen and mess wagon and a bunk tent, which are moved along with the crew, as previously stated.

The contractor is James O. Heyworth, Chicago, Ill., whose superintendent in charge of the work is R. H. Anderson.

English Channel Train Ferry Bridge of 120-Foot Span

Details of the Trusses, Lifting Tower, Operating Apparatus and Mooring Provisions—Special Design Features

By P. J. Risdon
Hove, Sussex, England

DETAILS of the train ferry bridges constructed during the war in connection with the train ferry between England and France instituted in 1918 contain several special features. These bridges vary in length from 80 to 120 ft., according to the range of tide to be provided for at the different ports of call. They are of the half-through type, like the 120-ft. span here described and illustrated. The especially noteworthy design details include the pin-connected intermediate floor-beams and transverse bracing to allow accommodation to any list of the boats, and the lifting and mooring details at the outer end, including the "elephant-foot" bearing and the mooring pin.

The train ferry between England and France instituted in 1918 comprised four services, namely, Richborough to Dunkirk, 54 miles; Richborough to Calais, 35 miles; Southampton to Dieppe, 130 miles; and Southampton to Cherbourg, 91 miles, one boat being assigned to each service. Each boat provided accommodation for 54 fully loaded, four-wheel railway wagons or motor lorries, or as many bogie vehicles, locomotives, heavy guns and tanks as the available space permitted, the effective length of tracks on board being 1080 ft. The cost of each boat was about $950,000. Upon the main deck four parallel railroad tracks are laid, which converge into two tracks near the stern, where switches and crossings are placed.

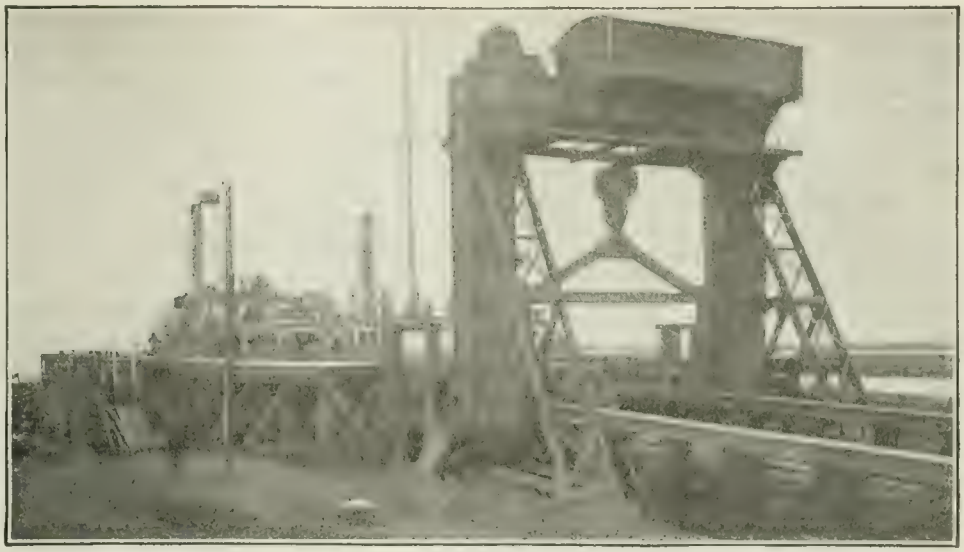
Each port was equipped with special landing facilities, to insure a smooth and uninterrupted passage for the rolling stock from the shore to the ship at any stage of the tide and under any condition of loading. The tidal range in some cases is nearly 14 ft.; moreover, the draft varies with the amount and distribution of the load. Again, a list occurs when either side of the vessel is more heavily weighted than the other during loading and unloading operations, with the consequence that one rail or set of rails is frequently at a higher level than the others. A steel structure, or train-ferry bridge was therefore interposed between the shore and the boat, the general arrangement and details of which are illustrated.

The bridge is of the half-through type, as stated above, and consists of two main trusses with cross-girders or floor-beams spaced 10 ft. apart and hung upon pins from the main vertical web members. These single-pin connections of the floor-beams to the main truss verticals permit of the bridge accommodating itself at the outer end to any list of the boat during loading operations. While providing for this, an extra allowance was made against an extraordinary list due to possible damage as the result of collision or of submarine attack.

Horizontal bracing, consisting of plates and angles, is provided at the level of the top of these intermediate floor-beams. This bracing constitutes a horizontal stiffening girder, of which the two outer longitudinal stringers form the flanges, thus avoiding direct con-

nections of this horizontal bracing to the main trusses, which would have impeded the freedom of vertical motion of the latter relatively to each other. The lower chords are connected together at 20-ft. intervals by transverse struts with single pin connections, and a light horizontal system of bracing.

From the foregoing description it will be seen that, instead of rigidly connecting the cross-girders to main girders and providing a separate hinged flap or apron between the end of the bridge and the boat to allow for list, the bridge as a whole accommodates itself to such a list as well as to tidal variations. Thus, with a list to, say, 1 in 24, the horizontal plane passing through each rail level on shore is gradually converted into an inclined plane (transversely) of 1 in 24 at the boat end, the winding of the plane being so gradual as to be imperceptible under working conditions. The maximum vertical relative movement provided for at the boat bearings of the bridge is 24 in. either way before anything fouls.

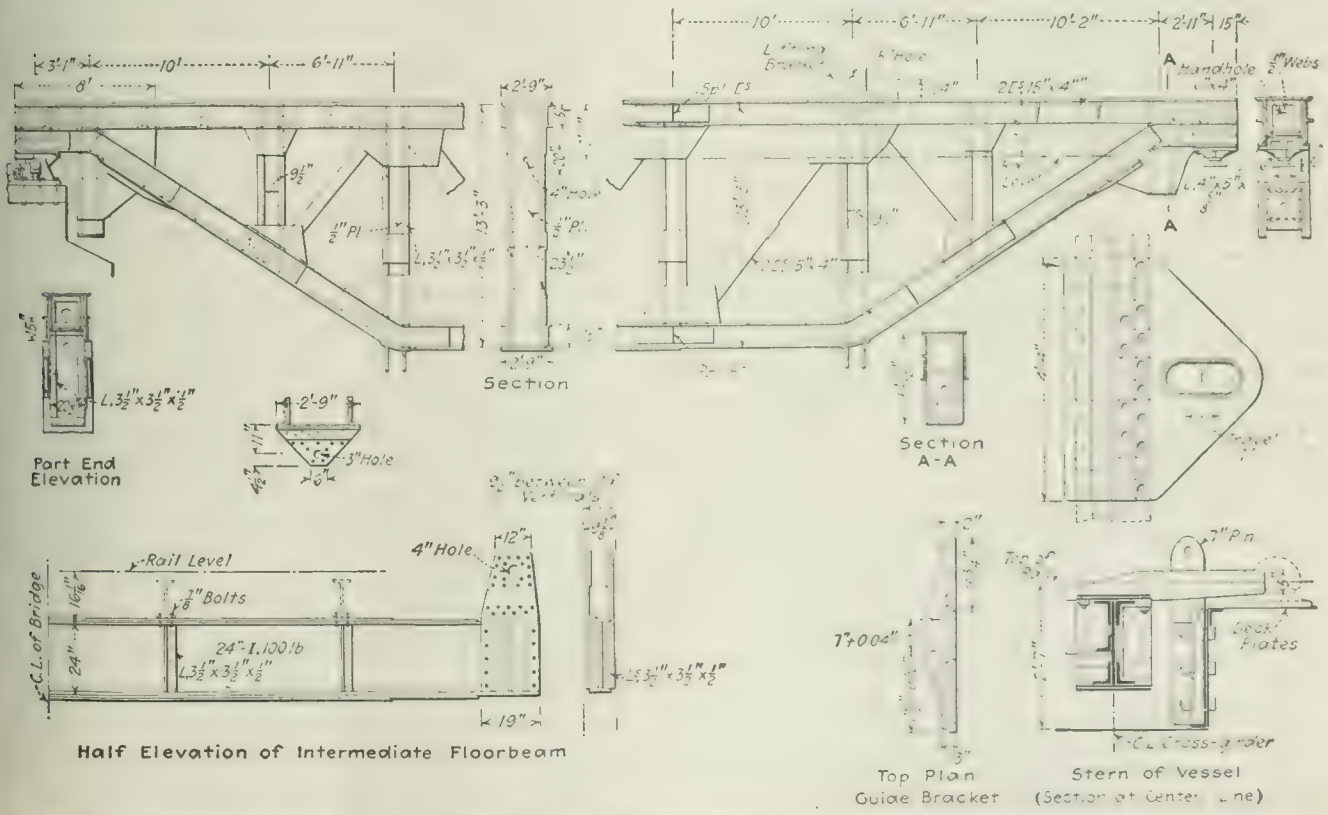


FERRY BRIDGE, OPERATING TOWER AND CHANNEL BOAT MOORED IN PLACE

At the boat end each main girder is fitted with a bearing of cup-and-ball type to insure a flat bearing on the deck of the boat at any variation from a horizontal plane under working conditions. This bearing is known as the "elephant foot."

At a distance of 21 ft. 3 in. from the boat end of the brigde, and outside the main trusses, a pair of box columns built upon masonry piers support transverse overhead girders which in turn carry the machinery house and hoisting gear. The hoisting frame, spanning the ferry bridge transversely, consists of a triangular truss, from the ends of which depend the vertical tension links upon which the main trusses hang. To the apex of the lifting frame the sheave pulleys for the steel wire lifting wire ropes are secured. Each joint between the sheave pulleys and the connections to the main girders is made by a single pin to permit of free longitudinal, transverse and vertical movement. The ends of the lifting frames are fitted with hardwood rubbing blocks working in vertical guides against rubbing strips on the inner faces of the two towers.

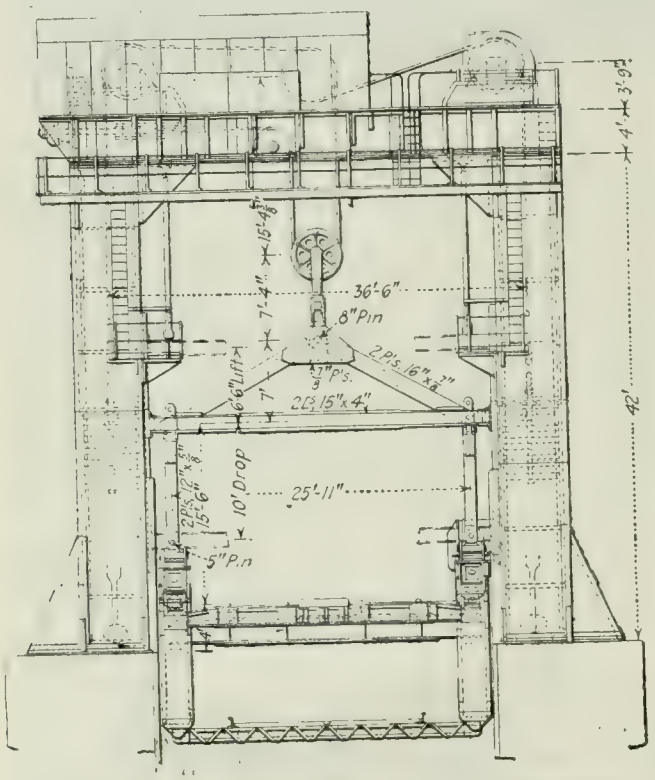
Continuous rail connections are provided by means of special rail flaps, hinged to the end cross-girder,



END PANELS OF 120-FOOT TRUSSES—DETAILS OF FLOOR-BEAMS, PIVOT PIN AND "ELEPHANT-FOOT" BEARING

which engage in tapered seatings on the boat deck in which they are free to slide longitudinally. Hinged plate flaps are also provided for the full width of the bridge floor for the passage of motor lorries, etc. On the boat a solid steel mooring pin of 7-in. diameter is fitted centrally between the two tracks. As the bridge is lowered onto the boat, this pin engages a slotted hole in a cast-steel plate bolted to the end of the bridge floor-girders. This serves approximately to preserve the gage and the correct relative position transversely of bridge and boat, and also as a safeguard against the boat parting from the bridge if the mooring hawsers give way.

One end of each of the steel wire lifting ropes is secured to links with screw adjustments fixed between the overhead tower girders near one end. Thence the ropes



END VIEW OF TOWER—SUPPORTING AND OPERATING DETAILS

pass around jockey pulleys down to the sheave pulleys, up again to the winding drum, round which they take 2 to 2¼ turns, and thence in opposite directions over pulleys at the tops of the tower columns, below which they are secured to counterbalance weights which work up and down inside the tower columns. Equalizing bars are introduced in the rope systems to insure equal tension on the ropes.

The counterbalance weights are so proportioned that there is an unbalanced weight upon the boat of about 10 tons to insure constant contact between the bridge and the boat. The winding drum is actuated through a reduction in gearing by an electric motor of 20 hp., giving a speed of lift of 4 ft. per minute. Hand gearing is also provided giving a speed of lift of 4 in. per minute.

Depending from the overhead girders is a pair of steel links to which the main girder suspension links can be secured by single pins on occasions when adjustments have to be made or when, for any other reason, the bridge may be out of commission for a considerable time, when the bridge may be hung direct upon these links and the ropes therefore be relieved of tension.

The ordinary working limits of gradients are: Longitudinally 1 in 24 up or down; transversely 1 in 35 either way. The shipment of locomotives, tanks and heavy guns is, as far as urgency permits, carried out at about mean tide so as to pass across the bridge approximately on a level track and avoid injury to rolling stock with long fixed wheel-base and heavy axle loads, which injury might occur when passing from a level track to a gradient of 1 in 24.

The erection of the bridges was a comparatively simple matter. In some cases they were floated into position on pontoon barges, in others they were built in position at a higher level than their working positions and were then lowered into their final positions, the outer end being suspended from the winding drum, and the shore end being lowered, in stages, by means of hydraulic jacks, in the usual manner.

The official record time for the complete cycle of the unloading and loading operations is 19 min., but under specially urgent conditions it has actually been done in 10 min. When it is considered that to discharge such a cargo and load up another by means of cranes occupies a matter of days, the saving of time effected by the train-ferry service can be better appreciated. In addition there is the saving of time, labor and expense otherwise involved in partially dismantling rolling stock for shipment and reërecting it upon arrival at destination. The 120-ft. span weighs 200 tons, and the 80-ft. and 100-ft. in proportion. The writer was the designer of these bridges.

To Reline Herron Hill Reservoir

Leakage from the Herron Hill reservoir of the Pittsburgh water-supply is to be eliminated by relining the reservoir. Money for the work was recently appropriated through a bond-issue vote of the people. The reservoir is part of the city's high-service system, and, on account of the high pumping cost, added to the filtration cost, the value of the water now wasted in leakage exceeds the carrying charges for a new lining sufficiently to make the proposed work a paying investment.

Herron Hill reservoir is a small basin, of 12,000,000-gal. capacity. It leaks about 1,000,000 gal. per day. The bottom is at present lined with an old concrete lining, thought to be of natural cement; the sides are paved with stone block. For relining, it was at first planned to apply to both bottom and sides a two-layer concrete lining with a waterproofing membrane between, each layer of concrete to be about 4 in. thick. On this basis the cost was estimated at about $90,000. Since then, however, the possibility of a single-layer lining has been considered, and Charles A. Finley, managing engineer of the Bureau of Water, is now studying the relative advantages of the two types of lining, in preparation for beginning the work of construction. The single-layer lining would be shot onto a reinforcing mesh, the latter being depended upon to prevent cracking, and expansion joints would be required at intervals of only 200 or 300 ft. The cost of this lining would be about $60,000.

Criticism of Contract-Bond Business Answered

To Queries Regarding Rates, Credit, Relations of Contracting Parties, and Payments Replies Are Made by

HARMON V. SWART
Contract Bond and Insurance Broker, New York City

CURRENT practice in the contract-bond business forms the subject of a communication recently received by this journal. The writer deals with such features as rates charged by surety companies, relations of owner, bonding company and contractor, a contractor's financial status, credit and payments on defaulted contracts. He also criticizes certain details of the business. In order to have these points answered, *Engineering News-Record* requested Harmon V. Swart, of New York City, a specialist in contract bonds and insurance, to reply to the questions asked and explain such points as seemed to demand further elucidation. In the matter which follows paragraphs from our correspondent's letter are printed in italics, while Mr. Swart's replies are in ordinary Roman type.

The uniform charge of bonding companies has been one-half of one per cent. per annum on total of contract sum. This work applies on all municipal work generally and, to a man up a tree, my opinion is that the bonding companies have been instrumental in promoting legislation in the various states to this effect.

The standard rate of all surety companies to all contractors is 1½ per cent. on the total amount of the contract. This rate has been in effect since November, 1917, and covers the total charge in all cases except where the work of construction carries over a period in excess of two years. In this event there is an additional charge after the second year. As far as I know, the opinion expressed—that bonding companies have been instrumental in promoting legislation relative to rates—is entirely without foundation in fact, for it is a generally understood fact that the rates are in no way fixed by legislation.

The bond is not reduced as the work is partially completed, but continues on the full amount of contract until work is completed.

With the exception of bonds covering work done for certain New York City departments and a possible few other isolated cases, this is true, but, however, the bonding company is in no way responsible for this general arrangement, as it is entirely beyond its power to reduce the amount of the bond as the work progresses. That is the option of the owner. In view of the fact that the face value of all bonds is determined by the owner, if the owner on a long-time contract would be willing to reduce the bond each year in proportion to the completed work and grant a final acceptance on the completed work, the bonding company would be perfectly willing to reduce the amount in the same proportion. Apparently it is through slight misunderstandings of the nature just referred to that unmerited criticism of the bonding companies has been promulgated.

The rate or risk assumed takes no account of the contractor's ability, organization, good financial standing, plant and record for making good on his obligation. So that the strong contractor has to carry the "lame ducks." As to bonds on private work, the same rate and statements above apply, except, of course, that the providing of a bond is a matter of agreement and not fixed by statute as in municipal or public work.

It is simply a matter of fairness that makes the rate on contract bonds the same to all contractors. In justice it could not possibly be otherwise. To begin with, no contractor, regardless of his financial standing, ability, plant or past record, is able to secure a contract bond until he is of his own ability, or with sufficient responsible indorsement, able to meet the qualifications of a bonding company. This done, nothing else matters.

Let me illustrate the point still further by comparing it with the borrowing of money at a bank, for the two transactions, as far as responsibility goes, are analogous: John Jones wants to borrow $10,000 at the bank. Now, John Jones' financial responsibility is not very great, but his character, his past record, his business ability and personal acquaintance with the bank satisfies the banker that he is worthy of a credit extension of this amount, and he is granted the loan at the standard rate of interest, 6%—as a matter of fact, such a thought as charging him in excess of the standard rate would never enter the banker's mind.

The following day Charles Adams asks a loan of a like amount, $10,000. His character, past record and business ability are not a bit better than those of John Jones, but his financial responsibility is probably ten times greater than that of Mr. Jones. Does he get a lower rate of interest than the standard, 6%? Most assuredly not. The rate of interest is so generally accepted that it is rarely ever asked or questioned. The whole transaction hinges on whether or not the borrower can satisfy the bank that he is worthy of the loan.

Still another case: Henry Brown asks a loan of the same amount, $10,000. His business record is fair; he is thoroughly honest; his financial responsibility is low, and, generally speaking, the bank does not consider him worthy of the loan without an indorser. He secures the indorsement of a responsible person, who has faith in him, and the bank accepts this indorsement and grants the loan. Does he pay a higher rate of interest because he is less responsible? Not at all. He has met the requirements of the bank in furnishing a responsible indorsement, and the loan is granted without further question, at the standard rate of interest.

SURETY COMPANY'S POSITION LIKE BANKER'S

The position of the surety company is precisely the same as that of the banker. The surety company obligates itself to pay up to the face value of the bond in the event that the contractor does not make good. And in the event that the contractor is, in its eyes, not strong enough to secure a bond on his own responsibility, he is, as in the case of Henry Brown, requested to get an indorser. Thus you will see it is palpably unjust for anyone to criticise the action of a bonding company in granting a bond to any contractor, for no outsider is in a position to understand what requirements have been met before the bond was issued.

Let us look at it from another angle for just a moment. The general practice of most bankers in loaning money is to loan up to about one-third of the net worth of the borrower, while in many cases surety companies, in underwriting a contractor, will issue a bond, the amount of which is many times the net worth of the contractor. It is thus very obvious that the assumed risk is proportionately greater.

Entirely aside from the justice of the proposition, any discrimination shown by a bonding company in rates would lay it liable to forfeiture of its charter authorizing it to transact business, for violation of the antidiscrimination law as applied to insurance.

Frequently a contractor would prefer to put up good securities for faithful execution of contract, but cannot do so under law on municipal work.

On a recent job the contractor deposited securities with the railroad company and saved over $25,000 which a railroad bond would have cost. The railroad company was in far better position to proceed in case of default as it had quick assets available instead of a possible or probable suit to force a bonding company to get under promptly and meet its obligation under the bond.

Personally, I know of no law preventing a contractor putting up securities in lieu of a surety bond. It sometimes is done, but nearly every contractor who does it says, "never again." I think I am entirely familiar with the $25,000 case mentioned above; if it is the one I have in mind, it is a percentage contract and, therefore, the contractor is fairly safe in putting up securities in lieu of a bond. If this is not the same case, I am familiar with one very similar, and I know something of the way the costs have gone up since the work started in October, 1917. Consider for a moment how the contractor would feel over having several hundred thousand dollars of his liquid assets tied up on the other side of a losing contract, as it would be were it a lump-sum instead of a percentage contract.

Contractor's Assets Tied Up Through Suit

Frequently, as we all know, there arises a legitimate difference of opinion, which occasionally must go to the courts for adjudication, and not infrequently considerable time has elapsed before a decision is rendered. In such case the contractor finds it extremely embarrassing to have a legal fight on his hands with a large amount of his liquid assets in the hands of his opponent. As a plain matter of fact, while I say there is no law preventing a contractor putting up securities in lieu of a surety bond, I have yet to find one thing in its favor.

While the putting up of securities tied up contractors' assets, it showed the strongest kind of good faith to the railroad company and creditors to make good, and if you have found a bonding company that did not tie up the assets of the contractor when giving a bond you have knowledge that I do not possess.

Yes, I must confess you are right when you say that, if this were the case, I have information that you do not possess, and I am glad indeed of the opportunity to pass it on to you. With rare exceptions—and the exceptions are so rare that they are really negligible—the surety company does *not* tie up the assets of the contractor when writing a bond. The contractor is asked to make a complete financial statement to the surety company, solely that the latter may form an opinion of the contractor's financial ability. Occasionally a contractor may be a little light financially and offer the indemnity of a third person, who is financially responsible. This corresponds to an indorser of a note already referred to in my illustration of "Henry Brown."

Almost never, however, are the assets tied up. The contractor and the indemnitor, should there be one, may do as they please with all of their property, and the surety company's hands are absolutely tied. It has formed its own opinions and is backing its own judgment by writing the bond for which it exacts the standard rate, and once this contract bond is signed, sealed and delivered, it is beyond the power of the surety company to recall or cancel it, and it is then bound until the contract is completed and it is released by the owner from all liability under the bond.

I have discussed these matters on two occasions with representatives of bonding companies, and the answer has been the rate of ½ per cent. per annum on total amount of contract for entire period has been found a fair average, but received no facts to substantiate the statement.

The history of the contract-bond business covering a period of the past 12 years furnishes the best possible answer to this statement.

Of the 10 companies writing contract bonds in 1908 but four still remain in business. Contract bonds are extremely hazardous even under the most favorable conditions.

No better justification of the present rates could possibly be given than the fact that several companies have tried to do business at lower rates than standard, and the majority of them were forced to close their doors; the remainder raised their rates and merged with older companies.

As the work progresses, the risk reduces and should be considered.

This was answered in a previous paragraph.

My feeling is that the general tendency is to get business and collect commissions with a different kind of ethics for assuming responsibility than we find in substantial, established businesses.

That this statement is in error there can be no doubt, and that the opinion was formerly solely through lack of information is equally clear to me. The trouble seems to be through the lack of publicity given in the great number of cases where payments are made on account of defaulted contract, the settlements of which are arranged to the mutual satisfaction of all parties

Three Parties to a Contract Bond

Do not overlook the fact that a contract bond is a three-party contract between the owner, the contractor and the surety company; that it is the contractor who gives his bond to the owner; that the surety company in return for its fee, based on a standard rate, certifies that the contractor is able to and will complete his contract, and for the fee just mentioned becomes the surety of the contractor in the amount of the bond, thus guaranteeing to pay this amount in the event of his default; that in the event of a default on the part of the contractor, or a dispute between the owner and the contractor, each has certain rights, under our law, which must be recognized by the surety company, and the surety company has no right or power to make any settlement with the owner that will in any way jeopardize the rights of the contractor under the law; that a contract imposes obligations on both the owner and the contractor, and the owner may not violate the contract without securing the consent of the contractor and the surety company, and later, still have the right to hold the contractor on his bond and his surety in the event that he, the contractor, violates his part of the contract.

Insurance of employees is covered by annual policies subject to renewal and cancellation on notice. Let a contractor meet with several losses of lives and you will find some of the companies much disposed to duck renewal.

This refers to workmen's compensation insurance. In the event that a contractor meets with numerous accidents, causing several losses of lives and the majority of investigations disclose the fact that most of the accidents were due to carelessness, his insurance company is entirely justified in declining to renew. The insurance companies are spending large amounts of money in accident-prevention work, and when an employer consistently disregards the recommendations made by his insurance company to put safeguards in his plant, I believe you will agree he is getting his just deserts when his company declines to renew his policy.

Many times refusal of the insurance company to renew is due to the contractor's having an incompetent broker—and, unfortunately, incompetent brokers are legion. Let me cite a definite case in point. A certain contractor secured a contract for $2,000,000. It was regarded as a particularly hazardous risk. For some time I had been handling this contractor's business, but in this particular case a friend influenced him to place the business with another broker who was representing one of the reliable companies, whose main office is outside of New York City.

Saving Effected in Cost of Insurance

Because the risk was so hazardous, the broker could get no policy issued at the branch office in New York and so used the long-distance telephone to talk it over with the home office. Still no satisfactory result, so he took his friend and together they went to the home office in New England. After an all-day session and considerable begging and pleading, the risk was accepted at an advance rate of 50%. The broker and his client both thought they were particularly fortunate in getting it accepted at all, so that, naturally enough, when I approached the man and told him I felt sure I could save him a tidy sum of money he was mighty skeptical about letting me attempt it, for fear the policy he had such a hard time to get would be cancelled forthwith.

Finally, he agreed to let me see what I could do. Very naturally I exercised great care in preparing my case prior to presenting it to the underwriter, and, when my data were all together I presented it personally from a viewpoint that I, as an engineer, thought would make the strongest appeal.

These are the results: I secured the policy at an annual premium of $30,000 as against $42,000 which he was paying for his old policy. Then, the second year I secured a further reduction of 40% or an additional $12,000 in the premium, making it cost him $18,000 per year instead of $42,000—a distinct saving effected of $24,000.

These notes have been prepared not necessarily with the idea that the surety company is always right, but rather to correct a few erroneous impressions which give birth to unjust criticism of a business that has made certain branches of big business safe at a minimum of expense—a business that through its fairness and equity has expanded and kept pace with its ever-growing requirements.

Status of the Engineer

THE following paragraphs are from the announcement of the state convention of engineers and architects to be held Oct. 14—15 in Columbus, Ohio, under the auspices of the Association of Ohio Technical Societies:

"No profession has done so little in the way of mutual helpfulness as technical men. We need an organization similar to that of the doctors and lawyers to place and hold our profession in its proper relative position before the public. This can undoubtedly best be done by reorganization of the Association of Ohio Technical Societies, providing for an executive board on which every member society shall be represented.

"Unionism is breaking into the ranks of the engineers. Already 40 unions have been formed by them. Is this the way to take care of our younger brothers? Unless we can provide other means for bringing the compensation of engineers to a reasonable parity with that of others, we must expect to see unionism increase rapidly, because men will not indefinitely see themselves left behind in the race for proper recognition of services rendered. This question deserves the attention of all technical men, and very careful deliberation should be given to it. We must look beyond the present, for hasty action based on present conditions may work immeasurable harm."

"The registration of engineers and architects is required by law in many states. It is a great question and affects every one of us. Whether we believe it or not, we will soon feel the effects of such legislation elsewhere and it is likely to come in Ohio at any time. Here, again, we need a strong organization to protect our interests, and, if desired by the majority, to propose and look after such laws as will assure satisfactory results."

Street Congestion in Pittsburgh

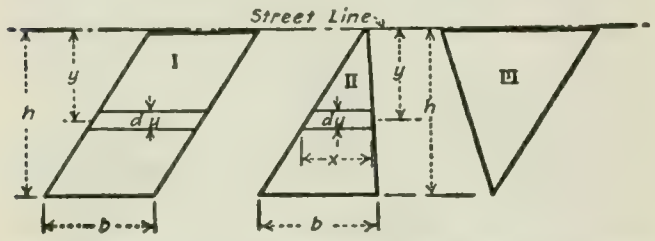
Abnormal traffic congestion in the streets of the central business district constitutes the most important problem of municipal planning in Pittsburgh, according to N. S. Sprague, chief engineer of the city's Department of Public Works. It has been estimated that 280,000 persons enter the downtown district each day, and of these, according to figures of E. K. Morse, transit commissioner, no less than 165,000 are brought in by street cars. As the thoroughfares are narrow and the blocks rather long, both vehicle and pedestrian traffic is remarkably dense at the morning, noon, and evening travel hours. This situation controlled the city authorities in devising the street-car loop subway which was authorized by bond-issue vote of the people two months ago. Rapid transit is considered to be only a secondary necessity, as the extreme time of travel between home and city with present facilities does not much exceed 45 min. and there is not likely to be urgent need for rapid transit until a travel time of one hour is reached. The authorities believe that with the clearing of the street cars from the entire business district, by means of the street-car subway, the street congestion will be sufficiently relieved to make it possible to postpone for another decade or two other means of relief. The removal of street cars from the surface is therefore planned to be permanent, and the full capacity of the streets within the business district will be made available for vehicle and pedestrian traffic.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Computation of Paving Assessments

Sir—Upon returning from overseas, I found an article in *Engineering News-Record* of May 30, 1918, p. 1049, by George H. Ruhling, on paving assessments. Some time before entering the service I made similar studies on this subject, but used different fundamental equations to get the rate of assessment varying from the street line. The equations used were of the form R equals y^a, where R is the total of assessment "units" on a 1-ft. strip perpendicular to the street line, at any depth of strip y. Equations of this sort give equitable results and, at the same time, allow the use of existing tables. My results as tabulated were theoretically correct for both triangular and rectangular shaped lots,



FUNDAMENTAL FORMS OF THE ASSESSMENT PROBLEM

while the method used by Mr. Ruhling gives only approximate values for the triangular shapes.

It is possible to develop definite equations for triangular shaped lots, the values of R may be computed for each foot of depth, and then it is only necessary to multiply these values by the base of the triangle to get the total number of units in the area. The method is as follows:

Consider the equation R equals $y^{\frac{1}{2}}$. This is a mass equation, as for any depth y the value of R is the total of all units up to the depth y. The number of units for a unit area at any depth can be obtained from the first derivative of this equation, or, if r equals the number of units per unit area, r equals $dR/dy = 1/2y^{\frac{1}{2}}$.

Take the three fundamental forms, Cases I, II and III.

Case I—The number of units on any strip, distance y from the street, is $rbdy$, and the total in the lot equals

$$\int_o^h \frac{b}{2y^{\frac{1}{2}}}\,dy = R_I = rxdy$$

$$\text{or } R_I = \int_o^h \frac{b}{2y^{\frac{1}{2}}}\,dy = bh^{\frac{1}{2}} = \text{original equation.}$$

Case II—Total unit in strip

$$xdy = \frac{xdy}{2y^{\frac{1}{2}}} = rxdy$$

$$x = \frac{y}{h}\,b$$

$$R_{II} = \frac{b}{2h}\int_o^h \frac{y}{y^{\frac{1}{2}}}\,dy = \tfrac{1}{3}\,bh^{\frac{1}{2}}$$

Case III = Case I minus Case III = $\frac{2}{3}bh^{\frac{1}{2}}$

Therefore, to obtain the number of assessment units for Case I it is only necessary to multiply the base of the area by the square root of the depth; Case II is one-third and Case III two-thirds of that value. No tables need be computed, as Carnegie, Trautwine, etc., give square roots from 1 to 1000.

The gradation of rates as given by Mr. Ruhling's formula has the advantage of being more easily explained to the property owners. It is easier to say that each 50-ft. strip is one half the value of the preceeding strip, than to say that the assessment varies as the square root of the depth of the lot.

His formula, 2 minus $2^{(50-y)/50}$ can be used in the same manner as the above. To put it in a little better form,

$$R = 2\left(1 - \frac{1}{2^{y/50}}\right)$$

$$\text{Then } r = \frac{dR}{dy} = \frac{2\ln 2}{50}\cdot 2^{-y/50}$$

Integrating this expression over a rectangular area, gives, as before, the starting formula:

$$R_I \text{ equals } 2b\left(1 - \frac{1}{2^{y/50}}\right)$$

Case II:

R_{II} equals the number of units in lot

$$= \int^h rxdy$$

$$R_{II} = \frac{b}{h}\cdot\frac{2\ln 2}{50}\int_o^h y(2^{-y/50})dy$$

$$= \frac{b}{h}\cdot\frac{2\ln 2}{50}\left[-\frac{50}{\ln 2}\cdot 2^{-h/50}\left(h + \frac{50}{\ln 2}\right) + \left(\frac{50}{\ln 2}\right)^2\right]$$

Simplifying this equation, letting ln 2 = 0.69313, we have,

$$R_{II} = \frac{b}{h}\left[144.27 - \frac{1}{2^{h/50}}(2h + 144.27)\right]$$

R_{III} equals R_I minus R_{II}.

Compute tables for values of R_I/b and R_{II}/b, and it is then only necessary to multiply the base of the area by the tabular values for any depth h.

To show the difference in results by using this method in comparison with that of Mr. Ruhling, the values of R_{II}/b by the two methods are shown below for values of h equal to 50, 100 and 150 ft.

h	RII/b This Method	$R(II)/b$ Mr. Ruhling
50	0.44200	0.44500
100	0.58203	0.58375
150	0.59158	0.59292

It will be noticed that Mr. Ruhling's method gives results precise only to the second significant figure. His table for rectangular lots is computed to the sixth figure. The tables for triangular lots should have the same degree of precision.

In practice, the measurements in the field are seldom taken closer than to the nearest $\frac{1}{10}$ ft. which would at the most be to only four significant figures. Therefore, the tables need to be computed only to four places. Besides saving an indefinite amount of work, the results would be just as accurate.

The especial merit of the exact method is that it allows the computation of R_{II} or R_{III} for any depth with any desired degree of accuracy, and it is not necessary to interpolate between 10-ft. intervals, as is the case using the approximate method.

In order to compare the results obtained by using the formulas of the type $R = y^a$, with the formula $R = 2\left(1 - \frac{1}{2^{h/50}}\right)$, I have computed the assessments for the example given in Mr. Ruhling's article, using $R = \sqrt{y}$ and $R = \sqrt[10]{y^4}$ in parallel with $R = 2\left(1 - \frac{1}{2^{h/50}}\right)$

	$R = 2(1 - \frac{1}{2^{h/50}}$	$R = \sqrt{y}$	$R = \sqrt[10]{y^4}$
1. Ed. Adams	46.85	40.60	35.00
2. Ed. Adams	120.38	122.00	122.50
3. Wm. Bond	120.38	122.00	122.50
4. John Jones	192.60	206.20	223.00
5. Frank Watson	96.30	85.50	71.50

Case 1. Triangular lot, apex at street; depth 100, width 50
Case 2. Rectangular lot, apex at street; depth 100, width 50
Case 3. Rectangular lot, apex at street; depth 100, width 50
Case 4. Rectangular lot, apex at street; depth 120, width 50
Case 5. Rectangular lot, apex at street; depth 120, width 50, but with case 2 intervening between it and street.

It is a question which of these three equations gives the most equitable results in the final assessment. For ease of manipulation there can be no question as to $R = \sqrt{y}$ being the best of the three.

Athens, Ohio. RAYMOND D. GLADDING,
First Lieutenant, Engineers, United States Army.

Groined Arches or Flat Roof for Concrete Reservoirs

Sir—The question of which type to use on concrete reservoirs—groined arches or flat reinforced-concrete roof—discussed in *Engineering News-Record* of Sept. 18, 1919, p. 566, is one which has always been of great interest to me and to which I have devoted a great deal of study in connection with the Philadelphia and Pittsburgh filter plants and also the East View and Jerome Park filter plants in the City of New York.

The final result has always shown that the question is determined by the loads involved. If, as is usually the case in the northern United States, the reservoir is to be covered with 2 to 4 ft. of earth to keep out frost, the decision is in favor of groined arches; if the load is less than 2 ft. of earth, then the decision may be in favor of a concrete slab. With 2 ft. or more of earth load the amount of concrete in the flat slab is as great as in the groined arch and the cost of reinforcement is, of course, an extra expense.

The cost of forms need not be considered in any reservoir which is large enough to allow the groined-arch forms to be constructed in a mill on the job and used at least five times. On the Philadelphia filters, Torresdale Plant, the labor cost of building these forms was only $7 per 1000 ft. b.m., and the cost of taking down, moving and setting up was less than in similar reinforced-concrete work. The labor cost of placing the concrete at the above plant was only about 20c. per cubic yard; the additional trouble of shaping the top surface when the men got used to it being apparently less than the trouble of working around the reinforcement in the flat slab. These costs, of course, were average costs on a large job at a time when labor was only about 15c. per hour and plentiful. On a small job, of course, bidders may favor the reinforced-concrete roof on account of the greater familiarity of ordinary workmen with this type of construction and of greater salvage of form lumber, if conditions permitted its use less than five times.

A groined-arch roof, it is true, must be loaded with some degree of care, if loaded while still incomplete; on the other hand, it will probably sustain greater accidental loads than the reinforced-concrete roof, without damage. For instance, on the Pittsburgh filtered-water reservoir I saw a conical pile of dirt, 15 ft. high, placed by a cableway on top of a bare roof, without a sign of failure, whereas a similar accidental load on a reinforced-concrete roof would probably have caused failure.

One point which has not been raised in the discussion in the matter of drainage. In filters, of course, drainage is taken directly through the roof into the interior. In pure-water reservoirs, however, drainage is necessarily prevented from entering the reservoir, and where this entails much expense it is a point to be considered in favor of the reinforced-concrete roof, as the depressions over the piers in the groined-arch roof do not have to be reckoned with. T. C. ATWOOD,
District Plant Engineer,
Baltimore, Md. Emergency Fleet Corporation.

Plane-Table Has Another Champion

Sir—There have been a number of divergent opinions expressed in the discussion of "Transit or Plane-table for Topography?" in your issues of July 10, Aug. 14 and Aug. 28, 1919. I should like to see this discussion continued.

My experience of some years in topographic mapping is entirely in favor of the plane-table, no matter what the conditions regarding the scale of the map, contour interval, amount of detail to be shown, or whether the area is timbered or cleared. I think from their letters in your issue of Aug. 14, 1919 that Fred Vernon and F. J. Howes both concur in this opinion.

Kenneth Allen in his letter of the same issue, and Emile Low, in a letter in the issue of Aug. 28, 1919, express other views. Mr. Allen would limit the use of the plane-table to large-scale maps, having a small contour interval, and where the country is open. Mr. Low thinks its use for taking topography along a railroad survey, not a reconnaissance, is not defensible. He also controverts the statement made by Mr. Howes that "a plane-table will give accuracy greater than that obtained by common methods." Yet both of these gentlemen substitute methods embodying the plane-table principle, which methods seem to me to have disadvantages not found in the plane-table proper, and at the same time do not offer any advantage of either accuracy or speed of operation. I agree with Hargraves Wood in his statement that one often sees descriptions of ingenious and often laborious methods to accomplish what could have been done more easily with the plane-table. I am at a loss to understand why this should be. My experience is that there are many different ways of operating a plane-table, each being best adapted to a particular class of work—one for large-scale maps showing a great amount of detail, another for small-scale maps of large areas, still another for timbered areas.

Certainly, the general success with which the plane-table has been used by the United States Geological Survey in mapping large areas would seem to be against Mr. Allen's contention that its use be limited to large-scale, detailed maps in open country. I fail to see any advantage in the method that he desires to substitute; namely, of transit with vertical arc and stadia and a small plotting table. With proper horizontal and vertical control, the telescopic alidade with

stadia and vertical arc will give equally accurate results—results well within any plotting scale. His method seems to me to have the disadvantage of having to read the horizontal angles and then the inaccuracy of having to plot those angles by protractor, introducing two chances of error, one in reading and the other in plotting. With the alidade these operations are eliminated, the alidade is set on the rod and the line drawn in its correct direction. He has the further disadvantage of having his original map drawn on small sheets, while with the plane-table the original maps are of a very convenient and useful size, 24 inches by 30 inches.

As to Mr. Low's position, I think he is in error and that Mr. Howes is correct. The accuracy with which the map as a whole represents the topography of the area will be greater where the plane-table method is used than that attainable by any other, with the same expenditure of time and money. The method of hand level along cross-section lines, working from known center-line elevations, locates the position of the contours at these cross-section points, but does not give accurate information concerning the position of the contours between these points. They are interpolated, or guessed in. With the plane-table one would work from the same known center-line elevations, determining the position of the contours with telescopic alidade, more accurately than with hand level. The position of every point of change of the contours would be thus determined and the intermediate portions drawn, with the topographer looking at and interpreting the ground he was trying to represent. The resulting map should be from 90 to 95% correct.

During the rush of war work I had opportunity to observe a number of field parties working side by side, using various methods of taking topography, each using the method with which the members were most familiar, and therefore with which they were most expert. This happened on at least four different jobs with as many different sets of men. In each case the honors were with the plane-table parties, both as to excellence of results and the economy and speed of obtaining them. On one occasion, the survey of approximately 3000 acres, the transit and plane-table parties were equal in number. The plane-table parties mapped seven-tenths of the area and the transit parties three-tenths. The quality of the work was about the same—if anything, in favor of the plane-table work. Upon working up the costs I found that if the entire area had been surveyed by the plane-table parties the cost would have been $1200 less than if it had been done by the transit parties.

In this connection, it may be of interest to quote from an address on cantonment construction, made to the Engineering Society of Western Pennsylvania, by Morris Knowles, supervising engineer at Camps Meade and McClellan. In describing the surveys he makes the following statements:

"A word as to the excellence of the plane-table work may not be amiss. Our own local experience would have led us to carry on this work by stadia, in the customary way with which so many of us are familiar; but if we had any misgivings at all as to the advantages of plane-table work they soon disappeared with the general success which we attained both at Camp Meade and Camp McClellan. It is our opinion that in no other way could the work have been done so quickly and satisfactorily as by the plane-table method."

Mr. Howes says: "Considerable experience is necessary to operate a plane-table efficiently. That is perhaps the reason why one never sees a plane-table in a railroad survey party." He excuses this on the ground that: "It is more nearly the rule than the reverse that railroad location parties are organized hurriedly for a limited amount of work. New men must be broken in to take topography, and, naturally, they must be taught the simplest method first." There is a great deal of truth in what he says; I would even go further and say that in many cases the engineers in charge would not use the plane-table even where experienced operators are available. But is not Mr. Howes' excuse an indictment rather than an excuse? Is it fair either to the client or the project to use makeshift methods in obtaining basic data upon which plans for large expenditures are to be made? Can one be sure that the one best location of a railroad is obtained unless the surveys are accurate and comprehensive? Is it fair to the client if methods of making these surveys are used that are more costly and less efficient than some other method? Is it a fact that the engineering profession attaches so little importance to the matter of obtaining complete and accurate basic data that there are not men sufficiently trained to make such surveys in a proper and economical manner? If so, then it is possible that the estimate of the profession, by the general public, as reflected in engineers' salaries, is more nearly correct than many of the recent letters appearing in your paper would indicate.

WILLIAM N. BROWN,
Of Brown & Clarkson. Civil and
Washington, D. C. Mining Engineers.

Constructors' Versus Designers' Pay

Sir—With reference to your editorial in the issue of Sept. 18, 1919, p. 539, concerning "Constructors' Versus Designers' Pay," I should like to take up the case for the designers, which was made especially prominent in the ruling of the Director General of Railroads, where engineers not on the supervisors' list were classed as "clerks." In several instances of which I know personally, young engineers with slight technical training, but who happened to be in charge on an outside job, received supervisors' rating and were given increases ranging from $40 to $80 per month, while men with university degrees, who had spent years of study on their particular lines of design, received no increase or a very small amount in comparison.

I cannot quite see the justice of such a procedure, and if continued it would discourage any young man from spending the time and money to enable him to do intelligent designing work. The more intensive training demanded of the good designer should at least bring him as great a monetary reward as that granted the supervisor.

The loss in efficiency and money due to a faulty and uneconomical design could not be compensated for by the most careful outside supervision. I do not think that sufficient recognition is given the time and trouble involved in compiling data and increasing a man's knowledge, which would enable him to produce a proper design. From one who has done both classes of work,

Elizabeth, N. J. WALTER E. BROWN.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Contractors' Tool Records Kept on Two Form Sheets

STOCK sheets which show the location of every tool of each kind, and tool lists which catalogue all tools for each class of work, enable the superintendent for any construction being performed by Villadsen Brothers, Inc., contractors, Salt Lake City, to requisition quickly the equipment wanted for his work, and also enable a clerk to fill this requisition with precision from stock or from another job or by purchase. The record prevents duplication, lessens the risk of overlooking essential items, preserves uniformity of equipment and checks losses.

The basis of the equipment records is the order blank. Order books are kept in the main office and at every job office, and it is a fundamental rule that no foreman shall allow anything of value to come to or to go from his work without a charge or a credit order. These orders are made in triplicate, the original going to the consignor, a copy going to the home office, and a copy remaining in the order book. The copies coming to the home office are the basis of the equipment records. From them the entries on the stock sheets are made.

One stock sheet, Fig. 1, is provided for the record of each article. Two articles are never grouped on a stock sheet unless they are interchangeable in use. For example, a wooden-handled wheelbarrow and an iron-handled wheelbarrow of the same capacity would be entered on the same sheet, but even here a change to separate listing is being considered because all the parts are not interchangeable. The sheets are kept in a loose-leaf binder, and there are now 350 sheets in the records of the contractors named. A search of any sheet shows where every article of the kind recorded by that sheet is located.

To facilitate search, each tool receives a number, which establishes its order in the stock sheets. These tool numbers are similar to catalog numbers in a hardware catalog. They run from A1 to M79; all tools in class A, for example, being concreting equipment and all in Class M being hand tools. Besides the class arrangement of the tools, there is also an alphabetical index, again similar to a hardware catalog.

The second feature of the equipment records is the tool list, Fig. 2, which is a complete list of tools arranged according to class or use. Many copies of this list are made on the multigraph, so that each job can have its list. In equipping a job, the number of pieces required is first entered opposite each item; then, in successive columns, the number to be taken from the store house, the number to be bought new, and the number that can be spared from job 166, 173, 175, etc. The entries so far are made by the general superintendent. From the superintendent's list, orders to equip a job can be made up by a clerk, requisitioning so many pieces from the hardware store, and so many from each job. There is also a place to enter up the material returned at the end of the job, so that any leakage of tools can be checked. The classifications of tools, which are carried

Other Articles in This Issue of Interest to Contractors:

Concreting Procedure on Miami Flood-Control Dams — Page 640

Notes on Army's Light-Railway Practice in France — Page 653

Large Paving Mixer Puts in 180-Yard Slab Every Hour — Page 658

Machines Take the Place of Men on 20-Mile Concrete Road — Page 664

Criticisms of Contract Bond Business Answered — Page 669

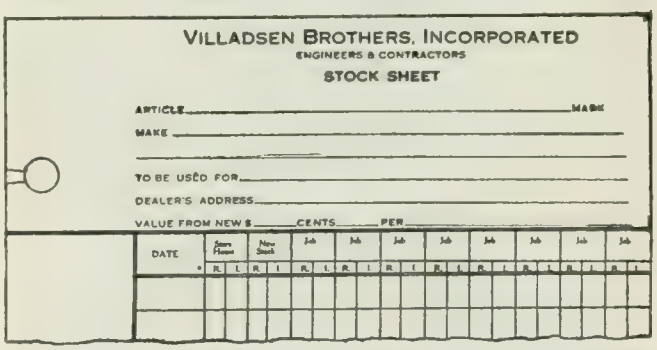


FIG. 1. STOCK SHEETS SHOW DISTRIBUTION OF STOCK OF EACH PARTICULAR KIND OF TOOL

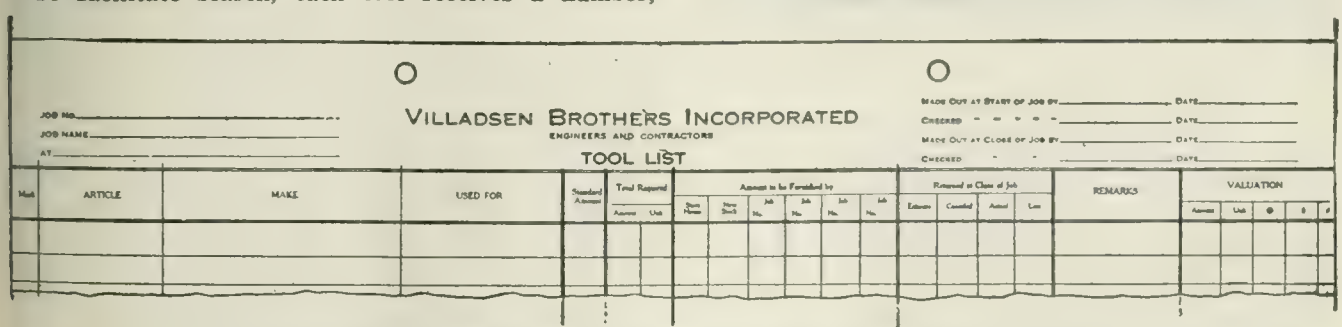


FIG. 2. TOOL LIST SHOWS ALL TOOLS ARRANGED ACCORDING TO CLASS

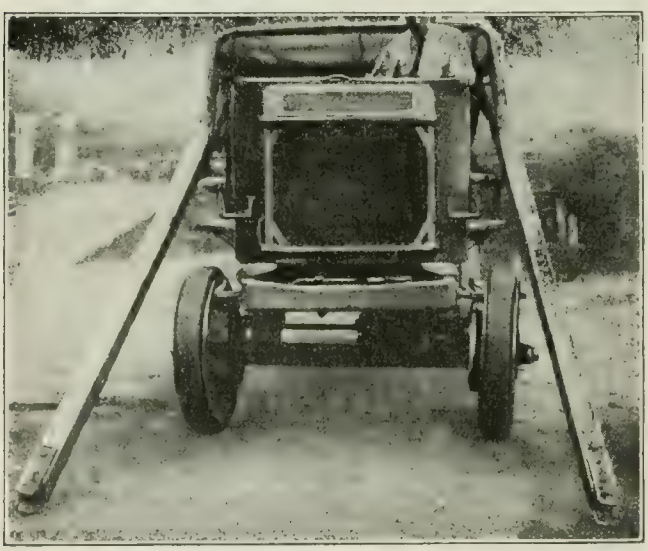
on a side-index on the sheets, are: Concrete equipment, hoisting equipment, saw-mill equipment, electrical equipment, reinforcing equipment, instruments, miscellaneous, water-supply and temporary heating, grease and oil, belting and hand tools. A supplementary account of rough hardware and construction material on hand is also run.

Carpet of Screenings Insures Clean Aggregate

BROKEN stone and screenings for concrete base on a Chicago paving contract are deposited in adjacent piles at intervals on the subgrade. The screenings, which are used as sand, are piled first; then, from the pile, shovelers spread about an inch of material on the subgrade over the area to be occupied by the pile of broken stone. On this carpet the stone is piled. The advantages of the practice are: (1) The shovelers in loading from the stone pile do not tear up the surface of the subgrade; (2) the bottom layer of stone does not lie on the dirt, and in shoveling no dirt is taken up with the stone, and (3) the shovel is easily forced through the fine material under the stone, and shoveling is nearly as easy as from a platform.

Improvised Method for Dumping Fixed-Box Motor Trucks

DUMPING fixed-box motor trucks by the method shown in the accompanying illustration has been resorted to in the maintenance division of the New York State Highway Department. It is often convenient to have some means of dumping a truck which is ordinarily used for non-dump purposes, and the method shown might be utilized in many cases. The particular truck being dumped was one of the United States Army surplus-equipment trucks delivered to the highway department for road-building purposes and was of the Nash-Quad type, with an ammunition box.



STRUTS ADJUSTED FOR DUMPING FIXED-BOX TRUCK

To prepare the truck for the operation, the box was first loosened from the frame. Then two steel plates with bolt holes in them were fastened to the sides of the box at the rear end to form a hinge. The connection with the frame was made by removing the trailing hooks and using the holes to pass the hinge bolts through. A beam reinforced with a steel plate on the under side was placed over the front end of the box and fastened by two rods extending from a king pin at its center to the lower front corners of the box. This allowed the beam to act as an evener between the two struts projecting in front of the truck. The struts, which are 11 ft. long in this instance, are provided with bearings which pass over pins placed in the ends of the beam. They are shod with strap-iron plates at the lower end to keep them from sliding.

To dump the box, it is simply necessary to adjust the struts and start the truck, the front part of the box being raised as the truck moves forward. The struts are made of such length that they will be vertical when the box is high enough to dump, and as the truck proceeds the box is lowered to its former position.

This method is not recommended for constant use, as it puts a strain on the truck frame for which it is not designed, but for occasional use it is satisfactory. The method was developed by Guy W. Pinck, assistant engineer in charge of maintenance for the sixth division.

Job Treatment of Timber by Steeping in Zinc Chloride

TREATED timber for temporary construction structures can be prepared by the contractor on the job by the zinc chloride steeping process. The only apparatus required is a wood, sheet-iron or concrete tank large enough to submerge any timber to be treated. The timber must be seasoned, and if it has to be framed the framing should be done before treatment. The directions for treatment, as given in a recent circular issued by the United States Forest Products Laboratory, are as follows:

Zinc chloride can be purchased either in solid form or in a 50% water solution. For treatment by the steeping process it should be dissolved in water to form a 5% solution. This can be done by mixing 5 lb. of the solid zinc chloride and 95 lb. of water, or 10 lb. of the 50% solution and 90 lb. of water. The solid form absorbs water from the air rapidly and will soon dissolve itself in this way. It should, therefore, be mixed in solution as soon as the package is opened.

As the timbers are being piled into the vat, spacers should be placed between the courses, so that the preservative solution will be able to reach every part of each stick. It is customary to allow the wood to soak one day for each inch of thickness, and one additional day. Thus, a 1-in. plank should soak two days, one 6 in. thick, seven days, a 12-in. timber 13 days, and so on. Longer steeping, however, would probably result in better absorption and penetration of the preservative, and when time is not an important factor it would be advisable to lengthen the soaking period.

If the timbers are to be used in contact with the ground, in damp places, or in places where slight shrinkage would be objectionable, they should be seasoned for a week or two after treatment before being used. If used where there is little leaching action of water, even if they are in direct contact with damp ground, the zinc-chloride treatment may be expected to add more than enough to their length of life to justify the cost of treatment.

Proposed Schedule of Salaries for State Highway Engineers

Preliminary Report of American Association of Engineers' Committee Submitted for Discussion Before Adoption

PROPOSED salary schedules for highway engineers, as suggested in a preliminary report of the Committee on Salaries of Engineers in Public Service, of the American Association of Engineers, are herewith submitted for discussion before being finally submitted to the association for adoption. It is suggested by the committee that highway engineers gather at their respective headquarters for consideration of the report and make suggestions for betterment. It is necessary that these reach the committee by Oct 15, so that the schedule may be revised and adopted before the state budgets are made up for the coming year.

The Committee on Salaries of Engineers in Public Service consists of S. C. Hadden, editor of *Municipal and County Engineering*, J. H. Prior, consulting engineer on public utilities, Chicago; A. R. Hirst, state highway engineer, Wisconsin; F. H. Newell, president of the association, and A. N. Johnson, chairman, consulting highway engineer of the Portland Cement Association. Preliminary to drafting the schedule for highway engineers, the following were invited to serve as corresponding members of the committee: Thomas H. McDonald, chief of United States Bureau of Public Roads; W. L. Basset, Bureau of Municipal Research, New York; Col. W. D. Uhler, chief engineer of the Pennsylvania State Highway Department; A. B. Fletcher, state highway engineer of California; A. W. Dean, chief engineer of the Massachusetts Highway Commission, and Clifford Older, chief engineer of the Illinois State Highway Department.

In studying the problem, the committee has endeavored to price engineering service and not to standardize and classify it. It does not suggest a plan of organization, but has attempted to list the titles and duties of the different grades in such a way that the engineers of all highway departments can be readily placed.

Proposed Schedule of Salaries for Engineers in State Highway Service

Administrative and Executive Positions

Assigned to state and division headquarters and having general duties as indicated by titles:

Chief engineer,	$8,000 to $15,000
Engineer of construction,	$6,000 to $10,000
Engineer of maintenance,	$6,000 to $10,000
Engineer of bridges,	$5,000 to $ 8,000
Office engineer,	$5,000 to $ 8,000
Engineer of tests,	$4,000 to $ 7,000
District engineer, in charge of all work in district or division,	$5,000 to $ 8,000

Engineering Positions Involving Some Administrative Duties in the Higher Grades

Advisory and consulting engineer to the chief engineer,	$5,000 to $10,000

First assistant engineers assigned to state and division headquarters and in general charge of office work:

First assistant engineer of construction,	$3,600 to $ 5,000
First assistant engineer of maintenance,	$3,600 to $ 5,000
First assistant bridge engineer,	$3,600 to $ 5,000
First assistant division engineer,	$3,600 to $ 5,000

Assistant engineers assigned to state and division headquarters:

Assistant engineers assigned to engineer of construction,	$2,400 to $ 4,000
Assistant engineers, assigned to engineer of maintenance,	$2,400 to $ 4,000
Assistant engineers, assigned to bridge engineer,	$2,400 to $ 4,000
Assistant engineers in office at state headquarters,	$2,400 to $ 4,000
Chief chemist, testing department,	$3,500 to $ 5,000
Assistant engineers, assigned to division headquarters, for field and office work on construction and maintenance,	$2,400 to $ 4,000
Assistant engineers, assigned to laboratory work,	$2,400 to $ 4,000
Assistant chemists, assigned to laboratory,	$2,000 to $ 4,000
Chief draftsmen, assigned to division headquarters,	$2,400 to $ 4,000
Chiefs of survey parties, field and office work,	$2,400 to $ 4,000

Inspectional Service

Assigned to State Headquarters

Confidential inspectoros, assigned to chief engineer	$4,000 to $ 5,000
General inspectors of maintenance,	$2,400 to $ 4,000
Inspectors of bridge construction,	$2,400 to $ 4,000
Field inspector of materials, testing department,	$2,400 to $ 4,000

Assigned to division headquarters for both field and office work:

Inspectors of construction,	$2,400 to $ 3,000
Inspectors of construction, employed during working season only, per month,	$ 250 to $ 300

Junior Positions Concerned with Routine Work Only

Assigned to state and division headquarters, various departments:

Engineering draftsmen, computers, checkers, estimators, assigned to state headquarters,	$1,800 to $ 2,400
Tracers, computers, checkers, assigned to bridge engineer,	$1,800 to $ 2,400
Engineer draftsmen, assigned to division headquarters,	$1,800 to $ 2,400
Instrument men, employed on field and office work,	$1,800 to $ 2,400
(If employed only during construction season, per month,	$ 200 to $ 250)
Rodmen and chainmen,	$1,200 to $ 2,400
Laboratory assistants,	$1,800 to $ 2,400

All engineers working away from state or division headquarters to which they may be assigned are to receive traveling and subsistence expenses.

This schedule not to operate to reduce present salaries.

A. N. JOHNSON, Committee on Salaries of Engineers in Public Service, American Association of Engineers, 63 E. Adams St., Chicago, Ill.

Excessive Rainfall at Manila

Record-breaking rainfall at Manila, P. I., occurred during recent typhoon weather, according to information sent to *Engineering News-Record* by A. F. Hillberg, Manila. In the 17 days which ended Aug. 10 a total of *3 in. of rain fell, or within 17 in. of the normal annual precipitation. On July 29 the rainfall was 11.56 in., the heaviest since American occupation, and on the day before it was 7.69. The precipitation exceeded 5 in. on six out of 17 days.

NEWS OF THE WEEK

New York, October 2, 1919

Interstate Agreement on Hudson River Tunnel

New Jersey and New York have entered into formal agreement through their Interstate Bridge and Tunnel Commissions to build and operate the vehicle tunnel under the Hudson River, for which initial legislative appropriations were made last spring. At that time authority was given to the commissions to contract with each other for the purpose; details of the agreement have been under discussion since. An important clause of the contract protects either state in case of default by the other, there being no obligation to make further appropriations. In the event of any default, the other state may complete construction and collect tolls at both portals until the cost in default is repaid. Taxes of either state must be collected from the toll income taken on its own side. The tolls are to be fixed at such a rate as to repay principal and interest within 20 years.

Intensive Drive for Members by Western Society

In order that it may play a part commensurate with the technical and welfare demands of engineers in Chicago, the Western Society of Engineers will undertake in the week beginning Oct. 5 an intensive campaign for increasing its membership. A survey has indicated that there are over 4000 technical men in Chicago eligible to membership in the society who are not now members, and it is hoped to add at least 2000 of these to the rolls by the close of the campaign on Oct. 11. The membership has been divided up into teams, each under a captain, and the campaign for members has been placed on a competitive basis among these teams.

Fourth Lock at the Soo Opened

On Sept. 18, 1919, the fourth lock at the American Canal at Sault Ste. Marie was thrown open to traffic. This is a companion lock to the so-called Davis or third lock, which was put into service in 1914. Each lock is 1350 x 80 ft. in plan and has a depth of 24.5 ft. over the miter sills. Construction on the fourth lock continued throughout the war, though this last part of the work had to be done by force account. The lock has been named the Sabin Lock, in honor of L. C. Sabin, the general manager of the canal and an engineer who has been connected with the work at the Soo for many years.

Employment Bureaus

Engineering Societies' Employment Bureau of the four founder societies, conducted by Engineering Council Employment service, for members and for other professional men introduced by members. Especial attention for those released from Government service. Address, 29 W. 39th St., New York City.

American Association of Engineers, 29 S. La Salle St., Chicago. Service to members only, but Army or Navy Engineers in uniform who are eligible to certified membership may join without payment of entrance fees or dues while in uniform and for six months after discharge.

Engineers' Service Bureau, 57 Post St., San Francisco. Only applications by mail or wire will be considered.

Professional and Special Section, United States Employment Service, 469 Fifth Ave., New York City.

Reëmployment Committee of New York City for Soldiers, Sailors and Marines, 505 Pearl St.

Downtown Street-Car Subways Proposed for Detroit

Rapid-transit studies for Detroit by Barclay Parsons & Klapp, consulting engineers, have resulted in the planning of downtown street-car terminal loop subways. H. M. Brinckerhoff, who has directed the studies, last week laid before the city authorities the plans for this loop system. The subways are intended primarily to relieve street congestion by removing from the surface most of the cars now using the downtown streets, thereby also permitting street-car service to be increased. In addition, they are to constitute the initial element of a rapid-transit system.

Two subway loops are projected, one in Woodward Ave. and one in Fort St. The Woodward Ave. subway would begin near Adelaide St. and extend to a loop near Atwater St., with five stations. The Fort St. subway would begin west of Cass Ave., pass under the Woodward Ave. subway and terminate in a loop at Cadillac Square, which would also constitute the transfer station for eastbound surface cars. At the main transfer station, just north of the City Hall, traffic would interchange between the two subways.

The plan is regarded favorably by the city officials, and it is reported that they intend to seek a popular vote on a bond issue before the end of the year.

Bills for Transfer of War Equipment for Road Building

Authorization granted to the Secretary of War for the free transfer of road-building equipment to the Department of Agriculture is included in a bill introduced Sept. 22 by Representative Kahn and referred to the Committee on Military Affairs. It authorizes the transfer of surplus motor-propelled vehicles and motor equipment to the Postoffice Department, the Navy Department, the Treasury Department, the Public Health Service and the Department of Agriculture.

The equipment to be transferred to the Department of Agriculture "for use in the improvement of highways and roads" includes surplus motor-propelled vehicles, motor equipment, road rollers, graders, concrete mixers, derricks, complete piledriving outfits, etc.

Representatives of the Director of Sales and of the Chief of the Bureau of Public Roads this week agreed on the main points of a bill providing for the transfer of surplus Army equipment suitable for road work. The measure was reported to the Senate Sept. 24.

The Senate committee, at the suggestion of Thomas H. McDonald, chief of the Bureau of Public Roads, inserted an amendment authorizing the state highway departments to rent the equipment to state or municipal agencies for road-building purposes.

Proposes Regulating Discharge of Lake Ontario

Regulation of the discharge of Lake Ontario into the St. Lawrence River has been proposed by F. C. Shenehon, consulting engineer, in a report to the Sanitary District of Chicago. This would be independent of but supplementary to the proposed regulation of the Niagara River in order to control the levels of Lakes Erie, Huron and Michigan. The Ontario plan provides for piers in the Galops channel on the American side, carrying bridge spans of 180 ft. Each span would carry hinged beams which could be lowered to rest on the bottom of the channel and between which sliding panels would be lowered to close the waterway. Thus the channel could be regulated so as to reduce the flow in time of low water and to provide ample discharge in case of high water or flood. The cost is estimated at $1,000,000, with annual operating expenses of $25,000, while the works could be built in two years. For the Niagara controlling works the first cost and annual expenses are estimated at $1,224,000 and $50,000.

Highway Engineering Fellowships Offered in Michigan

Several fellowships in highway engineering at the University of Michigan will be awarded about Oct. 10, according to an announcement made by Arthur H. Blanchard, professor of highway engineering. The allowances, conditions, and subjects of investigation are as follows:

The Detroit Edison Fellowship, contributed by the Detroit Edison Co.; allowance $500 per year, with $100 for expenses; subject, study of moderate-cost country roads.

The R. D. Chapin Fellowship, contributed by R. D. Chapin of Detroit, president of the Hudson Motor Car Co.; allowance $500, with $100 for expenses; subject, study of hard-surfaced roads and pavements.

Appointments for 1919 and 1920 have not been made, and all candidates applying up to Oct. 10 will be considered. A fellow must have a bachelor's degree in civil engineering from a college of recognized standing; must enroll as a candidate for the degree of master of science in engineering, and be in residence at the university for eight months.

Manager for Des Moines Water-Works Under City Ownership

Making appointment under a pending ordinance, the Board of Water-Works Trustees of Des Moines, Iowa, will select a manager for the local water-works after the plant is taken over from the Des Moines Water Co., about Oct. 1. The city will pay $3,535,000 for the works, which sum includes $75,000 for improvements made since Jan. 1, 1919. The valuation was made by Alvord & Burdick, Chicago, for the company, and W. S. & E. W. Bemis, Chicago, and Karl C. Kastberg, city engineer of Des Moines, for the city. Four elections were held before the city could buy the works. In 1898 a vote to purchase for $850,000 was cast, but the necessary bond issue failed. In 1905 a favorable vote was voided by a technicality. In 1912 a numerical but not a legal majority of voters declared for purchase at $2,250,000. The last legislature authorized purchase on a numerical majority vote, and at an election held Aug. 15, 1919, the vote was 2773 for purchase and 1998 against. All but 90 of the 205 miles of mains in the distribution system have been laid since 1900.

Work Progressing on St. Louis Municipal Dock

The City of St. Louis is this year spending $300,000 on the municipal dock which has been under construction for some years. The dock wall is being extended to a total length of 900 ft., the construction of pile fenders upstream and downstream from the concrete wall making the total length about ½ mile. There also is being built a warehouse with 60,000 sq.ft. of floor space and the necessary railway tracks and roadway in connection with the whole terminal. The construction work is being performed by city forces, and the city Supply Commissioner will purchase mechanical equipment on specifications furnished by the city.

Propose Enlarged St. Lawrence Canal System

Preliminary surveys are being made by the Canadian Government looking toward the construction of a St. Lawrence canal system capable of taking ships of the size to be accommodated by the Welland ship canal when that canal is completed. The new Welland ship canal has a miter-sill depth of 25 ft., which is greater than the depth over the present St. Lawrence marginal canal. The new project would include a new canal extending from Cardinal to Cornwall, would do away with the locks at Cardinal, Morrisburg, Fabians Point and Cornwall, and would involve a new canal farther back from the river than the present one.

American Association of Engineers To Admit Architects

The Executive Committee of the American Association of Engineers has decided that the constitution of the association does not prohibit the admission of architects, and has announced that applications of architects will hereafter be considered.

Governor of Virginia Signs New Highway Laws

Several highway bills were recently signed by Governor Davis of Virginia, and it is believed they will mark the beginning of unprecedented road construction. The new legislation provides for the levy of additional road funds, the formation of a state highway commission, appropriations for county aid by the state, and increases in the automobile license tax.

The new State Highway Commission will consist of five members appointed by the Governor and subject to the approval by the Senate. It is provided that, as far as possible, each of the five geographical sections of the state shall have representation on the commission, which will assume its duties Nov. 1. The commission does not displace the present State Highway Commissioner, with whom is left the jurisdiction in all matters which come in the civil-engineering field.

An additional levy of 7c. on general property, to be used in meeting the Federal aid for building and maintaining highways, is provided for in another bill. Another bill increases the automobile license tax from 40 to 60c. per horsepower, the increase to be devoted to state-road construction. Funds derived at the old rate of 40c. will still continue to be used for highway maintenance only.

Development Committee Writes Final Report

The Development Committee of the American Society of Civil Engineers met at the Michigan Union, Ann Arbor, Mich., last week to write its final report, which is to be presented to the board of direction of the society at its October meeting.

In the week before last the conference committee of the development committees (representing the four founder societies) met in New York City and agreed to a report which has been transmitted to the respective development committees.

American Society for Testing Materials in New Headquarters

Removal of the headquarters of the American Society for Testing Materials from the University of Pennsylvania to 1315 Spruce St., Philadelphia, took place recently. With this removal the society for the first time in its history occupies an independent home. Since its foundation twenty years ago its business has been conducted in the office of the late Prof. Edgar Marburg, secretary and treasurer of the society, at the University of Pennsylvania. The new quarters are located in the building of the Engineers' Club of Philadelphia, the third floor of which is now being fitted up for the society.

Joint Study of St. Lawrence River Started

Announcement has been made from Canada that the Government there has taken action in accordance with the request of the United States for an investigation by the International Joint Commission of the feasibility and cost of an international scheme for the improvement of the navigation facilities and water-power development on the St. Lawrence River. A suggested conference of this sort was a part of the last United States rivers and harbors bill. The Canadian Government has selected W. J. Stewart of Ottawa, who is Dominion hydrographer, as its representative to act in conjunction with Col. Charles Keller, Corps of Engineers, representing the United States Government, in preparing the question to be presented to the National Joint Commission. In the meantime, surveys have been carried on by the Canadian Government, and the Hydro-electric Power Commission of Ontario has been receiving data and preparing plans.

Railway Bridge Builders To Meet in Cleveland

The American Railway Bridge and Building Association will hold its 29th annual convention Oct. 21-23 in Cleveland, with headquarters at the Statler Hotel. In addition to committee reports, the program includes discussion of renewal of timber bridges, bridge inspection, painting of structural metal and fire-protection equipment.

Ask Consideration of New Pier Handling Methods at New York

Resolutions adopted by the Society of Terminal Engineers and directed to various officials in the City of New York ask that the city consider the desirability of redesigning the proposed Staten Island piers so that some other system of freight handling than the cargo-mast system common to New York City be used. The preliminary designs of these piers show the pier taken up practically wholly with the pier shed, and with cargo masts, which are operated with whip hoists or with the deck engines of the ships. According to the society, this will result in cargo being handled by these new piers in "the same inefficient, expensive and slow manner as it has been handled in the port of New York for the past twenty-five years." The resolutions continue: "Whereas, Staten Island is the only borough of the city in which direct rail connection can be made between docks and the transcontinental lines of the city; therefore be it resolved, that in the design of these piers provision should be made for leading rails on the piers for direct interchange of freight between rail and ocean carriers. Be it further resolved, that it is the opinion of this body that the interests of the port of New York demand that such contracts for erecting and equipping these piers that are let should contemplate that particular type of pier construction which is best adapted to the installation of modern cargo-handling devices and machinery." It is further requested that "the economic advantages of mechanical freight- and cargo-handling devices or machines be given proper recognition as a controlling factor in securing for the port of New York the prestige which its physical advantages should command."

Weights and Measures Laws Being Compiled

Work on the compilation of the weights and measures laws of the various states by the Bureau of Standards is being pushed forward, with a view to the issue in the near future of a new edition of Miscellaneous Publication No. 20, "The State and National Laws Concerning the Weights and Measures of the United States." On account of the great amount of weights-and-measures legislation which has been added to the statutes of a large number of the states since the publication of the last edition in 1912, and because of changes in existing legislation, the last edition has now become obsolete.

Welland Canal Work Shut Down

Certain parts of the construction work on the Welland ship canal between Lakes Erie and Ontario, which was started up a short time ago, have been shut down by order of the Department of Railways at Ottawa, because of labor difficulties. It is understood that the Government recommenced work on the canal, which had been shut down during the latter part of the war, mainly to provide employment as a measure of social relief. During the past month there has been a great deal of labor difficulty on the canal work, largely a demand for higher wages.

$262,000,000 Needed by Reclamation Service

(*Washington Correspondence*)

To complete the going projects of the United States Reclamation Service will cost $112,134,000, according to a statement made by Arthur P. Davis, director and chief engineer, before the House Committee on Irrigation of Arid Lands Sept. 19. Estimates for new projects total about $150,000,000 additional.

By states and projects the estimated cost to complete present projects is as follows:

Arizona—Yuma, $8,050,000; California—Orlando, $2,830,000; Colorado—Grand Valley, $1,870,000, and Uncompahgre, $585,000; Idaho — Boise, $1,050,000; King Hill, $877,000, and Minidoka, $19,805,000; Montana—Huntley, $172,000; Milk River, $5,000,000; Sun River, $3,400,000, and Lower Yellowstone, $260,000; Nebraska — North Platte, $6,580,000; Nevada—Newlands, $6,150,000; New Mexico — Carlsbad, $300,000, and Rio Grande, $5,630,000; Oregon—Umatilla $3,110,000, and Klamath, $3,000,000; South Dakota—Belle Fourche, $640,000; Utah—Strawberry Valley, $1,000,000; Washington—Okanogan, $430,000, and Yakima, $25,605,000; Wyoming—Shoshone, $15,790,000.

The probable cost of proposed new projects was given by Director Davis as follows: Arizona—Parker, $7,600,000; California—Imperial, $52,000,000; Iron Cañon, $18,000,000; Blythe, $4,000,000, and Kings River, $12,000,000; Colorado — Montezuma, $4,000,000; Idaho—Gem District, $1,500,000, and Hansen Butte, $2,200,000; Montana—Bitter Root Valley, $2,200,000; Nebraska—Lower North Platte, $8,400,000; New Mexico—Middle Rio Grande, $6,000,000; Oregon—Owyhee, $2,300,000; Lower Powder River, $4,500,000, and Rogue River, $2,100,000; Texas—Lower Rio Grande, $10,000,000; Utah—Castle Peak, $8,000,000; Wyoming—Riverton, $5,800,000.

On Sept. 20 the Senate Irrigation Committee ordered a favorable report on a bill to appropriate $250,000,000 for reclamation work approved by the Reclamation Service.

Contractors to Consolidate Publications

Arrangements have been made by the Associated General Contractors of America to consolidate the publication of its bulletin with that of the General Contractors' Association, New York City. The new publication is to be known as *The Bulletin of the Associated General Contractors of America.*

Federal Highway Council Takes Up Transport Committee Work

Upon information that the Highway Transport Committee was to be disbanded, the Federal Highway Council, after several conferences among organizations interested in the betterment of highway transportation, decided to take over and continue its work.

The work will be under the supervision of Charles W. Reid as manager of the transportation bureau of the council. He has been chief executive officer of the Highway Transport Committee since its reorganization, and prior to his becoming associated with the committee was vice-president of Rathbone, Sard & Co., of Albany, N. Y., and Aurora, Ill.

Additional Money for River Control Recommended

An additional sum of $1,500,000 should be spent on works to control the waters of the Puyallup, Stuck and White Rivers, according to a report by R. H. Thomson, consulting engineer, Seattle, to the Inter-County River Improvement Board of Pierce and King Counties.

The report accords with that of W. J. Roberts, chief engineer on the inter-county river improvement, who has had charge of the work for five years. This was to have been the last year of the work, but Mr. Thomson says several years more will be required to finish it. Additional bank protection on the rivers, control of the floods at the source by a series of dams and floodgates, and widening of channels under bridges, is recommended.

Postpone Chamber of Commerce Trade Conference

Announcement has been made from the headquarters of the International Trade Conference, Chamber of Commerce of the United States, that the Atlantic City meeting, postponed from Sept. 30, is to be held Oct. 20, on account of lack of transportation for British, French, Italian and Belgian delegates. Announcement regarding the meeting was made in *Engineering News-Record* of Aug. 14, 1919, p. 343.

Date of City Managers' Meeting Advanced

The date for the sixth annual meeting of the City Managers' Association has been advanced from Oct. 29-31 to Oct. 27-29. It will be held at Indianapolis, as previously announced, with headquarters at the Claypool Hotel.

Bridge Pier Drops Span

During reconstruction of an underscoured center pier of a highway bridge over the Mohican River near Greer, Ohio, Sept. 17, the pier fell over shortly after the two 125-ft. spans resting on it had been placed on falsework. One of the spans was wrecked by the fall.

New York Trying to Encroach on North River Channel

Relocation of the pierhead line on the Hudson River at the southern end of Manhattan Island is desired by the City of New York, and Dock Commissioner Hulbert has made application to the Harbor Line Board to that effect. Maj. Gen. W. M. Black, chief of engineers, has returned the application with various comments, the principal of which reduces it to the conclusion that this is another of the attempts on the part of the City of New York to encroach on the channel of the river. The present application relates to the widening of West St. below Rector St. so as to make that part of the marginal street as wide as the part north of Rector St. The request is that 85 ft. be added to the pierhead line. General Black's recommendation points out that if the desired extension of the pierhead line were granted it would create a reëntrant angle in the line at the upper end of the proposed change, and thus introduce into the situation a temptation to rectify the line at some future time by drawing a straight line from the outermost part of the extension to some point in the line at Chelsea, and that any extension of the pierhead line in this vicinity would be so much encroachment upon the deepwater channel, which is already too narrow and which the Federal Government proposes to widen by dredging along the New Jersey side of the channel. Commissioner Hulbert, in a letter to the Merchants' Association, states that the width of the river at the point under consideration is 3870 ft., as against 2775 ft. between Chelsea and Hoboken.

Ask Appropriation for Relief of Contractors

The Treasury Department has asked for an appropriation of $500,000 to be expended under the act for the relief of contractors and subcontractors on public buildings. In submitting the request for the fund, Secretary Glass stated that he understands a number of the claims are in such shape as to permit of their approval and immediate payment. Further appropriations will be requested as necessity arises.

Irrigation Bond Issue Voted in Imperial Valley

At a bond election held in Imperial County, California, Sept. 15, the proposition for issuing bonds in the amount of $2,500,000 to take up outstanding warrants to the extent of $1,500,000 and to cover the cost of improvements to the irrigation system, carrying water from the Colorado River, was carried by a vote of nearly 3 to 1. The improvements contemplated include the installation of six waste-gates in the various canals, which will result in a saving of $100,000 a year and insure more satisfactory delivery of water during the summer.

It is also proposed to improve the dredge "Delta," install two dragline dredges, and purchase locomotives, dump cars and steam shovels, as well as to raise and strengthen levees. Further information can be obtained by addressing the County Clerk, El Centro, Imperial County, California.

New Jersey County Engineers Demand Greater Recognition

Selection of materials for pavements and other engineering public works has so often been delegated to persons having no engineering knowledge that the County Engineers' Association of New Jersey has deemed it necessary to enter a protest. Such persons, and the property owners, when selection is determined by petitions, are considered incompetent to decide problems of this character. With a view to stopping the practice, the association passed the following resolution:

> Whereas, the constantly increasing use of the highways in state, counties and municipalities demands the proper, economical and efficient development of all the highway systems by the selection of proper materials to be used in the construction and maintenance of same, and
>
> Whereas, the selection of paving materials requires expert knowledge of the probable life of materials, when subjected to the different classes of traffic, and
>
> Whereas, it has long been the practice for governing bodies to be influenced, in the selection of materials to be used, by petitions from owners of property abutting on the line of the improvement, and
>
> Whereas, in such selection of materials the advice, opinion and knowledge of experienced engineers has been many times rejected, resulting in the improper selection of paving materials;
>
> Therefore, be it resolved, that the County Engineers' Association of the State of New Jersey does hereby strongly protest against, and condemn, the continuation of this practice, as being against the best interests of the public because it is promotive of excessive cost and because it is contrary to proper engineering practice

A. H. Nelson is secretary of the association.

Merchant Fleet Now Exceeds Eight Million Gross Tons

According to information from the Bureau of Foreign and Domestic Commerce, the seagoing fleet of American merchant ships of over 1000 gross tons each was on Sept. 1 composed of 3245 ships of 8,100,008 gross tons. This number has been registered for foreign trade or enrolled for coastwise shipping. One thousand five hundred and fifty-eight steamers are steel, and they represent 6,707,820 gross tons, and 347 ships are wooden, aggregating 840,611 gross tons.

More than 4,000,000 gross tons was the output of American shipyards during the twelve-month period which ended Aug. 31, 1919. With previously constructed vessels, this brings the total of tonnage built in American shipyards since Jan. 1, 1917, to 6,636,221 gross tons. This figure includes steel, wood and concrete ships, both seagoing and not seagoing. The output during August, 1919, was equivalent to 90% of the production of all American shipyards for the first six months in 1917.

Urge Coördination of Government Mapmaking Agencies

At the suggestion of the President, representatives of the Government agencies interested in mapmaking met Sept. 15, under the chairmanship of Maj. Gen. W. M. Black, Chief of Engineers, U. S. A., to discuss the situation with regard to the official map of the United States. A resolution was adopted declaring that a program of larger expenditure is imperative and that the coördination of existing mapmaking activities is a necessary step if the public funds are to be used economically.

General Black was authorized to invite to a future meeting representatives from Engineering Council, the American Association of State Geologists, American Association of State Highway Officials, National Research Council, Geological Society of America, Association of American Geographers, American Geographic Society and National Geographic Society. The representatives of those organizations will be asked to present to the Government representatives the various needs of map users.

The following Government agencies were represented at the meeting Sept. 15: The Engineer Corps of the Army; Coast and Geodetic Survey; United States Geological Survey; General Land Office; Postoffice Department; Bureau of Soils; Reclamation Service; Bureau of Roads; Forest Service; Indian Office; Mississippi River Commission; Naval Hydrographic Office; Survey of Great Lakes and Boundary Commission.

The President's action had been taken at the request of Engineering Council. The Secretary of War was directed to arrange the meeting and he, in turn, placed the matter in the hand of General Black.

In order to work out promptly the several matters involved in mapmaking, subcommittees, with chairmen, have been appointed by the main committee representing all Government agencies interested in the subject, as follows: Subcommittee on control, William Bowie, Coast and Geodetic Survey; chairman, subcommittee on base maps, Claude H. Birdseye, United States Geological Survey; subcommittee on map methods, Col. E. J. Marks, War Department; subcommittee on coördination in mapmaking, Col. C. McD. Townsend, Mississippi River Commission; subcommittee on hydrographic surveys, Capt. E. S. Parker, Navy Department. It is the intention of the subcommittees to draft plans which can be made the basis of discussion when representatives of outside organizations interested in mapmaking are called in.

Civil Service Examinations

New York State. Assistant civil engineer, State Highway Department, $1980 to $2160 per year, Oct. 25. Open to nonresidents. Apply to State Civil Service Commission at Albany before Oct. 13.

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Assistant examiner, Patent Office, Washington, D. C., $1500 to $1740 per year, Nov. 19 to 21. File applications in time to arrange for examination at place selected by applicant.

Senior highway engineer, Bureau of Public Roads, Department of Agriculture, $2220 to $4000 per year, Oct. 21, File applications before Oct. 21.

Engineer, $3000 per year; assistant engineer, $1800 to $2880 per year; junior engineer, $1200 to $1740 per year; engineering draftsman, $1200 to $3000 per year, Reclamation Service. Apply until further notice.

ENGINEERING SOCIETIES

Calendar

Annual Meeting

NEW ENGLAND WATER WORKS ASSOCIATION; Tremont Temple, Boston, Sept. 30, Oct. 1-3, Albany, N. Y.

NATIONAL SAFETY COUNCIL, 168 Michigan Ave., Chicago; Oct. 1-4, Cleveland.

AMERICAN SOCIETY OF NAVAL ENGINEERS: Secretary, Lieut. Com. F. W. Sterling, U.S.N., Navy Department, Washington, D. C.; Oct. 7, Washington.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION, 319 N. Waller Ave., Chicago, Ill.; Oct. 21-23, Cleveland, Ohio.

AMERICAN PUBLIC HEALTH ASSOCIATION: 169 Massachusetts Ave., Boston; Oct. 27-30, New Orleans.

CITY MANAGERS' ASSOCIATION, 1812 Tribune Bldg., New York City; Oct. 27-29, Indianapolis.

AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS; 304 E. Walnut St., Bloomington, Ill.; Nov. 11-14, New Orleans.

SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS; 29 W. 39th St., New York City; Nov. 13, New York City.

The Philadelphia Association of Members of the American Society of Civil Engineers will hold its annual meeting Oct. 6. The meeting will be devoted to a discussion of the best method of securing increased compensation for engineers.

The Twin City Chapter of the American Association of Engineers at a recent meeting indorsed, through resolutions, the bill providing for a Federal Department of Public Works, and the Townsend Federal highway bill, and rejected the Plumb plan for the nationalization of railroads. Resolutions were also adopted to petition the national board of directors to admit into the association architects and architectural draftsmen.

The Philadelphia Chapter of the American Association of Engineers has resumed its monthly meetings, and at its next meeting, Oct. 8, will discuss compensation schedules and classifications for municipal technical engineers.

The General Committee of Technical Societies of Chicago arranged a meeting held recently for the discussion of the zone system as applied to Chicago. Robert H. Whitten, director of the City Plan Commission of Cleveland, was the principal speaker.

The Southern California Association of Members of the American Society of Civil Engineers, through resolutions recently adopted, is to urge upon the Congressional representatives of the members support for the bill now pending providing for the creation of a Federal Department of Public Works. The association is to circularize its membership to secure financial assistance for campaigning for the bill.

The Oregon Chapter of the American Association of Engineers has elected the following: President, W. H. Marsh; first vice-president, O. Laurgaard; second vice-president, B. C. Ball; third vice-president, E. G. Hopson; secretary, R. W. Barnes; treasurer, W. C. Ruegnitz.

The Iowa Section of the American Water Works Association will hold its annual meeting Oct. 22-23 at Mason City. Jack J. Hinman is secretary.

The West Virginia Engineers' Association at a recent meeting adopted a resolution favoring the passage of Senate Bill No. 2232, which provides for the establishment of a Federal Department of Public Works. The association includes civil, mining, mechanical, telephone, sanitary and electrical engineers. A series of meetings has been planned to stimulate interest in public affairs, particularly those germane to the engineering profession; to encourage social relations, and to develop ethical and economic standards in the profession. A club house, centrally located in Charleston, has been obtained.

PERSONAL NOTES

PROF. JAMES M. BARKER has resigned from the civil-engineering department of the Massachusetts Institute of Technology to enter the employ of the First National Corporation, a subsidiary of the First National Bank of Boston.

O. P. MOHR, recently connected with the construction of the New Orleans Army supply base has become manager of the engineering department of the United Adjustment Bureau, Inc., New Orleans, La.

G. E. SHACKLEFORD, for a number of years chief engineer of the Republic Iron & Steel Co., Youngstown, Ohio, has been appointed consulting engineer. STANLEY H. MCKEE, assistant chief engineer, has been appointed chief engineer.

PAUL MERCIER, formerly chief engineer of the City of Montreal, Can., and later consulting engineer, has joined the staff of the Ecole Polytechnique, which is the engineering department of Laval University in Montreal. He assumed his new position Oct. 1.

A. C. GIESECKE, formerly of the Pacific Power & Light Co., Portland, Ore., is now associated with the Phoenix Utility Co., Astoria, Ore.

MAJ. WILLIAM P. ROTHROCK, U. S. A., has been discharged from the service and will take an extended vacation before entering the civil practice of engineering. During his two years in the Army Major Rothrock was in charge of the construction of Camp Logan, Houston, Tex., and he also built two helium plants at Fort Worth, Tex., another at Petrolia, Tex., and two picric-acid plants at Brunswick, Ga., and Grand Rapids, Mich.

W. H. SCALES, former chief designing engineer in Buffalo, N. Y., for the Lackawanna Bridge Co., has resigned and has become associated with W. E. Russ, architect, of Indianapolis, Ind., as chief of engineering and construction.

H. F. MERKER, for the past 11 years with the East St. Louis & Suburban Railway Co. in various engineering capacities, has resigned, and is now associated with the St. Louis Coke & Chemical Co. as chief engineer on its new plant now under construction at Granite City, Ill.

GEORGE MATTIS, for more than seven years in the engineering department of the California State Highway Commission, has resigned and has become assistant engineer on the California Railroad Commission.

MAJ. GEORGE A. MCCOLLOUGH, U. S. A., recently discharged from the service and appointed district engineer of the 8th district, Iowa State Highway Commission, has resigned to take an active interest in the Humboldt Sand & Gravel Co. CAPT. J. S. REYNOLDS, U. S. A., discharged from the service in July, has been appointed district engineer of the eighth district.

LIEUT. RAYMOND E. DAVIS, Engineers, U. S. A., who, while in the service, was assistant to the department engineer, Western department, and later served as head of vocational training for disabled soldiers at Letterman General Hospital, San Francisco, has been discharged from the service and has been appointed associate professor of civil engineering, University of Nebraska. Prior to entering the army, Lieutenant Davis was associate

professor of civil engineering, University of Illinois.

W. O'D. ROCKWELL is to be the city engineer, and J. WARD MOTTE director of public works of Savannah, Ga. At a recent meeting of the city council the offices of chief engineer and assistant chief engineer were abolished, and the offices of director of public works and city engineer were created in their stead. Mr. Rockwell and Mr. Motte were assistant chief engineer and chief engineer, respectively, under the old system.

T. O. GLADNEY, formerly of Sparkville, Miss., and for the past 16 years consulting engineer for the Atlantic Coast Line, has been appointed professor of civil engineering, Agricultural and Mechanical College of Mississippi. C. P. STOCKER, whose place Professor Gladney assumes, has become professor of civil engineering, University of Arkansas.

J. K. ANDERSON, chief engineer of the West Virginia Public Service Commission, has resigned and has opened consulting offices in Charleston. GEORGE E. TAYLOR, for the past five years assistant engineer, is now chief engineer, and WILLIAM GALLAGHER, of Charleston, has been appointed assistant engineer. Mr. Anderson will specialize in the valuation of, and rate making for, public utilities.

JACOB F. KRAKAUER, formerly appraisal engineer with the division of supply and sales of the Emergency Fleet Corporation, has joined the editorial staff of the "Iron Age Catalog of American Exports."

KARL F. UHDEN, who built the $10,000,000 dam and power plant at Long Lake, near Spokane, has accepted the engineering superintendency of the Skagit Power Development Company.

F. CLAY BAKER, construction engineer for the East St. Louis & Suburban Railway Co. for the past three years, has been appointed maintenance-of-way engineer.

L. D. BLAUVELT, consulting engineer, Denver, Colo., who, as major in the Construction Division, U. S. A., planned and built a $40,000,000 toxic gas plant at the Edgewater Arsenal in Maryland, has been appointed consulting engineer to the Colorado State Railroad Commission. The commission has been designated by the state legislature to suggest ways and means for making the Moffat tunnel under James Peak a reality. Mr. Blauvelt was previously connected with the Denver & Salt Lake Railroad.

WHITNEY C. HUNTINGTON, assistant professor of civil engineering, University of Colorado, has been made full professor in charge of the department, succeeding MILO S. KETCHUM, now head of the College of Civil Engineering, University of Pennsylvania.

HERBERT S. EVANS, professor of electrical engineering, University of Colorado, has been appointed dean of the College of Engineering, succeeding Dean MILO S. KETCHUM. Professor Evans was acting dean in the absence of Dean Ketchum during the last school year. He is president of the Colorado Section of the American Institute of Electrical Engineers, and is also an alderman and vice-mayor of Boulder.

R. F. GIFFIN has been made engineer in charge of street and sewer plans for Providence, Ky. Mr. Giffin is employed by N. E. STONE & Co., engineers and contractors, Madisonville, Ky.

MAJ. R. W. HEBARD, Engineers, U. S. A., who was with the 22nd Regiment of Engineers in France, has been discharged from the service and has resumed his position as head of R. W. HEBARD & CO., INC., engineers and contractors, 50 Broad St., New York City. The 22nd Engineers served with both the First and Second American Armies on the Meuse-Argonne and Toul-Metz fronts.

CHARLES H. WICKHAM, of Trenton, N. J., in the employ of the American Steel & Wire Co., was stricken with tropical fever in Guatemala, where he was sent to inspect an inclined haulage plane constructed at the Trenton plant, and is in a serious condition at the Belvidere Hospital, New Orleans, La.

BRUCE ALDRICH has been appointed district engineer for Canada for the Asphalt Association of New York. His headquarters will be in Toronto.

PROF. J. C. MCLENNAN, of Toronto University, who during the war was scientific adviser to the British Admiralty in connection with marine-engineering problems, has sailed from England to resume the chair of physics at Toronto.

HENRY A. PULLIAM, Paducah, Ky., has recently returned from Spanish Honduras, Central America, where American civil engineers are at work on several important projects. He was employed on engineering projects under construction by the Cuyamel Fruit Co., of New Orleans, La., such engineering work including improvement of port facilities, swamp-filling projects, railroad construction, drainage and river diversion, water-supply and hydro-electric construction. The work is being done under the direction of P. H. MYERS, chief engineer of the company.

ERNEST E. REESE, New York, has been nominated by the President as hydrographic and geodetic engineer of the Coast and Geodetic Survey. The nomination has been sent to the Senate for confirmation.

DR. FORD ASHMAN CARPENTER, for the past 28 years with the United States Weather Bureau, has been made manager of the recently established department of meteorology and aëronautics of the Los Angeles Chamber of Commerce. He has also opened offices in Los Angeles in connection with his work with the Chamber of Commerce as consulting meteorologist in climatic investigations for intensive agricultural development, water resources, and kindred matters.

CAPT. JOHN J. VANDEMOER, Engineers, U. S. A., who recently returned from France, where he served as commanding officer of the 467th Engineers, Ponton Train, has been appointed city engineer of Grand Junction, Colo., county engineer for Mesa County, and field engineer for the State Highway Commission of Colorado. Before entering the service Captain Vandemoer was assistant engineer for the United States Reclamation Service.

OBITUARY

J. W. JAYCOX, consulting engineer, Denver, Colo., died Sept. 8. From 1905 to 1909 he was state engineer of Colorado and at one time was mayor of Leadville, Colo., having previously held the offices of city engineer and councilman. He was born in Poughkeepsie, N. Y., and was a graduate of Cornell University. About 1872 he was a member of the Hayden geological expedition into the Northwest, making the trip through territory now comprising Colorado, Utah, Wyoming and the Yellowstone National Park. In recognition of his services one of the lakes in the park was named for him. Since 1882 he was a member of the American Society of Civil Engineers.

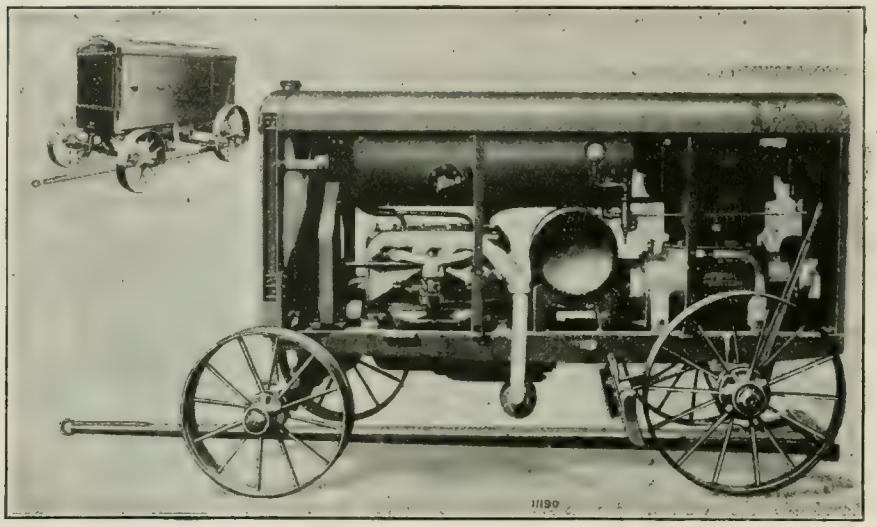
Conversant with practically every dam and hydraulic problem in the eastern Rocky Mountain region, Mr. Jaycox's office was a delight to the young engineer who was fortunate enough to have access to it.

Mr. Jaycox thought much of technical magazines and exhibited with delight complete sets of bound volumes of both *Engineering News* and *Engineering Record*, to both of which he contributed freely, believing that experiences, whatever the results, should be set down for the benefit of the profession. His interest was as great, or even greater, in telling of the failure of a detail as in its success. The tearing out of the steel lining of the outlets of the Santa Maria Lake dam was described (see *Engineering News-Record* of Jan. 24, 1918, p. 172) as freely as the new type of trip dam and sand eliminator used on the Huerfano River dam. (See *Engineering News-Record* of Apr. 24, 1919, p. 818.)

THOMAS RODEN, for 28 years superintendent of the Arlington, Mass., water-works, died recently at his home in Arlington, at the age of 74. Mr. Roden came to this country from Ireland 46 years ago.

Gas-Driven Portable Compressor Appears on Market

The Ingersoll-Rand Co. recently introduced a light-weight gasoline-driven portable air compressor, built in two sizes. All unnecessary weight has been eliminated, thereby affording maximum air-power output per unit of weight. From canopy to broad-tired wheels, these compressors are all steel.



ALL-STEEL, GAS-DRIVEN AIR COMPRESSOR OF 210 CUBIC FEET CAPACITY WEIGHS 6000 POUNDS

Each unit consists of a duplex, vertical compressor, driven at high speed by a four-cylinder, four-cycle tractor-type gasoline motor. The larger machines, of 210-cu.ft. capacity, weigh only 6000 pounds, and the 118-cu.ft. unit weighs 4000 pounds.

The compressors have cylinders cast *en bloc*, with cylinder heads, valve chambers, and water jackets integral. Both intake and discharge valves are of plate type and are located directly over the cylinder bore. Crankshafts and connecting rods are drop-forgings. Air pistons are fitted with three-piece piston rings, and, in addition, with an oil wiper ring. This latter returns all surplus oil from the cylinder walls to the crank case, and, it is said, obviates the difficulty caused by having the air carry an excess of oil into the receiver.

Both compressor and driving motor are water-cooled by a circulating system, with centrifugal pump, large radiator, and blast fan. Each compressor unit is equipped complete with receiver, safety valve, drain valves, pressure gage, and service valves to which the air-hose lines may be attached. When the fuel tank has been filled, lubricating oil provided, and the cooling system supplied with water, the units are ready for work. A swiveled front axle which moves freely in both horizontal and vertical planes, with a rigid rear axle, gives to the mounting of the machine three-point suspension.

New Plant for Chain Belt Company

With the announcement of the increase in capital stock of the Chain Belt Co., Milwaukee, Wis., from $1,000,000 to $2,800,000, comes the information that the company is planning an extensive building program, which, when completed, will give to Milwaukee one of its largest industrial institutions. The plans contemplate the ultimate evacuation of the present plant at 16th and Park Sts. and its removal to a 23-acre site at 39th and Orchard Sts. Within a few days ground will be broken for the first unit, a steel and brick structure 316 ft. x 150 ft., where the concrete-mixer assembling department will be housed. Building operations will progress by departmental units as rapidly as business conditions, removal difficulties and other considerations will permit. Plans and construction work will be under the direction of Frank D. Chase, Inc., Chicago.

Trade Publications

THE INTERNATIONAL MOTOR CO., W. 64th St. and West End Ave., New York City; catalog, 4½ x 7¼ in., 75 pages, illustrated; an exposition of the outstanding features of the Mack truck, with reasons for the adoption of such features.

THE ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.; two bulletins, Nos. 1537 and 1632 C, 8 x 10½ in. each, 30 and 50 pages, respectively; illustrated; Bulletin No. 1537 is a series of photographic plates showing the details of the Allis-Chalmers oil engine, Diesel type, to facilitate the ordering of repair and spare parts; Bulletin No. 1632 C covers centrifugal pumps and pumping units and contains tables indicating the size, revolutions per minute, horsepower, etc., of pumps when the head in feet, and the capacity in gallons per minute are known.

Business Notes

THE S. T. ENGINEERING CORPORATION, Buffalo, recently incorporated, has elected the following officers: President, Ralph McCarty; vice-president, Henry J. Turner; treasurer, William B. Powell; secretary and general manager, Harvey H. Hickman. The new company will manufacture and sell mechanical equipment.

C. P. DAVIDSON, formerly with the Raymond Concrete Pile Co., and W. H. DAVIDSON, formerly with Stone & Webster, both of whom have recently been discharged from the Army, have organized the SOUTHERN ENGINEERING CO., manufacturers' agents, New Orleans.

JAMES POSEY and STOCKETT M. WHITELEY, consulting and operating engineers, respectively, have formed an association under the firm name of POSEY & WHITELEY, ENGINEERS, INC., and have established offices in the Fidelity Building, Baltimore, Md. The new corporation will specialize in industrial power-plant management. Mr. Posey will continue his consulting practice in the same building.

H. BORTIN, cost accountant and highway engineer, who maintains offices in St. Louis and New York City, has associated with him as chief engineer W. L. LOVE, former superintendent of highway construction in Harris County, Texas.

THE STANDARD CHEMICAL CO., Toronto, the stock of which is largely held in England, has selected as its new president DAVID GILMOUR, a Scottish engineer of wide experience in various enterprises in South Africa, South America and the United States. During the war he served the British Government in the design and operation of factories for the manufacture of munitions.

J. H. KENYON is president and J. SCOTT THOMPSON is secretary-treasurer of the recently organized KENYON-THOMPSON CO., general contractors, Raleigh, N. C. The new company will engage in a general contracting and building business, specializing in fire-resisting and brick structures.

THE LACLEDE STEEL CO. has moved its offices from the Federal Reserve Bank Bldg. to the Arcade Bldg., St. Louis.

THE BOWERS SOUTHERN DREDGING CO. announced that it would open offices in New York City Oct. 1, closing the Philadelphia office at 688 Bourse Building.

THE CHICAGO PNEUMATIC TOOL CO. will move its Birmingham office Oct. 1 from 801 Brown Marx Bldg., to 1925 Fifth Ave., North, where a service station with a complete stock of pneumatic tools, electric tools, air compressors, oil engines, rock drills, and repair parts will be maintained.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—JAMES H. McGRAW, *President*

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. MEHREN, *Editor* — CHARLES WHITING BAKER, *Consulting Editor*

Volume 83 — NEW YORK, THURSDAY, OCTOBER 9, 1919 — Number 15

Bay State Against Radicalism

Coolidge by 125,000. Thus does Massachusetts give the answer to radicalism.

The Critical Hour

Crises have a tendency to force us back to fundamentals. Attorney-General Palmer thus puts the issue in the coal strike: "The question which we must now try out is whether the by-laws of the miners' union shall prevail against the great needs of the people and whether the supreme authority of any non-governmental body can be substituted for the authority of the Government under the law." And again, "This is the critical hour in the life of our country. The test is being made whether the Government has the right and the power to protect all the people from a national disaster which would be inflicted upon them by a single group for its own advantage." The Attorney-General speaks the mind of the country.

No Tremendous Emigration

One of the difficulties in the labor problem seems to have been exaggerated. For some months there have been statements abroad about the tremendous emigration of that foreign element which has made up the bulk of the common labor of the country. Now the Commissioner General of Immigration states that only 102,513 foreigners have left the United States since the signing of the armistice, only about 20,000 more than the emigration during the 12 months which ended June 30, 1919. For the five years which ended at that time 618,223 emigrants departed, so that the present outflow is but little greater than normal during the war. While the war stopped immigration, can it not be expected that, with the cost of living as high on the Continent as it is here and with every prospect of higher taxes, the balance in favor of immigration will return before long?

Americanization's Leaders

Back five years or more a group of students of social and industrial conditions concluded that the un-Americanized foreigner was a potential danger to our institutions, and that he was doing himself an injustice by not getting in tune mentally with the spirit of America. They set about to arouse the public to the pressing importance of the subject, and by the hardest sort of uphill work finally made an impression on our industrial leaders and got the Government to help in the work. The war gave a tremendous impetus to their efforts. Most of us awoke then to the peril of the un-Americanized foreigner, but since the recent revelations regarding the activities of our imported Bolsheviki, the whole country has come to see the need for systematic methods of developing among our foreign-born population a genuine sympathy for and attachment to America and its institutions. In our new-found devotion to a necessary work we owe a tribute to those who foresaw its need and long since developed its methods. To Miss Frances A. Kellor, in particular, leader always in Americanization propaganda, grateful recognition is due.

A New View on French Reconstruction

Further evidence against the probability of an extensive participation by American engineering, construction and manufacturing interests in French reconstruction is piling up day by day. Immediately following the armistice this country was deluged by a flood of loose statement and wild conjecture regarding our participation in the post-war work overseas. To one at all familiar with conditions and people abroad the situation, so far as this country was concerned, appeared anything but promising and during the early part of the present year this journal on several occasions pointed out the wisdom of discounting rather heavily the tales of opportunity for Americans across the Atlantic Yet the idea persisted that the American engineer, contractor and manufacturer were the agencies necessary to "save" France-- and incidentally to profit rather handsomely in the doing. What France was to be "saved" from was never quite clear. Nevertheless, a number of American organizations-- engineers, contractors and manufacturers-- sent emmissaries to France in quest of the Golden Fleece of reconstruction. Many of these Argonauts have since returned sadder but wiser men. From one of them still abroad, a man of wide experience as an engineer and a constructor, some very pertinent comment on general conditions has been received in a letter from France. In direct contrast to the belief in a big foreign market for American manufacturers in Europe this observer makes the radical statement that perhaps things may work out the other way-- that is, that American interests instead of exporting to France may take advantage of favorable conditions in the European labor market, establish foreign connections, produce abroad and <u>import</u> to America.

In support of this highly interesting point of view the low wages current in France and Belgium are cited. A quotation from the letter referred to above is apropos: "I saw men working for 6-1/2 francs per day

(at the present rate of exchange this is about 75¢ per day). They were breaking and loading pig iron on cars for 87-1/2¢ per ton. In Germany labor is drawing (figured at the present rate of exchange) 7 or 8 cents and mechanics about 13 cents. Coal is high now but conditions are going to improve very much faster than people realize. There is a lot more coal available all over Europe than you would gather from reading the newspaper. The whole situation convinces me, once this temporary buying is over, that America will not sell anything manufactured to Europe. I am convinced that Americans will contrive to gain connections whereby they will produce under these favorable conditions to import into America. If I am not wrong, nothing but the lack of ships will prevent the German from having the South American trade all back".

The role of prophet in these changing times is a hazardous one. For the present at least it seems reasonably clear, however, that the foreign opportunities for both American engineer and manufacturer are slim. While this point is not new it is pretty definitely substantiated by the engineer whose letter has been quoted. The most interesting thing about his communication, however, is the suggestion of American interests producing in France and importing into the United States.

What of the Public Safety in Pittsburgh?

Confronted with the duty of building for the community several new bridges over the Allegheny River, the commissioners of Allegheny County, which includes Pittsburgh, have turned over to architectural firms the work of designing and supervising the construction of two of these bridges. This matter was briefly adverted to in our Emergency Bulletin of Oct. 23, but the subject is of such importance as to call for fuller treatment than was then possible. Great engineering structures are in question. They will contain arch spans of steel up to 500 ft. in length. Problems that demand the highest engineering skill and most careful training in bridge design must be solved. It is these problems that have been entrusted with full authority to architects.

What of the public safety? The answer hinges undeniably on the question whether the work of designing bridges is within the proper field of the architect. The issue is not an academic one but goes to the root of things; public safety is the issue, and the question therefore needs to be urged very directly. Is the architect competent to design a large steel bridge or to direct its construction? If he is, surely the present-day science and art of engineering is a delusion and a mockery, and the endeavor of the engineering profession to combat engineering quackery by state regulation is as a stone cast into the water!

Time was, centuries past, when there were no engineers, and in those days not only bridge construction but also water supply and sewage disposal were dealt with by architects. Time was, also, when medicine was practiced by barbers. But the generations have progressed. Medicine has come into being as a great science. The engineer, the architect and the bridge of today are incomparably different from their predecessors of those early days. Today we have a medical profession and an engineering profession to deal with their respective sciences in practice. Power plants, bridges, cranes, and water-works are the objects of professional engineering work, as operations on wounds and treatment of disease are medical functions. Is it possible today that architects should attempt the construction of great bridges? The tonsorial artist who undertakes to treat the sick is thrown into prison, for he threatens the safety of the community!

As to the part of the Allegheny County commissioners in the matter we need not concern ourselves seriously. Political officialdom indulges in many queer actions; healthy local sentiment is the surest means of control. The engineers of Pittsburgh may be depended upon to stigmatize the commissioners' action and to make suitable protest. And if the law lays upon the commissioners a duty to see that public work of technical character is entrusted only to men properly qualified to deal with it, the people of Allegheny County will doubtless find the application of this law to the case in hand. For Engineering News-Record, however, the serious aspects of the situation lie on the professional side.

In the profession of architecture, sister profession to engineering, there is a well-developed professional conscience. And if the principles on which this is founded have merit, they surely include the rule that the architect shall not professionally undertake service that he is not qualified as an architect to perform. What then of the present case? Shall it be considered professional for an architect to barter this principle for six per cent by venturing upon work of pure engineering?

We ask what is the attitude of architects themselves as to this matter. In our view their professional honor is involved--and also, we would suggest, their good repute with the public and their relation of mutual respect and amity with the engineering profession. Do their tenets of practice discountenance the undertaking of work outside the scope of architecture? If they do, it may appear that professional principle has been violated in serious manner. But if they do not, the ethical foundations of the profession need revision.

Recent labors to bring about legal regulation of engineering practice are endowed with new significance in the light of the Pittsburgh case. In establishing definite professional recognition, such state regulation would -- this has been our hope--assure the public that works of engineering are undertaken only by men qualified as engineers through training and experience. The thought has been to protect the public against malpractice by engineers. A corollary to that is that the public needs to be protected against the malpractice of architects also.

It is no defense of the Pittsburgh procedure to say that the architects will employ competent engineers. The fundamental requirement is that the major responsibility must be in the hands of those technically competent to assume it. If it is not then the architects in question are acting merely as brokers.

The case is clean-cut and of such importance that at least four bodies should concern themselves with it. The Engineers' Society of Western Pennsylvania, the American Society of Civil Engineers, the American Institute of Consulting Engineers, and the American Institute of Architects. The issues need to be determined once for all.

Bridge Building and Warfare

In the war time work of bridging streams and hollows in order to carry rapidly-moving armies forward over the advance areas there resides a powerful stimulus to thought for the bridge engineer in civilian service. Remarkable similarities tie together his daily work with that of modern military bridging, and at the same time certain differences suggest reflection.

Chief among the latter are the range of structural classes necessary in field service, and the overshadowing importance of the two factors of weight economy and adaptability for very rapid construction. The ordinary requirements of peacetime work tend toward standardization on highly-elaborated types of bridge, with the result that the engineer of bridges is apt to relegate all less elaborate and non-standard forms to the realm of third-class or makeshift construction. Structural science, however, applies to them as fully as to the standard road or railway bridge, and there is no lack of opportunity for utilizing the refinements of engineering art in their design. Often, indeed, we may see an emergency bridge, as built after a flood washout or for service during renewal operations, embodying far higher skill and ingenuity of design than does the costly permanent bridge which follows it in service.

It will be a loss to the world if the profession of bridge engineers does not remain in full mastery of all the resources of its art. There is even now, perhaps, a tendency for collegiate instruction in the subject to ignore everything outside of standard construction, in order to serve practice more immediately. The tendency might well be reversed; for it is while the bridge engineer is acquiring his technical foundation--knowledge that he should become firmly grounded in the broadest possibilities of his science.

Seeking after maximum economy of material has become virtually a secondary objective in normal bridge design. Standardization of practice and the necessary predominance of robustness and permanence lead constantly in this direction. Yet the whole of the bridge-builder's art rests on most efficient utilization of material, in other words on weight-economy, and for this reason it has always appeared to us unfortunate that in practical bridgework structural efficiency should be treated as an academic matter. Truth is, we think, that every great achievement in the bridge field springs from a sound, deeply-rooted understanding of the ideals of structural efficiency. Let the bridge engineer come to realize that there is engineering of a high order in the simple trenchcrossing span; still more in footbridges; still more in ponton construction and (in more familiar form) in the main-road bridge of light weight, of great portability and of maximum adaptability to various emergency service-- and his field of thought is certain to be broadened. His civilian bridgework will be benefited, and in addition he or his successors will be better prepared to take up the burden of military bridging at any future time.

A revolutionary change in bridge operations came about during the war, and this is the outstanding feature of the summary of bridging experience which we are able to present in this issue. With one bound the range of the operations leaped beyond the confines of the soldier's manual or of rough-and ready method based on old equipment and mere ingenuity. It became a field for engineering. All that the war brought to the front in bridging was produced by virtue of the science and constructional procedure developed in civilian bridge-building work. So severe and suddenly shifting were the demands that only the experienced bridge engineer could meet them. To overlook the meaning of this transformation would be failure to grasp the full import of a weighty matter.

Why this transformation did not come about sooner is still obscure. A few crisp, cold facts in the situation are found to form the background of reflections on the subject. A year after we entered the war, American troops in order to cross the Marne were forced to build a bridge of old gasoline cans, nothing else being planned or provided for them. Before 1917, war experience had shown that service required a number of different types of bridge in the advance areas, and such types had been developed and were in use; but even long afterward our own bridge equipment was limited to one type, and this old equipment was not used by our forces. Our training camps taught the new men how to build a type of bridge that found no use whatever in the war, either before or afterward. A portable heavy-duty type of bridge was known to be needed for sustained offensive operations and had been developed by other armies, but the first American bridge of the kind was sent out of the maker's shop just nineteen months after we started to fight, and then was too late for use. Human lives hang on such matters as these.

It has often enough been emphasized that the warfare of today is the work of engineers, of specialists. But while we have readily thought of specialists in gunnery, in explosives, in motive power, in chemistry, we have not been willing to think of bridge specialists. Now, however, our thoughts are turned forcibly in this direction. If warfare needs bridge specialists, it means a thoroughgoing overturn in military engineering.

A most interesting fact of the matter is that loads and speeds were the key points of the war's new demands on bridges, as they had long been key points in civilian bridge work. For years during which the votaries of military academies were still summing up the bridge art in terms of traditional equipment and bounded their horizon with lumbering trains of parade-day fieldpieces, civilian engineers had been wrestling with the perplexities of steadily growing railway loads and the sudden burden of heavy and fast motor trucks overtaxing light highway bridges. This occupation gave a perspective that was needed in the war. The future military engineer must acquire a similar freedom and power of technical view.

Of immediate importance is the fact that the lesson of wartime bridging was left uncompleted. Aside from the problems of organization, spirit and scientific principle, there is the direct problem of carrying this lesson to its conclusion. At the time hostilities ended, planning was far from being finished, and provision of stocks of equipment had hardly been begun. But if bridges are as important as cannon, it is patent that they must be planned as far ahead, and that they must be on hand and ready at all times. There is important work to be done, then, work which we may hope is in progress at the present time.

Bridge Engineering in Active Warfare

Civilian Bridge-Design Methods Applied in Work of A. E. F. — Bridge Department Organized — Unprecedented Loadings — Traffic Conditions — New Types of Bridge Developed — Reinforced Pontons—Sectional Steel Bridges—Flooring, Loads, Impact and Unit Stresses

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IN MODERN warfare the motor truck, heavy artillery, and the 30-ton tank have conspired to render former types of military bridges wholly inadequate. The so-called spar-lock bridge, made of trees cut and lashed together, which was invented during the Peninsular campaign, early in the nineteenth century, and was carefully taught in its original form in the American training camps in 1917, has been displaced by the bolted sectional steel bridge. In both the British and the American Armies a new aspect was given to the subject of bridging by the introduction of what are in effect civilian bridge-engineering methods, and the virtual abandonment of the methods of the traditional military engineer, with respect to fixed bridges. One significant expression of this change was the organization of a bridge department. New types of equipment were developed, based on precise design to suit actual loadings.

As a result of the Army's work in bridging, experience was accumulated and certain standards were established that are likely to be of determining value ni future military bridge operations. The field practice strongly emphasized the necessity of our Army's having on hand at all times an ample stock of steel and ponton bridge material and of training the troops in using this material; when the war broke out we had none but a small amount of ponton material, and this was not used, and even after 1½ years of participation in the war we had no modern steel bridge material ready for use. Still more strongly, however, did it emphasize the need of providing construction equipment, such as portable piledrivers, A-frame derricks, and a proper complement of suitable tackle, gasoline hoists, and the like.

Organization of the Bridge Work

Because the military bridge differs essentially from the bridge of civil life, in that it must be erected with great rapidity, *always without falsework*, must be simple, must be made of parts small and light enough to be easily transported in Army trucks, must use readily available material, and must be built with a minimum of tools and equipment, it has in the past been dealt with by military engineers and its construction has been treated as a subject wholly apart from civil bridge engineering. But in the present war the new and very severe load conditions called for a different manner of treating the problem. The ponderous motor trucks traveling at high speed which replace the former Army supply carts, and the heavy mobile artillery and tanks of the present time, require bridges that are in every sense true engineering structures. Empirical methods of bridging could no longer be depended on. It was for this reason that a bridge department was organized by the A. E. F. at an early stage.

To trace the history of this department in detail seems unnecessary. It began with two officers only, a regular and a reserve, and gradually evolved toward the following: An officer in general charge, whose duty was to see that standards were prepared and that material was on hand and so placed as to be readily available with a minimum of transportation; a bridge officer with each Army, who had charge of all fixed bridge work, including design, construction and maintenance; a variable



FIG. 1. A NECESSARY TYPE OF MILITARY BRIDGE—FOOTBRIDGE FOR INFANTRY ADVANCE OVER MEUSE RIVER NORTH OF VERDUN
Built under gun fire, by divisional engineer troops; length, 120 feet

number of troops and certain construction equipment assigned to the Army bridge officer according to his needs.

It must be understood that this organization was worked out in its entirety with the First Army only, and that the construction of ponton, foot and trench bridges remained with the divisional engineer regiments.

Initially the function of this department was to design standard structures. Because of the requirements of the work and Amry necessities, it functioned largely through engineer officers commissioned from civil life, who used civilian bridge-engineering methods. It should be said that railway bridge problems, which are closely similar to those met in emergency railroad bridge work in civil life, were handled by other agencies.

When the United States entered the war, the divisional engineer troops were relied upon to design as well as construct and reinforce bridges, in addition to their other work. Beyond a small amount of ponton equipment in the United States, there was no bridge material on hand, and no adequate designs had been prepared. But in September, 1917, the development of bridge equipment and standards was commenced both in Washington and in the A. E. F. The work was finally completed in the American Expeditionary Forces.

From the commencement of the war in 1914 down to its end in 1918, the character and amount of traffic, and therewith the weight of the heaviest loads, steadily increased so that continuously stronger and more stable bridges were called for. The British revised their standards upward at least five times during this period. From the very first, therefore, the American Army had to meet conditions very greatly different from those contemplated by pre-war methods and equipment.

The quantity of supplies of all sorts required, and the high rate of consumption during active operations, are almost incomprehensible. During the attack on Verdun in 1916 the traffic on the Bar-le-Duc-Verdun road was more than 5000 vehicles per day in both directions, for over three months. During the battle of the Somme, in the same year, on the Amiens-Braye-Maricourt-Cappe road, a regular daily movement of 5000 vehicles was recorded, while on days when the troops were being relieved up to 17,000 were counted. Both of the above roads were 8 to 10 m. wide and carried three and four lines of traffic. During the Meuse-Argonne offensive in 1918 the traffic passing Varennes on a road carrying two lines of traffic was 4000 vehicles per day.

During the operations of the past year, a controlling factor often was the inability to restore quickly the lines of communication, rather than the ability of the enemy to resist attack. Transportation was often delayed, if not entirely stopped, by the condition of the roads and bridges. The lack of bridges sometimes interfered seriously with operations. Since bridges are usually the most vital and the most easily destroyed links in a line of communication, they are destroyed in retreat and must be quickly restored in case of an advance; their importance is more vitally felt when they are absent than when they are present. But besides the mere





FIGS. 2 AND 3. TYPICAL BRIDGING CONDITIONS ENCOUNTERED BY THE ARMIES IN FRANCE

At the location shown at the left, four bridges were built successively; a steel peace-time bridge was demolished by the retreating army; the replacement trestle, intended for light artillery only, was broken down when a tank tried to run over it; another trestle, built on top of the wrecked tank, was destroyed by the enemy; finally a steel demountable truss span of 72 feet was placed. The view at the right shows a typical mine crater in a road, one of the frequent and troublesome problems in an advance.





FIGS. 4 AND 5. TWO TYPICAL INSTANCES OF BRIDGE IMPROVISATION

Gasoline-can footbridge over the Marne, built for the counterattack of July 18; at the right a French cask-float footbridge over the canal at Dieue-sur-Meuse, for infantry

presence of a bridge, its traffic capacity is a momentous factor, and a one-way bridge on a two-way road, for example, throttles operations seriously. With the intense concentration of men and materials of modern military operations, an unusually large number of bridges is required in order to give adequate capacity. There were many instances when three or four bridges side by side had to be provided.

Some idea of the number of bridges involved may be gained from the following: Over the Meuse River between Verdun and St. Mihiel, approximately 33 km., the French constructed 23 crossings for wheeled traffic and 47 crossings for infantry. Between March and December, 1918, inclusive, the British Army erected 562 highway bridges. The American First Army built nearly a mile of bridges during the Meuse-Argonne offensive and immediately afterward, as the following table indicates. The table includes railway bridges, though the present article is confined to the subject of highway bridges.

	Number of Bridges	Lineal Feet of Bridging: Strengthened	Widened	New Framed Trestle	New Pile	New A-Frame	Trestle on Piles
Highway	40	1329	95	662	400	120	90
Standard-gage	12	230	..	305	186	...	..
60-cm gage	12	330	..	276	195	...	..
Totals	64	1889	95	1243	781	120	90

During an advance several bridges may have to be built at the same crossing: usually first a light footbridge for infantry, followed by a ponton bridge, and this in turn by a more permanent bridge of available material; and, finally, a demountable or sectional steel bridge or a timber crossing capable of carrying the heaviest loads. For very dense traffic a second span alongside the first may be required. Where bridges are apt to be shelled, a second bridge is sometimes built a little to one side, to be used when the other is under fire or is damaged. The best general rule, it may be stated from experience, is to build in the first place a bridge capable of carrying the heaviest traffic, when conditions permit; this conserves both labor and material.

So much for the general conditions of the service. The bridge department's work was necessarily varied. Its results, and the associated experiences and parts, are most easily and usefully stated by referring to the different types of bridge separately.

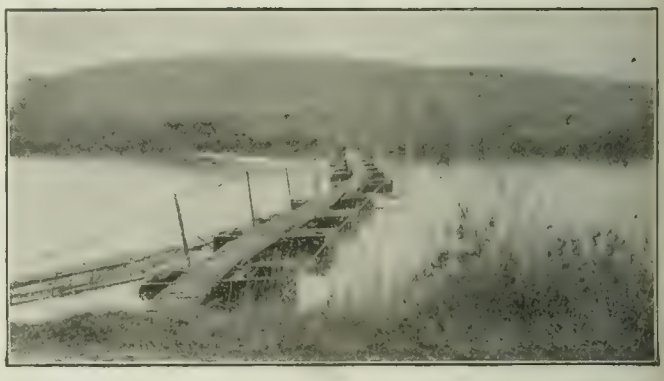
FOOTBRIDGES

Footbridges, used principally to enable infantry to pass an obstacle during an attack, and often built under fire, make the highest demands as to portability, simplicity and speed of construction. They are a prime field for improvisation. Lieutenant Colonel Stewart's famous gasoline-can bridge across the Marne (Fig.4) and other improvised footbridges illustrated herewith bring this graphically before the mind.









FIGS. 6 AND 7 (UPPER LEFT AND RIGHT). DIFFERENT USES OF PORTABLE TRENCH BRIDGES

At hte left, a German footbridge of 20-foot span; at the right, a British artillery bridge over a trench on Vimy Ridge, photographed two years after active operations

FIGS. 8 AND 9 (LOWER LEFT AND RIGHT). GERMAN FOOT PONTON AND LAMPERT FOOT PONTON

At the left, steel cylinder float easily penetrated by rifle balls; bulk hampers transportation; at the right; bridge over Meuse near Mouzon, placed under machine-gun fire in 30 minutes by troops who had never seen it before

Both fixed and floating footbridges were used of numerous different types. It is believed that in future it may be necessary to make them wide enough to carry the various infantry weapons, such as trench mortars, machine guns and 37-mm. guns, which accompany the infantry in an attack. Some of the varieties of footbridge are illustrated in the views herewith; the A-frame, framed trestle, pile and common beam bridges are so well known as to need no special comment. In many instances the débris of a demolished bridge served for a crossing, especially in the case of demolished truss bridges.

Light pile or stake bridges, much lighter than the pile bridges later mentioned, were used extensively for crossing streams and marshes; the French in particular

used a great many. Such structures usually consisted of two-pile bents with batter piles, cross-braced. All driving was done by hand mauls. Their bridges had a width of 1.8 m. in the clear, enough for machine-gun carriages as well as infantry.

Lampert Ponton—Foot ponton bridges did not exist in the American Army when it entered the war, but all the other combatants had developed such devices or their equivalent. The late Lieut. Col. J. G. B. Lampert developed a foot ponton that surpasses all others in ease and speed of erection, as well as in compactness for transport. This ponton consists of a wooden collapsible frame 6 ft. 5½ in. x 3 ft. x 18 in. deep, covered with canvas. A light gangway is laid across from ponton to ponton. This type was manufactured only just previous to the beginning of the Meuse-Argonne drive. In that advance a number of these bridges were erected by the engineers and they proved entirely satisfactory (see Fig. 9). A type of foot ponton using cork rafts as supports was developed by the Canadians (see sketch in Plate II). The cork floats are unsinkable under machine-gun fire, and when once laid are always ready for use, unless destroyed by a direct hit from a shell. The choice of the best foot ponton seems to lie between the cork-float ponton, on account of its reliability, and the canvas ponton of Lieutenant Colonel Lampert, on account of its portability. The two are about equal in ease and speed of erection.

Steel Pontons—A very different type of foot ponton (Fig. 8) was extensively used by the Germans. While good in many respects, it is undesirably bulky for transport and is easily sunk by rifle or machine-gun fire.

Canvas Fords—In connection with footbridges, the method frequently used by the French to ford a stream having mud or shell holes, or both, in the bottom deserves mention. Many small streams could not be forded because the men sank in the mud and shell holes and drowned. To get across safely a canvas carpet reinforced with chickenwire was then used. Ropes at one end of the carpet were fastened to two stakes driven on the near bank; then one man unrolled the carpet across the stream bed, walking upon it as he unrolled it. After reaching the far shore he fastened the end to stakes on that side also.

Trench Bridges for Foot and Artillery

All the combatant armies except the American were equipped with portable footbridges (Fig. 6) carried by the attacking troops to cross trenches, wire entanglements and streams. Our Army, like the others, developed short-span portable bridges on which guns

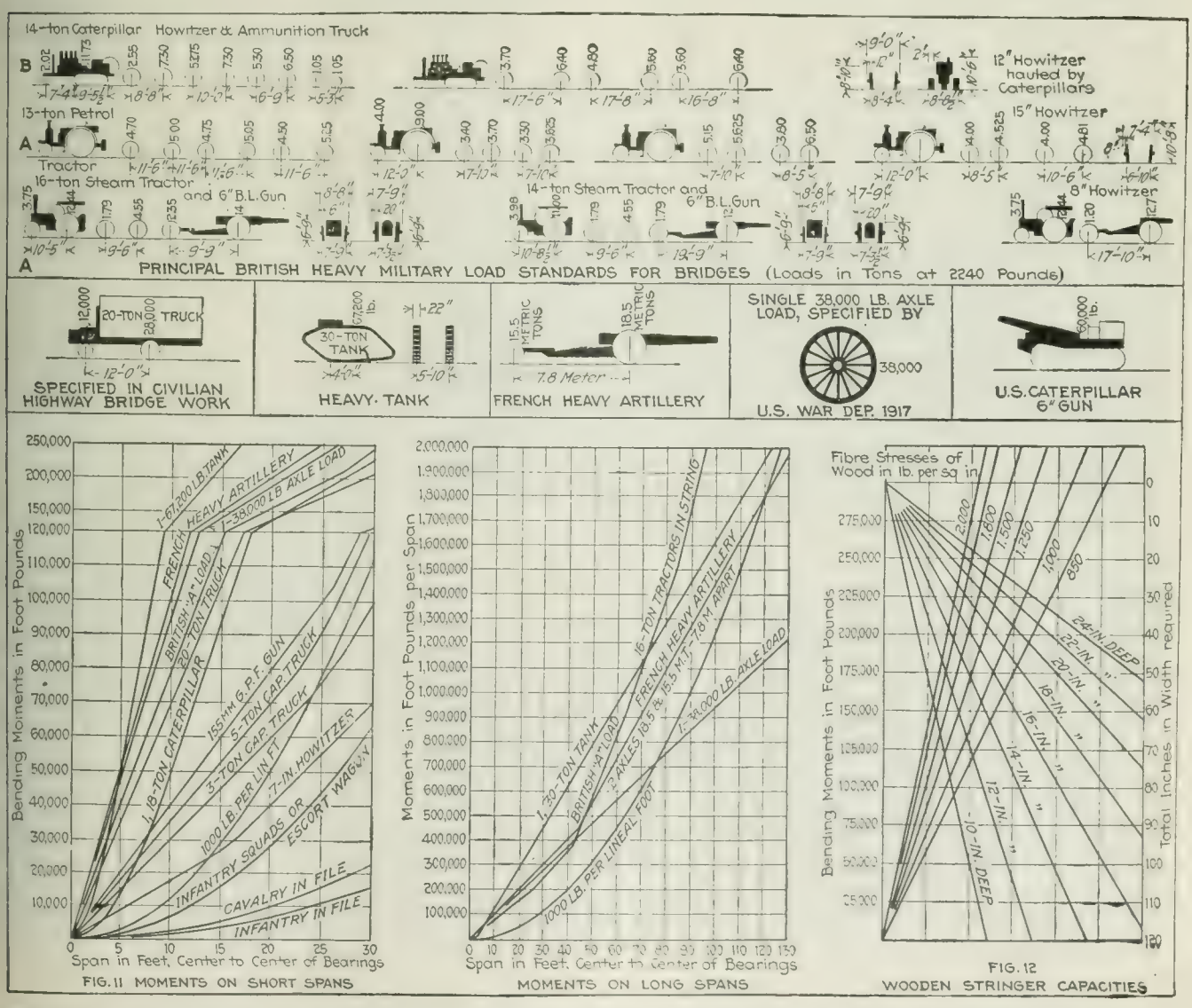


PLATE I—MODERN MILITARY BRIDGE LOADINGS AS DEVELOPED DURING THE WAR AND SUBSEQUENTLY
Typical moment curves and a diagram for proportioning wooden stringers are given below theloading diagram

would cross trenches (Fig. 7) in following up a drive over the trench systems of the war of position; these were long enough to span the ordinary trench or small hell hole and strong enough to carry the field guns. They were made in two longitudinal duplicate halves, to facilitate handling and were carried on gun carriages and limbers during an advance. A typical example is sketched in Plate II; this is as good as any of those used. In open warefare it is of course not necessary to supply such bridges.

The foot and artillery bridges are closely similar, being beam structures with transverse planking, designed for utmost lightness and strength. Trussed sticks were often used as the carrying members, to secure these objects, as in the German footbridge shown by the view, Fig. 6.

"Inglis Light" Footbridge—Shortly before the war a peculiar type of truss bridge, made of pipe sections, was developed by a British professor named Inglis. After its successful trial the British Government asked him to design one for highway loads; this is described farther on. The original light type of structure was used by the British Army to some extent, during the war, for footbridges.

The "Inglis Light" is triangular in cross-section (Plate III) and is composed of a series of identical bays each 8 ft. long, 8 ft. wide in the plane of the bottom chord, and 8 ft. high. It is intended to carry infantry in file over a 96-ft. gap. It should be noted that there is only one top chord. The members are drawn-steel tubes connected by junction boxes of steel castings. It is claimed that a trained crew can erect a bay in 60 sec. The bridge is launched over a pair of steel wheels, a temporary balancing arm having been built at the tail of the bridge. It is shoved forward across the gap or swung sidewise on the wheels as a pivot, and the balancing arm is then removed. There is a case on record of a 110-ft. span being thrown across in 11 min. by a green crew under school conditions. The type has been very useful, especially in crossing canals or streams with high, steep banks, where the approaches to a ponton bridge would be difficult.

Ponton Bridges for Modern Loadings

For many decades the most important type of military bridge, the ponton type retains a position of great though somewhat lessened importance in the light of the past war's experiences. Old ponton equipments, both American and allied, proved inadequate for the continuous service demanded of modern military bridges and inadequate to carry the heaviest loads. Reinforced types were constructed to carry moderately heavy artillery (but not the heaviest, or tanks); yet even so, practically no ponton bridges were left in service permanently, but were replaced as soon as possible by some







FIGS. 10 TO 12. THREE SPECIAL FEATURES F TIMBER BRIDGE CONSTRUCTION ON THE FRENCH FRONT
Fig. 10—Ice breakers on a French bridge over the Meurthe near Nancy, illustrating an occasional requirement in military bridging; Fig. 11—Built-up wooden girder bridge over canal near Turcoing, built by Australians; the upper part is a shelter fence; Fig. 12—Hurriedly built bridge at Consenvoye, 22-foot span





FIGS. 13 AND 14. MILITARY HANDPOWER PILEDRIVERS USED BY EUROPEAN ARMIES; CAN DRIVE ABOUT ONE PILE PER HOUR

Fig. 13—French demountable, used on Oise near La Fère; Fig. 14—German demountable, used by United States Sixth Engineers on Marne

other form of structure.

None of the American ponton equipment was received at the front in France during active hostilities. Our troops built all their ponton bridges with French or German equipment. They constructed several across the Marne River in July, 1918, and across the Meuse in November with German equipment captured along the Marne near Chateau Thierry.

When the various combatants found that their old ponton equipment was inadequate, they increased the floating power by using two pontons for each support, and strengthened the floor by using additional balk (stringers), a double layer of chess (planking) and a reinforcing balk as side rails. In some instances still further increase of strength was obtained by placing the supports closer together and using steel I-beams as balk. As already stated, however, all these reinforced ponton bridges were still inadequate for heavy artillery and for tanks.

Since the American standard ponton has an effective buoyancy of something less than nine tons, the greatest concentration that can be carried does not much exceed 15 tons. In view of the very much heavier loadings of modern warfare, stated more specifically farther on, it seems an important future necessity that ponton equipment be designed and provided capable of adaptation to these loadings.

Pile and Trestle Bridges

Pile and framed bent trestles will doubtless always be the principal reliance for military bridging, as they were in France. They are easily constructed, and the material required is more generally available than that for any other type of military bridge. Except for proportioning parts for the loads to be carried and to the construction equipment at hand, the practice on the front in France was closely parallel to our civilian bridge practice and needs but few further remarks.

Piledriving—Piledriving equipment was necessarily scarce, and the American Army, in fact, had none, except what it improvised in the field, captured or borrowed. No piling could be contemplated anywhere that required a hammer heavier than 1000 lb., and, generally speaking, the use of handpower or other light drivers had to be counted on.

Difficulty in driving was nowhere a factor. Along the Aire and Meuse River it was at first thought that it would be impracticable to drive piles, on account of the gravel and small stone. Examination showed that the layer of gravel was only 2 to 4 ft. thick, below which was a layer of 4 to 7 ft. of blue clay over gravel and stone, so that it was only moderately difficult to drive piles, and a good footing could be obtained. Along the





FIGS. 15 AND 16. TWO-WAY TRESTLE FOR HEAVY ARTILLERY AND DOUBLE PILE BENTS WITH CROSS-CAPS OFTEN USED BY GERMANS

Fig. 15—Built by Americans at Stenay, Meuse River; spans varied to suit footing on old masonry and river bed; Fig. 16—Bridge over Meuse near Consenvoye; far half American

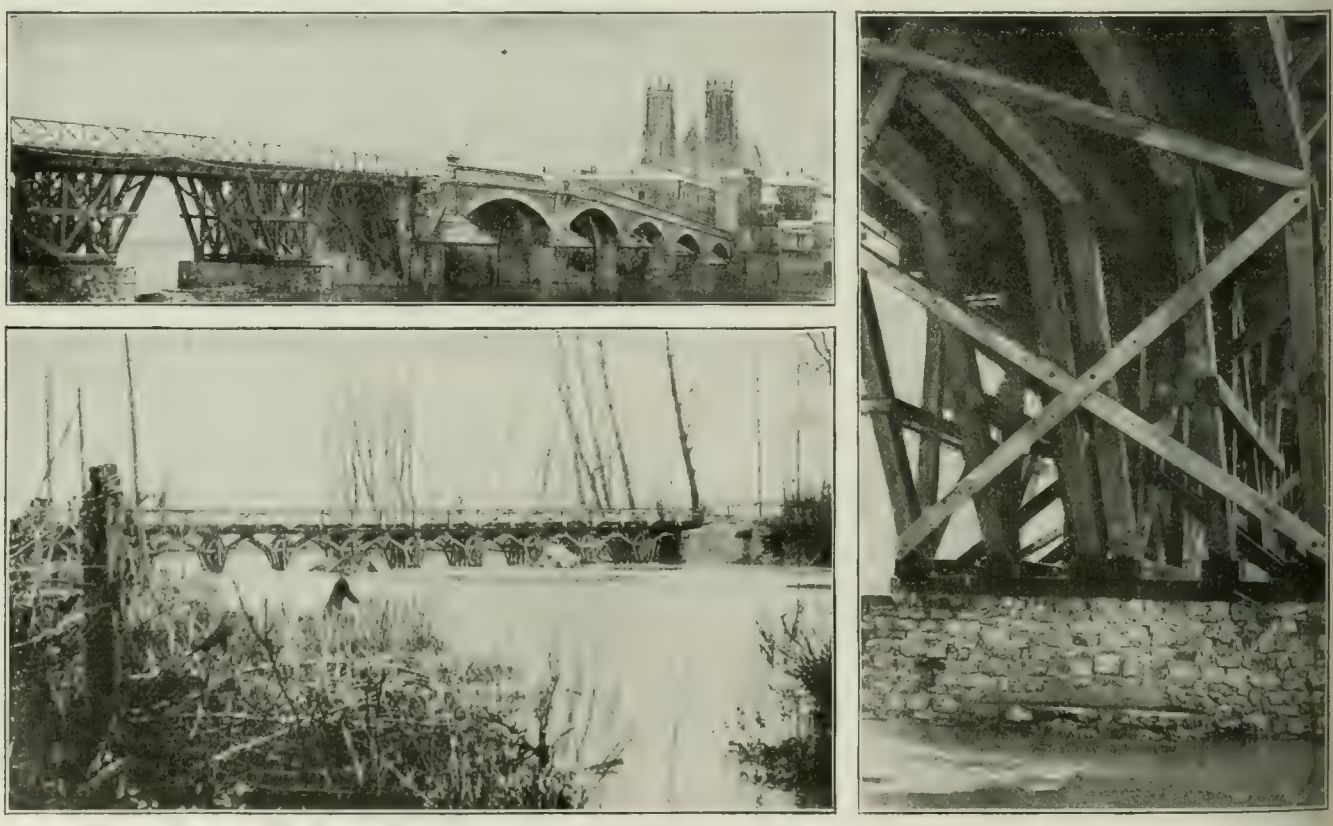


FIG. 17. FRAMED TRESTLE USING ROUND TIMBERS
Built in eight hours by United States engineer troops—Vesle River bridge near Bazouches, September 7, 1918.

Somme and on the Flanders front there were no beds of gravel; the soil was all clay or chalk.

The French used piles to a large extent. In fact, there are more bridges of this type than any other within their zone. Their standard practice was to use the girder cap, gaining both sides of the pile and bolting a light cap on either side. This consumes time and requires much hand labor. The American and British practice was to use a single rider cap, sawing the piles off level and driftbolting the cap into place on top of the piles. Another common practice with the French was to bolt two stringers together, sometimes with an I-beam between. Their timber bridges were fitted with walks on either side, a very advantageous feature, as men can cross readily without becoming involved with roadway traffic.

Framed Bents—On account of the delay entailed by driving piles in any event, framed-bent trestles were used wherever possible by the American troops. In the French rivers, where danger of scour is rare, this practice unquestionably justified itself. Nevertheless, it should be remarked that the French and also the Germans relied much more on pile than on framed-bent bridges.



FIGS. 18 TO 20. ARCHLIKE STRUTTING IN FRENCH AND ITALIAN BRIDGES
Upper picture shows French bridge over Moselle at Pont-à-Mousson, and at right a pier detail of the timberwork; below, an Italian strutted-beam trestle of archlike character over the Aisne River near Chateau Porcien, ten spans of five meters

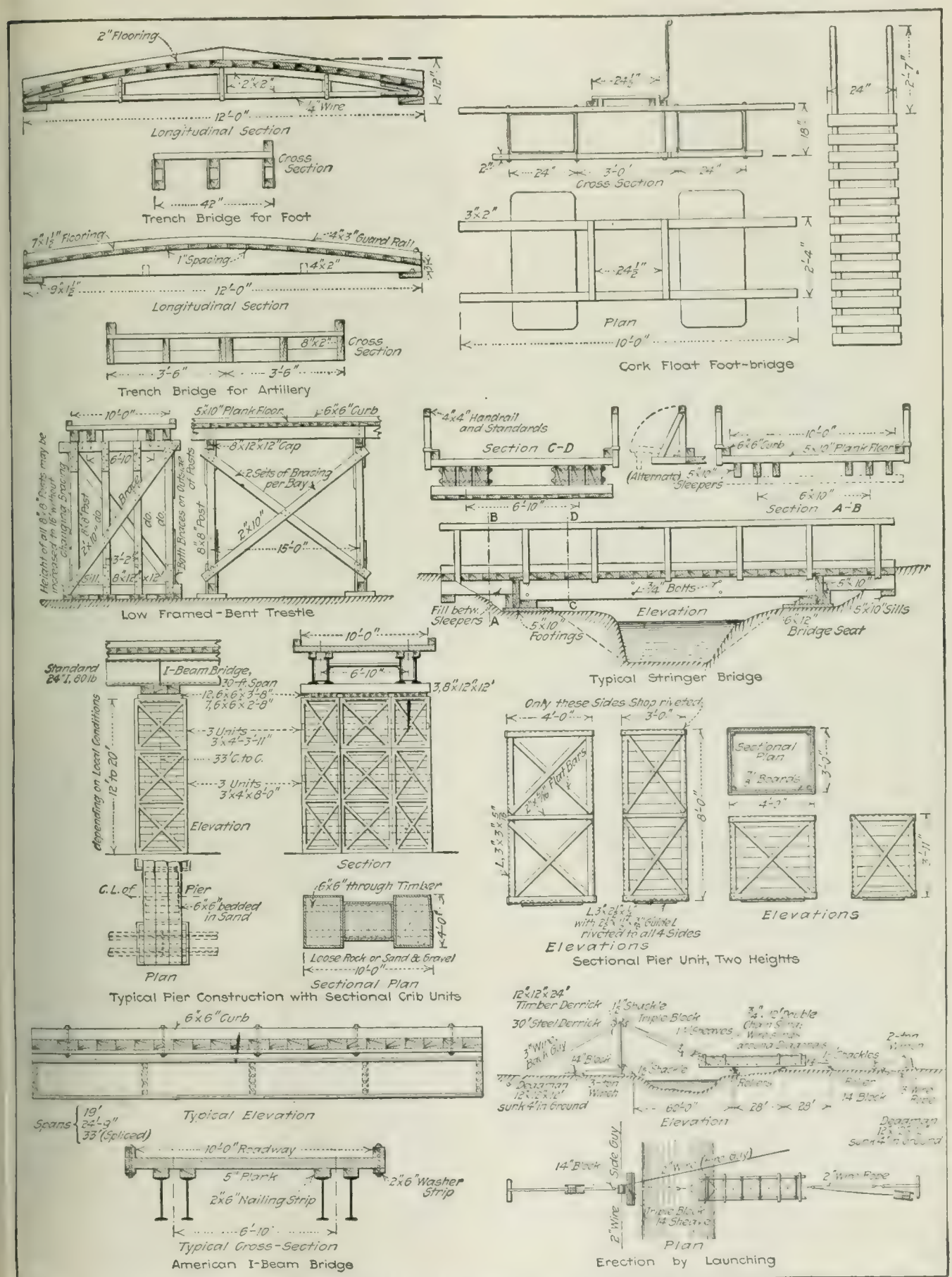


PLATE II—MODERN MILITARY BRIDGING PRACTICE—TRENCH BRIDGES; CORK FLOAT FOOTBRIDGE; STRINGER AND FRAMED-BENT BRIDGES; THE NEW SECTIONAL PIER (AMERICAN DESIGN); AMERICAN STANDARD I-BEAM BRIDGE TO CARRY HEAVY TANKS; LAUNCHING METHOD OF ERECTION

Conditions along the American front were in general quite favorable to framed-bent construction, and most of the timber bridges were of this type. It was used where there was no scour and where the bottom was firm enough (or could be made so) to support the bents. Where there was danger of scour, in some cases the framed-bent construction was made suitable by digging a foundation trench 2 or 3 ft. into the bed of the stream and placing mudsills in it, on which the sill of the bent was then placed. For example, at Griscourt the foundations were from 2 to 4 ft. below the stream bed, and the mudsills were 3-ft. lengths of 5-in. road planking; this was in rather soft clay soil. Through the meadow, in the central portion of this bridge there being two channels, no mudsills were used.

Bridges of considerable size of this construction could be built before a piledriver could be rigged up, especially where it was difficult to get a piledriver up to the bridge site. Canal crossings presented ideal conditions for framed bents, especially at locks, where the bottoms were paved. Again, when a stone or brick arch bridge was demolished it was usually possible to get good footings on top of the débris, though often a moderate flood would wash away enough of the smaller particles of débris, to undermine the supports.

Not until the last days of active operations could the American engineers secure any standard bridge timbers at the front; therefore, in most of the bridges, anything was used that could be procured, and often similar members in a given bridge were of different sizes.

Framed bents were used extensively by the British, with both timber and I-beam stringers. Their framing was much like what we are familiar with, except that they relied more on dogs for fastenings; these are mentioned separately farther on. As they also depended on timber and usually on framed-bent trestle construction for their railway bridges, it may be remarked as a matter of interest that they commonly made their stringers of 10 x 20-in., and posts and caps of 14 x 14-in. timbers. This was imported timber, and the sizes are much larger than can be obtained in France in any quantity. It will be recognized that the structures are needlessly heavy for the loads carried.

Timber Beam Bridges

For short spans—as very generally used for canal lock crossings—simple beam spans were used. With present-day loads the possible length of span is rather limited for this type.

Strutted Beams—The French generally used a strutted or braced beam for openings of more than 16 ft. This form was especially useful where the gap was rather deep and rigid abutments were available, as was the case not only at canal locks but also at demolished arch bridges and similar locations. In occasional cases the strutted-beam principle was successfully applied to spans of as much as 100 ft.; this involved, of course, the use of several sets of struts and beams. The type was most successful for spans up to about 35 ft. (11 m.). But even within the range of 30 to 35 ft. a sectional steel bridge could be erected more quickly.

Typical details of A. E. F. practice in wood-bridge construction are given by sketches in Plate II. As here shown, all structures were designed for one-way traffic. For two-way traffic two bridges were built side by side or the bents built wider than shown.

Approximately 2½ miles of bridging materials for standard timber-bridge construction, with caps and sills all bored for driftbolts, was on hand at Is-sur-Tille and was shipped to Abainville during October, 1918. Due to circumstances, very little of this material reached the front in time to be used, and the bridges of the Meuse-Argonne offensive had to be constructed of any materials that could be found on the spot.

Timber-Truss Bridges—Wooden trusses were very little used. The American Army used none whatever in its advance operations, and only two or three in its work farther back from the fighting area. Other armies built a few. The type is not of very much value, because of difficulties of fabrication and the practical impossibility of obtaining the proper hardware.

To be continued

Bituminous Paving of Railway Crossings

REDUCTION in cost and maintenance of railway crossings of streets and highways, together with conservation in the consumption of lumber and less liability of heaving of the roadbed by frost, are advantages urged for the use of oiled stone and bituminous macadam instead of the usual planking.

This construction is recommended in a committee report presented at the annual meeting of the Roadmasters' and Maintenance-of-Way Association, in Chicago, Sept, 16—18. It is estimated roughly that highway crossings represent about 76,800,000 ft. b.m. of lumber, independent of street and farm crossings. Preparatory to the paving, the ballast must be cleaned out to 2 in. below the bottom of ties for the full width of the crossing and 2 ft. outside of the outer rails; the rail jonts are to be bonded, the rails painted with asphalt under the base and up to the underside of rail head; tie renewals and drainage are to receive attention, and the track put in good line and surface. It is recommended that rail joints within the length of the crossing should be eliminated if possible.

Three methods of paving are proposed: In the first, a mixture of hot asphalt and ½-in. stone is packed and tamped around the rails for a width of 8 in. on each side, the interior space being then filled with stone ballast up to the underside of the rail head, and well rolled or tamped. Fine stone is filled in to the level of the tops of the rails, road oil being sprinkled freely as the stone is placed, and the surface is finished by rolling and sprinkling. By the second method, the asphaltic mixture along the rails is only 4 in. wide, while bituminous material is poured with the ballast filling and the ½-in. stone surfacing. In the third method, stone ballast is filled and packed between the rails up to their heads. On this is laid a bituminous macadam composed of clean gravel or stone screenings up to ½-in. size and a 2:1 emulsion of road oil and water. Two gallons of this mixture are used for 1 cu.yd. of stone. Traffic should be kept off for 24 hours, but if this is not possible the crossing should be watched and any ruts or patches smoothed out, until the material has hardened. Where paved crossings need only surfacing, about 2 in. of the old material may be removed and this bituminous macadam substituted.

The costs per crossings are given as follows, at 1918 prices, but the length of the crossing is not specified:

	Double-Track Crossing	Single-Track Crossing
1. Stone and road oil	$25.45	$11.95
2. Stone and bituminous	16.25	6.55
3. Stone and bituminous macadam	29.45	13.95
4. Planking	56.00	25.00

Economics of Railway Maintenance and Track Labor

Higher Pay and Permanent Employment Secure Better Men and Better Work—Wider Use of Machinery—Budget System

RAILWAY-MAINTENANCE work will benefit materially from the increased wages of section foremen and laborers, for under the new conditions it will be possible to attract and hold men of a higher grade. But with such an improved force, permanent instead of seasonal employment is highly desirable, while better housing and living conditions are imperative. Increased unit cost of labor will be an added inducement for the wider use of labor-saving appliances of a class that can be entrusted safely to men of the grade that may now be employed. This summarizes the opinions expressed by Charles A. Morse, chief engineer of the Chicago, Rock Island & Pacific R.R., in an address at the recent convention of the Roadmasters' and Maintenance-of-Way Association, in Chicago.

With the low wages formerly paid to section men, the railways obtained the poorest class of labor, except in the country districts, while a large proportion were foreigners who could not speak English. As they came to understand the work and the language, they drifted into other employment that offered higher pay, with the result that track labor was always more or less inefficient and afforded little material from which to select foremen. Mr. Morse considers it a good thing that changes must come under present conditions, as they will result in advantage to the railways as well as the men.

A budget system for each roadmaster's division, and subdivided for the foreman's sections, was advocated by Mr. Morse. This should cover the expense for four classes of work: (1) Minimum organization to maintain track, not including tie renewals; (2) additional seasonal help for mowing right-of-way and renewing ties; (3) additional help for improvements that will cheapen future maintenance cost, such as widening cuts and fills and cutting ditches; (4) exceptional expense due to storms, wrecks and snow removal. This last item should be based on average expenses for this class of work during the past five years, but revised to suit present prices of labor and materials.

The economic value of treated ties was also discussed, showing that they effect savings in three ways: In cost of material, in cost of renewals and in the lessened disturbance of track by renewals.

Concerning permanent employment of track men, Mr. Morse pointed out its advantages in keeping men who are skilled in the work and in attracting a better class of men who are looking for an opportunity to establish homes. Four men throughout the year will cost no more than two men for six months and six men for two months, and probably the track will be kept in better condition by the permanent gang. The former practice of employing large, temporary, extra gangs for occasional and special work was due to both the cheapness and inefficiency of the labor obtainable. Much work, such as the relaying of rails, can be done through the winter by grouping two or more section gangs, the general use of motor cars making this practicable without much loss of time. With rail-laying machines, ballast-distributing cars, ditching machines and similar appliances, the necessity for very large gangs will be eliminated to a considerable extent.

Finally, Mr. Morse urged the advantage of inducing and encouraging men to save a part of their earnings, a practice which will benefit not only the men themselves but the community and the nation. He recommended particularly the use of building and loan associations for their investments; associations of this kind have been established by some railroads for this particular purpose.

The Michigan Engineers' Registration Law

BETWEEN now and Jan. 1, 1920, engineers and surveyors wishing to practice in Michigan will have to satisfy the recently created state examining board that they have the requisite qualifications, as provided by the new registration law.

After Mar. 1, 1920, neither the state nor any of its minor civil divisions may construct or maintain public works for which plans, specifications and estimates have not been made by a registered architect or engineer, and no city or village plot shall be received for record that has not been prepared and signed by a registered engineer and surveyor.

Engineers and surveyors now practicing in Michigan, if citizens of that state, can readily secure certificates up to Jan. 1 on the basis of their existing status, but the case is so different for nonresidents that they may wish to look into the matter well in advance. They will be primarily concerned with Sec. 13 and 14, but for their convenience other sections bearing on registration are also quoted below:

1. Any person who represents himself to be an architect or as an engineer, or as a surveyor in any of the branches hereinafter mentioned, in the State of Michigan, shall be registered as hereinafter provided. Nothing in this act shall be construed to prevent any person, firm or corporation from preparing plans and specifications for buildings to be erected by themselves.

2. Any person who shall have been qualified in this state to use the title "registered architect" before this act takes effect shall be considered as registered under this act. Any citizen of the State of Michigan who shall have been engaged as an engineer or surveyor as a principal, or in the responsible charge or design or supervision of engineering works for not less than two years before this act goes into effect, shall be granted a certificate authorizing him to use the title of the branch of engineering in which he has been so engaged.

13. Any citizen of the United States of legal age and of good moral character, who has had not less than six years of practical experience in architectural or engineering work or surveying under the direction or supervision of a registered architect or a registered engineer or a registered surveyor, or of an architect or engineer or surveyor of equivalent professional standing, or who is a graduate in architecture or engineering of a college or school of recognized standing, and who has had not less than two years of such experience under like conditions, who desires to begin the practice of architecture or engineering or surveying as a principal or in responsible charge of such work, may, upon the payment of a fee of $5, apply for examination for a certificate under this act, and before receiving such certificate shall satisfactorily pass an examination in the English language and in such other appropriate subjects as are established by the board, and satisfy it as to his practical experience and general standing and ability; and shall pay the fee hereinafter provided for the certificate of registration. Provided, that time spent as a student of architecture or engineering in a college or school of recognized

standing shall be considered the equivalent of an equal amount of practical experience.

14. The board shall register architects and engineers of other states and of foreign countries to engage as principals, in the practice of architecture and engineering within the State of Michigan, when they are recognized as consulting specialists in some branch of their profession and have had at least 10 years of experience as such, or when they present credentials showing that they have qualified for such work under equivalent laws of their own states or Governments and are still in good standing thereunder. Provided, that such laws extend similar privileges to registrants under this act.

19. After Mar. 1, 1920, neither the state, nor any county, township, municipality or village, shall engage in the construction or maintenance of any public work of an architectural or engineering character, for which construction or maintenance the plans, specifications and estimates shall not have been prepared by a registered architect or a registered engineer under this act with qualifications appertaining to such work and the construction of which is not supervised by such a registered architect or registered engineer. Provided, that nothing in this section shall be held to apply to items of maintenance, repair or construction wherein the contemplated expenditure for the completed project does not exceed $2000.

20. After Mar. 1, 1920, no city or village plat, or plat of an addition thereto or of a subdivision thereof, or any plat dividing land into streets, lots or blocks, shall be received for record, which has not been prepared by a registered engineer or a registered surveyor and signed by him as such.

Pile Foundations for Unequal Load Distribution

Design Based Upon Analysis to Insure That Each Pile Will Sustain the Same Total Safe Load by Proper Spacing

By Edwin P. Arneson
Irrigation and Structural Engineer, Washington, D. C.

THE typical retaining wall or dam delivers to its foundation a resultant falling in the vicinity of the outer third point of its base, causing unit pressures on the latter varying from 0 or more at the heel to twice the average unit pressure or less at the toe. When such structures are supported on piles it is essential that the latter be located so that each may take no more than its specified safe load. The formula and method which follow will facilitate accurate and rapid designing of pile foundations of this class.

In Fig. 1, let d be the base width of the wall, S_1

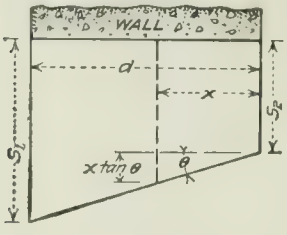


FIG. 1. TRAPEZOID OF PRESSURE

the unit pressure at the heel and S_2 the unit pressure at the toe, due to forces acting on the wall throughout a length equal to the distance center to center of pile bents or rows. Thus is defined the well-known trapezoid of pressure, the area of which represents the total load on the foundation. Ascertain the number of piles required, by dividing the total load by the safe load per pile. The piles must be distributed throughout the foundation in such positions that the axis of each pile will pass through the center of gravity of a small trapezoid whose area equals the safe load per pile (Fig. 2).

The problem now consists in dividing the trapezoid

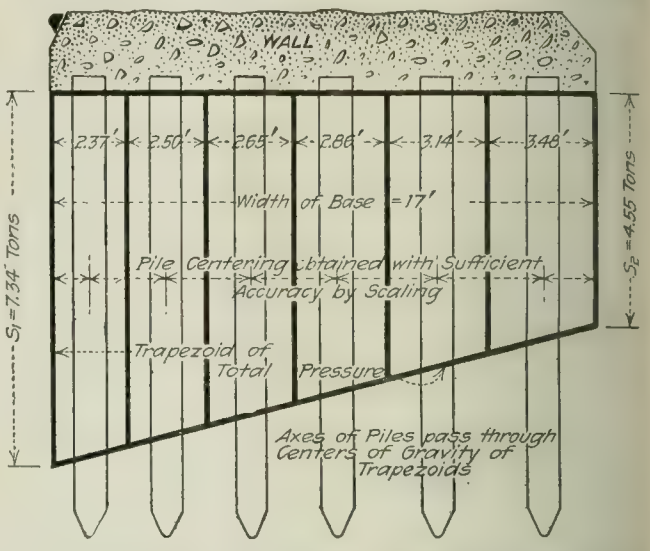


FIG. 2. METHOD OF FINDING DISTRIBUTION OF PILES

of pressure into a given number of vertical trapezoidal strips equivalent in area.

Let

A = Area of trapezoid of total pressure to be subdivided;

A_1 = Area of all equivalent vertical strips included in any width x;

x = Width of one or more equivalent vertical strips measured from heel;

$$\tan \theta = \frac{S_1 - S_2}{d}$$

$$\frac{A_1}{A} = k, \text{ a fraction.}$$

After writing out expressions for A_1 and A and placing them in the last equation above there can be found:

$$x = \frac{\sqrt{4S^2{}_2 + k[4d(S_1 + S_2)\tan \theta]} - 2S_2}{2 \tan \theta}$$

That this formula is not so formidable as it looks will be seen in the example worked out below. The procedure is: Find x for the strip nearest the heel; then find x for the two strips nearest the heel; subtract the first result from the latter to obtain the width of the second strip, and so on until the widths of all are obtained. The centers of gravity of the various trapezoidal strips so found determine the locations of the piles.

To illustrate the operations, a pile foundation will be designed for the following conditions (Fig. 2): Base width, 17 ft.; unit pressure at toe, 7.34 tons and that at heel, 4.55 tons; total pressure on foundation per pile bent, 101.11 tons; safe load per pile 17 tons, hence six piles are required; tan θ is 0.164. The formula for these conditions becomes

$$x = \frac{\sqrt{82.80 + 132.69k} - 9.10}{0.328}$$

Solving this equation for the various widths of the

six equivalent vertical strips, 16.85 tons each in area, the figures in the following table result:

Strip Numbered from Heel	h	x Measured From Heel Feet	Width Excess of Corresponding Value of x over Preceding Feet	Area of Strip For Check Tons
1	⅙	3.48	3.48	16.82
2	⅙	6.62	3.14	16.89
3	⅙	9.48	2.86	16.79
4	⅙	12.13	2.65	16.75
5	⅙	14.63	2.50	16.86
6	⅙	17.00	2.37	16.94
Total for check				101.05

Is Beam Strength the Important Item in Brick Roads?

Valuations of Theory Must be Weighed by Experience and Practical Application—Practice Shows Beam Strength Not Essential

By Will P. Blair
Vice-President of the National Paving-Brick Manufacturers' Association

CONSTRUCTION of all roads of whatever type, in such manner, method or design as will afford the greatest economy in use and conserve most completely the expenditure therefor, is or should be a most vital concern to the people of the country at this time. Neither theoretical enthusiasm nor the energy of commercial interest should be allowed undue influence in selection, and all the evidence available should be considered when a road design is to be made. Satisfactory highway surfacings of brick, with little beam strength, have been built throughout the country, and this experience should not be ignored.

Laboratory effort is to be commended and weight must be given to the data secured. Without the aid of such data, progress by experiment would indeed have a long road to travel. The producer and manufacturer, in efforts to obtain quality, cannot afford to place his sole reliance on the unit of his production. He must understand something of its behavior in practical use, so as to conform quality to practicability. Neither can laboratory conclusions be solely relied upon. What seems to sustain an assurance must stand the test of experience and reason before complete confidence can be placed.

Laboratory and Field Conditions Not the Same

It is well recognized that no laboratory data are attainable which embrace all the influences which surround materials in practical use. In the field of experience, covering the behavior of brick roads, we can find that which will greatly assist in conserving expenditures and attaining economy in the use of vitrified brick for highways. Vitrified-brick pavement possesses an inherent unit value of superior resistance to abrasion, but no hard and fast rule is justifiable for specifications for such pavement. Brick lend themselves to the variable road-building conditions. If held in place in the pavement, their superior value as to wearing surface may be realized. It is only necessary to place the brick so that they will perform their function economically.

Extreme conditions, such as plastic soils, those impossible of drainage, hillside, hazard of overflow, etc., impose necessarily expensive treatment. But elimination of expense, without lowering the value of the pavement in any degree, is made quite possible in the case of conditions which prevail throughout a vast proportion of the highway mileage awaiting improvement.

Conditions in some localities require very expensive foundations for buildings, but it would not be good engineering to put expensive foundations under all buildings over an entire state. Throughout the greatest portion of the country they are not needed. It is only by the recognition of this principle that the taxpayers' money can be conserved and the country's ability to improve the roads now demanded can be made possible. In the use of brick a parity of relationship in the cost of construction to the traffic to be borne is likewise possible. In other words, brick are adaptable for light-, medium- or heavy-traffic roads, and the cost for each may be regulated accordingly. In each case the greatest economy is attained by including no more than is necessary for the type.

It is contended by some that slab or beam strength is an all-important factor in the worth of a brick road. They regard it so highly that they attach an extraordinary value to the fraction of the balance that measures the difference between one character of construction and another. For this reason they discriminate in their specifications in favor of the slight advantage (if any) for slab strength, in total disregard of an excessive cost. It is an unreasonable position to take—to pay so much for so little in value. If such a position is to direct the vast expenditure in road building, one can readily see a great sacrifice of money in the coming years.

Effect of Varied Conditions on the Slab

But, after all, does the rigid slab for which contention is made supply the function most wanted and, in the end, conserve economy? Bearing in mind that our laboratory data on beam strength only consist of the measured results of dead weight applied to the slab, in practice, we have dead weight, impact, abrasion, intermittent temperatures, water, frost, and all the strains which follow these influences. We have but little, indeed, of laboratory data upon these various elements of road behavior. We must rely, therefore, for study and conclusion on the great field of experience and observation now available, through the long use of vitrified brick for paving, and on the study of the varied methods of installation as well as the variable climatic and other influences to which they have been subjected.

What, therefore, is the behavior of the slab under these influences?

In the north, frost expands wet subgrades, and, regardless of the quality or thickness of the slab—be it from 1 to 12 in. in thickness—it breaks. Every careful observer of road behavior knows this to be a fact, and that it occurs with great frequency. A wide extent of visible cracks further establishes the insufficiency of any slab strength hitherto employed. They know, too, that the chief remedy against injury is not increased thickness, but a dry subgrade condition or absence of frost action.

Of expansion due to high temperature we know but little, nor do we know the exact relation of moisture and heat in their influence in setting up internal strains in concrete. We do know that it results in injury, regardless of the thickness or the richness of the mix. Numerous instances are in evidence where the beam or slab of a brick pavement but 4 in. thick, entirely unsupported by contact with foundation of any sort, has

successfully withstood heavy traffic for a period of from 10 to 20 years.

The condition affording this observation arises from an expanded condition of the slab when its joints are filled with cement. Where rupture has occurred, it has been due to pressure from below and not from weight above. But it is not sound practice to rely on this strength alone. The tension may reach its limit, and rupture may follow. Undue importance in road construction cannot, therefore, he given to slab strength. There are other factors bearing relationship to these injurious causes which will lessen or obviate them. A better appreciation of the value of slab strength can be comprehended by a view of pavement behavior where least provision is made for that element.

Examples of Satisfactory Brick Pavements of Low Slab Strength

A brick pavement leading eastward from Mattoon, Ill., rests upon one course of common brick laid flat. The joints are sand-filled. A wooden curb was originally installed but disappeared long ago. The pavement retains its grade and, with the exception of a washout at one place, it has not needed repair. It was constructed in 1899.

The first five brick streets in the City of Anderson, Ind., built in 1893 and 1894, were founded on rolled gravel bases, and the joints were sand-filled. They have not been subject to repair from wear and tear, and only cuts and openings have caused depressions. Many streets constructed in like manner in South Bend, Ind., maintain their grade almost perfectly.

Seventy per cent. of the brick streets in Cleveland, Ohio, rest upon a natural earth foundation, and, whether they are sand, cement or bituminous-filled, the grade is maintained 80% as originally placed. On many streets where natural or artificial drainage obtains the surface is intact.

Years ago brick cross-walks were constructed in many cities and towns throughout the Middle West, biding the time when the streets might be better improved. Such walks were laid upon whatever soil existed. Where not displaced for further improvement, they remain undisturbed by the travel which has passed over them. Similar construction upon extremes of resilient subgrade may be found in many cities throughout Illinois, Indiana and Ohio. Brick roads built in this manner have given extraordinary service—life, cost of construction and maintenance all considered. Where injury and destruction have occurred in such pavements they are traceable to some inexcusable neglect in construction, such as in drainage, application of the filler or compacting of the base, but scarcely ever, if at all, to the traffic.

Rolled Stone and Slag Bases

Between the extremes of practically no foundation at all and a rigid one such as is sought in the use of concrete, 5 to 8 in. in depth, there is found a most convincing attainment of economy in brick-road construction. This method is by the use of a rolled broken stone or slag base. Approximately 65 miles of the National Road, extending westward from Wheeling, W. Va., to Zanesville, Ohio, are brick-paved. Sections of this road are built upon a rolled base of crushed brick-bats. Other sections are built upon a rolled slag base, and the remaining sections are built upon a base of rolled sandstone.

The road was carefully inspected recently by a number of engineers, in company with the writer. Not more than a half-dozen depressions below the grade were discovered in its entire length, and these were but slight indeed. Much of this mileage has been in use for more than five years. Both cement and bituminous fillers were used.

South Sixth St., Terre Haute, Ind., is built upon a broken stone base and has been in use for 27 years, without a single depression.

Around the court-house square at Lebanon, Ind., and on the street leading thence to the railroad depots, similar brick pavements constructed more than 20 years ago are without a single repair; and present a splendid surface and grade.

The brick-paved roads in Mahoning County, Ohio, of which there are more than 100 miles and which were constructed under the supervision of Ett Smith, engineer, furnish most valuable examples of the worth of brick laid upon old macadam, rolled stone or slag bases. A careful inspection of these roads clearly demonstrates the economy of this kind of construction. One of them, known as Inter-County Highway No. 82, is 10 years old. The base consists of rolled slag. The joints of the brick are sand-filled. Over this road passed all the heavy Army trucking from the Northwest. It has not been subject to any repair whatever. The rolled-stone base in connection with the use of the bituminous fillers such as have been developed and used for the past five years in the West, which possess extraordinary adhesive qualities, do not flow in warm weather or become brittle in cold weather, insures an economic durability which can scarcely be surpassed.

Proper design and care in construction are equally important, but more failures are due to neglect in construction than to other causes. Not less attention in other directions, but greater efficiency in supervising construction, is a crying need. Conditions surrounding road building are many and variable; economy and service must be the goal. No single cure-all, however plausible, can be applied. Adequate ingenuity, skill and sound judgment are required for the best attainment.

Cost of Railway Ditching

Different methods of cleaning railway ditches and the costs of these methods at 1918 prices are given in a committee report presented at the recent annual meeting of the Roadmasters' and Maintenance-of-Way Association in Chicago. The figures are for work on single track with six trains during working hours, the roadbed being in soft clay and the ditches being 3 ft. wide, 2 ft. deep and 7 ft. from the rails.

		Cubic Yards per Day	Cents per Cubic Yard
1.	Ditcher of steam-shovel type, on cars; ditch labor, $18,90; work-train labor, $28.36; rental of equipment, $31; maintenance, $1.45; supplies, $12.80; total $92.51	224	41.30
2.	Steam ditcher of drag-scraper type; ditch labor, $31.75; work-train labor, $28.36; rental, $30; maintenance, $0.93; supplies, $10.62; total, $101.66	252	40.34
3.	Push cars (2); 1 foreman at $83, $2.77; 11 laborers at $2.25, $19.80, total $22.57	38½	58 62
4.	Car barrows: 1 foreman, $2.77; 4 laborers, $7.20; total $9.97	13	76 70
5.	Wheelbarrows: 1 foreman, $2.77; 6 laborers, $10.80, total $13.57	19	71 42
6.	Casting or shoveling: 1 foreman, $2.77; 6 laborers, $10.80; total, $13.57	38½	35 25

Methods Used by Germany in Overcoming Tire Shortage

Steel Bands Cushioned by Wood, Rubber and Steel Springs Utilized—Asphalt Composition and Jelly-Filled Shoes

By H. M. Kistler
Captain, Infantry, United States Army

MANY expedients were employed by the German Army during the war to overcome the rubber-tire shortage. Among them were bands of steel cushioned by wood, rubber and steel springs, and asphalt-composition tire. Utilization of old tire shoes by pumping them full of a substance similar to jelly was also tried. As early as 1916, Germany found herself in need of rubber for auto tires. She had no reserve and was cut off from all sources of supply. She issued an order that all individuals and organizations possessed of bicycles, automobiles, or trucks should immediately present the tires to the Government for purchase, unless they could prove to the satisfaction of the officials that the surrender of the tires and the storing of the machines would seriously cripple their businesses. The interpretation of this order was strict, and pleasure cars became luxuries unknown. While this order helped the situation, yet Germany was compelled to use her ingenuity to supply the tires she required.

The accompanying illustrations show a few of the substitutions which may be seen in Berlin and throughout Germany today. In a way they served their purpose; the chauffeurs have not been arrested for noisy driving; and when a machine was completely knocked to pieces, it was junked. Germany's automobiles were and are still expensive necessities.

Practically plain steel tires were used on some of the trucks. A steel band 1½ x 4 in. is held on the wheel by means of wooden boards curved under steam and pressure. The wood is designed to absorb a little of the vibration; perhaps it does. The machine, however, gets its full share, and anyone who happens to be near has the full benefit, also.

In Fig. 1 are shown two other types. The front wheels are equipped with spring tires. The ends of the

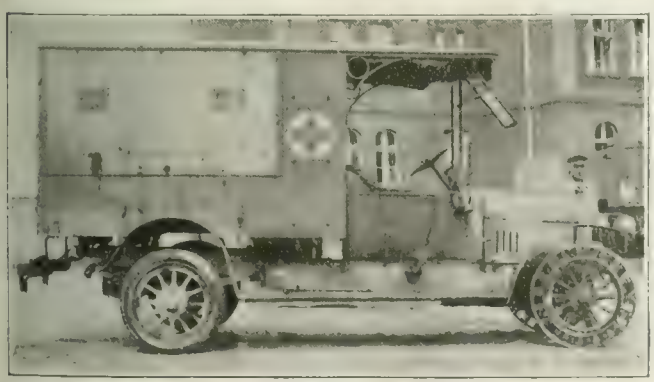


FIG. 1. STEEL SPRING TIRES IN FRONT AND JELLY-FILLED SHOES AT REAR

springs are fastened to the rim, and are immediately surrounded by a ¼ x 3-in. steel band into which they are fitted. This band holds them in place while a similar band is added for strength. This substitute is heavy and noisy, but travels with surprisingly little vibration. On the rear wheels are old shoes which have been overhauled and faced with steel rivet studded leather. After the shoes are mounted on the rims they are pumped full of a substance the drivers call "marmalade" or jelly. No tubes are used. This travels much like a solid tire. Its chief fault lies in the fact that, after being driven several hours, the marmalade becomes hot and runs out over the rim. The tire must then be replaced until it can be refilled in the workshop.

The front tires shown in Fig. 2 are similar to those in Fig. 1, except that solid-rubber blocks are used in



FIG. 2. RUBBER SPRING TIRES IN FRONT AND ASPHALT COMPOSITION ON REAR WHEELS

place of the springs. The rubber blocks are fitted into and held in place by cast-iron cups secured to the rim and band. The tires on the rear wheels have all the appearance of solid rubber, but are of asphalt. They perform their mission well, and make a fair substitution for solid rubber.

Fig. 3 shows a bicycle equipped with a type of tire which is seen less frequently as rubber is beginning to arrive. Toward the close of the war the Army issued such bicycles to its troops. It runs noisily but fairly



FIG. 3. BICYCLE WITH OPEN SPRING TIRES

lightly on sandy roads or paved streets, but is practically useless in clayey country.

Other types are to be seen throughout the country, but they follow the same principles. None functions as rubber. Suffice it to say that, if there is a real substitute for rubber in tires, Germany lacked either the men or the means to produce it in her hour of greatest need.

French Airship Sheds Built of Framed Concrete

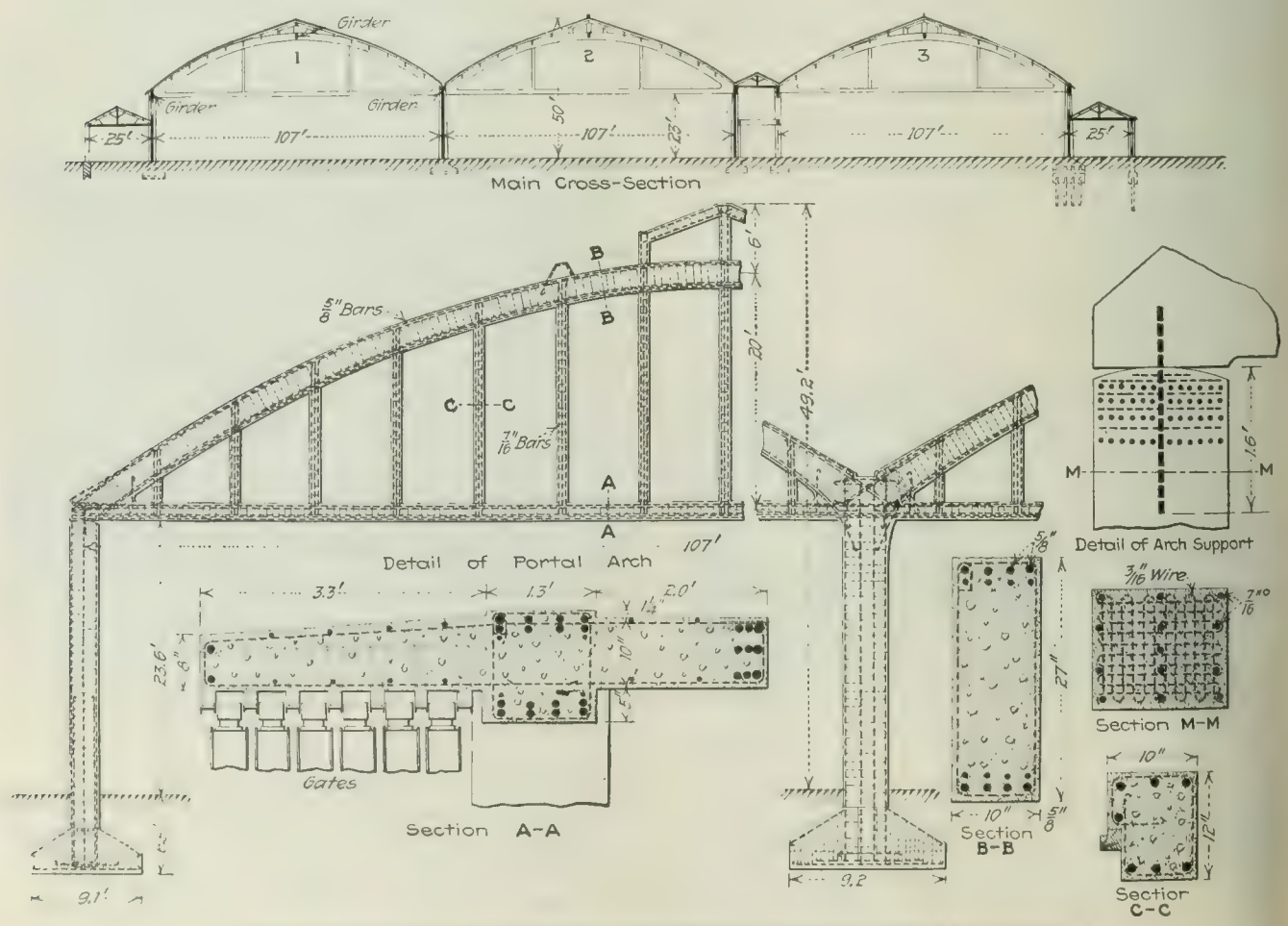
Both Arch Truss and Three-Hinged Arch Ribs Used as Roof Which Is Supported on Light Framed Side Posts

LARGE sheds to house airships are coming into general use. They constitute a somewhat new demand on the art of structural engineering, for while they resemble in their general outlines the familiar armory roof, they require somewhat less architectural quality, and there is every prospect of their running to much greater sizes than have hitherto been used in armories. The large dirigibles projected by the various governments approach 1000 ft. in length, and as economy suggests a roof to hold two such balloons, the width must be well over 300 ft. Difficulties of landing and launching, apparently, also require the height be around 200 ft. The French Navy, for instance, has already adopted a design for a shed 723 ft. long, 360 ft. wide, and 174 ft. high, while the United States Navy has under construction at Lakehurst, N. J., a shed of similar gigantic proportions.

In France, during the war, some of these sheds were built of reinforced concrete because of the shortage in steel. In fact, the large shed noted in the preceding paragraph is of reinforced-concrete design. There was built a shed of similar outline but smaller dimensions at Montebourg, in France, which was only designed to hold one dirigible. This shed, the design of which is described herewith, is 493 ft. long, has an open width of 80 ft. and a height to the under side of the roof of 100 ft. It consists of three-hinged arch ribs supported at a height of 61 ft. from the ground on triangular vertical bents. Another reinforced-concrete shed was built for planes by the French Government in Algiers during the war. This was in three bays each 107 ft. wide, with a clear height of 23 ft., and with a roof consisting of a tied or restrained arch resting freely on the columns.

The Montebourg shed, designed by the French engineer Henry Lossier, has the main framework—that is, the triangular vertical bents and the arch ribs—of concrete poured in forms in place, while the roof consists of reinforced-concrete precast purlins carrying reinforced-concrete precast tile. The arch ribs are spaced 20.5 ft. c. to c. Each rib is to the theoretical equilibrium curve so that the pressure keeps within the middle third under all conditions of load and wind pressure. The rib section is 30 x 13 in., and is reinforced with twelve $\frac{7}{16}$-in. rods with $\frac{1}{2}$-in. stirrups, as shown. Six of the main rods continue for the whole length of the semi-arch ribs, the other six are turned with the curved ends at various points along the rib, as shown in the drawing. The supporting bents are triangular trusses of the general dimensions shown in the drawing and rest on heavy concrete blocks set into the ground.

Crown and spring joints are of the type familiar to students of French concrete design as the Mesnager system. They consist of reduced sections of the continuous concrete shaft of the rib heavily reinforced in the section itself and with heavy rods crossing at

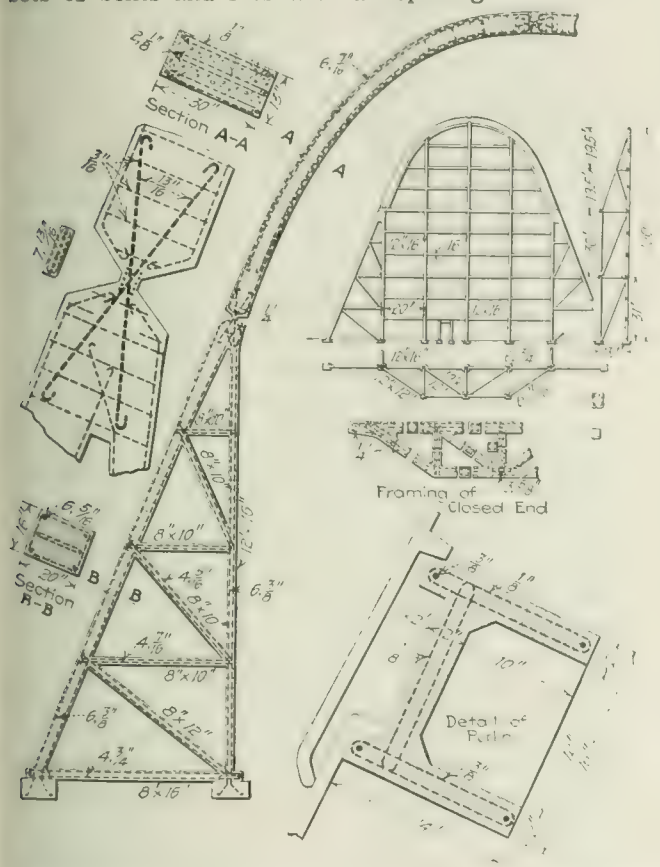


REINFORCED-CONCRETE SHEDS FOR FRENCH HYDROPLANES AT ALGIERS

the middle of the joint and extending up into the main shafts.

The purlins are of the channel section shown in the drawing and are precast concrete, reinforced with light rods, and of length sufficient to span the 24.5-ft. spacing of the ribs and bents. They have the reinforcement continued out beyond the concrete, and are placed in the forms of the frames during construction, the concrete being poured around them to complete the joints. Each channel purlin is braced at the third point with a cross-rib. Projecting lugs stick out towards the roof to engage lugs in the tile, as shown in the details.

The shed is divided into three parts of its length for expansion purposes. At these joints there are two sets of bents and ribs with an opening of 2 cm. and



REINFORCED-CONCRETE SHED FOR FRENCH DIRIGIBLES AT MONTEBOURG, FRANCE

an overlap of the roof tile. The entrance end of the shed is open and provided with a movable door, and the other end is closed by a wall—whether of concrete, tile or brick cannot be determined from the information at hand. At any rate, the main detail of the inclosure is a trussed vertical frame which holds the wall covering, and which is stable in itself to resist any wind pressure against the end of the shed, so that such pressure will not be transmitted into the main frames but will be taken up in the reaction of the trussed frame on its foundation. The movable steel gate or door is in two sections, one for each half of the shed. It is a self-supporting triangular vertical truss framing and moves independent of the shed itself on a solid-base platform on the ground, with wheel bases at the foot of the truss 43 ft. apart.

The Algiers sheds aer built for hydroplanes and therefore do not require as great height as the balloon sheds. The sheds numbered 1 and 2 on the drawing were first built, No. 3 being added after the others were completed. Each shed is 107 ft. wide and 132 ft. long, with a clear height to the bottom of the arch tie of 23.6 ft. Alongside are two subsidiary sheds 25 ft. wide with small truss roofs. The main part of these sheds are tied arches of reinforced concrete spaced 16 ft. c. to c. resting on reinforced-concrete columns with interposed spherical bearings, shown in the drawing, at the outside posts and with rigid connections at the inner posts. Longitudinal bracing is provided by stringers at the top of the posts and at the crown of the arch. For the portal arches the tie-beam is supported from 15 hangers placed at $\frac{2}{7}$ of the span from the end. As in the case of the larger shed, the purlins are of concrete, but the roof itself of wood, with frequent glass openings. The rear end of the shed is closed with a brick wall, but the front is open and has a rolling door supported as shown in the drawing on an extension of the end tie-rod of the arch. This shed was built under the direction of the Ponts et Chaussees. Both sheds are described in recent issues of *Le Génie Civil.*

Burnt-Clay Aggregate and Wood Reinforced Concrete

Scarcity of the usual materials for making reinforced concrete on some outlying work in British Guiana led L. P. Hodge, an engineer in that country, to investigate the possibility of burnt-clay aggregate instead of stone, and of wood instead of steel for reinforcement. The results of his studies are noted in London *Engineering* of Sept. 5, 1919. Unfortunately, they are not given in enough detail so that anything very definite can be deduced from them, except that wood-reinforced concrete with burnt-clay aggregate was successfully used in some bridge structures, even in some precast piles.

The clay used is what the author calls ordinary coast alluvium with the following analysis: Silica crystallized, 19.6%; silica combined, 34.7%; alluvium, 11.9%. This was burnt to clinker, and screened through a 1-in. mesh and retained on a $\frac{1}{4}$-in. mesh. It was used in a 1:2:4 concrete, with a British standard portland cement. The author assumes that the seven-day ultimate strength would be 1400 lb., and designed the concrete for 300 lb. per square inch. The wood used in reinforcement was of a local greenheart, with an ultimate tensile strength of 8800 lb. per square inch. It was used as reinforcement in pieces of about 1 x 2 in., and apparently was satisfactory in the tests. Seventy-two piles, 12 in. square, 25 ft. long, reinforced with two 2 x 2-in. corner wood rods, and two 2 x 3-in. corner wood rods, were driven in the bridge abutment through about 17 ft. of clay, about one month after casting. None failed or had to be recast. The piles were driven in the front and wing wall of an abutment, and the earth was retained against slabs of steel-reinforced burnt-clay aggregate concrete backing against the piles.

The author concludes that wood and clay in such use are satisfactory if no other materials can be obtained. The wood should be soaked at least 24 hours before being put into the concrete; otherwise it will tend to set up cracks.

Good Roads Without Great Debt In Bond Issues

New Iowa Law Provides Pay-As-You-Go Plan for 6278-Mile System of State Roads—Motor Vehicle Fees To Be Utilized

THOUGH today the mileage of paved roads in Iowa is negligible, the state plans to have within a decade, as the result of its preparation for quantity production, a hard-surfaced road system of over 6000 miles. This mileage will also have been built from current funds. The distribution of the improvement will be uniform. Each of the 99 counties will have a mileage in exact proportion to its area, and, counting both urban and rural population, fully 95% of the people will be able to reach a paved road by a journey not exceeding 1½ miles.

An act which became effective Apr. 19, 1919, establishes a system of primary and secondary roads and provides means for paving and otherwise improving both. The primary-road system has been located by the county engineers and revised by the engineers of the highway commission. It aggregates 6278 miles and connects every town and market place of 1000 inhabitants or more. The secondary system is composed of all the remaining roads—about 98,000 miles, in round figures.

The new law, in effect, substitutes primary roads and secondary roads for the old classification of county roads (16,000 miles) and township roads (88,000 miles). The 6278 miles of primary roads are the old county roads. The remaining 10,000 miles of old county roads are relegated to the secondary system. There are, then, primary roads, county secondary roads and township secondary roads. Administration of county and township road work is unchanged.

Initiation of Road Work Lies With Community

Initiation of primary road work lies with the community. No county may proceed with any paving project on any part of the primary system until the county at popular election shall sanction the general policy of hard-surfacing its roads. Once the people have voted for hard roads, the county road supervisors proceed on such program as they determine. Provision for paving secondary roads is made by authorizing the establishment of an improvement district by the county supervisors upon petition of 20% of the land owners.

The fund for paving primary roads comes (1) from Federal-aid allotments; (2) from motor-vehicle license fees, and (3) from special assessments against benefited property. The Federal-aid and automobile license funds are apportioned to the 99 counties according to area. Each county, however, does not receive its share annually. Instead, based on computations of the amount of Federal money coming to the state for the period covered by the Federal-aid allotments, and an estimate of the probable motor-vehicle license fees for the same period, the total due each county from both sources is estimated. Taking turns, the counties receive their full allotments in lump sums, and pave their primary roads all as one project. To their allotted funds the counties add as the work progresses the special assessment of 25% of the cost against benefited property. If a county does not care to postpone paving until its turn comes to receive its allotment of primary road money, it can issue 15-year, 5% bonds to the estimated amount, and use its allotment, when received, to retire these bonds.

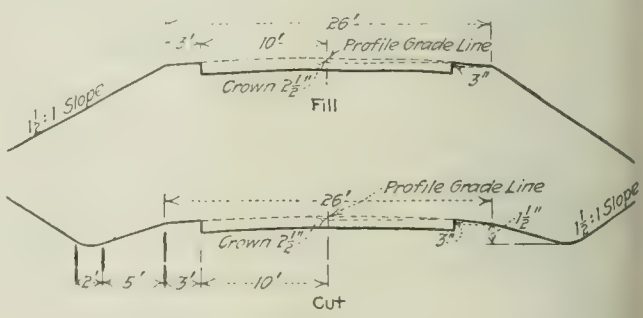
For paving portions of the secondary road system, the county supervisors, at discretion, upon petition of 20% of the land owners, create paving districts. If the district is on a county road, the county road cash fund pays 75% and the property benefited pays 25%; if it is on a township road the county pays 25%, the township 50% and the property 25%. Townships are helped in the matter of road funds for this and other township road purposes by a two-mill extra levy on all property, both rural and city.

Estimates indicate that the funds from motor-vehicle licenses and from Federal aid for paving primary road will in 1920 amount to about $8,000,000, and a large sum will accrue each succeeding year. These sums spent in permanent paving do not curtail the amounts which have been available in the past for normal county and township construction and maintenance. The original funds are hardly touched for the primary road work, while the original mileage is reduced to the extent of the primary road mileage, and, in addition, there is the extra two-mill tax for construction and a new one-mill tax on all property for maintaining township roads.

Paved road construction begins with an asset consisting of the permanent construction performed under the law of 1913. At the end of 1918 about 2900 miles of road had been completed to permanent grade—that is, to standard line, gradient and curvature and to full width and cross-section, with all drainage work and bridges and culverts complete. Of this 2900 miles perhaps 2000 miles are on the primary road system of 6300 miles. With the crown scraped down and the subgrade shaped, this mileage is ready for the paving gang.

Another considerable portion of the primary mileage has been brought to temporary grade and has many of its permanent bridges and structures completed. Besides this preparation physically for quantity production of paved roads, a comprehensive organization has been completed and trained for the technical direction of the work. On Aug. 1, 1919, fifteen counties had held elections on resolutions to pave their primary roads and 13 had voted for paving.

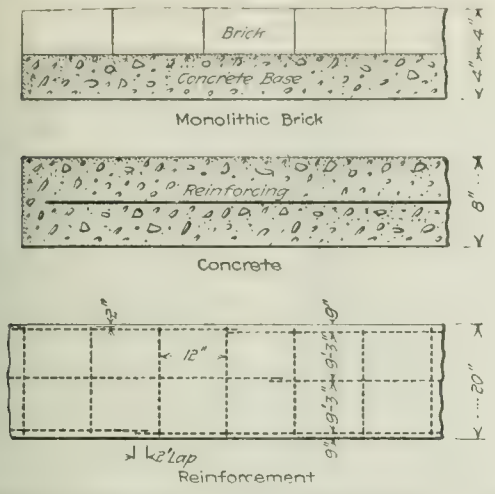
Standards for paving have not been finally adopted in detail. The diagrams herewith show typical sections in cut and in fill of paved roads, and these sections will



EXAMPLES OF PAVEMENT CONSTRUCTION

doubtless be closely followed. Widths of paving will extend upwards from 16 ft. Examples of brick and concrete pavement designed for a specific project are illustrated. The striking feature is the reinforcement of the concrete design at the center of the slab. This

reinforcement consists of ½-in. square bars, and is introduced chiefly to prevent cracking. Practice in respect to concree materials, proPortions, consistency,



TYPICAL SECTIONS OF PRIMARY PAVED ROADS

and methods of placing and finishing conform to general practice. Dry concrete has not been adopted.

Control of New Streets in Relation to Extension of Water Mains

By Bertram Brewer
Assistant Engineer, State Department of Health, Boston, Mass.

THE interesting discussion at the March meeting of the New England Water Works Association this year on the subject of financing the extensions of water mains, especially with reference to the possibility of special assessments on the abutters, suggested to the writer another problem connected with this particular branch of water-works activities. Neither the possession of the money nor satisfactory means for procuring it necessarily secures a proper street to build in. Both suitable conditions and a suitable location may be lacking. Very likely the street lines are not so marked on the ground as to make it possible to locate properly the new pipe line and the new surface fixtures.

While it is often very difficult to determine whether the public's money ought to be spent in laying water mains in these doubtful street developments, the question has a larger aspect in that it has to do with the orderly and reasonable development of the whole municipality—the town or city plan. It seems to the writer that the official in charge of the water department can exercise an exceedingly important influence in acutally making operative the town or city plan, because it is usually he who, by placing water pipe in a new street, first gives public sanction to its layout.

The initial control of new street development, so far as such control has been exercised, has, in Massachusetts, been delegated to an official body called the Board of Survey, a name that was adopted by the City of Boston in a law passed by the General Court in 1891 (Chap. 323) when a Board of Survey was established for that city under the able leadership of Ex-Mayor Nathan Matthews.

Briefly stated, the Boston law provided that either through the initiative of the Board of Survey or by petition of those developing land, all prospective streets must receive official sanction. Following is a condensed statement of some of the permanent interests of the whole community which are covered by this and later Board of Survey laws: [Now adoptable on option by any city or town in the state.—Editor]:

1. A plan, sufficiently accurate and complete so that the exact boundaries of the street can be easily reproduced at any time, must be permanently filed with the public records.

2. This official plan must show a final and reasonable street grade, also capable of reproduction at any time.

3. Due attention must be given to good connections with existing highways, as well as to an intelligent provision for future thoroughfares, all to be secured at a minimum of cost consistent with the conservation of the natural advantages of the entire district for home sites, factory sites, public uses or otherwise, as the case may be.

4. The development must be such as will provide a good system of sewerage and drainage for the district to be laid out, as well as suitable connections with the systems in the contiguous territory.

5. The new layout must accord with a reasonable development of the water-works system with due regard to cost, accessibility and circulation.

Sec. 9 of the Boston law of 1891 attempted to prevent building within the boundaries of a street approved by the Board of Survey, or at a grade other than one that would accord with the grade shown on the official plans. The courts declared this unconstitutional in that it took away certain individual rights without adequate compensation.

An act passed in 1918 (Chap. 110), applicable to towns only, appears to give to the proper authorities the right to establish formally the lines of Board of Survey streets without compelling their immediate construction. It prohibits new building within the lines of such streets, and provides for the payment of damages. It seems to the writer that its provisions and application are somewhat indefinite and might involve a town in two damage payments, one when the Board of Survey street lines were established by the town and another when the time came for constructing the street.

The author would suggest that while it is a fact that thus far the Government of this country has been wisely built upon the rights of each individual to hold and transmit private property, it would seem that the roads are in a peculiar class. It is certain that just as soon as a street is laid out on paper and lots are sold abutting upon it, certain public works, especially the water-supply, are demanded and the street is started on a course which insures its becoming in time practically the property of the public. Is it not, then, perfectly reasonable for that public to have some choice as to what kind of property is to come into its possession? It would seem that this peculiarity, ultimate and certain public ownership, puts the new street in a class by itself when it comes to public control over its alignment and grade.

The author believes that a scheme of control is in the process of making, a control that will ultimately eliminate the uncertainties that confront the water-works officials when they undertake to extend water-works pipe lines into private and unaccepted streets. Can your help be enlisted?

Electric Hoists Pull 3000-Ton Building 450 Feet

Ingenious Arrangement of Pulling Cables Enables Three Hoists to Apply Even Pull on Concrete Building at Twelve Points

BY A special arrangement of pulling lines, three 90-hp. electric hoists moved a three-story reinforced-concrete and brick building at the rate of 50 ft. a day, in clearing the site for the new $10,000,000 building of the General Motor Corporation in Detroit, Mich. The total distance traveled was 450 ft. from the old foundations across a street to new foundations prepared in advance. The building measured 60 x 95 ft. and weighed 3000 tons. In preparation, the four walls and 12 interior columns had to be cut clear of the footings and then the whole structure had to be raised 3 ft. vertically. The moving was performed while the building was occupied for its regular uses, and without interrupting telephone, light or power service.

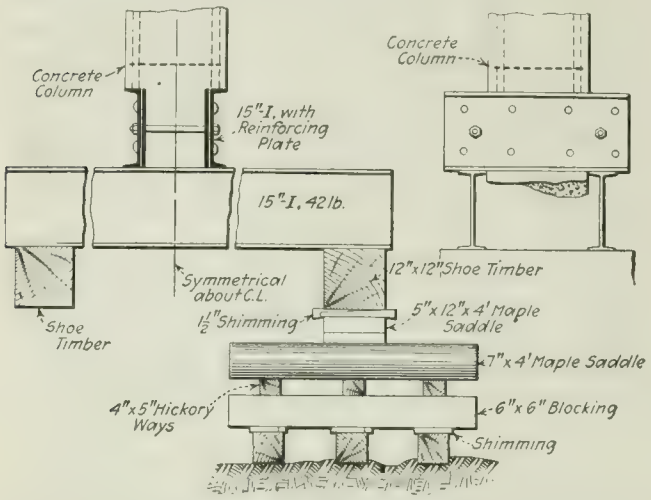


FIG. 1. INTERIOR COLUMN SUPPORT ON MOVING RUNS

Technically the operation presents two features: (1) Mounting the several supporting elements of the structure stably on the moving platform, and (2) applying the pull, by means of wire cables, of three power units, evenly and uniformly along the 95-ft. dimension of the moving platform.

About one-third of the weight of the building was carried by 12 interior concrete columns from 20 in. to 22½ in. in diameter. Each column was cut free and mounted as shown by Fig. 1. The channel clamp, I-beams and shoe timbers were placed and jacks were put under the shoe timbers. At the same time the walls were underpinned with needles, I-beams and shoe timbers, as shown by the view, Fig. 2, and jacks put under the shoe timbers. Altogether, 500 jacks were installed. Then the walls and columns were cut free from the footings, and the whole building was raised by simultaneous operation of the jacks, blocking being built up as the raising progressed. The saddles, rollers and ways were finally placed, and the building was mounted ready for moving. No interior bracing was employed, except under the long span of the garage entrance at the rear of the building.

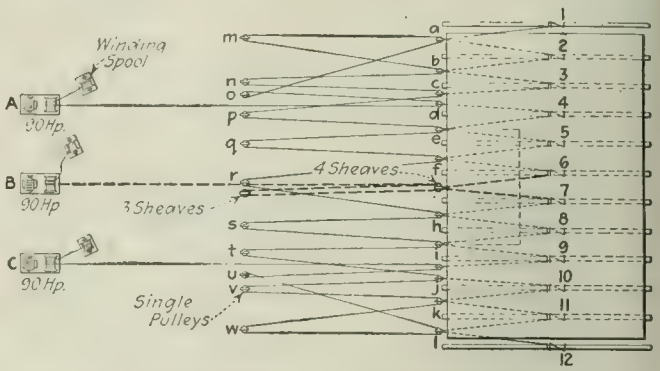


FIG. 3. ARRANGEMENT OF HITCHES AND PULLING CABLES

Twelve runs of shoe timbers, saddles, rollers and ways were employed, each carried by a track of blocking. For the first move the runs were completed about 60 ft. ahead; thereafter they were built ahead gradually as the travel of the building released the timbers at the rear. A level foundation was excavated for the blocking. Timber exclusively was employed in constructing the runs, it being considered that it combined elasticity and rigidity in a manner which minimized moving stresses on the building structure.

The travel of the building was in the direction of the shorter dimensions, and the problem was to distribute the pull evenly along the 95-ft. dimension, using three 90-hp. hoists for power. Fig. 3 indicates the arrangement adopted. Hitches 1 to 12 were made with 1¼-in. cable to the shoe timbers near the longitudinal axis of the building. To the free ends of the hitches were fastened single pulleys a to l. Well ahead of the building

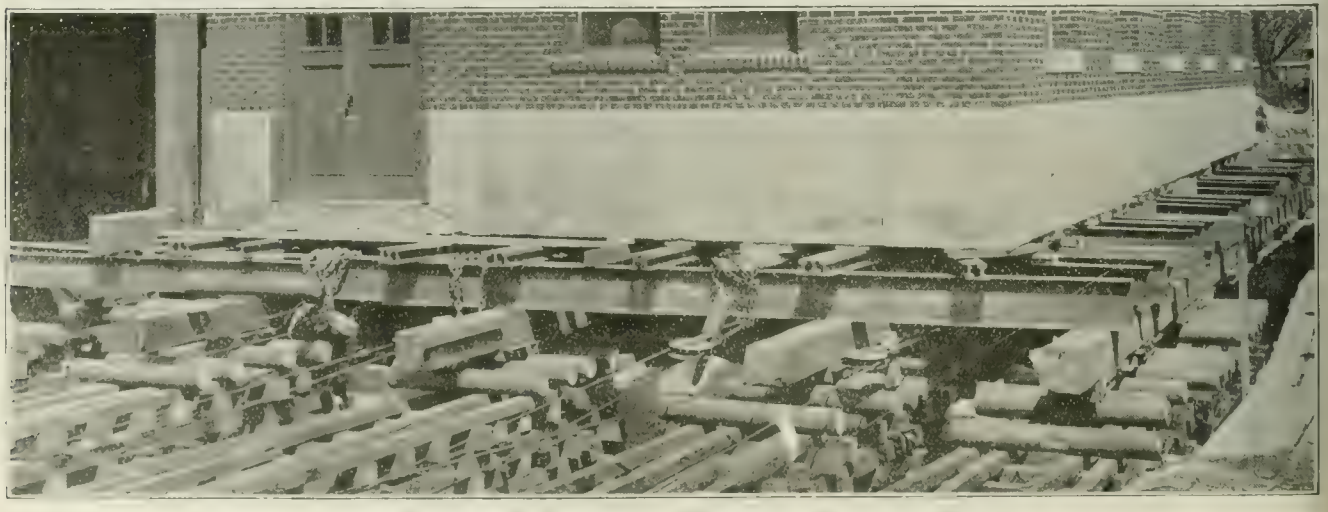


FIG. 2. WALL SUPPORT ON MOVING RUNS



FIG. 1. MOVING A 300-TON BUILDING 150 FEET

similar pulleys n to w were anchored. From hoist, A, a ⅞-in. wire cable was rove through these 23 pulleys and thence to hoist, B, as indicated by the diagram, Fig. 3. This arrangement insured an even pull on each hitch whether or not the drum speeds of the two hoists, A and B, were exactly uniform. A separate hitch and pulling line arrangement, as indicated by a distinctive symbol on the diagram, were employed for the third hoist, C.

The moving operation developed no cracks or other disturbances of the building structure and, as stated, the owner, the Hyatt Roller Bearing Co., occupied it for regular business during the whole period of raising and moving. The contractor for the operation was the L. P. Friestedt Co., Chicago, Ill.

Reinforced-Concrete Pipe Made By the Centrifugal Process

Cylindrical Form Is Placed Around Wire-Covered Mandrel, Concrete Is Poured and Whole Rig Spun Until Concrets Sets

By E. M. Weston
Union Club, Johannesburg, South Africa

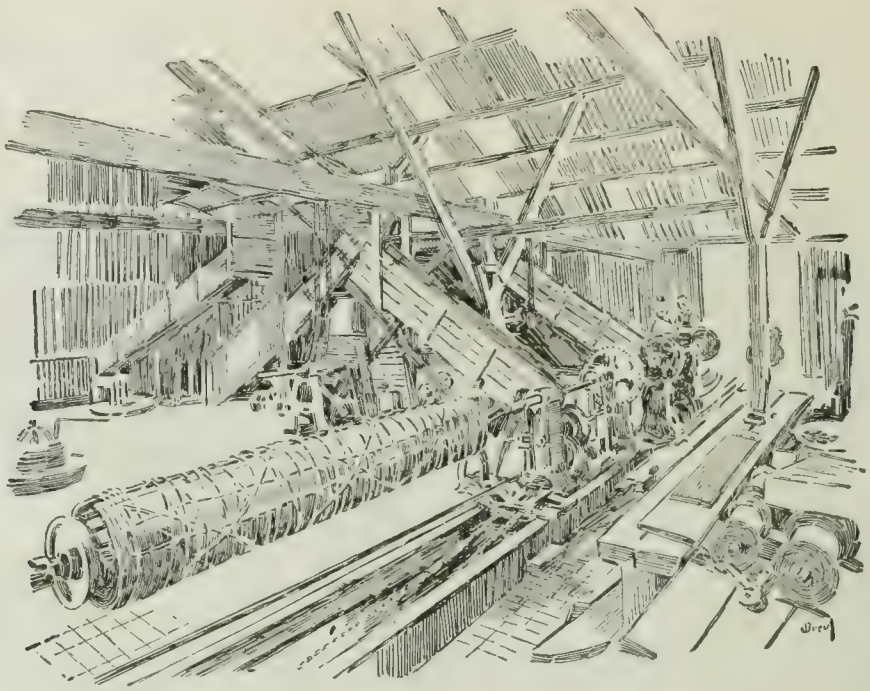
CONCRETE pipe which have been tested without serious rupture for an interior water pressure up to 400 lb. per square inch are being made by the centrifugal process for a number of uses in Australia and South Africa. The method of manufacture was developed by W. R. Hume, of Adelaide, South Australia, and the pipe are being made under concessions from him. In brief, the system consists of whirling a pipe mold full of concrete on a horizontal mandrel, trusting to the centrifugal action to compact the concrete.

The pipe are being made in 4-, 6- or 8-ft. lengths. The reinforcement is of wire. In South Africa old steel winding ropes from the mines are heated, to anneal and soften the wires and to burn off grease. They are then wound in various ways upon revolving cylinders the same diameter as the inside of the pipe, a sort of ropewalk being used for unwinding the strands of old rope.

The mold consists of a flexible $\frac{1}{16}$-in. steel cylinder cut in half lengthways and re-joined by hinges and clamps, so that when it is opened the pipe can be removed. This mold is placed horizontally on the rotation friction rollers of the casting machines. When a pipe is to be made, the steel wire reinforcement is placed inside the mold. Flanges, the same depth as the required thickness of the pipe walls, are placed on the end of the mold, and wet concrete of various grades corresponding to the quality of the pipe required is introduced from the ends, which are open except for the flanges mentioned. The pipe is revolved slowly at first, and the concrete is automatically destributed evenly along the whole length of the pipe and around the circumference, and completely incases and embeds the reinforcement.

The pipe is then revolved more rapidly, and the excess water, with any impurities, is collected in the center of the pipe and drawn off at the ends. Pipe of 4-in. diameter can be "spun" out at the rate of one per minute. Pipe 6 in. in diameter take 2 min.; 18-in. diameter take 8 min., and 48-in. diameter 20 min. The concrete by this time has set so hard that it is impossible to make an impression on it with the finger. The molds are run into a steam house for 24 hours and then opened, and the pipes are seasoned in water tanks for a month, usually. Pipe can, however, be put to use within a week.

The pipe show a remarkable density, and are impervious to great pressures either in sections or as a continuous line. A joint as strong as or stronger than the main itself has been designed. The ends of the pipe are recessed and butted together, forming a diamond-shaped cavity between them. A collar 6 in. wide, of strength similar to that of the pipe, is put on and secured with a backing of cement at both ends.



REINFORCED-CONCRETE PIPE ON MANDREL IN SHOP

Between the pipe a plastic bituminous cement is inserted, and pressure tends to compress this in the annular cavity of diamond-shaped section. This makes a joint which has been tested to 400-lb. pressure. Experiments show that a pipe designed for 100-lb. pressure shows at 200 lb. faint lines of dampness; at 250 lb. this becomes a dew. At 300 lb. the dew develops into a heavy sweat, and at 350 lb. jets of the finest misty spray appear. If this pressure is reduced the pipe takes up and is as capable as before of carrying 100-lb. pressure.

Until 1916 there was considerable skepticism concerning the suitability of these pipes for high pressure. In that year J. C. Ross, city engineer of Hobart, recomended the installation of 10 miles of 18-in. pipe to pass 13,000,000 gal. of water per day under a head of 250 to 350 ft. This line was successfully laid with a saving of $15,000 over cast iron, and the pipe is now almost universally used in water-supply and irrigation projects in Australia. Cylinders 10 ft. long and 6½ ft. in diameter are being made by this process for use in harbor works at Burnie, Tasmania, and cylinders 15 ft. in diameter have been made for use as buildings and silos.

Consistency of Cores of Hydraulic-Fill Dams Tested by Three Methods

DURING the progress of the hydraulic-fill work on the five detaining dams of the Miami Conservancy District in Ohio, the consistency of the core material is checked up in several different ways, with a view to making sure that solidification goes on rapidly enough to eliminate danger of slumping or bursting. H. S. McCurdy, engineer of the Englewood dam, stated before the New England Water Works Association at Albany, Sept. 30, 1919, that the core material is becoming stiff at the lower elevations. Referring specifically to the Englewood dam, he reported that a pole of 1½-in. diameter shoved into the core meets sensible resistance at about 15 ft., and that at 25 or 30 ft. penetration a man's weight will force the pole no farther.

In regular practice, resistance to penetration is measured not only by a pole, as just mentioned, but also by a 6-in. cast-iron ball. This ball method is the same as was used at the Calaveras dam of the Spring Valley Water Co. in California, so that the results will give comparisons not only between the five dams of the district, but between these and the Calaveras dam. In addition, Goldbeck pressure-recording cells are being built into the cores of the dam, so as to enable a record of the lateral pressure exerted by the core material in its change from fluid to semi-fluid and ultimately solid condition to be measured; this is on the view that lateral pressure is related to fluidity and that solidification will mean a decrease in lateral pressure.

Military Opinions on Scales for United States Maps

Metric, Decimal and English Systems of Measures Are Compared—Several Scales Needed—Contour Intervals Vary

WHAT scales should be adopted in mapping the United States for military purposes? This subject is discussed by Lieut.-Col. R. C. Kuldell, Corps of Engineers, U. S. A., in a paper on "The Military Mapping Problem in the United States," published in the March-April number of the "Professional Memoirs of the Corps of Engineers, United States Army." The system as used by the United States Geological Survey and for the progressive military map begins with 1:1,000,000, and doubles in series to 1:500,000, 1:250,000, 1:125,000 and 1:62,500.

Colonel Kuldell thinks that while the last is the scale most often met with in maps of this country, it is unfortunate in that most people use it as 1 in. to the mile, so that distances are given only approximately. The value of the 12-in., 6-in. and 3-in. scales now used is said to depend on whether it is decided to use for military service the decimal scales for both distances

and contour intervals, or to adhere to our standard unit of measure. As to the value of the two systems, Colonel Kuldell considers the metric system superior in every respect, but he points out that under present conditions a stated number of yards or miles conveys to the mind a definite distance, while a number of meters or kilometers induces a mental calculation to convert it into yards or miles, with a feeling that the result is only approximate. In this connection he makes the following statement:

"To obtain funds to make the desired maps, we must prove that these maps are of commercial value. The popularity of the United States Geological Survey atlas sheets is well known. The public knows that these maps are well worth their cost. Were we to print our maps on the scale of 1:20,000, with contour interval of 5 m., it would be like publishing a newspaper in a foreign language, and about as popular. On the other hand, our new artillery is supplied with instruments on the metric scale, and our officers have learned to use this scale."

Suggests Double System of Scales

A system of scales for both systems is suggested by Colonel Kuldell, as shown in the accompanying table. Of these, only the 1:500,000 and 1:10,000 should be made in the field and where the latter is made the former need not be made. All other maps would be made by reduction except the 1:5000, which is made in skeleton only from the 1:10,000 field sheets and filled in as needed by additional field work. In general, therefore, the task of securing adequate and accurate maps of the United States and its possessions consists in mapping the entire area at the scale of 1:50,000, except areas of strategic importance and training areas, which should be mapped at 1:10,000.

A considerable area has been mapped by the United States Geological Survey, and maps on a scale of 1:62,500 have been published. The field work on these maps was done on a scale of 1:48,000, and it would, therefore, be possible to reproduce the sheets on the scale of 1:50,000. To change the contour interval from feet to meters would require a great deal of costly work, but it could be done. On the other hand, says Colonel Kuldell, if the English units are retained the 1:63,360 scale should by all means replace the 1:62,500 scale, which is neither metric nor English.

The 1:10,000 scale for the field work should be used rather than the 1:20,000. Areas which are to be covered by the large-scale maps are relatively small. They consist of the territory within a radius of 20 miles of all important seacoast and border cities and the interior training areas. In all cases, the 1:10,000 map will be demanded by the artillery, and in many parts of the area the smaller infantry units will demand the 1:5000 map. To produce these satisfactorily the field scale should be not less than 1:10,000.

Contour Intervals

Closely allied with the question of scale is that of contour interval. Unlike the scale, the contour interval cannot be changed by photographic enlargement or reduction. This is a serious objection to prescribing rigidly the contour interval for each scale. Another and important objection to this practice is the freedom of expression that is taken from the topographer when he is required to portray level ground and mountainous ground on the same scale with the contour interval. Colonel Kuldell cites the following rule that has been adopted by the Chief of Engineers, U. S. A.: "The contour interval will be determined by the Chief of Engineers, having in view the maximum detailed delineation of the ground forms consistent with cartographic clearness. For each area the Chief of Engineers approves the contour interval before the field work is begun."

SCALES FOR MILITARY MAPS

Purpose	English			Metric
Aeronautic maps	1:190,080 or	3 in.	= 1 mile	1:200,000
Staff and progressive military maps...	1: 63,360 or	1 in.	= 1 mile	1: 50,000
General maneuver map	1: 21,120 or	3 in.	= 1 mile	1: 20,000
Artillery map	1: 10,560 or	6 in.	= 1 mile	1: 10,000
Local defense or attack map	1: 5,280 or	12 in.	= 1 mile	1: 5,000

That adoption of the metric system by the United States Army should only follow its adoption by the entire country, is the opinion expressed in a discussion of the above paper by Col. E. H. Marks, in charge of military survey and mapping in the office of the Chief of Engineers, U. S. A. He states that an order of the War Department (Bulletin 64, 1918) prescribes scales of maps to be used by the Army as 1:10,000, 1:20,000, 1:62,500 and 1:200,000. In this order no definite contour interval is fixed for maps of various scales, but it is to be some multiple of 5 ft. or 10 ft., "having in view the maximum detailed delineation of the ground consistent with cartographic clearness." This provides for some freedom of the topographic expression, although it gets away from the idea of "the unit system of scales and contour intervals," which, although facilitating the reading of maps, leaves but little room for interpreting topography in various kinds of country.

Decimal and Metric Scales

Confusion has sometimes arisen between the adoption of the decimal scale for maps and the adoption of the metric system for measurements, but these two questions are entirely independent of each other, says Colonel Marks. Maps drawn on scales of inches to the mile can be used only with very special scales, which cannot be ordinarily obtained, whereas a map drawn to the decimal scale lends itself to uses with any measuring scale, simply by multiplication. On a map drawn to the decimal scale, it is immaterial which system of units is used, since measurement in any system of units may be performed by means of scales in the same system, and commercial scales dividing feet into hundredths, and yards or meters into thousandths, may be obtained readily.

When distances in miles are required, the fact that the 1:10,000 and 1:20,000 scales are within about 5% of 6 in. and 3 in. to the mile, respectively, enables close estimates to be made, while with a map measurer or auxiliary scale distances may be determined quickly by simple arithmetic. To sum up, the use of a decimal scale for maps lends itself generally to measurement in any system of units, but this is not true of any scale which is based upon the relation between inches and miles.

Colonel Marks agrees that the adoption of the 1:62,500 scale is unfortunate, but he suggests that as the majority of topographic maps of this country exist to this scale, possibly the benefit resulting from a change would not be consistent with the large expenditure of funds required to reproduce the existing maps on a scale of 1:40,000 or 1:50,000.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Diagram for Machine-Banded Wood-Stave Pipe

Sir—I have read with interest the article on p. 472 of your issue of Sept. 4, 1919, by Willis T. Batcheller, giving a diagram for computing band spacing for wood-stave pipe.

The accompanying diagram for machine-banded wood-stave pipe is one being used in the office of the Chief of Construction, United States Reclamation Service, Denver, Colo., and has proved very satisfactory. It is more complete than Mr. Batcheller's diagram, in that it gives the spacing for any unit working stress in the steel within the range of 10,000 to 15,000 lb. per square inch. It also gives the spacing required in order that the bearing stress of the band on the wood will not exceed safe limits. A similar diagram can readily be prepared for continuous wood-stave pipe, and such a diagram has been published on p. 253 of my book, "Working Data for Irrigation Engineers."

To illustrate the use of the diagram here shown, assume that it is required to know the spacing for No. 1-gage wire for 30-in. pipe, to operate under a static head of 55 ft.; the tensile strength in the wire not to exceed 12,000 lb. per square inch and the bearing stress on the wood not to exceed 800 lb. per square inch.

Starting at 55-ft. head in the left-hand diagram for stress in bands, go horizontally as shown by the heavy dotted line to the intersection with the oblique line for 30-in. diameter pipe, thence vertically downward as shown by the heavy dotted line to the intersection with the horizontal line for the 00-gage wire, thence obliquely downward to the left of the intersection with the No. 1-gage wire, where the spacing required is shown to be 2 in. If the spacing for wire of any other size is required, it is similarly found by reading the spacing at the intersection of the downward to the left oblique line with the required size of wire.

If it is required to find the spacing for any other stress in the steel than 12,000 lb. per square inch, it is done by continuing vertically downward as shown by the dotted line to the intersection with the horizontal 12,000 lb. per square inch line marked "reference line" and thence obliquely upward to the left—or downward to the right, as the case may be—and as shown to the intersection with the horizontal line representing the required stress in the steel, and reading by the vertical lines at that point the required spacing.

The determination of the required spacing as governed by the bearing stress on the wood is made in a similar manner, as shown on the right-hand diagram for bearing on wood. For the assumed example, this spacing is 5½ in. for a safe bearing pressure on the wood of 800 lb. per square inch. It is seen in this case that the spacing of the bands is governed by the stress in the bands.

The small diagram in the lower right-hand corner shows the dividing line between the combinations of diameter of pipe and size of wire for which the stress in the steel at 12,000 lb. per square inch governs, and those in which the bearing stress on the wood at 800 lb. per square inch governs.

E. A. MORITZ,
Engineer, United States Reclamation Service.
Denver, Colo.

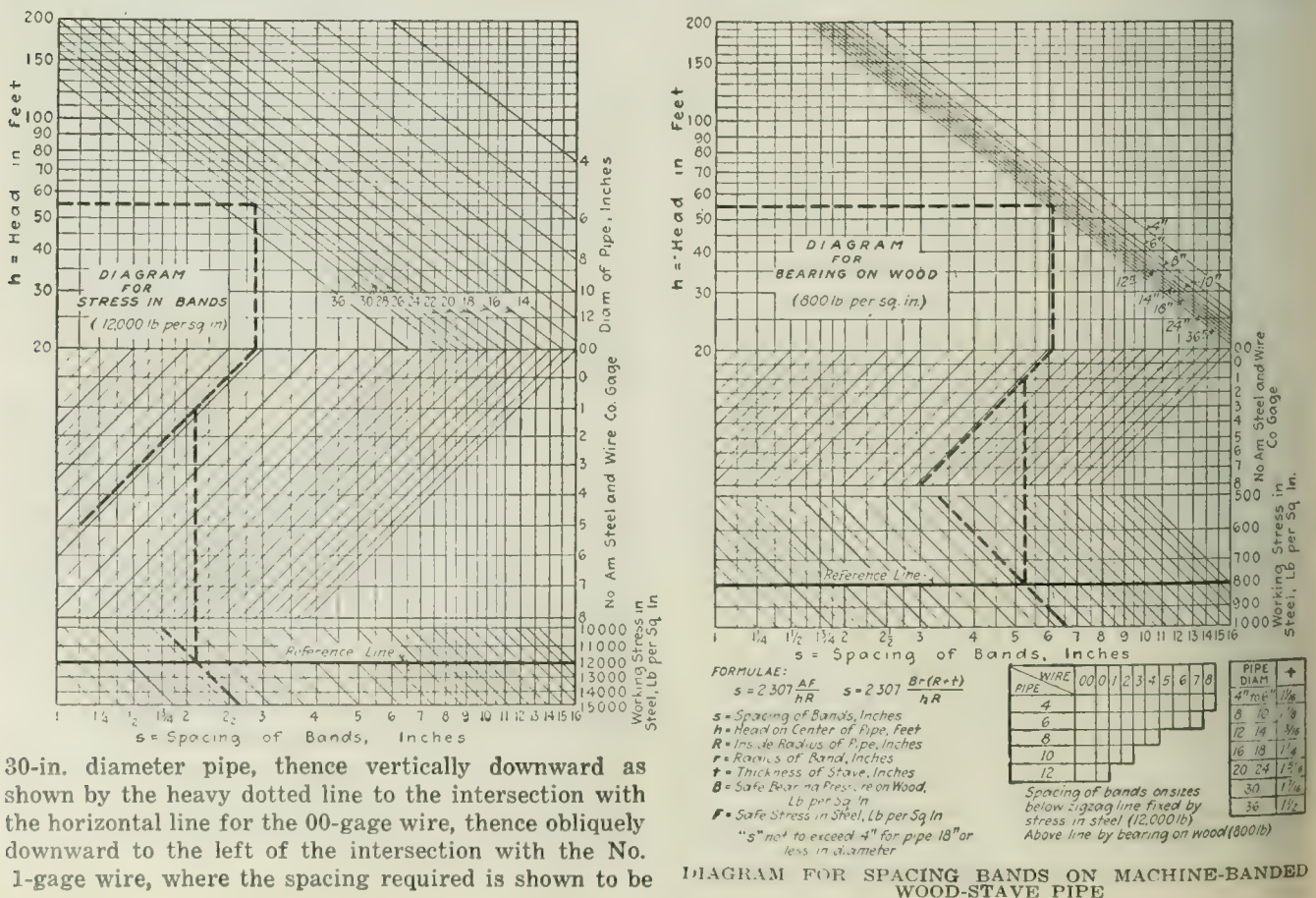


DIAGRAM FOR SPACING BANDS ON MACHINE-BANDED WOOD-STAVE PIPE

An Answer to the Water-Hammer Question

Sir—In your issue of Sept. 11, 1919, p. 530, B. Gibson, Decatur, Tex., describes an experience with

water-hammer in mains and services of the local water-works. He states that he has a 16 x 12-in. double-action piston pump driven by a motor at 50 r.p.m., lifting water 12 ft. from the reservoir through mains to a 90- or 100-ft. tank, and that he has a 7 x 15-in. air chamber 3 ft. from the pump on the discharge line. There are several possible causes for this water-hammer.

One may be the design and size of the intake, as well as the gradient of the main from the pump to the tower, which would involve the question of the hydraulic mean gradient, which might cause air pockets, etc. The lift, which he states is 12 ft., may also be involved, as when the pump is revolving at 50 r.p.m this 12-ft. lift may be increased beyond the atmospheric pressure on account of an inadequate supply of suction, and this would account at once for the water-hammer.

If Mr. Gibson would cut down his 50 r.p.m. to possibly 28 or 30 I think this will stop his water-hammer. In a plant in Nebraska I found that an inadequate supply of water from artesion wells, while running the pump at full capacity, produced water-hammer. By reducing the revolutions and pumping longer hours, this hammering was obviated.

Neligh, Neb. NELSON B. SWEITZER.

Anchorages, Cables and Lateral Stays in Suspension Bridges

Sir—While the Cumberland suspension bridge described in *Engineering News-Record* of July 3, 1919, is hardly of a magnitude to merit further discussion, Mr. Grove's reply to my comment in your issue of Sept. 11, 1919, p. 527, makes further reference to the subject necessary.

Regarding the submerged anchor: If the 25-ft. piles driven under the concrete blocks were extended up into the concrete and notched, there would seem to be no possibility of the anchor being pulled out until the piles decay. But the load conditions taken into account here are very different from those assumed for the cables.

We have here a footbridge of unusual length carrying an unusually heavy traffic, to which most careful consideration was given in design. The cables, whose strength is a fairly certain quantity, are designed for a live load of 400 lb. per linear foot, with a factor of safety of 5. The submerged anchor, which even the best informed must admit to be a less certain matter, is designed with a factor of 2; and even to arrive at this very slim factor of safety it is necessary first to increase the weight of concrete from 135 to 150 lb. per cubic foot, then assume that there will be no hydrostatic pressure, and finally cut the assumed live load in two. If 184 lb. per linear foot is the proper live load instead of 400 lb., as the anchorage calculations would indicate, then much money was spent on the cables that rightly should have gone into the anchors, and in any event the expensive, unsightly and extremely inconvenient arrangement at the saddles made necessary by the change of size of cables could have been avoided.

The design of the lateral systems for structures of the kind in question is apt to be not so much a matter of rigidity and cross-section of stress-carrying members as safeguarding against excessive swinging. It seems almost impossible to provide against this swinging unless wind cables are used. The writer knows of cases where stay cables had to be placed after the bridge was completed on account of swinging, although the lateral bracing had been designed for a wind load of 200 lb. per linear foot. Let us assume for the Cumberland bridge that the wind load on the bottom chord is only 100 lb. per linear foot, although most specifications call for three times this amount. The span being 540 ft. long and 9 ft. wide, there would be a maximum stress in the bottom chords of the stiffening truss of about 30,000 lb. per square inch. We then have this extreme case: A lattice girder 540 ft. long by 9 ft. deep, with its chords stressed to 30,000 lb. per square inch; what is its deflection? It would indeed be interesting to know whether this bridge does not swing considerably. D. ORDING,

Assistant Engineer, Midland Bridge Company.

Kansas City, Mo.

Method of Laying Out Split-Switch Turnout

Sir—During the winter of 1918-19 the writer laid out several split switch turnouts. I disagreed with the office engineer on the correct theory. His method is as follows:

Use a table of stub switch turnouts for the lead and make the curve back of heel of frog the same as given in table for curve in the lead. In running out the turnout, first deciding upon the location of point of switch—setting up the transit on this point—turning tangent and continuing the turnout curve through the switch and frog. Locating the point of frog by measuring from the point of switch back, the distance given in table for a stub switch lead.

This method is objectionable by reason of the fact that both the switch points and frog are straight, and no allowance is made for this, causing an angle both at the heel of the switch point, and the toe and heel of the frog. As most of the turnouts are No. 4 and No. 5, this angle is quite acute, and the following curve would be 38° 45′ 57″ and 24° 31′ 36″, respectively. Over 75% of the derailments occurred in turnouts.

My theory is that a table of split switch turnouts should always be used, and that the degree of curve back of the heel of the frog is not necessarily absolutely the same as the curvature in the lead.

Standard frogs and switch points for A.R.E.A. specifications were used.

I was unable to convince some of my associates of the correctness of my theory, and I should appreciate discussion through *Engineering News-Record.*

Cleveland, Ohio. L. C. SCOTT.

Pollution by Industrial Wastes Enjoined

Discharge of industrial wastes into the branches of the Rahway River from the plant of the Chemical Co. of America, located in Springfield Township, N. J., five miles above the point on the Rahway River from which the water-supply of Rahway, N. J., is drawn, has been enjoined by the Chancery Court of New Jersey, effective Oct. 1. The decision and order in the case are dated May 27, 1919, and are printed in *Public Health News* (State Department of Health, Trenton, N. J.) for August, 1919. The company provided some 4½ acres of lagoon for disposal by evaporation, but the dikes forming it were not water-tight. Ditches were then built outside the dikes, and the seepage pumped back into the lagoon, but this was insufficient.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Steel Ribs on Wide Concrete-Fininshing Belt Prevent Warping

WIDE belts for finishing concrete-road surfaces are considered by many engineers as preferable to narrow belts, but there has been great difficulty in keeping them from warping and digging into the finished surface. This difficulty has been overcome by Thomas,



WIDE FINISHING BELT KEPT FROM WARPING BY STEEL STIFFENERS

Bennett & Hunter, on one of the projects of the Maryland State Road Commission, by riveting steel ribs on the upper face of the belt, as shown in the illustration.

The ribs are placed about 1 ft. on centers, and, for a distance of 1 in. back from the front, are bent upward about ¼ in. This keeps the front edge of the belt from digging the concrete surface. John N. Mackall, from whom the above information was received, states that this device has given the most satisfactory finish for concrete roads that he has seen.

Resource of Contractor Saves Labor

By W. F. Reichardt

Municipal Consulting Engineer, Watertown, Wis.

IT HAS been the experience of nearly every engineer that the unstability of labor has caused more trouble this season than any other condition, and on some work a contractor was unable to carry on his work unless he was able to find some method of saving labor. This was the situation at Edgerton, Wis., where Lee Alder, contractor, had obtained a contract for the construction of 30,000 sq.yd. of one-course reinforced-concrete pavement. Realizing at the start that labor would be scarce, this young contractor worked out a novel and satisfactory method of saving labor.

Mr. Alder constructed a bin which would hold five carloads of sand and gravel. He then purchased an electric conveyor with which he unloaded all aggregates into this bin. By the use of the conveyor, he required only two men to unload the car, whereas ordinarily he would require four.

The question that next confronted this contractor was how he would get the materials into the hopper of the mixer. He had constructed sheet-steel boxes holding 15 cu.ft. The boxes contained 9 cu.ft. of pebbles and 6 cu.ft. of sand. The boxes were marked so that any laborer could get the exact proportions when loading from the bin. This method was of much value to the engineer, for he knew the proper proportions would be maintained because the boxes would not hold more than 15 cu.ft. of aggregates.

These boxes were hauled to the mixer on flat wagons, each wagon carrying four boxes. The wagon was placed alongside the mixer, and by the aid of a derrick the boxes were unloaded or emptied into the skip without



ELECTRIC CONVEYOR FILLS BIN FROM CAR

loss of materials or much time. With each box emptied into the skip, three bags of cement were added. An additional feature, though it did not concern labor materially, was the use of a derrick independent of the mixer, thus avoiding a great deal of the wear and tear



STEEL BUCKETS CONTAIN EXACT MIXTURE OF AGGREGATE

a mixer usually suffers through the attachment to it of a derrick for handling materials from a wagon or truck to a mixer hopper.

This method assured the engineer of the very best mixture, as there was no chance to get dirt into the sand and gravel, the material never touching the ground from the time it left the pit until in the finished paving mixture. This in itself was worth the cost of this method, even though it added to the original cost. However, the contractor also saved by this method, and an average day's run consisted of 203 lin.ft. of pavement 23 ft. wide with a 6 x 6-in integral curb, using a total of eight men, including the mixer operator and every other man laying concrete.

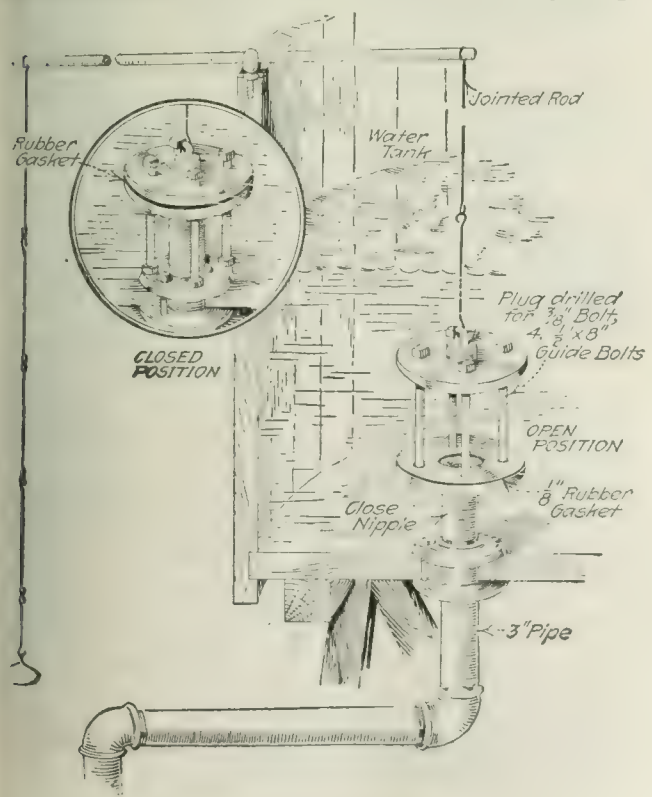
This method is without doubt one of the best I have seen in use and while it has saved the contractor money and made the completion of his contract possible, it has given me the best mixture I have ever secured and is as nearly accurate as it can possibly be made.

Home-Made Quick-Opening Valve Works Well for Small Water Tanks

By D. J. McFadden,
New Jersey State Highway Department, West Portal, N. J.

A VALVE which acts quickly in small water tanks for supplying donkey engines from the tanks can be made by any blacksmith on contract work. The valve has simple working parts, does not leak and is inexpensive.

To construct the valve, which is shown in the accompanying illustration, all that is required is a flanged pipe union for whatever size pipe is desired, a pipe plug, a close nipple and four bolts. The bolts used should be one size smaller than those for which the flange is drilled, so that the valve will work freely, the bolts being only used as a guide for the top flange.



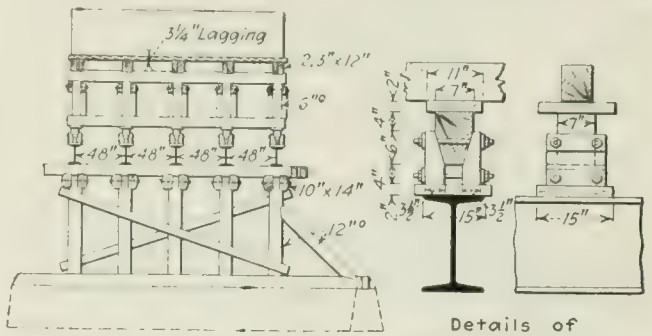
DETAILS OF SMALL, QUICK-ACTING VALVE

To keep the valve from leaking a ⅛-in. sheet-rubber gasket should be used, as shown in the illustration. The operation of the valve, which is shown open, is apparent. The closed position of the stopper is shown by the dotted line.

This device has been used on many contracts by the writer, with perfect satisfaction. It is not liable to freeze up, as it is completely immersed in water.

Spreading Wedge for Striking Arch Centers

IN BUILDING a concrete arch bridge over the Linth River, at Schwanden, for the railway line between Glarus and Linthal, Switzerland, to take the place of an iron lattice-truss bridge in service since 1879, the contractor (J. J. Rüegg, Zürich) used a new lowering device. It is a spreading wedge, held together by bolts, as sketched herewith after the *Schweizerische Bauzeitung* of Aug. 16, 1919. In describing the bridge



SPREADING WEDGE IN CENTERING FOR SWISS RAILWAY ARCH

and its construction, A. Bühler, bridge engineer of the Swiss Federal Rys., says that the wedge device proved very satisfactory.

The bridge has two arch spans, respectively 72 and 97 ft. between abutments. Both spans are of three-hinged construction, but of an unusual type in that the end hinges, instead of being at the skewbacks, are located some distance out, so that in the case of the larger arch the span between hinges is 82½ ft. The arch ring is 40 in. thick at the crown and 53 in. thick at the ends. As the posts of the centering were spaced 4 ft. apart transversely and about 8 ft. apart longitudinally, each wedge carried about 8½ tons when the ring was fully concreted. The crown settlement at time of striking centers was ¾ inch.

Dam and Reservoir Without a Spillway

Rensselaer Lake, a reservoir formed by a low earth dam built for the water-supply of Albany, N. Y., in 1852, with William J. McAlpine as engineer, has no spillway. It has a storage capacity of 130,000,000 gal., an area of about 30 acres and a drainage area of two to three square miles. The dam is 34 ft. high over all, is carried 8 ft. above the water level, is 10 ft. wide on top, has an inner slope of 1½ to 1 and an outer slope of 2 to 1. It has a puddled clay heart-wall 8 ft. thick at the top which increases 4 ft. in thickness for each 10 ft. in depth, and its upper slope is lined with puddle. The dam is protected from overwashing by opening gates in an overflow pipe. It is thought that the drainage area affords a large amount of ground storage. Wallace Greenalch is commissioner of public works of Albany.

NEWS OF THE WEEK

New York, October 9, 1919

DIGEST OF OCTOBER NEWS

(Editor's Note: As a matter of record there is given below a digest of news from the several Emergency Bulletins which this journal published while its regular issues were delayed by the printers' strike.)

Development committee, Am. Soc. C. E., completed final report and was discharged.

Nominating committee, Am. Soc. C. E., selected Arthur P. Davis, chief engineer, U. S. Reclamation, as candidate for president of society.

In drive begun Oct. 6 and directed by professional organizer, Western Society of Engineers gained about 2,000 new members.

Following salaries proposed in American Association of Engineers schedule for highway engineers in state employ: Draftsmen, $1800 - $2400; assistant engineers, $2400 - $4000; first assistant engineers, $3600 - $5000.

Mainly through efforts of members of local engineering societies an engineer, Charles H. Lee, of Los Angeles, has been appointed by the governor of California as State Water Commissioner.

Contract let for $2,384,458 memorial bridge over Susquehanna River at Harrisburg, Penn.

Committee from Engineering Council went to Washington to endorse plan for national budget.

Architects, instead of engineers, have been given charge of designing and supervising construction of two big Pittsburgh bridges. One or both structures may call for 500-ft. steel arch spans.

Permanent coordinating Board of Surveys and Maps recommended by conference at Washington, D. C. of 14 Government map-making agencies and 12 engineering or scientific societies. Engineering Council suggested the conference in letter to President.

About 230 cities and towns have settled claims for septic tank royalties under recent agreement between Cameron Co. and National Septic Process Protective League.

Columbia Basin Survey Commission, with $100,000 appropriation for its work, is completing surveys for immense irrigation project in State of Washington.

Future military policy of U. S. discussed at New York meeting, Am. Soc. C. E., Major-Gen. W. M. Black Chief of Engineers, U. S. A., taking leading part.

Street car terminal subways for Detroit recommended. City council approved project.

Baltimore authorities urged by local chapter, American Association of Engineers, to increase pay of all city's engineers. Similar request made on Cincinnati Rapid Transit Commission.

One of world's largest hydroelectric projects begun on Winnipeg River, Canada. Involves concrete dam 2000 ft. long and 70 ft. high and eight 21,000 hp. turbines.

Following Attorney General's opinion, War Department resumed delivery of surplus army motor trucks to State Highway Departments, but further legal complications leave ultimate result of transfer in doubt.

By overwhelming vote Maine decided to increase bonded indebtedness from $2,000,000 to $10,000,000 for good roads.

Engineering Council elected to membership in Chamber of Commerce of United States.

National Safety Council has organized an Engineering Section.

American Association of Engineers has established federal department with offices in Washington.

HEALTH TOPICS DISCUSSED AT NEW ORLEANS CONVENTION OF AMERICAN PUBLIC HEALTH ASSOCIATION

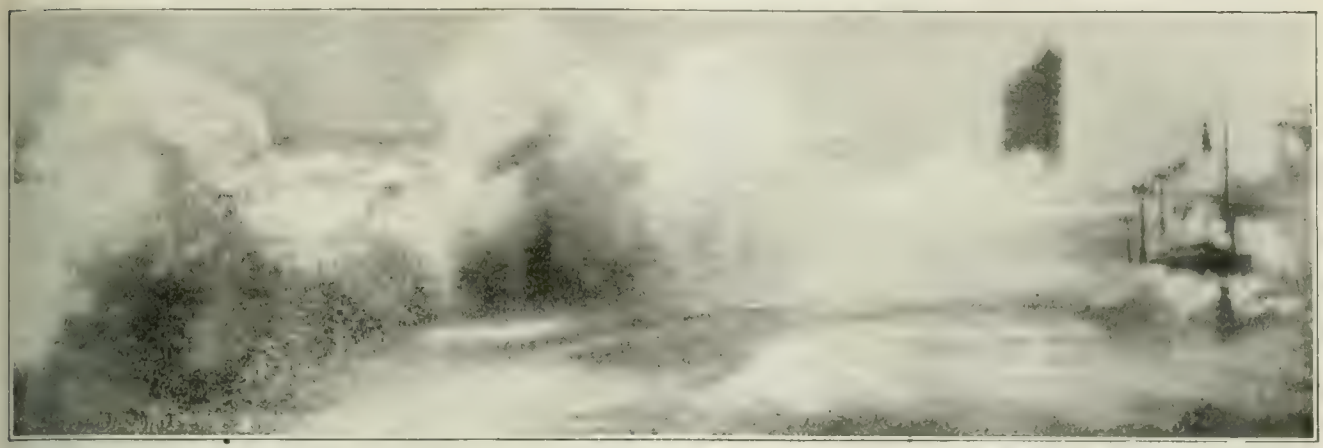
Engineers played an important part in 47th annual meeting of the American Public Health Association held at New Orleans Oct. 27-30. An organization to meet with the annual conference of state and provincial boards of health was formed by engineers connected with state health departments. In his presidential address Lee K. Frankel reported a membership of 4500, representing a 100 per cent increase during the year.

A national health council embracing representatives of seventeen national or international organizations was formed. W. S. Rankin, who was named as the association's next president, emphasized the need of better co-ordination of various Federal bureaus dealing with the public health. A committee was appointed to urge these views upon Congress.

San Francisco was selected as the convention city for 1920. Paul Hansen, engineer, Illinois Department of Health, was named chairman of the Sanitary Engineering Section, the various committees of which will be headed as follows:

Water-Supply and purification, George G. Earl, New Orleans; Sewerage and sewage treatment, Kenneth Allen, New York City; Waterways sanitation, H. P. Eddy, Boston; Refuse collection and disposal, M. N. Baker, New York City; Mosquito control, J. A. Le Prince, Memphis, Tenn.; Bathing places, I. W. Simons, Jacksonville, Fla.; Milk supply, H. A. Whittaker, Minneapolis, Minn.; Air conditioning, Major George A. Soper, Washington; Housing, Morris Knowles, Pittsburgh; Constitution, Paul Hansen, Springfield, Ill.

WAVES BREAK HARMLESSLY ON GALVESTON'S SEA-WALL



During the hurricane which swept over the coast cities of Texas on Sept. 14 the sea-wall at Galveston fulfilled the object for which it was built. The accompanying photograph, received from City Engineer C. A. Holt, Jr., gives an indication of how the huge waves were stopped by the concrete barrier. An idea of the height of the column of water may be gained by comparing it with the arc lamp pole on the right. The top of this pole, Mr. Holt states, is about 30 ft. above the sea-wall.

BRIBERY CHARGES AGAINST ROAD-MACHINERY AND PAVING COMPANIES

The Federal Trade Commission on Nov. 7 issued formal complaints charging unfair competition against thirteen interstate road-machinery and street-paving companies. Alleged bribery of public officials is one of the charges of unfair competition which will be heard when the case goes to trial.

Ten of the concerns are cited in the complaints for alleged giving of gratuities such as meals, cigars, entertainment and the like, and for alleged secret paying of sums of money to public officials and employees of customers; and also for alleged payment of the expenses of public officials for visits to the concerns' plants for the inspection of road machinery. These gifts and payments, the complaints allege, were for the purpose of influencing public officials and the employees of their customers to recommend, purchase or contract to purchase road machinery, street-cleaning machinery or like products.

The ten companies are: The Good Roads Machinery Co., Kennett Square, Penn.; Acme Road Machinery Co., Village of Frankfort, N. Y.; Buffalo Steam Roller Co., Buffalo; Russell Grader Manufacturing Co., Minneapolis; The Austin-Western Road Machinery Co., Chicago; Charles Hvass & Co., Inc., New York City; J. D. Adams & Co., Indianapolis; Stockland Road Machinery Co., Minneapolis; The Barr Sales Co., Chicago; and Galion Iron Works and Manufacturing Co., Galion, Ohio.

Two other companies were cited for giving of gratuities and paying the traveling expenses of public officials. They are: The Chamberlain Road Machine Co., Hutchinson, Minn., and The Barber Asphalt Paving Co., Philadelphia. The Dyar Supply Co., Cambridge, Mass., was cited for giving of gratuities and the secret payment of sums of money to public officials and employees of customers.

The thirteen concerns were directed to file answer with the Commission at Washington, Dec. 22.

ROADS' RETURN BY JAN. 1 NOW SEEMS CERTAIN

The Interstate Commerce Committees of Congress have agreed on a tentative program, in the form of an interim bill, to be enacted to the end of protecting all interests with the return of the railroads to their owners on Jan. 1 according to the announced intention of President Wilson, which has been reiterated by Director-General Hines.

NO PROVISION YET FOR FEDERAL HIGHWAY COMMISSION

No plan has been formulated as yet for taking up the Townsend Bill which provides for a Federal highway commission and the formation of a national highway system. The bill is before the Senate Committee on Post-offices and Post Roads. No attempt will be made to consider the bill at this session of Congress and no definite arrangements have been made for its consideration at the regular session.

GENERAL BLACK RETIRES AS CHIEF OF ENGINEERS

Maj. Gen. William M. Black, Chief of Engineers, U.S.A., retired from active service in the army Nov. 1 after more than 46 years of service. He has been appointed chief engineer of the Shipping Board.

He was graduated from the United States Military Academy at West Point in 1877 and has served in the army continuously since that time. His appointment as Chief of Engineers took place in March, 1916. Col. Frederick V. Abbot, ranking officer, Engineer Corps, is now acting as Chief of Engineers and it is anticipated that he will be nominated by the Secretary of War as successor to General Black.

NEW BRIDGE PLAN FOR PITTSBURGH

A proposal that the new Allegheny River bridges at Pittsburgh be equipped with liftable spans to accommodate them to the clearance requirements at all river stages, instead of building fixed spans at the height dictated by the maximum stage, has been made to local authorities by A. A. Henderson, of Wilkinsburg, Penn. At present fixed bridges are being designed to meet the War Department's requirements as to span lengths and navigation clearance. They involve steep approach grades. Under the liftable-span system the steep grades would exist only at high flood stages.

STRENUOUS OPPOSITION TO GRAND TRUNK PURCHASE

Strong opposition is developing in the Canadian Parliament to the proposed bill, embodying the terms of agreement entered into recently by the Canadian Government authorities and the officials of the Grand Trunk System, for the taking over of the Grand Trunk properties by the Government, by purchase of securities through the medium of long-term bonds. It is freely charged that an attempt is being made to saddle the Canadian Government with the losses of stockholders through the Grand Trunk Pacific venture and other projects.

The United States Government may oppose such ownership of Grand Trunk lines in this country.

GENERAL CONTRACTORS PLAN HIGHWAY CONFERENCE

A conference of road contractors will be held in Chicago late in November under the auspices of the Associated General Contractors of America to aid the association in formulating a representative opinion on road construction contracts and contractual policies to be presented on invitation of the American Association of State Highway Officials at their coming annual convention.

Among the subjects upon which an expression of thought is desired are the following: (1) The necessity for an increase in the size of highway contracts; (2) consideration as to whether grading and paving should be let in the same or in separate contracts; (3)

the effect of the shortage of open top cars on highway work in 1919; (4) the need for utilization of local supplies of aggregate that can be delivered direct to the job by motor truck or industrial railway, as a means of reducing cost and of relieving the probable car shortage of 1920; (5) the use of dry mixtures in concrete pavement construction and its effect on the contractor's work; (6) the needless refinement of some specifications for hard-surface pavements; (7) the value of utilization of the cost-plus-fixed-fee, with adjustments, form of contract on highway work; (8) the elimination of unreliable and incompetent contractors from consideration in awarding contracts; (9) letting contracts in the fall so that all arrangements may be made for an early start of work in the spring, and a reserve supply of aggregates accumulated during the winter, and (10) provision for safeguarding the contractor against unnecessary risks, as for example the assumption by the state of increased costs due to an advance in freight rates.

Road contractors are urged to attend this conference and to write the secretary, G. W. Buchholz, 111 W. Washington St., Chicago, of their intention so that proper arrangements can be made. In case attendance is impossible a discussion by letter will be welcomed.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN ASSOCIATION OF PORT AUTHORITIES, 75 Montgomery St., Jersey City, N.J.; Nov. 17-19, Galveston, Tex.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, 29 W. 39th St., New York City; Dec.2-5, New York City.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.; Dec.3-6, Savannah,

NATIONAL RIVERS AND HARBORS CONGRESS, 824 Colorado Building, Washington, D. C.; Dec. 9-11, Washington, D. C.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.; Dec.8-11, Louisville, Ky

AMERICAN MATHEMATICAL SOCIETY, Secretary, F. N. Cole, 501 W. 116th St., New York City; Dec. 30-31, New York City.

BRIDGE BUILDERS' & STRUCTURAL SOCIETY, 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

The Iowa Section of the American Water Works Association elected the following officers at the meeting Oct. 22-23: Chairman, G. B. Shoemaker; vice-chairman, F. D. H. Lawlor; directors, R. B. Wallace and F.B.Ross. The parent association will be petitioned for the extension of territory to include Nebraska, South Dakota and adjoining states not having sections. The next meeting will be in Iowa City. Jack J. Hinman, Jr., is secretary.

The Cleveland Engineering Society, on Nov. 4, was addressed by C. H. Benjamin, dean, Schools of Engineering, Purdue University, who read a paper on "New Requirements in Technical Education."

The Indianapolis Chapter of the American Association of Engineers will hold a regular meeting on Nov. 14 for the election of officers and for the consideration of various resolutions regarding the present labor and industrial problem.

A Phoenix Chapter of the American Association of Engineers may be the result of a recent organization of professional engineers in Phoenix which has applied to the national body for a charter. As last reported the temporary officers are: President, B. L. Hitchcock; organization committee, F. N. Nichols, E. R. Hayden and James E. Sellers; secretary, D. A. McClung

The Oklahoma Society of Engineers recently held its annual convention at Oklahoma City. The following officers were elected: President, Dan W.Patton; vice-presidents, Frank B. King, R. E. Brownell, and George Stein; secretary-treasurer, H. V. Hinkley.

The Southwestern Society of Engineers has voted to affiliate with the American Association of Engineers, according to announcement by the latter.

The Engineers' Club of Philadelphia will hold a regular meeting Nov.18 at which Hon. Edward M.Bassett, counsel for Zoning Committee, New York City, will speak on "Conference on Comprehensive City Planning." A junior meeting will be held Nov. 11, at which Thomas H. Winston will speak on "The Signal Corps as the Nerve System of the A. E. F." At the weekly luncheon, Nov.11, Dr. R. Tait McKenzie will present a paper on "Physical Training for University Men" and on the 18th George S. Webster, on "The Development of Facilities for Trade."

The Northwest Society of Highway Engineers has voted to affiliate with the American Association of Engineers, according to announcement of that body.

PERSONAL NOTES

Frank H. Clark, formerly general superintendent of motive power, Baltimore & Ohio R.R., now consulting engineer, New York City, left Oct. 4 for Pekin, China, to act as technical adviser to the Ministry of Communications of the Chinese Republic.

Ezra B. Whitman, consulting engineer, Baltimore, Md., has just returned from a three months' professional trip to Poland

G. H. Clevenger, vice-chairman and acting officer of the Engineering Division of the National Research Council, with office in New York, has given up his active supervision of the work of the Council and will leave shortly to fill a professional engagement in Mexico. Upon his return some months hence he will open an office in New York City as consulting engineer, specializing in metallurgical lines.

Harry Barker and Robert C. Wheeler have become associated in partnership and will engage in the private practice of engineering at 170 Broadway, New York City. In military service Mr. Barker was a captain of engineers and Mr. Wheeler held the rank of major in the Construction Division.

Robert E. Horton, consulting engineer, 57 North Pine Ave., Albany, N. Y., announces change of address to R. F. D. No. 1, Voorheesville, N. Y.

Capt. Robert B. Murdock, U. S. A., recently discharged from the service, has been appointed executive engineer, Asphalt Association, New York.

OBITUARY

Col. William R. Livermore, U. S. A., retired, who, together with English engineers, laid the cable from the United States to Havana in 1868 and who, as a young officer in the Corps of Engineers, was connected with fortification work at Key West, Tortugas, and Atlantic Coast ports, died Sept. 27 at the army hospital, New York City, aged 77 years.

Construction News

NOTE—
These items were prepared for the issue appearing in the 2nd week of Nov- bearing the Oct. 9. publication date —

Waterworks

PROPOSED WORK

Mich., Owosso—City having plans prepared for installing 12 in. pipe line around city, also purchase and installation of team pumping unit, 3,000,000-5,000,000 gal. daily capacity, and electric driven air compressor with 1200 cu.ft. per minute capacity. H. Riggs, Engineering Bldg., Ann Arbor, engr.

Mich., Pontiac—City having plans prepared by C. W. Hubbell, engr., 2348 Penobscot Bldg., Detroit, for water filter plant on Walnut St., to treat lake water for additional supply. Sand filter 10,000,000 gal. daily capacity to be designed.

Mich., Saginaw—City plans to trench and lay 16 in. c.i. force mains in Sheridan Ave., Highland and Webber Sts. Work will probably be done by day labor under supervision of R. F. Johnson, comr. About $40,000.

Cal., Sacramento—City having plans prepared by G. J. Calder, construction engr., 616-21 St., building water filtration plant. About $1,500,000. C. G. Hyde, ch. consult. engr. Noted July 17.

Cal., South Tule—South Tule Independent Ditch Co. plans to build dam. About $80,000. G. B. Sturgeon, Newhall Bldg., San Francisco, engr.

Ont., Seaforth—Town having plans prepared by James, Loudon & Hertzberg, engrs., 36 Toronto St., Toronto, for waterworks system, to include 15,000 ft. 6 in. c.i. pipe, pumphouse, centrifugal pumps and steel elevated tanks. About $100,000.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

***Pa., Phila.**—Bd. Water Supply let contract building 4 turbo centrifugal pumps, at Queen Lane Pumping Sta., to Bravo-Doyle Co., Commercial Trust Bldg., $404,600.

Mich., Highland Park—(Detroit P. O.)—City let contract furnishing 4 motor driven centrifugal pumping units and 3 venturi meters, 1 pump 5600 gallons per minute against 20 ft. head, one 3500 gallon per minute against 20 ft. head and two 3500 gallon per minute against 125 ft. head, to C. McIntosh, 422 Dime Bank Bldg., Detroit, $10,000 for pumps, $4000 for meters.

***Kan., Elk City**—City let contract building waterworks system and filteration plant, to Johnson, Morris & Hill, Independence. About $21,500.

Mont., Butte—Butte Water Co., 124 North Granite St., let contract furnishing and laying 3674 ft. 26 in. and 22,368 ft. 24 in. steel pipe, to Natl. Tube Co., Frick Bldg., Pittsburg, Pa., $34,680 and $157,694 respectively; 44,216 ft. 26 in. and 72,231 ft. 24 in. continuous wood stave pipe, to Redwood Mfg. Co., Hobart Bldg., San Francisco, Cal., $140,997 and $252,063 respectively.

***Okla., Ada**—City let contract for c.i. pipe in connection with proposed water works system, to Amer. Cast Iron Pipe Co., Birmingham, Ala., $94,000; hydrant, valves and valve boxes, to Darling Valve Mfg. Co., foot Walnut St., Williamsport, Pa., $5[illegible]. Noted Aug. 14.

***Okla., Afton**—City let contract extending waterworks system, to Smith & Whitney, Southwestern Life Bldg., Dallas, Tex. About $20,000.

***Okla., Enid**—City let contract furnishing 100,090 ft. 6-14 in. c.i. pipe and 48,566 lb. castings, to United States Cast Iron Pipe & Fdry Co., Security Bldg., St. Louis, Mo., cost $21,398; furnishing seventy-seven 4-14 in. valves and valve boxes and eight 6 in. fire hydrants, to Ludlow Valve Fdry. Co., 510 R. A. Long Bldg., Kansas City, Mo., $5896; laying pipes, to F. C. Brooks & Sons, Jackson, Mich., $53,076. Noted Sept. 18.

***Okla., Hartshorne**—City let contract improving waterworks system, to N. S. Sherman Machine Co., 18-32 East Main St., Oklahoma, $23,900.

Okla., Okmulgee—City let contract building storage dam, to Tibbets & Pleasant, Tulsa, cost $29,850, laying pipe, to Comstock & Hanson, Tulsa, $31,900, furnishing equipment, to Merkle Mchy. Co., 508 Interstate Bldg., Kansas City, Mo., $48,500. Noted Sept. 4.

Sewers

PROPOSED WORK

Mass., Chicopee — City appropriated $173,000 to build new vitr. pipe sewers in Williamansett Driving Park.

O., Barberton—J. Seiberling, dir. pub. serv., receives bids about December, building North Central Sanitary Sewerage System, involving 18,000 lin.ft. 8-15 in. vitr. tile pipe. R. W. Pratt, Hippodrome Bldg., Cleveland, engr.

O., Kenmore (Marietta P. O.)—L. W. Baughman, serv. dir., receives bids about January, building sewage disposal plant. Plans include sedimentation tanks, basins, etc. About $80,000. R. W. Pratt, Hippodrome Bldg., Cleveland, engr.

Mich., Grosse Point—City having plans prepared for storm sewerage system in Jefferson Ave., and sewer outlet to discharge into lake, involving 1100 ft. 36 in. vitr., rein.-con. or segmental black pipe. About $28,000. M. L. Brown & Son, 823 Chamber of Commerce, Detriot, engrs.

Mich., Midland—City soon lets contract backfilling, trenching and laying vitr. or concrete pipe in Ellsworth St. and Midland Ave. Work also includes furnishing and laying c.i. waterpipe, valves and hydrants. About $30,000.

Mich., Port Huron—City having plans and estimates prepared for sewer in Porter, Howard, Farley and Ballentine Sts. from 12th to 24th Sts., involving 7000 ft. 8-10 in. vitr. crock sewers with brick manholes and special connections. About $24,000. E. R. Whitmore, city engr.

Minn., Elmere—S. R. McQuarie, village recdr., soon lets contract building 8 blocks sanitary and storm sewers. About $12,000.

Minn., Hutchinson—City receives bids about January, building sewers in 40 blocks. About $100,000. J. W. Shaffer & Co., New York Life Bldg., Minneapolis, engrs.

Cal., Oakland—City plans to remove 1385 lin.ft. sewer and build new sewer in Alice St., 6 between 2nd and 7th Sts., involving 1503 lin.ft. 10-30 in. pipe. About $10,000. M. Campbell, city engr.

BIDS DESIRED

N. Y., West Haverstraw—Until Nov. 26, by G. Blagden, pres. bd. mgrs., New York State Hospital for the Care of Cripples & Deformed Children, for sanitary work, water tank and connection, new boiler, etc. and installing laundry equipment at institution, here. L. F. Pilcher, Capitol, Albany, archt.

Mich., Muskegon—Until Nov. 17, by B. H. Tellman, city recdr., furnishing material and constructing main and lateral sewers in Special Sewer Dist. No. 31, involving 22,007 10-24 in. pipe.

Mont., Baker — Until Dec. 2, by G. Haugh, mayor, building sanitary sewerage system. About $50,000. Burns & McDonnell, 400 Interstate Bldg., Kansas City, Mo., engrs.

PRICES AND CONTRACTS AWARDED

(*Indicates Award of Contract).

***N. J., Phillipsburg**—City let contract constructing and installing sewage disposal plant, to Municipal Disposal Co., Phila., $137,680. Plans include 2,000,000 gal. plant, 1 and 2 story building, 19 x 40 x 44 ft. electrolizer room, 15 x 22 x 24 ft. screen and grit chamber room, 15 x 30 x 45 ft. lime room, etc.

***Ga., Cartersville**—City will build sanitary sewerage system, involving 16 mi. 8-15 in. pipe, appurtenances, etc. Work will be done by day labor. Noted Aug. 7.

***O., Columbus**—G. A. Borden, dir. Dept. Pub. Serv., let contract building 12th Ave. relief sewer, involving 3970 ft. 24-42 in. sewer, 250 ft. catch basin drains, 1925 sq.yd. brick and 1700 sq.yd. asphalt pavement repairs and 13 manholes to I. O. Jones, 707 Grove St., $35,063. Noted Oct. 16.

***O., East Cleveland** (Cleveland P. O.)—City let contract building sewers in Belmar, Glenmont and Superior Rds., involving 4490 ft. 8-24 in. vitr. pipe, 36 manholes and 24 catch basins, to P. Ciraci, Brownhill Rd., Cleveland, $21,463.

***O., Rocky River**—Village let contract building sewers in various streets, involving 24,400 ft. 8-24 in. vitr. pipe, 6600 cu. yd. earth and 1800 cu.yd. shale excav., 53 brick manholes, to Gantore Constr. Co., Columbia Bldg., Cleveland. About $65,000.

***O., Vermillion**—City let contract building sewerage system, to T. Tripoletti, cost $48,000; sewage disposal plant, to Amer. Constr. Co., Marion Bldg., $25,000. Work involves 8 x 8 ft. screen building, 10 x 10 ft. disinfecting building, 32,500 lb. rein.-con. pipe, 32,450 ft. 6-12 in. vitr. pipe, 445 ft. 4-9 in. drain, 1350 cu.yd. earth trenching, 100 brick and iron manholes and 450 cu.yd. concrete.

***O., West Park**—S. H. Kleinman Realty Co., Garfield Bldg., Cleveland, let contract building sewers and water mains in Vassar Park Allotment, involving 4236 ft. 12-24 in. vitr. and 3768 ft. 4-8 in. c.i. pipe, 8 brick manholes and 24 catch basins, to A. J. Galvin, Columbia Bldg., Cleveland, $24,302; Industrial Allotment, involving 2760 ft. 12-24 in. vitr. and 2760 ft. c.i. water mains, 9 brick manholes and 8 catch basins, to Amato Constr. Co., Baldwin Rd., $27,732.

***Mich., Detroit**—City let contract furnishing labor and material for building and finishing complete, 8175 ft. lateral Sewer No. 3187 in blocks bounded by Log Cabin, Fenkel and Puritan Aves., and Highland Park Line, involving 1842 ft. 30-33 in. brick cylinder and 6333 ft. 12-24 in. crock sewer, to G. B. Hoag Constr. Co., Commercial Bank Bldg., Cleveland, O., $46,213; 9601 ft. lateral Sewer No. 3171, Connors, Drexel, and Mack Aves. and old city line, 9601 ft. 10-12 in. vitr. pipe, to Lennane & McIlvenna, Book Bldg., $17,500.

***Mich., Detroit**—Dept. Pub. Wks. let contract furnishing labor and material building Lateral Sewer No. 3114 in block bounded by Erwin, Rohns, Bessemore and Georgia Aves., and No. 3173 in block bounded by 12th, Hamilton Blvd., Burlingame and Webb Aves., to J. M. Affeld, 1208 Ford Bldg., $3279 and $21,648 respectively; Bates St. Sewer, sect. 1, dock section, to G. R. Cooke, Penobscot Bldg., $89,959.

***Mich., Grosse Point**—City let contract furnishing labor and material, trenching and laying 6000 ft. 8-22 in. vitr. pipe, Rivard Blvd., to G. R. Cooke, Penobscot Bldg., Detroit. About $19,000.

***Mich., Grosse Point**—City let contract furnishing labor and material for building, finishing and backfilling storm sewerage system in St. Clair Ave., involving 5000 ft. 8-20 in. vitr. pipe, to G. R. Cooke, Penobscot Bldg., Detroit. About $12,000.

***Mich., Grosse Point Farms** (Grosse Point P. O.)—Village let contract furnishing and laying 8435 lin.ft. 10-36 in. vitr. clay sewers, to Walker-Teetaert Co., 920 Majestic Bldg., Detroit. About $80,000, cost plus 15 per cent.

***Minn., Adrian** — Village Council let contract building sanitary sewerage system, involving 23,000 ft. vitr. pipe, septic tank system and accessories, to Kieffer Bros., Olivia., $45,750. Noted Oct. 23.

***Minn., Duluth**—City let contract building storm sewers in East Superior St. from 25th Ave. east to Duluth Co. Club property, involving 3410 ft. 12-36 in. pipe, 410 ft. culvert, 3000 cu.yd. earth and 250 cu.yd. rock trenching, to J. Hedberg, 313 21st Ave. W., $23,113.

***Kan., Enterprise**—City let contract building sanitary sewers in various

Sewers (Continued)

streets, to C. H. Everett, Hutchinson, $32,449.

*Mont., Billings—City let contract building 32,090 ft. 8 in. sanitary sewers in Yellowstone and Suburban Homes Additions, to E. Lindstrom, Billings, $72,144. Noted Sept. 18.

Tex., Van Alstyne—City let contract installing 20,000 ft. 6 in. sewer pipe and building sewage disposal plant, to Janes Contg. Co., Ranger, About $32,000.

Cal., Long Beach—City let contract building sewers in Hill St., et al, Sewer Dist. No. 8, to P. S. Tomich, 553 Pacific Ave., $47,500. Work involves 31,292 ft. 8-10 in. vitr. pipe, 323 ft. 6 in. c.i. siphon, 80 manholes and 48 flushtanks.

*Que., Shawinigan Falls—City Council let contract building main collecting sewer, to E. Bourassa, 95 Notre Dame St., Three Rivers. About $32,000.

*Ont., Owen Sound—City let contract supplying and laying 12,000 ft. 8-15 in. vitr. sanitary sewers in various steeets, to J. Cross Owen Sound. About $20,000.

Bridges

PROPOSED WORK

New Jersey—State Highway Comn., Trenton, plans to build steel bridge to connect Perth Amboy and South Amboy. About $1,500,000. A. Thompson, Broad St. Bank Bldg., Trenton, engr.

Mich., Detroit—City, Wayne Co. and Detroit United Ry. plan to build steel bascule bridge over river Rouge, on Fort St., to carry traffic including electric railway cars. About $800,000. C. F. Hubbell, city engr.

Cal., Newport Beach—Pacafic Electric Ry. and Southern Pacific Ry., Pacific Electric Bldg., Los Angeles, arranged with Orange Co. to build bridge over new channel to be dredged for Santa Anna River, to have three 60 ft. steel spans, rein.-con. piers and pile trestle approaches. County will pay $20,000 toward cost.

BIDS DESIRED

Conn., New Haven—Until Nov. 17, by city, building steel girder bridge encased, over Quinnipac River, on Middletown Ave., to have two 55 ft. spans and one 43 ft. span, 22 ft. roadway, 10 ft. sidewalk, rein.-con. slab floor, abutments, retaining walls and piers. F. L. Ford, city engr.

W. Va., St. Marys—Until Nov. 29 by Clerk Pleasants Co. building steel girder bridge with concrete floor and abutments, on Bens Run. Cost to be borne by Pleasants and Tyler Counties.

N. C. Beaufort—Until Jan. 5, by Bd. Comrs. Carteret Co., building North River Bridge 2190 ft. long, Smyrna Creek Bridge, 850 ft. long, and Howland's Creek Bridge 12 ft. long. C. S. Wallace, chn. L. Hooper, Beaufort, engr.

Michigan—Until Nov. 15, by F. F. Rogers, state highway comr., Lansing, building bridges Nos. 40, 41 and 42, forty-five ft. rein.-con. spans with plain concrete piers, 7 mi. south of Saginaw, involving 1300 cu.yd. concrete; Trunk Line Bridge No. 4, 120 ft. long, 20 ft. wide, 75 mi. west of St. Charles, involving 340 cu.yd. concrete and 57 1-2 tons steel. C. V. Dewart, Lansing, engr.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

*Pa., Conshohocken—Comrs. Montgomery Co., (Norristown) let contract building bridge over Schuylkill River, between here and West Conshohocken and bridge over Schuylkill Canal, to Seeds & Derham, 6320 Wissahickon Ave., Phila., $638,500 and $58,575 respectively. Noted Aug. 28 and Sept. 18.

*Pa., Harrisburg—Bd. Pub. Grounds & Bldgs. let contract constructing bridge over Wapaseening Creek, to Whitaker & Diehl, Union Trust Bldg., $37,351. Noted Sept. 11.

*Pa., Harrisburg—Bd. Pub. Grounds & Bldgs. let contract constructing Soldiers and Sailors Memorial Bridge along Capitol Park Extension and State St., about 1-2 mi. long, granite, to Central Constr. Co., Commonwealth Trust Bldg., $3,393,-[illegible]. Noted Aug. 14.

Pa., Millersburg—Comrs. Dauphin Co., (Harrisburg), let contract building concrete arch bridge over Wiconisco Creek, about 1 1-2 mi. below here, to Whitaker & Diehl, Union Trust Bldg., Harrisburg, $12,950.

*Pa., Shickshinny—Comrs. Luzerne Co., (Wilkesbarre) let contract building rein.-con. highway bridge, 30 ft. wide, 1517 ft. long, over Susquehanna River, here, to Walsh Constr. Co., Herald Bldg., Syracuse, N. Y. $409,380. Noted Aug. 7.

*Ga., Dublin—Comrs. Laurens Co. let contracts building steel and concrete bridge over Oconee River at foot of Jackson St., Project No. 39, Contr. No. 1, to Hodgson & Jones, Montgomery, Ala., $86,-251. Work involves 1608.5 cu.yd. Class "A" and 1006.0 cu.yd. Class "B" concrete (including excav.) 330,605 lb. steel reinforcing, 2953 sq.yd. vitr. brick paving, electrical work and taking down and stacking present approaches; Contr. No. 2, to Southern Bridge Co., 39th St., Birmingham, Ala., at $82,552, involving 876 cu.yd. Class "B" concrete (including wet and dry excav.) 26,723 lb. steel reinforcing, 1 swing span complete, including rails, wood block paving, side walk planking, etc. Noted Sept. 4.

*O., Columbus—Comrs. Franklin Co. let contract building approaches for Platter Bridge, 24 feet wide, over Big Walnut Creek, on Lockbourne Rd., Hamilton Twp., to Grant-Boulton Co., Columbus, $23,548. Work involves 6328 sq.yd. bituminous concrete, 7000 cu.yd. excav., 5540 sq.yd. water-bound macadam and 6134 lin.ft. penetration macadam berme. Noted Aug. 28.

*Minn., Duluth—St. Louis Co. let contract building 8 concrete bridges, north of Chisholm, to Minneapolis Bridge Co., Metropolitan Life Bldg., Minneapolis, $91,012.

*Kan., McPherson—D. D. No. 2, McPherson Co., will build bridges and culverts in connection with drainage system. About $25,000. Work will be done by day labor.

*Idaho, Homedale—State Bridge Dept., Boise, let contract building steel bridge across Snake River, here, to have four 162 1-2 ft. spans on concrete piers, 18 ft. roadway, paved with bituminous material, to U. S. Bridge Co., Great Falls, Mont., $89,994.

*Idaho, Twin Falls—City let contract building steel bridge over Rock Creek Canyon on Shoshone St., to C. H. Lull, Twin Falls, $46,850. Noted Aug. 7.

*Cal., Hanford—Bd. Supervs. King Co. let contract building 500 ft., rein.-con. bridge over Kings River south of Kingsburg, to Cotton-McCauley Co., 16 California St., San Francisco, $31,512. Noted Sept. 18.

*Cal., San Jose—Comrs. Santa Clara Co. let contract building 3 span rein.-con. bridge, 130 ft. long, 20 ft. wide, on Edmundson Ave., involving 343 cu.yd. rein.-con., to J. H. Miller, 101 South 16th St., $9885.

Streets and Roads

PROPOSED WORK

N. J., Jersey City—City soon receives bids repaving Fleet St., Holmes and Hopkins Aves., Belgian block on concrete foundation. About $30,000. C. A. Van Kuren, city engr.

South Carolina—State Highway Dept., Columbia, receives bids about Nov. 20, building 14.6 mi. road from Clemson to Russell, 28 ft. wide, Oconee Co., cost $70,-000; 4 mi. Washington-Augusta Highway, 28 ft. wide, gravel and sand clay, Aiken Co., $60,000.

Wisc., South Milwaukee (Milwaukee P. O.)—City receives bids in spring, paving Lawton Ave. and other streets, 30 ft. wide, concrete. About $60,000. H. E. Reinertsen, 683 1-2 Greenfield Ave., Milwaukee, engr.

Minn., Hopkins — City receives bids about January, for 30,000 sq.yd. paving, 18 ft. wide. Bids will be received on all types of pavement. About $150,000. J. W. Shaffer & Co., New York Life Bldg., Minneapolis, engrs.

Minn., Hutchinson—City receives bids about January, for 50,000 sq.yd. paving, 18 ft. wide. Bids will be received on all types of pavement. About $200,000. J. W. Shaffer & Co., New York Life Bldg., Minneapolis, engrs.

Minn., Slayton—City receives bids about January, paving 15 blocks, 18 ft. wide. Bids will be received on all types of pavement. About $150,000. J. W. Shaffer & Co., New York Life Bldg., Minneapolis, engrs.

Kan., Kansas City—City soon receives bids grading 37th and 38th Sts., from Metropolitan to Strong Aves., 16th St. from Douglas St. to south city limits and Lawrence St. from 14th to 17th Sts.; grading, curbing and paving Graystone Ave. from Shawnee Rd. to state line, concrete; resurfacing Central Ave. from Park to 18th Sts., rock asphalt. W. Barclay, city engr.

Neb., Wayne—City soon receives bids for 75,000 sq.yd. brick pavement. About $150,000. Rohrbough Eng. Co., 929 City Natl. Bank Bldg., Omaha, engrs.

Mo., Neosho—Newton Co. having preliminary plans prepared building 40 mi. hard surfaced roads from Seneca to county line, 18 ft. wide. A. C. Moore, Joplin, engr.

Mo., St. Joseph—City had plans prepared paving 3 blocks Lovers Lane and 4 blocks 28th St., 25 ft. wide, asphaltic concrete. Cost $25,000 and $30,000 respectively. W. K. Seitz, St. Joseph, engr.

Tex., Livingston—Polk Co. having plans prepared gravel surfacing and building rein.-con. bridges and culverts on 36.6 mi. Highway No. 35 from Trinity River to Neches River, 16 ft. wide. About $610,000. A. P. Rollins, Livingston, engr.

Colorado—State Highway Comn., Denver, receives bids about Nov. 17, building 1-4 mi. Federal Aid Project No. 27, 18 ft. wide. Work invcives 550 cu.yd. earth excav., 2800 sq.yd. concrete, 90 lin.ft. 15 in. and 50 lin.ft. 24 in. corrugated metal culverts, 225 cu.yd. gravel for sub-grade, etc. About $12,000. J. E. Maloney, state highway engr.

Ore., Coquille—Coos Co. Rds. Advisory Bd. plans election to vote on $1,500,000 bonds to build and improve roads. A. T. Morrison, chn.

Ore., Heppner—Morrow Co. will sell $125,000 bonds Nov. 12, to build 1st unit of Oregon-Washington Highway through county. Work includes grading and graveling.

Ore., Salem—North Salem Impvt. Assn. having tentative plans prepared for paving 4th St., 20 ft. wide, Hazel St. from Highland Ave. to Locust St., 20 ft. wide, Front St. between city and Marion Co. pavements, remainder of Hickory St., 20 ft. wide, extend Capitol St. to Fair Grounds Rd., Cherry St. Ave. through to Winter St., to include grade, level and drain, also gravel Hickory St. between Pacific Highway and River Rd., 18 ft. wide, concrete Nos. 1 and 2, asphaltic concrete or bitulithic. Cost will exceed $50,000. E. S. Tillinghast, pres.

BIDS DESIRED

Maine—Until Nov. 19, by State Highway Comn., Augusta, grading, draining and gravel surfacing 7.05 mi. river road, 16 ft. wide, with 2 1-2 ft. shoulders, Enfield Twp. P. D. Sargent, ch. engr.

Rhode Island—Until Nov. 19, by State Bd. Pub. Rds., Providence, improving 5080 ft. New London Turnpike, West Warwick and Cranston Twps., involving 3200 cu.yd. earth excav., 800 cu.yd. gravel foundations, 4700 tons crushed stone, hauling, heating and applying 28,000 gal. asphalt, (penetration method). A. L. Atwood, comr.

N. Y., Brooklyn—Until Nov. 19, by E. Riegelmann, boro. pres., regulating and repaving roadway of Atlantic Ave. from 5th to Washington Ave., permanent asphalt and grade 1 granite pavements on 6 in. concrete foundation; regulating and paving roadway of 35th St. from Neptune to Mermaid Aves., permanent asphalt on 6 in. concrete foundation, regulating, grading, curbing and laying sidewalks on 90th St. from 5th to Gelston Aves.

Fla., Sanford—Until Nov. 28, by Comrs. Seminole Co. grading, paving and building bridges and culverts on Roadways Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13; alternate bids will be received on brick, concrete, asphalt, bituminous, surface treated or waterbound macadam and shell. Noted Sept. 25.

Michigan—Until Dec. 2 by State Highway Comn., Lansing, grading and draining 48.506 mi. State Trunk Line Road No. 35-5, Marquette Co., involving 231 acres clearing, 34,385 sq.yd. grubbing, 474.327 cu.yd. earth excav., 86,742 cu.yd. rock excav., 21,778 ditch excav., 2035 cu.-

Streets and Roads (Continued)

yd. concrete in culverts, 63,231 lb. steel and 12,912 lin.ft. corrugated culverts.

Minn., Crookston—Until Nov. 24, by Comrs. Polk Co., building 1 1-2 mi. Federal Aid Project No. 112, Job No. 1913, involving 14,316 sq.yd. concrete paving and 14,320 lin. ft. drain tile. E. H. Harding, Crookston, engr.

Minn., St., Paul—Ramsey Co. receiving bids grading and graveling 2 mi. Sibley Memorial Highway, from Mendota to St. Paul. 24 ft. wide. About $10,000.

Kan., Emporia—Until Nov. 26, by G. L. Miller, clk. Lyon Co., building and paving 23,700 ft. Sect. "B", Federal Aid Project No. 30, 18 ft. wide, 1 or 2 course concrete, monolithic brick or bituminous filled brick. Work involves 47,400 sq.yd. paving 16,406 cu.yd. earth excav., 639 cu.yd. concrete in culverts and bridges and 25,833 lb. reinforcing steel.

Mo., New Madrid—Until Nov. 17, by New Madrid Co. Court, grading, clearing, ditching, rock surfacing and laying tile and metal pipe culverts on 12.05 mi. Morehouse-Lilbourn Rd., Sect. No. 2. C. V. Hansen, highway engr.

Tex., Tyler—Until Dec. 1, by Highway Comn. Smith Co., surfacing 7 3-4 mi. road, concrete and gravel. D. K. Caldwell, co. highway engr.

New Mexico—Until Nov. 25, by State Highway Comn., Capitol Bldg., Sante Fe, building 1.71 mi. Tijeras Canyon Cooperative Forest Aid Project, State Rd. 46, Sect. 1, Bernalillo Co. Work involves 3928 cu.yd. excav., 2741 cu. yd. borrow, 276 lin. ft. 18-36 in. corrugated metal culvert and 24.38 cu.yd. cement rubble masonry. L. A. Gillett, state highway engr.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

***Mass., West Roxbury** (Boston P. O.)—Bd. Pub. Wks. let contract grading Centre St., to A. Cefalo, 316 Belgrade Ave., Roslindale. About $10,000.

***N. Y., Brooklyn**—E. Riegelmann, boro. pres. let contract regulating and repaving Crown and 82nd Sts., to Uvalde Asphalt Paving Co., 1 Bway., New York City, $15,074 and $12,209 respectively; Atlantic Ave., to Sicilian Asphalt Paving Co., 41 Park Row, New York City, $43,990; paving, curbing and laying sidewalks on Bay St., to Camloh Contg. Co., 126 Prospect Park West, $15,312; laying cement sidewalks on Autumn Ave., Union and President Sts. to Grimm Constr. Co., 170 McKinley Ave., $570.

***N. J., Bayonne**—City let contract improving 39th St. between Hudson Blvd. and Bway. Ave., to C. T. Kavanagh, Inc., 32nd St., Bayonne, $23,323.

***N. J., Newark**—Bd. Supervs. Essex Co. let contract paving Grove St. and Lyons Ave., bitulithic and concrete, to Northern Constr. Co., 665 Broad St., $26,664 and $81,732 respectively.

***N. J., Trenton**—Bd. Freeholders Mercer Co. let contract paving East State St. or Nottingham Way, involving 8211 sq.yd. asphalt and 1078 yd. brick, to J. J. Barrett, 147 Lafayette Ave., $47,502. Noted Sept. 25.

***Pennsylvania**—State Highway Dept., Harrisburg; let contracts building 109,318 ft. Route 9, Lackawanna Trail, in Upper Pittston Twp., Lackawanna Co., macadam on concrete base, to R. Hand Constr. Co., Main St., Wilkesbarre, $410,327; 71,903 ft. Route 150, Luzerne Co., macadam on concrete base, to Rees & O'Brien, Wyoming Ave., Scranton, $460,000.

***Pennsylvania**—State Highway Dept., Harrisburg, let contract building 6191 ft. rein.-con. and vitr. brick road in Forest City, Susquehanna Co., to Holt Lumber Co., Belmont St., Carbondale, $59,463. Noted Sept. 11.

***Pa., Beaver Falls**—Town Council let contract paving 6th Ave., from 8th to 22nd Sts., to S. Gamble Co., Carnegie. About $70,000. Noted Sept. 4.

***Pa., Dormont** (Pittsburgh P. O.)—Boro. let contract grading, paving and curbing Philadelphia Ave. from Potomac to Ordinance Aves., involving 2600 sq.yd. vitr. brick on 5 in. concrete base, 3200 lin.ft. 18 in. concrete curbing and guttering, and 1800 cu.yd. earth excav., to Pittsburgh Paving Co., Bakewell Bldg., $21,054; Potomac Ave. from Dwight to Crosby Aves., 1650 sq.yd. vitr. brick on 5 in. concrete base, 1100 lin.ft. 24 in. concrete curbing and guttering and 1400 cu.yd. earth excav., to J. P. Garey, Oakmont, $10,871.

***Pa., Pittsburgh**—City let contract grading, paving and curbing (a) Shaler St. from McKnight to Well Sts., involving 4450 sq.yd. stone block on 5 in. concrete base, 3570 lin.ft. concrete curbing and 7194 cu.yd. excav., (b) Alexis St. from Saline St. to unnamed 10 ft. way, 2100 sq.yd. one block on 5 in. concrete base, 1650 lin.ft. concrete curbing, 5046 cu.yd. embankment and 513 cu.yd. excav.; regrading, repaving and recurbing, (c) 5th Ave., (d) roadway of Shady Ave. at second angle southwardly from 5th Ave., to T. Cronin, South 17th and Muriel Sts., (a) $36,306, (b) $17,747, (c) $640. (d) $381; A. R. Van Horn, 706 Taylor Ave.

***North Carolina**—Div. Office State Highway Comn., Greensboro, let contract grading and gravel surfacing roads in Person Co., to Person Co. Comrs., Roxboro, $47,000; hard surfacing 4 1-2 mi. Greensboro-Gibsonville Rd., Guilford Co., to Guilford Co. Comrs., Greensboro, $151,000. Contract for latter sublet by Co. Comrs. to R. G. Lassiter, Oxford. Noted Sept. 18.

***Ga., Griffin**—Comrs. Spalding Co. let contract building 42,240 sq.yd. road, 6 1-2 in. concrete, to McDougald Constr. Co., Healy Bldg., Atlanta, $111,514. Noted Aug. 28.

***Ga., Monroe**—Comrs. Rds. & Revenues Walton Co., let contract building 8.2 mi. top soil road from here to Jersey, to Stanley & Singer, Lafayette, Ala. About $46,000. Noted Sept. 25.

***La., Alexandria**—City let contract paving 4th St. from Lee to Casson Sts., vitr. brick, to J. F. Valleant & Co., Alexandria, $16,547. Noted Aug. 21.

***O., Bedford**—City let contract improving Ellenwood and Tarbell Aves., involving 1862 ft. 6 in. water mains, 370 ft. 10 in. vitr. tile sewer, 3 brick manholes, 9360 sq.ft. sand stone sidewalk and 1000 cu.yd. earth excav., to J. E. Horr, Bedford, $11,348.

***O., Chardon**—Geauga Co. let contract resurfacing 1.52 mi. Sect. "D" Cleveland Meadville Rd., 16 ft. wide, concrete, to Studebaker & Sons Co., Greenville, $36,692.

***O., Columbus**—G. A. Borden, dir. Dept. Pub. Serv., let contract grading, draining, curbing, laying water mains and paving 618 ft. 11th Ave, from Cleveland to St. Clair Aves., 24 ft. wide, involving 1570 sq.yd. asphalt and 600 sq.yd. brick gutters, to A. G. Pugh, Columbus, $10,050. Noted Oct. 16.

***Michigan**—State Highway Comn., Lansing, let contract to J. W. Ederer & Co., Saginaw, improving 1.764 mi. State Trunk Line Rd. No. 47-6, Saginaw Co., involving 16,562 sq.yd. waterbound macadam and 5528 cu.yd. earth excav., $26,744; McDermott & Cooper, 324 Weddicomb Bldg., Grand Rapids, 3.072 mi. State Trunk Line Rd. No. 17-3, 16 ft. wide, Kalamazoo Co., 5874 cu. yd. concrete and 10,280 cu.yd. earth excav., $82,277; H. C. Crane, Midland, 7.532 mi. State Trunk Line Rd. No. 18-8, 16 ft. wide, Arenac Co., 76,699 sq.yd. gravel, 25,197 cu.yd. excav., 6372 lbs. reinforcing steel and 1274 ft. 12 in. encased tile, $96,628; Bd. Ionia Co. Rd. Comrs., Ionia, 2.458 mi. State Trunk Line Rd. No. 44-1, 16 ft. wide, Ionia Co., 23,077 sq.yd. gravel and 7997 cu.yd. excav., $27,854; Bd. Menominee Co. Rd. Comrs., Menominee, 5.497 mi. State Trunk Line Rd. No. 15-1C, 16 ft. wide, 30,930 sq.yd. stone-gravel and 8211 cu.yd. excav., $57,785; J. E. McNicholas, Marenisco, 3.627 mi. State Trunk Line Rd. No. 28-4, 14 ft. wide. 29,788 sq.yd. gravel, Ontonagon Co., $29,476. Noted Sept. 4 and 18.

***Michigan**—State Highway Dept., Lansing, let contract grading, draining, and surfacing 2.538 mi. State Trunk Line Rd. No. 46-1, 16 ft. wide, Montcalm Co., involving 11,380 cu.yd. earth excav. and 23,828 sq.yd. gravel surface, to Bd. Montcalm Co. Rd. Comrs., Edmore, $32,038; 2.829 mi. State Trunk Line Rd. 47-7, 24 ft. wide, Saginaw Co., 18,747 cu.yd. earth excav. and 39 829 sq.yd. bituminous concrete, to Globe Constr. Co., Flint, $115,701; 7.459 mi. State Trunk Line Rd. 22-2, Leelanau Co., 28,774 cu.yd. earth excav. and 70,019 sq.yd. gravel surface, to Bd. Leelanau Co. Rd. Comrs., Cedar, $72,859; 4.465 mi. State Trunk Line Rd. No. 19-3, 16 ft. wide, Sanilac Co., 9377 cu.yd. earth excav., 41,908 sq.yd. gravel surface and 293 cu. yd. concrete, to W. Blard and A. J. Hodges, Snover, $58,000; .69 mi. State Trunk Line Rd. No. 20-9 B, 20 ft. wide, Reed City, 4000 cu.yd. earth excav. and 1565 cu.yd. concrete, to J. W Patterson, Reed City, $20,552. Noted Sept. 11.

***Michigan**—State Highway Dept., Lansing, let contract improving 4.456 mi. State Trunk Line Rd. No. 17-4, 24 ft. wide, Van Buren Co., involving 17,525 cu.yd. excav., 1920 ft. hardsurfacing and 122 cu. yd. concrete, to M. F. Shupp, Kalamazoo, $18,048, 3.759 mi. State Trunk Line Rd. No. 17-2 B, Jackson Co., 24,064 cu.yd. excav., 207 cu.yd. concrete and 1920 ft. hard surfacing, H. E. Wilkinson, Homer, $22,892; .723 mi. State Trunk Line Rd. No. 14-9, 20 ft. wide, Ingham Co., 1645 cu.yd. excav. and 8486 sq.yd. bituminous concrete, to Butter Constr. Co., Lansing, $26,714; 5.152 mi. State Trunk Line Rd. No. 25-1 A, 16 ft. wide, Chippewa Co., 29,255 cu.yd. excav., 47,702 sq.yd. waterbound macadam and 333 cu.yd. concrete, to J. Cottle, Rudyard, $105,035; .924 mi. State Trunk Line Rd. No. 32-2, 16 ft. wide, Otsego Co., 5271 cu.yd. excav. and 8672 sq.yd. gravel surface, Bd. Rd. Comrs. Otsego Co., Gaylord, $11,327; 4.911 mi. State Trunk Line Rd. No. 13-3, 16 ft. wide, St. Joseph Co., 19,160 cu.yd. excav. and 9604 cu.yd. concrete, to H. A. Hoxie, 1426 4th St., Grand Rapids, $129,415; .511 mi. State Trunk Line Rd. No. 11-1, 16 ft. wide, Van Buren Co., 1022 cu.yd. excav. and 1249 cu.yd. concrete, Marswan & Green, 47 Union Ave., N. E., Grand Rapids, $15,323; 2.027 mi. State Trunk Line Rd. No. 17-1, Jackson Co., 11,892 cu.yd. excav., 113 cu.yd. concrete and 1920 sq.yd. hard surfacing, Johnson & Co., 421 Fountain St., Ann Arbor, $11,330; 3.96 mi. State Trunk Line Rd. No. 21-8, 16 ft. wide, Clinton Co., 7462 cu.yd. excav. and 37,169 sq.yd. gravel surfacing, Dean & McCreary, St. Johns, $44,901; 2.967 mi. State Trunk Line Rd. No. 21-9, 16 ft. wide, Clinton Co., 7123 cu.yd. excav. and 27,841 sq.yd. gravel surfacing, Clinton Co. Rd. Comrs., St. Johns, $36,367; 2.115 mi. Asst. Project No. 359, 16 ft. wide, Berrien and Cass Counties, 5302 cu.yd. excav. and 4652 cu.yd. concrete, J. E. Nelson & Sons, 118 North La Salle St., Chicago, $60,520.

***Mich., Detroit**—Dept. Pub. Wks. let contract to Detroit Asphalt Paving Co., 20 McGraw Bldg., paving Newberry Ave., $15,717; Harper Ave., $73,391; Lennane & McIlvenna, Book Bldg., Alley No. 1081, $2571, No. 1083, $3713, No. 1086, $2911, No. 1082, $2513, No. 1085, $2293; Otis Cement Constr. Co., 806 Hammond Bldg., No. 1084, $3974, No. 1092, $5779, No. 1094, $3397, No. 1088, $1743, No. 1093, $3509, No. 1098, $4848; T. E. Currie, 20 McGraw Bldg., No. 1078 $5553, No. 1097, $5681; E. Meredith Co., 145 Harper Ave., No. 1079, $2424, No. 1088, $1743; R. J. Powelson, 1577 Iriquois Ave., No. 1080, $4496, No. 1091, $2045, No. 1087, $3009, No. 1090, $5115, No. 1096, $8007. Noted Sept. 25.

***Mich., Detroit**—City let contract to Detroit Asphalt Paving Co., 20 McGraw Bldg., paving Fenkell Ave., cost, $90,152, Colfax Ave., $20,820, Florida Ave., $54,808, Northfield Ave., $40,596, Olivet Ave., $4082, Schroeder Ave., $16,982, Silvan St., $5577; Cleveland Trinidad Paving Co., 2940 Woodward Ave., Fullerton Ave., $36,032, Clements Ave., $16,437; W. B. Brady Constr. Co., 1972 Grand River Ave., Otsego Ave., $13,605, Pingree Ave., $37,265, Wilson Ave., $5380, Blaine Ave., $39,421, Martindale Ave., $33,768; R. J. Powelson Co., 1577 Iriquois Ave., Alley No. 1068, $4063, No. 1071, $5400, No. 1075, $4123, No. 1076, $1499; Otis Cement Constr. Co., 806 Hammond Bldg., No. 1069, $5968, No. 1077, $5769; T. E. Currie, 20 McGraw Bldg., paving Garland Ave. 1072, $2131, No. 1074, $4492; E. Meredith & Co., 145 Harper Ave., No. 1073, $2006. Noted July 3 and 24, Aug. 14 and 28 and Sept. 25.

***Mich., Detroit**—Dept. Pub. Wks. let contract to Detroit Asphalt Paving Co., 20 McGraw Bldg., paving Garland Ave. from north line Shoemaker to south line Harper Aves., 26 ft. wide, asphaltic concrete on 6 in. concrete base, Amherst curbstone, $26,402. Lennane & McIlvenna, Book Bldg., Alley No. 1099, $5176, No. 1103 $2810; Otis Cement Constr. Co., 806 Hammond Bldg., No. 1100, $3456 No. 1107, $3949; Talbot Co., 400 Penobscot Bldg., No. 1101, $2846, No. 1104, $2388, No. 1108, $2881, No. 1102, $1906; T. E. Currie, 20 McGraw Bldg., No. 1105, $4093;

Streets and Roads (Continued)

R. J. Powelson Co., 1577 Iriquois Ave., No. 1166, $5094.

*Wis., Milwaukee—Milwaukee Co. let contract surfacing Burleigh St. No. 3, to Stein Constr. Co., 204 Grand Ave., involving 1800 cu.yd. excav., $1. per cu.yd., 4300 sq.yd. concrete surfacing, $2.19 and 20 cu.yd. concrete culverts, $26., total, $11,737; Wauwatosa Ave. No. 1, Wauwatosa Twp., 5000 cu.yd. excav., $1.05, 20,500 sq.yd. concrete surfacing, $1.83, 17 cu.yd. concrete culverts, $20 and 53 cu.yd. concrete bridges, $24., $44,377.

*Mich., Grand Rapids—Comrs. Kent Co. let contract grading and surfacing 2.67 mi. Rd. No. 19, Godfrey Ave., 16 ft. wide, 1 course concrete, to Golden & Boter, 25-27 Market Ave., $51,241.

*Kan., Kansas City—Wyndotte Co. let contract paving 1 mi. Federal aid highway, 18 ft. wide, concrete to Dawson Constr. Co., Ry. Exch. Bldg., Kansas City, Mo., $33,553. County will furnish cement.

*Kan., Lyons—Comrs. Rice Co. let contract to M. R. Ammerman, Salina, for 3 1-2 mi. brick paving, at $48,000 per mi., and tentative contract for 7 mi. (kind to be determined later). Bids received for 5 1-2 mi. rejected.

*Mo., Charleston—Mississippi County Court let contract grading, draining, paving and building culverts on 15.3 mi. Poplar Bluff-Cairo Rd. from Charleston to Bird's Point, State Rd. Project No. 7, Sect. "A", 16 ft. wide, to R. L. Williams, Wyatt, $461,616. Noted Sept. 25.

*Mo., Joplin—City let contract paving Indiana Ave., Main and F. Sts., concrete and waterbound macadam, to Ozark Paving Co., Joplin, $15,155.

*Tex., Dallas—City let contracts to Texas Bitulithic Co., Praetorian Bldg., paving Peabody Ave. from Wall to Horwood Sts., involving 8303 sq.yd. asphalt on 5 in. concrete base, 1944 lin.ft. combined concrete curb, gutter and sidewalk, 2114 cu.yd. earth excav., etc., $31,992; Rawlins St. from Oak Lawn Ave. to Wycliff St., 30 ft. wide, 7926 sq.yd. asphalt on 5 in. concrete base, 2368 lin.ft. combined concrete curb and gutter, 109 lin.ft. concrete sidewalk, 2056 cu.yd. earth excav., etc., $30,227; Oak Lawn Ave. from Cedar Springs to Lemon Sts., 6111 sq.yd. asphalt on 5 in. concrete base, 2381 lin.ft. combined concrete curb and gutter, 69 lin.ft. concrete sdiewalk, 1539 cu.yd. earth excav., etc., $23,900; Grand Ave. from Holms to Wall Sts., 4231 sq.yd. asphalt on 5 in. concrete base, 2479 lin.ft. combined curb and gutter, 166 lin.ft. sidewalk, 500 cu.yd. earth excav., etc., $17,655; Jefferson Ave. from Polk to Marlborough Sts., 30 ft. wide, 26,032 sq.yd. asphalt on 5 in. concrete base, 3106 lin.ft. combined concrete curb and gutter, 2485 lin.ft. sidewalk, 6701 cu. yd. earth excav., etc., $52,980.

*Tex., Falfurrias—Brooks Co. let contract excavating, grading, subgrading, caliche surfacing and building concrete culverts on 10.75 mi. Highway No. 12 from Encinal to south line Brooks Co., 16 ft. wide, to W. T. Hutto, Hutto, $31,981. Work involves 15 acres clearing and grubbing 10.36 mi. road machine work, 14,025 cu.yd. unclassified earth excav., 13 cu.yd. class A, 2 cu.yd. class B and 13 cu.yd. class C concrete and 1293 lb. reinforcing steel. Noted Sept. 11.

*Tex., Rockwall—Rockwall Co. let contract to Worthington, McElwrath & Rogers, Corsicana, building plain and rein.-con. road on 13.36 mi. Highway No. 1 from Dallas Co. to Collin Co. line, 18 ft. wide, involving 3.82 mi. blade machine work, 2524 sq.yd. bituminous surface treatment, 72,556 cu.yd. unclassified earth excav., 30,605 sq.yd. rein.-con. gravel concrete, 107,260 sq.yd. plain gravel concrete, etc., $409,120; rein.-con. drainage structures on same, involving 1200 ft. concrete viaduct, 1042 cu.yd. structural excav., 366,222 lb. reinforced steel, 33,060 lb. structural steel, 2181 ft. class A, 846 ft. class B and 67 ft. class C concrete, etc., $109,625. Noted Sept. 11.

*Ariz., Prescott—City let contract paving 5 blocks Mt. Vernon Ave., to Southwestern Constr. Co., 13th Ave. and Lincoln St. Phoenix, $76,944.

*Wash., Dayton—City let contract paving 1st St., 1 course concrete, to Alloway & George, Walla Walla. About $21,000.

*Wash., Everett—City Council let contract paving with concrete, building concrete curbs, gutters and sidewalks, on Rucker Ave., et al, 30 ft. wide, to Hoover & Co., Everett, $21,000.

*Wash., Yakima—Comrs. Yakima Co. let contract paving 2 mi. road from Buena to Toppenish, bitulithic top with concrete base, to Standard Asphalt Paving Co., North 517 Lincoln St., Spokane, $51,200.

*California—State Highway Comn., 515 Forum Bldg., Sacramento, let contract building 1.3 mi. Div. 7, Route 2, Sect. C road between Russel Ranch and former easterly boundary, Ventura Co., to G. R. Curtis, 2440 East 26 St., Los Angeles; 4.7 mi. Div. 3, Route 4, Sect. D, road between Houston School and Northerly boundary, San Joaquin Co., W. A. Dontanville, Salinas; 8.6 mi. Div. 7, Route 23, Sect. E, road between 2 mi. north of Acton and Palmdale, F. Hoffman, Long Beach. Noted Sept. 18.

*Cal., Los Angeles—City let contract paving 3 blocks Bway. from 10th to Pico Sts., to Los Angeles Paving Co., 2900 Santa Fe Ave., $30,532. Work involves 37,050 sq.ft. grading and bitulithic paving, 6240 sq.ft. asphalt paving and grading, 2150 lin.ft cement curbs, 30,385 sq.ft. cement sidewalks, 1833 sq.ft. concrete gutters and 187 sq.ft. granite block gutters.

*Cal., Oakland—City let contract paving, grading, curbing, guttering, 47th Ave., to Bates & Borland, Bway. and 12th St., $16,084; East 10th St., to Hutchinson Co., 444-17th St., $30,941; Jefferson St., to Ransome Randle Co., Oakland, $28,857. Noted Sept. 11 and 25.

*Cal., Oakland—City let contract grading, curbing, guttering paving and building 76 lin. ft. 10 in. pipe conduit in 8th St. from Clay to Market Sts., to Ransome Randle Co., Oakland, $22,896. Work involves 5468 sq.yd. asphalt, 4232 sq.ft. brick gutter, 3317 lin.ft. concrete curbing and 180 lin.ft. granite curbing reset.

*Cal., Oakland—City let contract improving, 26th Ave. from Foothill Blvd. to East 22nd St., involving grading 58,360 sq.ft., 176 lin.ft. concrete and 1809 lin.ft. redwood curbing, 6011 lin.ft. concrete guttering, 10,406 lin.ft. cement sidewalks, 28,942 sq.ft. oil macadam and 830 lin.ft. 10-16 in. pipe conduit, to Bates & Borland, Bway and 12th Sts., $12,739.

*Cal., South Pasedena—City let contract paving Orange Grove Ave., to W. Liddington, 420 East 60th St., Los Angeles, $34,024. Work involves 165,000 sq.ft. 5 in. concrete paving, 188,000 sq.ft. grading, 6000 lin.ft. cement curbs, storm drain, etc.

*Cal., Venice—City let contract paving Virginia Ave., to A. Stutzer, Menotta Bldg. About $30,000. Work involves 14,364 sq.ft. 5 in. concrete pavement, 8540 lin.ft. cement curbs, 10,488 cu.yd. earth fill, 4543 sq.ft. cement sidewalks and 162,000 sq.ft. oil surface.

Railways

PROPOSED WORK

New York—Emporium Forestry Co., New York Central Depot, Utica, plans to extend Grasse River R. R. from Cranberry Lake Village to Benson Mines. About $100,000.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

*Minnesota—Mesaba Electric Ry., Virginia, let contract for trestles, wooden and steel bridges in connection with changing of route between Chisholm and Hibbing, to Stack Constr. Co., Selwood Bldg., Duluth, $40,000; grading approaches along same, to C. Magnuson, 1617 Jefferson St., Duluth, $70,000. Work involves 12,000 lin.ft. piling, 180,000 ft. timber for trestles, 243 cu.yd. mass concrete and 275 cu.yd. rein.-con.

Excavation and Dredging

PROPOSED WORK

N. Y., Brookiyn—Dredging—E. Riegelmann, boro. pres., rejected bids received Sept. 10, dredging Gowanus Canal from its head to Hamilton Ave. and Newtown Creek Canal at and in canal and basin included within boundaries of Johnson and Varick Aves. and in Stagg St. basin. Work will be readvertised. Noted Sept. 4.

Mont., Laurel—Irrigation—Italian Ditch Co. soon receives bids irrigating 4000 acres in Yellowstone Co. Work includes 3-4 mi. extension to canal and involves 15,000 cu.yd. excav. and 60 cu.yd. concrete in headgates. About $10,000. B. C. Lillis, 239 Clark Ave., Billings, engr.

BIDS DESIRED

Minn., Austin—Dredging—Until Nov. 19, by Mower Co., dredging channel of Red Cedar River, involving 40,000 cu.yd. excav. About $15,000. A. B. Overland, Austin, engr.

Minn., Olivia—Ditch—Until Dec. 8 (change of date), by Comrs. Renville Co., building Ditch No. 75. About $115,889 F. M. Shepherd, Olivia, engr.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

*N. Y., Kingston—Excavation—State Highway Comn., Capitol, Albany, let contract excavating for anchorage shafts for bridge over Rondout Creek, on State Rd. No. 5599-B, to Booth & Flinn, 17 Battery Pl., New York City, $14,650.

*N. Y., New York—Dredging—M. H. Hurlburt, comr. docks, Pier "A", North River, let contract dredging 11,000 cu.yd. at Pier 33, North River, excavating and dredging 64,000 cu.yd. bulkhead at West 79th, 80th to 97th St. North River, to F. E. Jones, 17 Battery Pl., $5060 and $29,670 respectively; excavating and dredging 1850 cu.yd. bulkhead at East River, East 54th, East 64th and East 79th Sts. and 55,650 cu.yd. at all piers of East River, East 30th, East 94th, East 96th, East 98th, East 99th, East 100th, East 102nd, East 104th, East 108th, East 109th, East 110th, East 117th, East 118th, East 119th, East 123rd, East 124th and East 125th Sts., to P. S. Ross, Inc., 277 Washington St., Jersey City, N. J., $2714 and $36,292 respectively.

*Ia., Washington — Drainage — Comrs. Washington Co. let contract for open work for building D. D. No. 6, to Maring-Day Co., Lincoln, Neb., $32,427; tile to C. Hangsted, Nevada, $27,250.

*N. B., St. John—Dredging—Dept. Pub. Wks. let contract dredging 40,000 yd. along wharves at West St., John, to J. A. Gregory, West St. John, $.33 per yd.

*Ont., Lucknow—Drainage—W. A. Wilson, town clk., let contract to W. T. Johnston R.R. No. 2, Auburn, building Kirk Drain, in West Wawanosh Twp., involving 11,830 cu.yd. open work and 845 cu.yd. covered work and J. B. Young Drain, in West Wawanosh Twp., 15,300 cu.yd. open work and 272 cu.yd. covered work; cost, $12,187.

*Ont., Ogdensburg—Dredging—Dominion Government, Ottawa, let contract dredging 40,000 cu.yd. Ogdensburg Harbor, to Daly Dredging Co., Ogdensburg. About $65,000.

Industrial Work

PROPOSED WORK

Mass., Wakefield—Heywood Bros. & Wakefield Co., Gardner, having preliminary sketches made by Lee & Hewitt, archts. and engrs., 1123 Bway., New York City, for 3 story, rein.-con. and steel addition to factory, rein-con. flooring, concrete foundation, here. About $150,000.

R. I., Providence—R. Sturgis, Power and Thayer Sts., plans to build 1 story, 50 x 100 ft., brick and concrete garage, rein.-con. flooring, concrete foundation. About $25,000. Private plans.

N. Y., Alexandria Bay—J. H. and G. A. Hutchinson, plan to build 2 story concrete garage, to accommodate 100 cars. About $60,000.

N. Y., Bolivar—L. G. Burt, Bradford, Pa., heads a company, which has been capitalized with $1,000,000, to build refinery here, to include 11 mi. 3 in. pipe line. About $350,000.

N. Y., Charlotte (Rochester P. O.)—Rochester Folding Box Co. plans to build concrete, brick and steel addition to plant on Elizabeth Ave. and install additional transmission line. About $300,000. E. Z. Adams, pres.

N. Y., Clayton—F. Dailey plans to build 2 story, 60 x 92 ft., brick, concrete and steel garage, on Merrick St. Cost including equipment, $75,000.

N. Y., Dexter—Dexter Sulphite Pulp & Paper Co., plans to build concrete and steel plant. About $300,000. Address H. A. Long, secy.

N. Y., Geneva—Geneva Glass Mfg. Co., Ave. F, plans to build additions to plant. Cost, including equipment, between $50,-

Industrial Work (Continued)

000 and $60,000. Address J O. Jensen, Ontario St.

N. Y., Long Island City—G. Piel Co., 29-13th St., having plans prepared by C. H. Higgins, archt. and engr., 19 West 44th St., New York City, for 6 story, 150 x 200 ft. rein.-con and steel industrial building, rein.-con. flooring, concrete foundation, on 7th, 8th, Washington and Pierce Aves.

N. Y., Long Island City—Ballinger & Perrott, archts. and engrs., 47 West 34th St., New York City, soon let contract building 10 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Queens St., for W. P. White, c-o architects. About $1,000,000.

N. Y., New York—Vitreous Enameling & Stamping Co., Inc., 11 East 167th St., having plans prepared by F. W. Rinn, archt. and engr., 70 West 181st St., for 1 story, 70 x 172 ft., brick and steel factory and garage, rein.-con. flooring, concrete foundation, on Sedgwick Ave. and 171st St. About $80,000.

N. Y., Watertown—Marcy-Buck Co., 102 Mill St., plans to build 2 story, 35 x 200 ft. warehouse with 12 car trestle. About $100,000.

N. Y., Watertown — J. W. Phippen plans to build 2 story, 47 x 180 ft., concrete and steel garage at 114 North Massey St. Cost between $75,000 and $85,000.

N. Y., Rochester—North East Electric Co., 348 Whitney St., plans to build 2 story, 61 x 206 ft. brick and rein.-con. factory, on Orchard St. between Lime St. and Lyell Ave. About $200,000

N. Y., Rochester—Rochester Ice Cream Co., foot of White St., plans to build and equip 4 story, 150 x 200 ft. concrete and steel factory. Cost between $450,000 and $500,000.

N. Y., Salamanca—R. P. Stewart Dyeing & Bleaching Co., Rochester St., plans to build 1 story, brick, concrete and steel dye plant. Cost including equipment, $100,000.

N. Y., Schenectady—Superior Printing & Box Co., Clinton St., plans to build 2 story, 30 x 166 ft., rein.-con. factory, rein.-con. flooring, concrete foundation. About $35,000. J. Densham, 712 Campbell Ave., archt. and engr.

Pa., Bloomsburg—C. Housnick, c-o W. H. Lee, archt., 30 South 17th St., having plans prepared for 2 story, 112 x 117 ft. garage and dance hall, concrete and steel. Cost between $40,000 and $50,000.

Md., Baltimore—Consolidated Gas, Electric Light & Power Co., Lexington Bldg., preparing plans for 2 story, 53 x 101 ft., concrete and brick factory, rock foundation, on Kloman St. and Western Maryland R. R. About $50,000. G. Beadenkoff, ch. engr

Md., Towson—Baltimore City Printing & Binding Co., 352 Equitable Bldg., Baltimore, having plans prepared by Dewitz & Webb, archts., 232 St. Paul St., Baltimore, for 2 story, 70 x 120 ft., brick factory and print shop, rock and brick foundation. About $30,000. F. A. Vinton, pres. and mgr.

O., Akron—Star Rubber Co., 1068 Sweitzer Ave., having plans prepared by Osborn Eng. Co., engrs. and archts., 2848 Prospect Ave., for 4 story, 60 x 110 ft., concrete, steel and brick factory, on Sweitzer Ave. About $75,000.

O., Cleveland—City Ice Delivery Co., Cadillac Bldg., soon lets contract constructing 28 x 70 ft. storage building and 22 x 24 ft. engine room, 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Madison Ave. About $25,000 C. C Coneby, Cadillac Bldg. archt

O., Cleveland—City Ice Delivery Co., Cadillac Bldg., receives bids about January, constructing 1 story, rein.-con., steel and brick storage building, rein.-con. flooring, concrete foundation, on Cedar and Lee Rds. About $100,000. C. C. Coneby, Cadillac Bldg., engr. and archt.

O., Cleveland—W S. Ferguson Co., engrs., 1900 Euclid Ave., soon lets contract building 3 story, 100 x 385 ft., concrete, steel and brick factory and boiler plant, rein.-con. flooring, concrete foundation, on East 152nd St., for Ultimate Tire & Rubber Co., Hippodrome Bldg. About $200,000.

O., Columbus — Fireproof Storage & Warehouse Co., 1024 North High St., having plans prepared by F. L. Packard, archt., New Hayden Bldg., for 5 story, 70 x 80 ft., rein.-con. warehouse, on North High St. About $50,000.

O., Willoughby—Zenith Tire & Rubber Co., 456 Leader News Bldg., Cleveland, having plans prepared by A. W. Harris, engr. and archt., 829 Schofield Bldg., Cleveland, for 1 and 3 story, 100 x 585 ft., concrete, steel and brick factory and boilerplant, rein.-con. flooring, concrete foundation, here. About $500,000.

Mich., Detroit—Smith, Hinchman & Grylls, archts., 710 Washington Arcade, soon let contract building 123 x 678 ft. train shed, shipping and press room, 60 x 105 ft. storage building, brick and steel, rein.-con. loading platform with asphalt floor and 2 plate girder bridges over tracks, one 45 ft. and one 26 ft. spans, on West End and Railroad Aves., for Fisher Body Co., Oakland and Piquette Aves.

Mich., Jackson—Hup Motor Car Co., Park Ave., soon lets contract building 1 story, 170 x 280 ft., rein.-con., brick and steel factory, concrete foundation. Smith, Hinchman & Grylls, 710 Washington Arcade Bldg., Detroit, archts. and engrs.

Minn., Duluth—J. J. Wagenstein, archt. and engr., Providence Bldg., soon lets contract building 2 story, 50 x 120 ft. factory addition and 20 x 40 ft. boiler house, brick, rein.-con. flooring, concrete foundation, for Diamond Calk Horseshoe Co., 47th Ave W. About $70,000.

Minn., Minneapolis—State Highway Comn., Guardian Life Bldg., St. Paul, having preliminary plans prepared by C. L. Pillsbury Co., engrs., Metropolitan Life Bldg. and C. H. Johnston, archt., Capital Life Bldg., St. Paul, for 1 story, 24 x 100 x 150 ft., concrete, steel and brick garage, here. About $60,000.

Cal., Richgrove—Southern California Edison Co., Edison Bldg., Los Angeles, plans to construct 43,000 h.p. hydro-electric plant, dam, tunnels and flumes to divert 600 cu.ft. water per second from North Fork of Kern River, Tulare Co. About $9,231,358.

BIDS DESIRED

Pa., Duryea—(Pittston, P. O.)—Until Nov. 15, by Lockwood-Green, archts. and engrs., 101 Park Ave., New York City, building 2 story, 50 x 100 ft. silk mill, rein.-con., rein.-con. flooring, concrete foundation, for Bloomsburg Silk Co., c-o architects. About $35,000.

O., Cleveland—Until Dec. 1, by Arco Co., 6518 Euclid Ave., constructing 1 story, 80 x 150 ft., concrete, steel and brick storage building, rein.-con. flooring, concrete foundation, on Bessemer Rd. About $60,000. Lockwood Greene & Co., South Dearborn St., Chicago, engrs. and archts.

Ill., Chicago—D. S. Klafter, archt., 64 West Randolph St., receiving bids constructing 1 story, 125 x 200 ft. foundry, 2 story, 30 x 85 ft. warehouse and 2 story, 60 x 65 ft. office building, brick and timber, concrete foundation, on Loomis and 21st Sts., for H. Kramer & Co., 1330 West 21st St. About $165,000.

Ill., Chicago—Until Nov. 20, by Lowe & Bollenbacher, archts., 108 South La Salle St., building 1 and 2 story, 210 x 420 ft., factory and office, brick and rein.-con., rein.-con. flooring, concrete foundation, on 31st St. and Kilbourne Ave. for Tuthill Spring Co., 760 West Polk St. About $200,000.

Ia., Maquoketa—Until Nov. 19, by city, building 35 x 46 ft. addition to hydro electric plant, also furnishing one 250 h.p. Diesel type engine direct connected to 210 k.v.a. generator with belted exciter, oil tank, pole and line material, switch board and station equipment, meters, transformers, etc. G. O. Morse, supt. W E. Skinner, Lumber Exch., Minneapolis, engr.

Tex., Ft. Worth—Until Dec. 1, by F. C. Manning, c-o Manning Dyeing & Dry Cleaning Co., 425 Bway., building 1 or 2 story, brick and concrete factory, concrete foundation, on St. Louis Ave. About $30,000. C. Allen, 8th St. near Houston St., archt.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

***Mass., Cambridge**—Cambridge Rubber Co., 748 Main St., let contract building 4 story, 74 x 90 ft., brick and concrete addition to factory, rein.-con. flooring, concrete foundation, to W. M. Bailey Co., 88 Broad St., Boston. About $50,000.

***Mass., Newton Upper Falls**—Saco-Lowell Shops, Oak St., let contract building 1 story, 160 x 200 ft., brick, concrete and steel addition to factory, rein.-con. flooring, concrete foundation, to Natl. Eng. Co., 40 Central St., Boston. About $90,000.

***Mass., Spencer**—Bigwood Woolen Co., Valley St., let contract building 2 story, 57 x 84 ft., brick and mill construction addition to mill, concrete foundation, to E. D. Ward, 82 Foster St., Worcester. About $25,000.

***Mass., Worcester**—Taxicab Serv. Co., 353 Pleasant St., let contract building 1 story, 60 x 93 ft., brick and concrete garage, rein.-con. flooring, concrete foundation, to J. Miles & Son, 393 Main St. About $25,000.

***R. I., Pawtucket**—Potter & Johnston Machine Co., 1027 Newport Ave., let contract building 1 story, 112 x 273 ft. brick and mill construction addition to plant, rein.-con. flooring and foundation, on London Ave., to W. H. Hamlyn & Son, 35 Greenwich St., Providence. About $75,000.

***R. I., Pawtucket**—Rhode Island Fittings Co., Hillsgrove, let contract remodeling and building 2 story, 41 x 50 ft. brick and mill construction addition to factory, concrete foundation, on Newell Ave., here, to Interstate Constr. Co., 29 Weybosset St., Providence. About $30,000.

***R. I., Woonsocket**—Border City Garnetting Co., 24 East Mill St., let contract building 1 story, 60 x 100 ft., brick and mill construction addition to plant, concrete flooring and foundation, to J. F. Fleurant & San, 158 Rathbun St. About $25 000.

***N. Y., Brooklyn**—C. W. H. Carter, Columbia St., let contract building several 1 and 2 story, steel and brick factories, rein.-con. flooring, concrete foundation, to E. Taylor & Sons, 321-75th St. About $250,000.

***N. Y., Brooklyn**—I. Friedman, 16 Court St., will build 2 story, 50 x 50 x 140 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Pearl, Tillery and Adams Sts. About $250.000. Work will be done by day labor.

***N. Y., Brooklyn**—L. Gold, 44 Court St., will build 4 story, brick and steel garage, rein.-con. flooring, concrete foundation, on Atlantic Ave. between Franklin and Classon Aves. About $400,000. Work will be done by day labor.

***N. Y., Brooklyn**—Normandy Theatre Co., Fulton St. and Howard Ave., will build 1 story, brick and steel garage, rein.-con. flooring, concrete foundation, at 1874 Fulton St. About $25,000. Work will be done by day labor.

***N. Y., Brooklyn**—Safe Constr. Co., 125 Bristol St., will build 1 story, 100 x 200 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 4th Ave. between 4th and 5th Sts. About $30,000. Work will be done by day labor.

***N. Y., Brooklyn**—Shipley Constr. & Supply Co., Columbia and Warren Sts., let contract building 2 story, 240 x 340 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on 41st and 42nd Sts. between 2nd and 3rd Aves., to Post & McCord, 101 Park Ave., New York City.

***N. Y., Buffalo**—Fowler Nail Co. let contract building 73 x 400 ft., 120 x 126 ft., 47 x 275 ft. and 96 x 120 ft. rein.-con. and steel factories, rein.-con. flooring, concrete foundation, on Military Rd., to J W Cowper Co., Fidelity Bldg. About $250,000, cost plus percentage basis.

***N. Y., Buffalo**—Niagara Machine & Tool Co., 683 Northland Ave., let steel contract building 1 story, 75 x 140 ft. steel and concrete addition to assembly and machine shop, rein.-con. flooring, concrete foundation, to Pittsburg Steel & Iron Co., Union Arcade, Pittsburg; masonry, to Tifft Constr. Co., Iroquois Bldg. About $125,000. Noted Aug. 28.

***N. Y., S. I. Clifton**—Fraser, Brace & Clark Dry Dock Co., Inc., 47 West 34th St., New York City, let contract constructing eight 1 story, 50 x 100 ft., brick and steel, ship repair plants, rein.-con. flooring, concrete foundation, here, to Fraser, Brace & Co., Inc., 47 West 34th St., New York City. About $1,800,000

Industrial Work (Continued)

*N. Y., Dunkirk—Continental Heater Co., Otter St., let contract building two, 1 story, 60 x 100 ft., brick and steel additions to factory, concrete foundation, to J. W. Cowper Co., Fidelity Bldg., Buffalo.

*N. Y., Lockport—Lockport Foundries Corp. let contract building 1 story rein.-con. and steel foundry, rein.-con. flooring, concrete foundation, to H. D. Best, Flatiron Bldg., New York City. About $250,000.

*N. Y., Long Island City—M. Miller, 935 Intervale Ave., Bronx, will build 100 x 175 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Borden Ave. and Oliver St., here. About $100,000. Work will be done by day labor.

*N. Y., Marcy—State Hospital Comn., Capital, Albany, let general contract building 1 story, 65 x 280 ft. central heating plant and 1 story, 80 x 120 ft., boiler room, brick and steel, concrete foundation, for Utica State Hospital, Marcy Division, here, to P. Keeler Bldg. Co., 425 Orange St., Albany, $206,840; heating, to Shevlin Eng. Co., Inc., 110 West 34th St., New York City, $279,498; plumbing, to A. J. Eckert Co., 103 North Lake Ave., Albany, $10,382; electric work, to Langdon & Hughes Electric Co., 233 Elizabeth St., Utica, $20,131. Noted Sept. 18.

*N. Y., New York—Davis & Lawrence, 10 Christopher St., let contract building 3 story, 50 x 200 ft. rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 238th St. and Bronx Blvd., to Hegeman-Harris, 33 West 42nd St. About $100,000.

*N. Y., New York—East 55th St., Garage Co., c-o T. J. Schefeik, archt. and engr., 788-East 175th St., will build 2 story, brick and steel garage, rein.-con. flooring, concrete foundation, at 226-232 East 55th St. About $50,000. Work will be done by day labor.

*N. Y., New York—East 169th St. Realty Corp., 1474 Shakespeare Ave., will build 1 story, 117 x 200 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 156th St. and Cauldwell Ave. About $60,000. Work will be done by day labor.

*N. Y., New York—V. C. Farrar, archt. and engr., 4 East 39th St., let contract to J. J. McMahon, Inc., 20 West 34th St., converting 5 story, brick and steel building, at 117 West 46th St., into garage and office, for Hoover Letter Serv., Inc., c-o architect. About $25,000. Noted Sept. 18.

*N. Y., New York—Gordon Radiator Co., 154 West 18th St., let contract building 2 story, 100 x 262 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Wales Ave. corner 143rd St., to Austin Co., 217 Bway. About $60,000.

*N. Y., New York—Klein Impvt. Co., 605 West 131st St., will build 1 story, 50 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 135th St. and 5th Ave. About $30,000. Work will be done by day labor

*N. Y., New York—J. Latimer, c-o Ebling & Magnusen, archts. and engrs., 52 Vanderbilt Ave., let contract building 1 story, brick and steel garage, rein.-con. flooring, concrete foundation, to W. F. Henry, 316 Flatbush Ave., Brooklyn. About $100,000.

*N. Y., New York—Lever & Sidway, 238 Ft. Washington Ave., will build 2 story, 100 x 165 ft., brick and steel garage, rein.-con. flooring, brick foundation. About $105,000. Work will be done by day labor.

*N. Y., New York—Melville-Clark Piano Co., 518 West 55th St., let contract building 5 story, 68 x 263 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 132nd St and Walnut Ave., to Industrial Eng. Co., 30 Church St. About $250,000.

*N. Y., New York—Ballinger & Perrott, archts. and engrs., 47 West 34th St., let contract to Industrial Eng. Co., 30 Church St., for 6 story, 375 x 382 x 316 x 200 ft. rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 141st St., and Walton Ave., for Port Morris Holding Co., c-o Winters & Co., 137th St. and Southern Blvd. About $500,000. Noted Sept. 11.

*N. Y., New York—Uneeda Ice Co., Inc., 666 East 187th St., let contract building 3 story, 74 x 90 ft., rein.-con. and steel plant, rein.-con. flooring, concrete foundation, on Jumel Pl. and 167th St., to Lustbader Constr. Co., 103 Park Ave. About $100,000.

*N. Y., New York—M. Spodek, 157 Forsyth St., will build 2 story, 100 x 100 ft. brick and steel garage, rein.-con. flooring, concrete foundation, at 329-335 East 48th St. About $50,000. Work will be done by day labor.

*N. Y., Niagara Falls—Carborundum Co., Buffalo and 14th Sts., let contract building 3 story, 99 x 224 ft. rein.-con. addition to factory, rein.-con. flooring, on Buffalo St., to Kearns Constr. Co., Milk St., Boston, Mass. About $150,000. Noted Sept. 4.

*N. Y., Port Chester—Mint Products Co., Inc., 299 Madison Ave., New York City, let contract building rein.-con. and steel factory, rein.-con. flooring, concrete foundation, to Turner Constr. Co., 244 Madison Ave., New York City. About $400,000. Noted Aug. 28.

*N. Y., Rochester—Bastian Bros., 69 Mt. Hope Ave., let contract building 4 story, rein.-con. factory, rein.-con. flooring, concrete foundation, to F. T. Ley & Co., Inc., 499 Main St., Springfield, Mass. About $200,000.

*N. Y., Syracuse—Brown Co., 213 Bellevue Ave., let contract building 2 story, 50 x 98 ft., and 65 x 90 ft. rein.-con. factory, rein.-con. flooring, concrete foundation, on Chester St., to T. H. McHale & Son, Cahill Bldg. About $50,000; cost plus percentage basis.

*N. Y., Walton—J. Kayser Co., 32nd St. and Madison Ave., New York City, let contract building 1 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here, to M. D. Bennett, Sidney. About $100,000. Noted Sept. 11.

*N. J., Edgewater—U. S. Aluminum Co. let contract building 81 x 450 ft. and 80 x 176 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, to Turner Constr. Co., 244 Madison Ave., New York City. About $1,000,000.

*N. J., Jersey City—Colgate Co., 105 Hudson St., let contract building rein.-con. addition to factory on York St., to Turner Constr. Co., 242 Madison Ave., New York City. About $200,000.

*N. J., Jersey City—Continental Candy Co., 374 West Side Ave., let contract building 8 story, rein.-con. plant, rein.-con. foundation, to J. Mitchell, Inc., 76 Montgomery St. About $75,000.

*N. J., Jersey City—Drop Forge Co., 277 Westside Ave., let contract building 4 story, 46 x 134 ft. rein.-con. factory, here, to J. W. Ferguson, United Bank Bldg., Paterson. About $50,000.

*N. J., Jersey City—Novelty Candy Co., Claremont Ave., let general contract building rein.-con. factory, on West Side Ave., to J. T. Mitchell, Inc., 76 Montgomery St., excavating and foundation to E. M. Flaherty, Montgomery St. About $200,000.

*N. J., Phillipsburg—Wallace Silk Co. let contract building 3 story, 60 x 150 ft. rein.-con. factory, to Amer. Concrete Steel Co., 27 Clinton St., Newark; cost plus percentage basis.

*Pa., Allentown—International Motor Co., 2302 Chestnut St., Phila., let contract building 2 story, 300 x 540 ft. and 60 x 300 ft., steel and brick factories here, to Austin Co., Bulletin Bldg., Phila. About $300,000.

*Pa., Bethlehem—Traveler Tire & Rubber Co., 819 North Broad St., Phila., let contract building 1 story, 100 x 333 ft. concrete factory, here, to Butz & Clader, Ainey Bldg., Allentown. About $180,000. Noted Mar. 6.

*Pa., Mont Alto—E. Martin, comr. health, Harrisburg, let contract building additions to heating plant, constructing new heating plant, laundry and installing heating and plumbing systems for latter, here, to Central Constr. Corp., Commonwealth Trust Bldg., Harrisburg, About $100,000. Noted Sept. 4.

*Pa., Phila.—Abbotts-Alderney Dairies, Inc., 31st and Chestnut Sts., let contract building 2 story, 65 x 125 ft. brick and concrete addition to factory, at 220 Lombard St., to Barclay, White & Co., 1713 Sansome St. About $140,000.

*Pa., Phila.—Amer. Ice Co., 6th and Arch Sts., let contract constructing rein.-con. ice plant, to consist of three 1 story, buildings, 58 x 116 ft., 48 x 58 ft. and 16 x 28 ft., to Cramp & Co., Denchla Bldg. About $150,000.

*Pa., Phila.—Amer. Preserve Co., 946 Beach St., let contract building 5 story, 80 x 250 ft. factory and 1 story, 50 x 70 ft. boiler house, rein.-con. on 3rd and Lehigh Sts., to Cramp & Co., Denchla Bldg. About $400,000. Noted Sept. 18.

*Pa., Phila.—Folwell Bros. & Co., Inc., 625 Chestnut St., let contract building 5 story, 23 x 101 ft., factory, on American and Somerset Sts., to W. Steele & Sons Co., Inc., 16th and Arch Sts. About $400,000.

*Pa., Phila.—Hohlfeld Mfg. Co., 10th and Allegheny Sts., let contract altering and building additions to factory, to W. Steele & Sons Co., 16th and Arch Sts. Cost will probably exceed, $100,000.

*Pa., Phila.—Hulton Dyeing Co., 3819 Frankfort Ave., let contract building 2 story, 62 x 400 ft. brick factory on Wheatsheaf and Coral Sts., to F. Crompton & Bro., 4614 Oakland St. About $120,000.

*Pa., Phila.—Landis & Co., 45 North 3rd St., let contract building 6 story, 32 x 84 ft. and 48 x 55 ft. warehouse, brick, concrete and slow burning construction, on 2nd and Cuthbert Sts., to B. Turbin, 605 Reed St. About $50,000.

*Pa., Phila.—Liggett & Meyers Tobacco Co., Ontario and 3rd Sts., let contract altering and building 3 story, 62 x 211 ft. brick addition to factory, to Austin Co., Bulletin Bldg. About $90,000.

*Pa., Phila.—Newton Machine & Tool Wks., Inc., 23rd and Vine Sts., let contract building 1 story, 102 x 170 ft., brick and iron machine shop, on 23rd and Pearl Sts., to Belmont Iron Wks., Land Title Bldg. About $50,000.

*Pa., Pittsburgh—Allegheny Gear Wks., Keenan Bldg., let contract building 1 story, 80 x 135 ft., steel and brick factory, rein.-con. and wood block flooring, concrete foundation, on Page and Chateau Sts., to Toupet, Beil & Conley, East End. About $30,000.

*Pa., Plains—Magan Silk Co. let contract building 2 story, 70 x 150 ft. silk mill, steel and brick, rein.-con. flooring, rock foundation, on Wyoming St., to J. Schmitt & Sons, Bennett Bldg., Wilkesbarre. About $60,000.

*Pa., Scranton—Miner Hillard Milling Co., Wyoming Natl. Bank Bldg., Wilkesbarre, let contract building 3 story, 65 x 73 ft., rein.-con. and steel mill, rein.-con. flooring, rock foundation, on Cion St. here, to Turner Constr. Co., 242 Madison Ave., New York City. About $185,000.

*Md., Hagerstown—M. B. Sine will build ice cream plant, 2 story, 56 x 99 ft., rein.-con., steel and brick, rein.-con. flooring. About $40,000. Work will be done by day labor. Noted Oct. 16.

*Md., Silver Run—A. W. Feezer let contract constructing concrete, steel and brick power house, factory and storage building, to Roystone-Craig Eng. Co., Westminster. About $50,000.

*Md., Towson Heights (Baltimore P. O.)—Black & Decker Mfg. Co., 105-15 South Calvert St., Baltimore, let contract building 2 story, 100 x 200 ft., steel and brick addition to factory, concrete flooring, concrete foundation, to Austin & Co., 1821 North 5th St., Phila., About $100,000.

*O., Akron—Sinclair Oil Co., 111 West Washington St., Chicago, Ill., will build 2 story, 50 x 165 ft., concrete, steel and brick warehouse and filling station, rein.-con. flooring, concrete foundation, on Hazel St. and Baltimore & Ohio R.R., here. About $75,000. Work will be done by day labor. Noted Aug 7.

*O., Berea—Dunham Co. let contract building 1 story, 100 x 150 ft., concrete, steel and brick machine shop, rein.-con. flooring, concrete foundation, to D. Gilchrest, Berea. About $75,000.

*O., Cleveland—Euclid 71st St. Co., Schofield Bldg., let contract constructing 3 and 4 story, 195 x 283 ft., concrete, steel and brick garage and service building, rein.-con. flooring, concrete foundation, on Euclid Ave. and East 71st St., to Craig Curtiss Co., Guardian Bldg. About $500,000.

*O., Cleveland—Hercules Tire & Rubber Co., Wade Bldg., will build 3 story, 80 x 320 ft., concrete, steel and brick

Industrial Work (Continued)

plant, rein.-con. flooring, concrete foundation, on West Park Rd. Plans include factory, office building and power house. About $350,000. Work will be done by day labor.

*O., Cleveland—Marble Shattuck Chair Co., East 105th St. and Lake Shore R.R., let contract constructing 3 story, frame shop, 1 story, stone and brick bending room and 1 story, concrete, kiln building, rein.-con. flooring, concrete and brick foundation, to L. Dantel Co., 5716 Hough Ave. About $100,000.

*O., Cleveland—K. V. Painter, 6532 Euclid Ave., let contract building 4 story, 100 x 100 ft., concrete, steel and brick garage and service station, rein.-con. flooring, concrete foundation, on East 65th St. and Euclid Ave., to A. W. Kilbourne Co., 6532 Euclid Ave. About $150,000.

*O., Columbus—D. L. Auld Co., 5th St. and 6th Ave., let contract building 2 story 53 x 86 ft. addition to plant, to Frankenberg Constr. Co., Columbus Savings & Trust Bldg., $25,000.

*O., Dayton—Comer Mfg. Co., 139 South Main St., let contract building 2 story, 85 x 130 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Apple St., to J. Lowes, Schwind Bldg. About $65,000.

*O., Dayton—Crawford, McGregor & Canby, Albany St., let contract building 1 story, 75 x 130 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, to Frank Hill Smith Co., 1035 Reibold Bldg. About $25,000.

*O., Delphos—Amer. Road Mchy Co. let contract building addition to plant, to H. K. Ferguson Co., 6523 Euclid Ave., Cleveland. About $85,000. Noted Sept. 18.

*O., Elyria—Garford Eng. Co. let contract constructing 1 story 90 x 140 ft. and 80 x 300 ft., mill buildings, concrete, steel and brick, rein.-con. flooring, concrete foundation, to H. K. Ferguson Co., Vickers Bldg. About $100,000.

*O., Elyria—Worthington Golf Ball Co. let contract building 4 story 80 x 130 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to Buffalo Iron & Steel Corp., Buffalo, N. Y. About $100,000.

*Mich., Battle Creek—Postum Cereal Co., 484 Marshall St., let contract building 6 story, 110 x 250 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, to Witherspoon & Englar, 53 West Jackson Blvd., Chicago. About $300,000.

*Mich., Detroit—Anderson Electric Car Co., Milwaukee Jct., let contract to H. G. Christman Co., 315 Stevens Bldg. constructing 4 story, 100 x 187 ft., 3 story, 144 x 147 ft. and 3 story, 70 x 125 ft. factories, all rein.-con., rein.-con. flooring, concrete foundation, on Aberle and Russell Sts., $170,000, $120,000 and $60,000 respectively

*Mich., Detroit — Burroughs Adding Machine Co., 2nd and Burroughs Aves., let contract building 2 story, 97 x 99 ft., rein.-con. and steel, boiler room, rein.-con. flooring, concrete foundation, to A. J. Smith Constr. Co., Campau Bldg.

Mich., Detroit—Central Steel & Wire Co., 127 North Peoria St., Chicago, let contract building 1 story, 150 x 160 ft., brick and steel warehouse, rein.-con. flooring, concrete foundation, on Warren and Bellevue Aves., to Industrial Bldg. Co., 38 South Dearborn St., Chicago. About $65,000.

*Mich., Detroit — Detroit Gear & Machine Co., 129 Franklin St., let contract building 3 story, 50 x 90 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, to Walbridge-Aldinger Co., 2356 Penobscot Bldg. About $50,000.

*Mich., Detroit—Detroit Lubricator Co., Marquette Ave., let contract building 3 story, 90 x 124 ft., rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation, to Walbridge-Aldinger Co., 2356 Penobscot Bldg.

*Mich., Detroit—Fruehauf Trailer Co., 1371 Gratiot Ave., let contract building 1 and 2 story, 100 x 260 ft. rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on Harper Ave. and Detroit Terminal Ry., to Stokes & Whittingham, Penobscot Bldg. About $100,000. Noted Aug. 28.

Mich., Detroit—Genl. Aluminum & Brass Mfg. Co., St. Aubin Ave., let contract building 1 story, 60 x 75 ft., brick and steel, power house, rein.-con. flooring, concrete foundation, on St. Aubin Ave. and Grand Blvd., to Carlton Constr. Co., St. Aubin Ave.

*Mich., Detroit—General Ice Delivery, 275 Grand River Ave., will build 1 story, 36 x 322 ft., brick, frame and hollow tile storage building, rein.-con. flooring, on Warren Ave., and 2 story, 90 x 131 ft., brick, steel and frame, wagon shop and barns, rein.-con. flooring, concrete foundation, on Crane Ave. and near Mack Ave. Work will be done by day labor. Noted Sept. 18.

*Mich., Detroit—Johns Bros., 1757 Gratiot Ave., let contract building 1 story, 100 x 140 ft. brick and steel garage, rein.-con. flooring, brick foundation, on Gratiot Ave., to Teschdorf Bros., Penobscot Bldg. About $30,000.

*Mich., Detroit—Newbro Gallogly Corp., 35 Milwaukee Ave., let contract building 1 story, 54 x 110 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on East Grand Blvd. and St. Antoine St., to J. C. Ward & Son, 1088-14th Ave. About $35,000.

*Mich., Detroit—P. J. Olatte, 2608 Jefferson Ave., let contract for masonry work for 2 story, 70 x 130 ft., rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on Jefferson Ave., to Moore & Brown, 400-Penobscot Bldg. About $80,000.

*Mich., Detroit—Riverside Storage & Cartage Co., Congress St., let contract building 6 story, 100 x 120 ft. rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, on Grand River and Edmonton Aves., to A. A. Albrecht, 1130 Penobscot Bldg. About $50,000.

*Mich., Detroit—Wood Hydraulic Hoist Co., 1028 Bellevue Ave., will build 1 story, 60 x 240 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Hartwick Ave. About $35,000. Work will be done by day labor.

*Mich., Dowagiac—Rudy Furnace Co. let contract constructing 1 story, 50 x 960 ft., rein.-con. and steel, foundry and storage building, concrete foundation, to Byers Bros. Constr. Co., No. 3 McNair Bldg., Kalamazoo. About $60,000. Noted Mar 13.

*Mich., Hamtramck—Acme White Lead & Color Works, St. Aubin Ave. and Michigan Central Ry., let contract building 4 story, 73 x 161 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on St. Aubin Ave., to Foundation Co., Hotel Statler, Detroit.

*Mich., Ludington—F. Mayer Boot & Shoe Co., 166 Walnut St., Milwaukee, Wis., let contract building 3 story, 50 x 250 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, to Amer. Contg. Co., 193 Milwaukee St., Milwaukee, Wis. About $90,000.

*Mich., Marysville—Pressed Metals of Canada, 112 Adelade St., Toronto, Can., let contract building 1 and 2 story, 72 x 516 ft., rein.-con. brick and steel foundry, rein.-con. flooring, concrete foundation, near St. Clair River, to Witherspoon-Englar Co., Chicago. About $95,000.

*Mich., Marysville—Wills & Lee Co., Book Bldg., Detroit, let contract building 1 story, 72 x 370 ft. steel and brick factory, concrete foundation, on Huron Blvd., to Walbridge-Aldinger Co., 2356 Penobscot Bldg., Detroit. Noted July 31.

*Mich., Plymouth—H. S. Lee Fdry & Machine Co. let contract building 1 story, 80 x 150 ft., concrete, brick and steel addition to foundry, to Russell Wheel & Fdry. Co., Chene St. and Belt Line Ry., Detroit.

*Mich., Saginaw—Michigan Crankshaft Co. let contract building 1 story, 160 x 690 ft., brick and steel plant, concrete flooring and foundation, on Genessee Ave. and Pere Marquette R.R., to W. E. Wood & Co., 1805 Ford Bldg., Detroit. About $600,000

*Ill., Chicago—F. M. Barton Co., archts., 1510 Kimball Bldg., let masonry and carpentry contract to A. C. Thielberg, 154 West Randolph St., building 1 story, 32 x 40 ft. and 1 story, 26 x 48 ft. paint factories, 4 story, 37 x 91 ft. kalsomine factory and 1 story, 67 x 110 ft. warehouse, brick and rein.-con., rein.-con. flooring, concrete foundation, on Kostner Ave. and Taylor St., for Adams & Elting Co., 716 West Washington St. About $100,000. Noted Sept. 4.

*Wis., Alma—Alma Dry Milk Co. let contract building 3 story, 200 x 510 ft, brick and mill construction factory, concrete foundation. About $75,000. Work will be done by day labor.

*Wis., Ft. Atkinson—James Mfg. Co. let contract building 1 story, 400 x 600 ft. brick and steel factory, concrete foundation, to A. W. Stoolman, Woman's Residence Hall, U. of I., Champaign, Ill. About $375,000.

*Wis., La Crosse—La Crosse Clothing Co., 2nd and State Sts., let contract building 2 story, 150 x 150 ft. rein.-con. and brick factory, laminated flooring, concrete foundation, on 4th and Vine Sts., to F. Schwalbe & Sons, La Crosse. About $100,000, cost plus percentage basis.

*Wis., Madison—Burgess Battery Co., 1015 East Washington Ave., let general contract building 2 and 3 story, brick, rein.-con. and steel factory, to Worden-Allen Co., Port Washington Rd., Milwaukee. About $200,000.

*Wis., Madison—Fuller & Johnson Co., 1342 East Washington Ave., let contract building 162 x 200 ft. factory, on Dickinson St. and West Washington Ave., to Worden-Allen Co., 208 South La Salle St., Chicago. About $78,000.

*Wis., Marshfield—Carpenter & Weldon, archts., 30 North La Salle St., Chicago, let general cnotract to Appleton Constr. Co., Odd Fellows Bldg., Appleton, building 3 story, 42 x 120 ft. brick, rein.-con. and steel warehouse, for S. Miller Fruit Co. About $80,000. Noted July 31.

*Wis., Milwaukee—Amer. Radiator Co., 820 South Michigan Ave., Chicago, let contract building 1 story, 84 x 190 ft. brick and steel warehouse, rein.-con. flooring, concrete foundation, to H. Schmitt & Son, 430 Farwell Ave. About $60,000.

*Wis., Milwaukee—Chain Belt Co., 736 Park St., let contract building 1 story, 150 x 316 ft. brick and steel foundry, concrete foundation on 39th Ave. and Orchard St., to S. M. Siesee, 86 Michigan St. About $200,000.

*Wis., Milwaukee—W. Frankfurth Hardware Co., 119 West Water St., let contract building 7 story, 50 x 150 ft. brick and mill construction addition to warehouse, concrete foundation, on West Water St., to H. Schmitt & Son, 430 Farwell Ave. About $100,000

*Wis., Milwaukee—Gridley Dairy Co., 138-8th St., let contract building 3 story, 77 x 150 ft. rein.-con. and brick garage and repair shop, rein.-con. flooring, concrete foundation, at 822 Sycamore St., to Dahlman Constr Co., 912 Majestic Bldg. About $100,000.

*Wis., Milwaukee—Hummel & Downing Co., North Cambridge Ave., let contract building 7 story, 100 x 120 ft. rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation, to Hansen Constr Co., 425 East Water St. About $300,000.

*Wis., Milwaukee—R. A. Johnston Co., 270 Florida St., let contract building 1, 2 and 3 story, 120 x 185 ft. rein.-con. and brick power house and garage, concrete foundation, on 34th St. and National Ave., to P. Riesen's Sons, 1015 Humboldt Ave. About $80,000.

*Wis., Milwaukee—Milwaukee Electric Ry. & Light Co., Pub Serv. Bldg., let contract building 1 story, 85 x 200 ft. brick and steel addition to car barn, rein.-con. flooring, concrete foundation, on 22nd and Natl. Aves., to Klug & Smith Co., Mack Blk. About $50,000; cost plus percentage basis.

*Wis., Milwaukee—Nunn, Bush & Weldon Shoe Co., 1110-5th St., let contract building 4 story, 62 x 150 ft. brick and mill construction warehouse, concrete foundation, on 4th and Hadley Sts., to E. Steigerwald & Sons Co., 2303 Galena St. About $50,000

*Wis., Milwaukee—Pabst Brewing Co., 9th and Chestnut Sts., let contracts to L. J. Voell, 504-40th St., constructing 5 story, 85 x 210 ft. rein.-con. and brick factory, rein.-con. flooring, cost $125,000, Everwear Hosiery Co., 172-5th St., lessee;

Industrial Work (Continued)

6 story, 80 x 207 ft. rein.-con. and brick factory, $175,000. Great Western Knitting Co., 110 Buffalo St., lessee.

*Wis., Milwaukee—Stratton - Ladish Milling Co., South Bay St., let contract building 4 story, 90 x 135 ft. brick and mill construction warehouse, concrete foundation, to Klug & Smith Co., 40 Mack Blk. About $100,000.

*Wis., Racine—J. I. Case Threshing Machine Co., State St., let contracts to Nelson & Co., Robinson Blk., constructing 130 x 130 ft. testing plant, 142 x 164 ft. painting building and 200 x 308 ft. assembling plant, all 1 story, brick and steel, concrete foundations, $100,000, $125,000 and $200,000 respectively.

*Wis., St. Francis, (Milwaukee, P. O.)—Nash Motors Co., Kenosha, let contract building 1 story, 50 x 100 ft. brick and steel power house, concrete foundation, to Northwestern Bride & Iron Co., 32nd and Hopkins Sts., Milwaukee. About $75,000. Noted Nov. 6.

*Minn., Bemidji—Koors Bros., 101 Minnesota Ave., Minneapolis, let contract building 3 story, 50 x 80 ft., ice cream and butter factory, to Jackson-Winklesky Constr. Co., Bemidji. About $52,000.

*Minn., Fairmont—City let contract building 1 story, 83 x 83 ft., electric power house, to Clifford & Gould, Fairmont, $58,000; complete equipment, to J. G. Robertson, 2528 University Ave., St. Paul, $150,135.

*Minn., Minneapolis—Wallis Coach & Carriage Co., 12 East Grant St., let contract building 4 story, 84 x 155 ft., rein.-con. and brick factory, on University and Bedfor Aves., to Foley Bros., Gilfillan Bldg., St. Paul. About $100,000, cost plus percentage. Noted Oct. 30.

*Minn., St. Paul—St. Paul Welding Co., 173 West 3rd St., let general contract building welding shop, 2 story, 36 x 75 ft., brick and concrete. to Lauer Bros., Chestnut St. About $115,000. Noted Aug. 28.

*Mo., Joplin—Sorber-Kuhn Auto Supply Co., 512 Joplin St., let contract building 2 story, 85 x 120 ft., rein.-con., steel and brick garage and salesroom, rein.-con. flooring, concrete foundation, to Stroup & Wooten, Joplin. About $60,000.

*Mo., St. Joseph—Cleveland-Akron Bag Co., East 40th St. and Perkins Ave., Cleveland, let contract building 3 story, 280 x 300 ft., rein.-con., steel and brick factory, rein.-con flooring, rock foundation, on 11th and Sacramento Sts., here, to Lehr Constr. Co., 1712 Frederick Ave., St. Joseph. About $300,000, cost plus percentage basis.

*Mo., St. Louis—Certainteed Products Corp., Boatmen's Bank Bldg., let contract constructing 6 story, 80 x 165 ft., concrete and brick factory, rein.-con. flooring, rock foundation, on Union Ave., to Murch Bros., Ry. Exch. Bldg. About $80,000. Noted Sept. 18.

*Mo., St. Louis—Laclede Real Estate & Investment Co., 100 South Main St., let contract constructing 7 story, 125 x 160 ft., rein.-con., steel and brick warehouse, mercantile and office building, rein.-con. flooring, rock foundation, at 8 South 4th St., to J. A. Godfrey Co., 705 Chestnut St. About $500,000.

*Mo., St. Louis—H. P. Mueller, 215 Lombard St., let contract building 1 and 2 story, 125 x 289 ft., steel and brick foundry, rock foundation, at 4471-99 Fyler St., to Hartman & Schuermann, Odd Fellows Bldg. About $55,000.

*Mo., St. Louis—St. Louis Brass Mfg. Co., Jefferson and Washington Aves., let contract building 5 story, 80 x 110 ft., concrete, steel and brick factory, rein.-con. flooring, rock foundation, at 2600 Washington Ave., to J. Black Constr. Co., Wright Bldg. About $500,000. Noted Sept. 4.

*Mo., St. Louis—Scullin Steel Co., 6700 Manchester Ave., let contract building 3 rolling mills, 1 story, rein.-con., steel and brick, rein.-con flooring, concrete foundation, on Manchester Ave., to Fruin-Colnon Constr. Co., Merchants Laclede Bldg About $200,000. Noted Aug. 28.

*Mo., St. Louis—J. D. Street Oil Co., 6 South 2nd St., let contract building 2 story, 80 x 105 ft., concrete and brick warehouse and office, rein.-con. flooring, rock foundation, at 4055 Park Ave., to Fruin-Colnon Constr. Co., Merchants Laclede Bldg. About $28,000.

*Mo., St. Louis—Vailer & Spies Milling Co., Pierce Bldg., let contract building 3 story, 60 x 150 ft. flour mill, rein.-con. and steel, rein.-con. flooring, concrete foundation, on South Bway., to Fruin-Colnon Constr. Co., Laclede Bldg. About $100,000.

*Tex., Austin—Covert Automobile Co., 610 Colorado St., let contract building 2 story, 53 x 128 ft. brick, rein.-con. and steel garage, rein.-con. flooring ,to Walsh & Burney, Littlefield Bldg., $38,399.

*Tex., Houston—Houston Light & Power Co., Capitol Ave. and San Jacinto St., let contract building 1 story, 20,000 K.W. addition to plant, to Horton & Horton, McKinney and Velasco Sts. About $500,000, cost plus percentage basis.

*Okla., Sapulpa—Gantz Tank Co., 122 North Mounds St., will build 1 story, 100 x 208 ft. brick and steel shop, concrete foundation. About $60,000. Work will be done by day labor.

Buildings

PROPOSED WORK

Mass., Lowell—Auditorium—City rejected bid building 1 story, brick, stone, concrete, marble and steel, memorial auditorium, rein.-con. flooring, brick, concrete and rock foundation, on East Merrimack and Brown Sts. About $1,000,000. Work will be readvertised. Blackall, Clapp & Whittemore, 20 Beacon St., Boston, archts. Noted May 8

Mass., Peabody—High School—City having plans prepared by F. J. Cooper Corp., archts., 33 Cornhill St., Boston, for 2 story, brick and steel, on Central St. About $150,000.

Mass., Wakefield—High School—Town plans to build 3 story, brick and steel, rein.-con. flooring, concrete foundation. About $450,000. Architect not selected.

Mass., Worcester—Hospital — Trustees St. Vincents Hospital, 73 Vernon St., soon receive bids building 4 story, 50 x 120 ft. with 46 x 60 ft. wing, brick, concrete foundation. About $200,000. J. W. Donohue, 40 Walker Bldg., Springfield, archt. Engineer not selected.

Mass., Worcester—Sales, etc.—Livingstone Motor Co., 109 Grafton St., had plans prepared for 3 story, 80 x 250 ft., auto sales, service and assembly plant, brick and concrete, concrete flooring, on Shrewsbury St. About $150,000. Private plans.

Conn., Bridgeport—Club—Amer. Legion, Bridgeport Post, 317 Golden Hill St., had plans prepared by C. W. Walker, Jr., archt., 886 Main St., for remodeling and building 3 story, brick and steel addition, concrete foundation, to include gymnasium, swimming pool, assembly hall, dining room and billiard hall. About $50,000.

Conn. Bristol—High School—Bd. Educ. plans to build brick, concrete and steel, on Dunbars Meadows. About $250,000. W. Potter, 22 East 17th St., New York City, archt.

N. Y., Niagara Falls—Office, etc.—Republic Carbon Co., Sugar and College Aves., receives bids about Nov. 14, building 2 story, 60 x 100 ft. brick and rein.-con. office and wash room, rein.-con. flooring, concrete foundation. About $60,000. A. W. Hoffman, Berlin Arcade, Milwaukee, Wis., archt and engr.

N. J., Asbury Park—Store—W. Steinbach, Cookman and Bangs Aves., having plan prepared by R. N. Cleverdon, archt., 101 Park Ave., New York City, for 1 story, brick and steel addition to store. About $100,000. E. D. Litchfield, 477-5th Ave., New York City, engr.

N. J., Jersey City—Bank and Office—First Natl. Bank having plans prepared by A. C. Bossom, archt. and engr., 366-5th Ave., New York City, for 10 story, brick and steel, brick foundation, on Exch. Pl. About $1,000,000.

N. J., Jersey City—Office—P. J. McNulty, owner McNulty's Hotel, plans to build 10 story, on Washington and Montgomery Sts. About $1,500,000.

N. J., Pennsgrove—School and Rectory—G. I. Lovatt, archt., 418 Walnut St., Phila., soon lets contract building 2 story, 56 x 120 ft. school and 29 x 60 ft. rectory, brick and stone, on State and Beach Sts., for St. James Church, here. Cost to exceed $50,000.

N. J., Plainfield—Y. M. C. A., 2 West 45th St., New York City, having plans prepared by Jallader & Lindsey, archts. and engrs., 37 Liberty St., New York City, for 3 story brick, steel and stone, brick foundation. About $200,000.

N. J., Trenton—School—Bd. Educ., Hamilton Twp., plans to build 2 story, 36 x 105 ft., brick addition to Rowan School on South Broad St. About $60,000. W. A. Klemann, 1st Natl. Bank Bldg., archt.

Pa., Sunbury — Housing — Pontius & Guyer having surveys made by W. Mann, engr., Sunbury, for development of 240 acre town and factory site on Packers Island. Work involves construction of residences and boulevards. About $150,000.

Del., Middletown—School—Bd. Educ. having plans prepared by W. E. Hance, archt., 1619 Chestnut St., Phila., for 2 story school. About $100,000.

Del., Wilmington — Church — McCabe Memorial Church having plans prepared by W. E. Hance, archt., 1619 Chestnut St., Phila., for 1 story, 56 x 75 ft., terra cotta. Cost to exceed $50,000.

O., Columbus—Sales—Ohio Auto Sales Co., 772 North High St., having plans prepared by G. R. Bassett, archt., Central Natl. Bank Bldg., for 4 story, 62 x 187 1-2 ft., rein.-con. and brick, on East Broad St. About $125,000.

Mich., Amasa—School—Bd. Educ. soon lets contract building 3 story, 80 x 162 ft. rein.-con. and brick, concrete foundation. About $125,000. J. F. Thompson, secy. F. E. Parmalee, Iron Mountain, archt.

Mich., Ann Arbor—Hospital—Bd. Regents, University of Michigan, rejected bids received Oct. 27 building hospital, here. Work will be readvertised. Noted Oct. 23.

Mich., Detroit — Auditorium — J. R. Thompson Auto Co., Woodward Ave., having plans prepared by A. Kahn, archt., Marquette Bldg., for 2 story, 400 x 700 ft., rein.-con. and steel, commercial auditorium, rein.-con. flooring, concrete foundation, on Woodward and Cass Aves. About $2,500,000.

Mich., Detroit—Art Museum—City Art Comn., c-o A. Kahn, Marquette Bldg., having tentative plan prepared by P. C. Cret, archt., University of Pennsylvania, for brick and steel and stone, on Woodward Ave. About $500,000.

Mich., Detroit—Church—North Woodward Methodist Episcopal Church, c-o W. E. N. Hunter, archt., 1306 Chamber Commerce, soon lets contract building 2 story, 180 x 180 ft. brick, steel and stone, concrete foundation, on Woodward and Marston Aves. About $750,000. Noted May 8.

Mich., Detroit—Commercial—Goodyear Tire & Rubber Co., Jefferson Ave., plans to construct 200 x 380 ft., on East Grand Blvd., and Michigan Central Ry. Architect not selected.

Mich., Detroit—Hospital—Bd. Health plans to build 4 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Kiefer Hospital grounds, Hamilton Blvd. and Blaine Ave. About $350,000.

Mich., Detroit—Hotel—M. Kunstler, 304 Virginia Park, having plans prepared by A. D. Shank, archt., 38 South Dearborn St., Chicago, for 4 story, 50 x 90 ft., rein.-con., brick and steel, concrete foundation, on Adams Ave., E. About $150,000.

Mich., Detroit—Office—N. C. Sorensen, archt., 500 Congress Bldg., preparing plans for 4 story, 35 x 150 ft., rein.-con. brick and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. near Watson St. About $100,000. Owner's name withheld.

Mich., Detroit—Sales and Service—M. A. Young, 754 Woodward Ave., plans to build 3 story, 60 x 200 ft., rein.-con. and steel, rein.-con. flooring, concrete foundation, on Woodward Ave. and Brady St. About $100,000. Architect not selected.

Mich., Detroit—School Bd. Educ., 50 Bway. Ave., had plans prepared by Malcolmson & Higginbotham, archts., 405 Moffat Bldg., for 2 story, 150 x 211 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Northfield and Maplewood Aves.

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ENGINEERING NEWS-RECORD

New York — Emergency Bulletin — October 16, 1919

AN EMERGENCY BULLETIN

It has been found possible to use a four-page folder for communicating with our readers. The space is devoted chiefly to items regarding bids desired. This has been done because of the urging of both our engineer and our contractor subscribers. The engineers point out the need of a means for getting their forthcoming work before the contractors, the contractors in turn, face the prospect of idleness unless they learn what work is opening up. Work employment for plant and men is the very life blood of industry. Without it the creation of wealth ceases and the cost of living goes up.

We should like to give more space to general news, but our first duty is to try to keep the industry alive and healthy. Construction news, therefore, must come first.

* * * *

Our friends will note that the construction news has been cut down to the minimum. Ordinarily we carry three classes of items, "Proposed Work," "Bids Desired" and "Prices and Contracts Awarded." Of the three classifications, "Bids Desired," since it points to the work which is actually to be put under way, is the most important and is the only one covered in this Emergency Bulletin.

* * * *

This, by the way, is an opportune time and place to say that of all the items now published in our "Construction News" section 95 per cent are verified in the field by our own correspondents. In two years the expenditure on this department has been trebled.

THE STRIKE SITUATION.

Regarding the printers' strike there is no change. We could talk around the situation for a fat paragraph, but "No change" tells the whole story.

AND STILL THEY COME

We said "Thanks" most heartily for the five letters that have been pouring in unsolicited from our readers. And still they come filled with punch and aggressiveness, urging us to hold our ground. Here is a typical letter:

> "You are eternally right, and if necessary you have the attitude the publication of your paper for one month or for years and continue me as a subscriber rather than bow to the unreasonable demands which are being made against you. I have been following this to some extent in the New York papers and I congratulate you on your stand. We are all getting tired—oh, so tired—of this eternal discontent which has become a disease in this country."

Thanks ever so much. When we get going again, it will be with a conviction as never before that nothing is too good for readers who give that kind of encouragement and support.

ENGINEER APPOINTED WATER COMMISSIONER OF CALIFORNIA

Charles H. Lee, of Los Angeles, has been appointed state water commissioner by Governor Stephens. The San Francisco Association of Members of the American Society of Civil Engineers and the joint councils of engineering societies of San Francisco and Los Angeles had addressed strong appeals to the governor for the selection of an engineer, soon after the vacancy occurred. It is probable that Mr. Lee's appointment is the result of the action of the engineering societies.

BIG CONCRETE BRIDGE CONTRACT LET

Mayor [illegible] has [illegible] the contract for the [illegible] bridge [illegible] the Stark Street [illegible] Bridge Company, the Stone & Webster Engineering Corporation, Boston, Mass., and the Ransome Concrete Company, San Francisco. The contract price is $3,181,118 for the Center Construction Corporation of the bridge. It is the plan of the State officials to have the work in hand by Nov. 1 and to have it completed by Jan. 1, 1921. John E. Conner & Co., of Baltimore, Md., are the engineers.

AMERICAN SOCIETY NOMINATING COMMITTEE MAKES REPORT

The Nominating Committee of the American Society of Civil Engineers has made the following nominations for 1920:

For president, Arthur P. Davis, director and chief engineer U. S. Reclamation Service, Washington, D. C.

For vice presidents, Robert A. Cummings, consulting engineer, Pittsburgh, and Francis Lee Stuart, consulting engineer, New York City. For treasurer, Arthur S. Tuttle (for re-election), deputy chief engineer, Board of Estimate and Apportionment, New York City. For directors, district No. 1, C. W. Hudson and Carleton Greene; district No. 3, John A. O'Connor, Albany, N. Y.; district No. 5, John C. Hoyt, Washington, D. C.; district No. 7, Anson Marston, Ames, Iowa; district No. 12, D. C. Henny, Portland, Ore.

GENERAL LABOR SITUATION

The steel strikers are gradually going back to work. England has compromised her national railway strike, to the apparent satisfaction of all parties. Notable features of this strike were the absence of violence and the remarkable way in which, through the use of motor trucks, the food supply was maintained. Evidently the public disapproved of the strike, but, so far as we learn here, the disapproval was of a mild and calm type—probably due to the restraint of the strikers and the remarkable efficiency of the Government's organization of emergency transportation.

A HINT TO CONTRACTORS

Now is the time to accumulate sand for winter concreting. It's too late to start when the banks are frozen or covered with snow and sleet.

DEVELOPMENT COMMITTEE REPORTS

The Development Committee of the American Society of Civil Engineers met at the University of Michigan, Ann Arbor, Mich., on the last week of September to write its final report. The report was agreed to and will be presented this week to the board of direction of the society.

In the week preceding the Ann Arbor meeting the Conference Committee of Development Committees representing the four founder societies met in New York City and agreed to a report which has been transmitted to the respective development committees. The civil engineers adopted without alteration the conference committee report and have made it a part of their report.

ENGINEERS FAVOR NATIONAL BUDGET

In response to an invitation of Chairman [illegible] of the Committee on Reconstruction of the National Council a committee from the Council appeared at Washington, Oct. 1, and presented the views of the engineering profession. The committee was composed of Charles Whiting Baker, consulting engineer, New York City, chairman of the Committee on Public Affairs; Nelson P. Lewis, New York City; Wesley R. Warren, Cleveland, Ohio, and Arthur P. Davis, Washington, D. C.

IMPORTANT MEETINGS SCHEDULED

The Virginia Brewery Builders' Association has scheduled its [illegible] annual convention Oct. 21 and 22 at the Hotel Statler, Cleveland.

The 6th annual meeting of the City Managers' Association will be held at the Claypool Hotel, Indianapolis, Oct. 27-29. The meeting was originally scheduled for Oct. 20-21.

Engineers and architects of the State of Ohio will hold a convention at Columbus, Oct. 14 to 16, for the discussion of the proposed national department of Public Works, closer co-operation in the engineering profession and compensation and registration of engineers and architects.

HOW ABOUT EARLY LETTING OF CONTRACTS?

This year we've been in a devil of a fix because so many road contracts were let late. Why not award as many as possible during the remaining months of this year, even though work will not begin until spring? The contractor can begin to organize and order his new plant. Also, the material dealers will be forehanded in their plans for adequate supplies.

There are handicaps, surely, but pressure now will put next year's program "in the clear."

WESTERN SOCIETY MEMBERSHIP DRIVE

Directed by a professional organizer, the Western Society of Engineers started, Oct. 6, on a week's drive for 2000 new members.

A. A. E. MEMBERSHIP

Figures just given out by the American Association of Engineers show an interesting growth in the organization. This has been recently credited with [illegible] members on Jan. 1, 1919; 650 members on Sept. 1 and 741 members on Sept. 22. The average growth to Sept. 1 was 520 members per month, and the maximum 814.

SALARY SCHEDULE FOR HIGHWAY ENGINEERS

A proposed [illegible] for highway engineers [illegible] is being put out by the Committee on the American Association of Engineers. When we shall send it to you. Copies can be obtained by addressing the association at 19 E. Adams St., Chicago.

The minimum salary for draftsmen is $1,800; for assistant engineers, $2,400; for first assistant engineers, $3,600. The top salaries in these grades are $2,400, $4,000 and $5,000, respectively.

Construction News

BIDS DESIRED

STREETS AND ROADS

Connecticut—Until Oct. 21, by State Highway Comn., Hartford, improving 3-890 ft. Middlefield Rd., 3 in. trap rock macadam on 7 in. native crushed stone base. Middletown Twp., 3800 ft. Bozrah St., 3 in. trap rock macadam on 5 in. gravel base, Bozrah Twp., 5802 ft, Forest St., concrete or 3 in. bituminous trap rock macadam on 5 in. trap rock crushed stone base, New Haven. C. J. Bennett, state highway comr.

N. Y., Bronxville—Until Oct. 27, by Bronx Parkway Comn., West Pondfield Rd., reading Bronx River Parkway Reservation between Gun Hill Rd., Williams-bridge, and East 233rd St., Woodlawn, involving 20,000 cu.yd. stripping and stock-piling top soil, 42,000 cu.yd. earth excav. and 1,000 cu.yd. embankment. J. Downer, engr., 50 Church St., N. Y. City.

N. J., Cape May—Until Oct. 28, by Bd. Comrs., paving several streets with concrete, bituminous concrete or like durable material, including adjusting of street surfaces to correspond with proposed grade of paving. Work involves 13,317 sq.yd. paving and 3396 sq.yd. brick or concrete gutters. G. P. Wentzell, dir. Dept. Streets and Pub. Impvts.

Pennsylvania—Until Oct. 31, by State Highway Dept., Harrisburg, building roads in counties as follows:

Beaver Co., 5195 ft. rein.-con., Greene Twp., 12,062 ft. rein-con. and Hillside vitr. brick, Rochester and Daugherty Twps., 5200 ft. rein.-con. and Hillside vitr. brick, Center Twp.

Bedford Co., 55,742 ft. bituminous macadam penetration method on Telford foundation, or rein.-con., Hopewell and West Providence Twps.

Berks Co., 27,633 ft. bituminous mixture on prepared broken stone base, Amity and Douglas Twps.

Bradford Co., 26,215 ft, bituminous surface course on concrete foundation, or rein.-con., Wilmont ond Terry Twps., 19,-215 ft. bituminous surface course on concrete foundation, or rein.-con., Wysox and Rome Twps., 565 ft. vitr. brick, Towanda Boro.

Bucks Co., 20,902 ft. bituminous surface course on concrete foundation, or rein.-con. Falls Twp.

Clearfield Co., 11,222 ft. rein.-con., Decatur Twp., 5400 ft. rein.-con. Bigler Twp., 20,941 ft. rein.-con. Wallaceton Boro., Boggs and Bradford Twps.

Elk Co., 7543 ft. rein.-con. Ridgway Boro.

Erie Co., 7900 ft. bituminous surface course on concrete foundation and Hillside brick, or rein.-con. and Hillside vitr. brick, Northeast Twp., 11,207 ft. rein.-con., Harbor Creek Twp.

Fayette Co., 5950 ft. rein.-con. and Hillside vitr. brick, Perry and Jefferson Twps., 5950 ft. rein.-con and Hillside vitr. brick, Dunbar Twp., 31,452 ft. rein.-con. and Hillside vitr. brick, Stewart Twp., [illegible] ft. vitr. brick, Connellsville and [illegible] Twps.

Greene Co., 13,581 ft., Route 756 and [illegible] ft. Route 111, rein.-con., Center Twp.

Lackawanna Co., 5708 ft. rein.-con., Clarks Summit Boro. and Clarks Green Boro.

Mercer Co., 31,565 ft. rein.-con. or hydrocrete vitr. brick, Bradford Twp. and Lewis Run Boro.

Montgomery Co., 3709 ft. rein. con. and Hillside vitr. brick, Bridgeport Boro.

Potter Co., 8358 ft. bituminous surface course on concrete foundation, and vitr. brick or rein.-con. and vitr. brick, Shinglehouse Boro.

Somerset Co., 42,232 ft. rein.-con. and Hillside vitr. brick, Conemaugh Twp., 20,-109 ft. grading and drainage, Summit Twp.

Tioga Co., 3641 ft. bituminous surfeac course on concrete foundation or rein.-con. Knoxville Boro.

Venango Co., 3332 ft. rein.-con., Plum Twp.

Westmoreland Co., 38,434 ft. rein-con. and Hillside vitr. brick, Lower Burrell and Allegheny Twps. and Arnold Boro., 29,160 ft. rein.-con., Derry Twp., 9184 ft. rein.-con. and Hillside vitr. brick, Salem and Unity Twps., 57,688 ft. rein.-con and Hillside vitr. brick, Hempfield, Salem and Washington Twps. and Delmont Boro., 32,047 ft. rein.-con. and Hillside vitr. brick, Derry Twp. L. S. Sadler, state highway comr.

Maryland—Until Oct. 21, by State Rds. Comn., 601 Garrett Bldg., constructing .59 mi. concrete road between Benfield and Seven Cross Rds., Federal Aid Project No. 36, Contr. No. AA-16, Anne Arundel Co.; 5.86 mi. gravel road from state road near Grant Mills to Millstone Landing, Federal Aid Project No. 32, Contr. SM-12, St. Mary's Co. F. H. Zouck, chn.

Va., Danville—Until Oct. 28, by city, for 2400 sq.yd. vitr. brick and 16,000 sq.yd. concrete pavement. J. O. Magruder, city engr.

W. Va., Marlinton—Until Oct. 21, by Comrs. Pocohontas Co. grading and draining 5.5 mi. Marlinsbottom-Huttonsville Turnpike. Part of the above will be surfaced with bituminous macadam. About $84,000. F. Baxter, Marlinton, engr.

W. Va., Parkersburg—Until Oct. 21, by City Council, paving 24,000 sq.yd. with sheet asphalt on present brick pavement as foundation.

North Carolina—Until Oct. 21, by State Highway Comn., Raleigh, hard surfacing 19 mi. Central Highway, Lenoir Co. About $400,000. W. S. Fallis, state highway engr.

N. C., Kinston—Until Oct. 21, by Comrs. Lenoir Co., hard surfacing 8 mi. Kinston-Grifton Rd., cost $200,000, 17 mi. Kinston-Pink Hill Rd., $300,000; grading, paving, draining and building culverts 3 mi. highways, $150,000. G. C. White, Durham, engr.

N. C., Kinston—Until Oct. 27, by Comrs. Lenoir Co., building 3 mi. road, 16. ft. wide, asphalt, bitulithic or concrete. G. C. White, Durham, engr.

Ga., Ellijay—Until Oct. 17, by Comrs. Gilmer Co., paving, draining and curbing 1 mi. road between Court House Sq. and Louisville & Nashville R.R. tracks, involving 53,6 sq.yd. concrete and macadam. About $25,000. Johnson & Morgan, Atlanta, engrs.

Fla., Dade City—Until Oct. 21, by City Council, construction 9000 sq.yd. asphalt concrete pavement.

Miss., McComb—Until Oct. 21, by city, paving, curbing and guttering various streets, involving 18,725 sq.yd. pavement and 5894 cu.yd. excav. X. A. Kramer, Magnolia, consult. engr.

O., Columbus—Until Oct. 21, by G. A. Borden, dir. pub. serv., grading, draining, curbing and paving 350 ft. Adams Ave. from Olentangy St. to north terminus, 20 ft. wide, involving 600 sq.yd. asphalt or 900 sq.yd. brick paving and 300 sq.yd. brick gutters, cost $4,185, grading, paving, draining, curbing and laying water mains in 618 ft. 11th Ave. from Cleveland to St. Clair Aves., 24 ft. wide, 1570 sq.yd. asphalt or 1970 sq.yd. brick paving and 600 sq.yd. brick gutters, $11,080, also alley north Bryden Rd. from 18th to 20th Sts., 750 ft. long, 15 ft. wide, 1070 sq.yd. brick or asphalt, $4600. Noted Sept. 18.

Ia., Sioux City—Until Oct. 20, by Bd. Trustees Farmers' Ditch, D. D. No. 1, Woodbury Co., leveling 11 mi. road. C. Moriarty, engr., in charge.

Minn., Duluth—Until Oct. 21, by Comrs. St. Louis Co., clearing, grubbing, draining, etc., 3-4 mi. Job No. 1, State Rd. No. 1, from Maple Grove Rd. with Old Miller Trunk Rd. to Haines Rd.; 1.1 mi. Job. No. 2, State Rd. No. 1, from Haines Rd., northwest; 11 mi. Job No. 3, State Rd. No. 1; 7 1-2 mi. Job No. 4, State Rd. No. 1, 24 ft. wide. About $150,000. R. W. Acton, co. engr.

Minn., Duluth—Until Nov. 1, by Comrs. St. Louis Co., paving 8 mi. road, concrete. About $245,000. R. W. Acton, co. engr. Noted Sept. 11.

Kan., Abilene—Until Nov. 5, by Comrs. Dickinson Co., hard surfacing 12 mi. Golden Belt Highway, 18 ft. wide. K. Riddle, Abilene, engr. Noted Mar. 13.

Kan., Jewell—Until Oct. 20, by C. E. White, city clk., curbing, guttering and paving various streets, involving 8500 sq. yd. brick or concrete pavement, 2800 cu. yd. earth excav., 3500 lin.ft. 6 x 24 in. curb and gutter, 28 lin.ft. 14 in. curb and 208 lin.ft. headers. O. E. Noble, Norton, Kan., engr.

Kan., Oswego—Until Nov. 4, by E. A. Milliken, clk. Labette Co., building Sects. "C" and "D," Federal Aid Project No. 2, Ozark Trail Highway, and all farm entrance crossings, culverts and bridges. Improvement to consist of gravel surfacing on macadam base, 16 ft. wide, with 4 ft. earth shoulders, total length 123,657 ft. Bids will be received as follows: Sect. "C," (road), 55,566 ft. long, involving 35,-083 cu.yd. earth and 23,071 cu.yd. borrow excav., etc.; Sect. "C," (farm entrance crossings culverts and bridges), laying 1620 ft. 15-30 in. concrete pipe, 167 cu.yd. class "A," 48 cu.yd. class "B" and 578 cu.yd. class "C" concrete and 22,191 lb. reinforcing steel; Sect. "D," (road), 68,-091 ft. long, 44,958 cu.yd. earth and 2750 cu.yd. borrow excav., etc.; Sect. "D," (farm entrance crossings, culverts and bridges), laying 1620 ft. 15-30 in. concrete pipe, 199 cu.yd. class "A," 48 cu.yd. class "B" and 479 cu.yd. class "C" concrete and 22,471 lb. reinforcing steel; Sect. "E," (bridges on Sect. "C" Rd. and Sect. "D" Rd.), 793 cu.yd. class "A" and 749 cu.yd. class "C" concrete and 115,897 lb. reinforcing steel. County will furnish all concrete pipe, f.o.b.

South Dakota—Until Oct. 20, by State Highway Dept., at office of auditor of Lake Co., Madison, grading, graveling and draining 12.5 mi. Madison-Wentworth Highway, 24 ft. wide, involving 48,147 cu.yd. earth excav., 18,653 cu.yd. gravel, 18,398 lb. reinforcing steel, 283 cu.yd. concrete for culverts, etc. About $73,026.

Mo., Poplar Bluff—Until Oct. 20, by City Council, improving Elm St. from Main St. to east line of lot 11, involving 562 cu.yd. excav., 1330 sq.yd. 5 in. concrete paving, 1000 lin.ft. curbing, 70 ft. 12 in. sewer pipe and two 18 x 24 in. standard c.i. inlets; Kinzer St. from 5th to 9th Sts., 1510 cu.yd. excav., 1065 cu.yd. cement gravel, 8149 sq.yd. 6 in. concrete paving, 3756 lin.ft. curbing, 285 ft. 12 in. sewer pipe and five 18 x 24 standard c.i. inlets, Lester St. from 5th to 9th Sts. 1674 cu.yd. excav., 678 cu.yd. fill, 6460 sq. yd. 6 in. concrete paving, 3940 lin.ft. curbing, 405 ft. 10 and 15 in. sewer pipe, 4 standard inlets, 2 culvert inlets and one 6 x 4 x 32 ft. concrete opening; Poplar St. from Bway. to 5th St., 292 cu.yd. fill, 1756 sq.yd. 6 in. concrete paving, 876 lin.ft. curbing, rein.-con. covering for open ditch 10 ft. clear span, 1 abutment, 200 ft. 15 in. sewer pipe and three 18 x 24 in. standard inlets. E. C. Thomes, city engr.

Mo., St. Joseph—Buchanan Co. receiving bids building 1 1-4 mi. West Savannah Rd., 18 ft. wide, 3 in. bituminous macadam. About $15,000. J. D. Mohler, 1522 South 25th St., engr.

Mo., Webster Groves (St. Louis P. O.)—Until Oct. 18, by W. Stoecher, engr.,

Construction News

BIDS DESIRED

Webster Groves, Irving Baker Ave. from Gay St. to Rock Hill Rd., 30 ft. wide, concrete and brick. About $12,000.

Ark., Bentonville Until Oct. 20, by Comrs. Benton Co., building 3 mi. gravel road, 18 ft. wide, involving 46,397 cu.yd. earth and 3177 cu.yd. rock excav., 94,-300 sq.yd. gravel, 37.65 acres clearing, and 100 lin.ft. steel bridge. R. D. Alexander, Eureka Springs, engr.

Ariz., Tucson—Until Oct. 20, by J. S. Bright, dist. engr., Luna-Strickler Bldg., Albuquerque, N. M., building 4 mi. Oracle-Apache Project in Coronado Nat'l Forest, 16 ft. wide, involving 6349 cu.yd. earth and 1419 cu.yd. rock excav. Cost to exceed $10,000.

Washington Until Oct. 20, by State Highway Comm., Olympia, grading and draining 2.2 mi. Chelan-Okanogan Highway between Chelan and Chelan Falls, Chelan Co., 1.2 mi. State Rd. No. 1, between Kedet and Columbia River, Post Rd. Project No. 18, Ferry Co., grading, draining and surfacing 10.8 mi. Inland Empire Highway, between Dodge and Central Ferry, crushed rock, Garfield Co.; 6.6 mi. Inland Empire Highway, between Dayton and Delaney, crushed rock, Columbia Co.; 12 mi. Inland Empire Highway, between Burbank and Waulla, gravel, Walla Walla Co. J. Allen, state highway engr.

California—Until Oct. 20, by State Highway Comm., Sacramento, building 4 1-2 mi. concrete highway between Vina and Los Molinos, Tehama Co.

WATERWORKS

Del., Newport—Until Oct. 25, by City Comrs., building water and sewerage systems. Plans include 60,000 gal. tank on 85 ft. tower, 8 in. wells and 2 mi. 4-10 in. c.i. water pipe, fittings and valves, also 2 mi. 6-10 terra cotta sewer. S. W. Day, secy.

N. C., Franklinton—Until Oct. 23, by city, building waterworks and sewerage systems, including deep well, steel tank and tower, 4 1-2 mi. waterpipe, 4 mi. sewers, and sewage disposal plant. About $40,000. G. C. White, Durham, engr.

O., Norwood Until Oct. 24, by H. P. Pierson, dir. pub. serv., building water softening system. About $35,000. A. Kissinger, city engr.

Neb., Lincoln—Until Oct. 25, by T. H. Berg, city clk., building rein.-con. reservoir and cooling pond, 2,000,000 gal. capacity. About $40,000. G. W. Bates, city engr. Noted July 31.

S. D., Huron J. L. Sankey, city auditor, receiving bids building watermains in various streets, involving 6500 ft. 6 in., 7500 ft. 4 in. and 400 ft. 8 in. pipe. H. C. Wood, city engr.

Tex., Paris Until Oct. 20, by W. G. George, city secy., furnishing and installing two 750-gal. per minute motor-driven centrifugal pumps, one 1500-gal. per minute motor-driven centrifugal pump, motors, switchboards and supplementary equipment. A. C. Scott, 1816 1-2 Main St., Dallas, engr.

Colo., Vona Until Nov. 15, by Town Council, installing waterworks system and electric light plant. About $25,000. R. D. Sweeney, 1115 East Colfax Ave., Denver, engr.

Ariz., Phoenix Until Oct. 22, by F. Thomas, city clk., building 1300 ft. underground rein.-con. conduit, 7 ft. diameter inside and circular externally, bottom is about 13 ft. below ground, last foot or 2 for excav. will probably be wet. Work involves 800 cu.yd. concrete, 90,000 lb. steel, 3250 cu.yd. excav. and 1900 cu.yd. borrow and haul. Noted Aug. 21.

BUILDINGS

N. Y., New Rochelle—School—Until Oct. 30, by Bd. Educ., building Washington Grade School, 3 story, brick and terra cotta, brick foundation. About $300,000. Townsend, Steinle & Haskell, 47 West 34th St., New York City, archts. and engrs.

N. Y., Thiells Cottages, etc.—Until Oct. 30, by F. A. Vanderlip, pres. bd. mgrs. of Letchworth Village, 7 Wall St., New York City, for Building, heating, sanitary and electric work for service building, 8 cottages for girls group and industrial building for boys group, also building underground tunnel, conduit, hot water and steam connections, distributing equipment, sewer and water connections, electric service connections for girls group, laundry equipment, additional refrigeration equipment, electric elevator, chlorinating apparatus for Letchworth Village. Lee L. F. Pfeiffer, Capitol, Albany, state archt.

N. J., Perth Amboy—School—Until Oct. 28, by Bd. Educ., building School No. 11, on Hill and Arnold Aves., Alta Vista Pl. and Jacques St.

W. Va., Martinsburg—School — Until Oct. 29, by M. G. Tabler, pres. Bd. Educ., building 2 story, brick. About $75,000. C. E. Kent, Martinsburg, archt. Noted Feb. 20.

O., Centerville—School—Until Oct. 22, by Bd. Educ., Washington Twp., building 2 story, 80 x 100 ft., rein.-con. and brick, concrete foundation. About $80,000. Walker & Norwick, 1300 Conover Bldg., Dayton, archts. Noted Aug. 7.

O., Columbus—Until Oct. 24, by Y. M. C. Assn., 36 South 3rd St., building 7 story, 187 x 187 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation on Long and Front Sts. Plans include 2 gymnasiums, swimming pools, auditorium, etc. About $450,000. Shattuck & Hussey, 19 South La Salle St., Chicago, and O. Darst, Brunson Bldg., Columbus, archts.

O., East Cleveland Cleveland P. O.—School W. Hirsch, archt., 1900 Euclid Ave., Cleveland, receiving bids building 2 story, 100 x 160 ft., rein.-con., steel and brick, addition, on Prospect Ave., for Bd. Educ. About $150,000.

Wis., Oconomowoc School Until Oct. 20, by Bd. Educ., building 3 story, 120 x 187 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. Cost between $150,000 and $200,000. Parkinson & Dockendorff, Tuker Bldg., La Crosse, archts.

Wis., Sun Prairie—Church—Until Oct. 20, by J. Pauly, archt., St. Francis Church, St. Ste. Dr., Milwaukee, building 44 x 120 ft. brick, stone and tile, concrete foundation for Sacred Heart Church. About $80,000. Noted Sept. 18.

Minn., Northfield School—Until Oct. 15, by Bd. Educ., building 3 story, 76 x 90 ft., rein.-con. and brick. About $200,000. N. E. Mees, 510 Endicott Bldg., St. Paul, archt. Noted Aug. 28.

Minn., Virginia—Courthouse—Until Nov. 1, by Comrs. St. Louis Co., courthouse building, 3 story, 80 x 150 ft., reinforced brick and tile. About $[illegible]. Cass Gilbert & Bremer, Palace Bldg., Minneapolis, archts. and engrs. Noted Aug. 28.

Minn., Wadena Home, State Bd. Control, St. Paul, receiving bids building 3 story, 32 x 60 ft., home for nurses. About $50,000. Sand & Durham, Essex Bldg., Minneapolis, archts.

Kan., Atchison School—Until Oct. 21, by Bd. Educ., building 3 story, 78 x 121 ft., brick, rein.-con. flooring, concrete foundation, to be known as Roosevelt School. About $75,000. W. H. Saylor & Co., Kansas City, Mo., archts. Noted Sept. 18.

Utah, Salt Lake City School Until Jan. 30 by School Bd. building West Side High School. About $800,000. Connon & Fetzer, Templeton Bldg., archts. Noted July 3.

Cal., Berkeley School Until Oct. 21, by Bd. Educ., building rein.-con. school, concrete foundation on Colusa and Tacoma Aves. About $60,000. W. C. Hays, 1st Nat'l. Bank bldg., San Francisco, archt.

Que., Montreal Theatre—Until Oct. 31, by Amusement Areta Co., 562 Mt. Royal Ave., building 2 story, 165 x 192 ft., steel and brick, rein.-con. flooring, concrete foundation. About $65,000. Private plans.

INDUSTRIAL WORKS

Md., Hagerstown M. E. Sine receiving bids building for cream plant, 2 story, 60 x 90 ft., rein.-con., steel and brick, roof on framing, concrete foundation. About $40,000. McCormick Co., Century Bldg., Pittsburgh, archts. and engrs.

O., Cleveland L. W. Kaeb, archt., Hollenden Hotel, Superior Ave. and East 6th St., receiving bids building 5 story, 104 x 208 ft., rein.-con., steel and brick factory, on Taft Ave. for Amet Auto Trimming Co. About $100,000. Noted Sept. 25.

O., Cleveland—E. McGeorge, archt., 1900 Euclid Ave., receiving bids building 1 story, 80 x 130 ft., rein.-con., steel and brick factory, for Great Lakes Copper Co., Trumbull Ave. About $40,000. Noted Sept. 25.

O., Cleveland A. C. Wolf, archt., Swetland Bldg., receiving bids building 2 story, 170 x 200 ft., rein.-con., steel and brick factory, at 3053 East 82nd St., for Pioneer Mfg. Co., Harvard Ave. and 103rd St. About $50,000. Noted Sept. 18.

O., Columbus—Until Oct. 22, by G. Bobbs & Sons Co., 32 East Main St., constructing wholesale house and refrigerating plant, 5 story, 94 x 177 ft., rein.-con., on Front and Hickory Sts. About $250,000. F. L. Packard, Hayden Bldg., archt.

Minn., Minneapolis C. Kimport, archt., Andrus Bldg., receiving bids building 2 story, 100 x 135 ft., mill construction garage. About $50,000. Owner's name withheld.

SEWERS

N. Y., Rye Until Oct. 29 by Bd. Village Trustees, furnishing material and labor building sanitary sewers and sewage disposal units, involving 3100 ft. 8 in. and 400 ft. 15 in. vit. pipe sewers, 7100 ft. 6-10 in. iron pipe, siphon and force [illegible] pumping station complete, [illegible] tanks, sprinkling filters and sand [illegible]. C. H. Hull, 45 [illegible] New York City, engr.

N. J., Belleville Until Oct. 4 by Town Council, [illegible] Sect. 1 Belleville Sewerage System, [illegible] involving [illegible] ft. 24-in., 2300 ft. 20-in., and 950 ft. 12-in. pipe, [illegible] manhole connections, [illegible] Sect. 2, 1600 ft. 8-in., 1165 ft. 10-in., 750 ft. [illegible] and 265 ft. 30-in. pipe, [illegible] manhole connections, [illegible] F. T. Shepard, town engr.

O., Columbus—Until Oct. 21, by G. A. Hoffman, dir. pub. serv., building 12th Ave. [illegible] 1925 [illegible] H. A. Maetzel, [illegible]

Wis., Milwaukee—Until Nov. 6, by J. H. Puelicher, [illegible] Sewerage Comm., building [illegible] 7 ft. diameter, [illegible] Muskego Ave. under Menomonee Canal. About $80,000. T. C. Hatton, City Hall, engr.

Ia., Glenwood—Until Oct. 30, by Bd. Supervs. Mills Co., building storm sewerage system, involving 3880 ft. 36-48 in. sewer, 12 storm sewer inlets, etc. W. M. Moore, aud.

S. D., Menn.—Until Oct. 18, by J. S. Headley, city aud., building sewerage system involving 1315 ft 10 15 in. pipe, 7 flush-tanks, septic tanks, etc. W. L. Bruce, Yankton, engr.

Ariz., Clifton—Until Oct. 29, by E. R. Shortridge, town clk., building 7 mi. sewerage system, involving 37,140 ft. 6-12 in. vitr. or concrete pipe, 500 ft 6 in. class A. c.i. pipe, one 380 ft. 10 in. class B and one 45 ft. 8 in. class B c.i. siphons, 133 manholes, 20 x 28 ft. rein.-con. Imhoff tank, trenching, etc. About $150,000. Alternate bids will be received on vitr. clay and cement pipe. Olmsted & Gilleleu, 1112 Hollingsworth Bldg., Los Angeles, Cal., consult. engrs.

Ariz., Phoenix—Until Oct. 22, by City Clerk, building 1300 ft rein.-con. conduit, 7 ft diameter, about 13 ft. beneath surface of ground, involving 5350 cu.yd. excav., 1900 cu.yd. borrow and haul, 800 cu.yd. concrete and 90,000 lb. reinforcing steel. L. B. Hitchcock, supt. of streets.

FEDERAL GOVERNMENT WORK

N. Y., Brooklyn Elevator—Spec. 4046—Until Oct. 22, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing electric freight elevator in Building "F." at Hospital, here. About $14,000; $10 deposit required for plans and spec.

N. Y., Stapleton—Kitchen and Mess Hall—Until Oct. 22, by Treas. Dept., Wash., D. C., building kitchen and mess hall at Marine Hospital, here. Noted Sept. 25.

Del., Wilmington—Dredging—Until Oct. 20, (change of date), by U. S. Engr. Office, Old Federal Bldg., dredging in Cooper River, N. J. and in Chester River, Pa. Noted Sept. 11.

Md., Annapolis—Stokers—Spec. 4049—Until Oct. 22, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing and installing mechanical stokers of underfeed type, driving engine and auxiliaries for three 400 h.p. boilers, in Boiler Plant at Naval Academy, here. About $14,000; $10 deposit required for plans and spec.

D. C., Wash.—Boiler—Until Oct. 28, by Treas. Dept., Wash., D C., installing 200 h.p. water tube boiler at Bureau of Engraving and Printing. J. A. Wetmore, superv. archt.

D. C., Wash.—Iron Posts—Until Dec. 8, by General Land Office, Wash., furnishing and delivering iron posts with brass caps, for use during fiscal year 1920.

Ga., Savannah — Remodeling Marine Hospital—Until Oct. 28, by Treas. Dept., Wash., D. C., remodeling marine hospital building, here. J. A. Wetmore, superv. archt.

Fla., Jacksonville—Dredging — Until Nov. 10, by U. S. Engr. Office, Jacksonville, dredging and removing rocks in Sarasota Bay.

La., New Orleans—Dredging—Until Oct. 22, by U. S. Engr. Office, Custom House dredging canal between Mermentau and Calcasieu River.

La., New Orleans—Sale of Air Compressors. Until Nov. 5, by Supt. Lighthouses, New Orleans, for sale of 2 Rand, straight line, steam cylinder air compressors, 630 cu.ft free air per minute capacity.

Tenn., Johnson City—Road Work—Until Oct. 22, by Dist. Engr. of Bureau of Roads, U. S. Dept. of Agriculture, building 12.5 mi. Bristol Rd., between Bristol and Mountain City, involving 94,000 cu.yd. excavation, and 12,000 cu.yd. solid rock excav., 1200 ft pipe culverts, 600 cu.yd. rubble masonry, 175 cu.yd. concrete and 6,000 cu.yd. broken stone.

Tenn., Memphis — Hoisting Engines, Boilers and Locomotive Crane.—Until Nov. 1, by Mississippi River Comn., Custom House, furnishing hoisting engines, boilers and locomotive crane.

O., Cleveland Breakwater Extension—Until Oct. 30, by U. S. Engr. Office, Cleveland, extending West Breakwater to shore in Lorain Harbor.

Ind., North Vernon—Post Office—Until Nov. 4, by Treas. Dept., Wash., D. C., building post office, here.

Mich, Detriot—Dredging—Until Nov. 11, by U. S. Engr. Office, Detriot, dredging on Harbor Beach Harbor.

Ill., Chicago—Dredging—Until Oct. 30, by U. S. Engr. Office, 537 South Dearborn St., dredging in Indiana Harbor Canal, Ind.

Tex., Gilmer—Post Office—Until Nov. 28, by Treas. Dept., Wash., D. C., furnishing labor and material for building post office, here J. A. Wetmore, superv. archt. Noted May 8.

Cal., San Diego—Water and Sewer System and Fuel Oil Storage Reservoir—Spec. 4007 Until Nov. 15, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. About $200,000; $10 deposit required for plans and spec. Noted Sept. 11.

Cal., San Francisco—Kitchen, Mess Hall, Quarters, Garage, etc.—Until Nov. 10, by Treas. Dept., Wash., D. C., furnishing material and labor for construction of kitchen mess hall, officers' and attendants' quarters and garage, refrigerating plant, remodelling nurses quarters and approaches, at U. S. Marine Hospital, here. J. A. Wetmore, superv. archt.

BRIDGES

New Jersey—Until Oct. 24, by State Highway Comn., Broad St. Bank Bldg., Trenton, building incased I beam bridge No. F, 2 spans 22 ft. each, 30 ft. wide, located Sta. 1039 plus 05.32, Route 2, Burlington-Roebling Sect., rein.-con. box culvert No. G, 10 ft. span, 30 ft. wide, Sta. 1024 plus 62, Route 2, Burlington-Roebling Sect., rein.-con. box culvert, No. H, 10 ft. span, 30 ft. wide, Sta. 942 plus 25, Route 2, Burlington-Roebling Sect., Burlington Co.; rein.-con. arch bridge No. 33, 22 ft. span, 30 ft. wide, Sta. 1249 plus 15, Route 6, Mullica Hill-Mantau Sect., plate girder bridge No. 60, 70 ft. span, 30 ft. wide, Sta. 1351 plus 60, Route 6, Mantua-Woodbury Sect., rein.-con. slab bridge No. 32, 8 ft. span, 30 ft. wide, Sta. 1325 plus 35, Route 6, Mullica Hill-Mantua Sect., Gloucester Co. A. L. Grover, ch. clk.

S. C., Beaufort—Until Oct. 30, by Beaufort and St. Helena Twp. Bridge Comn., Beaufort, building 3800 ft. bridge over Beaufort River, connecting this city with Ladies Island, consisting of thirty 50 ft. concrete spans on concrete piers, one 80 ft. clear opening double leaf, deck plate girder bascule span and 2050 lin.ft. timber trestle. Work involves 400 cu.yd. dry and 2400 cu.yd. wet excav., 3700 lin.ft. untreated and 16,000 lin.ft. treated timber piling, 2830 cu.yd. class A, 1515 cu.yd. class B and 1600 cu.yd. class C concrete, 663,100 lb. deformed steel bars, 3280 lin. ft concrete railing, 36 concrete lamp standards, 4 operators houses, 1 steel superstructure, 310,625 ft. timber for trestle and fenders and 7000 lin.ft 3-4 in. unlined conduit. Noted May 22.

Ga., Franklin—Until Oct. 27, by Comrs. Heard Co., building 74 ft. bridge, involving 277 cu.yd. class A and 140 cu.yd. class B concrete, 9800 ft. lumber, 5 culverts and 6 abutments. About $30,000. J. L. Zachary, Atlanta, engr.

Fla., Vero.—Until Oct. 30, by W. Atkins, secy., Vero Bridge Dist., building 3200 ft. wooden bridge with swing draw, over Indian River. R. D. Carter, Vero, engr.

Wis., West Allis (Milwaukee, P. O.)—Until Oct. 18, by Bd. Pub. Wks., building 25 ft. rein.-con. bridge, 40 ft. wide, over Honey Creek, on George St. About $10,000. A. Schneider, city engr.

Minn., Pine City—Until Oct. 27, by A. P. Edin, aud. Pine Co., building Bridge No. 3128, 18 ft. rein.-con. slab span complete, No. 3125, 2 rein.-con. abutments, 36 ft. steel truss to be hauled 9 mi. and erected thereon, No. 3127, 2 rein.-con. abutments built under 36 ft. steel span; also refloorring 136 ft. steel bridge across Kettle River in Sect. 3. About $11,600. W. J. Buckley, Pine City, engr. Noted Aug. 28.

Neb., Shelton—Until Oct. 23, by G. E. Hasse, clk., Buffalo Co. (Kearney), building rein.-con. bridge, here, 800 ft. long, 24 ft wide, to have sixteen 50 ft. rein.-con. arches. Work involves 2500 cu.yd. rein.-con. and 17,000 lin.ft. wood piling. About $90,000. G. E. Johnson, state engr.

Ark., Marion—Until Oct. 22, by Bd. Comrs. Rd. Impvt. Dists. Nos. 7, 8 and 9, Crittenden Co., building 550 lin.ft. plate girder bridges, 1500 lin.ft. concrete viaduct and thirty 4 x 5 ft. concrete culverts.

Washington—Until Oct. 20, by State Highway Comn., Olympia, building 240 ft. steel span bridge over Cowlitz River, Lewis Co. J. Allen, state highway engr.

Cal., San Jose—Until Oct. 20, by Bd. Supervs. Santa Clara Co., building one 12 ft., two 20 ft. and one 50 ft. rein.-con. bridges, on Pierce Rd., to replace wooden structures. I. L. Ryder, co. surv.

MISCELLANEOUS

Automobile Truck Scale—Baltimore, Md.—Until Oct. 22, by Bd. Awards, furnishing material and building 20 ton automobile truck scale, with necessary appurtenances and pit, at about the location of present city scale, on Municipal Pier No. 4. G. F. Wieghart, highways engr.

Road Machinery—St. Cloud, Minn.—City is in the market for 2 or more combination street sweepers and flushers, 4 wheel gear with platform springs on front wheels, with pole for 2 horse team, heavy sheet iron circular shaped tanks on springs of front axel, 500 gal. capacity. A. W. Buckman, clk.

Signal System—Fargo, N. D.—Until Oct. 22, by A. R. Watkins, city aud., furnishing materials and installing a police call system to include ten call-boxes. Each proposal may state in addition the price which bidder will charge for system sufficiently large to accommodate 1, 2, 3, 4 or 5 additional boxes.

Imitation Icebergs, Mountains, etc.—St. Louis, Mo.—Until Oct. 27, by V. Borcherdt, city engr., furnishing and building artificial surroundings, in Forest Park Zoo, including imitation icebergs, mountains, etc., brass concrete and limestone. About $40,000.

Limestone and Miscellaneous Supplies—St. Louis, Mo.—Until Oct. 18, by J. B. Thomas, supply comr., furnishing Park Dept. with limestone and miscellaneous supplies for construction work. About $30,000.

EXCAVATION AND DREDGING

La., St. Joseph—Drainage—Until Oct. 29, by Bd. Comrs. Lake St. Peter D. D., at office of Bd. State Engrs., New Orleans Court Bldg., New Orleans; improving drainage in Lake St. Peter, D. D., Tensas Parish, along such routes as may be selected, to involve 850,000 cu.yd. excav. J. C. MacPherson, secy. and treas.

Tenn., Finger—Excavation—Until Oct. 27, by U. N. Bullman, secy. Sweetlips D. D. No. 8, R. F. D. No. 2, building 7 mi. open ditch, bottom width 5 ft., depth 6 to 7 ft., involving 68,300 cu.yd. dry earth excav., Chester and McNairy Counties.

Ia., Jefferson—Drainage—Until Oct. 20, by Bd. Supervs., Greene Co., furnishing labor and material for building Drain No. 151, involving 42,080 ft. 7-30 in. tile, etc. G. A. Coburn, aud.

Construction News
BIDS DESIRED

NOV 3 1919

ENGINEERING NEWS-RECORD

New York — Emergency Bulletin — October 23, 1919

SOME THINGS YOU CAN'T EXPRESS

We dislike to inject ourselves into these bulletins, but with a pile of 550 letters before us, endorsing our stand in the printers' strike, how can we be human and not say a word of thanks?

If you had for years been writing every week for 30,000 readers, seldom hearing from them, and then suddenly received 550 letters saying, "Bully for you. Stand your ground. We're with you," how would YOU feel?

Well, that's just the way we feel now. We'd like to shake hands all around and thank you for your backing. Maybe if we said, "Thanks, old pal. Drop in some day and let's talk it over," we'd get somewhere near the right thing. But you know how it is. Some things you can't express.

STRIKE SITUATION

The printers' strike in New York is still dead-locked. The situation is becoming very complicated. The presumably loyal Central Federated Union has endorsed the action of the outlawed unions, and the executive board of the American Federation of Labor has ordered it to rescind its endorsing resolution.

Meanwhile, the creation of wealth for everybody in the publishing business has ceased and the country goes hungry for information.

DEVELOPMENT COMMITTEE DISCHARGED

At the meeting of the Board of Direction of the American Society of Civil Engineers last week the report of the Committee on Development was received and the committee discharged. The three representatives of the committee on the Joint Conference Committee (considering intersociety relations) were authorized to continue to function, reporting now to the board.

ARCHITECTS AND BIG BRIDGES

A surprising bridge-engineering situation has developed in Pittsburgh, where two large and difficult bridge problems, the Sixteenth St. and Fortieth St. bridges, are in the course of design. One or both may include a steel arch of 500-ft. span. While these structures obviously represent engineering responsibilities of magnitude, the county commissioners (Allegheny County) have given full control of both design and construction to architectural firms. Early reports of this transaction seemed to indicate that the architects were merely consultants on aesthetic features of the bridges, but official statements now show that the architects hold contracts for making plans and specifications and supervising construction on a fee of 6 per cent of the total cost.

While it may be too late to alter this situation, since the contracts have been signed, the question raised is so fundamental as a matter of public policy that the advisability of the procedure must be called into question. Bridges of this magnitude are essentially engineering, not architectural, problems, and the interests of the public demand that they be placed in the hands of those thoroughly competent to take full responsibility for the technical adequacy of the structures. It is, moreover, a type of question in which there should be agreement between engineers and architects, for whatever fails to serve the public interest must, in the end, be detrimental.

We do not doubt that the architects in question will endeavor to hire competent engineers to do the work for them, but the matter is one of principle. Shall the community turn over its big technical problems to those competent to answer for their adequate solution, or shall they turn them over to brokers?

It is the duty of the engineers of Pittsburgh to inquire into this situation. They will want to be frank, too, with the architects of their city, for the problem passes beyond a case of pique to one branch of the constructive profession.

CIVIL ENGINEERS APPROVE CONSTITUTION OF STANDARDS COMMITTEE

During the past week the Board of Direction of the American Society of Civil Engineers approved the new constitution of the American Engineering Standards Committee and appropriated $1500 to cover its contribution to the committee's funds for 1920.

NATIONAL INDUSTRIAL CONFERENCE

So far the National Industrial Conference meeting in Washington at the call of the President has made little progress. The resolution looking to the settlement of the steel strike has been shelved, and the conference has been trying to get together on a statement of principles regarding collective bargaining. The labor and public groups have supported a resolution declaring the right of employees to select representatives of their own choosing, which would permit a minority to throw the case of all employees in an industry into union-labor hands. The employers' group has refused to accept such a resolution.

The reason for the employers' refusal is evident. It would tend to put the country's industries in the control of organized labor. We know what that did to England in its commercial competition with Germany before the war. If labor were responsible, if it were seeking the public good and not its selfish interests, the proposed resolution might not have serious consequences. With labor organizations as they are the results would be serious. Irresponsible power is always dangerous.

We hope that in the country's interests the employers will refuse to accept such a resolution.

SOCIETY MEETINGS

The following annual meetings are announced:

American Road Builders' Association, Nov. 7, 247 W. 54th St., New York City.

American Association of State Highway Officials, Dec. 8-11, Louisville, Ky.

TO PREVENT SHORTAGE OF ROAD MATERIALS

With the nation-wide increase in road-building activity, the capacity of the country to furnish gravel, sand and broken stone already has been passed, in the opinion of Thomas H. McDonald, chief of the Bureau of Public Roads. Even with the car shortage which has prevailed since the middle of the summer, production sources of these materials have been taxed severely. Unless everything possible is done to provide greater capacity of production during the next few months, it is stated, the spring, with its abundant car supply, will find inadequate supplies of basic materials the limiting factor in road construction.

LITTLE DUPLICATION IN MAPPING

That comparatively little duplication of effort is affecting the progress of mapping the United States is the opinion expressed in the report of the conference of Federal mapmaking organizations submitted to the President Sept. 30. At the meetings from Sept. 15 to 29, initiated by a suggestion from Engineering Council, there were represented 14 Government services and 12 engineering or scientific societies. Among the recommendations in the report are the creation of a permanent Board of Surveys and Maps to coordinate the work of all mapping agencies, and the provision of a central bureau of map information. The report forecasts an important part in future mapping by aircraft. According to Dr. George Otis Smith, Director of the United States Geological Survey, the topographic map of the United States on July 1, 1919 was 42.6 per cent computed. To finish the work by 1932, according to Dr. Smith's estimates, will require a total of $40,490,000.

PUBLIC WORKS MEETING PLANNED

From the office of the chairman of the Engineers, Architects, and Constructors' Conference on National Public Works comes the information that preliminary plans are being considered for a public-works meeting of state campaign committees, delegates from affiliated engineering, architects' and contractors' societies, and other interested parties, to be held in Washington in the early part of January. This meeting, it is predicted, will be one of the most effective features of the campaign in support of the project for a national Department of Public Works, and should result in placing the Jones-Reavis bill on the list of active legislative matters in Congress.

SEPTIC TANK ROYALTY SETTLEMENTS

About 230 cities and towns have settled claims for septic tank royalties under the agreement made several months ago between the Cameron Septic Tank Co., of Chicago, and the National Septic Tank Process Protective League (Frank G. Pierce, Secretary, Marshalltown, Iowa). Mr. Pierce has made an arrangement with the company named under which settlements may be made up to Jan. 15, 1920, by any cities that have not yet settled. The terms may be obtained by writing to Mr. Pierce.

COLUMBIA BASIN IRRIGATION PROJECT SURVEYS

Surveys of an immense irrigation project in Washington State, being made under a $100,000 state appropriation by the Columbia Basin Survey Commission (Marvin Chase, state hydraulic engineer, chairman), are nearing completion and will probably be reported on early in 1920. About 1,750,000 acres can be irrigated by gravity with water brought through 100 miles of canal, tunnels and siphons and 30 miles of natural lakes from a diversion weir on Pend D'Oreille Lake, in northern Idaho. This lake would be supplied through a 200-mile natural watercourse from Flathead Lake, western Montana, the level of which would be raised by a low dam.

HOG ISLAND DELIVERS 50TH SHIP

Completion and delivery of the fiftieth vessel by the Hog Island shipyard, announced by the Shipping Board during the week, sets a new mark of performance for a single shipyard, with a tonnage of 391,500 dead weight. Construction on the Hog Island yard started just two years ago, and the first hull was launched in August, 1918. Deliveries of completed ships have been in progress since December of last year. During the ten months since, this single yard has produced nearly 40 per cent more tonnage than all the yards of the United States built in 1916, the best pre-war year. However, American shipbuilding has been decreasing rapidly since early summer, and is already far below 50 per cent of the world's current ship production, a mark which it exceeded by good margin for many months.

ENGINEERS DISCUSS MILITARY POLICY

A resolution calling upon Engineering Council to appoint a committee to consider the relations between civilian and Army engineers and to draft recommendations governing the future military policy of the United States, with a view to the presentation of the recommendations before Congress, was the outcome of the meeting of the American Society of Civil Engineers in New York City, Oct. 15, at which members and non-members, including Maj. Gen. W. M. Black, chief of engineers, U. S. A., Maj. Gen. W. C. Langfitt, former chief engineer of the American Expeditionary Forces, and Brig. Gen. R. C. Marshall, Jr., chief of

the Construction Division of the Army, discussed the several Army bills now pending in Congress and the general subject of the relations between civilian members of the engineering profession and officers of the Corps of Engineers The discussion was opened by George D. Snyder, of Jacobs & Davies, consulting engineers, New York City.

AKRON CHANGES FROM GARBAGE REDUCTION TO FEEDING

After municipal ownership and operation of a garbage reduction plant, followed by company operation under a lease, and then municipal operation once more, the City of Akron, Ohio, has let a five-year contract for garbage disposal by feeding to the American Stock & Food Co., Alvah Brown, president, the city to receive $5c. per ton for garbage delivered by it to the contractor. Frank C. Tolles is general superintendent of the Bureau of Sanitation, under H. S. Morse, director of public service.

MINNESOTA DRAINAGE LAW MADE EFFECTIVE

State control of drainage and flood-protection work in Minnesota has been made practicable by a recent appropriation of $35,000. A law providing for a department of drainage under an engineer-commissioner was passed last spring, but the necessary appropriation for establishing the office was not made at that time.

TERMINAL SUBWAYS FOR DETROIT

Street-car terminal subways for Detroit have been recommended to the city authorities by Barclay Parsons & Klapp, consulting engineers, and the city council has approved the project. The problem of transit improvement, in the judgement of the engineers, was primarily one of relieving the downtown street congestion, which is made particularly serious by the radial arrangement of the street system, centering on the Campus Martius, and by the heavy traffic along Woodward Ave. As now approved, after modification of the original recommendations, the project consists of a subway in Woodward Ave. from Adelaide St. south to an underground loop at Jefferson Ave., and a subway in Fort St. from First St. easterly past Cadillac Square.

INCREASES FOR ENGINEERS ASKED IN BALTIMORE AND CINCINNATI

In a communication from the Baltimore Chapter of the American Association of Engineers, the Board of Estimates of Baltimore has been asked to increase the pay of all engineers employed by the city. A similiar request on the Cincinnati Rapid Transit Commission has been made by a delegation headed by the president of the Cincinnati Chapter of the association.

REACH AGREEMENT FOR TAKING OVER GRAND TRUNK

An agreement has been reached between representatives of the Canadian Government and of the Grand Trunk Ry. for taking over the stock of the Grand Trunk System and its subsidiaries into a Government fund, and for the operation of the lines in harmony with the Canadian National Co. as soon as the arrangement is ratified by the present shareholders.

BIG CANADIAN WATER POWER STARTED

One of the largest hydro-electric projects in the world is just being begun north of Winnipeg, Man., on the Winnipeg River. This is the development of the Winnipeg Power Co. It involves the present construction of a gravity concrete dam 2000 ft. long and 70 ft. high. Eight 21,000-hp. horizontal-type turbines will be installed in the primary unit. The power generated is to supply the City of Winnipeg.

NOT ENOUGH BID FOR NITRO

All of the bids for the purchase of the City and plant of Nitro, W. Va., have been rejected by the War Department. This powder town cost the Government close to $75,000,000 and was never put in operation. The highest bid, from a firm of wreckers, was $5,800,000.

ENGINEERS PARTICIPATE IN SAFETY CONGRESS

At the annual congress of the National Safety Council, held in Cleveland, Ohio, Oct. 1-4, the following were the main points of the papers and discussion before the construction section: Systematic accident-prevention practices are not limited to large operations; in proportion to his risk, the small contractor realizes as great benefit as the large contractor from accident prevention work; profit comes from reduction in liability insurance rates and reduction of lost time by workmen.

STEPS IN THE RAILROAD CASE

Last week the Interstate Commerce Committee of the Senate, by a vote of 14 to 1, decided on the inclusion in permanent railroad legislation of a provision to penalize strikes of railroad employees. The committee also voted that a portion of railway earnings above 6 per cent shall be transferred to the general fund of the Federal Transportation Board.

The Association of Railroad Executives, in session in New York City last week, named a committee to confer with the Director General of Railroads to ask that he reconsider the previous refusal to raise railroad rates to a self-supporting basis before the return of the lines to private operation. The Director General had previously indicated that any such action should be taken by the Interstate Commerce Commission.

The National Association of Railway and Utilities Commissioners, at the annual meeting in Indianapolis last week, adopted a resolution urging return of the railroads to private ownership before the first of next year.

The so-called Plumb plan appears to be gaining no headway.

REQUEST FOR MORE PAY FOR ENGINEERS

An appeal has been made to Congress by the Secretary of Commerce for substantial increases in the salaries of engineers. While the appeal was made in connection with the request for higher pay for the technical staff of the Coast and Geodetic Survey, the low salaries prevailing there are being cited as a condition which exists throughout the Government service.

WAR DEPARTMENT DELIVERS MOTOR VEHICLES

In view of the Attorney-General's opinion, recently rendered, the War Department has begun again to deliver motor vehicles to the Bureau of Public Roads for distribution to state highway commissions. The Secretary of War, however, declines to deliver other than motor equipment, without specific legislation.

LARGE CANADIAN IRRIGATION DISTRICT FORMED

The Lethbridge Northern Irrigation District has been formed, with offices at Lethbridge, Alta. Preparations are being made for a $4,000,000 bond issue and to let contracts for construction before next spring. H. B. Muckleston, of the Canadian Pacific National Resources Department, has been appointed chief engineer, and H. W. Lever is secretary.

MAINE RAISES BONDED INDEBTEDNESS TO $10,000,000 FOR HIGHWAYS

The State of Maine has voted to raise the bonded indebtedness for state highways from $2,000,000 to $10,000,000. The vote was overwhelmingly in favor of the proposal.

BRIDGE WORK

Work started on the new St. Johns River bridge at Jacksonville, Fla., Sept. 25. The foundations are being built by the Missouri Valley Bridge & Iron Co., Leavenworth, Kan., for $374,447, this sum covering also the approaches. The superstructure will be built by the Bethlehem Steel Bridge Corporation, Bethlehem, Penn., for $534,180.

Replacement of two old bridges over the Willamette River is under consideration by the Multnomah County, Oregon, commissioners. They are the Burnside and Morrison bridges, whose condition is said to be becoming dangerous. It is likely that a cost of $2,000,000 will be involved in the renewal.

Construction News

BIDS DESIRED

WATERWORKS

Wis., Milwaukee—Until Nov. 7, by Dept. Pub. Wks., furnishing materials and labor building Linwood Avenue Tunnel, to include construction of concrete lineal tunnel, 7336 ft. long, 9 ft. wide, rein.-con. bellmouth, "Y" branch, three distribution tunnels, two gate-wells, 83 ft. total depth, for 9 ft. sluice gates, said gates to be furnished by city. P. Braman, deputy comr.

Neb., Chadron—Until Nov. 3, by City Clerk, laying new supply mains and replacing some old ones, also building 750,000 gal. concrete reservoir. About $160,000. G. T. Prince, 532 Bee Bldg., Omaha, engr. Noted Sept. 11.

Wyo., Hudson—Until Oct. 31, by Town Council, building waterworks system, pumping station and reservoir, involving 5920 ft. 4 in. and 6400 ft. 6 in. c.i. pipe, valves, hydrants, electric motor, air lift pump, 1000 ft. 2 1-2 in. fire hose nozzles, tools, 2 hose carts, etc. C. C. Carlisle, 212 First Natl. Bank Bldg., Cheyenne, engr.

Okla., Grandfield—City soon receives bids building 8 in. water mains to replace 2 in. mains. About $70,000. H. Pressey, Grandfield, engr.

Ont., York Twp.—Town soon receives bids laying 10, 730 ft. 6 in. c.i. watermains in various streets. About $32,000. F. Barber, 40 Jarvis St., Toronto, engr.

SEWERS

N. Y., Niagara Falls—Bd. Pub. Wks. soon receives bids laying Muddy Run sewer 1 mi. of 8 ft. pipe. About $300,000.

N. Y., Port Washington—Until Oct. 28, by Sewer Comrs., 273 Main St., furnishing all labor and material building 10,000 ft. 8-24 in. vitr. pipe sewers, manholes, flush tanks, etc. B. F. Allen, 273 Main St., engr.

N. Y., Rye—Until Oct. 29, by Bd. Village Trustees, furnishing material and labor building sanitary sewers and sewage disposal units, involving 31,100 ft. 8 in. and 580 ft. 15 in. vitr. pipe sewers, 7100 ft. 6-16 in. iron pipe, siphon and force mains, also 1 pumping station complete, sewage tanks, sprinkling filters and sand beds with appurtenances. G. E. Hill, 45 7th Ave., New York City, engr. Incorrectly noted in our issue of Oct. 16.

O., Akron—City soon receives bids building 4000 ft. 48-57 in. concrete or brick sewer in North Howard St. from Little Cuyahoga River to York St. J. C. Root, Delaware Bldg., engr.

O., Akron—Sewerage Div., Delaware Bldg., soon receives bids building Willow Run Trunk Sewer from West Exchange St. to Ohio Canal, involving 3600 ft. 10 ft. brick sewer. J. E. Root, city engr.

Minn., Adrian—Until Oct. 27, by Village Council, building sanitary sewerage system. About $40,000. Druar & Smith, Globe Bldg., St. Paul, engrs. Noted Sept. 25.

Kan., Pittsburg—City receives bids in winter, laying storm sewers, in Dists. Nos. 4 and 5. About $50,000. L. E. Curfman, city engr.

Cal., Fresno—C. Dillon, city clk., receives bids about Nov. 1, laying 37,000 ft. 8-20 in. cement pipe sewers in North Fresno Dist. About $200,000. C. Murray, city engr.

Cal., Los Angeles—Bd. Pub. Wks. soon receives bids building sewer in Gulf Ave. Sewer Dist., Harbor Dist. (Wilmington), involving 60,000 ft. 8-24 in. vitr. clay pipe, brick manholes, etc. About $135,000. H. B. Ferris, secy. W. G. Rockwood, sewer engr. Noted June 19.

Cal., Riverside—City soon receives bids building Jackson Outfall sewer in Arlington. Dist. About $94,000. A. Braunschweiger, city engr.

BRIDGES

N. Y., Sardinia—Until Oct. 30, by M. H. Pitcher, clk. joint town bds., Ashford and Yorkshire Twps., Cattaraugus Co. and Sardinia Twp., Erie Co., building steel truss highway bridge and its foundations

and abutments, to replace existing span called Hakes Bridge over Cattaraugus Creek.

N. J., Hackensack—Comrs. Bergen Co soon receives bids building centre pier of Paterson Plank Rd Bridge over Hackensack River. About $10,000. R. P. McClare, co. engr.

Pa., Phila.—City receives bids about Oct 26, building 190 ft. steel girder bridge, 60 ft wide, encased in concrete, to replace old bridge on Oxford St., to have one 40 ft., one 45 ft and one 75 ft. spans, cost $60,000; 45 ft. span bridge, 60 ft wide, to replace old bridge on Morris St., over Chestnut branch of Pennsylvania R.R., supported on masonry abutments, steel girder encased in concrete, $65,000. C. Albright, city engr.

Mich., Okemos—Until Oct. 29, by Bd. Control Michigan State Training School for Women, c-o State Highway Dept., Lansing, building bridge over Red Cedar River, near here, having two 50 ft. rein.-con girders with 18 ft. roadway, two 20 ft. rein.-con. abutments and one 20 ft. pier, involving 501 cu.yd. concrete. B. Wickham, secy.

Kan., Paola—Comrs. Miami Co. soon receive bids building Sinkey Bridge, 60 ft. truss and Wea Bridge, 80 ft. truss. H. Stockwell, Paola, engr.

Ore., Astoria—State Highway Comm., Salem, soon receives bids building double leaf trunnion bascule bridge over Youngs Bay, here. Bids will be received on 3 alternate projects, as follows: (1) (substructure only), bascule bridge for combined railway and highway traffic including about 1580 lin.ft. of timber trestle approach span for highway project, involving 42,600 lin.ft. foundation piling, 4950 cu. yd class "D" concrete (Tremie concrete for pier base and cofferdam seal), 750 cu.yd. class "A" and 1500 cu.yd. class "B" concrete, 120,000 lb. reinforcing steel, 6700 lin.ft. protection piling, 1,000,000 lb. structural steel, 3650 sq.yd. asphalt paving; (2) (superstructure only), bascule bridge for highway traffic only, including about 1580 lin.ft. timber trestle approach span, involving 20,000 lin. ft. foundation piling, 2500 cu.yd. class "D" concrete, (Tremie concrete for pier base and cofferdam seal), 500 cu.yd. class "A" and 700 cu. yd. class "B" concrete, 70,000 lb. reinforcing steel, 5000 lin.ft. protection piling, 485,000 lb. structural steel and 3650 sq.yd. asphalt paving; (3) (entire project) bascule bridge for highway traffic only, including about 360 ft. permanent approach, steel plate girders with concrete floor and foundations and 1220 lin.ft. timber trestle approach, involving 29,000 lin.ft. foundation piling, 750 cu.yd. class "A" 1000 cu.-yd. class "B" and 3000 cu.yd. class "D" concrete, 117,000 lb. reinforcing steel, 5000 lin.ft. protection piling, 695,000 lb. structural steel, 3650 sq yd. asphalt paving. H. Nunn, state highway engr.

STREETS AND ROADS

N. J., Jersey City—Until Oct. 28, by City Comrs., regulating and repaving Zabiskie St. from Central to Summit Aves., sheet asphalt on present foundation. About $25,000. C. A. Van Keuren, city engr.

Pa., Greensburg—Until Oct. 30, by J. S. Sell, controller Westmoreland Co., building and improving 2 mi. road in South Huntingdon Twp., leading from Smithton Boro. towards Reagantown, rein.-con. and all grades over 6 per cent to be brick surface, integral curb and concrete base,

North Carolina—Until Oct. 30, by State Highway Comm., Raleigh, top soiling 5.8 mi Federal Aid Project No. 48, Northampton Co., involving 15,076 cu.yd. earth excav., 11.86 acres clearing and grubbing, and necessary vitr. and corrugated iron pipe. About $20,000. W. S. Fallis, state highway engr.

N. C., Burgaw—Comrs. Pender Co. soon receive bids building 26 mi. sand clay roads, 30 ft. wide. About $150,000. W. K. Allen, Wilmington, engr.

Ga., Atlanta—City receives bids in about 30 days paving Edgewood St. from Boulevard to Spruce Sts. About $75,000. H. L. Collier, city engr.

Ga., Monroe—Until Nov. 4, by Comrs. Walton Co., grading, draining, top soiling and building culverts on 9.25 mi. road between here and Social Circle and 34 ft. bridge with rein.-con. approaches. About $100,000. Garrett & Slack, Bell Bldg., Montgomery, Ala., engrs.

Ga., Quitman—Until Nov. 6, by Comrs. Brooks Co. paving Quitman-Morven Rd., 18 ft. wide, involving 39,036 sq.yd. bituminous concrete on concrete base and 22,-514 cu.yd. sand clay. About $150,000 Garrett & Slack, Bell Bldg., Montgomery, Ala., engrs.

Ga., Savannah—Comrs. Chatham Co. soon receive bids improving Louisville and Ogeechee Rds. About $425,000 and $495,000 respectively. O. T. Bacon, chn.

Fla., St. Augustine—St. Johns Co. receives bids about Dec. 1, building 100 mi. rock road. Bonds for $400,000 voted for project. G. T. Butler, St. Augustine, engr.

Tenn., Memphis—City soon receives bids paving 1000 ft. Oliver Ave from Barksdale east, 24 ft. wide, involving 2416 sq.yd. tar macadam on 5 in. concrete base, 1812 lin.ft concrete curb and gutter, 200 sq.ft. sidewalk removed, 2470 cu. yd. earth excav., 20 lin.ft. concrete steps, 65 cu ft. concrete coping and 1000 sq.yd. sodding. About $11,500. W. B. Fowler, city engr.

Tenn., Morristown—Until Oct. 27, by Mayor and Aldermen, grading, paving, curbing and guttering Cumberland St. from 1st North to 6th North Sts., and 3rd North St. from Cumberland St. to point 130 ft from western edge of right-of-way of Knoxville & Bristol R.R., Impvt. Dist. No. 15. Work involves 7587 sq.yd. asphaltic concrete, 2530 cu.yd. grade excav., 2400 lin.ft. curb and gutter, 1345 lin.ft. 6-24 in. storm sewer, 11 catch basins, 4 manholes, etc. Separate bids are asked for work as follows (1) curbing and guttering; (2) installation of storm sewers, manholes and catch basins; (3) excavation, (4) paving, also bids on the work as a whole. D. C. Morris, recdr.

Indiana—Bd. Co. Comrs. building roads in following counties:

Oct. 29, Jay Co., Portsmouth, 1175 ft. concrete road in Richmond Twp., known as G. A. Buckles Rd.; gravel road in Madison Twp., known as J. Theurer et. al. Rd. J. Bonifas, aud.

Nov. 1, Warren Co., Williamsport, 2560 ft. gravel road on county line between Grant Twp., Benton Co. and Pine Twp., Warren Co., known as C. E. Thompson Rd. W. N. Stephens, aud.

Nov. 3, Newton Co., Kentland, 3030 ft. macadam road in Beaver Twp., known as P. R. Duclos et. al. Rd. S. R. Sizelove, aud.

Switzerland Co., Vevey, 14,642 ft stone road in Posey Twp., known as H. Neahouse Rd., 14,248 ft. stone road in Pleasant Twp., known as H. E. Carmine Rd.; 54,700 ft. stone road in Cotton Twp., known as W. P. Truitt Rd. W. A. Reeves, aud.

Clark Co., Jeffersonville, 14,035 ft. road in Washington Twp., known as C. C. Bottorff Rd. G. W. Stoner, aud.

Jackson Co., Brownstown, 2800 ft. gravel road in Brownstone Twp., known as O. M. Koontz et.al. Rd.; 12,164 ft. gravel road in Jackson Twp., known as H. Sprenger Rd. A. Luedtke, aud

Vermilion Co., Newport, 3 mi. gravel road in Vermilion Twp., known as the R. V. Thompson Rd.; 3 mi. road in Vermilion Twp., known as E. H. Spellman Rd. L. F Wright, aud.

Decatur Co., Greensburg, 8145 ft. road in Sandquick Twp., known as W. Ralston et. al. Rd. J. C. Barbe, aud.

Vanderburgh Co., Evansville, road in Knight Twp., known as Morgan Ave. Rd. W. M. Copeland, aud.

Nov. 4, Harrison Co., Corydon, 15,580 ft. macadam road, Franklin Twp., known as J. Zabel et. al. Rd., 5575 ft. road, Harrison and Webster Twps., known as P. Seipel et al Rd. S. C. Mauk, aud.

Starke Co., Knox, road in Railroad Twp., known as Roney Rd.; road in Wayne Twp., known as Slansky Rd.; road in Davis Twp., known as Shanks Rd.; road in Washington Twp., known as McVey Rd. C. W. Weninger, aud.

Steuben Co., Angola, 26,000 ft. gravel road, Pleasant Twp., known as J. Brown et. al. Rd., road in Fremont Twp., known as G. Griffith Rd. I. W. Pence, aud.

Montgomery Co., Crawfordsville, 19,-560 ft. gravel road, Scott Twp., known as H. L. Smith Rd. W. F. Batman, aud.

Jasper Co., Rensselaer, road in Union Twp., known as W. L. Wood et al Rd.; road in Hanging Grove Twp., known as B. C. Eldrige et. al. Rd.; road in Gillam Twp., Jasper Co. and Salem and White Post Twps. Pulaski Co., known as T. F. Watson et al Rd., road in Walker Twp., known as J. Hine et. al. Rd. J. P. Hammond, aud.

Hancock Co., Greenfield, 5352 ft. gravel road, Vernon Twp., known as J. Lain et. al. Rd., 5285 ft. gravel road, Vernon Twp., known as J. H. Stottlemyer Rd.; 14,333 ft. gravel road Brown Twp., known as H. Riger et al Rd. H. J. Rhue, aud.

Nov. 8, Huntington Co., Huntington, road on line between Whitley and Huntington Counties. O. E. Eviston, aud.

Ind., Greenfield—Until Nov. 4, by Comrs. Hancock Co., paving Stottlemyer and Lain Rds., gravel, Rule Rd., waterbound macadam. C. Boone, Co. engr.

Mich., Detroit—City soon receives bids grading and paving Lakeview Ave. from Kercheval to Charlevoix Aves., 26 ft. wide, 4500 sq.yd. asphaltic concrete on 6 in. concrete base, Berea or Medina curbstone. About $23,375. C. W. Hubbell, City Hall, engr.

Wis., West Milwaukee (Milwaukee P. O.)—City soon receives bids paving Scott St., 38th, 39th, 41st., 42nd and 43rd Aves., involving 30,000 sq.yd. rein.-con. pavement with integral curb. About $60,-000. Parsons & Orbert, 627 M. & M. Bank Bldg., Milwaukee, engrs.

Ia., Leon—Until Dec. 3, by City Council, paving 53 blocks, 26 ft. wide, involving 7000 cu.yd. extra grading, 40,000 sq.yd. roadway area, 21,000 lin.ft. curb or curb and gutter. Alternate bids will be received on asphaltic concrete, bitulithic, rein.-con., sheet asphalt, vitr. brick; also on curb and combination curb and gutter. Shockley Eng. Co., 740 Reserve Bank Bldg., engrs. Noted Aug. 28.

Minn., Shakopee—Until Nov. 4, by T. H. Walsh, and Scott Co., building Job No. 1902, State Rd. No. 9, involving 65,000 cu. yd. excav., 2200 cu yd. gravel surfacing, high water crossing Minnesota River bottoms here, starting at intersect of Minnesota and Elm Sts., Savage, and ending south of Minneapolis, Northfield and Southern Ry. bridge over Minnesota River. About $275,000. C. Donald, Shakopee, engr.

Mo., Paris—Monroe Co. soon receives bids paving and hardsurfacing roads, out of Paris 30 ft wide, concrete and macadam on Telford base. About $972,000.

Tex., Highland Park (San Antonio P. O.)—Until Oct. 30, by F. Fries, city clk., grading, macadamizing, curbing and pavementing certain streets, in Impvt. Dist. No. 14. Noted Aug. 28.

Okla., Muskogee—Until Nov. 15, by Comrs. Muskogee Co., gravel surfacing 36 mi Jefferson Highway, 18 ft wide. About $400,000. T. P. Clonts, 2110 Garland Ave., engr.

California—Until Oct. 27, by State Highway Comm., 515 Forum Bldg., Sacramento, building 6.6 mi road, sect. C, Route 17, Dpv 3, between Auburn and northerly boundary, Placer Co., involving 26,000 cu. yd excav., 6080 cu yd class A cement concrete etc., 5.2 mi road, Sect A and B, Route 2, Dpv 3, between southerly boundary and Conejo Grade, Ventura Co., 1500 cu.yd. excav. and 7000 cu.yd. class C Portland cement concrete. A. B. Fletcher, comr.

Cal., Dinuba—City soon receives bids paving, building curbs, gutters and walks on various streets. About $130,000. C. E. Sloan, city engr.

Cal., Los Angeles—Bd. Pub. Wks. receives bids in November improving 3-4 mi. road in Clementina Ave. Impvt. Dist., involving 4 in. concrete paving with asphalt surface, cement curbs, concrete gutters, cement walks and vitr. pipe storm drains. Cost between $20,000 and $30,000. A. C. Hansen, city engr.

Cal., Los Angeles—Bd. Pub. Wks. soon receives bids paving and building sewers in 1 mi. Washington St. between Arlington St. and west city line, 80 ft. wide, less track space, 5 in. concrete base with asphaltic surface, cost, probably $50,000. 3 blocks Norton Ave., concrete base, Warrenite surface. A. C. Hansen, city engr.

Cal., Oakland—City soon receives bids paving 1450 ft. Oak St. between 2nd and [illegible] St., [illegible] grading, [illegible] lin ft. concrete curb, 2849 sq ft. brick gutter, 6270 sq yd. sheet asphalt pavement on 4 in. concrete base, 1 mi. 12 in. pipe conduit. About $44,000. M. Campbell, city engr. Noted June 19.

Cal., Riverside—Bd. Supervs. Riverside Co. soon receives bids paving portion Coachella-Elsinore Highway. Concrete or on macadam. About $25,000 available. A. C. Fulmer, Riverside, engr.

Cal., Riverside—Bd. Supervs. Riverside Co. soon receives bids improving roads in Fertilla, Rocky Comfort, Anelo

Valley, West Blythe and Arrowhead Rd. Dist., near Blythe. Bonds for $75,000 voted for project. R. W. Waterman, Riverside, engr.

Ont., Niagara Falls—City Council soon receives bids paving and curbing Palmer Ave. from Benson to Victoria Aves. and Kitchener St. from Victoria to Powell Aves., 24-34 ft. wide, involving 5800 ft. asphalt on concrete base. About $60,100. D. T. Black, Erie Ave., engr.

Ont., Toronto—City soon receives bids paving 15,748 ft. Morley Ave. from Gerrard St., to Walpole Ave., 24-34 ft. wide, brick block and asphalt, $29,150; 2 mi. St. Clair Ave., 40-56 ft. wide, asphalt, $130,000. R. C. Harris, City Hall, engr.

EXCAVATION AND DREDGING

Wis., Portage—Drainage—Until Nov. 8, by Comrs. Lewiston D. D., building open ditches, tile drain and 3 concrete bulkheads, involving 62,768 cu.yd. excav. and 24,732 ft. 10-22 in. tile. P. A. Paulson, comr.

Kan., McPherson—Ditch—D. D. No. 2, McPherson Co., receives bids about Nov. 1, building 4 1-2 mi. main line ditches and 7 mi. laterals, involving 250,000 cu.yd. dry earth excav. About $50,000. P. B. Balzer, chn. H. A. Nelson, 424 Bee Bldg., Omaha, Neb., engr.

Ore., Silver Lake—Irrigation—G. W. Marvin, secy. Silver Lake Irrigation Dist. receiving bids building irrigation system, including 10 mi. main canal, 3 timber faced, rock filled dams and distribution system, involving 78,000 cu.yd. earth excav., 55,500 cu.yd. rock embankment, 860 cu.yd. rubble masonry and concrete, 770,000 F.B.M. lumber, 26,000 lb. iron, 140 lin.ft. tunnel. About $100,000. Baar & Cunningham, Spalding Bldg., Portland, engrs.

INDUSTRIAL WORKS

N. Y., Jamestown—A. E. Baxter Eng. & Appraisal Co., engrs., Ellicott Sq., Buffalo, soon receives bids building 6 story, 100 x 100 ft. rein.-con. and steel, grain elevator, rein.-con. flooring, concrete foundation, for Grandin Milling Co., Gifford Bldg. About $100,000.

Md., Monkton—Monkton Roller Mills, 1101 Fidelity Bldg., Baltimore, had revised plans prepared and soon receives bids building 8 story, 44 x 116 ft. flour mill, concrete, cost $120,000; also grain elevator, 250,000 bu. capacity, $60,000. O. E. McCoy, Mt. Washington, pres. Nordyke & Marmon, Kentucky Ave. and Morris St., Indianapolis, Ind., engrs.

O., Cleveland—Osborn Eng. Co., engrs., 2848 Prospect Ave., receiving bids building 4 story, 51 x 110 ft., rein.-con., steel and brick factory, at 11100 Madison Ave., for Glidden Varnish Co., Madison Ave. About $110,000.

Mich., Detroit—C. W. Brandt, archt., 1114 Kresge Bldg. receiving bids building 1 story, 105 x 200 ft. rein.-con., brick and steel, concrete foundation, on Franklin St., for Young Bros.

Mo., St. Louis—Genl. Electric Co., Pierce Bldg., soon receives bids building rein.-con., steel and brick factory, rein.-con. flooring, rock foundation, on Union and Brown Sts. About $500,000. F. N. Boyer, mgr. Architect not selected.

Mo., St. Louis—S. Hamburg Co. care of Rosenbaum Hauschulte Real Estate Co., Wainwright Bldg., had sketches made and receives bids about Nov. 1, building factories of various sizes and dimensions, on Natural Bridge Rd. and Goodfellow Ave. About $300,000. Architect not selected.

Tex., Abilene—Abilene Gas, Electric & Ice Co. receives bids about Nov. 1., building combined power and ice plant. About $525,000. Sargent & Lundy, Edison Bldg., Chicago, engrs.

Ont., Toronto—James, Loudon & Hertzberg, engrs., 36 Toronto St., soon receives bids building 1 story, 85 x 180 ft., concrete, steel and brick machine shop, rein.-con. flooring, concrete foundation, for Bowden Machine Co., 163 Sterling Rd. About $125,000.

BUILDINGS

Conn., Hartford—School—Whiton & McMahon, archts., 36 Pearl St., receiving bids building addition to A. E. Burr School, on Wethersfield Ave., brick, concrete foundation, for South School Dist. About $200,000. J. H. Maylor, 5 Wethersfield Ave., chn. Noted July 17.

Conn., Middletown—Hospital—D. K. Perry, archt., 79 Golf Maple Hill, New Britain, soon receives bids building 2 story, 105 x 233 ft., brick, concrete and steel rein.-con. flooring, concrete foundation, on South Farms, for Connecticut Hospital for Insane. About $175,000. Noted June 19.

N. Y., Newtown (Flushing P. O.)—School—Until Oct. 28, by Bd. Educ., 500 Park Ave., New York City, building brick, steel and stone addition, on Etna Pl., Chicago and Parcell Sts. About $400,000. C. B. J. Snyder, Municipal Bldg., New York City, archt. and engr.

N. J., Orange—Hospital—Until Nov. 1, by Crow, Lewis & Wick, archts. and engrs., 200-5th Ave., New York City, building 4 story, brick, steel and stone addition, brick foundation, for Orange Memorial Hospital, here. About $250,000.

Pa., Phila.—Cafe—R. E. White, archt. and engr., Penn. Bldg., receives bids about Mar. 15, building 1 story, 100 x 250 ft. stone, in Fairmont Park, for W. J. Ostheimer, Arcadia Cafe, Widener Bldg. About $400,000.

Mich., Ann Arbor—Hospital—Until Oct. 27, by S. E. Smith, secy. Bd. Regents, constructing 6 story, 35 x 420 ft. hospital with 35 x 112 ft. and 35 x 88 ft. wings, also 3 story, 56 x 153 ft. administration building with 51 x 254 ft. and 44 x 58 ft. wings, rein.-con. and brick, rein.-con. flooring, concrete foundation, on East Anne St., for University of Michigan. About $1,000,000. A. Kahn, Marquette Bldg., Detroit, archt.

Mich., Benton Harbor—High School—Until Oct. 27, by C. Sykes, secy. Bd. Educ., 105 West Main St., building high school. J. C. Llewellyn, 38 South Dearborn St., Chicago, archt.

Ill., Bloomington — Temple — R. G. Schmidt & Co., archts., 154 West Randolph St., Chicago, receiving bids building 3 story, 145 x 180 ft., brick, terra cotta, concrete and steel, concrete foundation, for Scottish Rite Consistory. About $500,000. Westcott Eng. Co., 111 West Washington St., Chicago, engrs.

Ill., Chicago—Church—H. L. Cheney, archt., 208 South La Salle St., receives bids about Nov. 10, building 1 story, 160 x 170 ft., brick and concrete, concrete foundation, on Ashland and Kenilworth Aves., for 16th Church of Christian Scientist, 1716 Lunt Ave. About $200,000. Noted May 1.

Ill., Chicago—Office—D. H. Burnham & Co. archts., 209 South La Salle St., receiving bids building 2 story, 120 x 210 ft., brick, steel, stone and tile, concrete foundation, on Cass and Erie Sts., for A. W. Shaw Co., 5 North Wabash Ave. About $150,000. Noted Aug. 28.

FEDERAL GOVERNMENT WORK

Mass., Hingham — Officers' Quarters—Spec. 4056—Until Nov. 5, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Naval Ammunition Depot, here. About $12,000; $10 deposit required for plans and spec.

N. Y., New York—Dredging—Until Nov. 21, by U. S. Engr. Office, 39 Whitehall St., dredging in channel between Staten Island and Hoffman and Swinburne Islands.

Pa., Ft. Mifflin—Dredging—Spec. 4042—Until Nov. 5, by Commandant, Navy Yard, Phila., dredging at Naval Ammunition Depot, here. About $10,000; $10 deposit required for plans and spec.

Pa., Phila.—Electric Lighting System—Spec. 4045—Until Oct. 29, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing electric lighting system for extension to Shinbuilding Slips, here. About $10,000; $10 deposit required for plans and spec.

Pa., Phila.—Power Plant—Until Oct. 28, by Officer in Charge of Construction, Frankford Arsenal, building 4250 k.w. power plant.

Pa., Phila.—Tugs, Scows and Oil Barges—Until Nov. 17, by U. S. Engr. Office, 815 Witherspoon Bldg., furnishing 2 second hand steel tugs, 6 steel or wood bottom-dump mud scows and 1 steel oil barge.

D. C., Anacostia—Strengthening Hangar, Trusses, Installing, Heating System, etc.—Until Nov. 5, by Bureau Yards & Docks, Navy Dept., Wash., D. C., strengthening hangar trusses, installing movable scaffold for erection of gable rolling doors of hangar, heating system for radio building, constructing toilet and boiler rooms and coal bin additions to radio building, concrete floors and footings, brick chimney, also installing plumbing and sewer system at Naval Air Sta., here. About $12,000; $10 deposit required for plans and spec.

D. C., Wash—Sprinkler System—Until Nov. 4, by Treas. Dept., installing automatic sprinkler system in building at 412-16 14th St., N. W. J. A. Wetmore, superv. archt.

D. C., Wash.—Storehouse Extension—Until Oct. 25, by U. S. Engr. Office, 305 Southern Bldg., furnishing labor and material building extension to storehouse at Potomac Park.

S. C., Charleston—Spec. 4061—Chimney—Until Nov. 5, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing material and labor for erection of radial brick chimney, 250 ft. high and 12 1-2 ft. inside diameter at top, on foundation provided by Government. About $16,000; $10 deposit required for plans and spec.

Mich, Detroit—Dredging—Until Nov. 25, by U. S. Engr. Office, Detroit, dredging and rock excavation on Livingstone Channel, Detroit River.

Colo., Denver—Monitor—Until Oct. 28, by Treas. Dept., Wash., D. C., installing monitor over Sweep Cellar at U. S. Mint, here. J. A. Wetmore, superv. archt.

Cal., Mare Island—Chimney—Spec. 4062—Until Nov. 5, by Bureau Yards & Docks, Navy Dept., Wash., D. C., furnishing material and labor for erection of radial brick chimney, 150 ft. high and 10 ft. inside diameter at top, on foundation provided by Government. About $12,000; $10 deposit required for plans and spec.

Cal., San Diego—Water Supply and Sewer System and Fuel Oil Storage Reservoir—Spec. 4007—Until Nov. 5 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here. Noted Oct. 16.

Cal., San Francisco — Refrigerating Plant—Until Nov. 10, by Treasury Dept., Wash., D. C., installing refrigerating plant, in proposed building, here. J. A. Wetmore, superv. archt.

P. R., Point Borinquen—Light Station—Until Dec. 17, by Commissioner of Light Houses Wash., D. C., furnishing labor and materials building light station, here.

MISCELLANEOUS

Lock—Lockport, N. Y.—Until Oct. 28, by E. S. Walsh, supt. pub. wks., Capitol, Albany, rebuilding upper end of Lock No. 35, on Erie Canal, Sect. 10, Contr. No. 152.

Tank, etc—Lockport, Ill.—Until Oct. 28, by State Penitentiary Comn., at office of J. Lambert, pres., 863 Rookery Bldg., Chicago, building tank, tower automatic altitude valve and deep well pumping equipment at penitentiary site, near here.

Revetment—Milwaukee, Wis.—City soon receives bids building 1375 lin.ft. pile and timber revetment, at west end of Jones Island, here. About $95,000. Dept. Bridges & Bldgs., engrs.

Concrete Mixers, Roller, etc.—Ft. Scott, Kan.—C. A. Simons, Jr., care Railroad and City Y. M. C. A., is in the market for good road equipment, concrete mixers, road building machinery, crushers and roller, trucks and dump wagons.

Foundation—Phoenix, Ariz.—Masonic Order receives bids about Nov. 1, building foundation for 3 story, 120 x 140 ft., rein.-con. and brick temple, to be known as El Zabira Temple. Total cost, $200,000. Lescher & Kebbey, Bank of Arizona Bldg., archts. Noted Dec. 26 under "Buildings."

Levee—Meridian, Cal.—Recl. Dist. No. 70 soon receives bids raising and building 5-mi. levees, involving 40,000 cu.yd. dry earth excav. About $12,000. F. H. Tibbetts, Alaska Commercial Bldg., San Francisco, engr.

Pier—Pointe aux Trembles, Que.—Until Nov. 5, by Dept. Pub. Wks., Ottawa, Ont., repairing landing pier here, cribwork and stone fill. About $12,000. E. Lafleur, care Dept. Pub. Wks., engr.

Wharf—St. Francois, Sud, Que.—Until Nov. 5, by Dept. Pub. Wks., Ottawa, Ont., repairing wharf, here, 634 ft. long, 30 ft. wide and spur 91 x 81 ft., cribwork and stone fill. E. Lafleur, care Dept. Pub. Wks., engr. Noted July 24.

Bridge Abutments—St. Louis de Gonzague, Que.—Until Oct. 29, by Dept. Pub. Wks., Ottawa, Ont., building 2 concrete bridge abutments on River St. Louis, here. R. C. Desrochers, secy.

Street Flusher — London, Ont.—Until Oct. 27, by Chairman and Members, No. 2 Com. at office of City Clerk, furnishing one 1200 U. S. gal. capacity motor driven street flusher, complete. H. A. Brazier, city engr.

ENGINEERING NEWS-RECORD

New York — Emergency Bulletin — October 30, 1919

STRIKE SITUATION

The printers of New York have not yet been able to adjust their internal difficulties, and so the strike continues. For that reason we must still content ourselves with this emergency bulletin as a means of communicating with our readers.

A week ago there was no hope of early settlement. A break is in sight now, however, and an early resumption of work is not impossible.

EDITORIALS

INDUSTRIAL CONFERENCE PROVES ABORTIVE

Last week the National Industrial Conference, called by the President, was disrupted by the withdrawal of the labor group. The split came over the machinery of collective bargaining. The labor group insisted upon a wording which would have permitted the minority in any industrial establishment to force the acceptance of union-labor officials as their representatives. This the employers' group refused to accept, contending for a method of collective bargaining which would permit the settlement of difficulties by shop committees; that is, by conference of the employers and employees in each individual establishment. The public group voted with the labor group.

It is to be regretted that the conference has been fruitless, but we believe that it is better for the country to have this interruption of the deliberations than to have had the employers' group consent to labor's proposal. That way would lead to the rapid unionization of every industry and the throwing of the industrial relations into the hands of an organization which, of late, has given so repeated evidence of its irresponsibility.

The public has not weakened in its determination to do justice by the workers and to secure for them progressively improving conditions, but it stands with the employers in refusing to place unlimited power in irresponsible hands. In our view the so-called "public group" in the conference was not truly representative of the public.

Indications are that a new conference will be called, made up on a different basis and representing, we presume, the public interest solely. Such a conference, if it has real leadership, should be able to point the way out both to employers and labor. If it has real leadership it will have that which the disrupted conference did not have. There were able men in the conference, but no clear-cut leadership.

We still hope for results from a conference on industrial relations, but it will only come when all groups are dominated with the idea of service to the public. Anything that will tend to encourage profiteering, that will serve class interest against the public interest, will bring about another abortive conference.

RADICALISM VERSUS AMERICANISM

The testimony taken by the Senate Committee in connection with the steel strike and the recent activity of government officers at Gary have made clear to the country the fundamental reason for our present industrial disturbances. The labor unions of the country and the American Federation of Labor are in the hands of anti-Americans—in the hands of foreign radicals whose aim is to bring about the seizure of the government and industry by the workers.

What we are laboring with today is not a matter of adjusting grievances; we are engaged in a fight for the preservation of American ideals. It is a fight between Americans and un-Americanized foreigners.

Is it Bolshevism, is it I. W. W'ism, we are to have in this country, or the continuance of American institutions? The erstwhile conservative Federation of Labor has been captured from within and its great power is now made the tool of Fosters and Fitzpatricks and the other leaders of I. W. W. foreigners.

As long as the American Federation of Labor is in such hands it will deserve and it will receive defeat.

THEN AND NOW

"Another toilsome, troubled week has passed. Difficulty in obtaining good and willing servants is annoying and vexatious. To serve is no part of the intention of a large portion of the hired help or assistants—or only to serve according to their own pleasure and on their own terms. The great object is to render the least possible service and to obtain the highest amount of wages obtainable, with those who perform domestic labor. This, especially the striking part, is particularly the case with the Irish—more so than with American or other nationalities—and the difficulties are on the increase. * * * * There has been a class of demagogue politicians who have contributed largely to this state of things by which our domestic affairs are disturbed without benefit to the employers and the employed. The teachings and influence of the 'New York Tribune' have been pernicious. General Banks and a class of demagogues in Congress have enacted what is called the 'eight-hour law,' that is, workmen shall be paid wages for ten hours, though laboring but eight, when in the employ of the Government."

The above paragraph, which, with minor changes, might have been taken from yesterday's newspaper, was, as a matter of fact written June 6, 1869. It is taken from the diary of Gideon Welles, who was Secretary of the Navy under Lincoln, and was sent to us by Col. Thomas Crimmins.

Evidently the aftermath of the Civil War was not much different from that which has followed the Great War. Yet, we recovered from the disturbance of the Civil War. Who that believes in American institutions does not feel certain, deep down in his heart, that no matter how troubled the waters are at present we shall eventually come into a calm and a safe period? Until then the sane people of the country must stand together that radicalism may be hopelessly defeated.

CONGRATULATIONS

Congratulations are due the Western Society of Engineers for the success of its six-day drive for new members. Two thousand new names were put on the roll. A few years ago Philadelphia successfully put through a drive of this sort that marked the beginning of an enlarged and very successful career of the Philadelphia Engineers' Club. Chicago undoubtedly is now headed for an equally great success.

POSTPONE GOVERNMENT CEMENT FINENESS REQUIREMENT

In order to afford ample opportunity for mill adjustments the departmental cement committee has postponed the proposed increase in the fineness requirements for Portland Cement until Jan. 1, 1921. At that time the government will require a 20 per cent residue on the No. 200 sieve instead of the 22 per cent of the present standard specification.

STATES MAY LOSE ARMY TRUCKS

The Republican leaders in the House of Representatives, according to a bulletin from the Federal Highway Council, have discarded the plan for free distribution of the army's surplus automobiles and trucks among the various state highway departments. Instead, a resolution may be put through ordering the War Department to sell direct to the public all cars not required for military purposes. It is stated that thousands of cars valued at many millions of dollars are rapidly deteriorating while being withheld from the market.

The Federal Highway Council is urging that vigorous action be taken in support of the Kahn bill (H. R. 9412) which would make it obligatory for the Secretary of War to transfer surplus motor-propelled equipment for use on state highway work.

STEPS IN THE RAILROAD CASE

That the Government will return the railroads to their owners on Jan. 1, 1920, is considered almost certain, following a letter from the Director General to Chairman Esch of the Interstate Commerce Committee of the House of Representatives, urging early legislation and stating that it would be impracticable for the Government to return the roads if such a bill is not passed before the end of the year. The Cummins bill providing for the return of the roads under rigid Federal supervision and retaining the dual provisions against strikes, has been reported to the Senate by the Interstate Commerce Committee. The House bill, which does not contain a fixed income clause or specific penalty against strikes although providing for arbitration, is expected to be reported out of committee either this week or next.

The Interstate Commerce Commission has issued an order in its valuation docket "to file briefs upon the question of the final value . . . not later than Dec. 10, 1919." Argument in cases of disagreement between the Commission and the corporations is fixed for Jan. 7, 1920.

Immediately following the break-up of the Industrial Conference at Washington, the railroad brotherhoods have renewed old demands, insisting upon early settlements, with thinly veiled strike threats.

Following the refusal of the Director General to bring about an increase in rates during government control, the Association of Railway Executives has taken steps to make application to the Interstate Commerce Commission and to take advantage of the offer of the Director General to put at the disposal of the Association all information in his possession bearing on the subject.

It is reported from Washington that Congress is favorable to the financing of the National Equipment Corporation for the purchase of $400,000,000 worth of rolling stock.

The Interstate Commerce Commission has issued a docket ordering that the competitive bidding requirements for railroad purchases, provided for by the Clayton anti-trust law, will come into force Jan. 1, 1920. This apparently assumes the return of the roads at that time.

NITRO SOLD FOR $8,551,000.

After the first sets of bids for the powder town of Nitro, W. Va., had been rejected by the War Department as too low, a second call resulted in a bid of $8,551,000 by The Charleston Development Co. of Charleston, W. Va. This bid, which is about $3,000,000 greater than the highest of the previous bids and about one-eighth of the cost of the project, has been accepted by the Government.

ENGINEERING SOCIETY ACTIVITIES

The annual meeting of the American Society of Civil Engineers will be held Jan. 21st, 1920, in the Engineering Societies Building, New York City.

Engineering Council has been elected to membership in the Chamber of Commerce of the United States and will be represented by H. W. Buck, of New York, with Irving E. Moultrop, of Boston, as alternate.

At a recent meeting the Engineering Association of Nashville passed a resolution endorsing the stand taken by Judge Gary in refusing to deal with the representatives of the minority of workers in the steel industry.

The Associated Engineers of Spokane, Oct. 17, passed a resolution stating that the transcontinental airplane race has done more to injure legitimate aviation than perhaps anything so far attempted. It further urges the Government authorities to demonstrate the safety and not the hazard of air travel.

The National Safety Council has approved the organization of an Engineering Section. The purpose of the new section is to bring together into closer contact the civil, mechanical, electrical, mining, and chemical engineers in the Council's membership so that they may contribute more effectively toward the solution of the purely engineering problems frequently encountered in safety work.

As a result of Engineering Council's request to the Director of the Census, the National Service Committee has been successful in effecting the reclassification of engineers, so that all technical engineers will be listed as such, separately and distinctly from the non-technical engineers. The non-technical engineers, such as stationary engineers, locomotive drivers and other engine men, will be grouped under separate headings rather than under one group heading. The next census, therefore, will bring under a single enumeration all technical engineers grouped under the classifications of civil, mechanical, electrical, and mining engineering.

Success crowned the six-day drive for new members by 150 volunteer workers of the Western Society of Engineers. The goal was 2000 members and almost exactly that number of new names have been added to the roll. Loyalty, enthusiasm, good natured rivalry, hard work and a well planned smooth running campaign organization directed by F. C. Barber, a professional organizer, are responsible for the result. Chicago engineers, architects, chemists and contractors and a few business men, manufacturers, bankers and public utility officials are included in the list. A hasty review indicates that the older men came in in larger measure than the younger men.

A two days' meeting of engineers and architects to discuss current movements of special interest to the profession was held at Columbus, Ohio, Oct. 14 and 15, under the auspices of the Association of Ohio Technical Societies. The movement for a National Department of Public Works was presented in an address by Marshall O. Leighton of Washington, D. C., and the convention adopted resolutions pledging support to the movement. Prof. F. H. Newell spoke on cooperation among engineers to effect common ends. The progress of the committee of the Engineering Council which is working on a plan for a standard classification and standard salary schedules for engineers was described by Charles Whiting Baker, consulting editor of **Engineering News-Record.**

Legislation for the registration of engineers and architects was discussed by Gardner S. Williams of Ann Arbor. The sessions were presided over by Prof. Clyde T. Morris of Ohio State University, President of the Association.

To promote the non-technical interests of engineers in public service the board of directors of the American Association of Engineers has authorized the organization of a federal department to be located in Washington. Sections in the different departments and bureaus of the government, similar to those formed on the railroad, will be organized

$2,000,000 PIER APPROVED

At a recent special election the voters of the State of Maine authorized a bond issue of $10,000,000 (as noted in last week's Bulletin) of which $8,000,000 is to be spent for the improvement of highways and $2,000,000 to be used for a state steamship pier at Portland, Maine, and an interstate bridge across the Piscataqua River from Kitterey, Maine, to Portsmouth, N. H. The issue carried by vote of approximately 4 to 1. The state pier at Portland was recommended in a report to the Maine State Harbor Commission by the consulting engineering firm of Fay, Spofford & Thorndike, of Boston, Mass.

Construction News

BIDS DESIRED

WATERWORKS

Tex., Waxahachie—Until Nov. 10, by H. R. F. Hellund, city engr., building 250,000 gal. elevated water tank.

Okla., Shawnee—City Water Com. receiving bids building waterworks system. About $220,000.

SEWERS

Mass., Boston—Until Nov. 8, by T. F. Sullivan, city engr., building Stony Brook conduit and culvert, involving 900 ft. 17 ft rein.-con. pipe, 900 ft. 8 in vitr. pavers for invert pipe 11,700 cu.yd. earth trenching etc. About $140,000.

Va., Front Royal—Until Nov. 6, by Mayor and City Council building sewerage system and sewage disposal plant.

O., Toledo—Until Dec. 9, by D. H. Goodwillie, dir. pub. serv., building Contr. No. 1 of Ten Mile Creek Intercepting Sewer consisting of 17,080 ft. 72 in. and 1400 ft. 66 in. circular sewer along Manhattan Rd. Alternate bids will be received on concrete, segment blocks and brick.

Okla., Ada — City receives bids about Nov. 15, building sewage disposal plant and storm sewers in various streets. Bonds for $75,000 voted for project. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs. Noted Sept. 4, under "Waterworks."

Okla., Okmulgee—City receiving bids building 7491 ft. 8 in. sewers in 5th, 6th and 7th Sts. About $40,000. T. P. Paxton, Okmulgee, engr.

BRIDGES

N. Y., Cuba—Until Nov. 6, by E. S. Walsh, supt. pub. wks., Capitol, Albany, building a through plate girder bridge over Cuba Reservoir Spillway, on Cuba-Olean Highway, here, involving 1850 cu. yd. excav., 300 cu.yd. 2nd class concrete, 75 cu.yd. rein.-con., 120 cu.yd. cement concrete pavement, 110,000 lb. structural steel, 6500 lb. metal reinforcement, 13,000 ft. B.M. wooden sheet piling, 1500 lin.ft. foundation piles, 600 lin.ft. wooden fence, etc.

Pa., Johnstown—Until Nov. 7, by H. T. Jones, controller Cambria Co., (Ebensburg), building 30 ft. rein.-con. girder bridge, 25 ft. wide, over Slate Run, in Clearfield Twp., involving 1500 sq.yd. rein.-con. and 240 sq.yd. paving. About $10,000. Owen & Plummer, Otto Bldg., Johnstown, engrs.

Md., Pocomoke City Until Nov. 5, by State Rds. Comn., 601 Garrett Bldg., Baltimore, building 275 ft., rein.-con. bridge over Pocomoke River, 24 ft. wide, Somerset and Worcester Counties. Contr. No. S-11; superstructure of lift bascule span, double leaf over Pocomoke River, clear span between fenders 65 ft., clear roadway between curbs 24 ft., Contr. S-11A. F. H. Zouck, chn. Noted July 17.

W. Va., Wayne—Until Nov. 3, by Wayne Co., building 3 sets stone bridge abutments on Project G-1 known as Upper Workmen, Lower Workmen and Sidney Booth bridge sites. About $11,000. H. A. Levering, Ceredo, engr.

Ga., Americus—Until Nov. 7, by Comrs. Sumpter Co., building 3 concrete bridges on Dixie Highway, to be 24 ft., 60 ft. and 120 ft. long. About $50,000. Thomas & Hawkins, Atlanta, engrs.

Okla., Arnett—Until Nov. 3, by Comrs. Ellis Co., building 100 ft. concrete bridge, 20 ft. wide, across Boggy Creek. About $90,000. H. S. Thomas, Arnett, engr.

STREETS AND ROADS

Massachusetts—Until Nov. 5, by State Highway Comn., Boston, building 23,000 ft. road between Hingham and Norwell, 18 ft. wide, involving 46,000 sq.yd. concrete, cost $110,000; also 10,600 ft. River St., 18 ft. wide, Norwell Twp., involving 36,000 sq.ft. bituminous macadam, $19,000. A. W. Dean, state highway engr.

R. I., Cranston—Until Nov. 6, by city, resurfacing 1-2 mi. Broad St., sheet asphalt on 5 in. concrete base. About $20,000.

Maryland—Until Nov. 5, by State Rds. Comn., 601 Garrett Bldg., Baltimore, building 0.79 mi. Central Ave. from Western Branch toward Hall Station, 15 ft. wide, concrete, 8 in. thick in center, 6 in. sides, Federal Aid Project No. 13, Contr. P-17-A, Prince George's Co. J. N. Mackall, care State Highway Dept., engr.

W. Va., Wayne—Until Nov. 13, by Comrs. Wayne Co., building 7 mi. Wayne-Ft. Gay Rd., 26 ft. wide, from Project No. 51 to Trace Fork. H. A. Levering, Ceredo, engr.

Ga., La Grange — Until Nov. 18, by Comrs. Troup Co., building 13 mi. road between here and Coweta Co. line. Contr. No. 1 includes construction of 16 concrete culverts and 2 concrete bridges, and involves 11,700 lb. steel reinforcing, 957.4 cu. yd. class A concrete, 154.8 cu.yd. class B concrete, 105 cu.yd. stone rip rap, 248 cu.yd. excav., 11,220 ft. B.M. wood sheet piling; Contr. No. 2, 19 acres clearing and grubbing, 1650 lin.ft. vitr. clay pipe, 127 cu.yd. headwalls, 111,668 cu.yd. earth excav. and borrow, 1200 cu.yd. rock excav., 45,000 cu.yd. top soil surfacing, 10 mi. grassing slopes. W. T. Tuggle, clk. Garrett & Slack, Bell Bldg., Montgomery, Ala., engrs.

Fla., Jacksonville—Until Nov. 8, by City Comn., furnishing material and laying 3050 sq.yd. vitr. brick pavement on sand base with pitch filler, and 4 x 10 in. cement curb, on Davis St. from 8th St. to city limits. J. S. Bond, chn. About $10,-451.

Tennessee—Until Nov. 7, by Dept. of Highways, Nashville, building 50 mi. State Highway No. 1 in Grainger, Hawkins and Sullivan Counties, involving 178,698 cu.yd. common, 33,427 cu.yd. solid rock and 71,-635 cu.yd. borrow excav., 153,888 cu.yd. overhaul, 458,245 sq.yd. waterbound or penetration macadam surfacing, 3609 cu. yd. concrete, 244,609 lb. deformed steel bars, 3762 lin.ft. pipe culvert, 948 lin.ft. culvert pipe (cleaning and relaying), 2342 lin.ft. concrete curb, 32,674 sq.yd. scarifying reshaping macadam and 15,653 sq.yd. bituminous macadam. Plans also include bridge work involving 1168 cu.yd. dry and 76 cu.yd. wet excav., 663 cu.yd. class "A" and 43 cu.yd. class "B" concrete, 94,729 lb. deformed steel bars, 826 lb. structural steel, 3560 ft. B.M. bridge timber (treated) and 816 lb. cast iron. W. P. Moore, ch. engr.

Tennessee—Until Nov. 10, by Dept. Highways, Nashville, building 16.35 mi. State Highway No. 12, between Memphis and Millington, Shelby Co., involving 15,-840 cu.yd. common, and 95,000 cu.yd. borrow excav., 138,000 sq.yd. reconstructed base course, 9600 cu.yd. reconstructed base course, stone or gravel, 170,000 sq.yd. bituminous macadam surface, 374 lin.ft. culvert pipe, 30,400 lin.ft. wooden railing, 2000 sq.yd. woven wire mattress, 658 cu.yd. concrete in culverts and bridges, 45,640 lb. deformed steel bars and 1 330 lb. structural steel. Bids will also be received on cement concrete pavement, rock asphalt or bituminous macadam with seal coat of rock asphalt. W. P. Moore, ch. engr.

Ohio—Until Nov. 14, by State Highway Comn., Columbus, building roads in following counties:

Adams Co., Sect. "R" Cincinnati-West Union Rd., 6.2551 mi. grading, constructing bridges and culverts and paving with waterbound macadam. Cost $113,400.

Auglaize Co., Sect. "B" Bellefontaine-Wapakoneta Rd., 3.68 mi. grading, constructing bridges and culverts and paving with plain concrete, $127,132.

Sect. "C" Bellefontaine-Wapakoneta Rd., 4.13 mi. grading, constructing bridges and culverts and paving with plain concrete, $14,051.

Fayette Co., Sect. "P" Hillsboro-Washington C.H. Rd., 4.04 mi. grading, constructing bridges and culverts and paving with waterbound macadam, $48,103.

Jefferson Co., Sect. "F" Ohio River Rd., 2.327 mi. grading, constructing bridges and culverts and paving with brick, $111,-640.

Lucas Co., Sect. "A-1" Perrysburg-Holland Rd., 1.457 mi. grading, constructing bridges and culverts and paving with concrete, $40,000.

Sect. "A" Waterville-Swanton Rd., 2.385 mi. grading, constructing bridges and culverts and paving with plain concrete, $59,-858.

Sect. "Waterville," Waterville-Swanton Rd., 1.129 mi. grading and paving with concrete, $33,657.

Marion Co., Sect. "I-1" Marion-Marysville Rd., 1.49 mi. grading, constructing bridges and culverts and paving with concrete or bituminous macadam, $48,343.

Medina Co., Sect. "H-1" Cleveland-Hanckley-Medina Rd., 1.49 mi. grading, constructing bridges and culverts and paving with rein.-con., $63,989.

Mercer Co., Sect. "A" Van Wert-Rockford Rd., 2.44 mi. grading, constructing bridges and culverts and paving with plain concrete, $70,561.

Morgan Co. Sect. "H-1" McConnelsville-New Lexington Rd., 3.26 mi. grading, constructing bridges and culverts and paving with waterbound macadam on rolled base, $88,333.

Morrow Co., Sect. "I" Mt. Gilead-Galion Rd., 2.555 mi. grading, constructing bridges and culverts and paving with bituminous macadam, $86,072.

Pickaway Co., Sect. "F-1" Columbus-Washington C H Rd., 4.055 mi. grading, constructing bridges and culverts and paving with waterbound macadam, $96,-131.

Tuscarawas Co., Sect. "B" Canton-Canal Dover Rd., 2.69 mi. grading, constructing bridges and culverts and paving with bituminous macadam, $62,721.

O., Cleveland—Until Nov. 5, by Comrs. Cuyahoga Co., buuding Cedar Rd. between Green and Chagrin River Rds., involving 6750 cu.yd. waterbound macadam, 5300 cu.yd. excav., 4210 lb. 12 in. c.i. pipe, 500 lin.ft. 10 in. corrugated pipe and 37,145 lb. reinforcing steel. About $110,000. W. A. Stinchcomb, co. engr.

Minn., Mortevideo — Comrs. Chippewa Co. rejected bids received Oct. 7, grading and graveling 5 mi. Federal Aid Project No. 88, State Rd. No. 1, 24 ft. wide. About $30,000. Work will be readvertised. F. P. Nelson, Montevideo, engr. Noted Sept. 18.

Kan., Independence—Montgomery Co., receiving bids gravel surfacing, 1.1. mi. Sect. A., Project No. 37, and 9 mi. Sect. A. Project No. 23, 18 ft. wide, macadam base. H. K. Hibbard, Cherryvale, engr.

Mo., New Madrid—Until Nov. 12, by New Madrid Co., building 19 1-2 mi. Kings Highway from Sikeston to New Madrid. C. V. Hansen, co. engr.

Mo., Ridgeway—Until Nov. 3, by city, for 24,700 sq.yd. concrete paving and 1800 lin.ft. concrete curbing. About $40,000. C. A. Stone, Ridgeway, engr.

Tex., Boerne—Until Nov. 10, by J. A. Phillip, judge, Kendall Co., gravel surfacing, paving and draining 5.788 mi. Highway No. 9 from here to Bexar Co. line, 16 ft. wide, involving 2 acres clearing and grubbing, 1801 cu.yd. earth excav., 53,333 sq.yd. bituminous macadam and 4.86 mi. grader work. About $42,635. A. C. Pancoast, 102 Turner St., San Antonio, engr. Noted Sept. 11.

Idaho, Twin Falls—Until Nov. 3, by W. A. Minnick, city clk., for 270,000 sq.yd. hard surfaced pavement, 77,000 sq.yd. concrete curbing and 8000 cu.yd. earth excav.

Ont., Ancaster—Until Nov. 5, by W. A. McLean, deputy minister highways, Toronto, clearing, grubbing, building concrete structures and delivering crushed stone on Provincial Highway, near here. About $30,000. G. Hogarth, Parliament Bldgs., Toronto, engr.

Ont., Ottawa—Bd. Control soon receives bids building tarvia macadam pavements on Stewart St. from Waller to Chapel Sts., cost, $26,200, Hasley Ave. from Laurier Ave. W. to Osgoode St., $7330; asphalt pavement on Bessemer St. from Charlotte to Wurtemburg Sts., $5050. A. F. Macallum, city engr.

Ont., Ottawa—City Council soon receives bids paving Stewart St. from Walter to Chapel Sts., $26,191, Hasley Ave. from Laurier Ave. to Osgoode St., $7320, tarvia macadam; Bessemer St. from Charlotte to Wurtemberg Sts., $5040, asphalt; laying 9 in. tile pipe sewers in Warren Ave. from Wellington to Byron Sts., $2098, Granville Ave. from Wellington St. to Ottawa Electric Ry. tracks, $2320, Hampton Ave. from Wellington St. to Ottawa Electric Ry. tracks, $2170, Harmer Ave. from Wellington to Byron Sts., $2330, Cooper St. from lot 54 to 80 ft. west of Elgin St., $980, Grove St. from Leonard Ave. to Seneca St. $1680 and section of Beechwood Ave., $305. Total cost, $51,434. N. H. H. Lett city clk.

Ont., Toronto—City Council soon receives bids building concrete roads and sidewalks on portion of Adams St., $1680; asphalt pavements on Carlton, Dufferin, Maria Sts., Avoca, Gilmour, Logan, Morley, Rhodes and Clemens Aves., Normandy Blvd. and Park Rd., $172,914; wood block pavements on Rhodes, Humberside and Morley Aves. and Normandy Rd., $54,394; brick pavements on Park Rd., $17,439; concrete walks on Durie St. and Pine Ave., $6885; concrete curbs on Maria St. and Glendonwynne Rd., $587, extension of Stacy St., $5550; widening Day Ave., $2600. R. C. Harris, city engr.

EXCAVATION AND DREDGING

Utah, Richfield—Drainage—Bd. Supervs. D. D. No. 6, Sevier Co., soon receives bids furnishing and laying 78,000 lin.ft. 5-12 in. drain tile and digging and backfilling 80,000 ft. trench. H. S. Kleinschmidt, Walker Bank Bldg., Salt Lake City, engr.

INDUSTRIAL WORKS

Mass., Fitchburg—F. P. Sheldon & Son, engrs., Rhode Island Hospital Trust Bldg., Providence, R. I., soon receives bids building 3 story, 60 x 145 ft., brick and mill construction, addition to mill, concrete foundation, for Fitchburg Yarn Co. About $100,000.

R. I., Centreville F. Sheldon & Son, engrs., Rhode Island Hospital Trust Bldg., Providence, soon receives bids building 4 story, 100 x 125 ft., and 60 x 65 ft., brick and mill construction addition to mill, concrete foundation, for Warwick Mills. About $200,000.

R. I., Pawtucket—Perry & Whipple, engrs., 17 Exchange St., Providence, soon receive bids building 2 story, 53 x 183 ft., brick and mill construction factory, also shipping and compounding room, concrete foundation, for Tubular Woven Fabrics Co., Main and Carver Sts. About $45,000.

R. I., Providence—Lockwood-Greene & Co., archts. and engrs., 60 Federal St., Boston, Mass., soon receive bids building 3 story, 100 x 150 ft., rein.-con. addition to factory, rein.-con. flooring, concrete foundation, on Eagle St., for Revere Rubber Co., Valley St. About $200,000.

Conn., Centerville (New Haven P. O.)—L. W. Robinson, archt., 42 Church St., New Haven, soon receives bids building 1 story, 38 x 137 ft., brick and concrete addition to factory, concrete flooring and foundation, for Amer. Mills Co. About $25,000.

Conn., New Britain—M. J. Unkelbach, archt., 162 Main St., soon receives bids building 6 story, 80 x 160 ft. brick and mill construction and 1 story, 50 x 160 ft., brick factories, concrete foundation, for Landers, Frary & Clark, Commercial and Center Sts. About $150,000.

Conn., Rockville—J. Zaugg, 73 Talcott Ave., soon receives bids building 1 story, 60 x 140 ft., brick and steel garage and showroom, rein.-con. flooring, concrete foundation, on Windsor Ave. About $25,-000. Private plans. Noted July 24.

N. Y., Brooklyn—S. Millman, archt., 26 Court St., receives bids about Nov. 10, building 1 and 2 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Bedford and Park Aves., for H. Goldberg, care architect. About $42,000.

N. Y., Brooklyn—C. P. Cannella, archt. and engr., 1163 Herkimer St., receives bids about Nov. 6, building 1 story, 160 x 200 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on McKibbon and White Sts., for H. Hessner & Son, 33 Bartlett St. About $65,000.

N. Y., New York—Until Nov. 1, by Zipkes, Wolff & Kindroff, archts. and engrs., 25 West 42nd St., entering 6 story brick and steel factory, rein.-con. flooring, at 204-206 East 107th St., for B. Winer, care architects.

N. J., Jersey City—Colgate Co., York St. receives bids in November building 4 story, rein-con. plant. About $414,000.

Va., Richmond—Forbes Motor Co. receiving bids building 2 story, 100 x 120 ft., rein.-con. garage on Schafer and Broad Sts. About $85,000. Hallett & Pratt, Mutual Bldg., archts.

O., Cleveland—Osborn Eng. Co. engrs. and archts., 2818 Prospect Ave., receive bids about Dec. 15, building 3 story, 100 x 150 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Euclid Ave. and London Rd., for Cleveland Fruit Juice Co., 1382 West 90th St. About $150,000. H. A. Van Gorder, pres.

O., Cleveland—J. Kaleb, archt. and engr., 4500 Euclid Ave., receiving bids building 2 story, 69 x 83 ft., concrete steel and brick warehouse at 1680 Columbus Ave., for Para Lite Co., Swetland Bldg. About $50,000.

O., Cleveland—Christian, Schwartzenberg & Gaede, engrs., 1900 Euclid Ave., receiving bids building 3 story, 72 x 100 ft., rein.-con., steel and brick warehouse, at 2032 West 65th St., for H. S. Rivitz Co., 1112 Ontario Ave. About $50,000.

Mich, Detriot—Gray Estate, 914 Hammond Bldg., receiving bids building 6 story, 90 x 160 ft., and 3 story, 100 x 118 ft. addition to garage, rein.-con. and brick rein.-con. flooring, concrete foundation on Randolph St. A. Kahn, Marquette Bldg., archt. and engr.

Mich. Detroit—Gray Estate, Hammond Bldg., receiving bids building 2 story, 140 x 189 ft., rein.-con. and brick garage and service station, rein.-con. flooring, concrete foundation on Antoinette and Cass Aves. M. R. Barrows, 534 Woodward Ave., archt.

Wis., Racine—Ajax Auto Part Co., 15th and Clark Sts., receives bids about Nov. 1, building 3 story, 55 x 100 ft. brick and mill construction factory, concrete foundation, on 15th St. About $75,000. E. B. Funston Co., Robinson Blk., archts. and engrs.

Wis., Racine—Hamilton-Beach Mfg. Co., Rapids Ir., receives bids in February, building 3 story, 55 x 100 ft. brick and mill construction factory, concrete foundation. About $125,000. A. L. Flegel, Baker Blk., archt. and engr.

Wis., Racine—Journal Printing Co., 328 Main St., receives bids in January, building 2 story, 60 x 110 ft. brick and tile plant, rein.-con. flooring, concrete foundation, on Main St. About $75,000. L. Bassindale, Capitol Bank Bldg., St. Paul, Minn., archt.

Wis., Racine—Western Printing & Lithograph Co., 213 State St., receives bids about Nov. 1, building 2 story, 60 x 100 ft. brick and mill construction addition to warehouse, concrete foundation. About $40,000. A. L. Flegel, Baker Blk., archt. and engr.

Minn., Duluth—G. Phillips, city comr., Water and Light Dept., receives bids about Jan. 15, building 3 story, 50 x 140 ft., rein.-con. brick and steel warehouse and office, rein.-con. flooring, concrete foundation, on West 1st St. About $150,000. Engineer not selected.

Minn., Minneapolis—Wallace Coach & Carriage Co., 12 East Grant St., receiving bids for 1 story 84 x 155 ft., rein.-con. and brick factory on University and Bedford Aves. About $100,000. Foley Bros., Gilfillan Bldg., St. Paul, archts. Noted Apr. 3.

Ore., Portland—Pettit Feather & Bed Co., York and Guild Sts., receiving bids building 2 story, 100 x 150 ft., brick and concrete factory, concrete foundation. About $40,000. F. M. White, Chamber of Commerce Bldg., archt.

BUILDINGS

Mass., Holyoke—Theatre and Business—Mowell & Rand, archts., 185 Devonshire St., Boston, soon receive bids building 3 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Suffolk and Chestnut Sts., for Victory Theatre Co., Bridge St., Springfield. About $350,-000. Noted Aug. 28.

Mass., Milton (Boston P. O.)—Chapel—Coolidge & Shattuck, archts., 122 Ames Bldg., Boston, soon receives bids building 1 1-2 story, 30 x 100 ft., brick and stone, rein.-con. flooring, brick and concrete foundation, for Milton Academy. About $100,000.

Mass., West Springfield—School—McClintock & Craig, archts., 33 Lyman St., Springfield, receiving bids building 1 story, brick, steel and concrete, concrete foundation, on Westfield St., Tatham School Dist. for Bd. Educ. About $50,000. E. O. Stoddard, chn. Noted Aug. 21.

Mass., Worcester—Bank—T. M. James, archt., 5 Park St., Boston, soon receives bids remodeling present building, concrete and steel, concrete foundation, for Park Trust Co., 511 Main St. About $50,000.

R. I. Pawtucket—Theatre—W. R. Walker & Son, archts., 17 Custom House St., Providence, soon receives bids altering interior of 1 story, 100 x 100 ft. building, brick and rein.-con., rein.-con. flooring, concrete foundation, on East Ave., here, and constructing lobby and entrance through another building, for A. A. Spitz, C. Misch, Bldg., Providence. About $150,-000.

Conn., Ansonia—Armory—Until Nov. 1, by State Armory Bd., Hartford, building 3 story, 75 x 90 ft., armory and 75 x 130 ft. drill shed, brick and stone, rein.-con. flooring, rock and concrete foundation, on State and North Cliff Sts., here. About $150,000. Payne & Griswold, Manwaring

Bldg., New London, archts. Noted Sept. 11.

Conn., Bridgeport—Home, etc.—Salvation Army, 82 Elm St., receives bids about Nov. 4, building 2 story, 50 x 100 ft., brick and concrete, rein.-con. flooring, concrete foundation. About $50,000. H. V. Chase, 122 West 14th St., New York City, archt.

Conn., Milford—Hotel—J. Weinstein, archt., 6 Church St., New Haven, soon receives bids building 3 story, 52 x 200 ft., timber, concrete foundation, on Merwin St., Woodmont, to include restaurant, showers, bathhouses and dining hall, for P. M. Rosengarten, 335 Willow St., Waterbury. About $50,000. Noted July 31.

Conn., Norwalk—Bank—J. M. Vance, archt., 24 North St., Pittsfield, Mass., soon receives bids building 1 story, brick and stone, concrete flooring and foundation, for Fairfield Co. Savings Bank, 51 Wall St. About $50,000. Noted Aug. 14.

Conn., South Manchester—Store and Office—A. E. Fiske, archt., Johnson Bldg., soon receives bids building 3 story, 40 x 106 ft., brick and steel, concrete foundation, for J. Mamacos, 785 Main St. About $50,000. Noted Sept. 18.

Conn., Torrington—Club—Until Nov. 1, by St. Francis T. A. B. Society, Spear St., building 3 story, 31 x 54 ft., clubhouse, and 2 story, 58 x 190 ft., auditorium, brick and steel, rein.-con. flooring, concrete foundation. About $75,000. W. E. Hunt, 197 Water St., archt. Noted June 12.

Conn., West Haven (New Haven P. O.)—Church—R. Williams, archt., 185 Church St., New Haven, soon receives bids building 1 story, brick, limestone and steel, concrete foundation, on Elm St., for 1st Baptist Church. About $50,000. C. J. Marchant, rector.

N. Y., Brooklyn—Hospital—Until Nov. 1, by Parfitt Bros., archts. and engrs., 26 Court St., building 3 story, 38 x 65 ft., brick, steel and stone, brick foundation, for New York Congregation Home for Aged, 123 Linden Ave. About $65,000. Noted July 31.

N. Y., New York—Sales and Office—Until Nov. 1, by Renwick, Aspinwall & Tucker, archts. and engrs., 8 West 40th St., altering 5 story, brick and steel building on Park Ave. and 57th St., for H. Collins, 9 East 57th St. About $50,000. Noted Sept. 11.

N. Y., New York—Stores and Offices—Until Nov. 1, by M. J. Harrison, archt. and engr., 63 Park Row, building 3 story, brick and steel, brick foundation, at 128 West 30th St., for S. J. Manning, c-o architect. About $50,000.

S. C., Edgefield—Hotel and Store—Until Nov. 10, by Dixie Highway Hotel Co., constructing 3 story hotel and store building.

O., Cleveland—Commercial—W. Hirsh, archt., 1900 Euclid Ave., receiving bids building 2 story, 60 x 70 ft., concrete, steel and brick addition, for H. S. French, East 103rd St. and St. Clair Ave. About $50,000.

O., Cleveland—Office—Walker & Weeks, archts., 1900 Euclid Ave., receiving bids altering 4 story, 90 x 189 ft., rein.-con., steel and brick, at 2163 East 9th St., for Erie-Huron Realty Co., 522 Erie Bldg. About $50,000.

O., Cleveland—Sales—A. C. Wolf, archt., Swetland Bldg., receiving bids building 2 story, 90 x 150 ft., concrete, steel and brick, at 6101 Carnegie Ave., for Smith & Obey, 2035 East 18th St. About $50,000.

O., Steubenville—Bank and Office—Steubenville Bank & Trust Co. receiving bids building 12 story, 53 x 195 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on Main St. About $750,000. Peterson & Clark, Natl. Bldg., archts.

Mich., Detroit—Office—G. L. Rinand, Fine Arts Bldg., receiving bids building 5 story, 36 x 83 ft., rein.-con. and brick, rein.-con. flooring, on Park Blvd. About $125,000. Rogers, Bonnah & Chaffee, 528 Farwell Bldg., archts.

Ill., Chicago—Sales, etc.—W. F. Gubbins, archt., 155 North Clark St., receiving bids constructing 2 story, 50 x 125 ft., concrete and steel, sales building and garage, rein.-con. flooring, concrete foundation, on Michigan Ave. and 36th St., for Eisemann Magneto Co., 910 South Michigan Ave. About $50,000..

Wis., Halden—School—St. Patrick's Church receives bids in winter for labor for building 2 story, 50 x 75 ft. brick and concrete, rock and concrete foundation. About $50,000. Owner will purchase materials. A. Roth, Batavia Bank Bldg., La Crosse, archt.

Wis., Kenosha—Store and Office—T. J. Dale, 167 Main St., had plans prepared and receives bids about Nov. 1, building 3 story, 53 x 100 ft. brick and steel, concrete foundation, on Market Sq. About $50,000. F. E. De Money, Tacoma Bldg., Chicago, archt. and engr.

Wis., Madison—Vocational School—Until Nov. 10, by F. L. Kronenberg, archt., 18 North Carroll St., building brick addition on Johnson and Carroll Sts., for Bd. Educ. About $300,000. Noted Apr. 17.

Wis., Racine—School—School Dist., 212-5th St., soon receives bids, building 1 story, 159 x 159 ft. brick, concrete foundation, on Lakeside Ave., H. C. Case, clk. About $75,000. J. G. Chandler, 400 Main St., archt.

Wis., West Allis—Grade Schools—Bd. Educ. will receive bids in winter, building two 2 story, 78 x 185 ft. rein.-con. and brick, concrete foundations, in 1st and 4th wards. About $50,000 each. Lesser & Schutte, Majestic Bldg., Milwaukee, archts. and engrs.

Wis., Whitehall—High School—Until Nov. 10, by Bd. Educ., building 2 story, 50 x 73 ft. and 73 x 124 ft. brick and rein.-con., concrete foundation. About $80,000. A. V. Peterson, clk. Oppenhamer, Speer & Obel, Wausau, archts.

Ia., Elkart—School—Until Nov. 7, by Bd. Educ., building 2 story, 60 x 90 ft., rein.-con., brick and steel, concrete foundation. About $50,000. Proudfoot, Bird & Rawson, Hubbell Bldg., Des Moines, archts.

Minn., Blooming Prairie—High School—Bd. Educ. receives bids in November building 2 story, 80 x 120 ft. with 50 x 64 ft. wing, rein.-con., brick and terra cotta. About $150,000. Jacobson & Jacobson, Owatonna, archts. F. Tustison, 355 Auditorium Bldg., Minneapolis, archt. Noted June 19.

Minn., Buhl—High School—Until Nov. 6, by Comrs. St. Louis Co. Dist. No. 35, building 3 story, 65 x 195 ft. rein.-con. and brick, rein.-con. flooring, concrete and rock foundation, on Chestnut St. About $250,000. A. W. Kerr, 5 Amer. Exch. Bldg., Virginia, archt. and engr. Noted July 24.

Kan., Girard—Court House and Jail—Until Nov. 24, by Coms. Crawford Co., building 3 story, 97 x 123 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $300,000. Tonini & Bramblett, 417 Terminal Bldg., Oklahoma, Okla., archts.

Kan., Stockton—Court House—Until Nov. 4, by Comrs. Rooks Co., building 3 story, 80 x 100 ft. brick, rein.-con. flooring, rock foundation. About $130,000. F. C. Squires, 628 Kansas Ave., Topeka, archt. Noted July 10.

Kan., Topeka—Dormitory—Until Nov. 15, by Washburn College, 17th and College Sts., building 3 story, 65 x 150 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $125,000. R. E. Scamell, Topeka, archt. Noted Aug. 14.

Mont., Bozeman—Engineering Hall—Until Nov. 4, by State Bd. Examiners, Helena, building 2 story, 60 x 140 ft., for Montana State College, 9th Ave. About $125,000. F. F. Willson, Owenhouse Bldg. archt. Noted May 15.

Tex., Port Arthur—School—Until Nov. 3, by Bd. Educ., constructing 6 room and 16 room grade school buildings. W. B. Ittner, Bd. Educ. Bldg., St. Louis, Mo., archt.

Okla., Muskogee—Schools—Until Nov. 10, by Bd. Educ., building two ward schools, 1 story, brick, rein.-con. flooring, concrete foundation. About $100,000 each. C. W. Dawson, 207 Barnes Bldg., archt.

Colo., Boulder—Dormitories and Gymnasium—University of Colorado, receiving bids building 32 x 200 ft. and 140 x 175 ft., stone. Cost to exceed, $50,000. Day & Klauder, 9 5 Chestnut St., Phila., archt.

Ore., Salem—Dormitory—Willamette University receiving bids building 3 story, 60 x 154 ft., brick, on campus here, to include gymnasium, parlors, shower baths, etc., for girls. About $50,000. F. A. Legg, 263 South High St., archt. Noted Aug. 7.

Ont., Port Arthur—Courthouse—Dominion Government, Ottawa, soon receives bids building 3 story, steel, stone and marble, rein.-con. flooring, concrete foundation, here. About $350,000. R. B. De Corrivean, Parliament Bldgs., Ottawa, engr. Noted Jan. 9.

FEDERAL GOVERNMENT WORK

Mass., Quincy—Removal of Buildings—Until Nov. 12, by Bureau Yards & Docks, Navy Dept., Wash., D. C., dismantling machine shop and boiler shop annex at Fore River Plant, Bethlehem Shipbuilding Corp. and moving and storing dismantled material at U. S. Destroyer Yard, Squantum Plant, Atlantic. Also building end wall in boiler shop at Quincy. About $40,000; $10 deposit required for plans and spec.

R. I., Newport—Elevator—Spec. 4057—Until Nov. 12, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing electric freight elevator in Emergency Torpedo Repair Shop, Goat Island. About $6,000; $10 deposit required for plans and spec.

N. Y., Brooklyn—Elevator—Spec. 4046—Until Nov. 12 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing electric freight elevator in Building "F", at Hospital, here. About $5,000; $10 deposit required for plans and spec. Noted Oct. 16.

Pa., Lewiston—Post Office—Until Nov. 20, by Treas. Dept., Wash., D. C., furnishing material and labor building post office, here. J. A. Wetmore, superv. archt.

Va., Cape Henry—Buildings—Until Nov. 1, by Constr. Quartermaster, Fortress Monroe, for additional buildings, at Ft. Story, here.

Mich., Detroit—Dike Reconstruction—Until Nov. 12, by U. S. Engr., Office, Detroit, reconstructing East Dike, St. Clair Flats Canal, involving removal of revetment and old cribs, dredging to stable slope, casting over material to form new embankment and rip-rapping dredged slope.

Mo., St. Louis—Earthwork—Until Nov. 17, by Mississippi River Comn., 1311 International Life Bldg., building 120,000 cu.yd. earthwork in East Cape Girardeau and Clear Creek, D. D., Ill. Noted Aug. 21.

Cal., San Diego—Scraping, Cleaning and Painting Radio Towers—Until Nov. 12, by Bureau Yards & Docks, Navy Dept., Wash., D. C., scraping, cleaning and painting three 600 ft. steel towers at Naval Radio Sta. About $9400; $10 deposit required for plans and spec.

Cal., San Diego—Water Supply and Sewer System and Fuel Oil Storage Reservoirs—Spec. 4007—Until Nov. 19, (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Marine Corps Barracks, here. Noted Oct. 23.

MISCELLANEOUS

Station—New York, N. Y.—Until Nov. 5, by Interborough Rapid Transit R.R., at office of J. H. Pegram, ch. engr., 165 Bway., completing passenger station, electric lighting and heating systems for portion of rapid transit railroad. Routes 19 and 22, Sect. 2, Pelham Bay Park branch of Lexington Ave. line, Bronx Boro.

Boardwalk—Seaside Park, N. J.—Until Nov. 1, by A. Wilbur, boro clk., building 5400 ft. boardwalk and furnishing 380,000 ft. B.M. lumber, 2 x 6, 2 x 8 and 3 x 12 in.

Grandstand—West Allis, Wis.—State Dept. Agriculture, Madison, soon receives bids building 456 ft. rein.-con. and hollow tile addition to grandstand, concrete foundation, at State Fair Park. About $100,000. A. C. Clas, Colby-Abbot Bldg., Milwaukee, archt. and engr.

Incinerator — Outremont, Que. — City soon receives bids building garbage incinerator, with smoke stack 110 ft. high, 10 ft. wide. About $25,000.

Wharf—Sorel, Que.—Until Nov. 7, by Dept. Pub. Wks., Ottawa, Ont., repairing and rebuilding portion of wharf here, concrete. About $11,000. E. Lafleur, c-o Dept. Pub. Wks., engr.

Roofing—Toronto, Ont.—T. L. Church, City Hall, soon receives bids building new tile roof for city hall. About $15,000. W. B. Pearce, City Hall, archt.

NOV 13 1919

ENGINEERING NEWS-RECORD

New York | Emergency Bulletin | November 6, 1919

THE STRIKE SITUATION

The New York printers' strike seems to have become a habit. It is true that there are some breaks in the ranks, but on the whole there is little change. We hope within a week, however, to find means of again printing the Engineering News-Record. We may be able to make definite announcement in the next issue.

EDITORIALS

LETTING ROAD CONTRACTS THIS YEAR

In our Emergency Bulletin of Oct. 16 we urged that contracts for highway work to be done next year should be let during the remaining months of 1919.

Now the same thought is brought out emphatically in a communication from Thomas H. MacDonald, chief of the Bureau of Public Roads, to the state highway departments. He points out that the moneys available next year will aggregate the enormous sum of $633,000,000 —four times the amount that has ever been expended for a like purpose in a given year.

Mr. MacDonald is right, next year's highway program will be determined by materials shipments this winter. The moral is, Let your contracts as soon as possible.

THE NEXT CHIEF OF ENGINEERS

A vacancy exists in the office of Chief of Engineers, U. S. Army. Maj. Gen. Wm. M. Black was retired on his own application Nov. 1, after more than 46 years' service.

So much depends upon the next Chief of Engineers that the best qualified officer should be chosen, irrespective of a precedent which has insisted upon succession by seniority. Due to various factors the ending of the war, reductions in rank and inadequate pay—the morale in the Corps is at a low ebb. It will require a strong man combining technical ability, broad vision, an understanding of his fellow men, whether they be in the Corps of Engineers or civilians, and a certain amount of optimism in his makeup to put the Corps where it rightfully belongs.

The war has furnished us first-hand information as to how and how not to use engineer troops and to organize engineer work, both in the combat areas and in the zone of supply. It is a fair assumption that the officer who served with distinction as Chief Engineer of the American Expeditionary Forces, with 176,000 men under his direct command or technical supervision, is now best equipped to direct the future engineer work of the army. If the affairs of the Corps are to be conducted on a basis which will prepare it for actual warfare—and not peace time red-tape and office routine—Colonel (until recently Major-General) Wm. C. Langfitt, formerly Chief Engineer, A. E. F., should be named as Chief of Engineers.

Of great importance, also, is the selection of a man in thorough sympathy with the viewpoint of civilian engineers, for in the next emergency, as in the one just past, the big bulk of engineer officers will come from civilian ranks. On this score General Langfitt, himself a regular, qualifies admirably.

It is true that there are some half dozen officers between General Langfitt and the top of the ladder, but this is not the time for slavish adherence to precedent. In advocating General Langfitt's candidacy, no reflection is cast upon other officers in the list. They simply did not have his opportunity. General Langfitt's experience of more than two years in France, ranging through such posts as Manager of Light Railways, Chief of Utilities and, finally, Chief Engineer, A. E. F., should be capitalized to the fullest in the present administration and future plans of the Corps of Engineers. No efficient business organization would lose the opportunity of utilizing to the fullest the qualifications of a man of his broad experience.

This appointment should be made, not only because it will place at the head of the Engineer Corps the officer best qualified by temperament and experience to conduct the Corps' work, but because the non-appointment of General Langfitt will be a serious blow to the morale of the organization, especially among the younger men and those who saw foreign service. They saw him "make good" under the great stress in France, and will have little hope for the future if the practical experience and the great administrative ability there demonstrated are swept aside in selecting the new leader of the organization. There is no surer way of breaking the spirit of an organization than to allow exceptionally meritorious services to go unrewarded and fall back on seniority.

If there ever was a time when the Corps of Engineers needed a real leader, that time is now. That leader is William C. Langfitt.

THE GOVERNMENT AND THE COAL STRIKE

The Government's action on the coal strike is mighty encouraging. We have had good reason for expecting weakness from Washington on labor situations. The worm has begun to turn. Even the politicians cannot stomach the recent radicalism. The Senate and the House have strongly backed up the Administration.

The question was whether the nation would protect itself against exploitation by a single class. The answer is, it will. In Lloyd George's words, "The nation means to be strong, firm and just, but always master."

THE PUBLIC'S EMPLOYEES

Senator Edge enunciated sound doctrine in the Senate Oct. 27, when he said, "Labor is not the employee of capital but of the people at large, of the whole United States, and the people are the employer of capital also. . . . To such an extreme did capital once go that State and national legislation was enacted to restrain it from oppression; especially in these times, it seems to me, the other employee of the people also should be held in reasonable bounds."

THE INTER-PROFESSIONAL CONFERENCE

In another column will be found preliminary notice of the Inter-professional Conference which is to be held in Detroit next month. It is another evidence of the feeling of responsibility to the public that has taken possession of the thinking elements of our country. In these days there is need for solidarity between those who think sanely. For that reason the Inter-professional Conference should have a large attendance and should receive the whole-hearted support of every engineering society. Naturally, such a movement will develop slowly, but this, above all others, is an auspicious time for making a beginning. The country needs the united support the wisdom and the counsel of its professional men.

AGAINST RADICALISM, NOT AGAINST LABOR

There is a very real danger in the mounting sentiment against labor radicalism—namely, that bitterness may be developed against the workers as a class. In the ten years just passed a widespread sympathy with the aspirations of labor has developed, and to that sympathy the improved condition of the worker is due. Through the excesses of radicals, however, there is danger that this sympathy may be turned into bitterness and opposition.

At heart the vast majority of workers are sane, decent men. These men deserve the public's sympathy and the public's support. For their sake condemnation should be directed at the excesses and not against the workers generally. There needs to be continued sympathy with the legitimate aspirations of the working class.

ACT NOW IF NEXT YEAR'S ROADS ARE TO BE BUILT

With $633,000,000 worth of surfaced highway construction in sight for the year 1920 more than four times the amount of money expended during any previous year for like purposes—the Bureau of Public Roads, through the medium of a bulletin by Thomas H. MacDonald, chief of the bureau, sent out to all state highway departments Oct. 27, is making a strong plea for the shipment of road material during the months of February, March and April, when open-topped equipment is generally available. This would require the placing of material in storage piles and, of course, the letting of contracts as early as possible, in order that contractors may place their material orders.

"The importance of the movement of road materials," says Mr. MacDonald, "must be impressed on the public and the railroads, and for the present the road builders must correlate their calls for service so far as possible with the situation which exists. At any critical moment when shipping facilities are involved road materials will be the first to suffer."

Early letting of contracts is shown to be absolutely necessary if next year's huge volume of work is to be handled. Contracts which are not awarded during the winter months, it is claimed, will have little opportunity of being supplied with materials which require rail hauling. The placing of materials in storage piles involves some expense, but this expense is small in comparison to the loss occasioned by lack of materials when the contractor's organization is waiting.

The use by contractors of improved machinery and equipment is strongly advocated to meet the labor shortage.

The bulletin concludes with this paragraph: "These policies, to be effective, must be adopted by the state departments and the Federal Bureau individually and collectively, at once, and the first step is to place under contract during December and January as great a mileage of roads as possible. In doing this the Bureau of Public Roads wishes to cooperate with and aid the states in every way possible."

INTER-PROFESSIONAL CONFERENCE TO BE HELD AT DETROIT

With the purpose of bringing together the professional men of the country in order to plan more effective relations and act together on matters pertaining to the public good an Inter-professional Conference is being called to meet in Detroit Nov. 28 and 29. The conference was suggested by the Post-War Committee of the American Institute of Architects which was established to study the new obligations thrust upon the architectural profession by the war.

It is the hope of those fostering the movement to perpetuate to an appreciable degree the enthusiasm of the war-time service rendered to the public by the professional men of the nation. The subjects which might well come before such an inter-professional organization have been classified under three heads:

A The functions and inter-relations of professional organizations.

B Relations of the professions to the public.

C Educational obligations of the professions.

The Detroit program provides for an opening session in which representatives of the various professions will give their views as to the desirable objects, scope, method of procedure and organization for an inter-professional body. Following this discussion which will be opened by Thomas R. Kimball, President of the American Institute of Architects, the plan is to appoint a committee on plan

and scope which will be asked to report on the succeeding day, when, if necessary, both sessions will be devoted to a discussion of the committee's report and to the permanent organization of whatever type of body may be agreed upon.

To date, among others representatives of the medical, legal, educational and construction professions have accepted membership on the organizing committee. It includes Dr. Alexander Lambert, president of the American Medical Association, New York; Thomas R. Kimball, president of the American Institute of Architects, Omaha; Charles A. Boston, New York County Lawyers' Association, New York; Arthur D. Little, chemist, Boston, and Calvin W. Rice, secretary of the American Society of Mechanical Engineers, New York.

The office of the organizing committee of the Inter-professional Conference is at 56 West 45th St., New York. The meetings in Detroit will be held at the Hotel Statler.

$6,000,000 AVAILABLE FOR ALASKA RAILROAD

Although both houses of Congress passed the bill authorizing a further expenditure of $17,000,000 for the government railroad in Alaska—which bill became a law during the President's illness without his signature—only $6,000,000 was made available in the current deficiency bill, which covers the present fiscal year. The reduction was made at the instance of the House Conferees who took the position that the remainder of the appropriation could go over to the next Sundry Civil Bill, as the further expenditure will not be needed until next year.

TRADE WASTES DISPOSAL AT CHICAGO

An agreement as to the division of operating expenses of disposal plants to take care of trade wastes for the Chicago stockyards provides for 60 per cent. to be borne by the packing companies and 40 per cent. by the Sanitary District of Chicago. The district has voted also to proceed with the work.

MANUFACTURERS OF WATER PURIFYING EQUIPMENT TO MEET

The Associated Manufacturers of Water Purifying Equipment has now become a permanent organization, and will hold a meeting at the Hotel Fontenelle, Omaha, Nov. 17.

Although the organization was primarily formed for the purpose of securing necessary priority orders during the war, it will now continue largely for the purpose of taking up work in standardization of equipment sizes, of guarantees to customers, and of terms of sales. Co-operative advertising, educational campaigns, and freight rates are other matters which will receive attention.

The officers of the Association are: Chairman, F. B. Leopold of the Pittsburgh Filter Mfg. Co.; vice-chairman, Arthur M. Crane, New York Continental Jewel Filtration Co.; secretary, H. G. Tate, Borromite Co. of America.

TENNESSEE BUILDS OWN ROADS

The high price of materials and the general unreliability of labor have led the Tennessee State Highway Commission to enter into road building on its own account. Bids recently asked on the construction of 16-ft. macadam road in Claiborne county resulted in the submission of but one bid, and that in excess of $20,000 a mile. The state has therefore acquired its own road-building machinery and work has been started in Claiborne and Union counties, labor being recruited from the districts through which the roads are to pass.

MORE CAMPS FOR SALE

The government is continuing its policy of disposing of the various improvements at camp sites established during the war. Official notice has gone out that the chief of the Construction Division is now receiving proposals for the sale of government-owned improvements at Newport News, Va., including Camp Alexander, Camp Hill, and Camp Stuart; at Mineola, L. I., where Camp Mills is located; at Hattiesburg, Miss., the site of Camp Shelby, and at Fort Oglethorpe, Ga.

Construction News

BIDS DESIRED

WATERWORKS

Ill., Witt—Until Nov. 19, by Bd. Local Impvts., building 10,000 lin.ft. 8 in., 9000 lin.ft. 6 in. and 18,000 lin.ft. 4 in. c.i. water mains with necessary connections and fittings. Miller, Holbrook, Warren & Co., 416 Milliken Bldg., Decatur, engrs.

Okla., Shawnee—Until Nov. 29, by F. D. Brown, city engr., building waterworks system. About $220,000.

SEWERS

N. Y., Rye—Until Nov. 24, (change of date) by Bd. Village Trustees, furnishing material and labor building sanitary sewers and sewage disposal units, involving 31,100 ft. 8 in. and 580 ft. 15 in. vitr. pipe sewers, 7100 ft. 6-16 in. iron pipe, siphon and force mains, also 1 pumping station complete, sewage tanks, sprinkling filters and sand beds with appurtenances. G. E. Hill, 45-7th Ave., New York City, engr.

O., East Cleveland (Cleveland P. O.)—Until Nov. 12, by city, building sewers in Nela and Greyton Rds.; also water mains in East 133rd St. Work involves 3500 ft. 8-18 in. vitr. pipe, 1000 ft. 6 in. c.i. mains, 7 brick and iron manholes and 6 catch basins. M. W. Garnett, city engr.

O., West Park—Until Nov. 10, by village, building sewer in West 136th St., involving 2100 ft. 8 in. c.i. mains. About $11,129. H. Rietz, city engr.

Ont., Hamilton—E. R. Gray, engr., City Hall, receives bids in about 3 weeks laying 4000 ft. 10-18 in. vitr. pipe sewers in sections of Cannon, McNab and Ottawa Sts., Aberdeen Ave. and Paradise Rd. About $16,500.

Ont., North Bay—Town soon receives bids improving, altering and extending sewers in Worthington and Sherbrooke Sts., involving 6000 ft. 30 in. rein.-con. pipe, cost $25,640. H. J. McAusland, North Bay, engr.

BRIDGES

Pa., Laceyville—Until Nov. 11, by T. W. Templeton, supt. pub. grounds and bldgs., Capitol Bldg., Harrisburg, furnishing labor and material for construction of superstructure of bridge over north branch of Susquehanna River, here. L. W. Mitchell, secy.

N. C., Greenville—Until Dec. 1, by Comrs. Pitt Co., reconstructing Pillsboro Bridge over Tar River, 6 spans, total length 273 ft. J. B. Harding, highway engr.

Ga., Milledgeville—Until Nov. 17, by Comrs. Rds. & Revenues Baldwin and Putnam Counties, building bridge across Little River, at Gages Ford, to consist of one 150 ft. steel span, and 2 steel approach spans, each 30 ft. long, with 16 ft. clear roadway, resting on concrete piers and abutments.

Ia., Elkader—Until Nov. 11, by A. H. Andreae, aud. Clayton Co., building 175 ft pin connected truss bridge, 18 ft. wide, on two concrete piers and two 30 ft. "I" beam approach spans on two concrete abutments, concrete floor throughout. Work involves 482 cu.yd. concrete, 15,700 lb. reinforcing and 192,240 lb. structural steel.

Kan., Junction City—Geary Co. receiving bids building 90 ft. rein.-con. bridge over Lyons Creek, 20 ft. wide. About $20,000. B. Doyle, Junction City, engr.

Cal., Manhattan Beach—City Trustees soon receive bids building 300 ft. timber bridge, 40 ft. wide, over railway tracks on Laurel Ave. V. H. Staheli, city engr.

Cuba, Santo Domingo—Until Jan. 15, by A. J. Collett, dir. gen. pub. wks., Dominican Republic, constructing rein.-con. bridge and approaches over Rio Yaque del Norte on road from Monte Cristi to Laja bon, in Province of Monte Cristi, Dominican Republic, to consist of 2 rein.-con. cantilever arches of 100 ft. span each, 2 cantilever concrete approach spans of 42 ft. each and 2 approach fills each about 200 ft. long, over all length of bridge 314 ft., and out to out width 18 ft. 9 in.

STREETS AND ROADS

Connecticut—Until Nov. 10, by C. J. Bennett, state highway comr., Capitol, Hartford, paving Watertown Rd., Watertown Twp., involving 16,050 ft. concrete, (trap rock or native stone); Thomaston Rd., Thomaston Twp., involving 4750 ft. concrete, (trap rock or native stone); Millerton Rd., Salisbury Twp., involving 5550 ft. 2 in. gravel top over 7 in. slag base; Falls Village-Point of Rocks Rd., Canaan Twp., involving 5550 ft. gravel.

N. J., Atlantic City—Until Nov. 20, by Bd. City Comrs. improving portions Absecon Blvd. and New York Ave., to include dredging waterway and depositing dredged material on said Boulevard and avenue, amounting to about 94,000 cu.yd.; setting 20,200 lin.ft. wood curbing; graveling 40,700 sq.yd. driveways, 12,800 sq.yd. sidewalks and 14,750 sq.yd. grass plots, and constructing 350 lin.ft. terra cotta pipe culvert and 396 lin.ft. c.i. pipe drains. J. W. Hackney, city engr.

North Carolina—Until Nov. 18, by Div. Office State Highway Comn., Kingston, hard surfacing 21 mi. Central Highway, Lenoir Co. About $750,000. W. E. Fallis, Raleigh, state highway engr.

Ga., Americus—Until Nov. 21, by Sumter Co., building 3 mi. Andersonville Rd., involving 31,880 sq.ft. paving, 31,880 lin.ft. wooden curb, excav., drainage, etc. About $100,000. Thomas & Hawkins, Atlanta, engrs.

Ga., Augusta—Until Nov. 15, by Streets & Drains Com., paving 50,000 sq.yd. Greene St. from East Boundary to 3rd level of Canal, involving 13,000 cu.yd. excav. and 18,000 lin.ft. reset curb; 12,000 sq.yd. 11th St. from Tatnall to Fenwick Sts., 3500 cu.yd. excav. and 3500 lin.ft. reset curb; 7000 sq.yd. 10th St. from Broad to Walker Sts., 2000 cu.yd. excav. and 2000 lin.ft. reset curb; 6000 sq.yd. Telfair St. from 9th to 12th Sts., 1200 cu.yd. excav. and 300 lin.ft. reset curb; 36,000 sq.yd. Broad St. from 15th St. to Milledge Rd., 7000 cu.yd. excav. and 200 lin.ft. reset curb. W. H. Wise, city engr. and comr. pub. wks.

Ga., La Grange—Until Nov. 18, by Troup Co., grading, draining and top soiling 13 mi. road between here and Coweta Co. line. About $150,000. Garret & Slack, Montgomery, Ala., engrs.

Ga., Rome—Until Dec. 2, by Floyd Co., paving 2.848 mi. road from here to Lindale, involving 30,080 yd. asphalt macadam on macadam base. About $110,000. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, engrs.

Ga., Savannah — Until Nov. 20, by Comrs. Chatham Co., paving, draining and clearing 116,688 sq.yd. highway. About $325,000. W. B. Brown, Savannah, engr.

Ga., Savannah—Until Nov. 30, by Chatham Co., paving and draining 34,924 yd. highway. About $100,000. W. F. Brown, 310 Estill Ave. Savannah, engr.

Fla., Dade City—Until Nov. 10, by Comrs. Pasco Co. building 50 mi. brick, asphaltic concrete or concrete roads and 50 mi. sand clay roads. A. J. Burnside, clk.

La., South Highlands—Until Dec. 5, by village, paving various streets, involving 65,000 sq.yd. asphaltic concrete paving (Topeka mix) on concrete base, 27,650 lin. ft. concrete curb, 8100 lin.ft. rein.-con. and 2600 lin.ft. concrete or vitr. pipe storm sewer. H. E. Barnes, Shreveport, engr.

Michigan—Until Nov. 11, by F. F. Rogers, state highway comr., Lansing, grading, draining and surfacing 7411 ft. Assessment Dist. Rd. No. 265, Bath and Lansing Twps., 16 ft. wide, involving 69,000 sq.yd. class B gravel. About $80,000.

Illinois—Until Nov. 12, by Dept. Pub. Wks. & Bldgs., Div. of Highways, Springfield, improving roads in following counties: Shelby Co., 3250 ft. Sect. I, Route 5, 16 ft. wide, involving 5778 sq. yd. concrete pavement, 11 cu.yd. class A concrete, 2398 cu.yd. excav., 2016 bbl. cement, $4153; total cost, $12,465; Boone Co., 2500 ft., Sect. I, Route 1, 10 ft. wide, involving 2778 sq.yd. pavement, 1653 cu.yd. excav., 1040 bbl. cement, $2049, 7340 lb. reinforcing steel, 89 cu.yd. class "A" concrete, total cost, $8989; also building bridges in following counties: Hardin Co., 2 concrete bridges, Sect. D, Route 2, involving 5140 lb. reinforcing steel, 54 cu.yd. class "A" concrete, cost $1795; McDonough Co., 2 concrete bridges, Sect. R, Route 4-A, and Route 5-A, involving 21,620 lb. rein-

forcing steel, 194.8 cu yd. class "A" concrete, cost $5540. F. I. Bennett, dir. C. Older, ch. engr.

Illinois—Until Nov. 12, Dept. Pub. Wks. & Bldgs., Div. of Highways, Springfield, improving roads in following counties:

Vermilion Co., 25,600 ft. Sect. R, Danville-Hoopeston Highway, 8 ft. wide, involving 3833 cu.yd. excav., 1022 sq.yd. concrete, 21,689 sq.yd. brick, 50 cu.yd. class "A" concrete, 5940 lb. steel, 5040 bbl. cement, $10,130.

La Salle Co., 13,460 ft. Sect. I, Morris Henry Highway 19 and 30 ft. wide, involving 46,863 cu.yd. excav., 31,148 cu.yd. borrow, 41,050 sq.yd. pavement, 740.3 cu.yd. class "A" and 87.3 cu. yd. class "B" concrete, 102,755 lb. steel, 1188 bbl. cement, $2316; 8369 ft. Sect. U, 30 ft. wide, involving 7033 cu.yd. excav., 9666 cu.yd. borrow, 27,823 sq.yd. pavement, 193.3 cu.yd. class "A" concrete, 11,690 lb. steel, 282 bbl. cement $550.

Will Co., 41,475 ft. Sect. E, Joliet-Morris Highway, 18 ft. wide, involving 32,874 cu.yd. excav., 3125 cu.yd. borrow, 82,887 sq.yd. pavement, 243 cu.yd. class "A" concrete, 19,350 lb. steel 28,786 bbl. cement, $55,557.

Will-Grundy Co., 29,676 ft. Sect. F, Joliet-Morris Highway, 18 ft. wide, involving 31,419 cu.yd. excav., 4277 cu.yd. borrow, 59,026 sq.yd. pavement, 242 cu.yd. class "A" concrete, 17,350 lb. steel, 20,664 bbl. cement, $40,370.

Grundy Co., 40,109 ft. Sect. G, Joliet-Morris Highway, 18 ft. wide involving 34,662 cu.yd. excav., 10,425 cu.yd. borrow, 78,268 sq.yd. pavement, 722 cu.yd. class "A" and 83 cu.yd. class "B" concrete, 83,280 lb. steel, 28,018 bbl. cement, $55,195.

Macoupin Co., 25,415 ft. Sect. S, Springfield-East St. Louis Highway, 16 ft. wide, involving 20,328 cu.yd. excav., 1827 cu.yd. borrow, 45,259 sq.yd. pavement, 215 cu.yd. class "A" and 57.9 cu.yd. class "B" concrete, 15,660 lb. steel, 15,914 bbl. cement, $32,783; 15,830 ft. Sect. T, 16 ft. wide, involving 24,483 cu.yd. excav., 28,245 sq.yd. pavement, 484 cu.yd. class "A" concrete, 56,830 lb. steel, 10,465 bbl. cement, $21,558; 21,235 ft. Sect. V, 16 ft. wide, involving 32,829 cu.yd. excav., 12,357 cu.yd. borrow, 37,550 sq.yd. pavement, 920 cu.yd. class "A," 270 cu.yd. class "B" and 38.6 cu.yd. class "X" concrete, 81,420 lb. structural steel, 124,090 lb. steel, 3630 lin.ft. untreated piles, 14,720 bbl. cement, $30,323.

Madison Co., 19,762 ft. Sect. 33, Natl. Highway, 16 and 18 ft. wide, involving 21,194 cu.yd. excav., 36,417 sq.yd. pavement, 508.6 cu.yd. class "A" cncrete, 51,140 lb. steel, 13,237 bbl. cement, $27,268.

Bond Co., 19,307 ft. Sect. 34 Natl. Highway, 16 ft. wide, involving 17,365 cu.yd. excav. 34,158 sq.yd. pavement, 552 cu.yd. class "A" and 54 cu.yd. class "B" concrete, 59,720 lb. steel, 12,592 bbl. cement, $26,191; 23,864 ft. Sect. 35, 16 ft. wide, involving 38,870 cu.yd. excav., 38,332 cu.yd. borrow, 41,638 sq.yd. pavement, 1537 cu.yd. class "A" and 526 cu.yd. class "B" concrete, 178,260 lb. steel, 17,427 bbl. cement, $36,248; 20,223 ft. Sect. 36, 16 and 18 ft. wide, involving 20,444 cu.yd. excav., 39,338 sq.yd. pavement, 146 cu.yd. class "A" and 74.8 cu.yd. class "X" concrete, 162,840 lb. structural steel, 10,610 lb. steel, 7590 lin.ft. untreated piles, 13,780 bbl. cement $28,662.

Alternate bids will be received for Portland cement concrete, 3 in. and 4 in. monolithic brick, bituminous concrete with or without binder course, (Spec. C1, C2, C3 or CT). C. Older, ch. highway engr.

Ill., Chicago—Until Nov. 10, by Bd. Local Impvts., paving alley between School, Melrose, and Paulina Sts. and Ravenswood Ave., involving 361 cu.yd. grading and 1027 sq.yd. 7 in. concrete pavement, cost $3400.

Alley between Hamburg St., Garfield Blvd., Larrabee and Orchard Sts., involving 386 cu.yd. grading 1230 sq.yd. asphalt pavement on 7 in. concrete, $4500.

Alley between West 57th, West 58th, South Green and South Peoria Sts., involving 130 cu.yd. grading and 1030 sq.yd. asphalt pavement on 7 in. concrete, $2358.

Alley between Rice St., Chicago Ave., Robey St. and Hoyne Ave., involving 641 cu.yd. grading 1460 sq. asphalt pavement on 7 in. concrete, $5100.

East 102nd St., from Ave. N to Indianapolis Ave., involving 7000 cu.yd. filling, 3110 ft. concrete curbing, 5170 sq.yd. 8 in. blast furnace slag and 2 1-2 in. crushed limestone, 3 brick catchbasins, $15,500.

Eddy St. from North Cicero to North Long Aves., Cornelia St. from North Cicero to North Long Aves., Newport St. from North Laramie to North Long Aves., Laverne St., Laramie Ave. and Lockwood St. from Roscoe to Addison Sts., involving 25,900 ft. concrete curbing, 10,900 cu.yd. grading, 35,300 sq.yd. asphalt pavement on 6 in. concrete, and 45 brick catch basins, $153,000. C. D. Hill, ch. engr.

Minn., Crookston—Until Nov. 24, by Comrs. Polk Co., building 12 mi. Federal Aid Project No. 80, Job No. 1904, 24 ft. wide, involving 87,993 cu.yd. excav., 33,431 cu.yd. hauling, 14,229 cu.yd. gravel surfacing, culverts, etc., cost $80,000. 10 mi. Federal Aid Project No. 94, Job No. 1910, 24 ft. wide, 78,100 cu.yd. excav., 81,862 cu.yd. hauling, culverts, etc. $75,000. E. H. Harding, Crookston, engr.

Kan., Eureka—Until Nov. 15, by Comrs. Greenwood Co., paving 6 mi. road, 18 ft. wide, bituminous macadam. Rexroad Eng. Co., Hutchinson, engrs.

Kan., Lyons—Rice Co. receives bids about Nov. 13, paving, curbing and guttering 11 mi. roads, 18 ft. wide, monolithic brick or concrete. Rexroad Eng. Co., Hutchinson, engrs.

Montana—Until Nov. 20, by State Highway Comn., Helena, gravel surfacing 26 mi. Yellowstone Trail, Federal Aid Project No. 53, Yellowstone Co.; 4 mi. Yellowstone Trail, Federal Aid Project No. 15, Roselnd Co., 2.75 mi. Belgrade-Manallow Rd., Federal Aid Project No. 40, Gallatin Co. J. N. Edy, state highway engr.

Tex., San Angelo—Until Nov. 16, by Comrs. Tom Green Co., surfacing and draining 26.54 mi. Highway No. 4 from here to Schleicher Co., 18 ft. wide. Work involves 56.3 acres clearing and grubbing, 13.96 mi. crushed rock surface with asphalt treatment, 49,510 cu. yd. earth, 3378 cu.yd. rock and 407 cu.yd. structural excav., 88,525 gal. asphalt, 78,267 lb. reinforcing steel, 1936 cu.yd. concrete, etc. About $340,952. J. E. Beavers, San Angelo, engr.

Idaho—Until Nov. 10, by State Highway Dept., Boise, grading and surfacing 10 mi. state road between here and Halbrook, involving 50,000 cu.yd. earth and 5000 cu.yd. rock excav. and 22,000 cu.yd. gravel. J. A. Giles, Pocatello, engr.

Utah, Brigham—Until Nov. 10, by city, curbing and guttering 5 mi. Dist. No. 1, involving 25,000 lin.ft. curb and gutter. O. H. Roskelley, Brigham, engr.

Ariz., Tombstone—Until Nov. 17 at office of Bd. Supervs. Cochise Co., building Sects 2A and 2B of Bisbee-Douglas Highway, Federal Aid Project No. 11, involving 89,377 sq.yd. pavement. T. Maddock, Tombstone, state engr.

Wash., Tacoma—Comrs. Pierce Co. soon receive bids grading and paving 4.3 mi. East 11th St., involving 430 cu.yd. common excav., 6010 sq.yd. sub-grade, 4548 lin.ft. concrete curb and 6010 sq.yd. paving; 4.57 mi. East Side Drive, 16.59 acres clearing and grubbing, 44,353 cu.yd. common excav., 12,745 cu.yd. overhaul, 735 lin.ft. 18 in. concrete pipe, 54,149 sq.yd. sub-grade, 48,312 lin.ft. concrete curb and 54,149 sq.yd. paving; 3.66 mi. Sumner-Dieringer Rd. 4 acres clearing, 2 acres grubbing, 13,537 cu.yd. common excav., 1000 ft. 10-48 in. concrete pipe, 36,337 sq. yd. sub-grade, 38,678 lin.ft. concrete curb and 36,337 sq.yd. paving; 4 mi. road from top of Elhi Hill to Buckley pavement, 6.8 acres clearing. 4 acres grubbing, 34,508 cu.yd. common excav., 50,525 cu.yd. overhaul, 236 cu.yd. concrete, 394 lin.ft. concrete pipe, 44,759 sq.yd. sub-grade, 48,756 lin.ft. curb, 44,759 sq. yd. pavement and 4135 lb. reinforcing bars; 4.03 mi. road from Crocker to South Prairie, 4000 cu.yd. common excav., 38,622 sq.yd. subgrade 42,545 lin.ft. concrete curb and 38,622 sq. yd. paving; 2.28 mi. road from South Prairie to Buckley, 6.7 acres clearing and grubbing, 62,353 cu.yd. common excav., 3785 cu.yd. overhaul, 150 cu.yd. concrete, 322 ft. concrete pipe, 22,715 sq.yd. subgrade, 24,076 lin.ft. concrete curb, 22,715 sq.yd. paving, 3o40 lb. bridge iron, nails, spikes and bolts, 64,000 ft. lumber and 2530 lb. reinforcing bars; 2.68 mi. road from Buckley Junction to Wilkeson, 9.2 acres clearing and grubbing, 26,160 cu. yd. common excav., 17,943 cu.yd. overhaul, 288 lin.ft. 12-18 in. concrete pipe, 24,859 sq.yd. sub-grade, 26,938 lin.ft. concrete curb and 24,859 sq.yd. paving, 2.19 mi. road from Wilkeson to Carbonado, 10.3 mi. clearing and grubbing, 34,744 cu. yd. common and 214 cu.yd. solid rock excav., 45,349 cu.yd. overhaul, 328 lin.ft. 12 and 18 in. concrete pipe, 20,628 sq.yd. sub-grade, 23,206 lin.ft. concrete curb and 20,628 sq.yd. paving; 5.6 mi. road from Carbonado to Fairfax, 29.2 acres clearing and grubbing, 41,850 cu.yd. common, 31,121 cu.yd. loose rock and 71,726 cu.yd. solid rock excav., 1508 lin.ft. 12-30 in. concrete pipe, 54,787 sq.yd. sub-grade, 59,162 lin.ft. concrete curb, 54,787 sq.yd. paving and 11,271 cu.yd. crushed rock surfacing; 1.21 mi. Stilacoom Blvd., 1 acre clearing and grubbing, 5892 cu.yd. common excav., 314 cu.yd. overhaul, 122 lin.ft. 12 and 24 in. concrete pipe, 12,041 sq.yd. sub-grade, 1275 lin.ft. concrete curb and 12,041 sq.yd. paving; 4.05 mi. Gravelly Lake Drive, 1.4 acres clearnig and grubbing, 7752 cu.yd. common excav., 39,868 sq.yd. sub-grade, 42,800 lin.ft. concrete curb and 39,868 sq.yd. paving 0.6 mi. South 96th St., 4562 cu.yd. common excav., 5653 sq.yd sub-grade, 6200 lin.ft. concrete curb and 5653 sq.yd. paving; 4.59 mi. Nat'l Park Highway to Greendale, 4590 cu.yd. common excav., 43,633 sq.yd. sub-grade, 48,450 lin.ft. concrete curb and 43,633 sq.yd. paving; 3.66 mi. road from Greendale to Roy, 11,914 cu.yd. common excav., 131 cu.yd. concrete, 27 ft. 36 in. concrete pipe, 34,847 sq.yd. subgrade, 38,666 lin.ft. concrete curb, 34,847 sq.yd. paving and 2863 lb. reinforcing bars; 4.73 mi. road from Roy to McKenna, 5.1 acres clearing, 13,078 cu.yd. common excav., 6 cu.yd. concrete, 45,466 sq.yd. sub-grade. 50,001 lin.ft. concrete curb, 45,466 sq.yd. paving and 807 lb. reinforcing bars; 2 mi Kapowsin Highway, 8807 cu.yd. common excav., 11,690 cu.yd. overhaul, 185 lin. ft. 24-36 in. concrete curb, 18,740 sq.yd. sub-grade, 21,082 lin.ft. concrete curb and 18,740 sq.yd. paving; 2.26 mi. Eatonville Highway, 9 acres clearing, 7 acres grubbing. 19,795 cu.yd. common excav., 530 lin.ft. 12-36 in. concrete pipe, 21,608 sq.yd. sub-grade, 23,623 lin.ft. concrete curb, 21,608 sq. yd. paving, 200 cu. yd. gravel surfacing and 12,105 sq.yd. reinforcing mesh; 23.2 mi. Natl. Park Highway, 46,400 cu.yd. common excav., 258,471 sq.yd. sub-grade, 244,992 lin.ft. concrete curb and 258,471 sq.yd. paving; 5.3 mi. road from Gig Harbor to Kitsap Co. line, 18.14 acres clearing, 9 acres grubbing, 51,903 cu.yd. common excav., 31,580 cu.yd. overhaul, 7.1 cu.yd. concrete, 667 lin.ft. 12-48 in. concrete pipe, 52,535 sq.yd. subgrade, 55,957 lin.ft. concrete curb, 52,535 sq.yd. paving and 200 cu.yd. gravel surfacing; 2 in. bitulithic surface on 5 in. concrete base or 2 in. asphaltic concrete on 5 in. concrete base. About $2,500,000. E. A. White, co. engr.

California—Until Nov. 17, by State Highway Comn., 515 Forum Bldg., Sacramento, grading 13.8 mi. road between Casabere Ranch and Tecate Divide, 24 ft. wide, 4 mi. Cushion Creek-Crescent Rd., and 6.6 mi. Pine Valley-Casabere Ranch Rd. About $80,000. $30,000 and $50,000, respectively. A. B. Fletcher, state highway engr.

EXCAVATION AND DREDGING

N. Y., Fairport—Excavation—Until Nov. 25, by E. S. Walsh, supt. pub. wks., Capitol, Albany, improving Erie, Oswego and Champlain Canals between here and Kings Bend, Contr. 189, involving 17,000 cu.yd. excav. About $34,000.

Miss., Lake Cormorant—Drainage—Until Dec. 2, by Bd. Comrs. Lake Cormorant D. D., building 87 mi. open drainage canals, in Tunica and De Sota Counties, 12-70 ft. bottom widths, involving 3,340,000 cu.yd. floating dredgework. Morgan Eng. Co., Goodwyn Institute Bldg., Memphis, Tenn., engrs. Noted July 24.

INDUSTRIAL WORKS

N. Y., Brooklyn—State Hospital Comn., Albany, soon receives bids building 2 story, 50 x 71 ft. brick and steel addition to laundry, concrete foundation, at Brooklyn State Hospital, here. About $95,000. L. F. Pilcher, state archt.

N. Y., Cohoes—Until Nov. 25, by E. S. Walsh, supt. pub. wks., Capitol, Albany, building extension to present dockwall and timber freighthouse, here. Contr. 36-A, involving 13,500 cu.yd. excav., 2500 ft. B.M. sawed lumber, 452 lin.ft. wooden fence, 850 cu.yd. 2nd class concrete, 200 lb. structural steel, 440 cu.yd. gravel surfacing, etc. About $42,400.

N. Y., Flushing—Until Nov. 25, by E. S. Walsh, supt. pub. wks., Capitol, Albany, building barge canal terminal and timber freighthouse, here, Contr. 43, involving 51,000 cu.yd. excav., 8000 cu.yd. cinder fill, 86,000 lin.ft. foundation piles, 124,000 ft. B.M. sawed lumber, 115,000 ft. B.M. wooden sheet piling, 700 cu.yd. 1st class concrete, 5500 lb. iron castings, 22,000 lb. iron and steel fastenings, etc. About $162,590.

N. Y., New York—Until Nov. 25, by E. S. Walsh, supt. pub. wks., Capitol, Al-

bany, building headhouse and installing watermain and electrical work on Pier 93, West 53rd St., here, Contr. 225, involving 30,500 ft. B.M. sawed lumber, 30 cu.yd. 1st class and 17 cu.yd. 2nd class concrete, 65 cu.yd. 1st class rein.-con., 5600 sq.ft. granolithic surfacing, 162,000 lb. structural steel, 4700 lb. metal reinforcement, 10,110 sq.ft. 4-8 in. terra cotta tile, 12,400 lb. metal duct and fastenings, 2880 lin.ft. 00-12 single rubber insulated conductor, etc. About $49,753.

O., Cleveland—Until Nov. 12, by E. McGeorge, archt. and engr., 1900 Euclid Ave., building 1 story, 100 x 120 ft., concrete, steel and brick foundry and machine shop, rein.-con. flooring, concrete foundation, in eastern part of city, for Smith Fdry. & Machine Co., care archt. About $60,000.

Ind., Muncie — Moores & Dunford, engrs. 38 South Dearborn St., Chicago, receiving bids building 100 x 200 ft., rein.-con. and brick, storage warehouse, here, for Bainer Furniture Co., Indianapolis, $200,000.

Mich, Detroit—Until Nov. 8, by M. H. Finkel, archt., 303 Chamber Commerce, building 3 story, 82 x 90 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Erskine and Beaubien Sts., for Feigenson Bros., 118 Benton St. About $30,000.

Wis., Colfax—J. C. Jacobson, engr., Metallurgical Bank Bldg., Minneapolis, Minn., receiving bids building power house and diversion dam, on Red Cedar River, for Colfax Electric Co. About $100,000.

Wis., Kiel—Kirchhoff & Rose, archts., and engrs., Majestic Bldg., Milwaukee, receive bids about Nov. 8, building 1 story, 50 x 300 ft. brick and steel factory, concrete foundation, for Stoelting Bros. Co. About $50,000.

Wis., Milwaukee—Cadillac Motor Car Co., 1343 Cass St., Detroit, Mich., receives bids about Nov. 10, building 2 story, 120 x 230 ft. rein.-con. and brick assembling plant, rein.-con. flooring, concrete foundation, on North Ave. About $200,000. Kirchhoff & Rose, Majestic Bldg., archts. and engrs.

Wis., St. Francis (Milwaukee P. O.)—Nash Motors Co., Kenosha, receives bids about Nov. 8, building 1 story, 50 x 100 ft. brick and steel power plant, rein.-con. flooring, concrete foundation, on Clement Ave., here. About $75,000. Address B. W. Twyman, M. A. C. Bldg., Milwaukee. Private plans.

Tex., Fort Worth—Until Dec. 10, by O. A. Wood, pres., Invader Oil & Refining Co., State Bank Bldg., building 1-2 story, 5000 bbl., rein.-con., brick and steel refinery, concrete and brick foundation, on 70 acre site. About $700,000. Architect's name withheld.

BUILDINGS

Mass., Framingham — School — Until Nov. 14, by School Comn., building 3 story, 85 x 201 ft., brick and concrete, concrete foundation, on Lincoln St. About $200,000. Kilham & Hopkins, 9 Park St., Boston, archts. Former bids rejected.

Mass., Lynn—School—Until Nov. 10, by Pub. Bldgs. Dept., building 1 story, 60 x 110 ft., brick and steel, concrete foundation, on Pine Hill. About $50,000. W. H. McLean, 110 Tremont St., Boston, archt.

Conn., Middletown—Laboratory—Wesleyan University, 374 High St., receives bids about Dec. 1, building 2 story, 100 x 157 ft., Portland brownstone and rein.-con., rein.-con. flooring, concrete and rock foundation, on campus. About $300,000. H. Bacon, 101 Park Ave., New York City, archt. Noted June 19.

N. Y., Middletown—Mortuary and Laboratory—Until Nov. 12, by State Hospital Comn., Capitol, Albany, building mortuary and laboratory, for Middletown State Homeopathic Hospital, here. L. F. Pilcher, Albany, state archt.

N. Y., Niagara Falls—Hotel—A. E. Kemple, archt., Chicago, soon receives bids building 12 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Jefferson and 1st Sts., for J. H. L. Patterson, et al. About $1,500,000.

N. Y., Norwich—Library—Until Jan. 2, by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, building brick, steel and stone, brick foundation, for Library Assn., here. About $150,000. Noted Sept. 4.

N. Y., Norwich—Schools—Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, receive bids about Jan. 2, building brick, steel and stone, high and grade schools, brick foundation here for Bd. Educ. About $250,000.

N. Y., Wards Island—Hospital—State Hospital Comn., Albany, soon receives bids building 2 story, 58 x 98 ft., brick and rein.-con., concrete foundation, for Manhattan State Hospital, here. About $100,000. L. F. Pilcher, State archt.

Pa., Phila.—Office—Simon & Simon, archts., 249 South Juniper St., receiving bids altering and building 2 story 18 x 25 ft. brick addition, for Foster Mfg. & Supply Co., Venango and 20th Sts. About $50,000.

O., Lakewood—Market—W. R. Powell, archt. and engr., Rose Bldg., Cleveland, receives bids about Dec. 18, building 1 story, 80 x 240 ft., brick, steel and stone, rein.-con. flooring, concrete foundation, on Detriot Ave., for Lakewood Market House Co., care architect. About $250,000.

O., New Concord—Administration—Until Nov. 14, by F. L. Packard, archt., New Hayden Bldg., Columbus, building 3 story, 60 x 150 ft., brick, on campus, for Muskingam University. About $140,000. J. K. Montgomery, pres.

Mich., Grand Rapids—Gymnasium - Robinson & Campau, archts., 715 Michigan Trust Bldg., receiving bids building 1 story, 60 x 90 ft., brick, concrete and steel, rein.-con. and wood flooring, concrete foundation, to include concrete swimming pool, for Bd. Educ. About $50,000.

Wis. Stevens Point—Bank and Office—First Natl. Bank receiving bids building 2 story, 54 x 114 ft. concrete and stone, rein.-con. flooring, rock and concrete foundation. About $100,000. Brust & Phillipp, Free Press Bldg., Milwaukee, archts. and engrs.

Ia., Muscatine—Temple—Masonic Lodge receiving bids building 3 story, 55 x 120 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $120,000. Ketter & Jones, 201 Hubble Bldg., Des Moines, archts.

Ia., Spencer—Hotel—Until Nov. 21, by T. N. Tangley, Sheldon, building 4 story, brick, rein.-con. and steel, rein.-con. flooring, here. About $100,000. Boyd & Moore, 314 Securities Bldg., Des Moines, archts. Noted Aug. 21.

Minn., Chisholm—School—Until Jan. 2, by Bd. Educ., building 2 story, 68 x 147 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation. About $225,000. J. P. Vaughn, supt. W. T. Bray, Torrey Bldg., Duluth, archt. and engr.

Minn., Duluth—Theatre—Until Jan. 1, by M. S. Cook of Cook Enterprise, 313 West Superior St., building 2 story, 118 x 140 ft., rein.-con., brick, stone and stucco, rein.-con. flooring, concrete foundation, on West Superior St. About $500,000. Rupp & Rupp, Chicago, archts. and engrs.

Minn., Minneapolis — Theatre — Until Dec. 15, by Kees & Colburn, archts., Plymouth Bldg., constructing 1 story, 100 x 140 ft., rein.-con., steel, terra cotta and brick, on Nicollet Ave., for Hamm, Finkelstein & Ruben, Palace Theatre. About $175,000. Rose & Harris, Auditorium Bldg., engrs.

Kan., Norwich—School—Until Nov. 11, by Bd. Educ., building 3 story, 55 x 90 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $60,000. H. A. Noble, Kansas City, Mo., engr. Mann & Gerow, Hutchinson, archts. Noted Sept. 11.

S. D., Erwin—School—Until Jan. 15, by Bd. Educ., building 2 story, 65 x 135 ft. brick, steel and rein.-con., rein.-con. flooring. About $100,000. K. T. Snyder, 933 Plymouth Bldg., Minneapolis, Minn., archt. Noted June 5.

Mo., St. Louis—School—Cann & Corrupia and J. P. Jamieson, archts., Central Natl. Bank Bldg., receive bids about Nov. 16, building 6 story, brick, stone and concrete, on Skinker Rd., for Washington University Corp., Lindell St. and Skinker Rd. About $300,000.

Tex., Waxahachie—Sanitarium—Until Nov. 10, by Trustees of Syndicate, building 3 story, 40 x 90 ft. rein.-con., brick and steel, rein.-con. flooring. About $75,000. C. H. Page & Bro., Austin Natl. Bank Bldg., Austin, archts.

Okla., Oklahoma—Schools—Until Nov. 17, by Bd. Educ., 400 North Walnut St., building Webster Junior High School, 2 story, on 11th and Lindsey Sts., Classen Junior High School, 3 story, 17-19 Ellis St. and 3 story addition to Capitol Hill School, all rein.-con., brick and stone, rein.-con. and maple flooring, concrete foundation. About $165,000 each. J. C. Stearley, clk. Layton, Smith & Forsyth, 701 Southwest Bank Bldg., archts.

Okla., Tulsa—High School—Tulsa Co. receives bids about Nov. 15, building 3 story, 75 x 200 ft. brick, rein.-con. and steel, rein.-con. flooring, rock foundation. About $300,000. G. Winkler, 414 Palace Bldg., archt. Noted Sept. 18.

FEDERAL GOVERNMENT WORK

N. Y., New York—Dredging—Until Dec. 3, by U. S. Engr. Office, 39 Whitehall St., dredging and removing rocks in East River.

D. C., Wash.—Electrical Hardware, Equipment Cable, Cord, etc.—Until Nov. 10, by A. L. Flint, Purch. Agt. for Panama Canal, Wash., furnishing electrical hardware, equipment, cable, cord, etc.

D. C., Wash.—Storage Plant—Spec. 4035—Until Nov. 12, by Bureau Yards & Docks, Navy Dept., Wash., D. C., completing storage plant for fuel oil, here. About $12,000; $10 deposit required for plans and spec. Noted Sept. 11.

Va., Richmond—Post Office Alterations—Until Nov. 24, by Treas. Dept., Wash., D. C., altering Post Office and Court House, here. J. A. Wetmore, superv. archt.

La., New Orleans—Stone and Willow Brush—Until Dec. 1, by U. S. Engr. Office, Customhouse, furnishing and placing about 25,000 tons stone and 5000 cords of willow brush, along inner east jetty at South Pass, Mississippi River.

Wash., Keyport—Officers' Quarters—Spec. 4034—Until Nov. 19, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 3 officers' quarters, concrete footings, foundation, walls and floors, at Naval Training Sta., here. About $21,000; $10 deposit required for plans and spec.

Wash., Puget Sound—Officers' Quarters, Storehouse and Railroad Extension—Spec. 3983—Until Nov. 26, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 1 officers' quarters, 2 storehouses, concrete footings, foundations, platform and floors, built-up and sheet metal roofing, copper and tin sheet metal work, etc.; also railroad extension. About $52,000; $10 deposit required for plans and spec.

Cal., San Diego—Building—Spec. 4047—Until Nov. 19, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing 1 story central building, covering 30,000 sq.ft. floor space, consisting of power house at center with "L" shaped east and west wings for housing utilities, at Marine Corps Base, rein.-con. foundation on concrete piles, rein.-con. columns, slab floor and roof, steel trusses and purlins, brick and hollow tile walls and partitions, suspended metal ceiling, etc. and radial brick chimney, 125 ft. high. About $200,000 $20 deposit required for plans and spec.

Cal., San Diego—Power House—Spec. 4070—Until Nov. 26, by Bureau Yards & Docks, Navy Dept., Wash., D. C., extending existing power house at Naval Radio Sta., Challas Heights, brick, concrete floors, footings and machinery foundations, and electric system. About $6,500; $10 deposit required for plans and spec.

P. R., San Juan—Dwelling—Until Jan. 15, by Lighthouse Supt., San Juan, building keepers' dwelling for Port Juan Light Sta.

MISCELLANEOUS

Foundation — Albany, N. Y. — State Trustees Pub. Bldgs., Capitol, soon receive bids building concrete foundation for 60 x 288 ft. office building, with two 60 x 230 ft. wings. About $450,000. L. F. Pilcher, state archt.

Jib Cranes—New York, N. Y.—Until Nov. 25, by E. S. Walsh, supt. pub. wks., Capitol, Albany, furnishing and installing two 3 ton electric semiportal revolving jib cranes on barge canal terminals, at West 53rd St. and two at Greenpoint, Contr. 116. About $61,000.

Tunnels—Pittsburgh, Pa.—Comrs. Allegheny Co. soon receive bids building Twin Tunnels under Mt. Washington. A. D. Neeld, 442 Diamond St., engr.

Electric System—Maquoketa, Ia.—Until Nov. 19, by G. O. Morse, city supt., building complete electric light plant, including 250 H. P. engine, generator, excitor, switchboard, 12,000 gal. oil tank, distribution line, transformers and meters.

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, Editor — Charles Whiting Baker, Consulting Editor

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No "Back Numbers"

By the expedient of photographing typewritten pages it is possible, in spite of compositors on "vacation", to carry in this and succeeding issues of "Engineering News-Record" current news and editorial comment. The use of an old date on the cover temporarily means merely that we are carrying out a policy of giving readers the full number of issues to complete and make continuous their half-yearly volumes.

This and following issues are in no sense "back numbers."

Where the Farmers Stand

The National Grange, with a membership of 600,000 farmers, meeting in annual convention in Grand Rapids Nov. 15, refused the invitation of the American Federation of Labor to meet with it in Washington Dec. 13. Other farmers' organizations have taken similar action. The ground for the Grange's decision was that there is nothing in common between the two organizations. The Grange probably would have refused an invitation from the Federation even in the latter's conservative days but the refusal now has special significance. It shows that in any test between radicalism and sanity the farmers can be counted on to be sane.

Will the Federation Learn?

To any one who desires to learn, there is fully convincing evidence that the course latterly pursued by the American Federation of Labor has shorn it of its influence with the public. Such evidence appeared during the Boston policemen's strike, and during the steel and coal strike. Now the farmers, disclaiming any identity of interest, have refused to attend the meeting to be held in Washington Dec. 13, the meeting advertised by the Federation as a conference of organized labor and the farmers. To outsiders the lesson is evident: The public will have nothing to do with radicalism. But will the Federation learn the lesson? Will the conservatives in its ranks, forming the great majority, purge out the radicals? Bent on its present course the Federation can do much harm, but with the country against it it must be the loser in every major test, and eventually must succumb as an institution of influence in industrial matters.

Hearing Grievances

As was to be expected from the evidence, the Senate's committee on the steel strike roundly condemned in its report the radical leadership of the men. Of that we have said enough. The record is not complete, however, unless we set down that the United States Steel Corporation was not absolved from blame. The committee holds that there is a just grievance in the lengthy hours of some of the men, and declares that they had a right to have their grievances heard. On the latter point we want to place emphasis. With the doctrine of presenting grievances the corporation, in theory, was in accord; in some plants the practice probably squared with the theory. In general, though, machinery was lacking for giving grievances prompt and proper attention. In this respect, the corporation, despite its safety and sanitary work and its stock-selling plan, failed to measure up to the standard demanded of present-day industrial organizations. The committee goes further and declares that the men should have been permitted to have representatives of their own choosing; obviously, union representatives are in mind. With this view we have already expressed our disapproval, but that does not blind us to the just criticism regarding the lack of machinery for hearing the grievances of the men.

Crane Runway Difficulties

Repeated experience during the past three or four years made it evident that annoying complexities can turn up unexpectedly even in so straightforward a problem as that of building trestle supports for a traveling bridge crane. At a number of plants working on war contracts, crane runways developed a disconcerting lack of rigidity and had to be reinforced. The direct cause, it is said, was th hard service attendant upon speeding up for increased production. Yet we feel safe in saying that no structure in which sound theory had been strictly taken into account gave trouble even in the stress of those times--though information concerning the difficulties has naturally been kept private. It is a fact

that until relatively recent years empirical practices still held a place in crane-runway design, as they did in various other departments of the structural art. It would be a serious error to undervalue such practices; being crystallized from hard-won experience, they are certain to be for a time far in advance of any conclusions that scientific theory can furnish. But the growth of service conditions is almost certain to render them obsolete in time. Safety lies in frequent cross-checking between practice and theoretical deduction. Hitherto we have had to depend mainly on failures, or cases of incipient failure, for such cross-check. In the present state of the art there is opportunity for applying strain measurement and other methods of precise observation to the purpose. And the field for these methods will grow larger as structures increase in complexity.

Elastic Action and Practical Construction

Some years ago it was still not uncommon to estimate the transverse effects of bridge cranes on their supports by judgment rather than by calculation. As crane requirements became more severe, however, methods were refined, and a modern aspect was given to runway design. Still other phases of the problem are reflected in the remarkably heavy and thoroughly studied Newport News crane runway described in the present issue. This structure was built to meet exceptionally stringent service demands. Great carrying capacity a high degree of rigidity, and the unusual requirement of structural continuity over the full thousand-foot length combined to put a very special problem before the designers. In cases of this kind, difficulties well outside the normal design range confront the engineer, and he must be prepared to apply the full resource of scientific method in dealing with them. Generally speaking, the study of elastic structural action is likely to be found involved as a key point in the problem. The Newport News runway is a clear illustration, and thereby gives evidence of the steadily growing importance of this part of structural theory in practical construction. Except for a few minor expansion joints, the entire mass of steel is an elastic entity, and its design could not be carried through safely unless the distortions and stresses in various directions were kept in view. In particular the rigid-frame analysis made of the transverse bents represents a calculation of a kind that will undoubtedly play a considerable part in future structural engineering.

Nature Confirms Engineers Arguments

Nature sometimes furnishes arguments that are far more convincing to the layman than any well-worked-out plans of engineers, even though the plans are supported with much and sound argument. Last spring, for example the roads of Iowa were rendered almost impassable by a series of rains that never let the road user forget that Iowa was the leading mud-road of the Middle West. Her citizens and high officials had boasted, and with reason, of the dragged earth roads as being superior for most of the year to many surfaced roads. No one, of course, claimed that they were usable 365 days in the year. The engineers knew that a change of view would come, and they graded, dragged and bridged diligently so as to get the best service from what roads they had. The change came when nature sent the rains.

What the rains did in Iowa-- turned public sentiment in favor of the plans advocated by the engineers-- absence of moisture has done in the irrigated districts of Colorado, Wyoming, Utah and Idaho. All of the "dry" farmers in these districts have lost their crops. Storage water in the district east of Denver is at a premium. Only the oldest rights are recognized. For the first time in history of the water-works of Denver, water stored for domestic use (in Cheeseman Lake) has been sold to farmers east of Denver. Storage, and more storage, is in the mind of every farmer. The predictions of the engineers on what would happen without it have come to pass, and no press agent or propagandist could be more effective.

In Utah only those irrigators with rights thirty years old have been recognized since July, and the State Engineer is considering seriously adding on another 10 years. Scanty snowfall in the mountains last winter, and little precipitation since, have brought the flows down to those of record-breaking minimum years. For many years engineers have known that the Jordan and Weber Rivers poured large volumes of storm water into Great Salt Lake. Numerous storage-reservoir sites exist, and the streams are so close together that an interchange system can be worked out within reasonable cost. Eight counties have now been aroused, and more than $10,000 has been raised for an engineering investigation to determine what is feasible. Reclamation of from 100,000 to 200,000 acres, in addition to insuring water from many late filers, is hoped for. The Jordan River filings have never been adjudicated, so the task of gathering data is imperative. Whether Government aid can be obtained or the state or private capital builds the works, nature has brought the residents to the point of taking the first step toward its accomplishment, and the engineers are at work.

In Idaho the American Falls dam project on the Snake River, where a dam higher than any yet built has been a dream of engineers for years, is now clamored for. Only Government aid can assure this, for the cost will be enormous, $13,000,000 or more. However, the losses, that might have been prevented are said to represent a larger total. No wonder that Government officials are followed around by the interested persons wherever they travel in those parts.

The call now is from the man on the farm. The promoter is less in evidence.

Maintenance of Land Drainage Systems

Land drainage is at present confronted with one of the difficulties, lack of appreciation of necessity for maintenance, that seems to beset every engineering act before its processes or structures come under the care of elaborated organizations.

In the development of highway systems we have had the same experience. There was a feeling on the part of the laymen that once built the works would take care of themselves or at least could be cared for

without expert guidance. For that error the public treasury has paid dearly,and today, after a persistent campaign of education by engineers and technical journals, aided by the impassability or roughness of unmaintained roads, road maintenance is established as a necessary function of expert highway administration.

Parallel cases are found in the operation of water purification and sewage disposal plants. Inexperienced attendants, laymen boards contended, were competent to run the plants.

Even today in these three classes of works, ideal conditions do not obtain. The smaller water and sewage plants frequently suffer from inexpert operation, the county and township road systems from inexpert maintenance.

Just so is the condition in drainage work today. Drainage systems are designed by engineers and are built more or less under their supervision,but when completed they are left-- in most cases-- to take care of themselves. Banks slip or fall,silt is deposited, weeds and brush grow,and floating debris accumulates until the channels are choked and flow is restricted. The ditches are designed and built to carry off a certain amount of water in a given time.

If the capacity is reduced, the ground or flood water is not carried off as rapidly as was intended. The water level is kept higher than it should be, and the land may remain wet and unsuitable for cultivation, or crops may be spoiled if not destroyed.

As a rule the remedy adopted consists in local spasmodic attempts at cleaning,but not until after the ditch has fallen into bad condition. Even if the full length of the ditch is cleaned, the results are apt to be unsatisfactory, for the work is done without expert advice. Thus there is likely to be too much or too little excavation, and the designed grade and capacity of the ditch are rarely restored.

To maintain works of this kind in service condition, continual inspection and maintenance under expert supervision are necessary. Some progress in this direction has been made in regard to the operation of pumping plants, but the operation of ditch systems has received little attention. Undoubtedly, there are some well-maintained systems; data regarding the methods of procedure, and observations of the flow and capacity of the ditches over a period of years need to be collected and then disseminated for the general benefit.

Drainage works maintenance will have to be the text for persistent educational propaganda, and in such procedure the citation of works now properly maintained will be of great assistance. For that reason Engineering News-Record solicits correspondence with those who have knowledge of or experience with systems under expert maintenance, to the end that the data may be laid before the profession.

In Next Week's Issue:

The Railway Problem

By Charles Whiting Baker

Consulting Editor, "Engineering News-Record"

Ability vs. Seniority in the Corps of Engineers

No appointment has yet been made to fill the vacancy caused by the retirementon Nov. 1 of Major-Gen. Wm. M. Black as Chief of Engineers, U. S.Army. The Washington correspondence in the news columns of this week's issue, however, indicates a strong trend in favor of Col. (lately Major-Gen.) W. C. Langfitt. A few of the reasons why General Langfitt should be the next Chief of Engineers were set forth by "Engineering News-Record" in its emergency bulletin of Nov.6, published while the printers' strike delayed our regular issues. They may well bear repetition.

His chief claim to recognition rests upon the soundest of foundations-- demonstrated ability. As chief engineer of the American Expeditionary Forces he survived the severest kind of test. He proved conclusively his ability as an executive and a producer of results. If he had not done so it is certain that his tenure of office as head of the overseas Engineer forces would have been short, for General Pershing did not deal gently with department heads who, for one reason or another, failed to meet the exacting demands made upon them.

While General Langfitt is best known for his work as the chief engineer, A. E. F., it should be noted that one of the stepping stones to this post was the command of the American light railway regiments which served much of the time under fire-- with the British armies. An officer well informed on matters concerning the A.E.F., has said that during this detail with the British Gen. Langfitt was under fire oftener than any other American general officer during a similar period. The incident is cited merely to indicate that General Langfitt's experience has been well-rounded. He has seen much of the fighting front and has had the opportunity of learning not from report or manual, but at first hand, the problems of combatant troops as well as those of officers and men assigned to S.O.S. duties. Both are of vital importance in the machinery of modern warfare.

Initiative, vision, personality, knowledge of men, ability to command respect and at the same time win the support and loyalty of subordinates-- that nameless combination of qualities which every really great executive possesses-- must be a part of the next Chief of Engineers. Army men of the old school are not so apt as are those in industry or commerce to evaluate this quality at its true worth. To many of them, officers with silver eagles on their shoulders are all "colonels," cast in the same mold, one as good as another for any job demanding a "colonel". Business, on the other hand, in choosing its executives, attaches great importance to the human or personal element in its leaders. The army must do likewise. The day of the martinet in high office has passed.

War is business organized on a national scale. Business principles must govern the administration of the army's staff corps such as the Corps of Engineers. If the next Chief of Engineers is to be selected on the straight business basis of his ability to fill the job and not on a basis of seniority, the choice of candidates narrows down to a single man--- William C. Langfitt.

What Will Engineers Pay To Improve Their Status?

Readers of "Engineering News-Record" have entered freely into a discussion of the question, "What Will Engineers Pay to Improve Their Status?" An editorial treatment of that question in the issue of Sept. 11 brought numerous replies, some of which follow:

F. Lavis

American International Corporation, New York City.

Probably because I have been away so much, this editorial was the first intimation I had had that the American Society of Civil Engineers had refused to vote an appropriation to forward the work of Engineering Council, and I doubt very much that the action of the annual meeting in regard to this would have been taken in the negative if the matter had been presented in the way it is in your editorial.

Probably most of the members, used to the inertia of the A. Soc. C. E. in regard to public matters and its assumption that it was undignified to do anything more than collect dues, accumulate a surplus and read extremely technical papers, could not realize the possibility of a change, but even the Am. Soc. C. E. has shown signs of life and a little red blood recently, and I believe that if the matter is presented to the membership now, with an adequate statement of the aims and objects of Engineering Council—and if this statement shows that the council will adequately represent the engineering profession as a whole in public matters—there will be an overwhelming response in favor, and no difficulty in getting the necessary funds.

I believe your efforts to obtain greater publicity for this matter are to be commended, and I hope there will be, if necessary, a direct appeal by the council to the members of the profession, as I believe the large majority will support it, as I am prepared to do myself.

R. B. Shepherd, Jr.

Valuation Engineer, Atlantic Coast Line Railroad, Wilmington, N. C.

Personally, I feel that the engineering societies should confine their conscious efforts to the advancement of engineering knowledge and good practice and to the establishment and maintenance of a high moral and ethical status for the engineering profession. The improvement in status to which your editorial is addressed should result from the spontaneous and voluntary recognition of the beneficial activities of the engineers and of work well done.

I should be unwilling to encourage any organization which had as its object the forcing of a better material status from an unresponsive and begrudging public, and I believe that this feeling is shared by many of the engineers with whom I come in contact. A great many, if not most, of the representative engineers of standing are unalterably opposed to any steps or organizations which savor of labor unionism. With regret I am forced to class in this latter category certain combinations of engineers which have arisen of late, and I believe it is to the feeling that their activities are too closely related to labor-union methods that the apathy to which you refer is due.

A. L. Dabney

Consulting Hydraulic Engineer, Memphis, Tenn.

It has come to be the question not "What Will They Pay?" but "What Must Engineers Pay To Improve Their Status?" They must improve it, and general discussions without definite action will not do this. It is to be hoped that general discussion will, however, lead to definite action, which must be had through the instrumentality of a strong organization for the purpose.

The average engineer is too fully engrossed with the problems of his clients to give much thought to his own problems. If he had time to work directly for improving the status of his profession (and with it, as a logical result, his own status), he would not know how to start. He must help to support an organization maintained for the express purpose of doing this for him. He will gladly do so when he understands that the organization is going to "get busy" and bring results. Nearly every other class has bettered its condition by organized effort (for which it has had to pay). Engineers must do the same, or they will become the burden bearers for the rest of mankind.

Your suggestion of a "dramatic presentation" is wise. It is most urgent that the individual engineer be more fully awakened to the necessity for united and whole-hearted action. Having aroused the whole profession from its lethargy in relation to such matters, the next step will be to make such a "dramatic presentation" to the public that the important part of the engineer in the activities of the world will be more fully understood. Instances in great number could be cited, showing a lack of such understanding. The following are fresh in mind:

1. Recently I read a drainage law, enacted as late as 1909 by a nearby legislature. It provides that the court shall allow the engineer not exceeding $5 per day for time actually at work.

2. On a large war construction job where conditions in the mess-halls were not very appetizing, a new and better mess-hall was built, and was stated to be for executive and technical men, and for the women employees. The executive in charge—asserting that he was formerly an engineer (?)—would not issue passes to the engineers, saying they would come in perspiring and dirty. A number of clerks and men in minor positions had passes. There was a wave of indignation among the engineer employees, some proposing to leave the job. We were counseled by our chiefs that we were there to help win the war, and should ignore all such small insults, regarding them merely as petty annoyances. We did; and I think no engineer left because of this or for similar cause.

During the war much was published about the important, if not the predominating, part taken by engineers. Many an engineer, much over draft age, left his own field and entered the military service or went on war work. There was no case within my observation where an engineer tried to avail himself improperly of an advantage due to the urgent need for his services.

The war is over, and we are now at liberty to consider what we owe to ourselves. We must insist upon proper recognition by the Federal Government, by state legislatures and by municipalities in the fixing of engineers' salaries and placing engineers in executive positions. The public must be made to comprehend what we are and what we accomplish. e need an engineers' license law in every state. The status of the profession is much injured because incompetents can take engineering work in most communities. Members of the community get their impression of engineers' standards from the incompetent under their observation.

If Engineering Council has not the authority to go into a "dramatic presentation" by means of letters, magazine and newspaper articles, representation before law-making bodies, etc., its authority should be expanded. If a program for action is then sent out to engineers of every grade, with a request for contributions, for initial expenses, pending definite assessments, I believe a great many will respond liberally. A selected list should be asked for $10 or more; and all others for $2 or more.

Let's do it.

F. H. Newell

President, American Association of Engineers.

In your editorial of September 11, page 492, you touch a point of vital importance at the present time to engineers, when you ask "What Will Engineers Pay to Improve Their Status?" This is a question which many of us have been asking in different words. In particular, as the president of the American Association of Engineers, I have devoted a large part of the summer to personal study of this and related questions. I have visited many of the centers of population, from the Atlantic to the Pacific coast, meeting engineers of all kinds—civil, mechanical, electrical, mining, and chemical—socially and in their offices, obtaining a broad

view of the situation.

It is one which it is hardly necessary to say is seething with unrest. In this it partakes of the prevalent attitude of society, following the great war, but in addition there are forces for discontent at work which are peculiar to the engineering fraternities and which can be relieved only by effective action of its members. Surveying engineers as a whole, there may be distinguished three classes:

First and foremost, a vast army of a million or more, the mechanics, commonly and by legal definition (see dictionary of law terms) know as engineers. To these we of the engineering profession deny the use of the term "engineer," but classify these men as engine runners, or artisans. W do not admit them to our engineering societies nor do they dare to join; they have their own organizations, usually labor unions.

Second, the junior engineers, possibly a hundred thousand strong or perhaps a hundred and fifty thousand. These are the noncommissioned officers of this great army. They are the men who are executing or supervising the details of engineering work, making plans, computations, inspecting and performing innumerable details under general directions of higher officials. These men form the rank and file and pay a large part of the dues of the engineering societies, although but a small minority of the hundred thousand are thus included. They are less well paid, as a rule, than are the mechanics, especially that portion of the million men who are in the labor unions. For this reason they are being urged to join the latter.

Third, are the senior engineers, say ten thousand of them, men who are recognized as skilled in their profession, usually employers of engineers or responsible chiefs of engineering organizations. These are the men who practically control the technical or specialized engineering societies and who are trying to obtain a high standard of technical society activities.

Assuming that these figures are relatively, but not absolutely, correct, we can consider your question as to "What Will the Engineers Pay to Improve Their Status." Those engineers who are the privates in the ranks—namely, the mechanics or artisans—will and do pay large sums to maintain their status through labor unions. They can and will pay millions if necessary to carry out their plans.

What will the one hundred thousand junior engineers or the non-commissioned officers pay? Here is the point on which the American Association of Engineers stakes its future. Experience has shown that these men will pay at least $10 a year, and as much more as may be necessary, provide dthey see a direct benefit and have confidence in their leaders. As fast as they see results achieved they willingly contribute to the funds needed for other enterprises.

In other words, the amount of money which can and will be paid by the junior engineers to improve their status will amount to $1,000,000 or more a year; this will be done just as soon as the men are thoroughly convinced of the fact that their funds are being used wisely and efficiently in producing results. Already over 7000 of the hundred thousand are paying, and the number is increasing at the rate of 1000 a month. From all indications, this rate will double just as soon as better facilities are provided for handling the increased correspondence and details of the business. These men and their wives are beginning to see that their status, their ability to buy food and clothes and obtain decent surroundings, are dependent upon wisely conducted organized effort in their behalf.

How about the ten thousand senior engineers? Apparently they are content: their financial and social standing is assured, they have control of technical societies, each doing excellent work in its own way, in its publications and meetings. The $15 or more which they pay annually is needed to maintain their somewhat elaborately furnished New York offices and library. Relatively few are willing to pay more, because they believe that this sum should be adequate; their imagination is not touched by the somewhat remote projects which are proposed. These men consider themselves, and doubtless are, the "best men" of the profession. They form truly the aristocracy, using this term not in derogatory sense but in its original meaning, "the best people." Their chief anxiety is to maintain high professional standards, and to do this they believe that the only way is to keep the control in the hands of men who have distinguished themselves not so much as leaders of men nor sympathizers with the tims of democracy but as high-grade specialists.

At this time in the evolution of organization of engineers it is worse than useless to try to conceal certain facts, even though these may be unpalatable. One of these is that the great body of engine runners or mechanics—the million privates in the army—have little or no regard for the officers, especially the junior engineers upon whom they look down as being unwilling and unable to unite or to take effective action to obtain adequate pay. They are willing that these men should affiliate with them in their labor unions, knowing that they will be an inconsequential minority.

The second striking fact is that the great body of junior engineers or noncommissioned officers is somewhat distrustful of the seniors, from the human or social standpoint, not in a technical way. Deeply buried in their consciousness is the feeling that these leaders have not been loyal to the trust imposed upon them. The latter have had for a decade the means for securing to the younger men better recognition, in pay and in conditions of employment. They have neglected this trust and, while frequently talking about it, have taken few if any direct steps to help matters. Let anyone visit the larger engineering offices—public, corporate or private—contrast the working conditions of light, ventilation and space provided for the draftsmen and subordinate engineers, or visit the construction camps and see the conditions under which these juniors work. More than this, listen to the daily and hourly discussion, and form your own opinions as to what the juniors think of the men who have advanced technically in the profession and who in doing so seem to have lost many of the attributes of sympathy with the struggles of their subordinates.

It is this condition of the junior engineers that the American Association of Engineers is studying. It is utilizing all of the expedients successfully employed by other organizations of business men. It is ascertaining the wishes of its members: they in turn have a direct, personal control of its officers and activities. Their wishes and suggestions are promptly heeded. The expenses are kept at a minimum and are made known to the individual members so that they may know where their money goes. Every proper device is employed to attract and keep the members and all of the funds or forces available are directed to improve the status of the engineer, and, through him, to benefit the public.

It is now becoming apparent that while the older technical or exclusive societies are needed and are performing valuable functions and should be maintained to continue these functions, yet they cannot and do not have the money, experience and attitude to carry on economic or humanitarian work. For efficiency there must be a larger, more inclusive society, taking in *all professional engineers* and devoting its entire funds and energies to the good of its members. Such an organization is the American Association of Engineers. It is bound to grow, because it is in accord with the spirit of the times and is entirely democratic and responsive to the demands of its members. It is answering the question as to what engineers will pay to improve their status.

It may be asked, What will be the relations of the American Association of Engineers to the older technical organizations? The reply is that it supplements or precedes their activities. The time should soon come when membership in one of the older societies should be conditional upon active membership in the American Association of Engineers. In other words, the older societies may properly demand that a nengineer show his interest in his profession and in his fellowmen by first contributing his share to the American Association to improve and maintain the status of the engineer. Having done so he can be a candidate for participation in technical discussion and for membership to one of the older societies.

D. C. HENNY
Consulting Hydraulic Engineer, Portland, Ore.

In my opinion, engineers will pay generously in services for the purpose of improving their status, and in money far in excess of the small amounts mentioned by you, provided they can be made to see that their contributions will effectively assist in the desired direction.

A proposition to maintain a Washington office of Engineering Council must be shown to be sound and wise, and, for the purpose in view, necessary, and the showing must be made in concise, attractive and attention-compelling manner. A vague claim of advantages to the profession will not answer. Specific objects must be shown, their effect upon the profession and society must be made clear, and the need of funds must be explained in connection with the proposed method of their expenditure.

In all of these respects the question, assuming the cause to be worthy, is one of efficient advertising. The success or lack of success which has attended the specific case cited by you is, I believe, a true measure of the efficiency of the previous advertising, because engineers, as I know them, respond as readily to broad demands upon them as do the members of any other profession.

THEODORE F. SEELYE
Gannett, Seelye & Flemming, Harrisburg, Penn.

I venture to say that comparatively few engineers have any idea of the aims and purposes of Engineering Council, primarily through the failure of its promoters to present to the profession the objects of its organization. I believe that no body of professional men is more jealous of its dignity than the engineering profession, and I cannot conceive a deliberate inattention to a matter which has such high possibilities for them.

During the late war the engineers, through their large efforts, added much to their prestige, and it is certainly up to them to back Engineering Council financially or otherwise, to maintain and enhance this prestige.

W. L. BUTCHER
Consulting Engineer, Boston, Mass.

I am impressed with your reference to the promotion work for Engineering Council. There appears to be a lack of knowledge among engineers as to the function of Engineering Council, and I have heard one engineer state that after listening to an exposition of the council by one of the members thereof he (the engineer) still remained somewhat hazy as to the council's function and thought that this was partly due to the possibility that the council's members did not exactly understand their own status.

It is, of course, axiomatic that to "sell" a proposition one must understand perfectly the goods he has to sell and believe implicitly in them.

It seems to me that to "sell" Engineering Council to the members of the engineering profession its exact aims must be more faithfully set forth than has so far been the case.

WENDELL M. BUTTS
San Francisco, Calif.

A change in the status of the engineer must be made. It must be made by leaders who are more than animated slide rules and cost reducers in their everyday life. Men who are magnanimous leaders at society meetings and in professional publications, but carry their words no further, are not what is needed. These we have had before, and they have not succeeded in any measure. Let us have men with the red blood of today in their veins, let them raise a standard that means action and promises some success, and we younger members will contribute heartily.

The method of educating the American public to an appreciation of the value of the engineer to the community is almost hopeless. This method is put forward by theorists who fail to grasp one fact—the American people will no tpay for anything they do not *have to*. Appreciation and gratitude are located quite distant from the pocket-book in the American anatomy. The American business man, guided by his engineer who knows on just how much an engineer can starve through, is anything but generous.

The writer is just enough of the conservative to hope that the time will not come when the engineering profession will be affiliated with the labor union. Not that he sees the labor union as an enemy to society. The labor union is one of the greatest forces for true democracy in the country. It fights the fight o fthe many against the few; it is misled at times, but not more so than its enemies.

Unless the more conservative elements in the profession do something, however, the younger man, just entering the field, will join such unions en masse. The union offers the quickest remedy for inadequate income—and, say what you will, ethics do not pay grocery and doctor bills.

Let us think up a movement that can force the men who have the say to increase our compensation to somewhere near where it ought to be, and yet let us temper the movement with some of the ethics our seniors have written for us. Come now, let us hear what you have to say. Let us agree on something, and we will back it with more than one dollar, more than three dollars, and more than five dollars a year.

J. C. STEVENS
Consulting Engineer, Portland, Oregon

ENGINEERING NEWS-RECORD has, in my opinion, stated the problem correctly, that engineers will pay for civic and welfare work if the matter is properly and persistently presented to them. I doubt if 60 per cent. of the engineers in the country really know what Engineering Council is and what its intentions are. The question of a dollar a year or five or ten dollars a year is not material.

If a campaign is undertaken to enlighten the engineers of the country on the organization, activities and needs of Engineering Council, I am quite sure there will be no lack of funds to carry forward its work.

Steam and Electric Draglines Compared

A direct comparison of the relative merits of steam and electricity as motive power for large dragline excavators has been obtained in the Englewood dam excavation work of the Miami Conservancy District, at Englewood, Ohio. H. S. McCurdy, engineer in charge for the district at Englewood, gave the results in a paper presented to the New England Water Works Association, Sept. 30, 1919. Material for the Englewood dam is excavated from a borrowpit upstream of the dam, by two 115-ton dragline excavators equipped with 85-ft. boom and 4½-yd. bucket. One of the two machines is electric- and the other steam-operated. They work on the same track, one about 1000 ft. in advance of the other, and their operating results therefore are directly comparable. With electricity at slightly less than 1.6c. per kilowatt-hour, the steam dragline is somewhat more expensive. It is more rapid in operation, but the cost of coaling runs the unit cost of excavation above that of the electric dragline. Each of the machines can comfortably move 150 to 180 cu.yd. per hour, working on a 15-ft. face and loading into standard gage 12-yd. air dump cars.

A general discussion of the use of electric power on the Miami work was given in *Engineering News-Record* of Aug. 28, 1919, p. 417. In that article the statement was made (p. 420) that "with all costs on both sides fully presented, electric power is not much, if at all, less expensive than steam power might be." The statement of Mr. McCurdy furnishes a specific demonstration in support of this statement.

Heavy Double Trestle for Shipbuilding Cranes Over Newport News Battle-Cruiser Berths

Long Runway Without Expansion Joints—75-Ton and 15-Ton Cranes on Same Rails—Truss Loads Divided Between Tower Columns—Transverse Framing Statically Indeterminate

By R. W. Burpee
Engineer, McClintic-Marshall Construction Company, Pittsburgh, Penn.

In the construction of a recently completed double crane trestle over two new shipbuilding berths at the yard of the Newport News Shipbuilding & Drydock Co., Newport News, Va., it was necessary to resort to a design of highly individual character, partly because of the great size and loading of the structure, and partly because of the requirement that no expansion joints should be used in the length of nearly 1000 ft. The problem of dealing with longitudinal stresses in the structure was obviously made difficult by this requirement. In addition, the design was controlled by the necessity of providing heavy cranes for the maximum lifts and lighter cranes for ordinary service, and the use of different spans for the light and heavy cranes. Economy in metal was an important matter on account of the tonnage of steel involved, and it therefore received careful study.

The 1916 naval building program provided for battle cruisers 870 ft. long. The Newport News Shipbuilding & Dry Dock Co. obtained a contract for two of these ships and immediately started preparations for building them. Shipbuilding cranes and trestles much larger than any previously constructed in this country were necessary for this service, and under the special conditions already mentioned the structure described in the present article resulted.

Study of the general plan and elevations (Fig. 2) will show that the trestle covers two shipways, each with a clear working space about 130 ft. wide by 118 ft. high; its length is slightly over 1000 ft. Each shipway is equipped with one 75-ton crane spanning the full width (132 ft. 8½ in. c. to c. of rails), and four 15-ton cranes of a length equal to half the span, arranged two in each of the two runways formed (in conjunction with the outer crane rails) by a double line of crane girders supported over the middle of the berth.



FIG. 1. BRACED BAY OF NEWPORT NEWS DOUBLE SHIPBUILDING CRANE TRESTLE

In this connection, it should be observed that the outer ends of the 15-ton cranes use the same rails as the 75-ton crane, and that the latter is located on the outshore side of the small cranes. This arrangement prevents the small cranes from passing the large crane, which has to be used only at infrequent intervals during the erection of the ship, and then mainly at the stern end. The economy of this arrangement is evident, as it will be seen that provision for the cranes to pass would require two additional lines of trusses the full length of each trestle, and would thus involve a large increase in the cost of the structure.

An interesting arrangement of cranes provides for the supply of material to the berth. As Fig. 2 shows, the main body of the runway is composed of eight bays, each 113 ft. 5¼ in. long, but at the landward end there is a 75-ft. bay supplemented by a 40-ft. cantilever. Through the 75-ft. bay extends a transverse crane runway of 62-ft. span, which brings material from the various shops extending backward from it, and places it under the shipbuilding trestle. Cranes running out of each of the shops bring material to points directly alongside the transverse runway, where it is picked up by an extension arm on the crane which travels on this runway; when the crane moves forward, the arm is drawn in to clear the runway posts. Ordinarily, the material placed under the shipbuilding trestle by the transverse crane is picked up by the 15-ton shipbuilding cranes, but, in order to make it possible for the 75-ton crane to operate here also, the 40-ft. cantilever extension of the trestle was provided; when the four 15-ton cranes are run out on this cantilever extension the 75-ton crane can command the bay over the transverse runway and pick up and handle heavy material to the ship.

In the preliminary design of the trestles, further consideration was given to the limited use of the 75-ton crane. It was then proposed to add a cantilever at the west end on which a transfer bridge would be provided capable of transferring the crane from one aisle to the other. The cost of the transfer bridge was, however, found to exceed the cost of the second 75-ton crane, which fact resulted in the elimination of the transfer scheme.

Expansion Joints Barred by Specifications

It was required by the specifications that in order to assure smooth running of the cranes there should be no expansion joints in the trestle, and this became a governing feature of the design. Longitudinal bracing, therefore, had to be limited to one braced bay at mid-length of the structure, leaving the trestle free to expand longitudinally either way from the middle. Since this expansion would be of large amount, the towers had to be made relatively flexible if excessive temperature stresses were to be avoided. To obtain flexibility, the transverse bents of the towers were spaced 6½ ft. on centers longitudinally.

Absence of expansion joints would at first appear to add materially to the weight of the structure, due to additional stress set up, but careful consideration of the effect of temperature tends to show that the additional metal required is approximately the same as would be consumed in addi-

tional bracing and expansion details. The expansion joints would have been extremely heavy and difficult of design, especially at the intersection of the intermediate longitudinal trusses (I, Fig. 2) with the main transverse trusses (G).

The horizontal movement of the tower tops due to temperature expansion increases from zero at the braced bay to a minimum of plus or minus 2 in., these amounts being computed for a variation of 60 deg. either way, or from zero to 120 deg. F. In calculating the resulting stresses, two different conditions were assumed as giving upper and lower limits: (1) Towers fixed at base and free at top, and (2) towers fixed at both top and bottom. The actual stresses are undoubtedly somewhere between these limits, being more nearly represented by the second case. However, the maximum values found were used. In the extreme towers they produced column stresses as high as —219,000 pounds.

The longitudinal wind and temperature stresses were carried through the truss system by the members shown in heavy outline in Fig. 3. The stresses in the members "*a*" and the shears *s* between trusses and towers are given in the table below, from which it will be noted that a force of 21,000 lb. is developed by the resistance to a 2-in. deflection of the end towers of the central line. At the other towers the force *s* is less, due to the reduced movement. The individual tower shears accumulate in the members "*a*," giving a maximum stress of 53,000 lb. in the middle span.

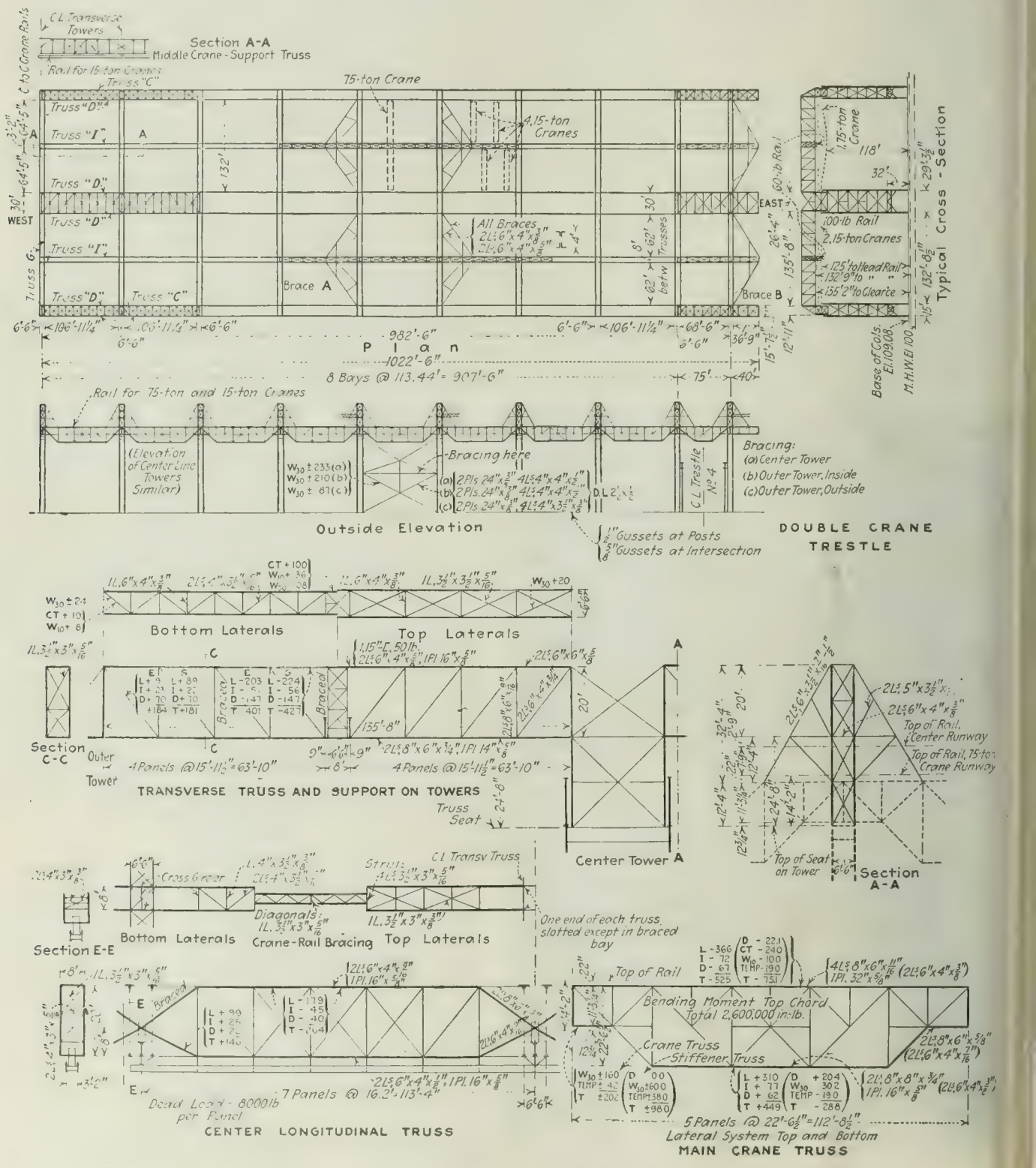


FIG. 2. GENERAL DESIGN OF TRESTLE OVER NEW BATTLESHIP BERTHS AT NEWPORT NEWS

STRESSES IN MEMBERS "a" DUE TO LONGITUDINAL WIND AND TEMPERATURE

(All stresses plus or minus)

Span	Center tower			Outer Tower Inside			Outer Tower Outside		
	W30	Temp.	Total	W30	Temp	Total	W30	Temp.	Total
End	40	21	61	36	20	56	15	18	33
2nd	80	37	117	72	35	107	30	32	62
3rd	120	48	168	108	45	153	45	42	87
4th	160	53	213	144	50	194	60	47	107
5th	200	53	253	180	50	230	75	47	122

STRESSES (s) TRANSFERRED FROM TOWERS TO TRUSSES DUE TO WIND AND TEMPERATURE

Span	Center tower			Outer Tower Inside			Outer Tower Outside		
	W30	Temp.	Total	W30	Temp.	Total	W30	Temp.	Total
End	40	21	61	36	20	56	15	18	33
2nd	40	16	56	36	15	51	15	14	29
3rd	40	11	51	36	10	46	15	10	25
4th	40	5	45	36	5	41	15	5	20
5th	360	0	360	324	0	324	135	0	135

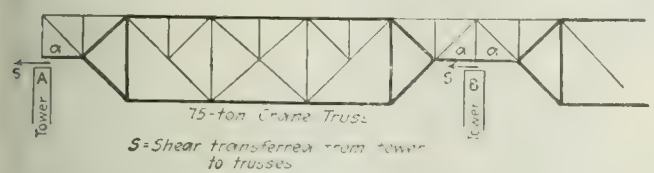


FIG. 3. PATH OF WIND AND TEMPERATURE STRESSES THROUGH MAIN TRUSSES

Considering the wind forces, we find from the same table that the force which transfers from trusses to towers at the braced bay is large, consisting of 200,000 lb. coming through the member "a" in compression from the windward end of the runway and 160,000 lb. coming in tension from the leeward end, thus giving 360,000 lb. shear between the towers and the trusses. The necessity of giving proper attention to accumulating wind forces on large structures is here clearly shown. It is again shown in the case of the transverse portals in the lower story of the towers, which provide for material-track and locomotive-crane operation. These portals carry larger horizontal wind forces than most bridge portals, and the column sections were more than doubled in area to carry the resulting bending stresses (see cover-plate arrangement in Fig. 6).

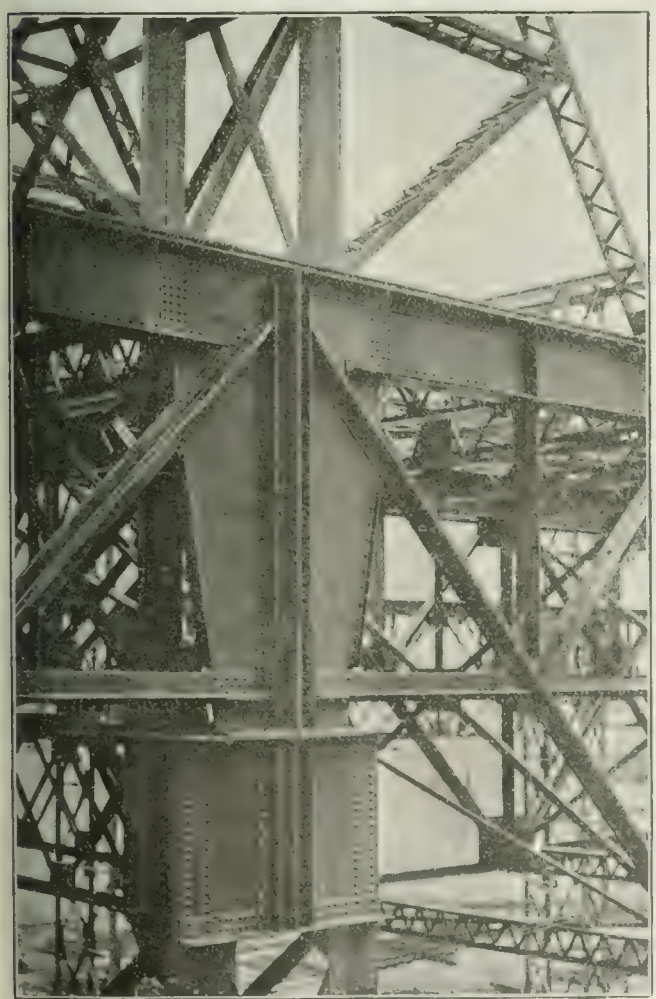


FIG. 4. EQUALIZER GIRDER AND SEAT OF MAIN TRUSSES

Design for Crane Loading

It was required by the specifications governing the loading that the main trusses should be designed to carry the 75-ton crane only. While it is true that the 15-ton cranes might also be on the same span, the probability of both being loaded to capacity at the same time is very small. The increased stresses due to this possible condition are found to be less than 30 per cent. in all cases; overstraining steel to this extent on rare occasions is allowable, and the material saved justifies the condition of loading specified. If such combined loads, however, created excessive stresses and necessitated strict field observance of the specified load conditions, we do not believe that any designer would be justified in placing such responsibility on the field forces.

The 75-ton crane has four wheels per rail, carrying 79,000 lb. each, spaced 6 ft., 15 ft., 6 ft. Two 15-ton cranes close together also have four wheels per rail, carrying 38,000 lb. each, at 15 ft., 3 ft., 15 ft. These are actual wheel loads; they were increased 25 per cent. for impact, in designing.

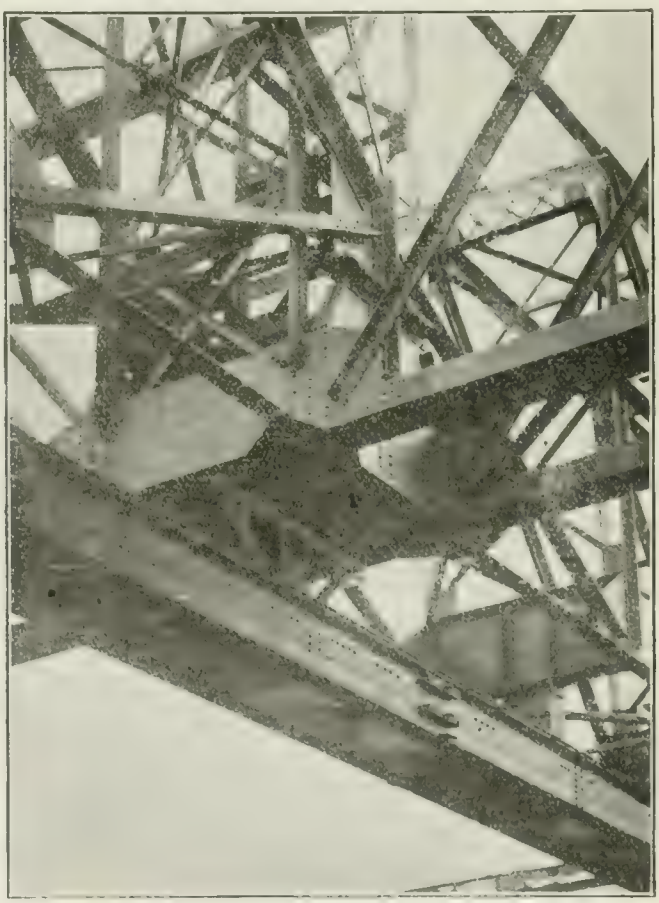
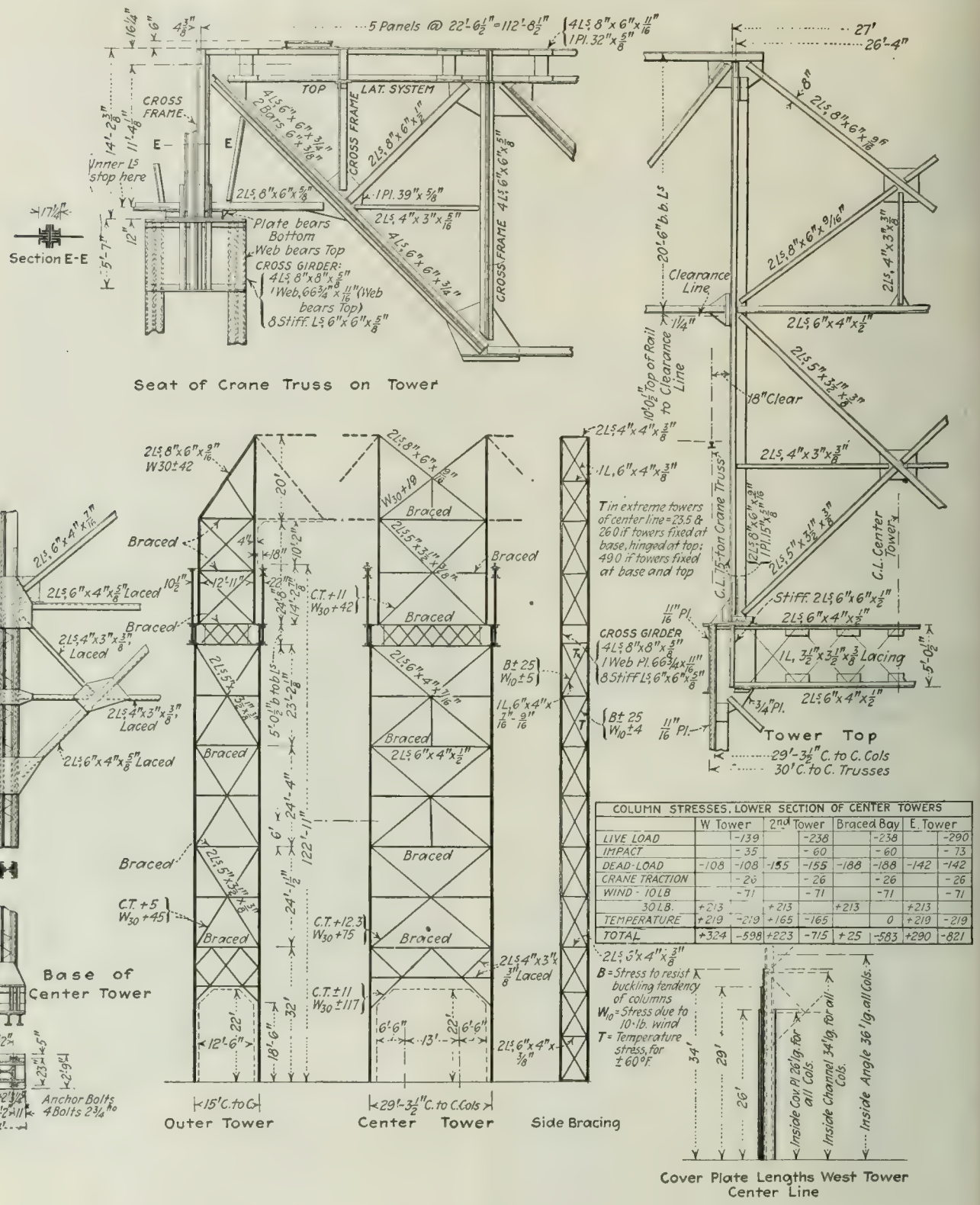


FIG. 5. INTERSECTION OF TRANSVERSE AND INTERMEDIATE LONGITUDINAL TRUSSES

The crane thrust (in transverse direction) was taken at 10 per cent. of the lifted load, and the traction (longitudinal to the trestle) at 25 per cent. of the total wheel loads. Unit stresses ranging from 16,000 to 20,000 lb. per square inch were allowed for various combinations of stresses. Wind pressure was taken into account at 10 lb. per square foot for the loaded structure and 30 lb. per square foot for the unloaded structure.



COLUMN STRESSES, LOWER SECTION OF CENTER TOWERS	W Tower		2nd Tower		Braced Bay		E. Tower	
LIVE LOAD		-139		-238		-238		-290
IMPACT		- 35		- 60		- 60		- 73
DEAD-LOAD	-108	-108	-155	-155	-188	-188	-142	-142
CRANE TRACTION		- 26		- 26		- 26		- 26
WIND - 10 LB		- 71		- 71		- 71		- 71
30 LB.	+213		+213		+213		+213	
TEMPERATURE	+219	-219	+165	-165		0	+219	-219
TOTAL	+324	-598	+223	-715	+25	-583	+290	-821

FIGS. 6 AND 7. FRAMING AND TYPICAL DETAILS OF CENTER TOWER AND SEAT OF MAIN TRUSSES

Division of Truss Loads Between Tower Posts

The towers are of four-post construction, and as previously mentioned the bents are set 6½ ft. c. to c. longitudinally. In the transverse direction the towers of the central line are 29 ft. 3½ in. wide and the outer towers are 15 ft. wide. These towers are about 109 ft. high. On each side of the tower, parallel to the axis of the trestle, a cross-girder 66 in. deep is framed between the posts; the main longitudinal trusses are carried by a pedestal on the center of this girder. This arrangement divides all the truss loads between the two tower posts. Since a direct connection of trusse sand posts would have concentrated the maximum truss reaction on a single post, a considerable amount of metal was saved.

Transversely the two posts of each bent are connected by a lattice girder 60 in. deep, on which the narrower top section of the tower is supported. The top section carries that part of the structure which forms the support for the 15-ton cranes ove rthe middle of the aisle. To clear the main crane-girder rails, the posts of this part of the tower are set back 18 in.; their tops are stiffened by an A-frame (see side elevation in Fig. 2- to the cross-frames of the main trusses.

The main crane-girder trusses (D) are 22 ft. 6½ in.

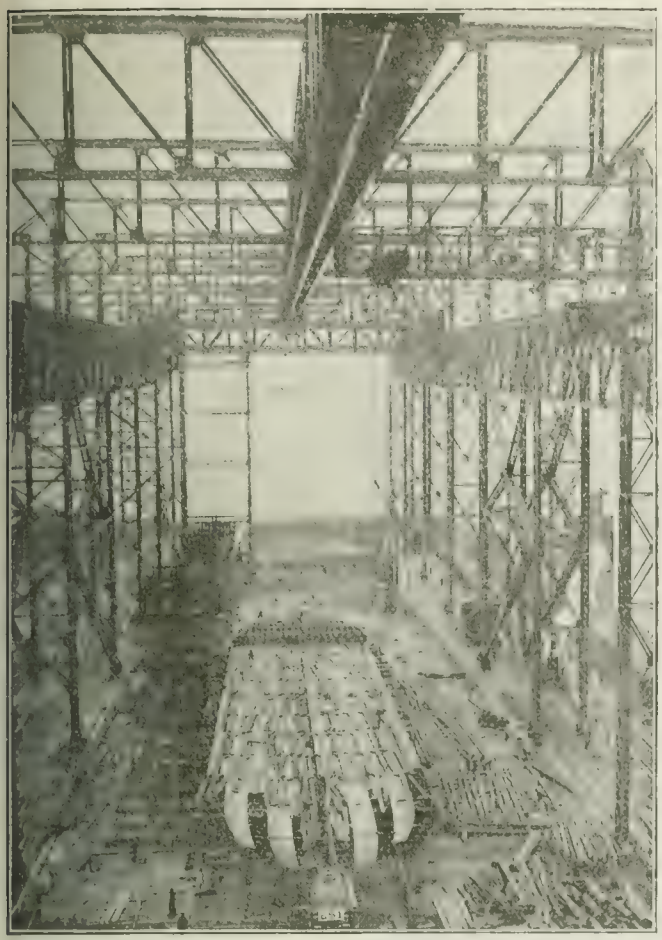


FIG. 8 —ABOVE—ONE AISLE OF DOUBLE CRANE TRESTLE

deep c. to c. of chords and are of the single-web type. The top chord, made up of four angles 8 x 6 x 11/16 in. and one web 32 x ⅝ in., carries the crane rail direct. This member is designed for a direct compression of 525,000 lb. and a maximum bending of 2,600,000 in.-lb. The center line of the top chord is about 12 ft. above the cross-girder of the towers, thus requiring an end post and bringing the seat on the cross-girder at approximately the neutral axis of the trusses; the bottom of the end post is connected by a horizontal member to the subpanel point on the end diagonal (Fig. 4). The seat being at the neutral axis, no change in length between towers occurs due to live loads. These end posts are built up of four angles 8 x 6 x 9/16 in. with the gusset-plate continuous between seat and top chord. The out-to-out length of the spans is ¾ in. shorter than the bay length; the opening of ¾ in. thus formed between spans is filled at the seat only, and the spans are riveted together through the filler only, so that the continuity of the spans is broken except for the rails. The continuous gussets practically make the top of the tower fixed, as previously mentioned. The detail was used with this point in view, in order to remove as far as possible the deformations due to live load which would result in the upper towers and main trusses if the top of the towers were free.

As the top chord of the crane truss constitutes the crane girder, and its upper flange angles therefore support the crane rail, the web of the chord was carried up to full depth and then chipped, to give a metal-to-metal seat of the rail and relieve the flange rivets from load shear. Furthermore, in order to hold the chord rigidly against twisting, cross-frames with deep latticed struts as upper members were used. The two parallel lines of main trusses on the center towers are joined by a cross-frame at each panel-point and by full top and bottom lateral systems. The single main truss of the outer line is similarly braced to a stiffening truss of the same outline as the main truss.

The supporting system for the two lines of crane rail over the middle of each shipway consists of the transverse trusses G, which with the towers form an indeterminate

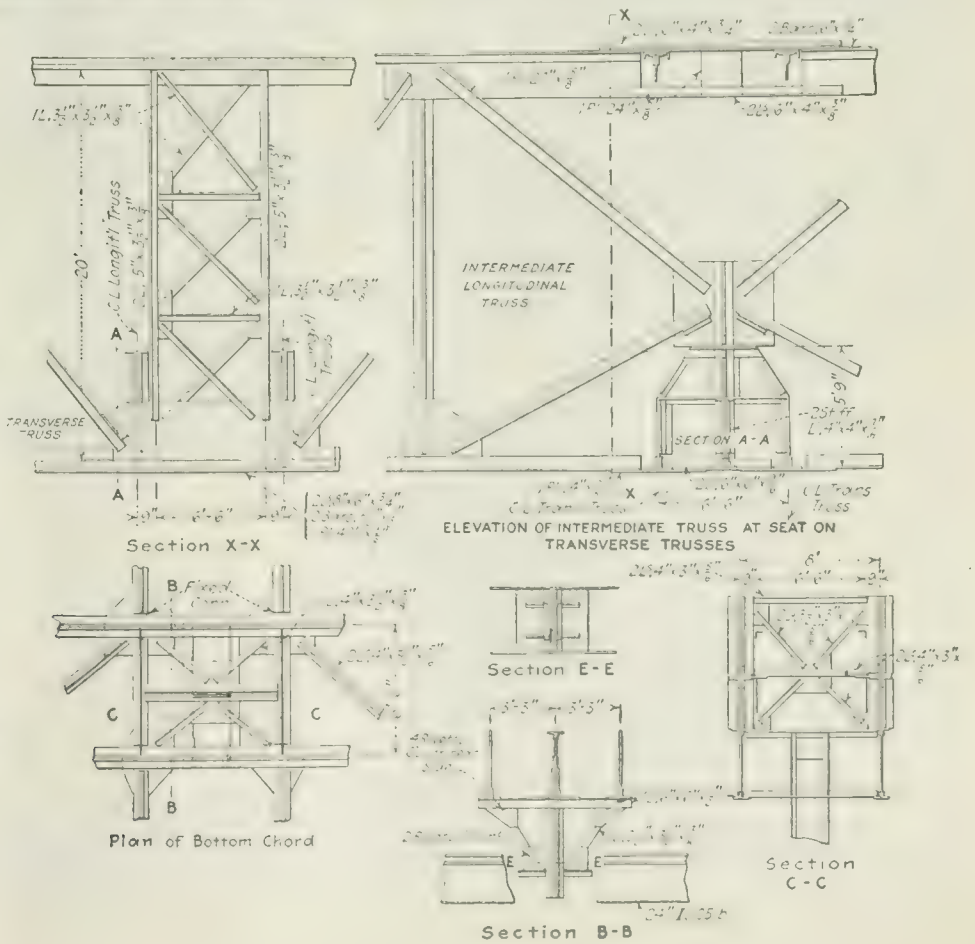


FIG. 9 —BELOW—SEAT OF INTERMEDIATE LONGITUDINAL TRUSSES

frame (see cross-section of trestle in Fig. 2). At the center of these trusses are supported the center longitudinal trusses I, under which are carried the 24-in. I-beam runways for the inner ends of the 15-ton cranes. These I-beam runways are 3 ft. 2 in. apart c. to c. and are jointly supported by hangers from cross-girders between the trusses I. The trusses, spaced 8 ft. apart, are divided into panels 16.2 ft. long; there is a cross-girder and runway hanger at each panel joint.

Top and bottom chords of trusses I are parallel except in the end panels, where they converge to a point just below their neutral axis, connecting to a shoe seated on a cross-girder between the transverse trusses G. The vertical forces from these trusses are thus divided equally between the transverse trusses.* The intersection of the two truss systems (Fig. 9) involves many combinations of vertical and horizontal forces and forms a very interesting problem in detailing.

The longitudinal forces developed in the center support system, which is continuous through the I-beam runways from end to end, are transferred to the braced towers by means of the bracing frames A, Fig. 2; the transverse forces on the cantilever at the east end are transmitted to the towers by similar braces.

The most important problem of this design, from an engineering and theoretical standpoint, is the solution of the continuous frame formed by the transverse trusses and towers. This solution for the effect of live load involves the use of the theory of least work with six unknown forces. A complete solution of this problem will be given in a subsequent article, as several points of special interest to future work were noted in the course of this computation.

*Mr. Wolfel advises that this construction is a modification of a similar arrangement used on a Government runway built by the American Bridge Company.—R. W. B.

The trestle is now completed and in operation. The following officials of the Newport News & Dry Dock Co. were in charge of the work and were responsible for the special features of the design as previously mentioned: H. L. Ferguson, president and general manager; F. P. Palen, vice president, and Godfrey L. Smith, civil engineer; the general layout was prepared by Mr. Smith. The steelwork was designed, fabricated and erected by the McClintic-Marshall Co., P. L. Wolfel, chief engineer, and D. S. Gendell, Jr., manager of erection. The writer was in immediate charge of the design.

Multiple Outlet Provides for Variable Sewage Flow

Regulation and Distribution of Sewage Discharge Through Seven Outlets Into Calumet-Sag Canal

By S. T. Smetters

Assistant Bridge Engineer, Sanitary District of Chicago.

A MULTIPLE outlet of 1000 sec.-ft. capacity will deliver the flow of sewage and storm water from 14,600 acres to the new Calumet-Sag channel of the Sanitary District of Chicago. The sewage will enter a five-compartment discharge chamber having seven outlets up through the bottom of the channel. Dry-weather flow will be handled by the center compartment, which has three outlets. As storm water increases the normal dry-weather flow, the side compartments, each having one outlet, will come into operation

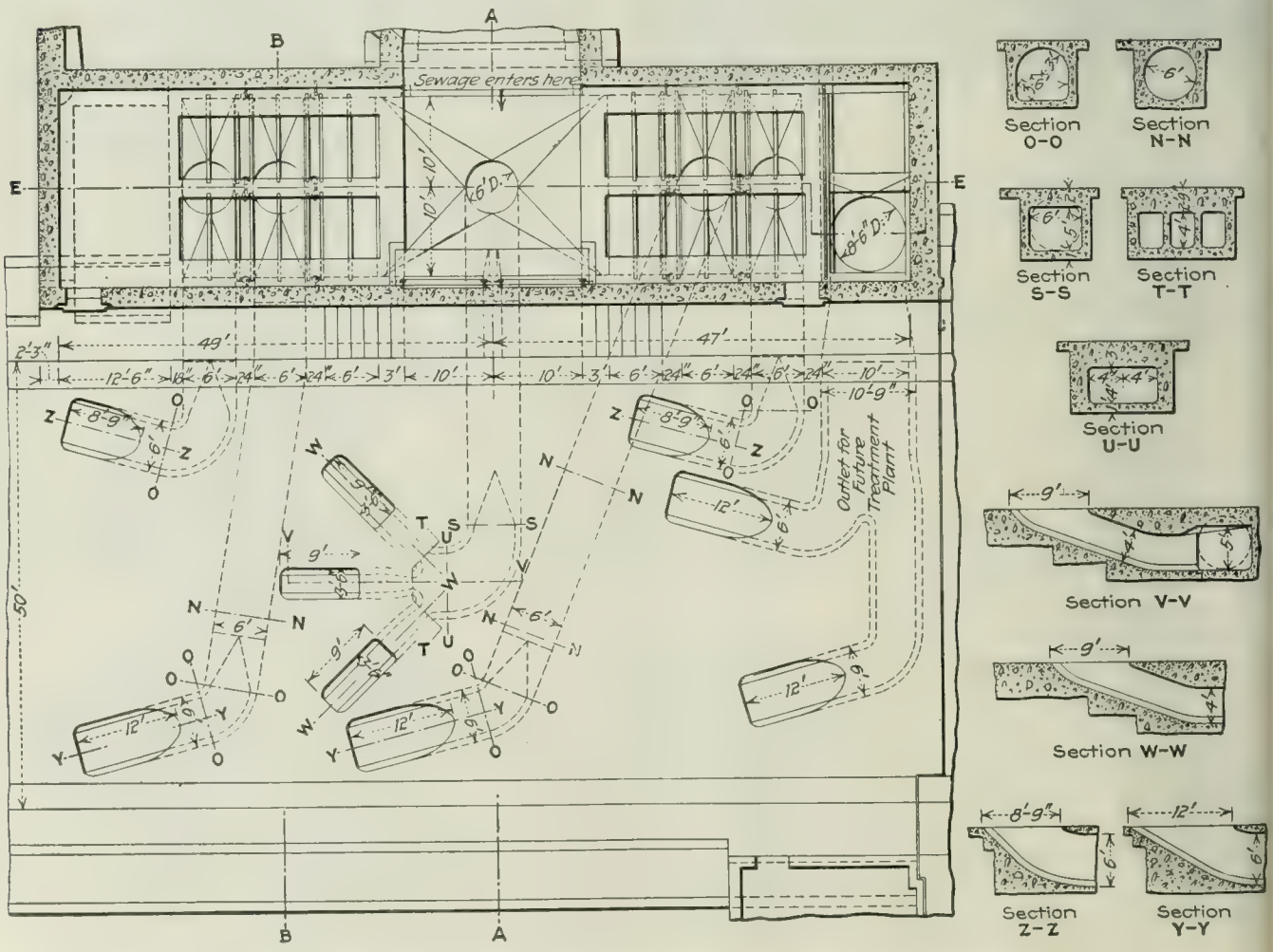


FIG. 1. PLAN OF MULTIPLE SEWER OUTLET INTO CALUMET-SAG CANAL

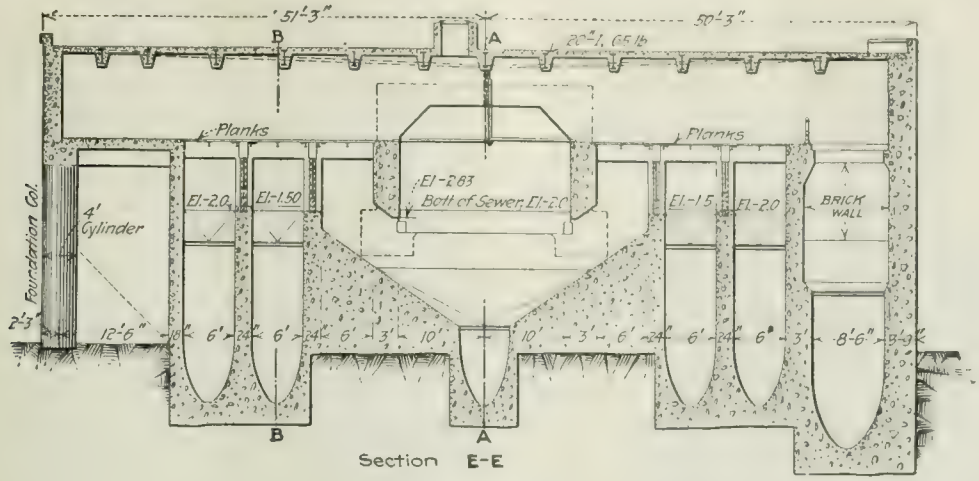


FIG. 2. LONGITUDINAL SECTION THROUGH OUTLET DISCHARGE CHAMBER

in pairs until all seven outlets are discharging to capacity.

The principal service features secured by the arrangement are: (1) a discharge capacity proportional to the volume of sewage being delivered without objectionable loss of velocity when the volume is minimum; (2) a division of the outlet into five units which can be closed off in several combinations to permit examination or to control the direction and the intensity of the flow; (3) the delivery of the discharge in the direction of the canal current and its distribution over a considerable area of the canal prism; (4) the provision of a safety overflow to prevent a clogged screen from backing up the water in the sewer; (5) the elimination of landing places for sediment.

From the Calumet River, about 1½ miles east of Blue Island, the Calumet-Sag channel extends west to a junction with the main drainage channel at Sag. Receiving sewage at its east end and taking flushing water from the Calumet River, the new channel flows west. The sewer outlet is located near the east end, where the channel consists of concrete walls 50 ft. apart on a rock bottom. The outlet occupies an area, under the channel and on the north side, of about 100 x 85 ft. The maximum estimated flow of the 14,600 acres drained is 1000 sec.-ft. Ultimately, at the same place, sewage from a treatment plant will be discharged by a separate, twin-outlet receiving chamber or compartment.

The sewage is received in a rectangular discharge chamber having five compartments, two on each side of a central compartment which is directly in front of the sewer entrance. From the hopper bottom of each compartment a

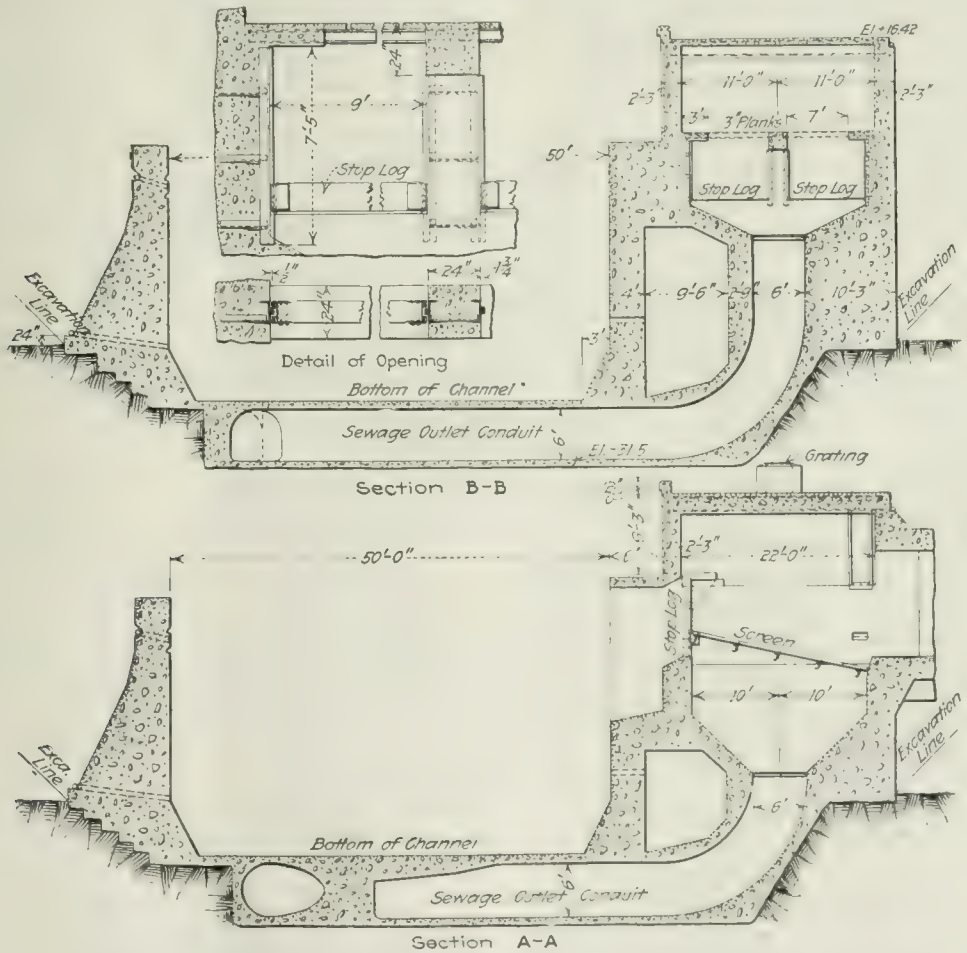


FIG. 3. SECTIONS THROUGH TYPICAL HOPPERS AND DISCHARGE TUBES

6-ft. tube leads down and out under the canal bottom, and at the end curves upward to one or more horizontal openings in the canal bottom. The arrangement of these outlets, as indicated by the plan, Fig. 1, is such that the discharge of the sewage into the channel will be distributed over a wide area and will be in the direction of the current. The area of each tube is 28.3 sq.ft. and the combined areas

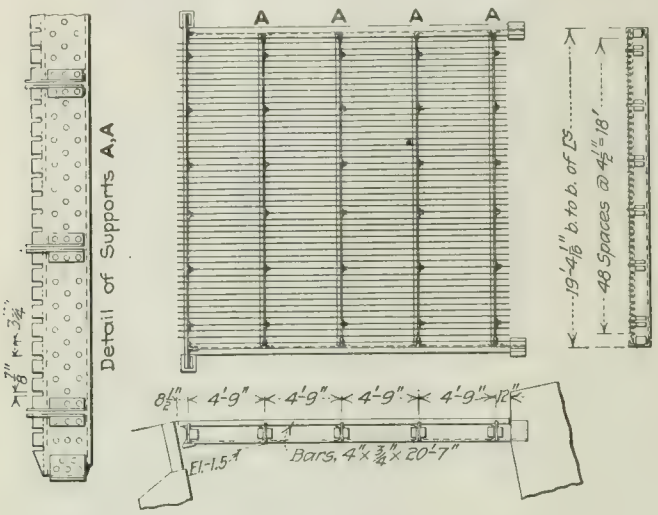


FIG. 4 DETAILS OF SEWAGE SCREEN

of all five tubes gives, at a velocity of about 7 ft. per second, a discharge capacity of 1000 sec.-ft. A head of 1 ft. gives about 7 ft. per second velocity.

The central compartment hopper is the largest and is at the lowest elevation. This hopper receives the dry-weather flow, and, always, all the heavier solids contained in the sewage. Its discharge tube has three outlets, whose combined area is virtually equal to the area of the tube, so that the velocity of flow will be uniform and settlement of solids will not be encouraged. For the same reason the outlet openings are spooned out, as shown by the sections, so that the current will keep them clean.

When storm water increases the volume of sewage beyond the capacity of the central discharge tube, the surplus passes under the baffle girders shown by Fig. 2 and enters the nearest right and left side compartments. When these two discharge tubes have reached their capacity the surplus passes to the extreme right and left end compartments. Flow into the side compartments is regulated by the difference in the heights of the concrete weir walls, and is further controlled as may be desired by closing the entrance openings partly or completely by stop lugs. Only in case of storm-water flow will the side compartments come into operation.

The sewer discharges into the central compartment, over which is a 20 x 20-ft. screen, with side girders in line with the side walls of the sewer, as shown by section AA, Fig. 3. This screen is inclined about 4 ft. in 20 ft., with its low edge at El. —1 and its high edge at El. +1. It was considered that two reasons favored the inclined screen. (1) It could be more easily cleaned and (2) if clogging occurred there would be less backing up of the water in the sewer than would be the condition if a vertical screen were used. In case of complete stoppage of the screen the water can overflow the top and enter the channel through the wall opening shown by Section AA, Fig. 3. The screen construction is shown by Fig. 4, and is distinctive in the respect that each screen bar is separate and removable.

Structurally the outlet includes only one unusual detail, all parts being concrete, with walls, partitions, girders and other slender parts reinforced as the conditions required. The hopper bottoms are unusual in the respect that they combine pyramidal and conical elements in a manner most clearly shown by the central hopper. With this combination there are no landing surfaces to encourage deposits of solids at the mouths of the circular inlets. Form construction was but very slightly complicated by the arrangement, as one pattern served for the four cone elements of the central hopper and another served for all the cone elements of the four side hoppers. Similarly, the conduit parts, as shown by Fig. 1, were duplicates and permitted the use of knockdown forms.

By means of the stop-lug dams any one of the side compartments can be closed against flow and examined by a diver. To close off the central discharge tube for examination a portion of the screen is removed and a steel cofferdam is placed. This cofferdam consists of a 3-ft. tube with the bottom belled out to 6-ft. diameter to fit into the cast-iron ring at the mouth of the discharge tube. While this cofferdam is in place the flow is diverted into the side hoppers.

The structure was designed by the writer, under the direction of C. R. Dart, bridge engineer, and G. M. Wisner, chief engineer, Sanitary District of Chicago.

Common Errors in Detailing Steelwork for Buildings

Weak Details of Three Main Types—Eccentric Connections of Beams to Girders or Columns Often Inadequate—Problems of Cantilever Beams—Strength of Curved Girders

By Edward Godfrey
Structural Engineer, Pittsburgh, Penn.

STANDARDIZATION in structural design tends to uniformity in both strength of details and workmanship. Uniformity in shopwork makes for economy, and no engineer can ignore economy. Uniformity in strength of details makes for safety, and no engineer can ignore safety. Safety should be the first concern of the engineer, but often it does not get the consideration that it should; so much attention is given the matter of designing economically that the safety of structures frequently receives secondary consideration.

The details and methods of design that are standardized are, of course, plain, straight work. There is no excuse for such to be other than safe. Departure from safe design and details is found generally in cases that appear to be but are not standard, and in cases that patently do not come within the range of the standards.

There are some errors of design that the writer has met with so frequently that in his mind he has classified them. The greater part of them occur in cases falling into three general classes: (1) Eccentric loads; (2) cantilever beams; (3) curve beams.

Eccentric Load Due to Column Bracket

In dealing with eccentric loading errors of design as well as of detail are frequent. A very common case of the former is found in the eccentric application of the load of beams or girders to columns. To be ultra-theoretical, of course, every case of beam connection to columns might be considered eccentric, but one of the things that the writer strives to avoid is fine-spun theory. He has given the matter of failures much study, and has yet to find a single failure where fine theory needs to be brought in to explain the cause.

In order to make clear what is and what is not practically central loading of columns, a few examples may be cited as illustrations. The ordinary case of a column with beams or girders connecting on all sides is,

of course a case of balanced loading, and need give no concern from the standpoint of eccentric loading, unless the load on one side is greatly in excess of that on the other side. When the latter is the case, there may be a bending stress worth considering. It is better and more economical, however, to make the details such that the bending moment is thrown into the girder instead of the column. It may sound odd or even improper to some minds to speak of shifting moments around in this manner by mere altering of details, but to the writer's mind this is one of the very important facts of structural detail designing. Engineers must learn to couple the theory of the toughness of steel with the theory of elasticity. A pertinent illustration will be given to show up this thing, which the writer believes should have a big place in all structural-engineering instruction.

Given the case shown in Fig. 1 at (*a*). Here is a heavy girder seated on a bracket at one side of a building column. The load is eccentric, and as it is the greater part of the load on the column the unit stress might easily be doubled or tripled by reason of the eccentricity. It is easy to see how this could cause the column to bend or even to fail, for the girder cannot assist the column in taking the bending moment due to the eccentric application of the load. But take the same girder and the same column and make the detail as at (*b*) in Fig. 1, and the case is quite different. By a little alteration in detail what might have been a dangerous piece of construction has been rendered perfectly safe. Considered merely as a detail to support vertical loads, either connection gives ample security, but from other standpoints the two are not equivalent.

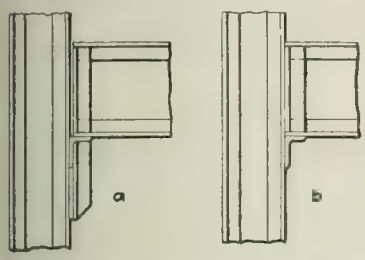


FIG. 1. ECCENTRIC LOAD ON COLUMN—GOOD AND BAD CONNECTION

This girder is, or should be, designed for a span equal to the distance between column centers. With the detail shown at (*b*) the portion of the column opposite the girder can be considered as virtually part of the girder. This makes the case equivalent to one of a centrally applied load with a girder ample to take all bending moments developed. It is impossible to conceive of a failure occurring here if girder and column are correctly proportioned for bending moment and central load, respectively.

Ultratheorists will say that by the theory of least work or the theory of relative rigidities the column should be designed for a portion of the bending moment. It is just this sort of theory and theorizing that confuses and disgusts the practical designer, and it is this that the writer believes has no place whatever in structural designing.

While there are many ways in which eccentric loading on columns may occur, in most cases the structural condition can be made practically equivalent to central loading by proper details. For a heavy girder a good web connection such as that shown at (*b*) in Fig. 1 is effective. For a lighter girder or beam a top and bottom flange connection may be sufficient; that is, an angle taking two or four rivets in the top flange of the beam and the side of the column and a corresponding number of rivets in the shelf angle, the shelf or seat being designed to carry the vertical load.

Various Cases of Eccentric Column Connection

Fig. 2 illustrates a number of cases of column loading. At (*a*) and (*b*) are simple cases of loading on one side only of the column. While the former gives a more eccentric load than the latter, the column is stronger to resist bending in this direction than in the other. The top and bottom flange connection is generally sufficient to take care of the bending due to eccentric application of the load. The case shown at (*c*) is another one of unbalanced loading, while that at (*d*) is balanced, assuming the beam on the right side to have a load about equal to the two on the left side. The loading at (*e*) is pretty well balanced. Those loadings at (*f*) and (*g*) are unbalanced and need flange or web connection to overcome this condition, and in (*g*) if the beam connecting to the flange at the left is a heavy beam, it may need in addition to the simple web connection a gusset plate, to accommodate more rivets than the web could otherwise receive.

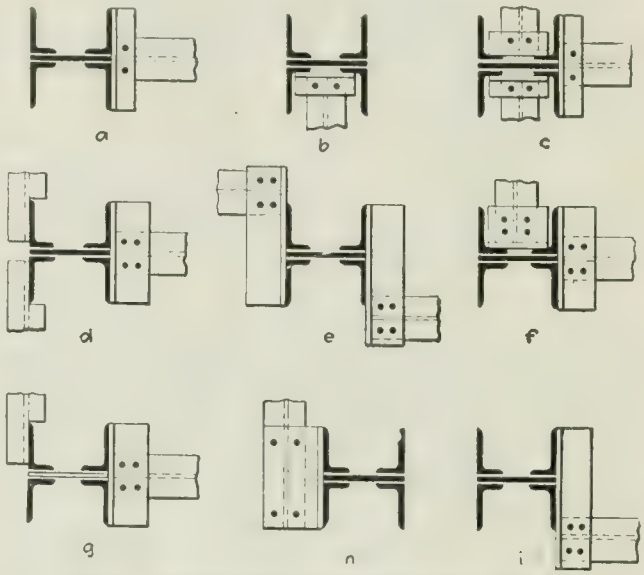


FIG. 2. NINE CASES OF ECCENTRIC LOADING

In the two cases of unbalanced loading shown at (*h*) and (*i*) the eccentricity cannot be counteracted by any detail of the connection to the column. This is because the plane of the beam does not intersect the column axis. It is cases of this sort that the writer finds give rise to weakness of design, for the eccentricity is frequently ignored, even when the succeeding floors all have the same condition. A little calculation will show that if the load is 12 in. or 15 in. off center in (*h*), or in the worse case (*i*), the unit stress is enormously increased. This cannot be ignored with impunity.

Where there is only one beam connecting to a column in this manner, the column should be turned so that the bending action is exerted in the strong direction, as at (*h*). In any event, the section should be proportioned so as to take care of the bending moment.

In general, when the load on a column is eccentric the bending moment can be divided, half of it being taken in the story above the applied load and half being taken in the story below. Thus, if a load P be applied d inches away from the column center, the moment to be added

to the direct load may be taken, without material error, at ½ *Pd*, except that when it occurs at the top of the upper story the full moment *Pd* must be provided for.

Details That Counteract Eccentricity

There are ways of counteracting the eccentricity of columns without incurring the necessity of increasing the section of the column for the full eccentric load. The writer has made use of the following means:

In the case shown in Fig. 3 the beam *C* would cause a heavy bending moment in the column, if connected on

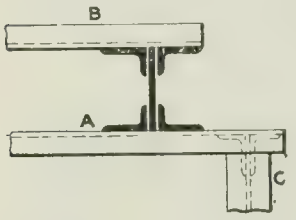


FIG. 3. A BEAM CONNECTION THAT AVOIDS ECCENTRICITY.

a bracket in the usual way. But the channel *A* can receive this beam and support it as a cantilever, the connection of the channel *A* to the column being made capable of carrying both the reaction of *C* and that of *A*. This load is then balanced, or nearly so, by the channel *B*, so that the column is relieved nearly all of the bending moment.

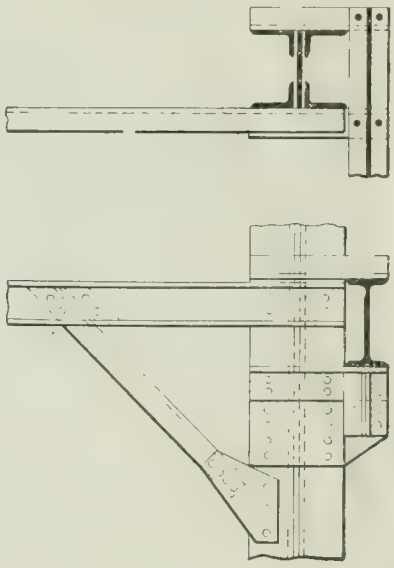


FIG. 4. SPECIAL COLUMN CONNECTION

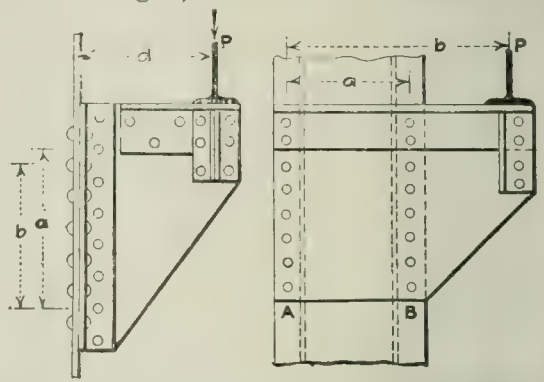
In Fig. 4 is given a case where the channel is not heavy enough to act as a cantilever for the beam. Here a kneebrace was added which served to stiffen the column and to relieve the bending moment in the channel.

Rivet Tension in Eccentric Connections

Eccentricity of rivet connections is also a source of frequent examples of weak design. Sometimes the detail is one that results in tension on rivet heads, and sometimes it means excessive shear on the extreme rivets of a group.

The writer is not among those who would avoid tension on rivet heads. He believes rather, that it is best to face the fact that there are occasions where tension on rivet heads is practically unavoidable, and to make the detail so that the tension is within reasonable limits. In other respects, also, the detail should be good. The thing against which the rivet heads pull must be capable of taking the pull, the angles must be heavy enough to stand the bending at the roots, the detail should be symmetrical, and there should be rivets provided for shear in addition to those for bending. The limit of tension recommended is one-half the single-shear value of the rivet.

There are many ways and many assumptions that may be employed to arrive at the strength of a connection where there is tension on the rivet heads. It is a case where approximate theory and approximate methods are just as good as the most exact theory. Given a bracket as in Fig. 5, assumed to be connected to some-



FIGS. 5 AND 6. RIVETS IN TENSION SOMETIMES NECESSARY; RIVET SHEAR IN ECCENTRIC CONNECTION

thing that is capable of taking the pull of the upper rivets and the inward force at the bottom of the bracket. The moment is *Pd*. The problem is to find the pull on the upper rivets. The compression at the bottom of the bracket does not need the same consideration. However, it is not proper to assume that this compression is taken at the extreme lower edge of the bracket, for this would imply a very heavy force on the edge which should be distributed on a flat surface. The writer would recommend that the bottom group of four rivets be used as the center of compression. Then a trial can be made of the top group of four rivets to take the tension, the lever arm being *a*. If this gives too great a stress per rivet, try the upper six, with the lever arm *b*. Apart from the rivets that are in tension, the connection should have enough rivets in sheer to take the vertical load. In this case there are eight, if six are required for the top tension of the bracket.

There are general and exact methods for determining the extreme stress on a group of rivets, where the load is eccentric and there is a twisting about the center of gravity of the group. These methods are to be recommended. A case frequently met with is that shown in Fig. 6. This can be solved by an approximate method: Given a load *P* on the beam seat and the distances *a* and *b*. By the principle of the law of the lever the vertical force on the row of rivets *B* is *Pb/a*. If there are enough rivets in this row, there will be more than enough in the row *A*, as the rivets in the latter row are forced upward.

Connections of Cantilever Beams

Errors under Class 2, cantilever beams, are generally errors of detail. Sometimes beams that must act as cantilevers are detailed with end connections that are standard for simple beams. Manifestly this fails to supply the requisite strength of connection.

An error very frequently made in connections where there are cantilever stresses is to provide for the top-flange tension and to ignore the bottom-flange compression. This applies to all brackets and is a common error in all classes of structural work. In bridge work

it is common to see sidewalk brackets detailed with provision for the top-flange tension and little or no thought given to the bottom-flange compression, a bent plate or such inadequate detail being provided for the latter.

A very short beam acting as a bracket may have but a small load to take as a cantilever, and if a standard connection is provided to take care of the shear it may suffice also for the moment. This will mean tension on the rivet heads, and some calculation should be made to see that this is not excessive.

In Fig. 7 at (*a*) and (*b*) are shown two details com-

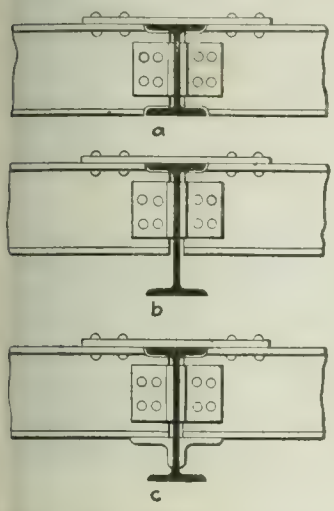


FIG. 7. CANTILEVER ATTACHMENT

monly met, where the top-flange tension of the cantilever beams is taken care of and the bottom-flange compression is ignored. In effect this reduces the depth of the beam one-half, for the compression of the bottom flange could be counted as taken by the standard connection at the middle of the beam. But the bending moment is very often too great to make this safe. The effective strength of the case shown at (*a*) Fig. 7 can be doubled by adding a bottom-flange plate similar to the one used in the top of the beam. That at (*b*) can be similarly strengthened by adding angles as shown at (*c*). If more than four rivets are needed, a longer seat angle and a gusset plate can be used.

Cantilever Brackets

Cantilever brackets are of frequent occurrence in building work, and these very often are detailed with little or no regard for the flange stresses to be taken. The top flange frequently has a one-sided connection and tension on eccentrically placed rivets. The bottom-flange stress is often inadequately provided for in using a bent plate or bent angles through which the stress must pass. It is not rare to find cantilever brackets where the top flange or the bottom flange fails to connect to anything that could resist their stress. Sometimes a heavy connection is made that would mean twisting on a girder with a force that the girder could not resist. Some times it is overturning on a small post or a bending moment on the post that it is incapable of taking.

It would be easy to cite examples of all these violations of the principles of stability that only need to be sketched out to demonstrate the errors, examples met in the writer's practice and in illustrated engineering articles. But for the present purpose it is sufficient to emphasize the fact that the ordinary standards for simple beam and column design do not apply in these special cases.

Support of Curved Beams

It ought not to be necessary to call attention to the obvious fact that when a beam is curved out of a straight line there are cantilever stresses at the end of the beam, and a simple end connection in the web of the beam or a seat for the end of the beam is not sufficient. But the writer has found that common practice justifies placing the most strenuous emphasis upon recognition of exactly this fact. There are theories about curved or circular girders that would scare most designers, and one would be justified in trying to sidestep these. But here, as in many other cases, simple methods of analysis can be employed with results that are satisfactory and safe.

Two things in particular need to be taken care of in a curved beam. One of these is the bracing of the flanges, both top and bottom, for the curve will tend to make the compression flange bend further and the tension flange straighten out. Lateral stiffness is therefore essential. The other thing that needs particular care in a curved beam is the flange stress at the ends of the beam due to the tendency to "flop down."

Curved beams are rare in a building, and some extra weight in the few employed does not cut much of a figure in the economy of the building. Hence a good stiff beam is the best solution of the problem of bracing the flanges. An oversized beam is in fact usually employed, and the flange bracing need give no particular concern when a good, heavy beam is used. Reinforced-concrete slabs afford a good means of stiffening the flanges of a curved beam.

In Fig. 8 a curved beam is shown which has a curve of 90°. It is recommended that points of inflection be

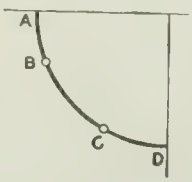


FIG. 8. A CURVED BEAM

assumed at the quarter points B and C and that the portion of the load of the beam between B and C be assumed as concentrated at B and C. Then for example, the cantilever moment at A can be found by taking moments around A, using the concentration at B and whatever other load may act on AB.

Sometimes, when the beam would have but a small curve, it is best not to put the curve in the steel work, but to use a straight beam and put the curve in the wood trim or concrete covering.

Decrease in Use of Horses in City Districts

While it seems probable that horses will continue to be used on farms without much, if any, decrease in number, their use in cities is decreasing very rapidly, according to the report of an investigation made by the field agents of the Bureau of Crop Estimates, United States Department of Agriculture. Horse censuses taken in recent years in New York City are as follows: 1910, 128,224; 1917, 108,036; 1919, 75,740. This shows a decrease of 41% in nine years.

Bridge Engineering in Active Warfare --- II

Civilian Bridge-Design Methods Applied in Work of A. E. F. — Bridge Department Organized — Unprecedented Loadings — Traffic Conditions — New Types of Bridge Developed — Reinforced Pontons—Sectional Steel Bridges—Flooring, Loads, Impact and Unit Stresses

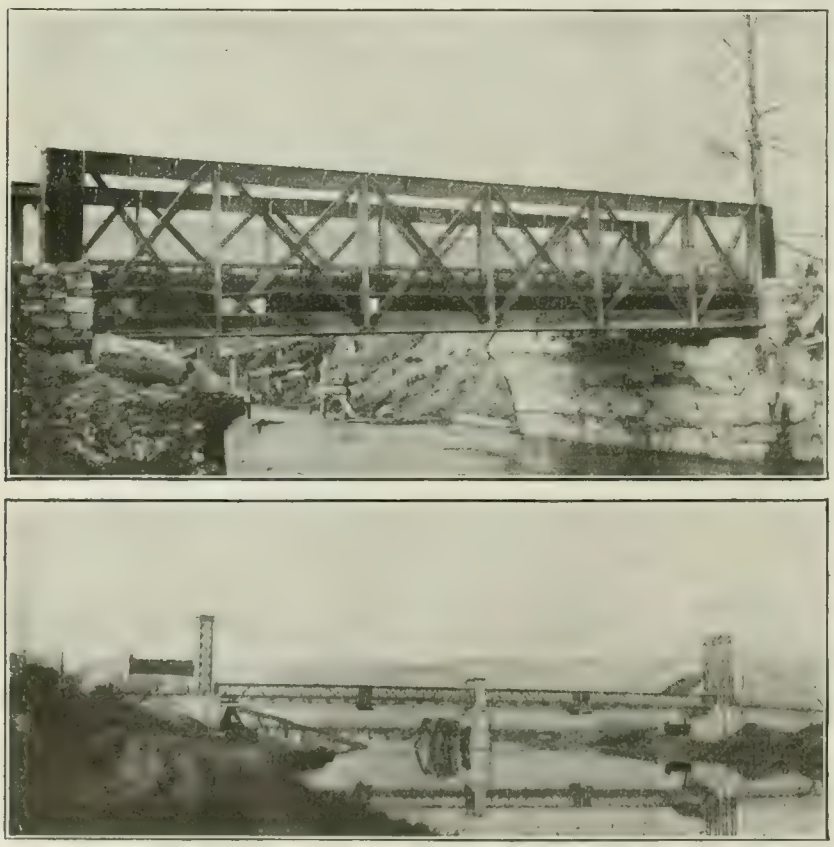
By Lewis E. Moore and Marshall W. McDonald
Formerly Major, Engineers, U. S. Army
Formerly Captain, Engineers, U. S. Army

The most important single development of the war in bridging was the construction and successful use of sectional steel bridges, which are structures capable of variation of length to suit different sites. The French were the only nation that had done anything in the matter before the war. The subsequent British and American developments were far superior, however, and constitute the best that has been achieved in this field.

Eiffel Type—A light portable bridge designed by Eiffel, the builder of the Eiffel tower, to carry light field-guns on spans of 30 m. or less, formed a part of the French pre-war equipment. It had to be discarded when the progress of the war made it necessary to transport heavier guns. The connections in this bridge were made by turned bolts or rivets, in reamed holes; the later French bridges follow the same practice.

Pigeaud Type—Colonel Pigeaud, of the French Army, developed a different type of bridge during the war, adaptable to spans varying from 7½ to 30 m., in panels of 2.5 m. By reinforcement the same bridge has been used even up to 37½ m. (123 ft.). The trusses are low (pony). The load capacity of the bridge is about 17 tons on each of two axles 7.8 m. (26 ft.) apart. In this type the members are separate and are bolted together in place. Short spans are erected by launching, assisted by a gin-pole placed on the opposite bank to pull the bridge across; a nose or *avant bec* is sometimes used in launching. Longer spans are usually erected by the help of a temporary suspension bridge. By setting up temporary towers on the banks, slinging cables over these and suspending from them a floor made up of material from the floor of the permanent bridge, a working platform is obtained on which the trusses are assembled. The assembled bridge is lowered to its seat and then the suspension bridge is removed.

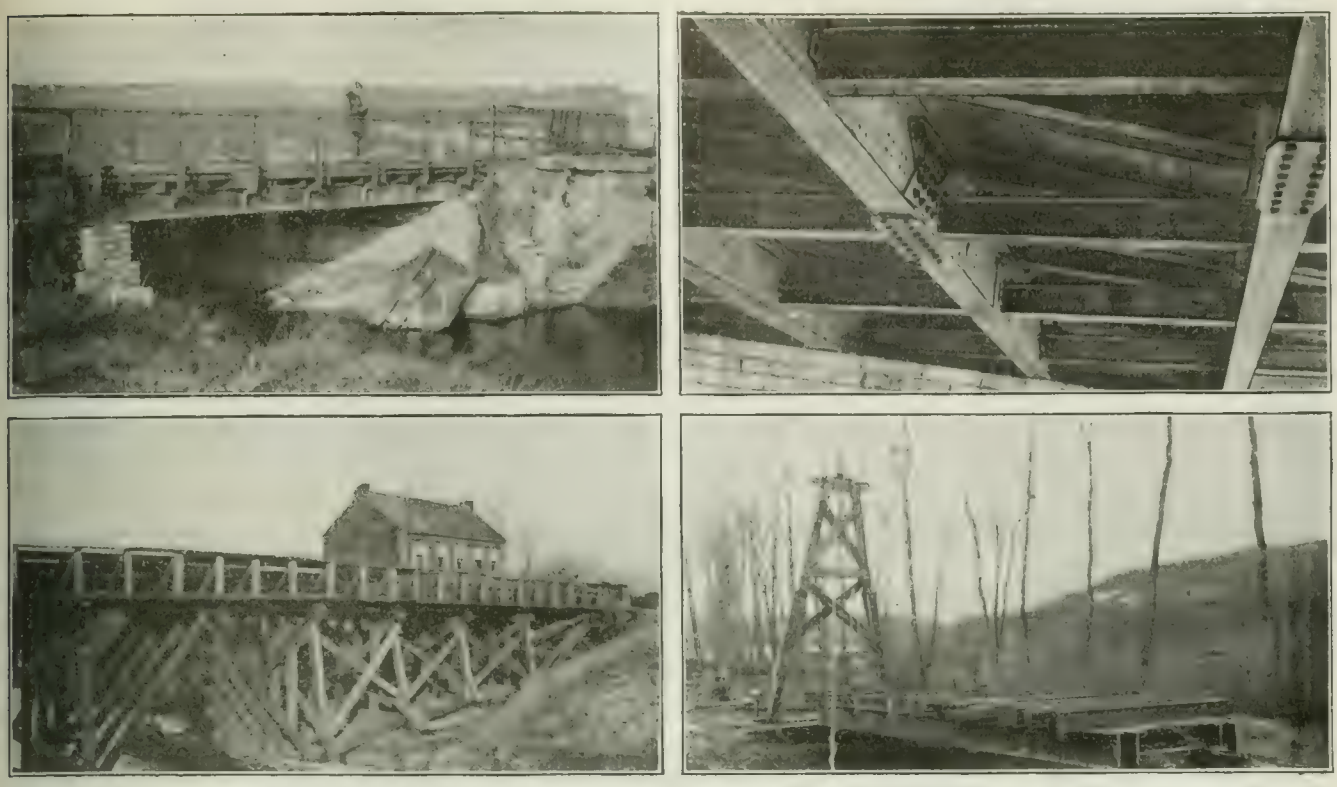
The Pigeaud bridge is very slow in erection. A much longer time is required than for other sectional bridges, and as a practical result it was noticed that timber bridges were used instead whenever possible. The slow erection is due to several factors: The fact that all members are separate, the use of tight-fitting turned bolts, and the use of the suspension principle. Its advantage lies in the fact that the heaviest pieces weigh only 660 lb. and consequently are easily handled. It has been widely used where long spans were required, as over a canal or in replacing demolished spans over a river, where the substructure was intact. However, all those seen tended to vibrate under traffic, and most of





FIGS. 21 TO 23. FRENCH PIGEAUD DEMOUNTABLE STEEL TRUSS BRIDGES

Above, Aisne Canal Bridge at Berry-au-Bac, fitted with wire netting guard. Below is exemplified the use of these trusses for longer spans by aid of the suspension system. This structure crosses the Marne at Bas Verneuil and has two openings of 40 meters clear, carrying highway and meter-gage railway with capacity 17½ metric tons on one axle; lateral bracing attached to outer ends of suspension chairs, as shown by view under float, at right



FIGS. 24 TO 27. STEEL I-BEAM BRIDGES

Above is shown standard spliced-beam bridge (British) over Souchez River near Lens; capacity tanks; note handrail and two-piece splice plate of main beams. Below, at left, is a trestle with steel stringers, made adaptable to the long span of the brook crossing by strutting (Escaut River near Denain). At the right is shown a 16-foot I-beam span which has just been launched by means of pulling across with hoist and tackle through an A-frame on far bank, with preventer tackle on near end (view taken at the United States Engineer School, Langres, France)

them had a pronounced sag. Several Pigeaud trusses also were used in building stiffened suspension bridges.

British Stock Spans—Like the American, the British sectional steel bridges were created during the war. Early in the war a series of "stock spans" was developed for openings of 16, 21½, 30, 60 and 85 ft. Successive increase in loads led to progressive development of stronger bridges, the same span lengths, however, being retained.

The three shorter spans are I-beams and the two longer spans are trusses. For the 16-ft. span the beams are full-length, while for the 21½- and 30-ft. bridges they are spliced so that the pieces come within more convenient transportation limits. Used with pile or framed-trestle supports these spans were very convenient for general bridging, in addition to having special application to single-span work.

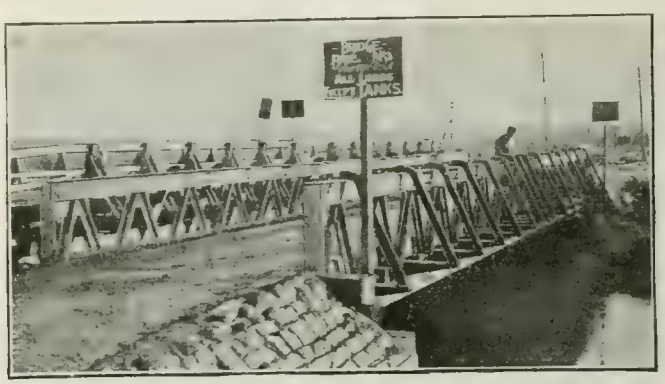
The 60- and 85-ft. spans are riveted and bolted pony-truss bridges, which may be used either as through or deck. They are unnecessarily clumsy in design, and some of the sections weigh 3.3 tons, which makes them difficult to handle in the field without special equipment.

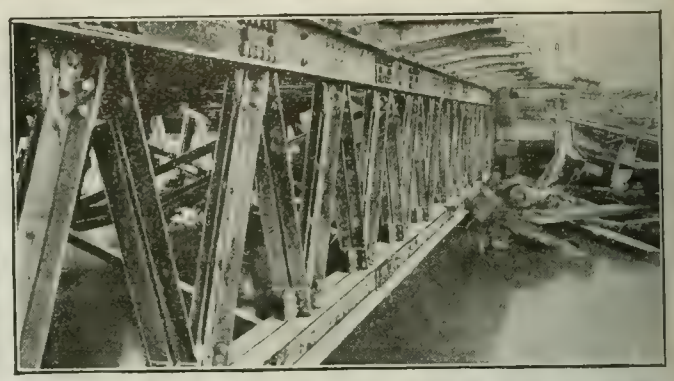
Hopkins Trusses—To overcome this last objection, Captain Hopkins, of the British Army, devised a sectional truss bridge consisting of standard plates, angles and channels put together with bolts in the field. It was built in three sizes, known as the 75-ft. type, the 120-ft. type, and the "lorry bridge." These are excellent military bridges, especially the 120-ft. type, which will take single large tanks over a clear span of 150 ft. The view, Fig. 31, shows this type applied to a 180-ft. span and gives an excellent idea of its utility; its construction is shown in outline in Plate III.

Erecting the Hopkins bridge is done by launching, in all cases. Pairs of stationary wheels or rollers constitute the supports over which the bridge is rolled ahead, the front end of the structure being held up by a hoist rope from an A-frame on the far bank. The rollers remain as permanent supports, the double roller as the expansion end support, and a similar single roller seated under a concave bolster (see Fig. 34), fastened to the under side of the truss, as the fixed support. The bridge shown by the view, Fig. 31, was placed by this method; the span was erected on the bank and pulled across the gap with hand winches. It was built complete in four days. This bridge, over the Canal du Nord, will carry a concentrated load of 20 tons.

Inglis Rectangular—Modified Inglis construction is the basis of another type of British military bridge (Fig. 30). In this case the bridge has a rectangular cross-section, unlike the "Inglis Light"; but, as in the latter, the members are made of steel tubes joined by cast-steel junction boxes. The panels in this rectangular type are 12 ft. long, and the bridge is 12 ft. wide and 12 ft. high. It was designed for carrying a distributed load of 84 tons over a clear span of 84 ft. The bridge is erected by launching on a pair of wheels, like the other Inglis type.

The Inglis rectangular was not used much, and it has the obvious objection that the members are special, expensive and not suited to regular shop methods or to quantity production. These bridges when used were replaced as soon as possible by "stock spans." It is said that a seven-bay span of the Inglis rectangular type could be erected and launched in five hours, which is fast working.

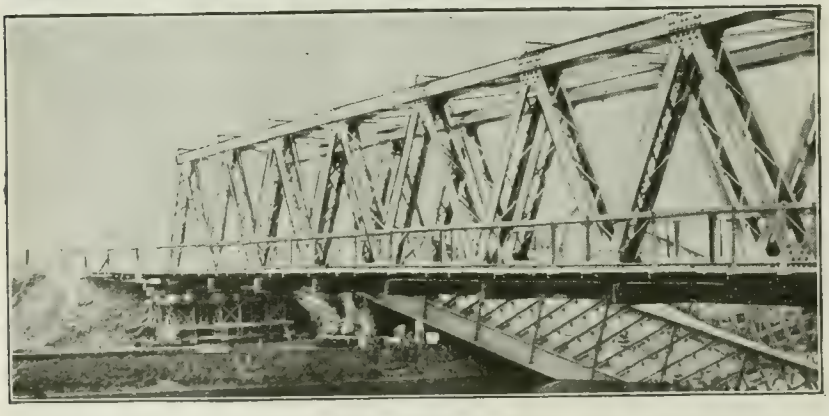








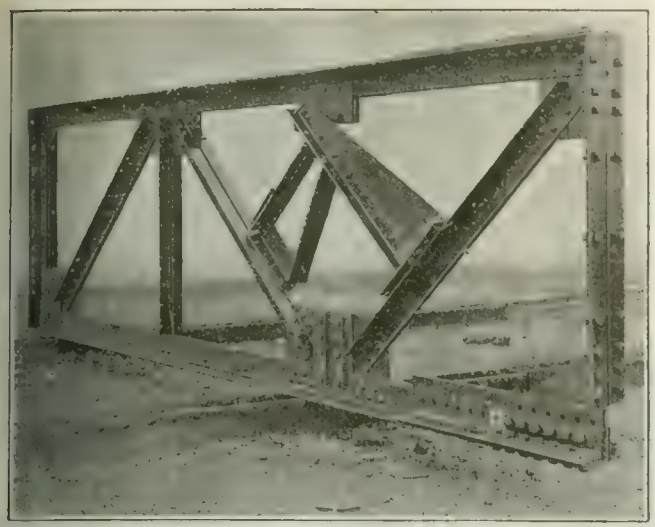


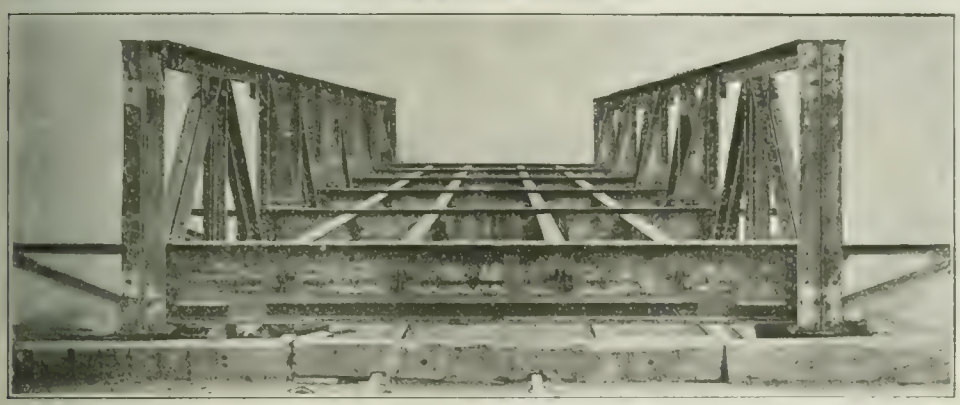




FIGS. 28 TO 34. STEEL TRUSS BRIDGES FOR MILITARY USE DEVISED BY THE ENGLISH

The two views at the top show "stock spans" in through and deck arrangement side by side, crossing the Somme at Brie, 60-foot span. The two spans are identical in form and either could be used in either deck or through arrangement, though in this case the deck span is of heavier section and is intended to carry tanks. Below this is an Inglis rectangular bridge near Pottes, Belgium. The two lower views show Hopkins demountable trusses, one being the largest yet built, a 180-foot span of 20 tons concentrated capacity, over the Canal du Nord near Havrincourt, which was erected in four days, while the bottom one is a 150-foot span over the Sensée Canal near Douai with steel cube abutments; the bridge is good for all loads including tanks. At the right are shown the double rollers at the expansion end of a Hopkins bridge, over which the bridge is launched and which serve also as permanent bearings, while below this is the fixed bearing, made by inserting a shoe casting between wheel and bottom chord. The use of the steel cube is very clearly shown here.





FIGS. 35 AND 36. AMERICAN SECTIONAL TRUSS BRIDGE—END SECTION SHOWN SEPARATELY

An intermediate section is of similar form with the omission of the far half panel. The separate floor-beam brace shown bolted to the truss for shipment has a projection extending outward to take the top of the sidewalk bracket shown just beyond; the sections weigh 2500 pounds each and will go into a truck body. The design represents the maximum of simplicity and interchangeability obtainable with regular structural make-up and detailing. The sections will make bridges of lengths from 33 feet 9 inches to 90 feet, good for the heaviest artillery loading and heavy tanks

Steel Bridges Developed by the American Expeditionary Forces

For the A. E. F., development of a successful sectional steel bridge was an early and important problem; and its importance steadily increased as the war went on. The development requird months; designs were completed in February, 1918, but although orders with complete detailed plans were sent to Washington in April they did not reach the fabricators until October, and the first bridges were turned out of the shop in the United States late in that month, too late for use in active warfare. The results of the work, however, show a convenient, efficient and widely applicable equipment.

Two types of standard steel bridge were worked out, I-beam and lattice girder, the latter being all sectional. The standard I-beam bridges are of three lengths: Nineteen ft., 24 ft. 9 in. and 33 ft. over all. Each stringer consists of a pair of I-beams riveted together with diaphragm spacers. The 33-ft. span is spliced, for ready handling. Two stringers with nailing strips and planking constitute a bridge (construction shown in Plate II).

Essential details of the sectional lattice truss span are given in Plate III. A complete structure of 56 ft. 3 in.-span and one section packed for shipment are illustrated by the views, Figs. 35 and 36. There are two kinds of truss section, end and intermediate, the intermediate section being one panel long while the end section is 1½ panels long. The floor-beams are 20-in. I-beams with shelf angles carrying the four 12-in. I-beam stringers. These latter are kept in place laterally by clip angles bolted to the floor-beams but not to the stringers. The stringers may also be placed on top of the floor-beams, for which purpose special clips are provided. The bridge may be built in deck arrangement, the floor-beams being then set on top of the trusses at the intersection of the diagonals with the top chord. Top flange braces are provided and also sidewalk brackets.

The panel length for this bridge is 11 ft. 3 in. and the depth of truss is 5 ft. 11 in. overall, which admits of placing the section in a truck body. Each section weighs about 2500 lb. The sections adjust to different span lengths, from 33 ft. 9 in. to 90 ft., by increments of 11 ft. 3 in. All bolts are 1-in. diameter, rough, and all holes are $1\frac{1}{16}$ in., reamed to iron templets, so that all like parts are completely interchangeable.

The bridge is for one-way traffic. Where a two-way bridge is required three trusses in all may be used, bolting both floor-beams to the center truss with the same bolts. In this case, tank and heavy artillery loads can pass over one roadway if the other is kept clear of traffic; as such loads are infrequent this restriction will not lead to undue delay to traffic.

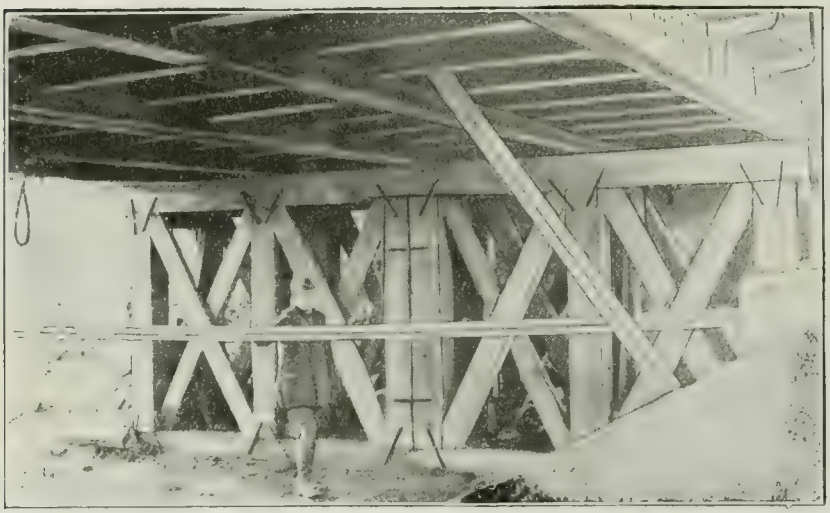
Suspension Bridges

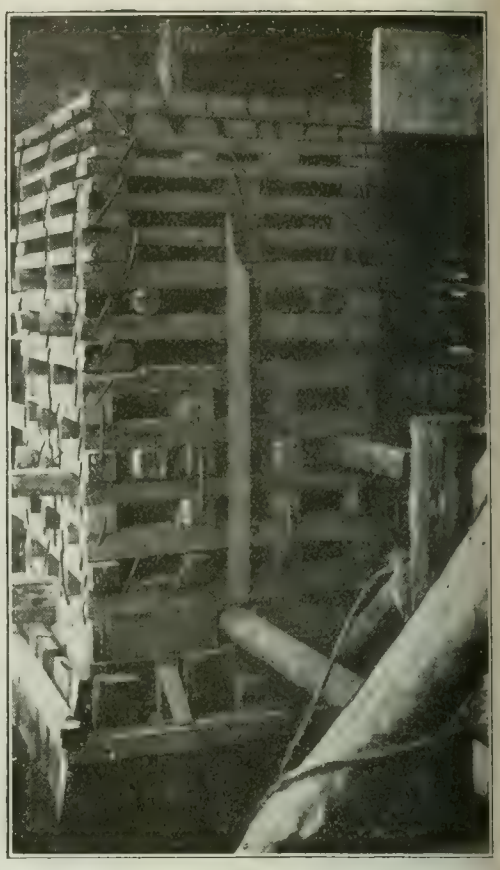
Suspension bridges are adapted for use as footbridges in occasional instances, on account of their ease in erection; with this exception they are not adaptable to modern military conditions, judging by the experiences of the campaign in France. The French repeatedly used the suspension principle to support the ends of adjoining trusses of their standard Pigeaud sectional bridges where the depth of water, poor foundation or other consideration made it more desirable than building a pier. In such construction (see views, Figs. 22 and 23) the ends of the trusses rested on a chair suspended from the main cables; lateral cable stays were provided to prevent swaying. The towers were built of steel cubes bolted together until the required height was reached.

Auxiliary Features of Bridges

Abutments and Piers—All kinds of abutments and piers were in service in the bridging in France, from simple mudsills to concrete and masonry structures. Abutments for ponton and timber bridges often were timber stringers laid (transversely) on mudsills. Piers were in one case formed of wagons set in the stream. Canal boats, anchored, made excellent piers in a few instances.

The Steel Cube—A very interesting and prospectively valuable development of the war is the "steel cube" used by the British for piers, and the American modification of this device.





FIGS. 37 AND 38. TWO ILLUSTRATIONS OF THE USE OF DOGS
Wooden pier for 30-foot I-beam bridge over Scarpe near Arras—Crib carrying I-beam bridge at Courtrai

The British construction is a 3-ft. cubical framework of steel corner angles connected by angle and bar bracing. The cube is 3 ft. on a side. It is shipped knocked down. Successive courses of these cubes are separated by wood planking to which the cubes are bolted. Care must be taken to set them level and to apply loads centrally, in order to avoid overloading, distortion or tipping. Examples of the use of the members are shown in Fig. 34.

American Sectional Pier—The American development of the cube idea is represented by sketches in Plate II. A steel angle framework of rectangular proportions is so arranged as to take plank sheeting set into its interior. With the sheeting in place such a frame can be filled with rock or other available material. The filling is intended to carry the load, and the sheeting and framework simply serve as container for the fill. Each unit has a steel angle lip on its bottom which drops into the top of the unit below to prevent lateral displacement. Various forms of assemblage are possible; some of them are sketched. Unfortunately, none of these pier units was used on account of the early termination of the war.

Flooring—Summarizing the experience gained from bridge traffic during this war, it may be stated that flooring should have a thickness of not less than 5 in. (single or double); the wearing surface (entire thickness in case of single floor) should be of hardwood, preferably oak or beech. On steel bridges the flooring should be spiked or lagscrewed to nailing strips on top of the stringers; no other method of fastening is adequate. Double flooring must have the upper course laid diagonally and thoroughly nailed to the lower course.

Tanks and tractors had the worst effect on the flooring. When the floor was not smooth or had large cracks, their cleats would sometimes tear out large pieces.

Handrails—Unless properly constructed, bridge railing will be sideswiped by trucks if the construction of bridge allows them to do so. The French therefore built their timber bridges with a narrow sidewalk on either side, or else put down a guard timber as a wheel curb. The British accomplished a similar object by giving the railing a flare of about 30°, not only to protect the railing but also to provide additional clearance for tanks.

Bridging Problems at Mine Craters

A specially troublesome problem often was the bridging at mine craters, an obstacle that an army in advance always has to reckon with. Where craters are encountered, it is to be considered certain that sooner or later they will have to be bridged.

An army in retreat not only blows up all the bridges, but also blows a number of road craters, which are very effective in retarding the enemy's advance. They not only produce delay and consume material, but, owing to the loosening of the soil by the action of the explosive, require a lot of maintenance before the road becomes normal again. Pile bridge crossings were built at nearly all craters with which the A. E. F. had to deal. Bridging is the inevitable recourse at craters, because in order to be really effective as obstructions they must be located where it will be difficult to detour traffic around them—as on an embankment across marshy ground, or at a side-hill cut, or a deep through cut, or in a village with no side streets. Crossroads were often blown up, a crater there blocking both roads. Many craters were

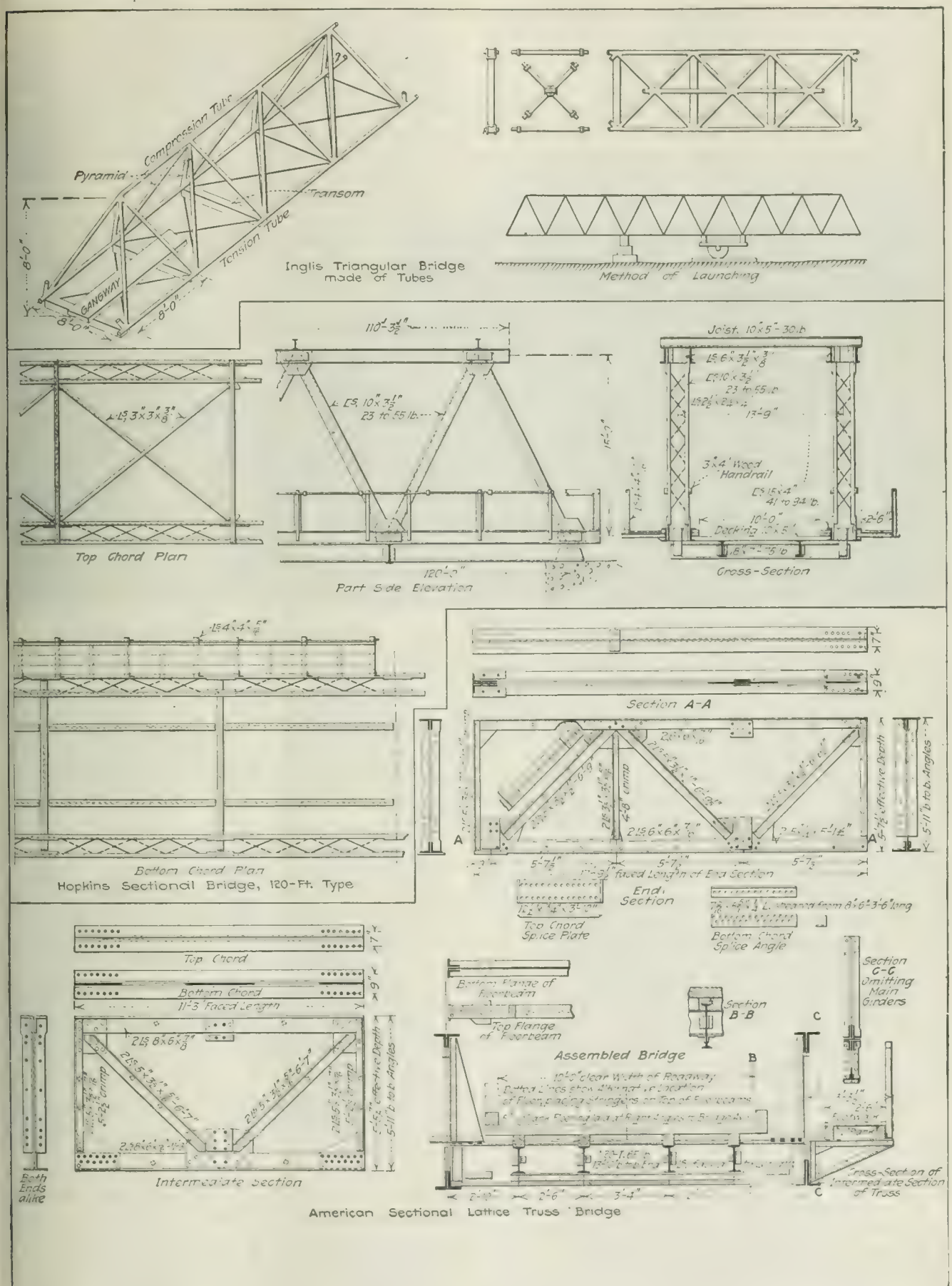


PLATE III—SECTIONAL STEEL BRIDGES FOR MILITARY USE—INGLIS TUBULAR BRIDGE; HOPKINS TRUSS BRIDGE; AMERICAN SECTIONAL LATTICE GIRDER

100 ft. in diameter and 20 to 30 ft. deep; and sometimes repair was rendered more difficult by the crater's filling with water. The view, Fig. 3, shows a typical crater.

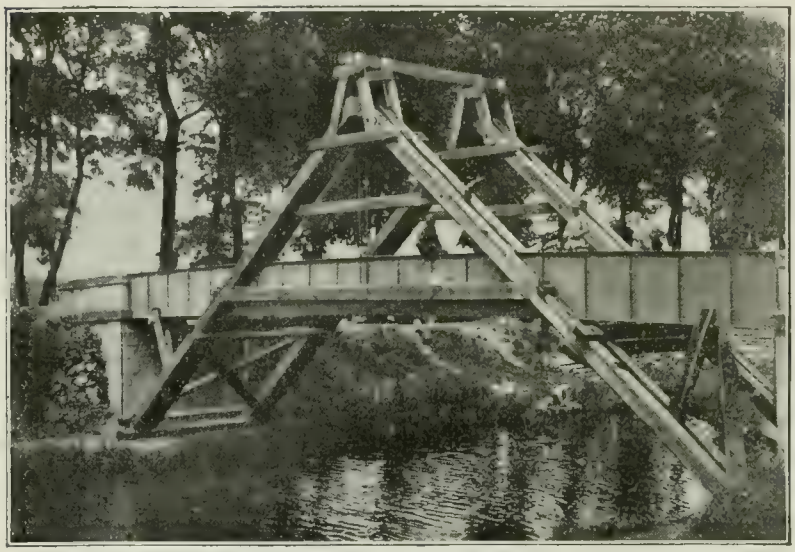
Effect of Shell Fire on Bridges—It was a very common occurrence for bridges to be damaged by shell fire, but cases where the bridge was sufficiently injured to require strengthening were rare. Generally such damage or complete demolition was incidental to the shelling of a road or some other objective, as it proved to be very difficult to destroy a bridge directly by shell fire. At Boureuilles one span of the masonry arch bridge over the Aire River was demolished by shell fire, but this was entirely incidental to the shelling of the German position in Boureuilles. Shell damage to bridges is apt to be only local. At Consenvoye a cast-iron I-beam bridge was struck by a large-caliber shell; the result was that four of the I-beams, in one span only, were broken.

American bridge engineers will find it instructive to take note of the fact that in France most bridges are built from the start with chambers in piers and abutments for blowing them up in case the approach of the enemy in war makes their demolition necessary. In these chambers are posted signs stating the exact amount of explosive required for demolition.

The importance of this subject is made obvious by the remarkable extent of the demolition work in certain operations of the war. During the spring campaign of 1918 along the Somme the British destroyed bridges estimated at many millions of dollars. It is certain that, in several of the large movements of the war, bridges numbered by thousands were destroyed. Such work is vital to cover a retreat, and provision for it in peace-time bridge construction is therefore especially interesting.

Where no means of the kind were provided, demolition often entailed considerable labor. In the case of a masonry arch bridge the common practice was to place heavy charges in holes cut in piers and abutments and lighter charges on a platform under the arch crown (see view, Fig. 41). Where the bridge had several spans, sometimes only the central span was blown up and the piers and abutments were blown toward the center, so as to block the stream and flood the country above. Extra large charges in the abutments, making large craters, increased the difficulty of reconstruction.

In the case of steel bridges, the French practice was to cut all the members in a certain panel or panels and thus drop the span. Melinite cartridges were fastened to the various members and connected by either melinite or electrical fuses. The method was very effective for making temporary gaps; and a number of bridges cut in this way were dropped without materially damaging the rest of the structure (Fig. 40). The Germans usually broke the truss up so that no portion could be used in rebuilding, and sometimes succeeded in throwing the whole span in such a way that a new bridge could not be built on the same spot without first clearing away the débris.





FIGS 39 AND 40. REINFORCEMENT AND REPAIR A FAC TOR IN MILITARY BRIDGING IN FRANCE

Special timber trussing to strengthen existing steel girder bridge for 20 tons (instead of six tons); Custine Canal near Belleville, span 20 meters—Marne Canal Bridge near Epernay, cut by French in 1914 by melinite cartridges and later restored by raising and supporting on a horse. Canal clearances were a controlling factor in both operations

Military Bridge Loadings

Increase in size of artillery, the use of heavy tractors to draw them, and finally the development of the "heavy" tank, weighing 67,200 lb., were responsible for the rapid increase of bridge loadings during the war. According to the final status of methods, the principal loads which must be provided for are as listed in the diagram compilation, Plate I. The moments produced by certain of these loads on spans up to 30 ft. are given by the curves below the diagram. From these it may be seen at once that the loads tend to divide into four groups.

It may be said generally that, as experience has shown, all the highway bridges (except footbridges) should be designed for the upper group; that is, for the 67,200-lb. tank on short spans or the string of 16-ton tractors on long spans. Practically the same substructure is required for heavy and for light loading, and in wooden bridges it is a simple matter to make the stringers heavy enough to carry the tanks. Steel spans should *always* be designed for the tanks, as it is highly undesirable to be obliged to carry on hand steel spans for diversified loading, or to risk breaking down the

bridge by running a tank over a span unable to carry it.

In connection with loads, the possibility of restricting loading and speed on certain bridges deserves a word. In war it is vitally necessary to foresee and provide for the actions of the fool; in bridges as much as elsewhere. The only way to keep excessive loads off a bridge, it has been found, is to post guards over it. In spite of warning signs, drivers would always be willing to risk the trial, unless guards forcibly prevented them. It is thus possible for even a momentary interruption in the guarding or an error of judgment to lead to the breaking down of a bridge, with the result that a road is interrupted which may be vital to military success. Speeds are in effect always unrestricted, as experience amply demonstrated. Motor trucks were run under nominal speed limits, but these were nominal only. That the loading of trucks was also nominal in some measure may be instanced by numerous cases of three-ton trucks loaded with about eight tons of ammunition. These considerations argue most strongly for making all bridges of heaviest capacity.

There are very few highway bridges in the United States, with the exception of masonry arches and some city bridges, which are capable of carrying modern military loads. In order to be available for possible future military operations, all parts of highway bridges (this affects chiefly floor members and hangers) should be of sufficient strength to carry one 30-ton (60,000-lb.) axle with 6 ft. wheel-gage, no allowance being made for impact.

Impact and Working Stresses

The subject of impact on highway bridges can be argued at great length. For wooden military bridges it seems good judgment to neglect impact entirely.

For steel bridges judgment and experience had to be relied upon almost wholly. It is interesting to observe that the British and Americans arrived at practically the same conclusions independently; namely, that the proper impact allowance for steel spans was 50% of the live load. The British used 50% for all members, while the Americans used it for steel stringer bridges and for the floors of latticed trusses; for the trusses themselves they used 40 per cent.

In designing wooden stringer spans for tanks, fiber stresses 60% higher than those recommended by the United States Forest Service may be used if the timbers are sound.

In steel bridges, with the 50-40% impact above mentioned, it seems justifiable to use 20,000-lb. fiber stress in tension and compression (reduced). Approximately these values were used in designing the American sectional steel latticed bridges. The values apply to ordinary structural steel. If high-strength steels are used the unit stresses could be suitably increased, thereby reducing the weight of the structures materially.

Bolts and Dogs

A noticeable feature of military practice as differentiated from civil is the exclusive use of bolts in field connections of steel structures

At the start of the war, turned bolts in reamed holes were used. They were troublesome because slight damage or rust made it very difficult to insert the bolts or afterward to turn the nuts It was also difficult to make the holes match exactly, because of the rough character of the supports. Turned bolts were therefore wholly abandoned by the British, who substituted rough bolts $\frac{1}{16}$ in. smaller than the hole. It was found that the resulting connections were fully as satisfactory as those made with turned bolts, and a great deal of time was saved in erection. At first $\frac{7}{8}$-in. bolts were used, but the desirability of reducing the number of parts



FIG. 41. BRIDGE PREPARED FOR DEMOLITION (HANONVILLE)

Note explosion chambers in piers and frame under crown to support explosives to be placed there

led to increasing their size, until some of the sectional bridges, notably the Hopkins, used bolts at least $1\frac{1}{4}$ in. in diameter for main connections. The American sectional bridges used rough bolts 1 in. in diameter.

No difficulty was experienced with bolts or nuts working loose.

European bridge practice (and for that matter other constructional practice in Europe) is noteworthy for the extensive use of dogs in place of driftbolts or scabs in the timber framing. Dogs—pieces of iron consisting of a bar, say, 18 in long, and pointed at both ends and with the ends then turned at right angles to the body—hold well in such work as trestle bents of round or square timbers, and crib piers can be fastened together with them in remarkably short time and with ease.

It is worth remarking that there is no complaint that dogs loosen, and at the same time they probably damage the timber less than do through-bolts or driftbolts. They are as applicable to civil as to military practice, and unquestionably many instances could be found in American construction where their use would effect a saving.

Future Types of Military Bridge

The types of military bridge to be used in future wars will unquestionably depend upon the natural conditions found in the country in which operations take place. There is no prospect of any reduction in the loads to be carried; on the other hand, there may be a distinct increase in loadings, not, however, enough to bring highway bridges up to railway bridge requirements.

Pile and trestle bridges similar to the standard American types will unquestionably continue to be used. Very large rivers will require pontons, though these must be of much greater capacity than any now existing.

I-beam spans will be needed for many locations, for spans up to about 30 ft., within which range they are the best that has been developed. For spans of 33 to 90 ft., the American sectional steel bridge is satisfactory. Above 90 ft. a new type of truss bridge will be needed, probably something similar to the Hopkins type

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Labor, Capital and the Public

AN AMERICAN LABOR POLICY—By Julius Henry Cohen, Author of "Law and Order in Industry," "The Law: Business or Profession?" "Commercial Arbitration and the Law." New York: The Macmillan Co. Cloth; 5 x 8 in.; pp. 110.

Written by a lawyer who has attained distinction in strike controversies and settlements, this short, readable book deserves thoughtful attention. It has as its thesis or conclusion that the American way of solving the difficulties between capital and labor should be (1) to permit the free organization of (a) employers and (b) employees in all industries; (2) that the two sides shall come to voluntary agreements with each other; (3) that these agreements shall be validated by law, after approval, and be enforced by Government agencies. In his final paragraph the author says: "Freedom [on both sides—Editor] to organize, freedom to deal collectively, security from arbitrary discharge, security against strikes, resulting from the free interchange of opinions, but, when made, the compact subject to the approval of the community and, after approval, enforceable by the community—these would seem to constitute the basic elements of a new *democratic law and order*. To accomplish it we shall need to revise our legal conceptions of freedom of contract."

Citizen's Guide to City Planning

TOWN IMPROVEMENT: A Review of the Principles by Which Physical Improvement in the Town or City May Be Accomplished, With Observations as to the Effect of Such Improvement Upon the Life of the Community—By Frederick Noble Evans, M. L. A., Assistant Professor of Landscape Gardening in the University of Illinois, Etc. New York and London: D. Appleton & Co. Cloth; 5 x 7 in.; pp. 261; illustrated.

Designed as a citizen's guide or introduction to city planning, this volume follows much the same lines as a number of earlier books. The book is largely a compilation, often from other compilations. Such a practice need not lessen the value of a book essentially educational in character, but is likely to pass on and increase errors and misleading statements. Portions of the section on water-supply are poor, and the two pages on sewerage and sewage disposal are poorer still. A little help from one of the instructors or a well-informed undergraduate in the engineering department of the university with which the author is connected would have enabled him to improve this part of his book with advantage to himself and his readers. Notwithstanding such faults, the book contains much information and opinion that if carried home to a large circle of readers would help improve living and working conditions in our towns and cities.

For Municipal Ownership

ONE HUNDRED REASONS WHY ONE HUNDRED CITIES HAVE CHANGED FROM PRIVATE TO MUNICIPAL OWNERSHIP OF THEIR PUBLIC UTILITIES: Kansas City, Mo.: Burns & McDonnell. Paper; 5 x 7 in.; pp. 16.

An interesting array of facts and opinions favorable to municipal ownership, drawn largely from the waterworks field. Perhaps 10% of the "reasons" are of doubtful pertinency, and some are duplications—the same "reason" illustrated by another city—but they may be accepted as legitimate propaganda for inclusion in such a pamphlet. Many of the "reasons" are open to argument, but are "reasons" if the premises are correct. Such are a number of citations of lowered rates or increased revenue after changes from private to public ownership, with no data to show but that the burden of supplying water was merely shifted to the taxpayers. Many of the "reasons" would be considered valid by all except uncompromising opponents of municipal ownership, but most of the judicially minded would wish to weigh them against opposing arguments.

PUBLICATIONS RECEIVED

Under a Postoffice Department ruling made applicable to *Engineering News-Record* in July, 1919, it is no longer possible to give the prices of new publications announced under this head or of books reviewed in the preceding columns. Readers will therefore have to obtain this information as best they can. Most of the public documents and of the pamphlet announced may be obtained free on application, or at least by paying postage. So far as possible, the name and address of the publisher of each book and pamphlet are given in each entry

THE NEW INTERNATIONAL YEAR BOOK: A Compendium of the World's Progress for the Year 1918--Editor, Frank Moore Colby. New York: Dodd, Mead & Co. Cloth; 7 x 10 in.; pp. 791; illustrated.
Following its usual lines of comprehensive treatment of the events of the year throughout the world in all branches of human activity, this volume includes, besides its general information, a large number of articles and paragraphs of direct interest to engineers.

PRINCIPLES OF REINFORCED CONCRETE CONSTRUCTION--By F.E.Turneaure, Dean of the College of Engineering, University of Wisconsin, and E. R. Maurer, Professor of Mechanics, University of Wisconsin. Third Edition, Revised and Enlarged. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6 x 9 in.; pp. 485: illustrated.

STEAM TURBINES: A Practical and Theoretical Treatise for Engineers and Students; Including a Discussion of the Gas Turbine-- By James Ambrose Moyer, S.B., A.M., M. Am. Soc. M.E., etc. Fourth Edition, Revised and Enlarged. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6 x 9 in.; pp. 495; illustrated.
Methods of governing the calculation of the strength of the disk type of blade wheels, and recent development in marine practice, are more fully discussed in this than in earlier editions, and many changes have been made in other chapters, the author states in his preface. The first edition was reviewed in Engineering News of Mar. 18, 1909, and the second was reviewed Sept. 14, 1914.

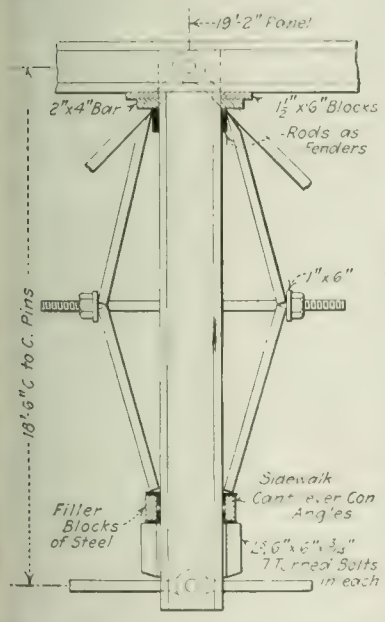
HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Toggle Relieves Load on Bridge Posts During Reinforcement Work

STRENGTHENING the 115-ft. approach spans to the 550-ft. steel arch bridge by which the Grand Trunk Ry. crosses the Niagara gorge at Niagara Falls, N. Y., required increasing the section of the truss posts, which would be overstressed by the E60 loading representing the new carrying capacity of the structure. To make the added metal effective, it was desired to rivet it in place while the posts were in unstressed condition. A very simple and effective toggle device made it possible to accomplish this result without placing the approach spans on falsework.

The approach spans, one at each end of the arch, are parallel-chord pin-connected trusses 18½-ft. deep, with Pratt web system. The posts are two-web riveted sections latticed in planes transverse to the bridge axis. The railway floor is on an upper deck, at the level of



TOGGLE AS APPLIED TO TRUSS POST, NIAGARA ARCH APPROACH

the top chord, while a highway deck is carried at the level of the bottom chord. Curved brackets stiffen the junction between the posts and the upperdeck floorbeams. Because of these brackets, any load on the upper deck subjects the truss posts to lateral bending, and in dealing with the question of strengthening the post both this bending and the direct stress due to truss action were taken into account. Charles E. Fowler, consulting engineer for the reinforcement work, concluded that the most effective way of strengthening the posts would be by riveting a vertical pair of angles to the outside face of each post web. But as these angles if riveted in place while the post still carried its dead-load stress would not be fully utilized, means were studied for taking the load off the posts during the work. At first it was thought that this would require shoring up the span, a matter of very great expense on account of the 100-ft. depth of the gorge slope. In this difficulty the prior use of a toggle for relieving the crown stress in the arch in order to permit measuring the dead-load stresses suggested that a toggle might be used in the case of the post also. The idea was carried out with entire success.

Each toggle, of which two were rigged up for the work on the posts, consists of four steel slabs 5 x 13 in., having a 2-in. central connecting screw with nuts on each end and large washer plates over the abutting ends of the toggle bars. At the outer ends the toggle bars are widened out to 16 in. by being forged down to a blunt chisel-shaped edge, but at the middle their meeting ends are left square and are butted without further preparation.

It was not possible to seat the toggle on the bridge pins, but by placing square steel blocks against the chords a satisfactory bearing was obtained without difficulty. Forcing the middle of the toggle together by the screw forces the two chords apart until the slack is taken out of the pin holes in the post. The point of no-stress condition is determined by taking readings with a strain-gage, and noting when the reduction of stress from the time of beginning operation of the toggle is equal to the computed dead-load stress. Then the reinforcing angles are applied, rivet holes drilled through angles and post webs, and the angles bolted up and at once riveted.

The toggle, when applied to a particular post, occasionally remains under load for as much as two or three days, while both decks of the bridge are in service. Though it thus has to carry all live-load stresses, no trouble of any kind has developed in the operation. The Terry & Tench Co., Inc., New York City, is doing the reinforcement work under the direction of Mr. Fowler, acting with H. G. Dickinson, superintendent, for the Niagara Railway Arch Bridge, owners of the structure.

Removing Marks Due to Belt Finishing From Concrete Roads

A METHOD of removing diamond-shaped serrations from belt-finished concrete roads was described in *Engineering News-Record* of Aug. 14, 1919, p. 338. In that instance the marks were removed by drawing the belt longitudinally over the surface a second time, with the forward edge slightly raised.

This method requires extra carrying of the belt, and care in keeping the front edge elevated as it is dragged forward. Albert R. Seiler, highway commissioner and village engineer of Gowanda, N. Y., has successfully used an ordinary garden hose instead of the belt. The hose is stretched across the road and dragged forward. Mr. Seiler states that all markings are satisfactorily removed by this method.

(Published Nov. 27, with Current News)

NEWS OF THE WEEK

New York, October 16, 1919

This Week's News

This issue carries news current for the week ending Nov. 19. It is dated Oct. 16 in order to preserve the sequence of numbers in the volume.

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DETERMINED EFFORT TO NOMINATE GENERAL LANGFITT FOR CHIEF OF ENGINEERS

(Washington Correspondence)

A very determined effort is being made to induce the Secretary of War to depart from precedent and recommend to the President the name of Col. (until recently Major-General) William C. Langfitt for nomination as Chief of Engineers, as advocated by "Engineering News-Record" in an editorial in its Emergency Bulletin, Nov. 6. General Langfitt lacks several places of being the ranking officer of the engineer corps, but his service as Chief Engineer, American Expeditionary Forces was so notable that many are urging his appointment. It is understood that General John J. Pershing is among General Langfitt's supporters.

Col. Frederick V. Abbot is the ranking officer in the Engineer Corps and is acting as chief of engineers. His service during the war was confined to this country. There will be strong opposition in the Senate to his confirmation. It is understood that the Alabama senators are ready to take any legitmate steps within their power to block his confirmation.

Ranking next to Colonel Abbot is Col. Curtis McD. Townsend; but if appointed Chief of Engineers he would have but a short time to serve before he would reach the retirement age. In addition it is considered undesirable at this time to remove him from the head of Mississippi River Commission.

Strong endorsements are being received by the Secretary of War for Col. Lansing H. Beach. These endorsements are coming largely from the lower Mississippi River. Another candidate receiving serious consideration, it is understood, is Col. (formerly Major General) Henry Jervey, who is General Langfitt's junior and who served in the United States during the war as assistant chief of staff in charge of the Division of Operations of the War Department General Staff.

As a result of the recent Cape Cod Canal hearing it is understood that Col. Edward H. Burr's chances for consideration have been improved. His showing in a searching cross-examination is said to have made a favorable impression on the Secretary of War.

MACKSEY NOMINATED TO HEAD NEW ENGLAND WATER WORKS

Henry V. Macksey, superintendent of public works, Woburn, Mass., is the candidate for the next presidency of the New England Water Works Association recommended by the nominating committee in a report issued Oct. 23. For secretary Frank J. Gifford, superintendent of the Dedham (Mass.) Water Company, has been named as candidate; Willard Kent the present secretary served in that post for a continuous period of 20 years.

POSTPONE GOVERNMENT CEMENT FINENESS REQUIREMENT

In order to afford ample opportunity for mill adjustments the departmental cement committee has postponed the proposed increase in the fineness requirements for Portland Cement until Jan. 1, 1921. At that time the government will not allow over 20 per cent residue on the No. 200 sieve instead of the 22 per cent of the present standard specification.

AMERICAN ROAD BUILDERS HOLD ANNUAL MEETING

Resolution Restricting Federal Aid Funds to Through Routes Elicits Sharpest Discussion-- G. P. Coleman Elected President.

An ammendment to a committee report endorsing the use of other than concrete foundations for highways that must sustain heavy truck traffic, and a spirited discussion of a resolution proposing that Federal aid funds be used only for the construction of trunk line roads and bridges of adequate width and strength, were outstanding features at the annual meeting of the American Road Builders Association held at the Automobile Club of America, New York City, Nov. 7. The program included reports of seven committees, submission of resolutions, report of the Board of Directors and the election of officers.

H. Eltinge Breed, consulting engineer, New York City, declared in a progress report of his committee on widening narrow trunk roads that concrete bases be used in such widening for all types of roadway subjected to heavy truck traffic. Such a recommendation was objected to on the ground that the wide variance of soil and climatic conditions in different parts of this country and Canada, precluded the selection of any single type of foundation. It was claimed that in regions where frost penetration is excessive, broken stone foundations had proved superior to those of concrete. Argument against the recommendation of a single type was made also on the ground that it might discourage foundation experiments now being carried on. Mr. Breed's report was divided into discussions of road width, drainage and type of pavement. Paved surfaces, he said should be 20 ft. for two-line traffic with an additional 9 ft. for each added line of traffic and with shoulders ranging in width from 6 to 9 ft.

Use of Federal Aid Funds

The resolution proposing that Federal aid funds be used only in the construction of trunk-line highways and bridges of adequate width and strength was transmitted through the Board of Directors and read by the President A. H. Blanchard. Its reading, and a prepared discussion by Nelson P. Lewis, chief engineer of the Board of Estimate and Apportionment of New York City, brought forth lively protest from various members. Mr. Lewis' discussion, read by George C. Diehl, included recommendations that Federal-aid funds be used only for highways connecting main routes of highway travel within states, or on through routes; that a minimum road width of 24 ft. be adopted; that roads and bridges be designed to carry the heaviest highway traffic; that adequate study be made of drainage; and that characteristic signs be posted indicating a national highway. After half an hour's discussion separate motions were passed to lay the resolution on the table, and to consider the subject at the annual convention in February, before which time a committee will meet with the chief of the Bureau of Public Roads to get the facts regarding Federal aid work and arrange for an adequate discussion of the subject. It was argued against the resolution that the purpose of the Federal-Aid law was not to build a national highway system but to help the states in building the roads most important for the welfare of the individual states themselves; that it would be inadvisable to try to secure amendment of the present law, and that it would be distinctly unwise and unappropriate to pass such a resolution without giving the Bureau of Public Roads an opportunity to present its views. Arguments in favor of the resolution were that it was the common sense view that money be expended on roads of national importance or on through routes. Opinions were also expressed that Federal-Aid funds should not be applied to the construction of surfacings of a lower grade than waterbound macadam.

The annual meeting opened with a report of the committee on "Uniform Highway Signs" intended to supplement and close the report made to the annual convention early this year. It added to the original document a recommendation regarding a new curve sign, consisting of a curved arrow, with appropriate lettering. The recommendation was adopted.

(Continued on Page 746)

ESCH RAIL BILL PASSED BY HOUSE

Bitter Fight Over Strike Provisions-- Both Parties Fight Federal Control

The Esch railroad bill was passed by the House of Representatives, Nov.17, by a vote of 203 to 159,after the provisions applying to the settlement of labor disputes had been denounced as inadequate to meet the situation. Under the terms of the bill, present rate laws, as a whole, will stand; the powers of the Interstate Commerce Commission are broadened to cover decisions on securities issues and joint use of terminals, and rates are to be determined upon the basis of the public interest and a "fair return on the value of the property."

According to advices from Washington, consideration of the bill by the House displayed clearly that it had not been carefully studied by the membership prior to its consideration. Due to the need for prompt action, consideration of the bill began almost as soon as printed copies of the complicated measure became available. With two very important exceptions, the general plan proposed, as submitted by the committee, has been adopted.

An important change in the manner of refunding the carriers' indebtedness to the United States was made in an amendment proposed by Representative Denison, accepted by Mr. Esch, and carried by a vote of 134 to 69,providing that the refunding of the carriers indebtedness to the United States Government for capital expenditures be partially offset by deductions from rentals. Any remaining indebtedness of the carrier, to the Government in respect to additions and betterments, previously approved by the carrier, shall be funded by the Government at 6% interest chargeable to the carrier, with such security as may be prescribed by the President of the United States. Wide powers are given the President for making arrangements for the extension of time of payment or for exchange of securities acquired under this provision.

A bitter fight developed over the section of the bill dealing with disputes between carriers and their employees. It resulted in the adoption of an amendment proposed by Representative Anderson, with the approval of the railroad brotherhoods and followed the general plan for adjusting disputes which was in effect at the time the Government took over control of the railroads,but without any of the drastic provisions against strikes that appear in the Cummins bill now under consideration by the Senate.

Several comparatively minor amendments were adopted to safeguard the rights of states in matters pertaining to docks and railroads' jurisdiction for purely intrastate lines.

Opposition to government ownership by both the Democratic and Republican parties was indicated throughout the debate. The statement by Representative Esch that such ownership could never be a solution of the problem was received with applause from all sides, as were similar statements by others. Mr. Esch stated that this decision was reached by the committee after hearing proponents of the Plumb plan.

KANSAS TAKES OVER ALL COAL MINES IN STATE RECEIVERSHIP

Upon application of the attorney general of the state of Kansas, the state supreme court, on Nov. 17, placed all coal mines in the hands of three receivers, who will operate the mines to capacity and have full charge of production, sale and distribution. The receiverships are based on the inherent right of the state to protect its citizens. The Governor has made an appeal to the miners to produce coal for the state.

The receivers appointed are Clarence D. Sample, Mayor of Fort Scott, representing the public; Willard Titus, a coal miner of Girard, and C. F. Spencer of Pittsburg, President of the Pittsburg Midway Mining Company.

URGES EARLY TRANSPORT OF ROAD MATERIALS

In an address at the annual meeting of the American Road Builders Association, held Nov.7 at the Automobile Club, New York City, George P. Coleman, state highway commissioner of Virginia, the new president of the association, asserted that one of the four biggest considerations which demand action is the transportation of road materials. With such a vast amount of money available for road construction through Federal, state and county appropriations, Mr. Coleman stated, the railroads are not going to be able to meet the excessive demand for open-top cars when the construction season begins in 1920. He recommended the diversion of the 250,000 open-top cars that usually lie idle during the winter season to the use of contractors for the delivery of materials before the construction season opened.

Another feature of President Coleman's talk was the emphasis he laid upon the need for adequate training of highway engineers to supervise execution of our future extensive roadbuilding programs. These two problems and those concerning engineer compensation and the labor situation, Mr. Coleman asserted, were the four big considerations demanding action of the American Road Builders Association.

INTER-PROFESSIONAL CONFERENCE TO BE HELD AT DETROIT

With the purpose of bringing together the professional men of the country in order to plan more effective relations and act together on matters pertaining to the public good, an Inter-professional Conference is being called to meet in Detroit, Nov. 28 and 29. The subjects which might well come before such an inter-professional organization have been classified under three heads:

A- The functions and inter-relations of professional organizations.

B- Relations of professions to the public.

C- Educational obligations of the professions.

The Detroit program provides for an opening session in which representatives of the various professions will give their views as to the desirable objects,scope,method of procedure and organization for an inter-professional body.

The office of the organizing committee of the Inter-professional Conference is at 56 West 45th. St., New York. The meeting in Detroit will be held at the Hotel Statler.

REPORTS ON COMPENSATION ELICIT LITTLE DISCUSSION

Compensation of Engineers, announced as the subject for the Nov. 5th meeting in New York City of the American Society of Civil Engineers, drew an attendance of only about 350, in spite of the fact that 5000 notices of the session had been mailed from the office of the secretary. Arthur S. Tuttle, chairman of Engineering Council's committee on classification and compensation of engineers, opened the meeting by describing the work of the committee's state and municipal section and presenting facts and figures relating to living costs, union wage scales and compensation in other professions. Francis Lee Stuart and John S. Conway spoke respectively for the railroad and the Federal Government sections.

In their investigations the three sections of the committee have followed similar lines: The preparation of tentative classifications of engineers, a study of living costs, and comparison of other professional and technical compensations with that of engineers,based on the results of questionnaires. It was emphasized in the reports and subsequent discussion that no real progress can be made in increasing engineer compensation until a classification system and a minimum-maximum salary scale have been agreed upon. The committee's recommendations as to classification and scales are expected to be completed at an early date.

Those who had attended the meeting in the hope that the subject of compensation would elicit a lively discussion were doomed to disappointment. Except for a forceful address by William W. Brush, deputy chief engineer of the New York Department of Water Supply, who criticized the apparent apathy of members of the profession toward the all-important question of the hour, nothing of interest developed. Secretary Hunt cited figures showing that, on the basis of attendance in proportion to number of notices issued, engineers were apparently more interested in subjects of purely technical interest than those affecting their own pocketbooks.

GRAND TRUNK BILL PASSES

In spite of strong opposition the bill providing for the purchase of the Grand Trunk Ry. by the Canadian Government has passed the Senate and the House of Commons of Canada and only waits the formal consent of the Governor General to become law. It was adopted intact by the House of Commons, but amendments were made by the Senate providing that nothing in the act should be construed as limiting the liabilities of the Grand Trunk in respect to the Grand Trunk Pacific or its branch lines or other companies; also that the limit of the award to be made by the arbitrators, in the value of Grand Trunk stocks,be fixed at a sum that at 4% will not yield more than $5,000,000 annually, inclusive of the $2,500,000 already arranged for,as interest on the issue of $60,000,000 guaranteed stock of the company. These amendments were accepted by the House of Commons and the bill was finally adopted by a vote of 57 to 28.

AMERICAN ROAD BUILDERS'S ANNUAL MEETING

(Concluded from Page 744)

In presenting the report of the committee on "Economic Status of Guarantees for Pavements on Roads and Streets," Francis P. Smith, consulting engineer, New York City, read recommendations that, on new construction involving grading, foundation and wearing surface, the municipality retain from the contractor an amount equal to 5% of the aggregate of these items of cost. Another recommendation was to the effect that on an old foundation 8% of the cost of surfacing be retained. Retention of this amount from the contractor was deemed sufficient to cover ordinary defects in workmanship and insure the making within reasonable time of the necessary repairs, though totally insufficient to cover extensive repairs rendered necessary by serious defects or failure of the work. Protection against this latter contingency is assured by the guarantee bond. In the case of a two-year guarantee the committee made the recommendation that the whole of the retained fee be payable at its expiration and not before, and in the case of a five-year guarantee, one-fourth of the retained money would be payable two years after the completion of the pavement, and the balance in three equal installments. Another recommendation in this report was to the effect that if the contractor, having received notice from the engineer, fail to make and complete the ordered repairs within a reasonable time, the city has the right to undertake and complete the ordered repairs at the expense of the contractor or his sureties. Thirty days was named as the maximum time. The report which like the preceding one, was an amendment of the report of last February was received and adopted without amendment.

The report of the committee on "Civil Service Requirements for Highway Engineering Positions" was read by Henry G. Shirley, secretary-treasurer, Federal Highway Council, Washington, D.C. The chief items of interest in Mr. Shirley's report were the recommendation that all state highway departments be put under civil service and that the heads of departments be given the widest latitude in the appointment or dismissal of men serving within the departments. Recommendation was also made that the classification and salary schedule proposed for highway engineers by the American Association of Engineers be, upon its completion, included in the report. Mr. Shirley's report was received and adopted with two amendments: (1) That, instead of appointees always receiving the minimum salary, the amount of their salary, within fixed limits, be determined by the department head; and (2) that no residence limitation be placed upon those seeking appointment.

Officers elected for the ensuing year were: President, George P. Coleman, state Highway commissioner, Richmond, Va.; vice-president, Northeastern District, J. A. Duchastel, city engineer, Outremont, Canada; vice-president, Southern District, Prof. R. D. Kneale, Atlanta, Ga.; vice-president, Central District, Prof. Robert C. Terrell, University of Oklahoma; vice-president, Western District, S. Benson, chairman, Oregon State Highway Commission; secretary, E. L. Powers, editor, "Good Roads," New York City; treasurer, James H. MacDonald, former state highway commissioner of Connecticut. Directors elected to serve three years were: Northeastern District: Frederick E. Everett, state highway commissioner, Concord, N.H.; Thomas J. Wasser, county engineer, Jersey City, N. J.; and M. F. Bramley, president, Cleveland Trinidad Paving Co., Cleveland, Ohio Southern District: Charles M. Upham, chief engineer state highway department, Dover, Del. Central District: J. Frank Smith, general manager, Kansas Good Roads Association, Kansas City Mo.; H. K. Bishop, state highway engineer, Indianapolis, Ind. Western District: Samuel Hill, Seattle, Wash.

HOUSE PASSES RESOLUTION TO HURRY DISTRIBUTION OF ARMY TRUCKS

After protracted debate a resolution intended to hurry the distribution of motor equipment for road building purposes was passed by the House of Representatives. The resolution, which has no force of law, but simply is an expression of the feeling of the House, provides "that the Secretary of War be and is hereby requested to deliver immediately to the Secretary of Agriculture for distribution among the highway departments of the several states for use on roads constructed in whole or in part by Federal Aid, the 22,195 motor vehicles for which requisition has been made heretofore by the Secretary of Agriculture, and that all other Army motor vehicles now or hereafter declared surplus be offered for sale immediately at public auction to the American people."

Before its passage, the resolution was amended so as to include equipment and spare parts "which can properly be used with said motor vehicles".

The announced object of the resolution was to spur the War Department to more rapid delivery of motor vehicles to the Bureau of Public Roads. The War Department claims to be delivering vehicles as rapidly as is possible to the Bureau for distribution for the state highway department. The debate brought out the review of the whole controversy regarding the delivery of motor propelled vehicles for road service. Various efforts were made to amend the resolution so as to make it apply to other road building equipment, but in each case such amendments were ruled out as not germane.

An attempt was made to add to the bill a proviso "that in the states where the highway department has no jurisdiction over the road highway within the exterior lines of cities and other municipalities of such states the highway department shall, so far as practicable, assign and get over to such cities or other municipalities an equitable proportion of the motor vehicles delivered to such highway department under the authority given hereunder."

During the debate, an insistent demand was voiced for the passage of the Senate bill #3037, which now is on the House calendar, and which provides not only for the delivery of motor vehicles, but a long list of other materials which can be used for road building purposes.

WISCONSIN'S SUPPLY OF ROAD BUILDING MATERIALS NOT DEPLETED

Following the publication in the Emergency Bulletin of Engineering News-Record, Oct. 23, of a statement on shortage of road materials by Thomas H. McDonald, chief of the Bureau of Public Roads, the following communication has been sent to Mr. McDonald by the Wisconsin Mineral Aggregate Association:

"In Wisconsin, at least, we do not agree with this opinion. It is extremely easy for those legitimate producers of these materials to quickly increase their production where the demand warrants it. This situation is being watched closely by all of the present producers, with an analysis being taken of the prospective requirements for 1920, at least, and production plans are being arranged accordingly.

"In some localities or some states, there is no doubt but what a shortage of these materials will prevail, but it should be remembered that 'Engineering News-Record' covers an extremely large field and is just as likely as not to go into other localities aside from Wisconsin, where no particular shortage exists.

"We believe that where such articles of opinion are published that proper reservations should be made covering those localities not affected."

DISTRIBUTION OF ESTIMATED ROAD FUNDS FOR 1920

Along with a statement that the amount of money expended on road construction during the 1920 season will be dependent chiefly on the quantity of materials the present limited railway facilities can transport, the U.S. Bureau of Public Roads has given out the following data on the distribution of computed available road funds for 1920:

Brought forward from unfinished work on 1919 contracts, $165,000,000; funds available from state and county taxes and Federal aid, $273,000,000; one-fifth state and county bond issues not before available, $50,000,000; one-third unexpended balance of state and county bond issues previously available, $45,000,000; available from new bond issues to be voted on in the fall of 1919 and spring of 1920, $100,000,000.

ENGINEERING COUNCIL COMMITTEE DRAFTS MODEL REGISTRATION LAW

Basing the reason for state registration laws on the protection of the public's life, health and property Engineering Council's committee named to draft a model law, if it found one was desirable, has produced a draft for discussion after a 5-day session ending Oct. 17. The proposed law is simple, short and has several features not included in existing license laws. It covers professional engineering, architecture and surveying. Some of its features are as follows:

There are no definitions of an engineer or an architect, but the qualifications required of applicants indicate the committee's views.

On a state board of seven members appointed for four years' service by the governor at least three must be engineers and three architects. Each board member must have had 10 years' practice and be a member of a recognized society of engineers or of architects. Members are to receive pay while attending meetings, but it is not expected that this will be considered in any sense as adequate compensation for professional service.

No examinations are provided for, but each applicant for registration may submit under oath evidence of having satisfactory qualifications to practice. He may

tempor rily practice in the state on an unexpired certificate previously held in another state or in a province of Canada.

He must be 25 years of age, of good character, a citizen of the United States or Canada, or must have declared himself for citizenship, must speak and write English; must have had six years' active practice immediately prior to application, one year of which must have been in responsible charge of work. Teaching and study of engineering is considered active practice. A total practice of ten years or graduation from a four-year engineering course and four years' active practice qualify a candidate for registration,and likewise full membership in a recognized engineering or architectural society will be considered sufficient evidence of the candidate's eligibility unless other known facts disqualify him. A majority of the architect members of the board must pass on architects and a majority of the engineer members on engineers.

Revocation of registration is to follow conviction because of fraud, deceit, negligence, incompentence or misconduct. Penalties include fines of from $100 to $500 and three months in prison.

Definite provision is made for engineers to practice architecture and for architects to practice engineering, because it is not possible to draw a fine distinction between the two professions.

Exemptions include the following points: Simply offering to practice in another state; practicing not more than 15 days per year in another state if legally qualified in home state; practicing of new arrivals after application has been filed; practicing as an employee of a registered engineer or architect; practicing of United States officials on government business; employees of the state at time of enactment; individuals, firm or corporation on property owned by them unless it involves the public health or safety. This last point is intended to exempt maintenance work.

One year after the law goes into effect all state county and city engineers engaged in the supervision of public work valued at more than $2,000 must be registered.

T. L. Condron, consulting engineer, Chicago, is the chairman of the committee. The other members are J. W. Alvord, Rion J. Arnold, F. C. Shenehon, Farley Gannett, Prof. J.H.Dunlap, Prof. Arthur M. Green, Jr. Caleb M. Saville, James H. Herron, J.W.Woermann, A.L. Fellows, Amos Slater, A.M.Schoen, John Klorer and Christopher H. Snyder. C.F. Loweth, member of Engineering Council, sat with the committe.

The draft of the proposed model law for the registration of engineers is still subject to revision by the committe, and has not yet been submitted to Engineering Council nor has Council taken any stand upon the necessity for the registration of engineers or the desirability of such a procedure. This advance publication of the principal features of the model law in preparation by the committee is authorized solely for the purpose of gaining the benefit of discussion by engineers throughout the country so that Council may have such guidance when the question is taken up for action. The next meeting of Engineering Council will occur December 18. Comments on the proposed bill for the registration of engineers should be sent to Chairman Condron, Monadnock Block, Chicago.

WATER WORKS ASSOCIATION HOLDS FOUR-DAY MEETING

New England Convention Has Two Sessions on Hudson River Boat-- Well Arranged Program of Business and Pleasure-- Much Discussion of Drifting Sand Filters.

(Publication Delayed by Printers' Strike)

A varied program of both papers and entertainment marked the thirty-eighth annual convention of the New England Water Works Association at Albany, Sept.30 to Oct. 3. By scheduling no more than two papers for any one session there was plenty of time for discussion. Two of the sessions were held on one of the Hudson River boats, with luncheon between, through the courtesy of the Water Works Manufacturers Association. The same organization combined with the Rensselaer Polytechnic Institute and the Troy Water Department to afford a visit to the Institute and over the drainage area of the Troy water-works. The Institute provided lunch and threw its large swimming pool open to inspection. Moving pictures illustrating the manufacture of steel pipe by the National Tube Co. were shown on the evening of Oct. 2.

The need for a full-time official at the Association's headquarters in Boston was urged by Samuel E. Killam in his presidential address. Mr. Killam also recommended the adoption of the budget system by the association and suggested that in each of the 37 states represented in the membership there be a committee to watch legislation and report to the Executive Committee anything needing its attention.

The Dexter Brackett memorial medal for the most meritorious paper read before the association during the past year was awarded to David A. Heffernan,superintendent of water-works, Milton, Mass.,for his paper on "Practical Methods of Determining Leaks in Underground Pipes". Patrick Gear, Holyoke, Mass., remarked that the medal had now gone successively to an engineer, a registrar and a superintendent and spurred on the superintendents to continue to keep at least even in the contest.

Committee work continues to be affected by the war, the various progress reports showed. No final report was submitted, but President Killam gave promise of efforts to see that a number of committees get down to work soon. One new committee was created, to deal with methods of meeting the cost of water main extension and of controlling the laying out of new streets.

A number of lengthy papers,some replete with engineering details were given. One of the most notable of these was entitled "Hydraulic Fill Dams of the Miami Conservancy District", by H.S.R.McCurdy, division engineer. The author outlined the Dayton flood of 1913 that led to the formation of the district,told how the district was created, described the river channel improvement and flood storage reservoir project and took up the construction work on the five dams, and the great conduits through them that will pass the entire ordinary flow of the streams on which the flood storage reservoirs are located.

Colonel F.F.Longley, who went to France in August, 1917 and organized the water-supply service of the A. E. F. outlined the work done overseas.

Superintendents Had Their Day

The single session on Thursday was devoted entirely to whatever subjects the superintendents might bring up for discussion. After somewhat over an hour of lively enough talk on fire hydrants broken by motor vehicles and on touching up pipe coating damaged in transit the session adjourned. As to broken hydrants, a number of superintendents seemed to have had no great success in collecting damages from the owners of the motor vehicles that caused the breaks, but one or two had collected not only such damages but also money wasted by the breaks. Common practice is to repair broken hydrants by welding.

No paper on the program gave rise to more questions and discussion than the one on "The New Drifting Sand Filter System at Toronto", by Norman J. Howard, bacteriologist in charge. (For detailed description of these novel filters see "Engineering News", June 25, 1914, p. 1446, April 8, 1915, p. 680, Dec. 21, 1916, p. 566, and Engineering Record, April 10, 1915, p.465, and for a summary of the contract test results see "Engineering News-Record", Oct. 31, 1916, p. 817. Those who asked questions were loath to believe that mechanical filters without coagulating basins and working at so high a rate as the Toronto filters were designed for could produce the guaranteed results. Mr. Howard stood his ground through the fusillade of questions, except that he was unable to go into operating cost details because these had not been supplied to him by the responsible authorities.

Except for a few sentences on preliminary tests, the paper on the unaflow pumping engine by D.A.Decrow, went over the ground covered by the author at the Buffalo convention of the American Water Works Association ("Engineering News Record", June 19, 1919, p.1193) With only 10° superheat available (against 100° intended), some 200 lb. steam pressure, 95 lb. water pressure, 27.2 in. vacuum, and 203 r.p.m., the steam consumption per indicated horse power was about 12.4 lb. and the duty about 140,000 foot-pounds.

The flat-slab covered reservoir at Dayton, Ohio, (see "Engineering News-Record", May 22, 1919, p. 1016) was described in a paper by Leonard Metcalf and William T. Barnes. The successful campaign against underground water losses at Washington, D.C., was outlined by Paul Lanhan, engineer in charge of waste detection. The city has been divided into districts, which are surveyed from time to time by means of the pitometer acusphone and house inspections.

In the matter of patching up damaged coatings the discussion showed stress laid on cleaning the surface. President Killam said that on the Metropolitan Water-Works this is done by using oak or chestnut scrapers, followed by wire brushes. then ordinary brushes to remove the dust. For pipe too small to admit men, the cleaning tools are secured to the middle of a pole, operated by a man at each end of the pipe length, while the coating for patching up is applied with a brush at the end of a pole.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, 29 W. 39th St., New York City; Dec.2-5, New York City.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.; Dec.3-6, Savannah,

NATIONAL RIVERS AND HARBORS CONGRESS, 824 Colorado Building, Washington, D. C.; Dec. 9-11, Washington, D. C.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.; Dec.8-11, Louisville, Ky.

AMERICAN MATHEMATICAL SOCIETY, Secretary, F. N. Cole, 501 W. 116th St., New York City; Dec. 30-31, New York City.

BRIDGE BUILDERS' & STRUCTURAL SOCIETY, 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

The New York Chapter of the American Association of Engineers plans to secure an attendance of 500 at the meeting in the Engineering Societies' Building, Nov.26, to which members are invited to bring ladies. Dr.F.H. Newell, president of the association, is included on the list of speakers.

The Maine Society of Civil Engineers held its annual field day meeting in Waterville, Me., Oct.28. Among the speakers after dinner were C. W. James, assistant chief engineer of the Bureau of Public Roads, and Prof. Burr and Dean H. S. Boardman of the University of Maine.

Cincinnati Chapter of the American Association of Engineers, meeting in Cincinnati, Nov. 7, formulated plans to increase its membership from 180 to 250 before the end of the year.

The American Society of Sanitary Engineers will hold its 1920 convention in St. Louis in September, according to recent information from that city.

The Engineering Society of Buffalo was addressed Nov.11 by Charles H. Norton, chief engineer, Norton Co., Worcester, Mass., who spoke on "American Federation of Industry."

The Engineers' Club of Trenton was addressed by H. E. Skougor on "Proposed Plan of the United Port of New York and New Jersey" at the meeting Nov. 13.

PERSONAL NOTES

W. G. TRIEST severed his connections with the Snare & Triest Co., general contractors, of New York City, on Oct. 31, and has formed the Associated Contractors, Inc., in which he will continue in the general contracting business, with offices in New York City. Mr. Triest's withdrawal from the Snare & Triest Co. comes after a period of 20 years' continuous service with that organization. He began his professional practice with the Passaic Steel Co., of Paterson, N. J., in 1888 and two years later became associated as principal assistant, with A. B. Boller in the preparation of plans and supervision of construction of the 155th Street viaduct and other important structures in New York. Entering private practice in 1897 as contracting engineer he executed many structural steel and building contracts, among them a $300,000 fireproof building job for the Brooklyn Navy Yard. He became vice-president of the Snare & Triest Co. in 1899 and as an executive of that organization handled many million dollars' worth of large-scale construction, including subway and elevated work in New York and dock and warehouse projects in Philadelphia and elsewhere. Mr. Triest enters upon his new work with a long and successful experience in the general contracting business.

JOHN ERICSON, for many years city engineer of Chicago, has resigned and has entered private practice, at the same time accepting an appointment as consulting engineer to the Chicago Department of Public Works.

MAJ. H. W. DURHAM, Engineers, U.S.A., returned from France in mid-October after a long term of service with the American Expeditionary Force. Major Durham was on Brigadier-General Jadwin's staff in charge of the road section of the Division of Construction & Forestry. Upon the signing of the armistice he was given complete charge of road repair work undertaken by the American engineers in France. In July, 1919, he was assigned to the Liquidation Commission to assist the Department of Agriculture in the accumulation of road repair machinery in France and the shipping of it back to the United States. Major Durham was formerly chief engineer, Bureau of Highways, Borough of Manhattan.

COL. CLARENCE S. COE, U. S. A., previously assistant to section engineer, base No. 1, St. Nazaire, France, recently sailed from New York to represent the head of the advisory mission to Serbia.

MORGAN CILLEY, previously of the editorial staff of "Engineering News-Record", has become vice president and assistant manager, Tharp & Co., transportation engineers and distributors of the United States motor truck for Pittsburgh and western Pennsylvania.

J. B. MARCELLUS has been appointed associate professor of civil engineering, University of Colorado, but will continue to spend some time in consulting work.

COL. A. H. ACHER, Engineers, has resigned from regular army to become chief engineer, United Food Products Corporation.

JAMES T. TAYLOR, Honolulu, T.H., has been appointed resident engineer and chief inspector of Belt R. R., Koolaupoko, Oahu, with headquarters at Kaneohe.

CARL H. REEVES, discharged from the service, has resumed private practice as a consulting engineer in the American Bank Bldg., Seattle, Wash.

LT. WM. L. STANTON, 304th Engineers, discharged from the service, has left the Whitehead & Kales Iron Works, to become an instructor in the College of Engineering, University of Michigan.

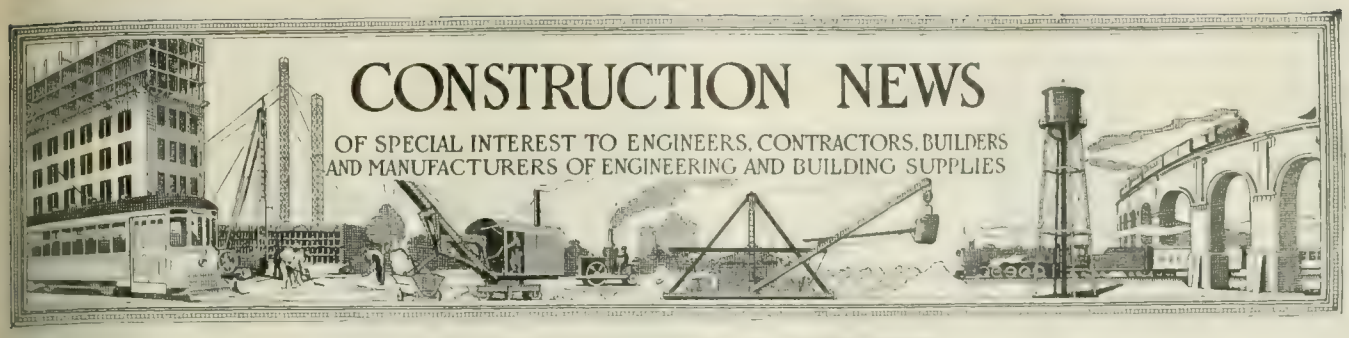
F. A IRVINE, has resigned as city engineer of Jamestown, N. Y., to enter private practice.

H. G. McGEE, captain, sanitary corps, U.S.A., Camp Dodge, and later hydraulic and sanitary engineer, Des Moines, Ia., has become connected with the Bureau of Municipal Research, Akron, O.

OBITUARY

BRIG. GEN. WILLIAM T. ROSSELL, former Chief of Engineers, U. S. Army, died recently at New Brighton, N. Y., at the age of 70. He retired as chief of engineers in August, 1913, and afterwards engaged in private work. He was graduated from the United States Military Academy at West Point in 1873 and entered the Corps of Engineers as second lieutenant, later becoming assistant professor of civil engineering at the U. S. Military College. In 1892 he was appointed engineer-commissioner for the District of Columbia.

WILLIAM DIXON WEAVER, previously editor of "Electrical World", "American Electrician", and "Electrical Engineer", died in Charlottesville, Va., Nov. 1. His engineering training began in 1876 with his entrance in the United States Naval Academy. After several years study at the Sorbonne, Paris, he accompanied the first Greely Relief Expedition in 1883. In 1893 he became editor of the original "Electrical World" and three years later enlisted the aid of James H. McGraw in the foundation of the "American Electrician", of which he became the first editor. Soon afterwards the "Electrical Engineer" consolidated, and Mr. Weaver and T. C. Martin became editors of the combined paper. He was active in the planning of the present Engineering Societies' Building in New York and in the success of the Electrical Engineering Library there.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

Price advances are indicated by heavy type; declines by *italics*

PIG IRON—

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	**$36 60**	**$30 35**
Northern Basic	27 55	27.55
Southern Ohio No. 2	.31 10	28.55
NEW YORK, tidewater delivery		
2X Virginia (silicon 2.25 to 2.75)	32 40	32.40
Southern No. 2 (silicon 2.25 to 2.75)	35.20	35.20
BIRMINGHAM		
No. 2 Foundry	**29.10**	27.75
PHILADELPHIA		
Eastern Pa.	*29.50**	30.65
Virginia No. 2	*33.10†	32 10-34 10
Basic	*26.75*	30 90
Grey Forge	*26.25*	29.90
CHICAGO		
No. 2 Foundry Local	**26.75**	26.75
No. 2 Foundry Southern	**33.60**	28.00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	28 15	28 15
Basic	27 15	27 15
Bessemer	29 35	29.35

All Prices Are of October 1

* F. o. b. furnace. † Delivered.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	$45 00	$55 00	$45 00	$65 00
Standard openhearth rails	47 00	57 00	47 00	67 00
Light rails, 8 to 10 lb	2 58½*	3 13	2 58½*	3 13
Light rails, 12 to 14 lb	2 54*	3 09	2 54*	3 09
Light rails, 25 to 45 lb.	2.45*	3 00	2.45*	3.00

*Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				San
	Current	One Year Ago	Chicago	St. Louis	Francisco
Standard spikes, ⅝-in. and larger	$3 35	$3.90	$4.27	$4 44	$5 65
Track bolts	4 35	4.90	5.17	Premium	6.65
Standard section angle bars	3.00	....	4.22	Premium	4.60

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

		7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In by 8 Ft.
Chicago	Plain	$1 48	$1.33
San Francisco	Douglas Fir—Green	1.42	1 00
San Francisco	Douglas Fir—Creosoted	2.12	2.00

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0 70	No. 1	$0 55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1 05
7x9x8 red oak (No. 4)	$0.80	No. 5	.87

Note.—Add 36c. each for treatment.

PIPE

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
¼ to 3 in. butt welded	47%	57 5%	45%
2½ to 6 in. lap welded	42%	53.5%	41½%

	Galvanized		
	New York	Chicago	St. Louis
¼ to 3 in. butt welded	31%	44%	30½%
2½ to 6 in. lap welded	27%	41%	27½%

Malleable fittings, Class B and C, from New York stock sell at +12½% list prices. Cast iron, standard sizes, 10% off.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York						
	Current	One Month Ago	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4 in.	$57.30	$55.30	$64 75	$58.80	$52.00	$77.55	$65 00
6 in. and over	54.30	52.30	61.75	55.80	49.00	74.55	62 00

Gas pipe and 16-ft. lengths are $1 per ton extra.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh: basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	50½%	24%			
½	54½%	40%			
¾ to 3	57½%	44%	¾ to 1½	39½%	23½%

LAP WELD

2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 6	34½%	21½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	46½%	29%	¼ to 1½	39½%	24½%
½	51½%	39%			
¾ to 1½	55½%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2½ to 4	35½%	23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Malleable fittings. Class B and C, banded from New York stock sell at list 2% off. Cast iron, standard sizes, 20% off.

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.:

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35 00	$35 00	$22 50	**$50 00**		$33.44
4	51 00	51.00	27 00	**60 00**	$45 00	50 16
5	65 00	65 00	45 00	**70 00**	65 00	62 70
6	90.00	90 00	55 00	**80 00**	90 00	83.60
8	130 00	130 00	100 00	**120 00**	150 00	133.76

SEWER PIPE—The following prices are in cents per foot for carload lots:

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	**$0 102**	$0 117		**$0 105**		$0 132
4	**102**	117		**105**	$0.15	.132
5	**.153**	.1755		**.1575**	.1875	.207
6	**.153**	.1755	$0 16	**.1575**	.225	.207
8	**.238**	.273	.21	**.245**	.3475	.2875
10	**.357**	.4095	.29	**.3675**	.45	.4025
12	**.459**	.5265	.37	**.4725**	.60	.5175
15	**.612**	.702	.56	**.63**	.9375	.7475
18	**.85**	.975	91	**1 00**	1.275	.9775
20	**1 02**	1 17	1 14	**1 20**	1.71	1.15
22	**1.36**	1.56	1.46	**1 60**		1.495
24	**1.53**	1.755	1.56	**1 80**	2.125	1.725
27	**2.45**	2.60	1.90	**2.75**		2.5875
30	**2 664**	2 88	2.57	**3.45**		3 1625
33	**3.51**	3.78	3 09	**4.00**		4 025
36	**3.9975**	4.305	3.37	**4.35**		4.60

	3	5	8	12	24	36
Boston	$0.078	$0 117	$0 182	$0 351	$1 17	$3.28
St. Paul	.12	18	.28	.45	2.00	4.75
Denver	.105	.16	.25	.425	1.575	.
Seattle	.	.	.36	.64	2.25	.
Kansas City	.12	.18	.25	.50	1.80	4.60
Los Angeles	.09†	.15†	.2475	.44	1.50†	.
New Orleans			40 per cent. off			
Cincinnati	.08	.1215	.189	.3645	1.215	3.1775
Atlanta	.	.	.34	.55	2.00	....
Montreal			55-60 per cent. off			
Detroit	0885	.133	2065	.398	1.44	3.536
Baltimore	.114	.171	.266	.513	1 71	.

†4-in., 6-in., 30-in. respectively.

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices per gallon in tank cars 8000 gal. minimum f.o.b. place named:

	Current	One MonthAgo
New York, 45-65% asphalt	$0.04½	$0.04½
New York, liquid asphalt	.06	.06
New York, binder	.06½	.06½
New York, flux	.04½	.04½
St. Louis, 40% asphalt	.0412	0412
Chicago, 15-20% asphalt	.10	10
Chicago, 100% dust layer	.11	.11
Dallas, 40-50% asphalt	07	.07
Dallas, 60-70% asphalt	.08	.08
Dallas, 75-90% asphalt	.10	.10
San Francisco, 75-95% asphalt, per bbl.	2.10	2.10

ASPHALTUM—Price per ton in packages and bulk in carload lots:

	Brand	Package	Bulk
New York	Texaco	$18 00	$14.00
Chicago	Mexican	33.00	31.00
San Francisco	California	17.00	13.75
Dallas	Texaco and Mexican	32.00	30.00
Seattle	D grade	23.50	.....
Denver	Trinidad	45.00	.....
Denver	California	38.00	.....
St. Paul	Mexican	21.00	.....
Kansas City	Mexican	26.00	24.00
Atlanta	Standard	24 00	19.80
New Orleans		16 50	.....
St. Louis	Stanolind	24.90	18.40
Detroit	Bermudez	49.40	.....
Baltimore	Manco	43.00	.....
Los Angles	D Grade	.....	13.50
Montreal		.....	18 90

PAVING STONE—

Chicago	About 4x8x4 dressed	$2.45	sq.yd.
	About 4x8x4 common	2.20	sq.yd.
San Francisco	Basalt block 4x7x8	57.75	per M
Kansas City	Granite	3.00	sq.yd.
Boston	5-in. granite	110.00	per M
St Paul	Sandstone	2.45	sq.yd.
Atlanta	Granite	1.85	sq.yd.
Detroit	Granite, small	2.75	sq.yd.
Baltimore	Common	2.25	sq yd.
Montreal	Granite	5 90	sq.yd.

FLAGGING—

New York	Bronx	$0.21	sq.ft.
	Manhattan	.22	sq ft.
	Queens, 5 ft. square	.23	sq.ft.
	5x20-in. cross-walk	.75	lin.ft.
Chicago	18 in. wide	.70	lin.ft.

WOOD BLOCK PAVING—

	Size of Block	Treatment	Per Sq.Yd.
New York	3½	16	$3.25
New York	4	16	3.50
Chicago	4	16	4.50
Chicago	3½	16	3.50
Chicago	City specifications		5 00
St. Louis	3½	16	2.45
St. Louis	4	16	2.70
Seattle	4	16	2.55
Kansas City	4	16	3.00
St. Paul	3½	16	2.13
Atlanta	3½	16	2.25
New Orleans	3½	16	2.63
New Orleans	4	16	3.00
Dallas	3½	18	3.17
Dallas	4	18	3.56
Baltimore	3½	16	3.60
Montreal	4	16	4 65

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd:

	Gravel 1½ In. Current	Gravel 1½ In. One Yr. Ago	Gravel ¾ In. Current	Gravel ¾ In. One Yr. Ago	Sand Current	Sand One Yr. Ago
New York	$2 00	$2 00	$2 00	$2.00	$1.25	$1.25
Denver	1.60	1.60	1 60	1.40	1 25	1 10
Chicago	1.35	2.00	1 35	1.40	1 35	1 95
Kansas City	2.50	2.15	3 00	2.60	1.00†	1.00
St. Louis*	1.78	1.35	1 82	1.35	1 68	1.45
Seattle	1.20	1.25	1 25	1.25	1.05‡	1 25
Dallas	3 00	2 00	3 00	2.00	2.50	1 40
St. Paul	1.25	1 25	1 35	1.50	60	60
San Francisco	1.15	1.20	1 15	1.20	1 15	1 20
Boston	1.60	2.00	1.60	1.75–2	1.00	1 00
New Orleans	2.40	2 27	2 40	1 80	1.20	2 25
Atlanta	2.00‡				1 10‡	
Detroit	2.00		2.00		2.00	
Paltimore	1.54		1.75		.65	
Montreal	1 20‡				1 10‡	

*Fine white sand, Pacific and Ottawa per ton, $6. †Kaw River sand is $1.50 per yd. ‡ per ton.

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In. Current	1½ In. One Year Ago	¾ In. Current	¾ In. One Year Ago
New York	$1.65-1.75	$1.70	$1.75-1.85	$1.85
Chicago	1.30	1.60	1.30	1.70
St. Louis	1.50	1 08	1.50	1.08
Dallas	2 90	1 51	2.80	1.55
San Francisco	1.50	1 20	1.50	1 20
Boston	2.75*(del)	1.75	2.75*(del)	1.75
St. Paul (lime)	1.15†	1.15	1.25	1.45
Denver		1 60	1 60	1.40
Kansas City	2 00	1 70	2 10	1.70
Seattle	1 50	1 20	1.50	1.20
Atlanta	2.25	3 36	2.35*	
New Orleans	4 00	.....	4 35	2 28
Los Angeles	1.20	1.50	1 20	1.60
Detroit	2 00		2 00	
Baltimore	1 25		1 50	
Montreal	1 90*		2 15*	

*Per ton †Limestone; traprock, $1 60 and $1 80 per ton for 1½ and ¾-in

LIME Warehouse prices

	Hydrated per Ton Finished	Hydrated per Ton Common	Lump per 200-Lb. Barrel Finished	Lump per 200-Lb. Barrel Common
New York	$17 50	$14 50	$2 90*	$2.65*
Kansas City	23 20	21 00	2 30	2.20
Chicago	18 00	17.50	1.80	1 10
St. Louis	22.00	18 00		2.00
Boston	22 00	18.25	3.70*	3.40*
Dallas	30.00		2 75	
Cincinnati	13 70	11.95	10 70‡	
San Francisco	30.00	.....	2.80†	
St Paul	23.00	20.00	1.60	1 50
New Orleans	.....	17.50		2.20
Atlanta			1.80	1.95
Detroit	18.00	16.65	3.00*	3.00*
Seattle	30.00	.....	3.05†	2.80†
Los Angeles			3.05†	2.80†
Baltimore	19 25	16 75		11 37‡
Montreal	20 00	20 00	15 00‡	15 00‡
Denver		26 25		2 50

* 300 lb barrels †Per 180-lb barrel ‡ Per ton.
NOTE—Refund of 10c per barrel.

NATURAL CEMENT—Price to dealers for 500 bbl. or over, f.o.b., exclusive of bags:

St. Paul (Austin)	$1.45
Kansas City (Ft. Scott)	1.40
New Orleans	2.52
Atlanta (Magnolin)	1 85
Cincinnati (Louisville)	1.35

PORTLAND CEMENT—Current prices are for barrels in carload lots, without bags, to contractors:

	Current	One Month Ago Without Bags	One Year Ago With Bags
New York	$2.30	$2 30	$3.35
Jersey City	2.27	2.27	2.99
Boston	2.42	2.42	3.59
Chicago	2.00	2.00	2.45
Pittsburgh	2.05	2 05	2.55
Cleveland	2 32	2.32	2.72
Detroit	2.08	2 08	2.68
Indianapolis	2 27	2.27	2.62
Toledo	2.12	2.12	2.62
Milwaukee	2.11	2.11	2.56
Duluth	2 10	2.10	2.60
Peoria	2.12	2 12	2.56
Cedar Rapids	2.18	2.18	2.68
Davenport	2 14	2.14	2.64
St Louis	2 20	2.20	2.70
San Francisco	2 43	2.43	3.48
New Orleans	2.36	2.36	3.66
St. Paul	2.22	2.20	3.40
Denver	2.67	2.67	3.67
Kansas City	2.26	2 26	3.40
Seattle	2.53	2.53	3.33
Dallas	2.03	2 03	2.80
Atlanta	2.50	2.50	.....
Cincinnati	2.30	2.30	2.80
Los Angeles	2 78	2.78	3.38
Baltimore	2.30	.....	.....
Detroit	2.08		.....
Montreal	2 70		.....

NOTE—Bag charge is generally 15c each

TRIANGLE MESH—Price per 100 sq.ft. in carload lots:

PLAIN 4-INCH x 4-INCH MESH

Style Number	Sectional Square per Ft.	Area Inches Width	Pitts-burgh	New York	Chicago	St. Louis	Dallas	San-Fran-cisco
032	0 032		$0 92	$1.16	$0.98	$0.99	$1.13	$1 32
049	0 049		1 18	1 48	1.26	1.26	1.43	1.67
068	0 068		1 44	1.86	1.53	1.56	1.79	2.06
093	0 093		1 85	2 39	1.97	2.00	2.41	2.65
126	0.126		2 28	3 02	2.43	2.47	2.92	3.28
153	0 153		2 72	3 59	2.90	2.95	3.48	3.93
180	0 180		3 12	4.13	3.33	3.39	3.99	.....
245	0.245		4 12	5 44	4.40	4 47	5.27	.....
287	0 287		4 76	6 29	5.08	5.16	6.10	6.86
336	0.336		5.52	7 30	5.89	5.99	7.06	.....
395	0.395		6.40	8.45	6.83	6.94	8.19	.....

PAVING

036P	0.036		$0 71	$0.92	$0.76	$1.77	$0.80	.....
053P	0 053		1 00	1.28	1.06	1 08	1.12	.....
072P	0.072		1 26	1 66	1.34	1.37	1.46	.....
097P	0 097		1 62	2 12	1.73	1 76	1.88	.....
049R	0.049		1 00	1 28	1.06	1 08	1.12	.....
067R	0 067		1 26	1 65	1 4	1.37	1.46	.....
089R	0 089		1 62	3.11	1 73	1.76	1 88	.....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths. Galvanized is about 10% higher.

EXPANDED METAL LATH—Prices in carload lots per 100 yd. for painted are as follows:

Gage	Weight	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
27	233	$29 10	$34.07	$29.00	$29.00	$34.00	$32.75
26	250	30.45	35.23	30.50	30.00	35.00	34.50
25	300	31.90	36 51	32.00	.....	37.00	36.75
24	340	33.50	37 73	33.00	33.00	40.25	39.25
22	450	36 60	40 48	.....	.....	.....	43.30

About 10% additional for smaller quantities.

BARS, CONCRETE REINFORCING—Following quotations are per 100 lb.

ROLLED FROM BILLETS

In.	Mill Pittsburgh	New York Current	New York One Year Ago	Chicago	St. Louis	Dallas	San Francisco
¾ and larger	$2 35	$3 37	$4 14½	$3.37	$3.68	$4.75	$4.60
⅝	2 40	3 42	4.19½	3.42	3.74	4.80	4.65
½	2.45	3.47	4.24½	3.47	3 79	4.95	4.70
⅜	2 60	3 62	4.39½	3.62	4 04	5.00	4.85
¼	2 85	3 87	4 64½	4.87	4.19	5.05	5.10

Twisted bars cut to length take extra of 27½c. per 100 lb. Extra on deformed bars, uncut, 7½c.

ROLLED FROM RAILS

	Chicago	St Louis	Dallas		Chicago	St. Louis	Dallas
¾ in and larger	$3 45	$3 55	$4.25	⅜	$3.70	$3.80	..
⅝	3 50	3 60	4.30	¼	3.95	.....	
½	3 55	3 65					

BRICK—To contractors price per 1000 in cargo or carload lots is as follows:

	Common Current	Common One Month Ago	Common One Year Ago	Paving Brick	Paving Block
New York	$15 00	$15.00	$14.00	No Quotations	
Chicago	12 00	12.00	11.00	.....	.....
St. Louis, selected	18.00*	16.00	16.00	$26.00	.....
St. Louis, salmon	12.00	10 00	10.00	.....	.....
Denver	14 00†	13 00	9.50	.....	38.00
Dallas	18.57	18 00	14.00	27.30	...
San Francisco	12 50	12.50	12.00	.....	.....
Boston	18 00	18 00	16.25	30.00	45.50
New Orleans	19 00	17 50	19.00	19.00	...
St Paul	14 50	13.00	9.75	30.00	36.50
Kansas City	16.00	15 00	13.00	42.50	.....
Seattle	15 00	15.00	15.00	.....	42.00
Cincinnati	17 00	16 00	16.50	.....	.....
Atlanta	16 00	15.00	.....	40.00	.....
Los Angeles	12 50	12 50	10.00	.....	.....
Montreal	15 00	15.00	.....	80.00	...
Detroit	17.25	19 00	...	37.00	...
Paltimore (del)	18 00	18 00		22 00	42.50

* Hard brick, $14 † Salmon is $13 in Denver.

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12	$0.11475*	$0.10125	$0 09	$0 08	$0 1125	$0 1088	
6x12x12	.153*	.13500	.1268	.105	.15	09	$0.1512
8x12x12	.204*		.183	.15		.115	.1944
10x12x12			.1	.173		.2546	.2268
12x12x12			.208	.208		.3082	.2916

*Delivered below 72nd St.

	4x12x12	8x12x12	12x12x12
Boston	$0 15	$0 24	$0.32
St. Paul	.065	.135	185
Cincinnati	08	.15	215
Kansas City	.0786	.15	.205
Denver	.1250	.18	.25
Seattle	.09	.175	.30
Atlanta	.09	.16	.25
Los Angeles	.082	.154	
New Orleans	.165	.22	.325
Detroit	.088	.1674	.2399
Baltimore	.115	.21	.2875
Montreal	.12	.28	.34

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill Pittsburgh, together with quotations per 100 lb. from warehouses at places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in	$2 45	$3 47	$4 24½	$3 54	$3 47	$4 45	$5 50
Channels, 3 to 15 in	2 45	3 47	4 24½	3 54	3 47	4 45	5 50
Angles, 3 to 6 in., ¼ in. thick	2.45	3 47	4 24½	3.54	3 47	4 45	5.50
Tees, 3 in. and larger	2.45	3 52	4.24½	3.54	3 47	4 45	5 50
Plates	2.66	3 67	4 49½		3.67	4 90	5 75

RIVETS—The following quotations are per 100 lb..

STRUCTURAL

	Mill Pittsburgh	New York Current	New York One Yr. Ago	Chicago	St. Louis	San Francisco	Dallas
			Warehouse				
½ in. and larger	$4.30	$4.72	$5.65	$4.72	$4.79	$6.05	$7.50

CONE HEAD BOILER

½ in. and larger	4.30	4 72	5 75	4.82	4.89	6.15	7.50
⅝ and ¾	4 45	4.97	5 90	4.97	5.04	6.30	7 50
⅞ and 1	4.70	5.32	6 25	5.32	5 29	6.65	7 75

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Chicago	San Francisco	Dallas
Wire	$3 25	$3 90	$3 90	$5 25	$5 00
Cut	4 25	5 85	5 50	6 65	6.40

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.
No. 1 grade	$1 50	$1 75	$1.90	$2.15	$2.30	$2.55
No. 2 grade	1 35	1 60	1.70	1 95	2 05	2.30

Asbestos asphalt-saturated Felt (14 lb. per square) costs $1.56 per ton

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.25 per roll in carload lots and $2.50 for smaller quantities

Shingles, red and green slate finish, cost $6.00 per square in carloads; $6.25 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$70 00	$70 00	$71 00	$71 00
Tar pitch (in 400-lb bbl.)	21 00	18 00	22.00	19 00
Asphalt pitch (in barrels)	34 00	34 00	37.50	37 50
Asphalt felt	68.00	48.00	72 50	72 50

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr Ago
No. 10	3.55	4 64	4 57	5 80	4.57	5 495
No. 12	3.60	4 69	4 62	5 75	4 62	5 545
No. 14	3.65	4.74	4.67	5 90	4 67	5 595
No. 16	3.75	4.84	4.77	6.00	4.77	5.695
Black						
*Nos. 18 and 20	4.15	5 24	5.42	6 75	5 30	6 295
*Nos. 22 and 24	4.20	5.29	5.47	6.80	5.35	6.345
*No. 26	4.25	5.34	5.52	6 95	5.40	6 395
*No. 28	4.35	5.44	5.62	7.05	5.50	6.595
Galvanized						
No. 10	4.70	5 79	5.97		6 20	6 845
No. 12	4 80	5.89	6.07	7.30	6 25	6 895
No. 14	4.80	5 89	6.07	7 30	6.30	6.945
Nos. 18 and 20	5.20	6 19	6 37	7.60	6 50	7 245
Nos. 22 and 24	5.25	6.34	6.52	7.75	6.75	7.295
*No. 26	5.40	6 04	6 67	7.90	6 90	7.445
*No. 28	5 70	6 79	6.97	8 20	7.20	7 745

*For painted corrugated sheets add 30c. per 1000 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Raw in carrs (5 bbl)	$2.15	$1 90	$2 50	$2.10	$2.07	$2.05
5-gaal.	2.28	2 00	2.75	2 25	2.57	2.25

WHITE AND RED LEAD—Base price per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Yr. Ago Dry and In Oil
100-lb. keg	13 00	14 50	14 00	14.50	13 00	14 00
25 and 50-lb. kegs	13 25	14 75	14.25	14.75	13.25	14.25
12½-lb. keg	13 50	15 00	14 50	15.00	13 50	14.50
5-lb. cans	15 30	16 50	16 00	16.50	15 00	16.00
1-lb. cans	16 00	17 50	17 00	17 50	16 00	17.00

500 lb. lots less 10% discount; 2000 lb. lots less 10-2½% discount.

LUMBER

San Francisco—Prices of rough Douglas fir No. 1 common, in more than carload lots:

	Lumber Prices in Yards at San Francisco 6-8-12 and 14 Ft.	10-16-18 and 20 Ft.	22 and 24	25 to 32 Ft.
3x3 and 4	$34.50	$35.00	$36.00	$38.00
3x6 and 8	35 50	36 00	37.00	39.00
4x4–6 and 8	36.00	37.00	38.00	40.00
3x10 and 12	36 00	37 00	38 00	40.00
3x14	36 50	37 50	38.50	40.50
4x10 and 12	36 00	37 00	38.00	40.00
4x14	37.00	38.00	39.00	41.00

	24 Ft and Under	25 to 32 Ft.	33 to 40 Ft.
6x10	$35 50	$37 50	$38.50
6x14	37 00	39.00	40.00
8x10	35.50	37.50	38.50
8x14	37.00	39.00	

New York, Chicago and St. Louis

	Southern Pine New York* 20 Ft. and Under	Southern Pine New York* 22-24 Ft.	Southern Pine Chicago 20 Ft. and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft. and Under	Yellow Pine St. Louis 22-24 Ft.
3x 4 to 8x 8	$48 00	$49 00	$50 00	$51 00	$40.00	$42.00
3x10 to 10x10	52 00	53 00	54 00	55 00	43.00	45.00
3x12 to 12x12	55 00	56 00	56 00	57 00	45.00	46.50
3x14 to 14x14	59 00	60 00	61 00	62 00	50 00	52.00
3x16 to 16x16	69 00	70 00	64 00	65 00	53 00	55 00
3x18 to 18x18	74 00	75.00	68.00	69 00	57.00	58.00
4x20 to 20x20	89 00	90 00				

* Prices from Lumbermen's Bureau

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In. x 20-Ft. and Under P.	Fir	Hemlock	Spruce	12 x 12-In. 20 Ft. and Under P.	Fir
Boston	$50 00	$49 00	$48 00	$48 00	$50.00	$50.00
Kansas City	51 00	51 25	51 25		57.00	48.25
Seattle		30 00				31.00
New Orleans	45 00				48.00	
St. Paul	60 00	59.00	59.00	46 00	42 00	66.00
Atlanta	55 50	57.50	58.00	68 00	68 50	70.50
Baltimore	46.00				60 00	
Cincinnati	45.00	45.00	42 00	42 00	48 00	48.00
Montreal	58.00	65.00†	65 00	58 00‡	58 00	58.00
Los Angeles		50.00				52 00
Denver		44.00				44 00

	1-In. Rough, 10 In. x 16 Ft and Under P.	Fir	Hemlock	2-In. T and G 10 In. x 16 Ft. P.	Fir
Boston	$50.00	$50 00	$48 00	$50.00	$50.00
Kansas City	84 50	74 25	74.25	87 25	77.25
Seattle		31.50			31.50
New Orleans	54.00			55 25	
St. Paul	53.00	53.00	53.00	63.00	58 50
Atlanta	80 00	85.00		65.00	67.50
Baltimore	40–42 00			38-40 00	
Cincinnati	45.00	43 00	42 00	45.00	45.00
Montreal	60 00*	60 00	44 00	65.00	63.00
Los Angeles		49 00			
Denver		44 00		42 00	

* 2x8 costs $56 † Up to 32 ft., above that add $4 ‡ Also tamarac.

Los Angeles—Base price (2x3 and 2x4, length 8 to 14 ft.), $43.
Detroit—Y. P. 1-in. rough, $48; 2-in. t. and g., $50.

Dallas—Yellow pine. Price per M:

2x4 to 2x12—10, 12, 14 and 16	$57.50
2x4 to 2x12—10, 18 and 20	60.00
2x4 to 2x12—22 and 24	62.50
4x4, 4x6, 6x6, 8x8 and 3x8	61.25
8x10, 10x10 and 3x10	62.50
12x12 and 3x12	67.50

Construction News — Up To The Minute

WATER-WORKS
ROPOSED WORK

Va., Orange—Town having plans prepared improving waterworks system and installing filtration plant. About $70,000. Saville & Claiborne, 7th and Mani Sts., Richmond, engrs. Noted Aug. 21.

S. C., Rock Hill—J. G. Barnwell, city mgr., receives bids in December building extension to waterworks and sewarage system. About $150,000. G. C. White, Durham, N. C., engr.

Tex., Terrell—City voted $200,000 bonds to build waterworks system. L. W. Wells, city engr.

Okla., Altus—City sold $50,000 bonds to improve waterworks system. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Okla., Cushing—City election Nov. 24, to vote on $75,000 bonds to extend waterworks.

Okla., Henryetta—City voted $200,000 bonds to improve waterworks system. Burns & McDonald, Interstate Bldg., Kansas City, Mo., engrs.

Okla., Tonkawa—City sold $60,000 bonds to extend waterworks system. Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs. Noted July 24.

Bids Desired

Pa., Erie—Until Nov. 28, by city, building 5,000,000-gal. rein.-con. reservoir. Chester & Fleming, Union Bank Bldg., Pittsburgh, engrs.

PRICES AND CONTRACTS AWARDED
(*Indicates award of contract)

***Conn., East Hartford** (Hartford P. O.)—Fire Dist., at office of Dist. Comrs., Wells Hall, Main St., let contract building extensions to waterworks system, to Beaver Eng. & Contg. Co., 51 Chambers St., New York City. Noted Sept. 11.

***Mich., Royal Oak**—Baker Land Co. let contract building complete waterworks system, involving 12,049 ft. 6-8-in. pipe, forty-seven 6-8-in. valves, 47 valve boxes and 5 hydrants, to T. C. Brooks & Son, West Grand Blvd., Detroit, $26,490.

***Okla., Ada**—City let contract to Merkle Mchy. Co., 508 Interstate Bldg., Kansas City, Mo., furnishing and installing two 750-gal.-per-minute turbine pumps and 100 hp. motors, two 1250-gal.-per-minute underwriter turbine fire pumps and 200-hp. motors, 3 panel switchboard complete with wiring, recording Venturi water meter, all piping, valves and fittings and one 10-in. automatic hydraulic valve. About $20,500.

***Okla., Madill**—City let contracts improving waterworks system, to U. S. Cast Iron Pipe & Fdry. Co., Security Bldg., St. Louis, Mo., pipe and fittings, $15,158; to Darling Valve & Hydrant Co., Oklahoma, valves and hydrants, $947. Noted Aug. 28.

SEWERS
PROPOSED WORK

N. J., Jersey City—City Comm. soon receives bids building 18-in. vitr. pipe sewers in Virginia, Clark and Yale Aves., Bennett and Water Sts. About $15,000. C. A. Van Kuren, city engr.

Mich., Detroit—Comr. Pub. Wks. soon lets contract furnishing labor and material for building and finishing complete 6475-ft. sewers in Bates, Congress, Randolph, Adams and Brush Sts., from center line Atwater St. to north line Adelaide St., 13-ft. 6-in. cylinder, brick or concrete segment block with 16-in. walls. Alternate plan, 2-barrel, 10-ft. 4-in. diameter, 16-in. wall. About $2,000,000. C. W. Hubbell, city engr.

Ia., Des Moines—City soon lets contract building Waveland Park Sanitary Sewer, involving 14,000 ft. 10-in. pipe, small septic tank and filter bed, cost $25,000; South Side Sewer, 37 mi. 10-36-in. pipe and two unit electrically operated centrifugal pumping plant, $450,000; Woodland Ave. Storm Sewer, 5000 ft. 15-36-in. pipe, $25,000. K. C. Kastburg, city engr.

Neb., Ord.—City soon lets contract laying 6-16-in. rein.-con. sewers in Main St. About $98,000. Rohrbough Eng. Co., 920 City Natl. Bank Bldg., Omaha, engrs.

BIDS DESIRED

N. J., Newark—Until Nov. 25, by Passaic Valley Sewerage Comrs., Essex Bldg., 31 Clinton St., for continuation and completion of construction of Sect. 2 of outfall pressure tunnel, beneath portion of New York Bay and Jersey City, Hudson Co. Work involves (1) earth or rock excav. and refilling, in compressed air tunnel, for 144-in. concrete sewer, 4940 lin.ft.; (2) concrete masonry in compressed air tunnel, and shafts, of Portland cement mortar, in place, 15,200 cu.yd.; (3) rock trimming of existing tunnel heading, 150 cu.yd.; (4) removing sand, stone, timber, etc., and debris from existing sewer and tunnel heading, 1500 cu.yd.; (5) trimming, caulking and tightening existing concrete sewer in tunnel, 15,000 sq.yd.; (6) removing existing tunnel timbering, raising heading and retimbering, 73 lin.ft.; (7) removing 4 existing concrete bulkheads, lump sum; (8) Portland cement grout, in place, 15,000 bbls. cement; (9) dry dock packing, 1000 cu.yd.; (10) removal and raising of arch and sidewalls of portion of existing sewer, 50 lin.ft.; (11) steel reinforcement for concrete, in place, 5000 lb. Two forms of proposals will be received: Form "A," under which payments are made on basis of stipulated unit prices; Form "B," under which payments are made on basis of stipulated percentage of actual cost of labor and materials. W. M. Brown, ch. engr.

Ont., Windsor—Until Nov. 27, by Essex Border Utilities Comn., 66 Ouellette Ave., completing South Sewage Interceptor, in Sandwich and Ojibway. Work involves 10,280 ft. rein.-con. lock-joint pipe, 15 concrete, and brick manholes, pumping and clearing 4000 ft. 27- and 42-in. sewer, shaping ditches, replacing 80 sq.yd. concrete pavement and sand and clay excav., 13-15 ft. deep. M. Knowles, ch. engr.

PRICES AND CONTRACTS AWARDED
(*Indicates award of contract)

***Mich., Port Huron**—City let contract building vitr. crock sewers in Farley, Ballentine, Howard and Porter Sts., from 20th to 24th Sts., involving 5008 ft. 15-20-in. pipe, to C. Mugovero, Huron Ave., $4691, $4944, $5462 and $4691, respectively. Noted Nov. 13.

***Neb., Tilden**—City let contract building sanitary sewerage system and sewage-disposal plant, involving 26,666 ft. 8-12-in. vitr. pipe, and septic tank, to Katz Constr. Co., 409 Brandeis Theater Bldg., Omaha, $47,700.

***Neb., Wilbur**—City let contract installing 32,151 ft., 8-12-in. tile sanitary sewers in various streets, to Martz Constr. Co., Seward, $42,880. Noted Sept. 11.

***Okla., Okmulgee**—City let contract building 1-mi. sewers in Dists. Nos. 34 and 35, to Tibbetts & Pleasant, Okmulgee, $2875 and $35,750 respectively. Noted Oct. 30.

Cal., San Francisco—Bd. Pub. Wks. received bids building 1137 ft. sewer through Presidio Reservoir, portion of its invert lined with vitr. brick, involving 100 ft. 6-in. vitr. salt glazed iron stone pipe and 1137 ft. 2 ft. 6 in. x 3 ft. 9 in. concrete pipe, from Hickey & Harmon, 370 Arguello Blvd., $12,446. T. D. Harvey, 821 Market St., $15,087

BRIDGES
PROPOSED WORK

O., Columbus—Franklin Co. voted $375,000 bonds to build bridge over Scioto River, on Greenlawn Ave. C. C. Lattimer, co. surv.

Ia., Manchester—Delaware Co. having plans prepared building 168-ft. rein.-con. bridge, 45 ft. wide, to have two 80-ft. span arches, 33-ft. roadway, two 6-ft. walks and 4 retaining walls, varying from 25 to 45 ft. long. About $40,000. H. Klaus, co. engr.

BIDS DESIRED

Pa., Reading—Until Dec. 5, by Berks Co., building 1586-ft. rein.-con. bridge, 60-ft. wide. C. F. Sanders, co. engr.

N. C., Greenville—Until Dec. 1, by Comrs. Pitt Co., reconstructing 273-ft. steel bridge ove rTar River. J. B. Harding, Greenville, engr.

S. C., Jacksonboro—Until Nov. 26, by Sanitary & Drainage Comn., Charleston, building 456-ft. bridge over Edisto River, here, to have one 150-ft. rivet connected steel swing span and two 150-ft. rivet connected simple spans, piers, abutments and fenders, for Charleston Co., (Charleston) and Colleton Co. (Waterboro). Work involves 375.8 cu.yd. class B rein.-con., 92.4 cu.yd. class C concrete, 3967 lbs. steel bars, 7320 lin.ft. wooden piling and 17,100 ft. B.M. yellow pine timber for fenders. About $65,500.

Wis., Milwaukee—Until Dec. 10, P. Braman, comr. pub. wks., furnishing labor and materials building North Ave. viaduct and side approach over Chicago, Milwaukee & St. Paul R.R. tracks and Milwaukee River, here. Work includes building concrete viaduct extending from intersection of North and Humboldt Aves. on the west, to east bank of Milwaukee River to east. From westerly end work consist of 183-ft. retaining wall with earth fill, 142-ft. concrete beam-and-slab construction, 141 ft. steel girders, concrete encased, over Chicago, Milwaukee & St. Paul R.R. tracks; 348-ft. concrete beam-and-slab construction and 571-ft. concrete arch construction, 3 arch spans, over Milwaukee River. Total width of viaduct, 61½ ft., with 40-ft. clear roadway. At west side of Milwaukee River will be side approach 600 ft. long, 28 ft. wide, with stairway. Alternate bids will be received on "A," work in case level of Milwaukee River is left at normal elevation, about 14 to 16 ft. above city datum, "B," in case gates of dam are opened and level of Milwaukee River is lowered about 10 ft

B. C., Erichson—Until Nov. 25 by A. E. Foreman, engr., Pub. Wks. Dept., Victoria, building bridge over Goat River, near here, 248 ft. long, 16 ft. wide, to include 150-ft. Howe span, and 58- and 39-ft. approach spans, timber on concrete abutments, involving 100,000 ft. timber, 20 cu.yd. concrete and 16 tons steel. About $16,000.

PRICES AND CONTRACTS AWARDED
(*Indicates award of contract)

***N. Y., Cuba**—E. S. Walsh, supt. pub. wks., Capitol, let contract building a through plate girder bridge over Cuba Reservoir Spillway, on Cuba-Olean Highway, here, to J. B. Smith, Cuba, $19,905. Noted Oct. 30.

***N. C., Rutherfordton**—Rutherford Co. let contract building steel bridge, concrete floor, on Avondale St., to Atlantic Bridge Co., Charlotte, $17,360.

O., Columbus—Comrs. Franklin Co. received only bid Sept. 10, building superstructure for Platter Bridge, 24 ft. wide, over Big Walnut Creek, on Lockbourne Rd., Hamilton Twp., involving 1,095,260 lb. steel, 26,771 lb. reinforcing steel and 167 cu.yd. concrete, from Grant-Boulton Co., Columbus, $41,750; substructure involving 2200 cu.yd. dry and 480 cu.yd. wet excav., 80 cu.yd. class "A" and 1100 cu.yd. class "B" concrete, from J. A. Swingle Co., Columbus, $18,792. Work will be held in abeyance for some time. Noted Aug. 28.

***South Dakota**—State Highway Comn., Pierre, let contract building 420-ft. steel bridge on concrete piers and abutments, over White River, to Standard Bridge Co., 1302 City Natl. Bank Bldg., Omaha, Neb. About $30,000.

***Washington**—State Highway Comn., Oylmpia, let contract building 240-ft. steel span bridge over Cowlitz River, near Nesika, Lewis Co., to Union Bridge Co., foot of Fenwick and Kenton Sts., Portland, $38,-149. Noted Oct. 16.

***Washington**—State Highway Comn., Olympia, let contract building concrete arched bridge on Inland Empire Highway, Columbia Co., to J. T. Stickler, Asotin. About $18,000.

STREETS AND ROADS
PROPOSED WORK

N. J., Trenton—City voted $1,000,000 bonds to build 1-mi. boulevard over Sanhican Creek, through City. Engineer not selected.

N. C., Ashboro Comrs. Randolph Co. soon let contract building 40,000 sq.yd. road, sheet asphalt, bitulithic and bituminous concrete. A. E. Taplin, High Point, engr.

S. C., Rock Hill—J. G. Barnwell, city mgr., receives bids in December paving various streets. About $700,000. G. C. White, Durham, N. C., engr.

Ga., Moultrie—Colquitte Co. soon receives bids paving various roads. About $500,000. Noted May 1.

O., Bellaire—City voted $150,000 bonds to improve various streets. H. Althar, Bellaire, engr. Noted Sept. 18.

O., Cincinnati—City plans to grade, pave and curb 3336 ft. Harrison Ave. from Colerain to State Aves., 40 ft. wide, granite, cost $88,000; Gage St., Intermediate, Bantry, Glen, Danto, Kennedy, Rulison and Hull Aves., 2100 ft. long, 25 ft. wide, concrete, $21,016. F. Krug, city engr.

O., Cleveland—Comrs. Cuyahoga Co. receive bids in spring building Som Center Rd. No. 3, waterbound macadam. About $57,000. W. A. Stinchcomb, co. engr.

O., Cleveland—Comrs. Cuyahoga Co. receive bids about March 10, paving 6-mi. Akron-Cleveland Rd., 20-ft. wide, vitr. brick on 6-in. concrete base. About $36,205. W. A. Stinchcomb, co. engr.

O., Cleveland—Cuyahoga Co. receives bids about Jan. 15, paving East View Kinsman Rd., vitr. brick. About $20,000. F. A. Pease Eng. Co., 804 Marshall Bldg., engrs.

O., Cleveland—W. H. Evers, engr., 332 The Arcade, receives bids about Dec. 1, grading, building sewers, watermains and sidewalks, and paving Detroit and Madison Aves. in Wagar Park, vitr. brick, for W. B. Nye, 6521 Hough Ave. About $80,000.

South Dakota—State Highway Comn., Pierre, plans to grade, gravel and drain 8.3 mi. Chamberlain-Plankinton Rd., Brule Co., involving 46,000 cu.yd. earth ecav., 12,450 cu.yd. gravel, 218 cu.yd. concrete for culverts and 15,000 lb. reinforcing steel, etc., $72,503; gravel 5.07 mi. and grade 9.07 mi Mobridge-McIntash Highway, Corson Co. involving 37,000 cu.yd. earth excav., 6084 cu.-yd. gravel, 186 cu.yd. concrete for culverts

1,600 lb. reinforcing steel and 1,000 sq. rods clearing and grubbing, $46,407.

Montana—State Highway Comn., Helena, plans to gravel surface 12 mi. Richey-Paxton Rd., cost $20,000, 5 mi. Richey-Vida Rd., $10,000, 10 mi. Richey-Rose Valley Rd., $20,000, 37 mi. Glendive-Lindsay-Brockway Rd., $74,000, 6 mi. Richey-Manrock Rd., $12,000, 34 mi. Red Trail, $68,000, 20 mi. Glendive-Sidney Rd., (Black Trail), $40,000, 50 mi. Richey-Bloomfield Rd., $100,000, all in Dawson Co.; 28 mi. Mullan Rd., $150,000, 40 mi. Anaconda-Drummond Rd., $150,000, Granite Co.; 20 mi. Bainville Dwyer Rd., $23,000, 9 mi. Poplar-Scobey Rd., $30,000, Roosevelt Co.; 41 mi. Wolf Creek-Augusta Rd., 9 ft. wide, $160,000, 10 mi. Helena-Rimini Rd., 16 ft. wide, $30,000, concrete surfacing ½ mi. and graveling 9 mi. Helena-Bozeman Rd., 16 ft. wide, $60,000, Lewis and Clark Counties. Federal Government asked to appropriate toward cost. J. N. Edy, state highway engr.

Missouri—State Highway Dept., Jefferson City, plans to build 7.8 mi. Natl. Old Trails Rd., 24 ft. wide, involving 26,000 cu.yd. earth excav., 73,390 sq.yd. 5 in. waterbound and 2½ in. bituminous macadam surfacing, 16 ft. wide, one 30-ft. concrete bridge and 9 culverts, cost $129,438, 5.55 mi. Natl. Old Trails Rd., 24 ft. wide, 17,000 cu.yd. earth excav., 52,000 sq.yd. 2½ bituminous macadam, 16 ft. wide, and 8 culverts, $88,579, both Cooper Co.; 13.5 mi. Doiphan-Alton State Rd., 24 ft. wide, 31,500 cu.yd. earth excav., 32,000 sq.yd. 6-in. gravel surfacing, 16 ft. wide, 20 culverts and two 30-ft. bridges, $28,292, Ripley Co.; 19 mi. Harrisonville-Belton Rd., 24 ft. wide, 57,000 cu.yd. earth excav., 178,350 sq.yd. 2-course waterbound macadam, 7 in. thick, 16 ft. wide, 3,500 ft. 6 in. tile underdrain, 20 culverts and one 70-ft. span bridge, $170,870, Cass Co.; 1.75 mi. Six Mile Lane, 26 ft. wide, 4,100 cu.yd. earth excav., 18,480 sq.yd. brick or concrete pavement on concrete base, 7 in. thick, $56,124, Moberly Special Rd. Dist., Randolph Co.; 8.56 mi. road from Stoddard Co. line to McGuire, 24 ft. wide, 80,379 sq.yd. 10 in. gravel with 2 course Novaculite surface, 16 ft. wide, 45,213 lin.ft. grading, and 12 drainage wells, $62,598, Dunklin Co.; 13.07 mi. Liberty-Excelsior Springs Rd., 24 ft. wide, 82,646 cu.yd. earth and 11,626 cu.yd. rock excav., 122,507 sq.yd. bituminous macadam, 16 ft. wide, 493 cu.yd. concrete, 9240 lb. structural and 12,240 lb. reinforcing steel, 100 lin.ft. iron railing, 1388 ft. 15-24 in. concrete pipe and 5,000 ft. 4 in. vitr. clay tile drains, $324,572, Clay Co.; 8 mi. Natl. Old Trails Rd., 24 ft. wide, 12,000 cu.yd. earth excav., 75,093 sq.yd. 2½ in. bituminous concrete, 16 ft. wide, 11 culverts and 2 bridges, involving 2263.9 cu.yd. concrete and 198,630 lb. reinforcing steel, $142,053, 9.2 mi. Natl. Old Trails Rd. 24 ft. wide, 20,000 cu.yd. earth excav., 86,357 sq.yd. 5-in waterbound and 2½-in. bituminous macadam or asphalt, 16 ft. wide, 18 culverts, one 30-ft. and one 80-ft. bridge, $168,014, Malta Bend Special Rd. Dist., Saline Co.

Mo., Independence—Jackson Co. rejected bids received Sept. 30, grading and surfacing 3.1 mi. Lone Jack East Rd., from Lone Jack to Jackson-Johnson Co. line, 16 ft. wide, bituminous macadam. Noted Sept. 11.

Mo., Joplin—Special Rd. Dist. plans to build 45 mi. hard-surfaced roads, 18 ft. wide. Bonds for $500,000 voted for project. Engineer not selected.

Mo., Monticello—Lewis Co. plans to build 5.5-mi. gravel road from Monticello to Lewiston; cost, $55,000; also 6-mi. road from Monticello to North Canton, $60,000; both 16 ft. wide.

Mo., Savannah—Andrew Co., (Savannah) and Nodaway Co. (Marysville) plan to build 50-mi. hard-surface roads from Iowa line to Buchanan Co., through Hopkins, Marysville and Savannah, 18 ft. wide. Leslie-Barnes Eng. Co., Amer. Natl. Bank Bldg., St. Joseph, engrs.

Tex., San Antonio—Comrs. Bexar Co. soon let contract gravel surfacing 7.27 mi. Highway No. 9 from Leon Springs to Bexar Co. line, 16 ft. wide, involving two 60-ft. flat concrete crossings, 24-ft. reinforcon span bridge, 14,578 sq.yd. bituminous macadam and 10.6 acres clearing and grubbing. About $76,056. C. E. Hoff, San Antonio, engr.

Cal., Oakland—City soon lets contract improving 3,200 ft. Porter and Suter Sts., from 35th to 38th Aves., Octavia and Abbey Sts., from Suter to Porter Sts. and Loma Vista Ave., from Quigley to Porter Sts., 40 ft. wide, involving 6,188 cu.yd. earth excav., 6,377 lin.ft. concrete curbing, 13,120 sq.ft. concrete guttering, 32,099 sq.ft. cement sidewalks, 78,288 sq.ft. oil macadam, 876 lin.ft. conduit pipe. About $29,000. M. Campbell, city engr.

BIDS DESIRED

Massachusetts—Until Nov. 25, by State Highway Comn., Boston, building 24,500-ft. road, 18-ft. wide, Community Twp., involving 53,000 sq.yd. Portland concrete. About $220,000. A. W. Dean, state highway engr.

N. C., Asheville—Until Nov. 25 by Div. Office, Sate Highway Comn., Asheville, building 3.7-mi. road, Buncombe Co., concrete Topeka on penetration macadam. About $140,000. W. S. Fallis, Raleigh, state highway engr.

Ga., Madison—Until Nov. 24, by city, grading, curbing, draining and paving Public Sq., Jefferson and Main Sts., involving 29,000 sq.yd. pavement. Bids will be received on concrete, brick and bituminous. Solomon-Norcross Co., 1624 Candler Bldg., Atlanta, consult. engrs.

Ala., Fairfield—Until Nov. 24, by city, grading and macadamizing about 1,300 ft. 53rd St. and Terrace Ave. A. C. Decker, mayor.

Mich., Harrison—Until Nov. 30 by J. W. Wilson, twp. clk., R. R. No. 3, Lake, grading, draining and surfacing 2½ mi. State Reward Rd., 12 ft. wide, Freeman Twp., Clare Co., involving 17,600 sq.yd. class B gravel. About $36,000. State Highway Dept., Lansing, engrs.

Tex., Ft. Worth—Until Nov. 25, by D. L. Lewis, city engr., repaving Commerce St. from East Front to Weatherford Sts., 50 ft. wide, involving 29,593 sq.yd. 3-in. vitr. fibre brick and 10,000 lin.ft. concrete gutter, cost $90,000; paving 2,305 ft. Calhoun St. from East Front and 9th Sts., 40 ft. wide, involving 10,867 sq.yd. 3-in. vitr. fibre brick and 5,000 lin.ft. concrete gutter, $45,000.

Tex., Ft. Worth—Until Jan. 1, by Comrs Tarrant Co., grading and concrete surfacing 5.8 mi. Ft. Worth-Dallas Highway, 18 ft. wide, rebuilding 10-mi. Camp Hix Rd., 18 ft. wide and 6.2 mi. Benbrook Rd., 18 ft. wide. Federal Government appropriated $200,000 toward cost. R. V. Glenn, Ft. Worth, engr. Noted Aug. 7 and Sept. 18.

Okla., Durant—Until Nov. 25, by city, for 7,500 sq.yd. vitr. fibre brick and 53,500 sq.yd. concrete pavement. D. C. Lipscomb, city engr.

Ore., St. Helens—City receiving bids improving West St., to include draining, paving, with concrete or bitulithic and building concrete curbs. About $10,000. E. E. Quick, St. Helens, city recdr.

California—Until Nov. 24 by State Highway Comn., 515 Forum Bldg., Sacramento, grading 4 mi. State Highway between Cushion Creek and Crescent City, Del Norte Co., involving 18,000 cu.yd. excav., 6,000 cu.yd. gravel, 60 cu.yd. class A Portland cement concrete, 538 lin.ft. 12-24-in. corrugated pipe; 6.6-mi. road between Pine Valley and Casbere Ranch, San Diego Co., involving 37,670 cu.yd. excav., 210 cu.yd. class A Portland cement concrete, 2,567 lin.ft. 18-30-in. corrugated pipe; 13.8-mi. road between Casbere Ranch and Tecate Divide, San Diego Co., involving 111,000 cu.yd. excav., 365 cu.yd. class A Portland cement concrete, 3,736 lin.ft. 18-30-in. corrugated pipe; paving 18.2 mi. road between Weed and Southerly Boundary, Siskiyou Co., involving 18,100 cu.yd. class A Portland cement concrete.

PRICES AND CONTRACTS AWARDED
(*Indicates Award of Contract)

Mass., Leominister—City received bids Oct. 30, scarifying and reshaping 3826 ft. North Main St., 18 ft. wide, 3-in. top of Topeka mixture, involving 8,000 sq.yd. bituminous macadam, from D'Onfro Bros., Leominster, $11,225; Framingham Constr. Co., Framingham, $11,818; R. H. Newell, Uxbridge, $13,859.

***Connecticut**—State Highway Comn., Hartford, let contract improving 3,800 ft. Bozrah St., 3-in. trap-rock surface over 5-in. gravel base, Bozrah Twp., to J. Arborio, 80 Park St., New Haven, $18,000; 3,890 ft. Middlefield Rd., 3-in. trap-rock macadam, Middletown Twp., to A. Brazos & Sons, Oak St., Middletown, $15,000; $802 lin.ft. Forest St., bituminous macadam, New Haven, to C. W. Blakeslee & Son, 58 Waverly St., New Haven, $41,000. Noted Oct. 16.

***N. Y., Buffalo**—City let contracts to H. P. Burgard Co., 1968 Fillmore Ave., paving 4957 yd. River St. from Erie to Genesee Sts., 42 ft. wide, dressed block on 6-in concrete base, Medina sandstone curbing, cost $32,220, 4621 sq.yd. Elmer St. from Kensington Ave. to Amherst St., 26 ft. wide, standard asphalt on 6-in. concrete base, Medina sandstone curbing, $23,530, 2,486 sq.yd. Page St. from Hertel to Lawn Aves., 26 ft. wide, standard asphalt on 6-in. concrete base, Medina sandstone curbing, $13,650, 6,935 sq.yd. Lathrop St. from Bway. to Sycamore St., 30 ft. wide, standard asphalt on concrete base, $32,870, 3,504 sq.yd. Fay St. from Walden to West Shore Aves., 26 ft. wide, standard asphalt on concrete base, Medina sandstone curbing, $17,320; to Rock Asphalt & Constr. Co., Morgan Bldg., 5,400 sq.yd. Ohio St. from proposed state improvement to Buffalo River bridge, 32 ft. wide, standard asphalt, Medina Sandstone curbing, $27,050, 10,847 sq.yd. South Park Ave. from Cumberland Ave. to Triangle St., 32 ft. wide, standard asphalt, $51,641. 592 yd. Kensington Ave. from Main St. to Humboldt Parkway, 30 ft. wide, standard asphalt, $3,421, 3,280 sq.yd. Fuller St. from Ontario St. to Briggs Ave., 26 ft. wide, standard asphalt on 6-in. concrete base, Medina sandstone curbing, $17,776, 1,111 sq.yd. Pennsylvania St. from Prospect Ave. to Niagara St., 32 ft wide, standard asphalt on concrete base, $6,235, 2,135 sq.yd. Armin Pl., from Seneca St to point 734 ft. northeast, 26 ft. wide, standard asphalt on concrete base, Medina sandstone curbing, $10,867, 2,000 sq.yd. West Humboldt Parkway, from Main St to Agassiz Pl., standard asphalt, $9,975; to B. F. Spire, 24 Colonial Circle, 2,997 yd Wex Ave., from Walden to West Shore Aves., 24 ft. wide, brick, $16,750; to Erie Contg. Co., Morgan Bldg., 4,657 sq.yd. Abby St. from end of present pavement to Bell St., 28 ft. wide, brick on 6 in. concrete base, Medina sandstone curbing, $26,300, 2,639 sq.yd. Ross Ave. from end of present pavement to Ontario St., 24 ft. wide, brick on 6-in. concrete base, Medina sandstone curbing, $14,300. Noted July 31 and Sept. 4.

***N. Y., New York**—Acting President, Manhattan Boro., let contracts to Asphalt Constr. Co., 1 Madison Ave., regulating and grading with granite blocks, Washington, Christopher and Little West 12th Sts., $73,435, 118th St. from Pleasant Ave. to Harlem River, $18,634; to W. J. Fitzgerald, 547 West 45th St., Battery Pl., State and Hall Sts., $38,816; to W. J. McCarthy, Audubon Ave., Park Ave. from 41st to 42nd Sts., $2,396; to Cleveland Trinidad Paving Co., Flushing Ave., Brooklyn, 42nd St from Lexington to Vanderbilt Aves., $17,573.

***North Carolina**—State Highway Comn., Greensboro, let contract hard surfacing 6 mi. Wilmington-Charlotte-Asheville Highway, 16 ft. wide, to Simmons, Whitton & Co., Selwyn Hotel Bldg., Charlotte. About $150,000

***N. C., Clinton**—City let contract paving various streets, to R. M. Hudson Co., Concord, $150,000. Work involves 20,000 lin.ft. curb and gutter, 10,000 sq.yd. concrete sidewalk and 20,000 sq.yd. asphalt. Noted Sept. 25.

***N. C., Goldsboro**—City let contract for 7 mi sheet asphalt pavement and 2,600 lin.ft. concrete curb and gutter, to West Constr. Co., Volunteer Life Bldg., Chattanooga, Tenn. About $300,000. Noted July 31.

***N. C., Oxford**—Granville Co. let contract graveling 4½ mi. road, to T. W. Chandler, Virgilina, Va. About $25,000.

N. C., Washington—Beaufort Co. let contract paving 15 mi. various roads, 18 ft. wide, sheet asphalt, to Lassiter Porter Co., Norfolk, Va.

Fla., Jacksonville—Jacksonville Terminal Co. let contract paving 400 ft. plaza in front of new terminal, 175 ft. wide, involving 7,700 sq.yd. concrete, to McDowell Constr. Co., Jacksonville.

Fla., Quincy—City let contract paving Main St., involving 23,000 sq.yd. asphaltic concrete and 14,280 lin.ft. curbing and guttering, to Kennedy Constr. Co., Tampa, $70,074. Noted Sept. 4.

O., Cleveland—Comrs. Cuyahoga Co. received only bid Nov. 5, building Cedar Rd., involving 6,860 cu.yd. concrete, 4,710 lin.ft. corrugated pipe gutter and 53,000 cu.yd. earth excav., from T. B. Husband, Rexwood Ave., $68,051. Noted Oct. 30.

***Michigan**—State Highway Comn., Lansing, let contract grading, draining and surfacing 7.651 mi State Trunk Line Rd. No. 18-7, 16 ft. wide, Crawford Co., involving 71,816 sq.yd. stone gravel and 27,614 cu.yd. earth excav., to Rd. Comms., Crawford Co., Grayling, $109,919; 1.468 mi. State Trunk Line Rd. No. 12-11 A, 16 ft. wide, Dickinson Co., 13,779 sq.yd. gravel, 13,000 cu.yd. earth and 150 cu.yd. rock excav., to Hoose & Pierson, Iron Mountain, $22,429; 4.508 mi. State Trunk Line Rd. No. 26-7 A, 16 ft wide, Gogebic Co., involving 42,315 sq.yd. gravel, to J. E. McNicholas, Marenisco, $48,927; 7.573 mi. State Trunk Line Rd. No. 18-3 B, 16 ft. wide, Otsego Co., involving 42,289 cu.yd. earth excav. and 71,089 sq.yd. gravel, to Midland Constr. Co., Inc., Midland, $110,478; 2.91 mi. State Trunk Line Rd. No. 10-5, 16 ft. wide, Presque Isle Co., involving 13,310 cu.yd. earth excav., 27,297 sq.yd. gravel and 97 cu.yd. concrete, to L. W. Edison Rogers, $37,573.

***Minn., Brainerd**—Comrs. Crow Wing Co. let contract grading and graveling 3.5 mi State Rd. No. 6, 24 ft wide to Williams & Pettyjohn, Park Rapids, $28,081. About Sept. 18.

***Minn., Duluth**—W. H. Borgen, treas. St. Louis Co., let contract clearing, grubbing and ditching right-of-way for 17-mi. State Rd. No. 4, 29 ft. wide, to Bartlett & Oustelhoult Co., c-o. County Engineer's Office, $29,321.

***Kan., Stafford**—City let contract building 15,000 sq.yd. brick pavement, to M. R. Ammerman, Salina. About $68,000.

***Neb., Beatrice**—Comrs. Gage Co. let contract building 1.15 mi road from Beatrice

to Institute for Feeble Minded, involving 10,986 sq.yd. vitr. brick, 12,176 lin.ft. concrete curbing, 6,468 cu.yd. earth excav. and 168 ft. 18-48-in. concrete pipe, to Abel Constr. Co., Lincoln. About $55,000.

*Neb., Blair—City let contract building sewers in various streets, involving 61,440 ft. 8-15-in. vitr. and 192 ft. 8-12 in. c.-i. pipe, 152 manholes and 7 flush tanks, to Hanson & Willadsen, 2907 Douglas St., Omaha, $87,-657.

*Neb., Lincoln—Lancaster Co. let contract paving 5¼ mi. 14th St. and Asylum-Penitentiary Rd., to Abel Constr. Co., 318 Terminal Bldg., $285,770. Noted Sept. 18.

*Neb., Omaha—City let contract to H. Murphy Constr. Co., 204 Karbach Blk., paving 6 blocks 60th St. from Military Ave. to Pratt St., involving 7027 sq.yd. 2-in. asphaltic concrete on 6-in. concrete base, 5,477 lin.ft. curb and gutter, 3,800 cu.yd. earth excav., $19,754; 3 blocks 58th St. from Military to Bensonhurst Aves., 4,780 sq.yd. 2-in. asphaltic concrete on 6-in. concrete base, 4,038 lin. ft. curb and gutter, and 2,700 cu.yd. earth excav., $13,491; 4 blocks Curtis Ave. from 30th to 34th St., 5,137 sq.yd. 2-in. asphaltic concrete on 6-in. concrete base, 3,910 lin.ft. curb and gutter, and 1,800 cu.yd. earth excav., $17,906.

*Neb., Peru—City let contract paving 4,700 ft. 5th St., 24 ft. wide, to Roberts Constr. Co., 404 1st Natl. Bank, Lincoln, $52,137. Noted Sept. 11.

*South Dakota—State Highway Comn., Pierre, let contract grading, graveling and draining 12.5 mi. Madison Wentworth Highway, Federal Aid Project No. 17, Lake Co., to D. D. Bidwell, Egan, $[101,055; 15.03 mi. Highmore Miller Rd., Federal Aid Project No. 18, Hand Co., and 7 mi. Highmore Miller Rd., Federal Aid Project No. 19, Hyde Co., to G. W. Humphrey, Pingree, N. D., $121,-993, and $51,979, respectively.

South Dakota—State Highway Comn., Pierre, received bids grading, graveling and graining 7.8 mi. Mitchell Plankinton Rd., Federal Aid Project No. 21, Aurora Co., from Aurora Co. Comrs., Plankinton, $69,437; 27.36 mi. Mitchell Alexandria Sioux Falls Rd., Federal Aid Project No. 24, Hanson Co., from W. R. Shipman Constr. Co., Sioux City, Ia., $165,205, Stevens Bros., St. Paul, Minn., $178,-572.

Ark., Marion—Comrs. Rd. Impvt. Dist No. 7, let contract to Roach & Shuford, grading 45 mi. road, involving 333,300 cu.yd. embankment, 50 acres clearing, 50 acres grubbing, 60 cu.yd. concrete, 950 lin.ft. 18-24 in. corrugated metal pipe, 950 lin.ft. 18-24 in. vitr. pipe and 960 lin.ft. 18-24 in. rein.-con. pipe. About $153,358. Noted Aug. 21.

*Tex., Ranger—City let contract paving 58 blocks, 50 ft. wide, vitr. brick, to McKenzie Constr. Co., Bedell Bldg., San Antonio. About $613,000. Noted Sept. 25.

*Washington—State Highway Comn., Olympia, let contract to Rajotte, Robert & Winter, Ziegler Bldg., Spokane, building 2.2 mi. Chelon-Okanogan Highway from Chelan to Chelan Falls, Chelan Co., involving 41,443 cu.yd. common excav., $0.54 per cu.yd. and 42,752 cu.yd. rock excav., $1.25 per cu.yd., total, $78,533; Root & Joslin, Spokane, 1.2 mi. State Rd. No. 4 south from Keller, Ferry Co., 27,360 cu.yd. common and 3370 cu.yd. solid rock excav., $21,491; Genl. Constr. Co., North 1324 Elm St., Spokane, 10 mi. Inland Empire Highway from Dodge to Central Ferry, Garfield Co., 123,754 cu.yd. common excav., $0.65 per cu.yd., 24,959 cu.yd. rock excav., $1.80 per cu.yd., and 14,800 cu.yd. crushed rock surfacing, $2.05 per cu.yd., total $184,002; J. T. Stickler, Asotin, 6.6 mi. Inland Empire Highway from Dayton to Delaney, Columbia Co., 72,680 cu.yd. common excav., $0.47 per cu.yd., 2700 cu.yd. solid rock excav., $2.25 per cu.yd., and 8981 cu.yd. crushed rock surfacing, $2.90 per cu.yd., total $95,184; W. J. Smith, Ritzville, 12 mi. Inland Empire Highway from Wallula to Pasco, Walla Walla and Franklin Counties, 68,455 cu.yd. common excav., $0.56 per cu.yd., 14,312 cu.yd. gravel or crushed rock, $2 per cu.yd., and 44.7 cu.yd. concrete, $32 per cu.yd., total $72,593. Noted Oct. 16.

EXCAVATION AND DREDGING

PROPOSED WORK

Ia, Des Moines—Ditch-Polk Co. soon lets contract building 15 mi. ditch and straightening and deepening Skunk River channel, Elkhart, Washington and Ft. Des Moines Twps. About $240,000. G. B. Wicks, 1160 13th St., engr.

Ia., Des Moines—Excavation—City soon receives bids excavating 5th St. between Chestnut and School Sts., involving 150,000 cu.yd. dry earth excav. About $100,000. F. Jeffries, city clk.

Minn., Willmar—Ditch—S. Nelson, aud. Kandiyohi Co., rejected bids received Oct. 24, building Co. Ditch No. 46, involving 80,680 ft. 6-35 in. tile, 2½ mi. overhaul, etc. About $71,400. Work will be readvertised in spring.

Mont., Hysham—Irrigation—Hysham Irrigation Dist. plans to irrigate 6000 acres, Treasure Co. About $250,000. B. C. Lillis, Billings, engr.

Mont., Missoula—Irrigation—De Smet Irrigation Dist. plans to irrigate about 500 acres, Missoula Co., by means of two pumping stations, each lifting 70 ft. water. About $150,000. C. F. Farmer, 315 Tremont St., engr.

BIDS DESIRED

Minn., Sherburne—Ditch—Until Nov. 23, by H. C. Nolte, aud. Martin Co., Fairmont, building Judicial Ditch No. 81, involving 1 retaining wall and outlet, 200 ft. pipe for railroad crossings and 11,300 ft. 7-14 in. tile. About $56,100. G. A. Taber, Fairmont, engr.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

*Minn., Carlton—City let contract building Judicial Ditch No. 1, involving 1259 cu.yd. excav., 452 acres clearing and grubbing, 32 mi. grading, 3 type "A," 14 type "B" and 4 type "C" bridges, and two 36 in. culverts, to W. J. Gleason, Aitkin, $208,499.

*Minn., Mankato—C. L. Kennedy, aud. Blue Earth Co., let contract building D. D. No. 55, involving 9750 lin.ft. 8-18 in. tile, to J. H. Sorensen, 413 Madison Ave., $10,980.

INDUSTRIAL WORKS

PROPOSED WORK

Mass., Fall River—R. W. Powers, 133 Pocasset St., soon receives bids building 1 story, brick and rein.-con. garage and service station, rein.-con. flooring, concrete foundation, on Union St. About $40,000. Private plans.

Mass., Willimansett—(Holyoke P. O.)—Stevens-Duryea Co., Chicopee Falls, soon lets contract building 1 story, brick, concrete and steel factory, concrete flooring and foundation, on 15 acre site, at Driving Park. About $800,000. Private plans.

N. Y., Niagara Falls—Carborundum Co., Buffalo Ave., soon receives bids building 2 story, 64 x 96 ft., rein.-con. addition to factory, No. 32, rein.-con. flooring. About $40,000. S. J. Call, c/o owner, engr.

N. J., Harrison—Driver—Harris, c/o Lockwood-Green, archts., 101 Park Ave., New York City, having plans prepared for 6 story, 80 x 200 ft. factory here, rein.-con. and steel, rein.-con. flooring, concrete foundation.

Pa., Overbrook—H. Trumbauer, archt., Land Title Bldg., Phila., soon lets contract building 3 story 65 x 100 ft., brick and concrete garage here, for M. Wood. About $30,000.

Md., Baltimore—Dewitz & Webb, archts., 232 St. Paul St., soon lets contract building 1 story, 60 x 200 ft., brick garage, cement concrete flooring, concrete foundation, on Chester and Madison Sts., for F. Rob, Raspeburg. About $55,000.

Md., Curtis Bay—(Baltimore P. O.)—Standard Guano Co., 1214 Continental Bldg., having plans prepared by P. S. Gilchrist, engr., Trust Bldg., Charlotte, N. C., for acid plant, on Aspen St. and Pennington Ave., here. Plans include four or five 1 story buildings, steel frame, concrete foundation. Cost, $300,-000, including 40 x 200 ft. wood pile and timber pier, for which bids are now in.

Md., Curtis Bay—(Baltimore P. O.)—W. E. Long, engr. and mgr. for Weyerhaeuser Timber Co., 1015 Lexington Bldg., Baltimore, preparing plans for lumber plant, at Old Quarantine Grounds, near here. Plans include five 76 x 900 ft. and one 30 x 900 ft., fireproof sheds, 480 ft. sorting shed, 156 x 500 ft. wood pile and timber pier and 2 smaller ones. About $500,000.

Tenn., Memphis—Quaker Oats Co., 80 East Jackson Blvd., Chicago, acquired 20 acre tract on South Parkway and Frisco & Calhoun R.R., here, and plans to build plant. Plans include 130 x 500 ft. main building and several other structures.

O., Berea—Village receives bids about Dec 30, building 1 story, 30 x 46 ft., steel and brick, light plant, brick and concrete foundation, on Main St. About $80,000. F. W. Ballard & Co., 811 Swetland Bldg., Cleveland, engrs.

O., Cincinnati—Multi-Color Type Co., 7th and Park Sts., plans to build 1 story, 250 x 300 ft. factory, on Parkway Ave. and Cincinnati, Hamilon & Dayton R.R. About $300,-000. Architect not selected. Work may be let without competition.

O., Cleveland—Lockwood, Greene & Co., archts. and engrs., Bangor Bldg., soon lets contract constructing 6 story, 80 x 240 ft. warehouse and boiler room, 2 story, 60 x 160 ft. factory addition, and 2 story, 150 x 180 ft. recreation building, all brick, concrete and steel, rein.-com flooring, concrete foundation, on Haight Ave., for Joseph & Feiss Co., 632 St. Clair Ave. About $750,000.

Mich., Detroit—Mildner & Eisen, archts., 924 Hammond Bldg., soon let contract building 2 story, 135 x 150 ft., rein.-con., brick and steel foundry addition, rein.-con. flooring, concrete foundation, on Wight St., for Detroit Grey Iron Fdry. Co., Wight St.

Mich., Detroit—Smith, Hindman & Grylls, archts., 710 Washington Arcade, soon let contract building 3 story, 73 x 396 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on Milwaukee and Moran Aves., for Hup Motor Car Co., Milwaukee Ave.

Wis., Milwaukee—Ford Motor Co., Highland Park, Mich., plans to build 5 story, brick, rein.-con. and steel addition to assembling plant, rein.-con. flooring, concrete foundation, on Prospect and Kenilworth Sts., here. About $1,000,000. Architect and engineer not decided.

Minn., St. Paul—U. S. Bedding Co., Arundel and Minnehaha Aves., soon lets contract building 2 story, 124 x 225 ft., rein.-con., steel, brick and stone factory and office, on Minnehaha and Western Aves. About $85,000. M. A. Wright, 600 Pittsburgh Bldg., archt.

BIDS DESIRED

O., Cleveland—Until Nov. 26, by Christian, Schwarzenberg & Gaede, archts., Euclid Bldg., constructing 3 story, 62 x 95 ft., concrete and brick factory, rein.-con. flooring, concrete and brick foundation, on West 25th St. and Meyers Ave., for Lion Knitting Mills Co., Whitney Blk. About $75,000. H. V. Einstein, pres.

O., Cincinnati—Until Nov. 29, by E. Anderson, archt., Citizens Natl. Bank Bldg., constructing 2 story print shop, on McMillan St. and Reading Rd., for Proctor & Collier Co., Tribune Bldg. About $50,000.

O., Cleveland—Until Nov. 24, by Ultimate Tire & Rubber Co., Hippodrome Bldg., constructing 3 story, 80 x 262 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on East 152nd St. About $200,000. W. S. Ferguson Co., 1900 Euclid Bldg., engrs. W. F. Ridge, Ohio Bldg. Akron, archt.

O., Cleveland—Until Nov. 24, by Colcher & Smith, archts., Lennox Bldg., constructing 1 story, 260 x 280 ft., concrete, steel and brick assembly building, rein.-con. flooring, concrete foundation, on Nottingham Rd., for Walker Motor Co., 8007 Euclid Ave. About $300,000.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

*Mass., Boston—Rivet, Lathe & Grinding Co., Newton St., let contract building 3 story, 60 x 200 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Brook St., to Aberthaw Constr. Co., School St. About $200,000.

*Mass., Charlestown—(Boston P. O.)—E. J. Doherty, Jr., 48 Mt. Vernon St., will build 1 story, 100 x 250 ft., rein.-con. and steel garage, concrete flooring and foundation, on Main S. Work will be done by day labor. Steel work, let to Smith Iron Wks., 215-5th St., Chelsea; foundation to New England Foundation Co., 70 Kilby St., Boston. Total cost, $75,000.

*Mass., Northampton—J. W. Riley, 132 Pleasant St., let contract building 1 story, 55 x 173 ft., brick and concrete garage, concrete flooring and foundation, on Pleasant St., to D. J. Sullivan, Paradise Rd. About $30,000. Noted Aug. 7.

*Mass., Pittsfield—Eaton, Crane & Pike Paper Co., 75 South Church St., let contract building 5 story, brick and mill construction warehouse, concrete foundation, to S. M. Green Co., 293 Bridge St., Springfield. About $125,000.

*Mass., Springfield—Tidewater Oil Sales Corp., 11 Bway., New York City, let contract building 1 story, warehouse, pump house, garage and oil plant, rein.-con., rein.-con. flooring and foundation, on Albany St., here, to J. G. White Eng. Co., 43 Exchange St., New York City. About $40,000.

*Mass., West Springfield—(Springfield P. O.)—Springfield Body Co., 10 Bway., Springfield, let contract building 1 story, 100 x 300 ft., brick and concrete factory, rein.-con. flooring and foundation, on New Bridge St., here, to E. F. Carlson Co., 310 Main St., Springfield. About $100,000.

*Mass., Williamstown—J. S. Boyd Co. will build 2 story, 50 x 160 ft. with 50 x 50 ft. ell, addition to weave shed and finishing mill, brick and steel. Work will be done by day labor. Steel contract let, to Bethlehem Steel Fabricators, Inc., Bethlehem, Pa.; erection of steel, to P. Bergmann, Boston. Total cost, $100,000. Noted Aug. 14.

*R. I., Providence—Revere Rubber Co., Valley St., let contract building 2 story, 50 x 90 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, to Cruise, Smiley Constr. Co., 12 East Ave., Pawtucket. About $100,000.

*Conn., Meriden—New Departure Mfg. Co., 269 North Main St., Bristol, let contract building two 3 story, 82 x 302 ft. and two 1 story, 67 x 312 ft., rein.-con. factories, rein.-con. flooring, concrete foundation, to Aberthaw Constr. Co., School St., Boston, Mass. About $1,500,000. Noted Sept. 25.

***N. Y., New York**—Marcus & Goldstein, Inc., 175 East 96th St., will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 229 West 60th St. About $50,000. Work will be done by day labor.

***N. Y., New York**—P. Viana, 505 Water St., will build 1 story, 99 x 100 ft., brick and steel garage, rein.-con. flooring, brick foundation, at 685-691 Lenox Ave. About $25,000. Work will be done by day labor.

***N. Y., New York**—Vitreous Enameling & Stamping Co., Inc., 11 East 167th St., will build 1 story, 70 x 172 ft, brick and steel factory and garage, rein.-con. flooring, concrete foundation, on Sedgwick Ave. and 171st St. About $80,000. Work will be done by day labor. Noted Oct. 9.

***N. J., Camden**—C. S. Haskell, Inc., 1520 Kater St., Phila., let contract building 2 story, 62 x 141 ft., concrete and brick factory, on Hudson Ave., to Barclay, White & Co., 1713 Sansom St., Phila.

***N. J. Elizabeth**—Willys Corp. let contract constructing plant to Warren, Moore & Co., Colonial Trust Bldg., Phila. Main buildings to be 1, 2 and 4 story, 50 x 90 ft., 120 x 240 ft., 120 x 1440 ft. and 320 x 400 ft., rein.-con. and steel. Cost between $6,000,000 and $10,000,000.

***Penn., Phila.**—Amer. Insulation Co., Roberts and Stokly Sts., let contract building 3 story, 60 x 90 ft., concrete warehouse, to W. Steele & Sons Co., 16th and Arch Sts. About $50,000.

***Pa., Phila.**—J. Lover, c/o L. W. Levin, archt., 536 Ritner St., let contract building 1 story, 45 x 60 ft. and 45 x 70 ft., brick garage, at 3503-05 Ludlow St., to N. Litman, 2030 South 5th St. About $40,000.

***Pa., Phila.**—Pennsylvania Forge Co., Jenks and Bath Sts., let contract building 1 story, 10 0x 200 ft., steel and concrete, rolling mill, to W. G. Donley Co., Drexel Bldg. About $30,000.

***Pa., Phila.**—H. O. Wilbur & Sons, Inc., 235 North 3rd St., let contract building 7 story, 80 x 92 ft., rein.-con. and brick, power and warehouse, on 3rd and Race Sts., to Turner Constr. Co., 1713 Sansom St.

***Penn., Phila.**—Winner Co., 2045 North 7th St., let contract building 2 story, 90 x 200 ft., stone, cement and concrete factory, on 32nd and Race Sts., to Mackle, McClelland Sons Co., Drexel Bldg. About $50,000.

***Md., Curtis Bay** (Baltimore P. O.)—Yale Underwear Co., 6 West Lombard St., let contract building 1 and 2 story, rein.-con. and brick factory, hall and office, concrete foundation, to Frainie Bros. & Haigley, 18 Clay St., Baltimore.

***Md., Woodberry**—(Baltimore P. O.)—Mt. Vernon-Woodberry Mills, Inc., 506 Continental Bldg., Baltimore, let contract altering south end of Mill No. 3, here, concrete and brick, to Cogswell-Koether Co., 406 Park Ave., Baltimore.

S. C., Clinton—Clinton Cotton Mills let contract building 1 story, 100 x 132 ft. rein.-con warehouse, to Fiske Carter Constr. Co., Greenville.

***O., Cincinnati**—T. J. Corcoran Lamp Co., 4900 Spring Grove Ave., let contract building 4 story, 130 x 160 ft., fireproof addition to plant, on Spring Grove Ave. and Baltimore & Ohio Southwestern R.R., to Austin & Co., 16112 Euclid Ave., Cleveland. About $250,000.

***O., Cleveland**—Air Reduction Co., West 69th St. and New York Central R.R., let contract building 2 story, 50 x 80 ft., concrete, steel and brick garage and machine shop, on West 69th St., to G. A. Rutherford Co., East 18th St. near Euclid Ave. About $25,000.

***O., Cleveland**—Mechanical Rubber Co., Lisbon Rd., let contract building 5 story, 80 x 200 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to Stone & Webster Co., 120 Bway., New York City. About $250,000.

***O., Cleveland**—Superior Brick Co., 311 Natl. City Bldg., will construct plant on Jennings Rd., to include several 1 story, steel and brick buildings of various sizes, brick foundation. About $300,000. Work will be done by day labor.

***O., Columbus**—Amer. Zinc, Lead & Smelting Co., Pierce Bldg., St. Louis, Mo., will build zinc oxide plant, on Windsor Ave. Plans include several various sized buildings. Work will be done by day labor.

***O., Columbus**—G. Bobbs & Sons Co., 260 East Naghten St., let contract constructing 5 story, 94 x 178 ft., rein.-con. wholesale building, including 40 x 94 ft. cold storage plant, on North Front St., to E. H. Latham & Co., Columbus Savings & Trust Bldg. About $190,000. Noted Oct. 16.

***O., Columbus**—Crystal Ice Co., West Broad St., let contract constructing 36 x 37 ft. storage building, 40 f. high, to R. H. Evans & Co., Columbus Savings & Trust Bldgg. About $50,000.

***O., Dayton**—Maxwell Motor Co., Leo St., let contract building 45 x 60 ft., brick, boiler house and 1 story, 100 x 120 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, to Blanchard Bldg. Co., Chapel Rd., cost $10,000 and $25,000 respectively.

***O., Lakewood**—(Cleveland P. O.)—Natl. Carbon Co., West 117th St. and Madison Ave., let contract building 3 story, 80 x 280 ft., rein.-con. and brick factory and office, rein.-con. flooring, concrete foundation, on West 117th S. to J. W. Cowper Co., Fidelity Bldg., Buffalo. About $200,000.

***O., Toledo** E. H. Close Co., 513 Madison Ave., will build 1 and 2 story, 26 x 50 x 158 ft., brick garage, at 91113 Cherry St. About $50,000. Work will be done by day labor.

***Mich., Detroit** Gray Estate, Hammond Bldg., let contract building 2 story, 140 x 189 ft., rein. con., brick and steel garage and sales room, rein.-con. flooring, concrete foundation, on Antoinette and Cass Aves., to F. H. Davis, Penobscot Bldg. About $150,000 Noted Oct. 30.

***Mich., Battle Creek** Battle Creek Paper Co. let contract building 2 story, 110 x 210 ft., rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation, at 81 Garrison St., to Witherspoon & Englar, 53 West Jackson Blvd., Chicago. About $175,000.

***Mich., Detroit**—Eastern Motor Sales Co. Grand River Ave., let contract building 6 story, 100 x 150 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on Grand River and Cass Aves., to M. Bartholomael Son & Co., 466 Warren Ave., E. About $200,000.

Mich., Detroit—Eastern Motor Sales Co., 404 Gratiot Ave., let contract building 3 story, 115 x 143 ft., rein.-con., brick and steel service station, rein.-con. flooring, concrete foundation, on Gratiot Ave., to O. Misch Co., Chamber Commerce Bldg. About $50,000.

***Mich., Detroit**—Tivoli Brewing Co., 1555 Mack Ave., let contract building 2 story, 60 x 100 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, on Mack Ave., to O. Misch Co., Chamber Commerce Bldg. About $45,000. Noted Sept. 18.

***Mich., Detroit**—Young Bros., Franklin St., let contract building 1 story, 105 x 200 ft., rein.-con., brick and steel heating plant, concrete foundation, to Ernst Bros, Bagg St. Noted Oct. 23.

Mich., Royal Oak—Baker Land Co. received bids trenching, laying pipe, and fitting water system complete in Meadowcrest Subdivision, involving 12,049 ft. 6-8 in pipe, 47 6-8 in. valves, 47 valve boxes and 5 hydrants, from T. C. Brooks & Son, West Grand Blvd., Detroit, $26,490, Monie Dunbar Co., Chemical Bldg., St. Louis, Mo., $27,567, R. D. Baker 1454 Penobscot Bldg., Detroit, $28,858.

***Ill., Amboy**—Amboy Milk Products Co. let contract building 2 story, 97-152 ft., brick and mill construction, condensory, rein.-con. flooring, concrete foundation, to Appleton Constr. Co., Odd Fellows Bldg., Appleton, Wis. About $100,000.

***Ill., Chicago**—Northwestern Terra Cotta Co., 2525 Clybourne Ave., let contract constructing 3 story, 84 x 325 ft and three 1 story 240 x 325 ft., 145 x 155 ft. and 48 x 58 ft. buildings, brick and concrete, rein.-con. flooring, concrete foundation, on Clybourne Ave. near Western Ave., to G. F. Meyne, 127 North Dearborn St. About $225,000.

***Ill., Rockford**—Burd High Compression Ring Co., 23rd Ave. and 10th St., let contract building 80 x 90 ft. foundry with 20 x 20 ft. cupola, to Austin Co., 16,112 Euclid Ave., Cleveland, O. About $35,000, (60 working days).

***Wis., Kiel**—Stoelting Bros. Co. let contract building 1 story, 40 x 50 ft. and 70 x 175 ft. brick and steel factory, concrete foundation, to Hutter Constr. Co., 128 Western Ave., Fond du Lac Noted Nov. 6.

***Wis., Milwaukee**—Bender Zimmer Co., 1530 Galena St., let contract building 1 story, 90 x 118 ft. factory, concrete foundation, on 21st and Lloyd Sts., to Bentley Bros., 609 Majestic Bldg. About $25,000.

***Minn., Duluth**—Holstead & Sullivan archts. and engrs., Palladio Bldg., let contract to Jacobson Bros., 410 Columbia Bldg., constructing 1 story, 75 x 100 ft., rein.-con., brick and stone garage and salesroom, rein.-con. flooring, concrete foundation, on East Superior St. and 5th Ave., for Pioneer Automobile Co., 328 East Superior St., $41,050

***Mo., St. Joseph**—Douglas Candy Co., 217 South 2nd St., let contract building 4 story, 40 x 140 ft., concrete, steel and brick factory, concrete foundation, to E. H. Lawhon Constr. Co., 905 Edmond St. About $60,000.

***Mo., St. Joseph**—St. Joseph Pub. Elevator Co., Corby Bldg., let contract constructing 60 x 90 ft., rein.-con. and steel elevator, 184 ft. high, rein.-con. flooring, concrete foundation, to Lehr Constr. Co., 1712 Frederick Ave. About $225,000.

***Tex., Houston**—Mack Mfg. Co., Ltd., 821 Kress Bldg., let contract building 1 to 3 story, rein.-con. plant, to include foundry machine, forge and pattern shops, warehouse and office, to W. C. Hedrick Contg. Co., Houston.

***Tex., San Antonio** Magnolia Petroleum Co., Bedell Bldg., let contract building 1 story filling station, at 418 Pecan St., to Coleman & Jenkins, Gibbs Bldg. About $52,000. Noted July 10.

***Tex., San Jose**—Stroud Mfg. Assn. let contract building several auto factories, concrete, steel and iron, power plant and foundry, also residences for employees, to Bartlett & Ranney, Chandler Bldg., San Antonio. About $550,000.

***Colo., Denver**—MacFarland Auto Co., 25 East Colfax Ave., let general contract building 2 story, 125 x 125 ft., warehouse and garage, to W. Tamminger, 1301 South Washington St., $121,450.

***Ore., Portland**—Portland News, 325-5th St., let contract constructing 2 story, 50 x 100 ft., brick, publishing plant, on 5th and Main Sts., to Zanello Bros., Builders Exch. About $35,000.

BUILDINGS

PROPOSED WORK

Mass., Boston—Bank Merchants Natl. Bank, 28 State St., soon receives bids building 5 story, 54 x 222 ft. rein. con. and limestone addition, rein.-con. flooring, concrete foundation, on Devonshire St. About $500,000 Coolidge & Shattuck, 122 Ames Bldg., archts.

Mass., Boston Chapel—Emanuel Church Society, Newbury St., receives bids in spring building 1 story, 25 x 105 ft. memorial chapel, concrete and Indiana limestone, concrete foundation Allen & Collens, 40 Central St., archts.

Mass., Boston—Office—A. R. Rosenthal, 1035 O. S. Bldg., having plans prepared by Monks & Johnson, archts. and engrs., 99 Federal St., for 11 story, 90 x 90 ft., rein con. and steel, rein.-con. flooring, concrete foundation, on Kneeland St. and Atlantic Ave. About $1,000,000.

N. Y., New York—Bank Federal Reserve Bank, 15 Nassau St., having plans prepared by York & Sawyer, archts. and engrs., 50 East 41st St., for brick, steel, stone and marble, brick foundation, on Maiden Lane, Nassau, Liberty and William Sts. About $2,500,000.

N. J., Atlantic City—Store—Braustein & Blatt, 1420 Atlantic Ave., soon let contract building 8 story, 110 x 150 ft., concrete and brick. Cost to exceed $50,000. Price & McLanahan, Belevue Court, Phila., archts.

O., Columbus—Y. M. C. A., 36 South 3rd St., rejected bids received Oct. 24, building 7 story, 187 x 187 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on Long and Front Sts. About $460,000. Noted Oct. 16.

O., Middletown—Bank—Werner & Atkins, archts., Mitchell Bldg., Cincinnati, receive bids about Dec. 1, building 7 story, 50 x 130 ft., steel, brick and terra cotta, for 1st Natl. Bank, 3rd and Main Sts. About $400,000.

O., Wilmington—Bank—Werner & Atkins, archts., Mitchell Bldg., Cincinnati, receive bids about Dec. 1, building 1 story, steel, brick, stone and terra cotta, for 1st Natl. Bank. About $100,000. Noted Sept 18.

Mich., Detroit Hospital—Bd Health, 233 Antoine St., retained A. Kahn, archt., Marquette Bldg., to prepare plans and estimates for 4 or 6 story, rein.-con., brick and steel, addition to H. Kiefer Hospital, on Hamilton Blvd. and Blaine Ave., rein.-con. flooring, concrete foundation. About $1,000,000 Noted Nov. 13.

Mich., Detroit—Theatre—H. C. Keywell, 501 Old Whitney Bldg., having plans prepared by M. H. Finkell, archt., 303 Chamber Commerce, for 2 story, 38 x 115 x 190 ft., brick and steel, rein.-con. flooring concrete foundation, on Grand River Ave About $90,000

Mich., Highland Park (Detroit P. O.)—School—Bd. Educ., soon lets contract building 2 story, rein.-con. and brick addition to Willard School, rein.-con. flooring, concrete foundation, on Waverly Ave. and Hamilton Blvd. About $300,000. Butterfield & Butterfield, David Whitney Bldg., Detroit, archts W. H. Adams, Vinton Bldg., Detroit, engr.

Mich., Royal Oak—High School—Dist. No. 9 soon lets contract building 2 story, rein con., brick and steel, rein. con. flooring, concrete foundation, on Woodward Ave. and Nine Mile Rd., Ferndale Village About $90,000. G. M. Parsons, Box 574, Detroit, secy., W. J. Fisher, Pontiac, engr., C. A. Fisher, Pontiac, archt.

Wis., Watertown—Home—Lutheran Home for Feeble Minded receives bids in winter, building 2 story, 60 x 100 ft rein.-con and brick, rein.-con. flooring, concrete foundation. About $65,000. R. A. Messmer & Bro., Majestic Bldg., Milwaukee, archts. and engrs Noted Mar. 6.

Ia., Marshalltown—Fidelity Savings Bank soon lets contract remodeling 2 story, concrete, brick and steel, concrete foundation

About $60,000. H. E. Reimer, Marshalltown, archt.

Minn., Chisholm—Recreation—City soon lets contract building 2 story, 250 x 300 ft., rein. con., steel and brick, rein.-con. flooring, on West Lake Ave. About $375,000. A. Puck, Torrey Bldg., Duluth, engr. and archt.

Minn., Duluth—Home—J. J. Wagenstein, archt. and engr., Providence Bldg., receives bids about Jan. 2, building 3 story, 40 x 104 ft., brick and stucco, rein. con. flooring, concrete foundation, on 19th Ave. E. and Blvd., for Aftenro Society. About $50,000. H. P. Bjorge, 1525 Woodland Ave., pres.

Minn., St. Paul—Hotel—F. Driscoll, Hook 'Em Cow Hotel, soon lets contract building 2 story, 140 x 180 ft., rein.-con. and brick addition, on Concord St. About $60,000. Private plans.

Kan., Hutchinson—School—Bd. Educ. soon lets contract building 3 story, 62 x 82 ft. school, to be known as Pershing School, brick, concrete and steel, concrete foundation. About $60,000. W. E. Hulse & Co., Hutchinson, archts.

Wyo., Sheridan—Bank and Office—Whitney Estate receives bids about Jan. 15, building 5 story, 66 x 125 ft. rein.-con. Link & Haire, 317 Electric Bldg., Billings, Mont., archts.

Mont., Billings—Store—P. Behrendt, 211 North 26th St., receives bids about Mar. 1, building 2 story, 75 x 140 ft., on 1st Ave. and 26th St. About $50,000. Link & Haire, 317 Electric Bldg., archts.

Mo., Carthage—Hotel—Stock Co. c/o Chamber of Commerce, having plans prepared by Sheppard, Farrar & Wiser, archts., R. A. Long Bldg., Kansas City, for 4 story, 75 x 132 ft., rein.-con., steel, brick and stone, on 4th and Howard Sts. About $150,000.

Mo., Columbia—Hospital—Boone Co. Hospital Bd. having plans prepared by Farrar & Wiser, archts, Kansas City, for 3 story, 40 x 125 ft., rein.-con., brick and stone. About $100,000.

Mo., Fulton—Academy—William Woods College having sketches prepared by Holmes & Flinn, archts., 8 South Dearborn St., Chicago, for 3 story, 65 x 140 ft., concrete and brick. About $85,000.

Tex., Austin—Church—Trustees University Baptist Church receives bids about Nov. 20, completing 1 story, 90 x 114 ft. rein.-con. and steel, on 22nd and Guadalupe Sts. About $70,000. R. L. Thomas, 806 Littlefield Bldg., archt. Foundation, basement and wings completed.

Cal., Arcadia—School—Trustees Arcadia School Dist. having plans prepared by N. F. Marsh, archt., 211 Bway. Central Bldg., Los Angeles for brick, hollow tile or concrete. About $50,000. Noted July 10.

Cal., Berkeley—High School—Bd. Educ. having plans prepared by W. C. Hays, archt., 1st Natl. Bank Bldg., San Francisco, for high school on Grove St. About $750,000.

Cal., Fresno—Hotel—S. N. Griffith, Fresno, having plans prepared by Glass & Butner, archts., Rupublican Bldg., for 6 story, rein.-con. containing 350 rooms, on Mariposa and M Sts. About $400,000.

Cal., Glendale—School—Bd. Educ. having plans prepared by Jeffery & Schaefer, archts., 1104 Kerckhoff Bldg., Los Angeles, for 8 room, hollow tile and plaster, on Bway., cost $72,500; addition to intermediate school, $10,000; 2 kindergarten bungalows $3700.

Cal., Modesto—Store—W. S. Thompson Co. having plans prepared by Walker & Eisen, archts., Hibernian Bldg., Los Angeles, for 2 story, 100 x 100 ft. rein.-con. and brick, on 10th St. About $100,000.

Cal., Modesto—Theatre—Pacific Theatre & Realty Co., c/o Reid Bros., archts., California Pacific Bldg., San Francisco, having plans prepared for 1 story, 100 x 140 ft., rein.-con. and brick, on 10th St. About $100,000.

Cal., Oakland—Hospital—California Memorial Hospital having plans prepared by C. Werner, archt., 785 Market St., San Francisco, for hospital, (to accommodate 250 patients) in Diamond Canyon, head of Fruitvale Ave. About $350,000.

Cal., San Francisco—Office and Store—W. M. Fitzbugh, Mills Bldg., having plans prepared by Bakewell & Brown, archts., 251 Kearny St., for 10 story, rein.-con., brick and steel, rein. con. flooring, concrete foundation, on Post and Powell Sts. About $400,000.

Ont., Windsor—School—A. H. McPhail, archt., Bd. Trade Bldg., soon lets contract building 3 story, 215 x 230 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Giles Blvd., for Bd. Educ., LaBelle Bldg. About $400,000.

BIDS DESIRED

S. C., Greenville School Until Dec. 1, by J. E. Sirrine, engr., Greenville, building 4 story, 80 x 250 ft. brick and concrete, for Furman University.

Ky., Frankfort Hotel Until Dec. 1, by Capitol Hotel Co., building 5 story, rein.-con. and stone. About $200,000. C. C. Weber, 3rd and Walnut Sts., Cincinnati, archt.

O., Akron—Hotel—Until Dec. 1, by Dittoe, Fahnestock & Ferber, archts., 18 West 7th St., Cincinnai, building 3 story, brick, for J. H. Wiener, 708 Diagonal Rd. About $200,000.

O., Cincinnati—School—Until Nov. 29, by W. D. Handman, business mgr. bd. educ., W. D. Handman, business mgr. Bd. Educ., building 1 story, 62 x 135 ft., brick, on Herchell Ave. About $60,000. Tietig & Lee, 4th Natl. Bank Bldg., archts.

O., Cincinnati School—Until Nov. 22, by W. D. Handman, business mgr. bd. educ., building 3 story, 135 x 300 ft., rein.-con. and brick, on 7th and Barr Sts. About $725,000.

O., Cleveland—Commercial and Theatre—Crawford Hough Bldg. Co., Williamson Bldg., receiving bids building 2 story, 112 x 140 ft., concrete, steel and brick, concrete foundation, on East 84th St. and Hough Ave. About $200,000. J. J. Dowling, secy. J. T. Brennan, 1298 West 108th St., archt.

O., East Cleveland—(Cleveland P. O.)—Hospital City receiving bids building 3 story, 80 x 260 ft., concrete, steel and brick, rein.-con. flooringg, concrete foundation, on Euclid Ave. About $250,000. C. M. Osborne, city mgr. W. Hirsh, Euclid Bldg., Cleveland, archt.

O., Owensville—Church—Until Dec. 10, by J. C. Grunkemeyer, archt., 1717 Eastern Ave., building 45 x 92 ft. church and brick chapel, for St. Louis Church.

Mich., Detroit—Bank and Office—Until Nov. 26, by A. Kahn, archt., Marquette Bldg., for 24 story, 186 x 100 ft. and x 169 ft., brick, stone and steel, rein.-con. flooringg, concrete foundation, on Woodward Ave. and Cadillac Sq., for 1st and Old Detroit Natl. Bank, Ford Bldg. About $2,500,000. Noted April 10.

Minn., Minneapolis—Office—Until Jan. 20, by Chamber of Commerce, 4th Ave. and 3rd St., building 12 story, 12 x 12 x 195 ft., rein.-con. About $1,000,000. Bertrand & Chamberlain, North West Bank Bldg., archts. Noted June 12.

N. M., Las Vegas—College—Until Nov. 25, by Bd. Regents New Mexico Normal University, 820 Main Ave., constructing 2 buildings at university. About $250,000. E. W. Hart, 14 Crockett Bldg., archt.

PRICES AND CONTRACTS AWARDED
(*Indicates award of contract)

***Mass., Beverly**—Theatre and Business—Ware Theatres, Inc., let contract building 2 story, 98 x 145 ft., brick and steel, concrete foundation, on Judson St., to J. Bowen, 184 Dudley St., Roxbury. About $80,000.

***Mass., Boston**—Bank and Office—First Natl. Bank, 70 Federal St., let contract building 108 x 171 ft., brick, rein.-con. and steel, rein.-con. flooring, brick and concrete foundation, on Milk St., to Stone & Webster Eng. Corp., 147 Milk St. About $2,000,000. Noted Aug. 7.

***Mass., Boston**—Office—First Natl. Bank, 70 Federal St., let contract building 170 x 250 ft., stone and rein.-con., rein.-con. flooring, concrete foundation, on Milk St., to Stone & Webster Corp., Milk St. About $1,500,000.

***Mass., Boston**—Theatre—O. F. Farley, Jr., 27 State St., let contract building 2 story, 200 x 200 ft., brick and concrete, concrete flooring and foundation, on West Bway., to F. T. Ley & Co., Inc., 185 Devonshire St. About $300,000. Noted May 15.

***Mass., Cambridge** Educational—Massachusetts Institute of Technology let contract constructing, 3 story, 60 x 175 ft., rein. con., rein.-con. flooring, concrete foundation, on Charles River Ave., to be known as Pratt Memorial Bldg., to Stone & Webster, Milk St., Boston, cost plus percentage basis. About $750,000 available.

***Conn., Bristol**—Club—New Departure Mfg Co., 269 North Main St., let contract building 6 story, on Center and North Main Sts., to include cafeteria, bowling alley, pool and billiard rooms, etc., to Aberthaw Constr. Co., School St., Boston, Mass. About $350,000.

***N. Y., Coney Island**—Bank—Bank of Coney Island, Surf Ave., let contract building 1 story, brick, steel and stone, brick foundation, on 25th St. and Surf Ave., to F. G. Fearon, 280 Madison Ave., New York City. About $75,000.

***N. Y., New York** Sales and Office—Renwick, Aspinwall & Tucker, archts. and engrs., 8 West 40th St. let contract to T. J. Murphy, 405 Lexington Ave., altering 5 story, brick and steel, on Park Ave. and 57th St., for H. Collins, 9 East 57th St. About $50,000. Noted Oct. 30.

***N. Y., New York** Showroom and Office—J. Tishman & Sons, 18 East 41st St., will build 16 story, steel and stone, brick foundation, at 19 West 37th St. About $1,200,000. Work will be done by day labor.

***N. Y., New York** Stores and Offices—M. J. Harrison, archt. and engr., 63 Park Row, let contract to I. Roth, 35 Nassau St. building 3 story, brick and steel, brick foundation, at 128 West 30th St., for S. J. Manning, c/o architect. About $50,000. Noted Oct. 30.

***N. Y., New York**—Theatre—C. Steiner, c/o New 14th St. Theatre, 235 East 14th St., will build brick and steel, brick foundation, on 2nd Ave. and 9th St. About $300,000. Work will be done by day labor.

***N. Y., Niagara Falls**—School—Bd. Educ let contract building 2 story, 60 x 168 ft., rein.-con., rein.-con. flooring, concrete foundation, on Niagara St., to Wright & Kremers, Gluck Bldg., $104,200.

***N Y., Rockaway Beach**—Stores and Offices—F. Hallfeld, c/o M. A. Cantor, archt. and engr., 371 Fulton St., Brooklyn, let contract building 2 story, 92 x 97 ft., brick and steel brick foundation, on Rockaway Beach Blvd. to H. Sprung, 126 West 118th St., New York City.

***N. J., Asbury Park**—Store—W. Steinbach, Cookman and Bangs Aves., let contract building 1 story, brick and steel adition to store, brick founation, to Chamberlain & Sons, Asbury Park. About $100,000. Noted Nov. 13.

***N. J., Atlantic City**—Hotel—Ambassador Hotel let contract building brick, steel and stone addition, brick foundation, to Thompson-Starrett, 49 Wall St., New York City. About $3,000,000.

***N. J., Atlantic City**—Hotel and Store—Leeds, Lippincott Co. let contract building 14 story, 132 x 145 ft., concrete, brick and steel addition to Haddon Hall, North Carolina St. and Boardwalk, to Roydhouse-Arey Co., 112 North Broad St., Phila. About $3,000,000.

***N. J. Camden**—School—St. Joseph's Church, 10th and Liberty Sts., let contract building 2 story, 65 x 100 ft., rein.-con. brick an steel, at 1020 Liberty St., to G. C. Dietrich, Riverside. About $50,000.

***N. J., Newark** Exchange—New York Telephone Co., 15 Dey St., New York City, let contract building 3 story, 100 x 200 ft. on South Orange and Morris Aves., here, to Amer. Concrete Steel Co., 27 Clinton St. About $100,000. Incorrectly noted in our issue of Sept. 11.

***N. J., Newark**—Store and Office—Feist & Feist will build 3 sory, brick and steel, brick foundation, on Broad and Center Sts. About $100,000. Work will be done by day labor. U. S. Cigar Stores, 44 West 18th St., New York City, lessee.

***N. J., South Amboy**—Bank—First Natl. Bank let contract building 1 story, brick, stone and steel, brick foundation, to A. J. Robinson, 15 West 38th St., New York City. About $55,000.

***N. J., Trenton**—School—Bd. Educ. let contract building 3 story, brick and stone addition to Jefferson School, Brunswick Ave., to T. Day, 1109 Greenwood Ave., $206,587. Noted July 10.

***N. J., Trenton**—Theatre—W. J. Vernon, St. Regis Bldg., received only bid building 1 story, 90 x 174 ft., brick and steel, on South Broad St., from R. J. Clark, 43 Passaic St. Estimated cost, $150,000. Noted Sept. 18.

***Pa., Phila.**—Office—Fidelity Mutual Life Insurance Co., 112 North Broad St., let contract building 5 story, 38 x 55 ft., rein.-con and brick addition, to Roydhouse-Arey Co 112 North Broad St. About $75,000.

***Del., Wilmington**—Theatre—West End Amusement Co. will build 1 story, 40 x 150 ft., brick, steel, concrete and terra cotta on Union St. between 3rd and 4th Sts About $50,000. Work will be done by day labor.

***Md., Baltimore**—Lodge—Knights of Pythias, Gay and Lexington Sts., let contract building 3 story, 60 166 ft., rein.-con., steel and brick, concrete foundation, on McCulloh and Preston Sts., to Childs & Miller, 2201 Calvert St. About $175,000.

***D. C., Washington**—Hotel and Terminal—Washington, Baltimore & Annapolis Electric R.R., Liberty and Marion Sts., Baltimore, let contract building 11 story, 200 x 200 ft., steel, brick and stone, concrete foundation, on 11th and 12th Sts, and New York Ave. here, to F. C. Lewin, 616 12th St. N. W. About $1,500,000.

***O., Cleveland**—Theatre—M. Loew, 1492 Bway, New York City, let contract building 1 story, 96 x 130 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 101st St. and Euclid Ave., here, to Craig-Curtiss Co., Guardian Bldg. About $250,000.

***O., Wharton**—School—Bd. Educ. let general contract building 2 story, 60 x 90 ft., concrete and brick, to C. M. Cress, Upper Sandusky. About $60,000.

***Mich., Detroit**—Hospital Grace Hospital Willis Ave., let contract building 4 story, 35 x 70 ft., rein.-con. brick and steel addition, rein.-con. flooring, concrete foundation, on Willis Ave. and John R St., to O. Misch Co., Chamber Commerce Bldg. About $75,000. Noted Aug. 21.

***Mich., Detroit**—Hospital Providence Hospital, West Grand Blvd., let contract building 4 story, 75 x 75 ft., rein. con., brick and steel, rein.-con. flooring, concrete foundation, to J. Finn & Co., 234 Fort St., E. About $75,000. Noted Aug. 21.

***Mich., Detroit**—Hotel—J. McE. Bowman, Hotel Biltmore, New York City, let contract building 23 story, 120 x 255 ft., brick, steel and stone, brick foundation, on Madison Ave., to G. A. Fuller, Penobscot Bldg. About $5,000,000.

***Mich., Detroit**—Hotel—W. J. Brown, 193 Woodward Ave., let masonry contract building 4 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Cass Ave. and West Columbia St., to N. Greenblatt, 187 Division St.; steel, to Detroit Metal & Steel Co., 1st and Congress Sts. About $200,000. Noted Aug. 7.

***Mich., Detroit**—Hotel—M. Kunstler, 394 Virginia Park, let contract building 4 story, 50 x 90 ft., rein.-con., brick and steel, concrete foundation, on Adams Ave., to H. Greenblatt, 185 Division St. About $150,000. Noted Nov. 13.

***Mich., Detroit**—Market—H. Myers c/o R. Finn, archt., 435 Woodward Ave., let contract building 2 story, 70 x 130 ft., brick and steel, rein.-con. flooring, concrete foundation, on Riopelle and Winder Sts., to Pine & Munnecke Co., 115-117 State St. About $55,000.

***Mich., Detroit**—Schools—Bd. Educ., 50 Bway. Ave., let contract building (a) Angell School, (b) addition to Carstens School, (c) addition to Trowbridge School, (d) Clippert open air school, (e) Davison Annex open air school, (1) masonry, (2) carpentry, (3) heating, ventilating and plumbing, (4) general specifications, to J. Bollin Co., 906 Bellevue Ave., (a1) $79,000; E. Thiede, 287 Berlin St., (a2) $20,900, (b2) $25,350, (c2) $15,500; J. W. Partlan, 51 Park Pl. (a3) $43,890, (c3) $36,833; W. H. Mueller, Ford Bldg., (b1) $99,700; W. J. Renoldt, 506 Owen Bldg., (b3) $51,051; M. A. Mahoney, Penobscot Bldg., (c1) $68,800; H. M. Martens Co., 221 Moffat Bldg., (d4) $25,780, (e4) $28,740; Irvine & Meier, 2289 Woodward Ave., (d3) $6512, (e3) $7393. Noted Sept. 25.

***Mich., Detroit**—Theatre—La Salle Garden Theatre Co., c/o C. W. Brandt, archt., 1113 Kresge Bldg., let contract building 2 story 160 x 124 ft., rein.-con. brick and steel, rein.-con. flooring, concrete foundation, on 14th Ave. and Ferry Park, to F. Farmington Co., 201 Scherer Bldg. About $150,000, cost plus percentage basis.

***Mich., Flint**—School—Bd. Educ. let contract building 2 story, 102 x 179 ft., concrete and brick rein.-con. flooring, concrete foundation, on Saginaw St. and Clayton Ave., to Burk & Smith, Flint, $240,000.

***Mich., Grand Rapids** Convent—Dominican Sisters let contract building 3 and 4 story, 46 x 232 ft., 58 x 175 ft., 64 x 120 ft., 34 x 174 ft. and 24 x 37 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to J. McNabb & Son, Grand Rapids. About $350,000.

***Mich., Highland Park**—School—Bd. Educ. let contract building 3 story, 38 x 215 ft., rein.-con., brick and stone addition, rein.-con. and wood flooring, concrete foundation, on Hamilton Blvd. and Waverly Ave., to Bryant & Detwiler Co., Dime Bank Bldg., Detroit. About $300,000. Noted Nov. 13.

***Mich., Muskegon** Office—R. W. Judson & B. Tobin, c/o Continental Motor Co., let contract building 2 story, 80 x 132 ft., brick, steel and terra cotta, on Western Ave., and 3rd St. to Natl Contsr. Co., 1026 Dime Bank Bldg., Detroit. About $85,000.

***Mich., Oakwood**—(Oxford P. O.)—School Bd. Educ. will build 2 story, 85 x 200 ft., rein.-con., brick and steel, rein. con flooring, concrete foundation. Work will be done by day labor under supervision of F. R. Patterson, c/o Van Leyan, Schilling & Keough, 1115 Union Trust Bldg., Detroit. About $230,000 Noted Sept. 11.

***Mich., Puritan**—School—Bd. Educ. let contract building 2 story, 72 x 136 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, to H. Gundlach, Houghton. About $140,000.

***Mich., Pontiac**—School—Bd. Educ. let contract building 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation on West Huron S., to W. H. Isgriss & Sons, Pontiac. About $270,000; cost plus percentage basis. Noted July 24.

***Mich., St. Louis**—School—Bd. Educ. let contract building 2 story, 80 x 107 ft., brick, stone and steel addition, concrete foundation, to C. A. Bernard, St. Louis. About $50,000. Noted Sept. 11.

***Wis., Milwaukee**—Bank and Office—Layton Park State Bank let contract building 2 story, 60 x 85 ft., rein.-con. and brick, on 23rd St. and Forest Home Ave., to G. E Kahn, 418 Caswell Blk. About $50,000.

***Wis., Neenah**—Bank—FiFrst Natl. Bank, 100 West Wisconsin Ave., let contract building 1 story, 41 x 84 ft., concrete and stone, rein.-con. flooring, concrete foundation, to C R. Meyers & Son, 50 State St., Oshkosh About $100,000. Noted July 31.

***Wis., St. Francis** Church and School—Paul's Catholic Church, 866 Racine St., Milwaukee, let contract building 1 story 60 x 165 ft rein.-con. and brick, rein.-con. flooring, concrete foundation, here, to G. E. Kahn, 418 Caswell Blk., Milwaukee. About $50,000.

***Ia., Cedar Falls**—Store—Bennison Dry Goods Co. will build 3 story, 44 x 100 ft. brick. Work will be done by day labor.

***Ia., Cedar Rapids**—Hotel Montrose Hotel Co., 223-3rd Ave., let general contract building 1 story, 120 x 140 ft. brick, rein.-con. and stone, rein.-con. flooring, to Stevens Eng. Co., Chicago, Ill. About $200,000; cost plus percentage basis.

***Ia., Muscatine**—Temple—Masonic Lodge let contract building 3 story, 55 x 120 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to C. Franklin, 510 South Gilbert St., Iowa City. About $120,000 Noted Nov. 6.

***Ia., Waterloo**—Auto Sales—Repass Clark Co., 217-19 W. 5th St., let contract building 2 story, 128 x 140 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to H. A. Maine & Co., 305-6-7 Marsh Pl. Bldg. About $125,000; cost plus percentage basis.

***Minn., Balaton**—School Bd. Educ. let contract building 2 story, 60 x 90 ft., brick, to Carlsted Bros., 542 Builders Exch., Minneapolis, $65,474. Noted Sept. 18.

***Minn., Biwabik**—High School—Independent School Dist. No. 24 let contract building 2 story, 106 x 111 ft., rein.-con., steel and brick, to L. J. Klippen, 1832 East 6th St., Duluth. About $102,000.

***Minn., Hibbing**—Bank—First Natl. Bank, 301-3rd Ave., let contract building 2 story, 105 x 125 ft., to A. Moorman & Co., Chamber of Commerce Bldg., St. Paul. About $150,000.

***Minn., Princeton**—School—Bd. Educ. let contract building 2 story, 75 x 126 ft., to Evenson & Utterberg, Builders Exch., Minneapolis, $51,000. Noted Aug. 14.

***Minn., St. Paul**—Hotel and Theatre—Toltz, King & Day, archts., Pioneer Bldg. let contract to F. J. Romer Constr. Co., 190 Ramsey St., building 16 story, rein.-con. and brick, rein.-con. flooring, rock foundation, on St. Peter St., for Hamm, Ruben & Finkelstein, Palace Theatre. About $1,000,000, cost plus percentage basis. Noted Aug. 14.

***Kan., Junction City**—Hospital—City let contract building 2 story brick, rein.-con. flooring, brick foundation, to G. E. Dalton, Junction City. About $70,000. Noted July 10

***Kan., Ottawa**—Auditorium—City let contract building 2 story, 75 x 135 ft. brick, rein.-con. flooring, brick and concrete foundation, to J. L. Zollars, Independence. About $72,800. Noted Sept. 11 .

***Kan., Tipton**—High School—Catholic Church, c/o C. Meing, let contract building 2 story, rein.-con., steel and brick, concrete foundation, to W. N. Penland, Osborne About $55,000.

***Kan., Wichita**—Business W. B. Harrison & Co. let contract building 2 story, 50 x 160 ft. brick, concrete and steel, concrete foundation, to G. H. Siedhoff, Wichita. About $50,000.

***Kan., Winfield**—Bank—First Natl. Bank let contract altering bank, brick, steel, marble and stone, to Hoggson Bros., 485-5th Ave. New York City. About $150,000.

***Tex., Ft. Worth**—Office and Bank Farmers & Mechanics Natl. Bank, 712-14 Main St., let contract building 24 story, 100 x 100 ft., steel, concrete, terra cotta and brick concrete, brick and rock foundation, on Main and 7th Sts., to Westlake Constr. Co., 717 Locust St., St. Louis, Mo. Noted Aug. 14.

***Tex., Houston** School—School Bd let contract building 3 story, brick, concrete and stone, on 20th Ave. and Blvd., to Horton & Horton, McKinney and Velasco Sts., $153,400

***Okla., Blackwell** Hotel H. C. Ferriman let contract building 4 story, 90 x 100 ft rein.-con., steel and brick, rein.-con flooring, rock and concrete foundation, to F. P. McClure Constr. Co., Kansas City, Mo. About $250,000.

***Okla., Elk City**—High School—Bd. Educ let general contract building 2 story, 60 x 195 ft., with 2 wings, brick and stone, rein.-con. flooring, to Kreipke-Schafer Constr. Co., Oklahoma, $112,850.

***Okla., Enid**—Dormitories—Phillips University, 22nd St. and Bway., let general contract building two, 2 story, 30 x 77 ft brick, rein.-con. and stone, to G. M Buxton Enid Natl. Bank Bldg. About $120,000.

***Okla., Jenks**—High School—Bd. Educ. let contract building 2 story, 75 x 100 ft. rein.-con. steel and brick, to Doroughty & Nichols Constr. Co., Muskogee. About $71,500. Noted July 10.

***Okla., Okmulgee**—Theatre—F. A. Young Ft. Worth, Tex., let contract building 3 story, 100 x 140 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Stiles Constr. Co., Chicago, Ill. About $250,000; cost plus percentage basis.

***Okla., Pleasant Hill**—School—Bd. Educ let contract building 1 story, 65 x 122 ft. brick, concrete and steel, rein.-con. flooring, concrete foundation, to A. F. Stewart & Co., 2230 West 16th St., Oklahoma. About $60,000; cost plus percentage basis.

***Colo., Ft. Collins**—Physics—State Agricultural College, here, let contract building 3 story, 52 x 106 ft., brick and timber, rein.-con. flooring, concrete foundation, to E. Reavill, 1435 Vine St., Denver, $93,533.

***Ore., Portland**—Home—B. P. O. E. let contract building 2 story, 100 x 100 ft., brick, on 12th and Alder Sts., to Trenchall & Parelius, Builders Exch., Portland. About $50,000.

***Ariz., Globe**—Schools—School Trustees let contract building addition to high school, to Whalley Lumber Co., $84,300; 2 story grade school on Hill St., to J. Garfield, Globe, $117,390. Noted Aug. 28.

***Ariz., Phoenix** Hotel Geronimo Hotel Co., c/o Postle & Fischer, archts., 140 South Dearborn St., Chicago, let contract building 8 story, 138 x 205 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to Paschen Bros., 111 West Washington St., Chicago. About $750,000.

***Ariz., Tucson** -Store, Theatre, etc.—East Congress Street Bldg. Co. let contract building 2 story, 110 x 185 ft. with 70 x 120 ft. wing, rein.-con. and brick, concrete foundation, on East Congress St., to Edwards & Wildey Co., 515 Black Bldg., Los Angeles, Cal. About $130,000.

***Ore., Roseburg** Hotel—Winchester Bay Lumber Co. will build 2 story, 70 x 100 ft frame, concrete foundation, near Mill R.R. spur. About $50,000. Work will be done by day labor under supervision of R. Noble.

***Cal., Berkeley**—School—Bd. Educ. let following contracts building, on Colusa and Tacoma Aves., cement and concrete work to W. J. Schmidt, 2027 Shattuck Ave., $10,600; carpentry, Conner & Conner, 2105 Berkeley Way, $17,250; heating, Scott Co., 243 Minna St., San Francisco, $10,690. Noted Oct. 16.

***Cal., El Segundo**—School—Trustees El Segundo School Dist. let contract building 1 story, 85 x 168 ft., to J. A. Crook, 619 Exch. Bldg., Los Angeles, $91,500. Noted Aug. 14.

***Cal., Fresno**—Office—A. Mattei let contract building 12 story, 50 x 150 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on J. and Fresno Sts., to Lindgren Co., Monadnock Bldg., San Francisco. About $500,000. Noted June 19.

***Cal., Long Beach**—School—Bd. Educ. let contract building 2 story, brick, rein.-con. flooring, concrete foundation, on American Ave., to J. D. Sherer, 1400 Elm Ave., $204,072. Noted Sept. 18.

***Cal., San Francisco** -Bank—Bank of Italy, Montgomery and San Francisco Sts., let contract for structural steel work for 5 story, rein.-con., brick and steel, on Eddy and Powell Sts., to Golden Gate Iron Wks., 1541 Howard St.; for excavating, shoring and concrete work, to Duncanson-Harrellson Co. Chronicle Bldg. Total cost about $500,000 Noted Aug. 14.

***Cal., San Francisco**—Office—Balfour Guthrie & Co., 350 California St., let contract building 12 story, 90 x 130 ft., steel, rein.-con. flooring, concrete foundation, to P. J. Walker Co., Monadnock Bldg. About $750,000; cost plus percentage basis.

***Cal., San Leandro** Hospital—Comrs. Alameda Co. let contract building 2 story, 52 x 82 ft. timber addition, rein.-con. flooring, brick or concrete foundation, on Foothill Blvd., to F. W. Maurice, 505 East 22nd St., Oakland, about $52,000

***Cal., Santa Ana** Hotel Santa Ana Hotel Co. let contract building 3 story, rein.-con concrete foundation, on North Bway. and Birch St., to E. C. English, 508 Citizens Natl. Bank Bldg. About $160,000.

FEDERAL GOVERNMENT WORK

PROPOSED WORK

N. J., Tuckerton—Radio Towers—Spec. 4083—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to paint radio towers, here About $2500

Del., Wilmington—Dredging—U. S. Eng. Office, Old Federal Bldg., rejected bids received Oct. 20, dredging in Cooper River, N. J. and in Chester River, Pa. Noted Oct 16

D. C., Anacostia Storehouse Spec. 4085 Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build storehouse for propellers, here. About $4000

S. C., Charleston Dredging—U. S. Engr Office, Charleston, rejected bids received Oct 16, dredging in proposed 40 ft. channel in Cooper River, near here Noted Sept 25.

S. C., Paris Island—Marine Aviation Field Spec. 4079 Bureau Yards & Docks, Navy Dept., Wash., D. C. plans to develop marine aviation field here. About $100,000

La., New Orleans—Storehouses Spec. 4084—Bureau Yards & Docks, Navy Dept., Wash.,

D. C., plans to build ammunition and mine storehouses, here. About $48,000.

Colo., Denver—Dredger—Secretary of Interior, Wash., D. C., has authorized U. S. Rec. Serv. to purchase 1 Ruth Dredger, to be used in connection with irrigation work on Yuma Irrigation project, Arizona-California. About $7000.

Wash., Wenatchee—Road Work—Bureau Pub. Rds., Portland, Ore., plans to build Stevens Pass Highway, Chelan Co., estimate cost $140,000. Forest Serv. will appropriate $90,000 and balance of cost will be borne by Chelan, Snohomish and King Counties; also 10 mi. Lake Chelan Rd., from 1st Creek to 25-mile Creek, $40,000. Chelan Co. and Forest Serv. will bear cost. C. H. Purcell, Post Office Bldg., Portland, dist. engr.

H. T., Pearl Harbor—(Kuahua)—Barracks—Spec. 4806—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build here. About $8500.

BIDS DESIRED

Mass., Hingham—Officers' Quarters—Spec. 4056—Until Nov. 26, (change of date) by Bureau Yards & Docks, Navy Dept., Wash., D. C., building at Naval Ammunition Depot, here. About $12,000; $10 deposit required for plans and spec. Noted Oct. 23.

R. I., Providence—Remodeling Elevator—Until Dec. 2, by Treas. Dept., Wash., D. C., remodeling electric freight elevator in Post Office, Customhouse and Courthouse, here. J. A. Wetmore, superv. archt.

N. Y., New York—Flooring—Spec. 3705—Until Nov. 26, by Bureau Yards & Docks, Navy Dept., Wash., D. C., asphalt block flooring in the light machine and electrical shop building No. 5, 32,000 sq.ft. rein.-con. floor slab, on compacted cinder fill and paved with 2 in. asphalt blocks, etc. Cost, $30,000; $10 deposit required for plans and spec.

Pa., Chester—Remodeling Post Office—Until Nov. 24, by Treas. Dept., Wash., D. C. remodeling post office, here. J. A. Wetmore, superv. archt.

Va., Norfolk—Quay Wall—Spec. 4044—Until Nov. 26, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here, uncreosoted timber bearings, batter piles, creosoted fender piles, chocks, etc. Cost, $60,000; $10 deposit required for plans and spec.

N. C., Thomasville—Post Office Until Dec. 18, by Treas. Dept., Wash., D. C., furnishing labor and material for post office, here. J. A. Wetmore, superv. archt.

S. C., Charleston—Pump Well—Spec. 4089—Until Nov. 26, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building pump well for Dry Dock No. 2, consisting of concrete structure, about 204 ft. long, 87 ft. deep and 48 ft. 3 in. wide, with removable structural steel galleries, etc. Cost, $350,000; $20 deposit required for plans and spec.

Miss., Meridian—Remodeling Post Office—Until Nov. 24, by Treas. Dept., Wash., D. C., remodeling post office and court house, here. J. A. Wetmore, superv. archt.

O., Toledo—Mailing Platforms—Until Nov 26, by Treas. Dept., Wash., D. C., building 2 rein.-con. mailing platforms to U. S. Post Office Bldg., here. J. A. Wetmore, superv. archt.

Colo., Denver—Inspection—Until Dec. 8, by U. S. Recl. Serv., for inspection of engineering materials and machinery for 1 year. A P. Davis, ch. engr.

Wash., Keyport—Radio Towers—Spec. 4077 Until Dec. 3, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 400 ft self supporting radio tower with concrete foundations on wood piles and for modifications of out riggers on existing towers at Naval Radio Sta., here. About $45,000; $20 deposit required for plans and spec.

Cal., Sacramento—Post Office—Until Dec. 29, by Treas. Dept., Wash., D. C., extending and remodeling post office, here. J. A. Wetmore, superv. archt.

Cal., San Diego—Building—Spec. 4047—Until Nov. 26 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C. constructing 1 story central building, covering 30,000 sq.ft. floor space, consisting of power house at center with ell shaped east and west wings for housing utilities, at Marine Corps Base, rein.-con. foundation on concrete pile, rein.-con. columns, slab floor and roof, steel trusses and purlins, brick and hollow tile walls and partitions, suspended metal ceiling, etc., and radial brick chimney, 125 ft. high. About $200,000; $20 deposit required for plans and spec.

PRICES AND CONTRACTS AWARDED
(*Indicates award of contract)

***N. Y., New York**—Pneumatic Tube System—Treas. Dept., Wash., D. C., let contract installing pneumatic tube system, in U. S. Assay Bldg., here, to Lamson Co., 100 Boylston St., Boston, Mass., $3698.

***N. Y., Stapleton**—Kitchen and Mess Hall—Treas. Dept., Wash., D. C., let contract building kitchen and mess hall at Marine Hospital, here, to Northeastern Constr. Co., 101 Park Ave., New York City, $147,360. Noted Oct. 16.

***Pa., Ft. Mifflin**—Dredging—Spec. 4042—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract dredging at Naval Ammunition Depot, here, to Amer. Dredging Co., 308 Chestnut St., Phila., $0.38 per cu.yd (35 days). Noted Oct. 23.

***Pa., Phila.**—Electric Lighting System—Spec. 4045—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing electric lighting system for extension to Shipbuilding Slips, here, to United Electric Constr. Co., Inc., 1727 Sansom St., cost $8000 (150 days). Noted Oct. 23.

***Md., Annapolis**—Stokers—Spec. 4049—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing and installing mechanical stokers of underfeed type, driving engine and auxiliaries for three 400 hp. boilers, in boiler plant at Naval Academy, here, to Westinghouse Electric & Mfg. Co., Hibbs Bldg., Wash., D. C., $14,741. Noted Oct. 16.

***D. C., Anacostia**—Strengthening Hangar Trusses, Heating System, etc.—Spec. 4058—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract strengthening hangar trusses, installing movable scaffold for erection of gable rolling doors of hangar, heating system for radio building, etc., at Naval Air Sta., here, to Boyle Robertson, 601 Evans Bldg., Wash., $9980, (60 days). Noted Oct. 23.

***D. C., Wash.**—Storehouse Extension—U. S. Eng. Office, 305 Southern Bldg., let contract furnishing material and labor building extension to store at Popomac Park to Boyle Robertson Contr. Co., Evan Bldg., $36,067. Noted Oct. 23.

***W. Va., South Charleston**—Motors and Controller—Spec. 4032—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing motors and controller for cranes, here, to Genl. Electric Co., Commercial Natl. Bank Bldg., Wash., D. C. About $218,250 (60 days). Noted Sept. 11.

***Fla., Hillsboro Bay**—Dredging—U. S. Eng. Office, War Dept., Wash., D. C., let contract dredging Sects. A, B and C, here, to United Dredging Co., 3910 Woolworth Bldg., New York City, $111,899.

***Fla., Key West**—Development of Base—Spec. 3762—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract developing submarine base, here, to Snare & Triest, 8 West 40th St., New York City, $1,705,730 (500 calendar days). Noted Aug. 28.

***Ala., Florence**—Derricks—U. S. Engr. Office, War Dept., Wash., D. C., let contract furnishing and erecting traveling tower derricks, for Wilson Dam, Tennessee River, to McMyler Interstate Co., Bedford, O., $108,000. Noted Sept. 18.

***La., New Orleans**—Levee—U. S. Engrs Office, War Dept., Wash., D. C., lea contract building 5,309,000 cu.yd. levee work in Lower Tensas Levee Dist., to Roach, Stansell, Lawrence Bros. & Co., North Memphis Savings Bank Bldg., Memphis Tenn., $587,860; Atchafalaya Levee Dist. (Grand Levee), to O. O. Ogden, Roumain Bldg., Baton Rouge, $185,575; Yatton Levee, to Grasser Contr. Co., Hennen Bldg., $96,800; Pontchartrain Levee Dist., (White Hall Levee), to D. B. Hearin & Co., 306 New Daymond Bldg., Baton Rouge, $43,450; Mt. Airy (Glencoe Levee), to L. F. Alexander, Pauline St. Wharf, $60,760; Lake Borgne-Levee Dist., (Story Levee), to Lower Coast Constr. Co., 122 Charters St., $25,520

***Ky., Louisville**—Dam—U. S. Eng. Office, War Dept., Wash., D. C., let contract building Maneuver Boat Dam No. 43, in Ohio River, to Howard Shipyards & Docks Co., Jeffersonville, Ind., $24,960.

***Ind., Logansport**—Boiler—Treas. Dept., Wash., D. C., let contract installing new boiler, here, to W. Wilby, Selma, Ala., $1978, (70 days).

***Ill., Chicago**—Breakwater—U. S. Eng. Office, War Dept., Wash., D. C., let contract building rubble mound breakwater in harbor, to Great Lakes Dredge & Dock Co., 104 South Michigan Ave., $292,098.

***Colo., Denver**—Monitor—Treas. Dept., Wash., D. C., let contract installing monitor in sweep cellar at U. S. Mint, here, to F. H. Cowell, 217 Central Savings Bank Bldg., $16,976. Noted Oct. 23.

***H. T., Pearl Harbor**—Power Plant Improvements—Spec 3856—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract improving power plant, here, to Adams, Britz & Co., 1759 Park Ave., New York City, $84,321 (200 days). Noted Sept. 11.

MISCELLANEOUS
PROPOSED WORK

Pier—Asbury Park, N. J.—A. Pryor, c/o Mann & McNeil, archts., 70 East 45th St., New York City, having plans prepared for timber and steel pier, here. About $100,000.

Gateway—Denver, Colo.—W. E. and A. A. Fisher, archts., 128 Gilpin St., receive bids about Nov. 25, building Voorhees Memorial gateway at Civic Center, 47 ft. high, 200 ft. long, turkey creek sandstone and rein.-cno. foundation, for City and Denver Co. About $100,000.

BIDS DESIRED

Transit Shed—Seattle, Wash.—Until Nov. 26, by Port of Seattle Comn., Bell St. Dock, building north half of proposed 1000 ft. transit shed, 2 story, 118 x 500 ft., heavy timber, on Pier B, Smith's Cove. About $150,000.

Pontoon Pipes—Ottawa, Ont.—Until Nov. 26, by R. C. Desrochers, secy. Dept. Pub. Wks., for 11 pontoon discharge pipes for dredge, 'P.W.D. No. 5."

PRICES AND CONTRACTS AWARDED
(*Indicates award of contract)

***Lock—Lockport, N. Y.**—E. S. Walsh, supt. pub. wks., Capitol, Albany, let contract rebuilding upper end of Lock No. 35, on Erie Canal, Sect. 10, Contr. No. 152, to Luffer & Remick, 594 Ellicott Sq., Buffalo, $126,847. Noted Oct. 23.

***Limestone Dust—New York, N. Y.**—City let contract furnishing and delivering 1500 ton limestone dust, to New York Trap Rock Co., 17 Battery Pl., $12,675.

***Tunnel—Jersey City, N. J.**—New Jersey Interstate Bridge & Tunnel Comn., Room 2110-115 Bway., New York City, let contract for tunnel borings for vicinity of Varick and Canal Sts., New York City along line of proposed Vehicular Tunnel under Hudson River to vicinity of Grove and 12th Sts., here, to P. J. Healey, 39 Cortlandt St., New York City, $24,240. Noted Sept. 11.

***Loading Station—Newark, N. J.**—Sun Co., Finance Bldg., Phila., will build 50 x 110 x 150 ft. concrete and iron loading station, here. About $10,000. Work will be done by day labor.

***Pier—Port Covington (Baltimore P. O.) Md.** Western Maryland Ry., Continental Bldg., Baltimore, let contract buildingg 450 ft., concrete and timber pier, 60 ft. wide near foot of Light St., here, to McLean Contg. Co., 1412 Fidelity Bldg., Baltimore. About $600,000. Noted Sept. 25.

***Breakwater—Cleveland, O.**—City let contract extending breakwater at Gordon Park along Lake Erie, involving 2000 tons stone to Central Dredging Co., Bangor Bldg., $35,176.

***Cast Iron Pipe and Cranes—Detroit, Mich**—Comrs. Purchases & Supplies, Municipal Courts Bldg., let contract furnishing 2000 tons 42 in. class C c.i. water pipe, to United States Cast Iron Pipe & Fdry. Co., 122 South Michigan Blvd., Chicago, $109,000; 2 one-motor monorail electric trolley cranes for Pub. Wks. Garbage Plant, to Northern Eng. Wks., Chene St., Detroit, $2704; c.i. pipe and fittings for filtration plant, to Flower Valve Mfg. Co., Clayton Ave., Detroit, $170. per net ton.

Filling—Detroit, Mich.—City received bids filling back of proposed dyke at Belle Isle Park for Scott Fountain, 7 ft. depth of water, involving 150,000 cu.yd. excav., from Duluth Superior Dredging Co., 1715 Ford Bldg., $51,000, E. Gray, Continental Ave., fill in more than 5½ ft. water, no charge, less than 5½ ft., 7½c. per cu.yd.

***FFoundation—Janesville, Wis.**—St. Patricks Catholic Church let contract building concrete foundation for 2 story, 100 x 200 ft. steel and timber school, to J. P. Cullen & Son, Janesville. Total cost $70,000. Noted July 26, under "Buildings."

***Runways—Milwaukee, Wis.**—Great Lakes Coal & Dock Co., 1507 Alworth Bldg., Superior, let contract building two 876 ft. concrete and pile runways, here, to E. E. Gillen Co., Wells Bldg. About $45,000.

***Foundation, etc.—Chisholm, Minn**—City let contract excavating and building concrete foundation for 2 story, 250 x 300 ft. recreation building, on West Lake Ave., to Winslow & Salvi, Chisholm. About $68,000.

***Transmission Line—Hudson, Kan.**—City let contract building transmission line to Conner Constr. Co., cost $3650; furnishing poles and line apparatus, to Western Electric Co., 608 Wyanotte Bldg., $6233; furnishing transformers to A| Bilbank, $1041; furnishing copper wire, to B. & R. Electric Co., $999; and furnishing aluminum cables, to Aluminum Co. of America, 608 R. A. Long Bldg., $1618; all contractors of Kansas City Mo. Noted July 31.

***Transmission Line—Willis, Kan.**—City let general contract building distribution system and transmission line from here to Horton, to R. McConnel, Horton, $18,490; poles, to E. P. Chapin, Spokane, Wash., $1618; transmission and motors, to C. L. Milbank, Interstate Bldg., Kansas City, Mo., $1350; pole line material and copper wire, to B-R Electric Co., 15th and Walnut Sts. Kansas City, Mo., $1062 and $1338 respectively.

CONTRACTS AWARDED

INDUSTRIAL WORKS

***Me., Lisbon Falls**—Worumbo Mfg. Co. let contract building 2-story, 130 x 197-ft., dye house, rein.-con., rein.-con. flooring, concrete foundation, to Turner Constr. Co., 178 Tremont St., Boston, Mass. About $150,000.

***Me., Sanford**—Sanford Mills, c-o Lockwood-Greene Co., archts. and engrs., 101 Park Ave., New York City, let contract building two 1-story, rein.-con. and steel, dye houses, rein.-con. flooring, concrete foundation, to Turner Constr. Co., 241 Madison Ave., New York City. About $200,000. Noted June 26.

***Mass., Belchertown** Massachusetts Comm. on Mental Diseases, Boston, let contract to M. I. O'Connor, 86 Main St., Northampton, building laundry, storehouse, bakery and power house, all 1-story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, at State Hospital, here. Cost, $115,620. Noted Sept. 18, under "Buildings."

***Mass., Beverly**—United Shoe Mchy. Co. let contract building 3-story, 60 x 400-ft. rein.-con. storage plant, to Aberthaw Constr. Co., 27 School St., Boston. About $275,000.

***Mass., Boston** Ace High Chocolate Co. let contract building 7-story, 60 x 165-ft. rein.-con. factory, rein.-con. flooring, concrete foundation, at 367 Bway., to W. A. and H. A. Root Co., 1 Beacon St.

***Mass., Boston**—T. G. Plant Co., Jamaica Pl., let contract building 3 story, 71 x 80 ft. concrete addition to factory, rein. con. flooring, concrete foundation, at 101 Bickford St., to W. H. Whitcomb, 6 Beacon St.

***Mass., Boston**- Wilson & Tomlinson, 79 Milk St., will build 2-story, 90 x 101-ft., rein.-con., beam and girder type, garage and storage plant, rein.-con. flooring, concrete foundation, on Beacon and Maitland Sts. About $75,000. Work will be done by day labor.

***Mass., Chelsea** (Boston P. O.)—A. McManus Box Co., Vale St., let contract building 2-story, 92 x 242-ft. concrete and brick addition to factory, to J. Slotnick, Chelsea. About $75,000. Noted Apr. 24.

***Mass, Chicopee** Springfield Coach Wks. will alter present factory and build 1-story, brick, boiler house, rein.-con. flooring, concrete foundation, on North Main St. About $25,000. Work will be done by day labor.

***Mass., Chicopee Falls**—Fisk Rubber Co. let contract building 1-story, 23 x 115-ft. addition to factory and 23 x 40-ft. substation, brick and concrete, concrete foundation, to F. T. Ley & Co., 499 Main St., Springfield. About $30,000.

***Mass., Dorchester** (Boston P. O.)—G. L. Glennon, 110 Mt. Vernon St., let contract building 3-story, brick and concrete warehouse, rein.-con. flooring, concrete foundation, to M. C. Fredennick Co., 10 High St., Boston. About $45,000.

***Mass., Easthampton** West Boylston Mfg Co., Hampton Mills, let contract building 2 story, brick and mill construction, addition to mill, concrete foundation, to F. T. Ley Co., 499 Main St., Springfield. About $350,000.

***Mass., Fall River** S. Boucher, 171 Hunter St., will build 1 story, 54 x 224 ft. brick, steel and concrete service station, concrete flooring, concrete foundation, on South Main St. About $35,000. Work will be done by day labor.

***Mass., Fall River**—Fall River Bleachery Lawton St., let contract building 1-story brick and steel addition to machine shop, rein.-con. flooring, concrete foundation, to F. T. Ley & Co., Inc., 499 Main St., Springfield. About $60,000.

***Mass., Fall River**—Sagamore Mfg. Co. Benefit St., let contract building 2-story, 13 x 57-ft. and 72 x 156-ft. brick and mill construction addition to mill, concrete foundation, to Beattie & Cornell, 33 North Quarry St. About $50,000.

***Mass., Fitchburg**—Crocker, Burbank & Co. Inc., 545 Westminster St., let contract building 2-story, 60 x 200 ft. brick and steel addition to plant, concrete foundation, to Foss & Janes, 75 Laurel St. About $100,000. Noted June 26.

***Mass., Florence** (Northampton P. O.) Florence Mfg. Co., Pine St., let contract building 4-story, 75 x 127-ft., brick and mill construction addition to factory, concrete foundation, to S. M. Green Co., 293 Bridge St., Springfield. About $70,000. Noted Aug 28.

***Mass., Haverhill**—Ellis & Hussey, 8 Wingate St., let contract building 5-story, brick and concrete factory, concrete foundation on Essex St., to W. A. and H. A. Root, 1 Beacon St., Boston. About $150,000

***Mass., Holyoke** Natl Blank Book Co. Riverside St., let contract building 2-story 88 x 180-ft., brick and concrete plant, on Winter St., to Casper Ranger Constr. Co. 20 Bond St. About $60,000.

***Mass., Holyoke** Walsh's Holyoke Steam Boiler Wks., Appleton St., will build 81 x 140-ft., brick and steel mill, concrete flooring and foundation. About $35,000. Work will be done by day labor.

***Mass., Lee**—Valley Mill let contract building 2-story, brick addition to mill, concrete foundation, to Lynch Bros., 206 High St., Holyoke. About $25,000.

***Mass., Lowell** U. S. Bobbin & Shuttle Co., Perry St., let contract building 3 story, 15 x 80-ft., brick and mill construction addition to dye house, concrete foundation, to J. J. Prindelville, South Framingham. About $50,000.

***Mass., Malden** (Boston P. O.)—Converse Rubber Co. let contract building 5-story 52 x 75 ft., rein.-con. storehouse, rein. con flooring, brick foundation, on Pearl St., to Stone & Webster Corp., Milk St., Boston About $75,000.

***Mass., Millbury** Mayo Woolen Co. let contract building 3-story, 60 x 60 ft., brick and mill addition to factory, concrete foundation to G. B. Cutting, 4 Walnut St., Worcester. About $30,000. Noted July 24.

***Mass., New Bedford** New England Refining Co., Boston, let contract building rein.-con. storage and terminal plant, rein.-con. flooring, concrete foundation, on Harbor here, to include storehouse, warehouse, garage, etc., to F. T. Ley & Co., Inc., 499 Main St., Springfield. About $250,000.

***Mass., New Bedford**- Passaic Mills, Orchard St., let contract building 3-story, 100 x 150 ft., rein. con. addition to factory, rein. con. flooring, concrete foundation, to New England Concrete Constr. Co., 201 Devonshire St., Boston. About $100,000.

***Mass., New Bedford** Wamsutta Mills, Acushnet Ave., let contract for altering and building 5 story, 65 x 100 ft. brick and mill construction addition to storehouse, on Purchase St., to F. B. Sistare & Son, 111 Willis St. About $50,000.

***Mass., Northampton**—C. A. Maynard Green St., will build 1-story, brick and concrete factory, concrete flooring and foundation, on North King St. About $25,000. Work will be done by day labor.

***Mass., Northboro**—Taylor Mfg. Co., Hudson St., let contract altering present plant and building between picker house and main building, also constructing 1-story, 40 x 50-ft. picker house, brick, concrete flooring and foundation, to C. H. Bailey, Maple St. About $25,000.

***Mass., North Oxford**—E. Bartlett Co. let contract building 2-story, 50 x 100-ft., brick and mill construction addition to factory concrete foundation, to L. O. Irish, Auburn. About $25,000.

***Mass., Otter River**—Otter River Fdry. Co will build 1-story, 50 x 60-ft. brick and steel addition to foundry, rein.-con. flooring concrete foundation. About $25,000. Work will be done by day labor.

***Mass., Pittsfield**—Smith & McCarthy South St., let contract building 1-story, 75 x 150-ft. brick and concrete garage, rein.-con. flooring, concrete foundation, on South St., to D. H. Pike, North St. About $42,000 Noted July 24.

***Mass., Spencer** -Allen-Squire Co., Main St. let contract building 4-story, 50 x 90-ft. brick and concrete, storehouse, concrete foundation, to E. J. Cross Co., 82 Foster St., Worcester. About $60,000.

***Mass., Springfield**—J. J. Aronson, 8 Magnolia Terrace, let contract building 3-story 62 x 80-ft., brick garage and storage plant concrete foundation, on Ferry St., to S. Kossofski, 54 Patton St. About $50,000.

***Mass., Springfield**—Bemis & Call Hardware & Tool Co., 983 Main St., let contract building 4-story, 46 x 101-ft., factory, and 1-story, 50 x 104-ft. factory and storage plant, brick and mill construction, concrete foundation, on South Main St., to E. T Davis & Son, 157 Lebanon St. About $60,000

***Mass., Springfield** E. A. Dexter, 194 Sumner Ave., let contract building 1-story, 65 x 113-ft. brick and concrete addition to garage rein.-con. flooring, concrete foundation, on Bond St., to D. W. Mellen, 293 Bridge St About $35,000.

***Mass., Springfield**—Springfield Ice Co., 47 Dwight St., let contract building 1-story 156 x 310-ft. ice house, brick and timber concrete flooring, concrete foundation, on Hickory St., to L. S. Wood, 14 Stockbridge St. About $100,000.

***Mass., Springfield**—United Mfg. Co., 57 Willow St., let contract building 1-story brick and steel boiler room, etc., concrete foundation, on Birnie Ave., to D W. Mellen 293 Bridge St. About $25,000. Noted Mar. 20.

***Mass., Taunton** H. L. White, 21 Weir St., let contract building 2-story, 60 x 115-ft., rein.-con and steel service station, rein.-con. flooring, concrete foundation, on Howard St., to J. A. Glenn, 15 Trescott St. About $40,000.

***Mass., Warren**—Warren Steam Pump Co will build 85 x 200-ft. factory, 40 x 130-ft boiler house and 40 x 130 ft office addition all 1 story, brick and concrete, concrete flooring and foundation; also 132-ft. stack. About $70,000. Work will be done by day labor Noted May 15.

***Mass., Worcester**—Arvidson Baking Co. 75 Ward St., will build 2-story, 93 x 115-ft. brick and steel bakery, rein. con. flooring brick foundation. About $75,000. Work will be done by day labor. Noted Sept. 11.

***Mass., Worcester**—A. I. Asher, 16 Harding St., will build 2 story, 152 x 163 ft. brick, steel and concrete garage, concrete flooring and foundation, on Green St. About $135,000. Work will be done by day labor Noted Aug. 28.

***Mass., Worcester**—Atlantic Refining Co. 503 Turks Head Bldg., Providence, let contract building 2-story warehouse, 1-story garage, 1 story storage and 1-story office, brick and concrete, rein.-con. flooring, concrete foundation, on North and Prescott Sts. here, to Metzger & Fisher Co., Otis Bldg., Phila., Pa. About $30,000.

***Mass., Worcester**—O. Bradley Car Co. Mountain St., will build 3-story, 90 x 300-ft. brick and steel addition to factory, concrete foundation, on West Bolyston St. About $80,000. Work will be done by day labor.

***Mass., Worcester**—J. H. Fontaine, 530 Grafton St., let contract building 2-story 60 x 80-ft., brick and concrete garage, rein. con. flooring, concrete foundation, on Rice Sq., Grafton and Acton Sts., to L. Rocheford & Son, 44 Front St. About $30,000.

***Mass., Worcester**—C. R. Hoyle, archt. and engr., 390 Main St., let contract to G. A. Fuller, 131 State St., Boston, building 2-story 150 x 200 ft., rein.-con. and brick garage rein.-con. flooring, concrete foundation, on Mechanic St., for B. L. Handelman, 32 Portland St. About $100,000. Noted Sept. 11.

***Mass., Worcester**—Simplex Player Action Co., 10 Blackstone St, let contract building 1-story, brick and steel addition to factory rein.-con. flooring, rock foundation, to W Daniels & Son, Worcester. About $25,000

***Mass., Worcester**—Walden-Worcester, Inc 211 Main St., let contract building 1-story 40 x 60-ft. garage, 1-story, 60 x 100-ft. hardening shop, and 1 story, 40 x 50 ft. boiler house, brick and concrete, rein.-con flooring concrete foundation, on Shrewsbury St., to Kearns Constr. Co., 206 Devonshire St., Boston. About $30,000

***Mass., Worcester**—Worcester Pressed Steel Co., Barbers Crossing, will build 1-story 90 x 150-ft., concrete and steel storehouse concrete foundation, on Randolph Rd. About $50,000. Work will be done by day labor.

***R. I., Berkeley** (Ashton P. O.)—Berkeley Co. let contract remodeling 3 story, 50 x 170-ft. building into storage plant, new rein.-con. flooring, to O. D. Purington & Co., 626 Industrial Trust Bldg., Providence. About $25,00.

***R. I., Central Falls** (Pawtucket P. O.)—Leader Weaving Co., 417 Mill St., let contract building 2-story, 30 x 162-ft. brick and mill construction addition to weave shed rein.-con. flooring, concrete foundation, to O. D. Purington & Co., 626 Industrial Trust Bldg., Providence. About $30,000

***R. I., Central Falls** (Pawtucket P. O.)—Pennsylvania Textile Co., 149 4th Ave., New York City, let contract building 4-story 100 x 155-ft., brick and mill construction addition to plant, on High St., here, to A. F Smiley, Oak Hall Bldg., Pawtucket. About $175,000.

***R. I., Central Falls** (Pawtucket P. O.)—Waypoyset Mfg. Co., Broad St., let contract building 1-story, brick and mill construcion addition to mill, to Willmarth-Mackillop Inc., Freeman St, Pawtucket. About $45,000

***R. I., Cranston**—Mueller Metal Co., 288 Dyer St., let contract building 2-story, 50 x 102-ft., brick and concrete factory, concrete foundation, on Webster St., to C. B. Maguire Co., 1208 Turks Head Bldg., Providence About $25,000.

***R. I., Esmond**—Esmond Mills let contract building 2-story, 68 x 96-ft., brick and mill construction addition to dyehouse, concrete foundation, to C. I. Bigney Constr. Co., 898 Westminster St., Providence. About $30,000

***R. I., Pawtucket**—Collyer Insulated Wire Co., 249 North Main St., let contract building 2-story, rein.-con. addition to factory rein.-con. flooring, concrete foundation, to F T. Ley & Co., Inc., 499 Main St., Springfield Mass. About $100,000.

***R. I., Pawtucket** Jenckes Spinning Co Weeden St., let contract building 3-story, 48 x 104-ft., and 4-story, 114 x 174-ft brick and mill construction addition to mill, wood floor ing, concrete foundation, to Willmarth-Mackillop, Inc., Freeman St. About $250,000.

***R. I., Pawtucket** Lang & Hoffman, 4th Ave., New York City, let contract remodeling present plant and building 1-story, 80 x 90 ft., brick addition to weave shed, rein.-con. flooring, concrete foundation, on Newall Ave. here, to C. I. Bigney Constr. Co., 898 Westminster St., Providence. About $30,000.

***R. I., Providence** Crompton & Knowles Loom Wks., 93 Grand St., Worcester, Mass. let contract building 2-story, 83 x 222-ft

rein.-con. foundry, rein.-con. flooring, concrete foundation, on Tingeley St., to Aberthaw Constr. Co., School St., Boston. About $150,000.

*R. I., Providence Franklin Machine Co. 189 Charles St., let contract building 1-story 61 x 81-ft., brick and mill construction foundry, rein.-con. flooring, concrete foundation to O. D. Purington & Co., 626 Industrial Trust Budg. About $25,000.

*R. I., Providence—Industrial Land Co. Chestnut and Pine Sts., let contract building 1-story, 70 x 108-ft., brick garage and service station, concrete flooring, to C. I Bigney Constr. Co., 898 Westminster St About $25,000.

*R. I., Providence—Mueller Metal Co., 288 Dyer St., let contract building 2-story, 50 x 100-ft., brick and mill construction factory concrete foundation, to C. B. Maguire Co. Turks Head Bldg. About $30,000.

*R. I., Providence—P. J. Nangle, Wood St., will build 1-story, brick and steel garage and service station, rein.-con. flooring, concrete foundation, on Sprague, Fuller and Webster Sts. About $25,000. Work will be done by day labor. Noted Sept. 11.

*R. I., Providence—H. A. Thayer, Winslow St., let contract building 3-story, 31 x 80-ft., brick and concrete garage and service station, concrete flooring, to C. I. Bigney Constr. Co., 898 Westminster St. About $28,000.

*R. I., Providence—D. M. Watkins Co. Pine and Eddy Sts., let contract building 95 x 125-ft. brick and mill construction factory, concrete foundation, to Hope Bldg. Co. 87 Weybosset St. About $100,000. Noted Aug. 28.

*R. I., Providence—Jenks & Ballou, engrs., 1035 Grosvenor Bldg., let contract to C. I. Bigney Constr. Co., 898 Westminster St. building 2-story, brick, tile and steel warehouse, rein.-con. flooring, concrete foundation, for What Cheer Beef Co., 356 Canal St. About $25,000. Noted Sept. 11.

*R. I., Woonsocket—Barnai Worsted Co. South Main St., let contract building 2-story 75 x 100-ft., brick and mill construction addition to mill, rein.-con. flooring, concrete foundation, to J. H. Grozier Co., 721 Main St., Hartford, Conn. About $50,000.

*R. I., Woonsocket—McClintock & Craig engrs., 33 Lyman St., Springfield, Mass., let contract to Eastern Constr. Co., Winter St. building 1- and 2-story, 90 x 180-ft., brick and concrete addition to dyeing and finishing plant, rein.-con. flooring, concrete foundation, on Canal and Water Sts., for Gold Mark Knitting Co., Water St. About $55,000.

*R. I., Woonsocket Novelty Knitting Co. Allen St. near Buell St., let contract building 1-story, 48 x 100-ft., brick and mill construction addition to plant, concrete foundation, to C. F. Parker, 65 Main St. About $25,000.

*R. I., Woonsocket—B. Yaroshefsky, Fairmount St. and 1st Ave., let contract building 1- and 2-story, 40 x 147-ft., brick and concrete factory, concrete foundation, to F. Avallone, 24 Main St. About $25,000.

*Conn., Bridgeport—Amer. Fabrics Co. Connecticut Ave., let contract building two 2-story, rein.-con. and steel additions to factory, rein.-con. flooring, concrete foundation, to Aberthaw Constr. Co., 27 School St., Boston, Mass. About $150,000. International Textile Co., lessee.

*Conn., Bridgeport—Amer. Tube & Stamping Co., 471 Hancock Ave., will build 1-story, 60 x 200-ft., concrete and steel addition to storage plant, on Stratford Ave. About $35,000. Work will be done by day labor.

*Conn., Bridgeport—Bridgeport Brass Co. Grand St., let contract building 1-story, 150 x 220-ft., brick, rein.-con. and steel addition to shop, rein.-con. flooring, concrete foundation, at union branch of works, to Levering & Garrigues Co., 552 West 23rd St., New York City. About $150,000. Noted Aug 21.

*Conn., Bridgeport—City Lumber Co., 729 Union Ave., let contract building 1-story, 52 x 100-ft., brick and steel garage, rein.-con. flooring, concrete foundation, to D. Schine & Son, 729 Union Ave. About $25,000.

*Conn., Bridgeport -Connecticut Breweries Co., 182 North Washington Ave., let contract building 1-story, 64 x 120 ft., brick and steel addition to storehouse, rein.-con. flooring, concrete foundation, to Eastern Eng. & Constr. Co., 886 Main St. About $25,000.

*Conn., Bridgeport—Home Products Co. 226 Harlam St., let contract building 3-story 45 x 75-ft., brick, steel and concrete addition to plant, rein.-con. flooring, concrete foundation, to Schwarz Bros. Co., 95 River St. About $25,000.

*Conn., Bridgeport—Peoples Ice & Cold Storage Co., 1335 Seaview Ave., let contract building ice plant, 3-story, 66 x 140 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, to T. J. Pardy Constr. Co. 1487 Seaview Ave. About $75,000.

*Conn., Bristol—J. H. Sessions & Son Riverside Ave., let contract building 4-story brick and concrete addition to plant, concrete foundation, to Torrington Bldg. Co. 197 Water St., Torrington. About $60,000.

*Conn., Danbury — Danbury Industrial Corp., Odd Fellows Bldg., let contract to W. R. Phillips & Co., 32 John St., Bridgeport, for 1-story, 90 x 220-ft. brick factory and 2-story, 60 x 160-ft. rein.-con. factory for Danbury Industrial Corp., Odd Fellows Bldg. About $100,000. Keystone Instant Food Co., New York City, lessee. Noted Sept. 11.

*Conn., East Hartford—Atlantic Refining Co., 503 Turks Head Bldg., Providence, R. I., let contract building 2-story warehouse. 1-story storage plant, 1-story garage, and small office, brick and concrete, rein.-con. flooring, concrete foundation here, to Metzger & Fisher Co., Otis Bldg., Phila. About $25,000.

*Conn., Forrestville—Sessions Clock Co. East Main St., let contract building 1-story 40 x 110-ft. brick and steel factory and 2-story, 15 x 20-ft. brick and steel dye vault. rein.-con. flooring, concrete foundation, to Torrington Bldg. Co., 197 Water St., Torrington. About $25,000.

*Conn., Hartford—Hall-Thompson Co., 844 Windsor Ave., let contract building 3-story 35 x 60-ft., brick and mill construction addition to factory, concrete foundation, to Bent-Bartlett Co., 43 Ann St. About $25,000

*Conn., Hartford—Hanson-Whitney Machine Co., Bartholomew Ave., let contract building 4-story, 60 x 120-ft., brick and concrete factory, concrete foundation, to Portens-Walker Co., 13 Forest St. About $100,000.

*Conn., Hartford—Hartford Mill Supply Co., 194 Pearl St., let contract building 2-story, 75 x 100-ft., concrete factory addition concrete flooring, to Bent-Bartlett Co., 43 Ann St About $50,000.

*Conn., Meriden—E. Miller Co., 99 Center St., let contract building two 1-story, brick and steel additions to factory, rein.-con flooring, to H. Wales Lines Co., 134 State St. About $25,000.

*Conn., Mystic—Packer Tar Soap Co., Lincoln Ave., let contract building 1-story storage plant, 2-story, 50 x 50-ft. addition to factory, 1-story, 25 x 30-ft. power house brick and mill construction, rein.-con. flooring, concrete foundation, to E. F. Miner Bldg. Co., 25 Foster St., Worcester, Mass About $40,000. Noted Aug. 14.

*Conn., New Haven—J. C. Haartz, Inc., 30 Lenox Ave., let contract building 2-story brick and concrete, storehouse, to N. J. Leonard Co., 902 Chapel St. About $25,000.

*Conn., New Haven—E. Malley Estate. 902 Chapel St., let contract building boiler house and engine room, 2-story each, brick and rein.-con., rein.-con. flooring, concrete foundation, on Temple St., to Larkin-Carey Co., 166 Brewery St. About $30,000.

*Conn., New Haven—H. W. Walker, 421 Housatonic Ave., Bridgeport, let contract building 1-story, 137 x 143-ft., brick storehouse, on James St., here, to Sullivan & McKeon, 843 Dixwell Ave. About $30,000

*Conn., Noank—Rossie Velvet Co. let contract building 2 and 3 story, 50 x 62-ft. and 19 x 38-ft. brick and mill construction addition to mill, concrete foundation, to R. A. Shermans Sons Co., 119 Main St., Westerly, R. I. About $35,000.

*Conn., Newington—Hartford Tube Products Co., 90 Fairfield Ave., Hartford, let contract building 1-story, 50 x 120-ft. brick and steel factory and 1-story, 30 x 30-ft brick office, concrete flooring and foundation, on Hartford Rd., here, to B. H. Hibbard Co., 153 Arch St., New Britain. About $30,000.

*Conn., New London - A. Bloom Co., Inc. 23 Market St., Paterson, N. J., let contract building 1-story, 46 x 250-ft., brick and steel factory, concrete flooring and foundation on Garfield Ave., here, to P. S. Van Kirk Co., 85 Fulton St., Paterson, N. J. About $50,000.

*Conn., Oakville—Oakville Co., Oakville St., let contract constructing 1-story, 44 x 56-ft., brick, concrete and steel plant, rein.-con. flooring and foundation, to F. T. Ley Co., Inc., 499 Main St., Springfield, Mass About $30,000.

*Conn., Plainville—Rockwell-Drake Corp. Woodford Ave., will build 1-story, 100 x 140-ft. brick and timber addition to factory concrete flooring, concrete foundation. About $30,000. Work will be done by day labor.

*Conn., Stafford Springs -C. Johnson Woolen Co. let contract building 2-story brick and steel, mill, concrete foundation, to F. T. Ley & Co., Inc., 499 Main St., Springfield, Mass. About $75,000.

*Conn., Waterbury—Amer. Brass Co., Grand and Meadow Sts., let contract building 1-story, 88 x 420-ft. addition to factory, with 10 x 75-ft. and 60 x 75-ft. ells, brick, steel and rein.-con., rein.-con. flooring, concrete foundation, on Freight St., to Torrington Bldg. Co., 197 Water St., Torrington. About $125,000.

*Conn., Waterbury—City let contract building 1-story, ell shaped, brick, concrete and steel garage, rein.-con. flooring, concrete foundation, on Field St., to G. S. Chatneld Co., 138 Division St., $32,631. Noted Aug 28.

*Conn., Waterbury—Farrel Fdry. and Machine Co., 425 Bank St., let contract building, 1-story, 72 x 102-ft., machine shop and 1-story hardening shop, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Meadow St., to G. R. Blodgett, 266 Willow St. About $60,000.

*Conn., Waterbury—Somers Co., Inc., 94 Baldwin Ave., will build 1-story, 52 x 144-ft brick and concrete addition to factory, rein.-con. flooring, concrete foundation. About $25,000. Work will be done by day labor.

*Conn., West Hartford (Hartford P. O.)—Whitlock Coil Pipe Co., Elmwood, will build 1-story, brick addition to factory, rein.-con flooring, concrete foundation, on South St About $25,000. Work will be done by day labor.

*Conn., West Haven (New Haven P. O.)—New Haven Machine Co., 179 Milford Turnpike, Allington, let contract building 1-story, 60 x 200-ft., brick and mill construction, machine shop, rein.-con. flooring, concrete foundation, on Orange Ave., here, to C. W. Murdock, 185 Church St., New Haven About $35,000. Noted Sept. 18.

*Conn., Willimantic—Dormitory—State Bd Educ. let contract to Tracy Bros. Co., 52 Benedict St., Waterbury, building 3-story 46 x 114-ft. with 30 x 46-ft. ell, brick, steel and concrete, rein.-con. flooring, concrete foundation, on Valley St., for State Normal School, here. About $201,000. Noted Sept. 18.

*Conn., Winnipauk (Norwalk P. O.)—Monks & Johnson, engrs., 78 Devonshire St., Boston, Mass., let contract to H. Wales Lines Co., 134 State St., Meriden, building 6-story, 80 x 128-ft. brick and rein.-con. addition to factory, rein.-con. flooring, concrete foundation, for Norwalk Tire & Rubber Co About $120,000. Foundation work will be done by day labor. Noted Sept. 11.

*N. Y., Belmont—Borden Condensed Milk Co., 108 Hudson St., New York City, let contract building 2-story, 140 x 270-ft., brick and steel plant, rein.-con. flooring, concrete foundation, to Jamestown Constr. Co., 60 River St., Jamestown.

*N. Y., Brooklyn—M. Goetz, c-o B. W Dorfman, archt., 26 Court St., will build 1-story, 96 x 121 x 131-ft., brick and steel garage, rein.-con. flooring, brick foundation, on Bergen St. and Classon Ave. About $40,000. Work will be done by day labor.

*N. Y., Brooklyn—B. Goldman, c-o. J. H. Sheler, archt., 25 West 42nd St., New York City, will build 1-story, 115 x 150-ft. rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation, on Bedford and Willoughby Aves. About $60,000. Work will be done by day labor.

*N. Y., Brooklyn—H. Lawrence, c-o. S Nullman & Son. Archts. and engrs., 20 Court St., will build 1-story, 80 x 100-ft brick and steel garage, rein.-con. flooring concrete foundation, on Utica Ave. and Herkimer St. About $40,000. Work will be done by day labor.

*N. Y., Brooklyn—H. Marcus, 237 Van Sindern Ave., will build 1-story, 100 x 100 ft., brick and steel garage, rein.-con. flooring. concrete foundation, on Atlantic Ave. and Hopkinson St. About $40,000. Work will be done by day labor.

*N. Y., Brooklyn—Midwood Bldg. Co., 44 Court St., will build 1-story, 75 x 131 ft. brick and steel garage, rein.-con. flooring concrete foundation, on Bergen St. and Underhill Ave. About $30,000. Work will be done by day labor.

*N. Y., Brooklyn—B. Morigl, Pennsylvania Ave., will build 2-story, brick and steel garage, rein.-con. flooring, concrete foundation. at 74 Jamaica Ave About $50,000. Work will be done by day labor.

*N. Y., Brooklyn—R. and A. S. Bldg. Co. 44 Court St., will build 2-story, 88 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Atlantic Ave., Herkimer St. and Perry Pl. About $60,000. Work will be done by day labor.

*N. Y., Brooklyn—R. and E. Bldg. Corp., 834-846 Lexington Ave., will build 1-story 100 x 200 ft. brick and steel garage, rein.-con. flooring, concrete foundation. About $35,000 Work will be done by day labor.

*N. Y., Brooklyn—Rockmore Constr. Co. 44 Court St., will build 1-story, 100 x 120 ft. brick and steel garage, rein.-con. flooring concrete foundation, on Bergen St. and Franklin Ave. About $25,000. Work will be done by day labor.

*N. Y., Brooklyn—F. W. and E. W. Rowe. 728 Eastern Parkway, will build 1-story, 100 x 200 ft. brick and steel garage, rein.-con. flooring, brick foundation, on New York Ave and Montgomery St. About $65,000. Work will be done by day labor.

*N. Y., Brooklyn—Snyder & Prince, 833

St. Johns Pl., will build 1-story, 25 x 75-ft. brick and steel garage, rein.-con. flooring, concrete foundation, on Bedford and Snyder Aves. About $25,000. Work will be done by day labor.

*N. Y., Brooklyn—G. Wildermith, 472-6th Ave., will build 2-story, brick and steel gasteel storage plant, rein.-con. flooring, concrete foundation, on Atlantic and Franklin Aves. About $25,000. Work will be done by day labor.

*N. Y., Buffalo—Buffalo Lens Mfg. Co., 507 Washington St., let masonry contract for 3-story, 60 x 150 ft. rein.-con. addition to factory, rein.-con. flooring, concrete foundation on Huron St, to G. Schaaf, 258 Kingsley St. About $50,000.

*N. Y., Buffalo—Herschell-Spillman Co. North Tonawanda St., let contract building 3-story, 60 x 135 ft., rein.-con. addition to factory, rein.-con. flooring, concrete foundation, to J. W. Cowper Co., Fidelity Bldg. About $60,000.

*N. Y., Cattaraugus—Setter Bros. let contract building 2-story, 20 x 200 ft. rein.-con warehouse, rein.-con. flooring, concrete foundation to B. A. Taylor, Union St., Olean, About $40,000.

*N. Y., Dunkirk—Empire Axle Co., Lamphere St., let contract building 1-story, 82 x 200 ft., concrete and steel shop, rein.-con. flooring, concrete foundation, to J. W. Cowper Co., Fidelity Bldg., Buffalo. About $35,000.

*N. Y., Huntington—Collins Motors, Inc., will build 1- and 2-story, 80 x 340 ft., rein.-con., assembling plant, rein.-con. flooring brick foundation. About $75,000. Work will be done by day labor.

*N. Y., Jamaica—J. T. Adikes, Fulton St., will build 1-story, brick and steel garage, rein.-con. flooring, concrete foundation, on Hillside Ave. About $30,000. Work will be done by day labor.

*N. Y., Jamestown—Union Furniture Co., 234 Crescent St., let contract building 5-story, 59 x 350 ft. mill construction factory, to P. Peterson, Jamestown. About $175,000. Noted June 26.

*N. Y., New York—Benenson Realty Co., 148th St. and Willis Ave., will build 1 story, 101 x 165 ft. brick and steel garage, rein.-con. flooring, concrete foundation, on Webster Ave. and 173rd St. About $25,000. Work will be done by day labor.

*N. Y., New York—Benson Realty Co., 177 East 101st St., will build 2-story, 75 x 100-ft. brick and steel garage, rein.-con. flooring, concrete foundation, at 177 East 23rd St. About $40,000. Work will be done by day labor.

*N. Y., New York—J. Bothwell, 30 West 130th St., will build 1-story, 100 x 115 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Sherman Ave. and 162nd St. About $35,000. Work will be done by day labor. Noted Sept. 25.

*N. Y., New York—Bronx Consumers Ice Co. let contract altering 1- and 2-story, 146 x 155-ft. ice plant, brick and steel, rein.-con. flooring, concrete foundation, on Devoe Ave. and 180th St., to L. B. Frees, 3029—3rd Ave. About $60,000. Noted Aug. 21.

*N. Y., New York—R. Carvel, 401 West 50th St., will build 2-story, 75 x 100 ft. brick and steel service station, rein.-con. flooring, concrete foundation, at 247 West 60th St. About $30,000. Work will be done by day labor.

*N. Y., New York—R. G. Corey, archt. and engr., 39 Cortlandt St., let contract to Industrial Eng. Co., 30 Church St., building 6-story 75 x 150 ft., brick and steel factory, rein.-con. flooring, concrete foundation, for C. Cory 290 Hudson St. About $200,000. Noted Sept. 11.

*N. Y., New York—T. G. Corvan, 125 West 53rd St., will build 5-story, 40 x 200 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 127-129 West 53rd St. About $25,000. Work will be done by day labor. Noted July 31.

*N. Y., New York—Demand Wet Wash Co., 89 Jewel St., Brooklyn, will build 2-story, 50 x 100 ft. brick and steel laundry, rein.-con. flooring, brick foundation, at 131 Lewis St About $35,000. Work will be done by day labor.

*N. Y., New York—F. Fflunger, 365 East 142nd St., will build 1-story, 58 x 110 ft., brick and steel garage, rein.-con. flooring concrete foundation, on Park Ave. and 179th St. About $30,000. Work will be done by day labor.

*N. Y., New York—M. Forman & Co., 1162 B'way., will alter 5-story, brick and steel factory, at 22 West 30th St. About $25,000. Work will be done by day labor.

*N. Y., New York—S. and C. Hyman, 2069-5th Ave., will alter 4-story brick and steel factory, rein.-con. flooring, on Grand and Goerck Sts. About $25,000. Work will be done by day labor. Noted Sept. 11.

*N. Y., New York—C. and P. Realty Co. 2167 Belmont Ave., will build 1-story, 103 x 138 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Carter Ave. and 176th St. About $35,000. Work will be done by day labor.

*N. Y., New York—S. Trimmer, 138th St and Harlem River, will alter 1-story, 78 x 125 ft., brick and steel factory, rein.-con. flooring. About $30,000. Work will be done by day labor.

*N. Y., New York—J. P. Walthen, 103 East 125th St., will alter 2-3-4- and 5- story, brick and steel storage buildings, rein.-con. flooring, at 2191-3rd Ave., 207 East 119th St. and 208 East 120th St. Work will be done by day labor.

*N. Y., Niagara Falls—Natl. Carbon Co. Madison St. N. W. and West 117th St., Cleveland, O., let contract building 1-story, 60 x 100 ft. brick and steel plant, concrete foundation, here, to J. F. McKinney Corp., Gluck Bldg. About $40,000.

*N. Y., Syracuse—Jackson & Hunter let contract building 3-story, 40 x 150 ft., brick and steel garage, rein. con. flooring, on North State and Laurel Sts., to F. J. Grassman, Syracuse. About $40,000.

*N. J., Newark—Conl. Electric Co., Boyd St., let contract building 60 x 80 ft., rein.-con. addition to plant on Boyd St., to Salmon Bros., Elm St., Arlington, $66,000.

*N. J., North Bergen—J. A. Migel, Inc. 442-4th Ave., New York City, let contract building silk mill here, 2-story, rein.-con. and steel, covering 80,000 sq.ft. rein.-con. flooring concrete foundation, to J. W. Ferguson, Paterson. About $250,000. Noted Aug. 21.

*N. J., Trenton—Mitchell-Bissell Co., 251-4th Ave., New York City, let contract constructing two 1-story, 75 x 260 ft., rein.-con. factories on Burnswick Ave., to Turner Constr. Co., 242 Madison Ave., New York City. About $50,000.

*Pa., Phila.—Columbia Carpet Mills, 3rd and Huntingdon Sts., let contract building 5-story, 60 x 100 ft., rein.-con. factory, to W. Steele & Sons Co., 16th and Arch Sts.

*Pa., Phila.—Notaseam Hosiery Co., Mascher and Oxford Sts., let contract building 1-story, 55 x 250 ft. and 4-story, 48 x 250 ft. rein.-con., steel and brick factory, on Atlantic and I Sts., to Turner Concrete Steel Co., 1713 Sansom St. Incorrectly noted in our issue of Sept. 25.

*Pa., Phila.—Sears Roebuck & Co., Arthington and Homan Aves., Chicago, let contract building power house, 9-story, 360 x 442 ft. and 6-story, 80 x 420 ft. rein.-con., brick and stone, mail order houses, rein.-con. flooring, concrete foundation, on Roosevelt Blvd., here, to Irwin & Leighton Co., 126 North 12th St. About $4,500,000. Noted July 31.

*Pa., Phila.—Standard Garage, 1205 North 4th St., let contract building 2-story, 107 x 200 ft., brick garage, on Rockland and 6th Sts., to J. H. McDaniel, 2622 Parrish St. About $90,000

*Pa., Phila.—Steel Heddle Mfg. Co., 2110 West Allegheny St., let contract building 6-story, 60 x 120 ft. and 40 x 60 ft. rein.-con. factory, on 21st and Allegheny Sts., to W. Steele & Sons Co., 16th and Arch Sts.

*Pa., Phila.—J. W. Vandergrift let contract building 2-story, 57 x 175 ft. brick garage, on 12th and Cambria Sts., to F. G. English, 1608 North Carlisle St. About $50,000. Noted Sept. 18.

*Pa., Phila.—D. F. Waters, 53 Wister St., let contract building 2-story, 91 x 95 ft. concrete garage and storage house, on Lena and Collum Sts., to R. M. Peterson & Sons, 5114 Germantown Ave. About $40,000.

*Pa., Pittsburgh—S. A. Maxwell & Co. let contract building 9-story, 52 x 88 ft. rein.-con. warehouse, concrete foundation, on Isabella and Sandusky Sts., to Mellon-Stuart Co., Oliver Bldg. Noted Sept. 18.

*Pa., Pittsburgh—Mayer Wagon Co., 6431 Reimer Way, let contract building 1 story 50 x 111 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation to Walker & Curley Co., 100 Farmers Bank Bldg. About $17,000.

*Pa., Pittsburgh—Natl. Casket Co., Chateau and Reedsdale Sts., let contract building 1-story, 98 x 100 ft., brick, dry kiln, concrete foundation, to A. and S. Wilson, 541-3rd Ave About $31,000.

*Pa., Plymouth—Rothman & Freidman let contract building 2-story, 62 x 135 ft. rein.-con. and steel warehouse, rein.-con. flooring rock foundation, on Main St., to Clarke Bros., Main St. About $50,000.

*Pa., Port Kennedy—Valley Forge Magnesia Co. will build 1-story, 35 x 177 ft. and 32 x 177 ft., rein.-con., brick and steel factory Work will be done by day labor.

*Md., Baltimore—H. F. Doelman, engr., 507 North Charles St., let contract to Hicks Tase & Norris, Inc., 106 West Madison St., building 4-story, 24 x 85 ft., brick warehouse, stone and concrete foundation, at 1027-29 South Howard St., for W. B. Cassell & Co. About $50,000. Noted Aug. 28.

*Md., Baltimore—Sherwood Bros., 8th and Bank Sts., let contract building 1- and 2-story, 75 x 204 ft. oil plant, brick and mill construction, cement flooring, concrete foundation, to J. L. Muller, 430 South Highland Ave. About $75,000. Noted Aug. 28.

*Md., Baltimore—Sun Co., Haines and Warner Sts., let contract to McLean Contg. Co. 1412 Fidelity Bldg., constructing 1-story, 27 x 42 ft. brick garage, 10 x 15 ft. frame addition to warehouse, and 2 story, 12 x 30 ft brick office building, also rein. con. foundations for four 14 x 44 ft. oil tanks and 15 x 75 ft., concrete and timber bulkhead. About $87,000.

*Md., Hagerstown—Antietam Sales Co., 29 West Antietam St., let contract building 2-story, 40 x 165 ft., rein.-con. repair shop to H. Angle, Manila and Dewey Aves. About $40,000.

*Md., Westport—A. S. Lorzeaux, engr., for Consolidated Gas, Electric Light & Power Co., Lexington Bldg., Baltimore, let contract constructing 2-story, 53 x 58 ft., rein.-con., service building, here, rein. con. flooring, concrete foundation, to A. Tufts, 1401 Lexington Bldg., Baltimore. About $50,000. Noted Sept. 25.

*Va., Richmond—C. M. Robinson, archt. Times-Dispatch Bldg., let contract to A Witte, 1010 North Ave., building 4-story, 22 x 88 ft., rein.-con. warehouse, concrete foundation, on Belvidere and Main Sts., for W F. Richardson Storage Co., 601-3 West Main St. About $150,000.

*Va., Richmond—Southern Stove Wks. Hermitage Ed. and Leigh St., let contract constructing factory, including one 120 x 600 ft., one 90 x 300 ft., and several smaller buildings, 1-story, to J. T. Nuckols, 1102 East Main St. About $200,000.

*W. Va., Fairmount—West Virginia Metal Products Co. let contract building brass plant, consisting of an 80 x 280 ft. casting shop, 280 x 380 ft. factory and 150 dwellings, to F. T. Ley Co., 495 Main St. Springfield, Mass. About $1,500,000.

*W. Va., Huntington—Liggett Meyers Tobacco Co., 212 5th Ave., New York City, let conrtact building 1-story, 120 x 300 ft., brick, steel and concrete warehouse, rein.-con. flooring, concrete foundation, here, to Austin Co., 16107 Euclid Ave., East Cleveland, O. About $200,000.

*W. Va., Parkersburg—Nat. Supply Co. let contract building 3-story, 40 x 100 ft. fireproof warehouse, rein.-con. flooring concrete foundation, to Rust Eng. Co., Keenan Bldg. Pittsburg, Pa. About $60,000.

*N. C., Charlotte—Parker-Gardner Co., 16 West Trade St., let contract building 1 story 92 x 175 ft. mill construction factory, on 5th St., to J. P. Propst, 19 West 5th St. About $35,000.

*N. C., Pomona—Pomona Mills Co. let contract building 3 story, 80 x 132 ft. rein.-con. mill, to E. H. Clements, Charlotte. About $75,000.

*N. C., Rocky Mount—Faison Brick Co. will build plant. About $60,000. Work will be done by day labor.

*S. C., Spartanburg—Spartanburg Co. Mills let contract building 12,000 spindle plant, to Fiske-Carter Contr. Co. Cost, including machinery, $150,000.

*Ga., Macon—Atlantic Coal & Ice Co., Waterville Rd., let contract building five 1-story rein.-con. and steel warehouses, to Foundation Co., 233 Bway., New York City. About $250,000.

*Ga., Savannah—Loose-Wiles Biscuit Co. 410 Williamson St., let contract building 62 x 153 ft., brick, warehouse, to R. J. Whalley

*Ala., Birmingham—Birmingham Age Herald let contract building 5-story, 48 x 65 ft addition to plant, on 5th Ave., 21st and 22nd Sts., to C. M. Allen, 1141½ North 21st St. About $50,000; comm. basis.

*O., Canton—Hoover Suction Sweeper Co. 119 North 4th St., N. W., will build 4-story 80 x 170 ft., brick and steel addition to factory. Work will be done by day labor.

*O., Cleveland—Auto Carriage Co., West 9th St., let contract building 3-story, 60 x 400 ft., rein.-con., steel and brick factory, on Bedford Ave., to H. K. Ferguson Co., 6523 Euclid Ave. About $300,000.

*O., Cleveland—G. S. Rider Co., engrs. and archts., Century Bldg., let contract to W. B McAllister Co., 2165 East 31st St., building 2-story, 36 x 165 ft., rein.-con., steel and brick power house and saw mill, for Barris Co. 2048 West 3rd St. About $100,000. Noted Sept. 25.

*O., Cleveland—F. H. Boltman Co., 10271 Berea Rd., let contract building 1 story, 84 x 112 ft., rein.-con., steel and brick machine shop, to A. A. Lane Co., Union Bldg. About $30,000.

*O., Cleveland—Crescent Brass Mfg. Co. 8410 Lake Ave., let contract building 4-story 65 x 100 ft., concrete, steel and brick factory, to Webber Co., 1609 West 25th St About $50,000. Noted Oct. 2.

*O., Cleveland—City Ice Delivery Co., 1935 Euclid Ave., let contract constructing 1 story 100 x 130 ft., rein.-con., steel and brick, storage building, on Euclid Ave., to Younger & Farmer, 1670 Crawford Rd About $60,000. Noted Sept. 18.

Bids Dec. 2.

TUNNEL CONSTRUCTION.

Pittsburgh, Pa.

Sealed proposals will be received at the office of the County Controller of the County of Allegheny, Pennsylvannia, Courthouse, Fifth Avenue and Grant Streets, Pittsburgh, Pa., until December 2, 1919, at 11 o'clock, a.m., and publicly opened and immediately thereafter. for the construction for said County of Allegheny of a public highway tunnel, through Mount Washington, together with approaches thereto, the tunnel and approaches together having an approximate length of 6,289 feet and extending from the southerly side of Brownsville avenue, opposite Manor Street, in the Seventeenth ward of the City of Pittsburgh, in said county, to the northerly side of Warrington avenue at its intersection with West Liberty avenue, in the Nineteenth ward of said city, the tunnel proper being approximately 5,690 feet in length with a northerly approach of approximately 325 feet and a southerly approach of approximately 274 feet in length, and consists of two separate parallel tubes or tunnels fifty nine (59) feet between centers, each twenty six (26) feet in width.

The proposed tunnel and approaches are to be built by said county under the provisions of an act of Assembly approved March 17, 1917, P.L. 12 and pursuant to proceedings in the Court of Quarter Sessions of said county at Commissioners' Road Docket No. 5, June sessions, 1919.

Prospective bidders, on application at either the office of A.D.Neeld, Consulting Engineer for said county, at Room 508 Bakewell Building, Grant and Diamond Streets, Pittsburgh, Pa., or at the office of the County Commissioners of said county, Courthouse, Fifth Avenue and Grant Street, Pittsburgh, Pa., will be furnished with a special pamphlet designating "Liberty Tunnel Contract" which gives full information as to the work, the conditions regulating bidding and the various requirements in relation thereto.

Said pamphlet consists of

(1) A copy of the public advertisement for bidders. (2) Information for bidders. (3) A bidding blank for the use of bidders (4) Specifications for the construction of the tunnel and approaches. (5) The form of contract required to be entered into by the successful bidder when the contract is awarded. (6) The form of bond to be given by the contractor.

The plans for said tunnel and approaches are on file in the office of said A.D. Neeld, Consulting Engineer, and in the County Commissioners office where they may be examined by prospective bidders, on request at all reasonable hours, and copies of said plans will be furnished prospective bidders under the terms and conditions set forth in the Information for Bidders.

In submitting bids, bidders must use the special bidding blanks found in said pamphlets, which must be sealed and addressed to the "County Commissioners of the County of Allegheny, Pennsylvania" and deposited with the County Controller and marked "Proposal for Liberty Tunnel Contract"

Proposals must be accompanied by a certified check to the order of the Treasurer of the County of Allegheny in the sum of two hundred thousand ($200.00) dollars as a guarantee that the bidder, if awarded the contract, will accept the same and will faithfully comply with every requirement and condition set forth in the advertisement and notice to contractors, as more fully set f forth in the Information for bidders.

The contract for said work will be awarded or all bids rejected within forty-eight hours after the opening of said bids.

The county reserves the right to reject any and all bids.

JOHN P. MOORE,
County Controller.

Bids Nov. 25.

TRANSMISSION LINES.

Charleston, W.Va.

Bids are requested by the Virginian Power Company, Charleston, W.Va., for subletting the construction of the following named the transmission lines which are included in contracts between the United States Government and The Virginian Power Company as contractor.

(a) Government line No. 2, approximately thirty-three and eight-tenths(33.8) miles in length, from the Cabin Creek Junction Plant of The Virginian Power Company to the U. S. Naval Ordnance Plant at South Charleston, W.Va., this being a single circuit, 66000 volt, steel tower transmission line. (b) Government line No. 24, approximately six and one half (6.5) miles in length, from the Charleston substation of the Virginian Power Company to the substation of the U. S. Naval Ordnance Plant at South Charleston, W.Va., this being a double circuit, 44000 volt, steel tower and wood pole transmission line.

The necessary rights of way and all material which will be a part of the completed lines to be furnished by The Virginian Power Company, the sub-contractor will be required to load, unload, distribute, and erect all material necessary to complete the lines and to furnish for this purpose all superintendence, labor, tools, plant or equipment. One total lump sum bid is desired for all the above. Bids will be opened at the office of The Virginian Power Company, Charleston, W.Va., November 25th, 1919 at 12 o'clock noon. The right is reserved to reject anyand all bids. A certified check for 2 per cent of the total amount of the bid is required.

Plans and specifications may be examined at the office of the Virginian Power Company, Charleston, W.Va. Contract forms can be obtained at the same address.

A Consolidation of Engineering News and Engineering Record — McGraw-Hill Company, Inc.—James H. McGraw, *President*

Published December 1, 1919, With Current News

ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, *Editor* — Charles Whiting Baker, *Consulting Editor*

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The Printers' Strike Ended

SINCE the beginning of the printers' strike in New York, our readers, by the hundreds, have evinced their interest by writing letters commending our stand and inquiring as to the situation and the likelihood of early settlement of the difficulty.

We are glad now to say that our troubles promise soon to be over. The pressmen began returning three weeks ago, and at the present writing the composing-room force is being rapidly recruited. The men are returning on the terms offered by the publishers preceding the strike. In other words, the justice of our offer has prevailed. The radicals have lost.

We say that without bitterness or a feeling of revengeful triumph. All parties have suffered—the printers, the publishers, and the public. A handful of radicals must carry all the blame. The great majority of the men wanted to be fair. Fear of personal violence kept them away, not because they were afraid of being hurt, but because of the consequences of their disablement on their families.

The resumption of work is brought about by the pressmen and feeders individually leaving the outlawed local unions and taking cards in the new internationals. The radical leaders still stand out, but they are leaders without followers. The compositors, never officially on strike, are returning because of union action.

While the strike was under way the publishers were far from being idle. Every effort was made to print the magazines outside New York. In this effort the McGraw-Hill Company was successful with seven of its ten New York printed journals. But no outside printers were willing to take the two largest magazines, *Engineering News-Record* and *American Machinist*, nor the Spanish paper, *Ingenieria Internacional*. Consequently these had to stay at home. *American Machinist* was lithographed in a New York plant, and the forms of *Ingenieria Internacional* held, thus giving over our own plant to *Engineering News-Record* whenever printing could be resumed.

If space were available we could tell an interesting story of emergency organization. Instead of the simple method of sending manuscript two floors below and putting it through a marvelously coördinated machine, manned by a force trained for years in handling the special problem of weekly-magazine publishing, it was necessary to establish a new organization attuned to direct work in seven different cities, the farthest away being San Francisco. To each plant went one of the editors and one of the business representatives of the appropriate paper and these men were supplemented as needed by mechanical and publishing experts. The emergency plants in no case were synchronized to do our work; some were job plants, others had printed monthly magazines, while one had done nothing but book work All worked with a will, but they lacked that special experience upon which efficient functioning depends Meanwhile, a clearance committee had been established at New York. Sitting for hours each day it received reports by telegraph and telephone from each plant, straightening out difficulties, insuring adequate supplies of paper (handicapped by a short market and wretched transportation service), forwarding cuts and other supplies, sometimes by auto-truck when express service was too slow, and frequently dispatching specialists when the difficulties seemed to get beyond the local resources.

No less effort was expended by other men in bringing about the resumption of work in New York. About three weeks ago pressmen and feeders began to return, and the belated Oct. 2 issue of *Engineering News-Record* was put on the presses. Much matter had been put into type before the strike came, and this was made up into pages. No new matter could be set, however, and so in this and the last two issues the timely matter —the news and the editorials—has been photo-engraved from typewritten pages. With the return of compositors this week there is promise that we shall be able after this issue to drop the emergency method, and send out again the familiar well-printed, crisp-looking *News-Record*.

While, therefore, the readers have been inconvenienced, we have not been idle. We set out to maintain a principle, and we determined that no work would be too hard and no sacrifice too great to maintain it. In our determination, in the fighting of obstacles we were very much encouraged by the splendid support of our readers. They realized that compromise with radicalism would be disloyalty to American industry and to the American public. We are glad to say that the New York printers' strike can now be bracketed with the other failures of radicalism—the Boston policemen's strike, the steel and the coal strikes.

Counted in dollars and cents the publishers have been heavy losers. But from the viewpoint of principle a great moral victory has been won for the sane, solid forces of the nation.

The Railroad Problem

WE commend to the careful consideration of our readers Charles Whiting Baker's lucid discussion in this issue of the railroad problem. It will be found to contain a clear recognition and careful weighing of all the factors. The first installment lays the groundwork for the solution, which will be presented in the second and concluding section next week. At that time there will be editorial discussion on the plan. In his fourth chapter, appearing in part in this week's install-

ment, Mr. Baker's strictures appear severe, but we must none the less concede their truth. In fact, the railroad problem is with us in such acuteness today because of the conditions he describes. If there be some who protest at his severity and believe that closer Government regulation will eliminate all the manipulation of the past, it may be answered that the public appears not to be so hopeful. The confidence which the railroad managements lost in the days of railroad debauchery has not been regained.

Engineers Should Back These Recommendations

CHOOSING a state engineer by popular vote is contrary to both common sense and sound political theory. Yet the practice still prevails in the great State of New York, which thus puts upon a million voters the choice of a man to fill an office demanding high and varied technical qualifications. Such a choice can be made wisely and the official chosen held responsible to his duties by one man only, and that man should be the chief executive of the state. The matter is brought to public attention in connection with other admirable recommendations of the Retrenchment Committee of the State Reconstruction Commission of New York. These recommendations include shortening of the ballot so as to reduce from seven to three the number of general administrative officers elected by popular vote—the Governor, Lieutenant Governor and Controller—a most desirable change. Further commendable recommendations are the reduction of state administrative departments from 187 to 19, most of which would be single-headed; and provision for a consolidated state budget, formulated by the Governor. The fact that essentially the same proposals were submitted as constitutional amendments in 1915 and defeated by a half-million majority shows the need of a persistent educational campaign to secure their adoption. In this the engineers of the state should not fail to play an important part, first by thoroughly informing themselves concerning the proposals and the fundamental reasons for their adoption, and, next, by bringing these reasons close home to their representatives in the state legislature. The engineering societies of the state have here an opportunity and a duty that they should fulfil.

America in European Eyes

LATE last month Charles H. Grasty, the well known foreign correspondent of the New York *Times*, returned to Europe after having spent some time in getting re-acquainted with conditions in the United States. After his return to the other side he wrote the following illuminating comment to his paper:

"To one going home after several years at war, America somehow does not seem normal and natural. The observer is struck by the high state of activity prevailing, but it does not seem entirely wholesome. There is too much prosperity, and the extent of the extravagance is sinful to eyes accustomed to the more economical ways of Europe.

"The unrest seems peevish and self-indulgent and without any quality of 'noble discontent.' There are no deep wrongs to be righted, and to a newcomer on the scene the agitation has little justification in the economic conditions which exist."

And against this impression made on him by his own land is this fresh impression of the England of late October:

"Arriving in Europe, one sees in England an improvement as compared with four months ago that is unmistakable. The whole atmosphere is different. The difficulties that were there then are still there, but the temper is changed. The failure of the recent [railroad] strike, not so much because of the outcome, but because of the way the people acted, has had a profound effect on the public morals. Good British horse sense has redemonstrated itself.

"England is not going to be run away with by any element. She is doing business at the old stand. Sacrifices and readjustments will go on for many a year, but there will be no breakdowns or upsets."

Are we not right in believing that the same sort of horse sense that Mr. Grasty finds in England is beginning to assert itself here and will eliminate the extravagance and peevish discontent which Mr. Grasty found?

Mechanical Society's Alliance with Employers

ENGINEERS are a unit in favoring a more general participation by members of the profession in civic affairs having an engineering bearing. As a result our societies are with more and more frequency expressing themselves on non-technical questions and forming alliances through which a larger public influence can be wielded. Care must be exercised, however, lest alliances be formed which are not consonant with the fundamentals on which the societies rest. If the fundamentals be compromised, the damage to professional standing will outweigh any possible good that may flow from the activity; in fact the only result may be damage, without any benefit whatsoever. Moreover, the professional prestige of our great engineering societies is so important, that untoward action of any one of them has an interest far outside its immediate membership. A case in point is a recent action of the American Society of Mechanical Engineers.

The society has taken membership in the National Industrial Conference Board, an organization consisting of associations of manufacturers banded together to study the labor problem. Mr. Morris L. Cooke, of Philadelphia, has entered protest against the action and has urged withdrawal, contending that the society's professional purpose demands that it remain impartial.

With Mr. Cooke's contention we are in accord. The society by taking membership in the board has made an alliance with one party to the industrial controversy, a position inconsistent with the professional attitude. And the reason is not merely the one Mr. Cooke has given, though that is fundamental. Additional objection is found in the fact that the board definitely allied itself with the employers as against the employees when it accepted the President's invitation to appoint part of the employers' group in the recent Industrial Conference in Washington.

It may be contended that the majority of members of the society, because of their education and traditions, as well as their service in industrial corporations, sympathize with the employers' as against the employees' viewpoint, and that, therefore, the society in taking sides with the employers would act in accordance with

the views of the members. That view is not sound. The society opens its full membership only to those who have technical qualifications, while its avowed object is to promote the development of the science and practice of engineering. When the member functions in the society he does so as a professional man, and in so far as he brings in a bias he is untrue to the proper spirit of the organization.

It should be said that the society does not attempt to justify alliance with the employers. In fact, we are informed that membership was taken without any thought that the society would be placed in a stultifying position. The organization was merely seeking to discharge properly its civic responsibility, and joined the conference board on the recommendation of a special committee formed to consider the sort of industrial relations activities in which the society might properly engage. It is significant, though, that the committee was composed of three executives of large industrial corporations, the managing director of the National Industrial Conference Board itself, and a former railroad official, then serving as chairman of the War Service Committees of the national Chamber of Commerce. Now that the propriety of the action has been questioned the society's council has appointed a committee to consider and report on the matter.

The case here discussed is clear cut, but it brings up questions with some similarity which are not quite so simple. Engineering Council, the American Association of Engineers and the American Institute of Consulting Engineers have taken membership in the Chamber of Commerce of the U. S. A., while many local engineering societies have joined their local chambers of commerce. Are these improper or stultifying relations?

The Chamber of Commerce of the U. S. A., like the National Industrial Conference Board, nominated part of the membership of the employers' group at the Washington conference, and so accepted identification with the employing as against the labor interests. On the other hand, the chamber does not address itself solely to labor problems. In fact, little of its time has been devoted to labor; its function is to consider all manner of economic questions.

Still another factor enters. Engineering Council and the American Association of Engineers have as their sole object the civic relations and welfare activities of the profession, while the consulting engineers' institute regards civic work as one of its chief functions. The council is in no sense a technical body; the institute has a dual function.

These two conditions place membership in the national chamber in a category different from the A. S. M. E. membership in the National Industrial Conference Board: (1) The broad economic function of the chamber, and (2) the civic character of the council, the association and the institute as distinguished from the essentially technical and professional character of the A. S. M. E.

One other difference there is—and while it may be of impression rather than provable fact, it is none the less pertinent—the National Industrial Conference Board is regarded as an anti-labor body, the chamber is not.

Under these circumstances membership of the council and the institute in the chamber are not necessarily stultifying. If under unwise leadership the chamber should assume a bourbon attitude on labor or an unfair position to the public on any question, withdrawal or public protest might be demanded.

The same general arguments apply to the affiliation of local societies with local chambers of commerce. The latter have broad civic functions, generally comprehending consideration of the many engineering features of a municipal administration, while the societies themselves have civic and welfare as well as professional purposes. The conclusion is the same—that such affiliations are not necessarily stultifying.

We all desire to see the engineer broaden his influence in the community and to discharge his civic responsibility. His societies can perform those functions, though, only by acting as a wise counselor, not as a member of a partisan body.

Professional Prestige

AS WAS emphasized in the preceding note, the maintenance of professional prestige is vital to the integrity of the great engineering societies. For that reason the incident discussed above, the action of the American Society of Mechanical Engineers in joining the National Industrial Conference Board, should be made the occasion of careful reflection on the precautions necessary to preserve the professional standing of these important bodies.

The American Society of Mechanical Engineers needs particularly to be on its guard. It has a large number of members whose position in industry brings them in touch with administrative, financial, and selling problems. Their technical viewpoint is likely to be warped, and there is danger, in consequence, that the society's actions and views will be colored by the commercial point of view unless extreme vigilance is exercised.

The action of the society in taking membership in the National Industrial Conference Board is an instance in point. One cannot conceive such a proposal coming before the Board of Direction of the American Society of Civil Engineers without a very thorough airing of the character and constitution of the conference board and a keen appreciation being formed of the position in which the society might be placed by taking membership. Yet, we are reliably informed, the possibly stultifying position of such action did not occur to the council of the American Society of Mechanical Engineers.

Much the same coloring of view was noted by civil engineers in the preliminary report of the mechanical engineers' aims and organization committee; it was therein recommended that the code of ethics in its existing form be dropped. The recommendation, it will be noted, was qualified, and in the final report was changed to advocate the writing and adoption of a new code. Yet codes, as such, were spoken of by members of the mechanical engineers' committee in such deprecatory language as to be a shock to the civil engineers who had occasion to confer with them.

Obviously, professional prestige is too precious an asset to be guarded in any but the most scrupulous manner. The American Society of Mechanical Engineers would not consciously tamper with it, but is there not some slackening of that strictness which is necessary if that professional prestige is to be maintained unimpaired.

The Railway Problem—I

Public Corporations as a Solution to Secure Efficient Operation and Fair Treatment to

Labor, Capital and the Public

By CHARLES WHITING BAKER

Consulting Editor, "Engineering News-Record"

The new plan for dealing with the railways of the United States here described differs from others in its recognition that efficient operation of the railways depends on the operating officers of the railways and their loyal staffs. Any successful plan must provide conditions which will encourage the energy, initiative and fidelity of these officers.

Congress cannot merely hand back the railways to their owners, without causing a financial disaster without precedent. It must adopt some constructive plan for solving the railway problem.

The supremacy of Federal control of the railways over state control must be established, or economic barriers to interstate commerce will imperil national prosperity and even national unity.

Railway capital must have a fair return; but in order to secure this return it must be relieved of risk from the demands of labor, the exercise of state or Federal control, and the manipulations of financiers.

The control of railway corporations by financiers who exercise the control for their personal benefit must be terminated.

The operating organizations of the railway companies, which are the main reliance for securing safe and efficient railway service, must not be destroyed by unwise consolidation or by too great centralization of Government control.

In order to secure the ends above set forth and at the same time to avoid the dangers of Government ownership and operation, the present railway corporations should be reorganized under Federal charters as corporations to render efficient public service, all profits above a fair return on the capital invested being used for the public benefit, to supply the need for new railway capital and amortize existing capital, so that the proportion of railway property on which no payments to capital will be required will increase year by year.

These public corporations would be managed by directors representing the public, the employees and officers and the stockholders, nominations being made by organizations of these three classes and final appointment being made by a Federal Railway Board. Railway rates would be so adjusted as to pay operating expenses plus the fixed return on capital and leave a surplus, part of which would be available for profit-sharing dividends to the operating force to encourage efficiency.

Voluntary reorganization of present railway corporations on the above basis will avoid litigation and controversy, and conditions are explained which will induce such voluntary action.

The key to such a reorganization will be the creation of a Federal Railway Board with broad powers to guide and to co-operate with these reorganized corporations for public service in carrying on and developing the country's railway system.

I.
Why Congress Must Adopt a National Railway Policy

WITHIN the next few months Congress must either adopt some national policy for dealing with the railways of the United States or order their return in their present condition to the companies which own them.

What does the latter alternative mean? It means that the railway companies would take back properties in which some $17,000,000,000 have been invested and which were worth that on the basis of their earning power two years ago. Today these railways, taken as a whole, have lost the greater part of their earning power. In the first six months of 1919 their net earnings were at the rate of less than 2 per cent. per annum on the capital invested. If current demands for increase of railway wages are granted, even this small return will be wiped out, and a deficit incurred.

But when the roads are turned back to their owners, they can no longer be dealt with as a whole. Each individual corporation will have to take its property and do the best it can with it. A few companies will be able to earn the interest on their mortgage bonds. A much larger number will be unable to do this and will go into the hands of receivers. The stockholders of those companies will lose most or all of their property, and the bondholders a good part of theirs.

Many companies will be unable to earn enough money to pay even their operating expenses. What are such companies to do? They cannot make up the deficit with borrowed money. No one will lend them any money. They have only two alternatives. One is to suspend operations entirely, to the serious injury of the communities which have relied on them for transportation. The other is to cut down train service and every possible expense to the barest minimum, to cut down in safety appliances, to neglect track and rolling-stock maintenance at the risk of train accidents, and thus continue some sort of operation. Of course, the property of those who own stock and bonds of these companies will be

practically wiped out. They will have left only their paper certificates and remote hopes.

The destruction of property which will result if Congress merely returns the railways to the owning companies will not fall on wealthy men alone. The bulk of the railway stocks and bonds are not held by the very rich. They are held by people of moderate means and very largely by the savings banks and life insurance companies which are trustees for the accumulations of many millions of persons. If the value of billions of dollars of railway bonds is destroyed, millions of wage workers will lose a part of their savings laid up for old age or illness.

But the train of impending calamity does not end here; it only begins. What sort of financial crash and business depression will result from the sudden annihilation of ten billions or more of the property represented by railway investment nobody knows; but there is good reason to expect the results to be most serious. Even more disastrous in the long run will be the certain dislocation of railway service. Prosperity for business and employment for labor are absolutely dependent on transportation facilities. Starvation for many millions promptly threatens when the railways cease to operate, as was many times demonstrated during the war. The stability of the Government itself—the nation's security against foreign foes or internal disorders—is put in peril when railway transport stops.

This is the most important reason of all, probably, why Congress *must not* take the simple and easy step of turning back the railways to the owning companies and doing nothing more.

Why Have Railway Net Earnings Disappeared?

But "the man in the street" who, like Mr. Ford, reads only newspaper headlines, says: "I don't see why any such terrible results should follow. It isn't two years since the Government took over the railways. I presume they have been badly managed; but the Government has spent a lot of money, has shoved up freight rates and passenger fares and claims to have introduced economies that will help the railways to save money. Why can't the railway companies take back their roads and go ahead and not have things much if any worse than they were before?"

Probably a large proportion of the average, intelligent business men of the United States who have given no particular study to the railway situation hold similar views. It is of such great importance to the public welfare that these ideas should be replaced by a correct understanding that a discussion is here attempted, covering only the broad general situation, with omission of details.

The chief facts in the situation may be emphasized as follows:

1. Railway net earnings have disappeared because the railways have increased their freight rates only 25 per cent. and their passenger rates 50 per cent. while their "cost of living" has more than doubled in the past four years. A railway company, like an individual, has only the margin between its "cost of living" (operating expenses) and its earnings from selling what it produces (transportation), with which to pay the interest on its debts.

2. Government operation of the railways should not be judged by the present financial condition of the railways. Government operation has been far more successful than is commonly understood; *but such success as it has had has been chiefly due to the use of organizations which had been created by the companies.* Actually, we have had no real trial of Government operation under such conditions as would exist if it were adopted as a permanent policy.

How Changes in the Value of the Dollar Have Hit the Railways

It is astonishing to note what a large proportion of the economic and social difficulties under which we are struggling today result directly from the rapid changes in our standard of value, the dollar, and especially from the fact that the public does not understand these changes.

One does not have to understand economics or theories about inflation of the currency to understand that the value—the "buying power"—of the dollar is varying all the time and in the past three years has had enormous variations.

Economists and a few financiers have known for many years of these variations in our standard of value: but all the rest of us—bankers and merchants and clerks and farmers and all—have supposed a dollar was as stable as a yardstick. The high cost of living—of which the changes in value of the dollar are an index—has now drawn general attention to these changes.

For many years statisticians have been keeping records of the changes in the value of the dollar by publishing so-called "index numbers" which show changes in average market prices of staple commodities. The

[1]Dun's "Index Numbers" are compiled from the average wholesale prices of about 300 standard commodities arranged in seven groups, as follows: (1) Breadstuffs; (2) meat; (3) dairy and garden; (4) other food; (5) clothing; (6) metals; (7) miscellaneous. The price of each of these commodities is multiplied by a figure determined as the estimated per capita consumption of that commodity. The commodities listed under "Miscellaneous" include such articles as coal, petroleum, building material and drugs, so that the individual's expense for fuel and shelter is represented in the total.

TABLE 1-- INDEX NUMBERS COMPILED by R.G. DUN & CO. FROM MARKET QUOTATIONS of 300 STANDARD COMMODITIES, SHOWING VARIATIONS in the COST of LIVING and in the PURCHASING POWER of the DOLLAR FROM 1896 to 1919.

Date	Dun's Index Number	Corresponding Number Indicating Buying Power of $1
Jan. 1, 1896	$77.780	1285
" 1897	75.502	1325
July 1, 1897	72.455	1382
Jan. 1, 1898	79.940	1253
" 1899	80.423	1244
" 1900	95.295	1049
" 1901	95.668	1046
" 1902	101.587	984
" 1903	100.356	996
" 1904	100.142	999
" 1905	100.318	997
" 1906	104.464	995
" 1907	107.264	932
" 1908	113.282	883
" 1909	111.848	894
" 1910	123.434	810
" 1911	115.102	869
" 1912	123.438	810
" 1914	124.528	802
" 1915	124.168	805
" 1916	137.660	726
" 1917	169.562	589
Feb. 1 1917	176.272	567
Mar. 1, "	186.244	537
Apr. 1, "	190.012	526
May 1, "	208.435	480
Aug. 1, "	218.779	457
Jan. 1, 1918	222.175	450
July 1, "	232.575	431
Oct. 1, "	233.227	429
Jan. 1, 1919	230.146	434
Mar. 1, "	217.037	460
May 1, "	222.193	450
July 1, "	233.707	428
Aug. 1, "	241.650	414
Sept.1, "	238.342	420
Oct. 1, "	235.867	424
Nov. 1, "	238.573	420

accompanying Table I shows the index numbers compiled, by R. G. Dun & Co.' for the period from Jan. 1, 1896, to Nov. 1, 1919. The low point of prices, or greatest value of the dollar, was reached July 1, 1897, when $72.45 was sufficient to buy the standard commodities on which the index number is based. On Jan. 1, 1902, only 4½ years later, it took $101.58 to buy the same amount. In the following 13 years there was a further increase and the index number was $124.18 on Jan. 1, 1915, just before the effect of the war on supply and demand and resultant prices began to be a strong factor. Then prices began to jump; the dollar began to fall off rapidly in value. The beginning of 1916 brought the index number to $137.66. A year later it was $169.56. Shortly after the United States entered the war it passed the $200 mark and it has remained above it ever since. It reached $233.23 in October, 1918, and after some reduction began climbing again and reached a maximum on Aug. 1 of $241.65.

Let us understand what these figures mean. They mean that a wage of $3 per day will buy no more now than a dollar would buy in 1897. They mean that the man who had a salary of $230 a month on Jan. 1 last could buy no more with it than he could with a salary of $124 a month four years earlier.

The Government Railroad Administration has had to deal with a situation that would have confronted the railway companies had they continued in control. Railway labor had to have a higher wage to meet the higher cost of living. The railway brotherhoods and unions demanded it and had the power to enforce their demands. The unorganized railway workers had to have a similar increase or they would have gone to the munition plants, shipyards and cantonments. The price of coal for locomotives doubled and trebled. Steel prices went up to four or five times the normal. And the product which the railways manufacture (transportation) was raised only 50 per cent. for passengers and 25 per cent. for freight.

Suppose—to get clearly in mind what has actually happened—that there was a standard of value which did not change and that all prices were based on this standard instead of on shrinking dollars. Then we would understand that railway wages have not been much increased. They have only been varied to offset the loss in value of the dollar so that the railway employee is getting about the same pay that he was getting 10 years ago. The cost of many railway materials, measured by an unchanging standard of value, did rise during the war and is still above the normal. Finally, the price which the railways get for their product has fallen away down. The increases in freight and passenger rates have not been nearly sufficient to offset the shrinking value of the dollar.

Of course, this is not the entire story. The eight-hour day, the abolition of piece work and other changes which have cut down the per capita output of labor have had a large influence in increasing the amount the railways have to pay out in wages. The Federal Railroad Administration has been partly wise and partly foolish in many matters; but these matters are unimportant compared with the great fact of the shrinking dollar above portrayed.

Let us now see if this thinking in terms of absolute value does not help us toward a solution of some of the serious difficulties in the railway situation. Suppose that railway freight rates, instead of being measured in shrinking dollars, were measured in a percentage of value of the goods transported. It would be a fair proposal, would it not, to pay for carrying to market the coal and iron and beef and cotton and a thousand other goods *the same percentage of their market value* that the railways received for freight on them 10 years ago?

But if that were done the railways would be on "Easy Street." Had that been done during the past two years, Uncle Sam would be counting his profits from his experiment in railway operation instead of hunting for a billion dollars and more to meet his losses.

Is there anything unjust in such an increase in freight rates? Is it not common knowledge that high prices for farm products have doubled the values of farming lands; that oil wells and mineral and metal mines have poured out wealth untold; that manufacturers in every line have reaped big profits? And they have all made part of their profits *by getting their railway transportation*—on which every industry absolutely depends—*at less than cost.*

But Director General Hines, in his review of the railway situation before Congress last Spring, opposed an increase of freight rates "because it would add further to the high cost of living."

Let us see what this argument amounts to. Table II shows the actual railway freight rates in force June 30, 1916, on various standard goods all the way from producing centers to consuming centers. (Since that time the freight rates have been raised only 25 per cent.) It also shows the total increase that would have taken place had these rates been raised 50 per cent. instead of 25 per cent. The table shows that on most merchandise the increase in total cost due to a freight-rate increase of 50 per cent. instead of the 25 per cent. that was actually made would be too trifling a percentage in the price to be noticeable. On such bulky and heavy articles as coal, lumber and ore, where transportation forms a large part of the final cost, the increase would be substantial, and yet it would represent only a small part of the rise in price of these goods which has taken place. The producers and buyers and users of these materials have no right to have them carried below cost at the expense of either the railway owners or the taxpayers.

TABLE II-- RAILWAY FREIGHT RATES FROM MARKETING CENTERS TO CONSUMING CENTERS, IN FORCE JUNE 31,1916.

Commodity	From	to	Miles	cents per 100 lbs.	An Increase of 50% per 100 lbs.
Refined oil	Tulsa,Okla.	Cleveland	960	38.5	19.2 = 1.3 c.per gallon
Fresh meat	Kansas City	Pittsburgh	898	52	26. = 1/4 c.per pound
Cattle	Dallas	Kansas City	484	33.5	16.7 = 1/6 c.per pound
Potatoes	Houlton,Me.	New York	667	30	15 = 8 c.per bushel
Lumber	Winona,Miss.	Phila.	1,160	35	16.5 = 5.37 c.per 1000 ft.
Oranges	Palatka,Fla.	Pittsburgh	1,121	62[1]	31. = 31 c.per crate
Grain	Fargo,N.D.	Chicago	640	18.5	9.2 = 4.6 c.per bushel
Grain products	Chicago	Baltimore	749	19.5	9.7 = 9.7 c.per 100 lb.
Butter	St.Albans, Vt.	Boston	315	65[1]	32.5 = 1/3 c.per pound
Anth. coal	Carbondale, Penn.	Springfield, Mass.	308	$2.75[3]	$1.38[3] = $1.23 per net ton.
Bit. coal	Cresson,Pa	Chatham, N.Y.	476	$2.40[3]	1.20[3] = $1.07 per net ton.
Iron ore	Ashtabula, Ohio	Latrobe, Penn.	170	.93[3]	46[3] = 46 c. per gross ton.

[1] Rates in effect Jan.1,1919

[3] Rate per gross ton.

If the simple, elementary facts above set forth could be understood by the business men of the United States, the first part of the railway question would be promptly solved. Whether the railways were kept by the Government or returned to the companies, whether they were to

be managed by financiers or managed by the railway employees, as the Plumb plan proposes, their rates would be brought up to a level that would give them a square deal.

This much at least Congress must do if it turns back the roads to the companies. If it does not provide for this, the resulting public disaster will cause many times the loss to the public that the increase in rates would cost.

II.

Why the Supremacy of Federal Control Over State Control of Railways Must Be Established

Congress would like—and everybody else would like—an easy and simple solution of the railway problem. One hears more or less frequently the opinion that the Government ought just to return the railways to the companies and then keep its hands off. Having established the fact that the railways must have higher rates, it may seem an easy solution for Congress merely to instruct the President to hand the railways back to the companies and say, "Thanks, awfully, for letting us use them while the war was on. Now go ahead and run your own business and charge rates high enough to keep yourselves going strong."

Let us see where the railways would be landed by such a benediction. Everybody agrees that the railways should have their rates raised to a point that will meet all their necessities—provided only that the increase applies to the freight shipped by the other fellow! Every city assents to the proposition that higher rates ought to be charged to rival cities; but its own rates must not be interfered with. Each state is willing—and, indeed, anxious—that its neighbor states should pay railway rates that shall be adequate for the railway's needs; but its own officers and Public Service Commission are keen that its own cities and citizens should pay railway rates and have railway service that will give them a competitive position as good as and a little better than rival states enjoy.

The prosperity and unity of the nation have been largely due to the success with which the Federal Government, created by the Constitution, has prevented all barriers to interstate commerce. State control of railway operations tends more and more to raise these barriers and to impair national unity by building up trade rivalries between states.

For the nation's political welfare, as well as its economic welfare, therefore, Congress *must* act on the railway question. It cannot, if it would, turn the responsibility for an increase of rates over to the companies themselves; for the companies themselves, under existing state control, would be powerless to raise rates as promptly and adequately as must be done to rescue the railway companies from financial disaster. Indeed, the rate increases already made will be abolished as soon as the railways are handed back.

The Interstate Commerce Commission is also clothed with authority over rates on all interstate traffic. No one would seriously propose that its authority should be annulled. On the contrary, all agree that Government control over the railways must be extended and made more nearly complete.

Does any one have any doubt about this? Just to settle this point beyond question, let us see what would happen if Congress should take an opposite course. Suppose a majority in Congress should say, "We want no more Government operation or control of railways. We will order the roads returned to their owners and we will take power away from the Interstate Commerce Commission and allow the companies to run their own business and fix their own rates for fare and freight."

Congress might take this course—if public opinion would permit it—but Congress has no power to alter the laws of the fifty sovereign states which make up the Union. The complete abolition of Federal control over the railways would merely transfer entire authority to the states; and they would not be slow to exercise it. The railway companies would be just as powerless to raise their rates as they are under the Interstate Commerce Commission; and there would promptly be inaugurated a carnival of chaos in the competition of the states over railway rates and facilities which would be ruinous to the railways and even more ruinous to the public welfare.

There is, therefore, no beneficial solution of the railway question to be found by abolishing or even relaxing the measure of Federal control over railway operations. On the contrary, the urgent need is that such control be made more nearly complete. The railway corporations themselves and the financiers who control them are asking for this.

Of course, it is easy to raise objections to this course. There are plenty who will declare that the railways are too much regulated already; there are others who will descant on the failings of the Interstate Commerce Commission; the evils of an overcentralized control may be pointed out; but to interpose delay with such objections at this time is like stopping a fire truck on its way to put out a fire because the foreman is incompetent and ought to be replaced by a better man.

In a nutshell, the situation is that Congress has got to establish full Federal control over the railways in order to save them from the chaos of multistate control. The need for this has been growing more evident for years. The huge railway deficit that has developed has produced a critical situation that makes the change imperative.

III.

A Fair Return to the Railway Investor

There is sharp controversy at Washington over rival plans for solving the railway problem. The smoke of the conflict is so thick that it is difficult to see through it and find where the truth lies. The road to a solution of the railway problem obviously lies by way of agreement, however, and substantial agreement already exists on certain basic principles, as follows:

1. The capital actually invested in railways—"every honest dollar," as the advocates of the Plumb plan put it—is entitled to a fair return. There is no considerable faction which advocates wholesale confiscation of the property of the railway owners.

2. The labor which operates the railways is entitled to a fair rate of wages, such a wage at least as could be earned in an occupation of similar difficulty and responsibility where free competition prevails.

3. The rates charged for railway transportation must be at least sufficient to pay to railway capital and railway labor the above-named return. Nobody advocates running the railways at a loss and making up the deficit from taxation.

4. The plan for settlement of the railway problem must provide for the *regular* and *efficient* operation of

the railways. We shall all suffer together—railway owners, railway labor and the general public—from the interruption of railway transport by strikes and embargoes or from waste in the use of material and labor. Most of all shall we suffer if we fail to provide for the constant development and improvement of transportation to meet the growing needs of the nation. At this very time, one important factor in the high cost of living is the failure to develop our transportation network to tap additional sources of food and other raw materials to keep pace with increased demand.

Taking up the first principle, that railway capital is entitled to a fair rate of return, let us see what this involves. Some of the plans offered at Washington propose to have the railway investor protected by a Government guarantee of a certain minimum return on his investment. The majority of the plans, however, recommend a "rule of ratemaking" under which Congress will order rates to be so fixed as to provide railway earnings sufficient to pay a certain rate of return on railway capital. One or the other of these plans must be accepted if railway capital is to receive the square deal to which all agree it is entitled. We must face the fact that the time has passed for carrying on railway transportation as a private business in which the investor bears all the risk of loss and is entitled to all the profits he can make. The risk has become too great to be fair to the capital already invested; and it is so great that new capital can no longer be obtained for railway enterprise.

Further than this, it is not to the public interest that the railway investor should bear the risk. He is entitled to a fair rate of return; but the question of what *is* a fair rate depends very largely on the amount of risk involved. The railway investor today sees his property threatened from one point by public regulation of rates and of the service, which cuts down earnings and increases expenses; from another point by the demands of railway labor, and from a third point by the manipulations of those who control the financial end of railway corporations. If the public frees the railway investor of all risk, railway capital can be had even in these times at a rate of 4 to 5½ per cent., depending on the extent to which it is subject to taxation. If, on the other hand, railway capital must bear the risks above enumerated it must have the prospect of a return of at least 8 to 10 per cent. Indeed, until Congress grants some amelioration of present risks, investors will not go into railways at all.

But neither the public nor railway labor will endure so high a return as this on railway capital. Demands for rate reduction and wage increases will certainly follow where a road earns such profits as 8 per cent. or more. The conclusion is inevitable, therefore, that railway capital can only receive a fair rate of return by accepting a fixed rate in lieu of standing the risk of losses for the chances of profit.

And railway investors are willing and anxious to do this. The principle is definitely recognized in most of the plans offered at Washington that if capital is to be assured of a fair rate of return—or, in other words, is to be relieved of all or most of its present risk—it will no longer be entitled to earnings above this fair rate of return. Such excess earnings it is proposed in most of the plans to divide between the railway employees and the public. Such excess earnings will be due in part to faithful and efficient service of the employees and officers and in part to the rates for transportation being fixed higher than necessary. Such a division is, therefore, entirely equitable.

A unique feature of the Plumb plan, backed by railway labor, is that railway officers are to have twice as high a rate of participation in such profit-sharing distribution of excess earnings as the rate allowed to the rank and file of railway labor. This is surely a step in the right direction, for where efficiency and economy in the service are obtained it will be due more largely to the energy and initiative of the officers than to the routine work of the employees.

It is true that in some of the plans presented it is provided that the railway companies may keep a certain proportion of the excess earnings. In the National Transportation Conference plan, for example, it is provided that a railway company may distribute one-third of its excess earnings to its stockholders. Furthermore, in this plan the individual railways are not fully relieved of risk, and the rate of return on railway capital is therefore set at 6 per cent., a rate considerably higher than would be necessary if the risk were made smaller.

The argument is made in defense of this that unless railway companies are under some risk of loss and have some prospect of profit, they will have no incentive to operate economically. Why bother to keep down expenses and keep up earnings if the rates are to be so manipulated as to yield a certain dividend anyway, and no more than that dividend could be received no matter how efficient the operation?

This argument is sound, provided we are to carry on railway transportation as a private business conducted for profit. But with such a degree of Government regulation as is now agreed upon as essential, and with the control and limitation of profits above specified, there is grave doubt that this will be possible. There is a further flaw in the argument in the assumption that the efficiency of railway operation has been caused by the railway stockholders' desire for dividends. No diagnosis of the railway situation is complete and no remedy for railway evils is complete that leaves out of consideration the fact that the stockholders who own the railways no longer control their property.

IV.

The Control of Railway Property; Theory Versus Facts

Most of the discussion at Washington of plans for solving the railway problem proceeds on the assumption that the railways are to be returned *to the control of their owners.* The real owners of the railways, however, are not the corporations which hold the title to the railway property, but are the millions of persons who either own railway stocks or bonds outright or own them indirectly through savings bank deposits, life insurance policies or interests in other concerns owning railway securities. It is these persons whose property rights must be safeguarded; and we must squarely face the fact that these owners of the railways long ago *lost all control of their property.*

The holders of railway bonds have, of course, nothing whatever to say concerning how the property on which they hold a mortgage is managed; and, as a practical matter, the holders of stocks have no greater voice. In theory, the stockholders of railway corporations elect the directors, who in turn conduct the operations of the company; but that theory long since ceased to have any basis in fact. What choice does the individual stockholder among the 100,000 men and women who own

stock in the Pennsylvania Railroad Co. exercise in the selection of its directors? He may execute the proxy annually sent to him by the management, authorizing certain men, of whom he has never heard, to vote in his stead for such men as they choose for directors; or he may throw the proxy in the waste basket. It makes no difference in the final result. And this is true not only of small stockholders but those with large holdings; and it is true not only of the Pennsylvania but of practically all railway corporations save a few very small ones of trifling importance in the transportation field.

There are, of course, exceptions where families of great wealth, or combined interests of large amount, hold large blocks of stock and are able to control the election of directors; but the case is no better here. Experience has proved that where control is so held it is quite apt to be administered for the benefit of the interests in control instead of for the benefit of the stockholders as a whole.

In theory, again, the elected directors control the corporation and are responsible to the stockholders for its conduct; but actually the directors seldom concern themselves with anything more than the finances of the corporation and often not even with those. Directors are selected by the financial interest or group which controls the corporation, although the actual ownership of stock by this group may be trifling. These directors merely ratify the plans and policies decided upon by the group in control. Directors' meetings are often as perfunctory as stockholders' meetings. They are held under the guidance of the corporation attorneys merely to comply with the legal formalities deemed advisable to ratify plans previously decided on.

It is, of course, true that in other great corporations besides the railways the control has passed from the hands of the owners to a small group of financiers; but with the railways the situation has become so acute that no plan for solving the railway problem can leave it out of account. The business of railway transportation is a natural monopoly. There can be no competition in it, such as prevails in a manufacturing or commercial business. The necessity of regulation of the railways and all other needed public utilities, to protect the public, is now everywhere recognized. The great mass of public-utility laws now in force all testify to the fact that the carrying on of public utilities is not a private business but a public business, affected with obligations that do not apply to any business in which competition is possible.

There is no need for drawing a sensational indictment of the financiers who control the country's railways. They are no worse than the generality of men. Indeed, we may go farther and say that most of the railways of the country are managed, by the financial interests in control, with fidelity to the interests of the stockholders as a whole. The exceptions, however, are so numerous and so glaring and the results are so disastrous to the owners of railway stock and bonds that any plan for solving the railway problem must provide protection for railway capital from the dangers of "high finance."

This is indeed recognized in some of the plans now under discussion, usually by a provision that all issues of railway securities must hereafter have the approval of some Government board. But will this be effective? Will any plan be effective that permits the railways to continue in control of men *who secure that control for what profit they can make out of it?* The financiers who control our railway systems are not engaged in business for their health, nor are they bothering themselves with railway affairs from philanthropic motives. The control of a great railway corporation carries with it possibilities of great profit without going beyond acts which are strictly legal.

Those in control of a corporation have an inside knowledge of the values of its securities and of the events that raise or lower these values—a knowledge that the ordinary investor or speculator does not possess. A director has a perfectly legal right to buy and sell shares of the company under his control. He receives nothing in return for the responsibilities involved in his director's office, save the nominal fees for attendance at directors' meetings. He may therefore consider the advantage he gains in stock purchases and sales, or in commissions on the sale of bonds and notes, as a legitimate recompense for his services as a director.

This is only a beginning of the ways in which control of a great railway corporation may be made to yield profits. The railways purchase more than $1,000,000,000 worth of supplies annually. They let contracts for many millions of dollars' worth of construction. Branch lines are bought and sold; subsidiary concerns are undertaken or wound up. In all these affairs huge competitive interests are involved. The financial group with which the final decision lies stands to profit directly or indirectly by these decisions, and its profit is limited only by the elasticity of its conscience, for there is no one to question its acts.

It is true that graft in the railway business is far less prevalent today than it was a generation ago. Some long standing sources of railway graft such as transportation rates to shippers favored by the financiers in control, have been pretty well eliminated. Yet so long as cause produces effect, the continuance of the existing system, which makes it easy for a group of financial buccaneers to obtain control of a railway property and loot it, will produce crops of financial scandals as regularly as the seasons roll around.

Of course, the railway investor tries to protect himself by buying stock in concerns where the control is reputed to be held by banking houses of high standing; and someone may defend the "financier control" of railways with a eulogy of the ability and honor of such financiers. How will such a eulogy sound to the owners of New Haven stock who bought it for years as they would Government bonds because it was controlled by the most famous banking house in America? At this time a suit is pending against former directors of the New Haven for the recovery of $150,000,000 alleged to have been lost to the stockholders through their malfeasance. The suit is opposed by the present board, so that the individual stockholders have to bear the burden of its prosecution. And the New Haven is only one of a long, long list extending back to the names of corporations and of men that are now only a shadowy memory. What stories of recent losses by investors are brought to mind by the names of the Pere Marquette, or the Cincinnati, Hamilton & Dayton, or the St. Louis & San Francisco, or the Baltimore & Ohio!

Long experience has proved that resort to the courts is no remedy for the evil. Such suits as that against the New Haven have never restored to stockholders the money wrongfully diverted from them. Let no one deceive himself, either, with the idea that all these financial scandals are past history and that the financiers now and henceforth in control will refrain from using that control for their own benefit. Cause and effect will operate in the future as in the past. Just so long as law and custom permit men to secure control of railway com-

panies for the direct purpose of making what profit they can out of it, just so long will great profits be reaped at the expense of the railway investors and the public.

But it may be said this control of the railways by Wall Street is no new thing. Why must it be altered now as part of the solution of the railway problem? The reasons are as follows:

1. It is agreed that a fair return to the railway owner on his capital actually invested must be a cardinal feature in solving the railway problem. Rates must be so fixed as to yield such a fair return; but the public will not endure rates high enough to compensate the investor for his risk of loss from the manipulations of the financiers.

2. It is argued in defense of the financiers that they have at least endeavored to operate the railways economically. They usually tried to keep down wages and expenses in order to increase the net earnings available for dividends. But if rates are hereafter to be so fixed as to yield a certain rate of dividend anyway, where will be the incentive for the financiers in control to save money? Will there not be an inevitable tendency to let off the brakes; to spend money for this and that where the expenditure will bring some benefit to the financiers in control? There will not be hereafter even the slight restraint of accountability to stockholders that has previously existed. Since the stockholders are assured of a return anyway, what will they care how their property is managed?

3. These are times when it is extremely important to defend the rights of property. It is a worth while achievement to secure acceptance of the principle that the owners of the railways are entitled to a fair rate of return on the fair value of their property. It will endanger this acceptance if we attempt to include in "fair value" what should not be included.

Under present control by financiers, railway capital is based on earning power; hence, the higher railway rates are raised, the greater the capitalization that can be issued upon a property. This may be defensible so long as railways are carried on as a private enterprise for their owners' risk and profit, but it becomes impossible as soon as we accept the principle that rates must be made sufficient to yield a return on the capital issued.

Manifestly, the fair value of a railway, on which it is entitled to earn a fair return, cannot be justly based on its earning power, since that in turn depends on the rate charged.

4. The question, What is the fair value on which the owners are entitled to a fair return? is a very difficult one, and the chief source of the difficulty is the financial methods of those who have hitherto controlled the railways. We cannot even pay a return on "every honest dollar" invested in the railways as the Plumb plan proposes, for many hundreds of millions of honest dollars contributed by honest investors have been lost in unproductive enterprises due to the ignorance, or worse, of the financiers in control.

It is impossible now to retrieve the errors of the past. We cannot search the titles of present owners of railway stocks and bonds and declare a flaw because, somewhere back, a moral fraud was involved in their issue. What we must do is to *see that railway capital hereafter issued shall fairly represent "honest dollars." We must take railway control out of the hands of those who have made profits by converting the "honest dollars" to their own use.*

It would seem too obvious to require proof that the desired end cannot possibly be attained merely by placing restrictive powers over the issue of new capital in the hands of state or Federal commissions. We have been trying that scheme on a larger or smaller scale for a dozen years, and it has been a dismal failure. Why should we expect it to succeed? How could half a dozen men at Washington possess such omniscient knowledge of the schemes hatched in connection with the administration of railways 300,000 miles in extent as to prevent misuse of stockholders' property? And if these half dozen men built up an organization of inspectors and clerks and supervisors in the attempt to prevent the evil practices just described, it is easy to foresee the antagonism and distrust and friction which would ensue. The execution of stringent cast-iron laws, and the delay in acting on cases, might cause even more harm to the transportation business than the benefit that would accrue.

[*Concluded next week.*]

Full-Length Smokejacks in New Roundhouse

In building a new roundhouse at Haselton, Ohio, recently, the Pittsburgh & Lake Erie Ry. equipped the engine stalls with smokejacks covering the full length of each stall. This not only allows for variation in the position of the locomotive stack and provides direct venting for steam, but also takes care of the smoke and steam while the engine is entering or leaving. As the main structure of the roundhouse is of steel, the accumulation of corrosive gases and moisture under the roof would be particularly harmful. The length of smokejack over each stall is divided into three hood sections, tapering up a separate stack. The stacks are about 5 ft. square. Hoods and stacks are of wood, 1-in. sheathing on a frame of studding. Each stack is equipped with a damper operated by a cord from the floor, except that the damper nearest the entrance door is interconnected with the door so as to open when this is swung open. Two other constructional items are the premolded gypsum roof slabs and specially designed swinging doors. The roof slabs about 8½ ft. long between purlins, are laid parallel to the axis of the stall space over which they are located, and the irregular areas thus left between adjoining stall sections are covered by slabs laid transversely and cut to fit on the job. The doors, which are of wood, have a 3-in. steel pipe the full length of the jamb edge, held to the door itself by four straps bolted to the wood and pinned through the pipe. At top and bottom the pipe projects beyond the door leaf and enters sockets in the frame.

Motor Haulage of Milk Into Detroit

It is estimated that 13,780 gallons, or 1378 cans, of milk daily are hauled into Detroit, Mich., by motor trucks from four outlying communities. This development has come about through the inability of the railroads to give proper service to the outlying districts. Six or seven years ago it was necessary for the farmers to rise very early to take their milk to the railway station, and finally, by changed schedules, the hour was made much more inconvenient. This offered an opportunity for the firm of Wilson & Son, which now operates a fleet of 15 Federal trucks hauling from 12 stations, of which Milan, 42 miles from Detroit, is most distant. Large tractors, with semi-trailers which will hold 204 cans, or 11.2 tons, are used to haul the milk. At peak output, it is often necessary to add an additional trailer.

Beginning a series of interviews with contractors:

Construction Labor's Instability

An Analysis---

I—In which W. J. Morrissey of MacArthur Brothers Company Blames Extensive War Work for Unrest and Decreased Efficiency—Welfare Work May Improve Conditions.

WHAT is the matter with labor, specialized and common; union and non-union? What of its demands for higher wages and shorter hours? Are they equitable? Why does labor continue its radical requests? What can be done to stabilize the situation?

These and other pertinent questions revolve daily in the minds of contractors whose business demands employment of large bodies of skilled mechanics and common laborers. In the following conversation overheard while a passenger on a train passing through a small Hudson Valley town, William J. Morrissey, an executive of MacArthur Bros. Co., New York City, finds the best analysis of the laborer's state of mind. The train had stopped. Several laborers, of foreign extraction, came into the smoking car.

"How much are you getting?" queried the first laborer.

"Forty-five cents an hour," was the answer.

"I'm getting 56¼ cents," was the first laborer's comment.

"You're both pikers," came from a third. "I'm getting 60 cents an hour, but I am no *common* laborer, I'm a *material handler*."

The laborer, according to views which Mr. Morrissey expressed in an interview with *Engineering News-Record's* representative, has acquired a nervousness due to a condition existing during the war emergency. The war created a labor shortage. It also gave rise to a general, though, as Mr. Morrissey asserts, an erroneous idea that the contractor was making huge profits from war construction. The laborer's idea of a cost-plus-percentage, fixed fee, or sliding-scale contract was a gold mine for the contractor, and, jealous of the fancied immense profits he was aiding to secure for the contractor, the laborer set about to get his "slice." Such men in labor circles were known as "gold diggers." The results were demands for increased wages. The labor shortage made him confident of being guaranteed steady employment, interrupted only by the few days of drifting from one job to another, in the hope that he might get more. He felt independent of any particular contractor for his livelihood, and this, coupled with the feeling that every time he raised a hand he was making large profits for the contractor, sowed the seed of the instability now generally felt.

Replying to the question as to whether labor received more wages now than it was reasonably entitled to, Mr. Morrissey said it was perfect equity for the wages to increase proportionately to the cost of living. In his opinion labor's increase had generally equalled the increased cost of living, but where the large employer of common labor is now losing is through the decreased efficiency of labor's efforts. The endless shifting about of common labor on wartime construction he believes has so impaired the efficiency of a laborer's effort that while the wages now paid approximate the same in actual purchasable value as pre-war wages, the value of his labor is way under pre-war efficiency. "If the cost of living has in the past few years advanced 75 per cent., then wages should have advanced accordingly," says Mr. Morrissey. "But it is obviously wrong that such an advance in living costs should bring labor 100 per cent. increase in wages, or that it should give but 50 per cent. efficient service with a 75 per cent. wage increase."

Another thing the matter with labor is the fact that the common laborer no longer wishes to be thought of merely as a common laborer. Pre-war construction never knew such minute classification as now obtains. During the war a man who never did anything but handle a pick or shovel dropped that pick or shovel and went into some shipyard or to some other center of construction where his otherwise common labor was rewarded with a title or classification. The minute he felt himself no longer a common laborer he considered his efforts worth greater compensation. So intensified became that system of labor classification that the common laborer almost ceased to exist. To use Mr. Morrissey's summation of the situation: "The minute you put a pair of rubber boots on a man he is no longer a laborer but a trench digger, sewer man, or what not, and as such demands more money."

Mr. Morrissey freely admits the equity of the principles of labor unionization, though there are union activities in the building trades for which he finds censure. Unions, seeing the labor shortage during the war, recruited their forces from all classes, the following incident serving to illustrate not an uncommon practice: A certain tailor was recommended to Mr. Morrissey for a job. His qualifications for building construction were a desire to take advantage of high wages, thereby bettering his financial condition, and a fancy that he could use a skilled workman's tools. His case came direct to Mr. Morrissey, who would not employ him because he was not a skilled mechanic. Had that tailor gone to an unprincipled union business agent, as unskilled workmen seeking better employment often did, paid his union initiation fee, bought himself a second-hand set of tools, he would probably have secured employment as a skilled mechanic. Such a business agent would tell the steward of the particular trade the situation, he would tell the foreman, who would tell the other workmen on the job to protect the newly acquired union "skilled" mechanic. Given such protection the tailor-mechanic would, nine times out of ten, have gone undiscovered, unless his work happened to be personally inspected by the superintendent. Such cases did happen where unions were not particular in picking skilled labor. The emergency was present. The demand for skilled building mechanics was great, and the end justified the means, in the union man's estimate of the situation. Because of the inclusion in their ranks of such unskilled "skilled" mechanics, the other workmen frequently adjusted their efforts to those of the newcomer, a fact that in no small measure contributed to the general fall in the efficiency of labor's efforts.

Mr. Morrissey finds that, because of the labor shortage, the common laborer is no longer amenable to the treatment that he was best managed by years ago. He

is a great believer in the old system of "the big boss" knowing all his workmen personally in so far as is possible, yet he is not now so sure that to go out onto a job, greeting this and that workman with a smile and calling his first name, is the best way to treat the workman. In some cases such treatment now makes the superintendent appear "soft." Neither do "gruff and hard" tactics secure best results. All of which is resolved into the assertion that in the treatment of workmen the superintendent has as diverse cases to study as he has workmen employed. Since most of his common labor is foreign the task is doubly severe, though increasingly interesting.

As to the employment of skilled, unionized labor, the chief difficulty is securing wage contracts which are enduring. When a bid is made upon a piece of work that may extend over a period of months, or perhaps years, the contractor has no assurance of the stability of skilled labor wages. He has not, for instance, the assurance that, though he may have a contract at present for a class of skilled labor at $1 an hour, such a wage scale will endure during the life of the contract. Wage demands are contingent upon cost of living and other factors and for that there is little help beyond a certain point.

Admitting, then, the general instability of labor, its often excessive demands, the volatility of its temper and its low percentage of efficiency, what remedial measures are possible? To this question Mr. Morrissey suggests that up to a certain point, granting that the standard local scale of wages is being paid, you can satisfy labor through the supply of comfortable living quarters, attractive meals and places in which to serve them, sanitary camps, and divers wholesome amusements. Extensive installation of such aids to comfort for the laborer is only possible on large jobs where the construction is to be carried on for a considerable length of time. Short jobs, though isolated, would not warrant large expense along such lines. Mr. Morrissey believes in the mental healing effect of comfortable sleeping quarters, proper bathing and sanitary facilities, good food well cooked, and wholesome entertainment. These can be provided within the confines of a large isolated job, so that the nearest village with its usual cheap amusement halls and saloons has no attraction for the laborer. If the laborer is a church member he usually finds a church of his denomination nearby, even in remote places. If the scale of wages paid is the standard local one, with the provisions of good quarters, clean, palatable food, sanitary conditions throughout the camp, comfortable mess halls, showers, pool and billiard halls, moving picture theaters, and reading and writing rooms, you have done about all you can toward stilling labor's restless spirit, thinks Mr. Morrissey.

Not only does the instability of his own labor directly influence the contractor in his bidding, but labor's general unrest, seriously affecting every industry it touches, furnishes the contractor a second worry since the prices of materials with which he builds vary so in cost. Therefore, inasmuch as labor produces the materials for building construction, the instability of labor is the tap root of construction risks, is Mr. Morrissey's judgment.

The possibility of each contractor holding his skeleton construction organization from one job to another, allowing him to recruit rapidly his construction forces once a job has started, has given the contractor a measure of assurance as to the quality and stability of his employees. Workmen, from the laborer in the gang through to the superintendent, often are found from one year's end to the next with the same contractor. The situation is explained through his attraction by that contractor's particular style of management and administration, though it does not concern a majority of the day laborers, as is indicated by the fact that the monthly labor turnover on large construction jobs where thousands of men are employed will usually average 300 per cent.

Mr. Morrissey has given his answers as to "What is the matter with labor?" To its general unrest he ascribes a state of mind developed through intensive war construction wherein the laborer viewed with envy contractors' fancied excessive profits, and realized his power through the scarcity of his numbers. He agrees that certain of its demands are equitable. Wages should advance along with the cost of living. He sees why demands continue, for the laborer is not easily dispossessed of his notions, nor does he wish to relax his hold upon his powerful position.

But the final question, "What can I do to lend stability to the situation?" is but partially answered. Profit sharing? "It never will operate on contract work." Prizes and bonuses? "That has been tried in some cases with good results, though if a habit it becomes a mere wage increase." Government wage fixing? "I don't believe that's the answer." Then is there real truth or not in Mr. Morrissey's laughing comment that "The solution is known only to the Lord and He won't tell!" Speaking more seriously he added: "I believe that the subject under discussion is worthy of the serious consideration of every one affected by the existing conditions—both employer and employee. Any satisfactory solution which will tend to alleviate the present condition is desired by the two classes mentioned and by the public at large. The welfare of the whole country is at stake, and the sooner labor is stabilized the better it will be for all concerned."

Tile Drainage for Iowa County Highways

Untiled Areas of "Seedling Mile" Concrete Road Cracked, While Later Sections Laid With Tile Remained Intact

By James A. King
Mason City, Iowa

EXCELLENT lessons in drainage for hard-surfaced, or paved roads, are furnished by the 16-ft. concrete pavement connecting Mason City and Clear Lake, Iowa. Here are found the comparative results of draining, and of not draining, before paving—which is the most conclusive evidence in the world.

The road runs through a comparatively level country at the western edge of the Iowa drift area, and its general topography consists of a series of low level stretches, and of higher level stretches or plateaulike areas, with gentle slopes connecting the two levels of flat areas. Practically every acre of the land along this highway needs tiling to give full crops of complete maturity every year; though the average farmer will dispute this statement when considering much of the farm land. Experience shows that every rod of the roadway should have been tiled before the paved surface was laid. But the road commissioners, and the engineer in charge of the work, did not know this when they laid the first stretch.

A "seed mile" of paving on this road was completed in 1912. This mile of road crosses a low, level area, but at each side of this area the original pavement

mounts a gentle slope leading to the higher levels to the east and the west.

Where the road crosses the low flat, a grade was built up about 3 ft. high, leaving a deep, open ditch on both sides of the pavement. No tile was put on either side of this road, even down in the low flat. The supposition of the builders seems to have been that no subsurface drainage was needed on the slopes, and that the high grade and open ditch at either side in



PAVEMENT ON UNTILED SECTION AFTER FIRST WINTER

the low area would give sufficient drainage there. The grading was done in 1911, and the road was left as a dirt road for one year so that the grade would become thoroughly compacted by the heavy traffic.

In 1912 the concrete surfacing was applied without reinforcement and with expansion joints every 32 ft. That winter, as the ground froze, the center of the pavement heaved. A large, longitudinal crack was formed along approximately the center line of the pavement, more or less irregular and with ramifying branches toward the side. This heaving and cracking was just as serious on the two slopes leading down into the low flat as it was across the flat itself, as shown in the illustration.

In 1913 tile were laid along both sides of this pavement. Surface intakes were placed in the low spots of the side ditches. Since that time there has been no further heaving of this piece of road, and no more cracks have developed in it.

In 1914 the mile of road immediately east of the "seed mile" was paved. The middle stretch of this mile was high ground; the builders thought it would not need tiling, and so did not lay any tile. Both ends of it were comparatively low ground and so, guided by their experiences with the "seed mile," they laid tile ditches there. That winter the untiled stretches of this mile of road heaved and cracked just as badly as had the "seed mile." Consequently, these were tiled the succeeding year. Since that time no further cracks have developed in it.

In 1916, $1\frac{3}{4}$ miles of road were paved just to the west of the "seed mile." Every rod of this stretch of road was tiled before the paving was laid—the lesson had sunk home. One 80-rod stretch was on a slope which was springy and spouty. The line of tile on each side of the grade did not cure this completely, so a third line was placed right down the middle of the crown. This stopped the seepage which had kept the crown wet and soft.

Probably a cross-cut string of tile placed above this springy spot would have done as well, and would have been cheaper. By cross-cutting some little distance above, and putting the tile clear down to the impervious layer which caused the seepage, all trouble-making water would have been caught before it ever reached the surface on the slope. In the three winters which have elapsed there has been no heaving and cracking on this part of the road which was tiled before it was paved.

Contracts were let in 1917 for paving the remaining section of this road between Mason City and Clear Lake. The last part was laid in 1918. Every rod of stretch of the road was tiled before the paved surfacing was applied.

When the ground froze last autumn (1918) it was more saturated with water than it has ever been at that time in this northern section of Iowa. The continued heavy rains of October and November filled the soil so full of water it could hold no more, where underdrainage had not been supplied. The first permanent freeze came right on top of a bad rain. This sealed the water in the soil, and it stayed there until the spring.

But there was no heaving and cracking along this newly-laid section of pavement. If ever conditions would cause heaving and cracking, they would have been caused last winter. But they did not occur. The tile prevented them. As fast as the water ran off the crown of the road and the adjoining fields into the surface ditches at the roadside, the surface intakes conducted it to the tile, and these carried the water away.

It did not have a chance to seep back under the pavement and heave it when frost reached it. That road will stand smooth and unbroken from heaving so long as these tile continue to do their duty.

These experiences prove indisputably the importance of tiling as a part of paved-road construction. Not a rod of paving should be laid unless it has a tile ditch along both sides of it—at least where a road runs across a level flat, and where it runs up a slope. If the road runs along a side hill, it may be sufficient to have a tile ditch only on the up-hill side. But even then, surface intakes should be placed in each low spot of the down-hill surface ditch with cross-cut tile ditches to conduct the surface flow across into the longitudinal tile ditch.

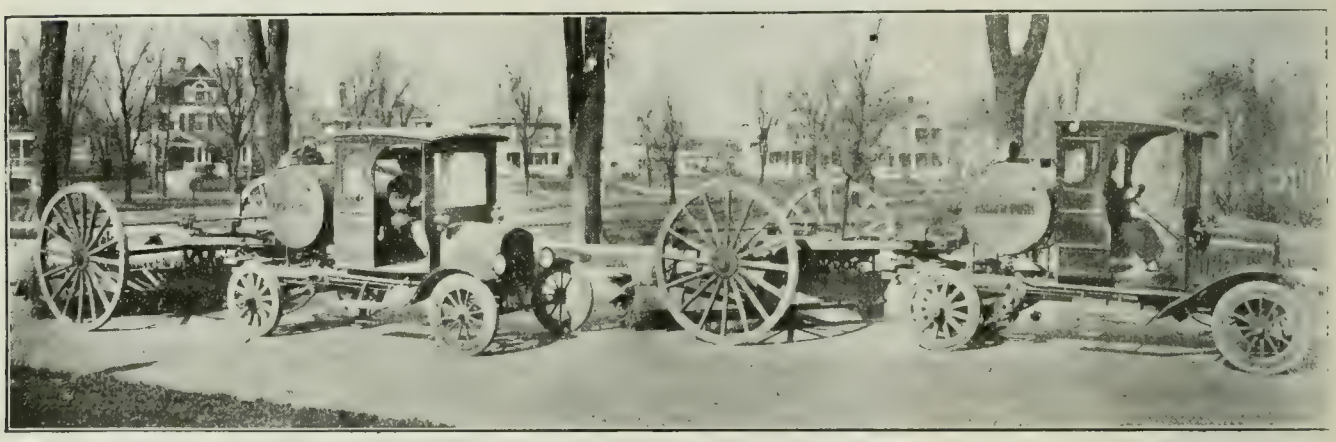
Where a community is spending the amount of money necessary to pave a road, the additional expense of a longitudinal tile ditch on both sides of the road for its full length is so slight that the community cannot afford to take the chances of injuring any part of the road by not laying this second tile ditch. Thorough drainage should be written into one of the very first paragraphs of the specifications for any and every paved road.

Savings Made by Motorizing Street Cleaning Equipment

At Albany, N. Y., Horse Sweepers Transformed by Attaching Ford Tractors—Truck Used With Sanding Device—Power Flusher Remodeled

TRANSFORMATION of old horse sweepers into motor sweepers, motorization of the street-sanding device by attaching it to a truck, and utilization of a remodeled motor flusher, are some of the changes made to promote street-cleaning efficiency at Albany, N. Y. These changes are saving the city many thousands of dollars a year, and the work is being accomplished in a more satisfactory manner than formerly, according to Wallace Greenalch, commissioner of public works.

The change which has resulted in the greatest economy is the motorization of street sweepers. A combination of the old horse sweepers and Ford tractor trucks has been substituted for horse and hand sweeping. This was accomplished by removing the front wheels from the old horse sweepers and connecting the rear or sweeping part to the tractors by means of what is known as a fifth wheel or horizontal turntable.



OLD HORSE SWEEPERS MOTORIZED BY SUBSTITUTION OF FORD TRACTORS FOR HORSES

The tractors are equipped with a 175-gal. tank which furnishes water to sprinkle the street in front of the revolving brooms. Originally the spraying apparatus was placed at the rear of the tractors, but this was found to be so close to the brooms that there was not sufficient time for the dust to absorb the water and lay it before the brooms picked it up. To overcome this the spray was moved to a point just behind the front wheels, where it may be seen in the illustration. The pipe running along the side of the truck supplies the water.

In forming the combination, the only changes needed were the addition of the fifth wheel, after removal of the front truck and placing of a smaller driving sprocket to reduce the broom speed. At the present time the city has seven of these combinations, and they are reported to be giving the greatest satisfaction.



STREET-SANDING DEVICE ATTACHED TO MOTOR TRUCK WHICH CARRIES SAND

In operation they make from 24 to 33 miles in 7½ hours, sweeping a width of 7 ft. This is at the rate of from 3.7 to 5 miles per hour. It is estimated that six motor sweepers will do the work of eight horse-drawn sweepers and four horse-drawn sprinklers, displacing 12 teams. Accurate cost data are not available on this work at present, but with teams at $8 per day there is a saving of from $15,000 to $16,000 per year by the substitution of the motorized equipment for street cleaning and pick up, according to the report of the commissioner of public works.

Pick-up sweepers and vacuum-cleaning apparatus have not been resorted to at Albany, partly because the men that work at pick-up are needed for the snow-removal force in the winter, and it is desired to keep them employed the year round. A shop for repair of street brooms has also been added to the plant.

Another piece of street equipment which has been motorized is a street-sanding device. It consists of a motor truck with the sander attached, as shown in the view. The truck is loaded with sand, and the spreader is replenished as it becomes empty. Sand is thrown out radially from the cone under the spreader which is operated from a sprocket and chain on the axle. This combination makes a speed of about four miles per hour and spreads for a width of about eight feet.

Some time ago a motor power flusher was added to the equipment. This was of the Hvass type, and worked very satisfactorily, with the exception that the engine appeared to be overworked when driving both the pump and the truck. To overcome this it was decided to remodel it substituting a Tiffin pumping unit. In this connection it may be noted

that Albany is a city having many thoroughfares of steep grades.

The tank was moved back on the chassis to give room for the new engine and pump, which handle the water entirely independent of the driving engine of the truck itself. This arrangement made it very hard for the driver to tell when his water pump was acting properly, and it was apt to race when the tank became dry, thus causing injury to the pumping outfit. To overcome this, a pipe was run from the tank to a point near the electrical connection for the magneto of the gasoline pumping engine. This pipe has a float at its upper end which is attached to an ordinary telegraph operator's key. The connection is so arranged that when the float drops as the tank becomes emty, the magneto spark is grounded, thus stopping the pump automatically. Another change made in the flusher was in the cooling system of the pump. This is directly connected with the discharge line from the pump, thus keeping the cooling water at a constant temperature and eliminating the necessity of utilizing space in the tank for a cooling reservoir which would gradually become heated.

A motor catch-basin cleaner is also being tried out, but up to the present time has not been accepted by the city on account of mechanical defects. The department feels that these basin-cleaning devices are bound to come into greater use, because it is increasingly hard to get men to perform this kind of disagreeable work by hand.

Street cleaning at Albany is directly under the supervision of Mr. Greenalch, with W. J. Coffin as deputy commissioner.

Washing Sewage-Filter Gravel at Clinton, Massachusetts

Dirty Material Moved to Washer by Drag Scoops and Hauled Back by Same Means—Cost $11.75 per Cubic Yard

REMOVING, washing and replacing the upper 6 to 10 in. of gravel in sewage filters, in somewhat the same way as slow-sand water filters were renewed in the earlier days, is being practiced on the sewage filters of Clinton, Mass. The filters are maintained by the Metropolitan Water and Sewerage Board in connection with the water-supply of Boston and its vicinity. The beds have been in operation for a number of years, and their upper portion has been filled with organic matter and the efficiency of the filters reduced. No suitable gravel for renewing the beds is available in the neighborhood.

The first gravel washing was done in September to December, 1918. A second bed has been renovated this year, and work on a third one was well toward completion early in September, 1919.

The bed washed in 1918 is about 200 ft. square and has an area of 1.02 acres. A one-horse drag scoop was used to rake up the dirty gravel and convey it to the washer, which was moved along as work on cleaning strips, 50 ft. wide, progressed. The washing plant is thus described in the annual report of the Metropolitan Water and Sewerage Board for 1918:

> The gravel-washing plant consisted of a No. 1 Stocker gravel washer, driven by a belt-connected 2½-hp. Alamo gasoline engine mounted on a wooden frame and moved about on wooden rollers; a small portable pumping unit consisting of a Swaby centrifugal pump with a capacity of 75 gal. per minute operated by a 1¾-hp. Brownwall gasoline engine. About 450 ft. of 2½-in. fire hose was used between the pump and the washer for conveying the washing water, and wooden troughs were used for disposing the dirty water from the washer. The cost of this outfit fully equipped and set up ready for operation was $630 for the apparatus and $125 for labor, making the total cost $755.
>
> The Stocker gravel washer consists of a steel cylinder 8 ft. long and 30 in. in diameter, to the inside of which are riveted steel angles running lengthwise of the cylinder about 3 in. apart. Hung from an independent frame inside the cylinder are a number of sheet steel chutes, the inclination of which may be varied to meet the requirements. The dirty material is fed into the revolving cylinder at one end and conveyed through it by alternately dropping down the chutes and being carried up again to the next one by the angle strips. The clean water enters at the other end of the cylinder and passes slowly through the washer in the opposite direction to the material. In this way the material gets several washings and scourings, each time with cleaner water, until finally the dirty water and material washed out of the gravel is discharged at one end and the clean material at the other end.
>
> The dirty gravel was shoveled into the hopper of the washer. The washed gravel was shoveled into piles and then moved back into place with the drag scoop, after a harrow had been employed to loosen up the bed.
>
> Some 1100 sq.yd. of material from the first bed was washed. The loss of material was about 20% by volume, of which 75% was the organic matter and sludge that had clogged the bed and a small percentage was sand grains in the gravel.
>
> Seven men and one horse were employed all the time, and two men and one horse extra while regrading was done. The work cost $755 for plant and $1891 for labor. Assuming that the plant will serve for 20 beds, the plant cost per bed would be $38, the report states, and the cost for the first bed cleaned would be $1930, or $1175 per cubic yard. Plant improvements to reduce labor would decrease the unit cost.
>
> After the first bed was cleaned the sewage entered it "freely when applied in doses of 62,000 gal. in 30 min. at intervals of 1.6 days," or at a rate of about 38,000 gal. an area a day, and dissolved oxygen was again found in the effluent.
>
> W. E. Foss is chief engineer of the Metropolitan Water and Sewerage Board.

Three Planning Commissions in One City

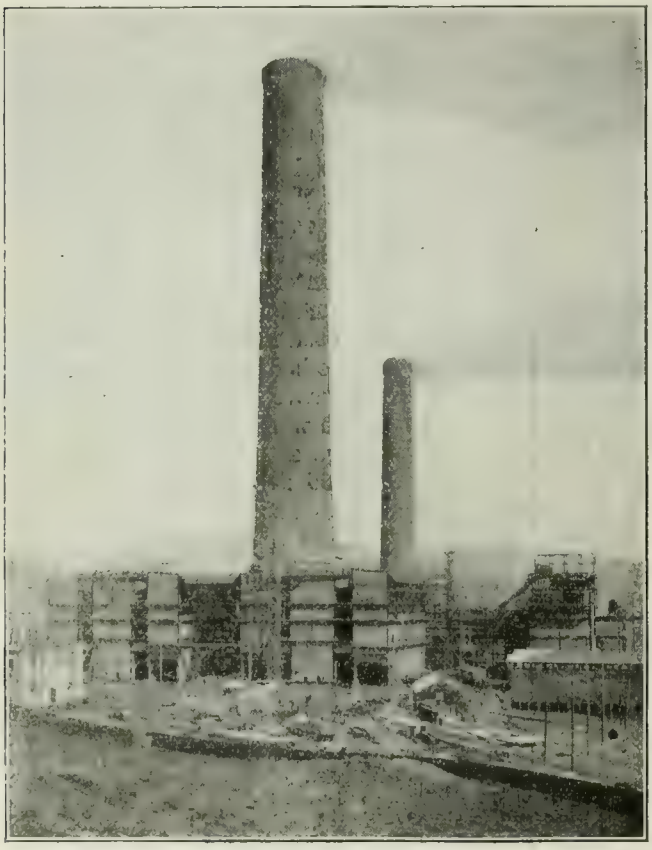
City-planning problems in Pittsburgh are at present being dealt with by three different bodies, in addition to the city Department of Public Works and the county engineer's office. There is a City Planning Commission of nine members, appointed by the mayor; a County Planning Commission of some 25, appointed by the county commissioners; and a volunteer Citizens' Planning Commission, which has recently been organized and has engaged a consulting engineer to carry on its studies. The actual official authority of the former two bodies is small, as the city commission has no other definite authority than the approval of lot subdivisions, and the county commission is purely advisory, on subjects referred to it by the county board. The citizens' body is entirely unofficial and will presumably aim to accomplish results by guiding and shaping public opinion.

Highest Chimney Built for Smelter at Anaconda, Montana

Brick Stack Is 585 Feet Above Ground and Has 60-Foot Top Inside Diameter—Concrete Base on Rock 3 to 10 Feet Below

OVERTOPPING by some feet the highest chimney hitherto built, and far exceeding in draft volume any previous stack, the new brick chimney of the Washoe Smelting Co., of Anaconda, Mont., can fairly be called the "largest chimney in the world" at the present time. The structure itself was completed last winter, and the various appurtenant works were connected up for service early this summer.

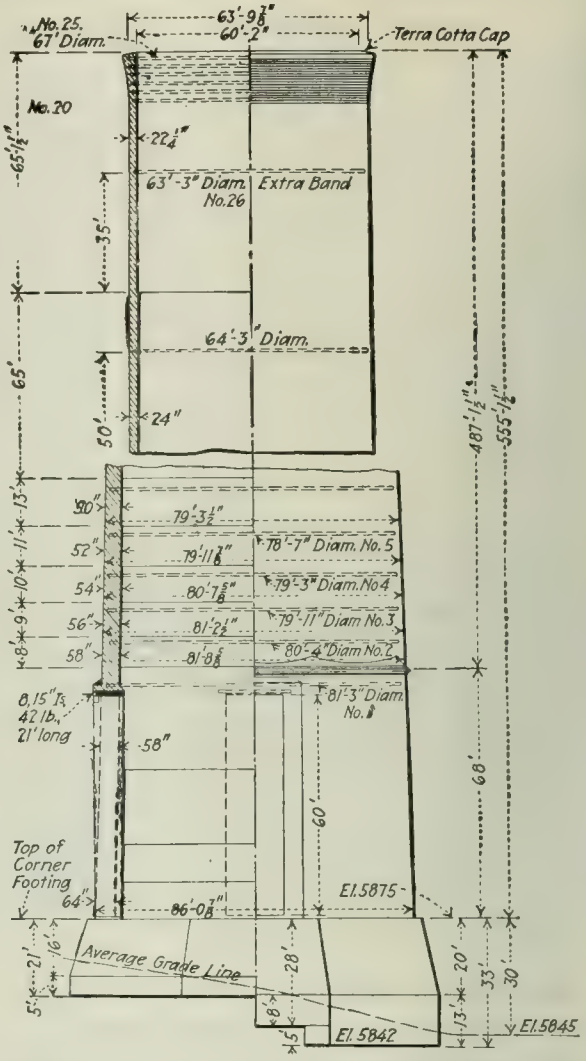
The new chimney is a part of a smoke-treating plant completed for the Washoe smelter, to reclaim gold,



NEW SMELTER CHIMNEY AT ANACONDA 585 FEET ABOVE GROUND LEVEL

silver, copper and arsenic, which were lost in the fume discharge. A Cottrell electric dust-reclamation system was installed, and this required a draft much greater than was available from the old 300-ft., 30-ft. inside top diameter brick chimney at the plant. The new stack stands about 200 ft. from the site of the old, and is connected to it by an extension of the main flue, built of structural steel frame with brick walls. Beyond the new stack is the Cottrell treating plant, which takes the deposited dust and passes it through a system of treaters and furnaces.

The stack is 555 ft. high from the top of an octagonal concrete base, itself 30 ft. above ground level at the treater-plant grade and 33 ft. above the lowest part of the stepped rock foundation on which the base rests. This makes the chimney 585 ft. 1½ in. above the main ground level, compared with 571 ft. for the next highest stack, that built for the Tacoma Smelting Co., at Tacoma, Wash., described in *Engineering News-Record* of Apr. 4, 1918, p. 644. The Tacoma brick stack was 1 ft. higher than the concrete stack built at Saganoseki, Japan, described in *Engineering News-Record* of Apr. 12, 1917, p. 100. The comparative dimensions of the three chimneys are given in the accompanying table.

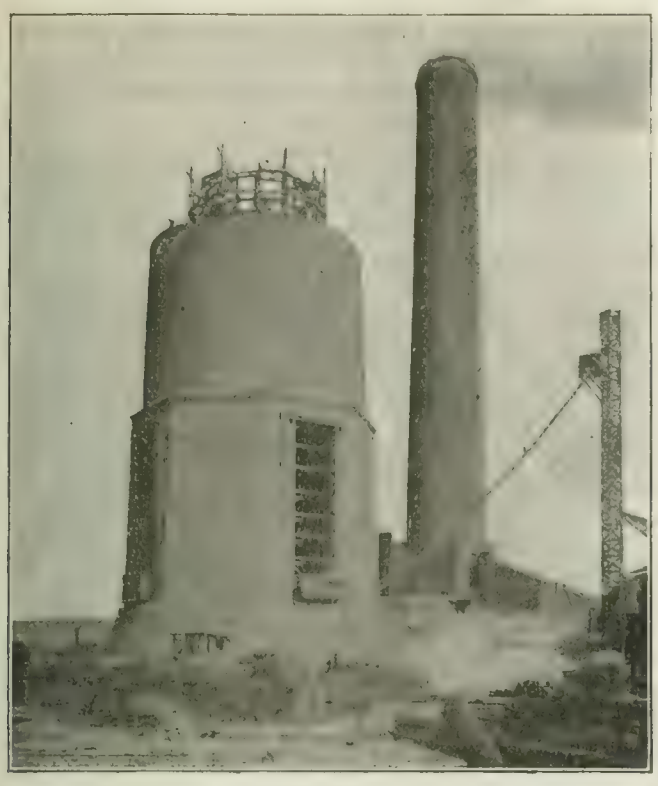


GENERAL DETAILS OF HIGH BRICK CHIMNEY FOR WASHOE SMELTERS AT ANACONDA

TABLE SHOWING DIMENSIONS OF THREE LARGEST CHIMNEYS

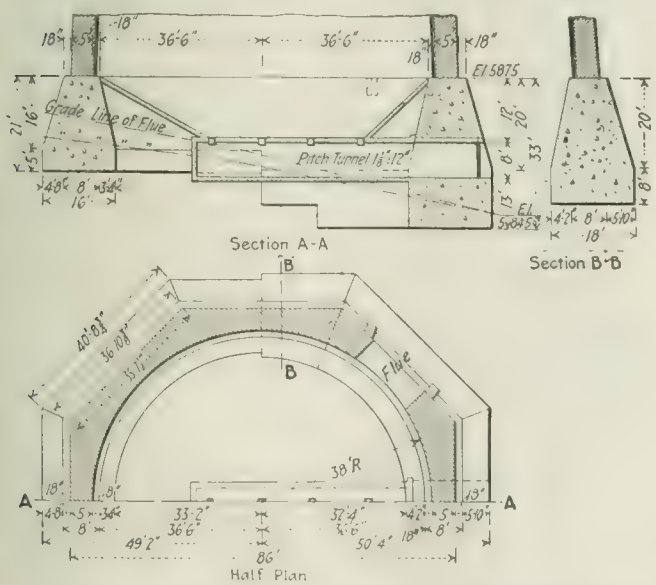
	Top Inside, Diam.	Bottom Inside, Diam.	Wall Thickness, Inches, Top	Wall Thickness, Inches, Bottom	Height Above Grade, Ft.
New brick stack, Anaconda	60 ft.	76 ft.	22¼	60	585
Old brick stack, Anaconda	30 ft.	31 ft. 4 in.	12½	62	300
Tacoma brick stack	23 ft. 11 in.	39 ft.	13⅔	61	571
Saganoseki concrete stack	26 ft. 3 in.	27 ft. 9 in.	7	29½	570

As shown in the drawing and in the accompanying view of the base of the Anaconda chimney, the concrete base is octagonal in shape, 89 ft. outside top diameter and from 10 to 30 ft. above the ground. On it an octagonal brick section 86 ft. in diameter and 68 ft. high carries the circular tapering brick chimney, rising as shown to a total height of 585 ft. The main shaft has five different tapers, and the thickness varies from 58 in. at the top of the octagonal section to 22¼ in. at the top, under the terra-cotta cap. The concrete base reaches down to a good rock foundation, with a load of about 7.5 tons per square foot.



WASHOE STACK BASE IS OF CONCRETE

The chimney is built of the radial blocks used by the Alphons Custodis Chimney Construction Co.; they are made of fine flotation tailings mixed with sand, and burned at a temperature of about 1800° F. About 17,000 tons of these blocks, 10,350 barrels of portland cement, 1850 tons of fire clay, and 2700 cu.yd. of sand were used in the chimney proper, and about 5100



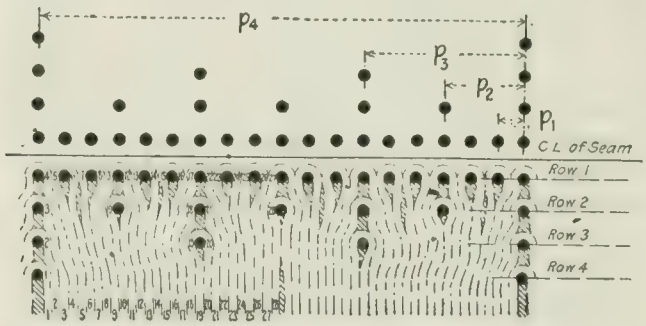
DETAILS OF FOUNDATION FOR WASHOE CHIMNEY

barrels of portland cement, 1750 cu.yd. of sand, and 4700 tons of rock in the 1:3:5 concrete used in the base.

The chimney was designed and built by the Alphons Custodis Chimney Construction Co., under the general direction of W. C. Capron, mechanical superintendent of the Washoe Smelting Company.

Design of Riveted Butt Joints After Schwedler Assumptions

AT THE spring meeting of the American Society of Mechanical Engineers, A. A. Adler, of Brooklyn, N. Y., presented a paper on the design of riveted butt joints, which after discussion of fundamental assumptions proceeded to treat analytically the Schwedler graphical method. Adopting the Schwedler conception that the plate can be considered as divided into hypothetical tension strips the resistance of each of which is equal to the strength of one rivet, simple



general equations for the analytical treatment are derived. These are here reproduced.

Considering the quadruple riveted joint shown in the diagram, in which the strips are so numbered as to show that each strip belongs to a particular rivet, the resistance of which it adds to the total resistance of the joint, if w is the width of the strip and d the diameter of a rivet, then the economical pitch for the first row is

$$p_1 = 2w + d$$

and the shaded area shown in the diagram is metal available for rivets in subsequent rows.

It is then shown that, as a general equation for the nth row,

$$p_n = \frac{{p_1}^n}{d^{n-1}}$$

A general equation for efficiency in tension of the nth row is derived in the following form:

$$e_n = 1 - \frac{d}{p_n}$$

As the number of rows, or n, becomes large, the efficiency approaches unity, or 100%. A slightly different form of this equation is given as follows:

$$e_n = 1 - \left(\frac{d}{p_1}\right)^n$$

The design of the cover plates, according to the author, should be made upon fundamental principles rather than from empirical rules given in certain textbooks. The principle that all strips pass through the first row is adopted, and since the pitch and tensile stress are fixed, the required area of plates is obtained by suitably determining the thickness t_c. For a joint with two cover plates, the following equation is given:

$$t_c = \frac{p_1\, t\, e}{200\,(p_1 - d)}$$

in which e is the actual efficiency of the joint in per cent. and t is the thickness of the plate.

Determination of Water-Supply From Snow Fields

Important for Irrigation and Hydraulic Works—Snow Sampler Measurements and Tables Based On Extended Investigations Made in the Sierra Nevada Mountains

SNOWFALL upon the mountain ranges adjacent to the semi-arid regions represents the greater part of the precipitation available there for irrigation and water-power purposes, so that it becomes highly important to estimate the water content of the snow upon the ground in order to determine the available supply. Extensive experimental investigations along this line have been made in the Sierra Nevada range in Nevada, while California has more recently extended similar surveys to all parts of its mountains. Two methods for determining the water content, or water equivalent of the snow when melted, consist in the use of sampling devices and of the tabulated results of investigations.

Tables of snow densities for estimating the water content for snow of given depths without the use of sampling devices are illustrated by the examples in Table I, selected from a series of tables giving the result of observations at different periods of the year and at different altitudes in both open and wooded country. These tables have been prepared by Professor J. E. Church, Jr., University of Nevada, Reno, Nev., and A. L. Smith, United States Reclamation Service, Tahoe, Calif. Professor Church is director of the university's observatory on Mount Rose and is in charge of the Nevada coöperative snow surveys (see *Engineering Record* of April 17, 1915, p. 494).

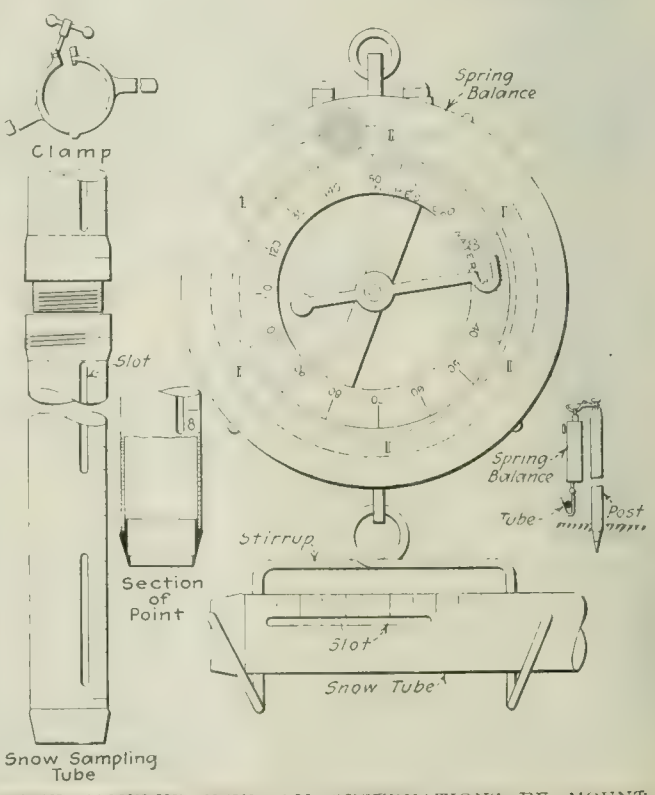
The tables are based on several thousand measurements and represent the average condition of the snow in the Sierra Nevada Mountains during seven years. While they are adapted particularly for the use of hydraulic and irrigation engineers in estimating the water content of snow, they are available also for estimating the snow loads on railway snowsheds, bridges and roofs. They are of particular interest also to the United States Forest Service. In regard to the application of these tables, sufficient measurements of the depth of the snow would be made in advance at various places in the snow field to assure determination of the average depth. Then, by consulting the nearest corresponding depth in the tables, the water content will be found in the adjoining column. This represents inches of depth, the cubic contents or acre-feet depending upon the area of the field. The column of "density" represents the ratio of water content to depth as a percentage, and is given for convenience in comparing the various depths. These tables are fairly representative of the Sierra Nevada and the mountains farther north, but it is explained that they should be used only when a snow sampler is not available.

The density and the water content of settled and compact snow rather than newly fallen snow are indicated, and the figures are to be regarded as approximate, owing to the wide seasonal variation that prevails in the density of snow. The figures apply to snow only and do not include the underlying slush or ice. Since the density of shallow snow is subject to great variation by the accretion of new snow or by melting, the top 4 in. of depth is discarded in the estimates. In making the measurements of depth, care should be taken to wait for several days after the precipitation, in order to allow the snow to settle and acquire approximately the density of the older snow cover beneath it.

An indication of the degree of accuracy to be expected from the use of the tables is shown in Table II, by the comparison of sampler measurements and of estimates based on the tables.

A survey or measurement of the snow cover on the ground and the measuring of snow as it falls by means of gages—on the same general principle as rain gages—are two methods employed for estimating snow resources for water-supply, as noted in a report on "Snow Surveying" by Professor Church. He considers the first method to be the more satisfactory by far, as there are numerous difficulties in obtaining reliable results with snow gages. These difficulties include the varying character of the snowflakes—which may be heavy or light—the influence of winds and air currents, the freezing of the contents of the gage chamber, the depths of snow and the inaccessibility of the gages. If it is possible for parties to reach the gages in March or April, which is the time when estimates should be made for the next season, it will be possible also for them to make the more accurate snow survey. (See also "Snow Surveys for Predicting Stream Flows," in *Engineering News* of May 29, 1913, p. 110.)

Stationary measuring stakes and portable samplers are the principal means employed in a snow survey. Unless the stakes are used in large numbers they are unsatisfactory, according to Professor Church, except in forested districts or in pockets on the mountains where the snow fields are protected against the erosion and shifting due to wind action. The snow sampler, however, eliminates the difficulties attending the use of gages and stakes, while it furnishes both the depth and the water content of the snow. It can be operated wher-



SNOW SAMPLER USED ON OBSERVATIONS BY MOUNT ROSE OBSERVATORY, NEVADA

ever two men on snowshoes can penetrate. Two men are necessary for safety reasons, but a third man would add to the expense of the work without any corresponding advantage.

The snow sampler used in the Nevada surveys, as described by Professor Church, and shown in the accompanying drawing, consists of a 1¾-in. tube of cold-drawn seamless steel tubing 4 to 10 ft. long, made in sections put together with screw sleeve couplings, and having the bottom fitted with a cutter 1½-in. in diameter. This tube is thrust into the snow and takes a sample or core, which is prevented from falling out when the tube is raised, by means of the interior shoulder formed by the cutter point. Vertical slots at intervals enable the core to be observed, and its height is indicated by graduations on the tube. An occasional coating of shellac protects the metal from rust and reduces clogging.

By inverting the tube the snow core is discharged readily, and any snow which adheres is removed by a cleaner in the form of a thin, curved blade which can be inserted through the slots. A two-handled wrench or circular clamp, made to embrace the tube, assists in driving and removing the sampler when working in compact snow. This tool is an aid also in uncoupling the sections. A rotary motion should not be given to the tube, except in hard snow, as such a motion tends to draw in snow through the slots. The tube is forced with a steady pressure, a plunging action being permissible only when the snow is very hard. However, a milled cutter has been perfected which permits of forcing the sampler by a slow, rotary motion through crusts of all degrees of toughness and even through 1 or 2 in. of ice, without losing the core of snow in the tube.

To determine the water content of the samples, the tube is laid horizontally in a stirrup attached to a spring balance of the Forschner type, the circular dial of which is graduated to indicate depth of water in inches. The

TABLE I. TABLE OF DEPTHS AND EQUIVALENT WATER CONTENTS OF SNOW ON MOUNTAINS IN NEVADA

	February-March: 5,000-7,000 Ft.						February-March: 7000-9000 Ft					
	Open Country		Forested Country				Open Country		Forested Country			
	Uniform Depth		Thin Forest		Dense Forest		Uniform Depth		Thin Forest		Dense Forest	
Snow Depth Inches	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density
10	3 84	38 4	3 89	38 9	3 42	34 2						
20	7 64	38 2	7 28	36.4	6 92	34 6			9 42	46 2		
30	9 65	32 2	10 56	35 2	10 44	34 8			11 71	39 0		
40	14 90	37 3	14 48	36 2	14 17	35 4	15 54	38 9	16 21	40 5	13 38	33 5
50	19 60	39 2	19 32	38 6	20 02	40 0	21 50	43 0	20 36	40 7	14 00	28 0
60	21 70	36 2	22 71	37.9	21 23	35 4	25 71	42 9	24 24	40 4	19 96	33 3
70	27 22	38 9	26 79	38 3	26 17	37 4	30 35	43 4	28 55	40 8	26 28	37.5
80	28 63	35 8	27 71	34 6	27 85	34 8	34 72	43 4	33 51	41 9	27.43	34 3
90	31 78	35 3	30 28	33.6	30 96	34 4	38 86	43 2	37 42	41 6	. .	. . . .
100	37.47	37 5	38 63	38 6	34 59	34 6	42 95	43 0	39 65	39 7	. .	. . . .
110	. .	. . . .	40 73	37 0	38.84	35 3	46 73	42 5	44 32	40 3	. . . . .	. . . . .
120	. .	. .	. .	. .	. . . .	.	51 44	42 9	49 71	41 4	. . . . .	. . . . .
130	. . . .	.	.	. .	. .	.	56 25	43 3	54 88	42 2	. . .	.
140	. .	.	.	. . . .	.		61 62	44 0	59 65	42 6	. . . .	. .
150	. . . .	.	.	. . .			66 76	44 5	62 00	41 3	. .	. .
160	. . . .	. .		. . . .	. .		72 06	45.0	65 86	41 2	. .	. . .

	April-May: 5000-7000 Ft.						April-May: 7000-9000 Ft					
	Open Country		Forested Country				Open Country		Forested Country			
	Uniform Depth		Thin Forest		Dense Forest		Uniform Depth		Thin Forest		Dense Forest	
Snow Depth Inches	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density	Water Content Inches	Density
10	3 75	37.5	4 10	41 0	4 52	45 2	3 73	37 3	4 57	45 7	4 13	41 3
20	8 84	44 2	8 18	40 9	8 29	41.5	8 16	40 8	8 21	41 1	8 58	42.9
30	13 75	45.8	12.25	40 8	10 69	35 6	12 19	40 6	11 74	39 1	12 00	40 0
40	17 93	44 8	16 08	40 2	17 06	42 7	18 38	46 0	16 50	41 3	17 50	43 8
50			20 37	40 7	21.32	42.6	22 11	44 2	20 60	41 2	19 92	39.8
60	. .		25 65	42 8	24 61	41 0	28 83	48 1	24 99	41 7	25 37	42 3
70			28 75	41 1	29 26	41 8	33 77	48 2	29 59	42 3	28 93	41.3
80	. . .	.	37 26	46 6	30 04	37 6	39 52	49 4	34 89	43 6	32 93	41.2
90	. .		41 09	45 7	36 06	40 01	43 08	47 9	39 99	43 8	38 04	42 3
100	. .		44 05	44 1	43 78	43 8	49 45	49 5	45 16	45 2	40 80	40 8
110	.		47 34	43 0			56 23	51 1	52 63	47 8	45 38	41 3
120	.		56 06	46 7			58 51	48 8	55 49	46 2	48 41	40 3
130							66 32	51.0	58 89	45 3	57 72	44 4
140	. .						67 26	48 0	64 66	46 2	59 65	42 6
150									66 23	44 2	65 01	43 3
160									70 84	44.3	74 97	46 9

TABLE II COMPARISON OF WATER CONTENT DETERMINATIONS OF SNOW AS MADE FROM SAMPLER MEASUREMENTS AND TABLES

(Entire Courses Only Are Compared)

	1913-14			1914-15			Feb.-Mar., 1915-16			April-May, 1915-16		
		Water Content			Water Content			Water Content			Water Content	
Stations	Depth	Sampler Meas	Computed from Table	Depth	Sampler Meas	Computed from Table	Depth	Sampler Meas	Computed from Table	Depth	Sampler Meas	Computed from Table
Summit				86 4	40 04	35 92	133 5	64 20	56 36	99 7	45 40	45 03
Ward Creek	100 3	53 02	49 60	94 1	43 17	45 04	139 8	67 52	61 66	111 4	58 90	56 94
Tahoe City	66 1	24 00	25 70	40.4	14 99	15 05	61 5	25 62	21 76	38 1	18 40	16 25
Sunnyside				46 2	18 26	17 85	69 5	27 03	26 60			
Blackwood	58 9	26 17	24 16	71 2	25 67	29 76	91 0	32 41	31 29			
Rubicon	143 9	63 07	63.89	95 4	35 72	38 92	55 3	22 14	20 93			
Mt Tallac	107 3	52 67	51 34	64 1	31.54	26 70A						
Mt. Tallac (9750 ft.)	146 5	68 83	69.67	70 0	31 36	28 29						
Mt. Tallac (8000 ft.)	134 2	65 92	68.46	73 7	35 54	31 16						
Lake Lucille				88 8	37 67	36 92				157 7	76 02	73 89
Glen Alpine	56 6	26 58	25 39	39 5	15 83	17 22				101 8	45 84	44 84
Bijou				27 8	9 01	8 94	41 9	16 01	15 17			
Zephyr Cove				25 1	9 11	8 07	41 8	15 96	15 57			
Marlette Lake				49 4	20 03	21 24	87 5	32 44	30 90			
Glenbrook				18 1	6 33	6 75						
Mt. Rose (9000-10,800)	99 9	48 12	48 65	58 0	24 56	26 91B	83 9	40 49	36 26*			
Mt Rose (9000-10,500)	70 5	32 55	32.40	51.6	20 98	22 62B	45 9	20 80	18 42*			
Mt Rose (9000 ft.)	90 8	46 40	42 35	56 5	25 06	26 15	102 9	49.56	46.58*			

A. Water running from the snow. B. Cornice, talus and timber.

* Measurements made Mar. 28. Consequently the average of the two tables for February-March and April-May was used.

pointer has an L-shaped head with graduations, so that fractional parts can be read with greater accuracy than by the ordinary arrow head. It has been objected that the core will be too small to permit of correct determination of its water content, but Mr. Church states that tests have shown it to be accurate within 1.1 per cent.

Tabular samplers of other designs, generally of larger diameter, have been used here and abroad, but the efficiency of the sampler described is indicated by the fact that it has been adopted by the Swiss Glacier Commission engaged in making studies of the glacial snows of the Alps. As the entire equipment, with a spring balance, tools and 21 ft. of sampler tube, weighs only 25 lb., it can be carried by two men even in rough country, while it has been carried by one man.

The range and the accuracy of the snow sampler are limited only by the spring balance, the accuracy decreasing proportionately as the range is increased. With a light sampler measuring only shallow snow, the balance might have a small range and be capable of recording water contents to 0.01 in. But for work in snow of 10- to 20-ft. depth the range must be 120 in. of water, which precludes measurements closer than 0.1 in. Professor Church suggests that this difficulty would be obviated by the use of a lever balance, if this could be made sufficiently light and compact. On the other hand, close refinement is necessary only for intensive study. In surveys over irregular ground, and where there is considerable variation in the depth of the snow, greater accuracy is obtained by a large number of measurements than by a small number of exact measurements.

Special Targets Facilitate Survey of Flood Works

By R. C. Chaney
Construction Engineer, River Channel Improvements, Columbus, Ohio

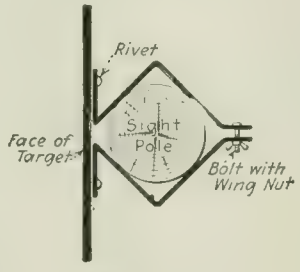
TWO special targets which proved especially convenient in making the surveys for the flood improvement work at Columbus, Ohio, were made of sheet metal on the job. The larger target, 10 in. square, was used on a sight pole held in a tripod, and the small one, a 3 x 8-in. hand target, was mounted on a marking pin. Both were painted on No. 12-gage galvanized iron, and had soldered at the intersection a wire loop from which to suspend a plumb bob for centering over the point.

The rod target was used principally on the triangulation work, and was very valuable, as it gave a fixed sight, accurately plumbed over the station at a height variable up to 9.5 feet when used with a 10-foot flag.

This was of great assistance in cases of obstacles such as low foliage, weeds, fences and levees. A rodman easily made the set-up, after a little experience, in one minute. The point of the flag was stuck into the ground about half a foot back of the station to allow the plumb line to clear the tripod head, and by the moving of the point to one side or the other the plumb bob was centered. When set, the instrument man was signalled, and the rodman, finding a shady seat, waited for his release to set up at the next station, or to orient the target to face the next transit set-up. Care was necessary to "line up ," or to place the vertical line of the target in the plane of the transit and plumb line. The target was attached to the flag by a clamp with wing nuts, riveted to the back of the target, as indicated by the drawing.



FLAG ROD AND MARKING PIN TARGETS



CLAMP FOR FLAG ROD TARGET

The hand target could be used with or without a plumb bob. The point of the pin was lined with the vertical line of the target and could be held on a tack or stuck into the ground for holding line or grade tilt.

Brick Water Conduit Gives Long Service

A brick conduit built in 1852 to convey water from Rensselaer Lake to the City of Albany, N. Y., is reported by Wallace Greenalch, commissioner of public works, to be giving good service after more than 65 years of use. It is built of brick, 8-in. shell, 3 x 4 ft. in size, egg-shaped, with the small end up, has a fall of 1 ft. per mile and is four miles long. William J. McAlpine was engineer for the new water-supply of Albany, introduced after the city bought out the Albany Water-Works Co. According to "The Manual of American Water-Works" for 1888: "The conduit was built in an embankment having foundations 42 ft. wide, slopes of 2½ to 1, top of bank 6 ft. wide and 9 ft. above grade line. After being in use a short time the conduit settled throughout its length, and cracks from 50 to 200 ft. long admitted quicksand and water, washing out the mortar in the arch. At other places large holes in the bottom allowed heavy leakage. The conduit was repaired and continued in use."

Impressions Here and There

Pittsburgh is an attractive stopping point for the seeker after news of municipal construction. It is a city whose public works are gradually transforming it from an area of steep and bare hillsides six hundred feet high into a habitable community with all modern conveniences. This is a carving-out process that is bound to go on rather slowly; even today the business district is connected with the east side residential zone by a scant half-dozen thoroughfares, and one of these was opened only a few years ago. Since there is so much to be done, however, Pittsburgh has always been unusually active in public-works construction: street improvements, bridges, extensive regradings, drainage and sewerage works.

Just now, however, any curiosity to learn what new things are going on in Pittsburgh is quickly satisfied. Walking up Grant St. you see no "hump cutting" operations such as were going on some years ago. There is no bridge construction in progress, in this city of hundreds of bridges. Little building work is seen. It almost looks as though things were waiting for clearer weather, financially and industrially. Fully three months ago the voters of the city passed a big bond issue, something like $20,000,000, for various public improvements, and it was the general expectation that the authorities would start work at once, so as to make use of the 1919 season. Yet there is nothing doing. A few small items are started, mainly little pieces of street work, but they do not show on the surface.

Status of Large Projects

Besides the city bond-issue work, there is the South Side tunnel and bridge project, undertaken by the county. Months ago it was announced that contracts for the tunnel would be let by October and work ought to be under way by now; but it seems that even plans for the tunnel have not yet been completed and approved, let alone designs for the bridge across the Monongahela that is needed if the tunnel is to be of any particular use, a bridge that is a very large undertaking in itself.

By far the largest item in the city's bond issue, the street-car loop subway, has been marking time ever since the vote was passed. Chief Engineer Sprague of the Public Works Department states that there is no use making plans or otherwise spending money on this project until a contract for operation can be made; that is, until the street railway company is out of its receivership. What if the receivership should be long continued?

There is, by the way, a most interesting situation surrounding the street-car loop subway matter. This subway scheme, it should be remembered, follows upon eight or ten years of scheming for rapid transit. The last preceding step in this planning was taken two years ago, when E. K. Morse, as city transit commissioner, worked out a plan for two combined subway and elevated lines running from the south side and north side respectively up to the east end. Now, however, comes Mr. Sprague and says that the city does not yet need rapid transit. Instead, he says, it is in very urgent need of better street-traffic facilities in the downtown district. And on the basis of this new view of the situation he has worked out the street-car loop subway.

Downtown Pittsburgh is small in area and has narrow streets, which in the rush hours are full to overflowing. Most of the street-car lines enter this small district, occupy the best part of the streets, and by their slow traffic movement while crowds are entering and leaving they largely create the condition of congestion. The situation is unique. Pittsburghers claim that no other city in the country has so acute a street-traffic problem, and observation tends to show that they are not far wrong. Something needs to be done if the necessary flow of downtown business is not to be hampered. Mr. Sprague's solution is the loop subway, and ejecting the cars from the streets.

But even this is not expected to be more than a temporary relief. Some years ago, in connection with the last hump cutting, the city widened several of the downtown streets. Still the streets of the district are much too narrow, and there is hardly a chance for more street widening on account of the tremendous costs involved, so that the business district will have to get along with the streets it now has. Expansion of the business district uphill, east from Grant St., is inevitable, yet it seems certain that for many years to come most of the business will be done on the flat, west of Smithfield St. When the increased street capacity obtained by removing the street cars has been used up there will still be more traffic than the streets can take care of in the long run, it is claimed. The final step, then, may be the removal of sidewalks and the construction of underground or overhead arcades for pedestrian traffic. This is a long look ahead, but they have taken that look in Pittsburgh.

Architects in Role of Bridge Engineers

There is some designing activity in connection with the necessary rebuilding of three of the county's bridges over the Allegheny River. This matter, however, is in a very peculiar condition, as at least two of the bridges have been turned over to architects to design and build. Just what an architect knows about bridges-- especially steel arch structures 400 or 500 ft. in span-- is not apparent, and from expressions of opinion of one or two engineers there would appear to be liklihood that the whole matter may develop into a little scandal, locally. The bridges involved are in every sense city bridges, serving city traffic, but the city owns them, having bought them from private owners some years ago, and therefore, being under orders of the War Department to provide more adequate navigation clearance, is proceeding to replace them by new bridges. The city authorities are interested not only in desiring to have the work handled with safety and with due observance of engineering principles and precautions, but also in that they must build

the approaches. It is generally agreed that the structures are of such magnitude as to constitute problems of the first importance, and that a high grade of engineering ability should be enlisted in their planning. There should be interesting news in this situation for the Engineering News-Record sooner or later.

While the two matters I have mentioned are the most interesting items of engineering thought just at present in Pittsburgh's municipal work, the fact remains that this community, whose construction work ought to be specially active just now, has practically nothing going on. The general psychology of uncertainty prevailing this season may be partly responsible, but in each individual case at least some of the delay is due to the time needed for getting out plans. Perhaps some of the blame ought therefore to be placed on lack of preparatory engineering work last year, the same thing that seems to be back of much municipal and industrial delay throughout the country. During the war Engineering News-Record repeatedly urged the duty of carrying on engineering preparatory work so that normal activity could be resumed after the close of the war without a dangerous idle interval. This advice seems to have been little heeded.

Oct. 15, 1919 Pittsburgh

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

HINTS ON APPLYING FOR A JOB BY LETTER

Sir-- Having had occasion during the past year to read a large number of applications for positions from engineers and would-be engineers, the writer has realized as never before the importance of care in the writing of an application.

Trained engineers should be better able to present their qualifications accurately and concisely than almost any other sort of applicant for a position, since their training is supposed to inculcate accuracy and conciseness. However, a scrutiny of a great number of applications, particularly those received since the war, reveals a great lack of these qualities. This may be partially accounted for by the fact that the war has produced a large number of "engineers" who did not know a transit from a level two years ago. These men naturally cannot make as good a showing with a tabulation of their experience as men of long service. But even among men who claim to have ten years' experience in engineering many omit to give a single detail as to where they have worked or from which school they were graduated.

A great many such statements as given below occur: "Graduate of a leading technical school"; "college graduate"; "three years in engineering course at college and five years' practical experience"; "two years as instrumentman and 15 months as head of party on railroad surveys"; "will send references if you wish them"; and many others just as uninforming.

If a man would think a minute he would realize that an employer would want to know the name of the school at which the applicant studied and that he would judge whether it was a leading college, etc. The employer should be able to form a mental picture of the applicant from reading his application, and the picture should be so nearly accurate that he will not receive a shock when the applicant appears in person later. In fact, it is well worth the trouble to send a recent photograph bearing a statement of the date on which taken.

Two items of the applicants' qualifications that are usually of considerable importance seem to be given more often since our war experience-- these are age and health. The information married or single is occasionally lacking.

There is also great variety in the manner of expressing confidence in one's ability to fill the position satisfactorily. It is not amiss to say something like, "I should do my utmost to give satisfactory service"; or "with my training and experience, I feel that I can satisfactorily handle the work involved in the position for which I am applying". But to say "I am sure that I am the very man for which you are looking" does not very deeply impress the employer.

It has been observed also that some of the men applying for position as draftsman wrote so poor a hand as to be almost illegible. Of course some allowance might be made for the old belief that lettering spoiled one's handwriting. But the more certain fact that poor lettering spoils an otherwise good drawing should not be overlooked.

Probably the most satisfactory application states, after an introductory sentence, the training and experience which fit the applicant for the position sought. Dates of employment and names of employers should be given, even though the period of employment has been brief. Age, height, weight, married or single, and condition of health should be given. Whether these are listed before or after statement of training and experience is a matter of choice, unless these items have received special stress in the advertisement for applicants, in which case they should, of course, come first.

It is remarkable how one's characteristics will show through even a brief letter of application. This is not so evident in applications filled out on printed forms. For this reason one should accompany such an application with a brief note emphasizing any valuable experience that has particularly fitted him for the position sought. A certain amount of self-confidence is a very valuable asset, but it should not be too evident in an application. Not many employers will admit, even to themselves, that they are seeking someone to come and show them how to run the business.

COLUMBIA, S.C. R. T. BROWN,
State Highway Department of South Carolina.

NATIONAL DEPARTMENT OF PUBLIC WORK VERSUS CORPS OF ENGINEERS

Sir-- You published in your issue of Sept. 18, on pp. 561-2, a communication from me under the caption, "National Department of Public Works vs. Corps of Engineers."

I have become aware of an error in that paper which I greatly regret. I gave the length of the continental and insular coast line of the United States and its dependencies as 48,881 miles, whereas the actual coast line, as given in the best authorities to which I have had access, is only 24,599 miles. I used the erroneous figures in a discussion of this subject six years ago, and I cannot now trace the error to its origin. The article under discussion has brought me very gratifying letters of commendation. It is also gratifying to learn through the statement made by ex-Col.Roger Black,Corps of Engineers, U.S.A., made on Sept. 17, at a meeting of the American Society of Civil Engineers, that the General Staff of the Army holds the view that the Corps of Engineers would be benefited if it were relieved of river and harbor work and so enabled to devote its whole time and thought to strictly military engineering.

I note that Colonel Black dissents from this view, as is natural, for, although he is no longer an integral part of the corps,he is loyal to its traditions and jealous of its prestige.

CHICAGO,ILL. ISHAM RANDOLPH
Consulting Engineer.

DOES RICH CONCRETE IN ROADS CRACK MORE THAN LEAN?

Sir-- The question and the answers on the above subject which appeared in "Engineering News-Record", Sept.11,1919, p.518, were published at a time when I was having several sleepless nights trying to determine the cause of the small cracks which were appearing in the two-course concrete pavement being laid in this city.

It is almost impossible to find in this part of the country good concrete aggregates suitable for pavement construction. However, the people of this city chose a two-course concrete using a 5-in. base of a 1:5 mix of a local pit-run gravel. The wearing surface is 2 in. of a 1:2:3 mixture of good, clean sand and traprock from Duluth, Minn.

The pit-run gravel contains a small amount of clay or silt which will pass a 400 sieve. The gravel is also unfit for use, as is shown by results obtained from the application of the colorimetric test. However, upon the strength of the fact that this material had been used as a base for a large amount of sheet asphalt, word was given the contractor that the material could be used.

The first use of the material since my coming to Bismarck was on concrete curb. The mix used was 1:4, laid in sections 10 ft. long. I noticed cracks developing in almost every section of this curb, some of them appearing even before the forms were removed, which was usually about three hours after filling.

I was positive the cracks were not due to a poor foundation nor to the concrete drying too rapidly. I decided they were due to an excess of fine material which actually increased in volume when wet and decreased rapidly upon drying. The following day I increased the proportion of gravel, using a 1:5 mixture. Only one crack developed on that day's run.

Since starting the actual laying of the paving, I have noticed a number of these shrinkage cracks appear in the wearing surface. At first I was at a loss to know why they should appear there, but have finally decided that they were caused by intermixing the two courses during a process of placing; and I have overcome this to a large extent by making the contractor mix the base course very dry and tamp it to place.

In conclusion I will say that I do not believe rich concrete will crack more than lean, providing the aggregates used are clean and coarse.

BISMARCK, N.D. B. H. TONG
Chief Inspector, Concrete Paving.

SATISFACTORY EXPERIENCE WITH BOLTED FIELD-CONNECTIONS

Sir-- In regard to the subject of bolted versus riveted field connection,dealt with in "Engineering News-Record" of Aug. 14,1919, p. 316, we wish to say that we have one important structure on the Chicago & Eastern Illinois R. R. which has bolted connections. This is the steel viaduct over the Kaskaskia River, just south of Shelbyville, Ill. The viaduct is 1400 ft. long and 85 ft.high. All of the tower bracing and the bracing in the 125-ft. truss span has bolted connections. The bolts are all turned bolts. This structure was built in 1896 and, so far as I know, there has never been a loose bolt found.

CHICAGO, ILL J. E. BERNHARDT
Bridge Engineer
Chicago & Eastern Illinois Railroad

Sir-- In regard to R. Fleming's article on "Bolted Field Connections," in your issue of Aug. 14, 1919, p. 316, the writer, looking at the question from the viewpoint of an erector, believes with Mr. Fleming that the advantages of bolted field connections over riveted connections in certain classes of work far outweigh any possible disadvantages.

While riveted field connections are the standard form of construction and always will be, so long as good rivets can be driven in the field, structures are often designed in which it is very difficult to drive good field rivets. I believe that a good bolt is superior to a poor rivet, and for all practical purposes is equal to the average field rivet. Unless all conditions are extremely favorable, it is hard to get a point of, say, 40 rivets tight; and every rivet cut out loosens one or more "tight" rivets, so that it is an endless job to get a tight point. The practice of riveting structural and cast steel together is decidedly wrong, and in such work a tight rivet is an accident.

There is no doubt in my mind that a field connection properly made up of turned bolts in reamed holes of the proper size is just as good as,if not better than, a riveted connection. A bolt can be drawn tighter with a wrench than a rivet can be drawn with a hammer, and the danger of stripping the threads can be controlled by limiting the length of the wrench handle. One of the best arguments in favor of bolts is that very frequently too much paint is applied to the surface of the steel before rivets are driven. The hot rivet burns the paint, and the result is very noticeable when connections are cut apart after several years. The burnt paint forms a powder which retains

moisture and causes corrosion of the rivet and plates at their points of contact. A painted connection fitted up with turned bolts, when cut apart, shows in good condition; even the color of the paint is very noticeable.

When long rivets are used in important work, the rivets should be "swell necked" or tapered in a reamed hole, as a long rivet will not upset in the hole from the side where it is held as it will from the driven end. The usual clearance in punched work is 1/16 in., and therefore the rivet, to fill the hole, would have to increase 1/16 in. in diameter throughout its length. If it did not do this it would not, theoretically, be a good rivet. As a matter of fact, a great many rivets which show no jar when tapped (because the rivet has shrunk tight) can be moved from 1/32 in. to 1/16 in. by a few blows from a 3-lb. hammer.

Field painted connections, improper heating, burnt rivets, poor air pressure and wornout tools are the principal causes of poor field rivets, while none of these enter into the quality of a field-bolted connection. Taking into consideration the extra costs of bolts and all other features, the cost is less on bolted work. If bolts are properly checked there is no more reason to inspect them after the initial inspection than there is to inspect rivets. I believe that a turned bolt in a reamed hole is superior to a field rivet, and that a field rivet in a punched hole is superior to a machine bolt in a punched hole.

In ordinary light mill buildings, for all practical purposes field bolts, while by no means the equal of field rivets in that they do not fill the hole completely, should be used more extensively than they are. It is much easier to get a good short rivet than a good long one; I would rather see turned bolts than rivets in long holes, and rivets rather than bolts in short holes. For mill-building work in general, particularly in concrete-incased work, I believe that ordinary machine bolts should be used more extensively. For bridge work and skyscrapers, however, I am of the opinion that turned bolts or rivets should be used. It is a waste of time and money to rivet purlins in roofs, small connecting beams in floor systems of buildings, and the intersections of cross-bracing or other isolated points having one or two rivets.

CHICAGO, ILL. W. L. KELLY,
President,
Kelly-Atkinson Construction Company.

AREA EFFECTS IN SOIL-BEARING TESTS

Sir-- The article entitled "Test of Sandy Foundations at Arch Bridge Pier," in your issue of July 31, 1919, p. 208, is very interesting and the writer feels that the desirability of making such tests should be more widely recognized by engineers at large. It is only in this practical way that the profession can hope to add to its fund of knowledge concerning the bearing value of soils. Chemical and laboratory tests throw little light on the subject, geological considerations are valuable on very large and a few special foundation designs, and theory is good to interpret and codify results; but actual test under working conditions is "the thing."

The settlement of a foundation under load is the result of three principal soil movements: (1) Vertical compression of the soil under the footing; (2) horizontal compression of the soil outwardly from the center of the footing, and (3) movement of the soil in mass outwardly from under the footing by lifting the soil around the outside of the footing.

Small footings and tests are likely to show lower unit values than would be shown by footings with larger areas, since the soil has a better chance to move out from under them by the lifting of the surrounding soil. In the test described in the above-mentioned article, however, the reverse is the case; the small test area was taken near the center of the already constructed pier footing so that there was practically no chance of lifting action of the soil around the outside of the test area. It is reasonable to believe, therefore, that the average bearing value of the soil under the pier as a whole will be somewhat less than that shown by this test

NEWPORT NEWS, VA. HUNLEY ABBOTT.

TRAVERSING BY THIRTY-FIVE MINUTE ANGLE METHOD

Sir-- Referring to an article entitled "Traversing by a Thirty-Five Minute Angle Method," by John H. Sawkins, in your issue of Aug. 21, 1919, p. 373: Mr. Sawkins has presented a novel and useful method of measuring traverse lines or similar distances approximately. However, if a great deal of this work is to be done, considerable time may be saved and a greater accuracy obtained by the use of vertical stadia-hairs.

The procedure is the same except that the spacing of the hairs in the telescope directly lays off the required 35' angle. Thus the time and error of setting the angle are eliminated. The transitman sets one stadia hair on the front flagpole, then lines in the front flagman in line with the second stadia hair, the flagman keeping the crossline as nearly as possible perpendicular to the line being measured. The cross distance is then measured, and its length multiplied by the stadia ratio (should be 1:100 for convenience) gives the length of the line in question.

Men on geological surveys have used their wye-levels for this work, the telescope being turned in the wyes to bring the horizontal stadia hairs into a vertical position. The only limit on the distance that can be measured is the limit on the distance that a flagpole can be set. The method has proved successful on distances up to 8000 feet.

CHAMPAIGN, ILL. C. B. SCHMELTZER.

PAYING FOR WATER-MAIN EXTENSIONS AT BRISTOL, CONN.

The cost of water-main extensions at Bristol, Conn., in excess of what is estimated to yield a revenue of 10%, will be assessed on abutting property owners hereafter, in accordance with a recently adopted amendment to the city charter. When a property owner who has not been taking water, and who has paid an assessment, connects with the water main the assessment will be refunded "or as much thereof as the assured income shall be 10% of." Assessments for mains, the cost of replacing services or laying new services, and all charges for water, are made a lien on the real estate supplied with water. Charles L. Wooding is chairman of the Bristol Water Board.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

TRACTION STEAM SHOVEL TAKES RAILROAD BRIDGE FOR SHORT CUT

BY H.P.J.EARNSHAW

Boston, Mass.

Due to a big bend in the Merrimac River at Nashua, N. H., a roundabout journey of a mile through the city streets was required to transport plant from the railroad yard where it was unloaded to the Jackson Mill job. However, a railroad bridge provided a direct



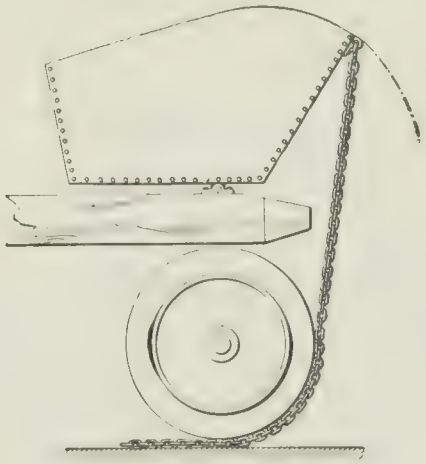
Shovel Crosses 200-Foot Bridge in 15 Minutes

shortcut from the yard to the job. In spite of the 40-ft. drop from the top of the rail to the bend of the river, we took a chance on derailment and wreckage, and crossed the bridge, running with our broad-tired wheels on the top of the two inside rails of the double track. The shovel was held rigidly in line on the rails and crossed the 200-ft. bridge in 15 minutes.

CHAIN TILTS AND DUMPS TRUCK BODY

Motor trucks with gravity dump bodies employed in hauling wet concrete for road construction on a contract in Illinois are successfully dumped with little loss of time by means of a 10-or 12-ft. chain with a hook at one end. These bodies carry 2 cu. yd. of wet concrete and are designed to dump by gravity when the holding-down tie is cast loose. With a load of wet concrete the center of gravity of the mass is not that computed for loose materials, and the point of rotation is wrongly placed for the body to dump without aid.

To overcome the difficulty, as the truck backs up to dumping position the chain is hooked over the edge of the body, as shown in the illustration, and the free end is thrown under the truck wheel. As the vehicle moves backward the chain winds under the tire and pulls down on the body until it tips to dumping position. The operation is performed so quickly that practically no time is lost in backing up to dump the load. This device was



Wheel Winds Up Dumping Chain.

worked out by The Embankment Co., Joliet, Ill., contractor, on road construction near Grant Park, Ill.

GAGE GLASS ON BARREL MEASURES WATER FOR CONCRETE

A barrel fitted with a gage glass, and having a dozen gimlet holes into which to insert a marking nail, provides a water-measuring outfit for a concrete mixer. The device has been found both accurate and flexible in use on the concrete-road construction of the Embankment Co., near Grant Park, Ill. In operation, the barrel is filled until the water in the gage shows opposite the marking nail. The barrel is filled and emptied for



Barrel With Gage Glass Measures Water for Concrete

each batch. The concrete is being mixed for road work according to the Illinois Division of Highways' specifications, which require such variation of the water content as is needed to keep the consistency constant. The barrel and gage-glass outfit has met the conditions satisfactorily. If the mixture runs a trifle stiff or too thin, the nail is shifted one or more holes up or down, until the adjustment is correct.

MATERIAL UNDER PIERS REMOVED BY JETTING WITH HYDRAULIC DREDGE

By R.W.Beuttenmuller

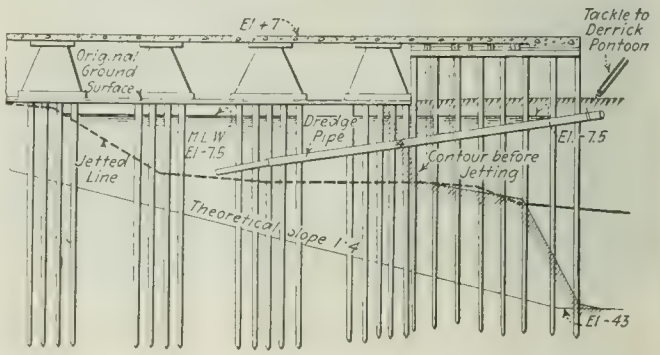
Great Lakes Dredge & Dock Company

On the Philadelphia Quartermaster Terminal, a war construction job, the progress mapped out required the dredging, piledriving and construction of the piers to be carried on simultaneously. This resulted in a condition that prevented the dredging of slopes under the piers in the slips. Due to the fact that the piers were designed to carry warehouses, the number of piles was large and required close spacing, thus preventing the material from caving and forming a natural slope. It was necessary, therefore, to remove the material from under the piers to a slope approximately the natural slope of the material, so as to relieve the pressure on the piles.

Various methods were tried to remove this material, without success. The writer then suggested that a hydraulic dredge be used to jet the material from under the piers. The dredge was placed in the center of the slip parallel to the length of the piers, with one pontoon and elbow astern and two pontoons across the slip connected to the elbow, the last pontoon being a derrick pontoon made up of two separate pontoons, so arranged as to permit the pontoon pipe to be raised and lowered, the pivot being at the first sleeve from the elbow. On the end of the derrick- pontoon pipe were connected two shore pipes with a reducer, reducing from 15 to 10 in. A tackle block was connected from the derrick pontoon to the pier. This outfit is illustrated in the photograph.

The method of procedure was as follows: The pipe was lowered at the edge of the pier to the depth previously dredged in the slip, and the dredge pump was started up. The action of the water caved the material ahead of it for a distance of 20 ft. in fairly soft material consisting of sand and mud, with a little gravel. After the required depth was obtained at this point, the pipe was raised sufficiently to clear it from the ground. The dredging pump was stopped, and by means of the tackle connected to shore the pontoon was pulled in towards the pier until the end of the pipe struck the bank, then the previous operation was repeated, until the natural slope was approximated. The tackle was then slacked off, and, due to the velocity of the water and the elbow, the whole pontoon line backed itself out slowly, at the same time cleaning the bottom of any material that might have caved in back of the pipe. Then, by means of quarter lines, the derrick pontoon was pulled ahead along the slip, and the operation was repeated between the next bents.

The bents on the piers were spaced on an average of 6 ft. apart, and jetting was carried on between each pair of bents. The dredge advanced itself in the ordinary way, by



Typical Section, Showing Result of Jetting

means of spuds and swinging wires. The swivel elbow permitted the jetting of a distance of 60 to 70 ft. along the length of the pier before it was necessary to move the dredge.

A typical cross-section of the result of jetting is shown. In the photograph the pipe has been raised to the level of the water in order to have it appear in the picture.



Arrangement of Dredge, Pontoons and Pipe with Relation to Pier

NEWS OF THE WEEK

New York, October 23,1919

This Week's News

This issue carries news current for the week ending Nov. 26. It is dated Oct 23 to preserve the sequence of numbers in the volume.

PAVEMENTS AND SANITATION MAIN TOPICS OF CONVENTION

American Society of Municipal Improvements in Meeting at New Orleans Shows Growth in Membership-- Extensive Technical Program

Registrations at the twenty-fifth annual meeting of the American Society of Municipal Improvements at New Orleans, Nov. 11-14, numbered 280. A large percentage of these, both among the municipal engineers and the liberal representation sent by the supply men, were members of the American Society of Civil Engineers. As usual, paving and road topics dominated the program.

The total membership on Nov. 14 was 570. The cash balance on Oct. 1 was $268,in addition to $1500 of Liberty bonds. Officers for 1919-20, as recommended by the nominating committee,were elected as follows: President, George H. Norton, Buffalo; vice presidents, R. Keith Compton, Baltimore; E.S.Rankin, Newark, N. J.; W. W. Horner, St. Louis. Charles C. Brown, Valparaiso, Ind., was re-elected secretary, and Fred. J. Cellarius, Dayton, Ohio, treasurer. The next meeting will be held at St. Louis, about the first week in October.

A resolution was adopted endorsing a national highway system but avoiding endorsement of any of the bills to that end now before Congress. No action was taken on the proposed Federal Department of Public Works, although a paper outlining and advocating the plan proposed by the Engineers', Architects' and Constructors' Conference on National Public Works was read by Prof. W. B. Gregory, Tulane University, New Orleans.

A plea for a consideration of the human as well as the technical relations of the engineer was a feature of the presidential address of E. R. Conant, Brunswick, Ga., who added that the importance of an engineering society's dealing with other than technical matters is shown by the rapid growth of the American Association of Engineers.

Townsend Bill Discussed

In connection with an outline of the Townsend bill for a national highway system and a Federal highway commission, S. M. Williams, Washington, D. C.,said that amendments to the bill have been proposed increasing the membership of the commission from 3 to 5, to meet a widespread demand. Another suggested amendment provides for two to four roads across each State in place of improving 4% of the road mileage, since the latter plan would give some eastern states many cross-state roads and hardly provide two such for some western states.

How far short the present Federal aid plan comes of meeting the needs of the country, Mr. Williams said, is shown by the fact that of the large total sum of money made available only a small percentage has been expended,owing to delays of the states in matching the Federal allotments. Another argument for a national system of highways urged by Mr. Williams was the fact that because of niggardly salaries paid to engineers in state highway departments the position generally is regarded only as a stepping stone. An engineer for 2000 miles of railways,Mr. Williams said, is paid five times as much salary as a state highway engineer.

(Concluded on page 778)

ENGINEERS DISCUSS RAILROAD NATIONALIZATION

Strong Sentiment Against Government Ownership and Operation

Strong sentiment against government ownership and operation of railroads was expressed at the meeting of the American Society of Civil Engineers in New York City, Nov. 19,when a paper by Col. W. J. Wilgus, proposing a plan for private operation under government ownership, was followed with discussion by Ivy L. Lee,formerly executive assistant to the president of the Pennsylvania R. R., representing the Association of Railway Executives, Col. F. A. Molitor, B. H. Bryant, Charles Hansel, and W. G. Besler, president, Central Railroad of New Jersey. The plan proposed by Colonel Wilgus was that outlined in an article by him in "Engineering News-Record" Sept. 11, 1919, p. 496, providing for government ownership but for operation under a system of competitive leasing to private companies. Exception was taken to the plan by all of the other speakers on the program. Colonel Molitor's statement that he considered government ownership now a dead issue was received with applause but none of the speakers who followed believed that the subject could so readily be discussed.

Colonel Wilgus emphasized the need for a clearer understanding of the term "Nationalization," as drawing a sharp distinction between ownership and operation. While private ownership and government operation have proved a failure, it would be preferable, he believes, to have government ownership with private operation rather than a "camouflaged" private ownership with government guarantees necessary to protect the owners of railroad securities. The system would be much less complicated, as the owners of securities would receive dividends from the Government, in the form of interest on government bonds, and the properties would be leased to private operating companies.

Mr. Lee said that he would find no objection to Colonel Wilgus' plan were it not for the fact that the railroad system of the country is as yet unbuilt, since no means are provided in the plan to attract the necessary capital for intensified railroad development. He pointed out that there is 260,000 miles of main track in the country, only 29,000 miles of double track, 2700 miles of three track, and 2100 miles of other track--- at an average cost of $78,000 per mile. In contrast the average cost per mile of track in Belgium is $216,000, and in England $275,000, showing the possibilities and the need for intensified railroad development in this country. Under the plan proposed by Colonel Wilgus it would be difficult to place responsibility for the authorization of betterments and additions.

Public's Confidence Needed

The upbuilding of public confidence in the private railroad managements was cited by Mr. Lee as the crux of the entire problem. He pointed out the dangers of the propaganda being spread broadcast by advocates of the Plumb plan,and of statements, not founded on fact, made to audiences wholly unacquainted with the subject. The opinion now seems to prevail that railroad investors have not the same rights for unrestricted returns as investors in other businesses. With a reasonable degree of regulation, railroads should have the unrestricted right to make all the money they can, according to Mr. Lee. He defined the Plumb plan as not a specific proposition but rather a "play for position"---- the aim appearing to be service for the sake of service and a share in management and profits by the employees. This would not stand against the fact that the whole purpose of a final settlement should be the best service at the least cost.

Colonel Molitor opened his remarks with the statement that he considered government ownership and operation a dead issue, basing this opinion on personal experiences on a recent trip in the West on which he found a practically unanimous sentiment against government ownership and operation on the part of individuals as well as the country press. He thought the Plumb plan could be dismissed but that Colonel Wilgus' plan must be answered. Such a plan would be satisfactory in

respect to protecting securities but it would not be possible to get bidders to operate the railroads. There would be danger of more or less universal public ownership.

The Esch bill and the Cummins bill were briefly analyzed by Colonel Molitor in whose opinion the establishment of a Transportation Board, under the Cummins bill, would be a wise provision and that the valuation should be transferred to such a board. If a rate of return is to be guaranteed, it should be a variable rate according to current interest rates to be named by the Federal Reserve Board. The anti-strike provisions of the Cummins bill should be pushed to the limit. He favored Federal incorporation, provided by the Cummins bill, since it removes railroads from state control. Colonel Molitor closed his remarks with the suggestion that members of the American Society of Civil Engineers, in a personal way, should further either of these bills--preferably the Cummins bill-- to the utmost.

B. H. Bryant spoke of his experiences in foreign countries and his observation of the results of government ownership. He pointed out the wasteful conditions in Brazil brought about by an old law, which still stands, providing a guaranteed return on a maximum expenditure per mile of line. Germany, which operated its railroads practically on a military basis, was the only foreign country which had really made a success of government ownership.

While fundamentally opposed to any form of government ownership, Charles Hansel emphasized the importance that the physical valuation bears upon the whole railroad question. It is the plan of the Interstate Commerce Commission to fix values as of June 30, 1914, deducting for depreciation, and from then on to the final date of valuation to add the cost of improvements. This Mr. Hansel considered absolutely unfair.

Mr. Besler described present tendencies toward nationalizing railroads as a form of socialism, which term he defined as the "science of envy", and which has always followed in the wake of great disasters and upheavals. He disagreed with the opinion that the proposition of government ownership is dead.

NEW INDUSTRIAL BOARD NAMED BY PRESIDENT

The personnel of the new industrial board, named by the President to work out a program for the adjustment of differences between capital and labor, after the failure of the first National Industrial Conference, was announced Nov. 20. The new board consists of:

William B. Wilson, Secretary of Labor.
Thomas W. Gregory, former United States Attorney General.
George W. Wickersham, former United States Attorney General.
Herbert Hoover, former Food Administrator.
Oscar S. Straus, former Secretary of Commerce.
Henry M. Robinson, Pasadena, Cal.
Professor Frank W. Taussig, former Chairman of Tariff Commission.
Samuel W. McCall, former Governor of Massachusetts.
Martin H. Glynn, former Governor of New York.
Henry C. Stuart, former Governor of Virginia.
Dr. W. C. Thompson, President of Ohio State University.
Richard Hooker, publisher of The Springfield Republican.
George T. Slade, formerly Vice President of Northern Pacific Railway, St. Paul, Minn.
Julius Rosenwald, President of Sears, Roebuck & Co., Chicago.
Owen D. Young, lawyer, New York City.
H. J. Waters, President of Kansas Agricultural College, Manhattan, Kan.
Stanley King, lawyer and manufacturer, Boston.

Unlike the first conference, the new body will not act as representing distinctive groups but will act in the interest of the country as a whole.

PITTSBURGH STREET-CAR LOOP SUBWAY CONDEMNED

A report rendered to the mayor and council of Pittsburgh on Nov. 22 by E. K. Morse, city transit commissioner, advocates abandoning the project of building a street-car loop subway through Grand and Liberty Streets and Second Ave. The subway would cost $6,000,000, according to estimates made last spring. A bond issue for its construction was approved by popular vote several months ago. Mr. Morse, who two years ago recommended that a rapid-transit system comprising two intersecting lines to the East End be built by the city, proposes using the bond-issue money for constructing the Grant St. and Diamond St. parts of these lines.

PROPOSED BRIDGE-INSPECTION CONTRACT IN PORTLAND

(Special Dispatch to Engineering News-Record)

Portland, Ore., Nov. 23, 1919-- Bridge-maintenance inspection under a fixed contract is under consideration by the commissioners of Multnomah County. Strong feeling has been aroused among Portland engineers by the proposed action and the matter is at present one of the main subjects of discussion in professional circles.

On account of the bad condition of the Burnside and Morrison Street bridges, which with other Willamette River bridges are maintained by Multnomah County, the commissioners asked the engineering firm of Harrington, Howard & Ash of Kansas City to submit a proposal for inspecting the old structures and designing new ones. The firm proposed a contract for semiannual inspection of all bridges at a fee of $500 per year, the service to include report on the physical condition of the structures, advice as to necessary traffic restrictions and preparation of plans for any reinforcement that might be required. When renewal of a bridge was recommended or contemplated, the engineers would make preliminary surveys, sketches and cost estimates additional charge unless the bridge was built, in which case a fee of 5% of the final construction cost was to be paid them, to cover all engineering and inspection charges. The proposed South Portland bridge was to be an exception to this arrangement; the preliminary engineering for this structure was to be compensated for at a price to be agreed on, if construction were not undertaken.

Objection was made to this proposal by the Oregon chapter of the American Association of Engineers, which claimed that competent bridge engineers could be found among the local men. In answer to the county commissioner's request for names of local bridge engineers the following were suggested: Samuel Murray, chief engineer O.W.R.R. & N.C.; C. H. Purcell, District Engineer, U.S. Bureau of Public Roads; and R. E. Kremers, chief of the city's Bureau of Construction.

No appointment has been made to date. The state highway department is inspecting the old bridges and will recommend repairs or replacement. It is thought likely that an engineer may be selected after the referendum vote on a bond issue to build the new bridges.

TRAFFIC ASSOCIATION DISCUSSES TRANSPORT PROBLEMS

Problems involving the use of highways by motor trucks; tests being made as aids to design of highways to carry heavy truck traffic; requirements of road surfaces to sustain heavy traffic; and effect of truck upon waterbound macadam and gravel roads, occupied most of the attention of the North Atlantic Division meeting of the National Highway Traffic Association, held at the Automobile Club of America, New York City, Nov. 7. Professional papers were read by A.T.Goldbeck, testing engineer, U.S. Bureau of Public Roads, on "The Present Status of Impact Tests on Roadway Surfaces;" W. G. Thompson, state highway engineer of New Jersey, on "Motor Vehicle Traffic Which Requires the Use of Cement-Concrete Foundations;" and by C. W. Reid, manager, Transportation Bureau, Federal Highway Council, on "Relation of the Motor Truck to the Railroad." In addition, information as to effects of intensive truck traffic upon gravel and waterbound macadam highways was supplied by Col. W. D. Sohier, state highway commissioner of Massachusetts.

In his discussion of the type of pavement to be used to sustain motor truck traffic, Mr. Thompson asserted that of all types yet developed, cement-concrete is the only foundation material capable of standing the strain for any appreciable length of time. Mr. Thompson declared that in view of the increasing use for freight transportation of the motor truck one could not assume that a road, once hard surfaced, was to be used solely by light motor vehicles, except in isolated rural districts. In addition, he said that design of hard-surface paving should take fully into account the traffic developments, both as to numerical, weight and dimensional increase, and that the future rather than the immediate present should be regarded in design and construction. Quoting figures from the Service Recorder Co. of Cleveland, Mr. Thompson stated that motor trucks had increased in number approximately 1,000% in the years 1912-1918: the increase being approximately 90000 per year, making the average annual investment, based on an average cost per motor truck of $3,500 of $315,000,000. In view of such an immense expenditure in trucks, Mr. Thompson is convinced that in the Middle and North Atlantic States between Norfolk, Va., and Portland, Me., no interurban highways should hereafter be built having a width of hard pavement less than 20 ft. for two lines of traffic; that graded widths for

two lines of traffic should be not less than 30 ft.: that right of way on all main highways should be 60 ft. or more; that foundations should be nothing but the best concrete obtainable, not less than 8 in. thick if other types of surfacing are to be used. Painstaking care should be exercised to provide adequate and permanent sub-foundation drainage facilities. He advocated the greatest length of visibility possible on curves to insure safety. He recommended that highway bridges be designed for not less than 20-ton loading, assuming that 75% of the load is carried on the rear axle.

The present status of impact tests, a review of which will be found in "Engineering News-Record," Sept. 18, p. 573, was explained by A. D. Goldbeck, engineer of tests, Bureau of Public Roads. His talk included an explanation of the methods used by the Bureau of Public Roads to determine motor truck wear upon different types of pavements with varying foundations. The particular feature in Mr. Goldbeck's discussion was his assertion that in the future he believed roads should be designed, not according to the gross tonnage of trucks, but according to the impact produced by unsprung weight.

It was the contention of Col. W. D. Sohier, state highway commissioner of Massachusetts, that waterbound macadam or gravel roads, if given proper surface treatment, would stand up under heavy motor-truck traffic if not more than from 100 to 150 motor vehicles a day made use of such roads. In instances where roads are constantly used by heavy traffic not even constant oiling and patching will make waterbound macadam and gravel roads, such as have been used by truck traffic emenating from army cantonments, stand up. Colonel Sohier cited the instance of one macadam road which, prior to the war, had required not more than $500 per mile per year in maintenance, but with the advent of the army trucks demanded constant attention and an average maintenance cost of $2500 per mile.

NAVAL ARCHITECTS AND ENGINEERS TELL OF PROGRESS IN SHIP BUILDING

Several new features of progress in ship construction were brought out at the annual meeting of the Society of Naval Architects and Marine Engineers in New York City, Nov. 13, 14. As at previous meetings the proceedings were about equally divided between the structural and mechanical phases of ship building.

The efficiency of a shipyard is less dependent upon plant layout than upon other factors, the principal one of which is personnel, according to the conclusion of Capt. R. E. Bakenhus, U.S.N., in a paper on the engineering features involved in efficient plant designing. From a mass of data concerning the operation and layout of the Emergency Fleet Corporation's many yards he obtained values for the several factors of hull construction and outfitting, which were shown as curves. The best producing yards, however, failed to show the most consistent layout factor curves, indicating the important part played by personnel and management.

A paper by Creighton Churchill dealt very largely with management and personnel, particularly in the phase of man-efficiency. The following deductions were made: (1) For a given man-efficiency there are a certain definite number of ways and a certain building program that will result in minimum costs; (2) As man-efficiency increases costs decrease according to a diminishing ratio; (3) The lower the man-efficiency, the greater the number of ways and the longer the building program necessary to secure most economical construction. In answer to questions Mr. Churchill asserted that the average overhead expense in a plant had been found to be about $1000 per ship per day, and that the ratio of material, labor and overhead was approximately 2:2:1 for steel ships. It has additional interest when compared with the ratio of approximately 33:44:23 as given for reinforced-concrete ship construction in a paper on that subject by R. J. Wig, former head of the Concrete Ship Division, Emergency Fleet Corporation.

Launchings in Restricted Areas

The use of wire rope cables and friction brakes to arrest a launched ship in a limited floating area and a series of subsequent experiments have demonstrated that the coefficient of friction on wire rope is 0.24, according to a paper on ship launching in restricted waters by Capt. H. M. Gleason, U.S.N., and Lt.Commander H. E. Saunders, U.S.N. The launching of three 4000-ton ships at the Mare Island Navy Yard and their stopping within 444 ft. by wire rope cables and friction brakes led to tests with a similar apparatus developed for the launching of the battleship "California". The resulting coefficient of 0.24 is 300 per cent of the 0.08 given by A. Hiley in 1917.

That the slow-speed ship is the money-earning ship sums up the conclusions of a paper read by A. J. C. Robertson. His calculations demonstrated that at a speed of 10 knots, a 400-ft. ship gives practically the best earning size that can be designed, while 450 feet is the maximum economical length for a speed of 11 knots. It was also shown that the earnings of a 350-ft. ship at 13 knots will be doubled when reduced to 10 knots.

A paper favorably comparing the Isherwood (longitudinal framing) system of ship construction with the transverse system drew out a considerable amount of discussion from partisans of both. No important facts were introduced, nor were there any brought out in a somewhat acrimonious discussion concerning the relative merits of the twin beam air pump and the air ejector for turbine condensates. This discussion, characterized by the chairman as a "pump war" followed a paper on high vacuum apparatus.

A.A.E. MEETING ENDORSES GENERAL LANGFITT AND DISCUSSES FREIGHT PIER DESIGN

Resolutions advocating the appointment of Col. (lately Major General) Wm. C. Langfitt to the office of Chief of Engineers, U.S.A., in place of Major-Gen. Wm. M. Black, retired, were passed by the New York chapter of the American Association of Engineers on Nov.12. Copies of the resolution have been sent to the Secretary of War and the chairmen of the House and the Senate committees on military affairs. The meeting also endorsed the Townsend bill for establishing more efficient cooperation in highway construction on the part of the Federal government.

Zenas W. Carter, secretary of the Material Handling Machinery Manufacturers' Association, delivered an address on needed improvement in terminal planning, under the title "Design Foresight and Mechanical Handling". Showing the remarkable advantages in efficiency and economy gained at the Brooklyn army base, at the Cincinnati railroad freight terminals and at the new Pittsburgh freight station by provision for mechanical handling, he discussed the proposed plans of New York City for new piers on Staten Island in critical manner. Planned to be 125 ft. wide by 1100 ft. long, these twelve new piers, Mr. Carter stated will be too narrow to permit of efficient mechanical handling. He urged that they be made wider, built strong enough to carry cranes in future, and equipped with a double-track railway line along the sides to permit of transferring freight directly between car and ship, and he strongly opposed the attitude of the Merchants Association against planning the piers for other than present freight-handling methods.

WHIPPLE AND LONGLEY TO HEAD RED CROSS DIVISION OF SANITATION IN SWITZERLAND

American engineers will head the newly created Division of Sanitation of the Bureau of Hygiene and Public Health of the League of Red Cross Societies, the international organization which will perpetuate and expand the post-war activities of the Red Cross organizations throughout the world. Prof. George C. Whipple of Harvard University, and Col. F. F. Longley, of the firm of Hazen, Whipple & Fuller, consulting engineers of New York, have been selected respectively as director and associate director of the new sanitation division, with headquarters in Geneva, Switzerland. Col. Longley before sailing for France Nov. 29 on "La Savoie" outlined the new work:

The international Red Cross organization of which the sanitation division is a part, is provided for under paragraph 25 of the League of Nations covenant. The division will be, in effect, an international department of health. For the present, at least, its chief problems will be of an educational nature and its activities will be directed towards those countries which are now most backward in matters of sanitation. The scope of the work will be large. Its engineering features will include public water supplies and purification, sewerage and sewage treatment drainage, mosquito prevention anti-typhus campaigns-- in fact everything which is understood to be in the field of sanitary engineering. One of the division's most important duties, however, will be relief work in time of great disasters, such as floods, fires, or earthquakes.

The division's activities, of course, must be carried on with the full cooperation of the country when its work is undertaken. The first real problem will probably be a number of sanitary surveys by field parties made up for the most part of local personnel.

Prof. Whipple will join Col. Longley in Geneva early next year.

PAVEMENTS AND SANITATION MAIN TOPICS AT CONVENTION

(Concluded from page 775)

In the course of an extended review of "Roads in France and America", Major Edgar A. Kingsley, San Antonio, Tex., urged that disinterested engineers rather than promoters of the use of cement decide whether old macadam shall be used as a base for more permanent surfacing. Supplementing his paper on "Recent Developments in Concrete Highway Construction", A.N. Johnson, Chicago, called attention to threatened difficulties in connection with the immense road program for 1920. It is estimated that 125,000,000 tons of highway material will be required in open cars during the year. It is evident that plant capacities will not be enlarged to meet the demand for material unless owners can see a prospect of railway facilities to move the material. Unless more transportation facilities are provided not more than half of the needed road material can be moved. New capital for railway equipment should be provided without delay.

In a paper on "Mineral Aggregate for Bituminous Material", Wallace L. Caldwell, Birmingham, reviewed the essential qualities for sand, broken stone and gravel, in the light of studies made at the Birmingham branch of the Pittsburgh Testing Laboratory. Too many people think that the main risk in bituminous pavements lies in the binding material. Hundreds of specifications are written yearly that show a lack of knowledge of the essentials of aggregates.

Resilience was placed before strength in a paper on "Foundations for Warrenite Pavement, and Roads", by George C. Warren, Boston, particularly where the subgrade material is good. There are millions of yards of macadam that would make good bases for roadways if strengthened in places, Mr. Warren said, and yet efforts are made to waste instead of utilize this macadam. Where old macadam is used tests of its integrity should be made immediately before resurfacing, preferably by complete cross-cuts rather than test holes.

A plea for research work on soils and soil moisture in relation to pavements was a notable point in a paper on brick pavements by Will P. Blair, Cleveland, Ohio. Major E.A. Kingsley, San Antonio, commended Mr. Blair for changing from disapproval to approval of asphalt filling for joints in brick pavements and for easing up on his demands for concrete base. The methods of manufacture and the advantages of vertical fiber brick pavement were presented by C. R. Mandigo, Kansas City. This type of paving brick now makes up 99% of the output between the Mississippi River and the Rocky Mountains and has been adopted as a standard by the National Paving Brick Manufacturers' Association. No lug or joint separator is used.

A financial problem connected with worn-out pavements at Norristown, Penn., was submitted by S.C. Corson, of that city. Brick pavements paid for with 30-year bonds need renewal, all before and some long before the bonds fall due. Should the resurfacing be paid for by another bond issue or by assessment against the abutters? George H. Norton, Buffalo, N. Y., suggested, and others seemed to agree, that since the cost of the original pavements was borne by all the taxpayers it would be just to assess the cost of resurfacing on the abutters, especially as they have never paid an assessment for paving. W.W. Horner, St. Louis, said that the Association of Engineering Societies of that city recently recorded itself against a proposed $1,000,000 bond issue for renewing pavements.

City Waste Reclamation

At the conclusion of a review of city waste reclamation, S. A. Greeley, Chicago, stated that where possible garbage disposal should be considered with a view to recovering valuable constituents, but the lure of profit should not be allowed to overbalance the comfort and convenience of householders. The economic value of garbage, and of other classes of city refuse, must be weighed against cost of collection, plant cost, annual and operating charges of the utilization plant.

Sacrifice of efficiency in order to reduce operating costs is no object in the Miles-acid process of sewage treatment, said E. S. Dorr, Boston, in a paper on that process, because to cut the treatment lessens the revenue from the grease and fertilizer produced. The acid process, Mr. Dorr said, is the only method of sewage treatment that recovers grease from sewage, and the grease in sewage has double the value of the fertilizer. The author believed that sludge drying alone, rather than pressing and drying, would be preferable.

After reviewing sewage utilization possibilities at some length in a paper on "Economic Values in Sewage and Sewage Sludge", Raymond Wells, of Homer, N. Y., expressed the hope that grease extraction might yield a small margin of profit. A lengthy paper reviewing five years of sewage experiments at Brooklyn was presented in abstract by George T. Hammond, New York City. If the project for a 30-ft. channel in Jamaica Bay is carried out two additional Riensch-Wurl screens at the 26th Ward plant may be all the treatment needed, on account of the large volume of diluting water that would thus become available.

A number of lantern-slide papers on war engineering work in the United States were presented.

Morris Knowles, John M. Rice and E. O. Rose presented a paper on the housing scheme known as Loveland Farms, for the Youngstown Tube Works, Ohio.

Reports of Committees on Specifications

Most of the many standing committees on specifications reported either no recommended changes or else only minor alterations. The Committee on Cement-Concrete Pavement, Wm. A. Hansell, Jr., Atlanta, chairman, submitted a number of alterations in the old specifications. Tentative specifications for sidewalks and curbs, including both concrete and granite curbs, were submitted for the committee on that subject by Sylvertus Sammelman, chairman, St. Louis. In both these and some other cases the changes proposed were ordered printed in the 1919 "Proceedings" referred to the 1920 committee for further consideration and for submission with recommendations next year.

The Committee on Traffic and Transportation, R. Keith Compton, Baltimore, chairman, suggested that the highways of the country be divided into interstate or National, state, and local, and that uniform traffic laws be established for each class. This done, the physical requirements of construction for each class could be more readily determined. Attached to the report was a draft of a uniform traffic bill prepared by a Committee from the American Association of Highway Officials and other organizations. Closely allied to this report was a paper on "Highway Traffic", by Frederic A. Reimer, Newark, N. J. Supplementary to the paper, as printed in advance of the convention, Mr. Reimer remarked that the increased use of large pneumatic tires on heavy trucks in Essex County, N. J., promises to reduce the disintegration of pavements through vibration.

In behalf of the Committee on Street Paving, W. A. Howell, chairman, Newark, N. J., presented summaries of the work done in the last half dozen years, gathered from manufacturers of paving materials and from municipal engineers.

Good results at Buffalo, N. Y., from a fleet of 15 tractors and street flushers were reported by George H. Norton, chairman of the Committee on Street Cleaning, Refuse Disposal and Snow Removal. In winter the flushers are housed and the tractors used for hauling ashes and, when needed, for snow removal.

The Committee on City Planning submitted no formal report but presented a paper on "Regional and Civic Planning as a Basis for Municipal Improvements," from Thomas Adams, lately of Ottawa. In transmitting this paper Nelson P. Lewis, chairman, New York City, commented on the work of the engineer as the basis for town planning. Mr. Lewis said that the engineer does not seem to recognize this relationship and that until he does it cannot be expected that others will do so.

For the Committee on Legislation and Finance, N.S. Sprague, Pittsburgh, summarized information gathered from a number of cities. A tendency towards greater efficiency in municipal administration and an increase in the use of adequate budgets was noted. Suggestions for budget reform made by L. L. Tribus, New York City, a member of the committee, were embodied in the report.

The new Canadian law on fire prevention, which among other things makes a penal offense of personal negligence which causes loss of life or property by fire, was outlined in the report of the Committee on Fire Prevention, sent from Montreal by Alcide Chaussé, chairman.

A considerable percentage of the American states now have engineers connected with their State Boards of Health, at salaries of $2000 to $5000 a year, stated F. A. Dallyn, chairman of the Committee on Sewers and Sanitation, Toronto, Ont.

Acting for the Committee on Water-Works, George G. Earl, New Orleans, submitted a duplicate of the report presented by him two weeks earlier at the meeting of the American Public Health Association. Mr. Earl also gave a lantern slide talk on the water, sewerage and drainage works of New Orleans, built at cost of $32,000,000, including $2,000,000 of interest charges during construction. The combined capacity of the drainage pumps is more than 7,000,000,000 gal. a day. By thorough pre-sedimentation and coagulation the mechanical filters are operated with only 0.5% of wash water.

The exhibit by associate members consisted mostly of printed matter. There were no heavy exhibits. The entertainment features included a boat ride, an automobile trip and a smoker. The attendance at the final session on Friday morning was very small.

OREGON ENGINEERS OPPOSE UNION LABEL ON PLANS

An organization of draftsmen in Portland, Ore., seeking affiliation with labor in order to force the use of a union label on engineering plans has encountered opposition from the Oregon Chapter of the American Association of Engineers. The draftsmen, having formed an organization which they designate a "draftsmen's union", sought the support of such building trades unions as were concerned in construction called for by locally-made plans and specifications. Such support was to be a refusal of members of the trade unions to work upon any projects whose plans and specifications bore no "draftsmen's union" stamp.

The Oregon Chapter of the American Association of Engineers, on Sept. 17, expressed its opposition in the following resolution:

"Whereas: One of the functions of the engineer and architect is to apply the forces and materials of nature to the use of man with the greatest economy consistent with the most satisfactory results to the contracting parties and to the public, his function is one requiring absolute independence of all influence, coercion and prejudice and the greatest freedom to exercise his judgment and skill in the design and supervision of his work.

"Therefore, be it resolved, that it is prejudicial to his interests and the interests of the public to restrict this independence and freedom by implication or otherwise, and we, the Oregon Chapter of the American Association of Engineers, resolve that to affix the stamp or label of any organization other than that of the engineer, architect or his client to plans or specifications prepared by him, is an encroachment on such independence and freedom and is economically incorrect, ill-advised and and opposed to the best interests of the community."

BIDS SOON TO BE ASKED ON WILMINGTON BRIDGE

Bids for the construction of the new memorial arch bridge at Washington St. in Wilmington, Del., will be asked some time early in December. The bridge is in charge of the Washington St. Bridge Commission, with F. W. Carpenter of Wilmington as executive officer and consulting engineer, and B.H. Davis of New York as consulting engineer. The bridge will be of concrete, with a total length of 700 ft. There are two 70-ft.spans, a central span of 250 ft., and two arches of 85-ft. span. The bridge will be 82 ft. wide,with two sidewalks 16-ft. wide and a roadway of 50 ft.

SIXTEEN MILLIONS FOR CAPE COD CANAL

As the result of the proceedings before the Federal District Court in Boston, the sum of $16,201,201 was fixed by a jury as a fair valuation of the Cape Cod canal. Last session Congress authorized the purchase of this canal from the Boston, New York & Cape Cod Canal Co., builders of the waterway. The sum noted is far in excess of what the government has offered the canal for the property, and no statement has yet been given out as to what the next step in the acquisition of the canal will be.

COLORADO SLOW IN PUTTING LICENSE LAW INTO ACTION

Although a license law was enacted by the Colorado legislature last spring, no licenses have yet been issued and V. A. Kauffman, in a recent issue of the Official Bulletin of the Colorado Society of Engineers, declares that the obstruction toward putting it into effect comes from the Colorado Section of the American Institute of Mining and Metallurgical Engineers. This society at a meeting in September resolved to ask for a repeal of the law and subsequently sent out literature explaining its action on the ground that the law excluded aliens from obtaining a license. Mr. Kauffman concludes that the alien members are not only honored but sufficiently powerful in their organization to direct its activities against the best interests of this state as well as of the profession. Mr. Kauffman was at the miners' meeting and states that 75% of those present, including the aliens, admitted not having read the law, and furthermore, the aliens led the assault on the law. The miners later called on the Colorado Section of the American Society of Civil Engineers to endorse their stand but the latter went on record as being against the repeal.

On the matter of aliens Mr. Kauffman comments as follows: "Most of us agree that a country which supports us is good enough to tie to. Some alien engineers of the miners' organization have been in this country as long as 30 years, yet have not seen fit to become naturalized. It occurs to me that we have had enough of alien dictation in our political affairs, and from the foregoing two things are obvious: First, aliens not entitled to a vote must not be allowed to evade this restriction. Second, our societies must not allow themselves to be used by the alien as a channel through which he may accomplish the same result as if he were allowed to vote. Therefore, alien members of societies should be denied any voice in those affairs of their societies which are of a political nature, or aliens must be excluded from the societies. We cannot afford to have the recommendations of the societies on political affairs questionable. Their recommendations must express the views of citizen members only, else the rights of citizenship are of no value."

The model law which Engineering Council's Committee has just drafted calls for citizenship in the United States or Canada or declaration of intention to become citizens. The new model law of the American Institute of Architects makes no provision for other than citizens or those who have declared their intention of becoming citizens.

The miners were apathetic during the campaign which the Colorado Society of Engineers waged almost single handed to make the bill a law, although earnest appeals for assistance and guidance were made to every engineering society and individual in the state that could be reached.

In Denver there is an Engineering Council with representatives of the various technical societies. This body considered the law this summer and concluded that while it was not ideal there was nothing vicious in it and decided not to oppose it or ask for its repeal.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

NATIONAL RIVERS AND HARBORS CONGRESS 824 Colorado Building, Washington, D. C.;Dec. 9-11, Washington, D. C.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Secretary, Joseph Hyde Pratt,Chapel Hill, N. C.; Dec.8-11, Louisville,Ky.

BRIDGE BUILDERS' & STRUCTURAL SOCIETY 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

The Detroit Engineering Society will discuss the Jones-Peavis Bill, proposing the establishment of a National Department of Public Works,at its meeting Friday, Nov. 28. Charles Whiting Baker, chairman of the Public Affairs Committee of Engineering Council and consulting editor of "Engineering News-Record", will open the discussion, in which David A. Molitor will be the other principal speaker.

The Cleveland Engineering Society will have as its principal speaker, at the Dec. 2d meeting, Gardner S. Williams, consulting engineer of Ann Arbor, Mich. Mr. Williams will speak upon the work of the aims and organization committees of the national engineering societies.

The Rochester Engineering Society held a joint meeting on Nov. 21 with the local chapter of the American Society of Mechanical Engineers. The use and application of belt and other conveyors to manufacturing was discussed by several representatives of manufacturing firms.

The Montreal Branch of the Engineering Institute of Canada, at its meeting on Nov. 17, discussed the relationship that architects should hold with respect to the construction of big bridges.The discussion was precede by a paper on "Automatic Fire Sprinkler System for Low Temperature Buildings," by Maj. Percy Sims.

The Albany Society of Civil Engineers listened [illegible] discussion of the activities of Engineering Council

regarding national engineering matters by M.O.Leighton, chairman of the National Service Committee of Engineering Council, at the meeting on Tuesday, Nov. 25.

The New York Chapter of the American Association of Engineers begins its membership drive Dec. 1. During the drive, which is to last thirteen days, the New York Chapter hopes to add 300 to its embership.

The Cleveland Chapter of the American Association of Engineers has issued a call for a mass meeting of professional engineers, architects, chemists, surveyors, and draftsmen, of greater Cleveland, to be held Dec.4. Speakers at the mass meeting will acquaint those present with the past and future wage activities in the railroad, industrial, and public engineering fields carried on and to be prosecuted by the American Association of Engineers.

PERSONAL NOTES

JAMES F. SANBORN has opened an office in New York City as consulting engineer. Preceded by a period in which he was engaged on mining and geological investigations, his professional experience has been gained principally on the New York subway construction and the Catskill aqueduct. Mr. Sanborn is widely known as an expert in subsurface work of all types and particularly those features which relate to preliminary investigation of geological conditions by means of deep borings. In tunneling both in compressed air and open air, and in shaft sinking Mr. Sanborn has had a long and varied experience. One of the subjects to which he has devoted a great deal of effort, and on which his opinion has frequently been sought, is the grouting of shafts or tunnels in order that excavation may proceed through "bad" ground, especially where subsurface water is encountered.

FRANCIS DONALDSON announces that he and Paul M. Kuder have organized the American Contracting Co., with offices in New York City. Marcus M. Farley will have charge of the engineering work in the New York district. The company will serve as consulting civil engineers, mechanical engineers and auditors and is also prepared to reorganize, refinance and manage industrial properties. Mr. Donaldson brings to the new organization a long experience in the general contracting business. As chief engineer of the Dravo Contracting Co., of Pittsburgh, and later of the T. A. Gillespie Co., of New York, he has been engaged on a wide variety of large-scale construction, particularly tunneling and shaft-sinking in connection with the Catskill aqueduct and the New York subways.

MAJ. CLINTON H. FISK, U. S. A., previously chief engineer of construction, city of St. Louis, has become vice-president of the United States Bank, St. Louis.

L. A. CANFIELD, A. W. LEE and ALVIN LE VAN have opened a consulting office in the Flynn Building, Des Moines, Ia., under the firm name of the Canfield Engineering Co.

R. V. GLENN, has resigned as senior highway engineer on Federal Aid projects at Forth Worth, Tex., to become consulting highway engineer of Tarrant County. He will remain at Fort Worth.

HALE SUTHERLAND, instructor, department of civil engineering, Massachusetts Institute of Technology, has been appointed assistant professor of structural engineering.

T. KEITH LEGARE, city engineer, Columbia, S.C., has resigned to enter private practice, specializing in highway and municipal engineering, with headquarters at Columbia.

G. S. HEWINS, former manager for L.H.Shattuck, Inc., Newington Shipyards at Portsmouth, N.H., has taken charge of construction work for the New England Power Co., with headquarters at Vernon, Vt.

CAPT. ANDREW H. HOLT, Engineers, U.S.A., discharged from the service, has returned to his former position as assistant profresor of civil engineering, College of Applied Science, University of Iowa.

H. V. LATHAM, formerly chief engineer, Porto Rico Irrigation Service, has been appointed chief engineer, Isabela Irrigation Project, for which the legislature of Porto Rico recently authorized a $3,000,000 bond issue. Mr. Latham has been in the service of the Government of Porto Rico for the past seven years, engaged in irrigation and public utility work. For many years he was resident engineer and assistant chief engineer, Mexican Light & Power Co., Necaxa, Mexico.

H. B. LIVINGSTON has resigned his position as chief engineer of the Cameron County Water Improvement District No. 2, at San Benito, Tex., and is now president and chief engineer of the Rio Grande Engineering Co., at the same city.

A. LINCOLN FELLOWS, formerly of the firm of Field, Fellows and Hinderlider, has opened a consulting office in Berkeley, Cal.

MAJ. L. D. BLAUVELT and CAPT. H. G. BURROWS have opened a consulting office in Denver, Col., under the firm name of Burrows & Blauvelt.

M. A. MILLER, formerly with the U. S. Department of Roads, has been made chief draftsman for the Montana Highway Commission at Helena.

THOMAS W. MACARTNEY, Yakima, Wash., has been promoted from assistant drainage engineer to chief drainage engineer for Yakima County, succeeding J. O. Greenway who has resigned.

EARL CHURCH, who during the war was engaged in France in geodetic operations and artillery fire control, has been appointed professor of civil engineering, Pennsylvania Military College, Chester, Penn.

CAPT. CHARLES H. LEE, 26th Engineers (Water Supply), U.S.A., recently discharged from the service, has been appointed executive member, California State Water Commission.

ROBERT A. CAUGHEY, formerly associate professor of civil engineering, Pennsylvania State College, has been appointed associate professor of structural engineering, Civil Engineering Department, Iowa State College.

MAJ. J. F. CARROLL, Engineers, U. S. A., recently discharged from the service, has returned to his former work as superintendent of construction, Department of Public Works, St. Paul.

WALTER E. ROSENGARTEN has resigned as highway engineer, United States Bureau of Public Roads, to become traffic engineer, Asphalt Association, New York City.

WILLIAM EASBY, JR., has resigned as professor of municipal engineering, University of Pennsylvania, to engage in private practice with offices in the Commonwealth Building, Philadelphia.

CAPT. ROBERT B. MURDOCK, U. S. A., recently discharged from the service, has been appointed executive engineer, Asphalt Association, New York.

J. E. KIRKHAM, formerly professor of structural engineering and chairman of the civil engineering faculty, Iowa State College, has resigned to become bridge engineer, State Highway Commission, South Dakota.

OBITUARY

W. DALE HARRIS, former president, Montreal Terminal Ry., died recently at Ottawa, Ont. He was a graduate of the Massachusetts Institute of Technology and had been connected with the Brookline & Boston Water-Works and the construction of the Intercolonial Ry. and the Nova Scotia Ry.

PROF. JOHN VOSE HAZEN, for the past 21 years connected with the civil engineering department, Dartmouth College, died recently at Hanover, at the age of 69.

ALBERT J. HIMES, valuation engineer, New York, Chicago & St. Louis R. R., died in Cleveland Nov. 5 at the age of 58. He graduated from Cornell in 1887 and except for a period of about three years he had engaged in railroad engineering. He entered the employ of the New York, Chicago & St. Louis R. R. as bridge engineer in 1901 and was appointed assistant chief engineer in 1907, and afterwards engineer of grade crossing elimination.

NATHAN F. BARRETT, landscape architect, New York City, past president of the American Society of Landscape Architects, died recently in Mt. Vernon, N. Y.



CONSTRUCTION NEWS

PIG IRON

ALL PRICES ARE OF NOVEMBER 1

	Current	One Month Ago
Cincinnati		
No. 2 Southern	$32.60	$30.35
Northern Basic	31.05	27.85
Southern Ohio No. 2	31.55	29.85
New York, tidewater delivery		
2X Virginia (silicon 2.25 to 2.75)	35.65	32.40
Southern No.2(silicon 2.25 to 2.75)	33.50	30.25
Birmingham		
No. 2 Foundry	30.00	28.75
Philadelphia		
Eastern Pa.	33.00*	29.30
Virginia No. 2	34.40*	33.10
Basic	29.00T	25.75
Grey Forge	29.40*	28.05
Chicago		
No. 2 Foundry Local	31.40	28.75
No. 2 Foundry Southern	34.10	28.00
Pittsburgh, including freight charges from the Valley		
No. 2 Foundry Valley	32.40	28.15
Basic	28.40	27.15
Bessemer	29.65	28.65

* F. o. b. furnace. T Delivered.

RAILWAY SUPPLIES

STEEL RAILS-The following quotations are per ton f. o. b. Pittsburg and Chicago for carload or larger lots. For less than carload lots 5¢ per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	$45.00	$55.00	$45.00	$65.00
Standard openhearth rails	47.00	57.00	47.00	67.00
Light rails, 8 to 10 lb.	2.58 1/2*	3.13*	2.585*	3.13*
Light rails, 12 to 14 lb.	2.54*	3.09*	2.54*	3.09*
Light rails, 25 to 45 lb.	2.45*	3.00*	2.45*	3.00*

*Per 100 lb.

TRACK SUPPLIES-The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				San Francisco
	Current	One Year Ago	Chicago	St. Louis	
Standard spikes, 9/16in. & larger	$3.35	$3.90	$4.27	$4.44	$5.55
Track bolts	4.25	4.90	5.17	Premium	6.65
Standard section angle bars	3.90	....	4.22	Premium	4.60

RAILWAY TIES-For fair-sized orders, the following prices per tie hold:

		7 In.x 9 In. by 8 Ft.	6 In.x 8 In. by 8 Ft.
Chicago	Plain	$1.48	$1.33
San Francisco	Douglas Fir-Green	1.35	.96
San Francisco	Douglas Fir-Creosoted	2.70	1.92

Prices per tie at Missouri mills; St. Louis prices about 25¢ higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$1.05
No. 2	.60	No. 2	.85
No. 3	.50	No. 3	.75
No. 4	.40		
7x9x8 white oak			1.05
7x9x8 red oak (No. 4)	$0.80	No. 5	.97

Note.-Add 36¢ each for treatment.

PIPE

STEEL-From warehouse at the places named the following discounts hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
3/4 to 3 in. butt welded	47%	57.5%	45%
2 1/2 to 6 in. lap welded	42%	53.5%	41 1/2%

	Galvanized		
	New York	Chicago	St. Louis
3/4 to 3 in. butt welded	31%	44%	30 1/2%
2 1/2 to 6 in. lap welded	27%	41%	27 1/2%

Malleable fittings, Class B and C, from New York stock sell at + 12 1/2% list prices. Cast iron, standard size, 10% off.

CAST-IRON PIPE-The following are prices per net ton for carload lots:

	New York							
	One Month	One Year			St.	San Fran-		
	Current	Ago	Boston	Chicago	Louis	cisco	Seattle	Dallas
4 in.	$51.30	$57.50	$74.20	$62.00	$61.00	$87.50	$75.00	
6 in. and over	50.30	54.30	67.70	59.50	58.00	74.50	68.00	

Gas pipe and 16 ft. lengths are $1 per ton extra.

PIPE-The following discounts are for carload lots f.o.b. Pittsburgh: owing card of National Tube Co. for steel pipe, Curry A. & Byers Co. for iron, both dated Mar. 31, 1910.

BUTT WELD

Steel Black		Steel Galvanized		Iron Black		Iron Galvanized	
Inches		Inches		Inches		Inches	
1/8,1/4 & 3/8	56 1/2%	24%		1/4 to 1 1/2	36 1/2%	23 1/2%	
1/2	54 1/2%	40%					
3/4 to 2	57 1/2%	44%					
LAP WELD							
2	50 1/2%	35%		2	36 1/2%	18 1/2%	
2 1/2 to 6	53 1/2%	41%		2 1/2 to 6	34 1/2%	21 1/2%	
BUTT WELD,EXTRA STRONG PLAIN ENDS							
1/8,1/4 & 1/2	45 1/2%	23%		3/4 to 1 1/2	26 1/2%	24 1/2%	
1/2	51 1/2%	40%					
3/4 to 1 1/2	55 1/2%	43%					
LAP WELD,EXTRA STRONG PLAIN ENDS							
2	48 1/2%	37%		2	33 1/2%	20 1/2%	
2 1/2 to 4	51 1/2%	40%		2 1/4 to 4	35 1/2%	23 1/2%	
4 1/2 to 6	50 1/2%	39%		4 1/2 to 6	34 1/2%	22 1/2%	

Malleable fittings, Class B and C, quoted from New York stock sell at list, 50% off. Cast iron, standard sizes, 10% off.

CLAY DRAIN TILE-The following prices are per 1,000 lin.ft.:

	New York						
	One					San	
Size, In.	Current	Year Ago	St. Louis	Chicago	Boston	Francisco	Dallas
3	$35.00	$35.00	$40.00	$45.00	.....	.....	$37.44
4	51.00	51.00	50.00	60.00	$45.00	.....	50.16
5	65.00	65.00	45.	75.00	55.00	.....	62.70
6	80.00	80.00	55.00	80.00	80.00	.....	87.60
8	130.00	130.00	130.00	120.00	150.00	.....	138.76

SEWER PIPE-The following prices are in cents per foot for carload lots:

	New York					San	
	One						
Size, In.	Current	Year Ago	St. Louis	Chicago	Boston	Francisco	Dallas
3	$0.09	$0.117	.....	$0.105	.....	.....	$0.132
4	.09	.117	.....	.105	$0.15	.....	.132
5	.135	.1755	.....	.1575	.20	.....	.207
6	.135	.1755	$0.16	.1575	.24	.....	.207
8	.21	.273	.21	.245	.44	.....	.2875
10	.315	.4095	.29	.3675	.48	.....	.4025
12	.405	.5265	.37	.4725	.64	.....	.5175
15	.54	.702	.56	.53	1.00	.....	.7475
18	.75	.975	.91	1.00	1.35	.....	.9775
20	.90	1.17	1.14	1.00	1.80	.....	1.15
22	1.20	1.56	1.46	1.60	.....	.....	1.495
24	1.35	1.755	1.65	1.80	2.25	.....	1.725
27	2.145	2.60	1.80	2.75	.....	.....	2.5875
30	2.376	2.88	2.57	3.45	.....	.....	3.1625
33	3.15	3.78	3.09	4.00	.....	.....	4.025
36	3.5875	4.305	3.37	4.85	.....	.....	4.60

	3	5	6	12	24	36
Boston	$0.105	$0.1575	$0.245	$0.4725	$1.575	$3.325
St. Paul	.12	.18	.28	.45	2.00	4.75
Denver	.105	.16	.25	.425	1.575	.....
Seattle	....	.....	.30	.4	1.75	.....
Kansas City	.12	.18	.25	.50	1.80	4.60
Los Angeles	.09T	.15T	.2475	.44	1.50T	.....
New Orleans			40 per cent off			
Cincinnati	.08	.1215	.189	.3645	1.215	3.1775
Detroit	....	.....	.28	.45	2.10	.....
Montreal			45 per cent off			
Detroit	.0885	.134	.208	.396	1.44	3.672
Baltimore	.105	.1575	.245	.4725	1.575	.....

T-4in., 5-6in., 8-12in. respectively.

ROAD AND PAVING MATERIALS

ROAD OILS-For carload prices per gallon in tank cars, f.o.b. point named:

	Current	One Month Ago
New York, 4-6¢ asphalt	$0.04 1/4	$0.04 1/2
New York, 4-6¢ asphalt	.03	.03
New York, Texas	.03 1/2	.03 1/2
New York, flux	.04 1/4	.04 3/4
St. Louis, 4-6% asphalt	.0415	.0415
Chicago, 15-20% asphalt	.10	.10
Chicago, 1st & 2nd layer	.11	.11
Dallas, 40-50% asphalt	.07	.07
Dallas, 50-70% asphalt	.08	.08
Dallas, 70-90% asphalt	.11	.10
San Francisco, 7½-8% asphalt, per bbl.	2.10	2.10

ASPHALTUM-Price per ton in packages and bulk in carload lots:

	Brand	Package	Bulk
New York	Texaco	$22.00	$14.00
Chicago	Mexican	33.00	31.00
San Francisco	California	17.00	13.75
Dallas	Texaco and Mexican	32.00	30.00
Seattle	D grade	23.50	.....
Denver	Trinidad	45.00	.....
Denver	California	38.00	.....
St. Paul	Mexican	21.00	.....
Kansas City	Mexican	26.00	24.00
Atlanta	Standard	24.00	19.80
New Orleans	.....	16.50	.....
St. Louis	Stanolind	24.90	18.40
Detroit	Bermudez	49.40	.....
Baltimore	Manco	43.00	.....
Los Angles	D Grade	.....	13.50
Montreal		.....	18.60

PAVING STONE-

Chicago	About 4x8x4 dressed	$2.45	sq.yd.
	About 4x8x4 common	2.20	sq.yd.
San Francisco	Basalt block 4x7x8	57.75	per M
Kansas City	Granite	3.00	sq.yd.
Boston	5-in.granite	110.00	per M
St. Paul	Sandstone	2.45	sq.yd.
Atlanta	Granite	1.85	sq.yd.
Detroit	Granite, small	2.75	sq.yd.
Baltimore	Common	2.30	sq.yd.
Montreal	Granite	5.90	sq.yd.

WOOD BLOCK PAVING-	Size of Block	Treatment	Per Sq.Yd.
New York	3 1/2	16	$3.25
New York	4	16	3.50
Chicago	4	16	4.50
Chicago	3 1/2	16	3.50
Chicago	City specifications		5.00
St. Louis	3 1/2	16	2.45
St. Louis	4	16	2.70
Seattle	4	16	2.55
Kansas City	4	16	3.00
St. Paul	3 1/2	16	2.13
Atlanta	3 1/2	16	2.30
New Orleans	3 1/2	16	2.63
New Orleans	4	16	3.00
Dallas	3 1/2	18	3.17
Dallas	4	18	3.56
Baltimore	3 1/2	16	3.60
Montreal	4	16	4.62

SAND & GRAVEL-Price for cargo or carload lots is as follows, per cu.yd

	Gravel 1 1/2 In.		Gravel 3/4 In.		Sand	
	Current	One Yr. Ago	Current	One Yr. Ago	Current	One Yr. Ago
New York	$2.00	$2.00	$2.00	$2.00	$1.25	$1.25
Denver	1.60	1.60	1.60	1.40	1.25	1.10
Chicago	1.35	2.00	1.35	1.40	1.35	1.95
Kansas City	2.50	2.15	3.00	2.60	1.00K	1.00
St. Louis*	1.78	1.87	1.82	1.35	1.68	1.45
Seattle	1.25	1.25	1.25	1.25	1.25	1.25
Dallas	3.00	2.00	3.00	2.00	2.50	1.40
St. Paul	1.25	1.25	1.25	1.50	.60	.60
San Francisco	1.15	1.20	1.15	1.20	1.15	1.20
Boston	1.60	2.00	1.60	1.75-2	1.00	1.00
New Orleans	2.40	4.00	2.40	1.80	1.20	2.25
Atlanta	2.00T	....	....	....	1.10T	....
Detroit	2.00	....	2.00	....	2.00	....
Baltimore	1.54	....	1.75	....	.65	....
Montreal	1.20T	....	....	....	1.10T	....

*Fine white sand, Pacific and Ottawa per ton, $6. KKaw River sand is $1.50 per yd. T per ton.

CONSTRUCTION MATERIALS

CRUSHED STONE-Price for cargo or carload lots is as follows, per cu.yd.:

	1 1/2 In.		3/4 In.	
	Current	One Year Ago	Current	One Year Ago
New York	$1.65-1.75	$1.70	$1.75-1.85	$1.85
Chicago	1.30	1.60	1.30	1.70
St. Louis	1.65	1.08	1.65	1.08
Dallas	2.00	2.05	2.00	1.55
San Francisco	1.50	1.20	1.50	1.20
Boston	2.75*(del)	1.75	2.75(del)	1.75
St. Paul (lime)	1.15T	1.15	1.25	1.45
Denver	....	1.60	1.60	1.40
Kansas City	1.80	1.70	2.00	1.70
Seattle	1.50	1.20	1.50	1.20
Atlanta	2.25*	3.35	2.45*	....
New Orleans	4.00	....	4.35	2.28
Los Angeles	1.75	1.50	1.90	1.60
Detroit	2.00	....	2.00	....
Baltimore	1.25	....	1.50	....
Montreal	2.00*	....	2.15*	....

*Per ton.Limestone;trap rock,$1.60 and $1.80 per ton for 1 1/2"/4in.

LIME-Warehouse prices:

	Hydrated per Ton		Lump per 200-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$17.50	$14.50	$2.65*	$2.65*
Kansas City	21.00	21.00	2.30	2.20
Chicago	18.00	17.50	1.80	1.10
St. Louis	22.00	18.00	.....	2.00
Boston	22.00	18.25	3.70*	3.40*
Dallas	30.00	.....	2.75	.....
Cincinnati	13.70	11.95	10.70T	.....
San Francisco	30.00	.....	2.65K	2.00
St. Paul	23.00	20.00	1.60	1.50
New Orleans	.....	17.50	.....	2.20
Atlanta	.....	1.90 (bbl.)	1.60	1.95
Detroit	18.00	16.65	3.00*	3.00*
Seattle	30.00	.....	.....	2.65K
Los Angeles	.....	.....	3.05K	2.80K
Baltimore	19.25	16.75	.....	11.37T
Montreal	20.00	20.00	.....	15.00T
Denver	.....	28.25	.....	2.50

*180-lb.Barrels. KPer 180-lb.barrel. TPer ton.
180-lb.Refund of 10¢ per barrel.

NATURAL CEMENT-Price to dealers for 500 bbl.or over, f.o.b., exclusive of bags:

	Current	One Year Ago
St. Paul(Austin)	$1.50	$1.93
Kansas City(Ft.Scott)	1.40	1.70
New Orleans	2.52	....
Atlanta(Magnolin)	1.85	....
Cincinnati(Louisville)	1.35	1.80

PORTLAND CEMENT-Current prices are for barrels in carload lots, without bags, to contractors:

	Current	One Month Ago Without Bags	One Year Ago With Bags
New York	$2.80*	$2.30	$4.00
Jersey City	2.47	2.27	3.64
Boston	2.42	2.42	3.67
Chicago	2.00	2.00	2.45
Pittsburgh	2.05	2.05	2.55
Cleveland	2.32	2.32	2.72
Detroit	2.08	2.08	2.68
Indianapolis	2.27	2.27	2.62
Toledo	2.12	2.12	2.62
Milwaukee	2.11	2.11	2.56
Duluth	2.10	2.10	2.60
Peoria	2.12	2.12	2.56
Cedar Rapids	2.18	2.18	2.68
Davenport	2.14	2.14	2.64
St.Louis	2.20	2.20	3.30
San Francisco	2.43	2.43	3.48
New Orleans	2.36	2.36	3.77
St.Paul	2.22	2.20	3.40
Denver	2.67	2.67	3.67
Kansas City	2.26	2.26	3.30
Seattle	2.53	2.53	3.33
Dallas	2.03	2.03	2.90
Atlanta	2.50	2.50	....
Cincinnati	2.30	2.30	2.80
Los Angeles	2.78	2.78	3.38
Baltimore	2.30	....	....
Detroit	2.08	....	....
Montreal	2.70	....	....

NOTE-Bag charge is generally 15¢ each. *Delivered Manhattan, The Bronx or Brooklyn.

TRIANGLE MESH-Price per 100 sq.ft. in carload lots:

PLAIN 4-INCH x 4-INCH MESH

Style Number	Sectional Area Square Inches per Ft.	Width	Pitts burgh	New York	Chicago	St. Louis	Dallas	San Francisco
032	0.032		$0.92	$1.16	$0.98	$0.89	$1.13	$1.32
049	0.049		1.18	1.48	1.26	1.26	1.43	1.67
068	0.068		1.44	1.86	1.53	1.56	1.79	2.06
093	0.093		1.85	2.39	1.97	2.00	2.41	2.65
126	0.126		2.28	3.02	2.43	2.47	2.92	3.28
153	0.153		2.72	3.59	2.90	2.95	3.48	3.93
180	0.180		3.12	4.13	3.33	3.39	3.99	....
245	0.245		4.12	5.44	4.40	4.47	5.27	....
287	0.287		4.76	6.29	5.08	5.16	6.10	6.86
336	0.336		5.52	7.30	5.89	5.99	7.06	....
395	0.395		6.40	8.45	6.83	6.94	8.19	....
			PAVING					
036P	0.036		$0.71	$0.92	$0.76	$1.77	$0.80	....
053P	0.053		1.00	1.28	1.06	1.08	1.12	....
072P	0.072		1.26	1.66	1.34	1.37	1.46	....
097P	0.097		1.62	2.12	1.73	1.76	1.88	....
049R	0.049		1.00	1.28	1.06	1.08	1.12	....
067R	0.067		1.26	1.65	1.34	1.37	1.46	....
089R	0.089		1.62	3.11	1.73	1.76	1.88	....

Made in 16,-20,-24,-28,-32,-36,-40,-44,-48,-52,-and 56-in. width in rolls. 150,-200,and 300-ft. lengths. Galvanized is about 10% higher.

EXPANDED METAL LATH-Prices in carload lots per 100 yd.for painted are as follows:

Gage	Weight	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
27	233	$29.10	$34.07	$29.00	$29.00	$34.00	$32.75
26	250	30.45	35.23	30.50	30.00	35.00	34.50
25	300	31.90	36.51	32.00	.....	37.00	36.75
24	340	33.50	37.73	33.00	33.00	40.25	39.25
22	450	36.60	40.48	.....	.....	.....	43.30

About 10% additi n l for smaller quantities.

BARS, CONCRETE REINFORCING-Following quotations are per 100 lb.:

ROLLED FROM BILLETS

In.	Mill Pittsburgh	New York Current	New York One Year Ago	Chicago	St. Louis	Dallas	San Francisco
3/4 & larger	$3.35	$3.37	$4.17	$3.37	$3.68	*4.75	$4.60
5/8	3.40	3.42	4.23	3.42	3.74	4.80	4.65
1/2	3.45	3.47	4.27	3.47	3.79	4.95	4.70
3/8	3.60	3.62	4.42	3.62	4.04	5.00	4.85
1/4	3.65	3.67	4.67	4.67	4.18	5.05	5.10

Twisted bars cut to length take extra of $7 1/2¢ per 100 lb. Extra on deformed bars, uncut 7 1/2¢.

BRICK-To contractors price per 1000 in cargo or carload lots is as follows:

	Common Current	Common One Month Ago	Common One Year Ago	Paving Brick	Paving Block
New York	$16.00	$15.00	$14.00	No Quotations	
Chicago	12.00	12.00	11.00	.....	.....
St. Louis,selected	18.00*	16.00	18.00	$26.00	.....
St. Louis,salmon	12.00	10.00	12.00	.....	.....
Denver,salmon	14.00T	13.00	9.50	.....	38.00
Dallas	18.57	18.00	16.03	27.30	.....
San Francisco	12.50	12.00	12.00	.....	.....
Boston	18.00	18.00	16.25	30.00	45.00
New Orleans	19.00	17.50	15.98	19.00	.....
St.Paul	14.50	13.00	10.25	.....	40.00
Kansas City	18.00	15.00	13.00	42.50	.....
Seattle	15.00	15.00	15.00	.....	42.00
Cincinnati	17.00	16.00	16.50	.....	.....
Atlanta	16.00	15.00	.....	40.00	.....
Los Angeles	12.50	12.50	10.00	.....	.....
Montreal	21.00(del.)	15.00	.....	75.00T	.....
Detroit	17.25	19.00	.....	37.00	.....
Baltimore(del.)	18.00	18.00	.....	72.00	45.00

*Hard red is $16.in Denver. *Hard brick, $14. T not delivered.

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12	$0.11475*	$0.11925	$0.09	$0 08	$0 1125	$0 1088	. . .
6x12x12	.153*	.159	.1268	.105	.15	.09	$0.1512
8x12x12	.204*	. . . . .	.183	.15	. . . . .	.1152	.1944
10x12x12	. . . . .	. . . . .	.19	.173	. . . . .	.2546	.2268
12x12x12	. . . . .	. . . . .	.208	.208	. . . . .	.3082	.2916

*Delivered below 72nd St.

	4x12x12	8x12x12	12x12x12
Boston	$0.15	$0.25	$0.35
St Paul	.065	.135	.185
Cincinnati	08	.15	.215
Kansas City	.0786	15	.205
Denver	.1250	.18	.25
Seattle	09	.175	.30
Atlanta	.0975	.17	.26
Los Angeles	.082	.154	. . . .
New Orleans	.165	.22	.325
Detroit	.088	.1674	.2399
Baltimore	.115	.21	.2875
Montreal	.19	.27	.34

STRUCTURAL MATERIAL—Following are base prices f o b mill, Pittsburgh, together with quotations per 100 lb. from warehouses at places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in	$2 45	$3 47	$4 27	$3 54	$3 47	$4 45	$5 50
Channels, 3 to 15 in	2 45	3 47	4 27	3 54	3 47	4 45	5 50
Angles, 3 to 6 in , ¼ in. thick	2.45	3 47	4 27	3 54	3 47	4 45	5 50
Tees, 3 in. and larger	2.45	3 52	4 27	3 54	3 47	4 45	5 50
Plates	2 66	3 67	4 52	3.54	3 67	4 90	5.75

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	New York Current	New York One Yr. Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
½ in. and larger	$4.20	$4.72	$5 65	$4.72	$4 99	$6.15	$7.50

CONE HEAD BOILER

½ in. and larger	4.30	4 82	5 75	4 82	5 09	6 25	7 50
⅝ and ¾	4 45	4 97	5 90	4 97	5 24	6 40	7 50
⅞ and 1"	4.70	5 32	6 25	5 32	5 49	6 75	7.75

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Chicago	San Francisco	Dallas
Wire	$3 50	$3 90	$3 90	$5 25	$5 00
Cut	4.25	5 85	6 00	6.65	6 40

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.
No. 1 grade	$1.50	$1.75	$1.90	$2.15	$2.30	$2.55
No 2 grade	1 35	1.60	1 70	1 95	2.05	2 30

Asbestos asphalt-saturated Felt (14 lb. per square) costs $156 per ton.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.25 per roll carload lots and $2.50 for smaller quantities.

Shingles, red and green slate finish, cost $6 00 per square in carloads; $6 25 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb per square of 100 sq.ft)	$70 00	$70 00	$71 00	$71 00
Tar pitch (in 400-lb bbl)	21 00	18 00	22 00	19 00
Asphalt pitch (in barrels)	34 00	34 00	37 50	37 50
Asphalt felt	68.00	48.00	72 50	72 50

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St Louis	Chicago	San Francisco	New York Current	New York One Yr Ago
No 10	3.55	4 64	4 57	5.80	4.57	5 52
No. 12	3.60	4.69	4.62	5.75	4.62	5.57
No. 14	3.65	4.74	4.67	5.90	4.67	5.62
No 16	3.75	4.84	4.77	6.00	4 77	5.72
Black						
*Nos 18 and 20	4.15	5 24	5.42	6 75	5 30	6.32
*Nos 22 and 24	4.20	5 29	5.47	6.80	5.35	6 37
*No. 26	4.25	5.34	5.52	6.95	5.40	6.42
*No. 28	4.35	5.69	5.62	7.05	5.50	6.52
Galvanized						
No 10	4 70	5 79	5 97	. . . .	6 0	6 87
No 12	4 80	5 89	6 07	7 30	6.25	6 92
No 14	4 80	5 89	6 07	7.30	6 30	6 97
Nos 18 and 20	5 20	6 19	6 37	7 60	6 60	7 27
Nos 22 and 24	5 25	6 34	6 52	7 75	6 75	7 32
*No 26	5 40	6 04	6 67	7 90	6 90	7 47
*No. 28	5 70	7 04	6 97	8 20	7 20	7 77

*For painted corrugated sheets add 30c per 1000 lb for 5 to 28 gage, 25c for 19 to 24 gages; for galvanized corrugated sheets add 15c , all gages.

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel (5 bbl.)	$1 75	$1.67	$1 92	$1.65
5-gal. cans	1.90	1.76	2 07	1.05

WHITE AND RED LEAD—Base price per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Yr Ago Dry and In Oil
100-lb keg	13 00	14 50	14 00	14 50	13 00	14 00
25 and 50-lb kegs	13 25	14 75	14 25	14 75	13 25	14 25
12½-lb keg	13 50	15.00	14 50	15 00	13 50	14.50
5-lb cans	15 00	16 50	16 00	16 50	15 00	16 00
1-lb cans	16 00	17 50	17 00	17 50	16 00	17 00

500 lb. lots less 10% discount; 2000 lb. lots less 10-2½% discount.

LUMBER

San Francisco—Prices of rough Douglas fir No. 1 common, in more than carload lots:

	Lumber Prices in Yards at San Francisco 6-8-12 and 14 Ft.	10-16-18 and 20 Ft.	22 and 24	25 to 32 Ft
3x3 and 4	$31 50	$32 00	$33 00	$35 00
3x6 and 8	32 50	33 00	34 00	36 00
4x4-6 and 8	33 00	34 00	35 00	37 00
3x10 and 12	33 00	34 00	35 00	37 00
3x14	33 50	34 00	35 50	37 00
4x10 and 12	33 00	34 00	35 00	37 00
4x14	34 00	35 00	36 00	38 00

	24 Ft. and Under	24 to 32 Ft.	33 to 40 Ft
6x10	$32 50	$34 50	$35 50
6x14	34 00	36 00	37 00
8x10	32.50	34.50	35.50
8x13	34 00	36 00	. . . . .

New York, Chicago and St. Louis

	Southern Pine New York* 20 Ft and Under	Southern Pine New York* 22-24 Ft.	Southern Pine Chicago 20 Ft and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft and Under	Yellow Pine St. Louis 22-24 Ft
3x 4 to 8x 8	$48 00	$49.00	$50 00	$51 00	$44 00	$45 00
3x10 to 10x10	51 00	51 00	54 00	55 00	48 00	49 00
3x12 to 12x12	56 00	57 00	56 00	57 00	52 00	53 00
3x14 to 14x14	61 00	61 00	61 00	62 00	57 00	58 00
3x16 to 16x16	71 00	71 00	64 00	65 00	63 00	64 50
3x18 to 18x18	77 00	77 00	68.00	69 00	68 00	69 00
4x20 to 20x20	89 00	90 00	. . .	. . .	. . .	. . .

* Prices from Lumbermen's Bureau

Over 24 ft —Add $1 for each additional 2 ft in length up to 40 ft for sizes 12 x 12 and under; for sizes over 12 x12 add $2. For merchantable add $2 to sizes 10x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In x 20-Ft and Under P	Fir	Hemlock	Spruce	12 x 12-In 20 Ft. and Under P.	Fir
Boston	$50 00	$50 00	$49 00	$49 00	$50 00	$50.00
Kansas City	51 00	51 25	51 25	. . .	57.00	48.25
Seattle	. . .	30 00	. . .	. . .	. . .	31 00
New Orleans	45 00	. . .	. . .	. . .	48.00	. . .
St. Paul	60 00	59 00	59 00	46 00	42.00	56.00
Atlanta	58 00	60 00	61 00	72 00	72 50	74.50
Baltimore	46 00	. . .	. . .	. . .	60.00	. . .
Cincinnati	45.00	45 00	42 00	42 00	48 00	48 00
Montreal	59 00	70 00	65.00	59 00	59 00	59 00
Los Angeles	. . .	50 00	. . .	. . .	. . .	52 00
Denver	. . .	40 00	. . .	. . .	. . .	40.00

	1-In Rough, 10 In x 16 Ft. and Under P	Fir	Hemlock	2-In T and Gr. 10 In x 16 Ft P.	Fir
Boston	$50 00	$50 00	$48 00	$50.00	$50.00
Kansas City	84.50	74.25	74.25	87.25	77 25
Seattle	. . .	31 50	. . .	. . .	31.50
New Orleans	54 00	. . .	. . .	55.25	. . .
St Paul	53 00	53.00	53.00	63.00	57 00
Atlanta	80 00	85.00	. . .	67 50	70.00
Baltimore	40-42 00	. . .	. . .	38-40.00	. . .
Cincinnati	45 00	43 00	42 00	45.00	45.00
Montreal	60 00	60 00	50 00	65.00	65 00
Los Angeles	. . .	49 00	. . .	. . .	. . .
Denver	. . .	43.00	43.00	. . .	42.00

‡Also tamarac

Dallas Yellow pine Price per M:

2x4 to 2x12 12, 14 and 16	$57.50
2x4 to 2x12 10, 18 and 20	60 00
2x4 to 2x12 22 and 24	62 50
4x4, 4x6, 6x6, 8x8 and 3x8	61 25
8x00, 10x00 and 3x10	62 50
12x12 and 3x12	67 50

FREIGHT RATES

On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	$0 30	New Orleans	$0.38½
Buffalo	17	New York	.27
Chicago	.27	Pacific Coast (all rail)	1.25*
Cincinnati	.23	Philadelphia	.24½
Cleveland	.17	St. Louis	.24
Denver	.99	St. Paul	.49½
Kansas City	.59	Detroit	.33
		Baltimore	.33

Note—Add 3% transportation tax. * Minimum carload, 80,000 lb.

Contractors' Supplies

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2 55	$2.55	$4

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand, iron rope	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized, less 5%, bright, less 25%.
Chicago, +5 on galvanized, 30–2½ off on bright.

MANILA ROPE—For rope smaller than ⅜-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅜-in., 8 ft., ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1¼-in., 2 ft 10 in.; 1½-in., 2 ft 4 in. Following is price per pound for ⅜-in. and larger, in 1200-ft. coils:

Boston	$0 27½	Kansas City	$0.27
New York	27	New Orleans	.25½
Chicago	.26½	Los Angeles	.28
St. Paul	26	Seattle	.25
San Francisco	24	St. Louis	.26½
Atlanta	29½	Montreal	.32
Denver	.29½	Detroit	.28
Cincinnati	29	Baltimore	.25

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb keg for black powder.

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York		$0.27	$0.30		$2.40
Boston	$.2225	.2425	.2675	$.3100	2.20
Kansas City	.19	.2375	.2625	.30	2.25
New Orleans	.2375*	.2275	.2475		
Seattle	.1425	.185	.21	.315	1.90
Chicago	.1875	.2125	.2550	.2975	2.15
St. Paul	.19	.2375	.2625		2.45
St. Louis	.19	.2325	.2375	3000	2.40
Denver	.1775	.22	.245	.2875	2.25
Dallas			.288	.342	2.75
Los Angeles	.21	.26	.30	2.75	
Atlanta	.20	.225	.245		2.45
Baltimore	.19	.23¾	.28¾	.30	2.35
Cincinnati	.1875	.2125	.2325		2.35
Montreal	.28	.31	.34	.39	3.10

* For 50%

POLES—For plain pine poles, delivered New York, the price is as follows:

10-in. butts, 5-in. tops, length 20-30 ft	$9.00
12-in. butts, 6-in. tops, length 30-40 ft	11.50
12-in. butts, 6-in. tops, length 41-50 ft	12.50
14-in. butts, 6-in. tops, length 51-60 ft	21.00
14-in. butts, 6-in. tops, length 61-71 ft	23.50

Note—At the present time it is almost impossible to give accurate prices on poles. The above are only nominal.

	Dallas Aug. 1, 1919
6-in. x 20-ft	$4.60
6-in. x 30-ft	7.10
8-in. x 30-ft	8.45
8-in. x 35-ft	10.38

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges.

	New York	Chicago	St. Louis
No. 1 railroad wrought	$24 00	$21.00	*$21.50*
Stove plate	17.50	22.00	*22.50*
No. 1 machinery cast	25 50	24.00	*22.00*
Machine shop turnings	12.00	10.00	*12.50*
Cast borings	14.00	12.50	*12.50*
Railroad malleable cast	16.50	20.75	*19.00*

SHIP SPIKES—Current prices per 100 lb.

In.	San Francisco Galv.	San Francisco Black	Seattle Black
¼	$9.20	$8.50	$8.55
⅜	8.75	6.75	8.25
½	8.60	6.60	8.30

Pittsburgh base, $3.85 to $4 per 100 lb.

LABOR RATES AND CONDITIONS

S means scarce; E, enough; P, plentiful

Cities	Brick-layers	Car-penters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor	Remarks
Atlanta	$0.90S	$0.70–80	$0.50–60	$0.45	$0.60	$0.75–80	$0.35	Atlanta—Some bricklayers are receiving $1.10 to $1.25 an hour. Some shortage of skilled labor. No strikes.
Baltimore	1 00–1 25E	.70–87½P	1 00E	.50– 60E	72½S	1 00E	.35– 43S	Baltimore—Structural iron workers are asking $1.
Boston	.90- 92S	.85- 92½S	.90-1.00P	.60-.70S	80–90P	1.00P	.52½-.62½E	Boston—Common labor, first-class diggers, etc., rather scarce; condition not likely to last, being result of usual autumn rush.
Cincinnati			.70		.50			
Dallas	1.00E	.87½S	.87½E	.37½-.40S		.75S	.35S	
Denver	1 00E	1.00E	87½E	.69 (Str.)		.87½	.50P	Denver—City pays $3.50 for common.
Detroit	1.00S	.80P	.90P	.60S	.90	.85-.90	55S	
Kansas City	1 00	85	90	.68¾	.77½	.90	.57½	
Los Angeles	.87½E	.75E	.75P	.56-.75S	.75P	.75P	.50-.62½E	Los Angeles—No general strikes
Montreal	.75P	.70S	.60S	.50S	.55P	50- 55S	.40-.50S	Montreal—Bricklayers only trade not officially on strike. Good labor scarce account of exodus of foreigners, who comprise 75 per cent. of Canadian labor.
New Orleans	.87½S	.75	1.00	.60	.80-1.00	.75	.30-.35	
New York	.87½	81¼	.87½	.57½	.81¼	.87½	56¼	
Pittsburgh	1 00	90	.90	60	.60	1.00	.40-.45S	Pittsburgh—No strikes.
St. Louis	1.00	87½	1.00-1.12½	.70	80-.92½	.90	.40- 50	St. Louis—Skilled labor, 50c. to 75c. Building laborers, 50c. Bricklayers on sewers, 1.25.
St Paul	87½	.75	.80	.50	.80	.85	.47½	St Paul—On Aug 12, bricklayers asked for $1, ignoring agreement to work until May 1, 1920, at 87½c. Sewer diggers, 50c an hour; paving-block layers, 50c.; teams, 90c
San Francisco	1 25E	1.00E	1.00E	.87½E	1.00E	1.00E	.45-.50E	San Francisco—All lines busy. No strikes.
Seattle	1 12	.93½	.94	75- 80	90	1.00	.75S	Seattle—Considerable residence construction; building construction improved over last month. Street and road work booming. Labor situation easier, although there is a shortage in skilled labor.

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

Waterworks

PROPOSED WORK

N. C., Asheville—City having plans prepared by B. M. Lee, engr., building concrete dam, settling basins at intake, reservoir, 10,000,000 gal. capacity and 9¾ mi. gravity line, involving 50,000 ft. 16 in. ci. pipe, 3000 cu. yd. rein.-con. 78,000 cu. yd. earth and 38,000 cu. yd. rock excav. About $500,000.

S. C., Arcadia—City plans to build 2 mi. water and sewerage system. J. E. Sinnie, Greenville, engr.

O., Columbus—City voted $3,000,000 bonds to extend waterworks system. J. H. Gregory, engr. Noted Aug. 21.

O., Wellington—Village receives bids about Dec. 1, building 5 mi. c. i. water mains. Bonds for $25,000 voted for project. G. E. Gadfield, Wellington, engr.

Mich., Ferndale—Village having plans prepared by G. Jerome, engr., 1323 Majestic Bldg., Detroit, for watermain extensions in vicinity Woodward Ave. and Nine Mile Rd., to include furnishing and laying 6-8 in. mains with valves, valve boxes and hydrants. About $70,000.

Neb., Norfolk—City soon lets contract building extension to waterworks in Dists. 37 to 47. Work involves 7748 ft. 4 in. and 1820 ft. 6 in. c. i. pipe. About $17,470. H. H. Tracy, Norfolk, engr.

Mo., Kirksville—City having plans prepared improving water works system, to include installation of one 100 h. p. water tube boiler, two 100 h. p. oil engines, two 600 gal. per minute centrifugal pumps, etc. About $30,000. W. B. Rollins & Co., Ry. Exch. Bldg., Kansas City, engrs. Noted Sept. 18.

Mo., Washington—City plans to improve waterworks system, including deep well pump, etc. About $5,000.

Okla., Nowata—City election Dec. 1, to vote on $200,000 bonds to improve waterworks and electric light plant. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., engrs. Noted Sept. 11.

Okla., Perry—City soon lets contract improving waterworks and electric light systems, to include building dam, involving 115 cu. yd. rein.-con., 2,740 cu. yd. concrete and 2,697 earth excav. Alternate bids on hydrants, valves, engines, generators, 4 panel switch board, etc. Black & Veatch, Interstate Bldg., Kansas City, Mo., engrs. Noted Aug. 28.

Wash., Seattle—City plans to replace wooden water mains with iron mains in Ballard Dist., as follows: West 60th St., et al. cost $165,000; West 61st St., et al, $150,000; West 45th St., et al, $161,000. A. H. Dimock, city engr.

Wash., Selah—Town plans to build waterworks system, to include concrete reservoir and wood or c. i. water mains and laterals. About $10,000. N. A. Gilman, Yakima, engr.

Ore., Baker—City having preliminary plans prepared building concrete reservoir and wood or c. i. pipe line system for taking water from Sam-O Springs to new natatorium. About $5,000. W. W. Gardner, mayor.

Ore., Baker—Loner Powder River Irrigation Co. plans to build concrete reservoirs at Balm Creek, 22,000 acre-ft.; Thief Valley, 120,000 acre-ft. and at West Eagle Creek, 19,000 acre-ft. Cost to exceed $50,000. P. E. Cupper, Salem, engr.

Ore., Heppner—City voted $100,000 bonds to build gravity water system to run from head waters of Willow Creek to city.

Ore., Monmouth—City voted $60,000 bonds to build gravity water system to include 10 mi. pipe line from Teal Creek to city.

BIDS DESIRED

O., Euclid—Until Dec. 8, by city, building 6 and 8 in. c. i. water mains in Brewer, Pond and Fuller Aves. and Cut Rd. from Lake Shore Blvd. to village limits. F. A. Pease Eng. Co., Marshall Bldg., Cleveland, engrs.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

***N. Y., Marcy**—State Hospital Comn., Capitol, Albany, let contract to Scott Bros., Arlington Blk., Rome, $158,914, building concrete dam, gate house, reservoir and appurtenances for Marcy Div. of Utica State Hospital, here. Work involves 30,000 cu. yd. grubbing, 8,100 cu. yd. excav., 11,500 cu. yd. concrete, 9,000 lb. structural steel and 2,200 lb. metal reinforcement. Noted Sept. 11.

***Ia., Mitchellville**—City let contract improving waterworks system, to include pumping station, power transmission line and wells, involving 10,200 ft. 6 in. c. i. pipe, to Pittsburgh-Des Moines Steel Co., 9th and Tuttle Sts., Des Moines. About $26,000.

***Ia., Toledo**—City let contract building 100,000 gal., elevated steel tank and tower and extensions to distribution system, involving 15,000 ft. 4-8 in. c. i. pipe, to Pittsburgh-Des Moines Steel Co., 9th and Tuttle Sts., Des Moines. About $12,000.

***Kan., Osawatomie**—State Bd. Administration, Topeka, let contract building ¾ mi. extension to water and sewerage systems, in State Hospital grounds, to C. F. Gustafson & Co., 116 West 6th St., Topeka, $11,200 and $9,273 respectively.

***Mo., Kirksville**—City let contracts improving waterworks system, involving installation of (1) one 100 h. p. water tube boiler, (2) 2 Gould centrifugal pumps, 600 gal. per min., (3) 2 Muncie oil engines, 100 h. p., to Heine Safety Boiler Co., 5319 Marcus St., St. Louis, (1) $4,980, Challenge Co., St. Louis, (2) and (3) $3,135 and $14,345 respectively. Noted Sept. 18.

Sewers

PROPOSED WORK

Mass., Woburn—Buckman Tanning Co. having preliminary plans prepared by Vaugh & Meyer, engrs., Security Bldg., Milwaukee, Wis., for rein.-con. sewage disposal tank and reclamation of tannery sludge. About $15,000.

N. C., Forrest City—City plans to install sewerage system. About $25,000. J. B. Mc Crary Co., Atlanta, Ga., engrs.

N. C., Wadesboro City—City plans to install sewerage system. About $35,000. Blair & Drane, Charlotte, engrs.

O., Cleveland—C. A. Selzer, The Arcade, receives bids about Dec. 1, building 2,000 ft. 48 in. segmental block sewer, 3 mi. 6-8 in. water mains, 8 manholes, etc., in Garfield Allotment. E. P. Wight, 567 Rose Bldg., engr.

O., East Cleveland (Cleveland P. O.)—City receives bids about Dec. 10, building sewer in Graydon Rd., involving 3,280 ft. 8-18 in. vitr. pipe, 7 brick manholes and 6 catch basins. H. W. Garnett, city engr.

Mich., Detroit—Dept. Pub. Wks. soon lets contract building Lateral Sewers Nos. 3,209, between Prairie, Livernois, Alaska and Van Buren Aves., involving 4,255 ft., 12-24 in. pipe, 3,165 between Dexter Blvd., Lawton Ave., Chicago and Boston Blvds., 3,012 ft. 12-18 in. pipe, 3,199 between Van Dyke, Erwin, Marion and Badger Aves., 1,537 ft. 12-18 in. pipe, 3,194 between Van Dyke, Edwin, Marion and Marcue Aves., 1,546 ft. 12-18 in pipe, 3240 between Watson St. from Woodward Ave. easterly, 203 ft. 12-15 in. pipe, 3,230 between Brooklyn, Greenwood, Ferry and Hudson Aves., 543 ft. 15-18 in. pipe, 3,235 between Detroit Terminal R. R., Turin, Elmhurst and Fullerton Aves., 4,017 ft. 12-18 in. pipe, 3,231 in alley south of Harper Ave. from Berwick Ave. west, 132 ft. 12 in. pipe, 3,218 in Hancock St., Vinewood Ave. westerly, 203 ft. 12-15 in. pipe, 3,237 between Erwin, Fisher, Georgia and Marcus Aves., 1,701 ft. 12-24 in. pipe, 3,227 beween Chalmers, Philip and Mack Aves., 6,443 ft. 10-12 in. pipe, 3,208 between Prairie, Livernois, Van Buren and Boneparte Aves., 4,255 ft. 12-18 in. pipe. C. W. Hubbell, city engr.

Minn., St. Paul—H. W. Austin, city purch. agt., soon lets contract building sewers in Bway. between 4th St. and Mississippi River, and Carlton St. from Page St. to point 160 ft. south. About $74,496.

Neb., Crete—City plans to build storm sewers in various streets. About $73,000. Engineer not selected.

N. D., Minot—City having plans prepared by F. H. Bass, engr., 515 South East 6th Sts., Minneapolis, for sewerage system and sewage disposal plant. About $285,000. Noted Sept. 4.

Ore., Bend—City voted $133,000 bonds to build sewerage system, cement or vitr. pipe. R. B. Gould, city engr.

Ore., The Dalles—City rejected bids building storm sewerage system in Uglow Ave. and Birch St. About $10,000. Work will be readvertised. P. W. Warx, city engr.

BIDS DESIRED.

Ia., Osage—Until Dec. 2 by City Clerk, building 76,020 lin. ft. 8-15 in. sewers, involving 11,879 cu. yd. rock excav. About $200,000. C. L. Pillsbury Co., Metropolitan Bank Bldg., Minneapolis, engrs.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

***N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contract laying sewers and appurtenances in Linden St. to Booth & Flynn, Ltd., 17 Battery Pl., New York City, $89,500; Dumont Ave., to P. J. Donlan Contg. Co., 82 South 3rd St., Brooklyn, $160,664; Junction Ave., to C. Petracca, 175 Spencer St., Brooklyn, $2,692; Ashland St., to J. H. Johnson Contg. Co., $5,271.

O., East Cleveland (Cleveland, P. O.)—City received lowest bid Nov. 12, building 3,048 ft. 8-18 in. vitr. pipe sewer in Nela Court and Greyton Rd., from Curro Bros., 1977 East 26th St., Cleveland, cost $5,230; building 1,000 ft. 6 in. c. i. water main, etc. in East 133rd St., from E. Hakin & Co., 2617 Carnegie Ave., $2,910. Noted Nov. 6.

Mich., Detroit—City received bids furnishing labor and material building lateral sewers, vitr. crock with brick manholes (a) No. 3181 involving 3514 ft. 12-24 in. pipe (b) No. 3200, 3820 ft. 10 in. pipe, (c) No 3205, 13,593 10-24 in. pipe, (d) No. 3233, 3129 ft., 12-18 in. pipe, (e) No. 3192, 8474 ft. 10-12 in. pipe, (f) No. 3232, 2294 ft., 12-24 in. pipe, from Wenzel Constr. Co., 54 Buhl Blk, (a) $9,755, (b) $6,730, (c) $34,364, (e) $17,185, (f) $8,012; Western Constr Co., 1208 Ford Bldg. (a) $13,873, (b) $7,807, (c) $34,419; (f) $9,640; Liberty Constr. Co., Penobscot Bldg., (a) $15,850; (c) $34,625; (e) $21,830; Lennane & McIlvenna, 1205 Book Bldg., (b) $6,685; (d) $12,074; N. Macini, 256 Hague Ave., (d) $9,555; J. A. Mercier, 216 Hammond Bldg., (e) $23,900

Mich., Detroit—Dept. Pub. Wks. received bids building Raymond Ave. sewer, involving 2312 ft. 3 ft. x 4 ft. 6 in. and 3 ft. 4 in. x 5 ft. pipe, from R. D. Baker, 485 Elmherst Ave., $47,500, C. A. Handyside, 833 Lathrop Ave., $49,246, W. E. Lennane, Jr., Union Trust Bldg., $51,850; Dexter Blvd. sewer extension, involving 1525 ft., 3 ft. 6 in. and 4 ft. pipe, from Lennane & McIlvenne, 1205 Book Bldg., $14,995, Jeynes & Affeld, 1208 Ford Bldg., $18,114, Wenzell Constr. Co., 54 Buhl Blk., $18,637.

***Wis., Milwaukee**—Sewerage Comn. let contract building 280 ft. rein.-con. syphon, 7 ft. diameter, and 2 shafts, in Muskego Ave., under Menomonee Canal, to Greene & Sons Co., 332 South Michigan Ave., Chicago, Ill., $116,870. Noted Oct. 16.

***Ia., Pocahontas**—City let contract building 1¼ mi. sewers in various streets, to Turner Impvt. Co., 309 Youngerman Bldg. Des Moines, $109,612; sewage disposal plant, to B. D. Viegel, Webster City, $21,900. Noted Aug. 21.

***Neb., Scribner**—City let contract building ½ mi. vitr. sewers in various streets, to A. A. Dobson, 3140 Sheridan Blvd., Lincoln, $40,724.

Ore., Portland—City Council received bids building cement sewer including catchbasins, manholes, lampholes, sewer service nad branch lines, in East 65th and Stanton Sts., from Jacobsen-Jensen Co., 407 Stanton St., $64,967; 56th St. from point 110 ft. south of East Glisan St., to East Davis St., from J. Keating, cement pipe, $2,011; Azar & Co., cement pipe, $2,394; Mehemarie & Co., vitr. pipe, $2,270.

Bridges

PROPOSED WORK

Del., Wilmington—F. W. Carpenter, engr., Memorial Bridge Comn., soon receives bids building concrete arch bridge over Brandywine Creek, on Washington St., 30 ft. wide for State. About $500,000. B. H. Davis, 17 Battery Pl., New York City, engr.

S. C., Gaffney—Cherokee Co. soon lets contract building one 50 ft. rein.-con. span over Little Thickety Creek, 2 reinforced abutments. Work involves 378 cu. yd. dry and 170 cu. yd. wet excav., 550.8 cu. yd concrete and 37,535 lb. deformed steel. About $24,000. State Highway Dept., Columbia, engrs.

O. Eaton—Preble Co. plans to build three 22-45 ft., rein.-con. or steel bridges, over Seven Mile, Four Mile and Twin Creeks. About $22,000. J. Ryder, co. surv.

Mo., Jefferson City—Osage Co. (Linn) and Cole Co. (Jefferson City), care State Highway Dept., Jefferson City, plans to build 811 ft. bridge, 18 ft. roadway, over Osage River, at Hubers Ferry, involving manufacture and delivery of (1) 78,000 lb. structural steel, (2) 11,000 lb. main sheaves, shafts and bearings, 1000 lb. equalizers and pins, 6,000 lb. operating machinery, (3) 2000 lb. wire ropes and sockets, (4) one 90 ft. vertical lift steel deck girder span, six 92 ft. rein.-con. arch spans, 156 ft. rein.-con. girder spans, 1220 cu. yd. plain and 2247 cu. yd. rein.-con., 165.5 tons steel, 1360 sq. yd. 2 in. concrete wearing surface, 7300 lin. ft. wooden piling, 320 cu. yd. excav., 1580 lin. ft hand railing with reinforcing, 10,000 board ft. creosoted timber and 165 sq. yd 3½ in. creosoted wood block paving. About $165,000.

Ore., Vale—Malheur Co. and State Highway Comn., Portland, having preliminary plans prepared by H. Nunn, state highway engr., Salem, building bridge over Malheur River. About $30,000.

BIDS DESIRED.

Minn., Duluth—Until Dec. 4, by W. H. Bergen, Aud., St. Louis Co., building 4 steel

Bridges (Continued)

and 7 concrete bridges, 12 to 250 ft. long, 18 ft. wide with curbs, on State Rd. No. 1, 5th and 6th Dists. About $50,000. R. W. Acton, co. engr.

Kan., Abilene—Until Dec. 1, by Comrs. Dickinson Co., building bridges on Sect. B, Golden Belt Rd., Federal Aid Project No. 32, to include three 24 ft. spans, with 24 ft. roadway and one 40 ft. span "T" girder, with 20 ft. roadway, involving 340 cu. yd. concrete and 21,994 lb. reinforcing steel, cost $10,000; Bee Line Rd., Sect. G, Federal Aid Project No. 29, to include 20 ft. span, with 18 ft. roadway, involving 159 cu. yd. concrete and 4818 lb. reinforcing steel. K. Riddle, Abilene, engr.

Kan., Beloit—Until Dec. 5, by Comrs. Mitchell Co., building 40 ft. "T" girder bridge, 20 ft. wide, on Sect. 10, Federal Aid Project No. 1. About $10,000. F. A. Slack, Beloit, engr.

Kan., Ft. Scott—Until Dec. 15, by Clerk Bourbon Co., building bridges, culverts and farm entrance culverts on Miles Nos. 3, 4, 5, 6, 7 and 8, of Azua-Devon Rd., Benefit Dist. Project. Work involves 390 cu. yd. class A and 132 cu. yd. class C concrete, 28,027 lb. reinforcing steel, and 288 ft. 15-24 in. rein.-con. pipe. Bids will also be received for 1 double 16 ft. concrete slab bridge, Franklin Twp., one 6 x 6 ft. stone arch culvert, Osage Twp. and 11.58 cu. yd. earth and rock fill over Williams arch culvert, Pawnee Twp.

Kan., Wellington—Until Dec. 3, by J. H. Large, clk. Sumner Co., building bridge on Meridian Highway Rd., Sect. C, Federal Aid Project No. 35, to have two 50 ft. spans, with 18 ft. roadway. Work involves 443 cu. yd. concrete, 49,835 lb. reinforcing steel and 1820 lb. structural steel.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

***Ia., Adel**—Dallas Co. let contract lowering two 100 ft. steel span bridge, 18 ft. wide, and building two new 30 ft. I beam approaches, to N. M. Stark & Co., 13th and Mulberry Sts., Des Moines. About $14,900. Work includes 316 cu. yd. rein.-con., 4 tons rein.-con. bars, 14 tons structural steel and 1440 lin. ft. wooden piling.

***Ia., Adel**—Dallas Co. let contract building 100 ft. steel truss bridge, 18 ft. wide, rein.-con. abutments and flooring, to Pittsburg Des Moines Steel Co., 9th and Tuttle Sts., Des Moines, $11,759. Work involves 174 cu. yd. rein.-con., 5 tons rein.-con. bars, 4 tons structural steel and 1088 lin. ft. wooden piling.

Streets and Roads

PROPOSED WORK.

Massachusetts—State Highway Comn., Boston, soon lets contract building 34,000 ft. road, 18 ft. wide, Greenfield Twp., involving 55,000 sq. yd. bituminous concrete, 14,900 ft. road 18 ft. wide, Lunenberg Twp., 33,000 sq. yd. bituminous concrete. A. W. Dean, state highway engr.

N. J., May's Landing—Bd. Freeholders of Atlantic Co. plans to improve 12 mi. State Highway Rd. between Absecon and Mullica River. About $500,000. J. B. Tomlin. chn. A. H. Nelson, Guarantee Trust Bldg., engr.

W. Va., Clay—Comrs. Clay Co. plan to grade 4 mi. Hartland Lick Branch Rd. About $26,000. J. S. Chase, Co. engr.

W. Va., Kingwood—Comrs. Preston Co. plan to improve 3½ mi. Morgantown-Kingwood Rd., involving 33,000 sq. yd. bituminous macadam penetration method and 12,000 cu. yd. excav. About $64,000. H. E. Wilhelm, Kingwood, engr.

W. Va., Moundsville—Marshall Co. Meade and Cameron Dists. voted $385,000 bonds to improve roads. R. C. Yoho, Co. engr.

S. C., Chester—City soon lets contract paving, draining and curbing 70,000 sq. yd. various streets. About $200,000. H. S. Jandon Eng. Co., Elherlon, Ga., engrs.

S. C., Rock Hill—City receives bids in December for 150,000 sq. yd. sheet asphalt pavement. Bonds for $350,000 voted for project. G. White, Durham, N. C., engr.

Fla., Palmetto—City having plans prepared paving, curbing, guttering and draining 20,000 sq. yd. various streets. About $75,000.

O., Cleveland—Cuyahoga Co. soon lets contract grading, draining and paving Stumph Rd. from Brookpark to Huffman Rds., involving 16,000 sq yd. waterbound macadam, 1500 lin. ft. 4 in. vitr. tile gutter and 8000 cu. yd. earth excav. About $44,157. W. A. Stinchcomb, co. engr.

O., Dayton—Montgomery Co., soon lets contract paving 1480 ft. Springfield St. from corporation line to Hydraulic Ave., 40 ft. wide, cost $70,000; 1708 ft. West 3rd St. from Baker St. to corporation line, 36 ft. wide, $95,000; both brick paving on concrete base, concrete curb and gutter. P. S Bookwalter, co. surv. Noted June 12.

Michigan—State Highway Dept., Lansing, soon lets contract shaping, grading and draining 7.12 mi. Sect. A, Federal Aid Rd. No. 35. Sylvan Twp., Washtenaw Co.

Mich., Detroit—City soon lets contract laying 60,000 sq. ft. sidewalk, Houseman-Spitzley Subdivision. About $10,000. C. W. Hubbell, city engr.

Mich., Gladwin—Gladwin Co. and State Highway Dept., Lansing, soon let contract shaping, draining, surfacing and graveling 6,443 mi. State Trunk Line Rd., 16 ft. wide, Tobacco Twp. About $70,000.

Mich., Standish—Arenac Co. and State Highway Dept., Lansing, soon let contract shaping, draining and surfacing 8.068 mi. road, 16 ft. wide. Arenac to Turner Twps.

Ill., Chicago—Cook Co. voted $5,000,000 bonds to hard surface roads.

Wis., Grand Rapids—Wood Co. having plans prepared for 25-27 mi. plain concrete pavement, 16 ft. wide, involving 19,000-20,000 cu. yd. sand and 38,000-40,000 cu. yd. crushed stone. L. Amundson, co. comr.

Minn., Bemidji—Beltrami Co. received no bids grading and graveling 25 mi. Cass Lake-Bemidji-Solway Highway, 24 ft. wide. About $165,000. S. D. Snyder, Bemidji, engr. Work may be readvertised in spring.

Neb., David City—City soon lets contract paving Dists. No. 3 to 8 inclusive, involving 36,756 sq. yd. vertical fibre, asphalt, concrete or bituminous concrete, on 5 in. concrete base, 29,790 lin. ft. concerte and curbing, guttering, and 6830 cu. yd. earth excav. About $189,000. Grant, Fulton & Letton, 595 Bankers Life Bldg., Lincoln, engrs. Noted Aug. 7.

Mo., Mt. Vernon—Lawrence Co. plans to build 22 mi. gravel road from Jasper to Green County lines, through here, 16 ft. wide. About $83,000.

Mo., St. Joseph—Buchanan Co. having preliminary plans prepared building 6.5 mi. Agency Rd. from Saxton to Agency, 18 ft. wide, 6 in. concrete on macadam base. About $195,000. J. D. Mohler, 1522 South 25th St., engr.

Mo., St. Louis—Bd. Pub. Serv. plans to widen following streets, from 60 to 100 ft.: Gravois Ave., between Calhoun St. and Grand Ave., also establish 100 ft. building line between Park Ave. and Calhoun St., cost $1,200,000; 7.75 mi. Natural Bridge Rd. and Palm St., $750,000; 1.5 mi. Olive St. between 12th St. and Channing Ave., $2,000,000; 75 mi. Vandeventer Ave. between Washington Ave. and Market St., $210,000; 4½ blocks Vandeventer Ave. between Chouteau Ave. and Tower Grove Viaduct, $60,000. C. E. Smith, city engr.

Mo., Troy—Lincoln Co. voted $800,000 bonds to build hard surfaced roads. Engineer not selected.

Tex., Corsicana—Navarro Co. voted $35,000 bonds to build roads in Dist. No. 6, R. J. Windrow, Austin, state highway engr.

Tex., Denton—Denton Co. plans to gravel surface and build rein.-con. drainage structures on 10.055 mi. State Highway No. 40, from here to Garza, 18 ft. wide, involving 17 acres clearing and grubbing 38,419 cu. yd. earth and 3000 cu. yd. rock excav., 67,762 lb. reinforcing steel and 488 cu. yd. Class "A" and 371 cu. yd. Class "B" concrete. About $164,897. Bryant & Huffman, Iittlefield Bldg., Austin, engrs.

Tex., Karnes City—Karnes Co. voted $300,000 bonds to build roads. R. J. Windrow, Austin, state highway engr. Noted Sept. 25.

Okla., Blackwell—I. O. O. F. plans to hard surface 2 mi. roads leading south of here to cemetery, which is under their supervision. About $50,000. State Highway Comn., Oklahoma, will appropriate $25,000 toward cost.

Okla., Enid—Garfield Co. having plans prepared hard surfacing various roads, 18 ft. wide, probably concrete. About $210,000. F. Denner, Enid, engr.

Ore., Portland—City received no bids paving portions of 45th St., S. E., 53rd Ave., S. E., Front and 1st Sts.; also building sewer in Division St. from point 50 ft. west of East 9th St. to sewer 100 ft. west of East 7th St. O. Laurgaard, city engr.

Ore., Portland—City plans to grade, drain and pave East 17th St. from point 100 ft. south of Insley Ave., to south line of Holgate St., asphaltic concrete on crushed rock base, cost $5,206; Russet St. from Drummond St. to Peninsular Ave., $1,139; Webster St. from Interstate to Denver Aves., $1,210; Bway. from point 97 ft. east of East 45th St. to east line of lot 9, block 2, Stroud, $6,217; Roosevelt St. from 22nd to 23rd Sts., $4,580; East 16th St., from East Morrison to East Stark Sts., $3,188, all with concrete Nos. 1 and 2; Van Houten St from Lombard St. to Columbia Slough, asphaltic concrete Nos. 1 and 2 or bitulithic, $11,915. O. Laurgaard, city engr.

Cal., El Centro—Imperial Co. voted $150,000 bonds to build 35 mi. road from ElCentro to San Diego. An election will be held soon to vote on $150,000 additional bonds for Mecca-Brawley-Los Angeles Rd.

Cal., Fresno—Fresno Co. soon lets contract paving Elm. Ave., 16 ft. wide, involving 21,550 cu. yd. earth excav. and 15,670 cu. yd. concrete.

Cal., Oakland—City plans to improve 5140 ft. 14th St. from Market to Wood Sts., 80 ft. wide, involving 247,096 sq. ft. grading, 9719 lin. ft. concrete curbing, 11,870 sq. ft. brick guttering, 26,136 sq. yd. asphalt and 396 lin. ft. 10 in. pipe. About $95,000. M. Campbell, city engr.

Cal., San Luis Obispo—San Luis Obispo Co. election Dec. 16 to vote on $1,500,000 bonds to build, pave and improve roads. F. J. Rodrigues, clk.

Cal., San Luis Obispo—San Luis Obispo Co. having preliminary plans prepared for improving 2 mi. Paso Robles-Cambria Rd., also continuing State Highway through Arroyo Grande, and paving same with cement. About $8,000 and $28,000 respectively.

BIDS DESIRED.

Ga., Folkstone—Until Dec. 5, by Comrs. Charlton Co., building 19.24 mi. Federal Aid Project No. 77, involving 112,875 yd. gravel or slag. About $200,000. J. B. McCrary, 3rd Natl. Bank Bldg., Atlanta, engr.

Fla., Ft. Meyers—Until Dec. 2, by City, improving various streets, involving 26,000 yd. pavement, 135,000 lin. ft. curb and gutter, and 27,443 lin. ft. 4-8 in. c. i. pipe. About $125,000. J. A. Davidson & Son, Ft. Meyers, engrs.

Ia., Charles City—Until Dec. 8, by Floyd Co., improving roads, involving 11.54 mi. grading, 48,066 cu. yd. earth excav., 131,034 sq. yd. paving, 52,452 lin. ft. tiling, etc.

Ia., Jefferson—Until Dec. 4, by Green Co., improving roads, to include 6.47 mi. grading, 17,442 cu. yd. earth excav. and 68,400 yd. paving.

Minn., Alexandria—Until Dec. 15, by City Council, paving various streets, 18 ft. wide, involving 32,800 sq. yd. concrete or asphalt and concrete. G. L. Pillsbury Co., Metropolitan Bank Bldg., Minneapolis, engrs.

Kan., Abilene—Until Dec. 1, Comrs. Dickinson Co., grading and building 4.53 mi. Golden Belt Rd., Sect. A, Federal Aid Project No. 32, 18 ft. wide, concrete, also bridges and culverts on same, cost $290,000; 3.96 mi. Bee Line Rd., Sects. D and G, Federal Aid Project No. 29, 18 ft. wide, brick or concrete, also bridges and culverts on Sect. G, to include 20 ft. span, with 18 ft. roadway, $265,000. K. Riddle, Abilene, engr.

Kan., Salina—Until Dec. 4, by Comrs. Saline Co., grading and building .906 mi. Country Club Rd., 20 ft. wide, brick or concrete, also bridges and culverts on same. About $65,000. W. H. Cost, Salina, engr.

Kan., Wellington—Until Dec. 3, by Comrs. Sumner Co., grading and building 8.55 mi. Meridian Highway, Sects. A, B and C, Federal Aid Project No. 35, 18 ft. wide, concrete, also bridges and culverts on Sect. C, to include two 50 ft. spans, with 18 ft. roadway, cost $360,000; grading and building road on .832 mi. Rome Rd., Sect. X, Benefit Dist., 18 ft. wide, concrete, also bridges and culverts on same, $43,000. J. E. Mavity, Wellington, engr.

Kan., Wellington—Until Dec. 3, by J. W. Mavity, engr. Sumner Co., building 9 mi. road, 18 ft. wide, 1 or 2 course concrete. Work includes 1 rein.-con. girder with two 30 ft. spans.

Mo., New Madrid—Until Dec. 1, by New Madrid Co., grading, ditching, rock surfacing and laying vitr. or corrugated pipe in 7.5 mi. Sect. 1 Canalou-Matthews Rd.; grading, ditching, grubbing, rock surfacing and laying culverts in Sect. 1, Lilbourn-Parma Rd., East half extending from Station 0-00 to Floodway, 8.71 mi., and West half from Floodway to Parma, 5.57 mi. Bids will be received for either half or for the entire project. C. V. Hansen, highway engr.

Tex., Tyler—Until Dec. 1, by Comrs. Smith Co. and D. K. Caldwell, engr., care State Highway Comn., Austin, gravel surfacing, 7.82 mi. Highway No. 15 Cost to exceed $35,000.

Tex., Tyler—Until Dec. 1, by W. R. Castle, judge Smith Co., building road and concrete drainage structures on 8.72 mi. highway from here to Van Zandt Co., 16 ft. wide, 4.78 mi. to be gravel surfaced and 3.94 mi. concrete surfaced. About $174,481. D. K. Caldwell, Tyler, engr.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract.)

***Mass., Boston**—City let contract paving Rutherford Ave., 40 ft. wide, involving 18,000 sq. yd. granite block on 6 in. concrete base and 6,600 lin. ft. concrete curbing, to Coleman Bros., Chelsea, $62,820.

***R. I., Cranston**—City let contract resurfacing 2-3 mi. Broad St., sheet asphalt on 5 in. concrete base, to E. P. Tracy, Derby. About $16,800. Noted Oct. 30.

Streets and Roads (Continued)

*N. Y., Brooklyn—E. Riegelmann, boro. pres. let contracts to C. A. Meyers, Contg. Co., Stagg St. and Morgan Ave., regulating and paving East 14th St., $7,400, East 12th St., $5,357, regulating and grading East 12th St., $3,629, East 14th St., $3,572; to L. Mangeri, 190 31st St., East 82nd St., $8,149.

*N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., let contract to Consolidated Asphalt Paving Co., 52 9th St., Brooklyn, paving Bway., concrete asphalt, $35,891, Hillside Ave., $170,316; to Uvalde Asphalt Paving Co., 1 Bway, New York City, Carona Ave., $24,375, Cooper Ave., $11,548, Jackson Ave., $32,980; to Union Paving Co., Bway. and 112th St., New York City, Rockaway Plank Rd., $172,497.

*N. J. Jersey City—City let contract repaving Zabriskie St., asphalt, to W. T. Crichfield, Hoboken, 113 per cent of engineers' estimate, (which was $25,000.) Noted Oct. 23.

*W. Va., Moundsville—Marshall Co. will grade, pave and drain ½ mi. Moundsville-Mc Mechen Rd., involving 4,500 sq. yd. concrete pavement. Work will be done by day labor.

*W. Va., Petersburg—Comrs. Grant Co. let contract grading and draining 8 mi. Franklin-Patterson Creek Rd., 16 ft. wide, involving 34,700 cu. yd. earth and rock excav. 2,066 sq. yd. waterbound macadam and 1240 lin. ft. 12-24 in. corrugated iron pipe, to H. W. Kaylor, 121 East Antietam St., Hagerstown, Md., $48,021.

*N. C., Charlotte—Comrs. Mecklenburg Co. let contract hard surfacing 6 mi. Monroe Rd., 16 ft. wide, to Simmons-Whitton & Co., Selwyn Hotel Co., Charlotte About $150,000 Noted Sept. 11.

*N. C., Jackson—Comrs. Northampton Co. let contract graveling 5.8 mi. road, to Virginia Constr. Co., Hopewell, Va. About $45.000.

*N. C., Kinston—Comrs. Lenoir Co. let contract paving 25 mi. sheet asphalt roads, 16 ft. wide, to West Constr. Co., Volunteer State Life Bldg., Chattanooga, Tenn.

*N. C., Raleigh—Comrs. Wake Co. let contract paving 7.8 mi. Raleigh-Carey Rd., Warrenite, to R. J. Lassiter, Oxford, $3.04 per sq. yd. Noted July 3.

*O., Garfield Heights—Village let contract paving Garfield Heights Blvd., involving 520,000 sq.ft. asphalt on 6 in. concrete base, to Cleveland Trinidad Paving Co., The Arcade, $105,977.

*Wis., Wausau—City let contract for 5000 sy. yd. concrete pavement, to C. Lotz, Wausau, $2.36 per sq. yd.

*Mo., Liberty—Clay Co. let contract grading and building bridges on 3 mi. road from Kansas City to Liberty, 18 ft. wide(to W. M. Spencer, Independence, $39,628.

*Texas, Columbus—Colorado Co. let contract gravel surfacing and draining 19.46 mi. Highway No. 3, east and west through Eagle Lake, 16 ft. wide, to M. M. Craven, Missouri City, $187,870. Work involves 3 acres clearing and grubbing, 63,317 cu. yd. unclassified earth excav., 6589 sq. yd. concrete paving, 45,923 lb. reinforcing steel, 480 cu. yd. Class "A" and 30 cu. yd. Class "B" concrete.

*Texas, Granbury—Hood Co. let contract gravel surfacing and draining 28 mi. Highway No. 10 from Erath Co. line to Parker Co. line, 16 ft. wide, to Mc Elwrath & Rogers, Corsicana, $208,875. Work involves 5 acres clearing and grubbing, 138,109 cu. yd. earth and 7,000 cu. yd. rock excav., 1578 Class "A," 1463 cu. yd. Class "B," and 103 cu. yd. 1-3 in. concrete. Noted Sept. 25.

Tex., Mt. Vernon—Franklin Co. received bids surfacing and draining 12.37 mi. Highway No. 1 from Titus Co. to Hopkins Co. line, 12 ft. wide, from Smith Bros., Crockett, $68,214, and N. B. Gregory, Texarkana, $70,512. Work involves 10,420 sq. yd. concrete and 13,328 cu. yd. unclassified earth excav. County to furnish gravel at cost of $22,637. Noted Aug. 28.

*Tex., Odessa—Ector and Crane Counties let contract gravel surfacing and draining 9,753 mi. Highway No. 1, from Ward Co. line to Judkins, Ector Co., 14 ft. wide, to Lee-Moor Constr. Co., 302 Two Republics Bldg., El Paso, $104,840. Work involves 3.54 mi. machine grading, 26294 cu. yd. earth excav., 2208 lb. reinforcing steel and 61 cu. yd. concrete. State will probably furnish engineer to supervise construction. Noted May 22.

*Tex., Port Lavaca—Calhound Co. will build mud shell surfaced road on 4.616 mi. Highway No. 2, from here to Wittenbert Gate, 16 ft. wide, involving 23,742 lin. ft. machine grading, 235 lin. ft. pile trestle and 4000 lin. ft. guard fence. Work will be done by day labor. Noted Sept. 4.

*Tex., Quitman—Wood Co. let contract grading, gravel surfacing and draining 21.69 mi. Highway No. 15A, from Mineola to Upshur Co. line, 15 ft. wide, to Harris & Powell, Tyler, $161,455. Work involves 91.9 acres clearing and grubbing, 204,807 cu. yd. unclassified earth excav., 793 cu. yd. Class "A" and 133 cu. yd. Class "C" concrete, one 29 ft. and one 22 ft. span bridge, two 32 ft. and one 48 ft. concrete trestles, etc. Noted July 3.

*Okla., Edmond—City let contract for 42 blocks concrete pavement, to H. F. Struble, Norman, $230,449.

*Ariz., Globe—Gila Co. let contract paving 1900 ft. lower Miami St., 20 ft. wide, concrete on concrete base, to Hoopes & Kinnemuir, Miami. About $14,000.

*Ore., Klamath Falls—Oregon California Eastern R. R. let contract grading 4 mi. Straborn R. R. from Dairy to Hildebrand, to E. Propst, and J. Morgan, Klamath Falls About $80,000. Culverts and all steel will be supplied by Coast Culvert & Flume Co., Columbia Blvd. and Derby St., Portland.

*Ore., Mt. Angel—Marion Co. let contract spreading 10,000 yd. crushed rock on roads, to L. A. Smith, Mt. Angel. About $10,000.

Ore., Portland—City Council received bids from K. G. Lundstrom, 457 East 19th St., paving Cardinal Drive, macadam, $7.40 per cu. yd., total cost, $5,453, Grenwolde Court from Upper Dr. to southern extremity of court, concrete in roadway, $2.50 per sq. yd. $2,646, Kearney St., stone block, $7.00 per sq. yd., $2,359.

*Ore., St .Helens—City let contract paving 2 blocks Columbia St. type E bitulithic, to Warren Constr. Co., Journal Bldg., Portland. About $11,000.

California—State Highway Comn., 515 Forum Bldg., Sacramento, received bids from R. C. Storrie & Co., Crocker Bldg., San Francisco, building Sect. B, Route 3, Div. 2, Federal Aid Project No. 32, Siskiyou Co., involving 95,000 cu. yd. excav. at $1.35 per cu. yd., 17,350 cu. yd. class A Portland cement concrete (pavement), $11.50, 684 cu. yd. class A Portland cement concrete (culverts, etc..) $25. 50 cu. yd. class A Portland cement concrete (slope paving) 20,-394 lin. ft. 12 in. corrugated pipe, $1.25, 588 lin, ft. 18 in. corrugated pipe, $1.59, 496 lin. ft. 24 in. corrugated pipe, $2, total cost, $354,081.

*California—State Highway Comn., 515 Forum Bldg., Sacramento, let contract to H. H. Lienau, Redlands, building 7.1 mi. Sect. B, Route 26, Div. 7, Federal Aid Project No. 33, Riverside and San Berbardino Counties, involving 82,300 cu. yd. earth excav. at $.60 per cu. yd., 618 cu. yd. class A Portland cement concrete, $20, 1051 lin. ft. pipe, $1.25, total, $63,663; to L. S. Aatchinson, Jr., 1124 5th St., Sacramento, 4.5 mi. Sect. A, Route 3, Div. 2, between Vina and Los Molinos Tehama Co., involving 17,000 cu. yd. excav., $1.00, 4350 cu. yd. class A Portland cement concrete, $7.50, 150 cu. yd. class A Portland cement concrete, $20, total $53,489; to G. R. Curtis, 2440 East 26th St., Los Angeles, Sect. A and B, Route 2, Div. 7, between southerly boundary and Conejo Grade, Ventura Co., involving 1500 cu. yd. excav. and 7,000 cu. yd. class A Portland cement concrete, total $114,250.

*Cal., Oakland—City let contract improving 23rd Ave. from Railroad to 29th Aves., and 29th Ave. from 23rd Ave. to North Alameda Tract, involving 137,319 sq. ft. grading, 14,414 sq. yd. asphalt, 7594 sq. ft. brick guttering, 6258 lin. ft. concrete curbing, 1442 lin. ft. 10-21 in. pipe conduit and 1622 lin. ft. 2 ft. 3 in. x 2 ft. 6 in. concrete culverts, to Municipal Impvt. Co., 357 12th St., $69,588.

Cal., San Diego—City Council received bids improving Granada Ave. between Upas St. and University Ave., involving 143,412 sq. ft. asphaltum macadam, surface on concrete base, 2816 lin. ft. concrete curbing, 14,550 sq. ft. concrete sidewalk, 2748 lin. ft. c. i. pipe, etc., from D. H. Ryan, East San Diego, paving, .2476 per sq. ft., curbing .56 per lin. ft., sidewalks, 185, watermains $2.92 per lin. ft.; J. Engebretsen, McNeece Bldg., paving, .265, curbing .54, sidewalks .1725, watermains 2.95; G. R. Daley, 432 F St., paving .26, curbing .50, sidewalks .15, watermains 3.03. Noted Sept. 18.

Cal., San Francisco—City received bids improving 42nd Ave. between Geary and Anza Sts., involving 933 sq. yd. vitr. brick, 2276 sq. yd. asphalt; 1294 lin. ft. concrete curbing, 4140 sq. ft. artificial stone sidewalks, etc., from Flinn & Treacy, Call Bldg., $11,385, C. B. Eatin, 407 11th St., $12,841, Raisch Impvt. Co., 46 Kearny St., $12,860.

Excavation and Dredging

PROPOSED WORK.

N. J., Trenton—Dredging—V. Gelineau, dir. bd. commerce & navigation, State House soon lets contract dredging section Inland Waterway connecting Barnegat Bay and Manasquan River. About $25,000.

Ore., Astoria—Channel—Port Comn. having preliminary plans prepared by R. R. Bartlett, engr., Astoria, building channel from Tongue Point to River mouth, from 1.5 to 1.75 mi. wide, 36 ft. deep at low tide: also at northern Youngs Bay, to divert water from Clatsop Co. bridge, 6000 ft. wide, 30 ft. deep, involving 82,750,000 cu. yd. sand excav. About $2,500,000.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

*O., Cleveland—Excavation—C. A. Selzer, The Arcade, let contract for $35,000 cu. yd. excavation, in Garfield Allotment, to Kahl Constr. Co., 2936 Huntington Rd., Cleveland Heights.

*Ia., Webster City—Joint Bd. Supervs. Hardin and Hamilton Counties, let contracts for labor for building Joint Drain No. 105, Hardin Co. and No. 216, Hamilton Co., to Jensen, Jensen & Williams, Webster City, $14,229; tile, to Natl. Sewer Pipe Co., Webster City, $19,865. Work involves 47,756 ft. No. vitr. clay drain tile, 24 in. minimum length, sewer pipe, etc.

Industrial Works

PROPOSED WORK.

Me., Biddleford—Saco-Lowell, 77 Franklin St., Boston, Mass., having plans prepared by Lockwood-Green Co., archts. and engrs., 60 Federal St., Boston, Mass., for 2 story, rein.-con. and steel machine shop and foundry, rein.-con. flooring, concrete foundation, here. About $200,000.

Mass., Lowell—Saco-Lowell, 77 Franklin St., Boston, having plans prepared by Lockwood-Greene Co., archts. and engrs.,60 Federal St., Boston, for 2 story, rein.-con. and steel, machine shop and foundry, rein.-con. flooring, concrete foundation, here. About $250,000.

R. I., Pawtucket—W. H. Haskell Mfg. Co., Main St., having plans prepared by W. B. Lewis, engr., Grosvenor Bldg., Providence, and soon receives bids building 2 story, 80 x 160 ft., brick machine shop, concrete foundation. About $100,000.

Conn., Bridgeport—Columbia Grafanola Co., Barnum St., plans to build 5 and 6 story, brick and steel factories, rein.-con. flooring, concrete foundation, on Barnum St. and Howard Ave. About $750,000 and $1,000,000 respectively. Private plans.

Conn. Naugatuck—Naugatuck Chemical Wks. having plans prepared by Lockwood-Green Co., archts. and engrs., 101 Park Ave., New York City, for 4 story, 60 x 80 ft. brick, rein.-con. and steel, plant, rein.-con. flooring, concrete foundation. About $70,000.

Conn., New Haven—A. C. Gilbert, Blatchey Ave., having plans prepared by Lockwood-Green Co., archts. and engrs., 101 Park Ave., New York City, for 3 story, 80 x 100 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation. About $80,000.

N. Y., Brooklyn—Ballinger & Perrott, archts. and engrs., 47 West 34th St., New York City, soon let contract building 4 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Devoe and Morgan Sts., for N. Alexander & Co., Lorimre St. About $350,000.

N. Y., Buffalo—C. J. Irwin, Ellicott Sq., having plans prepared by F. J. and W. A. Kidd, archts., 284 Delaware Ave., for 4 story 90 x 100 ft. brick and rein.-con. garage, rein.-con. flooring, concrete foundation, on Swan St. About $75,000.

N. Y., Long Island City—H. A. Mallison, care Lockwood, Green & Co., archts. and engrs., 101 Park Ave., New York City, having plans prepared for 2 story, 125 x 207 ft., rein.-con. and steel mill, rein.-con. flooring, concrete foundation. About $225,000.

N. Y., Rockville Center—Goodwin Motor Sales Corp., having plans prepared by E. O. Holmgren, archt. and engr., 371 Fulton St., Brooklyn, for 1 story, 70 x 170 ft. brick and steel, service station and salesroom, rein.-con. flooring, brick foundation.

N. J., Bayonne—White Oil Co., 501 5th Ave., New York City, purchased 16 acres along water front, here, and plans to construct distributing station, to include five 75,000 bbl. and fourteen 10,000 bbl. tanks, canning plant, other buildings, etc. Cost over $250,000.

N. J., Trenton—Maddock Pottery Co., 3rd St., plans to construct plant, to include 2 story, 50 x 120 ft. and 3 story, 60 x 120 ft. buildings, also 60 x 160 ft. kiln. About $150,000. J. O. Hunt, 114 North Montgomery St., archt.

Md., Orangeville (Baltimore P. O.)—J. E. Aldred, 24 Exch. Pl., New York City, T. M. Jones, 503 Lexington St., Baltimore, and others acquired site, here, and plans to build metal furniture manufacturing plant. About $200,000.

Md., Orangeville (Baltimore P. O.)—Columbia Graphophone Mfg. Corp., 16 South Howard St., Baltimore, having plans prepared by A. R. Palmer, engr., Howard Ave., Bridgeport, Conn., for factory, near Biddle St. and Loneys Lane, here. About $1,500,-000. Noted Oct. 23.

S. C., Bamberg—Bamberg Cotton Mills plan to build 2 story, 52 x 375 ft., mill construction, cotton mill. J. E. Sirrine, Greenville, engr.

Industrial Works (Continued)

S. C., Ft. Mill—J. E. Sirrine, archt., Greenville, soon lets contract constructing 60 x 120 ft. slasher room, 80 x 114 ft. dye house,and 2 story, 30 x 114 ft. opener room and waste building, mill construction, for Mill Mfg. Co.

O., Cleveland—Cleveland Ry., Leader News Bldg., having preliminary plans prepared by L. P. Crocelius, engr. and archt., 650 Leader News Bldg., for 1 story, 50x50 ft., automatic sub-station, concrete, steel and brick, rein.-con. flooring, brick and concrete foundation, on Detroit Ave. and West 65th St. About $60,000.

O., Cleveland—Cleveland Ry., Leader News Bldg., having preliminary plans prepared by L. P. Crocelius, engr., 650 Leader News Bldg., for automatic sub-station, concrete, steel and brick, rein.-con. flooring, brick foundation, on Superior Ave. and East 123rd St.

O., Cleveland—W. S. Ferguson Co., archts., 1900 Euclid Ave., receive bids about Dec. 29, building 8 story, 100 x 150 ft. concrete, steel and brick garage, rein.-con. flooring, concrete foundation, on Huron Rd. and East 12th St. for G. A. Tenbusch Realty Co., 1836 Euclid Ave. About $600,000.

O., Cleveland—G. S. Rider & Co., archts. and engrs., Century Bldg., receive bids after Jan. 5, constructing 12 story, 85 x 200 ft. concrete, steel and brick storage building, rein.-con. flooring, concrete foundation, for Sheriff St. Market House Co., East 4th St. and Bolivar Rd. About $1,000,000.

O., Cleveland—Titan Screw Products Co., 1175 East 152d St., plans to build brick and steel factory and machine shop, rein.-con. flooring, concrete foundation. About $200,000. W. J. Hayes, pres. Architect not selected.

O., Columbus—Amer. Educ. Press Co., 227 West 36th St., New York City, plans to build 3 story, 21x187½ ft. printing plant, at 78 South 3rd St., here. C. P. Davis, treas.

O., Dayton—Bart Motor Sales Co., 1810 South Brown St., plans to build 2 story, rein.con. garage and salesroom, rein.-con. flooring, concrete foundation, on 2nd and Jefferson Sts. About $75,000. Architect not selected.

O., Dayton—Dodge Bros. Auto Sales Co. plans to build 3 story, 60 x 100 ft., rein.-con. and brick garage and salesroom, rein.-con. flooring, concrete foundation, on 1st and Jefferson Sts. About $80,000. Frank Hill Smith Co., Inc., 1035 Reibold Bldg., archts.

O., Warren—Genl. Fire Extinguisher Co. having plans prepared by H. M. Lane Co., engrs., 701 Owen Bldg., Detroit, Mich., for 2 story, 100 x 200 ft., rein.-con. and steel foundry, rein.-con. flooring, concrete foundation. About $350,000.

Mich., Detroit—M. R. Burrows, archt., 435 Woodward Ave., soon lets contract building 2 story, 71x200 ft., rein.-con., brick and steel garage and sales room, rein.-con. flooring, concrete foundation, on Woodward and Lothrop Aves., for Nash Co., 1299 Woodward Ave. About $90,000.

Mich., Detroit—Kennedy Bros., 503 Sun Bldg., plan to build 2 story, 86 x 167 ft., rein.-con., brick and steel sales room and service station, rein.-con. flooring, concrete foundation, on Cass Ave. and Putnam St. Architect not selected.

Mich., Detroit—Sibley Lumber Co., Kercheval and Beaufait Aves., having plans prepared by Baxter, O'Dell & Halpin, archts., 1024 Hammond Bldg., for 3 story, 157 x 160 ft., rein.-con. brick and steel factory, rein.-con. flooring, concrete foundation. About $100,000.

Mich., Detroit — Smith, Hinchman & Grylls, archts., 710 Washington Arcade, soon let contract building 1 story 106 x 313 ft., concrete and steel, shed and shop, concrete and wood block flooring, concrete foundation, for Detroit Steel Products Co., West Grand Blvd.

Wis., Kewaskum—L. Hunt, archt., 501 Security Bldg., Milwaukee, soon lets contract building 2 story, 50 x 180 ft. rein.-con and steel factory, rein.-con. flooring, concrete foundation, for Kewaskum Aluminum Co. here. About $50,000.

Wis., Milwaukee—Bd. Educ., 10th and Prairie Sts., plans to build 2 story, 120 x 160 ft. rein.-con. and brick warehouses, rein.-con. flooring, concrete foundation. About $60,000. Van Ryn & De Gelleke, Caswell Blk., archts.

Wis., Milwaukee — Milwaukee Reliance Boiler Wks., 1102-32nd St., plan to build 1 story, 70x180 ft. brick and steel plant, rein.-con. flooring, concrete foundation. A. D. Koch, Wells Bldg., archt. and engr.

Wis., Milwaukee—Phoenix Knitting Co., 207 Bway., plans to build 7 story, rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation. O. C. Uehling, 425 East Water St., archt., and engr.

Wis., West Bend—West Bend Aluminum Co. plans to build 1 story, 70 x 190 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation. About $100,000. Federal Eng. Co., Stephenson Bldg., Milwaukee, archts. and engrs.

Ia., Cedar Rapids—C. S. Krause, 205-7 Security Bank Bldg., and G. P. Witwer, 1819-2nd Ave., plan to build 3 story, 90x140 ft., brick, rein.-con. and steel garage, rein.-con. flooring, concrete foundation. About $90,000.

Minn., Minneapolis—Northwestern Automobile Intelligence Assn., 417 5th St., S., having preliminary sketches made for 2 story, 55 x 198 ft. service and sales building, rein.-con. or mill construction, on 4th Ave., and 5th St. About $75,000. Architect not selected.

Minn., St. Paul—H. A. Bratz, engr., Commerce Bldg., receives bids in spring building grain elevator, 100,000 bu. capacity, for Acme Mills, care engr. About $60,000.

Minn., St. Paul—Western Chemical Co., 443 South Dearborn St., Chicago, plans to build factory and office, on 30th St. and University Ave. About $100,000.

Kan., Emporia—State Bd. Administration, Topeka, having plans prepared by R. L. Gamble, archt., 1415 Fillmore St., Topeka, for 1 story power plant, for State Normal School, here. Cost, including equipment, $70,000. J. A. Kimball, mgr.

Kan., Hutchinson—Solvay Process, Milton Ave., Syracuse, N. Y., having plans prepared for 1 story plant, to include 3 rein.-con. and steel buildings, rein.-con. flooring, concrete foundation. About $750,000. Private plans.

Mo., Joplin—Joplin Supply Co., 3rd and Wall Sts., having plans prepared by Smith, Rea & Lovitt, archts., Finance Bldg., Kansas City, for 5 story, 75 x 120 ft., rein.-con., steel and brick garage and salesroom, rein.-con. flooring, concrete foundation. About $150,000.

Mo., St. Louis—F. W. Whining and C. Peters, Chemical Bldg., plan to build 8 story, 127 x 140 ft., concrete, steel and brick garage, rein.-con. flooring, rock foundation, on 7th and Franklin Sts. Architect not selected.

Tex., Dallas—Dallas Auto Club, Richardson Rd., plans to build 15 story garage. About $150,000. Architect not selected. E. D. Spillers, mgr.

Tex., Jacksboro—Texas United Oil and Refining Co., Ft. Worth, plans to build 1 story refinery, here. About $350,000. Architect not selected.

Okla., Cleveland—City voted $40,000 bonds to build gas plant and pipe line system. D. B. Heller, clk. Engineer to be selected at once.

Idaho, Nampa—Gove Motor Co., 208 Ideal Bldg., Denver, having preliminary plans prepared for 2 story assembling plant, concrete, concrete foundation, on 40 acre site, adjoining here. About $50,000. H. E. Gove, Denver, mgr.

Ore., Portland—Aladdin Co., Bay City, Mich., having preliminary plans prepared by A. I. Lamb, engr., Bay City, Mich., building 2 or 3 story, factory, concrete or brick. About $80,000. F. A. Carr, Bay City, Mich., purch. dir.

Ore., Portland—W. C. Powell Mfg. Co., 117 North 3rd St., St. Joseph, Mo., having preliminary plans prepared for 3 or 4 story, brick or concrete factory. About $75,000. W. C. Powell, mgr. Architect not selected.

Ore., Rainier—Allen-Hendricksen Canning Co., plans to build 2 or 3 story frame and concrete cannery, concrete foundation, or D. Blanchard estate. About $55,000. Architect not selected.

BIDS DESIRED.

N. Y., Brooklyn—Until Dec. 10, by State Hospital Comn., Capitol, Albany, building 2 story, 50 x 71 ft., brick and steel addition to laundry, concrete foundation, for Brooklyn State Hospital, here. About $95,000. L. F. Pilcher, Albany, state archt. Noted Nov. 6.

N. Y., Brooklyn—Until Dec. 1, by M. Winston, archt. and engr., 63 Park Row, New York City, building 1 story, 60 x 85 ft. and 2 story, 25 x 75 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on East 8th St., for Parkway Riding Academy. About $40,000.

Ill., Chicago—L. C. Bouchard, arch., 64 West Randolph St., receiving bids building 4 story, 60 x 70 ft., brick, terra cotta and rein.-con. printing plant, rein.-con. flooring, concrete foundation, at 1855 North Halsted St., for Premier Lithographing Co., care architect. About $100,000.

Ill., Chicago—Schmidt, Garden & Martin, archts., 104 South Michigan Ave., receiving bids building 5 story, 125 x 500 ft., rein.-con., brick and terra cotta factory, on Franklin Blvd. and Homan Blvd., for Bunte Bros., 730 West Monroe St. About $1,500,000. Noted Jan. 2.

Ill., Chicago—H. Sider & Son, 1311 Blue Island, receiving bids building 2 story, 45 x 125 ft., brick and rein.-con. factory and garage, rein.-con. flooring, concrete foundation, on Washburne Ave., and Laflin St. About $30,000. H. I. Dalsey, 2321 West North Ave., archt.

Minn., Hastings—Until Dec. 1, by State Bd. Control, Capitol, St. Paul, building 1 story, 45 x 140 ft., rein.-con. and brick power house, including a tunnel, at State Insane Asylum, here. About $125,000. C. L. Pillsbury Co., Metropolitan Bank Bldg., Minneapolis, engr. C. H. Johnston, Capital Bank Bldg., St. Paul, archt.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract.)

***Mass., Boston**—N. Berenson let contract building 2 story 125 x 242 ft., brick and rein.-con. garage and storage plant, rein.-con. flooring, concrete foundation, on Brighton Ave., to W. Bailey Constr. Co., Broad St. About $250,000.

***Mass., Boston**—Union Wool Co., 10 High St., let contract building 7 story 100 x 200 ft., rein.-con. beam and girder type storehouse, rein.-con. flooring, concrete foundation, on Summer St., to W. F. Kearns Co., Devonshire St.

***Mass., Fitchburg**—F. P. Sheldon & Son, engrs., Rhode Island Hospital Trust Bldg., Providence, R. I., let contract to J. H. Grozier, Bartholomew Ave., Hartford, Conn., building 3 story, 59 x 115 ft., brick and mill construction addition to mill, concrete foundation, for Fitchburg Yarn Co. About $100,000. Noted Oct. 30.

***Mass., North Adams**—Arnold Print Wks. will build 1 and 2 story, 80x95 ft., brick and rein.-con. dye house, rein.-con. flooring, concrete foundation. About $50,000. Work will be done by day labor.

***Mass., Willimansett (Holyoke P. O.)**—Stevens-Duryea Co., Chicopee Falls, let contract building 1 story, 300 x 320 ft. brick, concrete and steel factory, rein.-con flooring, here, to P. J. Kennedy & Co., 464 Maple St., Holyoke.

***R. I., Centreville**—F. Sheldon & Son, engrs., Rhode Island Hospital Trust Bldg., Providence, let contract to J. F. McCusker, Phenix, building 3 and 4 story, brick and mill construction addition to mill, concrete foundation, for Warwick Mills. About $200,000. Noted Oct. 30.

***R. I., Pawtucket**—Perry & Whipple, engrs., 17 Exchange St., Providence, let contract to O. D. Purington & Co., Industiral Trust Bldg., Providence, building 4 story 55 x 185 ft., brick and mill construction addition to mill, concrete foundation, for Tubular Woven Fabrics Co., Main St. About $150,000. Noted Oct. 30.

***R. I., Providence**—E. F. Berkander, 43 Sabin St., let contract building 2 story, 83 x 204 ft., brick and rein.-con. factory, rein.-con. flooring, concrete foundation, on Broad St., to F. G. Rowley Co., 260 Central Ave., Pawtucket. About $100,000.

***N. Y., Albany**—Albany Chemical Co., 2-24 Bway., let contract building 3 story, 57 x 59 ft., steel plant, concrete foundation, on Quay and Gansevoort Sts., to F. J. Stevens, 85 Morris St. About $53,000.

***N. Y., Albany**—J. A. LaPorte, 9 St. Josephs Terrace, let contract building 2 story, 60 x 200 ft., rein.-con. garage, concrete flooring, on Sheridan Ave. near Lark St., to H. Goodman, 418 Delaware Ave. About $60,000.

***N. Y., Albany**—Lockwood-Green Co., archts. and engrs., 101 Park Ave., New York City, let contract to W. E. Sheehan Constr. Co., 28-30 De Witt St., building 3 story, 80 x 90 ft. brick and mill construction factory, rein.-con. flooring, concrete foundation, for Van Slyke & Horton, 471 Bway., New York City. About $75,000. Noted Mar. 6.

***N. Y., New York**—Buchman & Kahn, archts. and engrs., 56 West 45th St., let contract to Rosenthal Eng. Contg. Co., 226 Jackson St., Brooklyn, building 6 story, 75 x 200 ft., brick and steel addition to factory, rein.-con. flooring, concrete foundation, on Ave. D. between 13th and 14th Sts., for Eagle Pencil Co., 703 East 13th St. Noted Sept. 11.

***Md., Baltimore**—Wertheimer Bros., 1807 East Preston St., let contract building 3 story, 78 x 103 ft. and 32 x 36 ft. factory, mill construction, rock and brick foundation, on Gay and Preston Sts., to Austin Co., Bulletin Bldg., Phila. About $40,000.

***N. C., Roanoke Rapids**—Roanoke Mills Co., will construct 1 story, 158 x 274 ft. weave room, concrete, 3 story, 103 x 158 ft. finishing plant, brick, and 1 story, 50 x 75 ft. dye house, brick. About $500,000. Work will be done by day labor.

***N. C., Winston-Salem**—G. E. Nissen & Co., will build 187 x 200 ft. factory, boiler and engine house, brick. Work will be done by day labor.

***S. C., Columbia**—Neal Jordan let contract building 2 story, shop and garage, mill construction, to J. C. Heshop, 1302 Pickens St. About $30,000.

***S. C., Easley**—Easley Cotton Mills let contract building 1 story, 55 x 124 ft., concrete and mill construction laundry to Gallevan Bldg. Co., Greenville. Cost to exceed $25,000.

Industrial Works (Continued)

*O., Akron—Klages Coal & Ice Co., 551 South High St., let contract constructing 1 story, 50 x 60 ft., steel and brick storage building, rein.-con. flooring, concrete foundation, on South High St., to J. Crisp & Sons, 163 Annadale Ave. About $75,000.

*O., Cleveland—Astrup Awning Co., 2937 West 25th St., let contract constructing 2 story, 70 x 140 ft., concrete, steel and brick storage building, rein.-con. flooring, concrete foundation, at 2937 West 25th St., to Natl. Concrete Fireproofing Co., Citizens Bldg. About $75,000.

*O., Cleveland—Euclid Windsor Co., Hickox Bldg., let contract building 8 story, 90 x 194 ft. garage and 2 story, 90 x 200 ft. office, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 46th St. and Euclid Ave., to S. W. Emerson Co., 1900 Euclid Bldg. About $2,000,000.

*O., Cleveland—Grant-Lees Gear Co., 2367 East 69th St., let contract building 3 story, 68 x 120 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Carnegie Ave., and East 69th St., to Crowell, Lundoff & Little Co., Meriam Bldg. About $200,000.

*O., Cleveland—Guide Motor Lamp Co., 11400 Madison Ave., let contract building, 1 story, 120 x 500 ft., concrete, steel and brick factory and boiler house, rein.-con. flooring, concrete and brick foundation, on West 110th St., to Crowell, Little Co., 1957 East 57th St. About $200,000.

*Cleveland—Hydraulic Press Steel Co., Hydraulic Ave., let contract building 1 story, 75 x 200 ft., concrete, steel and brick factory addition, rein.-con. flooring, concrete foundation, to Craig-Curtiss Co., 1031 Guardian Bldg. About $100,000.

*O., Cleveland—Judd Automobile Co., 1216 Huron Rd., let contract building 1 story 100 x 110 ft., concrete and brick garage, rein.-con. flooring, concrete and brick foundation, on E. 46th St. and Huron Ave., to E. Paulsen, 528 Erie Bldg. About $100,000.

*O., Dayton—Gem City Ice Cream Co., 1005 West 3rd St., let contract building 3 story, 55 x 60 ft., concrete and brick addition to factory, rein.-con. flooring, concrete foundation, to H. R. Blagg & Co., 1229 East 3rd St. About $44,000.

Mich., Detroit—C. R. Wilson Body Co., Clay Ave., let contract building 6 story, 100 x 300 ft. factory, also 6 story, 100 x 130 ft. storage and shipping room, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to A. A. Albrecht Co., 1130 Penobscot Bldg. Cost withheld. Noted Mar. 16.

*Mich., Highland Park (Detroit P. O.)—Smith, Hinchman & Gyrlls, archts., 710 Washington Arcade, Detroit, let masonry contract to Montague & Forney, 813 Ford Bldg., Detroit, building 1 and 2 story, 315 x 557 ft., rein.-con. and steel plant, rein.-con. flooring, concrete foundation, on Oakland Ave., for Maxwell Motor Car Co., Oakland Ave. About $750,000. Noted Aug. 28.

*Wis., Beloit—Dowd Knife Wks. let contract building 1 story, 66 x 130 ft. rein.-con. factory, rein.-con. flooring, concrete foundation, to W. J. Fitzgerald, Beloit. About $30,000.

*Wis., Cudahy—Federal Rubber Co. let contract building rubber cement house, 2 story, 50 x 100 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, with 26 x 92 ft. concrete storage vault, to T. Siderits Constr. Co., 1574 2nd St., Milwaukee. About $60,000.

*Wis., Milwaukee—O. C. Hansen Mfg Co., 291 Milwaukee St., let contract building 6 story, 60 x 75 ft. and 60 x 260 ft. brick and mill construction factory, concrete foundation, on 6th and Wright Sts., to Immel Constr. Co., 200 North Main St., Fond du Lac. About $300,000.

*Wis., Milwaukee—Milwaukee Auto Engine & Supply Co., 841- 29th St., let contract building 1 story, 120 x 120 ft., brick, concrete and steel factory, rein.-con. flooring, concrete foundation, on 30th St. and North Ave., to S. M. Siesel, 86 Michigan St. About $50,000; cost plus percentage basis.

*Minn., Duluth—H. A. Ostrom, mgr. Duluth Show Case Co., 2800 West Superior St., let contract constructing factory, including 3 story, 75 x 325 ft. main building, 90 x 190 ft. dry shed and 40 x 60 ft. engine house, all brick, rein.-con. flooring, rein.-con. foundation, on Wadena St., to G. H. Lounsberry, 322 East Superior St. About $250,000.

*Minn., Duluth—Scott-Graff Lumber Co., 24th Ave. W., will build 2 story, 50 x 100 ft., rein.-con. and steel factory addition, rein.-con. flooring, concrete foundation, on Michigan St. About $30,000. Work will be done by day labor.

*Neb., Omaha—Farrell & Co., 10th and Dodge Sts., let contract building 6 story, 60 x 106 ft., brick, rein.-con. and stone factory, rein.-con. flooring, concrete foundation, on 9th and Dodge Sts., to P. Kiewit & Sons, 754 Omaha Natl. Bank Bldg. About $115,000.

*Neb., Omaha—Omaha Cold Storage Co., 801 Farnum St., let contract building 5 story, 126 x 154 ft. addition to plant, to Omaha Steel Wks., 4802 Leavenworth St. About $250,000.

*Mo., St. Louis—Christopher & Simpson Iron Wks., 9th and Park Aves., will build 1 story, 88 x 175 ft., brick foundry, rock foundation. About $75,000. Work will be done by day labor.

*Mo., St. Louis—St. Louis Mfg. Co., 5301 Natural Bridge Rd., let contract building 3 story, 40 x 80 ft., concrete and brick addition, rein.-con. flooring, rock foundation, to plant of Genl. Motors Co., Natural Bridge Ave. and Union Blvd., to G. A. Fuller Co., Syndicate Trust Bldg. About $75,000.

*Ark., Arkansas City—G. A. Shryock, 306 East Douglas Ave., Wichita, Kan., let contract building 1 story, brick and steel plant, rein.-con. flooring, concrete foundation, here to Westinghouse Church Kerr, 37 Wall St., New York City. About $60,000.

*Colo., Denver—T. H. Smith, 1520 Cleveland Pl., let brick contract for building 4 story 75 x 150 ft. plant, to Watts Bros., $19,400; carpenter work, to J. G. McDonald & Son, $42,470; steel work, to Jackson-Richter Iron Wks. Co., 32nd and Blake St., $18,268. Contractors all of Denver.

*Wash., Raymond—E. E. Case will build 1 story, 100 x 110 ft. concrete garage, concrete foundation, on 3rd and Alder Sts. About $50,000. Work will be done by day labor.

*Wash., Spokane—Crowley Bros. let contract building 2 story, 67 x 72 ft., concrete factory, concrete foundation, to Hurley-Mason Co., Gasco Bldg., Portland. About $50,000.

*Ore., Linnton—Associated Oil Co., Pittock Blk., Portland, let contract building oil plant, including 1 story, 32 x 180 ft. 14 stall concrete garage, 40 x 170 ft. concrete warehouse, 1 story, 10 room, frame bunk house, four 1 story frame cottages, 4 sets of iron stairways, sewerage system, concrete septic tank, steel roof, unloading rack and concrete and steel gaging tank buildings, to Dinwiddie Constr. Co., Yeon Bldg., Portland. About $120,000. Noted June 26.

*Ore., Portland—Pettit Feather & Bed Co., 4th and Johnson Sts., let general contract building 2 story, 100 x 150 ft., brick and mill construction factory, brick and concrete foundation, on 20th and Guild Sts., to R. O. Powers, 1148 East Harrison St. About $40,000. Noted Oct. 30.

Buildings

PROPOSED WORK

Mass., Boston — Office — New England Telephone & Telegraph Co., 119 Milk St., having plans prepared by Parker, Thomas & Rice, archts., 110 State St., for 3 story, 66 x 100 x 185 ft. el shaped rein.-con. and limestone, rein.-con. flooring, concrete foundation, on Essex St. About $700,000.

Mass., Boston — School — Suffolk Law School, Inc., 45 Mt. Vernon St., receives bids in spring building 3 story, limestone and rein.-con., concrete foundation. About $125,000. Woodbury & Stuart, 581 Boylston St., archts.

Mass., Boston—Theatre—Loews Enterprises, 1492 Bway., New York City, having plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, for 82 x 192 ft., brick, steel and stone, brick foundation, on Massachusetts Ave., here. About $400,000.

Mass., New Bedford—Church and Rectory—St. Joseph's Roman Catholic Church, 30 Ingraham St., receives bids in spring, building brick and concrete, on Acushnet Ave. About $75,000. O. Crapo, 514 Bowditch St., archt.

Mass., North Adams—Y. M. C. A., 2 West 45th St., New York City, having plans prepared by Jallade & Lindsey, archts. and engrs., 37 Liberty St., New York City, constructing brick, steel and stone building, brick foundation, here. About $250,000.

Conn., Ansonia—Armory—D. W. Orr 956 Chapel St., New Haven, and Payne & Griswold, Plant Bldg., New London, archts. revising plans and soon receive bids building 3 story, 75 x 90 ft. armory, and 75 x 130 ft., drill shed, brick and stone, rein.-con. flooring, rock and concrete foundation, on State and North Cliff Sts., here, for State Armory Bd., Hartford. Former bids rejected. About $150,000 Noted Oct. 30.

Conn., Hartford—Store—A. Steiger Co., 345 Main St., Springfield, Mass., having plans prepared by Buchman & Kahn, archts. and engrs., 56 West 45th St., New York City, for 90 x 150 ft. brick and steel, brick foundation, on Main and Pratt Sts., here. About $500,000. Noted Aug. 14.

Conn., New Britain—Church—St. Marks Protestant Episcopal congregation, West Main and Washington Sts., soon lets contract building 100 x 100 ft., brick and steel, brick foundation. About $200,000 Carrere & Hastings, 52 Vanderbilt Ave., New York City, archts. Noted June 12.

N. Y., Brooklyn (Bensonhurst)—Bank—West End Bank having plans prepared by Holmes & Winslow, archts. and engrs., 110 West 40th St., New York City, for 1 story, 30 x 90 ft., brick, steel, stone and marble, brick foundation. About $50,000.

N. Y. Geneseo—School—F. B. Gilbert, deputy comr. of educ., soon receives bids building 2 story, brick and rein.-con., addition to Geneseo Normal School. About $100,000. L. F. Pilcher, Albany, state archt

N. Y., Johnson City—School—Bd. Educ. receives bids in January building new Theodore Roosevelt School, on Floral Ave. and St. Charles St.. About $210,000. Former bids rejected.

N. Y., Niagara Falls—Office—Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa., having plans prepared for rein.-con., rein.-con. flooring, concrete foundation here. About $100,000. W. M. Fickes, Niagara Falls, mgr.

N. J., Pennsgrove—Hall and Fire House—C. A. Adams, archt., 1509 Arch St., Phila., soon lets contract building 2 story, 40 x 95 ft., concrete and brick, for town. Cost to exceed, $50,000.

N. J., Trenton—Y. M. C. A., 2 West 45th St., New York City, having plans prepared by Jallade & Lindsley, archts. and engrs., 37 Liberty St., New York City, for brick, steel and stone, brick foundation, here. About $250,000.

Va., Clifton Forge—Y. M. C. A., Bldg. 2 West 45th St., New York City, having plans prepared by Jallade & Lindsay, arch., 37 Liberty St., New York City, for 3 story, brick, steel and stone, brick foundation here. About $60,000.

N. C. Chapel Hill—Dormitory—State Bd. Educ., Raleigh, plans to build dormitory, at university, here. J. S. Salter, state archt. About $75,000.

N. C., High Point—Hotel—T. F. Wrenn plans to build 100 room addition to Elwood Hotel. Architect not selected.

N. C., Raleigh—School—Bd. Educ. plans to build 2 schools. About $100,000 each. Architect not selected.

O., Cincinnati—Club — Business Men's Club, 9th and Race Sts., having plans prepared by S. Hannaford & Sons, archts., 6th and Vine Sts., for 8 story, 90 x 200 ft., on 8th and Race Sts. About $1,000,000.

O., Cincinnati—School—Bd. Educ., Denton Bldg., having plans prepared building school, on West 8th St. About $850,000.

O., Cincinnati—School—Bd. Educ., Denton Bldg., plans to build school on Mitchell Ave. About $500,000.

O., Cincinnati — Theatre — Columbia Amusement Co., 7th Ave. and 47th St., New York City, plans to build brick, steel and stone, brick foundation, on 5th St. near Main St., here. About $400,000. Architect not selected.

O., Cleveland—Bank—Lake Shore Banking & Trust Co., Osborn Bldg., plans to build 3 story, concrete, steel and brick, on East 79th St. and Euclid Ave. About $100,000. J. H. Jones, vice pres. Architect not selected.

O., Cleveland—Bank—Walker & Weeks, archts., 1900 Euclid Bldg., receive bids about Dec. 1, building, 2 story, 30 x 110 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Buckeye Rd. and East 89th St. for Woodland Ave. Savings & Trust Co., Woodland Ave. and East 55th St. About $60,000.

O., Cleveland — Bank — Woodland Ave. Savings & Trust Co., East 55th St. and Woodland Ave., receives bids about March 1, building 2 story, 72x114 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Kinsman Rd., and East 140th St. About $75,000. Walker & Weeks, 1900 Euclid Bldg., archts.

O., Cleveland—Bank and Office—Federal Reserve Bank, Williamson Bldg., plans to build 12 or 16 story, 100 x 150 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 6th St. and Superior Ave. About $2,000,000. Walker & Weeks, 1900 Euclid Bldg., archts.

O., Cleveland—Commercial—G. A. Gricble, archt., Sloan Bldg., receives bids about Dec. 17, building 6 story, 60 x 140 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, at 640 Huron Rd., for Huron Sixth Co., care architect. About $450,000.

O., Cleveland — Exchange — Cleveland Telephone Co., Engineers Bldg., receives bids about March 1, building 4 story, 90 x 135 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on St. Clair Ave. and East 123rd St. About $250,000. Hubbel & Benes, 4500 Euclid Ave., archts. A. N. Symes, 602 Engineers Bldg., engr.

O., Cleveland — Exchange — Cleveland Telephone Co., Engineers Bldg., receives bids about March 1, building 3 story, 90 x 150 ft., concrete, steel and brick, rein.-con.

Buildings (Continued)

flooring, concrete foundation, on West 65th St. and Guthrie Ave. About $200,000. Hubbell & Benes, 4500 Euclid Ave., archts. A .N. Symes, 602 Engineers Bldg., engr.

O., Cleveland—Market—Euclid East 46th St. Market House Co. plans to build 1 story, 90 x 350 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Euclid Ave., and East 46th St. About $200,000. C. Kamp, mgr. Architect to be selected soon.

O., Cleveland — Office — G. A. Grieble, archt., Sloan Bldg., receives bids about Dec. 1, building 8 story, 98 x 118 ft. concrete, steel and brick, rein.-con. flooring, concrete foundation, on 9th St. and Theresa Ave., for 9th St. Theresa Co., care architect. About $500,000.

O., Cleveland—Theatre—Capital Amusement Co., receives bids about Dec. 15, building 2 story, 100 x 160 ft., concrete, steel and brick, rein.-con. flooring, concrete and brick foundations, on East 117th St. and Kinsman Rd. About $100,000. Private plans.

O., Columbus—Church—St. John's Evangelical Church, 59 East Mound St., having preliminary plans prepared for new church. $100,000 available for project. T. Lehmann, pastor.

O., Columbus—Theatre—J. W. and W. J. Dusenbury, Athletic Club, 136 East Broad St., receive bids about Dec. 15, building 100 x 150 ft., concrete, steel, brick and stone, 50 ft. high on North High St. About $75,000. H. C. Holbrook, Outlook Bldg., archt.

O., Garfield Heights—School—Bd. Educ. receives bids about Jan. 22, building 2 story, 85 x 85 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Bway. Ave. About $90,000. W. H. Nicklas, 1900 Euclid Bldg., Cleveland, archt.

Mich., Detroit — Bank — Dime Savings Bank, Fort and Griswold Sts., having plans prepared for 1 story, 40 & 74 ft., rein.-con. terra cotta and brick, rein.-con. flooring, concrete foundation, on Holbrook Ave. About $50,000. G. M. Lindsey, 2321 Dime Bank Bldg., archt.

Mich., Detroit—Office—S. E. Remey, archt., 503 Whitney Office Bldg., preparing plans for 6 story, 47 x 52 ft., brick and steel, concrete foundation, on Hastings and Erskine Sts. About $100,000. Owner's name withheld.

Mich., Detroit—Sales and Service—M. A. Young, 754 Woodward Ave., having plans prepared by Mildner & Eisen, archts., 924 Hammond Bldg., for 3 story, 60 x 186 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Woodward Ave. and Brady St. About $125,000. Noted Nov. 13.

Mich., Detroit—Temple—Odd Fellows' Assn., care H. Kopp, 117 West Fort St., plans to build 3 story, rein.-con. brick and steel, rein.-con. flooring, brick or concrete foundation, on Wheeler and Lafayette Aves. About $120,000. A. Clubb, Goebel Bldg., archt.

***Mich., Ferndale**—Commercial—G. D. Bader, 3002 Woodward Ave., will build 2 story, 80 x 100 ft., brick and steel, brick foundation, on Woodward Ave. About $60,000. Work will be done by day labor. Noted Sept. 25.

Mich., Flint—Lodge House—Odd Fellows' Assn. having plans prepared by Van Leyen, Schilling & Keough, archts. and engrs., 1115 Union Trust Bldg., for 3 story, 66 x 116 ft., rein.-con., brick, steel, terra cotta and stone, rein.-con. flooring, concrete foundation, on Harrison and 4th Sts.

Mich., Grand Rapids—Theatre—Regent Theatre Co., Bond St., having plans prepared for 3 story, 100 x 100 ft., rein.-con., brick and steel, rein.-con. flooring, on Crescent and Bond Sts. About $300,000. G. M. Lindsey, 2321 Dime Bank Bldg., Detroit, engr. and archt.

Mich., Highland Park (Detroit P. O.)—Theatre—Hamilton Theatre Co., care C. H. Crane, archt., Huron Bldg., Detroit, plans to build 3 story, 68 x 170 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Highland Ave. About $300,000.

Mich., Highland Park (Detroit P. O.)—Theatre—J. H. Kunsky, Inc., 501 Madison Theatre Bldg., Detroit, having plans prepared by C. H. Crane & E. G. Kiehler, archts., Huron Bldg., Detroit, for 2 story, 100 x 180 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Hamilton Blvd. About $250,000.

Mich., Highland Park (Detroit P. O.)—Theatre—Tuxedo Theatre Co., care L. W. Lehmkuhle, 1254 Philadelphia Ave., Detroit, plans to build 2 story, 135 x 140 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Hamilton Blvd. About $200,000. Architect not selected.

Mich., Strathmoor—School Dist. No. 4, care H. T. Hart, P. O. Box 84, having plans prepared for 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $100,000. W. H. Adams, Vinton Bldg., Detroit, engr. Butterfield & Butterfield, 1113 David Whitney Bldg., Detroit, archts. Noted June 19.

Ill., Chicago—Bank—Cosmopolitan State Bank, 1159 North Clark St., receives bids about March, building 1 story, 50 x 150 ft. rein.-con. and steel, concrete foundation, on Chicago Ave. and Clark St. About $200,000. Schmidt, Garden & Martin, 104 South Michigan Ave., archts.

Ill., Chicago—Office—Crane Medicine Co., 730 North Franklin St., plans to build 8 story, 100 x 130 ft., brick and rein.-con., on Chicago Ave., and Orleans St. About $250,000. Architect not announced.

Ill., Chicago—Home—Cook Co., voted $1,000,000 bonds to build juvenile home.

Ill., Chicago—Theatre—Asher Bros., 220 South State St., receive bids in spring, building 1 story, 90 x 90 ft. rein.-con. and steel, rein.-con. flooring, concrete foundation, on State St. near Randolph St. About $1,000,000. H. L. Newhouse, 4630 Prairie Ave., archt.

Wis., Janesville—Bank and Office—Bank of Southern Wisconsin, care M. R. Fish, Whitewater, having plans revised by R. A. Messmer & Bro., archts., Majestic Bldg., Milwaukee, for 3 story, 60 x 110 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, here. About $75,000.

Wis., Marshfield—Bank—First Natl. Bank receives bids about Jan. 1, building 2 story, 50 x 100 ft. brick and stone. About $150,000. H. G. Hambright, cashier. A. A. Guilbert, Robinson Bldg., Racine, archt. Noted Sept. 18.

Wis., Spooner—School—Bd. Educ. having plans prepared by W. L. Alban, archt., 347 Endicott Bldg., St. Paul, Minn., for 2 story, 60 x 134 ft. stone. About $75,000. Incorrectly noted Aug. 7, under "Spooner, Minn."

Wis., West Allis (Milwaukee, P. O.)—Exhibit—Wisconsin Dept. Agriculture, Capitol Bldg., Madison, plans to build 1 story, automobile exhibit building, brick and steel, concrete foundation, at State Fair Park, here. About $50,000. Architect and engineer not selected.

Ia., Aurelia—School—Bd. Educ. having plans prepared by W. Gordon, archt., 319 Hubbell Bldg., Des Moines, for 3 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, here. About $165,000.

Ia., Cushing—School—City voted $107,000 bonds to build 3 story school. Architect not selected.

Ia., Fairfield—High School—Bd. Educ., Independent School Dist., having plans prepared by W. Gordon, archt., 319 Hubbell Bldg., Des Moines, for 3 story, 75x122 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $125,000.

Ia., Fairfield—School—City voted $100,000 bonds to build school.

Ia., Iowa City—Home—State Bd. Control, Des Moines, having plans prepared by Proudfoot, Bird & Rawson, archts., Hubbell Bldg., Des Moines, for 3 story, 60 x 130 ft., nurses' home, here, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000.

Ia., Larabee—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 3 story, 82 x 139 ft., brick, rein.-con. and stone, concrete foundation. About $130,000. H. Montgomery, secy.

Ia., Marshalltown—Hotel and Theatre—A. McComb of Hotel Corp. having plans prepared by J. J. Cooper, archt., 317 Fleming Bldg., Des Moines, for 6 story, rein.-con. and brick, rein.-con. flooring, concrete foundation, on 2nd and Main Sts. About $400,000.

Ia., Olds—School—Bd. Educ. having plans prepared by Keffer & Jones, archts., 204 Masonic Temple, Des Moines, for 2 story, 62 x 150 ft., rein.-con. and brick, consolidated school, rein.-con. flooring, concrete foundation. About $110,000. J. E. Stuckey, secy.

Ia., Rock Rapids—School—City voted $150,000 bonds to build school. Architect to be selected at once.

Ia., Stennett—School—Bd. Educ. had plans prepared by W. Gordon, archt., Hubbell Bldg., Des Moines, for 2 story, 44x81 ft. brick, concrete and steel, rein.-con. flooring, concrete foundation. About $60,000.

Ia., Waterloo — Church — First Baptist Church, 500 Jefferson St., having plans prepared for C. P. Shockley, archt., 719-20 Black's Bldg., for 2 story, 95x116 ft., brick, rein.-con. and steel, concrete foundation. About $125,000.

Ia., Woodbine—School—School Bd. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 3 story, rein.-con., brick and stone, concrete foundation. About $100,000.

Minn., Buhl—High School—St. Louis Co. School Dist. No. 35 rejected bids received Nov. 7, building 3 story, 65 x 195 ft., rein.-con. and brick, rein.-con. flooring, concrete and rock foundation, on Chestnut St. About $250,000. Work may be readvertised later. Noted Oct. 30.

Minn., Columbia Heights—School—Bd Educ. having plans prepared by Croft & Boerner, engrs. and archts., 833 Palace Bldg., Minneapolis, for 3 story, concrete and brick. About $100,000.

Minn., Duluth—B. C. Wade, sec. Y. M. C. A., 3rd Ave. E., soon lets contract building 3 story, 75x113 ft., rein.-con., steel and brick, rein.-con. foundation, on Central Ave. About $100,000. German & Jenssen Exch. Bldg., archts.

Minn., Northfield—Church—First Methodist Church having plans prepared by H W. Jones, archt., Thompson Yards, Inc., Minneapolis, for 1 story, 60 x 125 ft., brick and stone. About $60,000.

Minn., St. Paul—School—H. W. Austin, city pur. agt., soon lets contract building Homecroft School, 2 story, 84x140 ft., rein.-con. and brick, on Field Ave. About $80,000. C. A. Hausler, City Hall, archt.

Kan., Holyrood—School—City voted $73,000 bonds to build school. Architect not selected.

Kan., Stockton—Court House—Comrs. Rooks Co. rejected bids received Nov. 4, building 4 story, 79 x 98 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $200,000. Work will be readvertised about Mar. 1. F. C. Squires, 628 Kansas Ave., Topeka, archt. Noted Oct. 23.

Neb., Grand Island—Theatre—J. Weil Theatrical Co., Kansas City, Mo., having plans prepared by Rapp & Bush, archts., Chicago, for 2 story, brick, steel and rein.-con., rein.-con. flooring, concrete foundation, here. About $100,000.

Neb., Hastings—Temple—Masonic Cathedral Assn. having plans prepared by Keffer & Jones, archts., 204 Masonic Temple, Des Moines, Ia., for 4 story, 125 x 232 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $500,000.

Neb., Hastings—Theatre—J. Weil Theatrical Co., Kansas City, Mo., having plans prepared by Rapp & Bush, archts., Chicago, for 2 story, brick, steel and rein.-con., rein.-con. flooring, concrete foundation here. About $140,000.

Neb., Kearney—Hospital—Roman Catholic Congregation plans to build 3 story, 42 x 157 ft., rein.-con., steel and brick, rein.-con flooring, concrete foundation. About $100,000. J. H. Craddock & Co., 504 Farnman Bldg., Omaha, archts.

Neb., Lincoln—High School—Bd. Educ. had plans prepared and soon receives bids for 3 story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation. Fiske & Meginnis, 533 Bankers Life Bldg., archts. About $600,000. Engineer not selected.

Neb., Lincoln—School—Bd. Educ. having plans prepared by Fiske & Meginnis archts., 533 Bankers Life Bldg., for 2 story, 70 x 134 ft., brick, steel and concrete addition to Belmont School, concrete foundation. About $90,000.

Mo., Kansas City—Loft—T. C. Bonoke, 3520 Bway., having plans prepared by Keene & Simpson, archts., Kansas City, for 10 story, 100 x 115 ft., rein.-con., on 19th and Walnut Sts.

Mo., St. Charles—Administration—Lindenwood College plans to build 3 story, 90 x 175 ft. concrete and brick. About $300,000. Address J. L. Roemer, pres. J. P. Jamieson, Security Bldg., St. Louis, archt.

Mo., St. Louis—Hospital—Jewish Hospital—5415 Delmar Blvd., plans to build hospital. About $1,000,000. A. Waldheim, 4522 Lindell Ave., chn. bd. directors.

Tex., Austin — Exchange — Southwestern Telephone & Telegraph Co., 410 Congress Ave., receives bids about Dec. 1, building 2 story, 85 x 97 ft. rein.-con., rein.-con. flooring, on 9th and Colorado Sts. About $150,000. C. H. Page, Austin Natl. Bank Bldg., archt.

Tex., Ft. Worth—Office—O. E. Haley and L. Russell, Oil Operators Bldg., purchased 4 story building on 10th and Main Sts., and plan to construct 6 story, 25 x 100 ft. addition.

Tex., Sonora—Hotel—Chamber of Commerce plans to build 3 story, 48 room, concrete. Cost to exceed $75,000. A. D. Swartz of Woerner & Co., Sumpter Bldg., Dallas, archt.

Tex., Tyler — Temple — F. & A. M., 209½ Bway, plans to build temple. About $60,000. Architect and engineer not selected.

Okla., Duncan—Court House—Stephens Co., having plans prepared by J. Hicks, archt., Oklahoma, for 3 story, 70 x 84 ft., rein.-con., marble and oak, rein.-con. flooring, concrete foundation, on Main St. About $150,000.

Okla., Enid—Hall—City plans to build convention hall. Garfield farmers will unite in this project and build agricultural hall to be used for stock shows, fairs and sales.

Buildings (Continued)

About $400,000. Architect and engineer not decided.

Okla., Kingfisher—City Hall—City voted $70,000 bonds to build city hall. Architect to be selected at once.

Okla., Norman—Dormitory—University of Oklahoma having plans prepared by W. J. Schmitt, archt., Oklahoma, for 2 dormitories, 95 x 200 ft., on Boyd St. and State Blvd. About $300,000.

Okla., Oklahoma—Theatre—United Theatre Co. soon lets contract building 2 story, 75 x 140 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $250,000. C. Boller & Bro., Kansas City, Mo., archts.

Okla., Okmulgee — Hotel — Chamber of Commerce plans to build 7 story, concrete and brick, on Main St. About $450,000. R. W. Budd, secy. Architect not decided.

Okla., Tulsa — Church — Sacred Heart Church, 15th and Rockford Sts., plans to build. About $300,000. A. Standaert, pastor. Architect and engineer not selected.

Colo., Denver—Office—State Bldg. Comn., Capitol Bldg., soon lets contract building 5 story, 112 x 114 ft., on Colfax Ave. and Sherman St. About $500,000. W. N. Bowman, Central Saving Bank Bldg., archt.

Utah, Salt Lake City—Theatre—Loew Enterprises, 1492 Bway, New York City, plans to alter Casino Theatre, here. About $150,000. T. W. Lamb, 644 8th Ave., New York City, archt. and engr.

Wash., Seattle—Church—Third Church Christ, Scientist, plans to build 2 story, 80 x 83 ft., concrete, at 4756 17th St., N. W. About $75,000. G. F. Dunham, North West Bank Bldg., Portland archt.

Wash., Seattle—Theatre—Loew's Enterprises, 1492 Bway., New York City, plan to alter Palace Hippodrome Theatre, 2nd and Spring Sts., steel and brick, brick foundation. About $150,000. T. W. Lamb, 644 8th Ave., New York City, archt.

Wash., Tacoma—Theatre—Loew's Enterprises, 1492 Bway., New York City, plan to alter Hippodrome Theatre, 823 Pacific St., steel and brick, brick foundation. About $100,000. T. W. Lamb, 644 8th Ave., New York City, archt.

Ore., Portland—Church—First Spiritualist Church plans to build 2 story, stone, on East 7th and Hassals Sts. About $60,000. W. Miller, 645 Tenins St., pres. Architect not selected.

Ore., Portland — Hospital — Hahnemann Hospital plans to convert 5 story, rein.-con. building on East 2nd and Multnomah Sts., into homeopathic hospital, (100 beds capacity). Cost $250,000. About $40,000 now avialable. W. Ladd, pres. bd. trustees.

Ore., Portland—Temple—Labor Unions having revised plans prepared by Houghtaling & Dougan, Henry Bldg., and W. W. Lucius, Lewis Bldg., archts., for 4 story, fireproof, temple. About $200,000. Former bids rejected.

Ore., Portland—Theatre—Loew Enterprises, 1492 Bway., New York City, plan to alter Hippodrome, Bway and Yamhill St., brick and steel. About $150,000. T. W. Lamb, 644 8th Ave., New York City, archt. and engr.

Cal., Fresno—Theatre—Loew Enterprises, 1492 Bway, New York City, plan to alter Hippodrome, 2019 Fresno St., brick and steel. About $100,000. T. W. Lamb, 644 8th Ave., New York City, archt.

Cal., Los Angeles—Theatre—Loew Enterprises, 1492 Bway, New York City, plan to alter Hippodrome, 320 South Main St., brick and steel. About $150,000. T. W. Lamb, 644 8th Ave., New York City, archt.

Cal., Sacramento—Theatre—Loew Enterprises, 1492 Bway, New York City, plan to alter Hippodrome, 1013 K St., brick and steel. About $150,000. T. W. Lamb, 644 8th Ave., New York City, archt.

Cal., San Diego—Theatre—Loew Enterprises, 1492 Bway, New York City, plan to alter Hippodrome, brick and steel. About $150,000. T. W. Lamb, 644 8th Ave., New York Cit, archt.

Cal., San Francisco—Theatre—Loew Enterprises, 1492 Bway, New York City, plan to alter Hippodrome, 160 O'Farrell St., and Casino Theatre, 198 Ellis St., brick and steel. About $100,000 and $150,000, respectively. T. W. Lamb, 644 8th Ave., New York City archt.

Cal., San Jose—Theatre—Loew Enterprises, 1492 Bway, New York City, plan to alter Hippodrome, brick and steel. About $100,000. T. W. Lamb, 644 8th Ave., New York City, archt.

Cal., Stockton — Theatre — Loew Enterprises, 1492 Bway, New York City, plan to alter Hippodrome, 27 North Sutter St., brick and steel. About $150,000. T. W. Lamb, 644 8th Ave., New York City, archt.

BIDS DESIRED.

N. Y., Lockport—Bank—Until Dec. 3, by P. A. Davis, archt., 1713 Sansom St., Phila., building 1 story, 50 x 60 ft., stone, for Natl. Exch. Bank, 45 Main St. About $50,000.

N. Y., Wards Island—Hospital—Until Dec. 10, by State Hospital Comn., Capitol, Albany, building 2 story, 58 x 98 ft., brick and rein.-con., concrete foundation, for Manhattan State Hospital, here. About $100,000. L. F. Pilcher, Albany, state archt. Noted Nov. 6.

Pa., Phila.—Bank—A. L. Levy, archt., 3960 Pennsgrove St., is receiving bids for 1 story, 40 x 95 ft., brick, marble and terra cotta, at 4022 Girard Ave., for United Bank & Trust Co. About $50,000.

N. C., Kinston—School—Until Dec. 5, by J. A. Salter, state archt., Raleigh, constructing 4 brick buildings at Coswell Training School, here, for State Bldg. Comn., Raleigh. About $100,000.

O., Troy—School—Until Dec. 9, by H. Sheaver, clk. Bd. Educ., Concord Twp., Miami Co., building 2 story, 72x90 ft. brick, concrete floors and foundation. About $100,000. O. D. Howard, 8 East Broad St., Columbus, archt.

Mich., Detroit—Engine House—Until Dec. 8 (change of date) by Fire Comn., Larned St., building 2 story, 40 x 80 ft. rein.-con., brick and stone, rein.-con. flooring, brick foundation, on 12th and Labelle Sts. About $50,000. Spier & Gehrke, 1317 Chamber Commerce Bldg., archts.

Mich., Detroit—School—Until Dec. 1, by Bd. Educ., 50 Bway, building 2 story, 58 x 211 ft. school with 44 x 62 ft. wing, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Maplewood and Spokane Aves. About $170,000. Malcomson & Higginbotham, 404 Moffat Bldg., archts.

Mich., Detroit—Theatre—Until Nov. 29, by M. H. Finkel, archt., 303 Chamber Commerce, building 2 story, 38 x 115 x 190 ft., brick and steel, rein.-con. flooring, concrete foundation, on Grand River Ave., for H. C. Keywell, 501 Old Whitney Bldg. About $90,000. Noted Nov. 20.

Ia., Ainsworth—School—Until Dec. 1, by Bd. Educ., Consolidated Dist., building 3 story, 60 x 85 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $75,000. H. C. Ecklund & Co., McKinnie Bldg., Moline, Ill., archts.

Ia., Waterloo—Theatre—Until Dec. 1, by Palace Theatre Co., 508 Sycamore St., building 1 story, 68 x 128 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000. M. B. Cleveland, 601605 1st Natl. Bank Bldg., archt.

Minn., Hibbing—School—Until Dec. 15, by H. Watue, city clk., building 2 story, 75 x 150 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on 3rd St. About $100,000. W. T. Bray, Torrey Bldg., Duluth, archt. and engr.

Kan., Wochita—School—Until Dec. 1, by J. L. Leland, secy. Bd Educ., building 3 story, 88 x 247 ft. rein.-con., brick and stone, rein.-con. flooring. About $350,000. L. Schmitt, 121 North Market St., archt. H. A. Noble, Kansas City, Mo., engr. Noted July 3.

Cal., Oakland—Hospital—Until Dec. 22, by Supervs. Alameda Co., constructing 4 story, rein.-con., brick, and steel, rein.-con. flooring, concrete foundation, on 14th Ave. and Vallecito Pl., to include service building; 2 ward buildings and connecting corridor About $535,000. H. H. Meyers, 1201 Kohl Bldg., San Francisco, archt.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

***N. H. Hanover**—Dormitory—Dartmouth College let contract building 5 story, 60 x 280 ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on campus, to H. P. Cummings Constr. Co., Ware, Mass. About $400,000.

Mass., Boston—Jail—City received bids Nov. 5, building 3 story, 60x100 ft., brick and concrete annex, concrete foundation, on Charles St., from Langan & Shore, Boston, $248,500; McGahey & O'Connor, 551 Columbia Rd., Cambridgeport, $253,000; C. S. Cunningham & Sons, 7 Water St., $261,900.

***Mass., Boston**—Mercantile—E. L. Snider, 18 Tremont St., let contract building 7 story, 60x100 ft., rein.-con., rein.-con. flooring, concrete foundation, on East St. near Essex St., to N. Hurwitz, 1255 Boylston St. About $300,000.

***Mass., Boston**—School—Bd. Educ. let contract building 2 story, 60 x 32 ft., brick, concrete foundation, on Cheverus St., to C. S. Cunningham, 7 Water St., $134,950.

***Mass., Holyoke**—Theatre, Stores and Office—Goldstein Bros., Springfield, let contract building 4 story, brick, concrete and steel, on Chestnut and Suffolk Sts., here, to Casper Ranger, Constr. Co., 20 Bond St. About $500,000.

***N. Y., Long Island City**—High School Bd. Educ., 500 Park Ave., New York City, let contract building brick and steel addition to Newtown High School, brick foundation, to T. Dwyer, 216th St., Bronx. Cost $781,000.

***N. Y., New York**—Dormitory—R. D. Kohn, archt. and engr., 56 West 45th St., let contract to J. A. Henderson, 30 East 42nd St., building 3 story, 50 x 75 ft., and 3 story, 27 x 56 ft., brick and steel, brick foundation, for United Odd Fellows Home, Havemeyer Ave. About $125,000. Sept. 11.

***N. Y., New York**—Home—Montefeiro Home, 210th St. and Gun Hill Rd., let contract building 5 story, brick, steel and stone, brick foundation, to Hegeman-Harris, 33 West 42nd St.

***N. Y., New York**—Hotel—Twenty-Two East 70th St. Corp., 52 William St., will build 12 story, brick and steel, brick foundation, at 22 East 70th St. About $400,000. Work will be done by day labor.

***N. Y., New York**—Store—Opperheim-Collins Co., 35 West 34th St., let contract building 6 story, 50 x 100 ft., brick and steel, brick foundation, at 24 West 57th St., to R. A. Cowan, 30 East 42d St. About $400,000.

***N. J., Bayonne**—School—Bd. Educ. let general contract building P. S. No. 1, to G W. Cranwell & Sons, Union St., West Hoboken, $243,400, P. S. No. 4, to Egan & Mortague, 1 Montgomery St., Jersey City, $243,255, heating and ventilating for both, to Gillis & Geoghan, 537 West Bway, New York City, $62,878, electrical work to Dugan & Forest, 505 Bway, $17,968; plumbing, to J. Reid, 608 Bway, $37,600. Noted Sept. 25.

***Pa., Phila.**—Administration—Link Belt Co., Hunting Park and Phila. & Reading R. R. let contract building 4 story, 60 x 180 ft., brick, stone and concrete, to W. Steele & Sons Co., 16th and Arch Sts.

***Md., Cumberland** — Theatre — Cumberland Amusement Co. let contract building 1 and 2 story, 80 x 138 ft., rein.-con., steel, brick, tile and terra cotta, rein.-con. flooring, concrete foundation, on Baltimore St., to G. A. Fuller Co., Munsey Bldg., Washington, D. C. About $150,000.

***Md., Curtis Bay** (Baltimore P. O.)—Bank—Industrial Bank of Baltimore, Munsey Bldg., let contract building 1 story, 56 x 60 ft., rein.-con., steel and brick, concrete foundation, opposite Curtis Bay Hotel, here, to Frainie Bros. & Haigley, 18 Clay St., Baltimore. About $50,000. Noted Sept. 11.

***W. Va., Martinsburg**—School—Bd. Educ. let contract building brick school on Winchester Pike, to A. R. Small, Martinsburg $81,500.

***N. C., Greensboro**—Hotel—O. Henry Hotel Co. let contract building 4 story brick addition, to C. G. Wright, Greensboro. About $200,000.

***N. C., Wilson**—Hotel—R. A. Cherry let contract building 7 story, 183 room, hotel, to J. W. Stout, Sanford. About $375,000.

***N. C., Winston-Salem**—Hotel—A. W. Galloway let contract building 50 x 100 ft., to J. L. Couse, Greensboro. About $85,000.

***O., Cleveland**—Theatre—Loew Theatres, 1492 Bway., New York City, let contract building 4 story, 125x175 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on 17th St. and Euclid Ave., here, to Fleischman Constr. Co., 316 Permanent Bldg. About $300,000. Noted Aug. 14.

***O., Galion**—Bank—Commercial Savings Bank let contract altering steel and brick bank, to G. F. Dalton, 533 East 102nd St., Cleveland. About $50,000.

***O., Steubenville**—Bank and Office—Steubenville Savings Bank let contract building 12 story, 110x195 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, to R. Kitchen & Co., Tomlinson Ave., Wheeling, W. Va. About $75,000. Noted Oct. 30.

***Mich., Amasa**—High School—Bd. Educ. let contract building 3 story, 100 x 170 ft., rein.-con. and brick, concrete foundation, to G. A. Gustafson, Norway. About $125,000. Noted Nov. 13.

Mich., Detroit—School—Bd. Educ., 50 Bway, received bids for masonry work, building 2 story, rein.-con., brick and steel, rein-con. flooring, concrete foundation, on Kenilworth Ave., from Culbertson & Kelly, 809 Ford Bldg., $72,985. F. N. Cooper, Penobscot Bldg., $74,000, A. J. Smith Constr. Co., Campau Bldg., $82,897; carpentry work, from Hareus & Co., 774 Russell St., $14,126, E. Thiede, 287 Berlin St., $15,550, H. M. Martens Co., 221 Moffat Bldg., $17,553; heating, ventilating and plumbing, from Irvine & Meier, 2289 Woodward Ave., $32,488, O'Connor, Bros., Vinton Bldg., $38,891, Drake-Avery Co., 40 State St., $39,887. Noted Nov. 13.

***Wis., Sun Prairie** — Church — Sacred Heart Church let contract building 64x170 ft. brick and steel, concrete foundation, to Stegerwald & Co., Sun Prairie. About $80,000. Noted Oct. 16.

***Minn., Chisholm**—Recreation—City let contract building 2 story, 251 298 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on West Lake Ave., to Mc Leod & Smith, Sellwood Bldg., Duluth, $391,265. Noted Nov. 20

Buildings (Continued)

*Minn., St. Paul—Fire Station—City will build 2 story, 40 x 90 ft. steel and brick, on Dale and University Aves. About $55,000. Work will be done by day labor.

*Minn., St. Paul—School—City will build 2 story, 60x140 ft., brick and hollow tile, on St. Clair St. About $90,000. Work will be done by day labor.

*Kan., Wichita—Court House—Wheeler Kelley, Hakrey Co., 215 East Douglas Ave., let contract building 6 story, 75X135 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to G. Siedhoff Constr. Co., 121 North Market St. About $350,000; cost plus percentage basis.

*S. D., Sioux Falls—Exchange—Northwestern Telephone Co., 10th St. and Dakota Ave., let contract building 3 story, 31x76 ft. addition, to Sioux Falls Constr. Co., 619 North Main Ave. About $125,000; cost plus percentage basis.

*Mo., St. Louis—School—Bd. Educ., 9th and Locust Sts., let contract building 3 story, 71x167 ft., concrete and brick, rock foundation, at 6107 Southwest St., to E. Gerhard, 615 Post Dispatch Bldg. About $209,000.

*Tex., Weatherford—Hotel—Weatherford Hotel Co. let contract building 4 story, 60x 100 ft., to A. O. Harvey, Abilene. About $100,000. Noted Aug. 28.

*Cal., Los Angeles—Store and Office—Story Bros., Story Bldg., let contract building 13 story, 119 x 153 ft., rein.-con., marble and terra cotta, on Spring St., to W. Crowell. About $750,000. Los Angeles Stock Exchange, lessee ground floor.

Federal Government Work

PROPOSED WORK

R. I., Newport—Piers—Spec. 4090—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build new piers, here. About $90,000.

Pa., Phila.—Cranes—Spec. 4092—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build two 5-10 ton hammer head cranes. Cost $100,000.

Md., Baltimore—Dredging—U. S. Engr. Office, Custom House, rejected bids received Sept. 29, dredging channel in Patapsco River from Ft. McHenry Channel toward Ferry Bar. Noted Sept. 11.

D. C., Wash.—Storage Plant—Spec. 4035—Bureau Yards & Docks, Navy Dept., rejected bids received Nov. 12, completing storage plant for fuel oil, here. Noted Nov. 6.

Va., Norfolk—Cranes—Spec. 4092—Bureau Yards & Docks, Navy Dept., Wash. D. C., plans to build one 5-10 ton hammer head cranes, here. Cost $50,000.

S. C., Charleston—Heating—Spec. 4091—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to heat torpedo storehouse, here. About $7,700.

La., New Orleans—Dredging—U. S. Eng. Office, Custom House, rejected bids received Oct. 22, dredging canal between Mennentau and Calcasien Sect. of Intercoastal Canal, here. Noted Oct. 16.

Ind., North Vernon—Post Office—Treas. Dept., Wash., D. C., rejected bids received Nov. 4, building post office, here. Noted Oct. 16.

N. D., Bismark—Quarters and Mess Hall—Dept. Interior, Office of Indian Affairs, Wash., D. C., rejected bids received Oct. 15, building brick quarters and mess hall, for employees, here. C. Sells, comr. Noted Sept. 18.

Wash., Keyport—Officers' Quarters—Bureau Yards & Docks, Navy Dept., Wash., D. C., received no bids Nov. 19, building 3 quarters for officers, at Naval Training Sta., here. About $21,000. Noted Nov. 6.

Cal., San Diego—Balloons and Hangars—Spec. 4087—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build 2 kite balloons and 3 seaplane hangars. Cost $111,000.

BIDS DESIRED.

Va., Harrison—Extension of Post Office—Until Dec. 10, by Treas. Dept., Wash., D. C., extending Post Office and Court House building here. J. A. Wetmore, superv. archt.

W. Va., Wheeling—Gate Operating Machinery—Until Dec. 16, by U. S. Engr. Office, Wheeling, W. Va., furnishing and delivering gate operating machinery for Dams Nos. 23, 25 and 27, Ohio River.

Fla., Tampa—Radio Towers—Spec. 4088—Until Dec. 10, by Bureau Yards & Docks, Navy Dept., Wash., D. C., removing and rebuilding two 200 ft. towers, here. Cost $3,560; $10 deposit required for plans and spec. Noted Oct. 23.

Ky., Dawson Springs—Post Office—Until Dec. 10 by Treas. Dept., Wash., D. C., building here. J. A. Wetmore, superv. archt.

Kan, Kansas City—Plumbing—Until Dec. 12, by Treas. Dept., Wash., D. C., changing plumbing in Post Office and Court House, here.

Cal., Mare Island—Electric Lighting and Power Systems—Spec. 3982—Until Dec. 3 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing, here. About $25,000; $10 deposit required for plans and spec. Noted Aug. 28.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract)

***R. I., Newport**—Elevator—Spec. 4057—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing electric freight elevator, at Torpedo Sta., here, to Burwak Elevator Co., 216 Fulton St., New York City, N. Y. Cost $4,485 (90 days). Noted Oct. 30.

***N. J., Tuckerton**—Painting—Radio Towers—Spec. 4083—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract painting radio towers and masts, here, to Malakatis Painting Co., 608 Union Trust Bldg., Wash., D. C., $2,265; (60 days). Noted Oct. 16.

***D. C., Wash.**—Boiler—Treas. Dept., Wash., D. C., let contract installing 200 h. p. water tube boiler at Bureau of Engraving & Printing, to W. G. Cornell Co., 923 12th St., N. W., $9,755. Noted Oct. 16.

***D. C., Wash.**—Derrick—U. S. Engr. Office, War Dept., let contract building 1 stiff leg derrick, to Lambert Hoisting Eng. Co., 117 Pioneer St., Newark, N. J., $5,475.

***D. C., Wash.**—Sprinkler System—Treas. Dept. let contract installing sprinkler system in building at 412-16 14th St., N. W., to Globe Automatic Sprinkler Co., 511 Munsey Bldg., Baltimore, Md., $5,670. Noted Oct. 23.

***D. C., Wash.**—Walks and Driveway—A. Ridley, care Pub. Bldgs. & Grounds, let contract building walks and driveway, to C. H. Tompkins, 1883 3rd St., N. W. About $14,000.

***Ill., Chicago**—Dredging—U. S. Eng. Office, 537 South Dearborn St., let contract dredging in Indiana Harbor Canal, to Great Lakes Dredge & Dock Co., 104 South Michigan Ave., $11,520.

***Cal., San Diego**—Scraping, Cleaning and Painting Radio Towers—Spec. 4067—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract scraping, cleaning and painting three 600 ft. steel towers at Naval Radio Sta., here, to Kootz & Banks, 616 Hight St., Portsmouth, Va., $8,288 (30 days). Noted Oct. 30.

Miscellaneous

PROPOSED WORK.

Piers—New York, N. Y.—Dept. Docks. Pier "A," North River, plans to build 6 piers along Jamaica Bay between Barren Island and Mill Basin, each 1,000 ft. long and 125 ft. wide.

Transformer Station—New York, N. Y.—W. Whitehall, archt. and engr., 32 Union Sq., receives bids about Dec. 10, building 3 story, 45x75 ft., rein.-con. and steel transformer station, rein.-con. flooring, concrete foundation, at 421-423 East 6th St., for New York Edison Co., Irving Pl. and 15th St. About $60,000.

Coal Yard—Dayton, O.—R. H. Ball Coal Mining Co., 322 Huffman Ave., plans to construct coal yard, to include 1 story, brick office building, concrete bins, hoppers, etc., on Livingston and Pennsylvania R. R. About $25,000.

Fire Protection Equipment — Detroit, Mich.—City soon receives bids furnishing 400 double hydrants, four hundred 6 in. gatevalves, 400 gate boxes, 85 tons, special castings, 80 tons 6 in. c. i. pipe, 20 tons pig lead and 2000 lbs. packing. About $70,225.

Paving Material—Detroit, Mich.—Bd. Co Rd. Comrs. Wayne Co., soon let contract furnishing granite, trap rock, limestone, pebbles, sand, cement and expansion joint filler. E. N. Hines, 220 County Bldg., chn.

Lighting System—Green Bay, Wis.—City having plans prepared for ornamental lighting system, in business streets. About $20,000. Vaughn & Meyer, Security Bldg., Milwaukee, engrs.

Trucks and Trailers—Milwaukee, Wis.—P. Braman, comr. Pub. Wks., has asked that $50,000 be appropriated to purchase auto trucks and trailers for hauling ashes and garbage.

Cement—Minneapolis, Minn.—K. E. Alexander, city purch. agt., soon receives bids for 100,000 bbls. Portland cement. Cost about $2.72 with sacks in car load lots, $2.90 local delivery.

Levee—Platte City, Mo.—Quindaro Bend D. D., care Jacoby Eng. Co., engrs., 527 Shukert Bldg., Kansas City, soon receives bids building levee, Platte Co., 4 mi. long, 7 ft. high, involving 125,000 cu. yd. excav.

Telephone Line—Tulsa, Okla.—Comrs Tulsa Co. granted permission to M. A. Phelps, engr., Tulsa, to use 10 mi. of right-of-way along Tulsa-Sand Springs Rd., to install rural telephone lines, to serve residents between here and Sand Springs. About $15,000.

Fire Hydrants, Water Mains, Etc.—Anacortes, Wash.—City Council plans to improve side streets by installing fire hydrants, connections, and 6 in. water mains. About $5,000. W. D. Cartwright, clk.

Power System—Astoria, Ore.—Port Comn. plans to install underground electric power system through port property, including building of concrete transformer house, wires to carry 11,000 volts. About $17,000. R. R. Bartlett, engr.

Bulkhead—Seaside, Ore. — Breakwater Club having preliminary plans prepared for ornamental bulkhead wall with steps from streets to beach along entire seaside waterfront. About $100,000. M. F. Hardesty, councilman.

Bulkhead—Seaside, Ore.—City plans election to vote on $20,000 bonds to build cement bulkhead from 12th Ave. S. to Hotel Seaside. G. W. Bosche, city engr.

Fender Piling—San Francisco, Cal.—Bd. Pub. Wks. soon lets contract constructing fender piling on 3rd Stover Channel Waterway. About $10,000. M. M. O'Shaughnessy, city engr.

BIDS DESIRED.

Tunnel—Pittsburgh, Pa.—Until Dec. 2 by J. P. Moore, controller, Alleghenny Co., 5th Ave. and Grant St., building public highway tunnel through Mount Washington, 5690 ft. long, with one 325 ft. and one 274 ft. approach, and consist of 2 separate parallel tubes or tunnels, 26 ft. wide, 59 ft. between centers.

Electric Pumps—Sault Ste Marie, Mich.—Until Dec. 22 by A. J. Eaton, city clk., furnishing 4 electric pumps for pumping station.

Heating, Plumbing, Etc.—Austin, Minn.—Until Dec. 3, by Bd. Educ., for heating, plumbing, electricity and water softening system, in school, here. About $32,000. F. Tustison, Auditorium, Minneapolis, engr.

Lumber—Minneapolis, Minn.—K. E. Alexander, city purch. agt., receiving bids for 3,000,000 ft. 4 x 5 in.—4 x 10 in. yellow pine lumber cut to specified size for creosoted wood paving blocks. About $55.00 per 1,000 ft.

Air Lift Equipment—St. Paul, Minn.—H. W. Austin, city purch. agt., receiving bids for air lift equipment, electric driven air compressor with motor and vertical steel air receiver, for Como Park Pumping Sta.

Hanger—Omaha, Neb.—C. W. Steinbaugh, archt., 662 Brandeis Theatre Bldg., receiving bids building 1 story, 115 x 127 ft. wood and steel hanger for airplanes, concrete foundation, on Chamber of Commerce Field for Chamber of Commerce, W. O. W. Bldg. Cost between $20,000 to $30,000.

Levee—Liberty, Mo.—Birmingham D. D., care Jacoby Eng. Co., engrs., 527 Shukert Bldg., Kansas City, receiving bids building Levee, Clay Co., 3 mi. long, 16 ft. high, involving 250,000 cu. yd. excav.

PRICES AND CONTRACTS AWARDED

(*Indicates award of contract.)

***Coal Storage—Malone, N. Y.**—Old Line Coal Co., recently incorporated with $50,000 capital stock, let contract building coal storage plant, with 3500 ton capacity, to M. Monaghan, Malone. About $20,000.

Track—Marcy N. Y.—State Hospital Comn., Capitol, Albany, let contract to Scott Bros., Arlington Blk., Rome, $14,893 building sub-grade of spur track, involving 22,000 cu. yd. excav., 35 cu. yd. concrete, 15,000 lb. c. i. pipe laid and 1,000 lb. metal reinforcement, for Marcy Div. of Utica State Hospital, here. Noted Sept. 18, under "Excavation and Dredging."

Shed—Baltimore, Md.—City received lowest 2 bids building 1 story, frame shed, on Pier 4, Pratt St., from J. L. Robinson Constr. Co., 1130 West Lafayette Ave., $31,623; Price Constr. Co., Maryland Trust Bldg., $53,400.

***Subway—Cincinnati, O.**—City let contract building second section of Rapid Transit Loop, involving excavation of canal bed and construction of subway from Charles to Liberty Sts., to Hickey Bros., Furnace and Mound Sts., Columbus, $498,540. Noted July 17, under "Railways."

***Overhead Grade Crossing—Cleveland, O.**—Hydraulic Press Steel Co., Hydraulic Ave., let contract building overhead grade crossing, on Hydraulic Ave., 60 ft. long, 40 ft. wide, concrete, to E. R. Russell, Sincere Bldg. About $20,000.

***Filling—Detroit, Mich.**—Dept. Parks and Blvds., 822 Farwell Bldg., let contract filling in site of foundation of Scott Memorial Fountain, West End of Belle Isle, to E. Gray, Continental Ave., $11,250. Noted Nov. 20.

***Dam—Okmulgee, Okla.**—City let contract building dam for reservoir, along Deep Fork River, to R. Hopper, Manhattan, Kan. About $20,000; cost plus percentage basis.

The following items were not published during the past month on account of labor difficulties, and for the same reason were not classified in the preceding pages. The first section consists of "Contracts Awarded" and the second "Proposed Work."

Waterworks

★**Mass., Auburn** — Auburn Water Co. will extend water system. About $20,000. Work will be done by day labor

★**Conn., Groton**—Bilderbeck & Langdon, engrs., 253 State St., New London, let contract to F. D. Miller, Poquetanuck, extending water system, for town. Work involves 13,000 ft. 6-12 in c.i. pipe, etc. About $50,000. Noted Sept. 18.

★**N. C. Franklinton**—Town let contract building waterworks and sewerage system, including deep well and Imhoff tank to J. J. Quinn Co., et al., Franklinton. About $88,000.

★**Ky., Ashland**—Bd. Water Comrs. let contract building 2,000,000 gal. filtration plant, centrifugal pumping plant of seven units and a 35,000 gal. wash water tank, to J. E. Nelson & Sons, 117 North La Salle St., Chicago, Ill.

★**Mich., Hamtramck**—(Detroit P. O.)—Village let contract laying water mains in Yemens, Evaline, Christopher and McDougal Aves., involving 2755 ft. 6 in. and 150 ft. 8 in. c.i. pipe, to J. A. McDace Co., Fairview Ave., Detroit. About $6000. Noted Sept. 18.

★**Ia., Grand Junction**—City let contract building waterworks system, to C. W. Rolland Co., 215 Good Blk., Des Moines, $30,000.

★**Ia., Sheldon**—City let contract building stand pipe, comfort station and elevated steel tank, to Des Moines Bridge & Iron Wks., Tuttle St. between 9th and 11th Sts., Des Moines. About $14,800.

★**Kan., Belle Plaine**—City let contract building complete waterworks system, to E. M. Eby, Welington, $38,300.

★**Kan., Pretty Prairie**—City let general contract extending waterworks system to C. H. Everett, Hutchinson, $10,199; tower and tank to Chicago Bridge & Iron Co., 37 West Van Buren St., Chicago, $7250; pumps to Amer. Well Wks Co., 319 Reliance Bldg., Kansas City, Mo., $2722.

★**N. D., Fairmount**—City let contract building waterworks and well system, to Minneapolis Steel Mchy. Co., 29th and Minnehaha Sts., Minneapolis, Minn., and McCarthy Well Co., Wabasha and Eustis Sts. St. Paul, Minn. About $50,000.

★**Okla., Garber**—City clerk let contracts to Nat'l. Cast Iron Pipe Co., Kansas City Mo., furnishing 22,380 ft. 6-8 in. c.i. pipe, cost $29,343; to Ludlow Valve & Fdry. Co., 510 R. A. Long Bldg., Kansas City, Mo., furnishing twenty-three 6 in. fire hydrants and valves, $1968; to F. C. Brooks & Sons Co., Jackson, Mich., laying pipes, $20,897. Noted Aug. 7.

★**Okla., Picher**—City let contract building water mains and sewers in various streets,, to Mackintosh & Walton Co. 1022 State Natl. Bldg., Oklahoma. About $250,000. Noted Mar. 20.

★**Colo., Flagler**—Town Council let contract building waterworks system, to Gordon Constr. Co., Century Bldg., Denver. About $60,000.

★**Ont., York**—Town let contract supplying and laying 3200 lin.ft. 6 in. c.i. water mains, to Murphy Contg. Co., 8 Wychwood Park, Toronto, $12,686. Noted Oct. 24.

Sewers

★**Mass., Boston**—City let contract laying sewers in Bradlee and Thatcher Sts., to F. Drinkwater, 35 Hemlock St., West Roxbury, $11,264. Work involves 1346 ft. 10 in. and 1337 ft. 15 in. vitr. pipe, 1000 cu.yd. earth and 180 cu.yd. rock trenching, etc.

★**Mass., Chicopee**—City will lay 2200 ft. 12 in vitr. sewer pipe in Meadow and Caroline Sts. About $11,500. Work will be done by day labor Noted Sept. 11.

★**Mass., Chicopee**—City will lay 24 in. vitr. sewer pipe in Roosevelt Ave About $15,000. Work will be done by day labor. Noted Aug. 28.

★**Mass., Worcester**—City will extend outfall sewer from present terminus to new disposal plant at Millbury, involving 5300 ft. vitr. pipe. About $30,000. Work will be done by day labor.

★**R. I., Centerville**—Warwick Mills let contract building sand filter beds, 150 x 200 ft. pump house, 25 x 30 ft. c.i. and drain pipe to J. F. McCusker, Phenix, About $35,000.

★**W. Va., Martinsburg**—City let contract building sewage disposal plant, to Cox Contg. & Lumber Co., Martinsburg, $48,562.

★**O., Springfield**—City let contract furnishing and laying 8-24 in vitr pipe sewers in Rubsam St. from Race to Light Sts., Race St. from Rubsam to Cedar Sts, and Grant St., to M. J. Cooney, 633 York St., $17,129. Noted Sept. 11.

★**Ill., Clearing**—(Chicago P. O.)—Alvord & Burdick, engrs., 8 South Dearborn St., Chicago, let contract to Amer. Sewer Pipe & Drain Co., 2816 North Washtenaw Ave., Chicago, building sewerage system, involving 3 mi. 12-39 in. sewer pipe (mostly vitr.), for Chicago Clearing & Transfer R.R. About $100,000. Noted July 31.

★**Wis., Chippewa Falls**—City let contract building sewers in various streets, to P. L. McQuillan, 32 West Central St. About $80,000.

★**Wis., Milwaukee** — Sewerage Comn., City Hall, let contract to G. E. Zimmermann, 3102 McKinley Blvd., building 617 ft 54 in. rein.-con. sewer in 13th St., from Clybourn, to St. Paul Aves., $36.90 per ft., rein.-con. overflow chamber, $4000, total $26,767.

★**Wis., Viroqua**—City let contract furnishing and laying vitr. pipe sewers, etc., in various streets to W. F. Ribbens, Mayville. $13,306. Noted Sept. 18.

★**Ia., Davenport**—City let contract building storm drainage sewers from 3rd to 5th Sts., east on 15th Ave. to 9th St. and 12th Ave. and east on 12th Ave to 11th St., to Natl Constr. Co., Davenport, $60,000.

★**Minn., Breckenridge**—City let contract building sanitary and storm sewerage system, to W. Fraser, 810 Guardian Life Bldg., St. Paul. About $31,000. Noted Sept. 18.

★**Minn., Duluth**—City let contract building outlet sewer in 2nd Ave., E. from Michigan St. to Lake Ave., to C. R. McLean, c/o City Engineer, $11,772. Work involves 220 ft. 4 x 5 and 4 x 6 ft. concrete pipe and 975 cu.yd. earth trenching. Noted Sept. 4.

★**Minn., Foley**—H. Bettendorf, village clk., let contract installing sewerage system and disposal plant, to Pastoret Constr. Co., 510 Lyceum Bldg., Duluth. Noted Sept. 4.

★**Minn., Lamberton**—City let contract installing 13,823 ft 8 in., 1471 ft. 10 in. and 1875 ft. 12 in. vitr. pipe sewers, to Kircher Bros., Olivia, $34,350. Noted Sept. 4.

★**Kan., Chapman** — City let contract laying sanitary sewers and storm drains in various streets, to Reed & Wheelock, Clay Center, $53,040

★**Kan., Coldwater**—City let contract building sewerage system, to Ashland Constr. Co., Tecumseh, Neb. About $59,000.

★**N. D., Carrington**—City let contract furnishing and laying 2218 lin.ft. 8 in. sanitary sewer pipe, 2248 lin.ft. 15 in. storm water sewer pipe, 2554 lin.ft. 6 in. water main pipe, 6 man holes and 7 fire hydrants, to Haggart Constr. Co., 60 Broadway, Fargo., $21,148.

★**N. D., Minot**—City let contract laying 3000 lin.ft. 12-15 in. vitr. storm sewers in various streets, to J. W. Kemper, Minot, $22,885.

★**Mont., Sidney**—City let contract building 8900 lin.ft. 18 in. outfall sewers in various streets, to S. O. Oliver, Glendive, $15,012.

★**Tex., Gorman**—City let contract building sanitary sewerage system and sewage disposal plant, to Winslett Eldredge Co., 1001 Main St., Dallas. About $159,000.

★**Okla., El Reno**—City let contract building sewage disposal plant and extending sanitary sewerage system, to Tibbets & Pleasant 204 Daniel Bldg., Tulsa, $91,002. Noted Aug. 7.

★**Okla., Garber**—City let contract building sewers, involving 28,864 ft. 8-12 in. vitr clay pipe, 59 manholes, 18 flush tanks, 500 cu.yd excav and 120 cu.yd concrete, to L. A. Galleciez, 1509 West Cherokee Ave., Enid, $51,048. Noted Sept 18.

★**Okla., Pawhuska**—City let contract improving sewerage system, to Hamilton Bros. Constr. Co., Junction City, Kan., $55,090.

★**Colo., Denver**—City let contract building South Side Special Sanitary Sewer No. 6, involving 7900 ft. 8 in. vitr. pipe and 35 manholes, to F. C. Dreher Contg. Co., 811 Cooper Bldg., $11,276.

★**N. M., Santa Fe**—City let contract building sewerage system, in 7 blocks, to Gordon & Sons, care W Turley, city engr., Santa Fe, $16,540.

★**Idaho, Buhl**—City let contract building sewers in Dists. Nos. 3 and 4, to C. H. Mull, Buhl, $26,845 and $34,300 respectively. Noted Aug. 26.

★**Wash., Cashmere**—City let contract building sewers in Dists Nos. 7 and 8, to Burke & Sengfelder, Cashmere, $11,549.

★**Cal., Huntington Beach**—City let contract building 240,000 ft. 5 in. tile drains on sugar beet ranch, to La Bolsa Tile Co., Huntington Beach.

★**Ont., London**—City let contract supplying and laying 11,300 ft. 8-15 in vitr. sanitary sewers, to W. McCracken, 481 Central Ave., and T. Murphy, Hayman Hall, $73,420 and $16,300 respectively. Noted Sept. 18.

★**Alta., Edmonton**—City let contract building trunk sewerage system, to Jackson & Webster, 9638-109 A Ave. About $20,400.

Bridges

★**Me., Mechanic Falls**—Town and State Highway Comn., Augusta, let contract building 2 span, girder bridge on concrete abutments, 108 ft. long, 20 ft. roadway, to J. H. Kerrn, Rumford. Work involves 180 cu.yd. rein.-con., 500 cu.yd. concrete, 35 ton steel, 6500 lin.ft. wooden piling, 1500 cu.yd. earth approach and fill, 350 cu.yd. excav., 400 ft. wood guard rail, 250 cu.yd. rip rap, 350 lin.ft. sheet piling, etc. Cost $41,721.

★**Mass, Westboro**—Boston & Albany R. R., South Sta., Boston, will build steel and concrete bridge on East Main St., to replace present one, and repair concrete roadway under bridge. About $30,000. Work will be done by day labor.

★**Conn., New Haven**—City let contract repairing Neck Bridge, on State St., concrete and steel, to C. A. Sibley & Co., 902 Chapel St. About $23,000. Noted July 17.

★**New Jersey**—State Highway Comn., Trenton, let contract building bridges Nos. 46, 174, 45 and 172, Route No. 3, Camden Co, to L. J. Sieling, Red Bank, $35,058 Noted Sept. 11.

★**W. Va., Morgantown**—Comrs. Monongalia Co. let contract building piers and abutments for Cheat River bridge at Ices Ferry, to H. C. Gilmore Co., Morgantown About $30,654.

★**N. C., Goldsbore** — State Highway Comn., Raleigh, let contract building steel and concrete bridge over Neuse River, here, to Roanoke Iron & Bridge Co., Roanoke, Va., $46,180. Noted Sept. 25.

★**N. C., Kingston**—Comrs Lenoir Co. let contract building 348 ft. rein.-con. bridge, here, 16 ft. wide, to have 1 draw span and 2 fixed spans, to Roanoke Iron Bridge Co., Roanoke, Va. $38,000. Noted Sept 25.

★**Ala., Birmingham**—Bd Revenue Jefferson Co. let contract building 100 ft. rein.-con. slab bridge over Five Mile Creek on Lewisburg Rd., 20 ft. roadway, to F. N Dobson, Montgomery, $14,560. Work involves 300 cu.yd. rein.-con., 18 tons steel and 225 cu.yd. stone. Noted Sept. 18.

★**Ind., Indianapolis**—Comrs Marion Co. let contract building bridge over Canal, on North Illinois Sts., to Natl Concrete Co., 1600 South West St., $25,860

★**Wis., Clintonville** — Waupaca Co. (Waupaca) let contract building Buchholz bridge, rein.-con., Matteson Twp, to Worden-Allen Co., 33rd and Burnham Sts., Milwaukee, $12,548.

★**Wis., Lake Geneva** City let contract building 42 ft. steel and concrete bridge 30 ft. wide, concrete abutments and approaches to Michie Constr. Co., Camp Bldg., Milwaukee, $14,990 Noted Aug 28

★**Wis., Whitehall** Trempealeau Co. let contract building McClary Bridge, Gale Twp., 120 ft. steel truss 20 ft. wide to La Crosse Bridge Co., La Crosse About $13,500

★**Minn., Duluth**—Comrs St. Louis Co. let contract to W. S. Hewitt, Metropol-

Bridges (Continued)

itan Bank Bldg., Minneapolis, building Bridge No. M-6-21-1, $4897, No. M-6-28-1, $3750, No. M-6-23-1, $1150, No. M-5-34-1, $999, involving 386 cu.yd. concrete and 20,693 cu.yd. reinforcing steel; O'Shea & Sons, 526 Ridgewood St., Minneapolis, No. Q-7-9-1, $19,992, No. R-7-22-1, $2865, 261 cu.yd. concrete, 17,982 cu.yd. reinforcing and 129,460 cu.yd. structural steel; Hennepin Bridge Co., 922 Laurel Ave., Minneapolis, No. C-0-36-1, $3377, No. C-9-33-1, $1897, No. I-8-3-1, $3084, No. G-1-9-1, $2760, No. G-0-18-1, $9697, 466 cu.yd. concrete, 22,257 cu.yd reinforcing and 70,-879 cu.yd. structural steel; Minneapolis Bridge Co., 1033 Metropolitan Life Bldg., Minneapolis, No. M-0-6-1, $16,440; No. N-0-7-1, $21.283, No. N-0-14-1, $19,530, No. N-1-9-1, $18,441, No. N-1-32-1, $15,-314, 1373 cu.yd. concrete, 68,963 cu.yd. reinforcing and 334,440 cu.yd. structural steel and 3058 lin.ft. piling; L. E. Baum, 2305 Ogden Ave., Superior, Wis., No. M-1-8-2, $5320, No. M-1-8-1, $4078, No. M-1-7-1, $5504, No. M-1-10-1, $5256, No N-0-6-1, $6780, No. N-1-34-1, $6644, 814 cu.yd. concrete and 66,497 cu.yd. reinforcing steel Noted Sept. 11.

★**Minn., Moorhead**—A. O. Hughum, aud. Clay Co., let contract building Bridge No. 3013, to J. A. Jardine, Fargo, N. D., $19,-897. Noted Sept. 25

★**Kan., Topeka**—Shawnee Co. let contracts building Menoken and Mud Valley bridges, to Kansas City Bridge Co., 510 Orear Leslie Bldg., Kansas City, Mo., $14,-878 each; Forbes Bridge to Capital Iron Wks., 7th and Holliday Sts., Topeka, $4551; Foster Bridge, to N. E. Marsh & Co., 205 Masonic Temple, Des Moines, Ia., $30,566.

★**Neb., Central City**—H. V. Nelson, clk. Hamilton Co. (Aurora), let contract building 800 ft. bridge, 24 ft. wide, to Western Bridge & Constr. Co., 648 Bee Bldg., Omaha, $83,990. Noted Sept. 11.

★**Neb., Grand Island**—H. V. Nelson, clk., Hamilton Co. (Aurora), let contract building rein.-con. bridge on line between Hall and Hamilton Counties, 24 ft. wide, to have sixteen 50 ft. arches and 40,000 cu.yd. fill, to Western Bridge & Constr. Co., 648 Bee Bldg., Omaha, $84,975 plus $.38 per yard for fill.

★**Neb., Henry**—V. B. Kirkham, clk. Scotts Bluff Co., (Gering) let contract building 600 ft. bridge, here, to Allied Contractors, Inc., Omaha, $65,925. Noted Sept. 18.

★**Neb., Morrill**—V. B. Kirkham, clk. Scotts Bluff Co., (Gering), let contract building 600 ft. bridge, 16 ft. wide, here, to Allied Contractors Co., Inc., Omaha, $57,950. Noted Sept. 18.

★**Neb., Minatare**—V. B. Kirkham, clk. Scotts Bluff Co., (Gering), let contract building 600 ft. bridge, 16 ft. wide, here, to Allied Contractors, Inc. About $57,000. Noted Sept. 18.

★**Neb., Scotts Bluff**—V. B. Kirkham, clk. Scotts Bluff Co., (Gering), let contract building 600 ft. bridge, 16 ft. wide, here, to Allied Contractors, Inc., Omaha. About $75,600. Noted Sept. 18.

★**South Dakota**—State Highway Comn., Pierre, let contract building pier and abutments for 300 ft. steel bridge, 16 ft. wide, over White River between Jackson and Washington Counties, to J. Stainer, Pierre, $6955; steel contract for superstructure for above involving 237,000 tons steel, to Bethlehem Steel Co., Bethlehem, $13,935. Superstructure will be erected by day labor.

★**Wyo., Lander** — State Legislature, Cheyenne, let contract building 20 ft. steel bridge, on Wind River Rd., Fremont Co., to Monarch Eng. Co., West Colfax Ave. and Larimer St., Denver, Colo., $12,365.

★**Mont., Billings**—Yellowstone Co. let contract building 175 ft. steel span bridge over Yellowstone River, here, to Security Bridge Co., 502 North 32nd St., $21,600.

★**Mont., Melrose**—Silver Bow Co. (Butte) let contract building concrete bridge over Big Hole River, here, 16 ft. wide, to have two 100 ft. steel spans on concrete abutments and concrete center pier, to J. R. Silver, 501 West Galena St., Butte. About $18,900.

★**Ark., Marion** — Bd. Comrs. Rd. Impvt. Dist. No. 7, Crittenden Co., let contract, to Larimer & Burget Bridge Co., Randolph Bldg., Memphis, Tenn., building 17 bridges involving 1460 cu.yd. rein.-con., 270 cu.yd. plain concrete, 155,000 lb. reinforcement, 750 cu.yd. excav., cost $95,-554; Rd. Impvt. Dist. No. 8, 17 bridges involving 820 cu.yd. rein.-con., 180 cu.yd. plain concrete, 92,000 lb. reinforcement, 560 cu.yd. excav., $56,672; Rd. Impvt. Dist. No. 9, 8 bridges, involving 700 cu.yd. rein-con., 130 cu.yd. plain concrete, 93,-000 lb. reinforcement, 430 cu.yd. excav., $50,574. Noted Oct. 16.

★**Colorado**—State Highway Comn., State Museum Bldg., Denver, let contract building 3 concrete bridges on Denver-Colorado Springs Rd., to F. Bullen, 303 West 17th St., Pueblo, $34,000

★**N. M., Santa Fe**—City let contract building 60 ft. concrete bridge over Arroyo Mascaros. 20 ft. wide, to Midland Bridge Co., Dallas, Tex. About $12,000. Noted July 24.

★**Wash., Pasco**—Auditor Franklin Co. let contract building 1556 ft. steel bridge over Snake River, near here, consisting of one 301 ft. cantilever, two 259 ft. anchor arm, two 260 ft. and one 217 ft. spans and approaches; for Franklin and Walla Walla Counties, to J. R. Woods, Seattle, $211,120. Noted Aug. 28.

★**Wash., Walla Walla**—Comrs Walla Walla Co. let contracts to Union Bridge Co., Portland, building 2 bridges over Yellow Hawk Creek, one 48 ft., including concrete diversion dam and 8 ft. concrete culvert, and one 34 ft. near Prospect Point, also 20 ft. bridge over Russell Creek, cost $19,571; 2 bridges over Touchet River, Touchet Twp., one double and one single span, and grading and graveling 2 1-5 mi. road, $54,010; to H. C. Malott, Seattle, building 3 concrete bridges over Dry Creek, including one 12 ft., one 20 ft., and one 40 ft., cost $13,940.

★**Oregon**—State Highway Comn., Portland, let contracts to A. Anderson, Grants Pass, building crossing over Southern Pacific Ry., Jackson Co., involving 190 cu.yd. class "A" concrete, 39,000 lb. reinforcing and 24,000 lb. structural steel, and 190 lin.ft. timber approach, $14,576; to Rees & Davis, Hermiston, building crossing over Oregon Washington R. R. & Navigation, Morrow Co., involving 175 cu.yd. class "A" concrete, 40,000 lb. reinforcing steel, 950 lin.ft. wooden piling, 180 lin.ft. concrete handrail and 114 lin. ft. timber approach, $13,240, also bridge over Willow Creek, Gilliam Co., involving 185 cu.yd. class "A" and 200 cu.yd. class "B" concrete, 32,000 lb. reinforcing and 56,000 lb. structural steel and 280 lin.ft. concrete handrail, $12,725.

★**Oregon**—State Highway Comn., Portland, let contract building bridge over Sand Creek, Pacific Highway, Douglas Co., to C. Gardner, Portland, $11,993. Work involves 225 cu.yd. class "A" concrete, 35,000 lb. reinforcing steel, 226 lin.ft. concrete handrail. Noted Sept. 25.

★**Cal., Santa Paula**—City let contract building bridge over Santa Clara River, to have 10 Howe trusses each 92 ft. span, wood floor, concrete abutments and concrete pile piers, to W. Ledbetter & Co., Pacific Electric Bldg., Los Angeles, $49,500.

★**Que., Herbertville**—Municipal Council let contract building steel bridge, to E. Tremblay, Herbertville. About $32,000.

★**Que., North Timiskaming**—Provincial Government, Quebec, let contract building 600 ft. steel highway bridge across River des Quinze, here, 24 ft. wide, to consist of two 60 ft. spans and two 240 ft. spans, to Hamilton Bridge Co., Bay St., N., Hamilton, Ont. About $130,000.

★**Ont., Pickering** — Dept. Highways, Parliament Bldgs., Toronto, let contract building 80 ft. rein.-con. bridge, clay soil pile foundations, 24 ft. wide, over Rouge River, here, involving 500 cu.yd. rein.-con. to J. McGinnity, Pickering. About $15,000. Noted July 24.

Streets and Roads

★**Massachusetts**—State Highway Comn., Boston, let contract building 7100 ft. bituminous macadam road. 18 ft. wide, Worthington Twp., involving 125 cu.yd. concrete, 12,000 cu.yd. earth and 1200 cu. yd. rock excav., 4400 ton broken stone filling, 3000 gal. bituminous macadam, etc., to Middlesex Constr. Co., Medford, $51,430; 2900 ft., 18 ft. wide, Northfield Twp., involving 1380 ton broken stone, 11,600 gal. bituminous macadam, 2500 cu. yd. earth and 160 cu.yd. rock fill excav. to Lane Constr. Co., 37 Colony St., Meriden, Conn., $10,974; state road, 18 ft. wide. Williamstown Twp., involving 185 cu.yd. concrete, 500 cu.yd. earth excav., 1400 ton broken stone, 14,000 gal. bituminous macadam, to J. W. Duff Co., Summer St., Boston, $16,475.

★**Massachusetts**—State Highway Comn., Boston, let contract building 5300 ft. bituminous macadam road, 18 ft. wide, Wareham Twp., involving 2600 ton broken stone, 23,400 gal. bituminous material, 1500 cu.yd. earth, 500 cu.yd., rock excav., to W. Jones. Barnstable. $17,896; 5500 ft., 18 ft. wide, Princeton Twp., 12,800 gal. bituminous macadam, 1600 ton broken stone, 3460 cu.yd. stone fill, 440 cu.yd. earth and 300 cu.yd. rock excav., to L. C. Corchia, Boston, $24,781; 2000 ft., 18 ft. wide, Lexington Twp., 1470 ton broken stone, 9200 gal. bituminous macadam, 2700 cu.yd. earth and 100 cu.yd. rock excav., to J. Gaffney, Medford, $11,-824. Noted Sept. 18.

★**Massachusetts**—State Highway Comn., Boston, let contract for 5200 ft. road, 18 ft. wide, Lanesborough Twp., to D. J. Walsh Co., Pittsfield, $40,078. Work involves 1850 cu.yd. concrete, 1700 cu.yd. stone fill and 3700 cu.yd. earth excav. Noted Sept. 11.

★**Mass., Boston**—City let contract paving Tremont St., involving 1900 sq.yd. granite block, 24,750 sq.yd. asphalt on 6 in. concrete base, 9360 sq.yd. concrete sidewalk and 1000 cu.yd. earth fill, to B. E. Grant & Co., 27 School St., $99,035; Hyde Park Ave., involving 25,000 sq.yd. asphalt on 6 in. concrete base, 93,400 sq.yd. concrete sidewalk, 9000 cu.yd. earth and 400 cu.yd. rock excav., to De Matteo Bros., 154 Dudley St., Roslindale, $125,519.

★**Mass., Boston**—City let contracts to Central Constr. Co., School St., paving Green St., 40 ft. wide, West Roxbury, involving 2660 sq.yd. asphalt on 5 in. concrete base. 1500 lin.ft. concrete curbing and 8600 sq.ft. concrete sidewalk, cost $13,016; Amory St., 40 ft. wide, involving 10,800 sq.yd. asphalt on 6 in. concrete base, 3136 lin.ft. concrete curbing and 8390 sq.ft. brick sidewalk, $26,047; to J. Doherty, Boston, Beacon St., 60 ft. wide, involving 6940 sq.yd. wood block on 5 in. concrete base, 2500 lin.ft. concrete curbing, 25,000 sq.ft. concrete sidewalk, $43,055, Federal St., 40 ft. wide, involving 3000 sq.yd. granite and 1510 sq.yd. wood block, 13,500 sq.ft. sidewalk and 350 cu.yd. earth excav., $20,973.

★**Mass., Boston**—City let contract paving Worcester St., 40 ft. wide, to Central Constr. Co., School St., $26,994. Work involves 10,430 sq.yd. asphalt on 6 in. concrete base, 5035 lin.ft. stone curbing, 3614 sq.yd. brick sidewalk and 200 ton stone fill.

★**Mass., Boston**—City let contract paving Brighton Ave., 48-60 ft. wide, involving 1480 sq.yd. granite block, 16,430 sq. yd. asphalt on 6 in. concrete base, 6240 lin.ft. stone curbing and 54,220 sq.ft. sidewalk, to Warren Bros., Berkeley St., $67,204.

★**Mass., Fall River**—City let contract paving Glove and Columbia Sts., to Simpson Bros. Corp., Devonshire St., Boston, $.97 per sq.yd. About $40,000.

★**Mass., Leominster**—City let contract paving 5645 ft. Lancaster St., to D'Onfro Bros. c/o Street Comrs. Work involves 11,290 sq.yd. concrete, 4600 lin.ft. granite curbing, concrete guttering, etc. About $35,000. Noted July 31.

★**Rhode Island**—State Highway Comn., Providence, let contract building 3.6 mi. bituminous macadam road on Plainfield Pike, Foster and Coventry Twps., to B. Perini, Ashland, Mass., $107,807.

★**Connecticut**—State Highway Comn., Hartford, let contract paving 5365 ft. Bantam Lake Rd., Litchfield Twp., to Lane Constr. Co., 52 Colony St., Meriden, $24,000; 10,450 ft. Bethlehem Rd., Morris Twp., to J. De Michael & Bro., 58 High St., Torrington, $40,000; 3837 ft. Grove St., Putnam Twp., to Lindberg & Street, 809 Old South Bldg., Boston, Mass., $32,-000; 18,410 ft., Thompson Twp., to A. Vito Constr. Co., Thompson, $75,000, all bituminous macadam, 18 ft. wide. Noted Aug. 28.

★**N. Y., Brooklyn**—E Riegelmann, boro. pres., let contract regulating and repaving with asphalt, High St., to Sicilian Asphalt Paving Co., 41 Park Row, New York City, $15,555; Liberty St., to Greico Bros., 172 Russell St., $28,323; 4th Ave., to Consolidated Asphalt Paving Co., 592 9th St., $236,970; 86th St., to Brooklyn Alcatraz Asphalt Paving Co., 407 Hamilton Ave., $42,324.

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contract to R. A. Hess, Corona, regulating and grading Chaffee St., $216; Wayne St., $1245; to T. Welsh, 149th St., $1197; to Welsh Bros., 39 Queens St., Astoria, Queens Blvd., $7683; to Scott & Kurth, Broad St., $12,293. Noted Sept. 25.

★**N. Y., New York**—Acting President, Manhattan Boro., let contract repairing asphalt pavements in railroad area, when and where directed by chief engineer,

Streets and Roads (Continued)

Bur. of Eng., to Uvalde Asphalt Paving Co., 1 Bway., $16,320. Noted Sept. 18.

★**N. Y., Rochester**—Bd. Contr. & Supply let contract building concrete walks on Monroe Ave., to H. Schoenfeldt, Rochester, $13,183; Maple and Kossuth Sts., to F. L. Hageman, Rochester, $15,-813; also grading, building concrete walks and sewers in Winton Rd., to T. Holahan, Rochester, $32,966. Noted Apr. 24 and May 29.

★**N. Y., Rochester**—Bd. Contr. and Supply let contract to M. Barber, Rochester, paving Wall St. from Court to Ferry Sts., brick, $18,002, Eldridge St. from Emmet to Liberty Sts., concrete, $7948.

★**N. Y., Rochester**—Bd. Contr. & Supply let contract paving Averill Ave., asphalt, to Rochester Vulcanite Paving Co., Exch. Pl. Bldg., $20,696; grading and building concrete walks and sewers in Federal and other streets, to O. Costich Co., Exch. Pl. Bldg., $75,310.

★**N. Y., Rochester**—Bd. Contr. & Supply let contract paving Dartmouth and Grove Sts., asphalt, to Whitmore, Rauber & Vicinus, 279 South Ave., $16,249 and $7260 respectively. Noted July 10.

★**N. Y., S. I. St. George**—C. D. Van Name, pres. Richmond Boro., let contract regulating and repaving roadway of North Burgher Ave. from Castleton Ave. to point 450 ft. south, bituminous concrete pavement and vitr. brick gutters on concrete foundation, Sharpe Ave. from Richmond Terrace to Staten Island Rapid Transit R.R., bituminous concrete on concrete foundation, to J. E. Donovan, Port Richmond, $16,798. Noted Sept. 18.

★**N. Y., S. I. St. George**—C. D. Van Name, pres. Richmond Boro., let contract repaving roadway of Manor Rd. between Richmond Turnpike and Willow Brook Rd., sheet asphalt, to J. E. Donovan, Port Richmond, $65,065. Noted Sept. 11.

★**N. J., Jersey City**—City let contract repaving Beacon Ave., asphalt, to W. T. S. Crichfield, Hoboken. About $40,000; cost plus percentage basis.

★**N. J., Jersey City**—City let contract to Crescent Constr. Co., 150 Nassau St., New York City, improving Eastern Parkway from Ocean to Garfield Aves., involving 900 cu.yd. earth excav., $1.40 per cu.yd., 2661 sq.yd. asphalt on 5 in. concrete base, $3.25, 773 lin.ft. 6 x 16 in. cement curb, $1.10; improving Danforth Ave. between Hudson Blvd. and West Side Ave., 1741 cu.yd. earth filling, $1.25, 6979 sq.yd. asphalt on 5 in. concrete base, $3.25, 3885 lin.ft. 5 x 16 in. concrete curb stone $1.25; resetting in concrete and dressing 450 lin.ft. curb stone, $.45; to W. Van Kewien, Grand and Prior Sts., regulating and paving Newark Ave. from Summit to West Side Aves., 210 cu.yd. additional concrete, $9, 7550 sq.yd. granite paving on present concrete base, $5.75, 3300 lin.ft. 5 x 16 in. blue curb stone, $1.25, resetting in concrete and dressing 2000 lin.ft. curb stone, $.40, 1250 sq.ft. cement walk, $.25. Noted Sept. 4.

★**Pennsylvania**—State Highway Dept., Harrisburg, let contracts building roads in counties as follows:

Adams Co., 7857 ft. bituminous surface course on concrete foundation and Hillside vitr. brick or rein.-con., Gettysburg Boro., to W. P. McDonald Constr. Co., Phila., $109,769.

Butler Co., 14,044 ft. rein.-con., Slippery Rock Twp., to N. J. Boyer, Butler, $134,700.

Clarion Co., 16,417 ft. rein.-con., Clarion Twp., to L. H. Hileman Constr. Co., 1st Natl. Bank Bldg., New Kensington, $164,-871.

Chester Co., 10,509 ft. bituminous surface course (penetration method) on telford foundation, East and West Marlboro Twps., to E. M. Humphrey, Hackensack, N. J., $67,363.

Indiana Co., 3812 ft. rein.-con., Blairsville Boro., to M. Bennett & Sons, Indiana, $54,139.

Warren Co., 7936 ft. rein.-con. Sheffield Twp., to Ridelsperger & Savage, Warren, $60,690.

Tioga Co., 24,112 ft. bituminous surface course on concrete foundation or rein.-con., Lawrence Twp. and Lawrenceville Boro., to Adams, Evans Co., 30 Church St., New York City, $191,287. Noted Sept. 11.

★**Pa., Phila.**—Bureau of Highways let contracts grading portions of (a) Cheltenham, Michener and Williams Sts., (b) Dorcas St., (c) Jackson St., (d) Osceola St., (e) Oxford St.; paving portions of (f) Hutchinson St., (g) Warrington Ave., (h), Windsor St., (i), 6th St., (j), 7th St., (k) 16th St., (l) 26th St.; repaving portions of old streets with asphalt, (m) Emerald St., (n) Morris St., (o) Ridge Ave., (p) Susquehanna Ave., (q) Kensington Ave. and Front St., (r) Germantown Ave., (s) Columbia Ave.; improving with bituminous macadam, (t) Gresham Valley Rd., to T. Connor, 3329 North 5th St., (a) $28,637; E. P. Bennis, Chew and Price Sts., (b) $2535; R. B. Wenner, Franklin Trust Bldg., (c) $1177; D. McMahon, Germantown and Chelton Sts., (d) $354; T. P. Lee, 5629 Cherry St., (e) $1843; Eastern Paving Co., Colonial Trust Bldg., (f) $5891; (g) $7839, (i) $4760, (j) $5759, (k) $4320; Barber Asphalt Paving Co., Land Title Bldg., (h) $3461, (m) $11,499; Union Paving Co., 30th and Locust Sts., (l) $3822, (n) $36,403, (o) $37,-015, (p) $22,477; J. Meehan & Son, 915 West Dauphin St., (q), $78,018, (s), $51,-589; Cunningham & Murray, 1345 Arch St., (r) $35,645; Mack Paving & Constr. Co., Nicetown Lane and C Sts., (t) $7880. Noted Aug. 28.

★**Pa., Phila.**—Dept. Pub. Wks., let contracts for grading portions of (a) Venango St., (b) Houghton St., (c) Bingham, Lawndale, Montour Sts., Whitaker and Tabor Aves., paving with asphalt portions of (d) 24th Ave. and Jackson St., (e) 21st St., (f) Passyunk St., (g) Shields St., (h) Marlyn Rd., (i), Hurley St., (j), Broad St.; (k) paving with bituminous macadam portion of Jefferson St.; (l) paving with vitr. block portion of Drinker St.; repaving with asphalt portions of (m) 11th St., (n) Tioga St., (o) Point Breeze Ave., (p) Kensington Ave., (q) Jasper St., (r) Hancock St., (s) F and G Sts., (t) Erie Ave., (u) Clearfield St.; repaving with granite block portions of (v) East Berks St., (w) Columbia Ave., (x) Frankford Ave., (y) Germantown Ave., (z) Marlborough St., (a1) Vine St., (a2) 5th St.; repaving with wood block portion of (a3) 12th St.; (a4) building retaining wall (cement concrete) at 55th St. and Phila., Baltimore & Washington R.R., to I. K. Davis Co., 6100 North 20th St., (a) $1122, (c) $10,438;

J. R. Leewright, 426 Seville St., (b) $299;

Barber Asphalt Paving Co., 30th and Race Sts., (d) $34,721, (e) $6903, (g) $3688, (j) $146,243, (k) $2033, (m) $15,356, (n) $5379, (o) $37,582, (p) $60,124, (s) $17,533, (u) $5963;

Union Paving Co., 30th and Locust Sts., (f) $71,017, (q) $14,877, (r) $5435, (t) $25,986;

Eastern Paving Co., Colonial Trust Bldg., (h) $3382, (i) $3607;

D. McMahon, Germantown and Chelton Sts., (l) $6704;

M. J. McCrudden Co., Franklin Trust Bldg., (v) $6908; Ryan Constr. Co., 33rd and Gray's Ferry Rd., (w) $12,200, (x) $61,513, (y) $21,257, (z) $4118, (a1) $46,-831, (a2) $48,957;

J. Meehan & Son, 915 West Dauphin St., (a3) $9930;

O'Neil Co., 27 East Mermaid Lane, (a4) $8790. Noted Sept. 11.

★**Md., Baltimore**—Bd. Awards let contract paving 32 private alleys in Walbrook Sect., cement concrete, to Aiello Contg. Co., 7301 Clairmont Ave., $27,193.

★**Md., Baltimore**—Bd. Awards let contracts to P. Flanigan & Sons, Harford Ave. and Baltimore & Ohio R.R., paving Charles St. from Read to Chase Sts., involving 3400 sq.yd sheet asphalt on concrete base, cost $11,000; Appleton St. from Baker to Presstman Sts., 1700 sq.yd. sheet asphalt on concrete base, $5738.

★**Virginia**—State Highway Comn., Richmond, let contract building 11 mi. gravel road from Burrowsville to Spratley's Project No. 58, Prince George Co., to Rodgers, Shumway & Co., Portsmouth, $69,487.

★**Va., Richmond**—City let contract to Saville & Claiborne, Richmond Trust & Savings Bldg., building 8000 ft. 8 x 18 in. and 8000 ft. 6 x 16 in. curb and 3700 sq.yd. granolithic gutter, on Chamberlayne Ave., cost $21,607; paving 4th St. 20 ft. wide, involving 5000 sq.yd. concrete, $10,350.

★**W. Va., Charleston**—City let contract paving ½ mi. 7th Ave., involving 8000 sq.yd. bituminous concrete surface on 5 in. concrete base, to West Virginia Bituminous Concrete Corp., St. Albans, $3.48 per sq.yd., total $28,040

★**W. Va., Keyser**—Mineral Co let contract grading and surfacing 12 mi. Cumberland-Romne Rd., to Vang Constr. Co., Baltimore, Md., $77,906. Noted Sept. 11.

★**W. Va., Keyser**—Comrs Mineral Co. let contract building 12.17 mi. Ridgely-Alaska Rd., to Vang Constr. Co., Cumberland, Md., $77,907. Work involves 45,000 cu.yd. earth excav., 5000 cu.yd. rock excav., 62 cu.yd. class "A," 50 cu.yd. class "B" and 50 cu.yd. class "C" concrete, 500 lbs. reinforcing steel, 1792 lin.ft. 12-24 in. corrugated pipe and 4200 cu.yd. gravel surfacing. Noted Sept. 4.

★**W. Va., Lewisburg**—Comrs. Greenbrier Co., let contract building 5 mi. and grading 20 mi. Midland Trail, to Patrick Constr. Co., Clarksburg, $133,000.

★**W. Va., Madison**—Comrs. Boone Co. let contract grading and draining 5 mi. Madison-Foster Rd., to H. H. Hening, Charleston, $80,600.

★**W. Va., Morgantown**—Monongalia Co. let contract building 3 mi. road from Maidsville Landing to Rosedale, to Chaplin, Derr & Van Voorhis, Morgantown. About $102,000.

★**W. Va., Parkersburg**—City let contract paving Avery, Green, Market, 4th and 5th Sts., asphalt, to Federal Asphalt Co., 125 Main St., Hamilton, $61,058.

★**W. Va., Parkersburg**—City let contracts to Kennedy Contr. Co., Parkersburg, concrete paving, Depot St., $10,272; Park St., $10,384; Latroke, Oak, 13th, 16th, 17th, and 18th Sts., $27,584; Beaver St., $12,185.

★**W. Va., Petersburg**—Grant Co. let contract grading 2 mi. road north of here, to H. W. Kaylor, Cumberland, Md., $48,021.

★**W. Va., Princeton**—Comrs. Mercer Co. let contract grading 6 mi. Princeton-Flat-Top Rd., waterbound macadam, to T. Towles & Co., Princeton. About $60,-000. Noted May 22.

★**W. Va., Warwood**—City let contract grading 6372 sq.yd. Warwood Ave. from 3rd St. to city limits, to P. J. Gilligan, 94-14th St., Wheeling. About $26,000.

★**W. Va., Wayne**—Comrs. Wayne Co. let contract grading and draining 7 mi. Wayne-Kenova Rd., 26 ft. wide, to Rogers & Shininry, Lynchburg, Va., $125,260. Work involves 98,500 cu.yd. excav., 482 cu.yd. class A concrete and 2000 lin.-ft. vitr. clay pipe.

★**N. C., Asheboro**—Randolph Co. let contract paving 2 mi. Sunset Ave., Worth, Depot and Fayetteville Sts., 37-40 ft. wide, sheet asphalt, to Adams, Evans & Co., 30 Church St., New York City, $2.67 per yd. Total abcut $160,000.

★**N. C., Lexington**—City let contract paving principal streets, asphalt, to Noll Constr. Co., 8 East 6th St., Chattanooga, Tenn. About $250,000.

★**Ga., Athens**—Clarke Co. let contract resurfacing 40,000 sq.yd. road, 18 ft. wide, penetration method, to Smith Constr. Co., Atlanta, $80,539. Noted Sept. 11.

★**Miss., Senatobia**—Comrs Tate Co. let contract grading 85 mi. roads, to F. D. Harvey & Co., Memphis, Tenn., $.40 per cu.yd

★**Ohio**—State Highway Comn., Columbus, let contracts grading, building bridges and culverts and paving roads in following counties:

Carroll Co., 3.14 mi. Sect. "A" Canton—Steubenville Rd., waterbound macadam, to P. Deifenbacher & Sons Co., Massillon, $63,615.

Clermont Co., .97 mi. Sect. "J-1" Cincinnati—Chillicothe Rd., waterbound macadam, S. B. Craig, Blanchester, $16,124.

Columbiana Co., .5 mi. Sect. "A" Lisbon—East Palestine Rd., concrete, E. E. McCartney, 769 Wilson St., Youngstown, $26,489

Crawford Co., 1.3 mi. Sect. "F" Bucyrus—Cresline Rd., bituminous macadam, J. W. Carey, Ada, $38,212.

Licking Co., 1.54 mi. Sect. "P" Columbus—Millersburg Rd., bituminous macadam, F. H. Vogelmeir, Newark, $44,726.

Montgomery Co., 3.35 mi. Sect. "C" Dayton—Germantown Rd., rein.-con., D. A. Onkst & Son, Dayton, $87,136.

Perry Co., 2 mi. Sect. "E-2" Zanesville—New Lexington Rd., brick, Foster & Reigert Co., Dayton, $10,271.

Scioto Co., 6.64 mi. Sect. "I" Portsmouth—Columbus Rd., monolithic brick, W. H. Ringwald & Sons, Chillicothe, $252,785.

2 mi. Sect. "A-2" Portsmouth-Jackson Rd., monolithic brick, S. Monroe & Sons Co., Portsmouth, $80,540.

Coshocton Co., grading and paving .57 mi. Sect. "C" Coshocton—Mewcomerstown Rd., monolithic brick, T. J. Norman & Son, West Lafayette, $17,021.

Geauga Co., resurfacing 1.52 mi. Sect. "D" Cleveland—Mayfield Rd., concrete, Studebaker & Son, Greenville, $36,692.

★**O., Cleveland**—City let contract paving East 18th St. from Central to Prospect Aves. involving 8260 sq.yd. 4 in. stone, to Riley Bros., 357 The Arcade, $25,077.

★**O., Columbus**—G. A. Borden, pub. serv. dir., let contracts to Cleveland Trinidad Paving Co., The Arcade, Cleve-

Streets and Roads (Continued)

land, grading, draining, curbing and paving 4th St., from Deshler Ave. to Hanford St., cost $11,784, Reinhard Ave. from Heyl Ave. to 22nd St., $13,659, Broad St. from 3rd to 4th Sts., including park spaces, $9898, Colton St. from Kimball Place to Kelton Ave., $20,469; Franklin Asphalt Paving Co., Columbus, grading, draining, curbing and resurfacing Buttles Ave. from High St. to Dennison Ave., $12,656; all asphalt.

★**O., Dayton**—City let contract repaving 1200 ft. Forest Ave. from Lehman to Neal Sts., 40 ft. wide, brick, to Finke Eng. Co., 15 South St. Clair St. About $7800. City will furnish material. Total cost, $20,000. Noted Sept. 4.

★**O., Norwalk**—Comrs. Huron Co. let contract paving Sect. "N" Oberlin—Norwalk Rd., 6950 ft. long, monolithic brick, to Modern Constr. Co., Fremont, $39,040.

★**O., Xenia**—City let contract paving Main, Whiteman, Collier, Galloway, Home, Market, Dayton, West 2nd, Union, Orange and Cincinnati Sts., 30 ft. wide, involving 20,000 sq.yd. vitr. brick, 35,000 sq.yd. asphalt and 5000 sq.yd. concrete, to J. E. Conley, 923 Grand Ave. About $220,000.

★**Ind., Indianapolis**—City let contract resurfacing College Ave. from 16th St. to 21st St., to Mansfield Eng. Co., Fletcher Bldg., $14,759.

★**Ind., Indianapolis**—City let contract improving 26th St. from Meridan St. to Capitol Ave., asphalt, to Amer. Constr. Co., Delaware St., $11,952.

★**Ind., Indianapolis**—City let contract paving Brookside Ave., and Bway. from 51st to 52nd Sts., bituminous concrete, to Indiana Asphalt Paving Co., 25th St. and Lake Erie & Western Ry., $5.56 per lin.ft. and $10,581 respectively; Bradley Ave. from Washington St. to second alley south of Washington St., asphalt, to Union Asphalt Co., 308 Amer. Central Life Bldg., $6.70 per lin.ft.; 46th St. from Illinois St. to first alley east of Winthrop Ave., bituminous concrete, to Amer. Constr. Co., 108 North Delaware St., $47,472; resurfacing Washington St. from Belmont Ave. to 538 ft. west of Harris St., asphalt, to Mansfield Eng. Co., 1014 Fletcher Savings & Trust Bldg., $36,805.

★**Ind., Indianapolis**—City let contract paving, curbing and guttering Guilford Ave. from 36th to 38th Sts. to Indiana Asphalt Paving Co., 25th St. and Lake Erie & Western Ry., $13,779.

★**Mich., Detroit**—City let contract resurfacing 1100 ft. Bellevue Ave. from Kercheval to Mack Aves., 26 ft. wide, involving 10,000 sq.yd. asphalt surface on present foundation, to Detroit Asphalt Paving Co., 20 McGraw Bldg., $15,500.

★**Mich., Detroit**—Dept. Pub. Wks. let contract resurfacing Hart Ave. from Kercheval to Mack Aves., involving 16,000 sq.yd. asphalt, to Detroit Asphalt Paving Co., 20 McGraw Bldg., $24,800. Noted Oct. 2.

★**Mich., Grand Rapids**—Kent Co., let contract grading, surfacing and draining 2.75 mi Little Pine Island Lake Rd., involving 15,100 sq.yd. gravel, to Todd & Kent, c-o Kent Co. Rd. Comn., Grand Rapids, $21,490.

★**Mich., Grosse Pointe**—City let contract grading and paving Rivard Blvd. from Jefferson Ave north, involving 10,000 sq.yd. asphaltic concrete on 6 in. concrete base, to G. R. Cooke, Penobscot Bldg., Detroit. About $50,000.

★**Illinois**—Dept. Pub. Wks. & Bldgs., Div. of Highways, Springfield, let contract paving Federal Aid Project No. 8, Sect. X, Madison Co., 3.8 mi. 3 in. brick, 2.34 mi. concrete, involving 22,451 cu.yd. excav., 24,760 sq.yd. Portland cement concrete, 40,453 sq.yd. 3 in. monolithic brick, 46.8 cu.yd. Class "A" concrete and 1130 lb. reinforced steel, to C. Degenhardt, Alton, $217,665; 2 concrete bridges, Sect. E, Randolph Co., to W. Melloy, Red Bud, $2975; 1 concrete bridge Sect. 1, Clinton Co., to C. Sims, Huey, $1544.

★**Wis., Manitowoc**—Manitowoc Co. let contract grading, paving and building culverts, bridges, etc., on 21 mi Lake Shore Rd. from Sheboygan to Green Bay, 20 ft. wide, involving 12,950 sq.yd. concrete, to J. Young & Bro., East Main St., Oconto, $48,113. Noted Sept. 25.

★**Minn., Duluth**—City let contract paving 5360 ft. 2nd Ave., W. from Superior to 7th St., 20.34 ft. wide, to E. Johnson & Son, 576 West 5th St., Superior, Wis., $62,112. Noted Sept. 18.

★**Minn., Farmington**—City let contract paving 20 blocks, to Warren Bros., 142 Berkeley St., Boston, $150,000. Noted Aug. 7.

★**Minn., Grafton**—City let contract for 6850 sq.yd. asphaltic concrete paving and guttering, 3743 lin. ft. concrete curbing and 1333 sq.yd. concrete alley paving, to O'Connor Bros., Grand Forks, N. D., $3.83 per sq.yd.

★**Minn., Owatonna**—Comrs. Steele Co. let contract grading and building culverts on Jobs Nos. 1901 and 1902, 24 ft. wide, to J. Brown, Madison Lake, $11,969 and $11,450 respectively.

★**Kan., Beloit**—Mitchell Co. let contract paving 4 1-4 mi. road, Federal Aid Project No. 1, 18 ft. wide, vitr. brick, to Dalton & Son, Junction City, $163,677.

★**Kan., Bonner Springs**—City let contract resurfacing and oiling 41,400 sq.yd. macadam pavement, to P. P. Young, R. F. D. No. 6, St. Joseph, Mo., $11,905. Noted Sept. 18.

★**Kan., Hutchinson**—City let contract paving Poplar St., brick, to Stamey-Mackey Constr. Co., Hutchinson. Cost $3.39 per yd.

★**Kan., Hutchinson**—Reno Co. let contracts to Stamey-Mackey Constr. Co., Hutchinson, paving Project No. 27, Sect. I concrete, $8087, Sect. F, brick, $254,659, Sect. G, brick $205,222, Project No. 15, Sect. A, brick, $341,301; to Wheeler Keleher Co., Hutchinson, Project No. 27, Sect. A, brick, $253,081, Sect. B, $281,201.

★**Kan., Jewell**—City let contract paving various streets, involving 12,000 sq.yd. concrete, to Central Bridge Co., Mankato $40,816. Noted Oct. 16.

★**Kan., Junction City**—Comrs. Geary Co. let contract building 8 1-2 mi. concrete road, 18 ft. wide, from Junction City to county road line, to Zeigler & Salton, Junction City, $240,910.

★**Kan., Lawrence**—Douglas Co. let contracts paving Federal Rd. Sect. E, to Central Constr. Co. Reliance Bldg., Kansas City, Mo., $21,396; Sect. F, to Gifford Contr. Co., Ry. Exch. Bldg., Kansas City, Mo., $46,471. Noted Sept. 18.

★**Kan., Leavenworth**—Leavenworth Co. let contract paving Sect. A, Fort to Fort Rd., involving 53,414 sq.yd. one course concrete, to Missouri Valley Bridge & Iron Co., Leavenworth, $166,857.

★**Kan., Stafford**—City let contract for 32,000 sq.yd. 3 in. brick pavement on 5 in. concrete base, to M. R. Amerman, Salina, $68,030. Noted Sept. 4.

★**Neb., Lincoln**—T. H. Berg, city clk., let contract paving 2600 ft. 33rd St. from Vine to Holdrege Sts., 30 ft. wide, involving 8300 sq.yd. asphaltic concrete on 5 in. concrete base, 300 sq.yd. concrete, 300 lin.ft. concrete curbing, 5000 lin.ft. guttering and curbing and 1027 cu.yd. earth evcav., to Burke, Cochrane Constr. Co., 522-1st Nat'l Bldg., $26,794. Noted Sept. 11.

•**South Dakota**—State Highway Comn., Pierre, let contract to Anderson Constr. Co., Rapid City, improving 11.4 mi. Sect. A, Whitewood Spearfish-Beulah Rd., 36 ft. wide, Lawrence Co., involving 1925 cu.yd. solid rock, 78,445 cu.yd. earth, 4761 cu.yd. loose rock and 46,587 yd. station overhaul excav., 826 cu.yd. class "A" and 200 cu.yd. class "B" concrete, 61,182 lb. reinforcing steel, cost $90,097; 11.54 mi. Sect. B, 39,766 cu.yd. earth and 20,884 yd. station overhaul excav., 16,034 cu.yd. gravel surfacing, to be hauled and placed, 3206 cu.yd. binder for gravel roads, 127 cu.yd. class "B" concrete, $73,211; to Davison Co., Mitchell, 13.95 mi. Mitchell-Plankerton Rd., Davison Co., 50,505 cu.yd. earth and 29,067 yd. station overhaul excav., 20,924 cu.yd. gravel surfacing to be hauled and spread, 314 cu.yd. class "A", and 51 cu.yd. class "B" concrete and 23,277 lb. reinforcing steel, $82,296.

★**South Dakota**—State Highway Comn., Pierre, let contract grading, draining and graveling 17.83 mi. Pierre-Blunt Rd., to Hughes County Comn. Pierre, $69,396.

★**N. D., Minot**—City let contract paving 2 mi. South Main St., 2nd St. N. W. and 4th Ave. N. W., bitulithic, to Hanlon & Oaks, 338 Liberty Exch., Minneapolis, Minn., $59,419.

★**Wyoming**—State Highway Comn., Cheyenne, let contract grading Rocky Ford-Beaulah sect. of Sundance-Beaulah Rd., Crook Co., to Anderson Constr. Co., Rapid City, S. D., cost $84,000; Sect. 1 of Shoshoni-Lander Rd., between Shoshoni and Riverton Twp., Natrona and Fremont Counties to Riverton Constr. Co., Riverton, Wyo., $34,000; Big Goose Rd., Sheridan Co., to R. S. Whitehead, Sheridan, $97,000.

★**Wyo., Casper**—City let contract grading sidewalks. Dists. Nos. 1 and 2, to Castle & Mechaley, Casper, $32,485 and $55,475 respectively.

★**Montana**—State Highway Dept., Helena, let contract gravel surfacing Hamilton-Corvallis Project, Ravalli Co., to H. S. Lord, Hamilton, $24,813; grading 9.83 mi. North Ford Rd., Meagher Co., to J. E. Soden, White Sulphur Springs, $25,159.

★**Montana**—State Highway Dept., Helena, let contract gravel surfacing 4.25 mi. Chinook-Malta Rd., to J. O'Connor, Malta, $22,765.

★**Mont., Whitefish**—City let contract building 30,000 sq.ft. cement sidewalks, to Two Miracle Constr. Co., 437 Ford Bldg., Great Falls, $18,170. Noted Sept. 11.

★**Tex., Beaumont**—Jefferson Co. let contract grading, draining, clearing and grubbing 4.85 mi. Beaumont-Amelia Rd., 16 ft. wide, to Horton & Horton, Beaumont, $148,381. Work involves 17,398 cu. yd. unclassified earth evcav., 7696 lb. reinforcing steel, 130 cu.yd. class A and 184 cu.yd. class B concrete, 7082 cu.yd. class B concrete base and 40,072 sq.yd. rock asphalt. Noted May 22.

★**Tex., Beaumont**—Jefferson Co. let contract building 7 mi. Highway No. 8, known as Beaumont-Port Arthur Rd. 16 ft. wide, to Horton & Horton, McKinney and Velasco Sts., Houston, $242,514. Work involves 23,134 cu. yd. unclassified earth excav., 61,610 sq.yd. 2 in. sheet asphalt, 169 cu.yd. Class A and 125 cu.yd. Class B concrete surface, 11,282 cu.yd. class B concrete base, etc.

•**Tex., Boston**—Bowie Co. let contracts to Arkansas Constr. Co., Texarkana, gravel surfacing and draining 4.77 mi. Highway No. 1-B, known as Red-Water Rd., 9 and 16 ft. wide, involving 27,810 cu.yd. unclassified earth excav., 3717 lb. reinforced steel, 41 sq.yd. class A and 15 sq.yd. class B concrete, cost $12,321; 8.64 mi. State Highway No. 5, known as De-Kalb Rd., 16 ft. wide, 50,321 cu.yd. unclassified earth excav., 24,823 lb. reinforced steel, 289 sq.yd. class A and 27 sq.yd. class B concrete, etc., $49,421. county will furnish gravel, $15,323.

★**Tex., Boston**—Bowie Co., let contracts to Arkansas Constr. Co., Texarkana, scarifying, placing, gravel surfacing and building rein.-con. drainage structures on 2.96 mi. Highway No. 1-A, known as Pace's Ferry Rd., 24 ft. wide, involving 3478 cu.yd. gravel, 33 cu.yd. class A and 18 cu.yd. class C rein.-con., cost, $17,878, gravel to be furnished by county, $5566. 3.64 mi. Highway known as Hooks Rd., 16 ft. wide, 4273 cu.yd. gravel, 25,321 cu. yd. unclassified earth excav., 66 cu. yd. class A concrete, 5425 lb. reinforcing steel, etc., $17,710, gravel to be furnished by county, $6837.

★**Tex., Bryan**—Brazos Co. let contract building gravel surfaced and concrete road and concrete drainage structures on 10.33 mi. State Highway No. 2, known as Millican-Navasota Rd., 15 ft. wide, involving 13,763 sq.yd. plain concrete, to Sline, Stanley & Byers, Waco. $103,233. Noted Aug. 28.

★**Tex., Cisco**—City let contract for 50,000 sq.yd. pavement, to P. Brown, Cisco. About $168,000.

★**Tex., Eastland**—Eastland Co. let contract paving 3½ mi. Public Sq., Lamar Seaman and Main Sts., 40-50 ft. wide, 3 in. brick, involving 21,000 lin.ft. combined curb and gutter, to Texas Bitulithic Co., 1101-6 Praetorian Bldg., Dallas. About $475,000.

★**Tex., El Paso**—El Paso Co. let contract paving 5 mi. road from Ascavato to Franklin Cross Roads, to Dudley & Orr, 2101 San Diego St. About $40,000.

★**Tex., Reby**—Fisher Co. let contract gravel surfacing and building rein.-con. drainage structures, bridges and culverts on 9 mi. Highway No. 4, known as Rotan-Aspermont Rd., 16 ft. wide, involving 20 acres clearing and grubbing, 71,520 cu.yd. unclassified earth excav., 44,793 lb. reinforced steel, 467 cu.yd. class "A" and 23 cu.yd. class "B" concrete, etc, to J. F. Hamer, Ft. Worth, $78,279. Noted Aug. 28.

★**Tex., Seguin**—Guadalupe Co. let contracts scarifying, reshaping and gravel surfacing 3.256 mi. highway No. 2 from Bexar Co. line to Comal Co. line, 16 ft. wide, also placing and gravel surfacing 14.6 mi. State Highway No. 3 from here to Gonzales Co. line, 16 ft. wide, to D. La Roe, Chandler, $18,457 and $21,100 respectively. Noted Sept. 11.

Streets and Roads (Continued)

★**Tex., Vernon**—Wilbarger Co let contract paving 2¾ mi. highway running from here, east, Federal Aid Project No 57, to H. K. McCollum, 1st Natl Bank Bldg., Ft. Worth, $184,417. Noted Aug. 21.

★**Okla., Bartlesville**—Washington Co. let contract grading 3 mi. Bartlesville-Ramona State Rd. to E. Horsley, Main St., Ramona. About $12,000.

★**Okla., Collinsville**—City let contract building 30,000 sq.yd. vitr brick pavement, to Standard Paving Co., 512 Robinson Bldg., Tulsa, $170,285. Noted Sept 25.

★**Okla., Nowata**—City let contract for 63,000 sq.yd. brick paving, to Park-Moran, Okmulgee, $369,119.

★**Colorado**—State Highway Comm., Denver, let contracts to Levy Constn Co., 630 Symes Bldg., Denver, paving with concrete, 1 mi. road west of Manzanola, $28,980, 1 mi. east from city limits of Fowler, $27,870, 1 mi. east from city limits of Rocky Ford, $32,100, 1 mi west from city limits of La Junta, $35,000, all in Otero, Co.

★**Colorado** — State Highway Comm., State Museum Bldg., Denver, let contract paving 1.6 mi. concrete road north from Lamar, Prowers Co., to Colorado Bridge & Constr. Co., 306 Gas & Electric Bldg., $47,500; grading 4 mi. Denver-Colorado Springs Rd., to E. Honnen, 316 East Dale St., Colorado Springs, $12,500.

★**Colo., Denver**—City let contract for 11,770 sq.yd. pavement in Alley Paving Dist. No 50, to J. J. Hines, 2363 Blake St., $22,608; 9760 sq.yd. in Alley Paving Dist. No 51, to Gibbons & Lawrence, 1041 Galapago St., $20,827. Noted Sept. 18.

★**Colo., Denver**—City let contract paving Acoma Dist. No. 1, asphaltic concrete, to C. S. Lambie Co., Tramway Bldg. $43,-431

★**New Mexico**—State Highway Comm., Santa Fe, let contract building 5.4 mi. State Rd. No. 15, Federal Aid Project No. 16, to Lea Co. Constr. Co., Lovington, $39,517; 5.4 mi. road between Captain and Ft. Stanton, Federal Aid Project No. 11, to Burgess & La Roe, Palestine, Tex., $42,661.

★**Idaho, Buhl**—City let contract for paving in Dists Nos 2 and 3 to Warren Constr. Co., Buhl., $44,442 and $38,072 respectively. Noted Aug. 28.

★**Idaho, Wallace**—Shoshone Co let contract building 2.95 mi. Yellowstone Trail, near here, to J. N. Nordquist, Wallace, $63,069.

★**Utah, Salt Lake City**—City let contract paving 8th St S. from 3rd W. to 9th Sts. 18-34 ft wide, to Campbell Bldg. Co., Newhouse Bldg., $87,796

★**Utah, Salt Lake City**—City let contract paving 3.66 mi. Ogden St. and 2.26 mi. Roy St., to F. E. Phelps, Brigham City, $100,413 and $60,324 respectively

★**Utah, Salt Lake City**—Salt Lake Co. let contract building 3.25 mi. Redwood Rd. south from 33rd St. S., 20 ft. wide, to Clifton, Applegate & Toole, Billings, Mont, $103,146.

★**Nevada**—State Highway Comm., Carson City, let contract building 7.57 mi road between Leetevile and Fallon, to Armstrong & Baker, Elko, $45,713.

★**Washington**—State Highway Comm., Olympia, let contract to Rajotte, Forbert & Winters, Spokane, clearing, grading and draining 12.2 mi Inland Empire Highway from Ellensburg to Roza Kittitas Co., involving 62,465 cu.yd. earth and 90,905 cu.yd. loose excav., at $.60 per cu.yd. each, 54,570 cu.yd solid excav., $1.50, 92,500 cu.yd. overhaul, $.03, total $198,534; J. T. Smith, Seattle, 18 mi Pacific Highway from Seattle to Lake Forest Park, King Co., 132,740 cu.yd. earth excav., $.60, 363,500 cu.yd overhaul, $.04, 22,314 lbs. steel bars, $.08, 254.25 sq.yd. 1st class concrete, $30., total $121,292; T Peterson, Eatonville, 3.6 mi. Natl. Park Highway from La Grand to Alder, Pierce Co., 13,994 cu.yd earth, 22,714 cu.yd. loose and 44,857 cu.yd solid excav., at $.70, $.90 and $2.55 respectively, 20,785 cu.yd. overhaul, $.03, total $147,-207; R. O. Wahlgren, Forks, 2 mi Olympic Highway from Forks south, Clallam Co 24,060 cu.yd earth and 1980 cu.yd solid excav., $20,932. Noted Sept. 4

★**Washington**—State Highway Bd. Olympia, let contract to K. I. Goulter Seaview, clearing and grading Ocean Beach Highway from Naselle to Bear River, involving 117,900 cu.yd earth excav. at $.70 per cu.yd 21,640 cu.yd solid rock excav. $2.25 per cu.yd and 175,760 cu.yd. overhaul, $.06 per cu.yd., total $195,014.

★**Wash., Aberdeen**—City Council let contract replacing east end trestle with permanent highway, 3200 ft. long, 24 ft wide, including 440 lin.ft concrete viaduct, to Puget Sound Bridge & Dredging Co., Central Bldg., Seattle. About $72,-000, cost plus 10 per cent. Work involves 23,000 cu.yd. filling, 5000 sq.yd riprap, 650 cu.yd. concrete and 50,000 lb. reinforcing steel

★**Wash., Charleston**—City Council let contract paving Wycoff St. from 1st to 6th Sts., and Cambrian St from 3rd to 4th Sts., involving 13,000 sq.yd concrete, 4200 lin.ft concrete curbing and 6000 cu.yd. earth excav., to R. G. Stevenson, 1327 Ewing St., Seattle. About $43,000

★**Wash., Davenport**—Comrs. Lincoln Co. let contracts to F. T. Young, Davenport, grading and graveling 3.5 mi. Rd No. 4 from Odessa west to Adams Co. line and 4.62 mi. Odessa—Adams Co. line Rd. No. 6, cost $32,925 and $32,737 respectively

★**Wash., Davenport**—Lincoln Co. let contract building 11 mi. Donahue Rd. No. 5 from Harington south, involving 70,000 cu.yd. common evcav., and 19,000 cu.yd. gravel, to C. M. Payne, 724 Mission St., Spokane, $86,348.

★**Wash., Everett**—City Council let contract paving Norton Ave from Hewitt to 22nd Aves., involving 8171 sq.yd 8 in. concrete, to J. W. Hoover & Co., Everett, $30,717.

★**Wash., Pomeroy**—City let contract crushing and spreading cliff-rock on West Main St., to R. Hender, Pomeroy, $12,000 Noted May 29.

★**Wash., Port Orchard**—City Council let contract paving Bay St., et al, involving 5993 sq.yd 7 in. concrete, to Sound Paving Co., Seattle, $26,100.

★**Wash., Ritzville**—Comrs Adam Co. let contract grading and surfacing 19¾ mi. Permanent Highway 4-A, crushed rock and gravel, to Mitchell Bros., East 127 Mission St., Spokane. About $168,000.

★**Wash., Seattle**—Bd Public Wks. let contract paving Westlake Ave. N., et al, involving 11,500 cu.yd. excav., $400 lin ft. armored concrete curb and 18,150 sq.yd 7 or 8 in. concrete paving, to Fiorito Bros., Seattle, $74,455.

★**Wash., Tacoma**—Comrs Pierce Co. let contracts to Warren Constr Co., Journal Bldg., Portland, paving 1.75 mi. road from Sumner to foot of Elhi Hill, involving 3602 cu.yd. common excav., 17,180 sq.yd. concrete and 18,506 lin.ft. concrete curbing, cost $47,033, 1.94 mi. Elhi Hill Rd. from foot to top, 2000 cu.yd. earth excav., 21,797 sq.yd. concrete and 20,528 lin.ft. concrete curbing, $49,055. Noted Aug. 14.

★**Oregon**—State Highway Comm., Portland, let contracts to A. D. Kern, foot of Mill St., Portland, improving 8 mi The Dalles-Rowena Rd., Wasco Co., involving 58,000 cu.yd. common excav., (concrete pipe) $76,425. 11.5 mi. Unit No. 4, Service Creek-Valedes Ranch Rd., 18 ft. wide, Wheeler Co., involving 103,000 cu.yd. common excav., (iron pipe) $154,561; to Lake Co. Court, Lakeview, 11.1 mi. Lakeview-Crooked Creek Sect., Lake Co, involving 17,000 cu.yd. gravel macadam and 58,000 cu.yd. common excav., (screened gravel) $140,795, 1.8 mi. Lakeview-South Sect., Lake Co., involving 2800 cu.yd. gravel and 8000 cu.yd. common excav., (oiled) $13,867; to J. E. Clarkson, 608 Yeon Bldg., Portland, 12 mi. Unit No. 3, Service Creek-Valedes Ranch Rd 18 ft wide Wheeler Co involving 19,000 cu.yd mixed excav., $115,-537, 12.5 mi. Unit No. 2, Service Creek-Valedes Ranch Rd., 18 ft wide, involving 74,000 cu.yd mixed excav., (both iron pipe) $126,935; to O. Huber, Sherlock Bldg., Portland, Hampton-Gilham Co Lane, Sect Oregon-Washington Highway, Gilham Co., involving 147,000 cu.yd common excav. (iron pipe) $146,494; to J. Hampshire, Grants Pass 6.1 mi Unit No 1, Remote-Camas Valley Sect Myrtle Creek-Roseburg Highway Coos Co., involving 112,000 cu.yd common excav., (iron pipe) $151,372, 8.1 mi Unit No 2, Remote-Camas Valley Sect., Myrtle Creek-Roseburg Highway, Coos Co., involving 150,000 cu.yd common excav (iron pipe) $198,721, to Johnston Contr Co., 311 Lumber Exch. Bldg., Portland, 9 mi. Mosier-Rowena Sect. Columbia River Highway 18 ft wide, Wasco Co involving 171,000 cu.yd. common excav., (concrete) $225,625, to Marion Co Court, Salem. 1.2 mi. Bordner Hill-Wain Hill Sect. Pacific Highway, Marion Co involving 1600 cu.yd gravel

★**Oregon**—State Highway Comm., Salem will gravel 7.9 mi Baker-Middle Bridge Sect. Baker-Cornucopia Highway, Baker Co., involving 10,500 cu.yd. gravel. About $34,800. Work will be done by day labor

★**Oregon**—State Highway comm., Portland, let contract macadamizing 6.4 mi Hood River-Mosier Sect. Columbia River Highway, Hood River Co., involving 12,800 sq.yd waterbound macadam, to A. D. Kern, foot of Mill St., Portland, $31,020 Noted Sept 25

★**Ore., Astoria**—City let contract paving Hume St., from Bond to Commercial Sts., concrete, to H. Makela, Astoria, $6661; laying plank sidewalks and dressing Agate St from Florence to Alameda Sts to J. Mattson, Astoria, $3233; 29th St from Franklin to Grand Sts., to W. Jacobsen, Astoria, $2321.

★**Ore., The Dalles**—City Council let contract paving east link Dalles City-Columbia River Highway, to United Contg Co., Northwest Bank Bldg. Portland, $19,503; 1000 ft east link Dalles City-Columbia River Highway, engineers station 0+00 to 1+00, to Tronzano Bros., The Dalles, $11,453. Noted Sept 25

★**California**—State Highway Comm., 515 Forum Bldg., Sacramento, let contract building 10.7 mi. Sect B, Route 34, Div 3, Federal Aid Project No. 2, between Ione and Jackson, Amador Co., to T. M. Onley, 358 Vernon St., Oakland. Noted Sept. 25.

★**Cal., Fowler**—City let contract paving, building concrete gutters and cement curbs on 2½ blocks Merced St., to H. Crummey, Hearst Bldg., San Francisco. $18,000.

★**Cal., Sacramento**—City let contract paving 21st St from Y St. to Freeport Blvd., to Clark & Henery Constr. Co. Ochsner Bldg. About $25,000. Work involves grading, 4 in. concrete paving with 1½ in. bitulithic surface, cement curbs, gutters and sidewalks.

★**Cal., San Bernardino**—City let contract paving Palm and Agate Sts., 22 ft wide, 4 in concrete and stone curbs, to R. T. Shea & Co., Riverside, $25,440.

★**Cal., San Bernardino**—City let contract surfacing and paving E St. from 9th to Highland Sts., oil and screenings surface on 4 in concrete base, to H. H. Lienau, Highland, $72,149

★**Cal., San Bernardino**—City let contract paving 117,700 sq.ft. Mt. Vernon Ave., 16 ft. wide, 4 in concrete, to H. H. Lienau, Highlands. About $15,500. County furnishes sand, rock and cement. Noted Sept. 4

★**Cal., San Francisco**—City let contract curbing, paving, guttering and building sidewalks on Carr, Gould, Exter, Crane, Cheat and Were Sts, also on Pond Ave from Railroad Ave to San Bruno, to Fay Impvt. Co., 760 Market St., $23,930. Work involves 7442 sq.yd asphalt, 3391 lin.ft concrete curbing, 1904 sq.ft brick gutter, 1442 sq.ft stone sidewalk, 15 brick catch basins and 300 ft. 10 in. culverts

★**Cal., Santa Cruz**—City let contract grading, concrete paving and draining Seabright Ave to Blanchard, Croker & Howell, 58-2nd St., San Francisco, $47,-268

★**Cal., Upland**—Comrs. San Bernardino Co. (San Bernardino) let contract paving 19th St. to W. C. Cline, Upland. About $15,000. Work involves 2151 cu.yd excav., $.75 per cu.yd., 75,160 sq.ft 3 in concrete paving $.08 50 cu.yd apron walls $30. County will furnish cement

★**Quebec**—Dept. Rds., Quebec let contract building 10 mi. Provincial Highway in town of St. Elzear, macadam, 20 ft wide, to E. Desormeaux, St. Francis Xavier St. Cape St. Martin. About $60,000

★**Que., Montreal**—City let contract rebuilding Notre Dame St. W. from Chamelez Sq. to Dominion St., to Sicily Asphaltum Repair Co., 60 St. Viateur St. E. $41,756

★**Que., Montreal**—Civic Comm. let contract rebuilding Cote des Neiges Rd. to Sicily Asphaltum Paving Co., Ltd., 60 St. Viateur St. E., $127,027

★**Que., St. Cecile**—City let contract building 5 mi. waterbound macadam road to L. Cassette, St. Cecile, $21,825

★**Que., St. Luc**—City let contract building 7 mi tar macadam roads, to O. Gaynow, 107 St. James St. Montreal. About $43,000

★**Que., St. Martine**—Dept. Rds. Quebec let contract paving 11 mi Provincial Highway here, 20 ft. wide, bituminous macadam to Leger & Charleton, Notre Dame St., Lachine. About $83,000

★**Ont., Barrie**—Simcoe Co. Rds. Com. let contract paving 1.2 mi Atherley Rd 20 ft wide to R. Curran. About $12,500

Streets and Roads (Continued)

★**Ont., Ridgeway**—Comrs. Welland Co. (Welland) let contract for 2650 sq.yd. concrete pavement, 18 ft. wide, Ridgeway Twp., to Begy & Co., St. Catherines, $29,50

★**Ont., Toronto**—City let contracts to Warren Bituminous Paving Co., McKinnon Bldg., paving portions of Northcliffe Blvd., Rosemount and Springmount Aves., bitulithic; to Asphaltic Concrete Co., Ltd., Excelsior Life Bldg., for brick block pavement on portion of Waverly Rd., $19,824; to Dept. Wks for concrete pavements on portions of Belsize Drive, $16,-044 Manor Rd., $737; Sheldrake Ave., $5583, Sheldrake Blvd., $12,934 and asphalt pavements on portion of Kenilworth Ave., $3157; to Constructing & Paving Co., Confederation Life Bldg., for asphalt pavements on Annette St., $43,-318, Middleton St., $4004; to Godson Contg. Co, Manning Chambers, for asphalt pavements on portions of Fernwood Park Ave., $7849, Front St., $25,-877, Kenilworth Ave., $15,313, Logan Ave., $9438, McLean Ave., $16,796, and concrete curbing on Front St., $.80 per lin.ft.

★**Ont., York**—Town let contracts building concrete sidewalks on sections of Bernice and Dennis Sts., to Angotti & Smythe, 7 Pendrith Ave., Toronto, $4725 and $1630 respectively; McRoberts St., Paulton and Torrens Aves., to Natl. Constr. Co., 228 Carlton St., Toronto, $8288, $2900 and $5510 respectively.

★**Ont., York**—Town let contracts building sidewalks on Todmorden, Glenholme and Lauder Aves., to Walton & Powell, 60 Gamble Ave., Toronto, $1708; Torrens and Barr Aves., to Angotti & Smythe, 7 Pendrith Ave., Toronto, $3175; Pape Ave., to J. E. Clarke, 139 Dowling Ave., Toronto, $4500; Eversfield Ave., to Giant Contg. Co., 50 Front St. E., Toronto, $3950; Lambton Ave., to W. H. Sheridan, 15 Langley Ave., Toronto, $3988; Brownhill Ave., to A. Johnson, 35 Burgess Ave., Toronto, 2924; Keene St., to Natl Contg. Co. 9 Garvock Ave, Toronto, $1350.

★**Ont., York**—Town let contract building concrete sidewalks, 4-6 ft. wide, on St. Johns Rd., Atlas and St. Clair Aves., to Walton & Powell, 46 Price St., Toronto, $4600, $4375 and $4500 respectively; Denison, Medway and Trejama Aves., to Angotti & Smythe, 7 Pendrith Ave., Toronto, $2875, $775 and $3200 respectively.

★**B. C., Chilliwacke**—City let contract paving 16,400 sq.yd. various streets, 2 in. bitulithic surface on macadam base, to Columbia Bitulithic Co., 402 Pender St. W., Vancouver. About $35,000. Noted Aug. 21.

Excavation and Dredging

★**Fla., Palm Beach** — Canal — Trustees Internal Impvt. Fund of Florida let contract building 5 mi. canal, 24 ft. wide, 11 ft. deep, involving 247,000 cu.yd. excav., to South Florida Dredging Co., Ft. Landerdale, $.11 per cu.yd.

★**O., Rocky River**—Excavation—Realty Underwriting Co., 810 Leader News Bldg., Cleveland, let contract for 15,000 cu.yd. earth excav., here, to F. G. Bieber, 2086 West 96th St., Cleveland. About $15,000.

★**Ia., Onawa**—Ditches—Comrs. Monona Co let contract building ditches in Upper Sioux, D. D., involving 1,227,000 yd. excav., to F. M. Crane Co., Omaha, Neb.., $ 139 per yd

★**Minn., Benson**—Ditch—D. P. Carney aud. Swift Co. let contract for labor for building Ditch No. 19, to A. Olson, Murdock, $10,250; tile, to N. W. Cement Tile Co., Starbuck, $6650. Noted Sept. 18.

★**Minn., Duluth**—Dredging—W. H. Borgen, aud. St. Louis Co., let contract dredging 2 rivers to J. Ferrier, 705 East 8th St., $43,055. Noted Sept. 4.

Me., Fairfax — Drainage — Fairfax Special D. D. let contract building drainage system involving 800,000 cu.yd. excav., to J. H. Boyce Sons Co., Omaha, Neb., $ 1473 per cu.yd.

★**Ark., Marianna**—Dredging—Daggett & Daggett, engrs., let contract building 22 bar floating dredge work in Black Swamp D. D., Lee Co., involving 650,000 cu.yd. excav., to Canal Constr. Co., Exch. Bldg., Memphis, Tenn., $.14 per yd. Noted Sept. 18.

★**Ark., Marianna** — Dredging — Comrs. Lee-Phillips D. D. let contract building 20 mi. floating dredge work, involving 1,905,000 cu.yd. earth work, to Canal Constr. Co., Exch. Bldg., Memphis, Tenn., $ 11 and $ 18 per cu.yd. Noted Sept. 1

★**Utah, Salt Lake City** — Drainage — Brighton D. D. No. 1 let contract improving system, Salt Lake Co., to Corey & Richardson, Ogden, $80,740.

★**Washington** — Dredging — State Highway Comn., Olympia, let contract dredging and building 2 mi. embankment along Bear River, Pacific Co., to Washington Diking Co., Astoria, Ore., $24,576.

★**Ore., Silver Lake** — Irrigation — G. W. Marvin, secy., Silver Lake Irrigation Dist. let contract building irrigation system to include 10 mi. main canal, 3 timber faced rock filled dams and distribution system, involving 78,000 cu.yd. earth excav., 55,000 cu.yd. rock embankment, 860 cu.yd. rubble masonry and concrete, 770,000 F. B. M. lumber, 26,000 lb. iron, 140 lin.ft. tunnel, to Warren Constr. Co., Journal Bldg., Portland. About $100,000. Noted Oct. 23.

★**Cal., San Francisco** — Excavation — Pacific Gas & Electric Corp., 445 Sutter St., let contract for grading in connection with 5 story, 150 x 155 ft. office building, to H. N. McClure, 602 Octavia St. Total cost, $200,000.

Industrial Works

***O., Cleveland**—O. Darst, archt., Brunson Bldg., Columbus, let contract to Voldt, Constr. Co., Cleveland, building 5-story, 90 x 132 ft., rein.-con. warehouse, on 12th St., for Central Ohio Paper Co., Bingham Bldg. About $156,000. Noted July 24.

***O., Cleveland**—Cleveland Ry. Co., Leader News Bldg., let contract building 5-story, 49 x 80 ft., concrete, steel and brick converter station, at 13006 Woodland Ave., to W. J. Thompson & Son, 6110 Euclid Ave. About $50,000. Noted Sept. 18.

***O., Cleveland**—Cross Candy Co., 1966 East 66th St., let contract building 1 story, 47 x 140 ft., rein.-con., steel and brick factory, at 6509 Hough Ave., to G. A. Rutherford Co. 1922 East 18th St. About $75,000. Noted Sept. 18.

***O., Cleveland**—Eller Motor Car Co., 7000 Euclid Ave., let contract constructing 2-story 128 x 239 ft., rein.-con., brick and terra cotta garage and service building, rein.-con. flooring, concrete foundation, on East 70th St. and Euclid Ave., to C. C. Kinne, 808 Union Natl. Bank Bldg. About $150,000.

***O., Cleveland**—Fink Body & Fender Co., 2075 East 65th St., let contract building 2-story, 62 x 101 ft., rein.-con., steel and brick factory, to W. Dunbar Co., 8201 Cedar Ave About $60,000. Noted Sept. 18.

***O., Cleveland**—Friedman, Blau, Farber Co. East 37th St. and Perkins Ave., let contract building, 1-story, 45 x 60 ft., concrete, steel and brick boiler house, rein.-con. flooring, concrete and brick foundation, to C. N. Grfifen, 5509 Euclid Ave. About $50,000.

***O., Cleveland**—Glidden Varnish Co., Madison Ave., let contract constructing 4-story 59 x 90 ft. grinding building, concrete, steel and brick, to J. R Gloyd Co., 1816 East 33rd St. About $60,000. Noted Oct. 2.

***O., Cleveland**—Whitworth & Johnson archts., Engineer's Bldg., let contract to W Vretman, Hollenden Hotel, Superior Ave. and East 6th St., building 2-story, 125 x 131 ft., concrete, steel and brick service and sales building, on East 67th and Carnegie Ave., for M. J. Hinkle, 817 Prospect Ave. About $150,-000. Noted Sept. 25.

***O., Cleveland**—T. Knight, Arcade Bldg., let contract building 1 story, 70 x 210 ft. rein.-con., steel and brick factory, on Scranton Rd., to Shader Constr. Co., Lennox Bldg. About $50,000. Noted July 31.

***O., Cleveland**—Manufacturers Oil & Grease Co., Century Bldg., let contract constructing 2-story, 78 x 83 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to Watson Eng. Co., 1101 Hipodrome Bldg. About $75,000.

***O., Cleveland**—Middle States Oil Co., 848 Engineer's Bldg., let contract constructing 2-story, 36 x 100 ft., concrete, steel and brick warehouse and storage building, rein.-con flooring, brick and concrete foundation, on 31st St. and St. Clair Ave., to F. Riley, 309 Williamson Bldg. About $30,000.

***O., Cleveland**—Monarch Brass Co., 4613 Payne Ave., let contract building 2-story, 66 x 200 ft., rein.-con., steel and brick factory rein.-con. flooring, concrete foundation, on 45th St. and Payne Ave. to Emerson Co. 1900 Euclid Bldg. About $150,000.

***O., Cleveland**—Ohio Varnish Co., East 87th St. and Kinsman Rd., let contract building 3-story, 56 x 97 ft., rein.-con., steel and brick factory addition, to G. A Rutherford Co. 1922 East 18th St. About $10,000.

***O., Cleveland**—G. S. Rider Co., archts. Century Bldg., let contract to Hunkin Conkey Co., Century Bldg., for 1-story, 91 x 161 ft., rein.-con., steel and brick addition to factory, for Par Brook Co., Brook Park Rd About $25,000. Noted Sept. 18.

***O., Cleveland**—Parish & Bingham, 10615 Madison Ave., let contract building 2 story 84 x 210 ft., concrete, steel and brick garage and shipping room, rein.-con. flooring, concrete and brick foundation, on Madison Ave. to W. I. Thompson, 6110 Euclid Ave. About $150,000.

***O., Cleveland**—F. P. Screw Products Co. 2279 East 77th St., let contract building 1 story, 60 x 150 ft., concrete, steel and brick factory, on East 79th St. and Woodland Ave. to G. A. Rutherford, 1922 East 18th St. About $50,000.

***O., Cleveland**—Stutz Motor Sales Co., 1309 East 13th St., let contract constructing 2-story, 54 x 165 ft., rein.-con., steel and brick service and sales building, at 4310 Carnegie Ave., to H. J. Claxton, 214 Vickers Bldg About $50,000.

***O., Cleveland**—Templar Motor Car Co. Halstead Ave., let contract building 3-story 120 x 442 ft., concrete, steel and brick factory and office, rein.-con. flooring, concrete foundation, to Hunkin-Conkey Co., Century Bldg. About $500,000.

***O., Cleveland**—Torbenson Axle Co., 1115 East 152nd St., let contract building 2-story 60 x 109 ft., rein.-con., steel and brick machine shop, to Crowell, Lundoff, Little Co. Meriam Bldg. About $30,000. Noted Sept 25.

***O., Cleveland**—Vita Mfg. Co., Williamson Bldg., let contract building 1-story, 132 x 252 ft., concrete, steel and brick factory, on Madison Ave., to H. G. Slatmeyer & Son, Lakeside Ave. About $100,000. Noted Sept. 25.

***O., Cleveland**—White Motor Car Co., East 79th St., let contract building 1-story, 200 x 600 ft., rein.-con., steel and brick addition to factory, to Watson Eng. Co., 1101 Hippodrome Bldg. About $600,000. Noted Sept. 18

***O., Cleveland**—White Motor Car Co., East 79th St., let contract building 2-story, 210 x 884 ft., concrete, steel and brick machine shop, to Watson Eng. Co., Hippodrome Bldg About $175,000. Noted Sept. 18.

***O., Columbus**—Bassett & Tresselt, archts. Central Natl. Bank Bldg., let contract to J W. Heckart, 79 Ruggery Bldg., constructing 6-story, 53 x 150 ft., fireproof addition to plant, for Natl. Ice & Storage Co., 5th and Naghten Sts. About $100,000. Noted Sept 25.

***O., Columbus**—O. Darst, archt., Brunson Bldg., let contract to R. H. Evans & Co. Columbus Savings & Trust Bldg., constructing 6-story 65 x 69 x 155 ft. wholesale grocery building on East Naghten St., for G. W. Bobb Co., 280 Naghten St. About $130,000. Noted Juley 24.

***O., Columbus**—Columbus Unnion Oil Cloth Co., 7th Ave. and Cleveland, Cincinnati, Chicago & St. Louis R.R., let contract constructing 1st unit of plant, consisting of two 1-story, fireproof buildings, 69 x 72 ft. and 50 x 92 ft., to M. J. Delaney, 31 Sycamore St. About $40,000.

***O., Columbus**—J. Kokenge Co., 4th and Lawrence Sts., let contract building 5- or 6-story, 60 x 187 ft., rein.-con. factory, on Main and Front Sts., to Frank Hill Smith Co., Inc., 120 Bway., New York City.

***O., Columbus**—Natl. Ice & Storage Co., 5th and Naghten Sts., let general contract constructing 70 x 90 ft. brick, cold storage building, 60 ft. high, at Plant No. 2, 11th and Grant Sts., to R. H. Evans & Co., Columbus Savings & Trust Bldg., cost $45,000; foundation, to M. J. Delaney, 31 Sycamore St., $10,000. Incorrectly noted in our issue of Sept. 25.

***O., Columbus**—Ohio State Journal, Spahr Bldg., let contract constructing 4-story, 34 x 197 ft. publishing building, on East Broad St. between Pearl and 3rd Sts., to E. Spencer, 914 Huntington Natl. Bank Bldg. About $160,000, cost plus percentage basis.

***O., Piqua**—Atlas Underwear Co. let contract building 4-story, 80 x 140 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, to Frank Hill Smith Co., Inc., East 3rd St., Dayton. About $125,000 Noted Aug. 21.

***O., Portsmouth**—Pure Milk Co., 1619 8th St., let contract building 2-story, 76 x 132 ft. creamery, brick and rein.-con., on Clay St., to F. Carson, 517 Glover St. About $40,-000.

***O., Springfield**—Clark Co. Lumber Co 1734 West Main St., let contract building

Industrial Works (Continued)

planing mill, 1 story, 70 x 110 ft., steel and timber, brick foundation, to Cogswell Bldg Co., Springfield. About $25,000.

O., Toledo Lewis Steel Products Co. let contract building 1 story, 150 x 300 ft., brick and steel foundry, machine shop and office to A. Bentley & Sons Co., 201-31 Belmont Ave. About $200,000.

Ind., Indianapolis—A. F. Bartel, 911 North East St., Richmond, will build 3-story, brick and steel factory, rein.-con. flooring concrete foundation, here. About $50,000 Work will be done by day labor. Noted Sept. 11.

Ind., Indianapolis—Millholland Machine & Mfg. Co., West 23rd St. and Belt R.R., let contract building 100 x 200 ft. brick, steel and concrete, machine shop, rein. con. flooring concrete foundation, to H. K. Ferguson Co., 6532 Euclid Ave., Cleveland. About $100,000

Ind., Muncie—Chevrolet Motor Co. let contract building 1 story, 60 x 240 ft., brick and steel factory, on 8th St. and Cleveland, Cincinnati & St. Louis Ry., to W. E. Wood Co., 1805 Ford Bldg., Detroit, Mich.

Ind., Richmond Natl. Automatic Tool Co. 7th St. and South St., N., let contract building 1-story, 200 x 250 ft. brick, steel and concrete factory, rein.-con. flooring, concrete foundation, to H. K. Ferguson Co., 6532 Euclid Ave., Cleveland, O. About $140,000.

Mich., Alma Northern Wheel Co. let contract building 2-story, 60 x 320 ft., rein.-con., brick and steel factory unit for assembly room, storage shed and power plant, to H. H. Soule, Alma. About $50,000.

Mich., Detroit—Amer. Blower Co., David Whitney Bldg., let contract building 2-story 127 x 144 ft., rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation, on Russell St. and Harper Ave., to E. D. Jackson Constr. Co., Ford Bldg. Noted Aug. 21.

Mich., Detroit—Belle Isle East Side Creamery; 1020 Forest Ave., E., let contract building 2-story, 45 x 100 ft., rein.-con., brick and steel, addition to factory, to O. Misch Chamber Commerce. Noted July 31.

Mich., Detroit—H. H. Lane, engr., Dime Bank Bldg., let contract to A. J. Smith Constr. Co., Campau Bldg., constructing 2-story, 60 x 75 ft., rein.-con. and steel addition to bakery, rein.-con. flooring, concrete foundation, on 4th and Labrosse Sts., for Detroit Baking Co., 4th St. and Michigan Ave. About $30,000. Noted Sept. 11.

Mich., Detroit—Detroit Edison Co., David Whitney Bldg., let contract building 2-story 25 x 113 ft., rein.-con. and brick sub station rein.-con. flooring, concrete foundation, on Connors Creek Rd., near Six Mile Rd., to A. A. Albrecht, 1130 Penobscot Bldg. About $50,000. Noted Sept. 11.

Mich., Detroit—Detroit Edison Co., David Whitney Bldg., let contract building 2-story 100 x 207 ft., rein.-con. brick and steel service station, rein.-con. flooring, concrete foundation, on Ledy and 2nd Sts., to A. A. Albrecht Co., 1130 Penobscot Bldg.

Mich., Detroit—Detroit Twist Drill Co., Ford St., let contract building 3-story, 45 x 87 ft., rein.-con. addition to factory, rein. con flooring, concrete foundation, on Fort St. and 14th Ave., to Montague-Forney Co., 813 Ford Bldg. Noted Sept. 11.

Mich., Detroit Detroit Vapor Stove Co. Kercheval and Connors Aves., let contract building 1-story, 55 x 380 ft., brick and steel factory, concrete foundation, to J. Whittaker & Co., 51 Church St. About $35,000.

Mich., Detroit—Fisher Body Co., Oakland and Piquette Aves., let contract building 2-story, 39 x 142 ft., rein.-con. and brick, dry kiln, rein.-con. flooring, concrete foundation on Riopelle and Farnsworth Sts., to G. A Fuller Co., 540 Penobscot Bldg. About $45,000.

....**Mich., Detroit**—Grennans Bakery Co., 108-17th St., let contract building 2-story, 25 x 104 ft., brick and steel addition to bakery rein.-con.. flooring, concrete foundation, on 17th St., to Spicer & Shock, 600 Sun Bldg About $25,000.

Mich., Detroit—Brown & Preston, archts. 406 Empire Bldg., let contract to Hazelton & Clark, Book Bldg., building 1 story, 65 x 200 ft., concrete, brick and steel garage and shop, rein.-con. flooring, concrete foundation for Mills-Fox Baking Co., Merrick Ave. About $40,000. Noted Sept. 11.

Mich., Detroit Morgan & Wright, Bellevue Ave., let contract constructing 7-story 80 x 174 ft., manufacturing and finishing plant, 7-story, 80 x 174 ft welfare building and 2-story, 50 x 174 ft. connecting factory all rein. con., rein.-con. flooring, concrete foundation, to Bryant & Detwiler, 2336 Dime Bank Bldg.

Mich., Detroit—Packard Motor Car Co., Grand Blvd., let contract building 2-story 165 x 180 ft., rein con. addition to foundry rein.-con. flooring, concrete foundation, on Harper Ave., to H. G Christman Co., 315 Stevens Bldg.

Mich., Detroit—Paige Detroit Motor Co. McKinstry Ave. and Fort St., let contract building 1-story, 69 x 275 ft., shipping room, rein.-con., concrete flooring, concrete foundation, on Warren Ave., also 20 x 275 ft., concrete shipping platform and rein.-con. tunnel, 102 ft. long, 9½ ft. sq., to A. J Smith Constr. Co., 110 West Fort St.

Mich., Detroit—Paige Detroit Motor Car Co., McKinstry Ave. and Fort St., let contract building 1-story, 275 x 528 ft., rein. con. brick and steel factory, rein.-con. flooring concrete foundation, to Amer. Bridge Co. Beecher Ave. and Michigan Central Ry. Noted Sept. 18.

Mich., Grand Rapids -Amer. Can Co., 251 Pearl St., let contract building 4 story, 66 x 286 ft., rein.-con. and brick factory, concrete foundation, on Front Ave. and 6th St., and 3 story, 66 x 83 ft. office, to Thompson Starrett Co., Lincoln Bldg., Detroit. About $300,000.

Mich., Grand Rapids Amer. Seating Co. 9th St., let contract building 2-story, 100 x 125 ft., rein.-con., brick and steel addition to factory on 9th St. and Bway Ave., to Owen-Ames-Kimball Co., Michigan Trust Bldg., 42 Pearl St.

Mich., Hamtramck (Detroit P. O.) -Detroit Carrier & Mfg. Co., Conant Ave., let contract building 2-story, 110 x 133 ft., rein. con. brick and steel factory, concrete foundation, on Conant Ave. and Grand Trunk Ry., to C. M. Davis Co., 1323 Woodward Ave., Detroit; cost plus percentage basis.

Ill., Chicago—Anderson-Clauson Motor Co., 4701 West Madison St., let masonry contract for 1- and 2-story, 50 x 175 ft., brick and timber auto service station, brick foundation, at 4633 West Washington Blvd., to W. J. Ratledge & Co., 2721 Lake St. About $60,000.

Ill., Chicago R. C. Harris, archt., 190 North State St., let contract to McLennon Constr. Co., 220 Walton Pl., for 5-story, 100 x 300 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on 30th St. and Sawyer Ave., for Apex Appliance Co., 3231 West 30th St. About $300,000. Noted Aug. 7.

Ill., Chicago—Armstrong Bros. Tool Co., 317 North Francisco St., let contract building 1-story, 60 x 150 ft. and 2-story, 60 x 115 ft rein.-con. and tile factory, concrete foundation, at 307 North Francisco St., to G. Thomson & Son Co., 30 North La Salle St. About $150,000.

Ill., Chicago—Buckley-Dement & Co., 632 Sherman St., let general contract building 6-story, 100 x 120 ft. rein.-con., brick and steel printing and mailing plant, rein.-con. flooring concrete foundation, on Jackson Blvd. and Throop St., to C. B. Johnson & Son, 111 West Washington St. About $300,000. Noted Aug 21.

Ill., Chicago—Central Bag Mfg. Co., 3622 Iron St., let contract building 1- and 2 story 330 x 400 ft rein. con and brick factory concrete foundation, on Western Ave. and 60th St., to Solomon-Waterton Co., 343 South Dearborn St. About $350,000.

Ill., Chicago—Chicago & Alton Ry., 608 South Dearborn St., let contract building 1 story, 154 x 460 ft., concrete, steel and hollow tile, freight house, concrete foundation at 344-355 West Harrison St., to Melton-Stewart-Nelson Co., 208 South La Salle St. About $1,000,000

Ill., Chicago—Churchill Cabinet Co., 2119 Churchill St., let contract building 2 story 80 x 180 ft., mill construction addition to factory, concrete foundation, at 1800 North Hoyne St., to F. E. Doherty, 133 West Washington St About $65,000.

Ill., Chicago—W. G. Uffendell, archt., 30 South State St., let masonry and carpentry contract, to G. Thomson & Son, 30 North La Salle St., for 5-story, 100 x 200 ft. rein.-con and brick factory, rein con flooring, concrete foundation, on Orleans St. and Institute Pl for Dallas Brass & Copper Co., 225 North Jefferson St. About $300,000 Noted Aug. 14

Ill., Chicago Edison Electric Appliance Co., 5660 West Taylor St., let masonry contract building 1 story, 340 x 350 ft., brick and timber factory, brick foundation, to A. E Anderson Co., 19 South La Salle St About $275,000.

Ill., Chicago A. M Harroun, 5501 Cornell Ave., let masonry contract building 1 story 100 x 150 ft. brick and timber garage, brick foundation, on Lake Park Ave and 55th St to Rune & Son, 6142 Rhodes Ave. About $25,000. Noted Aug. 21.

Ill., Chicago—Ideal Coated Paper Co., 38 South Dearborn St., let contract building 1 and 2 story, 70 x 135 ft., rein con and brick factory, rein con. flooring, concrete foundation, at 3329 South Western Ave., to E. W Sproul Co., 201 West 39th St. About $50,000

Ill., Chicago Ursus Motor Co., 6601 West Grand Ave., let contract building 1- and 2 story 120 x 150 ft brick and timber factory, brick foundation, on Grand and Fullerton Aves., to Industrial Bldg. Co., 38 South Dearborn St About $50,000

Ill., Chicago Westerlin & Campbell, 20 North Clinton St., let contract building 1- and 2 story, 125 x 147 ft., brick, rein. con. and steel factory, rein.-con. flooring, concrete foundation, at 1119 Cornelia Ave., to D Puvogel & Son, 935 Dakin St. About $50,000 Noted Sept. 11.

Ill., Springfield Illinois Watch Co., 9th St. and North Grand Ave., let contract building 3-story, 80 x 144 ft. addition to factory to Austin Co., 16,112 Euclid Ave., Cleveland, O. About $100,000. (75 working days.)

Wis., Fond du Lac Latex Tire Co. will build 45 x 200 ft. concrete factory. About $50,000. Work will be done by day labor

Wis., Milwaukee Edmonds Shoe Co., Burleigh and Weil Sts., let contract building superstructure for 1-story, 134 x 475 ft. brick and steel factory, rein.-con. flooring, on Bremen and Concordia Sts., to W. Winter, 1025-2nd St About $150,000.

Wis., Milwaukee Kiel Furniture Co 32nd and Center Sts., let contract building 1-story, 72 x 112 ft. brick, rein. con. and steel addition to factory, to H. Schmitt & Son, 430 Farwell Ave. About $25,000.

Wis., Milwaukee F. Martin Laskin Co. Fratney St. and Keefe Ave., let contract building 2-story, 60 x 140 ft. rein. con. and brick addition to tannery, rein.-con. flooring concrete foundation, to W. F. Tubesing Co. Wauwatosa. About $35,000.

Wis., Milwaukee—Slocum Straw Wks., 650 Natl. Ave., let contract building 2 story, 40 x 60 ft. rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation to Larbru Eng. Co., 2718 Wright St. About $25,000.

Wis., Milwaukee—Lesser & Schutte archts. and engrs., Majestic Bldg., let contract to Riesen Bros. Co., 86 Michigan St. building 2-story, 62 x 170 ft. rein-con. and brick warehouse, rein.-con. flooring, concrete foundation, on Muskego and Park Sts., for O. N. Stein, 89 West Water St. About $65,000.

Wis., Milwaukee—H. Thompson, 226 Grand Ave., let contract building 1-story, 120 x 160 ft. brick and steel garage and repair shop concrete foundation, on Milwaukee and Huron Sts., to Foster Constr. Co., 534 Caswell Blk. About $75,000.

Wis., Milwaukee—A. W. Hoffman, archt and engr., Berlin Arcade, let contract to W W. Oeflein Co., 86 Michigan St., building 4-story, 88 x 88 ft., 88 x 154 ft. and 88 x 375 ft. rein.-con. and brick plant. rein.-con. flooring, concrete foundation, on Port Washington Rd., for E. and J. E. Uihlein, care of Schlitz Brewing Co., Chestnut St. About $500,000; cost plus percentage basis.

Wis., Milwaukee—Van Dyke Knitting Co 880 South Pierce St., let contract building 4 story, 40 x 70 ft. brick, steel and mill construction addition to factory, concrete foundation, to J. L. Stanage, 144 Oneida St About $30,000.

Wis., Racine Hartman Trunk Co., Hamilton St., let contract building 3-story, 60 x 134 ft. brick and steel factory, on Forrest St., to L. Nelson Co., Racine. About $60,000 cost plus percentage basis.

Wis., Racine—Walker Mfg. Co., Hamilton and Michigan Sts., let contract building 1-story, 80 x 120 ft brick and steel foundry concrete foundation, on Hubbard St., to King & Smith Co., 40 Mack Blk., Milwaukee. About $40,000.

Wis., Schleisingerville Vim Tractor Co. 835 Caswell Blk., Milwaukee, let contract building 1-story, 60 x 200 ft brick, steel and timber factory, concrete foundation, here, to W. M. Tuckwell, Old Chicago Rd., Milwaukee About $50,000, cost plus percentage basis.

Wis., Sparta Interstate Milk Products Co. will build 3-story, 50 x 78 ft condensory rein con., steel and brick, rein con. flooring brick foundation, on Main St. About $75,000 Work will be done by day labor Noted Sept. 4.

Wis., Waupun Waupun Canning Co. let contract building factory, to Hutter Constr. Co 128-136 Western St., FoEnd du Lac About $100,000

Wis., West Allis Marks Bros. Co., 613 73rd Ave., will build 2-story, 70 x 100 ft brick and mill construction plant, concrete foundation, on 75th Ave. About $30,000. Work will be done by day labor

Wis., West Bend West Bend Equipment Co let contract building 2 story, 80 x 100 ft

Industrial Works (Continued)

concrete addition to factory, to P. Berres West Bend. About $30,000.

*Ia., Cedar Rapids—J. G. Cherry Co. let contract building 3-story, 120 x 140 ft., rein.-con., brick and steel factory and office, rein.-con. flooring, concrete and brick foundation on 10th Ave. and 4th St., to T. Stark Co., Cedar Rapids. About $180,000.

*Ia., Des Moines—H. Irwin, Ft. Dodge, let contract building 5-story, 50 x 120 ft., rein.-con., brick and steel factory, concrete and brick foundation, to A. H. Newmann, 519 Hubbell Bldg. About $75,000.

*Ia., Des Moines—S. Mandelbaum, 1316-34th St., let contract building 2-story, 100 x 130 ft. brick, rein.-con. and steel garage, concrete foundation, on 9th and Mulberry Sts. to J. E. Lovejoy & Co., 1006 Mulberry St. About $62,000.

*Ia., Des Moines—H. Schoen, 2102 Beaver Ave., let contract building 2-story, 66 x 120 ft. brick, rein.-con. and steel garage, rein.-con. flooring, concrete foundation, on 14th and Grand Sts., to W. Knudson, 301 Flynn St. About $100,000 cost plus percentage basis.

*Ia., Waterloo—Barths-Sheppard Oil Co. let contract building 2-story, rein.-con. brick and steel warehouse, concrete foundation, on Logan Ave., and Belt Line Ry., to H. A. Maine Constr. Co., 305 Marsh-Pl. Bldg. About $51,000.

*Kan., Girard—F. Thudium will build 1-story, 85 x 120 ft. ice plant, brick and concrete, concrete foundation. About $60,000 Work will be done by day labor.

*Kan., Wichita—Crystal Ice Co., 201 North Osage St., will build 3-story, rein.-con., steel and brick ice storage plant. About $55,000 Private plans. Work will be done by day labor.

*Neb., Omaha—C. A. Anderson, 1407 Jackson St., let contract building 1-story, 66 x 132 ft., brick and steel, machine shop and garage, concrete foundation, at 1514-18 Jones St., to O. F. Nelson, 1330 Park Ave. About $25,000.

*Mont., Billings—Crystal Ice & Fuel Co. 15 North 22nd St., let contract building 1-story, storage plant, to F. Jacoby & Son 1041½ North 31st St. About $50,000.

*Mo., St. Louis—Alligator Oil Cloth Co. 4146 Bingham Ave., let contract building 2-story, rein.-con., steel and brick factory rein.-con. flooring, concrete foundation, at 4151-55 Bingham Ave., to Murch Bros. Constr. Co., Ry. Exch. Bldg. About $47,000.

*Mo., St. Louis—A. J. Goebel, Clayton, let contract building 3 story, 82 x 100 ft., brick factory and store, rock foundation, at 5874 Delmar Ave., here, to M. C. Bartels Constr. Co., 4224 Bingham St. About $50,000.

*Mo., St. Louis—United Drug Co., 63 Leon St., Boston, Mass., let contracts to Westlake Constr. Co., 717 Locust St., constructing drug and chemical plant, here, on San Francisco and Margaretta Aves. and Kings Highway to include 102 x 471-ft. factory, cost $1,450,000; 124 x 201-ft. finished stock building, $200,000; 121 x 181-ft. maintenance building, $100,000; 124 x 181-ft. crude stock building, $150,000; 45 x 126-ft. power plant, $80,000; 53 x 200-ft. administration building, $100,000; all 8-story, rein.-con. and brick, rein.-con. flooring, concrete foundation. Total cost, $2,000,000. Noted June 12.

*Tex., San Antonio E. Steves let contract building 2-story, 69 x 150-ft. rein.-con. and brick factory, in southern part of city, to Wright & Sanders, Almo Bldg. About $58,700.

*Okla., Bartlesville — Wasage Motor Co. let contract constructing 2-story, 88 x 100-ft., brick garage and auto show building to G. H. Siedhoff Constr. Co., 121 North Market St., Wichita, Kan. About $75,000.

*Okla., Muskogee—O. T. Graham, 16th and Emporia Sts., let contract building 2-story, 100 x 100-ft. brick, rein.-con. and stone garage, to J. Dickman, 10 Colorado Bldg About $50,000.

*Okla., Oklahoma—Tibbs-Dorsey Mfg. Co will build 2 tory, 151 x 275-ft. mill, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, at 901 Walker St. About $60,000. Work will be done by day labor.

*Colo., Brighton—Midland Cereal Products Co. let contract building 3 story, 75 x 250-ft., rein.-con. factory, to Moorman & Twogood, 101 Broadway, Denver; cost plus percentage basis.

*Colo., Denver—H. H. Heiser Co., 7th St. and Bway, let contract building 2-story 25 x 125 ft. garage, to C. S. Lambie Co. Tramway Bldg. About $60,000.

*Idaho, Pocatello—Idaho Feeding & Livestock Co., recently incorporated, let contract building 1 story, stock pavilion, frame to Lynch-Cannon Eng. Co., Pocatello. About $50,000.

*Utah, Salt Lake City—Intermountain Electric Co., 43 East 4th St., S., let contract building 2-story, (Ultimately 5-story), 66 x 85-ft. rein.-con. warehouse and office, to J. E. and H. E. Shraver, Boston Bldg., $51,250.

*Wash., Seattle—City will build fireproof power house, at Cedar Falls power plant About $1,750,000 appropriated to cover cost including equipment. Work will be done by day labor under supervision of department engineers.

*Cal., Los Angeles—Bd. Pub. Serv. Comm. 645 South Olive St., will build power plant No. 2 in San Francisquito Canyon, near Chatsworth. Total cost, $2,500,000. Work will be done by day labor. Noted June 12

*Cal., Los Angeles Keystone Iron & Steel Wks., 973 North Main St., let contract building 2nd unit of its plant to consist of 2-story, 100 x 438-ft., rein.-con. and brick machine shop, concrete foundation, on 37th St. and Santa Fe Ave., to Pozzo Constr. Co. 421 Macy St., $71,600. Noted July 10.

*Cal., Los Angeles—C. E. Love, California Bldg., let contract building 1-story, brick assembling and distributing plant, concrete foundation, on 30th and Main Sts., to Lilly-Fletcher Co., 621 Investment Bldg. About $25,000. Master Carburetor Co., 922 South Los Angeles St., lessee.

*Cal., Modesto—T. J. Wiseacre let contract building 1-story, brick garage, concrete foundation, on 11th and H Sts., to G. J. Ulrich, Modesto. About $35,000.

*Cal., Oakland—Western Canning Co. let contract building 1-story, 100 x 200-ft., concrete and brick warehouse, in Emeryville Dist., to P. J. Walker & Co., Monadnock Bldg., San Francisco, $70,000.

*Cal., Sacramento—Capital Van & Storage Co., 805 L St., let contract building 5-story, rein.-con. and brick warehouse, concrete foundation, on 21st and R Sts., to G. D. Hudnut, California Fruit Bldg. About $72,000.

*Cal., San Francisco—N. Capro and A Podesto, c-o. L. Mastropasqua, archt., 580 Washington St., let contract building 2-story, 67 x 136-ft. rein.-con. garage and shop, concrete foundation, on Powell and Vallejo Sts., to Del Favero & Rossori, 710 Jessie St. About $25,000. Noted June 19

*N. B., Bathurst—Bathurst Lumber Co let contract building rein.-con. power house flume and dam, on Nepisiguit River, near here, to Morris & Beatty, Peterboro. About $500,000.

*Que., Montreal—Holt, Renfrew & Co., 401 St. Catharine St. W., let contract building warehouse and cold storage plant, to H. C Johnston Co., Ltd., 260 St. James St. About $120,000.

*Que., Rockfield—Dominion Wire Rope & Cable Co., Lachine, let contract building 3-story, 75 x 100-ft., steel and brick factory. rein.-con. flooring, concrete foundation, on Lachine Rd. here, to A. F. Byers & Co., 340 University St., Montreal. About $90,000.

*Que., Sherbrooke—J. Kayser & Co., Frontenac St., let contract building 4-story, 100 x 300-ft., concrete, brick and steel factory to Loomis-Dakin Constr. Co., 25 Belvidere St. About $250,000. Noted June 5.

*Que., Three Rivers—International Paper Co., 30 Broad St., New York City, will build paper mill on 100-acre site, here, to consist of several 2-story buildings, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $3,000,000. Work will be done by day labor. Noted Mar. 20.

*Ont., Brantford—A. J. Reach & Co., Gordon St., let contract building 2-story, 40 x 80-ft., brick, steel and concrete addition to plant, rein.-con. flooring, concrete foundation to Schultz Bros. Co., Ltd., 37 Albion St About $28,000.

*Ont., Cardinal—Canada Starch Co., Ltd. 164 St. James St., Montreal, Que., let contract building engine house and addition to refinery here, to D. Bremner & Co., 10 Cathcart St., Montreal, Que. About $47,000

*Ont., Chatham—Dowsey Spring & Axle Co., 81 St. George St., let contract building 3-story, 60 x 120-ft., rein.-con. factory, concrete foundation, to W. Sparling & Co., 120 Bay St., Toronto. About $80,000; cost plus percentage basis.

*Ont., Guelph—Brown & Little, 23 Cork St., let contract building 2-story, 82 x 160-ft rein.-con. and brick garage, rein.-con. flooring, concrete foundation, on Eramosa Ave. to P. H. Secord & Sons, 133 Nelson St About $60,000; cost plus $5,000.

*Ont., Hamilton—Dominion Sheet Metal Co., Ltd., 1322 Burlington St., let contract building 1-story, 50 x 100-ft. steel and brick factory, concrete flooring and foundation, to W. H. Cooper, Clyde Bldg. About $23,000

*Ont., Hamilton—T. Eaton & Co., Ltd. 190 Yonge St., Toronto, let contract building 5-story, 50 x 80-ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Houghson St. here, to Frid Constr. Co., Sun Life Bldg. About $92,000 Noted Sept. 25.

*Ont., Hamilton—Frost Steel & Wire Co. Sherman Ave. N., let contract building 1-story, 40 x 100-ft., brick and steel factory concrete flooring and foundation, to W. H Cooper, Clyde Bldg. About $27,500.

*Ont., Hamilton—Porrits & Spencer Paper Mfg. Co. let general contract constructing factory, consisting of 4-story, 56 x 146-ft 1-story, 63 x 362-ft., 4-story, 123 x 143-ft and 4-story, 62 x 81-ft., rein.-con. buildings and 2-story, 45 x 65-ft. brick office, rein.-con. flooring, concrete foundations, to W. H Yates, 24 Leeming St.; steel, to Hamilton Bridge Co., Bay St. N. About $450,000.

*Ont., Hamilton Yates Lehigh Coal Co 1168 Sycamore St., Buffalo, N. Y., let contract building rein.-con. coal elevator, with circular bins, here, 5,000-ton capacity, to involve 7,500 cu.yd. rein.-con. and 500 cu.yd. mass concrete, to J. B. Nicholson, Hamilton. About $50,000.

*Ont., Kitchener—Dominion Tire Co., 149 Strange St., let contract building 4-story 80 x 250-ft., structural steel factory, rein.-con. flooring, concrete foundation, on King St. W., to MacKinnon Steel Co., Drummond St., Sherbrooke, Que. About $300,000.

*Ont., Napanee—Farmers Dairy Co., Walmer Rd., Toronto, let contract building 3-story, 60 x 85-ft., dairy, rein.-con. and brick rein.-con. flooring, concrete foundation, here to Jackson Lewis Constr. Co., Bell Telephone Bldg., Toronto. About $75,000.

*Ont., Toronto—Chase Tractor Co. let contract building 2-story, 50 x 96-ft., brick and steel factory, rein.-con. flooring, concrete foundation, to Carswell Constr. Co. 58 Wellington St. E. About $40,000.

*Ont., Toronto—Cowan Co., Ltd., 72 Sterling Rd., let contract building 5-story, 82 x 250-ft., steel and concrete factory, rein.-con flooring, concrete foundation, to J. V. Gray Constr. Co., Confederation Life Bldg. About $450,000. Noted June 19.

*Ont., Toronto—A. D. Gorrie & Co., Ltd. 205 Victoria St., let contract building garage to T. E. Essery, Confederation Life Bldg About $90,000.

*Ont., Toronto—J. M. Loose & Sons, Carlan Ave., Let contract building 3-story, 52 x 96-ft. brick and steel factory, concrete foundation, to Witchall & Son, 156 St. Helens Ave. About $75,000.

*Ont., Walkerville—Peabody Sales Corp. Ltd., let contract building 4-story, 80 x 250-ft. and 4-story, 60 x 200-ft. rein.-con. additions to factory, rein.-con. flooring, concrete foundation, to Wells & Gray, Confederation Life Bldg., Toronto. About $300,000.

*Ont., Windsor—British Amer. Brewing Co. Pitt and Bruce Sts., let contract building 3-story, 40 x 80-ft. brick, steel and concrete brewery, rein.-con. flooring, concrete foundation, on Pitt St., to Wells & Gray Confederation Life Bldg., Toronto. About $32,000.

*Man., Selkirk—Dept. Pub. Wks., Ottawa Ont., let general contract building laundry at Hospital for the Insane, here, to Carter, Hall & Aldinger, 1010 Union Bank Bldg., Winnipeg, $47,229; heating and plumbing apparatus and installation of machinery, to J. Ballantyne Co., Ltd., Winnipeg, $18,275

*Sask., Regina—Canadian Consolidated Rubber Co. let contract building 3-story steel and rein.-con. addition to warehouse at 1118 Broad St., to Poole Constr. Co. Regina. About $40,000.

Buildings

*Me., Waterville—Bank—Ticonic Natl. Bank let contract building 2-story, 50 x 100-ft. brick and limestone, rein.-con. flooring, brick foundation, to H. Purintor Co., Waterville About $100,000.

*N. H., Portsmouth—Fire Station—City let contract building 2-story, brick, rein.-con. flooring, brick foundation, on Main St., to C. E. Currier, 10 High St., Boston About $60,000.

*Vt., Townshend—Hall—Town let contract building 2-story, 45 x 88-ft., brick and stucco, on Main St., to W. Cushman, Guilford St., Brattleboro. About $50,000.

*Mass., Amherst — Dormitory — Massachusetts Agricultural College let contract building dormitory and dining room, on campus 3 story, 60 x 155-ft., brick and 2nd class construction, concrete foundation, to E. F. Carlson Co., 310 Main St., Springfield. About $150,000. Noted Sept. 18.

*Mass., Boston—Dining Room—Comn. on Mental Diseases, 36 State House, let contract to H. Cummings & Co., 185 Devonshire St., building 2-story, brick and steel brick foundation, (east group) Boston State Hospital. About $68,700.

Buildings (Continued)

***Mass., Boston**—School—Suffolk Co. let contract building 3-story, 65 x 111-ft., brick, concrete foundation, on Rainsford Island to C. Logue Co., 18 Tremont St., $116,225.

***Mass., Chicopee** — Housing-Dwight Mfg. Co., Front St., will build eight 2-story brick and timber houses, concrete foundations, on Dwight Terrace. About $50,000. Work will be done by day labor.

***Mass., Gardner**—Assembly—Comn. on Mental Diseases, 36 State House, Boston, will build 2-story, brick and concrete addition, rein.-con. flooring, concrete foundation, for Gardner State Hospital, here. About $75,000. Work will be done by day labor. Noted Aug. 28.

***Mass., Indian Orchard**—Office—Indian Orchard Co., Front St., let contract building 1-story, 46 x 51-ft., brick, concrete and steel, rein.-con. flooring, concrete foundation to Adams & Ruxton Constr. Co., 33 Lyman St. About $50,000.

***Mass., Lexington**—School—Town let contract building 1-story, 74 x 84-ft. brick and hollow tile, on Bedford St., to F. C. Alexander, Old South Bldg., Boston. About $50,000. Noted July 17.

***Mass., New Bedford**—Business—E. H. Vien, 65 Main St., let contract building 2-story, 85 x 135-ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on Acushnet Ave., to N. Lapointe, 99 Ellen St. About $60,000

***Mass., New Bedford**—Hotel—Clinton & Russell, archts., 32 Nassau St., New York City, let contract to Longacre Constr. Co., 185 Madison Ave., New York City, building 9-story, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Middle, Pleasant, High and Foster Sts., here, for New Bedford Hotel Co., Pleasant St. About $1,000,000. Noted July 10.

***Mass., New Bedford**—Theater—A. A Spitz, C. Misch Bldg., Providence, R. I., let contract building 3 story, 86 x 140-ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on Elm St., here, to C. I. Bigney Constr. Co., Inc., 898 Westminster St. Providence, R. I. About $175,000.

***Mass., South Boston** (Boston P. O.)—Theater and Post Office—Bway.—Real Estate Trust Co., let contract constructing brick, steel and rein.-con., rein.-con. flooring, concrete foundation, to F. T. Ley & Co., Inc. 499 Main St., Springfield. About $400,000.

***Mass., West Warren**—Community—Warren Cotton Mills let contract building 1-story 51 x 114-ft. with 30 x 41-ft. ell, brick and steel, concrete foundation, on Main St., to include assembly hall, poolroom, bowling alleys, etc., to P. H. Provencal Co., 147 North St., Ware. About $75,000.

***R. I., Pawtucket**—Theater—W. R. Walker & Son, archts., 17 Custom House St., Providence, let contract to E. Turgeon, 86 Weybosset St., Providence, altering interior of 3-story, 100 x 100-ft. building, brick and rein.-con., rein.-con. flooring, concrete foundation on East Ave., and constructing lobby and entrance through another building, for A A. Spitz, C. Misch Bldg., Providence. About $150,000. Noted Oct. 30.

***R. I., Providence**—Hospital—Rhode Island Hospital, Eddy St., let contract building 5-story, 34 x 36-ft., 46 x 143-ft., and 34 x 36-ft. brick, steel and rein.-con. addition, rein.-con. flooring, brick and concrete foundation, on Lockwood St., to be known as Jane Frances Brown Memorial Hospital, to E. F. Miner Bldg. Co., 82 Foster St., Worcester, Mass. About $200,000.

***R. I., Providence**—Library—G. H. Shepley Benefit St., let contract building 1-story 19 x 22-ft., 31 x 62 ft., and 19 x 22-ft. brick and concrete, rein.-con. flooring, concrete foundation, to Williams & Marchant, Inc. 85 Weybosset St. About $50,000.

***R. I., Providence**—Theater and Business—S. Bomes, 71 Farragut Ave., will build 1- and 2-story, 80 x 102-ft., brick and terra cotta, concrete flooring and foundation, on Broad and Gallatin Sts. About $50,000. Work will be done by day labor. Noted Sept. 18.

***Conn., Bridgeport**—Bank and Office—Hincks Bros. & Co., 207 State St., let contract building 1- and 3-story, 39 x 104-ft. brick, concrete and steel, concrete flooring and foundation, on Main St., to M. C. Treddenick Co., 1188 Main St. About $100,000. Noted July 31.

***Conn., Bridgeport**—Police Station—Bd. Police Comrs. let contract building, 2-story, 55 x 75-ft., brick, concrete and steel, station and garage, rein.-con. flooring, concrete foundation, on Barnum Ave. and Caroline St., to D'Agostino & Cennamo, 1834 Main St. About $60,000. Noted Sept. 18.

***Conn., Bristol**—Housing—Bristol Realty Co. let contract building fourteen 1 and 2-family houses on Barnes, Hull, George and Queen Sts., 1½- and 2½-story, brick and timber, brick, concrete and rock foundation, to G. J. La Course, 108 South St.. About $83,600.

***Conn., Collinsville**—Housing—Collins Co. let contract building ten 2-story timber houses for workmen, brick and concrete foundation, to Ellison Constr. Co., 96 Wellington Ave., Hartford. About $50,000.

***Conn., Glastonbury**—Schools—Bd. Educ let contract building assembly hall and 1-story, 2-room addition to Hubbard St. school also 4-room addition to High St. school, brick and concrete, concrete foundation, to Dean & Bidwell, Glastonbury. About $60,000. Noted July 17.

***Conn., Hartford**—Bank and Office—Amer Industrial Bank & Trust Co., 688 Main St. let contract constructing 15-story, 56 x 156-ft. brick, concrete and steel, concrete flooring and foundation, to W. F. O'Neil, 277 Farmington Ave. Noted Mar. 20.

***Conn., Highwood** (New Haven P. O.)—Office—Yale Tire & Rubber Co., New Haven let contract building 3-story, 30 x 60 ft. brick concrete and steel, rein.-con. flooring, concrete foundation, here, to C. W. Murdock, 185 Church St., New Haven. About $50,000.

***Conn., Manchester**—Hospital—Town let contract building 3-story, 45 x 90-ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on Main St., to Wise & Upson, 36 Pearl St., Hartford. About $100,000. . Noted May 15.

***Conn., ..Mansfield**—School, etc.—State Training School let contract constructing 2- and 3-story custodial building, school and gymnasium, brick and rein.-con., rein.-con. flooring, concrete foundation, to H. Wales Lines Co., 134 State St., Meriden. About $300,000. Noted July 24.

***Conn., New Haven**—Business—Brown & Von Beren, archts., 185 Church St., let contract to Dwight Bldg. Co., 24 Center St., altering and building 4-story rein.-con. addition, rein.-con. flooring, concrete foundation, for Besse, Ritchey & Co., 784 Chapel St. About $75,000. Noted July 10.

***Conn., New London**—Synagogue—Congregation Chev Sholum, North Main St., let contract building 2-story, 40 x 82-ft. brick and steel, concrete foundation, on Blinman St., to T. Occhialine & Co., 4 Chelsea St. About $50,000. Noted July 17.

***Conn., Norwalk**—Home—Davis & Dane archts., 1024 Main St., Bridgeport, let contract to M. MacFayden, 174 Middle St. Bridgeport, building 3-story, 35 x 60-ft brick and steel addition, rein.-con. flooring, concrete foundation, on Westport Ave., here for Fairfield County, Bridgeport. About $50,000. Noted July 24.

***Conn., Plainfield** Club—Lawton Mills Corp. let contract building 2-story brick and rein.-con., rein.-con. flooring, concrete foundation, to A. Torrance, Prospect St., Norwich About $135,000.

***Conn., Stamford** School—Bd. Educ. let contract building 2-story, 24-room, brick concrete and steel, concrete flooring and foundation, on State and South Sts., to J. A. Trolle, Lafayette St. Cost $231,000. Noted July 31.

***N. Y., Binghamton**—Dormitory—Bd. Supervs., Broome Co., let contract building brick, concrete and steel dormitory and isolation ward for men, at County Farm, to Klein & Griffin, 20 Highland Ave., Binghamton, $79,721.

***N. Y., Brooklyn**—Office—Slee & Bryson archts. and engrs., 154 Montague St., let contract to A. J. Robinson, 15 West 38th St., New York City, building 3-story, 65 x 90-ft. brick, steel and stone, brick foundation, for Home Title Insurance Co., Jay and Pearl Sts. About $100,000. Noted Aug. 28.

***N. Y., Brooklyn** School—Bd. Educ., 500 Park Ave., New York City, let contract building P. S. 144, Howard Ave. and Prospect Pl., brick and steel, brick foundation, to Freymier & Hanna, 25 West 45th St., New York City. About $200,000. Noted Aug. 28

***N. Y., Brooklyn**—Store—A. I. Namm & Son, Fulton St., let contract building 6-story, 125 x 175-ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Livingston St. and Elm Pl., to J. Thatcher & Son, 60 Park Ave. About $500,000.

***N. Y., Brooklyn** Synagogue Congregation Beth El, c.o. Shampan & Shampan archts. and engrs., 50 Court St., will build 100 x 120-ft., brick and terra cotta, brick foundation, on 15th Ave.. About $200,000 Work will be done by day labor.

***N. Y., Brooklyn**- Theater—M Loew, 1492 Bway., New York City, let contract building brick and steel, brick foundation, on Bay Ridge Ave. and 5th St., here, to L. Gold, 44 Court St. About $500,000.

***N. Y., Jamaica** Bank—First Natl Bank of Jamaica, 335 Fulton St., let contract building 1-story, brick, steel and stone, brick foundation, to Wills-Egelhoff & Co., 101 West 40th St., New York City. About $55,000

***N. Y., Kings Park**—Hospital—State Hospital Comn., Capitol, Albany, let general contract building hospital for acute patients at Kings Park State Hospital, here, to M Kantrowitz, 20½ Market St., Albany, $277,700; heating, to A. B. Barr & Co., 6 River St., Yonkers, $21,800; plumbing, to W. B Armstrong, 3 Fulton St., Albany, $31,600 Noted Sept. 18.

***N. Y., Long Island City**—Store and Loft Egel Constr. Co., Hillside Ave., will build 2-story, 75 x 120 ft. brick and steel, brick foundation. About $50,000. Work will be done by day labor.

***N. Y., New York** Exchange New York Telephone Co., 15 Dey St., let contract building 4-story, brick and limestone, brick foundation, on St. Nicholas Ave., to D. C. Weeks, 1123 Bway.

***N. Y., New York**—Hotel—Allerton House Corp., 143 East 39th St, will build 16-story, 100 x 200-ft. brick, steel and stone, brick foundation, at 551-553 Madison Ave. About $1,000,000. Work will be done by day labor. Noted July 17.

***N. Y., New York** Hotel—Commonwealth Constr. Co., 18 East 41st St., will build 200 x 300 x 350 x 200-ft. brick, steel and stone, brick foundatoin, on Bway., 7th Ave., 56th and 57th Sts. About $15,000,000. Work will be done by day labor.

***N. Y., New York**—Hotel—Hotel Ormindl, 70th St. and Bway., let contract building 12-story, brick, steel and stone addition, brick foundation, to Fullam Constr. Co., 103 Park Ave. About $400,000.

***N. Y., New York—Lofts and Stores**—B. S. Castles, 43 West 38th St., let contract constructing 7-story, 25 x 100-ft., brick and steel, brick foundation, at 15 East 56th St., to J. H. Deeves Bros., 103 Park Ave. About $75,000.

***N. Y., New York**—Loft—Elman & Gitelman, c-o. J. H. Scheier, archt. and engr., 23 West 42nd St., let contract converting brick and steel hotel at 29 West 26th St., into loft building, to D. Ray, 696 Cauldwell Ave. About $75,000.

***N. Y., New York**—Office—Gilbert & Kramer, 103 Park Ave., will alter present building and construct 4-story, 51 x 203 ft. steel and brick addition, on Bway. and 48th St About $500,000. Work will be done by day labor.

***N. Y., New York**—Office and Stores—Larimore & Co., 1 West 46th St., let contract building 10-story, 33 x 97-ft. brick, steel and stone, brick foundation, at 15 17 West 46th St., to G. B. Beaumont, 286 5th Ave About $150,000. Noted June 12.

***N. Y., New York**—School—Bd. Educ., 500 Park Ave., let contract building P. S 83, brick and terra cotta, brick foundation, on 109th St. and 3rd Ave., to D. E. Connors, Brooklyn. About $288,500.

***N. Y., New York**—School—Bd. Educ., 500 Park Ave., let contract building P. S. 43, 3-story, 59 x 100-ft., brick and steel, brick foundation, on Brown Pl. and 136th St., to D. E. Connors, Brooklyn, $194,750.

***N. Y., New York**—Store and Loft Columbia University, 63 Wall St., let contract altering 5-story, brick, steel and stone, brick foundation, at 618-620 5th Ave., to T. J Murphy, 405 Lexington Ave. About $50,000 Noted Aug. 14.

***N. Y., New York** Store, Office, etc.—Circle Concrete Co., 570 5th Ave., will construct 18 story brick, steel and stone, store, office and loft building, brick foundation, at 49-53 West 45th St. About $1,000,000. Work will be done by day labor.

***N. Y., New York**—Synagogue—Temple Israel of Washington Heights, 120th St. and Lenox Ave., will build 100 x 100-ft., brick steel and stone, brick foundation, on 185th St and St. Nicholas Ave. About $100,000 Work will be done by day labor.

***N. Y., New York**—Theater—A. Lewinson, 61 Broadway, will build 83 x 176 ft., brick and steel, brick foundation, at 402-8 Bway About $120,000. Work will be done by day labor. Noted Aug. 7.

***N. Y., Scarsdale**—School—Bd. Educ let contract building, 3-story, 75 x 200 ft., brick and steel, brick foundation, to E. Cornish & Co., 52 Vanderbilt Ave., New York City About $200,000.

***N. Y., Silver Lake**—School Bd Educ let contract building 3-story, brick and terra cotta, brick foundation, to Oscawanna Bldg Co., 101 Park Ave., New York City. About $250,000.

***N. Y., Syracuse**—Hospital—St. Marys Maternity Hospital, 128 Spring St., let contract building hospital to A and T Constr Co.

Buildings (Continued)

115 South Salina St. About $70,000. Noted Aug. 28.

*N. J., **Morristown**—Clubhouse—Morris Co Golf Club let contract building stucco club-house, to Hegeman & Harris Co., 33 West 42nd St., New York City. About $140,000

*Md., **Annapolis**—Theater—Circle Theater Co., Church and South Sts., let contract building 1-story, 85 x 170-ft., steel and brick, concrete foundation, to J. J. Stehle, 170 West St. About $50,000.

*Md., **Baltimore**—Bank—Amer. Bank., 524 South Bway., let contract altering and building 3-story, rein.-con. and brick addition, cement flooring, concrete foundation, to H. Smith & Sons Co., 7 East Redwood St. About $75,000.

*Md., **Baltimore**—Hotel—Company, representing Washington, D. C., and Richmond Va., capitalists, let contract building 18-story, 180 x 250 ft., steel, brick and stone, concrete foundation, on Charles and Chase Sts., here, to Wise Granite & Constr. Co., Amer. Natl. Bank Bldg., Richmond. About $1,500,000.

*Md., **Lonaconing**—High School—Bd. Educ Washington Co., Hagerstown, let contract building 3-story, 100 x 175-ft., brick and stone, rock foundation, here, to E. G. Marshall Co., 17 Clark-Keating Bldg., Cumberland. About $50,000.

*Va., **Norfolk**—Church and Sunday School—Ghent Methodist Episcopal Church let contract building 1- and 3-story, at Stockley Gardens, to W. T. Gregory & Co., Law Bldg. About $150,000; cost plus percentage basis.

*Va., **Norfolk** Church St. Andrew's Episcopal Church let contract building 1-story, to R. R. Richardson & Co., Natl. Bank of Commerce Bldg. About $100,000; cost plus percentage basis. Noted July 10.

*Va., **Norfolk**—Store—R. C. Hogue, Monroe Bldg., let contract building 2-story, 90 x 200-ft., brick, to Erwin & Leslie, McKevitt Bldg. About $70,000.

*Va., **Onley**—High School—Bd. Educ. of Accomac Co., Onley, let contract building high school, to J. T. Cropber, Onley. About $50,000; cost plus percentage basis.

*Va., **Richmond**—Church—Calvary Baptist Church will build 1-story, 97 x 82-ft., brick, on Grove Ave. and Blvd. About $60,000 Work will be done by day labor. Address R. A. Gary, 2316 Stuart Ave.

*Va., **Richmond**—Store—Richmond Art Co., 5 East Broad St., let contract building 4-story, 34 x 152-ft., on 1st and Grace Sts. to J. C. Beazley & Co., Real Estate Exch. Bldg. About $66,000. Noted Sept. 25.

*W. Va., **Petersburg**—Bank—Union Trust & Deposit Co. let contract altering and building brick, steel and marble addition stone foundation, to Hoggson Bros., 485-5th Ave., New York City. About $100,000.

*N. C., **Charlotte**—Church—St. Mark's Lutheran Church let contract remodeling main building and constructing 45 x 112-ft. brick addition, on North Tryon St., to J. H. Deal, 27 South Tryon St. About $50,000; cost plus fixed fee.

*N. C., **Gastonia**—Hospital—State Hospital Bd., Raleigh, let contract building orthopedic hospital, brick, here, to J. H. Deal, Charlotte, $55,840.

*O., **Canton** School—Bd. Educ. let contract building 2-story, 133 x 180-ft., steel and brick, rein.-con. flooring, concrete foundation, known as McGregor School, to R. H. Evans & Co., 8 East Long St., Columbus, $363,000.

*O., **Cleveland**—Bank and Office—F. Hronek, archt., 3655 East 31st St., let contract to Alexander Bros., Williamson Bldg., for 2 story, 40 x 96-ft., concrete, steel, terra cotta and brick, on Bway. Ave., for Volea Bldg. & Loan Assn., 5733 Bway Ave. About $50,000. Noted Sept. 25.

*O., **Cleveland** Bank—Lake Shore Bank Huron Rd., let contract altering 8-story, 97 x 158-f., concrete, steel, brick and terra cotta, at Huron Rd. and Prospect Ave., to G. A. Rutherford, 1922 East 18th St. About $100,000

*O., **Cleveland** Church H. W. Maurer, archt., Schofield Bldg., let contract to Forschner Co., East 10th St. and St. Clair Ave. building 3-story, 38 x 95-ft., concrete, steel and brick, on Hayden Ave., for 6th United Church. About $50,000. Noted Sept. 18.

*O., **Cleveland**—Commercial—Berkshire Realty Co., Citizens' Bldg., let contract building 11-story, 66 x 147-ft., rein. con., steel and brick, on East 6th St., to Minnick Gibbons Co., Prospect Ave. About $350,000

*O., **Cleveland**—Commercial—Prame Realty Co., 214 Williamson Bldg., let contract building 4-story, 107 x 140-ft. ft., rein.-con. steel and brick, rein.-con. flooring, concrete foundation, on 27th St. and Payne Ave., to Craig Curtiss Co., 1030 Guardian Bldg. About $250,000.

*O., **Cleveland**—Library—O. Coltman, archt., 1375 Euclid Ave., let contract to H. F. Juergens, 3315 West 25th St., building 2-story, 70 x 80-ft., rein.-con., steel and brick, at 1347 East 105th St., for Cleveland Pub. Library Assn., 1375 Euclid Ave. About $50,000. Noted July 24.

*O., **Cleveland**—Loft—Paudett Investment Co., Citizens Bldg., let contract building 6-story, 94 x 122-ft., rein.-con., steel and brick, at 1825 East 18th St., to Paul Bros., Citizens Bldg. About $125,000. Noted Sept. 18.

*O., **Cleveland**—Observatory—Walker & Weeks, archts., 1900 Euclid Ave., let contract to Crowell & Little Co., East 57th St., building 3-story, 45 x 60-ft., rein.-con., steel and brick, on Taylor Rd., for Warner & Swasey Co. About $50,000. Noted Sept. 18.

*O., **Cleveland**—Office—Altamont Realty Co. 214 Williamson Bldg., let contract building 6-story, 99 x 125-ft., rein.-con., steel and brick, at 1730 East 12h St., to C. A. Carson, 6408 Euclid Ave. About $350,000. Noted Sept. 18.

*O., **Cleveland**—Office—Chandler Motor Car Co., St. Clair Ave. and 131st St., let contract building 5-story, 42 x 95-ft., concrete, steel and brick addition, to J. Gill & Sons, Citizens Bldg. About $100,000. Noted Aug. 21.

*O., **Cleveland**—Office—Willard Storage Battery Co., 246 East 131st St., let contract building 2-story, 50 x 104-ft., rein.-con., steel and brick addition, to J. J. Bill, 914 East 149th St. About $60,000. Noted Sept. 18.

*O., **Cleveland**—School—Bd. Educ. let contract building 1- and 3-story, 83 x 139-ft. concrete, steel, brick and stone addition rein.-con. flooring, concrete foundation, on Miles Ave., to Shirmer-O'Hara Co., 2031 Euclid Ave. About $250,000.

*O., **Cleveland Heights** (Warrensville P. O.)—School—Bd. Educ. let contract building 2-story, 110 x 176-ft., rein.-con. steel, brick and stone addition, rein.-con. flooring, concrete foundation, on Roxboro Rd., to Willing Bros. Bellevue, $369,549.

*O., **Cleveland Heights** (Warrensville P. O.)—Theater, Stores and Offices—L. Isreal, 743 East 91st St., let contract building 3-story, 100 x 198-ft., concrete, steel, brick and stone rein.-con. flooring, brick and concrete foundation, on Euclid Blvd., to Kinsman Builders Supply Co., E. 79th St. and Kinsman Rd. About $125,000. Noted Sept. 18.

*O., **Dayton**—Church—Schenck & Williams archts., Mutual Home Bldg., let contract to Engle & Gohn, 50 Callahan Bank Bldg., constructing brick, stone and rein.-con., rein.-con. flooring, brick foundation, on Salem Ave., for Grace Methodist Episcopal Church 4th and Ludlow Sts. About $200,000. Noted Jan. 30.

*O., **Dayton**—Exposition—Greater Dayton Industrial Exposition Co., Dayton Savings & Trust Bldg., let contract building 1-story 100 x 400-ft., timber and stucco, on Washington St., to J. H. Gibson, North Wilkinson St. About $50,000.

*O., **Fremont**—Hospital—W. W. Sabin archt., 1900 Euclid Ave., Cleveland, let contract to C. F. Steinway, Fremont, building 3-story, 100 x 130-ft., rein.-con., steel and brick addition, for Memorial Hospital Assn. Noted Oct. 2.

*O., **Mechanicsburg**—School—Bd. Educ. let contract building 3-story, 60 x 120-ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to L. G. Foltz & Co., Columbus Savings & Trust Bldg., Columbus. About $60,800.

*O., **South Euclid**—School—Bd. Educ. let contract building 1-story, 100 x 150-ft., rein.-con., steel and brick, to Cleveland Fireproof Constr. Co., Anisfield Bldg. About $150,000

*Ind., **Hammond**—Synagogue—Anshe Aneseth Israel Congregation, c-o H. L. Newhouse, archt., 4630 Prairie Ave., Chicago, Ill. let contract building 2-story, 55 x 115-ft. at 305 Sibley St., to Van Etten Bros., 143 East 111th St., Chicago, Ill. About $50,000.

*Mich., **Charlevoix**—Jail—Bd. Supervs. Charlevoix Co., let contract building 2-story 38 x 62-ft. rein.-con., brick and steel, concrete foundation, to J. Curtis, Charlevoix.

*Mich., **Detroit** Court House—Packard Motor Car Co., Grand Blvd., let contract building 1-story, 60 x 180-ft., steel and concrete, concrete foundation, on Grand Blvd., to Bryant & Detwiler Co., 2336 Dime Bank Bldg. About $50,000.

*Mich., **Detroit**—Parish House—Grace Episcopal Church, c-o. Smith, Hinchman & Grylls archts., 710 Washington Arcade, let contract building 2-story, 54 x 86-ft., rein.-con., steel and brick, rein.-con. flooring, brick and concrete foundation, on Virginia Park, to Gearing Bros., 1850 Penobscot Bldg. About $75,000. Noted June 26.

*Mich., **Detroit**—Schools—Bd. Educ. let masonry contract building Greusel School, 2-story, 40 x 61-ft., on Moran and Medbury Aves., and Capron School, 2-story, 32 x 39-ft. on Maple and Riopelle Sts., rein.-con., brick and steel, to A. J. Smith Constr. Co., 110 West Fort St., $33,500 and $20,000, respectfully heating, ventilating and plumbing for former to O'Connor Bros., Penobscot Bldg., $13,098; masonry contract for Park School, 1-story, 47 x 137-ft. and 40 x 56-ft., on Milwaukee Ave and East Grand Blvd., to M. A. Mahoney Penobscot Bldg., $52,900, heating, ventilating and plumbing, to J. W. Partlan, 51 Park Pl., $31,187.

*Ill., **Champaign**—Church—First Congregational Church let general contract building 1-story, 70 x 140-ft., brick and timber, concrete foundation, to English Bros., Champaign. About $100,000.

*Ill., **Chicago**—Hotel—Chicago Beach Hotel Co., 51st and Cornell Sts., let contract building 12-story, 223 x 233-ft., brick and rein.-con., rein.-con. flooring, concrete foundation, to F. C. Lewin, 122 South Michigan Ave. About $1,250,000. Noted June 19.

*Ill., **Chicago**—Library and Office—Holabird & Roche, archts., 104 South Michigan Ave., let contract to G. A. Fuller Constr. Co., 175 5th Ave., New York City, for 15-story 80 x 80-ft. steel and tile, concrete foundation, on Michigan Ave. and Randolph St., for John Crerar Library, Marshall Field Bldg About $1,250,000. Noted Aug. 14.

*Ill., **Chicago**—Store—E. Iverson & Co., 1342 Milwaukee Ave., let contract building 2-story, 61 x 100-ft. brick and concrete, concrete foundation, on Milwaukee Ave. and Elm St., to M. Rauem, 111 West Washington St. About $65,000.

*Ill., **Chicago Heights**—Theater—Carley & Hansen, let contract building 1-story, 75 x 125-ft. brick and timber, brick foundation, to Engel Bros., Chicago Heights. About $150,000.

*Ill., **South Chicago** (Chicago P. O.)—Store Office, etc.—J. Rusch, 4811 South Paulina St. let contract building 2-story, 27 x 100-ft. and 22 x 40-ft. brick and rein.-con. store, office and garage, rein.-con flooring, concrete foundation, to T. Koscielski, 8367 Baltimore Ave About $50,000.

*Wis., **Beloit**—School—Bd. Educ. let contract building, 2-story, 111 x 145-ft., to J Schneiberg, 945 Bluff St. About $210,000.

*Wis., **Menomonee Falls**—School—Joint Dist. No. 1, let contract building 1-story, 124 x 150-ft. brick and steel, concrete foundation, to W. M. Tuckwell, Old Chicago Rd., Milwaukee. About $65,000; cost plus percentage basis. Noted Aug. 28.

*Wis., **Superior**—Hospital—F. E. Johnson archt., Superior, let contract building 4-story, 30 x 50-ft. rein.-con. and brick, to Hill & Dauplaise, Superior. About $75,000. Owner's name withheld.

*Ia., **Council Bluffs**—Store—Krasne Bros. let contract building 2-story, 70 x 120-ft. brick, concrete and steel, concrete foundation at 308 West Bway., to C. O. Christensen, 610 Lainson Ct. About $50,000.

*Ia., **Creston**—School—Bd. Educ. let contract building 2-story, 52 x 81-ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to O. M. Woodward, Creston $53,830. Noted Sept. 18.

*Ia., **Le Mars**—College—Western Union College let contract building 2-story, 60 x 120-ft., rein.-con., brick and steel, concrete foundation, to S. W. Brown, Hutchinson Kan. About $80,000.

*Ia., **Newton**—Hospital—City let contract building 2-story, 40 x 118-ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to J. A. Benson Constr. Co., 422 Valley Natl. Bank, Des Moines, $160,000.

*Ia., **Patterson**—School—Bd. Educ. let contract building 2-story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation to Woodcock & Waller, Burlington. About $79,000.

*Ia., **Pilot Mound**—School—Bd. Educ. let general contract building brick, concrete and steel, concrete foundation, to J. W. Hopp Constr. Co., 403 Granby Bldg., Cedar Rapids $56,571; heating and power, to Boughton & Banzhof, Marshalltown, $10,648.

*Ia., **Sioux City**—Store—Western Iowa Co. 314 Mass. Blk., let contract building 2-story 52 x 10-ft. brick, rein.-con. and steel, concrete foundation, at 301 Wall St., to Keefe Constr. Co., Sioux City, $55,986.

*Ia., **Storm Lake**—Gymnasium—Buena Vista College let contract building 2-story, 68 x 108-ft., rein.-con., brick and steel, rein.-

Buildings (Continued)

con. flooring, concrete foundation, to standard Constr. Co., Minneapolis, Minn. About $65,000. Noted Aug. 14.

***Ia., Winterset**—High School—Bd. Educ. let contract building 2-story, 87 x 130-ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to A. Suggarman Constr Co., 1214 Mulberry St., Des Moines. About $157,000.

***Minn., Austin**—High School—Bd. Educ. let general contract building 3-story, 290 x 300-ft. to Madsen Constr. Co., Builders Exch., Minneapolis. About $450,000.

***Minn., Bemidji**—School—State Bd. Control Capitol, St. Paul, let contract building 3-story, 42 x 120 x 120-ft. rein.-con. and brick, brick foundation, to S. M. Klarkuist & Son, 215 Security Bldg., Minneapolis. About $72,000. Noted June 25.

***Minn., Cloquet**—City Hall—City let contract building 2-story, 16 x 86 ft., brick and stone, rein.-con. foundation, on Main St., to Timens, Helmer, Schaffer & Colburn, Duluth $55,250. Noted Sept. 25.

***Minn., Rochester** Clinic A. C. Fawcett Rochester, let contract building 5-story, 46 x 142 ft., rein.-con. and brick, to G. Korsmo Central Bank Bldg., St. Paul. About $300,000; cost plus percentage basis. Noted Sept 11.

***Minn., Willmar**—Business—Willmar Tribune let contract building 2-story, 40 x 100-ft., to J. H. Olson & Co., Willmar, $68,543 Noted Sept. 4.

***Kan., Eldorado**—High School—Bd. Educ let contract building, 2-story, 101 x 170 ft. rein.-con., brick and steel, rein.-con. flooring rock and concrete foundation, to Hamilton & Hamilton, Wichita, $189,200. Noted Sept. 11.

***Kan., Holton** Court House Comrs. Jackson Co. let contract building 3-story, 85 x 100 ft. rein.-con., steel and brick, rein con flooring, rock foundation, to J. Cuthbert & Sons, 18th and Topeka Aves., Topeka $11,875. Noted Sept. 4.

***Neb., Mead**—School—Bd. Educ. let contract building, 2-story, 123 x 125-ft., rein.-con. brick and steel, rein. con. flooring, concrete foundation, to G. R. Nuthank, Lincoln, $97,773.

***Neb., Omaha**—Hospital—J. Latenser & Sons, archts., 632 Bee Bldg., let contract to Selden, Breck Constr. Co., Keeline Bldg., constructing 5-story, 106 x 120 ft., rein. con brick and terra cotta, concrete foundation on 26th St. and Dewey Ave., for E. C. Henry 14th and Capitol Aves. About $175,000. Noted Sept. 11.

***Neb., Plainview**—School—Bd. Educ., c-o J. W. Blezek, secy., let contract building 2-story, 77 x 169-ft., rein.-con., steel and brick rein.-con. flooring, brick foundation, to G. R Unthank, 1701 Sewell Ave., Lincoln. $59,044.

***S. D., Sioux Falls**—School—Bd. Educ. let contract building 1- and 2-story, 65 x 130-ft., brick and timber, to Carlson-Snitkey Constr. Co., Sioux Falls. About $100,000.

***Wyo., Casper**—High School- Natrona Co let contract building 3 story, to Donohue-Selover Constr. Co., Casper, $138,835. Noted July 10.

***Mo., St. Louis**—Mercantile—Crowdus Estate, 104 North 1st St., let contract building 6-story, 50 x 150-ft., brick, terra cotta and glazed tile, rock foundation, at 1424 Washington St., to Gorg Constr. Co., Frisco Bldg About $50,000.

***Ark., Blytheville**—Courthouse—Mississippi Co. let contract building courthouse, to B. McGhee & Co., Little Rock. $159,000.

***Tex., Corsicana**—Dormitory—State Charity Comn., Austin, let contract building 2-story, 53 x 125-ft. rein con., brick and steel rein.-con. flooring, as State Orphan's Home here, to G. W. Brillhart, 213 West Collins St. About $88,000.

***Tex., Denison** Theater Rialto Theater Co. let general contract building 3-story, 50 x 120-ft., to C. H. Schley and W. A. Badgett, Denison. About $75,000.

***Tex., El Paso** School Trustees School Dist. No. 1, Gila Co., Ariz., let contract building school on Hill St., here, to J. J. Garfield Miami, Ariz. About $132,000.

***Okla., Oklahoma** Offices I. Day, 206 Mercantile Bldg., R. W. Dick, 204 Mercantile Bldg., and R. E. Stafford, let contract building 2-story, 50 x 140-ft. brick addition, rein.-con. flooring, concrete foundation, to R. H. Stodard, Oklahoma. About $150,000.

***Okla., Oklahoma**—Schools—Bd. Educ. let contracts building 2-story, 63 x 211-ft. and 2-story, 63 x 245-ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, to C. M. Dunning Constr Co., Oklahoma $88,000 and $90,500, respectively. Noted Aug 21.

***Okla., Oklahoma**—Store—Scott-Haliburton Co., 300 West Main St., let general contract building 8-story, 100 x 150 ft. brick and rein.-con., on Main and Harvey Sts., to F. A Gross Constr. Co., 127 West 2nd St. About $350,000

***Okla., Tulsa**—Store and Office—Aby & Tucker, 403 1st Natl. Bank Bldg., let contract building 2-story, 75 x 140 ft. rein con and brick, on 6th and Main Sts., to J. R Burnsides, 404 Commerce Bldg. About $65,000.

***Colo., Arvada**—High School—School Dist let contract building 3 story, 60 x 125 ft rein. con., steel and brick, rein.-con. flooring concrete foundation, to Kress Constr. Co. Denver, $70,600. Noted Sept. 11.

***Idaho, Boise**—Capitol Comrs. Pub Wks let contract building two 2-story wings to Capitol, to J. Stewart & Co., Walker Bank Bldg., Salt Lake City, Utah. Cost between $750,000 and $770,000. Noted Sept. 18.

***Idaho, Moscow**—Administration—Dept Educ., State House, Boise, let contract constructing south wing of administration building, concrete and brick, at University of Idaho, here, to Roth Constr. Co., Pullman Wash. Cost to exceed $50,000.

***Wash., Spokane**—Temple—B. P. O. E. of Spokane let contract building 2-story, 100 x 142 ft., concrete, on Riverside Ave., to Hurley-Mason Co., Gasco Bldg., Portland. About $146,000. Noted July 24.

***Ore., Portland**—Office—Lewis & Staver Co. 346 East Morrison St., let contract construct ing 4-story, 100 x 129 ft. rein con. building rein.-con. flooring, concrete foundation, on Bway. and Everett St., to include sales rooms service department, stock rooms, shop, etc. to G. Isackson, 1013 East Irving St. About $80,000. Noted July 24.

***Ore., Seaside**—Hotel—Seaside Hotel Corp let contract building 1st unit of 4-story 70 x 300 ft. brick and concrete hotel, on beach at Bway., to include large annex and seawall, to M. W. Lorenz, Worcester Bldg., Portland. About $100,000. Total cost, $300,000 Noted Aug. 7.

***Cal., Berkeley**—Schools Bd. Educ. let carpentry contracts building 1- and 2-story, 36 x 84-ft., and 60 x 104 ft., timber, wood and concrete flooring, concrete foundation, on University Ave. and Acton St., to S. J. Bertelsen, 667 39th St., Oakland, $30,950; 1-story 50 x 200 ft., brick, concrete and wood flooring concrete foundation, on Oregon and McGee Sts., to C. Christiansen, 1433 Franklin St. $21,864; 1-story, 60 x 291-ft., brick, rein.-con. flooring, concrete foundation, on Russell St., to C. D. Vezey, 1812 Prince St., $31,357; 1-story, 89 x 175 ft., timber, concrete foundation, on Claremont Ave., to M. Norton $47,777. Noted Aug. 28.

***Cal., Los Angeles**—College—University of Southern California let general contract building 3-story, 137 x 253 ft., rein con brick and steel, concrete foundation, on University Ave. near 36th St., to E. C. English 508 Citizens Natl. Bank Bldg., $387,300; wiring and fixtures, to Foulkes Electric Shop 903 South Figueroa St., $12,220; heating and ventilating, to T. Haverty Co., 9th St. and Maple Ave., $27,980; structural steel, to Baker Iron Wks., 950 North Bway., $36,441.

***Cal., Los Angeles**—Natatorium E. E Stone, et al., San Francisco, let contract building natatorium on 4th St. and Vermont Ave., here, to Milwaukee Bldg. Co., 310 Wright & Callender Bldg. About $300,000.

***Cal., San Francisco** Mausoleum Archbishop of City let contract building 85 x 160 ft., rein.-con., marble, stone and br nce in Holy Cross Cemetery, to J. L. McLaughlin, 244 Kearny St. About $250,000.

***Cal., San Francisco** Office W. F. McClure, state archt., Forum Bldg., let general contract constructing state office building, at Civic Center, to K. E. Parker Co., Clunie Bldg., $180,690; fabricating and delivering structural steel, to Pelin Iron Wks., 1414 15th St., Sacramento, $101,000; granite work, to Raymond Granite Co., Raymond, $339,680 Noted Sept. 11.

***Cal., Santa Barbara** Bank Santa Barbara Co., Natl. Bank, let contract building 1 story, 71 x 100-ft., concrete and brick, to Parker Brick Co., 605 East Monticito St About $65,000.

***Cal., Ventura**—Hospital—Bd. Supervs. Ventura Co., let contract constructing 2-story rein.-con. main building, hollow tile service building, nurses' home, etc., concrete foundation, to E. E. English, 508 Citizens Natl. Bank Bldg., Los Angeles, $90,200.

Federal Government Work

***N. H., Portsmouth** Turbo Generator—Spec. 4017—Bureau Yards and Docks, Navy Dept., Wash., D. C., let contract installing 1000-kw. turbo alternator, at Navy Yard, here to Rideout, Chandler & Joyce, 178 High St., Boston, Mass., $9066 (130 days).

***Mass., Boston**—Dredging—U. S. Engr. Office, Boston, let contract dredging in Weymouth Fore River, to Boston Dredging Co 172 Condor St., East Boston, $132,168.

***Mass., Chatham**—Gutters and Roofing Bureau Yards & Docks, Navy Dept., Wash D. C., let contract building gutters, roofing and downspouts for dirigible hangars, here to C. Meade Co., 38 Park Row, New York City. Noted Aug. 14.

***Mass., Hingham**—Dredging Spec. 4031 Bureau Yards & Docks, Navy Dept., Wash. D. C., let contract dredging at Naval Ammunition Depot, here, to Bay State Dredging & Constr. Co., 62 Condor St., East Boston $30,000 (165 days). Noted Sept. 18.

***Mass., Watertown** — Storehouse — Constr engr., U. S. Army, c-o. Arsenal, let con ract for substructure of 2-story, 100 x 400-ft. rein-cor storehouse, to M. Sorretto, 5 Tremont Row, Boston. Noted Sept. 11,

***R. I., Newport**—Dredging—U. S. Engr Office, Newport, let contract dredging in Providence Harbor, to J. S. Packard Dredging Co., 1004 Turks Head Bldg., Providence $23,586.

***R. I., Newport** Dredging—U. S. Engr Office, Newport, let contract removing boulders in Pawtucket River, R. I., and Conn., to T. A. Scott Co., Inc., 292 Pequot Ave., New London Conn., $2750. Noted June 5.

***Conn., New London** Dredging—U. S Engr. Office, New London, let contract dredging Bridgeport Harbor and repairing breakwater, to Bridgeport Dredge & Dock Co. 83 Fairview Ave. About $100,000. Noted Sept. 18.

***N. Y., New York** Dredging—U. S. Engr Office, 39 Whitehall St., let contract dredging and removing rocks in East River, to New Jersey Shipbuilding & Dredging Co., foot of 28th St., Bayonne, N. J., $668,122. Noted Sept 18.

***N. Y., Rockaway** Gutters and Roofing Spec. 4022 Bureau Yards, Navy Dept., Wash D. C., let contract building gutters, roofing and downspouts for dirigible hangars, here to C. Meade Co., 38 Park Row, New York City. Noted Aug. 14.

***N. Y., Rockaway** Heating System and Fan Room—Spec. 4021 Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing heating system and building fan room for Hangar No. 2, here, to E. Rutzler & Co., 404 East 49th St., New York City $7592 (60 days). Noted Sept. 25.

***N. Y., Stapleton**—Boiler Plant—Treas Dept., Wash., D. C., let contract building temporary boiler plant at Marine Hospital, here to J. R. Proctor, 74 Cortlandt St., New York City, $2775. Noted Sept. 11.

***N. Y., Stapleton** Mechanical Equipment Treas. Dept., Wash., D. C., let contract furnishing and installing mechanical equipment in kitchen and mess hall, to G. C. Ring Co., 22 Laigut St., New York City, $86,550. Noted July 31.

***N. Y., Tompkinsville** Rip Rap—Light house Supt., 3rd Dist., let contract furnishing 2800 tons rip rap stone at certain lights in East River, to H. Steers, Inc., 17 Battery Pl., New York City, $7980. Noted Sept. 25

***Pa., Ft. Mifflin** Conveyor System—Bureau Yards & Docks, Navy Dept., Wash. D. C., let contract installing conveyor system in T. N. T. Plant, here, to Lamson Co., 100 Boylston St., Boston, Mass., $6865 (35 days)

***Pa., Lock Haven** Post Office—Treas. Dept., Wash., D. C., let contract building post office here, to A. E. Badgley & Co., Stone Opera House Bldg., Binghamton, N. Y., $64,927. Noted Sept. 4.

***Pa., Phila.** Repairing Dike—U. S. Engr Office, Phila., let contract repairing dike at Bulkhead Bar, to Arundel Corp., Phila $14,880. Noted Sept. 11.

***Pa., Phila** Roads and Pavements—Bureau Yards & Docks, Navy Dept., Wash D. C., let contract, building here, to Curtis Bros., Bank Bldg., Tacony, $10,350 (40 days)

***Del., Wilmington**—Jetty Repairs U. S Engr Office Old Federal Bldg., let contract repairing jetty at mouth of Broadkill River to J. H. Terry & Co., Drexel Bldg., Phila $26,145. Noted Aug. 21.

***Md., Annapolis** Boiler Spec. 4025 Bureau Yards & Docks, Navy Dept., Wash D. C., let contract installing in Power Plant here, to E. Keeler Co., 238 West St., Williamsport, Pa., $37,249 (120 days).

***Md., Annapolis** Paving Spec. 4028—Bureau Yards & Docks, Navy Dept., Wash., D C., let contract paving, here, to E. F. Nonahan, 195 Hastings St., Manhattan Beach, N. Y., $23,957, (50 days) Noted Sept. 4.

***Md., Annapolis** Power House Addition—Spec. 4026—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building here, to Levering & Garrigue, 552 West 23rd St., New York City, $81,877 Noted Aug. 28.

Federal Government (CContinued)

*Md., Annapolis—Waterproofing Spec. 4036 Bureau Yards & Docks, Navy Dept., Wash. D. C., let contract waterproofing terrace roof of Bancroft Hall, here, to Levering & Garrigue Co., 552 West 23rd St., New York City $57,594 (45 days) Noted Sept. 18.

*Md., St. Helena Pavement U. S. Shipping Board Emergency Fleet Corp., Phila. Pa., let contract paving 2455 sq.yd. concrete building 248 lin.ft concrete curb and gutter and 1017 sq.ft. concrete sidewalk, to Commonwealth Constr. Co., Commonwealth Bank Bldg.

*D. C., Wash.—Grading—Dist. Comrs., Dist. Bldg., let contract grading, here, to G. B. Mullen, H. F. Voigt Co., 715 14th St., N. W., and W. F. Brenizer Co., 101 New York Ave. N. W. Noted Sept. 11.

*D. C., Wash.—Reflecting Basin—C. Ridley, Dept. Pub. Wks., let contract excavating 130,000 cu.yd. material from lagoon and concrete conduit 650 ft. long, 3 ft. in diameter for reflecting pool at Lincoln Memorial, to Fisher & Carozza Bros. Co., 803 Calvert Bldg., Baltimore, Md., (1) $44,512; (2) $.85. Total cost, $155,012. Noted Oct. 2.

*D. C., Wash.—Wharf Repairs—Spec. 4029—Bureau Yards & Docks, Navy Dept., Wash. D. C., let contract repairing wharf at Naval Militia Barracks, here, to Boyle-Robertson Constr. Co., 601 Evans Bldg., $4,109 (50 days) Noted Sept 25.

*Va., Hampton Roads—Grading, Fertilizing, Planting and Seeding Spec. 4040—Bureau Yards & Docks, Navy Dept., Wash. D. C., let contract grading, fertilizing, planting and seeding, here, to Southern Team & Constr. Corp., 304 Bankers Trust Bldg., Norfolk, $84,700, (118 days).

*Va., Hampton Roads—Gutters and Roofing Spec. 4022 Bureau Yards & Docks Navy Dept., Wash., D. C., let contract building gutters, roofing and downspouts for dirigible hangars, here, to C. Meade Co., 38 Park Row, New York City. Noted Aug. 14.

*Va., Quantico—Marine Flying Field—Spec 4059 Bureau Yards & Docks, Navy Dept. Wash., D. C., let contract building marine flying field, here, to C. Meade & Co., 38 Park Row, New York City, $218,120 (250 days).

*S. C., Charleston—Distributing System—Spec. 3977—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing distributing system, here, to J. R. Proctor, Inc., 74 Cortlandt St., New York City, $28,950 (200 days) Noted Sept. 18.

*S. C., Charleston Turbo Alternator Spec 4011—Bureau Yards & Docks, Navy Dept Wash., D. C., let contract installing 2500 K.V.A. turbo-alternator, to Shevlin Engr. Co. 10 West 34th St., New York City. $25,680, (120 days). Noted Sept. 25.

*Ala., Mobile—Repairs and Plumbing—Treas. Dept., Wash., D. C., let contract for repairs and plumbing in U. S. Marine Hospital, here, to Jett-Muths Co., 311 South Royal St., $13,700.

*Tenn., Memphis Levee Work—Mississippi River Comn., 1st and 2nd Dists., Custom House, let contract building levee work in Lower St. Francis Dist., to Lawrence Bros. & Co., Memphis, $284,040. Noted Sept. 25.

*Tenn., Memphis—Rip Rap—Mississippi River Comn., 1st and 2nd Dists., Custom House, let contract furnishing rip rap, to Southern Granite Co., Little Rock, $77,100 Noted July 31.

*Tenn., Memphis — Towboat — Mississippi River Comn., 1st and 2nd Dists., Custom House, let contract furnishing stern-wheel towboat, to J. Eichleay, Jr., Co., 20th and Wharton Sts., Pittsburgh, Pa., $105,489. Noted Aug. 7.

*Kan., North Topeka Post Office—Treas Dept., Wash., D. C., let contract building here, to W. D. Lovell, 1415 8th St., Minneapolis, Minn., $53,800. Noted Sept. 25.

*Nev., Winnemucca Post Office Treas Dept., Wash., D. C., let contract building, here, to F. Gallagher, 180 Jessie St., San Francisco, Cal., $41,280 Noted Sept. 25.

*Wash., Puget Sound Air Compressor—Spec. 3837—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing reciprocating air compressor, here, to Allis Chalmers Mfg. Co. Milwaukee, Wis., $56,900 Noted Aug. 28.

*Wash., Puget Sound—Building—Spec. 4009 Bureau Yards & Docks, Navy Dept., Wash. D. C., let contract construction extension to Building No. 178, here, to Garrick & Garrick, 403 Central Bldg., Seattle, $38,375 (60 days) Noted Sept. 11.

*Cal., San Diego—Road Work—Spec. 4030 Road Work Bureau Yards & Docks, Navy Dept., Wash. D. C., let contract building asphalt macadam roads, here, to W. E. Kier Constr. Co., 813 Amer. Natl. Bank, $3433 (21 days). Noted Sept. 11.

*Cal., San Diego—Tank—Spec. 4033—Local Navy Yard let contract installing fuel oil tank, at Naval Depot, here, to F. W. Steffgen 1040 2nd St., $1773 (30 days). Noted Sept. 11.

*Hawaii, Honolulu—Dredging—U. S. Engr Office, Honolulu, let contract dredging main basin and reserve channel, Honolulu Harbor to Hawaiian Dredging Co., Honolulu, $140,790, and $57,225, respectively. Noted June 26.

*Hawaii, Pearl Harbor—Boiler House Spec. 3931—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building terra cotta boiler house, at Hospital, here to C. L. Wold Co., 40 Montgomery St., San Francisco, Calif., $363,889 (270 days). Noted Sept. 4.

Miscellaneous

*Extending Electric Service—Massachusetts—Webster & Southbridge Gas & Electric Co., Southbridge, will extend electric distribution service in West Oxford, North Oxford Mills, Texas Village, Old Charlton and Howarths. About $25,000. Work will be done by day labor.

*Coal Pocket—Newport, R. I.—Newport Coal Co., 311 Thames St., will build rein.-con. coal pocket on wharf. About $10,000. Work will be done by day labor.

*Memorial Arch—Providence, R. I.—Brown University, College St., let contract building limestone memorial arch gateway, with 3 gates, columns and bronze tablets, to C. B. Maguire Co., 1205 Turks Head Bldg. About $40,000. Noted June 19.

*Tank—Olneyville (Providence P. O.) R. I—Atlantic Mills let contract building 300,000-gal. rein.-con. oil tank, to O. D. Purington & Co., 626 Industrial Trust Bldg., Providence.

*Foundation — Bridgeport, Conn. Amer Tube & Stamping Co., 471 Hancock Ave., let contract building concrete foundation for 1-story, 60 x 200-ft. concrete and steel addition to storage plant, on Stratford Ave., to T. J. Pardy Constr. Co., 1471 Seaview Ave. Total cost, $35,000.

*Power Line—Hallville, Conn.—Westerly Light & Power Co., Westerly, R. I., let contract building 18-mi. high-tension power line from here to Westerly, R. I., 7,000-kw. capacity, to Eastern Comn. Power Co., New London. About $100,000.

*Foundation—New Britain, Conn.—Landers Frary & Clark, Commercial St., let contract building concrete foundation for 6-story, 80 x 160-ft., brick and mill construction and 1-story, 50 x 160-ft. brick factories, rein.-con. flooring, on Center St., to MacArthur Concrete Pile & Foundation Co., 120 Bway., New York City. Total cost, $150,000. Noted Oct. 30 under "Industrial Works."

*Retaining Wall—Thompsonville, Conn.—Bigelow-Hartford Carpet Co., 58 Main St., let contract building 700-ft. concrete and stone retaining wall along power house and Connecticut River, to D. O'Connell Son, 480 Hampdon St., Holyoke, Mass. About $40,000.

*Coal Bunkers—Waterbury, Conn.—Waterbury Clock Co., 31 Cherry Ave., let contract building 32 x 40 x 72 ft. brick and concrete coal bunker, 2200-ton capacity, to Standard Constr. Co., 42 Church St., New Haven. About $30,000. Noted Sept. 18.

*Station—Brooklyn, N. Y.—J. H. Delaney comr. transit constr., let contract constructing station finish for part of Culver Rapid Transit R.R., extending over and along Shell Rd. and West 6th St., from near X to Sheepshead Bay Rd., to P. J. Carlin Constr. Co. 1123 Bway., New York City, $35,740. Noted Sept. 25.

*Pier and Bulkhead—Clifton, S. I., N. Y.—Fraser, Brace & Clark Drk Dock Co., Inc. 47 West 34th St., New York City, let contract building 60,000 sq.ft. pier and 50,000 sq.ft. bulkhead, rein.-con. and timber, here, to Fraser, Brace & Co., Inc., 47 West 34th St. New York City. About $200,000.

*Asphalt—New York, N. Y.—City let contract furnishing and delivering 150,000-ton refined asphalt and 150-ton asphaltic paving cement, to Standard Oil Co., 26 Bway., $7455 and $2700, respectively; 2000 cu.yd. binder stone, to New York Trap Rock Co., 17 Battery Pl., $3900; 4000 cu.yd. asphalt wearing surface sand, grade "B," to C. W. Crane, 17 Battery Pl., $4800.

*Cast Iron Pipe, etc.—New York, N. Y.—Dept. of Water Supply, Gas & Electric let contract furnishing and delivering c.-i. pipe and valve boxes, to J. Fox & Co., 253 Bway. $17,895 and $1115 respectively; valves, to A. P. Smith Mfg. Co., Norman St., East Orange, N. J., $540; hydrants, to Kennedy Valve Mfg Co., 81 John St., $1054.

*Wall—Weehawken, N. J.—Bd. Freeholders of Hudson Co. let contract repairing wall of Hudson Blvd. opposite Hudson Pl., here, to R. J. Emmer, 150 Nesbit St., $14.70 per cu.yd Cost to exceed $10,000. Former contract rescinded. Noted Sept. 25.

*Concrete Shipway—Fairfield, Md. (Baltimore P. O.)—Union Shipbuilding Co. let contract constructing concrete shipway, to Empire Eng. Co., Inc., 103 Bourse Bldg., Baltimore. About $200,000.

*Coke Ovens and Sheds—Dayton, O.—Maxwell Motor Car Co., Leo St., let contract building coke ovens and three 1-story, 30 x 40-ft., steel and brick sheds, brick foundation, to J. Lowes, Schwind Bldg. About $17,000. Noted July 17.

*Sheds, Runways, Platforms, etc.—Springfield, O.—Union Stock Yards Co. let contract constructing stock sheds, runways bridges, roads, platforms, 2 rein.-con. and several timber buildings, including office, at new stock yard, to Cosgrove Bldg. Co. Springfield. About $65,000.

*Iron Pipe and Valves—Detroit, Mich.—Dept. Purchases & Supplies let contract to Amer. Cast Iron Pipe Co., 512 1st Natl Bank Bldg., Chicago, furnishing 1000 tons 8-in. class B pipe in 16-ft. lengths, $1.36 per lin.ft.; U. S. Cast Iron Pipe & Fdry. Co. 122 South Michigan Blvd., Chicago, 500 tons 8-in. class B in 12-ft. lengths, $59.50, 1500 tons 6-in. class B in 12 ft. lengths, $59.50, 1500 tons 24-in. class C, $55.50, 1500 tons 16-in. class C $55.50 Flower Valve Mfg. Co., Clayton Ave., seven hundred and forty-four 6-48-in. gate valves, $104,240. Noted Sept. 18.

*Seawall—Detroit, Mich.—Dept. Parks and Blvds., 822 Farewell Bldg., let contract furnishing labor and material building rein.-con seawall on west end of Belle Isle, for J. Scott Memorial Fountain, to Dunbar & Sullivan Dredging Co., 2311 Dime Bank Bldg., $85,200 Work involves 60,000 tons of stone at prices from $1.42 to $2.25 per ton. Noted Sept. 4.

*Tapping Sleeves and Lead—Detroit, Mich—Bd. Water Comrs., 232 Jefferson Ave., let contract furnishing 212 tapping sleeves, varying in size from 4 x 2-in. to 12 x 48-in., to Flower Valve Mfg. Co., Parkinson St., $12,085; 100 tons pig lead, to Michigan Smelting & Refining Co., Joseph Campau Ave., $6.20 per ton, total, $12,400.

*Cattle Runaway—Chicago, Ill.—Union Stock Yards & Transit Co., Union Stock Yards, let contract building 12 x, 950-ft rein.-con. runaway, 30 ft. high, on Ashland Ave. and 41st St., to E. W. Sproul & Co., 2001 West 39th St. About $50,000.

*Foundation—Chicago, Ill.—Buckley Demen & Co., 632 Sherman St., let contract building concrete foundation for 6-story, 100 x 120-ft. printing and mailing plant, on Jackson Blvd. and Throop St., to C. B. Johnson & Son, 111 West Washington St. Total cost, $300,000. Noted Aug. 21 under 'Industrial Works."

*Foundation—Janesville, Wis.—Bd. Educ let contract building concrete foundation for 3-story, 180 x 210-ft. rein.-con. and brick school, to Ford Boos & Schoot, 209 East Milwaukee Ave. About $33,200. Total cost, $300,000.

*Road Roller—Sheboygan, Wis.—City let contract furnishing 15-ton steam road roller to Buffalo-Springfield Co., Kenton St., Springfield, O., $10,650. Noted July 24.

*Incinerator—Sedalia, Mo.—City let contract building 24-ton incinerator, to O. A Elliot & Co., Springfield, Ill. About $15,500

*Tunnel—Quinton, Ore.—State Highway Comn., Portland, let contract building 522 ft. tunnel on John Day River-Blalock Sect Columbia River Highway. Gilliam Co. to A Guthrie & Co., Sherlock Bldg., Portland, $41,858. Noted Sept. 25.

*Weir—Hanford, Cal.—Last Chance Water Co. let contract building cement weir in canal at Kings River, 5 mi. northwest of here, to Frederickson & Shannon, Cory Bldg., Fresno About $29,000.

*Foundation—Los Angeles, Cal.—Goodyear Tire & Rubber Co., of California, let contract building concrete foundation for 3-story, 130 x 580-ft., rein.-con. cotton mill, at 6601 Central Ave., to Hunkin Conkey Constr. Co., 6601 Central Ave., $15,000. Total cost, $300,000.

*Structural Steel—Los Angeles, Cal.—Bd Pub. Serv. Comn., 645 South Olive St., let contract furnishing about 200,000 lbs. structural steel, for hydro-electric plant, to Union Iron Wks., 5125 Sante Fe Ave., $13,188.

*Cement—Sacramento, Cal.—State Recl. Bd let contract furnishing 5000 bbls. Portland cement, f.o.b. point on Sacramento River, near Bright's bend, to Old Mission Portland Cement Co., Mills Bldg., San Francisco, $2.63 per bbl.

Waterworks

PROPOSED WORK

Mass., Palmer Town plans to install water system. About $250,000. Engineer not selected.

R. I., Woonsocket—City plans to lay 30 in. water main, from Manville Rd. pumping station to storage tanks in Benton Heights. About $230,000.

Conn., Stamford—Stamford Water Co., 271 Main St., plans to build new rein. con. reservoir and dam at Trinity Lake. Private plans.

N. J., Hamilton Square (Trenton P. O.) Hamilton Sq. Water Co. will apply to Utility Comm. for permission to lay 1 mi. water mains. About $20,000.

Md., Elkton—Town Comrs. plan to build filtration plant and enlarge water mains. About $65,000. L. J. Houston, Jr., 608 Parkwyrth Ave., Baltimore, engr.

Fla., Tallahassee—City plans to build and equip water and gas plant. About $65,000. Engineer not selected.

Tenn., Memphis City retained Chester & Fleming, engrs., Union Bank Bldg., Pittsburgh, to survey city water system and report on necessary improvements and extensions. Plans probably will include new wells, tunnels, etc.

O., Barberton—City plans to lay 15 mi. 6-24 in. c.i. water mains. R. W. Pratt, Hippodrome Bldg., Cleveland, engr.

O., Cleveland—City having preliminary plans prepared building filtration plant, 160,000,000 gal. capacity. About $5,000,000. R. Hoffman, city engr.

O., Portsmouth—City plans to extend water mains, rein. con or c.i. pipe. About $30,000. L. A. Zucker, city and.

Wis., Milwaukee—J. W. Ellms, engr., 1263 Cooke Ave., Cleveland, O., will complete experiments about Feb. 1, for construction of filtration plant and will submit same to City Council for its action. Cost between $4,000,000 and $5,000,000.

Wis., Racine—City having plans prepared for filtration plant and enlargement of storage and extension of distribution facilities. Alvord & Burdick, 8 South Dearborn St., Chicago, Ill., engrs.

Wis., Rio—City plans to install water system. W. Kirchoffer, 31 Roman Blk., Madison, engr.

Ia., Belle Plaine—City having plans prepared by J. H. Dunlap, engr., Iowa City, Improving waterworks. About $70,000.

Kan., Coldwater City voted $35,000 bonds to improve waterworks and electric light plant. W. T. Baker, clk.

Kan., Courtland City voted $45,000 bonds to build waterworks system. Engineer not selected.

Kan., Florence City voted $50,000 bonds to purchase and improve waterworks system.

Kan., Osborne City had plans prepared by Archer & Stevens, engrs., 609 New England Bldg., Kansas City, Mo., improving waterworks system, including 4,800 ft. drain pipe and two wells. About $20,000. Noted June 5.

Kan., Palmer—City having plans prepared by W. B. Rollins & Co., engrs., 209 Ry. Exch. Bldg., Kansas City, Mo., building waterworks system, standpipe, pipe lines, etc. About $20,000.

Neb., Auburn—City plans election to vote on $55,000 bonds to improve waterworks system, install new boilers, pumps, enlarge plant and extend pipe line. Archer & Stevens, 609 New England Bldg., Kansas City, Mo., consult, engrs.

Neb., Lincoln—City plans election to vote on $200,000 bonds to extend waterworks system. Plans include 10,000,000 gal. pump. Burns & McDonnell, 400 Interstate Bldg., Kansas City, Mo., engrs.

Neb., Schuyler—City plans to build waterworks system, involving 53,390 ft. c.i. pipe, 81 hydrants and 58 gate valves. Engineer not selected.

N. D., Fessenden—City plans to build well system, and mains in various streets. About $50,000.

Mont., Great Falls—City voted $225,000 bonds to improve waterworks system. L. B. Evenson, city engr. Noted Aug. 28.

Mont., Roundup—City plans to lay 10 in. water mains from 13th Ave. to 3d St. W., to connect with reservoir. Dist. No. 32. About $12,000. F. Quinnell, Roundup, engr.

Mo., Joplin—City plans election soon to vote on $500,000 bonds to purchase and improve present waterworks system. Burns & McDonnell, 400 Interstate Bldg., Kansas City, engrs.

Mo., Webb City—City plans election soon to vote on $300,000 bonds to improve waterworks system.

Tex., San Angelo—San Angelo Water, Light & Power Co. Plans to build filtration and purification plant. Cost between $40,000 and $50,000. Noted Feb. 6.

Okla., Eufaula—City voted $25,000 bonds to extend waterworks system.

Okla., Hobart—City plans to build dam, 14 in. gravity flow line and pumping station. About $120,000. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma, engrs.

Okla., Hominy—City having plans prepared completing waterworks system, doubling sewerage system, constructing new filtration unit, standpipe and sidewalks. About $350,000. C. E. Lee, city engr.

Okla., Perry—City having plans prepared for extending waterworks and improving electric light system. About $250,000. Black & Veatch, Interstate Bldg., Kansas City, Mo., engrs. Noted Feb. 20.

Idaho, McCammon—City voted $35,000 bonds to purchase Harkness Water System and build complete waterworks system. Work includes enlarging plant, installing new mains, remodeling present construction and general repairs.

Wash., Tacoma—City plans to build concrete reservoir, 140,000 gal. capacity, on Wapato Hill, to provide storage to guard against breakdowns in Green River gravity system. About $175,000.

Ore., Ashland—City Council having preliminary plans made for 25,000,000 gal concrete reservoir, on east fork of Ashland Creek, cost $20,000; also plans to install water meters throughout residential district.

Ore., La Grande—City plans to develop water system, involving 35 mi. pipe line and appropriating thirty 2nd ft. water from Looking Glass Creek. About $5,000,000. P. Cupper, Salem, State engr.

Ore., Reedsport City having preliminary plans prepared for gravity water system with 180 ft. fall, and 32,000 ft. 8 in waterpipe line, from Clear Lake to city. About $100,000.

Cal., Glendale—City Trustees plan election to vote on $260,000 bonds to extend water system and build power generating plant, and have sent out statement advocating following: 2 wells, 2 pumps and booster pump at San Fernando Rd. and Grand View Ave., $33,500; 30 in. trunk line from Verdugo Canyon to Doran St., $35,000; 7,500,000 gal. reservoir at entrance to Verdugo Canyon, $40,000; 20 in. pressure main from reservoir to middle of Verdugo Canyon, $34,800; wells and pumps in Verdugo Canyon, $32,000; 16 in. pressure main from main pumping plant to Grand View Ave., $19,000; reservoir at Grand View Ave., $8000; pumping plant at this reservoir, $3000; 5 mi. water mains and laterals, $34,250; electric generating plant with 100 k.w. generator, driven by Pelton water wheel at Verdugo Canyon reservoir, $9700; purchase of additional water rights, $10,000.

Cal., Redlands—Redland-Yucaipe Land & Water Co. plans to sink wells and lay water pipe on land, near here. About $75,000.

Cal., Whittier—City voted $361,000 bonds to develop additional water supply, extend distributing system and provide additional storage for water system. J. B. Lippincott, 1134 Central Bldg., Los Angeles, engr. Noted Mar. 27.

Ont., Brantford—R. S. and W. S. Lea, engrs., New Birks Bldg., Montreal, submitted preliminary report to Water Comm. for construction of filtration plan with slow sand filers, 3,000,000 gal. capacity. Cost between $500,000 and $600,000. T. Jones, city engr.

Ont., Kingston—City plans to lay water mains in sections of Concession and Ellerbeck Sts. and gas main in Brock St. About $15,000. Work involves 3200 ft. 6 in. c.i pipe. R. J. McLelland, City Hall, engr.

Man., Winnipeg—W. G. Chase, engr., 201 Tribune Bldg., will submit report to City Comrs. for construction of 50,000,000 gal. reservoir. About $500,000

B. C., Penticton—Town plans election in January to vote on $35,000 by law to build new reservoir and extend water works system. B. C. Bracewell, clk. C. E.

Sewers

PROPOSED WORK

Vt., Brattleboro City plans to install 6000 ft. drainage system in Main St. Engineer not selected.

Mass., Millbury City of Worcester plans to build sewage disposal plant here. About $250,000. Private plans.

Conn., Derby City appropriated $33,000 to extend sewerage system. Engineer not selected.

N. J., North Bergen Town Council plans to build storm water sewer in Secaucus Rd., from Hackensack Plank Rd. to Paterson Plank Rd. About $25,000.

Pa., Franklin City having surveys and reports made by M. Knowles, engr., Jones Law Bldg., Pittsburgh, for complete sewage disposal plant. About $200,000.

Md., Elkton Town Comrs. plan to build sewerage system, involving 6-12 in terra cotta pipe. About $15,000. L. J. Houston, Jr., 608 Parkwyrth Ave., Baltimore, engr.

W. Va., Wellsburg—City voted $30,000 bonds to build sewers in 10th and 24th Sts.

N. C., Concord City plans to extend sewerage system. Cost, between $15,000 and $20,000. R. J. Long, city engr.

N. C., Enfield—City plans to build waterworks and sewerage systems. About $75,000. J. B. McCrary Co., 3d Natl. Bank Bldg., Atlanta, Ga., engrs.

N. C., Gastonia City plans to construct sewage disposal plant and extend sewerage system and waterworks. About $100,000. W. M. Piatt, Durham, engr.

N. C., Lexington City having plans prepared extending water and sewerage systems.

Fla., Tallahassee City plans to install septic tank and two lines of sewers in Duval and Bronough Sts. About $10,000.

Ala., Gadsden City issued $90,000 bonds to build sewers and electric distribution system. E. Smith, city engr.

O., Cincinnati—City plans to build 1400 ft. sewer in 1st Ave. and right-of-way; cost, $12,450; 1210 ft. pipe and 2700 ft. trunk sewer in Millsdale Ave. and right of way, and Beach Ave., $39,000; 11,830 ft. pipe and 1555 ft. trunk sewer, Madisonville Contract No. 4, $80,000. F. Krug, city engr.

O., Dayton—City plans to lay 6 to 18 in vitr. pipe sewers in Brandt, Valley, Urbana, Paw Paw, Stegman, Leo, Bickmore and Bellefontaine Sts., Sanitary Dist. No. 3. About $10,000. F. O. Eichelberger, city engr.

O., Hamilton City plans to lay 3,000 ft. 6-30 in. vitr. pipe, in Prospect Hill Sanitary Sewer Dist. About $67,000. F. E. Weaver, city engr.

O., Medina—Village plans to build sewerage system and sewage disposal plant. G. Gascoigne, City Hall, Cleveland, engr.

Mich., Marysville City plans to install complete sewerage system, to include sewage treatment works, trunk sewers and laterals. Smith, Hinchman & Grylls, 710 Washington Arcade, Detroit, engrs.

Mich., Port Huron—City had plans and estimates prepared by E. R. Whitmore, engr., City Hall, furnishing and laying 5000 ft. 8-12 in. vitr. crock lateral sewers in Oak and Division Sts., from 20th to 24th Sts. About $13,000.

Wis., Beloit—City having plans prepared building 1 mi. 30 in. storm sewers, in east and west sides. G. E. Heebink, city engr.

Wis., Cumberland—City plans to excavate and lay 3.1 mi. vitr. pipe sewer and install sewage disposal plant. Cost between $25,000 and $30,000. Private plans.

Wis., Eau Claire—City voted $75,000 bonds to lay trunk sewers in various streets. J. I. Hurd, city engr.

Wis., Marion—City plans to excavate and lay 2 to 3 mi. vitr. pipe sewer in various streets and install sewage system. About $50,000. L. P. Pelishek, Clintonville, engr.

Wis., Wauwatosa—City plans to build sewage disposal plant. About $30,000. J. E. Lowther, city engr.

Minn., Warren—City having survey made by L. P. Wolff, engr., 1001 Guardian Life Bldg., St. Paul, for storm water sewerage system and street paving. About $100,000

Sewers (Continued)

Minn., Wells—City having plans prepared by L. P. Wolff, engr., 1001 Guardian Life Bldg., St. Paul, for extension of storm water and sanitary sewerage systems. About $60,000.

Kan., Douglas—City having plans prepared by F. E. Devlin, engr., Douglas, building 35,080 ft. 8-12 in. sewers in various streets.

Kan., Hutchinson—City passed resolution to build 26,000 lf. sanitary sewers in various streets. B. Lee, city engr.

Neb., Battle Creek—City having surveys made for sewerage system and sewage disposal plant. About $45,000. W. E. Standeven, 617 Bee Bldg., Omaha, engr.

Neb., Ord—City having plans prepared by Rohrbough Eng. Co., engrs., 929 City Natl. Bank Bldg., for sewerage system in Will Ave. Work involves 7000 ft. 12 in. inlet, 5670 ft. 36-48 in. rein.-con. and 7070 ft. 12-36 in. vitr. pipe. About $98,000. Noted Sept. 11.

Mont., Billings—City voted $400,000 bonds to build storm sewerage system. E. M. Sneckenberger, city engr. Noted Sept. 18.

Tex., Plainview—City Council voted $50,000 bonds to improve sewers.

Okla., Cleveland—City voted $20,000 bonds to build sewers in various streets. Engineer to be selected at once.

Okla., Shawnee—City voted $50,000 bonds to extend and repair sewerage system. F. D. Brown, city engr.

Okla., Tulsa—City plans to build sewage disposal plant, to have sufficient capacity to take care of entire city. About $250,000. C. E. Briggs, city engr.

Colo., La Juanita—City plans to install sewerage system in Dist. No. 1, which comprises all business section and 7-10 of residential section. About $50,000 F. T. Lewis, engr.

Idaho, Lewiston—City having plans prepared building sewerage system to cover entire eastern section of city, and connect with trunk line of downtown sewer, 9 ft. deep. About $13,959. J. Burns, Lewiston, engr.

Wash., Oaksdale—City Council having surveys made for sewerage system. Work includes excavation, laying vitr. or cement pipe, catchbasins, service and branch pipes, etc. About $12,000. G. H. Green, Oakdale, engr.

Wash., Seattle—Bd. Pub. Wks. rejected bids received Sept. 19, laying sewers, laterals, etc., in 63rd Ave. S. W. About $160,000. Work will be re-advertised Feb. 1.

Ore., Portland—City plans to build 8 in. vitr. or cement sewer, manholes, lampholes, catchbasins, sewer service pipes and branches in East 33rd St. from Shaver to Simpson Sts. About $30,545. O. Laurgaard, city engr.

Ore., Portland—City plans to build sewer in Tolman Ave., cost, $2508; 40th Ave. S. E. and 58th St. S. E. from center line 40th Ave. S. E. as laid out in Myrtle addition to sewer in 40th Ave. west of 58th St. S. E., 40th Ave. from point 80 ft. east of 48th St. S. E. to 58th St., $1931; 1st St. from Block 16, Terwilliger Homestead extended west, $822; Stockton St. from point 65 ft. north of north line of Oberlin St. to Lombard St., $1251; 30th Ave. S. E., 44th St. S. E., 43rd St. S. E., $3540; East 20th St. from point 50 ft south of south line of stanton St. to Knott St., $950; Glenwood Ave., $1489; also in 61st Ave. S. E. and Martins Ave. sewerage system from east line of Eastmoreland, 100 ft. south of Martins Ave. to west line of 48th St. S. E., north along west line of 48th St. S. E. to point 100 ft. north of 61st Ave. S. E., west parallel with 61st Ave. and its extension west, then south along east line of Eastmoreland to place of beginning, $12,065; East 13th St. trunk sewerage system from point 331 ft. south of center line of Winona St., north in East 13th St. and East 13th St. extension, $85,120. O. Laurgaard, city engr.

Ore., Portland—City Council adopted resolution to build sewers in East 67th, East 74th, East 75th and Halsey Sts. About $14,919. O. Laurgaard, city engr.

Cal., Antioch—City plans to build sewer along F St. to river. About $18,000.

Cal., Modesto—City plans election to vote on $75,000 bonds to build storm water sewers in east side district; extension to sanitary sewerage system also being considered. G. H. Freitas, city engr.

Cal., San Leandro—City plans to build storm sewers in Alvarado St. About $12,000. R. H. Goodwin, city engr.

Ont., Hamilton—City plans to extend Burlington St. sewer. Work involves 9000 ft. 18 in. vitr. pipe. About $34,000. E. R. Gray, City Hall, engr.

Bridges

PROPOSED WORK

Mass., Springfield—Hampden Co plans to build rein.-con. bridge over Frogs Hole between here and Westfield. About $25,000

Mass., Webster—Town having plans prepared for 247 ft. steel road bridge over railroad tracks, from Peter St., here, to Chestnut St. extension, Dudley Twp Private plans.

Conn., Bridgeport—City having plans prepared by J. A. McElroy, city engr., for new concrete bridge over Cedar Creek. Cost to exceed $40,000.

Conn., Manchester—Town plans to build concrete bridge at Seamans Ice Pond. About $10,000.

O., Cincinnati—Hamilton Co. plans to build steel bridge over Whitewater River, on Lawrenceburg Rd. About $120,000. E. A. Gast, co. engr.

O., Wellington—Comrs. Lorain Co., Elyria, plan to build Crozier Bldg., here, 80 ft. long, concrete or steel superstructure on concrete abutments. About $60,000. C. M. Theobald, co. engr.

Wis., Darlington—City having plans prepared by Wisconsin Highway Comn., Madison, building 140 ft. concrete bridge. About $30,000.

Wis., Grand Rapids—State Highway Comn., Madison, plans to build 500 ft. Bridge, here, with 52 ft. roadway and side walks. About $210,000.

Wis., La Crosse—State Highway Comn., Madison, plans to build 525 it. steel, movable span bridge, over Black River, from here to Campbell Twp., La Crosse Co., to have concrete flooring and 20 ft. roadway About $75,000. Cost will be borne equally by State, La Crosse Co. and Campbell Twp.

Mont., Columbus—Stillwater Co. voted $12,000 bonds to build bridges. G. N. Cardoza, Columbus, engr. Noted July 3.

Wash., Colfax—City plans to build 24 ft. rein.-con. arch bridge, 40 ft. wide, over Spring Flat Creek, on South Main St Cost to exceed $10,000. A. L. Maxwell, city aud.

Oregon—State Highway Comn., Salem, plans to build trestle on Newport-Toledo Highway over Depot Slough, Lincoln Co., involving 50,000 ft. B.M. timber and 1100 lin.ft. wooden piling, cost to exceed $10,000; 240 ft. trestle over Tryon Creek, Clackamas Co., 100,000 ft. timber and 40 cu.yd. class "B" concrete, $10,000; also crossing over Oregon-Washington R. R., Gilliam Co., involving 290 cu.yd. class "A" concrete, 36,000 lb. reinforcing steel and 345 lin.ft. concrete handrail, $10,000. H. Nunn, state highway engr.

Cal., Portersville—City plans election to vote on $30,000 bonds to bridge over Porter Slough. F. W. Pease, city engr.

Cal., Ventura—Comrs. Ventura Co. plan to build bridge over Grimes Wash on River Ave. About $15,000. C. Pettit, co. surv.

Ont., London—City having preliminary plans and estimates prepared by H. A Brazier, city engr., for concrete bridge over Thames River, on Ridout St., 300 ft. long, 24 ft. roadway. About $50,000. (Scott.)

Streets and Roads

PROPOSED WORK

Mass., Northbridge—Town plans to extend Worcester Co. Rd. from point 400 ft. south of Driscoll Crossing to Linwood Bridge. About $30,000.

Mass., Palmer—City plans to pave North Main St. About $50,000. Engineer not selected.

Conn., Manchester—Town appropriated $10,000 to build concrete sidewalks on various streets.

Conn., Milford—Town authorized $100,000 bonds to pave various streets Private plans.

Conn., Stratford (Bridgeport P. O.)—City appropriated $23,500 to pave various streets.

Conn., Suffield—City appropriated $25,000 for new macadam pavements on various streets. Engineer not selected.

N. Y., Buffalo—City plans to pave Moreland St. from Bailey Ave. to Greene St., 26 ft. wide, Schuehle St. from Northland to Delaware Aves., 26 ft. wide, Eller St. from Genesee to Heminway Sts., 26 ft. wide, Jewett Ave. from Main St. to Parkside Ave., 34-36 ft. wide, Humboldt Parkway, north drive, from Main St. to Agassiz Pl., 24 ft. wide, asphalt. G. H. Norton, city engr.

N. Y., Syracuse—Bd. Contr. and Supply rejected bids paving South West St. from Shonnard to Gifford Sts. Work will be re-advertised next spring. Noted June 19.

N. Y., Union—City voted to pave and build sewerage system in West Main St. About $35,000 and $7000 respectively.

N. Y., Watertown—City plans to pave 6400 ft. Water St., 18 ft. wide, concrete. About $46,000. E. W. Sayles, city engr.

N. J., Cliffside—City Council plans to improve Prospect Ave. About $16,000.

N. J., Jersey City—City plans to widen and pave Summit Ave. from north line Pavonia to south line Sip Aves. Cost to exceed $50,000. C. A. Van Keuren, city engr.

N J., Kearney—Bd. Freeholders Hudson Co. (Jersey City), plan to take over Passaic Ave. and widen and repave same, granite block. Cost to exceed, $50,000.

N. J., North Bergen—Town having plans prepared repairing 33rd St., granite block. About $75,000. P. Daly, town engr.

N. J., Riverside—City plans to pave 1 mi. Pavilion and Scott Aves., 18 ft. wide, sheet asphalt. About $10,000. W. Fairbrother, 38 Hancock Ave., chn.

N. J., Trenton Jct.—Bd. Freeholders Mercer Co. (Trenton), plans to build 2000 sq.yd. concrete road on Grand Ave., 20 ft. wide. About $10,000. H. F. Harris, co. engr.

Pa., Harrisburg—City Council plans to grade Hudson St. from Caledonia to Sycamore Sts. and Caledonia St. from 19th to Hudson Sts. M. B. Cosden, city engr. Paid clip.

Pa., Scranton—City plans to grade, pave and curb Forest and Dupont Courts from Vine to Olive Sts., 16th Ward, sheet asphalt on concrete base, $8109, Boulevard Ave. from Electric to East Market St., 2nd Ward, sheet asphalt on concrete base, $1932; Olive St. from Webster to Taylor Aves., 10th and 17th Wards, sheet asphalt and stone block on concrete base, $6389. W. Schunk, city engr. Paid clip.

Pa., Scranton—City plans to grade, pave and curb Woodlawn St. from Boulevard to Adams Aves., 1st Ward, sheet asphalt and stone blocks on concrete base. About $44,780. W. Schunk, city engr. Paid clip.

Va., Richmond—City plans to extend Chamberlayne Ave. from Ginter Park to Leigh St. About $178,000 available for project. C. H. Balling, city engr.

W. Va., Charleston—Kanawha Co. plans to surface 2.6 mi Elk River Rd., concrete cement, 20 ft. wide. About $127,000. F. G. Burdette, co. engr.

W. Va., Madison—Boone Co., Sherman Dist., voted $200,000 bonds to build road from Jarroras Valley to Kanawha Co. line. S. E. Bradley, Madison, engr.

W. Va., Pt. Pleasant—Mason Co., Robinson Dist., plans election soon to vote on $65,000 bonds to improve 14 mi. road.

W. Va., Winfield—Putnam Co., Scott Dist., voted $100,000 bonds paving roads; Union Dist., $75,000. J. S. Parkins, Paradise, engr.

W. Va., Winfield Putnam Co., Scott and Union Dists. voted $100,000 bonds to improve roads. About $175,000. G. H. Davis, Charleston, engr.

North Carolina—State Highway Comn., Raleigh, will build 7.4 mi. Gibsonville-Trollingswood Rd., Graham Twp., Alamance Co., asphalt. About $200,000. Noted Sept. 18

N. C., Benson—City plans to pave several miles streets. About $50,000. Engineer not selected.

N. C., Durham—Comrs. Durham Co. plan to hard-surface main highways, 18 ft. wide About $300,000 F. E. Schnepfe, co. engr.

N. C., Gastonia—Comrs. Gaston Co. plan to improve about 30 mi. roads, asphalt on old macadam. About $500,000. W. S. Fallis. Raleigh, engr. Noted Sept. 4.

N. C., Greensboro—City plans to hard surface various streets. About $200,000. W. B. Bandy, Greensboro, engr.

Streets and Roads (Continued)

N. C., Greensboro City and Guilford Co. plan to surface 6 mi. Greensboro-Ramsen Rd. About $10,000.

N. C., Raleigh Comrs. Wake Co. plan to gravel 3.34 mi. Ferry Rd. About $12,000. C. M. Miller, Raleigh, engr.

N. C., Smithfield Comrs. Johnston Co. plan to surface roads. Pine Level Twp. About $40,000. Engineer not selected.

S. C., Charleston Charleston Co. plans to build 7 mi. Charleston Savannah Highway, wide, 7 in. concrete base 18 ft. J. W. Martin, Charleston, engr.

Fla., Ft. Pierce St. Lucie Co. defeated $700,000 bond issue to build roads. New election soon to vote on $300,000 bonds for project.

Fla., Tallahassee City Council issued $10,000 to pave 1500 ft. College Ave., 24 ft. wide.

Fla., Umatilla City plans to expend $35,000 to pave various streets.

La., Lafayette—City voted $425,000 bonds to pave, gravel, drain and extend water mains. Noted Aug. 21. Clip

La., Pointe a la Hache Plaquemines Parish voted $50,000 bonds to build roads in Dist. No. 1. Address J. Dymond, Jr., 1005 Maison Blanche Bldg., New Orleans, pres. police jury. Noted Sept. 4. OC.

O., Cincinnati City plans to pave 600 ft. public landing from Bway. to Main St., 250 ft. wide, granite block. About $175,000. F. Krug, city engr.

O., Cleveland City plans to open, widen and extend Wheelock and Woodworth Rds., Adelaide, Almira, Benham, Earle, Fidelity, Harvard, Lambert, Milverton and Sargent Aves., vitr. brick paving and stone curbing. About $40,000. R. Hoffman, city engr.

O., Cleveland—Comrs. Cuyahoga Co. plan to improve Walling Mill Rd., Brooklyn Twp.; Drake Rd., Strongsville Twp.; Bennett, Edgerton and Spang Rds., Royalton Twp.; Riverside Rd., Chagrin Falls Twp. Bonds for $350,000 voted for project. W. A. Stinchcomb, co. engr.

O., Dayton—City plans to grade and gravel 750 ft. Leonard St. from Grove Ave. to Lukaswitz St., 30 ft. wide, involving 2600 sq.yd. gravel surfacing, 1500 lin. ft. cement curbing with 2 in. boulder gutter and 1500 cement sidewalk. About $12,425. F. O. Eichelberger, city engr.

O., Ironton—City plans to pave 6th St. from Center to Vesuvius Sts. and Vesuvius St. from Etna to St. Lawrence Sts., 900 ft. long, 30 ft. wide, involving 3000 sq.yd. vitr. brick or concrete on concrete base and 1800 lin. ft. cement curb and gutter. About $20,000. J. R. Toins, clk.

O., Springfield City plans to grade and gravel 1000 ft. (a) Maplewood Ave., (b) Fostoria Ave., (c) Willis Ave., 30 ft. wide, involving 3200 sq.yd. gravel surfacing and 13,000 cu.yd. earth excav., cost (a) $6290, (b) $6630, (c) $3768. W. E. Lucas, city engr.

Ind., Indianapolis City plans to resurface Gray St. from Washington to New York Sts., 10th St. from Illinois to West Sts., Meridian St. from first alley north of Merrill to McCarthy St. and McKin St. from Washington to Williams Sts. F. C. Linginfelter, 3025 Park Ave., engr.

Ind., Indianapolis—City plans to resurface Senate Ave. between 10th and 16th Sts. and Boulevard Pl. between 16th and 20th Sts., asphalt. H. N. Klausmann, city engr.

Mich., Grand Haven—Comrs. Ottawa Co. plan to grade and pave 12 mi. Zeeland-Jennison Rd., 16 ft. wide, involving 113,000 sq.yd. concrete.

Wis., Jefferson—Jefferson Co. plans to build 4.6 mi. concrete road, 18 ft. wide, commencing at city part of Watertown and continuing south on Janesville Rd., cost $25,000 per mi.; 3 mi. concrete road, 18 ft. wide, from west limits of here, west on Lake Mills, Rd., $25,000 per mi.; 5 mi. concrete road commencing at western limits of Watertown and running west toward Hubbleton, 18 ft. wide, $25,000 per mi.; 2 mi. concrete road, 18 ft. wide, from Watertown east toward Ixonia, $25,000 per mi.

Wis., La Crosse—Bd. Supervs. La Crosse Co., passed resolution appropriating $10,000 to improve McGilvray Rd. from here to Trempealeau.

Wis., Racine—Bd. Supervs. Racine Co. having surveys made improving road from here to Rochester and Burlington Rd. from Rochester to Burlington, concrete, total length 25 mi. Estimated cost $26,000 per mi.

Wis., Sheboygan—City plans to grade and pave 1.9 mi. North 6th St. from Pennsylvania to Michigan Aves., 20 ft. wide, involving 20,000 sq.yd. concrete and combined concrete curb and gutter. Cost between $25,000 and $30,000. C. U. Boley, city engr.

Wis., Sheboygan—Sheboygan Co. plans to grade and pave with 1 course reinf.-con. and build culverts, bridges, etc., on 20 mi. Sauk Trail Rd., from Cedar Grove to here, 18 ft. wide. About $40,000. Engineer not selected.

Wis., West Allis (Milwaukee P. O.)—City having plans prepared paving 1000 ft. Natl. Ave. from 75th to 77th Aves., 1800 lin.ft. 55th Ave. from Natl. to Burnham Aves., both 40 ft. wide, asphalt on concrete base. Cost $18,000 and $25,000 respectively. A. Schneider, city engr.

Minn., Albert Lea—Freeborn Co. plans to grade and gravel 25 mi. road, 24 ft. wide. About $125,000. E. V. H. Brown, Albert Lea, engr.

Minn., Alexandria Douglas Co. plans to grade and gravel 15 mi. road, 24 ft wide. About $75,000. A. Webster, Alexandria, engr.

Minn., Anoka—Comrs. Anoka Co. plan to pave 25 mi. road, 18 ft. wide, concrete and asphaltic concrete. About $750,00. H. H. Thurston, Anoka, engr.

Minn., Austin Mower Co. plans to grade and gravel 15 mi. road, 24 ft wide. About $75,000. A. C. White, Austin, engr.

Minn., Bagley—Clearwater Co. plans to grade and gravel 10 mi. road, 24 ft. wide. About $50,000. B. F. Umland, Bagley, engr.

Minn., Bemidji—Comrs. Beltrami Co. plan to grade and gravel 42 mi. road, 24 ft. wide. About $210,000. S. D. Snyder, Bemidji, engr.

Minn., Biwabik—City voted $100,000 bonds to hard surface roads. J. F. Godalthorpe, clk.

Minn., Blue Earth—Faribault Co. plans to grade and gravel 30 mi. road, 24 ft. wide. About $150,000 R. J. Short, Blue Earth, engr.

Minn., Brainerd –Crow Wing Co. plans to pave 5 mi. road, 18 ft. wide, bitulithic or asphalt. About $150,000. C. L. Motl, Brainerd, engr

Minn., Buffalo Wright Co. plans to grade and gravel 25 mi. road, 24 ft. wide About $125,000. F. W. Van Krevelen, Buffalo, engr.

Minn., Caledonia –Houston Co. plans to grade and gravel 20 mi. road, 24 ft. wide, and pave 5 mi., 18 ft. wide, asphalt. About $250,000. C. C. Conzett, Caledonia, engr.

Minn., Cambridge—Isanti Co. plans to grade and gravel 12 mi. road, 24 ft wide About $70,000. P. M. Torell, Cambridge, engr.

Minn., Carlton—Comrs. Carlton Co. plants to grade and gravel 25 mi. road, 24 ft. wide. About $125,000. P. D. Mold, Carlton, engr.

Minn., Center City—Comrs. Chicago Co. plan to grade and gravel 5 mi road, 24 ft. wide, cost $25,000; pave 10 mi road, 18 ft. wide, bitulithic and asphalt. $300,000. H. L. Colwell, Sunrise, engr.

Minn., Chaska—Carver Co. plans to grade and gravel 15 mi. road, 24 ft. wide About $75,000. W. H. Tischer, Waconia engr.

Minn., Crookston—Polk Co. plans to grade and gravel 25 mi road, 24 ft. wide, and pave 2 mi., 18 ft. wide. About $185,000. E. H. Harding, Crookston, engr

Minn., Detroit—Comrs. Becker Co. plan to grade and gravel 14 mi road, 24 ft. wide. About $70,000. H. W. Teague, Detroit, engr.

Minn., Duluth—Comrs. St. Louis Co. plant to pave 1 mi. Federal Aid Project No. 84, 18 ft. wide, rein.-con. About $30,000. R. W. Acton, co. engr.

Minn., Duluth—St. Louis Co. plans to grade and gravel 270 mi. road, 24 ft wide About $1,350,000. R. W. Acton, Duluth, engr.

Minn., Elbow Lake—Grant Co. plans to grade and gravel 25 mi. road, 24 ft. wide. About $125,000 W. H. Burgess, Elbow Lake, engr.

Minn., Fairmont—Martin Co. plans to grade and gravel 20 mi road, 24 ft. wide About $100,000. G. A. Taber, Fairmont, engr.

Minn., Fergus Falls—Ottertail Co. plans to grade and gravel 20 mi. road, 24 ft. wide. About $100,000. A. L. Flygare, Fergus Falls, engr.

Minn., Foley—Comrs. Benton Co. plan to pave 16 mi road, concrete and asphaltic concrete, 18 ft. wide, cost $480,000; grade and gravel 25 mi. road, 24 ft. wide, $125,000 J. L. Tierney, Foley, engr.

Minn., Glencoe McLeod Co. plans to grade and gravel 15 mi. road, 24 ft wide. About $75,000. I. C. Christlieb, Hutchinson, engr.

Minn., Glenwood Pope Co. plans to grade and gravel 20 mi. road, 24 ft. wide About $100,000. L. Martin, Glenwood, engr.

Minn., Grand Marais Cook Co. plans to grade and gravel 5 mi. road, 24 ft. wide About $25,000. H. A. La Sener, Grand Marais, engr

Minn., Grand Rapids Itasca Co. plans to pave 70 mi. road, 18 ft. wide, asphalt. About $2,100,000 D. J. Kidberg, Grand Rapids, engr

Minn., Granite Falls Yellow Medicine Co. plans to grade and gravel 30 mi. road, 24 ft wide About $150,000. N. S. Thayer, Granite Falls, engr.

Minn., Hallock Kittson Co. plans to grade and gravel 10 mi. road, 25 ft. wide. About $50,000. J. E Dishington, Hallock, engr

Minn., Hastings Dakota Co. plans to grade and gravel 20 mi. road, 24 ft. wide About $100,000. C. L. Methven, Hastings engr.

Minn., Henderson Sibley Co. plans to grade and gravel 5 mi. road, 24 ft. wide. About $25,000 S. P. Mullen, Gaylord, engr.

Minn., Ivanhoe– Lincoln Co. plans to grade and gravel 30 mi. road, 24 ft. wide About $150,000. E. Haugan, Ivanhoe, engr

Minn., Jackson Jackson Co. plans to grade and gravel 25 mi. road, 24 ft. wide About $125,000. W. M. Richmond, Jackson, engr.

Minn., Le Sueur Center—Le Sueur Co. plans to pave 7½ mi. road, 18 ft. wide, asphalt and concrete. About $225,000. R. F. Nichols, Le Sueur Center, engr.

Minn., Le Suer Center—Comrs. Le Sueur Co. rejected bids received Oct. 7, grading and graveling 7.49 mi. Federal Aid Project No. 89, State Rd. No. 5, 24 ft. wide. About $100,000. Work will be readvertised in spring. R. F. Nichols, Le Sueur Center, engr. Noted Sept. 25.

Minn., Litchfield Meeker Co. plans to grade and gravel 15 mi. road, 24 ft. wide About $75,000. R. P. McNamara, Litchfield, engr.

Minn., Little Falls—Morrison Co. plans to pave 12 mi. road, 18 ft wide Bids will be received on all types of pavement. About $360,000. A. J. Fenn, Little Falls, engr

Minn., Long Prairie Todd Co. plans to grade and gravel 35 mi road, 24 ft. wide. About $175,000. A. M. Graves, Long Prairie, engr

Minn., Luverne Rock Co. plans to pave 7 mi road, 18 ft. wide Bids will be received on all types of pavement. About $210,000 D. E. Davison, Luverne, engr.

Minn., Mahnomen Mahnomen Co. plans to grade and gravel 20 mi. road, 24 ft wide About $100,000. H. R. Chapin, Mahnomen, engr.

Minn., Mankato—Comrs. Blue Earth Co. plan to pave 7 mi road, 18 ft wide, concrete and asphaltic concrete. About $210,000. N. Moe, Mankato, engr.

Minn., Mantorville—Dodge Co. plans to grade and gravel 20 mi. road, 24 ft wide. About $100,000. R. D. Jorgens, Hayfield, engr

Minn., Marshall Lyon Co. plans to grade and gravel 20 mi road, 24 ft wide About $100,000 D. W. Webster, Marshall, engr

Minn., Minneapolis Hennepin Co. plans to pave 5 mi road, 18 ft. wide, asphalt About $150,000 E. E. Terrell, co. engr.

Minn., Montevideo — Chippewa Co. plans to grade and gravel 30 mi. road, 24 ft. wide. About $150,000. E. C. Nelson, Montevideo, engr.

Minn., Moorhead Clay Co. plans to grade and gravel 15 mi road, 24 ft wide. About $75,000 E. Martinson, Moorhead, engr

Minn., Mora Kanabec Co. plans to grade, and gravel 15 mi. road, 24 ft. wide. About $75,000 R. G. Streetly, Mora, engr.

Streets and Roads (Continued)

Minn., Morris—Stevens Co. plans to grade and gravel 25 mi. road, 24 ft. wide. About $125,000. W. A. Hunt, Morris, engr.

Minn., New Ulm—Comrs. Brown Co. plan to build 12 mi. road, 18 ft. wide. About $360,000. C. N. Robertson, New Ulm, engr.

Minn., Olivia—Renville Co. plans to pave 10 mi. road, 18 ft. wide. Bids will be received on all types of pavement. About $300,000. F. M. Shepherd, Olivia, engr.

Minn., Ortonville—Comrs. Big Stone Co. plan to grade and gravel 20 mi. road, 24 ft. wide. About $100,000. L. P. Zimmerman, Ortonville, engr.

Minn., Owatonna—Steele Co. plans to pave 7 mi. road, 18 ft. wide. Bids will be received on all types of pavement. About $210,000. C. H. Harholdt, Owatonna, engr.

Minn., Park Rapids—Hubbard Co. plans to grade and gravel 10 mi. road, 24 ft. wide. About $50,000. C. E. Spencer, Park Rapids, engr.

Minn., Preston Fillmore Co. plans to pave 4 mi. road, 18 ft. wide, asphalt. About $120,000. W. Dunbar, Preston, engr.

Mont., Princeton—Millelacs Co. plans to grade and gravel 17 mi. road, 24 ft. wide. About $85,000. A. W. Leonard, Milaca, engr.

Minn., Redwood Falls—City having survey made and plans prepared by L. P. Wolff, engr., 1001 Guardian Life Bldg., St. Paul, for 24 blocks paving, concrete and asphaltic concrete, 18 ft. wide. About $100,000.

Minn., Redwood Falls—Redwood Co. wide. About $125,000. J. A. Myron, Redwood Falls, engr.

Minn., Rochester—Olmsted Co. plans to pave 14 mi. road, 18 ft. wide. Bids will be received on all types of pavement. About $420,000. G. H. Smith, Rochester, engr.

Minn., St. Cloud—Stearns Co. plans to grade and gravel 10 mi. road, 24 ft. wide. About $50,000. M. J. Cleveland, St. Cloud, engr.

Minn., St. James—Watonwan Co. plans to grade and gravel 10 mi. road, 24 ft. wide, and pave 12 mi., 18 ft. wide. About $410,000. T. J. Buhl, St. James, engr.

Minn., St. Paul—Ramsey Co. plans to pave 10 mi. road, 18 ft. wide. Bids will be reveived on all types of pavement. About $300,000. J. H. Armstrong, St. Paul, engr.

Minn., Shakopee—Scott Co. plans to pave 25 mi. road, 18 ft. wide. Bids will be received on all types of pavement. About $750,000. D. Childs, Shakopee, engr.

Minn., Slayton—Murray Co. plans to grade and gravel 20 mi. road, 18 ft. wide, and pave 5 mi., 24 ft. wide. Bids will be received on all types of pavement. About $220,000. P. L. Minder, Slayton, engr.

Minn., Stillwater — Washington Co. plans to grade and gravel 10 mi. road, 24 ft. wide. About $50,000. G. F. Carstow, Stillwater, engr.

Minn., Thief River Falls—Penington Co. plans to grade and gravel 6 mi. road, 24 ft. wide. About $30,000. E. G. Martz, St. Hilaire, engr.

Minn., Two Harbors—Lake Co. plans to grade and gravel 10 mi. road, 24 ft. wide. About $50,000. H. C. Hanson, Two Harbors, engr.

Minn., Wabasha—Wabasha Co. plans to grade and gravel 15 mi. road, 24 ft. wide. About $75,000. C. M. Matthies, Wabasha, engr.

Minn., Wadena—Wadena Co. plans to grade and gravel 10 mi. road, 24 ft. wide. About $50,000. E. Ward, Wadena, engr.

Minn., Walker—Cass Co. plans to grade and gravel 60 mi. road, 24 ft. wide. About $300,000. A. W. Moulster, Pine River, engr.

Minn., Warren—Marshall Co. plans to grade and gravel 30 mi road, 24 ft. wide. About $150,000. J. A. Lindsay, Warren, engr.

Minn., Waseca—Waseca Co. plans to grade and gravel 20 mi. road. About $100,000. J. W. Hruska, Waseca, engr.

Minn., Willmar—Kandiyohi Co. plans to pave 10 mi. road, 18 ft. wide, asphalt. About $300,000. H. L. Wadell, Willmar, engr.

Minn., Windom—Cottonwood Co. plans to grade and gravel 25 mi road, 24 ft. wide. About $125,000. D. R. Savage, Windom, engr.

Minn., Winona Winona Co. plans to grade and gravel 10 mi. road, 24 ft. wide, and pave 5 mi., 18 ft. wide. About $200,000. H. B. Childs, Winona, engr.

Minn., Worthington—Nobles Co. plans to grade and gravel 25 mi. road, 24 ft. wide. About $125,000. R. J. Boomer, Worthington, engr.

Kan., Cottonwood Falls—Comrs. Chase Co. having plans prepared by Shawnee Eng. Co. ,engrs., Topeka, building 36 mi. concrete roads.

Kan., Hutchinson—Reno Co. having plans prepared by Southwestern Eng. Co., engrs., Hutchinson, paving 22 mi. Wichita-Hutchinson Rd., 18 ft. wide, monolithic brick.

Kan., Junction City—City having plans prepared by J. N. Bridgman, city engr., paving 20 blocks 7th, 11th, 12th, 13th and 14th Sts., 2-course concrete.

Kan., Manhattan—City having plans prepared by A. J. Rhodes, engr., Manhattan, paving 18 blocks principal side streets, 26 ft. wide, asphaltic concrete. About $200,000.

Kan., Newton—Harvey Co. plans to hard surface, curb and gutter 8 mi. road through Halstead, 18 ft. wide. About $250,000. Engineer not selected.

Kan., Oskaloosa—Comrs. Jefferson Co. having plans prepared by Kansas Eng. Co., engrs., Topeka, paving 28 mi. roads, 18 ft. wide, bituminous macadam.

Kan., Salina—Comrs. Saline Co. having plans prepared by Southwestern Eng. Co., engrs., Hutchinson, building 14 mi. Bee Line Rd., 18 ft. wide, brick, macadam or concrete.

South Dakota—State Highway Comn., Pierre, plans to grade, drain and gravel 17.54 mi. Tyndall-Lake Andes Rd., 24 ft. wide. Cost, $103,627. Work involves 60,000 cu.yd. earth excava., 26,310 cu.yd. gravel, 1400 lin.ft. corrugated culverts, 375 cu.yd. concrete for culverts and 30,000 lb. reinforcing steel.

South Dakota—State Highway Comn., Pierre, plans to grade, gravel and drain 11.4 mi. De-Smet-Brookings Highway, Brookings Co., involving 45,600 cu-yd. earth excav., 17,100 cu.yd. gravel, 1450 lin.ft. corrugated culverts, 438 cu.yd. concrete for culverts, 21,500 lb. reinforcing steel, etc., cost $85,965; 13.41 mi. De-Smet-Brookings Highway, Kingsbury Co., 56,300 cu.yd earth excav., 56,322 cu.yd. gravel, 1700 lin.ft. corrugated culverts, 513 cu.yd. concrete for culverts, 27,500 lb. reinforcing steel, etc., $116,579.

Wyo., Casper—Wyoming School Bd. gave Midwest Refining Co., Denver, Colo., contract for 3 years for state royalty oil, on condition that company contribute $100,000 a year for 3 years toward construction of Casper-Salt Creek Highway. The company has made entire amount available at once and Federal Government has appropriated like amount; 25 mi. will be contracted for early in 1920.

Montana—State Highway Dept., Helena, plans to grade 22 mi. Fattig Creek Rd., cost $24,000, 19 mi. Ryegate-Hedges Rd., $16,000, 33 mi. Lavina-Tuffley-Cabin Gulch Rd., $20,000, 35 mi. Franklin-Cabin Gulch Rd., $50,000, 20 mi. Klein-Billings Rd., $40,000, 13 mi. Ryegate-O'Brien Bench Rd., $12,00, 19 mi. Gage-Flatwillow Bench Rd., $20,000, 16 mi. Long Tree Rd., $16,000, 20 mi. Johnson Rd., $10,000, 9 mi. Ryegate-Barber-Harlowton Rd., $15,000, 15 mi. Melstone-Custer Rd., $15,000, 15 mi. Carpenter Creek Rd., $15,000, 8 mi. Musselshell-Flatwillow Rd., $10,000, 9 mi. Musselshell-Custer Rd., $10,000, 20 mi. Custef Gulch-Belmont Rd., $25,000, gravel surface 37 mi, Glendive-Lindsay-Brockway Rd., $74,000, 7 mi. Carroll Rd., $30,000, 8 mi. Ryegate-Big Coulee Rd., $30,000, all in Musselshell Co.; gravel surface 50 mi. Richey-Bloomfield Rd., Dawson Co., $100,000; grade 20 mi. Redwater-Paxton Rd., $20,000, 15 mi. Redwater-Brockway Rd., $20,000, both in McCone Co.; gravel surface 50 mi Great Falls-Cascade Rd., $200,000, 18 mi. Great Falls-Ft. Benton Rd., $72,000, and 30 mi. Raynesford-Geyser Rd., $120,000, all in Cascade Co. Federal Government asked to appropriate toward cost. J. N. Edy, state highway engr.

Montana—State Highway Dept., Helena, plans to grade 19 mi. Culberson-Froid Rd., cost $26,000, 95 mi. Moody Highway, $285,000, gravel surface 15 mi. Wolf Point Rd., $26,000, 5 mi. Brockton North Rd., $10,000, all in Roosevelt Co. Federal Government asked to appropriate toward cost. J. N. Edy, state highway engr

Montana—State Highway Dept., Helena, plans to gravel surface 45 mi. Glacier Park Trail, Toole Co., cost $90,000; 45 mi Great Falls, Sweetgrass Lethbridge Rd., Toole Co., $90,000; 40 mi. Yellowstone Trail, Stillwater Co., $200,000; 33 mi. Yellowstone Glacier Bee Line Rd., Teton Co., $132,000 Federal Government has been asked to appropriate toward cost.

Montana—State Highway Dept., Helena, plans to gravel surface 24 mi. Bonner-Nimrod Rd., Missoula Co., cost $75,000; hard surface 5 mi. Missoula-Bonner Rd., Missoula Co., $120,000; gravel surface 40 mi. Brady-Shelby Rd., 16 ft. wide, Pondera Co., $240,000; grade 24 mi. Roundup-Billings Rd., Musselshell Co., $20,000; gravel surface 30 mi. Lolo-Lolo Hot Springs Rd., Missoula Co., $120,000; grade 11 mi. Roundup-Melstone Rd., Musselshell Co., $20,000; grade 1½ mi. Big Coulee Hill Rd., Musselshell Co., $14,000. Federal Government has been asked to appropriate toward cost. J. N. Edy, state highway engr.

Mont., Anaconda—Deer Lodge Co. voted $150,000 bonds to build roads. Federal aid applied for. E. Cralle, Anaconda, engr. Noted July 3.

Mont., Big Timber—Sweetgrass Co. voted $125,000 bonds to build roads. D. J. Walvoord, Big Timber, engr. Noted July 10.

Mont., Boulder—Jefferson Co. voted $100,000 bonds to build roads. C. D. Flaherty, Boulder, engr. Noted June 26.

Mont., Chinook—Blaine Co. voted $100,000 bonds to build roads. C. R. Hanke, Chinook, engr. Noted July 10.

Mont., Choteau—Teton Co. voted $150,000 bonds to build roads. F. Daly, Choteau, engr. Noted July 10.

Mont., Columbus—Stillwater Co. voted $163,000 bonds to build roads. G. N. Cardoza, Columbus, engr. Noted July 10.

Mont., Conrad—Pondera Co. voted $200,000 bonds to build roads. J. N. Edy, c/o State Highway Dept., Helena, engr. Noted Aug. 28.

Mont., Dillon—City plans to pave 15 blocks, involving 25,000 sq.yd. pavement. About $85,000. G. V. Elder, Dillon, engr.

Mont., Forsyth—Rosebud Co. voted $100,000 bonds to build roads. J. N. Edy, c/o State Highway Dept., Helena, engr. Noted July 10.

Mont., Glendive—Dawson Co. voted $200,000 bonds to build roads. B. W. Adams, Glendive, engr. Noted July 31.

Mont., Hardin—Big Horn Co. voted $75,000 bonds to build roads. J. E. Graham, Hardin, engr. Noted June 26.

Mont., Harlowton — Wheatland Co. voted $200,000 bonds to build roads. C. C. Jewell, Harlowton, engr. Noted July 10.

Mont., Havre –Hill Co. voted $150,000 bonds to build roads. J. E. Peterson, Havre, engr. Noted July 10.

Mont., Helena—Lewis and Clark Co. voted $200,000 bonds to build roads. J. N. Edy, c/o State Highway Dept., Helena, engr. Noted July 24.

Mont., Lewistown—Fergus Co. voted $700,000 bonds to build roads. H. C. Tilzey, Lewistown, engr. Noted July 3.

Mont., Mondak — Roosevelt Co. voted $200,000 bonds to build roads. J. N. Edy, c/o State Highway Dept., Helena, engr. Noted Aug. 28.

Mont., Philipsburg—Granite Co. voted $150,000 bonds to build roads. E. B. Patten, Philipsburg, engr. Noted July 10.

Mont., Red Lodge—Carbon Co. voted $100,000 bonds to build roads. A. B. Cooley, Red Lodge, engr. Noted July 10.

Mont., Shelby—Toole Co. voted $200,000 bonds to build roads. H. B. Rawson, Shelby, engr. Noted July 10.

Mont., Thompson Falls—Sanders Co voted $75,000 bonds to build roads. T. Johnston, Thompson Falls, engr. Noted July 10.

Mont., Townsend — Broadwater Co. voted $100,000 bonds to build roads. L. K. Pool, Townsend, engr. Noted July 3.

Mont., Wibaux—Wibaux Co. voted $75,000 bonds to build roads. J. N. Edy, c/o State Highway Dept., Helena, engr.

Mo., Albany—Gentry Co. plans to build 10.46 mi. gravel road, 16 ft. wide. About $210,946. J. B. Ray, Albany, engr.

Mo., Albany—Gentry Co. plans to build 30 mi. road, east and west from Albany, 18 ft. wide. Leslie-Barnes Eng. Co., Amer. Natl. Bank Bldg., St. Joseph, engrs.

Mo., Albany—Gentry Co. plans to build 8.6 mi. bituminous road through King City, 18 ft. wide. About $181,537.

Mo., Bethany—Harrison Co. plans to build 6.6 mi. road through New Hampton, 18 ft. wide. About $65,019.

Mo., Bolivar—Polk Co. plans to build 13.8 mi. gravel road, 18 ft. wide, near here. About $59,275. Engineer to be announced soon.

Streets and Roads (Continued)

Mo., Carthage—City plans to pave various streets, concrete, asphalt or vitr. brick. Bonds for $150,000 voted for project.

Mo., Carthage—Jasper Co. plans to build 4 mi. Joplin-Springfield Rd., 18 ft. wide, concrete. About $88,000.

Mo., Danville—Montgomery Co. plans to build 8.2 mi. road from New Florence to Danville, 18 ft. wide, macadam. About $62,042. Engineer not selected.

Mo., Gentry—Gentry Co. plans to build 8.17 mi. Kansas City-Albany Rd. near Stanberry, and 4.12 mi. Stanberry-Albany Rd., 18 ft. wide, gravel. Cost $137,000 and $85,000, respectively.

Mo., Hermitage—Hickory Co. plans to build 4.5 mi. gravel road, west of Preston, cost $15,548; 7.5 mi. gravel road from Dallas Co. line to Cross Timbers, $26,839.

Mo., Huntsville—Randolph Co. plans to build 8.5 mi. road west of Huntsville, 18 ft. wide. About $49,550.

Mo., Linneus—Linn Co. voted $1,000,000 bonds to build hard surfaced roads. Engineer not selected.

Mo., Monticello—Lewis Co. plans to build 8.3 mi. road through Canton, 18 ft. wide, cost $88,977; 7.7 mi. road north of LaGrande, $67,759. Engineer not selected.

Mo., Mt. Vernon—Lawrence Co. plans to build 10.5 mi. gravel road through Mt. Vernon, 18 ft. wide. About $39,576. Engineer not selected.

Mo., Osage—Linn Co. voted $500,000 bonds to build hard surface roads.

Mo., Palmyra—Marion Co. plans to build 10.5 mi. Hannibal West Ely Rd., 18 ft. wide, gravel. About $64,543.

Mo., Platte City—City plans to pave 4th St. from Main St. to city limits, bituminous macadam. About $35,000. E. Ross, clk.

Mo., Richmond—Ray Co. plans election soon to vote on $1,300,000 bonds to build hard surface roads.

Mo., Rolla—Phelps Co. voted $400,000 bonds to build hard surface roads.

Mo., Stockton—Cedar Co. plans to build 9.7 mi. gravel road from El Dorado Springs to Stockton Rd., 18 ft. wide. About $43,678.

Mo., Versailles—Morgan Co. plans to build 13.8 mi. gravel road from Versailles to Moniteau Co. line, 18 ft. wide. About $46,124. Engineer to be announced soon.

Mo., Westplains—Howell Co. plans to build 40 mi. road from Texas to Oregon Co. lines, 18 ft. wide. About $186,000.

Tex., Brownsville—Cameron Co. had plans prepared gravel surfacing and building rein.-con. drainage structures on 5.56 mi. Highway No. 12, from here to Hidalgo Co. line, 15 ft. wide. About $20,000. D. L. Conrad, Brownsville, engr.

Tex., Cameron—Milam Co. had surveys made for gravel surfacing and building rein.-con. drainage structures on 9.07 m.i. Branchville Port Sullivan Rd. from Maysfield Pike to Brazos River, 16 ft. wide, involving 7 acres clearing and grubbing, 19,000 cu.yd. earth excav., 700 cu.yd. concrete and 45,000 lb. reinforcing steel. About $40,000. A. F. Mitchell, Cameron, engr.

Tex., Corpus Christi—Comrs. Nueces Co. plan to build causeway over Nueces Bay. About $1,000,000.

Tex., Cuero—De Witt Co. had plans prepared building road and rein.-con. drainage structures on 12.1 mi. Middle-Buster Highway No. 9 from here to Victoria line, 15 ft. wide, involving 2200 cu.yd. gravel per mi., 8.5 mi. machine road work and 3 acres clearing and grubbing. About $72,200. Engineer not announced.

Tex., Dallas—City having plans prepared paving San Jacinto St. from Washington to Haskell Sts., 30 ft. wide, involving 3002 sq.yd. asphalt on 5 in. concrete base, 1236 lin.ft. combined concrete curb and gutter, 44 lin.ft. sidewalk and 883 cu.yd. earth excav. About $11,818. G. D. Fairtrace, city engr.

Tex., Gilmer—Upshur Co. having plans prepared gravel surfacing 5 mi. Jefferson Highway from Camp Co. line to Harrison Co. line, 16 ft. wide. About $20,020. Wilder & O'Neal, Mt. Pleasant, co. engrs.

Tex., Gonzales—Gonzales Co. plans to grade, gravel, surface and build concrete drainage structures on 8.9 mi. State Highway No. 29, Honon Sect., involving 35 acres clearing and grubbing and 41,720 lin.ft. machine work. About $78,770. Wilder & O'Neal, Chronicle Bldg., Houston, engrs.

Tex., Hillsboro—Hill Co. plans to surface and drain 23.5 mi. Kings Trail Highway from McLennan Co. to Ellis Co. line, 16 ft. wide, gravel with bituminous topping, involving 6 acres clearing and grubbing. About $526,000. Bryant & Huffman, Littlefield Bldg., Austin, engrs.

Tex., La Grange—Fayette Co. having plans prepared gravel surfacing and building rein. con. drainage structures on 11.27 mi. Highway No. 3, 16 ft. wide, involving 10 acres clearing and grubbing. About $144,827 A. Schlafli, LaGrange, engr.

Tex., New Braunfels—Comal Co. voted $175,000 bonds to build Highway No. 2 and laterals. A. C. Rothe, New Braunfels, engr.

Tex., Pearsall—City plans to pave various streets. About $25,000.

Tex., Pearsall—Frio Co. plans to gravel and macadamize various streets. About $25,000. Walton & Arneson, Gunter Bldg., San Antonio, engrs.

Tex., Sherman—Grayson Co. plans to drain and surface 6.9 mi. State Highway No. 11, known as Whitewright Sherman Rd., 16 ft. wide, involving 10 acres clearing and grubbing, 6.9 mi. machine grading and 24,000 gal. bituminous surface. About $77,460. J. C. Field, Denison, engr.

Tex., Snyder—Scurry Co. had plans prepared gravel surfacing and draining 22.05 mi. Highway No. 7, known as Snyder-Fock Rd. 16 ft. wide, involving 13.5 acres clearing and grubbing. About $107,082. H. Exall Elrod Co., Interurban Bldg., Dallas, engrs.

Tex., Snyder—Scurry Co. having surveys made gravel surfacing and building rein.-con. drainage structures on 22 mi. State Highway No. 7 from here to Nolan Co. line, 16 ft. wide, involving 15.5 mi machine grading. About $92,300. R. E. Schiller, c/o H. E. Elrod Co., Interurban Bldg., Dallas engr.

Tex., Tyler—Smith Co. had plans prepared building 8.72 mi. Highway No. 15, known as Porters Bluff Rd., 4.78 mi to be surfaced with gravel and 3.94 mi. to be surfaced with concrete. Work involves 3.45 acres clearing and grubbing. About $174,514. D. K. Caldwell, Tyler, engr.

Tex., Waco—McLennan Co. plans to build 63 mi. Highway No. 31, known as Waco-Axtell Rd., 15 ft. wide, involving 100 cu.yd. concrete, 5547 sq.yd. one course rein.-con. pavement and 2641 lb reinforced steel. About $25,238. M. Hannah, Waco, engr.

Oklahoma—State Highway Dept., Oklahoma, plans to build hard surfaced road east of Enid, 7 mi. into oilfield district. Cost $25,000 to $30,000 per mi. Garfield Co. and Federal Government have $200,000 available for project. H. C. Smith, asst. state highway engr.

Okla., Broken Arrow—City having plans prepared paving 5 blocks main streets in Dist. No. 2, 25 ft. wide, 1 course concrete. About $40,000. Hughes Eng. Co., 304 Bank of Commerce Bldg., Tulsa, engrs.

Okla., Commerce—City having plans prepared paving various streets, 1 course concrete. About $95,000. Hughes Eng. Co., 304 Bank of Commerce Bldg., Tulsa, engrs.

Okla., Hartshorne—City plans to pave 3 blocks Main St., involving 20,000 sq.yd. concrete and 200 lin.ft. concrete curbing and guttering. About $45,000. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma, engrs.

Okla., Muskogee—City having plans prepared paving State St. from Court to Dennison Sts., Dist. No. 15, asphalt. About $50,000. H. H. White, city engr.

Okla., Pawhuska—City plans to pave 200 blocks various streets. About $250,000.

Colo., La Junta—City plans to pave Dist. No. 1 which comprises the business section, and Dist. No. 2, which comprises the residential section. About $75,000 and $50,000 respectively. P. T. Lewis, city engr.

New Mexico—State Highway Comm., Santa Fe, plans to build 6½ mi. Federal Aid Project No. 40, between Ruidoso and Tularosa, Otero Co., cost $45,000. 18 mi. Federal Aid Project No. 41, between Orogrande and west county line Otero Co., cost $80,000. 17 mi. Federal Aid Project No. 35, between Farmington and Aztec, San Juan Co., $51,626. L. A. Gillett, state highway engr.

New Mexico—State Highway Comm., Santa Fe, plans to build 15 mi. Federal Aid Project No. 24, Roosevelt Co., cost $123,000. 15 mi. Federal Aid Project No. 25, Curry Co. $122,353.

N. M., Albuquerque—City plans to pave 4 blocks East Central Ave. from High to Mulberry Sts., 60 ft. wide concrete or bitulithic. About $10,000. A. Hebenstreit, city engr.

N. M., Roswell—Chaves Co. voted $200,000 bonds to build and improve highways.

N. M., Roswell—City plans to pave streets from Railroad to Washington Aves., east and west from Railroad to Michigan Aves., north and south from Tilden to 8th Sts. and Main St. from Hondo River Bridge to Spring River Bridge. About $10,000. A. G. Jaffa, engr. Clp.

Idaho, Boise—Ada Co. voted $100,000 bonds to build roads, including scenic highway from Boise to Arrowrock Dam. Noted July 31.

Idaho, Lewiston—Nez Perce Co. voted $400,000 bonds to build and improve roads and bridges. State and Federal Government will appropriate $800,000 toward project. Noted Sept. 4.

Idaho, Weiser—Washington Co. voted $300,000 bonds to improve roads. Total cost $600,000. Federal Government will appropriate $300,000 toward cost.

Utah, Pleasant Grove—Town Council passed ordinance to pave various streets in Dist. No. 1. About $18,000.

Ariz., Florence—Pinal Co. voted $1,000,000 bonds to grade and pave highways and build bridges and culverts, etc. Noted Aug. 7.

Ariz., Holbrook—Navajo Co. voted $300,000 bonds to improve highways.

Ariz., Tucson—Pime Co. voted $1,500,000 bonds to improve 350 mi. highways, including concrete or bituminous paving and other paving not yet decided on, bridges, culverts, grading, etc. G. S. Foster, Tucson, engr. Noted Aug. 21.

Ariz., Yuma—Yuma Co. election soon to vote on $1,200,000 bonds to build roads, $150,000 additional available from federal aid funds.

Wash., Bremerton—City plans to pave side streets with concrete or bitulithic, build curbs, extend water mains and lay drainage and sewer pipes. About $100,000. F. Hathaway, Bremerton, engr.

Wash., Port Orchard—Comrs. Kitsap Co. plan to issue $116,000 bonds for general road improvement, including grading, draining and surfacing.

Wash., Spokane—City Council having preliminary plans prepared paving fill between 2 bridges on Trent Ave., concrete. About $10,000. A. W. Burch, aud.

Wash., Wenatchee—Chelan Co. plans to grub, grade, clear and gravel 10 mi. road along Lake Chelan from First Creek to Twenty Five Mile Creek Rd., 18 ft. wide. About $40,000. U. S. Forest Serv. will appropriate half the cost.

Oregon—State Highway Comm., Salem, plans to improve 4 mi. Salem South Sect. Pacific Highway, Marion Co., 16 ft. wide. Work includes grading, draining and patching with gravel macadam. About $25,000. H. Nunn, state highway engr.

Oregon—State Highway Comm., Salem, having plans and estimates made building 51 mi. Myrtle Point-Roseburg Rd., Coos Co., to include grading, surfacing with gravel macadam and crushed rock, also building culverts. About $1,051,000. H. Nunn, state highway engr.

Oregon—State Highway Comm., Salem, having preliminary plans prepared for grading and graveling 7 mi. Mayville-Thirty Mile Bridge Rd., 16 ft. wide, Gilliam Co., cost $150,000, Gilliam Co. to appropriate $75,000 toward cost; concrete or gravel macadam road through Klamath Co., 12-16 ft. wide, $1,520,000, Klamath Co. will appropriate $380,000 and Federal Government will be asked to appropriate like amount. H. Nunn, state highway engr.

Ore., Baker—City voted $100,000 bonds to improve streets in suburban district. Plans include grading, leveling, draining and paving.

Ore., Gearhart—City plans to grade, excavate, level, remove old sidewalks and pave 1st St. from Ocean to Marion Aves. and 2nd St. from Marion to Ocean Aves., involving 385 sq.yd. concrete and 1163 cu.yd. common excav., etc. About $10,000. F. L. Hager, aud.

Ore., Helix—City Council adopted resolution to grade and pave several streets, concrete or bitulithic. Cost to exceed $75,000. V. Mason, city recdr.

Ore., La Grande—Union Co. voted $1,500,000 bonds toward cost of hardsurfacing 125 mi. road and graveling 600 mi. of branch roads, 18-24 ft. wide. Noted Aug. 14.

Streets and Roads (Continued)

Ore., Marshfield—City Council authorized Street Com. to report on all needed street improvements and take steps for improving Commercial Ave. from 9th to 12th Sts., Flanagan Ave., 10th, 11th and South 4th Sts. Work to include grading, draining and surfacing. About $10,000. E. K. Burton, city engr.

Ore., Oregon City—Clackamas Co. plans election to vote on $1,700,000 bonds, to improve 144 mi. of roads, 12-16 ft. wide. Work includes grading, paving, draining and hard-surfacing with concrete, asphaltic concrete or bitulithic. C. H. Compton, Oregon City, road master.

Ore., Oswego—City plans to surface 5 blocks of streets, involving 400,000 yd. crushed rock or gravel. About $10,000. J. N. Webster, Oswego, recdr.

Ore., Pendleton—City Council adopted resolution to improve streets in Dist. No. 70. Work includes grading, draining, leveling and some concrete paving. About $20,000. H. B. Longley, comr.

Ore., Pendleton—City Council adopted plans, estimates and specifications made by F. B. Hayes, city surv., to pave with gravel bitulithic, Assessment Dist. No. 68, from Lot 4, Livermores Addition, north parallel with Garfield St. 1020 ft., east along South of Martin St. 260 ft., east 1020 ft., west along north line of Jackson St. 260 ft., cost $9953; Assessment Dist. No. 69, from Lot 6 Raleys Addition, north 300 ft., east 260 ft., south 300 ft., west 260 ft. on north line of Raley St. to point of beginning, $2474. Plans include grading, draining, leveling and surfacing. J. Hailey, Jr., acting city recdr.

Ore., Portland City Council adopted resolution to change system of grades on East 19th St. from center line of Skidmore St., north line of Crane St., center line of Skidmore St. to system of grades at center line of Skidmore St., center line of Crane St., north line of Mason St., 80 ft. north of north line of Mason St. Cost to exceed $10,000. O. Laurgaard, city engr.

Ore., Portland—City Council adopted resolution to pave, curb and drain driveway around Central Park, bitulithic. Cost $10,740. O. Laurgaard, city engr.

Ore., Portland—City plans to improve Front St., et al. and Leonard St. Plans include paving with concrete No. 1 or bitulithic concrete, draining, constructing concrete curbs and laying wooden headers. About $50,000. O. Laurgaard, city engr.

Ore., Portland—Multnomah Co. plans to improve Montgomery Drive, cost $67,200; Fairmount Blvd., $166,500; Marquam Gulch Rd., $159,750; Boones Ferry, $150,000; Base Line Rd., $47,840; St. Johns Rd., $165,000, and Columbia Blvd., $47,840. W. A. Eatchel, co. roadmaster.

Ore., Roseburg—City Council having plans prepared by F. Frearer, engr., Roseburg, for paving Spruce and Washington Sts., concrete or bitulithic. Cost to exceed $10,000.

Ore., The Dalles—City Council adopted resolution to pave 8th St. from Trevitt to Union Sts., asphalt. About $10,000. P. W. Marx, city engr.

Ore., Vale—Malheur Co. and State Highway Comn., Portland, plan to build Brogan-Cow Valley Rd., cost $66,000; Cairo-Nyssa Rd., $76,000; Brogan-Vale Rd., $192,000; Ontario-Slide-Bottom Rd., $152,000; Vale-Burrell Ranch Rd., $34,000; Ontario-Snake River Rd., $25,000. Grading will be done by county, surfacing with gravel macadam or concrete by State Highway Comn. H. Nunn, Salem, state highway engr.

Cal., Berkeley—Comrs. Kern Co., appointed P. E. Kressley, engr., Newport Beach, to make surveys and supervise construction of 40 mi. roads in vicinity of Fellows, McKittrick and Midway Rd. Dists., (now being organized), 15-16 ft. wide, 6 in. concrete.

Cal., Long Beach—City plans to pave 4170 lin.ft. Olive and Alamitos Aves., involving 750 lin.ft. cement concrete curbing, 2750 sq.ft. cement concrete sidewalks and 23,454 sq.yd. bituminous concrete on 5 in. concrete base. About $43,002. A. de Ruiz, City Hall Annex, engr.

Cal., Long Beach—City plans to pave 2560 lin.ft. Magnolia Ave. between 4th and 10th Sts., involving 12,725 sq.yd. 2 in. asphalt on 4 in. concrete base. About $24,995. A. de Ruiz, city engr.

Cal., Long Beach—City plans to pave 4th St. from Molino to Peruino Aves., involving 17,953 sq.yd. 5 in. concrete, 800 lin. ft. 18 in. cement concrete curbing and 10,435 lin.ft. cement concrete sidewalk. About $23,833. A. de Ruiz, city engr.

Cal., Oakland—City plans to improve 63,615 sq.ft. Alice St. from 2nd to 7th Sts., involving 6773 sq.yd. asphalt, 1968 lin.ft. concrete curb and 2657 sq.ft. brick gutters. About $16,000. M. Campbell, city engr.

Cal., Oceanside—City plans to pave 2nd and 3rd Sts. About $60,000.

Cal., San Francisco—City plans to rebuild portions of large number of streets, principal one of which are Bay St. from Columbus Ave. to Embarcadero St., $48,919; Leavenworth St. from Post to McAllister Sts., $21,000; Eddy St. from Leavenworth St. to Van Ness Ave., $20,000; Powell St. from Jackson to Pacific Sts., $13,000, and Van Ness Ave. from Turk to Eddy Sts., $10,000. Total cost $359,462. M. M. O'Shaughnessy, city engr.

Cal., San Francisco—City having plans prepared for grading and paving 1700 ft. Market St. extension from Collingwood to Ord Sts., 74 ft. wide, involving 9445 sq.yd. asphaltic concrete and 1900 lin.ft. concrete curbing, cost $32,000; grading 3400 ft. Market St. from Mono to 24th Sts., 70 ft. wide, 5000 ft. iron stone pipe and building retaining walls and sewers, $62,000. M. M. O'Shaughnessy, city engr.

Cal., Ventura—Bd. Supervs. Ventura Co. set aside money for road work during this fiscal year as follows: $60,000 for resurfacing road from La Crosse to Ojai and from Moorpark to Royal Ave., $24,000 for resurfacing 7 mi. road from Royal Ave. to Santa Susanna, $25,000 improving South Maintain Rd. in Santa Paula, $23,000 improving Ojai Rd. in Santa Paula, $7500 for improving Cuyama Rd., $6000 for improving streets in front of court house and $20,000 for highway maintenance. C. Pettit, co. surv.

Cal., Yuba City — Comrs. Sutter Co. voted $810,000 bonds to pave roads. Noted Apr. 24.

Cal., Woodland—Yolo Co. voted $1,000,000 bonds to grade, pave, build bridges, culverts, etc., on 74 mi. highways. Noted July 31.

Que., Valleyfield—City plans to build 10 mi. waterbound and tar macadam roads. About $45,000.

Railways

PROPOSED WORK

Minnesota — Minnesota Northwestern Electric Ry., 2nd and Labree Aves., Thief River Falls, plans to extend road 500 mi. through Wisconsin, Minnesota and North Dakota. About $20,000,000. H. W. Protzeller, genl. mgr.

Nebraska—W. J. Dobbs, 6804 Florence Blvd., Omaha (representing company), having preliminary surveys made for 35 mi. railroad from Bengelman to Champion. About $700,000. H. E. McClintock, 1810 Manderson St., Omaha, engr.

Texas—F. H. Chandler and C. Neblett, of Stephenville, S. E. Snodgrass and D. W. Poers, of Desdemona, have formed company with $250,000 capital stock and plan to build railroad to oilfield district, to be known as Stephenville-Desdemona Oil R. R.

Texas—R. Q. Lee, Cisco, plans to build railroad line northward from Cisco to Breckenridge, 51¼ mi. long. About $700,000. J. Mead, Cisco, ch. engr.

California—Pacific Electric Ry., 6th and Main Sts., Los Angeles, plans to double track line, about 8 mi., between Gardena and San Pedro. G. E. Pillsbury, ch. engr.

Excavation and Dredging

PROPOSED WORK

Pa., Wilkes-Barre—Dredging—City and Hanover Twp. plan to dredge Solomons Creek, 5 mi. long, and build new channel to change course of water. About $1,000,000. Engineer not selected.

La., Lake Providence—Drainage—Baxter Bayou D. D., East Carroll Parish, plans to drain 45,000 acres alluvial lands. About $200,000. Morgan Eng. Co., Goodwyn Institute, Memphis, Tenn., engrs.

La., Lake Providence—Drainage—Tensas D. D., East Carroll and Madison Parishes plans to drain 175,000 acres alluvial lands. About $500,000. Morgan Eng. Co., Goodwyn Institute, Memphis, Tenn., engrs.

Ia., Onawa—Drainage—Monona Co. having plans prepared by C. Moriarty, engr., Sioux City, for system to drain 100,000 acres, including 25 mi. main ditch and 100 mi. lateral ditches. About $250,000.

Mont., Roundup—Irrigation—Deadman's Basin Irrigation Dist. plans to irrigate 25,000 acres in Musselshell Co. About $1,000,000. C. A. Renshaw, Roundup, engr.

Tex., Sulphur Springs—Levee—Levee Dist. No. 43, newly created, plans to build 1½ mi. levee, 15 ft. high, to reclaim 4000 acres of land, ¾ of which is in cultivation. About $185,000. R. B. Sparks, Cooper, engr

Idaho, Emmet—Drainage—D. D. No. 1, Gem Co., organized by District Court, and plans to build system of open and closed drains, to cover 10,000 acres. About $175,000. Engineer not selected.

Idaho, Picabo—City plans to build 7 mi. open drain ditch, to drain 2200 acres, involving 150,000 cu.yd. excav. About $43,000. Engineer not selected.

Idaho, Preston—Irrigation—Cut River Canal Co. plans to enlarge corporation and build large reservoir on Worm Creek. About $200,000.

Utah, Brigham—Drainage—Comrs. Box Elder Co. retained B. McBride, engr., Logan, to prepare plans and estimates for draining Bear River district, here. About $100 000.

Utah, Provo — Drainage — Comrs. Utah Co. created Skipper Bay D. D. to drain 625 acres of land. About $25,000.

Ariz., Bowie — Irrigation — Citizens of San Simon Valley, organizing district embracing 200,000 acres and plans to build storm water irrigation district. Olmsted & Gillelen, 1112 Hollingsworth Bldg., Los Angeles, engrs.

Ore., Baker — Irrigation — Burnt River Irrigation Co., having plans prepared by L. R. Stockman, engr., Baker, building reservoir preparatory to irrigating lands on the South Fork of Burnt River. About $25,000. H. E. Tweed, Baker Co., agricultural agt., promoter of project.

Ore., Enterprise—Irrigation—J. Nuxell, S. M. Lovell and E. Y. Haskell, having preliminary plans prepared by P. Cupper, state engr., Salem, for system to irrigate 6000 acres of land, in Wallowa Co. Plans include building canals and reservoir to divert water from Little Sheep Creek and tributaries. About $100,000.

Ore., Keating — Irrigation — Property owners in Lower Powder River and Bib Creek Dists., having preliminary plans prepared by P. A. Cupper, Salem, state engr., irrigating 8000 acres near here. Work includes building reservoir, channels, laterals and flood gates. About $40,000.

Ore., Portland—Levee—Multnomah Co. D. D. No. 1, 577 Corbett Bldg., plans to build 11 mi. of levee embankment, involving 420,000 cy.yd. material, 80 acres clearing and grubbing, etc. Cost to exceed $25,000. W. G. Brown, 1322 Yeon Bldg., dist. engr.

Ore., Powell Butte—Irrigation—Powell Butte Irrigation Dist. voted to hire engineer and have plans and estimates prepared for irrigating 25,000 acres west of Prineville, to include building reservoir or storage dam, flumes, channels, canals and laterials. About $100,000.

Ore., Prineville — Irrigation — Bear Creek Irrigation Co. plans to build rock and earth fill dam on Bear Creek, preparatory to irrigation of 2000 acres in Bear Creek Valley. About $10,000. R. Luepper, Prineville, engr.

Ore., Redmond—Irrigation—Land owners in North Deschutes River Dist., making preliminary plans for irrigating 10,000 acres, by taking water from Central Oregon Irrigation Ditch. Work includes building of main canals, bridge across Deschutes River for carry flumes, head and flood gates and laterals, concrete and heavy timber. About $50,000. D. G. Burdick, dist. atty.

Ore., Vale—Irrigation—Shattuck-Edinger Co. having inspections made preliminary to extending Nevada Irrigation Ditch, installing pumping plant, enlarging mill ditch to capacity sufficient to carry the Gellerman-Froman Ditch water from Willow Creek pumping plant to Nevada Ditch diversion. Work includes extensive excavation, gates, waterheads, laterals, flumes, etc. About $75,000. J. Lewis, mgr.

Cal., Danville—Dam—Danville Irrigation Dist., having preliminary plans prepared by S. E. Keifer, engr., 57 Post St., San Francisco, for earth dam 92 ft. high, near San Ramon, concrete lined main canal and laterals to serve 1500 acres. About $224,000. A. G. Bell, secy.

Cal., Red Bluff—Irrigation—State and Federal engineers making surveys for Iron Canyon Project, which will involve dam, reservoir and about 70 mi. irrigation canals, etc., 7 mi. north of here. About $18,000,000. Address S. W. Curtis, Forum Bldg., Sacramento, asst. state engr.

Industrial Works

(☆Indicates award of contract.)

Mass., Fairhaven—Atlas Storage Warehouse, Inc., 608 Pleasant St., New Bedford, plans to build 1 and 3-story, 75 x 200 and 30 x 50 ft., brick and rein.-con. refrigerating plant. About $100,000. Architect not selected.

Mass., Fall River Fall River Electric Light Co., 85 North Main St., plans to build 1-story, brick and concrete addition to power plant, on Hathaway St. Architect not selected.

Mass., Fall River A. J. Fearnley, 188 County St., plans to remodel 2-story factory, on South Main St. About $25,000. Architect not selected.

Mass., Holden Jefferson Mfg. Co. purchased site on Grove St. and plans to build 1-story extension to weave shed. About $20,000. Architect not selected.

Mass., Holyoke—Holyoke Real Estate Trust Co., Boston, plans to build 3-story, brick and rein.-con. garage, on Suffolk and Elm Sts., here. About $200,000. Architect not selected.

Mass., New Bedford—New England Oil & Refining Co., Boston, plans to build oil station, on Washburn St., here. About $100,000.

Mass., New Bedford Robertson Motor Car Co., Cottage St., plans to build brick and rein.-con. service station, on Kempton St. About $75,000. Architect not selected.

Mass., North Adams — New England Warehouse Co., Pittsfield, purchased site here along Boston & Albany R. R. tracks, and plans to build warehouse. About $75,000. Architect not selected.

Mass., Pittsfield—General Electric Co., Morningside St., plans to build brick and rein.-con. addition to factory. About $200,000. C. C. Chesney, genl. mgr. Private plans.

Mass., West Springfield (Springfield P. O.)—**Sinclair Refining Co., New Bridge St.,** plans to build 1-story addition to oil plant, to include storage tanks, storehouse, etc. About $30,000. Private plans.

Mass., Woburn—L. Foucar Co. plans to build brick and conc. to factory, to replace one recently destroyed by fire. About $60,000. Architect not selected.

Mass., Worcester -Main— Park Motors Co. plans to build 1 story, brick, concrete and steel garage and salesroom, on Main and Park Sts. About $50,000. Architect not selected. W. L. Vaughan, pres.

R. I., East Providence (Providence P. O.)—**New England Oil & Refining Co.,** Boston, Mass., plans to build distributing station here. About $100,000.

R. I., East Providence (Providence P. O.)—**Tidewater Oil Sales Co., 34 Central** Wharf, Boston, Mass., plans to build distributing station to include storage tanks, warehouse, etc., at foot of Massosoit Ave., here. About $30,000. Private plans

R. I., Providence C. H. Levy, 114 Pratt St., plans to build 1-story, rein.-con. and steel garage, rein. con. flooring, concrete foundation, on Canal St. About $40,000.

R. I., Providence—Silverman Bros., 150 Chestnut St., had plans prepared by T. J. H. Pierce, archt., 230 Industrial Trust Bldg., for 1-story, 100 x 150 ft., rein. con and steel garage, rein. con. flooring, concrete foundation, on Lexington Ave. About $50,000

R. I., Providence W. L. Wilcox, 322 Broad St., plans to build 1 story, 60 x 100 ft., brick garage and service station, concrete foundation, on Elmwood Ave. About $40,000. Private plans

R. I., Woonsocket—M. Novogroski, 5 Trumbull St., Worcester, Mass., plans to build 1-story, brick and concrete garage, on Main St., here. About $40,000 Architect not selected.

Conn., Bridgeport- Bridgeport Storage Co., 10 Whiting St., having plans prepared by Lockwood-Green Co., archts and engrs., 101 Park Ave., New York City, building 8-story, rein.-con. and steel addition to warehouse, rein con. flooring, concrete foundation. About $150,000.

Conn., Bridgeport—A. F. Crotty, 385 William St., plans to build 1 story, 50 x 150 ft., brick and steel garage, concrete flooring and foundation About $25,000 Architect not selected.

Conn., Bristol—J. H. Sessions & Son, Riverside Ave., plans to build 1-story, brick and rein. con. storehouse, rein con flooring, concrete foundation. About $40,000. Private plans.

Conn., Cedar Hill (New Haven P. O.) Eastern Terminal Co., New Haven, plans to build concrete warehouse, here. About $100,000. Architect not selected

Conn., Danbury- Metal Ball Co., 43 Foster St., plans to build 2 story, brick and steel addition to factory. About $35,000. Architect not selected

Conn., Hartford Amer. Sumatra Tobacco Co., Burnside Ave., plans to construct 5-story warehouse and office building on Commerce St., About $500,000.

Conn., Hartford Williams & Carleton Co., 206 State St., plans to build warehouse on Connecticut Blvd. About $30,000. Architect not selected.

Conn., Manchester Williams & Stephens Auto Co. plans to build brick garage and salesroom, on East Center St. About $50,000. Architect not selected.

Conn., Meriden—Cuno Eng. Co., South Vine St., having plans prepared by M. J. Unkelbach, archt., 162 Main St., New Britain, for concrete and steel factory, on Colony and Lake Sts. About $50,000.

Conn., Meriden — Landers, Frary & Clark, Commercial St., New Britain, plans to build factory on Main St. here. About $150,000. Architect not selected.

Conn., Milford—D. F. Webber, 10 Broad St., plans to build 2-story, brick and mill construction, bakery, on New Haven Ave. About $50,000. Architect not selected

Conn., New Britain New Britain Machine Co., 140 Chestnut St., having plans prepared by M. J. Unkelbach, archt., 162 Main St., for 1-story, 32x320 ft. factory, with 40x70 ft. ell, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Chestnut St. About $40,000.

Conn., New Britain—G. E. Prentice Mfg. Co., Berlin, plans to build brick and mill construction factory on Pleasant St., here. About $35,000. Architect not selected.

Conn., New Haven N. Anastasio, 153 Wooster St., having plans prepared by H. S. Cannicel, archt., 42 Church St., for 3-story, 18 x 95 ft., brick factory, on Grand Ave. About $30,000.

★Conn., Waterbury - Farrel Fdry. & Machine Co., 425 Bank St., plans to build 1 story, brick, concrete and steel foundry, on Meadow St. About $31,000 Work will be done by day labor Private plans.

Conn., Westport -Hunt & Downs, State St., plan to construct 1 story, garage and business building. About $40,000. Architect not selected

Conn., Winsted—Fitzgerald Mfg. Co., Meadow St., plans to build 3-story brick addition to factory on Boyd St. About $50,000 Architect not selected

N. Y., Brooklyn H. Frank, c/o Ebling & Magnusen, archts. and engrs., 52 Vanderbilt Ave., New York City, having preliminary sketches made for 1 story, 200 x 300 ft. brick and steel garage, rein. con. flooring, concrete foundation, on Easter Parkway, here. About $80,000

N. Y., Brooklyn—S. L. Max, 2567 Atlantic Ave., having plans prepared by M. Whinston, archt., 63 Park Row, New York City, for 1-story, 100 x 100 ft. brick and steel garage, rein. con. flooring, concrete foundation, at 406-414 Osborne St. About $40,000.

N. Y., Elba—Wheat's Ice Cream Co., 235 Elm St., Buffalo, purchased plant of Flanders Co., here, and plans to alter same and install new power plant machinery and equipment. About $250,000

N. Y., Huntington Collins Motors, Inc., plans to build rein con power plant and factory About $100,000 and $25,000 respectively Work will probably be done by day labor. Private plans.

N. Y., Long Island City—Pathe Exch., Inc., 25 West 45th St., New York City, plans to build 200 x 400 ft., rein. con. and steel laboratory, rein con. flooring, concrete foundation, on Anby St About $500,000. Architect or engineer not selected

N. Y., Morristown Carthage Sulphite Pulp & Paper Co., Front St., Carthage, purchased Gillis sawmill property, on St. Lawrence River, here, and plans to build pulpwood terminal with dockage and rail facilities. About $125,000 J. A. Outterson, Carthage, pres

N. Y., New York Advance Novelty Candy Mfg. Co., 511 East 72nd St., plans to build 5-story, 100 by 225 ft., rein-con. and steel factory, rein.-con. flooring, concrete foundation, on 138th St. and Willow Ave. About $500,000. Architect or engineer not selected

N. Y., Ogdensburg Morgan Chemical Co. plans to convert Arnod Brewing Co. plant into chemical factory, mill construction. About $60,000. N. E. Morgan, Hermon, pres.

N. Y., Oswego Oswego Milling Co. plans to build grain elevator and poultry food mill, 6-story, concrete and steel, on East 9th and Mercer Sts.; also install transmission line.

N. Y., Rochester—Allen Woolen Mills, Elton and Russel Sts., plans to build 1-story, 133 by 185 ft. factory and 2-story, 48 x 84 ft. office and finishing plant, brick and steel, cost $135,000; also new boiler plant, $25,000. A. Allen, pres.

N. Y., Rochester—J. Cohen & Co., 123 Joseph Ave., plans to build 2-story, brick, storage plant and garage, on Joseph Ave. and Ward St. About $25,000.

N. Y., Rochester—Lehigh Valley R. R., Granite Bldg., plans to build 1-story, brick round house and repair shop, on Cronchs Island. About $28,000. G. T. Hand, 143 Liberty St., New York City, ch. engr

N. Y., Union Universal Instrument & Metal Co., recently incorporated with $75,000 capital stock, plans to build factory. About $50,000. D. S. Mersereau, Union, dir.

N. J., Bloomfield — Townsend Lawn Mower Co., Central Ave., West Orange, plans to build 3-story, 60 x 240 ft., concrete, brick and steel factory, on Henry St., here. About $40,000.

N. J., Jersey City—Tide Water Oil Co., Constable Hook, Bayonne, plans to build 4-story, concrete storage plant at foot of Communipaw Ave., here. About $200,000.

N. J., Newark—New York Linen Supply & Laundry Co., 372 East 22nd St., New York City, purchased site at 92-97 Sumner Ave., and plans to build 75 x 100 ft. plant. About $50,000. N. J. Convery, 28 Central Ave., archt.

Pa., Altoona—E. A. Caum, 504 9th Ave., receives bids in spring building 3-story, 75 x 120 ft. brick plant on 9th Ave. and 11th St. About $75,000. Architect not selected.

Pa., Johnstown J. H. Brachen, Johnstown and M. J. Brachen, Gallitzin, plan to build 2-story, 60 x 80 ft. tile garage and storehouse, on Franklin and Poplar Sts. About $50,000. Architect not selected. Contract will be awarded privately.

Pa., New Castle—Jersey Creamery Co. plans to build creamery, brick, rein.-con. flooring, concrete foundation. About $50,000. McCormick Co., Century Bldg., Pittsburgh, archts. and engrs.

Pa., Nicholson—Calvin Silk Co., Tiffany Bldg., plans to build 2-story, 80 x 200 ft. silk mill, steel and brick, rein con flooring, rock foundation. About $90,000. Architect not selected.

Pa., Pittsburgh Crane Co., 836 South Michigan Ave., Chicago, Ill., purchased 192 x 447 ft. site here on Railroad and 24th Sts. and plans to build factory. Architect not selected.

Pa., Seward Penn Pub. Serv. Co., Johnstown, plans to build concrete, steel and brick power plant along Conemaugh River near here. About $2,000,000 T. T. Hepburn, pres.

Pa., Sunbury R. Shipman plans to build 3 or 4-story, 60 x 70 ft., concrete and steel machine shop, on Susquehanna Ave., Reagan and Front Sts. About $60,000 Architect and engineer not selected

Pa., Wilkes-Barre—Goldsmith Silk Co. plans to build 3-story, 300 x 400 ft. silk mill, steel, rein-con flooring, rock foundation, on Blackman St. About $500,000 Architect not selected

Md., Baltimore—G. E. Blaylock Tire & Rubber Co., 1811 North Charles St., plans to build plant About $300,000

Md., Baltimore C. Freudenthal, 6 South Eutaw St., plans to build 3-story, 41 x 48 ft. steel, frame and brick factory, rock foundation, on Redwood and Eutaw Sts. About $30,000. B. Frank, 328 North Charles St. archt.

Md., Baltimore — Kaufman Beef Co., Union Stock Yards, 6th St. near Wilkens Ave., having plans prepared by C. H. A. Wannamwetsch archt., 563 Williams St., Buffalo, for 3-story, 150 x 150 ft., rein-con and brick packing house, rein. con. flooring. About $150,000

Md., Baltimore Reus Bros. Co., 146-50 West Mt. Royal Ave., plans to build 1 and 2-story, 75 x 225 ft., steel, frame and brick factory, rein.-con. flooring, concrete foundation, on Western Maryland R. R. near North Ave. Cost between $75,000 and $100,000. Private plans

Industrial Works (Continued)

Md., Baltimore—C. Spoerer's Sons Co., 901-9 South Carey St., plans to build 3-story warehouse and salesroom, on Cathedral St. and Park Ave. About $50,000.

Md., Brooklyn—J. H. Geis & Co., preparing plans for 1-story, 150 x 150 ft. planing mill, brick and frame.

Md., Cambridge—T. M. Bramble Co., Church Creek, plans to rebuild cannery recently destroyed by fire, loss $50,000. Plans include 1 and 2-story, brick and corrugated iron structure.

Md., Curtis Bay (Baltimore P. O.)—Armour Fertilizer Co., 1501 Munsey Bldg., Baltimore, acquired 20 acre site, here, and plans to build fertilizer plant, firepoof construction. About $2,000,000.

Md., Greensboro—Helvetia Milk Condensing Co. plans to build 1 and 2-story, 175 x 250 ft., brick or tile plant, rock foundation. About $100,000. Helfensteller, Hirsch & Watson, Chemical Bldg., St. Louis, Archts. Address J. Latzer, Greensboro.

Va., Fulton (Richmond P. O.)—W. F. Richardson, Jr., 216 South 7th St., Richmond, R. L. Purcell and others, plan to build rein.-con. elevator, 500,000 bu. capacity, near Chesapeake & Ohio R. R., cost $360,000; also remodel and alter building now on site, $25,000.

Va., Norfolk—Fenorstein & Co. having plans prepared by R. E. Mitchell & Co., engrs and archts., Flatiron Bldg., for 5-story, 180 x 250 ft., steel and brick storage plant.

Va., Richmond Cheek-Neal Coffee Co., 1011 East Carey St., having plans prepared by Finger & Bailey, archts. and engrs., 601 Kress Bldg., Houston, Tex., for 70 x 100 ft., rein.-con. factory, concrete foundation, on 2nd and Hull Sts., here.

Va., Richmond—Long Ice & Coal Co. plans to build ice plant, on Brook Rd. About $100,000. Engineer not selected. Address A. T. Massie, 723 Natl. Bank Bldg.

Va., Richmond — C. F. Sauer Co., Meadow and Broad Sts., had plans prepared by H. T. Barnham, archt., Chamber of Commerce Bldg., for 4-story, 80 x 100 ft., concrete and brick factory, concrete flooring, also 2-story addition to present building. About $55,000.

W. Va., Huntington—Huntington Drug Co. having plans prepared by S. L. Day, archt., 216 8th Ave., for 5-story, 80 x 100 ft. rein. con., wholesale drug house, on 7th St. and 7th Ave. About $100,000.

N. C., Durham—Durham Hosiery Mill plans to build rein.-con. dye house, also 6-story, 115 x 255 ft., steel and concrete plant. J. E. Sirrine, Greenville, S. C., archt.

N. C., Greensboro—Pomona Mills, Inc., plan to build 3-story, 95 x 125 ft., dye house, rein.-con. and standard mill construction. J. R. Sirrine, Greenville, S. C., archt. and engr.

N. C., High Point—Durham Hosiery Mill, Durham, plans to build 4-story, 80 x 125 ft., standard construction, mill, here. J. E. Sirrine, Greenville, S. C., archt.

S. C., Charleston—Hahn Ice Cream Co., Inc., King St., having plans prepared for 2-story, 100 x 100 ft., concrete and steel factory, on Laurens St., between Wall and Anson Sts. About $50,000. Benson & Borbott, 26 Broad St., engrs.

S. C., Ft. Mill Ft. Mill Mfg. Co. plans to construct 60 x 120 ft. slasher building, 80 x 114 ft. dye house, 30 x 114 ft. opener building, all 2-story, standard mill construction. J. E. Sirrine, Greenville, archt.

S. C., Rock Hill Manchester Mills plan to build 1-story, 260 x 320 ft. standard mill construction factory. J. R. Sirrine, Greenville, archt.

S. C., Sumter E. H. Moses, former manager of Sumter Lighting Co., plans to build 50-ton ice plant, here.

S. C., Ware Shoals Ware Shoals Mfg. Co. plans to build 100 x 125 ft. ice plant, rein.-con. J. E. Sirrine, Greenville, archt.

Fla., Moore Haven—L. G. Burton and A. J. Hendry, Arcadia, plan to build peanut mill here. About $250,000.

Fla., Tallahassee—City plans to install new electric light plant. About $100,000. Engineer not selected.

Tenn., Memphis Seven States Oil Co. plans to build oil refinery, 2000 bbl daily capacity. About $175,000. Address W. T. Berlin, chn. bldg. com. Architect not selected.

O., Akron—Klages Coal & Ice Co., 551 South High St., having plans prepared by A. C. Bishop, engr., Guardian Bldg., Cleveland, for 1-story, 57 x 106 ft., concrete, steel and brick factory, on South High St. About $100,000.

O., Bellevue—Collier Motor Truck Co., having plans prepared by E. McGeorge, archt., 1900 Euclid Ave., Cleveland, for 1-story, 60 x 90 ft., concrete, steel and brick assembling building. About $100,000.

O., Cincinnati—Ahrens Fox Engine Co., Cook and Alfred Sts., plans to build 3-story factory addition, on Colerain and Alfred Sts. About $100,000. Architect not selected.

O., Cincinnati—Kruse & Bahlman Hardware Co., Pioneer and Broad Sts., plans to build 8-story warehouse, on Pioneer St. About $325,000. Architect and engineer not selected.

O., Cincinnati—Rapid Electrotype Co., Canal St., near Race St., plans to build 2-story, 100 x 215 ft., rein.-con. factory, on McMicken and Elm Sts. Zettel & Rapp, Mercantile Bldg., archts.

O., Cincinnati—Sayer & Scovil Co., Gest and Summers Sts., having plans and specifications prepared by Tietig & Lee, archts., 4th Natl. Bank Bldg., and W. Franz, engr., Union Trust Bldg., for 3-story, 80 x 350 ft., rein.-con. factory, on Spring Grove Ave. About $400,000.

O., Cleveland—Bolivar Smith Co., 340 Leader News Bldg., having plans prepared by Concrete Steel Co., archts., 524 Guardian Bldg., for 3-story, 33 x 180 ft., rein.-con., steel and brick addition to garage, on Bolivar Ave. and 9th St. About $100,000.

O., Cleveland—Chandler Motor Car Co., East 131st St., having plans prepared by E. McGeorge, archt., 1900 Euclid Ave., for 3-story, 60 x 440 ft., rein.-con., steel and brick addition to assembling hall. About $200,000.

O., Cleveland—Co-operative Stove Co., 2322 East 67th St., having plans prepared by G. S. Rider Co., engrs., Century Bldg., for 1-story, 75 x 240 ft., rein.-con., steel and brick foundry, on East 67th St. About $300,000.

O., Cleveland — Federal Packing Co., East 4th St., having plans prepared by N. Petti, archt., Williamson Bldg., for 4-story, 40 x 115 ft. cold storage building, rein.-con., steel and brick. About $100,000.

O., Cleveland—Green, Hass, Schwartz Co., East 55th St., near Superior Ave., plans to build 3-story, 164 x 290 ft., concrete, steel and brick factory, boiler house and office, rein.-con. flooring, concrete foundation, on 105th St. and Elk Ave. About $500,000. Christian, Schwarzenberger, Gaede Co., 1900 Euclid Bldg., archts.

O., Cleveland—S. Levin, 2407 East 46th St., having plans prepared by A. Sharowsky, archt., 2349 East 43d St., for 2-story, 116 x 139 ft., rein.-con., steel and brick garage, on Warren Rd. About $50,000. Noted Sept. 18.

O., Cleveland—L. Malewitz, Waterloo Rd., having plans prepared by Whitworth & Johnson, archts., Engineer's Bldg., for 2-story, 75 x 90 ft., rein.-con.; steel and brick factory. About $30,000. Noted Sept 5.

O., Cleveland—Midwest Box Co., 111 West Washington St., Chicago, had plans prepared for 3-story, 98 x 402 ft., concrete, steel and brick factory and power house, rein.-con. flooring, concrete foundation, on West 106th St. and Western Ave., here. About $300,000. De Vore Co., 908 Nicholas Bldg., Toledo, archts. and engrs.

O., Cleveland—Rubay Co., 1328 West 78th St., plans to build 3-story, concrete, steel and brick, factory addition, rein.-con. flooring, concrete foundation, on West 78th St. About $500,000. G. S. Rider Co., Century Bldg., engrs. and archts.

O., Cleveland—T. H. Towell, Cadillac Bldg., having plans prepared by H. E. Shimmin, engr. and archt., 2631 Euclid Ave., for 2-story 200 x 220 ft., rein.-con., steel and brick, service and sales building, on East 21st St. About $300,000.

O., Cleveland—Union Tire & Rubber Co., Hippodrome Bldg., having plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., for 3-story, 165 x 190 ft., rein.-con., steel and brick plant. About $125,000.

O., Columbus—Columbus Union Oil Cloth Co., 7th Ave. and Cleveland, Cincinnati, Chicago & St. Louis R. R., having plans prepared by Bassett & Tresselt, archts., Central Natl. Bank Bldg., for 4-story, 95 x 105 ft., concrete and brick factory, also warehouse, several stories high. About $60,000.

O., Columbus—Hanna Paint Mfg. Co., 95-105 West Long St., plans to build 90 x 100 ft. warehouse on Ludlow St.

O., Dayton—Domestic Eng. Co., Taylor St., plans to build 4-story, rein.-con. addition to factory, rein.-con. flooring, concrete foundation, on East 1st St. About $100,000. Private plans.

O., Dayton—L. C. R. Storage Battery Co., North St. Clair St., plans to build 1-story, 70 x 150 ft., rein.-con. and brick service station, rein.-con. flooring, concrete foundation, on Ludlow and Franklin Sts. About $75,000. Architect not selected.

O., Dayton—B. Lehman's Sons, North Taylor St., plans to build 2-story, 50 x 100 ft., rein.-con. and brick warehouse, concrete foundation, on East Monument St. About $50,000. Architect not selected.

O., Dayton—F. Smith, 1035 Reibold Bldg., plans to construct 5-story, 20 x 90 ft., rein.-con. and brick, storage building, rein.-con. flooring, concrete foundation, on East 3d St. and St. Clair Ave. About $100,000. Architect not selected.

O., East Palestine—Natl. Tire & Rubber Co., East Taggart St., having plans prepared by E. McGeorge, archt., 1900 Euclid Bldg., Cleveland, for 2-story, 45 x 200 ft., rein. con., steel and brick factory. About $50,000.

O., Franklin—Franklin Tractor Co. plans to build 1-story, 30 x 100 ft., steel and brick factory, rein.-con. flooring, brick foundation. About $25,000, Private plans.

O., Kent — Mason Tire & Rubber Co., Leader News Bldg., Cleveland, having plans prepared by Osborn Eng. Co., engrs., 2848 Prospect Ave., Cleveland, for 1-story, 100 x 150 ft., concrete, steel and brick garage, here. About $60,000.

O., Mansfield—Mansfield Electric Hardware Co. plans to build addition to plant. About $25,000.

O., Piqua—Val Decker Packing Co. having plans prepared by Cleveland Constr. Co., archts., Citizens Bldg., Cleveland, for 2-story, 36 x 170 ft., concrete, steel and brick storage building. About $50,000.

Ind., Indianapolis—Cole Motor Co., 750 East Washington St., plans to build 5-story, 180 x 228 ft. brick and steel factory, on Washington and Davidson Sts. About $1,000,000.

Ind., Indianapolis—Haywood Tire & Equipment Co., 526-32 North Capitol Ave., plans to build 2-story, 100 x 200 ft., concrete and brick factory, on Pennsylvania St. About $115,000.

Mich., Alma—Battle Bros. having plans prepared by G. J. Bachman and N. Maxon, archts., Flint, for 1-story, 70 x 150 ft., brick and tile garage, concrete flooring, concrete foundation. About $25,000.

Mich., Detroit—Genl. Motors Corp., 435 Woodward Ave., having plans prepared by Esselstyn, Murphy & Hanford, engrs., Marquette Bldg., for oil pumping system and 26 x 26 ft., concrete pump house, concrete foundation, on Holbrook Ave., also furnishing and installing 5 motor-driven oil pumps for circulating oil in heat treating and hardening plant. Owner will purchase equipment.

Mich., Detroit J. Green, Michigan Ave. and 8th St., having plans prepared by H. T. Millar, archt., 320 Lightner Bldg., for 1-story 50 x 195 ft., brick and concrete garage, rein. con. flooring, concrete foundation, on Michigan Ave. About $40,000.

Mich., Detroit—Superior Machine & Eng. Co., East Larned St., having plans prepared by Brown & Preston, archts., 406 Empire Bldg., for 5-story, 100 x 104 ft., rein.-con. and steel, machine shop, rein.-con. flooring, concrete foundation.

Mich., Detroit—Western Gear Mfg. Co., 1040 Scotten Ave., having plans prepared by L. Scisorek, archt., 226 Farwell Bldg., for 1-story, 40 x 80 ft., brick and steel plant, rein. con. flooring, concrete foundation, on Scotten Ave. About $30,000.

Mich., Fenton New Egyptian Portland Cement Co. having plans prepared by H. H. Lane, engr., 2320 Dime Bank Bldg., Detroit, for 1-story, 66 x 150 ft. rein.-con. storage bldg., rein. con. flooring, concrete foundation.

Mich., Flint—Flint Bread Co., Poplar St., having plans prepared by G. J. Bachman and N. Maxon, archts., Flint, for 2-story, 64 x 66 ft. bakery, on Poplar and Walnut Sts., brick, stone and steel, concrete foundation. About $30,000.

Mich., Grand Rapids—Grand Rapids Furniture Mfg. Assn., 216 Lyons St., N. W., having plans prepared by Robinson & Campau, archts., 715 Michigan Trust Bldg., for 2-story, 80 x 400 ft., rein. con. and brick warehouse, rein. con. flooring, concrete foundation, on Fulton St.

Industrial Works (Continued)

Mich., Grand Rapids Kent Steel Co., 523 Bond Ave., plans to build 1-story, brick and steel factory, concrete foundation, on Scribner Ave. Private plans.

Mich., Grand Rapids—Toledo Plate & Window Glass Co., 19 Ottawa Ave., plans to build 2-story, 132 x 132 ft., brick and steel factory and warehouse, concrete foundation. About $35,000. Private plans.

Mich., Jackson—Hup Motor Car Co., plans to build 1-story, 60 x 90 ft., rein.-con., brick and steel power house, rein.-con. flooring, concrete foundation. Smith, Hinchman & Grylls, 10 Washington Arcade, Detroit, archts.

Mich., Kalamazoo — Fuller & Sons, Pitcher St., plan to build 4-story, 100 x 100 ft., rein.-con. addition to factory, rein.-con. flooring, concrete foundation. Architect not selected.

Ill., Chicago—Amer. Car & Fdry. Co., 2847 South Paulina St., purchased 240 x 461 ft. site on Paulina St. and Blue Island Ave. and plans to build addition plant.

Ill., Chicago Fitzsimmons Steel & Iron Co., West 37th St. and Racine Ave., plans to build 1-story plant, on 33rd St. and Kedzie Ave. About $300,000. Engineer not announced.

Ill., Chicago—Lincoln Ice Co., 317 North Elizabeth St., plans to build 4-story, 75 x 150 ft. rein.-con. plant, concrete foundation, at 329 North Elizabeth St. About $100,000. C. M. Almquist, 118 North La Salle St., archt.

Wis., Appleton—Reliance Motor Truck Co., Story and Spencer Sts., plans to build 4-story, 70 x 300 ft. brick, concrete steel addition to factory. About $100,000. Architect not selected.

Wis., Hartford — Paramount Knitting Co., 337 West Madison St., Chicago, plans to build 4-story, 250 x 300 ft. brick, rein.-con. and steel mill, brick foundation, on Main St. here. About $60,000. Architect not selected.

Wis., Janesville—J. G and W. Cronin, 426 Eastern Ave., plan to build ice cream plant. About $70,000. Architects not selected.

Wis., Kewaskum—A. L. Rosenheimer plans to build 4-story, 60 x 250 ft. brick, rein.-con. and steel factory, brick foundation, on Main St. About $50,000. Architect not selected.

Wis., La Crosse—P. Lorillard Tobacco Co., 651 West Doty St., Madison, having plans prepared by J. Law, archt., Stand Bldg., Madison, for 2-story, 150 x 250 ft. factory, on Rose and Sill Sts. here. About $100,000.

Wis., Lancaster — Burnelle-Suttle preparing plans for 2-story, 42 x 60 ft. rein.-con. and brick factory, rein.-con. flooring, brick foundation, on Main St. About $25,000. Private plans.

Wis., Milwaukee—Evinrude Motor Co., 279 Walker St., plans to build, 1-story, 300 x 300 ft. brick and steel factory, rein.-con. flooring, concrete foundation, on 27th St. near Lake St. About $125,000. Federal Eng. Co., Stephenson Bldg., engrs. and archts. Noted Dec. 12.

Wis., Milwaukee — Kalt-Zimmers Mfg. Co., 405 Reed St., plans to build 5 or 6-story, rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation. H. J. Esser, Camp Bldg., archt. and engr.

Wis., Milwaukee—Milwaukee Bedding Co., 292-4th St., plans to build 4-story, rein.-con. and brick factory, rein.-con. flooring, concrete foundation. Architect and engineer not selected.

Wis., Milwaukee—G. Ziegler Co., 362 Florida St., having plans prepared by Brust & Philipp, archts., Free Press Bldg., for 7-story, 80 x 115 ft. rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation. About $250,000.

Wis., Portage Weinbrenner Shoe Co., 66 Juneau St., Milwaukee, plans to build 4-story factory here. About $125,000.

Wis., Sheboygan—Badger State Tranning Co., South Water St. and Maryland Ave., plans to build 3-story, 60 x 250 ft. tannery, brick, rein.-con. and steel, brick foundation, on Water St. About $50,000. Architect and engineer not selected.

Wis., Sheboygan—Excelsior Wrapping Co., 1635 Erie Ave., plans to build 3-story, 60 x 290 ft. brick, rein.-con. and steel factory, brick foundation. About $30,000. Architect not selected.

Wis., Sheboygan Globe Co., 824 Pennsylvania Ave., having plans prepared by W. C. Week, archt., 720 Ontario Ave., for 1-story, 50 x 128 ft. brick and steel foundry and 70 x 150 ft. cupola building. Noted Sept. 4.

Wis., South Milwaukee (Milwaukee P. O.) Universal Aniline Dyes & Chemical Co., 1009 Wells Bldg., Milwaukee, having plans prepared by O. C. Uehling, archt. and engr., 511-1st Wisconsin Natl. Bank Bldg., Milwaukee, for 1, 2 and 3-story dye manufacturing plant to include 1-story, 30 x 40 ft. laboratory, power house, main building, 2 or 3 dye houses, warehouse, office, etc., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $200,000.

Ia., Sioux City—Auto Corp., 201 Morton Mart St., having plans prepared by Osborne Eng. Co., engrs., 2848 Prospect St., Cleveland, O., for 3-story, 175x280 ft. brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation. About $200,000. B. A. Rheinstrom, mgr.

Minn., Detroit—Walz Bros. having plans prepared by Kampfer & Sons, archts., 103 Bates Ave., St. Paul, for 2-story, 42 x 80 ft., ice cream plant, rein. con. and brick. About $52,000.

Minn., Minneapolis — W. T. Rawleigh Co., 9 Washington St., Freeport, Ill., preparing plans for 2-story, 50 x 160 ft., rein.-con. and brick factory, here, on 10th Ave. N. and 3rd St. About $60,000. A. R. Collette, mgr.

Minn., Minneapolis—State Fair Assn. having plans prepared by C. H. Johnson, archt., Capital Bank Bldg., St. Paul, for 1-story, 140 x 240 ft., steel and brick, stock barn on state fair grounds. About $300,000.

Kan., Fort Scott—W. G. Brown, of Brown Motor Co., plans to build 1-story, 50 x 120 ft., rein.-con., steel and brick garage and salesroom, concrete foundation, at 23 South National Ave. About $30,000. Architect not selected.

Kan., Wichita—J. Luling, 1st and Emporia Sts., plans to build 2-story, brick, laundry. About $70,000. Architect not selected.

Kan., Wichita—Sterling Oil & Refining Co., 511 Beacon Bldg., plans to building rein.-con., steel and brick addition to plant, concrete foundation, to increase capacity 4000 barrels per day. About $100,000. Architect or engineer not selected.

Neb., Auburn—City plans election to vote on $60,000 bonds to enlarge electric light plant. Archer & Stevens, 609 New England Bldg., Kansas City, Mo., consult. engrs.

Neb., Lincoln City plans election to vote on $300,000 bonds to extend light plant. Plans include one 3000 k.w turbo-generator, one 500 h.p. boiler, also rebuilding and remodeling plant. Burns & McDonnell, 400 Interstate Bldg., Kansas City, Mo., engrs.

Neb., Norfolk—Armour & Co., 208 South LaSalle St., Chicago, preparing plans for 3-story cold storage and poultry plant. About $100,000. Private plans.

Neb., Sidney—F. M. Wooldridge, c/o Nebraska State Bank, plans to build a 2-story, 72 x 132 ft. cold storage warehouse. About $60,000. Wilson & Wilson, Commonwealth Bldg., Denver, archts.

Mo., Kansas City—Kansas City Bolt & Nut Co., Sheffield, plans to build steel rolling mill, rein.-con., steel and brick, rein.-con. flooring, on Blue River, here. About $1,000,000. C. E. Duncan, Kansas City, engr.

Mo., Nevada — H. R. Primmer, archt., Nevada, preparing plans for 2-story, 97 x 160 ft., rein.-con., steel and brick garage, rein.-con. flooring. About $75,000. Owner's name withheld.

Mo., St. Joseph R. E. Hastings, 311 North 8th St., plans to build grain elevator, in southern section of city. About $200,000 Architect not selected.

Mo., St. Joseph G. W. Helm Grain Co., Corby Bldg., plans to build grain elevator, 3-story, concrete, steel and brick, rein.-con. flooring, rock foundation, on 8th and Olive Sts. Architect to be announced soon.

Mo., St. Joseph St. Joseph Structural Steel Co., 4th and Franklin Sts., plans to construct steel plant, on 8th and Atchison Sts. Plans include steel shop buildings and brick office buildings. About $75,000. Private plans. Work will probably be done by day labor.

Mo., St. Louis—Amer. Seed Co., Franklin Ave. and Bway., plans to construct 3-story, 80 x 95 ft., concrete and brick warehouse, office and other buildings, rock foundation, at 814 North Bway. About $50,000. Architect not selected.

Mo., St. Louis—Central Shoe Co., 17th and Washington Sts., plans to build concrete, steel and brick addition to factory, on Washington Ave. About $70,000. Architect not selected.

Mo., St. Louis — Mineral Refining & Chemical Corp., Iron Mt. R. R. and River Des Peres, plans to build rein.-con., steel and brick factory, rein con flooring, rock foundation. About $4,000,000.

Mo., St. Louis Oliver Electric & Mfg. Co., 4221 Forest Blvd., had preliminary plans prepared for concrete, steel and brick addition to factory. About $100,000. Architect not selected.

Ark., Dermott R. M. Scott, mgr. Dermott Bottling Works, plans to build ice plant, ice cream factory, bottling works and grist mill, here. About $30,000.

Tex., Beaumont—Ford Agency, 509-11 Colorado St., Austin, having plans prepared by H. F. Kuehne, archt., Littlefield Bldg., Austin, for 2-story, 120 x 140 ft. rein.-con. and brick garage, here. About $60,000.

Tex., Ft. Worth—Royal Duke Refining Co. plans to build 1 and 2-story, 5000 bbl., rein.-con., brick and steel refinery, brick and concrete foundation, along St. Louis & San Francisco R. R. T. A. Hilburn, pres. E. E. Costley, c/o owner, engr.

Tex., Ft. Worth—Royal Duke Refining Co., Box 1100, purchased 112-acre site and plans to build steel and concrete, tank farm. E. E. Costley, c/o owner, engr.

Tex., McKinney—McKinney Ice & Coal Co. plans to build ice storage plant, 50 x 50 x 50 ft., brick and concrete. About $30,000.

Tex., Marshall — Coca-Cola Bottling Wks. 107 North Lafayette St., plans to build 70 x 120 ft. brick and concrete factory. About $100,000.

Tex., Wichita Falls—Holliday Refining Co. plans to build refinery. About $500,000. J. G. Lawrence, Little Rock, Ark., engr.

Okla., Chickasha — Walker Refinery plans to build refining plant, to increase capacity from 1000 to 4000 bbl. E. White, Chickasha, engr.

Okla., Henryetta—A. Rowing plans to build 2-story, 70 x 160 ft. factory, on Main St. About $75,000. Architect and engineer not selected.

Okla., Nowata—City election in December to vote on $200,000 bonds to build electric light and power plant.

Okla., Pawhuska—A. J. Love & Co., archts., Pawhuska, preparing plans for 2-story, 50 x 140 ft. rein con., steel and brick, factory, rock foundation. About $65,000. Owner's name withheld.

Idaho, Boise—Idaho Co-operative Sugar Co., 90 Idaho St., preparing plans for four 2 and 3-story concrete factories, concrete foundations, in southwest section of city. About $2,000,000. R. G. Cole, mgr.

Idaho, Caldwell Interstate Warehouse Co. plans to build storage house, 1-story, concrete, concrete foundation, cost $50,000; grain elevator, 2-story frame, concrete foundation, $50,000. Architect not selected. B. M. Holt, dir.

Nev., Reno — Sierra Auto Supply Co. having plans prepared by G. C. Sellon & Co., archts., 1005 8th St., Sacramento, Cal., constructing automobile sales station and loft building, 4 story, brick. About $60,000.

Wash., Pullman T. C. Martin plans to build 2-story, 120 x 120 ft., brick and terra cotta garage and shop, on Grand and Oleson Sts. About $40,000. W. Swain, Pullman, archt.

Wash., Spokane Blazeout Co., recently incorporated, plans to build 2 or 3-story, concrete factory, concrete foundation. About $100,00. Private plans.

Wash., Tacoma—J. C. Heitman, 111 South 10th St., and J. A. La Gasa, Ansonia Apts., plan to build 3-story, 65 x 130 ft., rein.-con. garage, on South 9th and E Sts. About $50,000. Architect not selected.

Wash., Walla Walla—H. H. Harris Mfg. Co., Park and East Sts., Stockton, Cal., purchased the Gilbert Hunt Mfg. plant, here, and plans to establish foundries and construct several new buildings. Cost, including equipment, $350,000.

Ore., Astoria—C. H. Davis, Jr., and Weyerhaeuser estate, Northwestern Bank Bldg., Portland, purchased 3200 acre tract along Youngs Bay and plans to build 2-story, concrete and timber mill. About $75,000. Architect not selected.

Ore., Cottage Grove—Woodson Bros. purchased site and plan to build 2-story, 100 x 100 ft., rein. con. garage and machine shop. About $50,000. Private plans.

Industrial Works (Continued)

Ore., Marshfield—Rupert Co., Worcester Bldg., Portland, plans to build 2-story, 200 x 400 ft., cannery, timber, concrete foundation, in Coquille Valley, here. About $50,000. A. M. Mears, mgr. Architect not selected.

Ore., Marshfield—Southern Pacific R. R., Yeon Bldg., Portland, preparing preliminary plans for 2-story, 25 x 150 ft., freight depot and warehouse, frame, concrete foundation, on Bway, St. About $50,000. A. Mercier, Portland, supt. Private plans.

Ore., Oregon City—Stuart Non-Puncturable Liner Tire Co. plans to build 2 or 3-story, brick or concrete factory. About $50,000. C. A. Stuart, Oregon City, pres. Architect not selected.

Ore., Roseburg—City having preliminary plans prepared by F. Freaser, city engr., for light and water power plant on North Umpqua River, near Rock Creek, also for building concrete dam and laying cast iron pipe line from reservoir site to city. About $400,000.

Ore., Roseburg—C. W. Parker plans to build 2-story, 75 x 100 ft. concrete garage, concrete foundation, on Rose St. About $50,000. Private plans.

Ore., Salem—Salem Paper Mill Co. plans to build 2-story, 86 x 275 ft. concrete plant, concrete foundation, with 3-story tower on each end and concrete pier walls with glass between piers. About $50,000. Private plans.

Ore., Silverton—Coolidge Co. plans to build 1-story, 40 x 68 x 93 ft. brick garage, concrete foundation, on 1st and Lewis Sts. About $50,000. Architect not selected. Johnson & Simmons, lessees.

Cal., Bishop—Watterson Bros. having plans prepared by Eng. Serv. Co., engrs., 816 Washington Bldg., Los Angeles, for 1-story, 71 x 150 ft., rein.-con. garage, concrete foundation.

Cal., Gustine—Carnation Milk Products Co., Stuart Bldg., Seattle, Wash., plans to build 7-story plant, here. About $250,000

Cal., Hanford—Swift & Co., 76 West Monroe St., Chicago, plans to build 2-story, rein. con. creamery and warehouse, here. About $150,000

Cal., Los Angeles—Bekins Fireproof Storage Co., 1335 South Figueroa St., plans to build 4-story, 50 x 150 ft. storage plant. Architect not selected.

Cal., Los Angeles—Goodyear Tire & Rubber Co. of California plans to build cotton mill at 6601 Central Ave., 3 story, 130 x 580 ft., rein.-con. About $300,000. Condron Co., 53 West Jackson Blvd., Chicago., archts.

Cal., Los Angeles—W. E. Hampton, c/o Shepherd & Hamm, archts. and engrs., Central Bldg., Pasadena, having plans prepared for group of buildings on 10 acre site, on 6th, Industrial, Mill and Mateo Sts., to consist of warehouses, packing house, ice factory and cold storage building. About $750,000.

Cal., Los Angeles—Pacific Sewer Pipe Co., 306 West Ave. 26, plans to build factory. About $150,000. Architect not selected.

Cal., McCloud—McCloud River Lumber Co. plans to build 3-band mill, etc., to be operated by electricity instead of steam, brick refuse burner, 150 ft. high, 50 ft. diameter. About $500,000. Work involves 785,000 common brick, 1650 bbls. cement, 800 bbls. lime, 1,000,000 ft. lumber, etc.

Cal., Oakland—Bisceglia Bros., Monterey Rd., San Jose, purchased site, on High St. and Tidal Canal, here, and plan to build packing plant. About $200,000. Architect not selected

Cal., Oakland—Pacific Tank Co., 318 Market St., San Francisco, plans to build warehouses and docks along waterfront.

Cal., Sacramento—J. Brenner Co., 604 K St., having plans prepared by E. C. Hemmings, archt., 1203 J St., for 2-story, rein.-con. garage and shipping building, on 6th and L Sts. About $50,000

Cal., Sacramento—A. R. and E. A. Meister, 403 9th St., purchased 5½ acre site on 12th St. Rd., and having preliminary plans prepared by E. C. Hemmings, archt., 1203 J St., for concrete, brick and timber factory. About $200,000

Cal., Whittier—Standard Oil Co., 1727 North Spring St., Los Angeles, purchased 9½ acre site near here, and plans to build refinery.

N. B., Moncton—City Council appropriated $30,000 to extend electric light plant. J. Edington, engr. Clip

Que., Montreal—S. Osborn Co., St. Antoine St., plans to build 3-story, 50 x 70 ft. steel and brick factory, concrete foundation. About $25,000. E. Cormier, St. Catherine St. E., archt.

Que., Quebec—P. Marton & Co., 50 St. Paul St., had plans prepared by C. Dufort, archt., 195 St. Catherine St., Montreal, building 4-story, 60 x 100 ft., concrete, steel and brick warehouse, rein.-con. flooring, concrete and rock foundation. About $90,000.

Que., Quebec—J. Ritchie Co., Ltd., 39 St. Helene St., preparing plans for 3-story, 50 x 75 ft., steel and brick factory, concrete foundation. About $35,000.

Ont., Brockville—Brockville Paper Mfg. Co., having plans prepared and soon receives bids building factory on Park St. N. About $60,000.

Ont., Goderich—Lake Huron Steel Corp. purchased 250-acre site along Lake Huron and plans to construct 1-story, brick and steel plant, concrete flooring, to consist of blowing, rod and bar mills. Cost between $6,000,000 and $10,000,000. E. H. Beck, Goderich, ch. engr.

Ont., Hamilton—International Plow Wks. having plans prepared by B. H. Prack, engr. and archt., Lumsden Bldg., Toronto, for brick, steel and concrete factory, concrete flooring and foundation, probably 1 story. About $50,000.

Ont., Toronto—Blackford, Davies & Co., 60 Front St. W., plans to build 10-story, 40 x 150 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, at 48 Bay St. About $200,000. Engineer not selected.

Ont., Toronto—Cutten & Foster, 302 Church St., having plans prepared by W. Steel & Sons, archts. and engrs., Ryrie Bldg., for 3-story, 60 x 120 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Church St. About $80,000.

Ont., New Toronto—Goodyear Tire & Rubber Co. preparing plans for 4-story, 80 x 300 ft., rein con., steel and brick factory, rein.-con. flooring, concrete foundation, on Lake Shore Rd. About $200,000.

Ont., Toronto—Ideal Bedding Co., 10 Jefferson Ave., having plans prepared by C. J. Gibson, archt., Excelsior Life Bldg., for 3-story, 50 x 100 ft. brick and steel addition, concrete flooring and foundation. About $50,000.

Ont., Toronto—Pearson Bros, Ltd., 17 Adelaide St., E., plans to build 3-story, 60 x 220 ft. rein.-con. and brick garage, concrete flooring. About $100,000. Architect not selected.

Ont., Wingham—Town voted $40,000 bonds, thereby authorizing Hydro Electric Power Comm. of Ontario to build power plant and distribution system. Work includes 30 mi. power line from here to Eugenia Falls. E. A. Gaby, Hydro Bldg., Toronto, engr.

Buildings

PROPOSED WORK

Me., Auburn—Memorial—City Memorial Comm. plans to construct memorial building to include clubrooms, community center, etc. About $250,000. Architect not selected

Me., Bangor—Theatre—B. S. Moss, 729 7th Ave., New York City, plans to build 100 x 100 ft., brick, steel and stone, brick foundation, here. About $400,000. De Rosa & Pereira, 116 West 40th St., New York City, archts. and engrs.

Vt., Barre—Theatre—Brattleboro Theatre Co. plans to build theatre, with 1200 seating capacity. About $150,000. E. C. Farrington, pres. Architect not selected

Me., Bath—Hotel—Bath Hotel Co., 97 Exchange St., Portland, plans to build large hotel here, to be known as "Hunters Lodge." About $500,000. Address I. E. Vernon, c/o owner. Architect not selected.

Mass., Blackstone—Library—Memorial Bldg. Comm. plans to build 1-story, stone library. About $50,000. Architect not selected.

Mass., Boston—Dining Room, etc.—Comm. on Mental Diseases, 36 State House, had plans prepared by Kendall, Taylor & Co., archts., 93 Federal St., for 2-story dining room (west group) and 2-story, nurses home, brick and steel, for Boston State Hospital. About $80,000 and $75,000 respectively. G. M. Kline, dir.

Mass., Brockton—Theatre—B. S. Moss, 729-7th Ave., New York City, plans to build 100 x 100 ft., brick, steel and stone, brick foundation. About $400,000. De Rosa & Pereira, 110 West 40th St., New York City, archts. and engrs.

Mass., Easthampton—Church—Church of Notre Dame plans to build brick and stone church on Pleasant St. About $100,000. Architect not selected.

Mass., Fall River—Hospital—City plans to build brick and steel hospital. About $150,000. D. H. Fuller, supt. of hospitals. Architect not selected.

Mass., Fall River—School—St. Anne's Roman Catholic Church plans to build school. About $150,000. Architect not selected.

Mass., Greendale (Worcester P. O.)—College—Assumption College plans to build addition to college. About $500,000. Architect not selected.

Mass., Holyoke—Church—Unitarian Church, 40 Morgan St., plans to build church on Appleton and Poplar Sts. About $50,000. A. H. Coar, pastor. Architect not selected.

Mass., Leominster—Hospital—City plans to build hospital. About $150,000. B. W. Doyle, chn. com. Architect not selected.

Mass., New Bedford—Community—City plans to construct memorial community house. About $300,000. Architect not selected.

Mass., North Adams—School—City plans to build school and athletic field on State St. About $100,000. Architect not selected. B. J. Merriam, supt.

Mass., Northampton—College—Smith College, College Hall, plans to construct physics and geology building, on campus. About $150,000. W. A. Neilson, pres. Architect not selected.

Mass., North Reading—Dormitory—State Comm. Mental Diseases, Boston, having plans prepared by H. F. Kellogg, archt., 93 Federal St., Boston, for 2-story, 42 x 86 ft., brick and timber, on state grounds, here. About $50,000.

Mass., Pittsfield—Hospital—Hillcrest Hospital, North St., plans to build two 3-story, brick, concrete and steel additions with connecting corridor. About $150,000. Architects not selected.

Mass., Pittsfield—School, etc.—Berkshire Co. Home for Crippled and Deformed Children plans to construct school, dormitory and industrial building. About $100,000. Architect not selected.

Mass., Provincetown—Hospital—Town plans to build 3-story, memorial hospital. About $150,000. Architect not selected.

Mass., Quincy—Housing—J. S. Draper, 10 State St., Boston, having plans prepared by J. E. McLoughlin, archt., Tremont Bldg., Boston, for one hundred 2-story houses on Sea St. Plans include building sewers, sidewalks and 5 mi. of streets. About $1,000,000.

Mass., Quincy—Theatre—B. S. Moss, 729 7th Ave., New York City, plans to build 100 x 100 ft., brick, steel and stone, brick foundation, here. About $400,000. De Rosa & Pereira, 110 West 40th St., New York City, archts. and engrs.

Mass., Shrewsbury—Church—St. Theresa Roman Catholic Church plans to build 1-story, 35 x 85 ft., brick. About $60,000. Private plans.

Mass., South Hadley—Dormitory—Mt. Holyoke College having plans prepared by Brainerd & Leeds, archts., 89 Franklin St., Boston, for 3-story, stone and concrete, concrete foundation, on campus. About $500,000. Noted July 31.

Mass., Springfield—Bank and Office—Atlas Trust Co. plans to build 10-story, brick, concrete and steel, on Main and Court Sts. About $500,000. Architect not selected.

Mass., Springfield—Club—Amer. Legion of Springfield plans to build brick and steel Spring St., About $250,000. Architect not not selected.

Mass., Springfield—Hotel—D. H. Sievers & Co., Hillman St., having plans prepared by W. B. Reid, archt., 226 Walnut St., Holyoke, for 6-story, 100 room, brick and steel addition to Highland Hotel, on Hillman St. About $100,000. Noted Aug. 7.

Mass., Springfield—High School—City plans to build vocational high school on Spring St. About $250,000. Architect not selected.

Mass., Springfield—School—City plans to build 22-room grammar school on School and High Sts. About $225,000. Architect not selected.

Mass., Springfield—Store—A. Steiger Co., 345 Main St., purchased Lange Bldg. on Bridge St. (4-story), and plans to remodel same for own use. About $50,000.

Mass., Webster—Hospital—Chamber of Commerce plans to build new hospital. About $125,000. Architect not selected.

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ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, Editor — Charles Whiting Baker, Consulting Editor

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Combined Issues

AS A RESULT of the strike we have lost four issues of *Engineering News-Record*. We are faced with the alternative of dropping them entirely or of catching up by getting out issues with greater frequency and increasing the amount of reading matter in a certain number of issues. We have decided on the latter course. From now until the end of the year we expect to put out a copy of the paper every five days, combining eight issues into four. This issue, therefore, carries the dates of Oct. 30 and Nov. 6. By the making of these combinations, the bound volume will show all serial issue dates and thus avoid confusion in later years. Each of the combined issues will carry additional text matter, principally in the technical section. The departments—editorials, letters to the editor and the news—will remain about normal. We shall not, even by these expedients, make up a volume of reading matter equivalent to what we have lost, but we will give weekly far more than even the studious reader will be able to digest. Thus, while not living up to our normal intentions, we believe that we shall fully satisfy all our readers, and that whatever loss there is in total pages they will gladly stand as their contribution to the winning of the strike. By doubling up issues and publishing every five days we shall get on normal schedule again at the beginning of the new year.

A Series of Transportation Monographs

THIS issue concludes the second of three monographs on transportation prepared for *Engineering News-Record* by its consulting editor, Charles Whiting Baker. The first was a comparison of the cost of hauling by rail and by motor truck, published July 10, 1919; the one now concluding is on the railroad problem, while the third, which will appear within 60 days, is on waterways. These three monographs, representing substantially a year's investigation and study, were prepared in recognition of the vital bearing of transportation on our economic life. We need not repeat what everyone knows, that failure to handle effectively our railroad problem will bring widespread disaster. Anyone who can make a real contribution to the solution confers a public benefaction. Equally sound reason underlies the monographs on truck haulage and waterways. Motor trucking is a form of transportation of growing importance. Within what limits is it economical? Where is the line of demarcation between economical truck and railway carriage. These questions Mr. Baker sought to answer in July. The remaining monograph—by far the longest—is a most vigorous and scholarly discussion of the waterway problem. It handles the subject without gloves, and will come as a tonic after all the wishy-washy thinking and wild-eyed propaganda on waterway improvement.

Coal and Construction Materials

THE coal situation is so very serious that one must put in the background personal interests, yet engineers and contractors should know that the present short market will be made shorter still by the stoppage of practically all plants producing structural materials. The brick plants, both building and paving, the lime kilns and the cement mills, have been shut down on account of coal shortage, and the steel output is being curtailed. This will react seriously on an already unsatisfactory building situation, to say nothing of the unemployment and loss that will occur in these structural-material industries themselves. Serious as this situation is, it takes the second place to domestic and public-utility necessities. The Government has been struggling with the situation, but the time is here when action is necessary to prevent severe suffering. If reasonable compromise will not bring a general return of the strikers, there will have to be military protection to let those work who wish to do so, and possibly also military operation of the mines. Coal must be had.

The New Industrial Conference

WITH the appointment of a new group to study the industrial situation, the President falls back on a theory diametrically opposite to that on which the abortive National Industrial Conference was called together. The theory of the first attempt is that on which we have generally acted in the composing of industrial disputes—that the two parties at issue should come together presenting their respective cases, with an arbitrator to endeavor to get either or both of the parties to accept compromises. The theory of the new effort is that the public, the chief party at interest, should take up the whole problem as it sees best and, through the fairness of its findings, impress its solution on the parties at odds. Proceeding on that theory, the President—in part, at least—has selected well. In Herbert C. Hoover he has picked a man as sound in his thinking as he is able in administration. In Oscar S. Straus, in former Attorney General Wickersham, in Dr. W. C. Thompson, in Julius Rosenwald, he has chosen clear thinkers, each with a different angle on the problem but having in common a deep sense of the obligations which the parties to the controversy owe to the public. With the others we are less well acquainted; that they are broad-gaged can be taken for granted. If that be so, there is leadership enough in those mentioned by name to give warrant for hoping for a good result. Of course, it is not conceivable that any body should be able to bring instant or early industrial peace, but there should be the possibility of enunciating a program which the public could take hold of and gradually and systematically force upon employers and employees.

Paternalistic Standardization

GOVERNMENT officials should not be held too strictly to account for statements they make before a Congressional appropriation committee. The science of wheedling necessary funds out of reluctant Congressmen calls for tactics directed mainly to that end. But the suggestion of the Director of the Bureau of Standards for the routine commercial testing of cement by the Government, as noted on p. 671, should not be passed unnoticed. Whatever is the intention of those in charge of the bureau, the idea of a series of warehouses loaded with Government-tested cement for sale to whoever would buy exceeds the bounds of toleration. Passing by the obvious sales difficulties inherent in such a scheme, and avoiding here, at least, the ready arguments against Government competition in what is not a matter of public service or interest, the issue may be clearly stated. Do we want an official control of materials in this country? Doubtless the bureau would deny any such intention, but the time to stop any such tendency is when it begins. If cement, why not steel and if steel then canned beans and motor tires? Already the bureau is working on standards for the technical performance of public utilities and on safety ordinances, so the range of its ambition is catholic. Some definite restriction must be made, some limit fixed to the functions of a Government research and standardization body.

Business for Breakfast

EXTENSION of the discussion period, when interest in any subject outlasted the time scheduled for its consideration in regular session, was accomplished at the Cleveland convention of the Construction Section of the National Safety Council by inaugurating breakfast clubs. When, at a session, it came time to proceed with the next item and discussion was still active, the chairman called on one of those who had been leading the debate to head a breakfast club and asked those who wished to continue consideration of the subject to meet with the leader. Each morning of the convention witnessed a number of these breakfast clubs and from experience at some of them the editor can testify that they were successful in clearing up debated questions and in creating personal contacts difficult to form in the regular sessions. Not the least important advantage of the practice is that it expedites the proceedings by providing a by-pass for an unexpected volume of discussion on subjects not of wide interest to the members generally. The idea worked at Cleveland lets everyone interested come in on the dining table discussion.

The Common Basis of Professionalism

THE discouraged seeker after light in this troubled age would have found consolation in the atmosphere that pervaded the Inter-Professional Conference that met in Detroit last week. There was frank confession of failure to fulfill the primary professional obligation, that to society, but when the speakers turned to the future they collectively pictured an appreciation of the duty to the public that was inspiring. If that which they pictured could be made fully operative in the profession, if those standards could be carried forward strongly so that the public would force them on all the manifold activities of life, the ills of the minute would disappear in direct measure with the extent of acceptance.

Manifestly, overnight conversion of the professions is not possible, and the conferees did not belittle their task. But there are stirrings in every profession, groups here and there struggling to have the highest ideals accepted within their ranks, that justify not merely a beginning of inter-professional discussion but also the hope that a force of great power can be generated with reasonable speed.

Nor must it be thought that the conferees lost themselves in idealism and forgot the conditions in which and with which they must work. In fact, the whole purpose was to see how forces could be united, first for mutual strengthening in professional faith and, second, for developing methods of attack on actual problems. When a dentist described a ten-year campaign to convert his own profession to advocate preventive rather than corrective work, when a surgeon told the story of war coöperation with architects and sanitarians in order to get the best results, when an architect explained how the whole city plan must be his first concern and not the interest of a client who wants a certain improvement on a certain plot, the ground was never far away from the conferees' pet.

Yet it is true that ideals controlled the conference. The business of the new body is to translate ideals into action. The dominant thought was that the profession —that professional men and women—must see that all their work promotes first the public interest. Inhibitions are recognized—indifference and selfish interest within the professions and without—and those present frankly blamed the professions themselves for conditions rather than the outsiders. They recognized that their obligations spring from the "heritage of knowledge and skill" which the ages have accumulated and with which they, for a brief span, are privileged to work. That heritage was accumulated by the whole people; to them it belongs. They have a right to demand that it shall be used in their interest, not against them; and whereas they have the right to demand, the professional man is under obligation to deliver.

It may be said that those in callings other than the professions are similarly utilizing the accumulated knowledge of the ages, and have a similar obligation to the public. That is exactly true, and it is the failure to discharge this obligation that is responsible for the present untoward social conditions. If all business had, since the modern industrial period began, been run with an eye first to the interests of the public—not merely as to the character, use and quality of the product, but to the effect on the operatives and the local community—we should be lacking in our labor difficulties, in our slums, in our overgrown cities, etc., of the present day. This is not a new thought. Everywhere we hear the idea that "business must become socially minded." For a generation we have been enacting laws to bring it about. We have tried to clip the fangs of the trusts, we have established workmen's compensation laws, we forbid the working of women at night and of young children, we demand safeguards in hazardous occupations.

So, the Inter-Professional Conference was merely in tune with the accepted theory of the present day. It sounded its note higher and clearer than we get it in the mart or the factory. There was no discordant note of compromising the public interest for the sake of profit. Therein lies its strength, that it comes from the

only group that is even measurably free from sordid interests. Only this group can be the leaven that shall lighten the whole lump.

Mr. Baker's Solution of the Railroad Problem

NO EXPLANATION needs to be offered for the use of so many pages of this issue and the last for the discussion of the railroad problem. We are in a precarious position. The railways are struggling along with equipment and facilities inadequate for even the traffic of the moment If that large production should come for which we are all pleading, the roads could not handle it. In fact, it is probable that a production representing even a 50 per cent. average increase in efficiency of all workers would be impossible of attainment due to the sheer inability of the railways to carry the raw materials to the operatives. To prepare the roads for the traffic which normal peace operations should offer will require, according to Samuel O. Dunn, editor of the *Railway Age*, the expenditure of $6,000,000,000 in the next three years.

With this situation confronting us—the railroads hampering our industrial life—we find them mistrusted by the public, disorganized through war-time Government operation, stripped of all credit by inadequate revenues—in fact, in certain bankruptcy were the Government's sustaining power withdrawn.

In this predicament what solution does Mr. Baker offer in the monograph concluded in this issue? He goes to the root of the difficulty, which is the lack of confidence on the part of the public in railroad management, and proposes that the railroads be managed by public corporations, composed of a directorate elected one-third by (1) the stockholders, one-third by (2) the officers and classified employees, and one-third by (3) the public. A fixed return would be allowed the stockholders; the question of sharing in profits above the fixed return he leaves open.

This solution, while obviously not satisfying extremists in either the labor or banker ranks, meets the generally conceded essentials. It provides a basis for public confidence; it eliminates stock-manipulation of properties; it places service to the public first; it retains private ownership and private operation, though in the operation two-thirds of the control lies with nonowners —the public and the railroad employees.

Obviously, such a plan would be experimental. But any plan that deals adequately with the situation must be so. It must, therefore, be examined on the basis of its probable feasibility. The charge most likely to be made against it, is the unfairness of removing control from the owners. We should fear that ourselves were safeguards not erected for chosing the controlling two-thirds of the directorate. One-third would be nominated by the officers and employees, with the former probably exercising the predominating influence; that should insure the selection of efficient railroaders. The other third would be nominated by business and civic organizations, and would probably be business men of proved worth. Nominations would be subject to the *visé* of the Federal Railroad Board, whose political slant, if it had one, would hardly go so far as to play politics with the nominations of business organization and the officers of the roads. The public interest would be too strong to permit of such political use.

Yet while the plan is new we have had something in the way of precedent in the joint public and private control of the street-railway systems of Chicago and Kansas City. The Chicago systems under this joint control was entirely rehabilitated, and the feasibility of the plan proved. The Kansas City arrangement is of relatively recent date.

Mr. Baker's strictures on the past conduct of the Wall Street railroaders are severe, but deserved. With close supervision of financing as the sole change in railroad supervision much of the speculative danger would be removed, but we believe that even this removal would not restore the Wall Street type of management to public favor. Even if profits were to be restricted we should expect the public to be dubious about placing these enormous powers again in the hands of private corporations. In any event, the supervision would be so close and the restrictions on the freedom of the operators such as to amount to Government conduct of the properties. Facing this almost certain result, Mr. Baker takes a bold step forward and suggests a solution that will at once restore public confidence, while retaining private ownership and avoiding the evils of public operation. His solution, as we see it, offers hope that the drift which Colonel Wilgus and Mr. Lindenthal believe will inevitably result in public ownership may be checked. After all, the great majority of the public do not actively desire public ownership. They may stand by with folded hands and see it come, merely because they have been dissatisfied with past management. What they do desire, though, is a conduct of the properties in the public interest first, and the elimination of the stock-jobbing and property-busting of the past. If they can be assured of these things they will be willing to see the properties continue to be privately owned.

With one part of Mr. Baker's discussion we are in accord only if suitable qualification be understood. At the end of Chapter VI he points out that the surplus should be applied to amortization. With a reasonable rate of amortization, of course, we are in accord, and it is such a rate to which Mr. Baker has reference. In fact, it is not conceivable that a high rate of amortization could be provided for in the tariffs. Nevertheless, the inference might be drawn that speedy amortization is desirable in order to eliminate private capital. That, in our judgment, would be undesirable. The retention of private capital is one of the strongest features of Mr. Baker's scheme. The proprietary interest would always have to be reckoned with, and would be an effective barrier against political football-balling. It would, moreover, prevent that indifference to the volume of investment which is characteristic of Government enterprise.

Obviously, a day may come when a stationary population will have allowed the railway system to be developed to a reasonable maximum. With great traffic density, fairly rapidly amortization, with the title to the properties correspondingly accrung to the public, would then be possible, but that day is so far away as not to figure into present calculations.

The Baker plan appeals to us, then, as worthy of the most careful consideration. It avoids radicalism, but in so doing it does not fall into the error of most, if not all, of the other conservative plans, in failing to meet all the essentials. Above all, it gives that assurance of the winning of public confidence without which no plan can succeed.

An Appraisal of Modern Plant Performance in Concrete Road Construction

Increasing Use of Machine Instead of Hand Methods Only Emphasizes Importance of Managerial Ability and Organizing Genius on the Part of Contractor—Machinery Cannot Make a Road Job

By H. D. Hammond
The Lakewood Engineering Co., Cleveland, Ohio

WHEN one has made a tour, such as the writer has just completed, of this season's concrete road work in the Central and Eastern states and has studied the new methods and the old side by side, one feels more strongly than ever the force of the fundamental rule of contracting—that the contractor stands or falls by his own ability. Give the organizing genius two hundred dollars' worth of wheelbarrows and a mixer, and he will break the state record for square yardage laid, even if he has to beat the time specifications of the state to do it. Give the less able organizer the finest mechanical layout in the world, coördinated to a hair, and the "minute mix" is as safe from violation on his job as the North Pole. Give the organizing genius sixteen mule teams and he manages so that he shall never run out of materials, though every other contract in the state is shut down. Give the other fellow forty thousand dollars' worth of the finest tractors and trailers to be bought, and he cannot keep a two-bag paver busy with them. Give the genius a line of inferior track, in poor shape when it hits the works, the cheapest rolling stock that any maker ever had the nerve to sell, and locomotives that "may hit back on the track when they go up on a tangent, but never ketch it again when they take a flyer on a curve," and he will make an average running time of 11 miles an hour for his job, including wrecks and all delays. Give the ordinary man the finest track, rolling stock and motive power, and he tells you about how much concrete he "will get in today," when you have just found him averaging less than four miles an hour with such of his transportation equipment as was in commission.

As is the case with all improvements in means and machinery for doing things, those who have applied mechanical equipment to road construction have made a great contribution to highway expansion. They have raised the general average of performance among contractors. They have given the organizing genius something to work with and he has not been slow to take advantage of it. They have given the average man something to think about. In addition, they have made possible a scientific accuracy and uniformity of result in the construction of concrete roads that was the despair of highway departments but a very brief while ago. The type of plant to which these observations apply is that which includes a subgrader and in which the materials are stored at a central plant and brought to the mixer over an industrial-track system.

It is nothing new to assert that subgrade which is not uniform is responsible for much failure of concrete pavement slabs. Neither is it surprising to find that one of the first efforts and one productive of the best results in the campaign to apply mechanical methods to highway work was to provide a smooth, accurate mold for the concrete, of which the forms are the side and the subgrade the bottom. This mold is made cheaply, made right in the beginning and never disturbed till the finished concrete is placed thereon. A machine with horizontal cutting knives, pulled by the tool which rolls the subgrade, riding at exact and unvarying eleva-



BATCH CHARGING WITH REMOVABLE CAR BODIES FROM INDUSTRIAL-RAILWAY SYSTEM ON ROAD SHOULDER

tion on solid steel forms, shaves the grade down a fraction at a time till it has been cut and rolled to exact elevation, and is uniform from side to side and end to end. The machine does the work at a part of the cost of hand labor. One operator and the roller man constitute the ordinary crew. Compare this with an average of several contracts where the work was being done at an expenditure of 60 man-hours for every day's run of subgrade prepared—and reflect that the machine and the roller can double this output, working part time, or going on as far ahead as the contractor cares to provide forms, and then laying off.

Look at the saving from a much more important angle. With a subgrade formed by this equipment the area of the actual pavement cross-section does not vary a quarter of one per cent. from that shown on the blueprints of the highway department. The best hand subgrade the writer found this year produced a cross-section which varied 1½% from the theoretical, and they ran all the way up to 10%, with the average nearer the top than the bottom. Of course, it is necessary that this variation shall always result in placing more concrete and never less than called for on the plans, for to average the variation would produce a succession of weak spots in the concrete. If you had contracted to put down 60,000 sq.yd. of highway concrete, rich in expensive cement, for $3 per yard, as many have, and at that price found yourself delivering $2700 to $18,000 worth of extra concrete *for nothing*, would you be interested in accurate subgrade? And remember that the fellow who escaped with the $2700 worth, so to speak, was working under antiquated specifications regarding rolling. His record had been made by filling up the low spots with loose dirt right around the mixer—a practice to which some engineers might object. The public, of course, pays in the long run for this extra concrete. Except for careless bids, it is always figured in by those who have had experience.

Aside from cost, compare the method of applying machinery with older methods. The hard, compact, accurate, uniform subgrade is there ready to receive the concrete—and does so receive it. After good money has been spent aligning a wall form and bracing it, would any engineer permit this form to be banged and knocked an inch or so out of adjustment? Yet, where materials are hauled over and placed on the subgrade, the road suffers worse treatment than this. With the new method, however, nothing is put on the subgrade, nothing travels over it or cuts it up, after it is finished, except, of course, the concrete mixer. The mixer can be, and usually is, so carried that its weight, traveling but once over the grade, scarcely leaves a mark. All this is accomplished by bringing the concrete materials up the shoulder of the road, by moving the storage area back from the road and by adopting the system of batch charging. The obvious economies in man-power of this system are well known, in theory. The superior results in terms of finished road are beginning to be appreciated. The ultimate economy of the system, then, is no longer in question. It would come, even if it involved extra payment, because the results achieved with it are worth the price. But even its immediate economy is now no longer a matter of theory. Just what is being done in terms of dollars and cents with these new methods? It is the answer to this question that the writer set out to find; some of the pertinent facts are set forth below.



IN THE TUNNEL PLAN OF HANDLING, THE MATERIAL IS UNLOADED WITH BUCKET AND LOCOMOTIVE CRANE AND ENTERS NARROW-GAGE CARS THROUGH TRAPS, WITHOUT REHANDLING

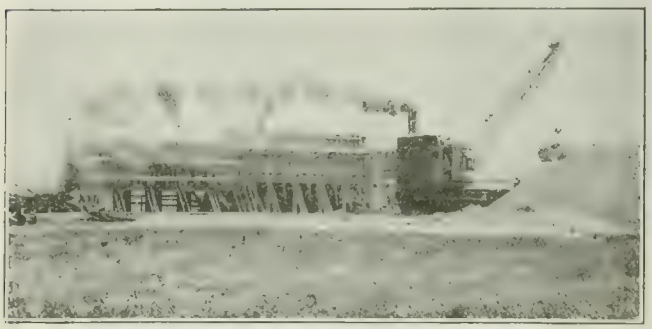
The case of the subgrader and its savings have been told. Suffice it to add that even before the concrete-finishing machine which made California famous had made its bow, the inventor of that finisher was known from Oregon to Mexico as the "subgrader king." That state no longer lays a road on which this tool has not shaped the grade.

Improvement in Central Loading Plants

The first great objection which was met in attempting to introduce central loading plants and batch transportation in the East was the cost of right-of-way for such plants and of possible right-of-way for industrial track. It is not out of place, therefore, to state that of all the work examined, the cost of such right-of-way ran from nothing, in some cases, and $5 in one, up—but not very far up. In fact, $200 a season now seems rather exorbitant for a yard site, where $2000 a season was considered conservative in estimating some of the work under way. The additional cost of constructing sidings can be furnished the prospective road builder and will be so furnished on application to the railroad concerned. Final net costs run from $1.50 to $2 per foot. This for cases where sidings of sufficient size do not exist. And, before we lose sight of the matter, inadequate siding capacity is handicapping more plants than any other one thing. As for bins, those inspected cost from $500 per car of capacity, for good bulk cement bins, down to $350 per car of capacity for very fair sand bins. Such bins rarely exceed 200-cu.yd. storage. With the tunnel plan, on the other hand, 600 cu.yd. of stored material, which would flow through the traps without rehandling, was secured on perhaps the most expensive installation in the country at a total cost of $1900—less than that of the smallest bins with which an industrial plant layout has been operated. Other installations cost as low as $1.20 per cubic yard of material that would flow, and barely 30c. per cubic yard of total storage.

Both bulk and sacked cement are being used in such installations, and of course the bulk is the cheaper and quicker to handle. It takes, for instance, 3 sec. by the stop watch for the average barrel batch of bulk cement to slip out of the scale and find a home in the batch

box, while the best efforts of three men clocked in loading sacked cement into batch cars direct from the sack was about 18 sec. per barrel. This handicap, however, is overcome by using quick-dumping boxes into which the cement is put between trains. The train slides in, and 10 or more of these boxes are discharged into it almost simultaneously. However, it is obvious that when better storage and handling methods for the use of bulk cement have been worked out (and they are



A 30-YARD SAND CAR WAS UNLOADED IN 12 MINUTES AT THIS PLANT

being worked out) this cheap and convenient method of shipment will come into its own on road work all over the country.

"Charging batch cars is the easiest thing we do on the average road contract," says one Eastern operator who loads 18 cars with four-bag batches in 15 min. In the Central states they are satisfied to load a batch a minute, which is considerably faster than most states will permit putting the batches into the road. However lest suspicion be directed against the Easterner, let us hasten to add that he is running two mixing plants to capacity from one central station and getting in as high as 1600 sq.yd. of good, solid concrete in 10 hours. Another road builder near Chicago loads 15 batches in 10 min., but the batches are three-bag size. To reach this speed requires 5, 6 and 7 men, with or without the service of a locomotive to spot the trains. The preference, naturally, is to have a gate in the tunnel for every car length, so that three spots per train are sufficient. However, loading just as fast has been accomplished with two gates for each kind of material and bins, handling the cars by hand. The chief advantage of having a gate every car length thus appears to be the ability to draw all of the material off the top of tunnel by gravity. On some jobs cars are spotted by hand, some employ a hoisting engine (which adds an extra man, as does locomotive spotting, and others, again, arrange their tunnel track on a slope (6 to 9 in. to 100 ft. seems best) and spot by gravity. In addition to the car chargers, two or three men cleaning up cars, a fireman and operator for the unloading rig and a foreman are required at the average unloading plant.

Locomotive cranes or traction cranes are pronounced by the stop watch to be the fastest tools used for unloading cars. Derricks are often 100 per cent. slower, but can be made to do. It made little difference, on most jobs, whether a ¾-yd., 1-yd. or 1½-yd. bucket was used. The three sizes all take about the same load after the cream of the digging is off (which is in a surprisingly few grabs) and the larger sizes lose in speed of operation because of the restricted quarters offered by the average gondola. One operator timed was able to take advantage of the full size of a 1½-yd. bucket, and did unload a 30-yd. sand car in 12 min. and handle 18 cars in one day. It is doubtful, however, if one other runner of equal skill could be picked up today, and certainly such men are not available for the average contract.

The story is entirely different, however, when unloading from a barge. Here the bigger bucket and larger crane take full advantage of their superior power to double the rate of the smaller tools. Due, perhaps, to the inequality of operators, the best average performance of all the cranes, 12 cars per tool per 10 hours, was equalled on a single contract by each of two derricks. As to the average capacity of derricks, however, more than 10 cars per 10 hours per bucket cannot, apparently, be counted on without an unusual operator. As these plants have a transporting, mixing and placing capacity of as high as 12 cars per day per mixer, including cement, more than one plant cannot be run continuously to full capacity by one rig where the grab also handles bulk cement, unless a tunnel be sunk below ground and half the material for the job stocked during the winter. Several firms in the Central states have work on hand for which just this procedure is planned. Two rigs, however, are not out of place for the results to be achieved with the yard mixer, or the two-mixer plant using four-bag machines. We have always the possibility of finding the location in which a trestle can be built cheaply over the loading tunnel, in which case, by expressing a preference for bottom-dump cars, the contractor can triple the capacity of the single crane.

When the road contractor with railroad experience first conceived the idea of using the narrow gage for road work, he seized on the then industrial track as the only track within reach of the job from the standpoint of cost, and found it woefully inadequate from the point of view of the speed possible over it with his heavy steam dinkies. A new track was developed, better methods of laying it were found, and the gasoline locomotive was available, as well as one or more far



MAIN ITEMS OF THE EQUIPMENT EMPLOYED AT CENTRAL LOADING PLANT

superior designs of light steam dinkies. How have these factors affected train speed? As indicated in the opening paragraphs, speeds of 4 to 11 miles per hour, including all stops, have been found. Running speeds of 10 miles per hour loaded and 12 miles per hour light are easy for the locomotives and the improved track and rolling stock, while much higher speeds have been registered for short stretches. Speeds in excess of 15 miles per hour, however, are frowned upon.

As for the improved rolling stock developed, it does all that was ever hoped for it. With it, a three-ton locomotive can start a load of 36 loaded ½-yd.-batch cars. With the old brass-bearing, rigid frame cars, a Michigan contractor could pull but six units with a three-ton machine. The seventh car invariably stalled the engine. He bought some of the new cars and has added six of them to the train, making a train of six rigid-frame and six spring-draw-bar-and-pedestal cars, all



THIS ROAD WAS ENTIRELY MACHINE MADE—CONCRETE FINISHER IN FOREGROUND

loaded, which is pulled at the same speed, over the same track, day in and day out, by the same locomtive. Rolling friction as low as 2 lb. per ton has been measured with a dynamometer in the field on such cars, while figures of 6, 8, and 10 lb. per ton are common. No reading on spring-drawbar, roller-bearing, spring-pedestal rolling stock has gone over 14 lb. per ton for fair track, and that was with inferior equipment. On the other hand, rolling friction as high as 50 lb. per ton has more than once been met with on "contractors' dump cars" of the sort universally used up to a few years ago.

The military track with pressed-steel ties applied this year to road work is winning its way with every contractor who sees it in use. It takes but 80 man-hours to lay a mile of this track in first-class condition. Of course, when poorly laid, it can be crooked, though it never exhibits the sharp kinks which cause derailment, and which were a common feature of the bolted track examined after its third or fourth laying. However, it has been found possible by some who take the bolted track apart between layings and rebuild it, to keep it in good shape. Some of the best track conditions encountered were on the first laying of such track on a job where great care had been taken. The shoulder had been first graded and rolled (a couple of hours' extra work per mile for the blade grader and roller which pay big dividends) and the track had been carefully put down. Such track, however, while it would do our road work if we had nothing better, is more expensive to lay and maintain, and with the same care can never equal the riveted pressed-tie track. For all loads contemplated, none of which exceeds 1½ tons to the wheel, the 20-lb. rail is sufficient, with six of the pressed ties per 15-ft. track section.

In the case of the type of container for the batch of concrete materials there has been a battle in the four-bag field between the batch box and the car body. In the field of the 1-yd. mixer it is likely also that preference will be divided. However, the larger car body provides a good-sized V-dump car, useful with a steam shovel on any grading operation, while the same cannot be said for the smaller body. Moreover, in the case of the smaller mixer, the batch box offers the obvious economy of carrying two to a running gear. This feature, in turn, is out of the question with the larger mixer because of excessive wheel loads. The work of this summer, therefore, has been closely watched to discover the answer to the question, "Batch box or car body?" The answer is in sight, and it has at least been demonstrated that both types of equipment have given good service. There is coming, however, a demand that the cement, irrespective of the type of container, be carried in a compartment separate from the other materials—that is, the sand and stone.

But it is on the road that the greatest saving of men occurs with such equipment. To effect this saving without a complete road plant, however, has thus far baffled those who have tried it. In using subgrade storage, picking up the materials again and putting them into the mixer, no one has yet, to the writer's knowledge, beaten the wheelbarrow game, though several have given it a good run. One job comes to mind where the contractor used three horses, 22 men and a good many thousand dollars' worth of equipment in the attempt, and succeeded only in being badly beaten as to progress by a neighbor who broke records with a couple of hundred dollars' worth of wheelbarrows and a crack gang. It must be remembered, however, that these crack gangs, and the genius which creates them, are scarce as hen's teeth, and that when such brains get hold of a modern plant the fur begins to fly. To such an organizer, capacity production with a double plant, day after day for a whole season, would be nothing.

To sum up, then, it was found that in typical cases with modern plant, nine men were on one job averaging 700, on another 860 sq.yd. per 10-hour day; 10 men had laid 1000 sq.yd. in a like period; seven men had averaged 800 and 900 sq.yd. per 10 hours respectively; and eight men had averaged 840 sq.yd. for a day of the same length, in still another case. On 5-in. base course work far higher yardages have, of course, been



WITH A MECHANICAL SUBGRADER A TRUE SURFACE IS PRODUCED, THEREBY SAVING CONCRETE

made, one Southern operator running 1675 sq.yd. in 10 hours and averaging over 1200 sq.yd. daily for a week. These examples are all taken from contracts using the machine finisher. More men on the road would be required without it. The figures all include firing and operation of the mixer, charging and discharging, spreading and finishing, but not setting forms.

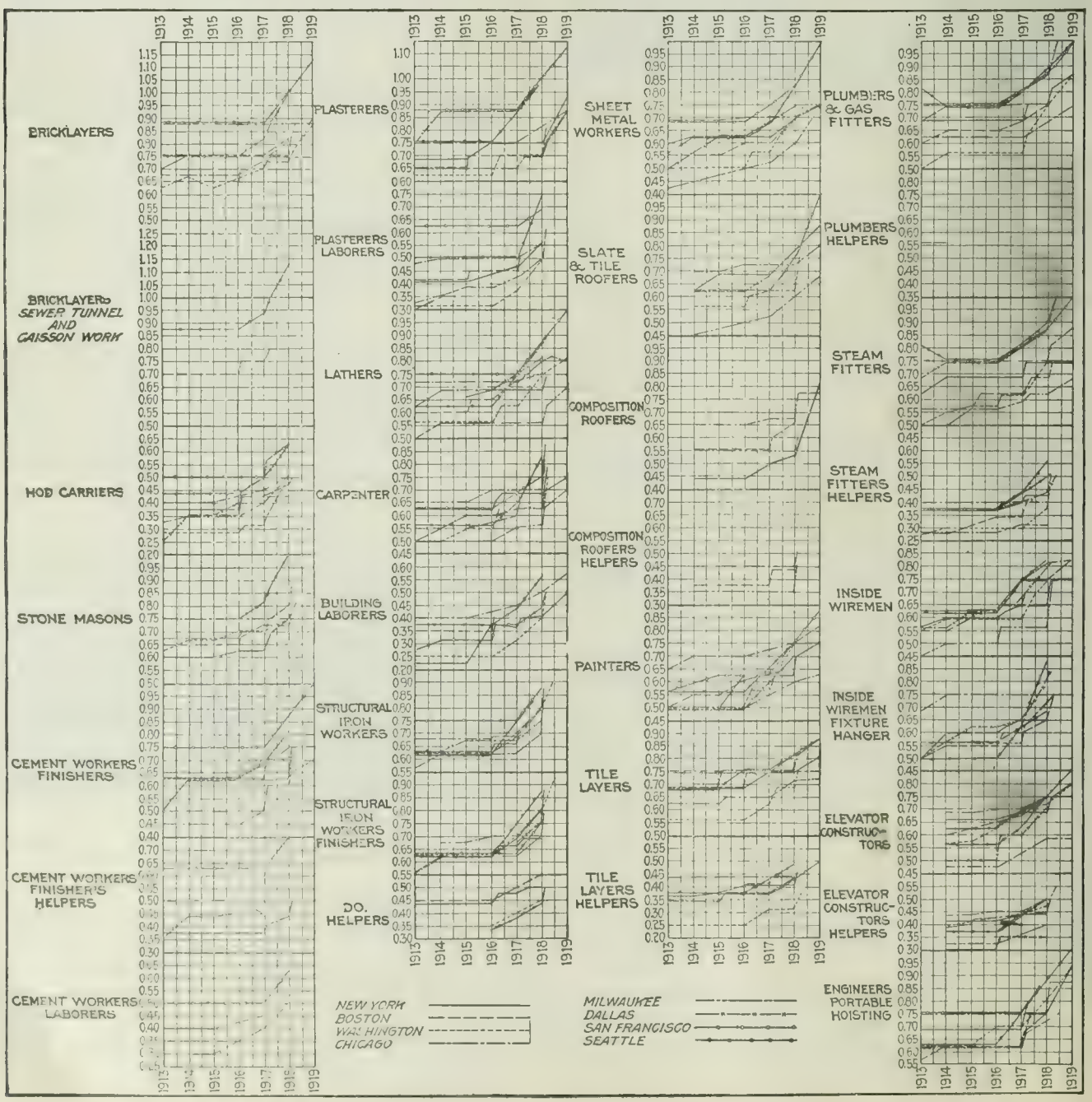
In view of the fact that, at the time of the revival of the narrow-gage haul on road construction, contrac-

tors universally estimated that with an average output of 600 sq.yd. per 10 hours per mixer, and nine men to each crew, the method would show a larger profit than wheelbarrow operation (not as carried on by the crack operators, but on a good, high average), it is evident that investment in such plant has proved more than justified. The range of figures indicates variations in managerial ability, the writer is inclined to think, rather than in local conditions. He believes that the best of them can be exceeded anywhere in the United States when the time limit of mixing each batch will permit; and that poor management may result in much lower figures.

It must be again asserted that much plant only offers some men a greater opportunity to "go broke"; and that while the highway engineer is justified in expecting and specifying, as a result of the year's developments, a class of work which could not previously be expected in actual practice, these superior results will cost for some years about what the inferior work of the past would have cost using the methods of the past under the same conditions. To the contractor, the developments of the year offer a means of doing a more stable business at a cost which, measured over a term of years, shows considerable saving, and of maintaining at the same time a reputation for doing the best work that can be done rather than an opportunity to "get rich quick."

Building Trade Wage Increase Since 1913

DIAGRAMS showing the increase in the union wage scale for the building trades in the United States have been prepared by the United States Housing Corporation from data compiled by M. A. McCarthy, librarian of the Corporation. As shown, the data include practically all of the trades and give information concerning cities in various parts of the country.



The Railway Problem—II

Public Corporations as a Solution to Secure Efficient Operation and Fair Treatment to

Labor, Capital and the Public

By CHARLES WHITING BAKER

Consulting Editor, "Engineering News-Record"

IV—Concluded from page 758

The Control of Railway Property; Theory Versus Facts

Let us squarely face the fact that the railway problem will not be solved until the control of the railways is taken away from men who gain that control for their own profit. As long as we permit anyone who can secure a majority of the proxies of the stockholders to control a railway, so long will men work for such control and make all the profit they can out of it. The most essential step toward solving the railway problem is to establish the principle that those who control the railways hereafter must exercise that control as trustees for the public welfare and not for the stockholders merely. The stockholders' interests will be taken care of any way, if rates are so fixed as to yield them a fair return.

Of course, this principle will not be established without a fight. The great fortunes have not accrued to the investors in railway stocks and bonds. They have been made by those who have exercised control over other people's property for what profit they could make; and it has been the most profitable business in the world. Those who are engaged in this business will not give it up until they are compelled to do so. They will attempt to deceive the public with the claim that any attempt to alter the present railway control is an attack on property rights. The greatest danger to property, however, arises from the attempt to identify the cause of the financiers with the cause of the owners of railway capital. The investors are willing to give up their claim on railway profits in exchange for the certainty of a fixed return. The financiers want to continue the old system of taking the risk and all the profits, because that system furnishes a foundation for the changes in value that promote speculation.

There is a defence of the "financier control" over the railways which has been widely published and which deserves fair examination. It is said that these great financiers have, after all, created the American railway system; that it was their genius and executive ability that built up this wonderfully efficient transportation machine. But was it? Is it really true that we owe to the Morgans and Vanderbilts and Goulds the development of our railways to their present stage of technical excellence? Is there any evidence to show that the financiers who control our railway systems are now a material factor in the promotion and maintenance of efficiency and of the development of better methods?

There have been, of course, in the past individual cases where the men in financial control, such as Hill and Harriman, have done important constructive work; but, broadly speaking, the credit for the excellence of American railway technique today does not belong at all to the men who have held financial control. It is the result of the patient labor of many thousands of officers of American railways in all ranks and in all branches of the service. It is the initiative and energy of these men and of thousands of others in the kindred industry of railway supplies which have developed the railway from its small beginning nearly a century ago to its present status. It is these railway officers today on whom we must rely for preserving what has been gained in the past and going forward to the achievements of the future.

Is it necessary to continue eminent financiers in control of the railways in order to insure their efficient operation? These eminent financiers might all be given a year's leave of absence at once, and railway operations would not be impeded for an hour. If, however, all the officers of all the railways in the United States were tomorrow to quit their jobs permanently, it would be a public calamity whose effects would be felt for many years.

So far is it from being the case that "financier control" of the railways is necessary for efficient operation, that in railway official circles it has long been recognized as a disaster to have the control of a railway property pass into hands which will, as the saying is, "operate it from Wall Street."

And now, bearing clearly in mind the facts just presented, let us stand off and take a bird's-eye view of the railway situation. We have allowed railway operation to be carried on as a private business at the risk and for the profit of its owners. We have allowed the control of that business to be made a source of private profit by whoever was able by any means whatever to secure such control.

What we need to do—surely all will agree—is to establish the principle that the men in control of the railways shall act as trustees. They should reap no pecuniary benefit from their trust and should administer the property not to earn the largest profit but to render the largest public service at the lowest cost.

It may be said that some railways are now managed with just such honesty and recognition of public obligations; but we have no assurance of it so long as law and custom permit corporation control to be secured for the direct purpose of making a profit.

V.

The Danger in Too Centralized Control

There will be general agreement, surely, that an acceptable solution of the railway problem must not destroy valuable property of the railway companies. There is one very valuable asset of the railways which some of the plans that have been proposed would injure seriously. We refer to *the operating organizations.*

A railway is not merely so many cubic yards of excavation and embankment, so many miles of rails, so many locomotives and cars. It is an organization of men who have had years of training and experience in using the track and equipment to carry on, systematically and economically, with discipline and team work, the business of transportation. These organizations have been built up by years of painstaking, conscientious, loyal effort on the part of thousands of men—managers, superintendents, engineers, foremen. These men know one another and are accustomed to working with one another.

No question is raised here as to whether this great asset should be included as one of the elements in railway valuation. On that question there may be difference of opinion; but there can be no question that in any necessary reorganization of the country's railway system great care should be taken to preserve this asset. Changes which may affect it should be gradual and not sudden.

The experience of the past two years has shed an important light on this matter. There is a general public impression that we have been making an actual trial of Government railway operation since the beginning of 1917 and that the results have been disastrous. But this is very far from being the true state of affairs. We have not really tried Government operation at all. When the Government took control of the railways it continued the entire operating organization of each corporation. If it had not done this, if it had attempted to discharge all the officers and employees of every road and start operations anew with an entirely new force, complete chaos would have resulted.

The really grave difficulties which have developed where Government operation of railways has been adopted as a permanent policy—partisan political interference in the selection of officers and employees, delays in operation due to Governmental red tape, conflicts between departments, and so on through a long list—we have not experienced.

And yet it is true that the short experience with Federal control has already exhibited one of the essential defects of Government railway operation—undue centralization. In *Engineering News-Record* of Sept. 4, 1919, p. 457, and Sept. 25, 1919, p. 615, a railway executive officer has well set forth some of the ways in which the attempt to establish central control has injured the service and increased the cost of operation.

Of course, there had to be a central control over certain matters. In the war emergency the railways of the country had to be operated as a single system, and it was that necessity that compelled Federal control. But the extension of central control to an unnecessary extent, the emphasis laid on the absolute authority of Director General McAdoo—who can measure the influence this had in paralyzing the energy and initiative of thousands of railway officers in all branches of the service? It is these officers on whom we must rely for safe and economical operation of our railways, and we must preserve in every possible way the conditions that inspire these men to energetic and faithful service.

These men are almost without exception opposed to any sweeping consolidation of the railways. They have a pride in the existing organization of which they are a part. They labor diligently in its interest with a zest and spirit impossible to maintain were they merged in a single, vast organization. They see in any wholesale consolidation the complete disappearance of the individual. There would no longer be the chance for a man who proved his ability and worth on one road to find opportunity on another road. Competition among different railways for the services of valuable men would be at an end.

The public is right, therefore, in its demand that competition among the different railways shall be re-established. This does not mean that there will again be material competition in rates. Present-day conditions forbid that. It means that the operating organizations of the Pennsylvania R.R., for example, will take pride in their work in comparison with that of other roads in the same territory. And this has really long been the mainspring of progress in our railway operations. The railway officer does not put his best energy into "playing the game" because of any benefit to himself from increased earnings. It is not fear of discharge or hope of promotion that incites him to work long hours and strive to better records. It is the same incentive to "play the game" that energizes the men of a football team.

There is a general belief that Federal control of railways has worked badly. This is partly based on the poor financial showing, for which, as was shown in the first chapter, Federal control should not be unduly blamed. The other respects in which Federal control has not worked well will be found on analysis to be generally traceable to the unnecessary centralization of control and the accompanying discouragement of the individual railway officer. Thus, the brief experience in Federal control has furnished an object lesson which should certainly be heeded. We need efficiency and energy and ambition in the conduct of this vast transportation business. These are plants which will not grow in obedience to a fiat from the top.

The great railway corporations long ago found out that a system several thousand miles in extent could not be efficiently operated from a single headquarters. Much more is this true of the nation's railway system covering a continent 3000 miles in width.

Any project for consolidating all the railways of the country into a single corporation is therefore inherently defective. The judgment of railway executives coincides with this. Judge Lovett, president of the Union Pacific, in his pamphlet on "The Railroad Problem," says:

> My judgment is against the consolidation of all the railroads of the country into a few companies, say from 10 to 30, because I believe the companies would be too large and unwieldy for efficient and economical management. I believe railroad executives generally will agree that railroad systems may be made too big and that there are limits beyond which a railroad system should not in the interest of economy and efficiency be extended. . . . I believe the existing railroad systems should be taken as a basis and such consolidation as is desirable should be built up on that basis.

The evils of undue centralization in operating control apply also to measures proposed for Government control. Necessary though it has been demonstrated to be that a single Federal control be established to supersede, or at least be superior to, the control by the separate states,

the facts brought out in the hearings at Washington have made it evident that no single board at Washington, whether it be the Interstate Commerce Commission or any other body, can exercise that detailed supervision of railway operation which all agree to be necessary in the future. With all it has been able to do in delegating its powers, the Interstate Commerce Commission is overloaded with work almost to the breaking point. It is a year behind with its decisions. It is self-evident that any body which is to supervise railway operations effectively must be so organized as to be able to act promptly; but an event which happens a thousand miles away cannot possibly be intelligently handled from Washington without long delays.

VI.

Public Corporations To Replace Private Corporations

On the basis of the facts recited in the previous chapters, it becomes possible to lay down the general principles on which an acceptable solution of the railway problem must be based. The existing state corporations must be succeeded by Federal corporations, as the Cummins Bill now before Congress provides. These corporations must be conducted not with the object of making all the profit possible for the stockholders or of yielding any benefit whatever to financiers in control. The purpose of these corporations must be to carry on the transportation business in the most efficient manner at the lowest cost. Rates must be so fixed that there will be in the long run a fair return to the owners of the road on their invested capital. Profits above this fair return may be divided among the stockholders, the employees and officers, and the public. There is general approval of the proposition that part of the excess profits may well be distributed among the employees as a premium on efficient and faithful service, but there is general dissent from the idea that the employees are entitled to all the surplus profits, as if they owned the roads. Even the Plumb plan does not propose this.

The Cummins Bill provides that rates shall be so fixed as to return as nearly as may be 5½% on the value of the property. Where a company earns over 6%, it may retain one third of the excess over 6% for itself and must pay the remaining two-thirds to the Federal Transportation Board, which is to use it for the public benefit in improving railway transportation.

The National Railway Conference plan allots one-third only of the excess profits to the stockholders. The remainder, after provision is made for insuring against deficits in operation, reverts to the public. In this plan some risk is left to the railway investor, so that giving him some share in surplus profits earned is equitable. It is noteworthy that this plan, which represents the best thought and study of a group of eminent financiers, business men and economists, practically accepts the principles above set forth, and discards entirely the present theory of the law that a railway is a private business whose owners have an absolute title to all the profits they can make.

How shall the directors who are to conduct these reorganized public corporations be selected? The Cummins Bill provides for the appointment of two directors selected from the classified employees, while two are to be appointed directly by the Railway Board, a Federal body vested with complete supervision over all railway activities. On every important committee of the board there must be one employee director and one board director. The Lenroot Bill provides for the organization of a National Railroad Corporation, with 11 directors appointed by the President of the United States from nominations made as follows: One from the Interstate Commerce Commission, one from the State Railway Commission, two from railway employees, two proposed by the Chamber of Commerce of the United States, two by agricultural organizations and three by the stockholders, voting by letter ballot and not by proxy. The National Transportation Conference proposes Federal corporations with 12 directors, one chosen by the employees and three by the Federal Railway Board.

It will be seen from these plans and others which might be cited that the principle is already generally accepted that there is no infringement whatever on property rights in placing the power to select directors elsewhere than in the hands of the stockholders. Further than this, if the principle is accepted that the stockholder is entitled to a fair return on his investment anyway, he is no longer the chief party in interest in the efficient conduct of the property. It is the general public which must pay the bill if the railway in which the stockholder has an interest is badly run. The railway employees, too, have a direct interest in the safe and efficient operation of the road. It is the business in which they earn their living. Their lives and limbs as well as their daily bread are at risk if the road is badly managed. There is therefore nothing inequitable in giving both the public and the employees a voice in the selection of directors.

Even if the old basis, where the stockholder bears all the risk and takes all the profits, were to be re-established, the stockholder will stand to gain rather than lose if some intelligent plan of selecting directors can replace the present plan. Is there any body of electors more helpless to exercise intelligent choice than the stockholders of a great corporation? They may be ten thousand or a hundred thousand in number, scattered all over the United States. A stockholder has not even the legal right to know who his fellows are. The voters of a city ward at least live in one locality. The members of a trade union know one another by association in the same occupation. Either body is better able to select intelligently men of ability and honesty for positions of trust than are the stockholders of a big corporation.

The importance of a right selection of directors can hardly be overestimated; for if corporations for public service are to supersede corporations for private profit, the director's office will be one of great responsibility. The rubber-stamp type of director will not do. If we are really going to displace the financier from the control of our railway systems we must put someone else in his place. It will be "up to" the directors to formulate and decide questions of general policy, finance, relations with the public, etc., questions that have hitherto been settled in bankers' parlors.

Herein, indeed, lies the greatest hope for the better development of our transportation system. Suppose the directors of a great railway were men with a broad grasp of the larger problems of transportation. Suppose the position were one to which executive officers of the road might aspire as the final step in promotion. Suppose the policy of the railway were studied with the public interest clearly in mind and with the motive of private profit for a group in control wiped out. It would open a new era in railway development.

It is that ideal toward which intelligent and unsel-

fish students of the railway problem are really striving. The Lenroot Bill provides a salary of $20,000 for the directors in its proposed National Railway Corporation. The Esch Bill, amending the Interstate Commerce law, provides that a director can hold office in only one corporation and must not benefit directly or indirectly from the corporation's financing. There is no public defense anywhere of the use of company control for the profit of financiers.

Where can the responsibility for the selection of directors be placed with the greatest likelihood of having men chosen of the requisite ability and fidelity? The body of men best capable of making an intelligent selection are the officers of the railways; and the Plumb plan gives them the choice of one-third of the directors. This excellent feature is overbalanced in the public mind by the fact that with another third of the directors chosen by the employees a majority of the board would represent those whose interest lies in high wages and salaries, and the public might be made to pay excessive transportation rates for the benefit of railway workers. The employees and officers may properly be given a voice in the choice of directors; but they should not name a majority.

Various plans propose that directors to represent the public shall be appointed by the President of the United States. The fear here is that politics might control in the selection or the directorships might become asylums for Congressional "lame ducks." The Cummins Bill and the Conference plan both provide for the appointment of public directors by the Federal Railway Board, responsible for the supervision of railway operations. No better plan has been anywhere proposed. There is no reason why it should not be possible to secure for the Federal Transportation Board men of as incorruptible quality as those who have served on the Interstate Commerce Commission in the 30 years since its establishment.

There are other causes besides the different manner of selection which will operate to place the office of director on an entirely different plane. The financier who spends his good money in obtaining control of a railway property easily squares with his conscience his use of that control to bring business to his banking firm or to the industrial concern in which he has an interest. The very same man appointed as a public trustee would feel an entirely different attitude toward the property.

And there will not be the same temptations for directors. With railway stocks yielding a substantially fixed rate of dividend, their market price will suffer little variation; the mainspring of speculation will be taken away; and with it will go the director's temptation to profit by his inside knowledge. Again, in the passing upon large purchases, or the acquirement or transfer of a subsidiary corporation, it was easy for the financiers in control to cover up irregularities when directors acted as a rubber stamp; but with a dozen men on a board of directors exercising actual responsibility and devoting most or all of their time to the work, it will require a conspiracy of the entire board to carry out a dishonest act.

Certain eminent financiers have recently declared that the re-establishment of railway credit is the heart of the railway problem. This is true if we are to go back to the methods of the past; and yet a return to these methods would make the railway problem practically unsolvable. Railway bonds and notes are continually falling due, and the holders who have been getting 3½ to 5 per cent. will only renew for 7 to 8 per cent. or more. New capital required in large amounts is even more costly. If we allow this condition to continue only a little while, the payments on railway capital will rise so high as to arouse public protest. It will make more serious the very risk that now deters capital from railway investments and will aid those who are seeking to destroy all property rights.

Suppose, however, that public corporations operated by trustees are to supersede the present private corporations and that rates are to be fixed to yield a moderate but certain return to the stockholders. Railway investments would be transferred to the same class as Government bonds so far as safety is concerned. It would no longer be necessary to finance railway requirements with short-term notes sold by bankers for high commissions. That pump which has proved so serviceable in producing a repeated flow from the railway treasuries to the bankers' coffers would be put out of business.

With the railways thus conducted, moreover, it will be possible gradually to amortize railway capital. Rates should be so fixed as to provide an ample margin of earnings over that required for regular returns on capital, and a large part of this margin should be used to furnish the capital required for new construction and to retire existing bonds and notes falling due. With the railways operated for public benefit, there will no longer be a motive for starting big enterprises in order that the interests in control may reap some profit.

With the railways of the country operated on these principles, every year should see a decrease in the amount of railway capital outstanding and in the proportion of railway earnings required to pay a return on capital. And it is in this direction that progress lies. The public should not be forever obligated to pay the interest on money spent a half century or more ago. These debts should be paid off from the surplus earnings. These surplus earnings are contributed by the public, and the property thus paid for will thereafter be public property like the highways. There is no injustice to property rights in such a policy; on the contrary, it safeguards them. The public is willing to pay for the use of the live capital in the railway machine; but a limit must somewhere be placed to the accumulation of dead investment upon which an interest charge must be paid.

If anyone objects to this policy, let him face squarely the opposite alternative. Railway capitalization has been rolling up like a snowball in recent years, and so have the returns to railway owners. Holders of railway capital received $393,000,000 in 1900. In 1917 they received $857,000,000. Our hope for social progress and for averting revolutionary attacks on property lies in amortizing railway capital instead of enormously increasing it.

VII.

How May the Change From Private to Public Corporations Be Effected?

There will be general agreement among all well informed students of the railway problem that realization of the ideal here set forth—to have the railways of the country directed by men of ability and integrity, with the aim of conducting the transportation business in the most efficient and economical manner—would open a new era in railway development.

But to effect the transformation from the present organizations is a task full of difficulties. Many of the plans proposed at Washington contemplate the consoli-

dation of the railways either into a single, vast corporation or into a number of large, "regional" corporations. The Cummins Bill requires the formation of "not less than 20 or more than 35 distinct systems, so planned as to preserve competition, yet effect a uniform cost of transportation and earn the same percentage of returns when operated under the same rates!"

But nobody is wise enough to know now to what extent these results *can* be obtained by consolidation. Nobody is wise enough to determine now to what extent consolidation will promote efficiency in operation. For the reasons set forth in the preceding Chapter V (as well as for many others which lack of space forbids presenting here) any changes in the present operating organizations should be made only after their advantages have been positively determined by long and thorough expert study.

Any huge, hastily planned consolidations, even were they eventually beneficial would make shipwreck of the railway transportation machine during the transition period. Further than this, the railway problem demands *a prompt solution.* The only safe and practical plan, therefore, is to deal first with the existing railway corporations. Let these be transformed from private to public corporations first. It will then become one of the tasks of the directors who conduct them to ascertain, by thorough investigation, where consolidation will be advantageous. That problem can be dealt with far more intelligently by the directors of these individual corporations, familiar with the practical operating conditions in their own part of the country, than by a Federal board in Washington.

In the second place, it is extremely desirable that the reorganization from private to public corporations here proposed shall be done as *a voluntary act* by the present railway corporations. If Congress attempts to *compel* state corporations to reincorporate as Federal corporations, protracted litigation is certain. The old question of state vs. Federal authority would introduce bitter political controversy. If it were attempted to force consolidations, as the Cummins Bill proposes, by condemning railway properties, there would be litigation, over the determination of values, that would tie up the whole reorganization plan for years. The same thing would be true of any of the plans which propose the taking over of the railways by the Government. The Plumb plan, for example, would throw the entire burden of appraisal of the railways on the courts and would produce so vast an amount of litigation as would absolutely block the wheels of justice.

If, then, any plan can be devised under which the present railway corporations will *voluntarily* reorganize as public corporations under Federal authority, it will be vastly easier to put into operation than any compulsory plan. Furthermore, it will obviate the very real danger that if the settlement of the railway problem is left to long-drawn-out court proceedings, public impatience with the courts will pass all bounds, and the forces that make for anarchy and would destroy courts and all other authority will be strengthened.

Of the numerous plans for determining what is a fair return to the owners of railway capital, presented befor the House Committee on Interstate and Foreign Commerce, that of Mr. Victor Morawetz, chairman of the board of directors of the Atchison, Topeka & Santa Fe Ry. (published on pp. 522 to 532 of the printed reports of the hearings) comes nearest to meeting the conditions above set forth. The plan here presented is closely similar in principle to that of Mr. Morawetz in a number of its features.

Mr. Morawetz demonstrates more fully than space here permits that the declaration that railway owners are entitled to a fair return on the fair value of their property "furnishes no standard whatever for establishing just rates." The "value" of a railway is not the money which was originally expended in its construction plus later additions to the investment. It is impossible to determine today how much the original expenditure was. Even if it could be determined, it would form no fair basis for taking over the railway property or fixing rates. Billions of dollars have been spent on railways which are not and never can be profitable.

Neither does the present cost of reproducing the physical property of a railway give any fair basis for determining its value. The cost of reproducing the railway system of the United States at the prices of labor and material now prevailing would be at least 50 per cent. greater than the total of all railway stocks and bonds outstanding. Besides this, the value of a railway, or of any other piece of property, may be very little compared with what it cost originally to build or with what it would cost to reproduce it now.

It has been proposed that the railway companies' property investment accounts shall be taken as the basis on which they are entitled to a fair return; but this would tax the public for returns on thousands of miles of moribund railway properties which can barely earn their operating expenses.

Mr. Morawetz concludes that there is no possible basis fairer to both the public and railway owners for determining the value of the railways than their past net earnings, averaged over a series of years. He proposes the three years prior to Federal control, which is the present basis on which the Government rental is fixed. Mr. Morawetz provides also for adjustment in certain cases where the net earnings may have been abnormally high or low.

The criticism has been made, however, that in these three years the net earnings of the railways averaged greater by nearly 40 per cent. than the average of any three years preceding. To meet this criticism, it would be fair to take the average of a seven-year period for the standard rate of return, and add to this, for each individual road, interest on money actually invested in extensions and improvements since the average was taken.

One of the greatest difficulties with which those who are trying to solve the railway problem are wrestling is to equalize the income of the weak roads and the strong roads. Judge Lovett and Justice Hughes declare that by no possible subterfuge can the Government take away part of the earnings of the strong roads and give them to the weak roads. Elihu Root and other eminent constitutional lawyers take the opposite view. This disagreement means at best a long fight in the courts if by process of law it is attempted to force an equalization of income between weak and strong roads.

But while there is doubt as to the power of Congress to *compel,* there is no question as to the power to *permit.* Congress can *permit* any carrier of interstate commerce now incorporated under a state law, to reincorporate under a Federal law. There may well be doubt of the power of Congress to take part of the earnings of a prosperous railway and give it to a struggling rival; but Congress can charter a Federal Guarantee Corporation which can guarantee to railway corporations which are reorganized under Federal law a certain rate of return on their capital, and if the corporations voluntarily accept such a guarantee there will be no need of a resort to the courts.

The plan by which these principles may be carried into effect is as follows:

To every railway corporation engaged in interstate commerce is offered the privilege of reincorporating as a *Federal corporation for public service,* with the declared object of carrying on the business of railway transportation with greatest efficiency and economy, under the general regulations of the Federal Railway Board. The corporation is to be conducted by directors of three classes: One class will be nominated by the stockholders of the corporation; one class nominated by its organized employees and officers, and a third class, representing the public, will be nominated by organized commercial, financial or agricultural associations, or Governors of states, or state public service commissions, in the territory served by the company's roads.

These nominations are all to be made to the Federal Railway Board, by which the final appointments will be made. These directors are to be men of experience and ability in the administration of business affairs and are to receive adequate compensation.

That *nomination* instead of final selection should be made by the groups of stockholders, employees and public organizations, is believed to be very important. It would be incumbent on the group presenting a candidate to show that he was fitted by experience and character for the responsibility he was to undertake. Under this plan any organized group of employees could offer candidates. The locomotive engineers might offer one man, the conductors another, the shop employees another. So candidates representing local interests might be offered by Governors of states, by organizations of shippers, by chambers of commerce, etc. The Federal board would have before it lists of candidates with their qualifications, and could select those best fitted to render service. The Federal board should have authority to make other selections for the class of directors representing the public than those nominated by public bodies and public officials in the territory served by the road. On the other hand, for the directors representing the operating force and those representing the stockholders, the board's selection might be confined to the candidates nominated, in order that both employees and stockholders might be assured of representation by candidates of their own choosing.

There will be created also a Federal Guarantee Corporation under the management of the Federal Railway Board. Every railway corporation reorganizing as a Fderal public-service corporation will enter into contract with the Federal Guarantee Corporation; under this contract it will turn over to the corporation its net earnings and will receive from the corporation its "standard adjusted return," being the average net earnings which it made for the seven years from 1911 to 1917, inclusive, plus interest on the money actually invested in its property as "live capital" since the middle of the test period.

Of course, agreement will have to be reached as to what is a fair rate of interest to allow on this additional investment. After the plan above set forth is put into effect, however, there need be no further controversy over what is a fair rate of return on the new railway capital hereafter required. Each company will issue, under the authority of the Federal Railway Board, such new securities as its needs require, will sell them to the highest bidder, just as cities do their bond issues, and the interest on this added capital, whatever it may be, will be added to the company's standard guaranteed return.

On the other hand, the surplus earnings of the railways, after operating expenses and the standard guaranteed return on capital are paid, will be available toward the need for new capital. The Federal board will use this surplus either to invest in the new securities or to retire outstanding issues, whichever will effect the greatest reduction in the guaranteed return to capital.

It will be to the interest of the present railway corporations to enter into the above-described agreement and accept the guarantee. They will receive the advantage of Federal incorporation. They will have a certain return, through good years and bad years. They will be freed from the risk of depreciation of their investment by demands of labor, by restrictions of Federal or state laws, and by the manipulations of financiers. These considerations should be sufficient to bring in even the corporations which are making the best earnings under present conditions and have the best prospect of future increases in earnings. The weaker corporations will, of course, be very glad to come in.

The Federal Guarantee Corporation, which should be started in business by Congress with a revolving fund of, say, $500,000,000, should be able to restore this sum to the Treasury in no long time, for rates should be so controlled by the Interstate Commerce Commission (or other Government rate authority) that the net earnings of the railways in each section of the country would meet the operating expenses plus the standard return, and leave a good margin besides.

To provide an additional incentive for efficient operation, a certain percentage (say 30 per cent.) of the amount by which the net earnings of any road exceed its standard rate of return should be distributed annually as a profit-sharing dividend to all regular employees and officers of the road in proportion to their respective wages and salaries, the officers, however, on whom efficiency chiefly depends, sharing at double the rate of the employees, as the Plumb Bill proposes. The remaining margin will be added to the revolving fund, and this increment would be available toward supplying the needs of the several companies for additional capital, as explained in a preceding chapter.

This will be a far more effective stimulus to efficient service than that offered by the Plumb plan, which lumps all the employees of all railways together. This annual "bonus" will interest the men and officers of a particular road as does the prize in an athletic contest. It will be an index of the extent to which the operating force of that particular road has made good in comparison with men on other roads. It will very likely effect enough saving in increased efficiency to more than offset the payments made to the men. And such saving as is made will revert to the public, not to railway stockholders.

To eliminate eventually the complicated financial structure by which most railway corporations have been built up, it should be provided that in reincorporating as a Federal corporation the old company agrees to sell all its property to the new Federal corporation, or to any other similarly organized Federal corporation, for a sum proportionate to the adjusted operating income or standard return of the company in the past, as defined above, and to accept the securities of the new company in payment therefor.

This would provide a foundation on which to effect consolidations, where consolidations are later found to be advantageous, on an equitable basis without resort to the courts, without bargaining, which might result in detriment to security holders of some of the companies affected, and without heavy commissions to financiers.

The criticism may be made of the above plan that it

gives stockholders the right to make nominations for directors, whereas, as has been demonstrated in the preceding chapters, stockholders as a class are so incapable of intelligently selecting directors that the selection has gravitated to the hands of financiers.

In framing the above plan, however, it has been deemed wise to take the conservative rather than the radical view, to change nothing that it is not absolutely necessary to change, and to defer so far as possible to existing prejudices. We have to recognize that the financiers of the country have for years been in control of the railways. If any group of them, holders of railway stock, can recommend to the Federal Railway Board a man with the ability to be a real railway director and can show that he would use that ability with the same fidelity as he would the trusteeship of a university, they might give valuable aid in solving the big problem in which the welfare of all of us—bankers and business men and laborers and all—is bound up.

We must all recognize, too, that the great need is a policy on which all can agree. The business community may find it easier to accept a plan which still leaves stockholders some voice in the selection of the men who are to control the operation of the roads.

For a similar reason it may be the part of wisdom to permit the stockholders of a reorganized company to have some share of the profits earned by it in excess of its standard returns. For example, the Federal Guarantee Corporation might guarantee to a railway 80 per cent. of its "standard adjusted return" for 80 per cent. of its actual net earnings. Thus, suppose a railway company's standard adjusted return were $1,000,000 and its actual net earnings in the year 1921 were $1,200,000. The company would retain 20 per cent. of the latter sum ($240,000) and pay 80 per cent., or $960,000, to the Federal Guarantee Corporation, receiving in return the guaranteed sum of $800,000, or a total amount of $1,040,000 to distribute among its security holders. This provision would furnish an added incentive for the stronger roads to accept the plan voluntarily.

Let it be said frankly that this feature is proposed here not to defend it as logical or equitable, but as a concession that it may be necessary to make to the natural prejudice in favor of past methods and customs. If this concession is necessary to secure the acceptance by the business community of the constructive plan here presented, it will be worth making.

And now the question may again be raised, Would the present railway corporations voluntarily accept such a plan?

In order to have it accepted, the decision upon it should be made by the actual owners of the road, the stockholders, and not by the financiers in control whose interest lies in the perpetuation of past conditions. That holders of railway bonds and stocks are willing to accept a fixed rate of return in lieu of carrying the risk for the chances of excess profits is evidenced by the fact that this principle has been formally accepted by the National Association of Owners of Railroad Securities, representing an investment of nearly $9,000,000,000.

Assuming that the decision lies with the security holders, it is obvious that the plan would certainly be accepted by all the companies whose financial returns are now unsatisfactory. Even the companies whose finances are in fair shape would find the majority of their security holders glad to be freed of the risk from threats of labor troubles, rate restrictions and Wall Street manipulators, and would be glad to be assured a fixed rate of return.

The only companies concerning which a question would arise would be a very few which have prospects of future earnings largely in excess of those during the period from 1910 to 1917. Even such a company, however, could not well afford to stay out and remain a state corporation. If a company did so, it would be subject in the future to such state legislation as the full-crew laws and the other onerous and costly state restrictions that are increasing in number all the time. Immediately on the return of the roads to their owners, such state-fixed rates as the two-cent a mile local passenger fares will be re-established. Imagine also the position of a company which continued to carry on its business with the avowed object of earning profits for the owners when other railroads in the same locality were operated to render public service, were rewarding their operating force with a share in the profits, while the balance of their excess profits was being returned to the public by retirement of the invested capital.

It will be evident that a railway corporation attempting to carry on its business in the old way would find itself in an unenviable position with shippers, with the public and with its own officers and employees. And if a railway company did survive all these vicissitudes and make earnings in excess of those which it would have received as a Federal corporation entitled to its standard return, would the stockholders feel sure that this excess would be distributed to them and not absorbed by those in control of the property?

Also, the question will inevitably and properly be raised whether under this plan the railways would be conducted with as great efficiency and economy as under the present corporations, where the transportation business is carried on for profit.

In the preceding discussion it has been explained how fallacious is the common belief that the desire of the railway owners for dividends is the underlying cause of economical railway operation. Interesting additional testimony on this point was given by the Hon. George W. Anderson, a former interstate commerce commissioner, before the Esch committee, on Aug. 27, 1919. Mr. Anderson said:

"I regard capitalistic management of the railways as we have had it in the past as a failure. I do not think there is any effective initiative in any of the big railroad companies today, nor has there been for 20 years. The offer of a share in the management and a share in profits promises an improvement over the state in which employees have long been, and should improve the morale and efficiency."

In answer to the question whether the railroads would come under political influence if part of the directors were Government appointees, he answered:

"I think that an organization of this kind will be less political and more responsive to sound principles than the accidental financial cliques called railroad corporations which have managed this business during recent years. They have given us neither economy, efficiency, progress nor just and proper care of the rights of their investors."

There may be difference of opinion as to whether Mr. Anderson overstates the deterioration in morale among railway officers and employees; but it is absolutely certain that the railway officers as a class have been seriously disheartened by their experiences under Federal control, and that projects for wholesale consolidation which will reduce them further to the status of mere cogs in a huge machine will inevitably drive into other occupations a large proportion of the men with greatest energy, initiative and ambition.

If, however, there is promise that the railways may

be relieved of Wall Street control and may be administered by men who understand the transportation business, railway officers from top to bottom will have better assurance that ability and merit will win promotion and fair compensation than they have had for many years.

VIII.
Federal Railway Control, Past and Future

A very easy way for Congress to solve the railway problem would be to "pass the buck" to the Interstate Commerce Commission. Congress has had that habit for many years now. Every time a new measure for regulating the railways has been brought forward, Congress has tossed the matter over to the Interstate Commerce Commission. Not a question has been raised as to whether that body was not already overloaded with responsibilities, or as to whether its organization and methods fitted it for the job. There is no statute limiting the load which can be placed on an executive officer. There is a law of nature, however, which decrees that the overloaded man will either fall under his burden or else shove some of it off.

The Interstate Commerce Commission has struggled manfully to keep from being submerged by increasing duties; but in spite of all it has been able to do in delegating its responsibilities, it is far behind in its work, as is well known. Cases brought before it require a year to reach a decision. Further than this, the commission's organization and methods are those of a court, not an executive body. It cannot possibly do the sort of work in Government control that the present necessity demands.

Hitherto Government railway regulation has consisted chiefly of "thou shalt not" laws. Repression and punishment have been the chief aim. The time has come when this will no longer suffice. For example, laws are on the statute book to prohibit railway construction, or the issue of railway capital, until the necessity is proved. It never occurred to the lawmakers that public necessity might demand new railway construction or the issue of new capital, and no one would come forward with an offer to supply the necessity.

Railway transportation is a public necessity. If private capital will no longer take the initiative in furnishing it, then the Government must. There must be some Government body with the power and authority *to get things done*—not merely, like the Interstate Commerce Commission, to stop the doing of wrong things.

Both the Cummins Bill and the National Transportation Conference plan provide a Federal Transportation Board, with complete authority over the operation of the country's railways. The success of such a board will turn on the question whether a reorganization of the railways for public service instead of private profit can be effected. If the railways are transformed to organizations for public service on the lines laid down in Chapter VI, it will be comparatively easy to effect a central Federal control and co-ordination of railway activities.

Under these conditions the different railway companies will be working in harmony with the Federal board. They will have no object to do otherwise. On the other hand, if we go back to the conditions of the past and have a thousand railway corporations working for private profit and a little group of five men trying to enforce certain statutes that run counter to that profit, antagonism is certain.

For reasons already set forth, we cannot go back to the old conditions. Unregulated exploitation of the public by the railway companies will never again be tolerated. It has become impossible to finance private railway companies under public regulation to the extent now necessary. The only alternative, therefore, to outright Government ownership and operation, with all its inevitable inefficiency and waste, is the establishment of public corporations on the lines above laid down.

A Federal Transportation Board to co-ordinate and direct the operations of such companies is absolutely essential. Upon its ability and fidelity would depend to a very large extent future progress in the art of transportation.

The selection of the directors to represent the public by the board, will be a task of the highest importance. These men will have a power such as has seldom been wielded. Upon the board will devolve the task, in all probability, of working out the details of the new plan of carrying on the country's transportation, with the aid, of course, of the best expert advice that can be secured. The Cummins Bill provides a salary of $12,000 a year for the members of this board; but what is needed is not $12,000 men but $50,000 or $100,000 men. Let their salaries be such as to relieve them from all temptation to make use of their enormous power, directly or indirectly, for their own profit.

How would such a system of public companies under public control work in comparison with past methods? Space permits a single illustration. It is agreed that consolidation ought to be undertaken on a large scale. The day of the little railway corporation has passed. Heretofore railway consolidation has been carried on solely to make profits, and not always the profit of the stockholders concerned, by any means. There has been no more effective machine for transferring money from the stockholders to the financiers in control than the buying and selling of roads.

The existing railway systems have not been planned with a view to economical operation and efficient public service. They have grown by bargain and sale. There is general agreement that these systems must be radically altered and rearranged, to facilitate economical operation. If we leave the railways in the hands of corporations operated for private profit, with the gate wide open for the diversion of that profit to the benefit of the interests in control, there will be all sorts of schemes for the spoliation of investors, and probably a huge addition to the bulk of railway capital. Both the Cummins Bill and the Conference plan foresee this, and clothe the Federal board with full authority over such consolidation.

That task will be difficult at best; but it will be vastly easier if the railway corporation management is first transformed, on the principles herein proposed, for those in control of the corporation will have then no ulterior motives to serve and from the start will be working in harmony with the Federal board.

Imhoff Tanks for Worcester

The most important work now in hand at Worcester, Mass., according to Frederick A. McClure, city engineer, is the preparation of plans for the installation of an Imhoff system of sewage disposal in lieu of the chemical precipitation and filter plant which has been in operation since 1888. This work will consist of 20 Imhoff tanks, six pairs of dosing tanks, and 14 acres of sprinkling filters 9 ft. in depth. The plan is designed for a daily flow of 24,000,000 gal. of sewage, with provision to take care of storm flow of 60,000,000 gallons.

Impressions Here and There

From Niagara to Ottawa

ONTARIO is not very different from the States. Topography and climate, the two great natural factors which affect a people's characteristics, have offset many of the national differences between those who live on opposite sides of the Great Lakes. To an engineer, particularly, the trip from the Niagara peninsula through Toronto to Ottawa does not seem to carry one through strange country until Ottawa is reached. The types of engineer met are the same, the ways of doing work and the habits of thought are identical. In the Dominion capital, though, one begins to feel less at home. Whether it is the burr on the tongue which betrays the birth or training in the British Isles, or the French explanations on the blueprints, there is enough to make one feel that here, at least, the national influences begin to overcome the geographical.

There is, too, one subtle difference. Canada was in the great war nearly five years. Nowhere can this be escaped. Service flags carry much heavier proportions of gold maple leaves than do ours of gold stars. Maimed men are everywhere; service buttons are on the lapels of nearly every man up to middle age and sometimes beyond. And more important still, the heavy burden of war has crushed the spirit more nearly to the limit of elasticity than it did on this side of the border in the 19 months of our participation in the war.

Just how much this depression of spirit contributes to the quite obvious engineering depression it is hard to say, but it is evident that it is partly responsible. Labor troubles in Canada are as prevalent as in this country. The Winnipeg general strike, beaten though it was, left its impress throughout the neighboring province of Ontario, and the threat of labor control has not altogether passed. Everywhere is heard the same complaint, so familiar to American engineers, "Business men will not go ahead with construction so long as prices of material and labor are so unsettled." Prospects for the coming season are not over-bright, due largely to this uncertainty. There has been the same flashy increase in small industrial construction noticed in this country; plants withheld from normal increase during the five years past had to be added to, but the big work—large public construction, power plants, railroad revision and the like—is still holding back for better times.

In Ontario, too, what amounts almost to a political revolution complicates the future. In this country little has been heard of their October elections, but they have some importance for us as an indication of the trend of things. A new party, known as the United Farmers, with a composition well expressed in its name, has come into power and, with the aid of an unexpected number of representatives elected on a straight Labor ticket, will control the provincial parliament to the exclusion of the two established parties, Liberal and Conservative. No one knows whether the farming and labor elements will be able to compromise their many opposed interests to put through the advanced social and economic theories their leaders advocate, but, whether they do or not, the defeat of the old-line parties indicates the usual dissatisfaction with conditions which follows a long war and presages an unsettled state. This, rightly or not, reacts strongly to prevent an industrial or engineering boom.

All these observations are, of course, general. They should not be taken too pessimistically. Engineers everywhere seem to have enough to do, though few of them talk very hopefully of the immediate future, and there are a few outstanding features in construction and planning worth specific comment.

"Hydro."—The first of these is the big Queenston-Chippawa power canal that the Hydro-electric Power Commission of Ontario is building around Niagara Falls. "Hydro," as the Commission is known in Ontario, is a real issue in Canada. One does not have lukewarm feelings about it. Either it is a messianic deliverer from all public-utility ills or it is a socialistic fraud which by clever accounting is leading the people straight to financial destruction. Whatever its purpose or its practice economically, it is doing a big job in a big way at Niagara. Outside of the Miami Conservancy work above Dayton it is the largest construction job today on the continent. Thirteen miles the canal stretches from the mouth of the Welland River to below the Whirlpool, and in those 13 miles are all kinds of digging. More earth-moving machinery of a modern sort is concentrated here than at any place since Panama, and wherever you go along the line, every minute or so there goes trundling by on the well-laid railroad a train of heavy dump cars pulled by a businesslike electric locomotive on its way to the 240 acre farm which is slowly being covered yards deep with the 15,000,000-yds. spoil dump. Other and more technical columns of this journal will tell of the engineering work; let it be sufficient in this comment to confess that a trip along it gave to one engineer, at least, that thrill of pride in his profession that every professional man needs once in so often to counteract the dullness of his routine life.

The Welland Canal.—A few miles beyond Niagara is the Welland Canal. During the war the old canal many times repaid its cost. Through its narrow locks passed many of the lake-built steamers on their way to the fight against time with the submarine. Alongside of these old-fashioned locks are now rising the massive masonry structures of the new ship canal. During the war all work on the new canal was shut down, and the construction machinery was mobilized for war work. In the season just past, over $3,000,000 was spent by the Canadian Government in dredging and concreting and replacing equipment, but work was shut down in September because of labor troubles. At this place Canada tried to put into practice a theory that was popular here a year ago. It opened up the canal work, in spite of many financing obstacles, in order to provide work for the returning soldier and war worker. Unfortunately, the idea did not succeed, for labor became unreasonable in its demands, and struck. The Government did not argue, but closed down forthwith. Today the huge locks, half completed, the dredges, the shovels and the drills look very lonesome to the traveler scooting by on the gasoline "speeder" which rises above all traffic regulations.

Toronto.—Toronto is an American city. Let that be said without condescension. It is Cleveland; it is Buffalo; it is Detroit. Its fine new union station, fast approaching completion, its well paved streets, its frequent skyscrapers, the magnificent new Bloor St. via-

duct, one of the handsomest bridge structures in America, all show the skill and push of efficient engineering. But in one particular it is passing its neighbors across the lakes. That is in its harbor work. Instead of much talk and no action, Toronto is really doing something with its lake front. Seven years ago it began a comprehensive scheme which includes recreational and residential improvement along the exposed shore and industrial development behind the protection of the large island that fronts the city, and throughout the war it has been continuing the work. Most important of all, it is actually beginning to enjoy the fruits of the plan, for industrial plants are beginning to rise on ground which a few years ago was swamp or open water, and the return from the rentals is beginning to repay the costs of the project.

Like the other lake cities, Toronto is planning a traffic center. This one will be on the lake front and will gather all of the long-distance passenger entrance, by train, interurban, ferry and lake steamer. Fortunately, the urban traffic centers in the business district, some blocks inland, so the engineers feel that there is no danger of the congestion which threatens Cleveland if the new terminal scheme there goes through.

Ottawa.—Ottawa inevitably recalls Washington to the engineering visitor seeking information. Not architecturally, because, though favored with far more natural advantages than the American capital, the planning has not been as expert or the building execution so successful, but officially one gets the same reactions. There are the same centralized Government offices, under somewhat different names and with occasionally differing functions, the same vagueness regarding specific activities, the same undue respect for the nearby legislative authority, which can make or break a project. And, curiously enough, there is the same uncanny influence of men and methods imposed by the old-fashioned type of Government building.

Government building architecture a half century or so ago became standardized. It apparently was necessary to make every office a huge, high-ceilinged room, with deep recessed windows, seemingly uncleanable, and fireplaces and mantles of a splendor varying with the distinction of the proposed occupant. No man can be modern in such an office. One enters fully expecting to find letter presses instead of carbons, and file cases of antediluvian origin. Typewriters almost seem irreverent, and one feels sure that in the drafting rooms they grind their own india ink. The surroundings hypnotize the men. As it is in Washington so it is in Ottawa. All too frequently those who occupy the old Government buildings reflect stolid officialdom or affect a freezing coldness which they mistake for dignity. Where, for lack of room, offices have been moved to modern quarters in city buildings, or where the Government has itself put up new structures within a few years, the occupants have the snap and go one expects from a business man.

Perhaps because Ottawa has more architectural relics than Toronto, the feeling of depression was more marked there. Government engineering seemed to be marking time. In railways and canals and the Department of Public Works, whose duties correspond to the civilian field of our Corps of Engineers, little other than necessary maintenance was reported. The international investigation of the power and navigation possibilities of the St. Lawrence, authorized on this side by last year's rivers and harbors bill, is only just starting, the two representatives being now engaged in preparing the program of study. Government railway control is the subject of political controversy just now on account of the current bill before Parliament for the acquisition of the Grand Trunk, and pending a settlement there is not much activity in Government railway circles.

Roads, public buildings and harbors are more active. Under an appropriation of $20,000,000 the Dominion is to assist Provincial road building to the extent of 40%, and the national road commissioner is organizing his department to take care of this work next year. It is not the intention to control construction of Federal-aid roads to the extent practised in this country, but merely to approve design and layout and to see that the provincial road departments are so organized as to guarantee good work, seeking also to coördinate the practice in the different provinces. In harbors, the national Government is underwriting expenditures of $1,250,000 at Montreal and $250,000 at Quebec, and has approved an expenditure of $5,000,000 for initial construction of a huge harbor development at Vancouver. It is also considering taking over the harbor of St. John, N. B., which under ancient royal charter is vested in the city. New public buildings of a monumental sort are about to be started in Toronto, alongside the new union station, and in Montreal. The interesting thing about these two is that they are to be of reinforced concrete. In fact, that material for buildings seems to be having a decided boom through Ontario, notably at Toronto, where several of the large new industrial plants are of concrete.

Ottawa, Nov. 1, 1919

Electrolysis in Underground Structures

LEAKAGE resistance of street-railway roadbeds, and its relation to electrolysis of underground structures, form the subject of "Technologic Paper No. 127," recently issued by the United States Bureau of Standards. Electric railways, says E. R. Shepard, author of the paper, can do much toward reducing leakage currents from their tracks, by observing the following suggestions regarding roadbed construction:

1. Solid-concrete ballast should be abandoned, and clean crushed stone should be used as a foundation under ties. This type of construction is approved by the American Electric Railway Association, as it gives greater resiliency to the track and is cheaper than the full concrete ballast.

2. Where crushed stone or gravel is used it should be kept clean by proper coverings or pavements. If earth, sand, or street dirt is permitted to filter into ballast of this character, its function as an insulating material is greatly impaired.

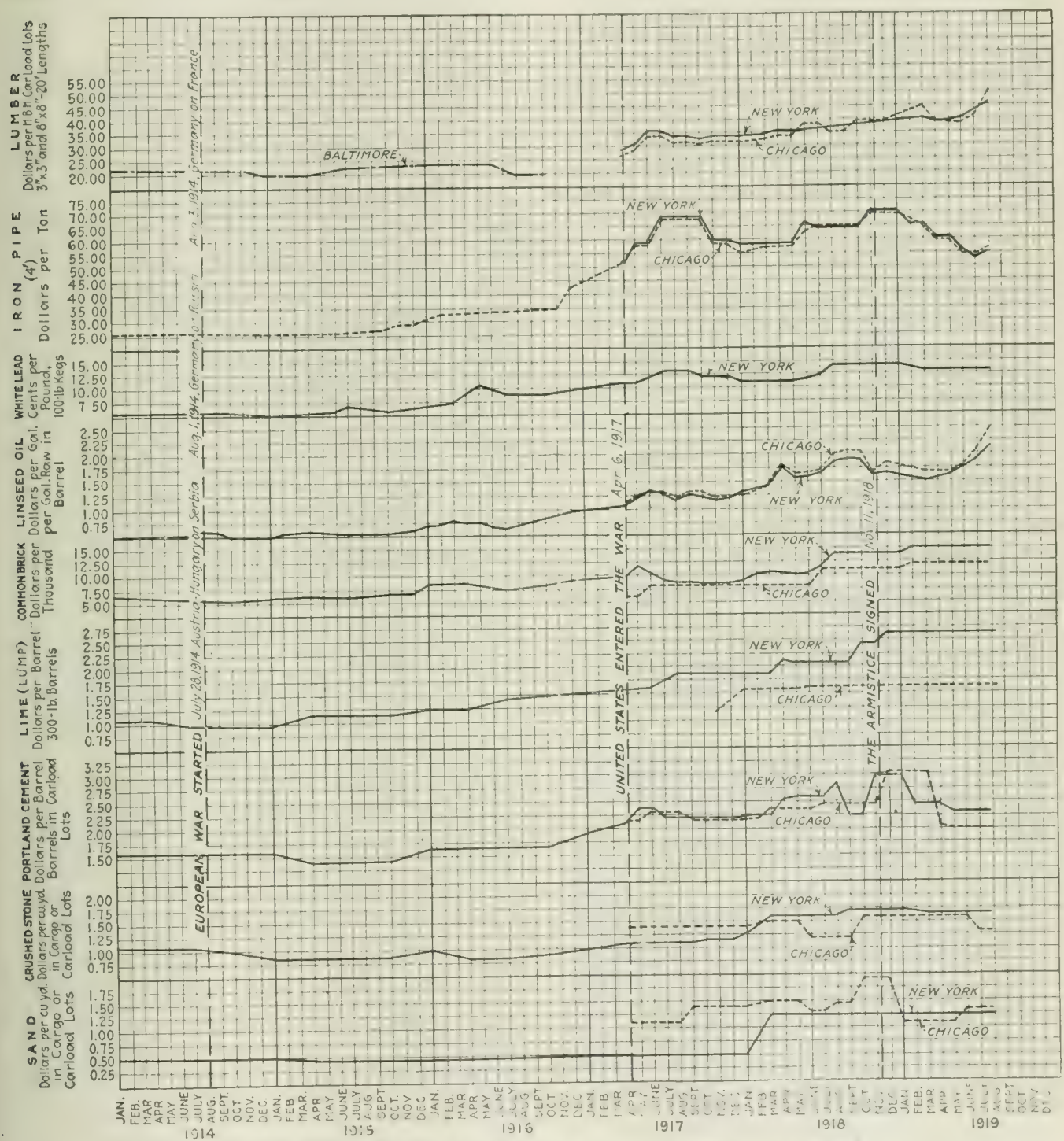
3. Salt, which is often used to prevent frogs and switches from freezing, will greatly reduce the resistance of roadbeds and should be avoided if possible.

4. In open construction, rails should be kept out of contact with the earth. The roadbed should be well drained to prevent fine material from washing into the ballast and to keep the ties as dry as possible. Vegetation should be kept down, as it tends to make the roadbed moist and to fill ballast with foreign material.

5. Zinc chloride and similar chemical preservatives should be avoided where the escape of stray currents is objectionable or where block signals are used. A treating mixture of creosote and gas oil improves the insulating properties of wood ties.

Prices of Building Materials, 1914-1919

The accompanying diagram indicates price changes in building materials during 1914-1919. The data were collected and plotted by the United States Housing Corporation.



COMPARISON OF UNIT PRICES FOR BUILDING MATERIALS, 1914-1919

Data Compiled by M. A. McCarthy, Librarian, United States Housing Corporation

Sources—

Lumber

1914-1916 *New York Lumber Trade Journal*
1917-1919 *Engineering News-Record*
*At Baltimore

Brick

1914-1916 United States Bureau of Labor Statistics Bulletin, Wholesale Prices, No. 149, 181-200
1917-1919 *Engineering News-Record*

Portland Cement

1914-1916 United States Bureau of Labor Statistics, Bulletin Wholesale Prices, No. 149, 181-200
1917-1919 *Engineering News-Record*

Sources—

Sand

1914 *Record and Guide*
1915-1916 *Rock Products and Building Materials*
1917-1919 *Engineering News-Record*

Crushed Stone

1914 *Record and Guide*
1915-1916 *Rock Products and Building Materials*
1917-1919 *Engineering News-Record*

Lime

1914-1916 Bureau of Labor Statistics Bulletin Wholesale Prices, No. 149, 181-200
1917-1919 *Engineering News-Record*

Sources—

Iron Pipe

1914-1916 *Iron Age*
1917-1919 *Engineering News-Record.*

White Lead

1914-1916 *Oil, Paint and Drug Reporter*
1917-1919 *Engineering News-Record*

Linseed Oil

1914-1916 *Oil, Paint and Drug Reporter*
1917-1919 *Engineering News-Record*

Columbia Basin Irrigation Project Report Nearly Completed

SURVEYS being made to determine the possibilities and the approximate cost of bringing irrigation water to a large tract of land on the Columbia River in Washington are nearing completion under the direction of the Columbia Basin Survey Commission. This work has been carried on with an appropriation of $100,000, noted in *Engineering News-Record* of Apr. 17, 1919, p. 793. The complete report and cost estimates may not be finished before the first of the year, but in the meantime the following general statement of what the surveys have shown was given to a representative of *Engineering News-Record*:

The tract of land to be irrigated lies on the north and east side of the Columbia River near the center of the state and not far east of the Yakima project. The area is already partly under cultivation, and is served by four main-trunk railways and their branches. Production has been comparatively low, however, because of the slight rainfall and the impracticability of getting irrigation water for small tracts. The project contemplates including all the several small districts that have heretofore tried to get water and supplying also adjoining areas of considerable extent.

A total of 2,500,000 acres in this section has an easy slope to the southwest, and of this about 1,750,000 acres can be irrigated by gravity from a trunk canal along the upper boundary. All this tract of 1,750,000 acres has been classified in sections according to kind of soil, crops for which it is best suited, amount of water required, etc. With these data as to the amount of water required, the report will be able to state definitely that with a very low dam at the outlet of Flathead Lake a water-supply can be secured which will far exceed the requirements of the area.

Flathead Lake, with an area of 120,000 acres, is located in western Montana. From this lake the flow would be through a natural water course some 200 miles long to Pend D'Oreille Lake, in northern Idaho, which has an area of 76,360 acres. The drainage area above the diversion weir at the outlet of this lake would be about 25,000 square miles, from which the run-off is very heavy, and whose high-water season occurs at the time when the maximum irrigation water is required.

Between the Pend D'Oreille diversion weir and the boundary of the tract to be irrigated there would be about 100 miles of canal, tunnel and siphons and 30 miles of lakes or other natural water channels. The open canal would be designed to convey about 20,000 sec.-ft. Twin tunnels will be recommended, but it will be necessary to construct only one at the outset. There would have to be one 15-mile tunnel and several of lengths up to five miles; tunnels and open canal to be lined with concrete. In the case of the siphons the recommendation will be for units possibly about 18 ft. in diameter, to be built one at a time. Six units of this size would be equal to the capacity being recommended for open canal construction. Siphons would be of steel pipe armored with concrete. The only river crossing of importance would be over the Spokane River just above the City of Spokane; this would be on a concrete aqueduct.

Marvin Chase, state hydraulic engineer of Washington, is chairman of the Columbia Basin Survey Commission. Prof. O. L. Waller, head of the department of civil engineering at Washington State College, is secretary; A. J. Turner is chief engineer and J. C. Ralston is consulting engineer. D. C. Henny of Portland has been designated by the United States Reclamation Service to act as consulting engineer to the commission.

Templet Used in Clearing Sand From Irrigation Canals

Winds Blow 60,000 Cubic Yards Into Ditches — Draglines, Plows and Iron Sheaves Used Before Templet Proves Worth

DRIFT sand, almost filling in places the west extension main canal of the Umatilla irrigation project, Oregon, and seriously impairing the general water flow, has been removed by a scheme of sluicing and the use of a special templet devised by H. M. Schilling, project manager, United States Reclamation Service. The canal was built during 1914 and 1915 and has been operated since 1916. It is 26¾ miles long, concrete-lined throughout, and has a designed capacity varying from 365 sec. ft. at the head to 77.5 sec.-ft. three miles from its end. It is built through some very sandy areas, and the high winds prevailing in the spring have blown much of the excavated material into the canal.

During the first year the canal was in operation considerable sand was blown into it, nearly filling it in some places between Stations 566 and 1227. Only about 25 sec.-ft. could be run in the canal without overflowing the banks. The high spots between those stations were cut down with teams and scrapers, to allow the passage of 75 sec.-ft., 6127 cu.yd. of sand being thus removed from the main canal. In 1917 similar trouble was experienced, the sand in some places filling nearly to the top of the lining, and during the summer it was necessary to work a channel through by means of a "V," to allow the passage of the small flow required.

During the summer of 1918 the amount of sand blown into the main canal was so large that settlers in the region became alarmed over the possibility of having their irrigation water completely cut off. The first seven miles and the last five miles of the canal were comparatively free from sand deposits, but the intervening 12 miles contained an amount variously estimated at from 50,000 to 75,000 cubic yards.

The first suggestion was that a small dragline, gasoline-driven, with caterpillar tread, operate from the bank with a 30-ft. boom and a ½-yd. bucket, but owing to the difficulty of obtaining such a machine in wartime, and the uncertainty of successful operation of the bucket in the concrete-lined section, the proposition was abandoned. The canal could not be cleaned by teams without turning out the water, which was not desirable, so a means was sought to improve conditions with the least amount of disturbance to the water delivery. The suggestion was therefore made that sluiceways be built at intervals of several miles, and an effort be made to remove the sand by the aid of water.

After two of these sluiceways had been operated, it was discovered that the immediate result was the movement of sand for a distance of ¼ mile, after which distance the sand took a grade of about 4 ft. to 1000 ft. and, with but 30 sec.-ft. of water, all that was available, no further action was effected.

The main problem then became one of loosening the sand and holding it in suspension until it could be re-

moved by the available water-supply. A drag attached to a cable leading to a team on either bank was used with little effect. A farm plow was effective, but was so heavy that it required two 4-horse teams and was given up as too expensive. Two iron sheaves, 16 in. in diameter, attached to a chain, had the desired loosening effect, and could be pulled by two 2-horse teams, but the problem of transportation still remained. The sand was too heavy to remain in suspension, and after being loosened it settled again.

Finally, after study was made of operations above one of the sluiceways where the sand was filled with a growth of moss roots, it was decided to construct a gate or templet to loosen the material. The first experiment was made with a 4 x 6-ft. gate attached to a 4 x 6-in. timber which spanned the canal. The gate was placed inclining upstream, and the water pressure held its lower edge down on the sand. Thus higher velocities were created around the gate, and the sand was dislodged. The sand then settled gradually and eventually washed completely under. The gate was then removed upstream 20 or 25 ft., and the operation was repeated. This method was so successful that it led to the development of the present templet, which consists of a wooden diaphragm about 6 in. smaller than the section of the canal, with an opening 2 ft. wide, running vertically from bottom to top. This permits the increased water velocity to concentrate through the middle directly on the sand, as well as on the sides and bottom. Instead of attempting to work upstream, the progress was reversed, and as the water washed the sand out ahead of the gate the templet was moved downstream a few feet. The water pressure assisted materially in moving the gate, so one man could easily operate it by crossing back and forth on the 4 x 6 and regulating the movement. In this way the problem of transporting the sand with a comparatively small head of water was solved. This last type of templet has been a decided success, and through a systematic program of sluicing, approximately 40,000 cu.yd. of sand had been removed from the canal by May, 1919. Approximately 21,000 cu.yd. yet remain, but the canal may be considered successfully cleaned, with the exception of about 11,000 cu.yd. of sand in the vicinity of Juniper Cañon. It is the intention to remove this before the spring of 1920, by bunching the material with the templet and removing it with teams in order to avoid the long transportation of the sand through sluiceway No. 5.

Under the most successful operation of these templets two shifts were arranged, and several gates were in operation at the same time. Gates were kept about 4000 ft. apart. The larger bars were moved in sections, about 700 to 1000 ft. proving to be the most economical load. In this manner sand was transported above No. 1 sluiceway, a distance of 14,300 ft. Under ordinary conditions a gate progressed about 600 to 1000 ft. per eight-hour shift, depending on the density of the sand deposit. Sometimes several trips were necessary to get the sand out to the desired depth. After the larger portion of the sand had been gone over above No. 1 sluiceway, and the head increased to about 75 sec.-ft., the water was divided at No. 1 and about half passed on to No. 2. This enabled operations to be carried on at two sluiceways at the same time.

Comparative costs of the different methods of sand removal from these canals indicated that the method of using templets was by far the most economical. Records of the team costs show that under favorable conditions the upper portion of the sand bars could be removed for $0.27 per cubic yard. Under less favorable conditions the cost amounted to $0.40 per cubic yard, where teams were very difficult to secure and fresno work could not be done successfully below a depth of 5 ft. on the slope. To have gone deeper it would have been necessary to use slips, and the cost would have been increased greatly. Complete cost records to May 1, 1919, on the sluicing method of sand removal show that the field cost was $0.158 per cubic yard. With the addition of $0.059 per cubic yard for engineering superintendence and all overhead charges, and $0.04 per cubic yard as a plant charge for building sluiceways, the total unit cost becomes $0.257.

In order to avoid recurrence of filling of the canal by sand, considerable work has been done in replacing embankment and covering it with brush for protection against wind. Sand fences of brush were placed at right angles to the center line of the canal, where some of the worst winds operated. Some portions of the banks were sown to rye, but not sufficient moisture fell to start it. Once the canal has been cleared entirely of sand deposit, it is expected that it can be kept cleaned by the protective bank work and by running heads of water to the limit of the canal's capacity.

Safety in Steel Erection—The Equipment and the Men

Teaching and Enforcing Safe Practice—Bulletin for Bridgemen—As to Equipment—Some Safety Principles

By Col. E. A. Gibbs
General Manager, McClintic-Marshall Company, Pittsburgh, Penn.

From a Paper Read Before the Construction Section of the National Safety Council, Oct. 2, 1919.

STEEL erection, like other outside construction work, is done under more difficult conditions than shop work, for the reason that the conditions are varied and continually changing, while in the shop many conditions affecting accidents are fixed. The weather plays a much more important part in the field than in the shop. The force of workmen is much less stable; with the field force constantly changing, it is much more difficult to educate the men to safety and to avoid getting men who are unsafe on the work.

There are, however, certain differences between steel erection and general construction: The loads are generally much heavier and are handled under more varying conditions and at a greater distance from the ground. There is an element of risk in every lift. While the derrick may have been tested throughout and proved safe, an accident may be caused by a bridgeman making one careless hitch on a load of beams.

The appliances for erecting steelwork have been developed and increased greatly during the past twenty years, and erection is relatively much more safe. Nevertheless, many new difficulties have arisen. The average weight of pieces to be handled has greatly increased, while certain limiting features have remained unchanged, such as track clearances and gage. A girder may increase in weight, but the derrick car that handles it must run on and be supported by the same track as previously. This increased weight has had one benefit: Heavy members cannot be juggled and handled

in any manner that the foreman desires; the equipment can be designed to handle these in only a few ways, and the foreman must be governed accordingly. Therefore, the work is likely done as the design of the equipment contemplates and with corresponding safety.

Preventable Accidents and the Workman

Well over half of all accidents are preventable, and the proportion is probably higher. Preventable accidents may be divided into three classes: 1. Accidents due to workmen themselves by reason of being physically incapacitated, ignorant, inexperienced, intemperate, careless or reckless, acting the fool, or to actual disobedience.

2. Accidents due to foremen; improper selection of men placed in charge of work or doing the work; inadequate instruction to workmen; putting men or allowing them to go into dangerous places unnecessarily; lack of vigilance and orderliness on the work; failure to investigate questions of safety made by workmen.

3. Accidents due to superiors; improper selection of foremen, safeguards, equipment for doing the work and instructions regarding its use.

It is believed that the greatest difficulty is with the men themselves. Construction companies long ago recognized the necessity of having proper equipment, and that phase of the situation is in relatively good shape. The foreman, while still skeptical as to the value of certain expedients for safety, can be educated more easily. It isn't so easy to get them to *enforce* safety methods. The conditions on a job are changing rapidly, and the foreman is crowded to make time. He cannot do everything, and naturally devotes his time to things that speed the work and affect the direct cost. Only constant pressure on the question of safety, and using *every* accident to point out the neglect of foremen or men, will bring results.

A Safety Bulletin

The workmen are by nature and training a daring class of men, and instinctively feel that their courage and skill are questioned when they are asked to comply with many of the expedients for safety. However, they can and must be educated to take proper precautions to protect themselves and their fellow workmen. Bulletins, notices and placards of various kinds containing written and illustrated cautions and showing effects of neglect are very good. Our company, in 1910, issued a book to its foremen containing instructions and cautions for the prevention of accidents. We also started at that time to post a bulletin pointing out certain of the most common faults of workmen and how to avoid them. A small copy of this bulletin is handed to each bridgeman whom we employ. It contains several short paragraphs, as follows:

Don't Be Reckless—More accidents occur through recklessness than any other cause. Don't walk on rods. Don't ride a load. Don't ride on a locomotive crane.

Don't Be Careless—Look where you step, and be sure that on what you step is safe and secure. Don't step on ends of loose plank. Don't start to slide down a line unless you are sure the ends are fastened.

Be Orderly—Do whatever you do in an orderly, careful manner. Pile material so that it cannot roll, fall, tumble or be blown over. Don't let tools or equipment such as bolts, nuts, drift-pins, blocks, dolly bars, etc., lie around so that they can be knocked off the work or so that anyone can fall over them.

Unfit Condition—Don't go to work if you have been drinking or do not feel well. If you are lame or have any defect in hearing or eyesight you should not work at this business, as by so doing you endanger your own and fellow workmen's lives. If you are inexperienced in, or unsuited for the work to be done, don't undertake it.

Be Vigilant! Watch What You Are Doing—Don't stand or work under a load. Don't go in the "bight" of a line nor stand in front of a snatch-block. Don't work on or about a crane runway when the crane is in use unless there is a stop between you and the crane.

Don't Use Unfit Tools—Be sure the tools and equipment you use are in good working order. If they are not, don't use them.

DON'T WORK WITH MEN WHO DON'T OBSERVE THESE RULES.

Cautions as to Equipment

The first requirement for safety in erection is to have the proper equipment. And it is not enough to provide first-class equipment. It must be kept in good condition by constant attention on the job and by overhauling at the completion of the job if necessary. Some of the principles observed by our company regarding equipment are: (1) Use no wooden travelers or derricks, except very light derricks and jinnywinks; (2) all castings in erection equipment carrying any strain to be made of steel. We make all of our sheaves for cable blocks, except small blocks for $\frac{5}{8}$-in. cable, of steel. All castings when bending strains are encountered are made of vanadium steel. Vanadium insures a more uniform casting and tends to eliminate blow-holes; (3) forgings of importance, such as the headblock of a derrick car, are made of nickel steel; (4) use the very best manila lines; (5) use cable slings, instead of chains; *very important;* (6) automatic brake in addition to mechanical brake on all electric hoists.

Erection equipment should be so designed as to make all stresses as determinate as possible. Even then the many positions in which a load can and will be handled will produce more varied strains and conditions than occur in bridges or other permanently fixed structures. Be sure that all stresses and combinations of stresses are fully cared for. Then, not only make the main members strong enough, but pay especial attention to details. Most failures in erection equipment are primarily due to poor details. Booms with light lacing or lacing improperly detailed are common. Poor detailing often produces very great bending stresses that are ignored.

Erection equipment should be most carefully inspected during its manufacture, and test reports required for steel castings, all alloy metals and steel cables. The assembling and erection of a traveler or heavy derrick should be carefully done, to insure that no stresses are introduced by improper alignment. This is extremely important. Booms and traveler hoists should be tested with gradually increasing loads before using them to full capacity. While in use they should be inspected frequently to see that no weaknesses have developed through wear or other means, and that the equipment is working as designed.

Instructions should be issued as to just how equipment on heavy work is to be used, and nothing left to chance. A movement of a very short distance in the setting of a traveler or in radius of a heavy boom may be perfectly safe as far as the equipment itself is concerned, but may endanger the falsework or the permanent structure.

In the erection of falsework, great care and an accurate knowledge of conditions are necessary. Timber should be carefully inspected, and none but of good quality used. In case mudsills are used, examine the soil carefully and provide sufficient mudsills to support the load with ample safety. The matter of bracing the falsework bents themselves, their connection by bracing and struts, and the fastening of the end bents to the piers or abutments so as to prevent any longitudinal movement of falsework, are all points where too much care cannot be exercised.

Seventeen Cautionary Principles

Following are some cautions that if followed will prevent many of the accidents in steel erection:

1. Select the proper man for the particular task in hand.

2. Do not order men to work in unnecessarily dangerous places, and be on the alert to see that they do not run unnecessary risks of their own volition.

3. Do not allow the men to work on corrugated iron roofs or steel when there is a coating of ice thereon.

4. Walking on rods, riding loads or locomotive cranes, sliding down lines without inspecting the fastening, standing in the bight of a line or in front of a gate block, are all unnecessary risks and should not be permitted.

5. Do not permit men to work about crane runways without placing an effective stop between the men and the traveling crane, and see that the electric wires are properly insulated.

6. Require the rivet boss to inspect carefully all riveting scaffolds. Improperly hung scaffolds have caused many serious accidents. Only the best material should be employed. Clear spruce is the best.

7. Pipe used as needle beams should not be spliced.

8. All scaffold plank should have a stop bolt about 6 in. from each end to prevent it from slipping off the needle beam, and if the scaffold is inclined it should have cleats nailed on the plank. All scaffold material should be tested for twice the load it is expected to carry. Even this care will not suffice unless the men are careful. This was demonstrated in a case where a riveting gang used their scaffold as a brace for an air buckup. The scaffold—amply strong for its purpose—broke under this sudden additional load, and the men fell into the river.

9. On high bridge work, scaffolds should be provided with a railing. This is a requirement by law in some states.

10. Piling of material must be carefully watched, particularly with heavy work. Skids should be amply heavy and level, and the piles not topheavy. Poor piling of material is responsible for a large number of accidents.

11. When it is necessary for men to work above other men, put up a danger sign calling attention to the fact that men are working overhead.

12. Keeping small tools in condition will avoid many accidents.

13. Wearing of goggles while chipping is a necessary precaution, but one the men dislike to follow.

14. In the use of cable slings, inspect them frequently and keep them properly oiled, and in handling heavy loads pad the sharp corners to prevent cutting the cable.

15. If a boom or other derrick section is bent or damaged and then straightened in the field, do not use if for the maximum load until it has been replaced with new material.

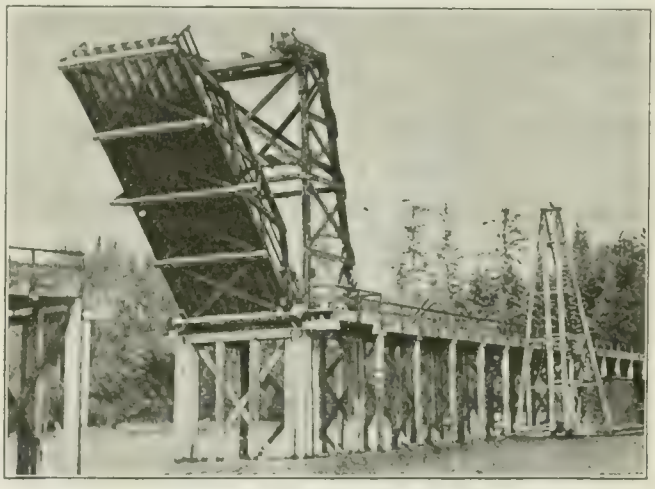
16. Do not put too much lashing in the hook of a gate block. It will cause the hook to open up and fail.

17. Keep bystanders away from the work.

Spiral Drums for Operation of Timber Lift Spans

Opening of Small Oregon Bridges Made Easier for One-Man Operation by Winches—Typical Details for 40-Foot Span

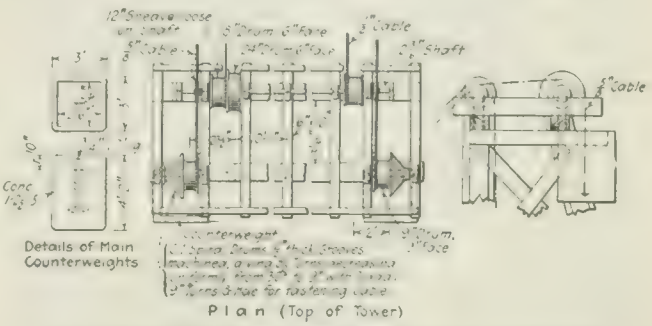
OPERATING details of a 40-ft. timber lift span are here described. Six or seven such spans, of which the one illustrated is typical, have been constructed by the bridge department of Oregon over openings at navigable sloughs along the coast of that state where traffic requires only infrequent operation. The adoption of spiral drums supporting the concrete counterweights resulted from the desire to make op-



TYPICAL TIMBER LIFT SPAN WITH SPIRAL DRUM

eration as easy as possible. These short spans have been approved by the United States War Department, and are designed as a cheap contrivance which can be operated by one man, as most of the boats which pass through these openings are of the one-man type.

The operating mechanism in these spans is simple, consisting of a hand winch located on the approach near the hinges. The ½-in. cable from the winch is passed over a drum vertically above it and fastened to the end of the needle beams of the timber span. The



PLAN, TOP OF TOWER AND DETAILS OF COUNTERWEIGHTS

greater portion of the work of opening this span is done by the concrete counterweights. These counterweights are hung from the spiral drums located at the top of the tower. When the bridge is closed, the counterweight cable is located on the large diameter end of the spiral drum to give the maximum lever arm and counterweight effect in that position. As the bridge is raised, the lever arm of the counterweight constantly diminishes, and thus preserves a uniform pull on the truss in its various positions.

To open the span, the operator starts to wind the winch, and as the truss rises from its position an automatic gate located at the open end begins to close by the release of a trip. The gate comes to a final closed position when the draw has been raised about 8 or 10 ft., and remains closed until the span is lowered. The maximum clearance which can be obtained with this type is an angle of about 60 degrees.

When it is desired to close the span, it is lowered by means of a hand brake similar to the emergency brake of an automobile. It is under easy control of the operator at all times.

The foregoing details were furnished by C. B. McCullough, bridge engineer, Oregon State Highway Commission. The details illustrated were drawn under the direction of C. H. Purcell, who was formerly bridge engineer.

Sanitary Effect of Water Storage in Open Reservoirs

Studies of Chemical and Bacterial Characteristics of Water on Entering and Leaving Two Reservoirs in Maryland

By Abel Wolman and S. T. Powell

Maryland State Department of Health, Baltimore

Baltimore County Water and Electric Company

THE sanitary importance of storage reservoirs for water-supplies has been discussed in a number of different connections. Where valuations of water systems are under consideration, storage reservoirs often assume a value, on account of their purification power, greater than would be normally accepted upon the basis of their quantitative capacity only. In such cases, the true sanitary effect of storage is a moot question, since the confusion between the nominal and actual sanitary capacities of reservoirs still persists. The general tendency, therefore, in such discussions is to measure the sanitary performance of the reservoir in terms of capacity units. Such measurement leads one into error, since two reservoirs of the same physical capacity may not necessarily produce the same sanitary result. This confusion of nominal and actual capacities appears also in practically all attempts to improve water-supplies by filtration subsequent to storage. The arguments pro and con in these situations are rarely on common ground, because of this same interchanging of sanitary and capacity units.

Another source of error in estimating the effect of storage upon the sanitary quality of water arises from the *a priori* reasoning from one reservoir to another. In this manner, attempts are sometimes made to assign relative sanitary values to storage accomplishment based upon experience in other localities. This gives rise to the quantitative conversion of effects observed in storage reservoirs which have actual capacities measured in months, to those supposedly obtainable in reservoirs of capacities measurable only in days or weeks.

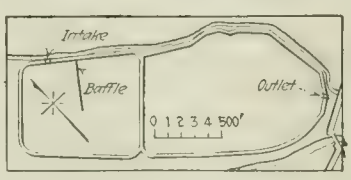
Having such problems as the above in mind, the present writers have made a series of studies upon the general question of storage functioning. Our plan is to secure quantitative material regarding the physical, chemical and bacterial characteristics of waters entering and leaving different storage reservoirs and obtain in this manner certain measures of the minimum performances of different types of reservoirs. This present discussion is the first of such studies intended to add to our present fund of material regarding storage effects. It has been prepared in the course of investigations in the Engineering Department of the Maryland State Department of Health, under the general direction of Robert B. Morse, chief engineer.

1. *Description of Reservoirs*—The reservoir system used in this initial study of storage effects is one operated by the Baltimore County Water & Electric Co. on Herring Run. The system consists of two reservoirs, in series, at Highlandtown. These reservoirs are in continuous operation, and have a combined nominal storage capacity of 21 days. The lower reservoir, put in use about 24 years ago, is an excavated earth basin, around which a bank was placed. When it was first put into service the top soil was not stripped, but later the greater portion of it was removed to a depth of 12 in. About seven years ago a concrete facing was built on the bank of the lower side of this reservoir, so as to prevent high turbidities in the water on account of washing of the slopes during storms.

The second reservoir was built only four years ago, and is also of earth. The top soil from this basin was practically all removed before it was put into service. This reservoir acts as a preliminary settling basin, the water passing directly from the effluent chamber of this reservoir to the lower one. On the lower reservoir there are three outlet gates at different elevations, so that water is always drawn therefrom at the surface.

The raw water feeding these reservoirs is supplied by Herring Run, a small surface stream subject to the surface pollution of the drainage area. The water is usually high in organic matter in suspension and in solution. Algæ growths in the stream are usually not high, but develop after the waters enter the reservoirs.

2. *Analytical Data*—The data reported in this brief study have been collected during a period of three years. In each characteristic reported, the average number of samples was approximately 100 at each station. The samples represent at all times the water (1) entering and (2) leaving the reservoirs, and do not include the stream waters which are sometimes bypassed during periods of excessive turbidity. The effluent sampling station was located at the outlet of the second reservoir, so that the changes in chemical, physical and bacterial characteristics are due only to the complex storage effects in the two reservoirs.

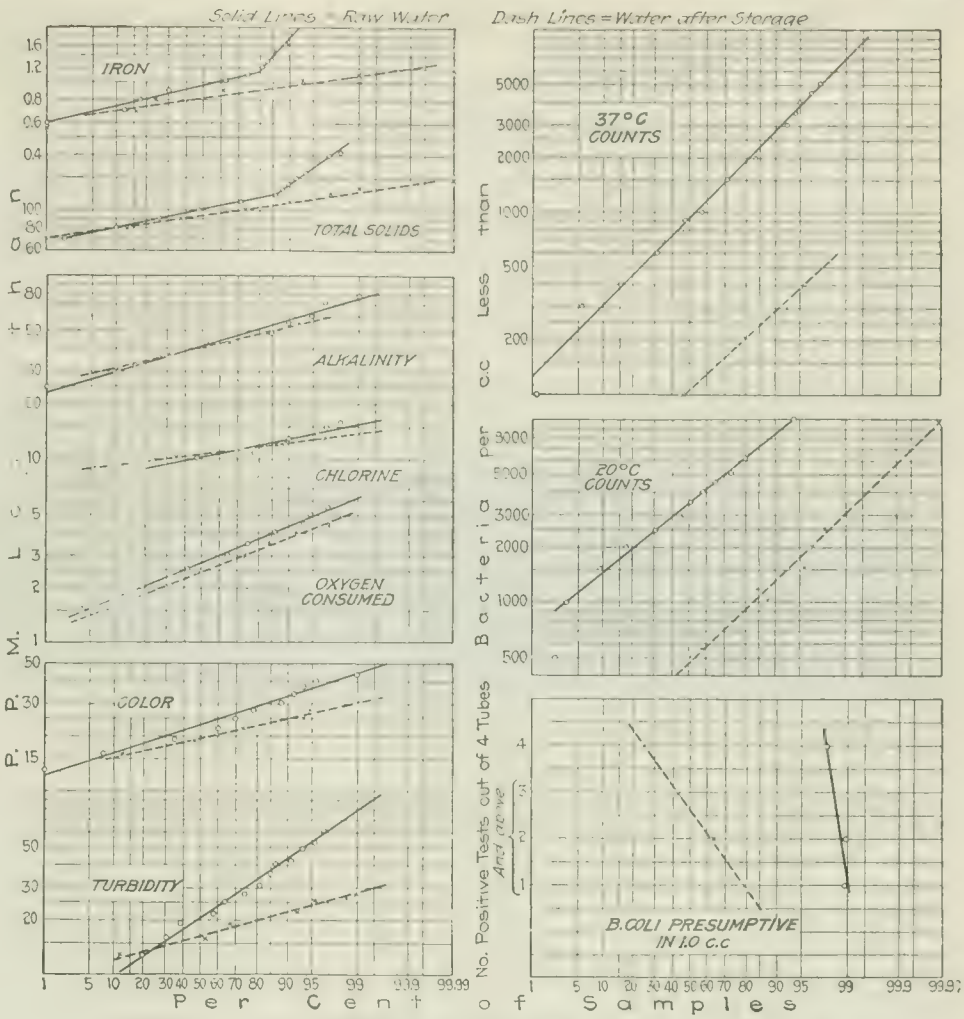


SAMPLING POINTS AT RESERVOIR INLETS AND OUTLETS

The analytical determinations were all made according to the 1917 A.H.P.A. Standard Methods of Water Analysis. The data were then classified for each station and plotted out on the accompanying charts.

3. *Charts*—The graphic presentation of the results on the charts requires little explanation. Probability paper designed by Allen Hazen is used. Its advantages lies in the fact that the material may be presented in its entirety, so that a complete picture of the distribution of the results is obtainable for each characteristic at each station. On all the charts the samples at the inlet to the first reservoir are represented by continuous lines, while those at the outlet of the second reservoir are shown by discontinuous lines.

It is not thought desirable to make any conclusive statements regarding the data here presented, since it is thought that the reader will be in a position to interpret the facts for himself by mental comparisons with the performance of other purification processes. It is believed that the charts are sufficiently complete to give a clear quantitative picture of the effect of storage upon the important chemical, physical and biological characteristics of a water. Emphasis should be placed, of course, upon the fact that these findings are typical only under the special local conditions of storage already described. It is our purpose to present in later studies further quantitative evidence of the changes in storage in other types of reservoirs.



BACTERIAL AND CHEMICAL RANGES FROM INLET TO UPPER AND OUTLET TO LOWER RESERVOIR

4. *Preliminary Conclusions*—It is not amiss, however, to indicate briefly some outstanding features displayed by the data on the charts. In the case of turbidity and color, for example, the action of the particular storage under discussion appears to be almost entirely one of levelling. In other words, the total cumulative decrease in these two physical characteristics is by no means appreciably high, but the holding in storage, as we should expect, results only in a diluting effect, in a reduction of maximum values, and in a general ironing out, without any complete removal. This levelling without complete removal represents, in this instance, the shortcoming of storage as opposed to filtration, since the latter may be expected to produce at least a water completely free from turbidity.

In the case of the alkalinity, chlorine, and oxygen consumed values, storage plays little or no part, other than giving slight diluting and sedimentation results. In its effect upon these qualities, however, filtration also has no considerable importance.

The data for iron and total solids are of interest in illustrating the marked tendency of storage to eliminate excessive chemical constituents of a water, by means of dilution and sedimentation. But in these instances, as with turbidity and color, filtration usually offers greater promise of complete removal than of simple equalization.

The nature of the bacterial changes resulting from storage is similar to that consequent upon filtration processes (which term we have assumed to include coagulation and short-period sedimentation). In the degree of these removals, however, filtration takes a considerably higher rank. The bacterial reductions induced by the storage factors of equalization, sedimentation and devitalization appear to have a limiting maximum value, in the storage reservoirs here described, which is considerably lower than that possible of attainment in an efficiently operated filtration plant. This conclusion, although obvious to some water-works officials, is still subject to controversy in a number of municipalities, where improvements in sanitary quality are often blocked through the unfortunate existence of a cure-all storage reservoir. The cause of this failure of storage to produce bacterial results comparable with those of filtration lies probably in the fact that, in the first case, complete bacterial destruction is predicated upon the absence of a continuous minority of bacterial growth, which largely is to be expected, while in the case of filtration in the last-mentioned desideratum is of far less importance, since the natural processes, upon which storage depends to a large degree, are here reinforced by effective artificial means of destruction. Whereas in storage bacterial removal is largely a function of time, in filtration it is dependent upon effective artificial and natural barriers, and since the latter are more easily controlled and modified, they may be expected to produce better results.

Choose Wilmington Bridge Engineer by Competition

Five Engineers Asked to Submit Designs for New $500,000 Memorial Structure—Each One Is Paid $500

FIVE engineers were each paid $500 by the Washington Street Bridge Commission, at Wilmington, Del., for the designs, plans and estimates for a proposed memorial bridge in that city. As a result, one of the engineers. B. H. Davis of New York City, is selected to prepare the final plans of the bridge. It is expected that bids for the construction will be opened before the end of the year.



ARCHITECT'S PERSPECTIVE OF THE NEW WASHINGTON STREET MEMORIAL CONCRETE BRIDGE AT WILMINGTON, DELAWARE, CENTRAL SPAN 250 FEET

The Washington Street Bridge Commission was created by an act of the General Assembly of the State of Delaware during its last session, and received authority and power to construct a bridge across Brandywine Creek at Washington St., in the City of Wilmington. The commission consists of Alfred I. du Pont, chairman; B. F. Shaw, J. S. Rossell, I. C. Elliott and Albert Stetser. After the formal organization of the commission Frederick W. Carpenter, formerly division engineer in charge of construction of the seventh division of the dual subway system, Public Service Commission, New York City, was selected as executive officer and consulting engineer.

Competitive general plans and estimates were invited May 26, 1919. The invitation indicated the general character to be given to the proposed structure, the width of the roadway and sidewalk, as well as the loading and stresses in specific terms. Competitors were required to submit with their estimates a schedule of quantities and unit prices and total costs of the various classes of materials entering into the construction of the bridge, the limit of total expenditure in connection with the erection of the bridge being $500,000. Competitors were required also to submit, with their plans and estimates, photographs of structures that they had designed, with their location, also a list of references and a proposal for engineering work involved in the preparation of detailed plans, specifications and supervision of construction of the bridge. The time set for the submission of these plans and estimates was July 1, and a fee, as stated above, of $500 was named as full payment for suitable studies and estimates in accordance with the invitation.

The invitation was sent to six designing engineers and architects in various parts of the country. Five responded and submitted, collectively, 10 different designs. To each designer was given a hearing by the commission, subsequent to the submission of his design. After careful consideration of the designs and estimates, the commission July 29 invited all the designers who had accepted the original invitation to submit on or before Aug. 13 new plans and estimates for a stone bridge or a combined stone and concrete bridge. Those who had already submitted plans providing for stone treatment were permitted to submit any alterations in their plans and estimates which they might desire to make.

On this basis some additional designs and modifications of designs were submitted. On Aug. 14 the commission, after further consideration and comparison of the various designs and estimates, accepted the general design submitted by Benjamin H. Davis, engineer, New York City, in collaboration with Capt. Vance W. Torbert, architect. Mr. Davis and Captain Torbert are now elaborating and completing general plans and a form of contract and specifications, under the direction of the commission, for a bridge in general according to the design shown in the accompanying architect's perspective. Diamond-drill core borings are now being made at the site of the proposed bridge.

The total length of the bridge, including the approaches, will be about 700 ft. It will consist of two arches of 70-ft. span at the southerly end, a central span across the Brandywine of 250 ft., and two spans at the northerly end of approximately 85 ft. each. The end or flanking spans will have closed spandrels, the main or central span open spandrels. The total width of the bridge is tentatively fixed at 82 ft., made of two sidewalks of 16 ft. each, including balustrade and nosing, and a roadway of 50 ft. All arches will be composed of three reinforced-concrete ribs carrying, through the medium of spandrel walls and columns, some type of reinforced-concrete bridge floor or deck. It is expected that the balustrades and pylons will be of stone, and consideration is being given to the use of stone for the facing of spandrels and arch rings and possibly for the other portions of the structure.

The loading and stresses provided for in the preliminary request for designs were as follows:

The bridge should be designed to carry a train of 60-ton electric-railway cars on each track, each car to be assumed to have an overall length of 60 ft.; a distance c. to c. of trucks of 37½ ft., and a truck wheel base of 6½ ft.; and also on the roadway at each side of the tracks a line of 20-ton trucks having 12-ft. wheel bases and 6-ft. wheel gage, 14 tons to be on the rear wheels and six tons on the front wheels, trucks to be spaced 30 ft. c. to c. along the roadway; load on sidewalks assumed to be 100 lb. per square foot. To all of these loads 50% should be added to provide for the effect of impact and vibration. The structure

should be so designed that the stresses produced by these loads and by the dead load of the structure itself shall not exceed 100 lb. per square inch in shear or 500 lb. per square inch in compression in concrete, or 16,000 lb. per square inch in tension in steel.

Elements of Value in Pittsburgh Street-Railway Case

New Analysis of Cost of Financing in Engineers' Board Report—Itemized Allowances for Omissions in Inventory

A NEW form of analysis of the cost of financing is presented in the recent report of the Board of Engineers, consisting of F. Herbert Snow, Robert M. Feustel, George W. Fuller, J. A. Emery and Morris Knowles, to the Public Service Commission of Pennsylvania on the valuation of the Pittsburgh Railway Co. This item is included in "structural overhead cost," which is defined as the fixed expenditure which has been made and would have to be made again in reproducing the propery, but cannot be accurately apportioned among the various items of the inventory. The report is rendered on seven bases of cost, according to various periods, ranging from the time of construction to 1922. Allowances for omissions and contingencies are itemized in detail for various portions of the inventory.

The first basis of cost (historic) deals with the total cost of creating and developing the properties and underlying companies, as determined by statements prepared from books and records, supplemented by estimates where necessary, and the remaining bases deal with the estimated costs of reproduction new of the existing physical property, as determined by the application, to the inventoried property as of Apr. 1, 1918, of prices fixed for each of the several bases as follows:

"Original Prices" makes use of prices current during the year in which each portion of the construction was done or equipment installed; "Average 1906-1915" makes use of arithmetical averages of the prices paid from 1906-1915, inclusive; "1918 at 20-Year Trend" makes use of prices indicated for 1918 by the trend of prices for 20 years previous to 1916; "Average 1914-1918" makes use of arithmetical averages of prices from 1914 to 1918, inclusive; "Average 1918-1922" makes use of arithmetical averages of actual prices for 1918 and 1919, and of estimated prices for 1920, 1921 and 1922; and "Current" makes use of prices current at the date of inventory, Apr. 1, 1918.

Allowances for Omissions and Contingencies

The report defines structural overhead costs as including (1) engineering and superintendence; (2) legal services, administration and miscellaneous general expenses; (3) interest during construction; (4) expenses during construction and (5) financing, but not including allowances for omissions, incidentals and contingencies, as follows:

No allowance: Special work; trolley wire supports; poles and fixtures; electric equipment of cars.

½ of 1% allowance: Rails—cuts, loss and wastage for suburban work; all cars except service equipment—to cover attachments only (a: see footnote a).

1% allowance: Rails—cuts, loss and wastage for city work; tie-rods and rail braces—loss and wastage; service equipment (a).

1½% allowance: Ties—excess ties at joints.

2% allowance: Field rivets (where manufacturer's shipping weights of steel were used); paving.

3% allowance: Joints and bonds—open track; substation equipment—incomplete inventory; shop equipment—incomplete inventory.

4% allowance: Feeders and transmission system—incomplete inventory, construction loss and wastage.

5% allowance: Joints—city track; signal—incomplete inventory (a); telephone and telegraph lines—incomplete inventory; underground conduits—loss and wastage; furniture; miscellaneous equipment—incomplete inventory; electric equipment of cars—incomplete inventory of spare parts only (a); track spikes; bonds—city track.

6% allowance: Ballast, open track—compacting, loss and wastage.

10% allowance: Grading outer city—for shrinkage and incomplete inventory; pipe culverts—incomplete inventory; roadway machinery and tools; farm crossings.

15% allowance: Fences and signs—incomplete inventory (a).

The cost of engineering and superintendence was determined as 4% by weighted averages of various items of the property. Administrative, legal, miscellaneous and general expenses of construction were estimated as 3.5% and include the compensation of administrative officers during construction, the development of satisfactory public relations, supervision of legal and engineering departments, and office expenses. Interest during construction was reported at 6% to 11% of the total property expenditure, according to short-time loan rates prevailing during the years covered by the bases of the valuation, assuming that one-quarter of the property would go into operation 18 months after the beginning of construction and that one-quarter would go into operation at the end of each of the following three years. Taxes during construction were determined as 0.7% on the cost of reproduction, on the basis of the company's records.

Cost of Financing Distinct From Bond Discount

The cost of financing is determined as 3% on the basis of original prices and as 5% on the basis of current prices Apr. 1, 1918. The board unanimously reports its opinion that there is an element in the cost of financing distinct from bond discount, and that this element may properly be considered an overhead cost in the same class with engineering and legal expenses, and consists of compensation for bankers' services and cost of underwriting security issues. It is stated that the expense involved in assembling the necessary capital for a large property may not be present in the case of a smaller one. This expense is commonly met by money obtained from the sale of securities, so that the company receives less than sale price. The element of cost for bankers' services in marketing securities consists of personal and corporate service and expenses of examination, negotiation, advertising and selling through all of the various stages until the sale to the final investor. This expense would be incurred whether the securities were marketed by bankers or by the company's own salesmen. In the issue of securities running into many millions of dollars it is necessary to arrange for the underwriting of the issue by a large firm or syndicate, so that it may be promptly marketed without even a temporary lack of funds to embarrass the company or halt construction, this item of expense being given as the second element in the cost of financing.

In reference to bond discount the report states:

Frequently, in selling the securities, the foregoing costs are merged with an additional definitely recognized element

(a) Percentage to be added to costs and not to qualities. In small buildings and timber bridges the allowances for construction wastage were provided for in the unit prices.

Frequently, in selling the securities, the foregoing costs are merged with an additional definitely recognized element which reduces the sales price of securities below par value. This element is that of bond discount which may be required to attract investors and which is a mere adjustment of the stated rate of return on the securities to yields prevailing at the time of sale. In essence this discount is absolutely distinct from the true costs of financing; it is virtually a prepayment of interest which is disregarded by this board in conformity with decisions of the commission in estimating structural overhead costs. It is properly to be taken care of in rate of return.

The cost of "organization and development prior to construction" is defined as compensation for services and expenses necessary in the organization and development of a company from the time of its inception to the time when the charter, franchise and other rights have been obtained, and agreement obtained to furnish the capital and the project brought to a point where construction can be commenced. The item includes: (1) Compensation for promoters on a reasonable salary basis; (2) clerical costs; (3) general expenses; (4) advertising; (5) expenses for obtaining charter; (6) expenses of obtaining franchises; (7) legal expenses; (8) technical expenses; (9) expenses of consolidating smaller companies, and (10) interest during this period.

The board defines "working capital" as the mobile capital required in addition to the fixed capital, consisting of two elements, the first of which covers general stores and supplies, and the second, cash funds necessary to meet irregular payments and enable the company to buy in an advantageous market. The amount of necessary stores was determined by inventory of stocks in storehouses and storage yards, as carried on the general account of the company. The balance sheets of the company were used in determining average amounts of working capital carried on hand. A second method of estimating this element is given as assuming that it is, exclusive of materials and supplies, equal to one month's operating expenses.

A Common Professional Platform

Opening Address of Thomas R. Kimball, President, the American Institute of Architects, at the Inter-Professional Conference, Detroit, Nov. 28, 1919

Opening the Inter-Professional Conference in Detroit, Nov. 28, 1919 (the details of which are reported in this issue, p. 835 T. R. Kimball, of Omaha, president of the American Institute of Architects, laid the groundwork for the discussions of the conference. He justified the foundation of a new association on the ground that there was need to organize against the commercialism of the day, and to bring the professions forward in unswerving support of the professional principle. He pointed out the difficulties to be met on account of misunderstandings and jealousies between the professions, but hoped that all could come together on a common platform of unselfishness as opposed to commercialism, erecting on that platform a standard "calling for skilled service wherein the common interest of all mankind is first considered, the client second, and self last." Mr. Kimball's address, in full, follows:

A DEFINITE, far-reaching, purposeful object is, I take it, the only possible excuse for suggesting further organizing a machinery-laden, overorganized, unhappy, perplexed, well-nigh discouraged humanity.

Essentials to such an object should be:

1. Undebatable justification of the object itself.

2. A common viewpoint from which to consider its problems.

3. A clear understanding as to who are rightly concerned with it, and an intelligent prognosis, which shall point out the obstacles that *will* be met, and that *must* be overcome, and

4. A simple program that promises a result.

I should concentrate the purposes of this gathering on the formation of the strongest, most effective, far-reaching organization that can be conceived.

As justifications of such an object, I offer:

1. The present dire necessity of mankind for some so far unevident defense against our present chaotic expectancy.

2. The all-too-apparent dominance of commercialism in most existing organizations.

3. The fact that the professional principle seems to offer the one so far unorganized social element, and at the same time, as I understand it, the one and only one that can hope to qualify as noncommercial.

4. The present subservience of the professions.

5. Their meager contribution, except as the servile doers of the will of others—witness, the spectacle presented by the recent august conference called by the President of the United States, in his untiring effort to harmonize labor and capital, wherein the representatives of a great profession, unaccredited as such, however, retained by the contending interests, unmindful of that higher professional obligation, completely nullified each other's endeavors, endeavors which if combined for furthering the objects of the conference might have offered a solution of its problem, instead of a potent contribution to its failure.

Continuing in justification of organizing, I offer also the total failure of the so-called professions to overcome the baneful effect of jealousies inherent in the interrelation of all arts and sciences, and the failure to get their disciples past the breadwinning stage in time to contribute worthily to either art or science.

Should none of these reasons seem sufficient, I would justify this conference by the belief that most, if not all, of our professional ills can be cured by the *right sort* of an organization.

Our hope of accomplishment lies, I think, in a clear common understanding—a single thought language in which to discuss and clarify—for unless we can, in common, differentiate between unselfishness and greed—and distinguish professionalism from its counterfeits—our task is hopeless!

In considering who are rightly concerned in this matter, we should, I think, look first to those who see in professional life something more than the obligations of business and art, for every so-called profession will, I am sure, be found to have, and to cling to, its accepted prerogatives; and in each group that professes there will be found a very small percentage who practice what they profess.

Each art and science will be found almost hopelessly jealous of all kindred callings, and within each group individual jealousies will prove the order, not the exception. The finding of a common understanding of what a profession is will in itself be no easy task, while agreement on essential professional qualifications will, I prophesy, go far to justify all the accusation embodied in what I have just said.

Let a clear and none-too-optimistic forecast lead us to approach our problem with appreciation of its difficulties. Let us make a great effort to be unselfish. Let each try to see with the other's eyes—and let us join in the hope that a common understanding and a clear way may be shown us.

In the matter of program for this meeting, I hesitate to lessen the range of possibilities by making even a single suggestion, yet I feel so strongly on certain points that I must offer some ideas at the risk of thereby proving my own disqualifying selfishness.

It seems to me that we should keep before us the creation of an instrument, big enough and broad enough, to make known to the public the fundamental principle of professionalism and to secure for it recognition and acceptance. And to that end, we should strive for qualifying standards far more human and far less technical than any so far advanced.

I should wipe out that time-honored distinction which for so many years has sought to limit the professions to the "cloth," law, medicine, Army, and Navy.

I would warn against trying to form any coalition of the recognized vocations through their representative organizations. I would seek to establish, instead, a single, fundamental qualification, based on unselfishness as opposed to commercialism. And on that as a foundation I would erect a standard, calling for a skilled service wherein the common interest of all mankind is first considered, the client second, and self last. Under such a flag let us rally all who can and will practice according to that creed!

Let us try this in the belief that the object is worthy, the opportunity here—and to justify our abiding faith in mankind!

If in this work we can avoid all stereotyped philosophies and theories and look only to a practical way to gather and harness skilled brains and big hearts, wherever we find them joined, I venture the opinion that a defense will be found before which commercial greed will stand checked, and behind which life—human life—will at last find sanctuary.

"Service Charge" for Water Defined

E. O. Edgerton, president of the California Railroad Commission, during the recent hearing of the Spring Valley Water Co.'s application for an increase in rates, gave a definition of the "service charge." He declared that the charge was the only method of making every person bear a share of the cost of maintaining an ability to get water service on demand. He gave the definition following a description of the service charge by Allen Hazen, consulting engineer, of New York. President Edgerton said:

"Mr. Hazen, is this a fair statement of the philosophy of the service charge? In addition to the direct charges which you have mentioned, such as collections, interest on meter installation, etc., there is a cost for holding the service ready for use, of which, in fairness, everybody attached to the system having available the service of the system should bear a portion; the only way it is possible to make every such person bear a portion of the cost is to assess a charge, whether the water is used or not, a charge which represents the ability of the consumer to get water whether he used it or not."

"I accept that as a very, very complete statement of the case," replied Mr. Hazen.

The Personal Element—

A Discussion of One Phase of Industrial Unrest and a Suggested Remedy.

By P. B. McDonald,
Assistant Professor of English, New York University

A WELL known engineer who has had experience in executive work has remarked that it is not difficult to find clever men, but that it is exceedingly difficult to find clever men who will work together. This very human trait, reminiscent of the reason why we see no Irish bands, since each member would want to be leader, was much in evidence during war activities, and is becoming more and more of a problem in industry.

At Nitro, W. Va., for instance, where many millions of Government money were spent on a great smokeless-powder plant, the directing representative of the War Department, Milo S. Ketchum, was kept busy settling disputes over conflicting authority. Like General Goethals at Panama, he had to decide, in addition to disputes between officials and departments, such ticklish questions as whether clothes-lines and dogs should be allowed in the town, to what extent Government automobiles and telephones should be used for private purposes, and the apportionment of responsibility in neighborhood spite-wars. In an old community such difficulties are not so likely to arise, or at least they settle themselves, but in a "company town," or where petty officials contend for predominance in various departments, or where contractors oppose inspectors, even a judicial dictator with the ability of Harun-al-Rashid has difficulty in keeping peace.

The psychologists who served the Government during the war suggest that the problem of the future in the administration of industry will lie in conforming routine and bureaucratic machinery so that exceptional individuals—of whom the number is very large—can do the work for which they are fitted under the most favorable conditions. Such exceptional individuals are likely to possess unusual talent behind the unlikeliest-looking and unlikeliest-acting exteriors.

A few years ago, during the reaction against individualism, they were largely disregarded or ridiculed as "cranks," but a broader policy is now becoming evident. It is being realized that many apparently normal people may develop occasional "queer streaks" and evince stubborn prepossessions about trivial matters, and that the handling of such irregularities is going to be of more consequence than might at first appear. We hear of labor strikes nowadays over grievances about eating lunch on company time, or the recognition of a committee, or the attitude of a straw-boss. The executive in most demand, particularly by unpopular corporations, is the man who can adjudicate and "head off" such outbreaks.

The Craze for Standardization

Possibly the curious, often ridiculous, disputes which are occurring in industry are a consequence of too much mechanizing of the habits of human beings. At the end of the nineteenth century there came a reaction against the extreme individualism which writers like Herbert Spencer had made popular, and Americans underwent a craze for standardizing everything that possibly could be standardized. The high point of this standardization campaign was reached in Taylor's efficiency engineering, and while the merit of the application of scientific method to the details of human activ-

ity is well recognized, it is also acknowledged that human beings must be treated like human beings.

Many large companies have established a grievance or welfare or sociological department which aims to keep the employees as contented as possible. These departments appear to have some measure of success, but are likely to be counteracted in influence by the conscious separation of such an attitude as they attempt to foster from the actual operating experience of the daily work. It is as though a man went into a department store and received unpleasant treatment from a floor-walker for which the only satisfaction that could be obtained was an apology from another official whose daily task consisted in making apologies and who had little or no contact with the floor-walker. The obvious solution would consist in employing floor-walkers more capable of understanding and dealing with human beings. Managers and employers might ask, "But how are such floor-walkers to be obtained?" The answer of course, is that they are obtained as anything else is, by making a special and persistent effort to get them and keep them. There could well be a little more trusting to one's intuition, rather than to organization, in the directing of enterprise and in the selection of leaders.

Since it is obvious that everyone cannot be a boss or "a leader of the band," the only consistent way of attaining harmony and loyalty throughout an organization is to put in the positions of leaders only those men who possess the qualities of leadership. The average employee does not object to working under the direction of a man who really is a leader; what he does object to is working under a "bounder" or "two-spot." Most soldiers who served during the war are familiar with the feeling which Arnold Bennett has described as coming to the young subaltern who was marching in a review past a general; the soldier suddenly realized that in the person of the general was that quality of leadership which could induce men to lay down their lives at his order—men otherwise selfish and independent.

We are told that Carlyle's ideas on hero-worship are extravagant, but we should realize that without the hero-worship that is instinctive in the human race democracy would be only chaos and anarchy. It is impossible for employees to feel the least symptom of deference toward many of the industrial officials who are set to direct them. When such misplaced bosses become fairly numerous in mines and factories, an epidemic of unrest and strikes begins. It is an indication that the personal element has been neglected; that positions demanding leadership have multiplied faster than the employers have ferreted out real leaders; that to the wrong men has been given authority over employees, who are quick to detect such mistakes.

Workmen are beginning to realize that they care as much about the personal treatment which they receive in their work as they do about the wages paid. Many men prefer to work for less wages in a position where they are looked upon as human beings than to receive high pay but scant personal consideration under bosses who should be driving trucks or ringing up fares. Man is still a very human individual and there are limits to the power of higher wages. An additional payment of so few cents per hour cannot permanently recompense men for the general lack of consideration for the personal element in employees. Much of the unrest and discontent now so prevalent throughout the country is caused not so much by low wages or long hours as by a neglect of the personal element in industry. This personal element can be supplied, not by the creation of a new department in organization, but by a general change in attitude and policy in the personnel of officials. There are indications that such a change is under way. A franker recognition of the need for it may bring it about more surely and expeditiously.

Garbage Collection and Disposal at Utica, New York

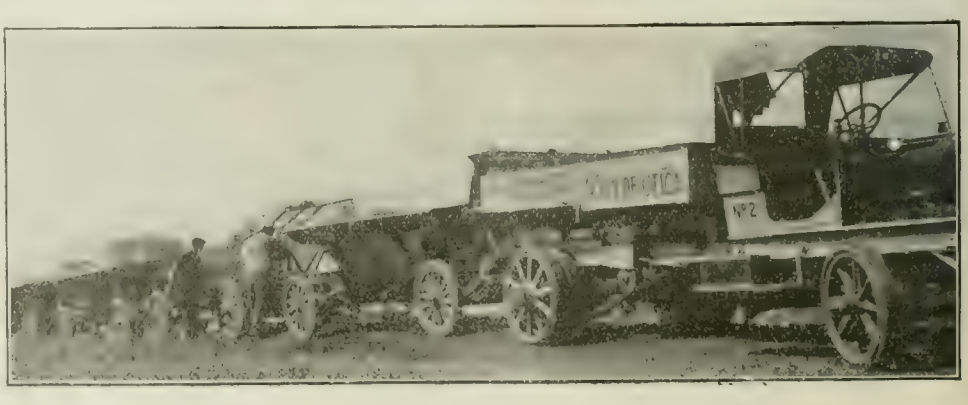
Pickup Made By Trucks With Trailers—Disposal by Feeding To Hogs and Sheep—Methods Employed—Cost of Operation

COLLECTION of garbage by motorized equipment, and disposal by feeding to hogs and sheep, have been employed in Utica, N. Y., and have been found to effect a large saving. The pickup is made by trailers drawn by teams, which in turn deliver the trailers to a motor truck for haulage to the disposal farm outside the city. By means of this system the city is saving about $5000 per year, besides having the work better done. The satisfaction of the public with the new system is evidenced by the large decrease in complaints from property owners.

When the old contracts for disposal by reduction ran out April 1, 1919, new bids were taken for the work. The old company, whose contract price for the disposal had been $4100 per year, raised it to $8000, while a new firm bid $3100 for disposal by feeding. With this saving of practically $5000 in view, the city determined to take over the work of collection, and gave the contract for disposal to the low bidder.

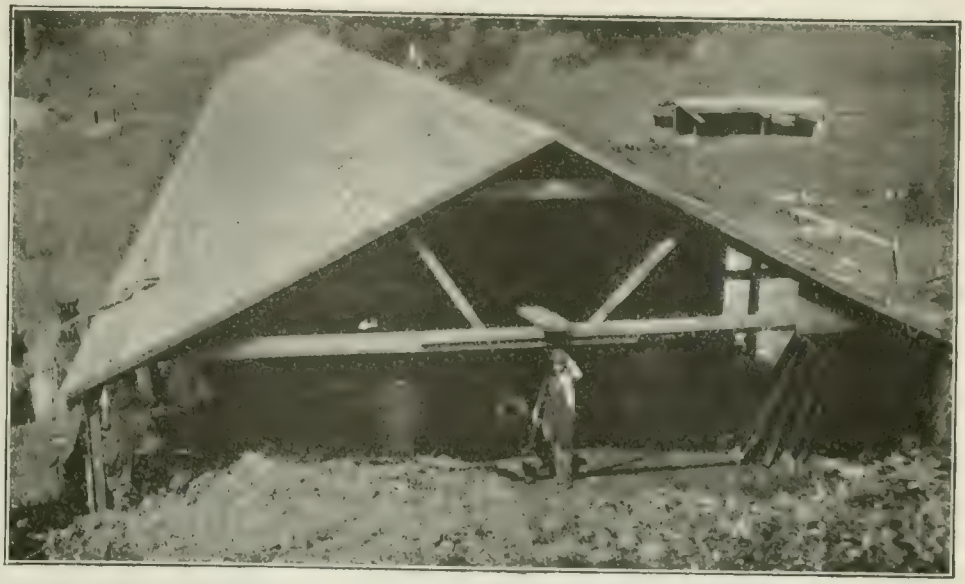
For collection purposes the city immediately purchased a new plant consisting of sixteen 3½-yd. side-dump Lee trailers and two 5-ton White motor trucks. Each trailer handles about three tons of garbage, and, when loaded, the trucks handle four trailers over the road to the piggery.

The system used in collection of the garbage is as follows: Eight teams leave the barn at 8 a. m. with one



GARBAGE BEING DUMPED FROM TRAILER TRAIN AT FEEDING FARM

trailer each. These operate over a specified route, taking a different section of the city each day, until the whole is covered. About 10 a. m., the two trucks, each with four empty trailers, start for agreed places of meeting with the teams. Upon arriving the teams exchange their loaded trailers for the empties, and the trucks proceed to the feeding farm while the teams continue collection. The haul to the piggery is about four miles. After dumping, the trucks return for another load.



DUMPING CHUTE AND BREEDING PEN AT FEEDING FARM

Upon arriving at the feeding farm, the loads are side dumped from the trailer down a chute, where the material is picked up by teams and hauled to the various feeding colonies on the farm. The chute is flat and built on an angle of about 45°, with a width equal to two trailers. A view shows a four-trailer train standing at the head of the chute, with one trailer in the operation of dumping. To arrive at the site the trains operate over unimproved country roads, which in some places have grades from 7 to 8%. Little trouble has been experienced in operation at any time.

A large pile of garbage may be seen at the foot of the chute at one end of the breeding pen, where it is loaded for delivery to the various feeding grounds. In collecting the garbage, care is taken that no glass or other substance injurious to the pigs or sheep is included. At the time of instituting the new system the common council passed an ordinance which prescribes heavy penalties for including in the garbage any foreign matter such as glass or tin cans, etc. The ordinance also provides that householders, hotel-keepers, restaurant keepers, etc., must provide proper receptacles and must not deliver their garbage to parties unauthorized by the city to collect it.

Care of the Hogs and Sheep

Great care is taken to keep the breeding and feeding pens in such condition that the animals will not become diseased. The breeding pen shown in the view is divided into small pens about 8 x 12 ft. In these the sows breed and remain with their litters until weaning time. The young pigs are then kept in the breeding pen until they are large enough to take care of themselves, after which they are removed to the feeding colonies in the pasture. One of these colonies, with the small colony houses in the background, is shown. A colony of larger hogs is shown in the foreground of the same view. The garbage for feeding is brought from the chute and deposited in the feeding boxes.

The farm consists of 160 acres, and 1600 pigs are being fed at the present time. Besides the pigs, there is a flock of about 200 sheep, which are being raised on garbage. It was not supposed that sheep would eat refuse of this character, the discovery being made by chance. It is stated by the Commissioner of Public Works that the sheep clean up the garbage fully as well as do the pigs, and appear to thrive on it better.

TABLE I—ITEMIZED ACCOUNT OF HAULAGE AND COLLECTION COST FOR JULY, 1919, AT UTICA, N. Y.

		Total
Tractors		
Operation		
605 gal. of gasoline at 25½c	$154 28	
2½ gal. of oil at $1 00	2 50	
22½ gal. of oil at $0 56	12 60	
Grease, 20 lb., at 11c	2 20	
Labor, 40 hours at $1 00	40 00	
Repairs: 2 lb. bearings at $2 31	4 62	
Paint	9 40	
Interest	65 00	
Depreciation	216 00	
Insurance	22 53	$529.13
Trailers		
Operation:		
4 gal. of oil at 56c	$2 24	
15 lb. of grease at 10c	1 50	
Repairs, mechanical	34 80	
Painting	31 65	
Interest	152 00	
Depreciation	240 00	$462 19
Harness		
Repairs	$1 20	
Interest	6 00	
Depreciation	20 00	
One new harness	82.50	$109 70
Miscellaneous Tools, Etc.		
Replacements and repairs	...	$6.55
Horses		
Feed, 176 bu. of oats at 85c	$149 60	
400 lb. of bran at $2 40 per cwt.	9 60	
9,920 lb. of hay	153 87	
45 bbls. of shavings at 50c	22 50	
Veterinary	43 68	
Interest	20 00	
Depreciation	75 00	
Disinfectant	5 00	$479 25
Office Charge		
Printing		34.00
Insurance, Truck Operation		
Repairs: 2 new fan belts at 35c	$0 70	
Interest	3.50	
Depreciation	10 00	
Operation:		
92½ gal. of gasoline at 25½c	23 59	
2 gal. of oil at 56c	1 12	
1 lb. of grease at 10c	.10	$39.01
Labor		
Superintendence and inspection	$478 00	
Teamsters and Helpers	1,310.12	
Chauffeurs and Helpers	336 50	
Cleaners	81 00	
Barn man and superintendent	250 00	
Timekeeper	83 32	$2,538.94
Total for July, 1919		4,198 77
Number of yards collected	1,119	
Number of tons collected	746	
Total unit cost per ton		$5 63

TABLE II. COSTS PER TON-MILE OF MUNICIPAL TRAILERS AND TRACTORS COMPARED WITH PRIVATE CONTRACT METHOD BY TEAMS, FOR GARBAGE COLLECTION AND HAULAGE AT UTICA, N. Y.

	Month	Tons Collected	Total Cost	Haul in Miles	Ton Miles	Cost per Ton-Mile	Collections per Month	Complaints
Contract method, by teams.	May, 1918	550	$2,328.00	1.6	880	2.64	3	205
	June, 1918	570	2,328 00	1 6	912	2 55	3	77
	July, 1918	600	2,328 00	1 6	960	2 43	3	135
Municipal collection, tractor and trailer system	May, 1919	738	3,962 48	4.0	2,952	1.34	*8	15
	June, 1919	755	3,935 17	4 0	3,020	1 30	8	24
	July, 1919	746	4,198 77	4 0	2,984	1.40	8	25

Includes $829.96 interest, insurance and depreciation on equipment per month.
* One-quarter square mile downtown area now collected daily

Equipment	Force Employed and Salaries		Summary
2 tractors.	Superintendent	$1,500 00	29% increase in tonnage
	Assistant superintendent	1,320.00	
† 16 Lee 3½-yd S.D trailers	Clerk	1,000 00	150% increase in length of haul
	Barn boss	90 00 mo	
8 teams..	2 barnmen	80 00 mo	166⅔% increase in number of collections
	2 foremen	3 00 day	
1 emergency truck	2 chauffeurs	3 50 day	45% decrease in cost per ton-mile
	2 cleaners	3.00 day	
	18 laborers	3 00 day	85⅔% decrease in number of complaints

†Trailers 4 cu yd capacity to water level; our tonnage computed on a capacity of only 3 cu yd.

In the operation of the truck and trailer apparatus for collection, two men accompany each team and trailer on pickup, and a truck driver and one helper accompany the truck and trailer trains. The men with the teams and trailers and the helper with the truck get $3 per day, while the truck driver gets $3.50 per day. On an average they work six hours, from 8 a. m. to 3 p. m., and pick up from 35 to 40 tons of garbage. These men get straight time. An itemized cost account for collection and haulage for the month of July is shown in Table I. The average cost per ton for May, June and July was $5.40. The costs include a depreciation



GARBAGE-FEEDING COLONIES IN THE PASTURE

and renewals of plant. Table II, shows a comparison between collection and haulage to the disposal plants by the old method and the new method by trucks and trailers. Large increases in material hauled, efficiency and satisfaction are indicated—this with an increased haul. The general satisfaction is shown by the greatly decreased number of complaints. While there was considerable complaint against the reduction plant used heretofore, no complaints have been lodged against the piggery. During August, 1918, 500 complaints were recorded, and it was not uncommon to have 260 complaints per month. Under the new system 26 has been the maximum for any one month. It is intended to instal a similar system for ash collection as soon as the contract for that runs out.

The system has been put in operation under H. R. Hayes, commissioner of public works, A. J. Armstrong being superintendent. The former contract for disposal by reduction was with Harry Stappenbeck & Sons, who were engaged in the manufacture of fertilizer, while the new contractor is Sauer & Hameline.

Supervision of Public Water-Supplies by the State of New York

By Theodore Horton
Chief Engineer, New York State Department of Health, Albany

Abstract of Paper Read Before New England Water Works Association

THE public water-supplies of New York State are under the supervision of the State Department of Health as regards quality and under the State Conservation Commission so far as legal and certain engineering questions are concerned. This paper deals with matters of quality.

About half of the 12 full-time engineers in the State Department of Health give practically their entire working hours to public water-supplies.

From 1886 to 1907 the typhoid death rate in the state averaged 23.1 per 100,000 and had its ups and downs. For the period 1908-19 the rate averaged 11.3 and declined almost continuously, falling to about 5 per 100,000 in 1918. The curve is now so flat as to indicate comparatively little further average decline, although the high rates which still prevail in some cities will afford plenty of work to do for some time. It may be noted, however, that of the approximately 530 water-works, supplying 8,500,000 persons in 1919, some 130, furnishing water to a population of 6,900,000, treat the water in the same way.

Chlorination alone is not a safe reliance, largely because of the impure liquid chlorine now being supplied, which causes stoppages by clogging. Of a hundred chlorination plants in the state, half get out of order from time to time.

American Ships Built Since Armistice

During the 12 months which ended Nov. 1, 1919, American shipyards turned out 2395 vessels, of 4,258,045 gross tons, officially numbered by the Bureau of Navigation, Department of Commerce. These figures, included in a recent issue of *Commerce Reports*, indicate that during that period American shipping gained approximately 85 per cent. over the similar 1917-1918 period.

Continuing a series of interviews with contractors:

Construction Labor's Instability

An Analysis—

II—In Which W. P. Schmuck of the Degnon Contracting Company Suggests Changes in Immigration Legislation as a Remedy for the Shortage of Labor

IN the judgment of W. P. Schmuck, secretary of the Degnon Contracting Co., New York City, contractors face a labor crisis unprecedented in construction history. That crisis, in his opinion, is due to the labor shortage caused by a closed door to immigration and the exodus of men of foreign extraction to their former homes, unvisited for many years. Mr. Schmuck believes the labor shortage to be so acute that large stable industries will, in time, absorb all the common labor, leaving high and dry the contractor who cannot guarantee, as can these large industries, yearly employment. So thoroughly does he believe that immediate remedial measures should be applied that he has employed much of his own time in the attempt to secure data which will be convincing to Federal lawmakers.

Mr. Schmuck's discussion of the labor situation, of which the above is a summary, reveals a close personal contact with its radicalism. He ascribes labor's restive spirit to a combination of causes, though the shortage of labor is the chief contributing factor. In all his dealings with labor the radical element, a decided minority, has held the whip hand. Take, for instance, subway construction in which the Degnon Contracting Co. has wide experience where the majority of labor used is Italian. Mr. Schmuck asserts that labor, in the main, may entirely refrain from open acknowledgment of union affiliation, but when a strike is imminent the radical leaders, through intimidation of the laborer or his family, usually control the situation. Such intimidation and the laborer's inherent dislike for the term "scab" or "strike-breaker" are the great aids to the union business agent in bringing about a strike. In many cases, laborers are not positive strikers. When a strike is called they remain at home to insure the safety of their families and to avoid the stigma attached to strikers' characterizations of non-unionists.

Radicalism Growing

As an example of the increasing radicalism of labor he cites the following paragraph, which is section 5, article VIII, of the working rules for Local 1456, Dock and Pier Carpenters, and which is incorporated in their agreement with the Contracting Dock Builders' Association for 1920:

"Any foreman who uses abusive language or rushes men under his supervision shall be fined $25, ruled off the job, and not allowed to act as foreman for this employer for one year. Where discrimination is charged, reasons must be given and in case the charges are proven no members shall be permitted to work for the employer."

Granting that there is a great deal the matter with labor, Mr. Schmuck is more concerned with measures of relief. He accepts the existence of a crisis which demands immediate application of remedial measures. To meet this crisis he has more than theory. He has in mind a well-developed course of action on which he has spent considerable time and thought. He gives it to us for what it is worth. Realizing that the labor shortage is the underlying cause of labor unrest, he has formulated a plan of attack whereby he would convince Congress of the necessity of passing immigration laws which will allow the absorption by the American contractors of adequate foreign labor. Facts and figures must be exact to be compelling, otherwise Congress will, with little investigation, drop the contractors' plea that immigration be permitted. His plan is therefore comprehensive and is, essentially, susceptible of division into two main heads.

The first of these two divisions involves a census of industrial labor and that used on construction work in enough centers of population or seats of industrial and construction activity to give an adequate relation between labor supply and labor demand. The second part of his plan contemplates a canvass of American ports to discover the extent of the exodus of Americanized Europeans to their former homes, and the number of newly arrived immigrants. Through the combined information as to the exact shortage of labor, and the extent to which labor is returning to foreign soil, Mr. Schmuck believes he would be able to produce such convincing figures as to force the most careful consideration by Congress of his plan for limited immigration.

Sources of Information

Two sources, from which could be secured information as to the exact labor shortage, and the balance between emigration and immigration, present themselves to Mr. Schmuck. They are the United States Chamber of Commerce, through its constituent members, and the United States Department of Labor. Though the former might produce results the more quickly, it is believed that, inasmuch as the several congressional immigration committees would doubtless be more impressed by reports emanating from Federal agencies, a labor balance sheet would probably secure more thoughtful consideration if all the facts and figures contained in it were expressions of the Federal Department of Labor, or some other authorized agency for the accumulation and dissemination of such data.

Mr. Schmuck believes that were true conditions in Europe made known to those men who are daily returning to European soil, many of them would hesitate to leave the United States. He believes that, generally speaking, the Americanized foreigner, returning to his former home, has little knowledge of the living conditions that he will meet across the Atlantic, although in a measure the social and economic turmoil has been indicated to him by those of his friends who have made this transatlantic trip. In order fully to inform prospective voyagers as to exact conditions in those countries which they intend visiting, Mr. Schmuck advises the establishment of information bureaus at ports of embarkation and at such places where passports must be applied for. He also suggests the distribution of information concerning living conditions in European countries through foreign language press reports. All this information would be devoid of colorful detail and would not be given out with the idea of creating prejudice.

Mr. Schmuck has already gone so far as to write to

certain members of Congress indicating that the most careful consideration must be given legislation concerning immigration. A reply to one of these letters, written shortly after the armistice, contained an oft-repeated argument, the fallacy of which Mr. Schmuck wishes to expose. This particular Congressman asserted that the then apparent shortage of labor would be corrected when the American Expeditionary Forces were returned to American soil. Such a view, asserts Mr. Schmuck, does not take into consideration the fact that the poorest man in the American Expeditionary Forces would not do subway construction work. Firms such as the Degnon Contracting Co., which specialize in that class of construction, must therefore count upon other than ex-soldier labor. Mr. Schmuck has also written to chambers of commerce and similar bodies in the hope of securing information as to the extent of the labor shortage in certain centers, as well as the extent of the exodus of the Americanized foreigner.

Mr. Schmuck believes in his plan. He believes in it to such an extent that he has utilized a good deal of his own time, although his duties in connection with the Degnon Contracting Co. are extensive, in perfecting it and in endeavoring to secure information which will be convincing to members of Congress. He is thoroughly alive to the dangers that lie in the enactment of such legislation as will permit of the wholesale immigration of radical foreigners. Nevertheless he believes in the possibility of the passage of such immigration laws as will allow entrance to the sane and industrious foreigner. He believes that the United States could readily absorb all the sane laboring element that the recently war-ridden European countries could allow to leave.

Like many of his associates, Mr. Schmuck believes that all incidental difficulties would be eliminated were the labor shortage to be corrected. He pleads for correction through adequate immigration legislation. Without it he sees the possibility of stabilized industries absorbing all common labor, leaving the contractor stripped of working forces. The execution of his plan for a labor survey he finds makes greater claims upon his time and energies than he can afford to give. He frankly admits the immensity of the project, and he asserts that the individual or organization or agency which carries these ideas into successful execution will have done the greatest possible service to the American contractor.

Typhoid Suit Over Rochester Dual Water-Supply

The dual water-supply at Rochester, N. Y., has given rise to a suit against the city for typhoid damages. The suit, after being dismissed by the trial court for lack of evidence, has been remanded for jury trial by the New York Court of Appeals (Stubbs vs. City of Rochester, 124 N. E., 137). For decades Rochester has been the only city of any size in this country, and almost the sole city, to maintain a separate water-supply for ordinary fire protection and for street sprinkling, the water being pumped from the Genesee River. The plaintiff alleges that mixture of the fire protection and potable supplies caused him to have typhoid, and he brought suit against the city for damages. The evidence indicated that during the period of mixed supply there was more typhoid in Rochester than usual and that typhoid was contracted by many who drank the mixed water. The city health officer testified that in his opinion the mixed water caused the case of typhoid in question. The defendant city claimed that the case was not proved, with the result already stated.

Flood Protection and Drainage at East St. Louis, Illinois

City, Industrial and Farm Areas Protected From Mississippi and Hill Streams by Levees, Channels and Large Pumps

REMOVAL of drainage waters and control of storm waters through the low lands along the Illinois side of the Mississippi River, opposite St. Louis, Mo., by means of channels, pumping stations and the use of lakes as reservoirs during exceptional floods, are the recommendations of a recent report made to the East Side Levee and Drainage District by Alvord & Burdick, consulting engineers, Chicago. These lands, known as the American bottoms, were subject originally to flooding by the Mississippi River and by storm waters from numerous streams flowing down the steep bluffs which form the eastern boundary of the bottoms.

About 12 years ago the above-named district was organized, for the protection of an area of about 96 square miles, having a length of nearly 20 miles and a width of about five miles from the bluffs to the river. Since then a channel has been cut across the north end of the district to carry the flood waters of Cahokia Creek, the largest of the hill streams, which formerly followed a circuitous route through the district to an outlet in the City of East St. Louis. A system of levees also has been built, extending along this channel, down the river front and back to the bluffs. These works and the flood-control problem were described in *Engineering News* of Feb. 2, 1911, p. 132; Aug. 28, 1913, p. 432, and Feb. 5, 1914, p. 300. The present report deals with the control of water falling upon the district and coming into it from the smaller hill streams, which latter have a drainage area of about 81 square miles, but it touches also upon the possible requirements for improving the existing flood channel and levees.

Seven Cities and Much Farm Land Included

The drainage district includes a group of seven cities and extensive railway and manufacturing interests, but about 90% of its area is farm land, a considerable area of this being useless at present on account of insufficient drainage. The present population is about 140,000; it is estimated that it will reach 400,000 by 1950. This is largely within East St. Louis, Ill., which, as shown by the report, has grown in 10 years to become the second city in the state, owing to its importance as a freight terminal and as a location for industries dependent upon shipping facilities.

Storm waters now to be dealt with are those from the 81 square miles of drainage area in the hills and the 99 square miles of drainage from the bottoms, which find outlets through Cahokia Creek and Prairie du Pont Creek, shown on the accompanying map. During heavy storms the water accumulates in the lakes, and flows gradually away through the creeks, but with the river at the 20-ft. stage at the Eads Bridge, corresponding to 407.1 United States datum, the flood gates at the mouth of Cahokia Creek are closed and the accumulated waters must remain until the river recedes. A low ridge extending from the bluffs to the river and occupied by the Baltimore & Ohio R. R. divides the district into two sections, connected by some culverts. The lower section is still subject to flooding by backwater



PRESENT AND PROPOSED WORKS FOR FLOOD PROTECTION OF 96 SQUARE MILES AROUND EAST ST. LOUIS, ILLINOIS

from the river, as the Prairie du Pont levee on the south boundary has not been completed to the bluffs. The old channel of Cahokia Creek extends through a congested industrial district of East St. Louis, where it is restricted by numerous railway bridges and embankment, while it creates a nuisance by taking the sewage and trade wastes of the packing-house section.

Run-off from the bottoms is influenced largely by storage in the lakes and ponds, and by ponding at the numerous railway embankments, which are well above the interior flood plane. Storage capacity of about 400,000,000 cu.ft., 540,000,000 cu.ft. and 2,700,000 cu.ft. at El. 410, 415, 420, respectively, is provided by the lakes and low ground.

Maximum flood heights in the Mississippi reached El. 428.5 in 1844 and 425.1 in 1903, while the low water plane is 387.1 United States datum at the Eads bridge. With the completion of the Prairie du Pont improvements the district will be inclosed by levees corresponding to El. 433 at the bridge. The lowest parts of the district are at about 402, while the major portion lies between El. 420 and 430. After the great storm of Aug. 20, 1915, water was ponded in Horseshoe Lake, the lowest part of the district, to El. 417.64, and though

the river fell rapidly the land was not cleared of the surplus accumulation for about 16 days. The records of this storm show a rainfall of 6.85 in. in one day and 7.29 in. for two days.

As to the method of drainage, the engineers conclude that the best way is to handle both local rainfall and storm water from the hills by carrying it through the district to the river. They consider it economical so to drain the bottoms that farming can be carried on to the normal low-water lines of the lakes, as damage to crops on the lowest ground will occur probably only one year out of 10. It will be economical so to design the outlet works and pumping plants that in such exceptional storms as that of 1915, occurring probably only once in 50 years, the lakes and adjacent low lands would be flooded for from 2 to 15 days up to a maximum of El. 414, United States datum.

Three 12-Foot Conduits Proposed

Improvements recommended in the report include two main sections. For drainage of the northern part of the district and elimination of the nuisance from stockyard wastes, a reinforced-concrete conduit 6600 ft. long is to extend east from Cahokia Creek to the river. This would have three channels 12 ft. in diameter, with a combined flow capacity of 2000 sec.-ft. It is explained that a single 20-ft. conduit would be more economical, but that its lower portion would be in wet ground below ordinary low-water stages of the river, while with the triple conduit the excavation will be mainly in the dry and the top elevation will be sufficiently low to provide good drainage. At the river end there will be controlling gates and a pumping station having a present capacity of 1000 sec.-ft., this capacity being increased as required. Larger and smaller conduits were considered. but the 2000 sec.-ft. capacity was decided upon as meeting the flood conditions most economically. Larger conduits would be of unduly high cost, while with smaller ones the run-off would be so slow that water would remain on the land long enough to kill crops.

For the southern section of the district it is proposed to enlarge and extend the present main ditch, connecting it with two lakes and providing an outlet of 1000 sec.-ft. capacity through the Prairie du Pont levee near the St. Louis & Iron Mountain R. R. At this point there would be a pumping plant having a present capacity of 500 second-feet.

Large Centrifugal Pumps Required

Pumping at these stations would average 52 days per year, records indicating variation from zero to a maximum of 130 (in 1915). Most of the discharge would be against the relatively low stactic head of 7 to 12 ft. For a few days it might reach 15 ft., and even 21 ft. in exceptional floods. The report states that centrifugal pumps as large as any yet manufactured would be required; probably six 72-in. and two 42-in. pumps for the eventual 2000 sec.-ft. capacity of the larger station. Electric operation is assumed on the basis of lower cost for plant and operation than under any other power.

A summary of the cost estimates follows:

Cahokia Creek conduit	$1,284,000
North pumping station (1000 sec.-ft.)	450,000
Ditch and outlet conduit	300,000
South pumping plant (500 sec.-ft.)	250,000
Total	$2,284,000

An alternative method of handling the hill drainage is to carry it outside of the district to a diversion channel for gravity flow to and through Prairie du Pont Creek, as shown by the map. The creek, as improved by levees, has a capacity for 200 sec.-ft. per square mile, which is ample for all the hill drainage, and the channel preferably would have this same capacity. Its slope would be about 1½ ft. per mile, giving a maximum velocity of 5 ft. per second. The channel would be about 17 miles in length, with some heavy cuts, and having a levee on the west side to prevent river floods backing up into the channel from overflowing into the district. The low land between the levee and channel and the hills would provide ample area for occasional heavy floods and storm waters, the flooded width varying from 500 to 2500 feet.

This diversion channel would serve about 45% of the drainage area and relieve the bottom lands of 40% of the water now reaching them and to be handled by the works described above. With outlets of the capacity noted, for these latter works, however, this relief would not materially improve the interior conditions during the floods of 10-year intervals, while in the exceptional 50-year floods the maximum water level in the district would be only 2 ft. to 3 ft. lower than that provided by the plan recommended, protecting an additional 7700 acres in such storms.

This diversion would reduce the operating expenses of the pumping plants, but would involve higher cost of maintenance for the diversion channel than for the main ditches in the bottom lands. Its cost would be about $1,072,500, while in the plan recommended the proportion of cost due to the hill drainage is about $912,000. In the possible event of municipal development on the low lands, the diversion channel might be warranted as an additional precaution in the future.

As to capacity of the main ditches, it is considered that they should be proportioned to carry off a rainfall of ½ in. in 24 hours over the area tributary to them. They would be of larger capacity where the hill drainage enters the bottoms, in order to remove the flood flow rapidly. Ordinary rainfalls would be carried in the ditches at such a level as not to injure crops on the adjacent lands, while storage in the low spots would be utilized so as to cause the least damage under exceptional storm conditions.

The adequacy of the existing works to exclude floods of the Mississippi River and Cahokia Creek is an important point dealt with in the report. Property values in the district are high and likely to increase, so that there should be assurance of ample protection. In the 1915 storm the present Cahokia Creek diversion channel at the north end of the district was filled practically to capacity, while rainfalls of that period on the west side of the river indicate the possibility that the drainage areas of the creek and the East Side district may be subjected to still heavier rainfalls. Under such conditions, and in view of the disastrous consequences of levee failure on the river front, especially if near any of the towns, the engineers recommend that study be made of the safety of the existing levees, in view of the possibility of a higher future flood plane.

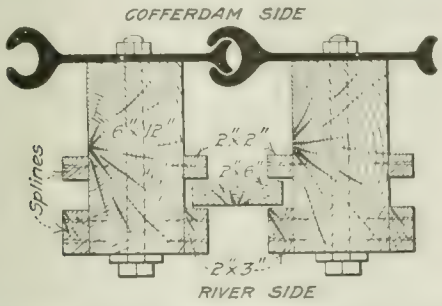
Assistance in the form of surveys, maps and records was furnished to Alvord & Burdick, for the purpose of this report, by E. F. Harper, consulting engineer, and W. E. Putman, chief engineer of the East Side Levee and Drainage District.

New Type of Thin-Wall Cofferdam

Combined Steel and Timber Piles Form Sectional Design Giving Low-Cost, Stiffness and Water-Tightness

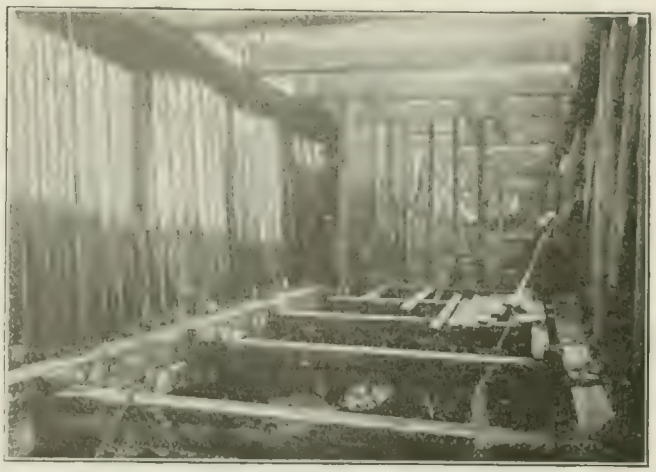
A SECTIONAL type of cofferdam, designed to combine the advantages of steel sheeting and puddle-wall construction, is a new development employed in building the concrete bulkhead wall along the river front of the site of the new union station, Chicago.

In this design the wall of the cofferdam consists of individual piles, each composed of an interlocking steel



COMBINATION PILES FORM THIN-WALL SECTIONAL COFFERDAM

sheet pile having a heavy timber secured to the outside of its web by bolts spaced about 7 ft. on centers. Wood splines are spiked to the sides of the timber, as shown in one of the drawings. After these combination piles have been driven for any desired length of



COFFERDAM HAS STIFF WALL REQUIRING BRACING ONLY AT TOP AND BOTTOM

wall, the spaces between the timbers are closed by driving vertical planks in the grooves formed by the splines. In this way a closed pocket is made in front of each joint in the steel sheeting, so that any leaks are isolated and can be closed by filling the pockets with sand, sawdust, cinders or other material.

This construction provides a thin but stiff and water-tight wall, the stiffness of which makes it possible to use less bracing than is usually required, and this reduces the obstruction to the work within the cofferdam. The narrow width is of particular importance for work in navigable waters. In cost, speed and facility of driving and pulling the piles, this construction is approximately equal to a single line of steel sheeting, while it is considered to have advantages over the puddle-wall type of cofferdam in cost, amount and salvage of material and time required for construction and removal.

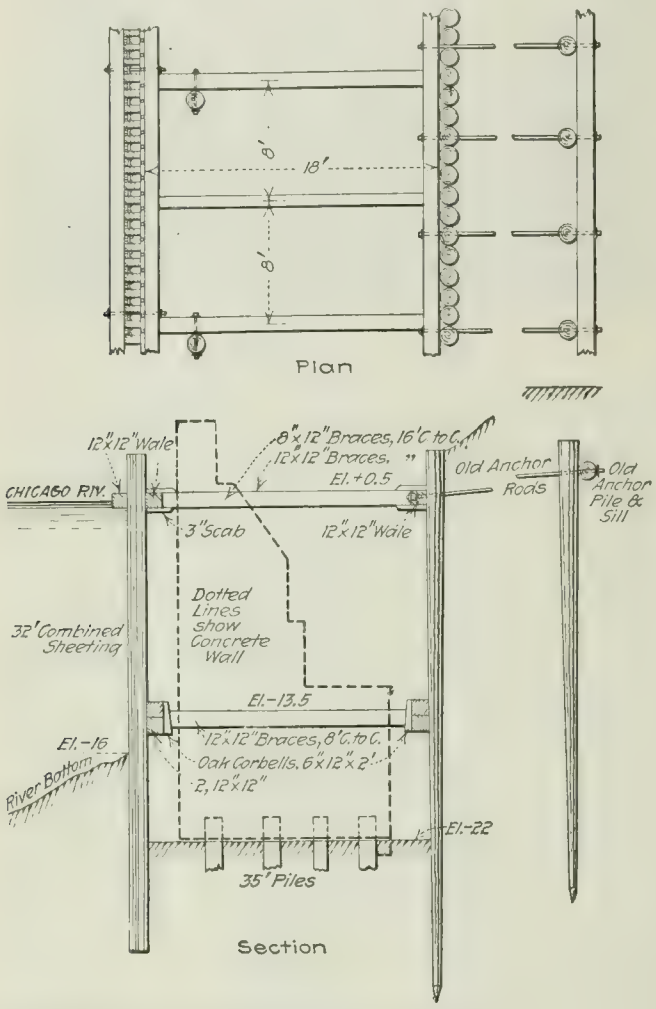


CHICAGO RIVER COFFERDAM WITH THIN BUT WATER-TIGHT WALL

Pumping down the water to a depth of 13 ft. before placing any lower bracing was practicable on this Chicago River work, owing to the stiffness of the cofferdam. This enabled all bracing to be placed in the dry, instead of being submerged in advance of lowering the water level. On this work the excavation is 18 ft. wide and 22 ft. deep below the surface of the water. The river wall is built in the manner described above, while on the land side are the old bulkhead piles or a single close row of round piles which are tied to the anchor piles of the old timber bulkhead wall.

Only two sets of bracing are required, one of these being a little above the water line and the other 13 ft. below this, or 9 ft. above the bottom of the excavation. For the lower bracing, double wales are used to give additional resistance.

This new type of cofferdam construction is the invention of John F. Cushing, assistant general manager of the Great Lakes Dredge & Dock Co., which has the contract for the river wall. The work is under the direction of J. d'Esposito, chief engineer of the Chicago



COFFERDAM CONSTRUCTION FOR BULKHEAD WALL ON CHICAGO RIVER

Union Station Co. All piledriving, excavation and concreting are done by floating equipment.

For future construction operations modified designs of the combination piles have been worked out to meet various conditions. In hard ground, where the driving of the large timbers would be a difficult matter, it is proposed to use I-beams riveted to the sheet piles. Angles riveted to the webs of the I-beams would serve to hold the stop or closing planks, which would be driven in grooves formed by the angles and the flanges of the I-beams.

A Long-Range Transit

A surveyor's life is not all pleasure. H. L. Brightman, engineer of surveys, Michigan State Highway Department, makes the following observations in the *Proceedings of the Michigan Engineering Society*: "Foolish questions are also a nuisance. One in particular I have often been asked by a bewhiskered native is, 'How fer kin ye see with the durned thing?', meaning the telescope. You might as well take a short cut and tell them you can see the sun 91,000,000 miles away. This generally precludes further interruption. 'Tis a glorious life."

Insulation Resistance in Motors Reduced by Moisture

By W. W. Brush
Deputy Chief Engineer, Department of Water Supply, New York City

Moisture, aided to some extent by natural deterioration from old age and infrequent operation, was responsible for the burning out of a number of the electric motors which drive the high-pressure fire-service pumps in New York City. The pumps are six-stage, centrifugal machines having a capacity of 3000 gal. per minute against a pressure of 300 lb. per square inch. They are driven by 6600- and 6300-volt induction motors. Under normal conditions of operation a motor is started on receipt of a fire alarm and stopped when the Fire Department notifies the pumping station that no further supply is needed.

In 1917 there was a fire in Brooklyn and after the pumping station had been in operation for about 48 min. one of the motors burned out. A second motor was started and ran for 40 min., when it burned out; a third motor was started and ran for 66 min., when it also burned out. The fourth motor finished the run on this fire, which required it to be in operation about 45 min. An examination showed that the insulation of the stators had failed and would have to be rewound.

After the repairs were made tests of the insulation resistance were made. Inquiry of the manufacturers showed that they considered that a minimum of five megohms resistance was necessary for safe operation, although operating men of experience expressed the opinion that two megohms would be sufficient. To eliminate moisture, the machines were baked and varnished, but eight months later the insulation resistance dropped to slightly under two megohms on days when the weather conditions were unfavorable. The motors absorbed moisture from the air in sufficient volume to lower the insulation resistance to a dangerous degree.

To prevent deterioration by moisture, it was decided to try various devices, such as covering each motor with a canvas housing and applying heat with a small steam coil at the base of the motor frame. Consideration was given to the use of unheated air dried by means of a special electric fan or blower, and this method offers interesting possibilities which may later be tried out by tests, but for the present the drying of the air by heating seems to be the surest method in its results.

Milwaukee Water Siphon Under River a Difficult Job

An inverted siphon for carrying water under the Menomonee River at W. Water St. in the City of Milwaukee is now being constructed. The barrel of the siphon, according to T. Chalkley Hatton, chief engineer of the Sewerage Commission, is to be about 100 ft. below city datum and composed of a concrete ring 60 in. in diameter, inside of which is to be laid a 30-in. cast-iron hub-and-spigot pipe. One caisson shaft has been sunk to subgrade and vertical air locks installed. The other caisson shaft is now being sunk with considerable difficulty, owing to obstructions encountered in the form of old timbers, piles and marine wreckage. These caissons consist of steel rings lined with concrete, built on the surface in 6-ft. sections and sunk by their own weight, assisted occasionally by hydraulicking around the cutting edge.

Bituminous Concrete and Brick Roads for Indiana

New State Specifications for Brick Paving and Bituminous Paving on Concrete Base—Special Brick on Grades

CEMENT concrete, bituminous concrete and vitrified brick are the three types of highway paving provided for in the new specifications of the Indiana State Highway Commission. The first two of these types are included in work now under construction, with cement concrete in the majority of cases, as noted in *Engineering News-Record* of Sept. 4, 1919, p. 488. In all cases the paved width is 18 ft., with a 2-in. crown. The specifications were prepared under the direction of H. K. Bishop, chief engineer of the commission, and an abstract of those for concrete paving and preparation of road-bed was given in *Engineering News-Record* of Sept. 25, 1919, p. 614.

Bituminous-Concrete Roads

This construction includes a 1½-in. wearing course and 1-in. binding course on a 6-in. concrete base, the base being extended upward at each side to the finished level of the paving so as to form 6-in. curbs 2½ in. high. Asphaltic cement for this surfacing is to have a penetration of from 50 to 75, but generally between 60 and 63, the requirement being varied by the engineer according to the kind of asphalt that is used. At 77° F. the penetration must be at least 50% of the above limits. Loss by volatilization must not exceed 3% by weight of the bitumen, and the ductility test must show an elongation of not less than 60 cm. for material having a penetration of 50 at 77° F. Increase or decrease of 2 cm. will be allowed for each five points above or below the 50 penetration.

Mineral aggregate for the binder includes stone and sand passing a 1-in. screen and a ¼-in. sieve, respectively, but slag may be substituted for stone on approval. Of the total mineral aggregate, 15% to 65% must be of 1-in. to ½-in. size and 20% to 50% from ½-in. down to a No. 10 sieve, while 15% to 35% must pass this sieve. Sand and stone heated to between 225° and 325° F. are measured separately, and then mixed with asphaltic cement to produce a mixture containing 15% to 25%, by weight, of material passing a No. 10 sieve and from 5% to 6% of bitumen.

For the wearing course the mineral aggregate includes ¼-in. to ½-in. stone, stone-dust or portland cement, fine sand not exceeding 4½% of the total mixture and the mineral dust contained in the refined asphalt. The stone dust must all pass a No. 50 sieve and at least 67% must pass a No. 200, while all the sand must pass this latter sieve. The final mixture is to contain 9% to 12% of bitumen, as directed by the engineer, with other parts as follows: 5% to 10% of ½-in. to ¼-in., 5% to 15% of ¼-in. to a No. 10 sieve, 7% to 25% of No. 10 to No. 40, 11% to 36% of No. 40 to No. 80, 10% to 25% of No. 80 to No. 200, and 10% to 14% passing a No. 200 sieve.

Before mixing, the three materials are to be heated to about 300° F., not exceeding 375° F. for the sand and stone at the mixer or 325° F. for the asphaltic cement at the discharge pipe. After the sand and stone are mixed the stone dust or cement filler is added, the asphaltic cement being then poured and the mixing continued for at least 1 min. It is required that the asphaltic cement be measured at all times by weighing with scales attached to the bucket, while stone, sand and stone dust must be weighed also, unless an approved method of gaging is used.

In laying the binder course, it is to be at a temperature of 200 to 325° F., spread and rolled to a 1-in. thickness with a tandem roller of at least eight tons, working at a rate of not over 300 sq.yd. per hour. Hot tampers of 25 lb. weight and not over 48 sq.in. in area are specified for use within 8 ft. of structures. This binder course must not be laid for a greater distance that can be covered by the next day's output of wearing surface and no traffic must pass over the binder.

For the wearing course, a temperature of 250° to 280° F. is required, according to the asphalt used. It is first rolled with an eight-ton tandem roller having a main roll of such width as to give about 250 lb. per inch of tread, the rolling not to cover more than 200 sq.yd. per hour, while a 10-ton roller is required for the final compression. Tamping is done as above. Contact surfaces of structures, curbs and joints are painted with asphaltic cement. After ironing all projections, joints and honeycombed areas, portland cement is swept over the surface. Traffic must be excluded for at least six days.

Brick Paved Roads

This construction provides for 4-in. vitrified blocks with cement grouting, laid on a ¾-in. cement-sand bed over a 4-in concrete base. For the bedding course, a 1:4 dry mix is used, made by a batch mixer or by hand. This is compacted by a hand roller not less than 36 in. in diameter and 24 in. in width, weighing 10 lb. per inch width of tread and having a 12-ft. handle.

Bricks must not lose more than 22% of weight in the rattler test, and "hillside" blocks are required on grades of 5% or over. The surface of the brick paving is to be rolled with a tandem roller of three to five tons, working first transversely and then at 45° in the opposite directions. Hand tampers on 2-in. boards are to be used at curbs and inaccessible points. Grouting must follow the paving closely, using a 1:1 hand mix or 1 : 1½ machine mix, the grout for the hand mix being spread with scoop shovels and swept over the paving. Any open spaces are to be filled with a thicker grout, and the paving finished to a smooth surface with squeegees. With paving of hillside blocks, the grooves are cleaned out when the grout has taken its initial set but is still soft, the pavement being then swept clean.

Expansion joints ⅝ in. thick, of the premolded type, are to be placed adjacent to street-car rails. Testing the finished surface is to be done with a 10-ft. straightedge, all depressions exceeding ¼ in. being corrected. After inspection, the surface will be covered with ½ in. of sand, to prevent too rapid drying of the grout filler, this being sprinkled three times a day when the temperature is 75° F. or over. Traffic must not be permitted for at least 10 days, the sand covering being removed before the road is opened.

Concrete Base For Paved Roads

Concrete for the 6- and 4-in. bases of bituminous and brick paving, respectively, is made with crushed stone, slag or gravel, graded from a maximum size of 1½ to 2 in. down to ¼ in., not more than 5% of the material passing a ¼-in. screen. Stone must have a French

coefficient of wear of 8. Slag must have been air-cooled and exposed to the weather and must weigh not less than 75 lb. per cubic foot when dry and shaken. Gravel must be washed.

The mix is specified as 1 part cement to 9 parts total aggregates. This will approximate 1 : 3 : 6, but the fine aggregate must not exceed 50% of the volume of the coarse aggregate, while 7 cu.ft. of concrete in place must contain 94 lb. of cement. The cylinder test for consistency allows a vertical settlement of 4 in. in a 6 x 12-in. column of concrete when the cylinder is removed. A mixer of the batch type is required, with a minimum time of 1 min. at 14 to 20 r.p.m. Timing and measuring devices are not specified, as in the case of concrete paving (see *Engineering News-Record* of Sept. 25, 1919, p. 614). Hand mixing is permitted in batches not exceeding ½ cu.yd. No expansion joints are used. Bucket placing is not specified, as for concrete paving, but the concrete must be deposited by a "discharging device which does not cause segregation of the mortar and coarse aggregates."

Forms may be of wood or metal and must be set to line and grade for 200 ft. in advance of the concreting, their faces being cleaned and soaped or greased. Concrete must not be made when the temperature is at 35° F. or below, nor may materials containing frost be used. During hot weather, the concrete is to be sprinkled for at least three days after placing, while during cold weather, when the temperature may be expected to reach the freezing point, it must be covered with fodder, straw or stable manure.

Concrete base for bituminous concrete paving must be given a moderately rough surface, with the coarse aggregate well embedded but not coated with mortar, while for block paving the surface must be brought to a smooth finish. The specifications state that the concrete shall be brought to the required grade "by means of a templet, straight-edge or the backs of shovels."

Large Production of Synthetic Cast Iron

Over 150,000 tons of "synthetic cast iron," made from steel turnings, were produced in France during the war by a single company operating three works, according to information given by C. A. Keller at a meeting of the Iron and Steel Institute in September, 1919. The process involved is one in which the steel turnings are melted in an electric furnace in contact with coke. To reduce the conductivity of the mixed charge of turnings and coke, and at the same time to desulphurize the metal, basic slag is mixed with the charge. As the mass is heated by the electric current passing through it, carburization of the iron begins well before fusion, but goes on much more rapidly as the melting temperature is approached. Complete carburization is attained upon melting. The silicon content of the metal may be kept practically unchanged. Working the electric furnace by continuous charging, the consumption of electrical energy has been reduced to as low as 675 kw.-hr. per ton of pig, in a 2500-kw. furnace of 80 to 100 tons capacity per 24 hours. In case the raw material used is undesirably high in phosphorus, it is necessary to resort to duplex working, dephosphorizing in an electric furnace, with partial carburization, and then carrying out the remaining carburization in an open furnace. The power consumption is more than doubled in this case, but an iron of a very high degree of purity may be produced.

Federal Purchase of Railroads at Fair Value

MEANS to be employed in effecting the "acquisition by the Government of the railroads of the country at their fair value," as outlined in the article on "A Plan for Private Operation of Federalized Railways," published in *Engineering News-Record* of Sept. 11, 1919, p. 496, have been presented in some detail by the author of the article, Col. William J. Wilgus, consulting engineer, New York City, in a letter replying to an inquiry on the subject.

After pointing out that the determination of fair value must be faced in every other railroad plan so far advanced, Colonel Wilgus states a preference for making such a determination on a basis of capitalized net income for the "test period," 1915-1917, rather than on a basis of stock market quotations, physical valuation or investment cost. In outlining the manner of Government purchase, it is stated that the problem is primarily one of how the Government will raise the annual sums required for a proper return on railroad investment, rather than whether the capital involved is represented by a corporate or a Federal security.

The letter follows:

You ask how the Government can be expected to arrive at a fair value of the railroads, and how the Government would get the money to pay cash for such portion of the purchase price as the owners might elect so to receive in lieu of Government securities.

Before attempting to answer these queries I should like to call your attention to the fact that they apply not only in the case of the plan we are discussing, but also with equal force in the case of every other plan that has been so far advanced.

To determine the adequacy of fair rates, fair value must be known, and this means that in some manner the fair value of the railroad properties of the United States must be arrived at, whether the ultimate solution is to be attained through private or public ownership. Therefore, we cannot escape dealing with this situation face to face.

As to the manner in which the Government will raise the money with which to finance the transaction, this, in the final analysis, resolves itself into the question of how the Government will raise the annual sums required for a proper return on capital invested in the railroads of the United States. In other words, annual income is the point at issue, regardless of whether the piece of green paper which represents the title of the holder to a share in such annual income has engraved upon its face the name of a corporation or the name of the Government. As you know, in France securities are purchased on the basis of annual income rather than on the principal. In a nutshell, the question of financing primarily rests on the raising of an annual income directly or indirectly to be guaranteed by the Government. This applies, as stated above, to every plan that has been so far advanced, and is not peculiar to the one that I am proposing.

If, instead of leaving the title of ownership of the railroads in private hands, the Government should take the title along with the financial responsibilities thereto attached, it seems to me that the problem can be solved with comparative ease through the acquisition, by the Government, of the owners' equity in the properties, namely, through the purchase of the common stock. Under this plan the Government would assume the responsibility for the payment of the principal and interest of outstanding bonds, and the interest on outstanding preferred stock, to the extent that the par value of such securities would be found to be covered by "fair value." Of course, in some cases it might prove advisable for the Government to acquire the preferred stock, but this is a detail.

Under this suggested method of solving one phase of the problem common to all plans, it would only be necessary

for the Government to issue securities of sufficient volume to acquire the owners' equity in excess of the par value of outstanding bonds and preferred stock.

As to the way in which fair value shall be determined, a phase of the problem common to all plans, it seems to me that there are four angles from which to approach the subject: (1) A value based on current market quotations for securities, both bonds and stock; (2) physical valuation; (3) capitalized net income for the "test period," 1915-1917, and (4) investment cost.

It is probable that those in the first instance clothed with the responsibility of determining fair value will be authorized to take into account any or all of these various methods.

It seems to me (a) that the first should have little bearing on the subject, because market quotations not only are subject to manipulation, but, above all, they reflect only the value of the floating supply which usually is a comparatively small proportion of the total issues of outstanding securities; (b) that the second has little, if any, bearing on real value, in the true sense of the word, according to my conception of that term—the desirability of a thing expressed in money, and in any event will take so long finally to determine, that in most instances it will not be available for use when needed; (c) that the third, with proper modifications in special instances, is perhaps the most equitable way of determining fair value, and (d) that the fourth has merit as a check in connection with the main use of the third means of arriving at fair value.

Illustrating how these ideas would work if applied to a concrete case, I will take that of the Norfolk & Western Railroad.

Using round figures, the total income of that company from all sources in 1918 was approximately $20,500,000, from which, deducting interest on bonds and preferred stock and miscellaneous items—say, $5,000,000—there remained about $15,500,000 for the common-stock holders, whose holdings, we will say, are to be acquired by the Government. In capitalizing this annual return, however, there should first be deducted items that cannot be assumed to be of a continuing nature. We will assume that the net annual income to be capitalized is $15,000,000.

Taking into account the risks of the present and future, it would seem that the rate of interest to be used in capitalizing this annual income should be not more than 8%, which would make the value of the common stock, say, $187,500,000.

To compare this with investment cost, $307,000,000, there should be deducted from the latter the par value of outstanding bonds and stock, say, $114,000,000, leaving $193,000,000 as the value of the common stock based on investment cost, this contrasting with $187,500,000 arrived at through capitalization of net earnings for the "test period."

Taking the less sum, the value of the outstanding $120,000,000 of common stock would be at the rate of approximately 156.

As to how the Government would get the money with which to pay cash for the purchase price of this stock, this also may be best illustrated by taking a concrete case.

The owner of 100 shares of Norfolk & Western common stock, valued in the market at the present time at something less than $100 per share, is receiving $700 per annum. On the basis above set forth he would, we will say, be offered by the Government the alternative of receiving $15,600 for his stock (which, of course, includes not only the value flowing from the income he is now receiving, but also future potentialities through the distribution to him of a larger share of the earnings not only of the railroad but also from Pocahontas coal field holdings) or an equal amount of Government 5% bonds returning him $780 per annum.

It is fair to assume that a large proportion of the holders would prefer the ease of mind that accompanies the holding of a Government security and would take the latter instead of demanding cash. Those of a speculative turn of mind would ask for cash, which then, of course, would immediately seek investment in various enterprises, domestic and foreign.

The domestic field being largely restricted because of the removal of the railroads as a field of endeavor, the seeker for high returns would look to other lands in which capital is now so badly needed for restoring the ravages of war.

As a matter of fact, the same will be true if the Government, in effect, guarantees a return on existing railroad securities, including the common stock, as the latter would then be removed from the speculative field, and those of a venturesome disposition would market their holdings exactly as in the case of similarly inclined holders of Government securities issued in exchange for those of private corporations. In other words, the question of raising cash in connection with the solving of the railroad problem, from any angle, appears to be alike whether through guarantee of existing private corporation securities or the issue of Government bonds in payment therefor.

Summed up, it seems to me that the determination of fair value, absolutely necessary regardless of the plan that is adopted, is comparatively easy of solution if gone at in the right spirit by both sides to the controversy; and that the question of financing, also unavoidable no matter which plan is adopted, is comparatively easy in the case of Government acquisition because of the simplicity with which the necessary annual burden will be placed on the shoulders of the users of the railroads, and the probability that a comparatively small proportion of Government securities will have to be sold for cash with which to pay off those stockholders who prefer cash for investment in speculative fields instead of a worryless premier security.

French Tests of Concrete for Ships

DURING the war concrete barges and small ships, mostly tugs, were built by the French Navy. Preliminary to the construction work, experimental investigations were carried on looking into the availability of concrete for shipwork. A few of these are reported in *Le Genie Civil* of Sept. 20, 1919. They include studies into the permeability of concrete against fresh water, salt water, and oils, the effectiveness of certain coatings in promoting oil-tightness, the value of various kinds of rod ends in increasing bond strength, the effect of repetitive loading, and value of reinforcement welding.

It was found that normal concrete could readily be made water-tight both in sea water and fresh water for any pressures that might be expected in shipwork, but the experiments with oil are not as satisfactory as those made in this country. Tests proved the great permeability of light oils through concrete, even when protected with an especially rich mortar face. Of the coatings tried, only one, a French patented process known as the "Holzapfels" method, proved at all efficacious, and the details of this method are not given except to state that it consists of the use of a special paint for oil-carrying concrete. No very good paints were found for the hulls of concrete ships, in which respect the French tests differ from American experience. The rod-end tests showed again that the most effective method is a long, semicircular hook. Further tests of reinforced-concrete bars in kerosene showed that the 72-day immersion in oil materially reduced the bond strength of the steel in the concrete. This concrete is presumably the same kind of concrete as that penetrated by the oil in the previous tests.

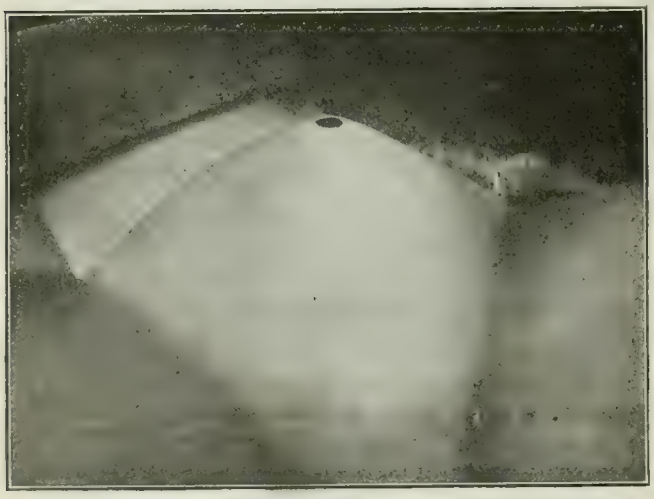
Repetitive tests made on very small pieces, and few in number, indicated that beams are apt to go to pieces under repetitive loading which would not be dangerous as a continuous load. In the conclusions on the welding tests, it is stated that it is possible to obtain a joint fully equal to the strength of the rod itself, but it is thought that ordinary forged welding should not be attempted, as electrical welding and gas-flame welding are much more efficacious and economical. Electrical welding, however, is more expensive.

Toronto Drifting-Sand Filter Results

By Norman J. Howard
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Abstract of a Paper Read Before the New England Water Works Association

THE drifting-sand water-filtration plant at Toronto, Ont., has a daily capacity of 60,000,000 Imp.gal. in 24 hours, but a maximum rate of 72,000,000 Imp.gal. daily must be maintained for a period of 10 hours. [Under the terms of the contract.—Editor.] The rate of filtration is 150,000,000 Imp.gal. per acre per day. The two principles involved in the operation of the plant are coagulation without sedimentation, and the necessity for a drifting as well as a stationary body of sand in the filter. The coagulant is introduced in the suction well before the water is pumped to the filters. As regards operating results, this paper deals with the year 1918. [The plant was described in detail in *Engineering News* of Dec. 21, 1916, p. 566; a summary of the results of the contract tests was published in *Engineering News-Record* of Oct. 31, 1918, p. 817.—Editor.] When in operation, the stationary body of sand is hard and compact, with a cone-shaped surface. The drifting sand is of a buoyant, spongy nature, and offers little resistance to penetration. In practice it is found that the slope of the drifting surface cone is a minimum of about 32 degrees, and the slope on the surface of the cone forming the stationary plan is about 64 degrees.



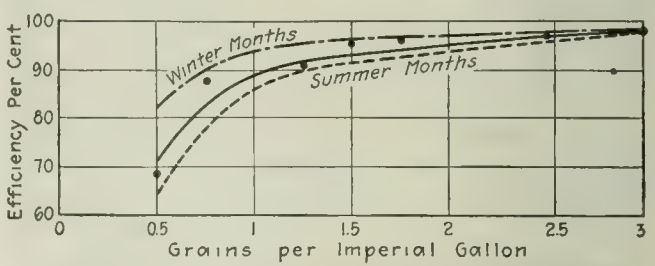
CONE FORMATION IN DRIFTING-SAND FILTER

The initial loss of head in the filters is 6 ft., and it gradually increases to 11 ft., when the filter is backwashed. The length of run ranges between one and seven days, according to the physical condition of the raw water and the amount of alum applied. Backwashing is effected by reversing the flow of filtered water through the bottom of the filter, the wash water coming from an elevated tank having a head of 25 lb. The backwash water is 1 to 2%, and in addition 2% of the water treated is lost through the sand washer.

The cast-iron throats of the sand washers did not wear as long as was expected and they were relined, first with extra-heavy black iron pipe and finally with similar pipe carbonized. Most of the scour has been traced to a tail eddy, which forms at the back of the sand nozzle by the water passing it. By using the modified sand-washer base, scour has been greatly reduced, and a number of new washers are being installed.

During 1918 the only effect of turbidity was to cause an increased amount of alum to be applied for clarification purposes. Water free from pollution offered most difficulty. In the winter months the polluted water required at least 1½ to 2½ grains of alum in order to get a satisfactory effluent. During the summer months it was found necessary to apply at least 2½ grains per Imperial gallon of polluted water which often was free from turbidity. Water slightly polluted required about one grain per gallon.

Frequently, the water becomes heavily polluted after less than 8 hours' change in the meteorological condition. Three abnormal results are excluded from the average of bacterial counts. [That is, the averages are presented both with and without the abnormal results included.—Editor.] One of the results excluded was in September and two in October, when the bacterial count in the raw water was in the neighborhood of 15,000 per cubic centimeter, and at the same time an insufficient quantity of coagulant (1.5 grains per gallon) was being applied. On the other occasion the alum was reduced too soon, following a change in the direction of the wind. When chemical tests were made it was found that the water was still polluted, and consequently the alum was again increased. During the intervening period a sample was collected and proved to be unsatisfactory.



BACTERIAL EFFICIENCIES WITH INCREASE OF ALUM

Including all bacterial results, the average number of bacteria on standard agar, 37-39° C., was 369.5 per cubic centimeter in the raw and 53.4 in the filtered water, showing an average reduction of 85.4%. Excluding the three abnormal samples, the figures were 303.6, 34.7 per cubic centimeter, and 80.4%. The B. coli were 612 per 100 c.c. in the raw and 31.7 in the filtered water, with a total average reduction of 94.8%. Excluding the three abnormal samples, the corresponding figures were 608 per cubic centimeter for the raw water and 22 for the filtered water, with an average reduction of 96.4%. The chlorinated water showed an average bacterial count of 1.72 per cubic centimeter, while only two samples out of 1900 showed the presence of B. coli in 1 c.c. This gives a total removal of 99.9 per cent.

The original specification called for certain efficiencies being obtained on an average of one grain of alum per Imperial gallon, this figure being largely based upon the results from an experimental plant on Humber Bay water in Toronto. As a result of practical experience with the mechanical filtration of Lake Ontario water, considerable modification has had to be made as regards the operation of the new plant. Conclusive evidence shows that Lake Ontario water cannot be bacterially purified to a high degree by mechanical filtration with only one grain of alum per Imperial gallon. The actual purification effected by the drifting-sand filters in 1918 was on an average application of 1.027 grains of alum per Imperial gallon, and the results obtained with so small an amount are satisfactory. The accompanying diagram shows that if a higher dose of alum be applied a corresponding degree of purification is obtained. The economical practice, however, had to be taken into con-

sideration on account of the enormous cost of aluminum sulphate, and when it is considered that during periods of high pollution as much as 2.5 grains per gallon was applied, a policy of operation that was definitely economical as well as practical had to be adopted. The final conclusion is that the drifting-sand filters during 1918 effected satisfactory purification with an average of one grain per alum per gallon.

New Life Apparent in Engineering Institute of Canada

Inclusion of All Engineers in Society, and Certain Constitutional Changes, Invest Members With Sense of Individual Responsibility

REVIVIFICATION of the Engineering Institute of Canada, accomplished through certain constitutional changes which have been operative a sufficient length of time to permit judgment of their merits, is attested in recent correspondence to *Engineering News-Record* from the institute's secretary, Fraser S. Keith, and is reflected in recent copies of the institute's *Journal*. Broadening the scope of the organization by changing the name of the Canadian Society of Civil Engineers, which included but a part of Canada's technical men, to the Engineering Institute of Canada, in which all classes of technical engineers are admitted to membership, and the investment of each member of the institute with a feeling of direct responsibility to the public, as well as to the technical organization of which he is a member, are conditions that Mr. Keith holds accountable for the increase of the institute's usefulness and the enlargement of its influence.

As another contributing factor to the reinvigoration of the institute, Mr. Keith points to the new system of election of counselors, of whom there are 38, consisting of a president, 3 past-presidents, 4 vice-presidents (2 elected each year), and 30 counselors—10 elected each year. The sphere of influence of the institute is more or less geographically divided into 16 districts, each now supporting strong local organizations, and counselors are representatives of the districts in which they are elected instead of being elected from the membership at large, as was the case under the old system.

District chapters of the institute have become very strong, and the system now in vogue of holding provincial, interprovincial or regional, and Dominion sessions has resulted in the establishment of a strong national organization. Formerly all meetings of the society, including the annual meeting, were held in Montreal. Now the annual meeting may or may not be held at Montreal, and any meeting of any branch is as important and as influential in proportion to the number of its membership as any held at Montreal or elsewhere, with the exception of the annual meeting and another form of meeting which is an elaboration of a system formerly in vogue. In discussing this latter method of bringing institute members into close personal contact, Mr. Keith offers the following explanation:

Professional Meetings Stimulate Interest

"These are called general professional meetings, and were adopted to give the members in the various parts of the country an opportunity not only to attend a meeting of the whole institute, but to bring members in various provinces together and to make them better acquainted; to permit discussion of local engineering problems; and to allow members larger participation than theretofore in the affairs of the whole institute. Discussions at these professional meetings are not limited to local engineering problems, but may, and often do, include those affecting the whole profession. Although the by-laws permit one general professional meeting to be held annually in each province, it was found that this procedure was neither desirable nor expedient. Now at least one professional meeting each year is held in the East and one in the West—these professional gatherings are in addition to the general professional meetings usually held in connection with the annual general session of the institute."

These general professional meetings, Mr. Keith states, have been of greatest benefit not only to the individuals attending them but also to the technical profession concerned in the discussions. "Much greater stimulation of professional spirit than any that theretofore existed has followed such meetings," says Mr. Keith, "and members residing at great distances from headquarters have been impressed, because of their participation in such conferences, with a sense of direct responsibility to both the public and to the institute."

Questions in which all members of the institute are professionally interested are discussed in the *Journal* of the institute, a monthly publication whose single purpose, as the cover on each issue proclaims, is: "To facilitate the acquirement and interchange of professional knowledge among its members, to promote their professional interest, to encourage original research, to develop and maintain high standards in the engineering profession, and to enhance the usefulness of the profession to the public."

Is Medium for Professional Discussion

Two of the most vital of the problems confronting engineers—those bearing upon professional legislation and salaries—have received the widest discussion in the *Journal*. The most far-reaching in its possible effects of all legislation proposed by the institute has been a recently drafted bill providing for the examination and registration of all professional engineers practicing in Canada. This bill was drafted by a special committee of the institute, one member being chosen from each of 16 districts. The proposed bill defined a professional engineer, declared who might practice, provided for regulations governing engineering partnership, and included provisions for the suspension of members because of misconduct, with penalties therefor, and set forth those rules governing the examination and the registration, both with and without examination, of professional engineers.

The strength of district organizations is indicated in the manner in which they have attacked the question of obtaining salary increases for Canadian engineers, particularly those in civil-service employ. Letters from various chapters of the institute, urging upon members of Parliament the necessity for making adequate financial provision for those engaged in engineering work, as well as personal letters from members of the institute to members of Parliament secured from members of Parliament, in many instances, pledges to support legislation favoring increases in engineers' salaries.

Not only has the institute been particularly concerned with questions of legislation and compensation, but its district branches have often led in industrial developments in their respective localities. A good example of such work comes from the Victoria branch, which has charged itself with the organization of a committee bearing the tentative designation of the "British Columbia Board of Industry." This board, including returned soldiers, representatives of various

financial and manufacturing interests, boards of trade, and like organizations, is to investigate possibilities and develop propositions for the general industrial development of the province.

Further proof of the public-spiritedness of members of the institute is evident in the example set by members of the Winnipeg branch. During a strike in that city, when power-plant operators and men responsible for the supply of water to the city joined in the strike, members of the Winnipeg branch took off their coats and kept the plant in operation.

A great deal has been done by the institute itself as well as the district branches toward re-establishing returned soldiers in civil occupations. Committees from these district branches, co-operating with the Department of Soldiers' Civil Re-establishment, are representative of both employer and employee, and such committees have been frequently instrumental in placing in congenial positions returned soldiers who, before entering the service, had followed engineering work in Canada.

New branches of the institute may be organized only upon the request of a sufficient number of members in any locality. Consent of the council must be obtained before any new branch is inaugurated. Already a number of new branches have been started.

Schoharie Development Involves Dam and 18-Mile Tunnel

By J. Waldo Smith

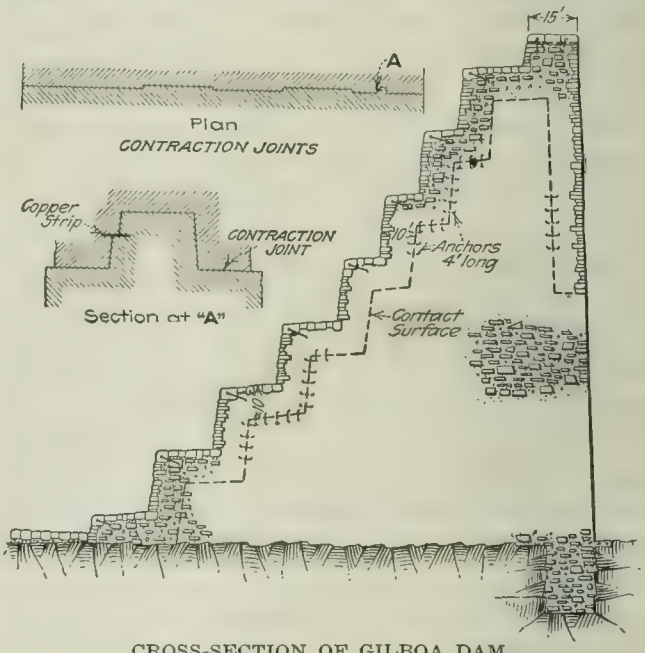
Chief Engineer, Board of Water Supply, City of New York

Abstract of Paper Read Before the New England Water Works Association

AN 18-MILE tunnel in rock and a dam 160 ft. high with both masonry and earth sections, involving a combined cost of $22,000,000, are the main features of the development of the Schoharie watershed which the Board of Water Supply of New York City has undertaken as part of the original Catskill project for an additional daily supply of not less than 500,000,000 gallons.

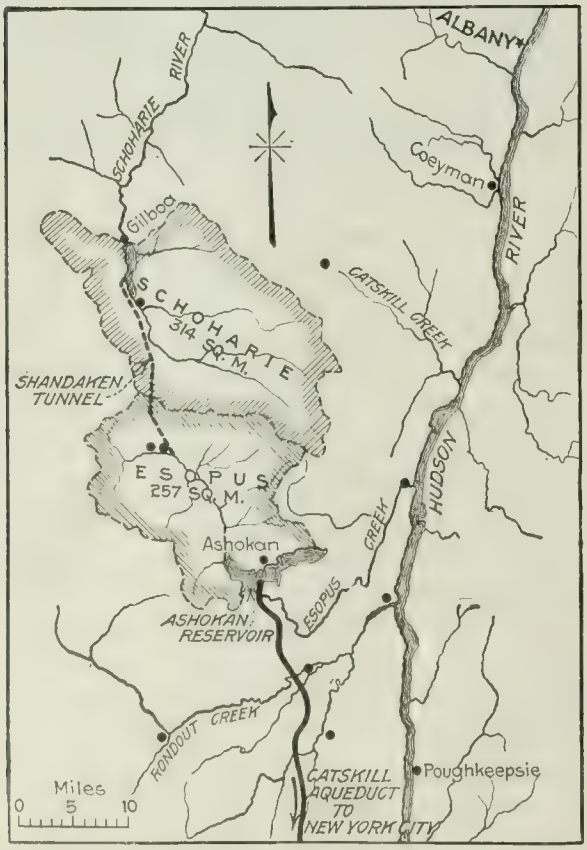
Of this total amount one-half comes from the existing development of the Esopus watershed, while the Schoharie works, now under construction, will be depended upon for the remainder. As shown in the accompanying drawing, the Schoharie water will be collected behind the Gilboa dam, forming a diversion reservoir of 20,000,000,000-gal. capacity, from which the flow will be through the 18-mile Shandaken tunnel to a point of discharge into Esopus Creek, and thence along the original stream bed into the Ashokan reservoir, the main feeder of the Catskill aqueduct.

The Gilboa dam will be of two distinct types. The overfall, or masonry, section, 1300 ft. long, is designed with steps on the downstream side leading to a spillway channel along the toe of the dam. The earth portion

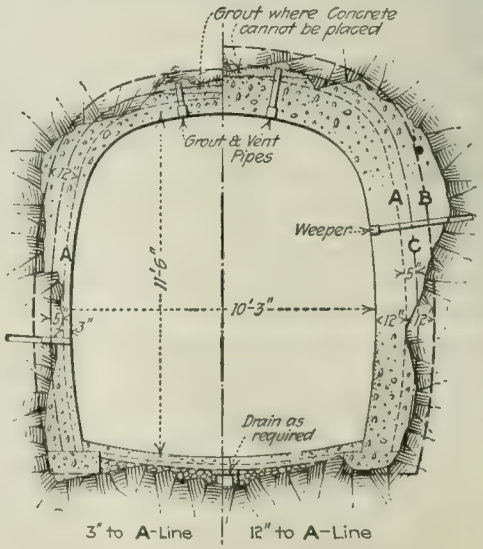


CROSS-SECTION OF GILBOA DAM

of the dam is of conventional design with masonry core wall and heavy rock paving on the upstream slope; its length is about 1000 ft. At the transition section the dam will be flanked both upstream and downstream by



SHANDAKEN TUNNEL CONNECTS TWO WATERSHEDS



TYPICAL TUNNEL SECTIONS

a heavy masonry retaining wall to intercept the long slope of the earth section. Dovetailed contraction joints with a continuous vertical copper strip water-stop extend across the dam from the foundation upward at intervals of 80 feet.

A cross-section of the Shandaken tunnel is shown in an accompanying drawing. The tunnel will have a maximum capacity of 600,000,000 gal. a day and will be operated intermittently at varying rates, depending upon the condition of stream flow and storage. Its construction will require about 5.7 cu.yd. of excavation per linear foot of tunnel. There are, in all, seven intermediate shafts, concrete-lined, and having a 14-ft. diameter. The aggregate depth of shafts is 3238 ft., while the maximum depth of a single shaft is 630 ft. The minimum distance between shafts is 1.3 miles and the maximum 2.7 miles. At the present writing the shaft-sinking work has been practically completed.

Proposes Government Testing of All Cement

Extract from testimony of Dr. S. W. Stratton, Director of the Bureau of Standards, before subcommittee of House Committee on Appropriations in charge of deficiency appropriations.

MR. STRATTON—During the war we had to establish three or four [cement testing] stations—one at San Diego, one at San Francisco and one at Denver—all for Government work. Four or five men were kept at each. It was cheaper to do it there than to ship it to other places. Of course, this is all done for the departments. There is no reason why the states should not have the right to use out of Government-tested bins of cement, and they should do so.

MR. BYRNS—Have the state [highway] commissioners availed themselves to any extent of the services rendered by the bureau?

MR. STRATTON—Not of the inspection service. They come to us for help in standards and we help them all we can. There is no reason why the state commissioners, and even the public, should not be permitted to buy from inspected bins. . . . I wish that this service might be extended to the United States and also to the public. I do not see why the public should not have the benefit of the guaranty. It would cost but very little as compared with its importance, and would, I think, meet with the approval of manufacturers of cement, who desire, as a rule, that their product should be good.

MR. BYRNS—You say you wish it might be extended. Just what do you mean by that?

MR. STRATTON—I mean that with $60,000 out of the item for structural material to do that work we can only do a small part of the work required for the Government service here. With a larger appropriation we could test cement at the great centers of manufacture—and there are not many of them—and let the people buy their material from these inspected bins. This estimate we are considering does not contemplate that, but it should be done in time, and would not cost much additional.

MR. BYRNS—Then it is a question of funds?

MR. STRATTON—Yes, sir; absolutely. Our organic act would, I think, cover the authority. These increased funds do not anticipate that work for the public, but simply for the increased Government construction.

Sewage-Treatment Report Forms and Testing Apparatus

Monthly Blank Sheet for Daily Test Records and Apparatus for Finding Settleable Solids and Sludge Depths

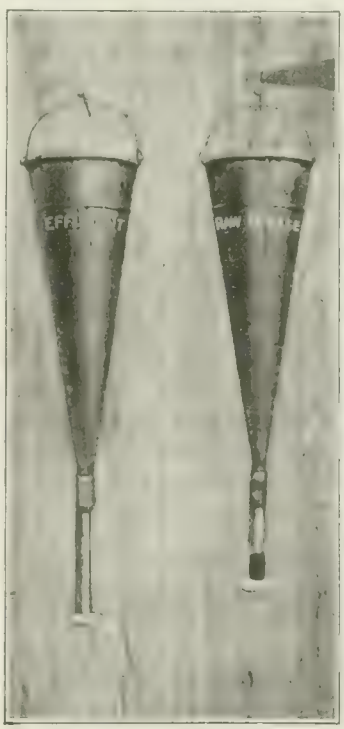
BY E. J. TULLY
Chemist, State Board of Health

AND JAMES H. MACKIN
Operating Engineer, Madison Sewage Works

A REGRETTABLE feature of the sewage-treatment plants which have been inspected by the sanitary engineering division of the Wisconsin State Board of Health has been the lack of operation data. This is due, at least to a considerable degree, to what seem to the operators as difficulties in making the simple and necessary tests required for practical purposes, and in part to lack of recognition of the value of treatment data.

With a view to securing enough data to show general plant accomplishment, at least in connection with the larger units, the division has initiated a program of instructing sewage-works operators in regard to the general functions of sewage-treatment units, and as a part of this plan has prepared a monthly report sheet for settleable solids and stability. Some simple testing apparatus has also been devised.

The gravimetric method of determining suspended solids is not suited to the average plant, because of lack of proper facilities. Realizing this, attention was directed to developing a method of determining settleable solids, combining simplicity, approximate accuracy for operating purposes, and utility in the hands of the ordinary operator. With these features in mind, a volumetric instrument was devised, consisting of a 100-c.c. graduate with unit divisions, and without a lip, attached at its upper end by a rubber collar to a 1-gal. funnel having its sides sloped at 80° and finished smooth inside and without a shoulder at the point of junction of the angular sides with the narrow part of the funnel.



FOR DETERMINING SETTLEABLE SEWAGE SOLIDS

The utility of this simple instrument for practical purposes is illustrated by its service over a period of nine months at the large treatment plant at Madison, under the supervision of one of the writers, who had six of these instruments made and placed in use. This plant includes a sedimentation unit comprising primary, secondary and colloidal sections, each section divided into five chambers; a contact dosing section of five chambers; and a three-section percolating filtration unit of 2.3 acres surrounded by a

moat or shallow sedimentation chamber. An average of 4,000,000 gal. is treated daily. The procedure at this plant in determining the general effectiveness of sedimentation includes collecting twice each morning and afternoon samples of raw sewage and effluents from the chambers in service, and reading the sediment after a period of two hours, the instruments being placed in a rack for convenience. The readings are recorded and averaged on the report sheet. Filtration accomplishment is determined by the methylene blue tests. Samples are daily collected from each section of the filter as discharge takes place into the moat, and a combined effluent sample is also taken. The putrescibility tests are run for 10 days at 20°, and the results are recorded on the report sheet, a copy of which is submitted to the division each month.

MADISON SEWAGE TREATMENT SYSTEM

Monthly Summary of Operation and Results

RELATIVE STABILITY TESTS AND REMOVAL OF SUSPENDED MATTER Month of_____

Date	Millions of Gallons Treated	Contact dosing Filters Comb of	Trickling Filters: North Sec Effluent	Trickling Filters: West Sec Effluent	Trickling Filters: South Sec Effluent	Combined Final Effluent	Outfall Sewer Rahway River	Lake Moonna	Raw Sew. A.M.	Raw Sew. P.M.	Sediment Unit No. 1 A.M.	Sediment Unit No. 1 P.M.	Sediment Unit No. 1 % Removal	Sed A.M.	Unit No. 5 M	Unit No. 5 % Removal	Plant % Removal A.M.	Plant % Removal P.M.	REMARKS
1																			
2																			
3																			
31																			

APPROVED_____ State Sanitary Engineer.

_____SUPERINTENDENT

FORM USED FOR RECORDING RESULTS OF SEWAGE TREATMENT AT MADISON, WIS.

The original was 18 by 10 inches. At the left there is a margin of two inches, with holes for loose-leaf file, and at the right there is a three-inch margin for remarks.

All percolating filter effluents, combined and as taken from the sections, have shown over this period an indicated relative stability of 95%, with the exception of 12 samples taken at section outlets when "unloading" was occurring during extremely hot weather, and at these periods the relative stability was not less than 50%. In no instance, however, was the relative stability of the combined effluent less than 95%. The removal of settleable solids by the sedimentation unit, as determined volumetrically by the instrument, averages about 90%. The device readily serves to indicate when a section needs cleaning, as the settleable solids substantially increase under such conditions.

The instrument suggested for ascertaining the approximate depth of deposits has been developed in detail by Mr. Mackin. It consists of a thick-walled glass tube, of 25 in. internal diameter and, for use at the Madison plant, 5 ft. long, equipped at the lower end with a perforated brass cap, fitting tightly, attached to the glass by litharge. At the upper end, and similarly attached, is another brass cap with four side perforations, each ½ in. in diameter, through which the liquid and sludge may escape when the instrument is tipped after use. The perforation in the lower brass cap, through which the sludge enters the instrument, contains a simple valve in the nature of a circular brass plate, ⅛ in. thick, beveled on the under side, which fits into the beveled opening of the circular cap. The valve has a play of about 1 in. and carries on its lower side three short legs 1 in. long and about ⅛ in. thick, bent in such a way as to give the 1-in. play mentioned. When the instrument is lowered into the deposit the valve is pushed upward and sludge enters. The valve is pulled into place by the hydraulic pressure when the apparatus is withdrawn from the tank. The instrument may be provided with a long wire handle—the weight of the instrument is sufficient to carry it to the bottom of the tank—or attached to a pole. This simple device has proved useful for the purpose of ascertaining the approximate depth of deposits and in indicating when cleaning of this type of units should be undertaken.



APPARATUS FOR FINDING SEWAGE SLUDGE DEPTHS

Watershed Leakage in Relation to Gravity Water-Supplies

By Robert E. Horton

Consulting Hydraulic Engineer, Voorheesville, N. Y.

Abstract of a Paper Read Before the New England Water Works Association

PROBABLY everyone has noticed the apparent difference in yield sometimes occurring in the case of small adjacent similar drainage areas. When precipitation, soil and cultural conditions for such areas are similar, the difference in yield is no doubt due to watershed leakage.

Watershed leakage may be defined as the passing of water under ground from one topographic drainage basin into another. The area tributary to a stream at any point may be considered as a drainage basin at that point. Watershed leakage often occurs from the upper to the lower portion of the same drainage basin; that is to say, some of the waters naturally tributary to the stream above a certain point do not enter the stream above the point but pass under the ground into the stream at some lower location.

Watershed leakage may also be defined as a condition where the boundary of the groundwater horizon supplying the stream is not coincident with the surficial watershed line. Nearly all large artesian systems involve watershed leakage, but this discussion will be mainly limited to its occurrence in conjunction with the surficial groundwater horizon.

Watershed leakage from the upper to the lower portion of the same drainage basin, or from the lower portion of a tributary to the stream it enters, is commonly called "underflow" in the West. Its occurrence requires that the groundwater horizon shall lie below the level of the stream bed. In such cases water may be lost from a stream directly by percolation from the stream bed, or there may be no such loss, and the bed of the stream frequently becomes water-tight or impervious

as a result of the clogging of the pores in the stream-bed material. A stream channel of this character has been described by O. E. Meinzer as an "insulated stream."

Many gravity water-supplies, and some high-head power developments and irrigation systems, are dependent on the yield of relatively small drainage basins, which often lie at high elevations. Rainfall records of such basins, and gagings of the yields of such small areas, are much less common than in the case of large drainage basins, and in estimating the available yield it is frequently necessary to depend upon studies based on rainfall and water losses, gagings of other streams, or these data in conjunction with limited gagings for the stream in question.

When any small drainage basin is proposed as a source of upland or gravity water-supply, or for similar uses, where watershed leakage is liable to occur, the yield should be determined by gagings, if possible. In the absence of a long gaging record, measurements during a dry period, in conjunction with observations of rainfall, are very desirable. If the occurrence of watershed leakage is suspected, the drainage basin should be examined with reference thereto.

[After giving a number of examples of watershed leakage due to various causes, the author concluded his paper as follows—EDITOR.]:

In investigating watershed leakage, especially in small drainage basins such as are used for gravity water-supplies, the following suggestions may be useful:

1. Watershed leakage is always from a higher to a lower drainage basin. In case of inversion, higher-lying adjoining areas should be examined. In case of diversion, the presence of lower-lying adjoining areas which may afford an outlet for the water losses should be looked for.

2. Aside from loss through solution channels in limestone regions, watershed leakage usually occurs only where there is a continuous groundwater horizon. It does not occur where there is an impervious rock barrier forming the boundary between the two areas in question.

3. Watershed leakage is more likely to occur in areas overlain by deep beds of sand, gravel or porous glacial deposits between areas with less permeable soils, or with rock near the surface. It is more likely to occur in regions underlain by limestone and sandstone than in regions underlain by shale or granite. It is more likely to occur through rock of moderate dip than through horizontal strata, and it is more likely to occur through broken, seamed and fissured rock than through compact, uniform beds of rock.

4. It is more likely to occur between basins with low, poorly marked watershed divides than between steeper areas. The configuration of the surficial groundwater tables generally follows closely that of the overlying topography, and the topographic form, as well as the geologic conditions, should be taken into account.

Summarizing, the shallower the soil mantle, and the closer to the surface of the rock, the steeper the slope, and the more impervious the soil and rock, the less the likelihood of serious watershed leakage.

Railway Bridge Painting Practice

RED lead as the priming coat and lampblack or graphite for the succeeding coats represents the prevailing practice in painting railway bridges, according to a committee report presented at the recent annual meeting of the American Railway Bridge and Building Association.

Of 17 railways, 13 favor red lead in some form for the primer, and the report states that although there are a number of inhibitive pigments on the market none of them has the same popularity as red lead. One of these roads favors a mixture of 33% white lead and 67% red lead, while another adds 1% of lampblack to make the paint denser and more impervious to moisture. The other four roads use a proprietary paint for the primer. For the succeeding coats, opinion is divided about equally between lampblack and graphite, while two roads report satisfactory results with mineral brown. The method which seems to be most generally used and to give the best satisfaction is to prime the work with red lead, using a mixture of red lead and lampblack for the second coat and lampblack and graphite for finishing.

By mixing lampblack with the second coat the difference in color makes it easy to see that the work is properly covered, while the finer pigment increases the density of the paint.

Temperature does not appear to have much influence on the life of paint, the durability of similar paints being identical in the mountains of Montana and the hot valleys of Arizona, although there is a temperature difference of 50° to 60° most of the time. The shortest life is reported from coast regions where the atmosphere is damp, warm and impregnated with salt. Under such conditions painting must be done every year. The longest life is reported from Montana and Texas, where repainting may be required only at intervals of 15 to 18 years.

For experimental purposes, one span of a bridge in Idaho was finished with a bituminous paint and the other with a standard bridge paint composed of 10% red lead, 50% lampblack and 40% inert material. After 10 years the latter was in excellent condition but the bituminous paint had disappeared, except for a layer of black dust which was removed easily with a scraper and duster. As the red-lead priming coat had been well applied there was no rusting.

Bridge paint is used with success for water tanks and coaling stations, but some tanks are painted on the inside with hot tar. An extra coat of paint may be applied to prevent rust at the footings of tanks due to the spilling of water from engines. Paint does not adhere well to galvanized iron, unless the zinc is partly removed. The best plan seems to be to leave this material unpainted until the zinc coat has been lost by exposure, thus obtaining its full value before incurring the expense of paint.

Decline of Typhoid Fever in New York City

Typhoid fever in New York City has declined from 21 deaths per 100,000 in 1898, the year of consolidation, to 3.3 in 1918, according to a review by Dr. Louis I. Harris, in the *Monthly Bulletin* of the Department of Health, New York City, for August, 1919.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Professional Obligations of the Engineer

Sir—The professional engineer should no more adopt union tactics in solving his problems than the physician; although his duty to society is not so evident, and although a suspension of it would not have effects directly so severe as the suspension of the duties of the physician. The eventual results would be as bad, however, and a universal suspension of professional functions would constitute a breach of faith with the public, which has learned to depend upon the engineer.

It is as unthinkable that a group of engineers should strike as that a group of ministers should forsake the pulpit in a body. Yet no one would blame ministers as a group from doing, in an effort to increase their remuneration to an adequate figure, anything that did not interrupt or affect their service to mankind.

The engineer asserts that he renders a higher service to humanity than the functions of a trade or a business. This higher service imposes on the profession an obligation of continued service which transcends any matter of compensation. This obligation limits the possibilities of collective bargaining to reasonable statements, scientific studies and reports, firm requests and coöperation.

It cannot be denied that unionism, in some circumstances, may be not objectionable, but, carried to the extent when the strike is its principal weapon and when its leaders hobnob with socialism and bolshevism, unionism makes a sticky mess which will soil the hands of any professional man who attempts to associate himself with it.

There is no use wasting words arguing for the principle of unionism. Unionism is what it is, not what it might be. The engineer who joins a union may still be an engineer, but he is no longer a member of the engineering profession—not because he has by joining admitted the principle of collective bargaining, but because he has aligned himself with an organization which places selfishness above service and resorts to the strike as a means of enforcing its demands—even in the face of the public welfare. There is no halfway landing. An engineer is either a professional engineer or a union man—he can't be both. SIMULTANEOUS.

Chicago, Ill.

[The above communication was sent to *Engineering News-Record* as the result of asking several engineers to dictate offhand their views on trade unionism within the profession.—EDITOR.]

Labor Conditions "Then and Now"

Sir—I read with a great deal of surprise and regret an article on the front page of the "Emergency Bulletin" of Oct. 30, 1919, entitled "Then and Now."

I consider the entire article a gratuitous insult to American citizens of Irish ancestry.

I take it that readers of *Engineering News-Record* are interested in engineering problems and their relation to the economic situation generally.

An editorial on existing labor and industrial conditions comes, of course, within this scope, but I submit that the domestic-servant problem of 1869, as judged by the Secretary of the Navy in office then—even assuming his judgment to be sound, which is not admitted—or, for that matter, the domestic-servant problem of 1919, should not be used as a criterion of engineering or industrial conditions today.

I hope it is only a coincidence that the quotation from the Secretary of the Navy of 1869, reflecting, as it does, upon the Irish people, appears simultaneously with similar gross misrepresentations recently made over the signature of a prominent admiral of the United States Navy. JOHN E. L. MONAGHAN,

District Engineer, Boston Sewer Service.

Boston, Mass.

[A reading of the note in question indicates, to us at least, that Mr. Welles was discussing the labor problem generally, and that his reference to "domestic labor" served as an example. How else account for his comment on demagogue politicians and the pernicious influence of the *New York Tribune?*—EDITOR.]

"What Causes This Water-Hammer?

Sir—My attention has been called to a communication entitled "What Causes This Water Hammer?" which appeared in *Engineering News-Record* of Sept. 11, 1919, p. 530, and was signed by B. Gibson, in which the writer desires information concerning the cause of water-hammer in an isolated water-works system. In this case the water is lifted to an elevation of 90 ft. by a double-acting piston power pump and delivered into an open tank. The pump is provided, as he states, with an air chamber or cushion.

The writer did not give the size of the pipe through which this volume of water is delivered; perhaps the pipe is not sufficiently large to deliver the water without much friction head. That can be best ascertained by observing the pressure gage on the water line near the pump. If the pressure remains relatively the same whether the pump is operating or whether it is not running, then the friction is not excessive, but if the pressure at the pump exceeds 45 lb. when pumping against the 90-ft. head, a larger pipe should be supplied, unless there is some way to slow down the speed of the pump. The pump is now running too fast, as the piston speed should not exceed 200 ft. per minute.

I might say also that many "air chambers" are not air chambers at all, being filled with water through a leak or otherwise. This fault can be remedied by allowing the water to run back through the check valve or a bypass. All plumbing, if properly done, provides for air cushions, but to keep them filled with air requires constant draining out of the water after the outside valve is shut. W. P. BULLOCK.

Kansas City, Mo.

Thirty-five-Minute Angle Method of Traversing

Sir—In *Engineering News-Record* of August 21, 1919, p. 373, there is an article on "Traversing by a Thirty-five-Minute Angle Method," by John H. Sawkins, and in the issue of Sept. 18, 1919, is a letter commenting on the same by R. F. Jaeger. A reference to an article, in *Engineering News* of Nov. 5, 1914, p. 943, will show the method described by the writer, with the exception that 0°34′ is recommended instead of 0°35′. The sine or tangent of 34′, or 2 × sine of

17′ (considering the measured distance as a chord) is more nearly $\frac{1}{100}$ than the sine or tangent of 35′ or 2 × sine of 17½′. For ordinary distances it is still more accurate to use a horizontal angle of 1° 09′, and divide the "spread" by 2 before multiplying it by 100.

I agree with Mr. Sawkins that for rough traverses, with long sides, this method is quite convenient and useful, and has the following advantages in comparison with the stadia: "It permits the use of the plain transit reading to minutes with the ordinary cross-wires, requires no stadia or level rod, no reduction to the horizontal, and longer courses can be taken than by the stadia or gradienter method. The transitman is not limited by the distance at which he can distinguish figures on a rod, but by the distance at which he can clearly see a sight rod."

Mr. Jaeger objects to the probable errors due to the difficulty involved in approximating a right angle. At a distance of 500 ft. an error of about 5° in this approximation would cause an error of only 0.02 ft. in the measurement of the spread, and 10° would cause an error of but 0.08 ft. in measurement. It is not necessary to carry two flagpoles, as the writer has frequently used the following procedure: The flagman carries an ordinary chaining pin, and after giving sight at the first point sticks the pin into the ground through the ring at the end of the metallic tape, and then gives sight at the second point, at the same time reading the tape.

Mr. Jaeger describes how he determined a distance by measuring the angle intercepted by a 20-ft. rod on a distant hill and multiplying the cotangent of this angle by 20. This method is manifestly incorrect unless correction were made for the vertical angle.

That for general topographic surveying the stadia used in connection with the transit or plane-table is the best method is admitted. Its accuracy depends largely upon the care taken in determining the constants, with proper use of reduction tables or slide rules, and on the skill of the transitman and his assistants. In the case of offices, such as railway maintenance or construction, where the instrument-men are often unfamiliar with the theory or practice of the stadia, the "34′ method" may be used to advantage in rough traverses where an accuracy greater than about 1 in 200 is not required. It has been used for years by railway engineers in the West in determining drainage areas in the case of water-way or bridge surveys. The successful surveyor gages his methods according to the purposes of his survey. G. F. SCHLESINGER.

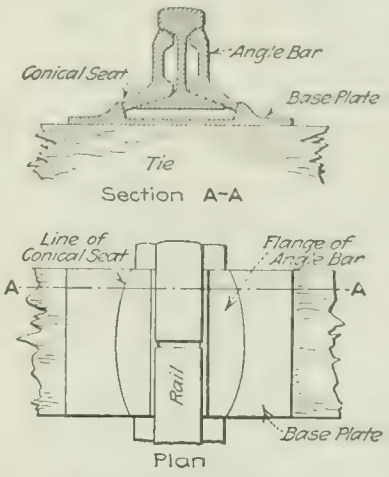
Columbus, Ohio.

Rail Joint Simulates Continuous Rail

Sir—To eliminate the hammering due to wheel drop at joints in railroad track, a homogeneous rail juncture should probably be developed, for the reason that kinetic conditions at the juncture influence a cupped wear on the receiving end of a rail. It is significant that cupping is audibly announced before there is perceptible trace of wear and before relative motion of rail ends has set in. A proposed design for such a joint was illustrated in *Engineering News-Record* of June 26, 1919, p. 1278, showing two of the three essential elements. Now it is proposed to include the third element which completes a homogeneous rail juncture.

It was previously implied that the metal in contact with the rail ends should be reduced to a minimum and that the posture of a rail across a tie should be simulated by introducing a common support for the rail heads through the juncture, while the rail bases are held out of bearing contact. Then a continuously effective pressure should be provided in lieu of bolt pressure.

It will be observed from the accompanying drawing that the length of the angle bars is limited by the requirements for two bolts to hold the rail ends against longitudinal separation, and also that the angle bars support the rail heads while the rail bases are held out of bearing contact by seating the angle bars on a base plate resting on a tie. The base plate has conically shaped seats that engage the similarly shaped toes of the angle bars. This engagement is operated by the wheel load, which permanently sets the conical tightening elements, providing continuously effective pressure to complete a homogeneous rail juncture, which is virtually a weld in the open track, built up synthetically.



PROPOSED RAIL JOINT EQUIVALENT TO CONTINUOUS RAIL

My claims for these conical tightening elements were allowed by the United States Patent Office, Oct. 4, 1919.

Newburg, N. Y. W. M. PEGRAM.

On the Economy of Motor Trucks and Good Roads

Sir—I have been greatly interested in the article in your issue of July 10 on the sphere within which, on a strictly economic basis, the use of the motor truck is justifiable. Your study of the problem, which study is, in my opinion, in the main, sound and pretty thoroughgoing, shows in brief that a light railway is a cheaper means of moving freight when there is as much as 25,000 tons annually than a motor truck, for a length of haul of 10 miles.

But what influence does this conclusion have on the action taken by state highway commissions and on good-roads propaganda put forth by automobile salesmen? Why, the influence is practically *nil*. Yet such an investigation as you made *has* value. We go into the matter of wasting millions with our eyes open, at any rate. When you say that the only correct basis of comparison as between railroads and trucks is to charge the motor truck with the cost of building and maintaining the road, you are making a beautiful display of charming *naivété* that is, except for its "charm," about as effective as spitting at the moon. Surely that is the only correct basis, but when the jobs of 10,000 men depend on that fact being suppressed, as much as it can be suppressed, and when the sales of motor factories capitalized at many millions of dollars depends on that conclusion being hid, what chance is there that the truth will make its way and will be heard from?

In the very same issue of your paper is a letter from

Prof. C. T. Johnston of Ann Arbor, Mich., touching on "common surveying" and on unionism among young engineers; such unionism is logical when the leaders in the profession will not make a stand for sound economics. And when the leading members of the profession will not trouble themselves to point out even *some* of the extravagance of the propaganda working day after day for highway "improvement" and some of the bias that exists on the part of salesmen of the automobile industry, when they cry "good roads," the advancement of the engineering profession will not go forward as it should.

The fact that the rate of interest on capital has risen to so great a height shows clearly and unmistakably that capital has become scarce and should be conserved in every way possible—in other words, saved.

The "good-roads" movement is without doubt intimately connected with the automobile production movement, though one is under Governmental and the other private control. In my city (Nashville) the construction of garages goes furiously forward, though rents for dwelling houses are very high and, even so, houses are scarce and hard to get. And as everybody knows who has watched the course of the stock market in New York, the leading automobile stock, General Motors, has led the way in the recent boom in stocks and frenzy of speculation. As engineers we are not, perhaps, concerned with the stock market and with speculation and with money rates, etc., but in another sense there is nothing affects us so vitally. If capital goes into building motor cars and good roads to excess, then there is less to be had for building railroads and houses and the thousand and one other things which are vitally necessary and which some of us have spent a lifetime learning to build (railroads, for example). When our employment stops, pretty nearly everything stops with us for the time being, and so far as the public is concerned, if a wrong course is taken in building, let us say, garages instead of cotton-spinning mills, then surely we are impoverishing ourselves and are sure to feel the effects later—though not in the very distant future, either.

I am not pessimistic. I think we shall have progress; but in some ways, as I believe, it will come more quickly than in other ways, and I believe that a rational program will get us farther than an irrational one. I was struck by an editorial in *Engineering News-Record* of Oct. 2, which said that nine-tenths of our engineering knowledge was originally empirical and based on precedents, or words to that effect—the idea being that our engineering science has slowly evolved and really reaches back for thousands of years (in some cases). That being so, we should argue that if rail transportation has given economical results in the past fifty years we should not lightly divert all our capital from railroads and well tried operations to automobiles (or even, if you will, to motor trucks and "good roads").

JOHN WILKES,
Civil Engineer.

Nashville, Tenn.

[There is little doubt that we are in serious danger of the overstimulation of highway development. But the propaganda that has brought the rapid popularity of good roads about is not entirely printer's ink propaganda. The best promoters of good roads have been good roads themselves and the automobiles and motor trucks that are rapidly becoming standard equipment on every farm. But Mr. Wilkes is right in insisting on a better understanding of transportation economics. Only by such understanding shall we work out at lowest cost our transportation problems.—EDITOR.]

More Accuracy Needed in Collecting Data on Rainfall

Sir—I inclose a photograph of the rain gage and thermometer station at Bakersfield, Calif. The records from this station are published by the Weather Bureau month after month and, I presume, year after year. It will be noted that the drooping trees which are above the rain gage will make particularly erratic any record obtained therefrom. The picture is of more interest because of the moral that it carries than because of the inaccuracy of the station. I have seen other stations that have been made fully as inaccurate by local change as this one, notably the building of a brick wall next to a rain gage at one of the oldest stations in southern California, at Escondido.



RAIN GAGE IMPROPERLY LOCATED BENEATH TREES

The point this illustrates is that the Weather Bureau does not inspect its field stations. The excuse is that Congress does not appropriate the money to make the inspection, but probably the reason for its not doing so is because it is not asked with sufficient vigor and explanation.

Engineers who are studying the physical data of a region use records of this kind, and are misled. It seems to me improper that the Government should continue an official publication of a record without knowing something of its accuracy. To me the whole system of meteorological observations by the Weather Bureau needs a complete and most thorough renovation. The main or official stations are nearly always located on the roofs of tall office buildings and are placed in cities of the larger size rather than in such places as will best illustrate the physical data of the region in question.

For instance, in California the official stations are either in the low valleys or along the seacoast, and there are no regular stations in the high mountain regions from which the water-supply of the state comes and where the climatic conditions are totally and radically dissimilar from the points of official observation. The rainfall records that are taken on the roofs of tall buildings are not correct representation of the rainfall that occurs on the ground, because of the effect of eddying winds on the gage; neither are temperature records taken on tall buildings a correct index of ground temperatures.

In a horticultural region such as southern California, where a few degrees make the difference between the freezing or nonfreezing of a citrous crop, such discrepancies are material and misleading. If the Weather Bureau desires to maintain its records in comfortable office buildings, it should at least have substations on

the ground which would establish the factors of error in the main stations.

This question was made the subject of a special report of a committee appointed by the American Society of Civil Engineers for the Los Angeles section several years ago; the report was published by the parent society. Apparently the Weather Bureau has gotten into the habit of doing business in a certain fixed way, and it will require a scientific earthquake to produce some change in habit. J. B. LIPPINCOTT,

Los Angeles, Calif. Consulting Engineer.

[A copy of Mr. Lippincott's letter was submitted to Robert E. Horton, consulting engineer, Albany, N. Y., whose comment follows:—EDITOR.]

Sir—Relative to the matter of the importance and desirability of regular official inspection of United States Weather Bureau rain gages, I would say that I heartily indorse Mr. Lippincott's views on such inspection. I think it proper to add that, in so far as I can learn, lack of such inspection is no fault of the section directors who are in immediate charge of the stations. I know that some of these section directors feel very keenly the humiliating position in which they are placed by lack of provision whereby they can inspect rain gages in their territory.

I believe that we are just entering upon a new and greatly enlarged understanding and use of records of rainfall and stream flow. Existing shortages of food and fuel may be in part remedied by drainage and irrigation, in the one case, and by increased utilization of water power, in the other. Everyone knows the failures in such projects which have occurred in the past because of the use of inaccurate records, or the improper use of accurate records. It is exceedingly disappointing to an engineer, in working up an important hydraulic proposition, to find that records which should form the keystone of his investigations are not altogether above suspicion. Errors in such records can sometimes be eliminated by careful study, coupled with long experience and good judgment, but it is vastly better that the records should be right in the first instance.

There is another line of thought suggested by Mr. Lippincott's letter, and that is the real necessity for a greatly increased number of rainfall records in the United States. I believe that the records at regular Weather Bureau stations in cities should be continued by all means. Men in the cities want knowledge of weather conditions in the cities. Those records have their own use. As Mr. Lippincott's letter suggests, they are not so well adapted to the determination of the conditions in the surrounding country. I see no other adequate remedy for this defect than the establishment of additional stations.

There are many ways in which such records could and would be used, in addition to the ordinary uses to which they are put by engineers. They would furnish a better basis for weather forecasting, and for flood and frost prevention. I confidently feel that within a few years the cost of establishing and maintaining a greatly increased number of rainfall and temperature stations throughout the water-power, agricultural and navigation regions of the United States will produce economic results having a value very greatly in excess of the cost of the records. It seems to me proper to add, however, that one trouble heretofore has been lack of facilities to work up the records which have been accumulated and to make useful deductions therefrom. That should go hand in hand with increase in the number of records available.

Probably one reason why so few attempts at broad studies of hydrologic questions have heretofore been undertaken has arisen from the feeling that oftentimes the data are so meager and inadequate as not to justify the labor involved. That question would be eliminated by the establishment of such additional records.

There is about to be established an American Meteorological Society. As engineers are among the most extensive users of meteorological records, it would seem to me proper that they should be cognizant of and participate in the work of the proposed society. Furthermore, some method should be devised for getting direct practical results along the lines suggested by Mr. Lippincott. ROBERT E. HORTON,

Albany, N. Y. Consulting Hydraulic Engineer.

Finds No Competition in Society Employment Agency

Sir—In *Engineering News-Record*, Sept. 18, 1919, p. 579, is an article regarding a technical employment agency operated by the Colorado Society of Engineers. We would draw your attention particularly to the last paragraph. We, of course, have no objection to your boosting for the agency operated by the society referred to, but we object very strongly to the sentences in the last paragraph, as follows: "The paid employment agencies watch the activities of the organization closely. Their engineering business is reported to have dwindled since the engineers established the free bureau."

Neither of these statments is true in any way, and they do us an injustice. We pay no attention whatever to the agency referred to, and without looking up the matter could not even tell you where its offices are located. In our dealings with employers we have run across their track but once. As for our business having dwindled since they were established, we have more business at the present time than we can handle, and our business is showing a steady growth every month and every year. S. SERGEANT NEWBURY,

President, The Business-Men's Clearing House.

Denver, Colo.

The Fourteenth Census of the United States

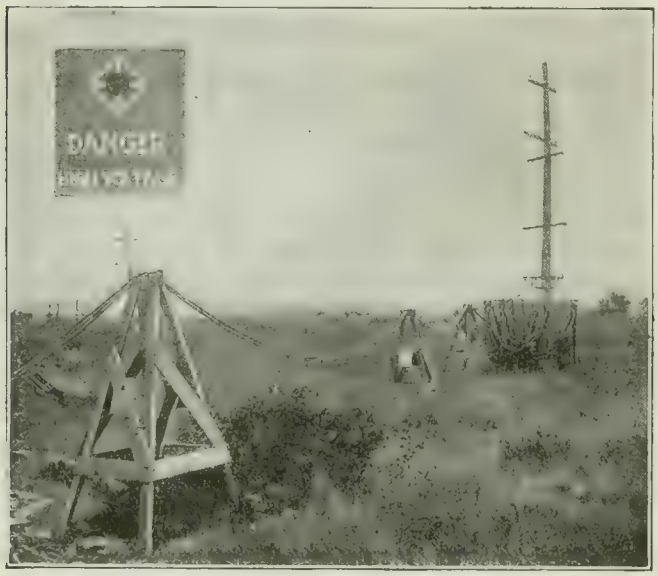
Enumeration of population for the fourteenth census of the United States will be taken as of Jan. 1, 1920. Aside from population, the census will be restricted to agriculture (including irrigation), manufactures, forestry and forest products, and mines and quarries, and will cover the calendar year 1919. The authorizing act provides for a census of agriculture and livestock in 1925, also, and every 10 years thereafter, and for a census of manufactured products in 1921-23-25-27 and for every tenth year after each of those years. All 1914 census reports must be published by July 1, 1922. During the census period which will end on the date just named the director of the census will be paid $7500 a year; the assistant director, who must be "an experienced practical statistician," $5000; three chief statisticians for population, manufactures and agriculture, $4000 each; five other chief statisticians of divisions, $3600 each; and the geographer, $3000. Included in the list of minor officials [or employees?] is "one engineer" at $1200 and two photostat operators at the same rate. Skilled laborers are to be paid from $729 to $1000.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Carrying High-Tension Wires to Steam Shovels

ALL construction machinery on the new Queenston-Chippawa power canal of the Hydro-electric Power Commission of Ontario around Niagara Falls is electrically-driven, and practically all of it, particularly the steam shovels working in the deep cut of the canal, operates on a 4000-volt line with a transformer on the shovels. The accompanying view shows the portable



PORTABLE HORSES FOR HIGH-TENSION WIRES

connection from the main transmission line running alongside of the canal to a shovel which is in a cut immediately to the left outside of the view. This comprises a series of small horses about 6 ft. high, over the top of which the high-tension line is draped, each horse being marked with a conspicuous sign, reading "Danger—High Voltage." The fence around the pole from which the temporary line is taken off is also marked with a sign, not readable in the view, which has on it "Danger —4000 Volts."

Improper Winding on Engine Drum Injures New Rope

WIRE rope may be practically ruined by being reeled improperly onto the drum the first time or by the first few pulls, states James O. Hearne, logging superintendent, English Lumber Co., Mount Vernon, Wash., in a paper read before the Pacific Logging Congress held Oct. 8-11, 1919, at Portland, Ore.

There are several methods of reeling that are satisfactory. One is to wind from the reel to the drum, having the reel arranged on a rack for unwinding, and snubbing the wire between the reel and the drum to secure tight winding and proper spooling. A better method is to wind from the reel to the drum, taking no special pains with the winding, then run the line out with a haulback or other line and rewind carefully; the weight of the line and snubbing with the haulback gives the proper tension and spooling. Another method that is good is to run the wire off the reel at the warehouse, secure the ends properly, and drag it along the ground. The dragging tends to straighten the rope and put it in good shape for winding onto the drum.

For the first few days, the use of excessive loads should be avoided, the slack in the line taken up gradually, and the engine run at a moderate speed. This gives the strands and the wires in the strands a chance to adjust themselves to work together.

Special Rig for Jacking Up Bridge Spans To Renew Baseplates

BY CHARLES BAKER
Assistant Engineer, Wabash Railroad, St. Louis.

RECENTLY the Wabash R. R. was under the necessity of renewing two baseplates of the Missouri River bridge near St. Charles, Mo. Lack of space for jacking supports on the pier made this work difficult and required the use of special means for lifting the spans while changing the bases.

The bridge is on the main line between St. Louis and Kansas City; exclusive of approaches it consists of seven 300-ft. through truss spans. The original stone piers, built in 1870, are still in use, though the superstructure was replaced in the early 80's. While the trusses are still in good condition, the cast-iron baseplates on the center pier, known as No. 4, showed signs of failure this spring. The pier rests on solid rock and is about 100 ft. high. The upper 30 ft. is in the form of two columns 8 ft. square, with a curtain wall between them to within 10 ft. of the top. A cast-iron baseplate, 5½ x 7½ ft. 12 in. high, rests on each of these columns, one plate supporting a shoe of each of the adjacent trusses (the roller end of one and fixed end of the other). The spans resting on Pier 4 are Warren trusses, 318 and 315 ft. long c. to c. of end pins, built by the Keystone Bridge Co. in 1882.

As the stone columns of the pier were only slightly larger than the baseplates to be removed, and the height of the pier made the placing of bents in the river very expensive, the problem of obtaining sufficient bearing space for jacks to lift the spans constituted the principal difficulty. Advantage was taken of the rather ornate design of the pier to enable the necessary supports to be attached. At the bottom of the columns and curtain wall the width and length of the pier are increased, the offset being made with a series of beveled copings. (See sketch at left in Fig. 1.) These copings were cut down to form a seat for 12 x 12-in. posts held in place against the sides of the pier by 3 x 10-in. collars (right-hand sketch). Caps of 12 x 14-in. timber brought to the level of the top of the stonework supplemented the projection of the stone beyond the baseplates sufficiently to give bearing for the blocking under the jacks.

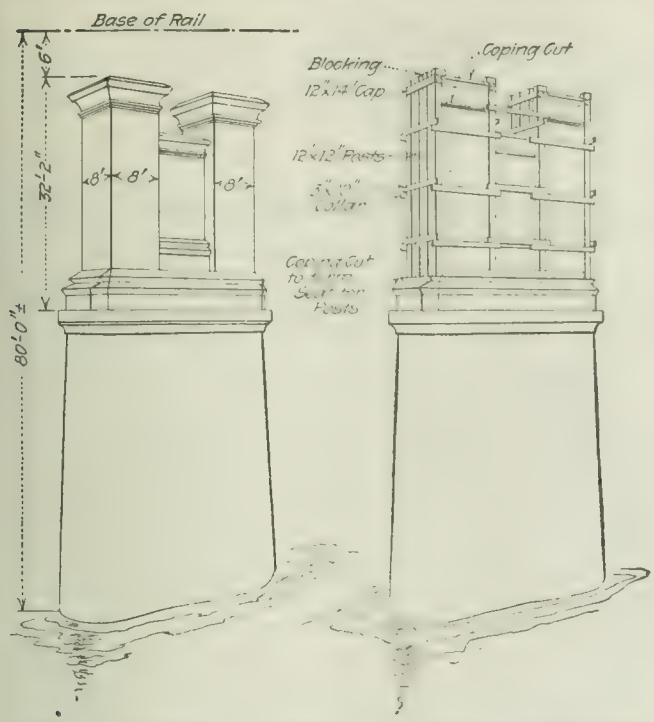


FIG. 1. SKETCH OF PIER AND JACKING SUPPORTS

The end pins were extended by pilot nuts to form a seat for 15 x ½-in. hanger plates, two plates to each end of each pin. The plates were bolted to two 12-in. channels which rested on four 24-in. I-beams set above the batter posts at right angles to the line of the bridge. These in turn rested on blocking under which were placed the jacks, as may be seen in the view, Fig. 2.

One baseplate was changed at a time, but, as it supported two shoes, a corner of each of the two adjacent spans had to be raised simultaneously. From data on the original plans for the superstructure the weight of the spans to be lifted was calculated as 200 tons apiece. Eight 100-ton jacks were used; according to the figures this would give less than 14 tons to the jack. No attempt was made to ascertain how much each jack carried, but the action seemed to indicate that it was greatly in excess of what had been expected.

As soon as the baseplate was relieved of the load, it was pulled out longitudinally with the bridge by means of a cable and ratchet jacks onto a scaffold hung from the lower chord. A similar scaffold on the opposite side of the pier held the new baseplate, a grillage of five 12-in. I-beams 7 ft. long, which was rolled into place simultaneously with the removal of the old baseplate. It was filled with concrete after being set.

The time consumed in making the change was about 4 hours for each plate. Freight trains were not running at the time, due to a strike of shopmen, and there was no interference with the passenger traffic. The work was done by the Kansas City Bridge Co., under the direction of A. O. Cunningham, chief engineer of the Wabash Railroad.

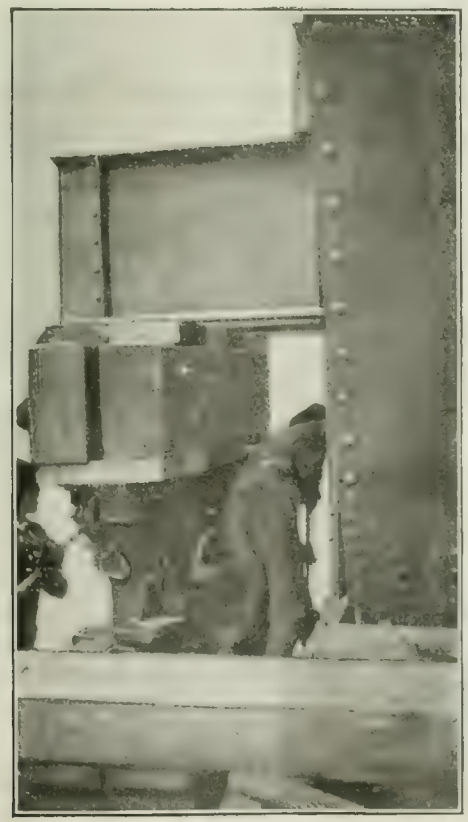


FIG. 2. JACKING UP ONE CORNER OF BRIDGE SPAN

Templet With Saw Teeth Cuts Off and Finishes Concrete Surface

SAWING off and finishing concrete road to a true surface is accomplished by means of a new type of templet being used near Utica, N. Y. The cutting edge of the tool is equipped with teeth, and, moves back and forth, as is common in cutting with a straight edge. The contractors and engineers claim that it is a time and labor saver, besides being much easier for the men to operate than the hand tamping templet used heretofore.

A general view of the rear of the device is shown in Fig. 1. The main templet is constructed of a 3 x 12-in. plank cut to the desired crown and shod with steel. Attached to the front face of this plank is a 2 x 10-in. plank shod with horizontal saw-teeth at the base, as shown in Fig. 2. These teeth are similar to those on an ordinary mowing machine, but are shorter, being about 2 in. long. To hold the sawing section in the correct position, two rollers project from the 3-in. plank through strap-iron slots attached about 3 ft. from the ends of the templet.



FIG. 1. REAR VIEW OF TEMPLET. NOTE HANDLES, CABLE DRUMS AND ROLLERS

Two upright handles produce the sawing motion and are used in furnishing motive power for the templet. The motive power is applied by stretching ⅛-in. steel wire cable from the templet to two stakes, one on each side and about 20 ft. ahead. These cables wind over the drums shown in the back of the templet, as they are revolved by a ratchet operated by the handles. As the

cable winds up the templet moves ahead with a sawing motion, and leaves a smooth and well flushed surface.

To facilitate the sawing motion, several rollers are set in the 3-in. planks so as to project and press against the



FIG. 2. FRONT VIEW OF TEMPLET, SHOWING TEETH AND SUPPORT OF CUTTING EDGE

2-in. sawing plank. Stability is given by the ⅜-in. strap-iron skids at each end. One man can easily operate the handles, though it is customary to have one at each end. It is estimated that two men can do as much work as four using the old tamping templet, and with much less effort. The screed is being used on New York State Highway work under the supervision of R. B. Graham, assistant engineer. The device was invented and is manufactured by James A. Lair, Amsterdam, N. Y., who, it is understood, has applied for a patent on the idea.

Locomotive Transported by Motor Truck in Northwestern Timber Lands

TRANSPORTATION of a large logging locomotive, as shown in the accompanying illustration, was accomplished in the timber lands of the Northwest by a Garford 10-ton tractor and semi-trailer. The locomotive is the property of the Clipper Shingle Co., Bellingham, Wash., and was moved by truck when it became necessary to transport it by highway from one timber claim to another.

The distance between the tractor and its trailer was first increased by substituting a timber reach for the usual connection. The locomotive was then lifted from its trucks by a derrick and mounted upon the prepared conveyance. Although the route was over rough forest roads, the operation was thus successfully completed.



LOCOMOTIVE BLOCKED UP FOR TRANSPORTATION ON TRACTOR AND SEMI-TRAILER

Improvised Backfiller Cuts Costs on Panama Sewer Job

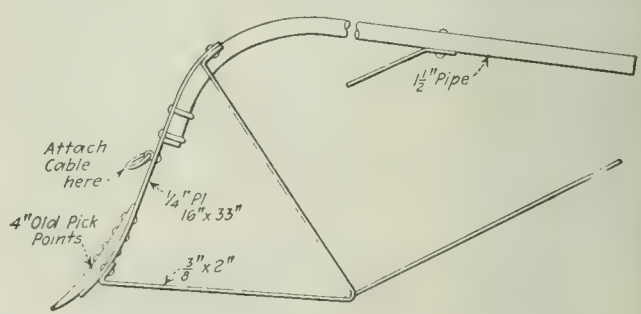
BY R. C. HARDMAN

Superintendent, Division of Municipal Engineering, the Panama Canal, Ancon, Canal Zone

IN THE backfilling of a large sewer trench in the City of Panama by the forces of the Division of Municipal Engineering under J. B. Miller, general foreman, a novel backfilling scraper was constructed from "scrap." It worked very satisfactorily in the material encountered, which was rock mixed with stiff clay.

The trench, which was approximately 6 ft. wide and 18 ft. deep, ran parallel to a railroad track. Upon this track the "power plant" for the scraper was operated. The power plant was built up from a small locomotive-crane truck upon which was mounted a horizontal boiler from a scrap well drill, an old hoisting drum geared to a well-drill engine and a snatchblock under the drum to permit of pulling the scraper from any angle.

The scraper was constructed as shown in the accompanying drawing and provided with four digging points



DETAILS OF IMPROVISED BACKFILLER

projecting from the plate 4 in. These points are essential when scraping in rock, as without them the scraper blade merely slides over the material to be moved. The braces on the back of the blades serve a twofold purpose, that of bracing the handles and that of preventing the blade from digging itself in too deeply. Lateral bracing not shown in the sketch was also provided. The bail for attaching the cable was rescued from an old hoist bucket.

The power plant was also used on the same job in connection with a short ginpole for pulling sheet piling. The cost of backfilling by this improved dragline was very low as compared with hand methods. No cost data are given, as they would be valueless for purposes of comparison with costs of similar work in the states, owing to the class of labor used on the isthmus.

NEWS OF THE WEEK

New York, October 30–November 6, 1919

Inter-Professional Body Formally Organized

Seeks to Bring All Professions Together on Common Basis of Discharging Obligations to Public

Following deliberations lasting through two days there was formed at Detroit, Nov. 29, the Inter-Professional Conference, the objects of which, to quote the declaration adopted, will be "to discover how to liberate the professions from the domination of selfish interest, both within and without the professions, to devise ways and means of better utilizing the professional heritage of knowledge and skill for the benefit of society, and to create relations between the professions leading to these ends." Membership will be open to professional men and women. The organization of the conference was purposely left loose so that it might work without too much restriction the first year, and then be free to cast itself into whatever form experience dictates to be advisable. Power to manage the affairs of the body was vested in a general council, to consist, at the beginning, of 21 members. Local conferences of professional men and women are to be formed in the large centers, the details to be worked out by the council. Dues were fixed at $1 per year. A sustaining membership of $10 was also established, while underwriting by members, limited to a maximum of $100, is also sought.

The dominating thought of the meeting was that the first obligation of the professional man is to the public, not to his client, and that his personal interest must come last. Starting with this premise, the purpose was to create an organization which would secure a wider acceptance of this obligation. That selfish interests are all too dominant and that the public's interests are generally given second rather than first consideration, was the confession of most of the professional men and women who responded on behalf of their professions to the opening remarks of Thomas R. Kimball, of Omaha, president of the American Institute of Architects. [Mr. Kimball's address is published in full on p. 808 of this issue.] Dean Henry M. Bates, of the University of Michigan Law School, spoke for the legal profession; Dr. George E. McKean, president of the Wayne County Medical Association, for the doctors; Dr. Charles H. Oakman, of Detroit, for the National Dental Association; Charles Whiting Baker, of New York, delegated by Engineering Council, for the engineers;

(*Concluded on page* 838)

This Week's News

This issue carries news current for the week ending Dec. 2. It is dated Oct. 30—Nov. 6, to preserve the sequence of numbers in the volume.

Builders' Committee Protests Coal Restrictions

Following the issuance, by the United States Fuel Administration, of the preference list for the distribution of coal, which practically cuts off the supply of all manufacturing plants during the strike, a builders' committee, appointed at a meeting held in Philadelphia, called on a representative of the Central Coal Committee in Washington, Nov. 24, to urge that construction activities be allowed to have coal. The preference list issued by the Railroad Administration and signed by H. A. Garfield, fuel administrator, is as follows: (a) Railroads; (b) Army and Navy; (c) Governmental institutions; (d) public utilities; (e) retail dealers. Manufacturing plants, jobbers and shipping follow.

It was pointed out to the builders' committee that the railroads have been forced to restrict deliveries of coal to the first five activities on the preference list, and that it would be impossible to make any general exceptions.

Would Enlarge Nitrate Plant

An additional appropriation of $12,000,000 to enlarge the Muscle Shoals, Ala., nitrate plant, and equip it for extensive production of nitrate for use as fertilizer during peace time, has been recommended to Congress by Secretary Baker. A bill to carry out the recommendations has been drawn by Chairman Kahn of the House Military Affairs Committee.

Grange Asks Highway Construction Cost Be Equalized

In the closing hours of the 53rd annual convention of the National Grange, held recently at Grand Rapids, Mich., a public highways report was adopted declaring for the unification of all Government highway activities in one single administrative body, and the equal distribution of expense of highway construction among the beneficiaries. In view of the number of bills pending, it was deemed inadvisable to approve any specific measure concerning highways.

Would Unite Profession in Single Organization

Joint Conference Committee of Four National Societies Outlines Plan for Comprehensive National Body

Including as its outstanding feature a recommendation for the formation of a single comprehensive organization to secure united action of the engineering and allied technical professions in matters of common interest to them, the report of the Joint Conference Committee, representing the development committees of the four national societies of civil, electrical, mechanical and mining and metallurgical engineers, was made public in the form of a pamphlet distributed last week among the members of the American Society of Civil Engineers. The proposed national body, it is stated, would provide "a voice to speak for the ideals of the profession, a hand to enforce unity of action and render the maximum of national, social and political service." The report pointed out, also, that the proposed organization would supply the machinery for united action on such questions as: The licensing and registration of engineers; national service committees; national Department of Public Works; conservation of natural resources; publicity; classification and compensation of engineers; general employment bureau; engineering education; international affiliation of engineers; industrial relations.

The desire of the four founder societies to provide for coöperation and solidarity among engineers was communicated to the Conference Committee by their respective development committees. The resulting plan of organization is designed to promote the desired end by providing an opportunity to use the strength of all existing technical associations in the country without taking from them any of their present privileges, or interfering with their respective fields of usefulness. It was the unanimous opinion of the Conference Committee that to make the engineering and allied technical professions a more active national force in economic, industrial and civic affairs, and to facilitate united action, it is desirable that there be coöperation through a single comprehensive organization. The report points out that Engineering Council can be molded into such an organization by making it more democratic. It could at the same time retain its present functions relative to the founder societies.

According to the report, such a na-

(*Concluded on page* 838)

Hearings on Townsend Bill Set for Late December

Owing to the stress of other matters, including the peace treaty, the League of Nations, and railroad legislation, Senator Townsend has announced that hearings upon his Federal highway bill will not be held until late in December or early next year. However, at that time, he said, the committee on post-offices and post roads would take up the measure, hold hearings, and put the bill in its final form for presentation to the Senate. For this reason it is important, says Senator Townsend, that those desiring to make recommendations regarding amendments send them in immediately.

Townsend Highway Bill May Be Dropped

(Washington Correspondence)

Such decided opposition to the Townsend bill has developed from the state highway departments that there is much doubt concerning whether the measure will be pushed. Any plan for national highways constructed directly by the Federal Government, it is believed, will be unpopular with the states, because only a limited portion of the state would be benefited directly by such a highway, while the Government with its road-building activities would be in competition for labor and supplies with the states and the counties. It is believed, also, that it will be very much easier for the Federal Government to hold the states up to a standard than to attempt to maintain the standard in its own work.

Those in favor of the Townsend bill admit that no plans have been made to secure its consideration at the present session of Congress.

Tallahassee Is To Have Manager

The commission-manager plan of city government was adopted by Tallahassee, Fla., at a recent election, by a large majority. Commissioners will be elected in January, 1920, after which they will appoint a manager. The salary of the manager as fixed in the act is said to be not less than $3000. G. P. McCord is Mayor of Tallahassee.

Chicago Votes Improvement Bonds

Public improvement bonds totaling $28,600,000 were authorized at the election in Chicago Nov. 4, including $2,000,000 to cover additional expenses on the Michigan Ave. widening and extension now well advanced. The new works to be undertaken are as follows: Robey St., widening and straightening and subways under railroads, $9,200,000; Ashland Ave., widening to 100 ft., $5,800,000; Ogden Ave. extension across city, $5,400,000; South Water St., widening and double-decking, $3,800,000; Western Ave., widening to 100 ft. for 25 miles, $2,400,000. Surveys and plans have been made in advance, and it is hoped that the court proceedings for acquiring the necessary property can be carried on expeditiously. The Cook County road-bond issue of $5,000,000, which also passed, will add 170 miles to the 197 miles already in use or completed this season.

Cleveland Orders Bond Issue Vote on Subway

On Nov. 24 the city council of Cleveland passed a resolution giving the rapid-transit commission authority to submit a bond issue of $15,000,000 to approval of the voters Feb. 10, the bond issue being for the construction of a subway system. The amount named corresponds to the cost of the system of four terminal loops recommended last summer by Barclay Parsons & Klapp, consulting engineers.

Railroad Executives Ask Emergency Law

The standing committee of the Association of Railway Executives, after an all-day session last week, issued a statement urging protective emergency legislation that will insure the roads the continuation of the payment of standard returns until final legislation is passed, and that will protect them by a continuance of rates in force during the period of Federal control, as well.

Indorse Public Works Bill

The Engineers' Club of Minneapolis, at its meeting Nov. 24, voted to support Engineering Council in educational work in the state to create sentiment for the Department of Public Works bill now before Congress. A committee was named to assist the Joint Engineering Board of Minnesota in presenting to the Congressional delegation at Washington the necessity for legislation permitting utilization of water power now being wasted at High Dam, Fort Snelling.

Twenty-one Colleges to Hear Lectures on Asphalt

Through the activity of the Asphalt Association a series of lectures on the properties of asphalt and on asphalt as a construction material is to be given in at least 21 Eastern, Middle Western and Southern universities and colleges. The lectures will be given during the coming winter. Among the colleges included are Harvard, Massachusetts Institute of Techology, Carnegie Tech., University of Illinois, University of Michigan, University of Wisconsin, Georgia School of Technology, Brown University, etc. The series includes three lectures, the first on "Asphalt," by Prevost Hubbard, Asphalt Association; the second on "Asphaltic Macadam and Asphaltic Concrete," by A. H. Blanchard, head of the Highway Engineering School, University of Michigan; and the third on "Sheet Asphalt" by Francis P. Smith, consulting engineer, New York City.

British Engineering Society Favors Registration

The Institution of Civil Engineers, London, announces that the result of a referendum vote of members favors by a large majority the registration of civil engineers. In July a proposal was placed before the institution that steps should be taken to obtain statutory powers to establish and regulate registration for the civil engineering profession. Following receipt of members' strong approval as expressed in the vote, the council of the institution has resolved to introduce a bill in the next session of Parliament with a view to attaining this object.

The institution's council announces that it has carefully studied the effect of the tentative bill on the interests of the public, the institution's membership, members of other important engineering societies, and persons now engaged in civil engineering practice who may not be connected with any such society.

The opinions and observations accompanying the letter ballots were factors in the framing of the bill, the details of which it was not possible for the council to make public until it had been deposited with Parliament. The principal provisions of the bill are a definition of the term "civil engineer" and the creation of a register which, as first established, would contain (a) all corporate members of the Institution of Civil Engineers and of the Institution of Civil Engineers of Ireland; (b) other persons who are engaged as civil engineers and are members of important engineering societies, or who, although not members of such societies, have been engaged in civil engineering practice for a substantial period. There would be set a time limit for the application of these conditions to the formation of a register. For the purpose of determining the eligibility of individuals comprised in the second group, a tribunal would be established upon which the important engineering societies would be duly represented, and by means of which the interests of their members who are civil engineers would be safeguarded.

New Jersey Ship Canal Being Agitated

The sea-level ship canal across New Jersey, linking up the Delaware River with New York harbor, is under serious consideration by a number of different interests. United States Army engineers have already recommended that such a canal is practicable, and the Secretary of War has submitted to Congress a recommendation that it be constructed. New Jersey already has committed itself to an appropriation of $1,000,000 for the acquisition of a right-of-way, and has passed appropriate legislation making it possible to cede the right-of-way so acquired to the Federal Government. In New York City, the New York-New Jersey

Port and Harbor Development Commission held recently a hearing on the project, at which a considerable amount of favorable sentiment was expressed, and the Chamber of Commerce of the State of New York has gone on record as favoring the construction of such a canal.

It is expected also that at the present regular session of Congress there will be an attempt to put the construction of such a canal into the current rivers and harbors bill.

Contractors' Association Sets Annual Dues

Subject to approval at the coming annual convention, the executive board of the Associated General Contractors of America has set the following annual dues for membership:

Class of Member	Average Annual Business	Annual Dues
A	Over $2,000,000	$250
B	$1,000,000 to $2,000,000	150
C	$500,000 to $1,000,000	100
D	$250,000 to $500,000	50
E	Less than $250,000	25

Two general classes of members, individual and association, will be admitted. Dues of member associations will be 20% of the annual income of the organization, provided that in no instance shall the total dues be less than $25 or more than $100 for each member of the member association.

Railroad Valuation Report To Be Ready January, 1922

At the office of Judge Prouty, director of the valuation of the railroads, in Washington, it was said that it was expected the final report on valuation would be made Jan. 1, 1922.

With the exception of the Eastern district, it was said, all road and track work on all the railroads throughout the country would be completed by the end of the present year. The work on the Eastern district has been held up, and it is not thought that it will be complete until September, 1920. The track and road work on the Southern district has already been completed, while the track and road work on the Central district will be finished, it is expected, by Jan. 1, 1920. With the exception of the Union Pacific Ry., in the Pacific district road and track work will be finished by Nov. 1. In the Western district road and track work is nearly completed. In every instance mechanical work has lagged behind road and track work.

Judge Prouty stated that he expected to make a final report on 75,000 miles of track by Jan. 1, 1920. Approximately 250,000 miles of track are involved throughout the country. It is calculated that it will take about two years to assemble the field data.

In the Eastern district the work of six of the twelve parties now operating in the field will be abandoned this winter on account of the difficulty in working under cold-weather conditions. This will involve the discharge of about 66 engineers.

Engineering Salaries Increased by New York City

Salary increases of 10% to 20% have just been granted to the municipal engineering employees of New York City by vote of the Board of Aldermen approving the 1920 budget as passed by the Board of Estimate recently. This action follows requests and arguments by engineering societies and a campaign of several months conducted by the local chapter of the American Association of Engineers. The Union of Technical Men and the Municipal Engineers were active in the campaign, and assistance was given by Engineering Council and the Brooklyn Engineers' Club.

Originally, a flat increase of $500 for every engineering employee of the city was requested. A full study of salaries was presented to the Board of Estimate by a committee of the American Association of Engineers headed by L. S. Benton. It recommended increases ranging from 20% for $5000 positions to 73% for $900 positions. L. B. Smith, assistant secretary of the association, delegated from the Chicago office to carry on the campaign, argued the subject before the Board of Estimate. For Engineering Council, the committee on compensation (A. S. Tuttle, chairman) urged the board to grant the increases asked for, as the committee's studies of municipal salaries, while not yet far enough advanced to warrant specific recommendations, showed that the recommended increases of 20% to 73% are conservative.

The increases granted to date from Jan. 1, 1920, are considerably smaller than those asked for. Engineering employees now receiving $1200 or less are increased 20%; those receiving $1201 to $1900, 15%; those receiving $1901 to $2600, 10% (except for larger increases in individual instances). A few increases have been made in salaries over $2600.

Engineers in the service of the Public Service Commissioner and the Transit Construction Commissioner are not included in the general budget. It is expected that the separate budget for these offices will provide for an increase of $300 for each employee.

Railway Association of Canada to Succeed War Board

It was determined that the Canadian Railway War Board should be abolished, at a meeting of leading Canadian railroad officials, held in Montreal recently, which formed the Railway Association of Canada to succeed the War Board. While the board will be abolished Dec. 1, the view was taken that it had accomplished so much in the way of coördination and efficiency that its place should be taken by another organization, with practically the same officers and functions. Lord Shaughnessy, honorary chairman of the War Board, was elected to the same office in the new organization, and Howard G. Kelley, of the Grand Trunk, chairman of the executive committee. Other members of the executive committee are A. H. Smith, president, New York Central R.R. Co., previously director, Eastern Region, United States Railroad Administration; D. B. Hanna, Canadian National Rys.; C. W. Beatty, president, Canadian Pacific Ry., and J. N. Beckley, president, Toronto, Hamilton & Buffalo Railway.

Railway Congress Reorganized

The International Railway Congress has been dissolved and reconstituted under the name of the International Railway Association, embracing only 35 countries, exclusive of the central powers of Europe.

Renewed Society Activity Among British Columbia Engineers

The British Columbia Technical Union has changed its name to the British Columbia Technical Association, and expects to absorb the Engineering and Technical Institute of British Columbia. This consolidation will bring the membership up to about 300.

The association has appointed an executive committee of members, in which are represented all the Vancouver branches of engineering societies, and it is planned to have this committee serve as a clearing house for all matters in which the coöperation of engineers is desirable. One of the first joint moves has been to invite the various engineering societies to select through this committee dates and topics for a series of lectures or talks this winter to each of which all engineers can be invited.

Eight committees have been appointed to take up the matter of the compensation of engineers, it being felt that this subject should have thorough attention in each of the eight branches concerned. The association maintains a paid secretary and has offices jointly with the Engineering Institute of Canada in the Board of Trade Building, Vancouver, B. C.

New Sewerage Board and More Sewers for Louisville

To expend $2,000,000 of sewerage bonds authorized at Louisville, Ky., a new or second sewerage board has been created, and appointments to it have just been made by George Wessinger Smith, mayor of Louisville, who is an ex officio member. The four appointed members are Oscar Fenley, C. C. Mengel, George T. Wood and Capt. W. W. Davies. The bonds will bear 4½% interest and run 40 years. It is expected that the board will create an engineering staff that will include a chief engineer and a designing engineer. It may appoint a consulting engineer also. A similar board was appointed in 1906, was in existence about eight years and expended $4,000,000 for intercepting and other sewers. John Chambers is city engineer.

Would Unite Profession

(*Concluded from page* 835)

tional engineering organization should have the following component parts:

1. Local affiliations, preferably under the auspices of local engineering societies or clubs, as follows: (a) Local "associations" or "sections" of the national engineering or technical societies; (b) local engineering societies; (c) other local engineers and members of allied technical professions.

2. A National Council, consisting of representatives of national engineering and technical societies and of representatives of local and state, or regional affiliations or organizations.

The function of local affiliations is to consider local matters of public welfare in which the engineering and allied professions are concerned, as well as other matters of common interest to those professions, followed by united local action thereon. The constitution and bylaws of all such local affiliations are to be approved by the National Council's executive board. The report states that the creation of state or regional councils is advisable in that such organizations could best study state matters of public welfare concerning engineering and allied technical professions, and apply remedies where necessary, but it is not stipulated that such councils are essential.

National Council to be Representative

The purpose of the National Council is to consider all those matters concerning engineering and the allied technical professions which have a national scope, or which have an interstate or interlocality character. The report presents the basis of representation thus: Each local, state or regional affiliation or organization whose membership is not otherwise represented through the national engineering or technical societies shall be entitled to one representative to the National Council for a membership of 100 to 1000, inclusive, and one additional representative for every additional 1000 members or major fraction thereof. Each national engineering or technical society shall be entitled to one representative for a membership of 200 to 2000, inclusive, and an additional representative for every additional 2000 members or major fraction thereof.

The plan stipulates that a national headquarters is to be maintained; stated annual or biennial meetings of the National Council are to be held; other meetings may be called by the executive board on its own initiative, and shall be called by it on direct request of 25 delegates to the National Council. Delegates are to serve four-year terms; the officers elected by the delegates are to hold office as follows: A president and a treasurer are to serve for two years, and two vice-presidents are to serve for four years. In addition, a permanent secretary is to be appointed by, and hold office during the pleasure of, the executive board. He is not to be a member of the executive board, however.

Council's Executive Board

There is to be an executive board with the function of directing the activities of the National Council in accordance with the latter's adopted policy, and have such additional functions as may be assigned to it by the National Council. The executive board is to consist of (a) the four officers elected by the National Council; (b) one representative for each national society of 2000 members or less, with one additional representative from each national society for every additional 2000 members or major fraction thereof, to be selected from the membership of the National Council in each case by the national society concerned; (c) a number of representatives selected from the membership of the National Council by the representatives therein of the local, state or regional affiliations or organizations, which number is to bear the same ratio to the representatives of the national societies as the total membership of the local, state or regional affiliations or organizations bears to that of the national societies.

The proviso is made, however, that the numerical basis of representation shall be so changed from time to time that the membership of the executive board shall not exceed 30. The president and secretary of the National Council are to be the chairman and secretary, respectively, of the executive board.

The plan provides for the admission of any national engineering or technical society or any local, state or regional affiliation or organization to representation on the National Council by the submission of its written request to the secretary of the National Council, together with such data regarding its aims and status as the bylaws may provide. The secretary is to refer the request to the executive board, which in turn submits it to the delegates together with its recommendation for a letter ballot. The applicant is to be admitted by a majority vote of the National Council, provided that not more than 25% of that body shall vote in the negative.

In order to finance the National Council and its executive board, the report prescribes the following assessments: Each national society represented on the National Council shall contribute annually $1.50 per member; each local, state or regional affiliation or organization represented on the National Council shall contribute annually $1 per member.

The report of the Joint Conference Committee also contains opinions and recommendations on the subject of coöperation in society activities. The committee reported that although a great many matters of urgent character were presented for its consideration, in the two and a half months of its existence it had been able to consider only the more important ones, the most vital of which was the general organization of engineers for public activity. The general plan, as outlined above, is now before each of the founder societies for its consideration and approval.

Inter-Professional Body Formally Organized

(*Concluded from page* 835)

Miss Lena M. Phillips, of New York, executive secretary of the National Federation of Business and Professional Women's Clubs, for professional women, and Basil M. Manly, of Washington, for the economists and journalists. There also appeared representatives of the American Library Association, of the State Geologists' Association, of the teachers, and of the nurses.

The members of the general council so far chosen are F. L. Ackerman, Felix Adler, Robert D. Kohn, E. J. Mehren, Calvin W. Rice and Lena M. Phillips, all of New York; Thomas R. Kimball, Omaha; C. T. Chenery, Basil M. Manly, and Charles H. Whitaker, Washington; Dr. W. G. Ebersol, Cleveland; Dr. Gillette Hayden, Columbus; Paula Laddey, Newark, N. J.; M. B. Medary, Philadelphia; W. W. Bishop and Miss D. M Barnes, Ann Arbor, Mich.

The office of the conference is at 56 W. 45th St., New York City.

Labor Conditions in Portland, Oregon

(From "Engineering News-Record" Correspondent)

Portland, Ore., Nov. 26—Only one shipyard in Portland, the Columbia River Shipbuilding Corporation, is on a closed-shop basis. As very little work is being done at this yard, the company calls one man "chief draftsman" and another "clerk" and thus "sidesteps" the union requirements. There are some union draftsmen at the other yards, and a few at the city hall, but this affiliation does not count either for or against them.

O. Laurgaard, city engineer, says: "We do not ask a man whether he is a union member or not, and I, personally, do not know whether all or none of our draftsmen belong to the union, nor do I care."

In the railroad offices a few union men are found, but their superiors do not seem to care any more about that than they do about their religion.

Portland Local, No. 23, was organized among the shipyard men to protest against a proposed reduction of wages, and nearly all of the city hall draftsmen joined at that time, but now only a small percentage of the city men are union members.

The energetic chapter of the A. A. E. in Portland has been a strong factor in keeping the radical element from getting a very strong hold here.

American Association of Engineers' Chairmen

The American Association of Engineers has announced the appointment of chairmen of national committees for the ensuing year, as follows:

Americanization—Garrison Babcock, consulting telephone engineer, Chicago.

Education—Professor Frederic Bass, University of Minnesota, Minneapolis.

Ethics—Isham Randolph, consulting engineer, Chicago.

Finance—Glen Vivian, accounting department, Bureau of Statistics, Chicago, Milwaukee and St. Paul Ry., Chicago.

Highway—R. C. Yeoman, chief engineer, Indiana Sand and Gravel Association, Indianapolis.

Legislation — W. H. Whipple, chief engineer, Lime Association, Washington, D. C.

Membership—R. W. Barnes, principal assistant engineer, Southern Pacific Ry., Portland, Ore.

Municipal Engineering—S. C. Hadden, editor of *Municipal and County Engineering*, Chicago.

Practice — H. W. Clausen, general office manager, C. D. Osborne Co., Chicago.

Program—L. Winship, assistant engineer, Missouri Pacific Railroad Co., St. Louis, Mo.

Public Relations — L. K. Sherman, president of the United States Housing Corporation, Washington, D. C.

Publications and Publicity — W. W. Horner, chief engineer, City of St. Louis.

Qualification—A. C. Irwin, engineer, Structural Bureau, Portland Cement Association, Chicago.

Salaries of Engineers in Public Service—A. N. Johnson, consulting highway engineer, Portland Cement Association, Chicago.

Canal Makes Wells Dry Up

As a result of the building of the power canal between Chippawa and Queenston by the Ontario Hydro-electric Commission, about 60 wells in Stamford Township, within half a mile of the ditch cut through the rock for the canal, have dried up. The township council of Stamford seeks to hold the commission responsible, but the latter refuses to admit any liability. The council has been advised that it cannot bring an action as an organization, but that the farmers interested must sue individually. A test case will be brought unless an amicable settlement can be made.

Plan New Railroad in Western Quebec

It is reported that the Canadian Pacific Ry. is considering the extension of the Kipawa branch in Western Quebec to a distance of 65 miles to the north end of Lake Timiskaming. It is likely that a large paper mill will be erected at the lake in proximity to water power capable of developing about 200,000 horsepower.

Drainage Congress Urges Laws for Federal and State Aid

Land drainage as a necessary factor in the problem of increased production was one of the main matters advocated at the annual meeting of the National Drainage Congress, held at St. Louis on Nov. 11—13. That funds and active assistance should be provided by the United States Government in the development of drainage projects was the familiar attitude taken by several of the speakers, and it was represented in some of the resolutions. A different viewpoint was taken by F. H. Newell, formerly director of the United States Reclamation Service, in an address which was almost a warning concerning the future work of the Drainage Congress. He sees very little prospect of large appropriations for work of this kind, and considers that individual enterprise is needed at present. On the other hand, there is still a tendency to regard the smaller projects as local or neighborhood matters, so that broad vision, clear understanding and engineering assistance are missing factors. Public sentiment is a strong factor in promoting such developments, and one of the duties of the Drainage Congress should be to create such sentiment and thus help in the progress of both large and small projects.

Sanitary aspects of drainage, applying especially to malarial districts, were discussed by Dr. T. H. D. Griffitts, U. S. A. In some cases improvements such as roads actually tend to increase bad conditions by checking drainage flow, and he urged that engineers should give full attention to providing ample capacity in the way of culverts and bridges. Furthermore, in view of the influence which insanitary conditions of living have upon the existence and spreading of disease, he suggested that in providing for the settlement of newly drained areas consideration should be given to the disposal of human excreta and refuse.

While Dr. Griffitts discussed drainage conditions relative to swamp lands, Prof. C. F. Shaw, of the University of California, discussed those relative to irrigated lands in the semi-arid regions. Not only does irrigation tend to cause waterlogging of the ground, with resultant rising of alkali salts to the surface, but it causes groundwater to stand at so high a level as to be injurious to crops. It is found very necessary to educate irrigation farmers concerning this latter condition. He considered drainage to be a necessary supplement of irrigation and a matter not to be left until land has been damaged by excess of water. As a supplement to this, a speaker from Iowa voiced the opinion that ditches are not sufficient in themselves and that no farm is properly drained unless it is so tiled that the farmer can work on the ground 24 hours after the heaviest rain. Flood protection as applied to the Mississippi River was discussed by Col. C. McD. Townsend, United States Engineers, who showed the development from the old policy of building levees which would allow severe floods to pass over them, to the present policy of building levees high enough to confine the maximum floods within the river channel.

Satisfactory financial results of drainage work were cited by Isham Randolph, consulting engineer, Chicago, who referred to the Little River drainage district of Missouri, with an area of some 800 square miles. Numerous other speakers referred to districts where lands that were worthless and sold at $15 to $25 an acre are now sold at $200 or more ($800 in one case). Drainage bonds as investment securities were discussed by Edward Bower, banker, Cleveland, Ohio. He showed the necessity of high-class engineering as well as legal work, and thought that drainage districts should employ consulting engineers to review the projects and plans of the drainage engineers and thus provide for a broader view of the situation. Transportation, markets and soil characteristics are important factors in the development of a district, while good business management is an essential which has been overlooked in so many cases as rather to throw a cloud upon drainage bonds.

Resolutions Passed

Resolutions were adopted in favor of the following: (1) Federal and state aid of drainage and other projects for the development of natural resources, but upon a financial plan providing for the return of the money advanced within a reasonable time; (2) Federal laws to authorize and aid interstate drainage projects, whose development by individual enterprise is difficult if not impossible, the immediate control of all interstate drainage being left with the states; (3) state laws guaranteeing the payment of interest charges on sound drainage securities; (4) Federal laws to encourage the construction of canals and the improvement of navigable rivers in order to promote water transportation and provide outlet channels for drainage waters; (5) Federal and state aid in the completion of a standard topographic map of the country, together with closer coördination of the several mapmaking agencies of the Government; (6) the Jones-Reavis bill for the establishment of a national Department of Public Works; (7) indorsement of the Government action during recent labor troubles, and the deportation of aliens who counsel opposition to the United States Government.

The committee on legislation reported plans to secure drainage planks in the party platforms for 1920. The committee on engineering referred to defects in existing laws, and was continued for the purpose of making investigations along this line. Edmund T. Perkins, consulting engineer, Chicago, was reëlected as president. The next meeting is to be held at Atlanta, Ga., in 1920.

Engineers in India To Unite in Single Society

Body Embracing All Branches of the Profession, to Hold Inaugural Meeting At End of This Year—2000 Members

Partly as the outcome of a recommendation contained in the Indian Industries Commission Report, a society of engineers is being formed in India embracing all forms of engineering. Various attempts have been made in recent years for the collaboration of members of engineering institutions in England and America who are resident in India, but nothing had previously been done, chiefly owing to want of support from the parent bodies.

The various institutions of civil, mechanical, electrical and mining engineers have from time to time met in various parts of India, and certain conferences and congresses of railway and of Public Works Department engi-



E. M. HUGHMAN, ORGANIZING SECRETARY OF NEWLY FORMED INDIA SOCIETY OF ENGINEERS

neers have been held, but these have all been local, and there has been a great need of a movement such as the one now under way.

Sir Thomas Holland, K. C. S. I., K. C. I. E., who was president of the Indian Industries Commission and later president of the Indian Munitions Board, in 1918 took the lead, and opportunity was taken of the joint meeting held in Calcutta in December, 1918, of the English and American electrical institutions, to extend this meeting to engineers of all branches. The outcome is the formation of the Indian Society of Engineers. Sir Thomas has been ably supported by the leading engineers resident in India. E. M. Hughman, honorary secretary of the India Centre of the English Institution of Electrical Engineers, was appointed honorary organizing secretary, with the support of a strong committee formed to undertake the necessary steps for the formation of the new society. Mr. Hughman is now in the United States, and in addition to taking care of his private interests has been studying engineering society developments in this country. He is seeking also to enlist the interest and support of the leading national engineering societies of the United States, for the new society will admit members of the American societies to the new body on a par with those who belong to the English institution. In fact, members of the American societies are active in the formation of the Indian Society of Engineers.

The organizing committee was instructed to consult the existing engineering congresses in India, all chambers of commerce, the port trusts, the railway conferences, the Mining and Geological Institute of India, as well as the local representatives of the English and American institutions and societies of engineers. The committee was also instructed to consult with the heads of the civil, military and marine engineer services, and particularly with representatives of the Provinces of India, Burma and Ceylon, where engineering organizations were not then in existence.

All Organizations Coöperate

The first work of the organizing committee, therefore, was to obtain the coöperation of all these provincial organizations, and for that reason Mr. Hughman, with the organizing committee, visited such centers as Calcutta, Bombay, Delhi, Lahore, Karachi. Representatives from Burma, Madras and Ceylon attended some of these meetings, with the result that the organizing committee was able to obtain the solid coöperation of these bodies as well as the united support of members of the various engineering institutions resident in India, Burma and Ceylon.

India is so vast a country that it is practically impossible for engineers belonging to one institution to meet members of the same institution in other towns, as the big centers are at least two days' train journey apart, and the territorial difficulties are immense. By means of this new society of engineers each center will have its own organization. There must, of course, be one headquarters, where a central library will be instituted, but each center will have its own library and all the facilities required to enable the members to obtain the knowledge of progress and research which go on in other parts of the world, and to meet and exchange their ideas.

The qualifications for membership in the new society are based on the rules of the English Institution of Civil Engineers, the object of the society being the advancement of all branches of engineering science in India. The rules have been drawn up very strictly, and it will be impossible for anyone to join the society who is not fully qualified to join his home institution or society for such branch of engineering as he has taken up. Members of recognized and approved bodies, which are to include the national American societies, will be eligible for membership in the new society, and those members of the new society who do not belong to their home institutions will be urged to take up such membership.

The inaugural meeting of the new society will take place toward the end of the present year, and His Excellency the Viceroy and Governor General of India will preside.

Government Gives Support

The Government of India strongly supports the formation of the society, and it has already been indicated that the Government will ask the society to deal with such questions as engineering standards for India and matters affecting the engineering departments of the Government. It is understood also, from promises already given, that the question of a charter will have the support of the Government of India.

The education of the Indian engineer in India will not be overlooked, and it is the intention also to look after the welfare of the members, particularly with regard to the salaries of engineers in Government and private service.

An ample guarantee fund has been subscribed by the members, and a paid secretary has been appointed in the person of Major Brady, R. E., an experienced engineer with sound journalistic training, as well as an organizer of exceptional merit.

Late news coming from India to Mr. Hughman indicates that 2000 members have already been obtained, assuring successful inauguration of the new body.

Discussing engineering society organization in this country, Mr. Hughman pointed out that engineers in India are doing what we are trying to do here—secure an affiliation of all the branches of the profession. He believes that such an affiliation must be effected in England, too, where at present the great institutions have no coördinated activities.

Illinois Will Pay for Road Materials on Delivery

Additional contracts for 1000 miles of paved roads in Illinois will be awarded in 1920, according to a statement made to *Engineering News-Record* by Clifford Older, chief highway engineer, Division of Highways. Ten surveying parties are now in the field laying out the routes and preparing plans, and as soon as the construction season closes the number of surveying parties will be increased to 30 or 40 organizations. The letting of contracts for 1920 construction will begin about Jan. 10.

Conditions relating to materials supply for 1920 construction will, it is believed, be very serious. This year's experience with railway transportation has been discouraging. The shortage of open-top cars has been extreme. Besides, the addition of 1000 miles of road to the considerable mileage of 1919 contracts which will continue over into 1920 will require so large a percentage of the capacity of available commercial

plants that some difficulty in obtaining aggregates for concrete may be expected. The remedy sought is to lengthen the producing season of the aggregate plants by purchasing and storing aggregates on the job during the winter when the necessary cars are available.

To inaugurate this movement for winter storage, the Division of Highways will pay contractors for sand, gravel, stone, etc., as delivered. Vouchers will be issued directly to the railways for the freight charges and to the producers for materials, and the amounts will be charged against the contractors and will be deducted from the contractors' estimates as the materials are consumed. This arrangement will apply to existing uncompleted contracts as well as to the new 1920 contracts.

Urge Retention of Massachusetts Highway Commission Members

A number of past presidents and members of the Massachusetts State Highway Association, in a recent letter, have urged Governor Coolidge to retain the present members of the State Highway Commission during the organization of the new Department of Public Works. The plea is based on the excellent record maintained during the 27 years in which the commission has been in existence. The letter says, in part:

In 27 years since the organization of the highway commission was formed, it has had but 10 different members—strong testimony to the soundness of its organization and policies, and there has been no change in its chairman or its personnel in seven years. In the past 20 years, as you well know, the system of Massachusetts state roads, acknowledged to be the finest in the country, has been developed. In the same period the great business of administering the motor-vehicle law has been organized.

Despite the fact that it has handled over $35,000,000 in public funds, the honesty, integrity and efficiency of this commission has never been questioned, which record is unique among highway departments in the United States. Its administraion has been absolutely clean.

Furthermore, the methods of road construction it has originated and the highway and motor-vehicle laws it has formulated have been copied by practically every state in the Union.

This commission has always been the leader in the development of new types of highways to meet changes in the character of the traffic and to improve motor transportation ,and its specifications have been the highest standing wherever roads are built. It was the leader in the introduction of bituminous materials in road construction, it inaugurated the sand-oil road and introduced other roadmaking methods now widely known and employed. The road census, recognized as a most valuable method of forecasting the character of road needs for future travel, was first introduced in the United States by the Massachusetts commission. In its motor-vehicle work the commission has established the standards that have been followed everywhere, and in its difficult position which combines legislative, judicial, and executive functions, it has been notably free from criticism. It has the distinction of operating the motor-vehicle department so economically that almost 90% of the total money paid to the state in motor vehicle fees is used directly on the roads.

In view of these facts, we feel that it would be a serious loss to the state and to those who make and use the highways, which comprises practically the whole population, if in the organization of the new Department of Public Works all of the present members of the Highway Commission are not retained. Such action on your part will continue existing policies that have proved satisfactory from every point of view, and we believe will meet with the approval and commendation of the citizens of Massachusetts.

Car Shortages Big Limiting Factor in Road Construction

Lack of rolling stock for the transportation of road materials has been and still is the greatest limiting factor in highway construction, and is responsible for at least 50% of what 1919 contract work remains unfinished, in the belief of Thomas H. MacDonald, chief of the Bureau of Public Roads. Lack of materials, inability to interest a large percentage of the more efficient contractors in road work, lack of trained highway engineers, and scarcity of common labor are the other four limiting factors named by Mr. MacDonald in the order in which they have affected highway construction, in his opinion.

Lack of materials has been brought about largely by inability to get cars, for, if ample cars had been available capital would not have hesitated to develop additional materials, he believes. Demands in other construction lines have been so great as to keep most of the large contractors out of road work, though this condition is changing very markedly at present, he states, and within the past few weeks several large contracting organizations have taken over road-construction work. To a Chicago firm have been awarded 80 miles of concrete road work in Illinois, the usual unit for a contract of this class of work being only from five to six miles.

The small effect that the general labor shortage has exerted upon road construction is explained by Mr. MacDonald as a result of the intensive use of mechanical equipment. Few common laborers, he asserts, are needed, the demand being chiefly for men with mechanical knowledge.

The Federal-aid plan for highway construction has made available more money during the 1919 season than it was found possible to expend efficiently. A like condition is predicted for 1920. With such conditions prevalent, Mr. MacDonald urges unusual scrutiny in road expenditures in order to prevent waste.

Delaware Highway Department Holds Annual Meeting

In order to indicate to the public what must be demanded in road construction, and in order to stress the point that more engineers must become capable of building good roads economically, a road exhibit, combined with the annual meeting of the Delaware State Highway Department, was held Nov. 20-22 in the lobby of the du Pont Hotel, Wilmington, Del.

In the exhibit were included a complete model of a hydrated lime plant, a section of Delaware road showing brick on concrete foundation with a cement-sand cushion, laboratory equipment for testing materials, samples of materials in use, photographs of all the developments during road construction, and other items of definite educational value for both roadbuilders and for those who pay for the construction of the roads.

The meeting of the Highway Association was held Nov. 22, and included in the program were six papers presenting technical features, and three touching upon the general aspects of the road situation. Emphasized in these three discussions was the thought that money for construction is forthcoming, but that roads must be worthy of the expenditure made upon them, or else a sharp and damaging reaction will be met.

Evidence of the change in sentiment regarding roadbuilding from several years ago was brought out by the fact that some of the early opponents of the du Pont highway, traversing the state from north to south, were numbered among the men who organized the Delaware Good Roads Association Nov. 22, an organization of which Charles M. Upham, chief engineer of the State Highway Department, was chosen president.

With Mr. Upham presiding, the following program of papers was read at the meeting: "Road Situation," by Josiah Marvel, commissioner; "Survey and Preparation of Plans for State Highways," by Arnold Richardson, assistant engineer; "Design and Construction of Highways, Bridges and Culverts," by C. N. Conner, bridge engineer; "New Methods in the Construction of Concrete Roads," by C. S. Gale, construction engineer; "Methods of Testing Materials Entering Into State Road Construction," by G. W. Hutchinson, testing engineer; "Acquiring Right-of-Way for State Highways," by C. S. Gale and J. E. Tate; "Construction of Bituminous-Macadam Roads," by W. E. Hawkins, Sussex County engineer; "History and Statistics of the State Highway Department," by W. W. Mack, assistant engineer, and "History, Ethics and Practices of the American Association of Engineers," by R. C. Bailey, Washington, D. C.

Large State Road Projects

Seventeen road projects in Pennsylvania, which have been approved by the Bureau of Public Roads, will cost $4,607,000, for which the Federal aid is $1,969,000.

The figures of the bureau, which just have become available, show that during July Nebraska obtained the approval of projects aggregating the greatest mileage. Oklahoma had the largest single project, of which the estimated cost is $1,271,556.

One Massachusetts project, which was approved recently, will be constructed at an estimated cost of $127,864 a mile. This is the highest average cost per mile so far shown in any Federal-aid road. One Ohio project is expected to cost $66,716 a mile; another one in Pennsylvania will average $64,015, while still another Pennsylvania project will be constructed at an estimated cost of $56,443 per mile.

To Reorganize Boston's Supply Bureau

Officials of the City of Boston have long realized the inefficiency of the present Bureau of Supplies. It has remained for Mayor Peters to take a drastic step and provide for an effective department. He has asked the firm of Stone & Webster of Boston to make an investigation and recommend the necessary changes.

Civil Service Examinations

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Town manager, $2400 per year, Dec. 16. To fill vacancy in Ordnance Department, Nitrate Plant No. 1, Muscle Shoals, Ala. File applications before Dec. 16.

Structural steel inspector, Naval Ordnance Plant, South Charleston, W. Va., $7.04 per diem, Dec. 23. File applications before Dec. 23.

Civil engineer, Philippine service, $2500 to $3000 per year. Applications received until further notice.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

NATIONAL RIVERS AND HARBORS CONGRESS, 824 Colorado Building, Washington, D. C.; Dec. 9-11, Washington, D. C.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.; Dec. 8-11, Louisville, Ky.

BRIDGE BUILDERS' & STRUCTURAL SOCIETY, 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

ENGINEERING INSTITUTE OF CANADA; General Secretary, Fraser S. Keith, 176 Mansfield St., Montreal; Jan. 27-29, Montreal.

AMERICAN ROAD BUILDERS' ASSOCIATION, 150 Nassau St., New York City; Feb. 9-13, Louisville, Ky.

AMERICAN WOOD-PRESERVERS' ASSOCIATION; Secretary-Treasurer, F. J. Angier, Mt. Royal Station, Baltimore; Feb. 10-12, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle St., Chicago; Feb. 20-21, Chicago.

Castle Post of the American Legion, composed of engineers of all schools and from many branches of the Engineer Corps of the Army, who served from Chicago, met Nov. 25 in the rooms of the Western Society of Engineers and elected the following officers: Commander, Robert I. Randolph; vice-commander, Myron B. Reynolds; adjutant, Walter A. Wade, 1400 First National Bank; finance officer, Eugene C. Heron; directors, C. Vandeventer and Arthur R. Lord. Plans have been undertaken looking to a close study of the industrial side of military requirements.

The Rochester, N. Y., Engineering Society was addressed Nov. 28 by Mathias R. Kondolf, who spoke on the proposed Kondolf state act in regard to the survey and fixing of boundaries within the state. At the luncheon Nov. 25 Prof. Dexter Perkins spoke on "Why We Should Save the Treaty," and on Dec. 2 C. Solon Kellogg spoke on the "Soft Coal Situation."

The Montreal Branch of the Engineering Institute of Canada was addressed Nov. 27 by W. E. L. Dyer on "Railway Track: Design and Manufacture." On Nov. 28 and 29 members of the society visited the Montreal branch of the St. Lawrence sugar refinery.

The Engineers' Club of Lansing, Mich., completed its organization at a meeting Nov. 17, having been organized by members of the Michigan Engineering Society. Its membership is not restricted, however, to members of the Michigan society. Meetings will be held twice a month. The officers elected for the ensuing year are Otto E. Eckert, president; C. E. Bement, vice-president; Fred L. Radford, secretary-treasurer, Reo Motor Car Co., Lansing.

The Idaho Society of Engineers voted Nov. 16 to amalgamate with the American Association of Engineers, under the title of **the Idaho Society of Engineers' Chapter of the American Association of Engineers.**

The New England Water Works Association will hold its December meeting at the Hotel Brunswick, Boston, Dec. 10. The following papers are included on the program: "My Trip to France," by Col. Richard K. Hale; "Modern Pumps for Small Water-Works," by A. O. Doane, and "Description of Motor-Driven Portable Thawing Machine Mounted on Truck," by Frank J. Gifford. The report of the committee on budget for 1920 will also be presented.

The Southern California Association of Members of the American Society of Civil Engineers was addressed Nov. 12 by H. Hawgood on "Cost of Flood Damage and Economic Relations," continuing the discussion of "Flood Control." The committee on universal military training submitted its report in favor of training for a reasonable period of time. Careful study of the report of the committee on development was urged.

A New Haven, Conn., Chapter of the American Association of Engineers may be the result of the recent organization of professional engineers in New Haven, at a meeting held Nov. 21, at which the following temporary officers were elected: E. B. Muny, president; Philip Sellers, vice-president; G. B. Taylor, treasurer; Irving Alpert, secretary, 113 Asylum Street.

The Oklahoma Society of Engineers, Nov. 24, selected Tulsa as the next place of meeting, in October, 1920.

The Engineers' Club of Trenton held a special meeting Dec. 1, at which Fred C. Carstarphen spoke on "Time, Space and the Theory of Relativity."

PERSONAL NOTES

RUSSELL W. STOVEL, recently lieutenant colonel of engineers, U. S. A., has been appointed consulting engineer, Westinghouse, Church, Kerr & Co., Inc., and has become a member of that organization. He will devote his entire time to the company's electrical and mechanical work. He served in France as chief of the terminal facilities division of the Army Transport Service. He was graduated from McGill University in 1897, with the degree of electrical engineer, and the following year entered the employ of Westinghouse, Church, Kerr & Co. He soon became an assistant engineer, then successively engineer-in-charge, mechanical engineer of the company and finally mechanical engineer. In 1914 he left the company to become managing engineer for Gibbs & Hill, consulting engineers, New York, and was in charge of the Paoli and Chestnut Hill electrification of the Pennsylvania R.R., the Elkhorn grade electrification of the Norfolk & Western Ry., and the electrification of the New York Connecting Railway.

CAPT. PAOLO. TUCCIMEI, a member of the executive board of the Associated Engineers of Italy, is in the United States to attend the International Trade Conference as one of the delegates from Italy. Captain Tuccimei was an officer of artillery in the Italian Army, serving four years on the Austrian front. Prior to the war the engineering profession in Italy had 37 different organizations, all of them local. Need for a national engineering organization was made manifest during the four years of war activity, and the Associated Engineers of Italy was organized last April. In September it had attained a membership of 4000, and it is expected to have as members, within a few months, practically all of the 10,000 professional engineers and architects in Italy. Only university graduates are eligible. The local engineering societies will become sections of the new national association.

R. WINTHROP PRATT, consulting engineer, Cleveland, Ohio, has opened a branch office in Detroit, Mich., at 88 Griswold St., with H. A. STRINGFELLOW in charge.

ARTHUR L. BOMAN, Federal-aid project supervisor, Nebraska State Highway Commission, has been appointed city engineer and superintendent of the water-works of Kansas.

H. F. JOHNSON, for the past year and a half with the Construction Division of the Army and the United States Housing Corporation, has become superintendent, Joseph E. Nelson & Sons, Chicago, and is at present in charge of terminal building improvements for the Chicago, Rock Island & Pacific Ry., at Cedar Rapids, Iowa.

GEORGE S. LONG, previously water-works engineer, Camp Meade, Maryland, has become assistant engineer on sewer design with the Department of Public Service, Akron, Ohio.

RALPH S. HEATH, for the past several years in charge of engineering and construction work for the Navy Department on dry dock No. 4, Norfolk, Va., Navy Yard, and on the coaling plant at the Pearl Harbor station, Hawaii, has become engineer for the M. J. Roche Construction Co., Cincinnati.

CAPT. WILLIAM MICHENER, Engineers, U. S. A., has become assistant professor of military science and tactics, Alabama Polytechnic Institute, Auburn, Ala.

JOHN F. BUCKNER, formerly city engineer, Cleburne, Tex., has become secretary of the Rush County, Texas, Highway Commission.

E. W. METCALF, formerly assistant field engineer, Pacific district, Department of Valuation, Interstate Commerce Commission, has been appointed assistant engineer, Missouri, Kansas & Texas Ry., at Dallas, Tex., assigned to valuation work.

CAPT. LEROY E. GARDNER, Construction Division, U. S. A., has returned to his former work as resident engineer for CHARLES T. MAIN at New Bedford, Mass.

H. B. BILFORD, resident engineer, Illinois State Highway Department, has resigned to become resident engineer, Ohio State Highway Department for Brown County, with headquarters at Georgetown.

W. F. LAWRY, who recently finished his work as chief draftsman for the Kipawa Co., Ltd., at Timiskaming, Quebec, has become designing engineer, Algoma Steel Corporation, Sault Ste. Marie, Ontario.

R. W. FELIX, previously captain, Construction Division, U. S. A., has become associated with the Lakewood Engineering Co. as sales engineer, with headquarters in Pittsburgh.

CAPT. THOMAS G. MACCARTHY, U. S. M. C., recently discharged from the service, is now with N. S. HILL, JR., and S. F. FERGUSON, consulting engineers, New York City, as civil engineer.

THOMAS J. SCULLY, formerly captain, 214th Engineers, has become associated with the Constantia Lumber Corporation, with offices in New York City and Constantia, N. Y.

GEORGE SIDNEY BINCKLEY, previously major, Engineers, U. S. A., has become associate editor of *Ingeniería Internacional*, McGraw-Hill Co., Inc. Since 1890 Mr. Binckley has been engaged in civil engineering work in Mexico and in the West. Previous to entering the Army in 1917 he was engaged in private practice in Los Angeles, Calif.

ALFRED E. STROBEL, structural engineer, formerly with the Chicago, Burlington & Quincy R.R., on the design of the Harrison St. freight terminal, has joined the staff of the Kniskern Construction Co., Chicago.

LIEUT. LAYTON F. SMITH, U. S. N., recently discharged from the service, has reopened his office at 218 N. Charles St., Baltimore, Md., for the practice of engineering and architecture.

W. C. DAVIS, formerly first lieutenant, Engineers, U. S. A., has been appointed manager in charge of the office of the United States Gypsum Co., Builders' Exchange Bldg., Cincinnati.

GUSTAV HIRSCH, previously lieutenant-colonel, U. S. A., has resumed private practice with offices in the Hartman Bldg., Columbus.

CECIL N. HAGGART has resigned from the American International Shipbuilding Corporation to resume his former work in engineering and contracting with headquarters in the Fitzsimmons Bldg., Pittsburgh, Penn.

JEREMIAH HANNAFIN has been appointed superintendent of streets and highways of Winsted, Conn.

S. B. RAMBO has been elected city engineer of Greenwood, S. C.

CAPT. E. N. PETERSON, Corps of Engineers, U. S. A., recently resigned from the service, has resigned from H. L. COOPER & CO., consulting engineers, New York City, to become associated with the Franco-American Agency, 54 Rue Taitbout, Paris, France.

CHARLES ASH, resident engineer on construction of the Scioto River bridge, Broad St., Columbus, Ohio, has been appointed deputy state highway commissioner, assigned to duty in the bridge bureau.

ROBERT D. MCCARTER and WILLIAM L. COOPER have become associated under the firm name of MCCARTER & COOPER, and will engage in consulting engineering and purchasing for clients, with offices at 50 Church St., New York City.

ALEXANDER MACOMBER and JOHN WEST, who since 1910 have been associated with CHARLES H. TENNEY & Co., engineers and managers of public utilities, Boston, have become associated with GEORGE P. CARVER, industrial architect and engineer, under the firm name of CARVER, MACOMBER & WEST, INC., engineers, 261 Franklin St., Boston.

JAMES M. WOOTEN, recently returned from service in France, has resumed his position as chief engineer, Kentucky River Power Co., Hazard, Ky.

CAPT. JOSEPH R. GREENWOOD, U. S. A., recently discharged from the service, has renewed his association with the firm of CHARLES H. HIGGINS, architects and engineers, located at 19 West 44th Street, New York City.

HOWARD B. LUTHER, instructor in civil engineering, Massachusetts Institute of Technology, has been appointed assistant professor of civil engineering.

OBITUARY

HENRY LAWRENCE GANTT, industrial engineer, New York City, died at his home in Montclair, N. J., Nov. 23, after a brief illness. He was a native of Calvert County, Maryland, and was educated at Johns Hopkins University and at Stevens Institute, from which he was graduated in 1884. He was closely associated with the late Fred W. Taylor in the original development of scientific management, and his active professional life was devoted to this work, in which he rendered service to manufacturing concerns in many different fields. Early in his work he rejected the theory that the function of scientific management was merely to get more out of the employees, believing it should embrace a high degree of cooperation between employees and the management. He was active in the American Society of Mechanical Engineers. He was the author of "Work, Wages and Profits," published in 1913, "Industrial Leadership," published in 1916, and "Organizing for Works," published in 1919.

W. T. WILSON, former county highway engineer, Fulton County, Georgia, died recently in Atlanta.

Handbook on Export Methods Issued by Government

A handbook entitled "Selling in Foreign Markets" was recently issued by the Bureau of Foreign and Domestic Commerce of the Department of Commerce, Washington, D. C. It was prepared in conjunction with the Federal Board for Vocational Education. The book of 638 pages aims to discuss in a practical way all the aspects and problems of export trade. It consists

mainly of reports and articles by experts of wide experience, either in large private business or commercial investigations for the Government.

The bureau issues this book with the opinion that it affords an unusual opportunity for Americans interested in oversea trade to obtain information that will enable them to profit by the training and skill of others and to acquire pertinent authoritative information concerning the manifold phases of effective salesmanship abroad.

Copies can be obtained for 50c. each from the Superintendent of Documents, Government Printing Office, Washington, D. C., the order name being "Selling in Foreign Markets," Miscellaneous Series No. 81.

Cement Export Firm Elects Officers

The Cement Export Co., an association of 11 portland cement manufacturers whose annual production approximates 15,000,000 bbl., the organization of which was noted in *Engineering News-Record* of May 22, 1919, p. 1036, has elected the following officers: President, Charles S. Conn, Giant Portland Cement Co.; first vice-president, Joseph A. Horner, Nazareth Cement Co.; second vice-president, J. W. Alker, Pennsylvania Cement Co.; secretary, Morris Kind, Hercules Cement Corporation; treasurer, Joseph Brobston, Dexter Portland Cement Co., and general manager, F. C. Green.

The association has secured terminal facilities in New York City for the storage of about 50,000 bbl. of cement. From 5000 to 50,000 bbl. will be kept in stock so that all orders can be promptly filled. Representatives of the export company have left to develop the export market in the Argentine Republic and in Brazil.

Janney Process for Reproducing Tracings Improved

Improvements have been made in the Janney process, for the reproduction of tracings, whereby it becomes a one-man instead of a three-man operation. The floor space occupied by each machine will be reduced at least 75% and the time required for the reproduction of each tracing will be reduced from 30 to 10 min. The improvements have been made by Reynold Janney, originator of the process, and president of the Waterbury Tool Co. of Connecticut, and E. S. Holland, of the E. S. Holland Co., New York City.

The process, as described in *Engineering News-Record* of Feb. 27, 1919, p. 451, is based upon the gelatinizing of a zinc plate with sensitized gelatin, which, after being refrigerated and maintained at the proper temperature, receives the impression of a matrix blueprint made on special transfer paper, such a blueprint being neither developed nor washed.

Flat tables, upon which gelatinizing and inking were done, and the refrigeration chest, have been replaced in the new design through the utilization of an electrically driven cylinder whose surface is of zinc and which is gelatinized and refrigerated simultaneously. The cylinder is gelatinized from below through contact with the gelatin in a trough easily adjustable; is refrigerated from within through its attachment to a small refrigeration plant, and is inked in much the same manner as is employed by cylinder presses.

The new device is now being perfected, patents have been applied for and the manufacture of the new machine will soon be started.

Western Wood Pipe Manufacturers Form Publicity Bureau

Four of the largest manufacturers of wood pipe on the Pacific coast have formed the Western Wood Pipe Publicity Bureau, with offices in the White Bldg., Seattle, in charge of E. J. Bartells, manager. The four companies uniting in the work are the Continental Pipe Manufacturing Co., Seattle; American Wood Pipe Co., Tacoma; Redwood Manufacturers Co., and the Pacific Tank and Pipe Co., both of San Francisco.

Business News

THE FEDERAL BRIDGE & STRUCTURAL CO., Waukesha, Wis., has reopened its contracting and sales office in the People's Gas Bldg., Chicago, with M. E. Allen as contracting engineer in charge of sales. Mr. Allen was formerly in charge of sales for the Central States Bridge Co., Indianapolis, Ind., and later was associated with the Baily & Allen Co.

THE DEWEY CEMENT-GUN CONSTRUCTION CO., Allentown, Penn., has been reincorporated under the name of THE TRAYLOR-DEWEY CONTRACTING CO., and announces that, in addition to its previous work, it is prepared to estimate upon and to undertake the construction of roads, pavements and buildings.

THE READING IRON CO. announces the appointment of Comly B. Shoemaker, Jr., as assistant superintendent of the Roe puddling department.

THE RICHARDSON-PHENIX CO., lubrication engineer and manufacturer, Milwaukee, has reopened its Philadelphia office, which is in charge of George F. Fenno, recently released from Government service.

CHARLES F. AMES & CO., New York City, has appointed Paul D. Goodman, previously of the Epping Carpenter Pump Co., Pittsburgh, as sales manager, sales department, Platt Iron Works, Dayton, Ohio.

THE PARSONS-MOORHEAD MACHINERY CO., 237 Fourth Ave., Pittsburgh, Penn., has been organized to do a general machinery business.

THE HOFMANN-SPROUL CO., manufacturer of iron and steel, Philadelphia, has appointed the Faison Co., Banner Bldg., Greensboro, N. C., as representative for the South.

THE INTER-STATE MACHINERY CORPORATION has been formed to succeed the Ralph R. Lewis Co., retaining the same management and offices in the Commercial Trust Bldg., Philadelphia, Penn.

Trade Publications

The following companies have issued trade publications:

THE MACHINERY EXCHANGE CO., New Orleans; booklet, 10x7 in., 24 pages, illustrated, including insert of line drawing showing arrangement of aërial, radial crane and cableway for handling coal.

THE PORTLAND CEMENT ASSOCIATION, booklet, 9x6 in., 36 pages, illustrated, entitled "Concrete Tanks for Industrial Purposes."

THE FRANKLIN MANUFACTURING CO., Franklin, Penn.; catalog, F.C., 7-19, 11x8 in., 78 pages, illustrated, including information on heat insulations and "Franklin Fuel-Saving Products."

THE GEORGE HAISS MANUFACTURING CO., INC., New York City; booklet 619, 9x6½ in., 16 pages, illustrated, on coal, stone and sand elevators and conveyors.

THE DAVIS-BOURNONVILLE CO., Jersey City, N. J.,; circular, 6x3 in., eight pages, illustrated, describing the Davis flare light and generator.

THE ALEXANDER RAILROAD CROSSING & EQUIPMENT CO., Chicago; folder, 8½x3½ in., illustrated, describing swing rail construction of "shockless" railroad crossings.

THE F. C. AUSTIN CO., INC., Chicago; catalog, 11x7½ in., 12 pages, illustrated, describing the "Austin Wagon Loader."

THE HOWE CHAIN CO., Muskegon, Mich.; catalog No. 4, 9x6 in., 24 pages, illustrated, describing "Howe Trucking System" and equipment for industrial plants.

THE BLAW-KNOX CO., Pittsburgh; bulletin 203, 9x6 in., 28 pages, illustrated, describing "Blaw Forms" for light walls and foundations.

THE TITAN TRUCK CO., 25th and St. Paul Aves., Milwaukee, Wis.; booklet 8½ x 11 in., 20 pages, illustrated; showing salient features of the Titan 3½-, 5- and 6-ton trucks; illustrations indicate the uses to which the Titan truck is put for hauling material on contract work.



CONSTRUCTION NEWS

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

SEWERS

Bids Close		See Eng. News-Record
Dec. 15	Okmulgee, Okla.	Dec. 4
Dec. 19	Cleveland, O.	Dec. 4
Dec. 22	Euclid, O.	Dec. 4

BRIDGES

Dec. 9	Trenton, N. J.	Dec. 4
Dec. 9	New York Adv. Dec. 4.	Dec. 4
Dec. 9	Massachusetts	Dec. 4
Dec. 10	Findlay, Ill.	Dec. 4
Dec. 15	Aspermont, Tex.	Dec. 4
Dec. 16	Newark, N. J.	Dec. 4
Dec. 16	Rochester, N. Y. Adv. Dec. 4.	Dec. 4
Dec. 16	Washington, Ga.	Dec. 4
Dec. 19	Sylvester, Ga.	Dec. 4
Jan. 19	Finch, Ont.	Dec. 4
Dec. 22	Wenatchee, Wash.	Dec. 4

STREETS AND ROADS

Dec. 10	Michigan	Dec. 4
Dec. 11	Cameron, Tex.	Dec. 4
Dec. 17	Riverside, Cal.	Dec. 4
Dec. 23	Henderson, Minn.	Dec. 4

EXCAVATION AND DREDGING.

Dec. 17	Portage, Wis.	Dec. 4

INDUSTRIAL WORKS

Dec. 14	Milwaukee, Wis.	Dec. 4
Dec. 15	Ft. Worth, Tex.	Dec. 4
Dec. 17	Brooklyn, N. Y.	Dec. 4

BUILDINGS

Dec. 8	Chester, Pa.	Dec. 4
Dec. 8	Bridgeport, Conn.	Dec. 4
Dec. 9	Cherokee, Okla.	Dec. 4
Dec. 10	Ansonia, Conn.	Dec. 4
Dec. 10	Detroit, Mich.	Dec. 4
Dec. 11	Swampscott, Mass.	Dec. 4
Dec. 15	Pittsburg, Kan.	Dec. 4
Dec. 15	East Cleveland, O.	Dec. 4
Dec. 16	New Bedford, Mass.	Dec. 4
Dec. 16	Stennett, Ia.	Dec. 4
Dec. 17	Wards Island, N. Y.	Dec. 4
Dec. 17	Cleveland, O.	Dec. 4
Dec. 18	Pittsburgh, Pa.	Dec. 4
Dec. 19	Macksburg, Ia.	Dec. 4
Dec. 19	Cleveland, O.	Dec. 4
Dec. 19	Carlisle, O.	Dec. 4
Dec. 20	Ness City, Kan.	Dec. 4
Dec. 20	Independence, Kan.	Dec. 4
Dec. 22	Yuma, Ariz.	Dec. 4
Dec. 23	Fairport, O.	Dec. 4
Dec. 29	Cleveland, O.	Dec. 4
Jan. 13	Storm Lake, Ia.	Dec. 4

FEDERAL GOVERNMENT WORK

Dec. 8	Earth Work — Memphis, Tenn. Adv. Dec. 4.	Dec. 4
Dec. 10	Quay Wall—Spec. 4078—Charleston, S. C.	Dec. 4
Dec. 17	Heating — Spec. 4091 — Charleston, S. C.	Dec. 4
Dec. 17	Cranes—Spec. 4092—Norfolk, Va.	Dec. 4
Dec. 17	Cranes—Spec. 4092—Philadelphia, Pa.	Dec. 4
Dec. 17	Concrete Walls — Spec. 4096—Paris Island, S. C.	Dec. 4
Dec. 19	Dredging—Seattle, Wash. Adv. Dec. 4.	Dec. 4
Dec. 23	Animal House Extension — Washington, D. C.	Dec. 4
Dec. 26	Lock Gates — Wheeling, W. Va. Adv. Dec. 4.	Dec. 4

MISCELLANEOUS

Dec. 9	Grain Conveyor Equipment —St. Johns, N. B.	Dec. 4
Dec. 12	Wharf—Owen Sound, Ont.	Dec. 4
Dec. 16	Foundation—New Bedford, Mass.	Dec. 4
Dec. 17	Tractor — Hollidaysburg, Pa.	Dec. 4
Dec. 19	Pump—Cleveland, O.	Dec. 4
Dec. 22	Electric Pump—Sault Sainte Marie, Mich.	Dec. 4
Dec. 23	Jib Cranes — New York, N. Y. Adv. Dec. 4.	Dec. 4

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Pa., Morrisville—City voted $45,000 bonds for waterworks system. T. F. Bowe, Triangle St., East Rutherford, N. J., engr.

O., Silver Lake—(Cuyahoga Falls P. O.)—Village soon lets contract building two 1 story, 17x17 ft., concrete, steel and brick pump houses. About $15,000. R. W. Pratt, Hippodrome Bldg., Cleveland, engr.

Mich., Lansing—City retained Alvord & Burdick, engrs. Hartford Bldg., Chicago, to prepare report on tentative plans and estimates for proposed filtration plant.

Ia., Arnolds Park—City retained M. I. Evinger, engr., 222 Davidson Bldg., Des Moines, to prepare preliminary surveys and submit estimate of cost for waterworks and sewerage systems. G. H. Sherburne, city clk.

Okla., Clinton—City voted $350,000 bonds to improve waterworks system. Engineer to be selected at once.

Idaho, Ashton—City sold $50,000 bonds to improve waterworks system.

Wash., Anacortes—City plans to install 10 in. cement or c.i. watermains in Commercial Ave. from 17th to 38th Sts. About $12,000. E. Swanberg, clk.

Ore., Portland—City plans to install 54,000 additional meters. An appropriation of $30,000 will be asked to cover partial cost. J. Mann, comr.

Ont., Acton—Town having plans prepared by E. A. James Co., Ltd., engrs., 36 Toronto St. Toronto, for deep wells, 80,000 gal. concrete tank, reservoir, 300 gal. per minute turbine pumps, and 4 mi. 6 in. c.i. mains. About $80,000. Noted July 3.

Ont., Beaverton—Town retained James, Louden & Hertzberg, engrs., 36 Toronto St., Toronto, to make preliminary report on waterworks system, to include brick pumphouse, 5000 ft. 12 in. wood and 2000 ft. 6 in. c.i. pipe. About $50,000.

Ont., Chatham — City Council had plans prepared by E. A. James & Co., engrs., Excelsior Bldg., Toronto, for (1) Thames River proposition, involving 4 mi. 22 in wood pipe, pump house, rapid sand filter, tank and electric pumps, cost $300,000; (2) Snye proposition, 21½ mi. 24 in. pipe, etc., water taken from the Cheval Ecarte, St. Clair River, $720,000; (3) Lake Erie proposition, pump house, concrete reservoir 900,000 gal. capacity, gravity pipe line, 22 mi. 24 in. wood pipe, $600,000.

Ont., Milverton—Town having preliminary plans prepared by E. A. James Co., Ltd., engrs., 36 Toronto St., Toronto, for cast iron distribution system, deep wells, pumps, pumphouse, water tower, etc. About $80,000.

Ont., Richmond Hill—Town having preliminary plans prepared by E. A. James Co., Ltd., engrs., 36 Toronto St., Toronto, for natural reservoir, brick pumphouse, duplex electric and gasoline turbine pumps, rapid sand filters, elevated steel tank, 7500 imperial gal. capacity, 4 miles 6-8 in. c.i. pipe, hydrants, valves, etc. About $80,000.

Ont., Scarborough—Town Council having plans prepared by E. A. James Co, Ltd., engrs., 36 Toronto St., Toronto, for steel intake, concrete subsidence basins, pumphouse, pumps, 75,000 gal. steel water tower, 2500 ft. c.i. pipe, hydrants, valves, and mechanical filters. About $300,000. Noted Feb. 27.

Ont., Timmins—City having plans prepared by Lulcliffe & Neelands, engrs., New Liskeard, for waterworks and sewerage system. Work involves 23,000 ft. 8-18 in vitr. tile sewer, 6400 ft. of which is trunk sewer and 9600 ft. c.i. water piping. About $115,000.

BIDS DESIRED

Minn., Grand Rapids—City receiving bids building watermains in various streets, involving 3622 cu.yd. earth and 10 cu yd rock excav., 6112 lin.ft. 4-8 in. c.i. pipe. About $11,000. Duluth Eng. Co., 612 Paladio Bldg., Duluth, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—Dept. Water, Gas & Electricity received lowest 3 bids Nov. 24, hauling and laying watermains in East 164th and East 161st Sts., from Masterson Constr Co., 15 East 40th St., $13,262; Astoria Contg. Co., $13,971; Norton Eng. Co., $14,100.

O., Cleveland—Calvary Cemetery Assn. East 9th St. and Superior Ave., received bids building 3600 ft. 6 in. c.i. water mains in Calvary Cemetery, from M. A. Ryan, 870 Eddy Rd, $8462; Sprague & Burkhardt, 12011 Woodland Ave., $8883; Philips & Bixel, Blackstone Bldg., $9390.

★Ill., Witt—Bd. Local Impvts. let contract building water system, to Monie & Dunbar, Chemical Bldg., St. Louis, Mo. Work involves 10,392 ft. 8 in. pipe, $2.20 per ft., 9151 ft. 6 in., $1.67 and 18,202 ft. 4 in. c.i. pipe, $1.275. Total cost, $67,939.

★Minn., Redwood Falls—M. C. Rutter, city recdr., let contract extending waterworks and sewerage systems, involving 3180 ft. 6 in. water mains, 3483 ft. 6-8 in. sewer, etc., to W. C. Fraser, Guardian Life Bldg., St. Paul., $7790.

★Neb. Norfolk—City let contract building extension to waterworks in Dists Nos. 37 to 47, to Norfolk Bridge & Constr. Co., Norfolk, $15,470.

★Neb., Ord.—City let contract laying watermains in various streets, to Hammen-Kruse Constr. Co., Spencer, Ia. About $10,300

★Okla., Shattuck—City let combined contract improving waterworks and electric systems, including hydrants, valves, wells, power equipment and c.i. pipe, to Merkle Mchy Co., 508 Interstate Bldg., and Amer. Cast Iron Pipe Co., 716 Scarritt Bldg., (both) Kansas City, Mo., $75,957.

★Colo., Peetz—City will improve waterworks system. About $25,000. Work will be done by day labor. Machinery contract let, to Hendrie & Bolthoff Mfg. & Supply Co., 1639 17th St., Denver.

★Ont., Walkerville—H. Walker & Sons let contract installing turbine driven unit with capacity of 5,000,000 imperial gallons per day, to Turbine Equipment Co., 304 Excelsior Life Bldg., Toronto. About $26,000

Sewers

PROPOSED WORK

Pa., Ellwood City—City plans to build sewage disposal plant. R. W. Pratt, Hippodrome Bldg., Cleveland, O., engr.

Pa., Harrisburg—City having plans prepared by M. B. Cowden, city engr., for sewer running east from Derry and 21st. Sts., to eastern city line, south to Phila. & Reading R.R., thence west to Mish's run; 2nd sewer following Asylum run from North and Cameron St., east to north-eastern part of city. About $100,000.

Sewers (Continued)

O., Cleveland—Corrigan Realty Co., c/o W. H. Evers Eng. Co., engrs., The Arcade, soon lets contract building 2880 ft. 8-20 in. sewer in Edgewood Ave. About $11,000.

O., Cleveland—E. White, c/o R. Hecker, engr., Leader-News Bldg., soon lets contract building sewer in Edgewood Ave., involving 1770 ft. 20-30 in. vitr. pipe, 8 manholes, etc. About $14,600.

Mich., Ferndale—City soon lets contract building, (1) 5123 ft. sewers in Ferndale Ave., from Campbell Ave., to point 20 ft. west of east line of Farmdale Ave., involving 30 in. vitr. crock and 36-42 in. rein.-con. or segmental block pipe; (2) 2001 ft. sewer in Farmdale Ave. from Ferndale to Clearfield Aves., 18-20 in. vitr. crock; (3) 1402 ft. sewer in Planavon Ave. from Ferndale to Lewiston Aves., 15-20 in. vitr. crock.

Ill., Mt. Vernon—See "Streets and Roads."

Ia., Odebolt—L. R. Bassett, town clk., soon lets contract building sanitary sewer, involving 1945 lin.ft. 8 in. vitr. sewer pipe, 36 lin.ft. 8 in. w.i. pipe, 3 manholes, 1 flush tank and ejection outfit, complete with sump and house and all appurtenances. W. E. Standeven, 619 Bee Bldg., Omaha, Neb., engr.

Ia., Winfield—City having plans prepared and receives bids in January building 5 mi. sewers and disposal plant. H. R. Green, Union Blk., Cedar Rapids, engr.

Minn., Ellsworth—City having plans prepared building sewerage system. About $40,000. Druar & Smith, Globe Bldg., St. Paul, engrs.

Minn., Forest Lake—Village having plans prepared building sanitary sewerage system. About $40,000. Druar & Smith, Globe Bldg., St. Paul, engrs.

Okla., Oklahoma—State Bd. Health has ordered city to build sewage disposal plant. About $1,000,000. J. W. Bennett, city engr.

Colo., Denver—W. B. Lowery, mgr. impvts. and parks soon receives bids installing 19,000 ft. 8 in. vitr. sewer pipe in Part B, West and South Side Sewer Sub.-Dist. No. 18. About $33,625. J. B. Hunter, city engr.

Idaho, Ashton—City sold $50,000 bonds to improve sewerage system.

Idaho, Malad—City plans to build sewers in Impvt. Dist. No. 2. About $16,000. J. J. Evans, clk.

Idaho, Rupert—City will sell $30,000 bonds to extend present sewerage system to include installation of vitr. or cement branch and service pipes. A. Kelset, Rupert, engr.

Ore., Portland—City Council adopted resolution to build 8 in. vitr. sewer pipe, lamp-holes, catchbasins, manholes, sewer service and branch pipes, in East 44th St. from East Hoyt to East 47th Sts.; Holladay Ave. form East 84th to East 82nd Sts.; East 84th St. from point 160 ft. north of Holliday Ave. to proposed sewer in Holladay Ave. and East 84th St. from point 84 ft. south of center of Holladay Ave. to proposed sewer, $4330. O. Laurgaard, city engr.

Ont., Peterboro—R. H. Parsons, city engr., submitted report recommending that City Council build rein.-con. sewage disposal plant consisting of 2 story sedimentation tank, sprinkling filters and humus tanks. About $125,000.

Ont., Sandwich—M. Knowles, Ltd., engrs., 66 Onellette Ave., Windsor, soon lets contract building 8700 ft. 27-42 in. lock joint concrete sewers in Sandwich and Ojibway Twps., for Essex Border Utilities Comn. About $150,000.

BIDS DESIRED

O., Cleveland—Until Dec. 19, by city, building twelve 8 x 50 ft. grit chambers, flow channels, pump wells and buildings to cover same, also installing pipe and pumping equipment, at easterly sewage treatment works, foot of East 140th St. G. Gascoigne, 618 City Hall, engr.

O., Euclid—Until Dec. 22, by village, building sewers and watermains in Coulter Ave. from Bliss to Coulter Aves. and laying 6 in. watermains in Ormiston Rd. from Cut Rd. to Clifton St. F. A. Pease Eng. Co., Marshall Bldg., Cleveland, engrs.

Okla., Okmulgee—Until Dec. 15, by city, building sewers in Dist. No. 36, involving 7500 ft. 8 in. tile block. About $18,000. T. P. Paxton, Okmulgee, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

★**Mass., Worcester**—City will improve sewerage system. About $100,000. Work will be done by day labor.

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres., let contract laying sewers and appurtenances in West 8th St., to Tomasetti Contg. Co., Inc., 1133-60th St., $22,694; 84th St., to Ramsey and New York Contg. Co., 26 Court St., $16,259; Elmore Pl. and Ave. M, to C. Patracca, 3506 Neptune Ave., $2213 and $1053 respectively; Coffee St., to Murphy Bros., 8856-26th Ave., $1770.

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contracts laying sewer in Anable Ave. and 15th Ave., (Type "A"), to N. Lacalzo, $1670 and $9208 respectively; 15th Ave., (Type "B"), to Green Contg. Co., 734 Vernon Ave., $10,550; Raymond Pl., to F. L. Paino, Woodhaven, $4600; Woodbine St., to T. Welsch, $2222; Stockholm St., to J. H. Johnson, $993.

★**N. Y., New York**—H. Bruckner, pres. Bronx Boro., let contract building sewer and appurtenances in Holland Ave., to C. McDonald, 1910 Webster Ave., $213,721.

N. J., Newark—Passaic Valley Sewerage Comrs., Essex Bldg., 31 Clinton St., received lowest 3 bids building outfall pressure tunnel under Bayonne and New York Bay, from Haskin Tunnel Co., 3½%, A. McMullen Co., 149 Bway, New York City, 4 %, North Atlantic Constr. Co., New York City, 4⅜%; cost plus percentage basis; North Atlantic Constr. Co., $2,528,633, unit price.

★**Pa., Westmoor** (Kingston P. O.)—Boro. Council let contract building sewer in 4th Ward, to Davis and Parry, Dorranceton, $45,890.

N. C., Statesville—City received bids Nov. 12, laying 33,000 ft. sewers and watermains in various streets, from H. H. Abee, Hickory, N. C., $28,950; Dysard Constr. Co., Austell Blk., Atlanta, Ga., $29,-785; A. H. Guion, Gastonia, N. C., $32,500.

★**Mich., Detroit**—Dept. Pub. Wks. let contract building lateral sewers Nos. 3181, 3192, 3205 and 3232, to Wenzel Constr. Co., 54 Buhl Blk., $9755, $17,185, $34,364 and $8012, respectively; No. 3200, to Lennane & McIlvenna, 1205 Book Bldg., $6685; No. 3233 to N. Mancini, 256 Hague Ave., 9555. Noted Nov. 27.

Ia., Des Moines—City received bids Nov. 14, building (a) Sect. No. 1, South Side Sewer, involving 159,266 ft. 10-24 in. vitr. pipe sewer, (b) Sect. No. 2, South Side Sewer, 31,856 ft. 10-27 in. vitr. pipe sewer, 400 ft. 36 in. segmental block and two unit electrically operated centrifugal pumping plant, (c) Woodland Ave. Storm Sewer, 630 ft. 15 and 18 in. vitr. pipe sewer, 2970 ft. 30 in. rein.-con. pipe and 1400 ft. 36 in. segmental block, (d) Waveland Park Sanitary Sewer, 14,000 ft. 10 in. vitr. pipe sewer, from O. P. Herrick, 704 Observatory Bldg., (a) $393,387, (b) $183,732; Mereno Burkham Co., St. Louis, Mo., (a) $395,378; Empire Constr. Co., 209 Flynn Bldg., (a) $410,906, (c) $40,750; Alexander & Higbie, 2733-6th Ave., (b) $178,347, (d) $38,501; Nat. Constr. Co., Davenport, (b) $178,942; G. F. Lambert, 405 Utica Bldg., (c) $39,-800; Lytton Constr. Co., Des Moines, (c) $40,500; J. Hansmann & Sons, 48th St., (d) $34,178; Johnson Bros., Des Moines, (d) $34,209.

★**Minn., Redwood Falls**—See "Waterworks."

★**Neb., Ord**—City let contract installing 11,750 ft. sewers in various streets, to Hammen Kruse-Constr. Co., Spencer, Ia. About $97,000.

★**Ore., Bend**—City Council let contract building West Central Sewerage System, to United Contg. Co., Northwest Bank Bldg., Portland, $13,501.

Ore., Portland—City Council received bids building sewers in (a) East 71st and Pacific Sts., (b) East 47th St. and private property, (1) cement, (2) vitr., from Azar & Co., (a1) $6555, (b1) $5016; Mehemarle & Co., (a2) $5546; Finnigan & Williams, (a1) $5525; Jacobsen-Jensen Co., (b1) $5675; J. Keating, (b) $6080. Contractors all of Portland.

★**Ont., Toronto**—City let contract building 1770 ft. 5 ft. storm overflow brick sewer in College St. from Beatrice St. to Palmerston Ave., to T. C. Agnew, 350 College St., $35.50 per ft., total cost, $63,-000; 2830 ft., 4 ft. in College St. from Palmerston Ave. to Spadina St., to J. Maguire, 265 Russell Hill Rd., $28.85 per ft., total, $82,000.

★**B. C. South Vancouver**—City Council let contract building 32,060 ft., 12 in. monolithic sewer, in Kerr Rd., Collingwood East Dist., to A. J. McDonald, Vancouver, $14,343.

Bridges

PROPOSED WORK

Conn., New Haven—City soon receives bids building 154 ft. bridge, over Quinnipiac River, on Middletown Ave., 31 ft. wide, to include one 40 ft. and two 52 ft. spans deck plate girders encased in concrete with rein-con. roadway slab, sidewalk slab and fence, brownstone facing on piers, abutments and retaining walls, 4 ft. above high. tide. About $80,000 appropriated for project. Former bids rejected. F. L. Ford, city engr.

S. C., Saluda—Saluda Co. soon lets contract building 18 ft., 25 ft. and two 30 ft. span bridges, one 6 x 6 ft. and one 10 x 6 ft. rein.-con. culvert, involving 246 cu. yd. rein.-con., 372 cu.yd. concrete and 12¼ tons steel. About $22,000. State Highway Dept., Columbia, engrs.

O., Bellaire—Comrs. Belmont Co. (St. Clairsville) having plans prepared building concrete bridge over McMahon's Creek, here. About $20,000. L. Darrah, St. Clairsville, engr.

Ia., Manchester—Delaware Co. soon lets contract building 168 ft. bridge, 45 ft. wide, to have two 80-ft. rein.-con. span arches, 33-ft. roadway, two 6-ft. walks and 4 retaining walls, varying from 25-45 ft. long. About $40,000. H. Klaus, co. engr. Noted Nov. 20.

Kan., Independence—See "Streets & Roads."

Kan., Winfield—See "Streets & Roads."

Utah, Parleys Canyon—Comrs. Salt Lake Co. plan to build rein.-con. memorial bridge. About $250,000. G. G. Bywater, 518 E St., Salt Lake City, engr.

Wash., Cashmere—Comrs. Chelan Co. (Wenatchee) soon let contract building 500 ft. concrete bridge, consisting of five 100 ft. spans, over Wenatchee River, near here, involving 1825 cu.yd. concrete, 80,600 lbs. steel and 2000 cu.yd. earth approach and fill. F. M. Berry, Wenatchee, engr.

Cal., Red Bluff—Tehama Co. plans to build rein.-con. bridges over Thomes Creek, cost, $81,000; Mill Creek, $30,000; Deer Creek, $54,000; Red Bank Creek, $30,000; Brewery Creek, $10,000; south fork of Reed Creek, $3400; Dry Creek, $5000; Antelope Creek, $8900; Dye Creek, $11,500; north fork of Mill Creek, $9000; slough between Tehama and Los Molinos, $19,000; Singer Creek, $16,000; steel bridges over south fork of Battle Creek, $5000; Sacramento River, between Vina and Corning, $150,000.

Ont., London——London & Portland Stanley Ry. Co., Phillip St., plans to build bridge over Kettle Creek. About $11,000. J. E. Richards, Phillip St., ch. engr.

BIDS DESIRED

N. J., Newark—Until Dec. 16, by I. L. Raymond, dir. Dept. Streets and Public Impvt., building 2 plate girder bridges over Morris Canal at Heller Parkway, 46 ft. long, 20 ft. roadway, involving 1130 cu. yd. 1-5 in. concrete and 6781 cu.yd. earth filling.

N. J., Trenton—Until Dec. 9, by Freeholders Mercer Co. building bridges Nos. 421.1 and 423.1, 15 ft. rein.-con. spans, 30 ft. roadway, Ewing Twp. About $10,000. H. F. Harris, co. engr.

Pennsylvania—Until Dec. 16, by State Highway Dept., Harrisburg, building bridges in following counties:

Armstrong Co., superstructure for 1 deck plate girder highway bridge, 48 ft. center to center bearings, 18 ft. center to center outside girders, Route 69, Parks and Gilpin Twps.

Berks Co., 1 plate girder highway bridge, 79 ft. center to center bearings, 25 ft. center to center girders, Route 147, Union Twp.

Bucks Co., 1 plate girder highway bridge, 62 ft. center to center bearings, 25 ft. center to center girders, 1 plate girder highway bridge, 74 ft. center to center bearings, 25 ft. center to center girders, Route 150, Falls Twp.

W. Va., Wayne—Until Dec. 8, by F. H. Fry, clk, Wayne Co., building 3 sets of bridge abutments on Project G-1, known as Upper Workman, Lower Workman and Sidney Booth Bridge sites, involving 1700 cu.yd. stone masonry. About $23,000. H. A. Livering, Wayne, engr.

Ill., Findlay—Until Dec. 10, by town, building bridge between Sullivan Twp., Moultrie Co. and Okaw and Windsor Twps., Shelby Co., to have two 120 ft. spans on center line, 18 ft. roadway, 32 ft. abutments, 34 ft. pier, involving 843 cu.yd. concrete, 46,140 lb. reinforcing steel. About $37,800. T. C. Fleming, Sullivan, supt. highways, Moultrie Co.

Bridges (Continued)

Minn Roseau—Until Dec. 10, by Auditor Roseau Co., building one 132 ft. 4 span and one 99 ft. 3 span bridge over Roseau River, plank floors with steel I beams and channels for floor joists, timber pile and timber crib foundation. About $16,000. V. B. Chapin, Roseau, engr.

Neb., Meadville—Until Dec. 20, by R. M. Herre, clk., Brown Co., (Ainsworth) building 200 ft. bridge here, 16 ft. wide, for Brown and Keyapaha Counties, to have two 100 ft. steel spans on two 42 in tubular piers at center, concrete abutments, involving 988 lin.ft steel piling. About $20,000. G. E. Johnson, Lincoln, state engr.

Tex., Aspermont—Until Dec. 15, by T. B. Hardin, judge Stonewall Co., building 160 ft. steel truss span bridge, over Salt Fork of Brazos River, 18 ft. wide, to include rein.-con. pier, plain concrete abutment and wooden flooring. Work involves 13,500 ft. B. M. creosoted timber, 1808 lb. reinforcing steel, 68,775 lb. structural steel, 500 lin.ft. wooden piling, 4 cu yd. class A, 30 cu.yd. class B and 21 cu.yd. class C concrete. About $10,000. F. L. Hargett, Haskell, engr.

Wash., Cashmere—Until Dec. 22, by Comrs. Chelan Co., (Wenatchee), building 500 ft. concrete bridge over Wenatchee River, consisting of 5 concrete arches with concrete retaining walls, involving 1820 cu. yd. concrete and 80,600 lb. steel. F. M. Berry, Wenatchee, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Pa., Media—Comrs. Delaware Co let contract building concrete bridge over Naylors Run, on Marshall Rd., Upper Darby Twp., to J. J. Skelly, Middletown. About $11,700.

★Md., Pocomoke City—State Rds. Comn., 601 Garrett Bldg., Baltimore, let contract building 275 ft., concrete bridge, 24 ft wide, over Pocomoke River, Somerset and Worcester counties. Contr. S-11, to Fisher & Carozza, 805 Calvert Bldg., Baltimore, cost, $67,153; superstructure of lift bascule span of above bridge, double leaf, clear span between fenders 65 ft., clear roadway between curbs 24 ft., Contr. S-11A, to Strobel Street Constr. Co., 1744 Monadock Bl., Chicago. $26,442. Noted Oct. 30.

★Ga., Camilla—Bd. Comrs. Mitchell Co. let contract building 7 bridges and 3 concrete culverts, involving 287 cu.yd. class A and 118 cu.yd. class B concrete, 180 cu.yd. excav. and 29,579 lb. steel, to A. E. Ittner & Co., Albany, $15,700.

★Ia., Elkader—A. H. Andreae, engr. Clayton Co., let contract building 175 ft. pin connected truss bridge, 18 ft. wide, to Pittsburgh-Des Moines Steel Co., Des Moines. About $32,900. Noted Nov. 6.

★Kan., Independence—Comrs. Montgomery Co. let contract building 150 ft. deck girder bridge, with 4 spans, 18 ft. roadway, 205 ft. deck girder, 5 spans, 20 ft. roadway and 35 ft. through girder, 18 ft. roadway, to Western Bridge Co., Harrisonville, Mo., $36,991. Work involves 495 cu.yd. rein.-con., 500 cu.yd. concrete and 44 tons steel.

★Kan., Oswego—Comrs. Labette Co. let contracts to M. E. Gillioz, Monnett, Mo., building 6 bridges on Sect. E Federal Aid Project No. 2, involving 809 cu.yd. rein.-con., 749 cu.yd. concrete, 63 tons steel and 1526 cu.yd. earth excav., cost $35,000; bridges and culverts, Sects. C and D, Federal Aid Project No. 2, 1511 cu.yd. rein-con., 22¼ tons steel and laying 3836 ft. rein.-con. pipe, $34,103.

★B. C., Squamish—A. F. Proctor, engr., c/o Dept. Rys., Victoria, let contract to Canadian Bridge Co., Walkerville, erecting 1160 ft. steel viaduct over Deep Creek for Pacific Great Eastern Ry., Victoria. About $330,000.

Streets and Roads

PROPOSED WORK

N. J., North Bergen—Town plans to curb, flag and install sanitary sewers in Townsend St. About $10,000.

Pa., Harrisburg—City having plans prepared by M. B. Cowden, city engr., paving Cameron, Herr, 19th and Front Sts., Bellevue Rd. and other short sections. About $50,000.

Md., Baltimore—Bd. Awards soon lets contract paving 290 ft. 39th St. from Canterbury Rd. east and 300 ft. Cloverhill Rd. from point 337 ft. north of 39th St. to Mallory Lane, 40 ft. wide, 6 in. concrete. G. F. Wieghardt, city engr.

Virginia—State Highway Comn., Richmond, plans to build Richmond-Petersburg Rd., cost $330,000; Courtland-Franklin Rd., $90,000; Lebanon Church-Toano Rd., $250,000; Williamsburg-Toano Rd., $70,000; Williamsburg-Jamestown Rd., $10,000, Hampton-New Port News Rd., $6000; Flemings Corner-Virginia Beach Rd., $180,000; Wilroys-Norfolk Rd., $224,700.

W. Va., Beckley—Raleigh Co. voted $147,000 bonds to grade and drain Clear Fork Rd.

W. Va., Charleston—City soon lets contract grading, re-surfacing and re-paving 50,000 sq.yd. roads, asphalt. E. Bruce, city engr.

W. Va., Louisburg—Greenbrier Co. plans election to vote on $43,000 bonds to grade and drain roads in Frankford Dist.

W. Va., Petersburg—Grant Co. soon lets contract building 3 mi. road D. P. Hendrickson, clk.

Ga., Carrollton—Comrs. Carroll Co. having plans prepared and receive bids about Jan. 1, building 115 mi., sand clay road About $500,000. J. L. Zachery, 210 Spring St., Atlanta, engr.

Ga., Madison—City soon lets contract for 29,000 sq.yd. pavement, 6000 sq.yd. excav., 18,000 lin.ft. granite curb, etc. About $100,000. Solomon-Norcross, Candler Bldg., Atlanta, Ga., engrs.

Ala., Selma—City soon lets contract paving Selma Ave. from Lauderdale to King Sts., vitr. brick on concrete base. W. O. Crisman, city engr.

Miss., Vicksburg—Warren Co voted $500,100 bonds to build roads. Noted Aug. 21.

O., Cincinnati—City plans to pave with granite blocks (using old granite blocks as far as possible), reset old and cut new granite curb on 3940 ft. Freeman Ave. from Kenner to Central Sts., 36 ft. wide, cost $105,416; pave with rein.-con. and build concrete combined curb and gutter on 950 ft. Verdin Ave. from Boudinot to Epworth Aves., 24 ft. wide, $12,098. F. Krug, city engr

O., Cleveland—Cleveland Land Sales Co 510 Erie Bldg., receives bids about spring, grading and building sandstone sidewalk on Riverside Drive and Brookpark Rd About $18,000. A. Weston, mgr.

O., Cleveland—Cuyahoga Co. receives bids about Apr. 10, grading and paving Lloyd Rd. from Lake Shore Blvd. to county line, vitr. brick on concrete base. About $90,000. W. A. Stinchcomb, co. engr.

Ill., Mt. Vernon—City plans to pave 40 blocks and build 1 mi. sewers. About $200,000.

Ill., Rockford—City plans to pave with vitr. brick and construct concrete gutters on portions of Market, North 1st, North 2nd, North 3rd and North 4th Sts., 3600 ft. long, 40 ft. wide, cost $65,100; macadamize and gutter with concrete portions Catherine and Magnolia Sts., 1500 ft. long, 35 ft. wide, $14,200; pave and curb with concrete, 10th and Woodruff Aves., 2800 ft. long, 35 ft. wide, $36,800. C. E. Hand, city engr.

Wisconsin—State Highway Comn., Madison, having plans prepared and receives bids about January 1, grading, draining, and surfacing 6 mi. Trunk Highway No. 13, Adams-Kilbourn Rd., clay, cost, $42,000, Trunk Highway No. 13, Kilbourn-Friendship Rd., clay, $45,000, Adams Co.; Trunk Highways Nos. 10 and 13, Sanborn and Ashland Jct. Rds., 18 ft. wide, concrete and sand-clay, $60,000, Ashland Co.; Trunk Highway No. 14, Barron-Poskin Rd., $45,000, Trunk Highway No. 14, Canton-Chetek Rd., $30,000, Barron Co.; new State Trunk Highway No. 10, Ashland-Iron River Rd., $171,000, Bayfield Co.; State Trunk Highway No. 15, Green Bay-Oconto Rd., 18 ft. wide, concrete, $90,000, Brown Co.; Trunk Highway No. 37, Alma-Mondovi Rd., 16 ft. wide, concrete, $66,000, Buffalo Co.; State Trunk Highway No. 35, Sirem-Webster Rd., $60,000, Burnett Co.; Trunk Highway No. 48, Chilton-Hilbert Jct. Rd., 18 ft. wide, concrete, $162,000, Calumet Co.; Trunk Highway No. 64, Cornell-Bloomer Rd., 15 ft. wide, gravel, $30,000, Chippewa Co.; State Trunk Highway No. 18, Neillsville-Humbird Rd., $24,000, Trunk Highway No. 16, Owen-Abbotsford Rd., 15 ft. wide, gravel, $21,000, Trunk Highway No. 13, Abbotsford-Medford Rd., gravel or granite, $30,000, Clark Co.; Trunk Highway No. 29, Portage-Columbus Rd., gravel or top soil, $81,000, State Trunk Highway No. 10, Madison-Portage Rd., $42,000, Columbia Co.; Trunk Highway, Wauzeka-Prairie du Chein Rd., $90,000, Crawford Co.; Trunk Highway No. 19, Watertown Plank Rd., 18 ft. wide, concrete, $54,000, Trunk Highway, Horicon-Beaver Dam Rd., 18 ft. wide, concrete, $234,000, Dodge Co.; Trunk Highway, Green Bay-Sturgeon Bay Rd., stone and gravel, $75,000, Door Co.; Trunk Highway No. 11, Superior-Solon Springs Rd., 18 ft. wide, concrete, $150,000, Douglas Co.; Trunk Highway, Menomonie-Hudson Rd., $48,000, Trunk Highway No. 12, Menomonie-Eau Claire Rd., 18 ft wide, concrete, $90,000, Dunn Co.; Trunk Highway No 11, Birch St., 20 ft. wide, concrete, $18,000, Trunk Highways Nos. 11 and 12, Eau Claire-Osseo Rd., 18 ft. and 24 ft. wide, concrete, $72,000, Eau Claire Co.; Trunk Highway No. 15, Fond du Lac-Milwaukee Rd., 18 ft. wide, concrete, $114,000, Fond du Lac Co.; Trunk Highway No 14, Crandon-Laona Rd., $30,000, Forest Co.; Trunk Highway No 28, Platteville-Dubuque Rd., $36,000, Trunk Highway No. 30, Boscobel-Fennimore Rd., 18 ft. wide, concrete, $60,000, Grant Co.; Trunk Highway No. 42, Monroe-Monticello Rd., $180,000, Trunk Highway No. 42, Monroe-Monticello Rd., $57,000, Green Co.; Trunk Highway No. 49, Berlin-Auroraville Rd., gravel, $9000, Green Lake Co.; Trunk Highway No 19, Madison-Dodgeville Rd., $75,000, Iowa Co.; Trunk Highway No 10, Hurley-Mercer Rd., $30,000, Iron Co.; Trunk Highway No. 19, Watertown Plank Rd., 18 ft. wide, concrete, $57,000, Trunk Highway No. 19, Watertown Plank Rd., 18 ft. wide, concrete, $42,000, Jefferson Co.; Trunk Highway No. 12, Adams and Bridge Sts., 18 ft wide, concrete, $30,000, Trunk Highway No. 21, New Lisbon-Necedah Rd., top soil or clay, $30,000, Trunk Highway No. 71, Mauston-Elroy Rd., $30,000, Juneau Co.; Geneva Rd., 18 ft. wide, concrete, $120,000, Kenosha Co.; Green Bay-Sturgeon Bay Rd., 15 ft wide, gravel, $33,000, Kewaunee Co.; Trunk Highway No. 21, La Crosse-Sparta Rd., 18 ft. wide, concrete, $99,000, Trunk Highway No. 21, La Crosse-Sparta Rd., tarbound macadam, $57,000 La Crosse Co.; State Trunk Highway No. 62, Darlington-Hicks Corner Rd., $78,000, Trunk Highway No. 20, Schullsburg-Benton Rd., $30,000, Lafayette Co.; Antigo-Merrill Rd., $45,000, Langlade Co.; Trunk Highway No. 10, Merrill-Tomahawk Rd., Federal Aid Project No. 23, $48,000, Merrill Medford Rd., $42,000, Lincoln Co.; Trunk Highway No. 17, Manitowoc-Two Rivers Rd., 18 ft. wide, concrete, $54,000, Trunk Highway No. 17, Manitowoc-Sheboygan Rd., 18 ft. wide, concrete, $132,000, Manitowoc Co.; Pembine-Iron Mountain Rd., $48,000, Marinette Co.; Trunk Highway No. 23, Montello-Oxford Rd., $42,000, Marquette Co.; Trunk Highway No. 74, Fox Point-Brown Deer Rd., 18 and 20 ft. wide, concrete, $150,000, Milwaukee Co.; Trunk Highway No. 21, La Crosse-Sparta Rd., 18 ft. wide, concrete, $24,000, Sparta-Black River Falls Rd., $78,000, Monroe Co.; Trunk Highway No. 15, Green Bay-Stiles Jct. Rd., 15 ft. wide, gravel, $51,000, Oconto Co.; Trunk Highway No. 63, Rhinelander Eagle River Rd., gravel, $39,000, Oneida Co.; Lake Shore Rd., $90,000, Ozaukee Co.; Trunk Highway No. 25, Durand-Alma Rd., shale or gravel, $19,200, Trunk Highway No. 34, Mondovi-Durand Rd., shale or gravel, $13,500, Pepin Co.; Trunk Highway No. 45, Ellsworth-River Falls Rd., 15 ft. wide, gravel, $105,000, Pierce Co.; Trunk Highway No 14, St. Croix Falls-Barron Rd., $63,000, Trunk Highway No. 46, Amery-Balsam Lake Rd., $36,000, Polk Co.; Trunk Highway No. 18, Stevens Point-Marshfield Rd., 18 ft. wide, concrete, $60,000, Portage Co.; Fifield-Radisson Rd., $48,000, Price Co.; Trunk Highway No. 58, Cazenovia Bridge, (concrete) and its approaches, $24,000, Trunk Highway No. 11, Richland Center-Boaz Rd., $54,000, Richland Co.; Trunk Highway No. 14, Glen Flora-Tony Rd., $9000, Trunk Highway No. 14, Ladysmith-Bruce Rd., $42,000, Rusk Co.; Trunk Highway No 12, Hudson-Eau Claire Rd., $45,000, Trunk Highway No. 12, Hudson-Menomonie Rd., 18 ft. wide, concrete, $90,000, St. Croix Co.; Trunk Highway No 33, Reedsburg-La Valle Rd., gravel, $33,000, Trunk Highway No. 12, Kilbourn-Mauston Rd., gravel or top soil, $12,000, Trunk Highway No 65, Baraboo Portage Rd., bituminous macadam, $45,000, Sauk Co.; Trunk Highway No. 16, Shawano Wittenberg Rd., $61,500, Trunk Highway No. 47, Shawano-Appleton Rd., 15 ft. wide, gravel, $63,000, Shawano Co.; Trunk Highway No. 17, Lake Shore Rd., 18 ft. wide, concrete, $120,000, Sheboygan Co.; Medford-Cornell Rd., $36,000, Trunk Highway No. 13, Phillips-Medford Rd., 15 ft. wide, gravel, $24,000, Taylor Co.; Trunk Highway No. 11, Whitehall-Ettrick Rd., 16 ft. wide, gravel, $120,000, Trempealeau Co.; Trunk Highways Nos. 11 and 27, Viroqua-Prairie du Chein Rd., 18 ft wide, concrete, $90,000, Vernon Co.; Woodruff-Fifield Rd., $60,000, Trunk Highway No. 32, Eagle River-Woodruff Rd., $60,000, Vilas Co.; Trunk Highway, Minong-Hayward Rd., $78,000, Trunk Highway No. 24, Spooner-Hayward Rd., $37,500, Washburn Co.; Trunk Highway No. 15, West Bend-Milwau-

Streets and Roads (Continued)

kee Rd., 18 ft. wide, concrete, $57,000, Washington Co.; Trunk Highway No. 19, Milwaukee-Madison Rd., 18 ft. wide, concrete, $93,000, Trunk Highway No. 15, Milwaukee-Fond du Lac Rd., 18 ft. wide, concrete, $66,000, Waukesha Co.; Trunk Highway No. 18, Waupaca-Weyauwega Rd., 18 ft. wide, concrete, $151,500, Trunk Highway No. 18, Fremont Bridge, $75,000, Waupaca Co.; Trunk Highway No. 49, Berlin-Auroraville Rd., $45,000, Trunk Highway No. 10, Portage-Stevens Point Rd., $18,000, Waushara Co.; Trunk Highway No. 15, Oshkosh-Appleton Rd., 18 ft. wide, concrete, $207,000, Winnebago Co. Counties and Federal Government will appropriate toward cost.

Wis., Waupun—City receives bids in spring curbing and guttering 9 mi. various streets, concrete. About $30,000. Parsons & Orbert, 627 M. & M. Bank Bldg., Milwaukee, engrs.

Wis., Waupun—City receives bids in spring paving 45,000 sq.yd. various streets, bitulithic. About $100,000 Parsons & Orbert, 627 M. & M. Bank Bldg., Milwaukee, engrs.

Ia., Hartley—City having plans prepared and receives bids in January, improving various streets, involving 20,000 sq.yd. pavement and 10,000 ft. concrete curb and gutter. H. R. Green, Union Blk., Cedar Rapids, engr.

Ia., Strawberry Point—City had plans prepared and receives bids in January improving various streets, involving 38,000 sq. yd. pavement and 17,000 ft. concrete curb and gutter. H. R. Green, Union Blk., Cedar Rapids, engr. Noted July 10.

Ia., Winfield—City retained H. R. Green, engr., Union Blk., Cedar Rapids, to prepare plans for paving 2 mi. various streets.

Minn., Duluth—W. H. Borgen, aud. St. Louis Co., soon lets contract for subgrade construction on State Rd. No. 1 as follows: 10 mi. State Job No. 1903, Div. No. 1, involving 55.6 acres clearing, 54.3 acres grubbing, 85,269 cu.yd. excav., 290,733 cu.yd. overhaul, 30,316 cu.yd. ditching, Bridge No. F-7-3-1, 100 ft. steel span, Bridge F-7-3-2, 16 ft. concrete slab and Bridge No. G-7-34-1, 40 ft. steel span, cost $80,000; 15 mi. State Job No. 1903, Div. No. 2, 77.8 acres clearing, 73.5 acres grubbing, 170,588 cu.yd. excav., 308,774 cu.yd. overhaul, 23,423 cu.yd. ditching, Bridge No. H-7-4-1, 150 ft. steel span, $150,000; 9.3 mi. State Job No. 1904, 56.87 acres clearing, 48.69 acres grubbing, 127,216 cu.yd. excav., 344,888 cu.yd. overhaul, 13,587 cu.yd. ditching, Bridge No. D-7-26-1, 250 ft. steel deck bridge consisting of 2 main 95 ft. spans and two 30 ft. I-beam approach span, Bridge No. D-7-23-1, 40 ft. concrete girder, Bridge No. D-7-14-1, 35 ft. concrete girder, Bridge D-7-14-2, 30 ft. concrete girder, Bridge E-7-35-1, 30 ft. concrete girder, Bridge E-7-26-1, 12 ft. concrete slab, cost $105,000; all 24 ft. wide. R. W. Acton, co. engr.

Minn., Ellsworth—City preparing plans paving various streets, 18 ft. wide. About $70,000. Druar & Smith, Globe Bldg., St. Paul, engrs.

Minn., Fairmont—H. C. Nolte, aud. Martin Co., rejected bids received Oct. 15, grading and graveling 5.5 mi. Federal Aid Project No. 71, 24 ft. wide, involving 44,303 cu.yd. excav., 3080 lin.ft. guard rail, culverts, 40 ft. rein.-con. bridge, etc., cost, $25,000; 4.6 mi. Federal Aid Project No. 72, 24 ft. wide, 46,720 cu.yd. excav., culverts, etc., $24,000. Work will be readvertised.

Minn., Minneapolis—Bd. Park Comrs. having plans prepared building cement sidewalks between Shingle Creek and Lyndale Ave., also concrete foot bridge over Shingle Creek and suspended walk under Lyndale Bridge. About $128,000.

Minn., Minneapolis—Dakota Co. (South St. Paul) and Hennepin Co. (Minneapolis) having surveys made for grading and graveling 3.8 mi. Lyndale Ave., 24 ft. wide, involving 282,338 cu.yd. excav., 91,800 cu. yd. side excav., etc. About $200,000. E. E. Terrell, Minneapolis, co. surv.

Minn., Minneapolis—Hennepin Co. having surveys made for paving 5 mi. Excelsior Ave., 24 ft. wide, concrete or vitr. brick. About $125,000. E. E. Terrell, co. surv.

Kan., Ft. Scott—Bourbon Co. having plans prepared paving, grading and building bridges on 9.18 mi. Kansas City Rock Rd., Federal Aid Project No. 5, 16 ft. wide, bituminous macadam. About $250,000. B. Boyle, Ft. Scott, engr.

Kan., Independence—Comrs. Montgomery Co. soon let contract gravel surfacing, grading and building bridges and culverts on 9½ mi. Ozark Trail, Federal Aid Project No. 23, Sect. A, 16 ft. wide. About $190,000. H. K. Hibbard, Independence, engr.

Kan., Winfield—Cowley Co. having plans prepared building .9 mi. Alfalfa Rd., 16 ft. wide, gravel, also for necessary bridges and culverts on same. About $20,000. Rexroad Eng. Co., Hutchinson, engrs.

Missouri—State Highway Dept., Jefferson City, plans to build 11.1 mi. Tipton-Versailles Rd., 24 ft. wide, Morgan Co., involving 20,000 cu.yd. earth excav., 63,450 sq.yd. 10 in. gravel surfacing, 16 ft. wide, one 80 ft. rein.-con. bridge and 26 culverts, cost $46,123; 3.53 mi. DeSota-Potosi-Caledonia Rd., 24 ft. wide, Washington Co., 9257 cu.yd. earth and 692 cu.yd. rock excav., 33,497 sq.yd. gravel surfacing, 16 ft. wide, 18,646 lin. ft. grading and 12 culverts, $12,053.

Texas—State Highway Comn., Austin, soon lets contract paving 26.5 mi. Highway No. 4, Federal Aid Project No. 116, 20 ft. wide, bituminous macadam. Cost to exceed $50,000. R. J. Windrow, state highway engr.

Texas—State Highway Comn., Austin, soon receives bids surfacing 5.9 mi. Highway No. 3, Federal Aid Project No. 15, 20 ft. wide, gravel and bituminous macadam, Wharton Co. About $25,000. R. J. Windrow, state highway engr.

Texas—State Highway Comn., Austin, plans to surface 5.3 mi. Highway No. 32, Federal Aid Project No. 54, 20 ft. wide, gravel, Walker Co. About $20,000. R. J. Windrow, state highway engr.

Okla., Marlow—City having plans prepared paving principal streets, concrete, asphaltic concrete, rock asphalt, brick or sheet asphalt. About $30,000. G. L. Orr, clk. V. V. Long & Co., 1301 Colcord Bldg., Oklahoma, engrs.

Okla., Muskogee—Comrs. Muskogee Co. receive bids about Dec. 10, gravel surfacing 37 mi. Jefferson Highway, 18 ft wide. About $400,000. T. P. Clonts, Muskogee, engr.

Colorado—State Highway Comn., Denver, soon lets contract grading and draining 18 mi. road between Burlington and Idalia, Federal Aid Project No. 43, 24 ft. wide, Kit Carson Co., involving 44,500 cu.yd. common earth excav., 24,400 cu.yd. borrow fill, 11,800 cu.yd. overhaul, 682 lin.ft. 15 and 24 in. corrugated metal culverts, 102 cu.yd. concrete and two 30 ft. I-beam and one 40 ft. girder bridges, concrete abutments and floors, cost, $43,000; 7¾ mi. between Wray and Idalia, Federal Aid Project No. 11, 24 ft. wide, Yuma Co., 41,000 cu. yd. common earth and 200 cu.yd. solid rock excav., 1850 cu.yd. borrow fill, 15,000 cu.yd. overhaul, 520 lin. ft. 15 and 18 in. corrugated metal culverts, 100 cu.yd. dry rubber retaining wall, $24,000. J. E. Maloney, state highway engr.

Colo., Denver—City receives bids in Februrary paving 12 blocks Alley Paving Dist. No. 52, involving 10,445 sq.yd. 2 course concrete and 1100 cu.yd. common earth excav., cost, $24,164; 12 blocks Alley Paving Dist. No. 53, 9980 sq.yd. 2 course concrete and 1500 cu.yd. common earth excav., $23,753; 12 blocks Alley Paving Dist. No. 54, 9035 sq.yd. 2 course concrete and 900 cu.yd. common earth excav., $20,761; 12 blocks Alley Paving Dist. No. 55, 13,219 sq.yd. 2 course concrete and 1700 cu.yd. common earth excav., $31,750; 12 blocks Alley Paving Dist. No. 56. 12,982 sq.yd. 2 course concrete and 1500 cu.yd. common earth excav. $31,301. All 16 ft. wide. J. B. Hunter, city engr.

Utah, Provo—City Council passed ordinance to pave, curb and gutter 3rd South St. About $96,000. C. A. Swan, city engr.

Oregon—State Highway Comn., Portland, received no bids graveling 2.5 mi. Canyon Sect. Baker-Cornucopia Highway, Baker Co., involving 5200 cu.yd. gravel. About $10,000. H. Nunn, Salem, state highway engr.

Ore., Astoria—Clatsop Co. having preliminary plans prepared for road from McEachern shipyard to Olney Rd. at Williamsport, cost $50,000; 3.25 mi. Upper Lewis-Clark River Rd., $50,000. J. C. Clinton, clk.

Ore., North Bend—Coos Co. Good Rds. Advisory Com. plans election to vote on $1,250,000 bonds to build, grade and hard surface roads. L. J. Simpson, Astoria, member of com.

Ore., Portland—City plans to pave and build concrete curbs on East 11th St. from East Davis to East Flanders Sts., cost, $2903; curbing, paving and building sidewalks on Jessup St., $6135; improve East Sherman St. from East 34th St. to east line of Stratford-Sydney Addition, $1998; also lay sewers in Bybee Ave. from point 40 ft. west of 41st St. S. E. to east line of Eastmoreland St., $2499; Grand Ave. from point 30 ft south of Alberta St. to Wygand St., $1137 and in East 29th St. from point 50 ft. south of Stanton St. to Knott St., $950. O. Laurgaard, city engr.

Ore., Princeville—Crook Co. voted $220,000 bonds to build, hardsurface and improve roads.

Ore., The Dalles—City Council plans to pave with bitulithic on macadam or concrete base, Elm St. from east line of Kelly Ave. to west line of I St. and Kelly Ave. from east end of pavement on Clay St. to south line of Elm St. P. W. Marx, city engr.

California—State Highway Dept. plans to build Sky Line Blvd. between San Francisco and Glenwood, 60 mi. long. About $1,650,000.

Cal., Oakland—City plans to improve 1688 ft. Fruitvale Ave. between East 14th St. and Foothill Blvd., involving 88,962 sq.ft. grading, 3377 lin.ft. concrete curbing, 5312 sq.ft. brick guttering, 9294 sq.yd. asphalt, 940 lin.ft. 10-12 in. pipe condult. About $36,000. M. Campbell, city engr.

Cal., San Luis Obispo—Bd. Supervs. San Luis Obispo Co. having preliminary plans made for grading and hard surfacing 20 mi. Santa Margarita-Pozo Rd., 20 ft. wide, Santa Margarita Co. About $100,000. W. Burch, co. engr.

N. B., Woodstock—Town plans to improve various streets. About $50,000.

Ont., Preston—City plans to pave 2 mi. automobile drive and bridle path in Speed Park, asphalt on concrete base. Plans include soldiers' memorial gate. About $25,000. Address Park Comn.

BIDS DESIRED

Massachusetts—Until Dec. 9, by state Highway Comn., Boston, building 34,000 ft. bituminous macadam road, 18-24 ft. wide, Groton Twp. A. W. Dean, state highway engr.

New York—Until Dec. 9, by State Highway Comm., 53 Lancaster St., Albany, improving roads in following counties:

Saratoga Co., 6.1 mi. Rexford Flats-Wait Corners-Groom Corners, Rd. No. 1117, bituminous macadam, penetration method, involving 13,000 cu.yd. earth and 1600 cu.yd. rock excav., 6526 cu.yd. field or quarry stone, etc., cost $99,107;

Yates Co., 9.63 mi. Rushville-Potter-Middlesex-Overacker Corners, Rd. No. 1352, waterbound macadam surface treatment, 20,000 cu.yd. excav., 35 cu.yd. concrete, 5280 sq.yd. cobble gutters, 5880 cu. yd. top course waterbound macadam, $140,292;

Ulster Co., Rosendale Village, Rd. No. 1419, 2.35 mi cement concrete and .82 mi. waterbound macadam, cold tar, 6180 cu.yd. earth excav., 286 cu.yd. concrete, 1600 sq. yd. cobble gutter, 3270 cu.yd. cement concrete pavement, $84,356;

Oswego Co., 6.36 mi. Rd. No. 1428, bituminonus macadam, penetration method, 20,662 cu.yd. earth and 593 cu.yd. rock excav., 40 cu.yd. concrete, 2190 sq.yd. cobble gutters, 4317 cu.yd. broken stone, 2641 cu.yd. bituminous macadam, 87,728 gal. bituminous material, $99,070;

Broome Co., 5.35 mi. Maine-Glen Aubrey, Rd. No. 1449-A, cement concrete, 29,000 cu.yd. excav., 365 cu.yd. concrete, 14,950 bbl. Portland cement for pavement, 9340 cu.yd. concrete pavement, $225,983; 6.93 mi. Castle Creek-Whitney Point, Rd. No. 1450-A, 53,500 cu.yd. earth and 1200 cu.yd. rock excav., 470 cu.yd. concrete, 19,380 bbl. Portland cement, 12,100 cu.yd. concrete pavement, $305,473;

Rensselaer Co., 1.44 mi. Riders Mills-Brainerd, Rd. No. 1521, bituminous macadam, penetration method, 8000 cu.yd. earth and 1150 cu.yd. rock excav., 2550 cu.yd. field or quarry stone, 1100 cu.yd. bituminous macadam, 26,500 gal. bituminous material, $43,795, 1.27 mi. Oakwood Ave., Rd. No. 1527, 5000 cu.yd. earth excav., 155 cu.yd. concrete, 2110 cu.yd. cement concrete pavement, $42,056;

Saratoga Co., 4.17 mi. Malta-Bemis Heights, Rd. No. 1528, 38,000 cu.yd. excav., 640 cu.yd. concrete, 7460 cu.yd. cement concrete pavement, 1070 cwt. metal reinforcement, $176,694;

St. Lawrence Co., 3.64 mi. Massena-Winthrop Rd. No. 5641, 16,700 cu.yd. excav., 250 cu.yd. concrete, 9640 bbl. Portland cement, 6025 cu.yd. cement concrete pavement, $117,556;

Steuben Co., 2 mi. Canisteo-Whitesville, Rd. No. 5650, 13,000 cu.yd. earth excav., 55 cu.yd. concrete, 4800 cu.yd. field or quarry stone, 1565 cu.yd. bituminous macadam, 42,300 gal. bituminous material, $64,091;

Jefferson Co., 4.78 mi. Watertown-Phila., Rd. No. 5651, 19,800 cu.yd. earth and 500 cu.yd. rock excav., 835 cu.yd.

Streets and Roads (Continued)

concrete, 11,720 bbl. Portland cement, 7325 cu.yd. cement concrete pavement, $155,963;
Wyoming Co., 6.99 mi. Bennington-Attica-Attica Center, Rd. No. 1267, waterbound macadam. F. S. Greene, comr.

N. Y., Rochester—Until Dec. 16, by E. S. Walsh, supt. pub. wks., Capitol, Albany, placing and compacting gravel surfacing and building frame freighthouse on terminal site here, Contr. 228. Work involves 150 cu.yd. excav., 45 cu.yd. 2nd class concrete, 4400 lb. iron castings, etc. About $14,444; advertised in this issue.

Pennsylvania—Until Dec. 16 by State Highway Dept., Harrisburg, for reconstruction of roads in following counties:
Allegheny Co., 10,452 ft. 1 course rein.-con., Route A-495, Forward Twp.
Armstrong Co., 10,610 ft. 1 course rein.-con., Route R-188, Kiskiminetas Twp
Beaver Co., 5443 ft. 1 course rein.-con., Route A-340, North Sewickley Twp.; 13,592 ft. 1 course rein.-con and Hillside vitr. brick, Routes A-455 and A-431, Daugherty and New Sewickley Twps.; 12,062 ft. 1 course rein.-con and Hillside vitr. brick, Route R-78, Rochester and Daugherty Twps.; 5200 ft. 1 course rein.-con., Route R-76, Center Twp.
Berks Co., 29,100 ft. 1 course rein.-con., Routes R-284 and A-1031, Earl, Amity, Colebrookdale and Olev Twps.; 14,850 ft. 1 course rein.-con., Route R-141, Tilden and Upper Bern Twps.
Butler Co., 28,188 ft. 1 course rein.-con., Route R-309, Adams and Forward Twps.; 16,133 ft. 1 course rein.-con., Route R-251, Fairview Twp.; 31,663 ft. 1 course rein.-con., Route R-78, Conoquessing and Butler Twps.
Carbon Co., 23,420 ft. 1 course rein.-con., Route A-1012, Lehigh Twp.
Center Co., 1720 ft. 1 course rein.-con., Route R-27, Bellefonte Boro.; 5326 ft. vitr. brick, Route R-56. State College Boro.
Chester Co., 11,523 ft. 1 course rein.-con., Route A-650, London Britain Twp.
Clearfield Co., 39,911 ft. 1 course rein.-con., Route R-57, Wallaceton Boro., Boggs and Bradford Twps.
Crawford Co., 18,514 ft. 1 course rein.-con. and Hillside vitr. brick, Route R-89, East Mead Twp.
Delaware Co., 10,700 ft. 1 course rein.-con., Route A-717, Thornbury Twp.
Elk Co., 7543 ft. 1 course rein.-con., Route R-97, Ridgway Boro.; 3169 ft., 1 course rein.-con., Route R-99, St. Mary's Boro.; 25,563 ft. 1 course rein.-con., Route R-59, Horton and Ridgway Twps.
Erie Co., 10,600 ft. 1 course rein.-con., Route Auth-398, Mill Creek Twp.; 21,268 ft., 1 course rein.-con., Route R-295, Girard Twp. and Platea Boro.; 21,109 ft. 1 course rein.-con., Route R-88, Greene Twp.
Fayette Co., 960 ft. 1 course rein.-con., Route A-874, Fayette Boro.; 9424 ft. 1 course rein.-con., Route R-117, Bullskin and Upper Tyrone Twps.; 5475 ft. 1 course rein.-con., Route R-363, Henry Clay Twp.; 20,995 ft. 1 course rein.-con. and Hillside vitr. brick, Route R-117, Dunbar Twp.; 4889 ft. 1 course rein.-con. and Hillside vitr. brick Route A-1022, German Twp.; 15,323 ft. 1 course rein.-con. and Hillside vitr. brick, Route R-288, Perry Twp
Greene Co., 10,620 ft. 1 course rein.-con., Route R-111, 12,581 ft. 1 course rein.-con., Route R-256. Center Twp.
Lawrence Co., 14,611 ft. 1 course rein.-con., Route R-233, Scott Twp.; 11,625 ft. 1 course rein.-con., Route R-265, North Beaver Twp.
Luzerne Co., 4231 ft. 1 course rein.-con., Route R-11, Dorranceton Boro.
Montgomery Co., 8596 ft., either bituminous surface course on concrete foundation, or 1 course rein.-con., Routes R-198 and A-943, Hatfield and Towamencin Twps.
McKean Co., 14,750 ft. 1 course rein.-con., Route R-210, Eldred Twp.
Northampton Co., 15,000 ft. 1 course rein.-con., Route A-1075, Palmer Twp.; 31,200 ft. 1 course rein.-con., Routes A-1082 and R-175, Allen and East Allen Twps.
Northumberland Co., 18,140 ft. 1 course rein.-con., Routes A-902 and R 182, Ralpho Twp.
Potter Co., 8358 ft., either bituminous surface course on concrete foundation or 1 course rein.-con., Route R-236, Shinglehouse Boro.
Somerset Co., 5900 ft. 1 course rein.-con., Routes R-52 and A-282, Jenner Twp.
Susquehanna Co., 3844 ft. 1 course rein.-con. and Hillside vitr. brick, Route R-10 and A-976, Oakland Boro.
Tioga Co., 6280 ft. 1 course rein.-con., Routes R-103 and A-500, Westfield Boro.
Warren Co., 2080 ft. 1 course rein.-con., Route R-88, Warren Boro.; 12,142 ft. 1 course rein.-con., Route A-973-974, Tidioute Boro.; 41,349 ft. 1 course rein.-con., Route R-279, Farmington and Sugar Grove Twps.; 22,383 ft. 1 course rein.-con. and Hillside vitr. brick, Route A-154, Farmington and Pine Grove Twps.
Westmoreland Co., 9184 ft. 1 course rein.-con. and Hillside vitr. brick. Route R-68, Salem and Unity Twps.; 32,047 ft. 1 course rein.-con. and Hillside vitr brick, Route R-68, Derry Twp.; 57,688 ft. 1 course rein.-con. and Hillside vitr. brick, Route R-69. Delmont Boro., Hempfield, Salem and Washington Twps.

W. Va., Wayne—Until Dec. 15, by Wayne Co. grading and draining 8 mi. Wayne-Ft. Gay Rd., involving 83,000 cu.yd. excav. About $110,000.

N. C., Greenville—Until Dec. 19, by Pitt Co. Highway Comn., building 13.94 mi. highways. J. B. Harding, c/o State Highway Dept., Raleigh, engr.; advertised in this issue.

South Carolina—State Highway Comn., Columbia receiving bids improving 16 mi. road from Union to Santuc, 18 ft. wide, Union Co. About $114,000.

South Carolina—Until Dec. 16, by State Highway Dept., Columbia, improving 6½ mi. Effingham Rd., Florence Co. About $216,000.

South Carolina—Until Dec. 11, by State Highway Dept., Columbia, improving 4½ mi. road, 18 ft. wide, Saluda Co. About $64,000.

Ga., Quitman—Until Dec. 9, by Comrs. Brocks Co., paving and draining 39,036 yd. Quitman-Morven Rd. About $150,000. Garrett & Slack, Bell Bldg., Montgomery, Ala., engrs.

Ga., Sylvester—Until Dec. 19, by Comrs. Worth Co., building 3.95 mi. Federal Aid Project No. 107. Work involves 37,333 sq.yd. paving. About $120,000. O. H. Lang, Moultrie, engr. Noted July 10.

Ga., Washington—Until Dec. 16, by Comrs. Wilkes Co., paving and draining 5.236 mi. Federal Aid Project No. 92, involving 49,652 sq.yd. pavement. Jandon Eng. Co., Elberton, engrs.

O., Cleveland—Until Dec. 19, by Comrs. Cuyahoga Co., building Pleasant Valley Rd., involving 24,000 cu.yd. grading. About $19,872. W A. Stinchcomb, co. engr

Michigan—Until Dec. 10 by F. F. Rogers, state highway engr., Lansing, grading, draining and surfacing with gravel, 7.411 mi. Assessment Dist. Rd. No. 265, 16 ft. wide, Bath, DeWitt and Lansing Twps., involving 69,000 sq.yd. class "B" gravel. About $80,000.

Ia., Odebolt—Until Dec. 9, by city, improving various streets, involving 130,000 sq.yd. concrete pavement and 70,000 lin. ft. concrete curb and gutter. About $170,000. W. E. Standevan, 423 Bee Bldg., Omaha, Neb., engr.

Minn., Henderson—Until Dec. 23, by Comrs Sibley Co., gravel surfacing 1 mi. Federal Aid Project No. 116, State Rds. Nos. 6 and 8, 24 ft. wide, involving 68,000 cu.yd. excav., 2000 cu.yd. riprap, 1755 cu. yd. loading and hauling, and 105 ft. portable culvrt pipe. About $20,000. S. F. Mullen, Gaylord, engr.

Kan., Independence—Until Dec. 9, by Comrs. Montgomery Co., grading, surfacing and building bridges and culverts on 2.246 mi. Cherryvale-Coffeeville Rd., Sect. B, Federal Aid Project No. 37, 18 ft. wide, gravel or macadam. About $50,000. H. K. Hibbard, Independence, engr.

Kan., Oswego—Until Dec. 12, by Comrs. Labette Co., building 23.42 mi. Sects. "C" and "D," Ozark Trail, Federal Aid Project No 2, 16 ft. wide, gravel. About $350,000. W. J. King, Oswego, engr. Noted Oct. 16

Ark., Osceola—Until Dec. 16, by Dir. of Rd. Impvt Dist No 1, Mississippi Co., at office of Pride & Fairley, engrs., Osceola, building roads and bridges within said district; advertised in this issue

Tex., Cameron—Until Dec. 11, by Comrs. Milam Co., grading, gravel surfacing and draining 9.07 mi. Branchville-Port Sullivan Rd., 14 ft. wide, involving 7 acres clearing and grubbing, 18,491 cu.yd. earth excav., 43,198 lb. reinforcing steel, and 700 cu.yd. concrete. About $40,002. A. F. Mitchell, Cameron, engr.

Tex., Fredericksburg—Until Dec. 9, by A. H. Kneese, judge Gillespie Co., surfacing with crushed rock and gravel and building rein.-con. drainage structures on 17.617 mi. Highway No 9 from here to Mason Co., 16 and 24 ft. wide. Work involves 64.2 acres clearing and grubbing, 66,575 cu.yd. earth excav., 681 cu.yd. rubble masonry or concrete, 21,805 lb. reinforcing steel, 172 cu.yd. class A, 209 cu.yd. class B and 40 cu.yd. class C concrete. About $137,896. A. F. Mounsand, Fredericksburg, engr. Noted July 24.

Cal., Riverside—Until Dec. 17 by Bd Supervs. Riverside Co., grading and surfacing with gravel, Fertilla, Rocky, Comfort, Arrowhead, Comer, West Blythe and Anelo Valley Rd. Dists. About $70,000. D. B. Clayton, co. clk. A. C. Fulmot, co. engr.

Ont., Finch—Until Jan. 19, by J. G. Cameron, Co. Rd. Supt., building 40.5 mi. road, 12 to 16 ft. wide, in United Counties of Stormont, Dundas and Glengarry, advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Maine—State Highway Comn., Augusta, received bids Nov. 19, grading, draining and gravel surfacing 7.05 mi. river road, 16 ft. wide, with 2½ ft. shouders, Enfield Twp., involving (a) 13,300 cu.yd. excav., (b) 50 cu.yd. rock excav., (c) 2450 cu.yd. borrow, (d) 260 cu.yd. gravel V drain. (e) 7500 cu. yd. gravel sub-base, (f) 52 cu.yd. Class "A" concrete, (g) 156.4 cu.yd. class "B" concrete, from M. Seretto, 3 Tremont Row, Boston, Mass., (a) $1.55, (b) $7., (c) $1.55, (d) $3.25, (e) $3.25, (f) $27.50, (g) $25, total $99,349; M. Hughes, Bangor, (a) $1.50 (b) $8., (c) $1.60, (d) $4, (e) $4, (f) $25., (g) $25, total cost, $124,088; E. E. Greenwood, Skowhegan, (a) $1.60, (b) $7., (c) $1.60, (d) $3.50, (e) $4, (f) $30, (g) $26, total, $128,796.

★**Massachusetts**—State Highway Comn., Boston, let contracts building 14,900 ft. road, Lunenburg Twp., involving 6260 cu. yd. waterbound macadam, 8800 cu.yd. earth and 30 cu.yd. rock excav., 1500 cu.yd. earth borrow and 6500 cu.yd. stone fill, to Rowe Constr. Co., 45 Milk St., Boston, $113,375; 34,000 ft., 18 ft. wide, Greenfield and Bernardson Twps., 43,600 sq.yd. bituminous concrete, 150 cu.yd. concrete masonry, 13,900 cu.yd. earth and 400 cu.yd. rock excav., 13,900 cu.yd. borrow, to West Roxbury Trap Rock Co., West Roxbury, $117,010

★**Rhode Island**—Bd. Pub. Rds., Providence, let contract improving 5080 ft New London Turnpike, West Warwick and Cranston Twps., involving 3200 cu.yd earth excav., 800 cu.yd. gravel foundations, 4700 tons crushed stone, hauling, heating and applying 28,000 gal. asphalt, penetration method, to Lane Constr. Co., 52 Colony St., Meriden, Conn. About $26,370.

★**Connecticut**—State Highway Comn., Capitol, Hartford, let contracts paving 16,050 ft. Watertown Rd., Watertown Twp. and 4750 ft. Thomaston Rd., Thomaston Twp., to J. H. Grozier Co., 721 Main St., Hartford, $120,000 and $32,000 respectively; 5550 ft. Millerton Rd., Salisbury Twp., to F. B. Hastings, 2450 North Ave., Bridgeport, $17,000; 5550 ft. Falls Village-Point of Rocks Rd., Canaan Twp., to Arborio Co., 30 Park St., New Haven, $18,860. Noted Nov. 6.

★**N. Y., Long Island City**—M. E. Connolly, pres., Queens Boro., let contracts to T. Welsch, 460 Lockwood St., laying sidewalks on Cherry Ave., $1029; to R. A. Hess, Corona, Jamaica Ave., $238, 98th Ave., $1112; to Sicilian Asphalt Paving Co., 41 Park Row, New York City, paving Jackson Ave., $44,970; to Uvale Asphalt Paving Co., 1 Bway., New York City, Vandervere Ave., $51,045; to J. L. Brusstar, Harlem River and 150th St., New York City, 80th to 98th Sts., $115,825; to Asphalt Constr. Co., 2197 Madison Ave., New York City, 98th to 110th Sts., $115,650; to Cleveland Trinidad Paving Co., Flushing Ave., Brooklyn, Centre St., $7700, Decatur St., $15,210, Olmstead Pl., $23,023, also regulating and repaving, Marble Arch to 80th St., $112,700.

★**N. Y., New York**—Acting President, Manhattan Boro., let contracts paving Riverside Drive from 135th to 147th Sts., to Uvalde Asphalt Paving Co., 1 Bway., $108,876, and from 147th to 158th Sts., to Davney Asphalt Co., Inc., 438 East 91st St., $118,670.

★**N. Y., New York**—H. Bruckner, pres Bronx Boro., let contracts repaving with sheet asphalt East 187th St., to Uvalde Asphalt Paving Co., 1 Bway., $15,223, Hoe Ave., to Union Paving Co., Bway. and 112th St., $13,995.

N. Y., New York—Dept. of Parks received lowest 3 bids Nov. 26, improving carriage drive at Central Park, asphaltic concrete, from Sicilian Asphalt Paving Co., 41 Park Row, $106,000; J. L. Brusstar, Harlem River and 150th St., $112,450; Uvalde Asphalt Paving Co., 1 Bway., $113,700

★**Pennsylvania**—State Highway Dept., Harrisburg, let contract building 26, 215 ft. State Highway Rd. in Wilmot and Terry Twps., Bradford Co., to B. G. Coon Constr. Co., Luzerne, $236,335; 20,109 ft. grading and draining between Meyersdale and Garrett Twps., Somerset Co., to the Cumberland Contg. Co., Cumberland, Md., $129,524

Streets and Roads (Continued)

★**Pennsylvania**—State Highway Dept., Harrisburg, let contract building road between Beaver and Washington Twps., Route No. 278, Beaver Co., involving 5195 ft. rein.-con. extending out from Georgetown, to Chester Genl. Contg. Co., East Liverpool, O., $66,490; road between Clearfield and Hollidaysburg, Route No. 234, Clearfield Co., involving 11,222 ft. rein.-con. at Osceola, and 5400 ft. rein.-con. near Madera, to Gifford & Pritchard, Philipsburg, $97,225 and $56,569, respectively.

Pennsylvania—State Highway Dept., Harrisburg, received bids improving 4 mi. highway between Tullytown and Morrisville, Bucks Co., rein.-con., from B. Foster Co., 20th and Vernango Sts., Phila., $144,085, Union Paving Co., 30th and Locust Sts., Phila., $153,717, Standard Bithulithic Co., 50 Church St., New York City, $154,018.

★**Pennsylvania**—State Highway Comn., Harrisburg, let contract building 8 mi. Somerset Pike from Somerset line to Loncoln Highway, Route No. 317, 20 ft. wide, involving 42,232 ft. concrete, to MacArthur Bros. Co., 120 Bway., New York City, $470,098.

★**Maryland**—State Rds. Comn., 601 Garrett Bldg., Baltimore, let contract building .83 mi. Central Ave. from Western Branch toward Hall Station, Federal Aid Project No. 13, Contr. P-17-A, Prince George's Co., to J. Daiuto, Martinsburg, W. Va., cost, $34,606; 6 mi. Kensington Rd., Contr. No. 527, Montgomery Co., to H. F. Voigt & Co., 816 14th St., N. W., Washington, D. C., $17,000; both 15 ft. wide, concrete 8 in. thick in center and 6 in. at sides.

★**W. Va., Wayne**—Comrs. Wayne Co let contract grading and draining 7 mi. Wayne-Ft. Gay Rd., to Stringer, Lockwood & Stringer, Hamlin, $111,342. Work involves 69,000 cu.yd. excav., $1.17 per cu yd., 43,800 lb. steel, $.12. 470 cu.yd. class A concrete, $24. and 270 cu yd. class B concrete $20. Noted Oct. 30.

★**Ohio**—State Highway Comn., Columbus, let contracts building roads in following counties:

Auglaize Co., Sect. "B" Bellefontaine-Wapakoneta Rd., 3.68 mi., grading, constructing bridges and culverts and paving with plain concrete, Radebaugh & Graham, Columbus, $125,078.

Sect. "C" Bellefontaine-Wapakoneta Rd., 4.1? mi., grading, constructing bridges and culverts aand paving with plain concrete, Radebaugh & Graham, $138,635.

Fayette Co., Sect. "P" Hillsboro-Washington C. H. Rd., 4.04 mi., grading, constructing culverts and paving with waterbound macadam, Fayette Sand & Gravel Co., Washington, C H. $44,233.

Jefferson Co., Sect. "F" Ohio River Rd., 2.327 mi., grading, constructing bridges and culverts and paving with brick, Floto Bros. Constr. Co, Steubenville, $111,459.

Lucas Co., Sect. "A-1" Perrysburg-Holland Rd., 1.457 mi. grading, draining and paving with concrete, M. P. Hannin, Toledo, $38,834.

Sect. "A' Waterville-Swanton Rd., 2.385 mi., grading, building drainage structures and paving with concrete, M. P. Hannin, $57,381.

Sect. "Village of Waterville" Waterville-Swanson Rd., 1.129 mi., grading, building drainage structures and paving with concrete, M. P. Hannin, $32,345.

Marion Co., Sect., "I-1" Marion-Marysville Rd., 1.49 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Foster, Reigert Constr. Co., Dayton, $34,252.

Mercer Co., Sect. "A" Van Wert-Rockford Rd., 2.44 mi, grading, constructing bridges and culverts and paving with plain concrete, Studebaker & Sons, Greenville, $65,303.

Morgan Co., Sect., 'H-1" McConnelsville-New Lexington Rd., 3.26 mi. grading constructing drainage structures and paving with waterbound macadam on rolled base, H. D. Curtis, Greenville, $87,941.

Morrow Co., Sect. "I" Mt. Gilead-Tiffin Rd., 2.555 mi. grading, constructing bridges and culverts and paving with bituminous macadam, J. S. Edwards, Sunbury, $83,617.

Pickaway Co., Sect. "F-1" Columbus-Washington, C. H. Rd. 4.055 mi. grading, constructing bridges and culverts and paving with bituminous macadam, E W. Botkin, Ada, $90,735.

Tuscarawas Co., Sect. "D" Canton-Canal Dover Rd., 2.69 mi., grading, constructing bridges and culverts and paving with bituminous macadam, Seiple & Wolf Constr. Co., Youngstown, $60,047.

O., Cleveland—Comrs. Cuyahoga Co. received only bid building Stumph Rd. from Huffman to Brookpark Rds., involving 8000 cu.yd. grading, 16,000 sq.yd macadam, 1500 lin.ft. 4 in. vitr. tile sewer pipe and 400 lin. ft. 10 in. corrugated iron pipe, from Cleveland Macadam Co., Leader-News Bldg., $41,557. Noted Nov. 27.

★**O., Cleveland**—Comrs. Cuyahoga Co. let contract grading and draining Cedar Rd., involving 6860 cu.yd. concrete, 4710 lin.ft. corrugated iron pipe and 53,000 cu.yd. earth excav., to T. B. Husband, Rexwood Ave. $68,051. Noted Nov. 20.

O., Cleveland Heights (Warrensville P. O.)—Village received only bid improving East Monmouth Rd. from Taylor Rd. to Van Deboe Hager Allotment, and Crest Rd. from Wayfield to Wood Rds., involving 9565 sq.yd. asphalt on 4 in. concrete, 4630 lin.ft. sandstone curbing and 6440 lin.ft. 5 x 20 in. sandstone sidewalk, from Cleveland Trinidad Paving Co., Superior Arcade, Cleveland, $11,129 and $40,552 respectively.

★**Illinois**—State Highway Comn., Springfield, let contracts improving roads in following counties; (a) Madison Co., 19,762 ft. Sect 33, Natl. Highway, 16 and 18 ft. wide. (b1) Bond Co., 19,307 ft. Sect. 34 Natl. Highway, 16 ft. wide, (2) 23,864 ft. Sect. 35, 16 ft. wide, (3) 20,223 ft. Sect. 36, 16 and 18 ft. wide, (c) Will Co., 41,475 ft. Sect. E. Joliet-Morris Highway, 18 ft. wide, (d) Will Grundy Co., 29,676 ft. Sect. F, Joliet-Morris Highway, 18 ft. wide, (e) Grundy Co., 40,109 ft. Sect. G, Joliet-Morris Highway, 18 ft. wide, (f1) La Salle Co., 13,460 ft. Sect. I, Morris Henry Highway, 19 and 30 ft. wide, (2) 8369 ft. Sect. U, 30 ft. wide, (g) Boone Co., 2500 ft. Sect. I, Route 1, 10 ft. wide, (h) McDonough Co., building 2 concrete bridges, Sect. R, Route 4-A and 5-A, to Hug Lumber & Constr. Co., Highland, (a) $112,411, (b1) $110,633; Cameron-Joyce & Co., Keokuk, Ia., (b2) $273,500, (b3) $110,167; Powers-Thompson Co., Joliet, (c, d and e) $647,572, (f1 and f2) $134,362; J. Fair & Co., Belvidere, (g) $8982; H. C. Holmes, Macomb, (h) $5540. Noted Nov. 6 E B.

★**Wis., Manitowoc**—City let contract grading, paving, curbing and guttering 1.9 mi. 21st and 24th Sts., 16 ft. wide, involving 8700 sq.yd. concrete, to J. Fischer, Main St., $11,980. Noted Sept. 11.

★**Minn., Duluth**—Comrs. St. Louis Co. let contract grading 15 mi. State Job No. 1902, 18 and 24 ft. wide, to S. J. Groves & Son, Kasota Bldg., Minneapolis. About $200,000. Paving project postponed indefinitely. Noted Oct. 16.

★**Kan., Ft. Scott**—Comrs. Boubon Co. let contract macadamizing 4½ mi. Pawnee Rd., 16 ft. wide, to Dolan & Son, Junction City, $139,678.

Kan., Great Bend—Barton Co. will build 5 265 mi. Santa Fe Trail, Federal Aid Project No. 3, Sect. D, 18 ft. wide, 2 course concrete, involving 38,397 cu yd. earth and 9495 cu.yd. rock excav., 55,506 sq.yd. concrete, (470 cu.yd. concrete and 13 tons steel, for bridge and culvert work). About $150,000. Work will be done by day labor.

★**Kan., Hutchinson**—City let contract paving and building curbs and gutters on Monroe St. from 17th to 20th Sts., 25 ft. wide, to Stamey-Mackey Constr. Co., Hutchinson, $55,661 and $10,450 respectively; curbs and gutters on 15th St. from Maple to Plum Sts., to C. E. Brown, Hutchinson, $4587.

★**Kan., Independence**—Montgomery Co. let contract surfacing, grading and building bridges and culverts on 1.116 mi. Coffeyville-Cherryvale Rd., Federal Aid Project No. 37, Sect. A, 18 ft. wide, to R. L. Plunkett, Independence, $20,175. Work involves 21 cu.yd. concrete, 7145 cu.yd. earth excav., 11,934 sq yd. semi-gravel, 212 lb. steel, etc. Noted Oct. 30.

★**Neb., David City**—City let contract improving Dists. 3-8 inclusive, to Murphy Constr. Co., Omaha, saving, $3.87½ per yd., guttering and curbing, $1.29 per ft.

★**Tex., Austin**—C. Huppertz, aud. Travis Co. let contract gravel surfacing and building concrete dips on 5.984 mi. Highway No. 2, from Austin City reservoir north to Walnut Creek, 15 ft. wide, involving 7344 cu.yd. granite gravel, to Uvalde Rock Asphalt Co., Swearingen Bldg., San Antonio, $26,652. County will do concrete work, (which includes building concrete dips) involving 17 cu.yd. class B, 19 cu yd. class C and 21 cu.yd. 1-3 in. concrete.

Arizona—State Highway Dept., Phoenix, received bids building Clifton-Franklin Highway, Federal Aid Project No. 13, from Webster Co., Contr. No. 1, $78,341, Contr. No. 2, $57,296; Apache Co., Contr. No. 2, $66,528; Cotey-Black Co., Contr. No. 1, $80,153, Contr. No. 2, $67,088. Noted June 12.

★**Oregon**—State Highway Comn., Portland, let contract grading (a) 23.9 mi. Bend Jefferson Co. Line Sect. of The Dalles-California Highway, Deschutes Co., involving 68,000 cu.yd. common excav., (b) 9.3 mi. Cow Valley-Brogan Rd., Malheur Co., 68,000 cu yd. common excav., (c) 31.8 mi. Crooked River Rd., Crook Co., 165,000 cu.yd. mixed excav., (d) grading and surfacing 8.9 mi. Algoma Rd., Klamath Co., 43,000 cu.yd. common excav., 20,000 cu.yd. surfacing, (e) grading 15 2 mi. and graveling 4.6 mi. Redmond-Prineville Rd., Crook Co., 62,000 cu.yd. common excav., 30.000 gravel surfacing, (f) 13.9 mi. Dairy-Klamath Falls Rd., Klamath Co., 30,000 cu.yd. common excav., 29,000 cu yd. gravel, (g) 14.7 mi. Klamath Falls-Merrill Rd., Klamath Co., 55,000 cu.yd. mixed excav., 6000 cu.yd. gravel, (h) 7.5 mi. Pendleton-Cabbage Hill Rd., Umatilla Co., 56,000 cu.yd. mixed excav., 16,000 cu.yd. gravel, (i) reshaping 11 mi., cindering 4.1 mi., graveling, 1 mi. and grading ½ mi. Bend Allen Ranch Sect. of The Dalles-California Highway, Crook Co., 550 cu.yd. mixed excav., 8870 cu.yd. gravel and cinder surfacing, (j) building concrete guard fence on Deer Island-Galena Rd., 4400 ft. long, Columbia Co., (1) concrete pipe, (2) iron pipe, (3) f.o.b. gravel, concrete pipe, to O. Huber, Sherlock Bldg., Portland, (a1) $84,943, (d1)$124,422, (e1) $73,417, (f3) $146,008, (g1) 155,033, (i) $25,019; Morrison & Knudson, Boise, Idaho, (b2) $81,154; A. Guthrie & Co., Sherlock Bldg., Portland, (c) $199.588; Clifton, Applegate & Toole, Spokane, Wash., (h1) $100,701; A. I. McGarry, Seattle, Wash., (j) $4390. Noted Sept. 25.

★**Ore., Ashland**—City let contract paving Boulevard-Ashland St., concrete, to O. Huber, Sherlock Bldg., Portland, $13,555.

Cal., Dinuba—City received bids improving various streets, involving 43,000 sq.yd. asphalt, from Federal Constr. Co., Call Bldg., San Francisco, $122,000, H. Crummey, 333 Kearny St., San Francisco, $124,700, A. Teichert & Son, Ochsner Bldg., Sacramento, $129,000.

Cal., Oakland—City received bids improving 3200 ft. Porter and Suter Sts., between 35th and 38th Aves., Octavia and Abbey Sts. between Suter and Porter Sts. and Loma Vista Ave. between Porter and Quigley Sts., involving 6377 lin.ft. concrete curbing, 13,120 sq.ft. concrete guttering 32,099 sq.ft. cement sidewalk, 6188 cu.yd earth excav., 106 cu.ft. concrete end walls, 8699 sq.yd. oil macadam, and 876 lin.ft. conduit pipe, from Hutchinson Co., 444 17th St., $33,016, Bates & Borland, Bway. and 12th Sts., $33,387; Oakland Paving Co., 5000 Bway., $33,842.

★**Cal., San Francisco**—City let contract improving 42nd Ave. between Geary and Anza Sts., involving 1294 lin.ft. concrete curbing, 4140 sq.ft. artificial stone sidewalk, 2277 sq.yd. asphalt, 100 lin.ft. 10 in culverts, to Flinn & Treacy, Call Bldg., $11,385.

Cal., San Francisco—City received only bid improving London St. between France and Amazon Aves., involving 2270 lin.ft. concrete curbing, 17,450 sq.ft. artificial stone sidewalks, 5428 cu.yd. earth excav., 1000 sq.yd. vertical fibre, 3163 sq.yd. asphalt and 1915 cu.yd. filling cut, from Flinn & Treacy, Call Bldg., $35,620.

Railways

PROPOSED WORK

Oklahoma—Oklahoma Union R.R., Tulsa, having plans prepared for 25 mi. lines from Tulsa to Mounds, Beggs, Okmulgee and Henryetta, to connect with Missouri Pacific R.R., double track system. About $500,000. I. F. Crow, 1602 South Boulder St., Tulsa, ch. engr.

Oklahoma—C. Page, F. Miller and K. C. Davidson, Sapulpa, and others, plan to build 32 mi. railroad from Sapulpa to Bristow, Depew, Shamrock and Drumright. About $650,000.

Quebec—Sherbrooke Ry. & Power Co., Clement Theatre Bldg., Sherbrooke, plans to build 5 mi. extension to street car system in city of Sherbrooke. About $50,000. F. X. Conture, Murray St., Sherbrooke, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

Massachusetts—F. W. Hodgdon, secy of state, Boston, received only bid building 3700 ft. standard guage track involving 2200 cu. yd. earth evcav., 200 cu.yd. earth fill, 3000 cu.yd. ballast, from J. F. Kennedy Co., Boston, $9275.

★**Arizona**—Dept. Interior let contract building 4.8 mi. Oak Creek cut-off, Coconino Natl. Forest, involving 17,320 cu.yd. earth

Railways (Continued)

and 1836 cu.yd. rock excav., to Miller Constr. Co., San Bernardino. About $30,000.

★**British Columbia**—Canadian Pacific Ry. Canadian Pacific Ry. Sta., Winnipeg, Man., let contract extending existing line from Alberni to Great Central Lake, on Vancouver Island here, 10½ mi., to Foundation Co. of Victoria, Old Indian Reserve, Victoria. About $150,000..

Excavation and Dredging

PROPOSED WORK

Mo., Barnard—Drainage—Barnard-Bolcho D. D. having plans prepared building drainage system to cover 7000 acres, involving 9 mi. ditches. W. B. Hazen, Commercial Bldg., St. Joseph, engr.

Ore., Fort Rock—Irrigation—Property owners of Fort Rock Valley have organized irrigation district and association and plan to irrigate 46,000 acres. Work will include leveling, building flood gates, laterals, flumes and canals. About $60,000. J. Naldrett, chn.

Ore., Grant's Pass—Irrigation—Gravity Ditch Impvt. Co. receives bids about Dec. 15, digging 20 mi. irrigation ditch. About $36,000. D. McFarland, Grant's Pass, engr.

Ont., Holland Landing — Reclamation — City appointed E. A. James Co., Ltd., engrs., 36 Toronto St., Toronto, to make preliminary surveys and estimates on reclamation of 10,000 acres of swamp land, Gwillumbury Twp. Work includes ditches, retaining walls, low lift pumps, etc. Cost between $50,000 and $100,000.

Man., Winnipeg—Drainage—City plans to build 4.2 mi. 96 in. rein.-con. conduit pipe. This work of protection made necessary by action of soil alkalies on reinforced concrete. About $300,000. W. G. Chace, 201 Tribune Bldg., engr.

BIDS DESIRED

Wis., Portage—Drainage—Until Dec. 17, by Lower Baraboo River D. D., straightening and deepening Baraboo River from Butterfield Bridge to river mouth. Work involves 400,000 cu.yd. excav., 3 mi. new cut, 40 ft. wide at bottom, 13 ft. deep, etc. H. V. Tennant, Portage, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., McKeesport**—Dredging—Y. M. C. A., 2 West 45th St., New York City, let contract dredging and excavating for foundation for building, here, to Schutz, Schreiner & Clyde, May Bldg., Pittsburgh. About $55,000. Noted Sept 25 under 'Buildings."

★**Minn., Albert Lea**—Ditch—F. Tavis, aud. Freeborn Co., let contract building Ditch No. 31, including 4 branches and 4 laterals, to N. K. Nelson, Albert Lea, About $78,000. Noted Sept. 4.

Industrial Works

PROPOSED WORK

Mass., Everett—W. W. Partridge, School St., soon lets contract building 1 story, 60 x 120 ft., brick garage, concrete flooring, on Boulevard and 2nd St. About $25,000. Concrete foundation for above let to New England Foundation Co., 70 Kilby St., Boston. W. T. Littlefield, 9 Hamilton Pl., Boston, archt.

Mass., Fall River—W. C. Bergeron, 770 King Philip St., plans to build 2 story, 45 x 150 ft., rein.-con. storehouse and garage. About $45,000.

R. I., Providence—Federal Truck Sales Co., 276 West Exchange St., preparing plans for 1 story, 96 x 320 ft., brick and concrete service station, on Reservoir Ave. About $100,000. Private plans.

Conn., Bridgeport—Coulter & McKenzie Machine Co., 771 Water St., plans to build 1 story, brick and steel, machine shop, concrete flooring and foundation, on Seaview Ave. W. R. Phillips & Co., 24 John St., engrs.

Conn., Bridgeport—United Illuminating Co., 84 Temple St., New Haven, plans to build brick, concrete and steel power plant, on Main St. fronting on Pequonnock River. Private plans.

Conn., Danielson—River Weaving Co., Inc., Water St., plans to build addition to weave shed. About $50,000. Private plans.

Conn., Goodyear (Killingly P. O.)—Goodyear Cotton Mills soon receives bids building 3 story, 150 x 350 ft., brick and mill construction mill. About $500,000.

Conn., New Haven—Oven Equipment & Mfg. Co., 205 Orange St., soon receives bids building 1 story, 90 x 280 ft., brick and steel factory, concrete flooring and foundation, on Lombard St. About $50,000. Private plans.

Conn., Windsor—General Electric Co., having plans prepared for addition to present plant. About $75,000.

N. Y., Brooklyn—Ebling, Magnerson & Kleinert, archts. and engrs., 52 Vanderbilt Ave., New York City, soon let contract building 8 story, 60 x 100 ft., rein.-con. and steel addition to factory, rein.-con. flooring, concrete foundation, at 24 Henry St. here, for Mason, Au & Magenheimer, 22 Henry St. About $150,000. Noted June 12.

N. Y., Brooklyn—H. J. Nurick, archt and engr., 772 Bway., New York City, preparing plans for 1 story, brick and steel garage, rein.-con. flooring, concrete foundation, on Bedford and Flushing Aves. About $30,000. Owner's name withheld.

N. Y., Buffalo—Daily Bread Co having plans prepared by L. S. Beardsley, archt. and engr., 40 West 32nd St., New York City, for 3 story, rein.-con. and steel bakery, rein.-con. flooring, concrete foundation. About $200,000.

N. Y., Buffalo—Bellony, Mellichamp & Wade, archts., Buffalo, soon receive bids building 2 story, 60 x 100 ft., brick, rein.-con. and steel garage and show room, rein.-con. flooring, concrete foundation, on Main St., for M. H. Meyer, 746 Washington St. About $50,000.

N. Y., Coney Island—F. Kelsey, c/o Parfitt Bros., archts. and engrs., 26 Court St., Brooklyn, having plans prepared for 1 story, 100 x 196 ft., brick and steel service station, rein.-con. flooring, concrete foundation, on West 8th St., here.

N. J., Jersey City—Pencil Exch., 67-69 Fleet St., plans to build 3 story, 48 x 69 ft. factory. About $29,314.

N. J., Newark—J. Lichtman & Sons, Frelinghuysen Ave., plan to build 2 story, 85 x 255 ft. addition to factory, to include 20 concrete vats with system of paddle wheels, etc. About $50,000.

Pa., Altoona—Bd. Dirs. School Dist. authorized C. M. Piper, secy., 2634 7th Ave., to engage engineers to prepare plans for 2 story, 70 x 80 ft. steel and brick, power plant. About $100,000.

Pa., Altoona—B. Cohn, 3015 Broad Ave., plans to build 2 story, 60 x 120 ft., concrete and brick, auto repair station and storage house, on 31st St. About $55,000. Altoona Storage & Forwarding Co., lessee.

Pa., Coatesville — B. R. Stevens, archt., 1737 Filbert St., Phila., soon receives bids building 2 story, 80 x 126 ft., rein.-con. and brick factory, for Breuninger Bros., 338 East Lincoln St.

Pa., Phila.—Bigelow-Willey Motor Co., 304 North Broad St., having plans prepared by McIlvaine & Roberts, archts., 16th & Sansom Sts., for rein-con. and brick garage and service building, on Broad and Vine Sts. Cost to exceed $100,000.

Pa., Phila.—F. V. Nickels, archt., 4400 Manayunk St., soon receives bids building 3 story, 80 x 225 ft., rein.-con. factory, on Boynton and Chelton Sts. About $90,000. Owner's name withheld.

Pa., Pittsburgh—P. H. Butler Co., 17th and Pike Sts., having plans prepared by Hunting-Davis Co., archts., Century Bldg., for 1 story, 60 x 130 ft. rein.-con., brick and steel garage, rein.-con. flooring, concrete foundation, on Fisk and Howley Sts. About $50,000.

Md., Baltimore—T. H. O'Connor, 445 Guilford Ave., having tentative plans prepared by J. H. Smallwood, archt., 3915 Kate Ave., for 4 story, 18 x 100 ft., brick warehouse, brick and concrete foundation, at 447 Guilford Ave. About $50,000.

Md., Baltimore—F. Steil Brewing Co., 202-212 Garrison Ave., plans to convert brewery into packing plant and slaughter house. About $150,000. F. Steil, pres.

N. C., Durham—J. E. Sirrine, engr., Greenville, S. C., soon lets contract building 7 story, 115 x 255 ft. steel and concrete factory, for Durham Hosiery Mills

N. C., Statesville—Southern Milling Co. plans to build brick and concrete flour mill to have capacity of 1000 bbls. Architect not selected.

S. C., Greenville—Southern Textile Machinery Co. plans to build 3 story, 57 x 117 ft. mill construction factory. J. E. Sirrine, Greenville, engr.

Ala., Fairfax—Fairfax Mills plans to build 75 x 163 ft., rein-con and standard mill construction bleachery, rein.-con. flooring. J. E. Sirrine, Greenville, S. C., engr.

Ala., LaFayette—LaFayette Cotton Mills soon lets contract building cotton mill. warehouse, etc. J. Hill, Healy Bldg., Atlanta, Ga., engr.

Ky., Bowling Green—Atlantic Producing & Refining Co., recently organized with $1,500,000 capital stock, has purchased and will develop oil properties, also build additions to present plant. About $300,000. W. G. Williams, pres. Engineer not selected.

O., Cincinnati—Kruse & Bahlman Hardware Co., Pioneer and Broad Sts., having plans prepared by Frank Hill Smith Co., Inc., engrs. and archts., East 3rd St., Dayton, for 8 story, warehouse, on Pioneer St. About $325,000. Noted Oct. 23.

O., Cleveland—Auer Register Co., 403 Lenq Ave., postponed until 1920, building of 2 story, 73 x 102 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on East 37th St and Payne Ave About $75,000. A. M. Allen Co., 1900 Euclid Bldg., archts.

O., Cleveland — Withington, Roberts, Wright Co., archts. and engrs., Swetland Bldg., soon let contract building 2 story, 45 x 73 ft. brick, concrete and steel factory, rein.-con. flooring, concrete foundation, at 688 East 82nd St., for Dill Mfg. Co., 694 East 82nd St E. T. Tobold, mgr.

O., Cleveland—Koblitz Plumbing & Heating Co., 1310 Huron Rd., plans to build 4 story, 144 x 240 ft., concrete, steel, brick and terra cotta warehouse, shop and office, rein.-con. flooring, brick and concrete foundation, at 5012 Euclid Ave. About $200,000. Architect not selected.

O., Cleveland—J. Rutkowski, 7001 Polonia Ave., soon lets contract building 1 story, 81 x 142 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, at 6600 Park Ave. About $40,000. Private plans.

O., Columbus—Cole Motor Sales Co., 630 North High St., postponed until spring, building of 2 story, 50 x 265 ft., steel and brick garage and salesroom, rein.-con. flooring, concrete foundation, on East Broad St. About $100,000. Noted Sept. 25.

O., Columbus—Ohio Wax Paper & Printing Co., Hanford St., having plans prepared by Stribling & Lum, archts., Columbus, for 1 story, 111 x 151 ft., steel and brick plant, concrete foundation. About $25,000.

O., Dayton—Burkam-Herrick Publishing Co., South Jefferson St., plans to build 4 story, 100 x 190 ft., rein.-con. and brick, publishing plant, rein.-con. flooring, concrete foundation, on 4th St. About $200,000. Architect not selected.

O., Dayton — Miami Ice Delivery Co., Ludlow Bldg., plans to build 2 story, steel and brick plant, brick foundation, on 3rd St. About $100,000. Architect not selected.

O., Dayton—Stinson Aero Co., East 3rd St., plans to build plant, on East 5th St. About $30,000.

Mich., Adrian—State Industrial Home for Girls soon lets contract building 1 story, 36 x 75 ft., rein.-con., brick and steel laundry, rein.-con. flooring, concrete foundation. About $25,000. A. H. Gould & Son, 611 Empire Bldg., Detroit, engrs. and archts.

Mich., Detroit—A. J. Detlaff, 121 Lafayette St., E., plans to build 1 and 2 story, rein.-con., brick and steel, machine shop and foundries, rein.-con. flooring, concrete foundation, on Grand River Ave. and Terminal Ry. Architect not selected.

Mich., Detroit—Smith, Hinchman & Grylls, archts., 710 Washington Arcade, soon let contract building 1 story, 310 x 482 ft., rein.-con., brick and steel, storage plant, rein.-con. flooring, concrete foundation, on Fort St., for Fisher Body Corp., Oakland and Piquette Aves.

Mich., Detroit—R. W. Koch, archt., Book Bldg., preparing plans for 7 story, 150 x 220 ft. rein.-con. and steel factory, rein.-con. flooring, concrete foundation. About $230,000. Owner's name withheld.

Mich., Detroit—Sewell Cushion Wheel Co., 1296 Gratiot Ave., purchased site on Harper Ave. and Detroit Terminal Ry., and plans to build plant. About $100,000. Architect not selected.

Mich., Detroit—Baxter, O'Deli & Halpin, archts., 1024 Hammond Bldg., soon let contract building 3 story, 157 x 160 ft., rein.-con., brick and steel, factory, rein.-con

Industrial Works (Continued)

flooring, concrete and brick foundation, on Beaufait St. near Kercheval St. for Sibley Lumber Co., Kercheval and Beaufait Aves. About $100,000. Noted Nov. 27.

Mich., Detroit—F. J. Whitney, 1443 Grand River Ave., having plans prepared by H. H. Lane, archt. and engr., Dime Bank Bldg., for 1 story, 200 x 250 ft. brick and steel garage, concrete foundation, on Franklin St.

Mich., Fenton—H. H. Lane, engr., 2320 Dime Bank, Detroit, soon lets contract constructing 1 story, 66x150 ft., rein.-con., storage building, rein.-con. flooring, concrete foundation, for New Egyptian Portland Cement Co.

Ill., Chicago—Arabol Mfg. Co., 100 William St., New York City, plans to build brick and steel factory, rein.-con. flooring, concrete and brick foundation, here. About $100,000. Architect not selected.

Ill., Chicago—M. Born & Co., 540 South Wells St., having plans prepared by A. S. Alshuler, archt., 28 East Jackson St., for 12 story, 44 x 120 ft., brick, concrete and steel addition to factory, rein.-con. flooring, concrete foundation, on Harrison and Wells Sts. About $850,000.

Ill., Chicago—Natl. Beverage Co., 1926 West 18th St., having preliminary plans prepared by R. Griesser, archt., 64 West Randolph St., for 2 story, brick and rein.-con. factory, rein.-con. flooring, concrete foundation, at 1926 West 18th St. About $150,000.

Ill., Chicago—Packard Motor Car Co., West Grand Blvd., Detroit, plans to build 2 story, 298 x 304 ft., service and assembly station, rein.-con. flooring, concrete foundation, on West 37th and Princeton Aves., here. A. Kahn, Marquette Bldg., Detroit, archt.

Wis., Beloit—Fairbanks-Morse Mfg. Co. plans to build addition to plant. About $1,000,000.

Wis., Fond du Lac—Northern Casket Co., 16 North Brooke St., plans to construct 3 story, brick and concrete factory. About $75,000. J. E. Hennen, 74 South Main St., archt.

Wis., Manitowoc—Juul & Smith, archts., Dempsey Bldg., North 8th St., soon receive bids building 2 story, 75 x 175 ft. brick, rein.-con .and steel factory, rein.-con. flooring, concrete foundation, for A. H. Franke, 1119 Columbus St. About $80,000.

Wis., Milwaukee—Kirchhoff & Rose, archts., Majestic Bldg., receive bids about Dec. 12, building 2 story, 121 x 150 ft. rein.-con. and brick service station, rein.-con. flooring, concrete foundation, on North Ave., for Cadillac Motor Car Co., 1343 Cass St., Detroit, Mich. About $200,000.

Wis., Milwaukee—Gemco Mfg. Co., 742 South Pierce St., having plans prepared by M. Fernekes, archt. and engr., Ry. Exch. Bldg., for 2 story, 50 x 150 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation. About $50,000.

Wis., South Milwaukee (Milwaukee P. O.)—Universal Aniline Dyes & Chemical Co., 1009 Wells Bldg., soon receives bids building 1 and 3 story, 75 x 122 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Carroll Ave. About $200,000. O. C. Uehling, 1st Wisconsin Natl. Bank Bldg., Milwaukee, archt. and engr.

Wis., Watertown—Monarch Tractor Co., c/o W. Ray, supt., plans to build 1 story, 80 x 100 ft. brick and steel foundry, brick foundation, on Main St. About $35,000. Architect not selected.

Ia., Burlington—W. A. Rayburn Co., Hamilton, Ill., receives bids in spring, building 1 story glass factory, on North Bottoms St. About $300,000. Engineer not selected.

Minn., Minneapolis—Red River Lumber Co., 87 Hennepin Ave., plans to build 2 story, 100 x 135 ft., brick, timber and stone garage, on Franklin and Lyndale Aves. About $50,000. C. L. Kinport, Andrus Bldg., archt.

Kan., Dodge City—Associated Mill & Elevator Co., Kansas City, Mo., having plans prepared by Lehrack Eng. Co., engrs., 705 Gloyd Bldg., Kansas City, Mo., for concrete elevator, rein.-con. flooring, concrete foundation, here. About $250,000.

Kan., Hutchinson—W. Kelley Milling Co. plans to build brick, concrete and steel mill, rein.-con. flooring, concrete foundation. About $500,000. Engineer to be selected at once.

Kan., Wichita—J. O. Adams Music Co. plans to build 4 story, 90 x 125 ft. brick, rein.-con. and steel warehouse, rein.-con. flooring, on East 2nd St. About $100,000. Architect to be selected at once.

Kan., Wichita—Bennison Bros. Bag Co., 601 South 4th St., St. Louis, Mo., purchased site and plans to build 3 story, 130 x 300 ft., brick factory, here. About $50,000. Architect not selected.

Kan., Wichita—Red Star Milling Co., 1901 North Emporia St., having plans prepared by Sherman Eng. Co., engrs., 1019 New York Life Bldg., Kansas City, Mo., for 9 story, 60 x 170 ft. mill, 3 story, 60 x 96 ft. warehouse, 60 x 61 ft. headhouse, 70 ft. high, and six 20 ft. tanks, 90 ft. high, all rein.-con. About $750,000.

Kan., Wichita—F. Schwartz plans to build 2 story, 125 x 150 ft. brick warehouse. About $55,000. Architect will be selected at once.

N. D., Grand Forks—Standard Oil Co., 4th Ave., S. and Front St., N., plans to build warehouse, tanks and distributing stations on McCormick St., south of Dike Ave. About $300,000.

N. D., Grand Forks—State Industrial Comn., Bismarck, plans to build 8 story, 40 x 160 ft. mill and 60 x 120 x 140 ft. elevator, here. About $2,000,000. W. F. Kurke, Huntington Blk., Fargo, archt.

Tex., Abilene—Amer. Pub. Serv. Corp. plans to build 3 story, ice factory and power plant, here, rein.-con., to furnish power for Anson, Merkel, Stamford, Hamlin and Cisco Twps. About $700,000. A. Hardgrave, Southwestern Life Bldg., Dallas, genl. mgr.

Tex., Corsicana—Corsicana Oil and Refining Co. plans to build refinery. About $400,000. W. M. Elliott, 1004 West 3rd Ave., engr.

Tex., Ft. Worth—See "Buildings."

Tex., West Dallas (Dallas P. O.)—Monarch Petroleum Co., Western Indemnity Bldg., Dallas, secured 30 acre site here, and plans to build 5000 bbl. refinery. About $500,000. J. R. Aiken, pres.

Wash., Centralia—Sherman Co. Light & Power Co. having surveys made preparatory to building steam plant adjoining plant of Eastern Ry. & Lumber Co. About $150,000.

Ore., Astoria—H. R. Hoefler plans to extend candy factory to cover 100 x 125 ft. space, by building 4 story, concrete addition east of Centennial Candy Factory. About $50,000. Private plans.

Ore., Marshfield—Martin Candy Co., 2nd St., having plans prepared by F. Magnussan, archt., Marshfield, building 2 or 3 story, 85 x 120 ft., brick or concrete factory, concrete foundation, on Alder and Bway. About $50,000.

Ore., Marshfield—I. R. Tower plans to construct 2 story, 100 x 100 ft., concrete garage and sales building, concrete foundation, on 2nd and Market Sts. About $50,000. Private plans.

Ore., Portland—Crystal Ice & Storage Co. 432 East Salmon St., having plans prepared by Camp & Du Puy, archts., 426 East Adler St., for 3 story, 110 x 115 ft. rein.-con. plant, concrete foundation, on East 7th and Main Sts. About $125,000.

Ore., Portland—Eagle Mill Co. hivng plans prepared by J. V. Bennes, archt., Chamber Commerce Bldg., for 7 story, flour mill, and 1 story, 100 x 130 ft. warehouse, concrete. About $200,000. W. R. Bagot, Bd. Trade Bldg., pres.

Ore., Wallowa—Wallowa Pine Lumber Co. recently incorporated with $350,000, plans to purchase 100,000,000 ft. timber on Bear Creek and build 2 story, frame and concrete sawmill. About $300,000. Address C. A. Hunter, Wallowa. Architect not selected.

N. S., Bedford—Moirs, Ltd., having plans prepared for 50 x 70 ft. sawmill and 50 x 110 ft. box factory, each 38 ft. high, steel and brick, concrete foundation, on River St

Ont., Elk City—McCarthy & Porter, having preliminary surveys made for hydro electrical development of 5000 h.p. at Indian Chute on Montreal River, near here, and for distribution lines to different mines. About $200,000. Sutcliffe & Neelands, New Liskeard, engrs.

Ont., Fergus—J. Alpaugh & Son preparing plans for marble works, brick. About $25,000.

Ont., Ft. William—City preparing plans for rebuilding 1 story, 80 x 150 ft., brick and steel carbarns, concrete foundation. About $200,000. A. McNaughten, clk.

Ont., Hamilton—Firestone Tire & Rubber Co., South Main St., Akron, O., having plans prepared by B. H. Prack, archt. and engr., Lumsdem Bldg., Toronto, for steel, brick and concrete factory, concrete foundation, on Barton St., here. About $1,500,000.

Ont., Toronto—Prest-O-Lite Co., Ltd., Elm and Center Aves., purchased 10 acres Hillcrest Race Track, and plans to build large steel and concrete factory. About $1,500,000. Architect not selected.

B. C., Vancouver—British Columbia Fir & Cedar Lumber Co., foot Laurel St. plans to rebuild saw-mill. About $250,000.

B. C., Vancouver—Gibsons Ltd., 101 Water St., plans to construct 1 story, mill construction factory, concrete foundation, on Industrial Island, to consist of several buildings of various sizes. Cost, including machinery, $100,000. Gardiner & Mercer, Birks Bldg., archts.

BIDS DESIRED

N. Y., Brooklyn—Until Dec. 17, (change of date) by State Hospital Comn., Capitol, Albany, building 2 story, 50 x 71 ft., brick and steel addition to laundry, concrete foundation, for Brooklyn State Hospital, here. About $95,000. L. F. Pilcher, Albany, state archt.

N. Y., Rochester—See "Streets and Roads".

Pa., Phila.—F. V. Nickels, archt., 4400 Manayunk St., receiving bids building 2 story, 24 x 90 ft., brick garage and dance hall, on East Broad and Wharton Sts., for J. Reale, 1609 Wharton St. About $45,000.

Pa., Pittsburgh—Until Dec. 4, by Colonial Ice Co., 35 South 16th St., building 1 story, 70 x 114 ft., concrete, brick and steel storage plant on 16th St. About $60,000. A. C. Bishop, 427 Guardian Bldg., Cleveland, archt. and engr. Noted Nov. 6.

O., Cleveland—Enamel Products Co., Eddy Rd. and Taft Ave., receiving bids building 1 story, 100 x 200 ft., brick and steel factory, concrete foundation. About $60,000. J. Foster, secy. Withington-Roberts-Wright Co., Swetland Bldg., archts. and engrs.

O., Cleveland—Standard Wire Spring Co., 5915 Pennsylvania Ave., receiving bids building 1 story, 101 x 165 ft., brick, wood and steel factory, brick foundation, on 39th St. and Superior Ave. About $75,000. A. A. Bartlett, mgr. Lehman & Schmitt, Electric Bldg., archts.

O., Cleveland—E. McGeorge, archt., 1900 Euclid Bldg., receiving bids constructing one 100 x 225 ft. and one 100 x 120 ft. factory buildings, 3 story, steel and brick, rein.-con. flooring, concrete foundation, on East 79th St. and Woodland Ave., for Van Dorn Iron Works Co., 2685 East 79th St. About $250,000.

Ill., Chicago—Berlin, Swern & Randall, archts., 19 South La Salle St., receiving bids building 3 story, 50 x 100 ft., mill construction factory, rock and concrete foundation, for Jewell Electric Instrument Co., 1640-42 Walnut St. About $50,000.

Ill., Chicago—P. Gerhardt, archt., 64 West Randolph St., receiving bids building 6 story, 60 x 125 ft., brick and rein.-con. storage plant, rein.-con. flooring, concrete foundation, on Halsted St. and Bway., for A. E. Oblander, 3833 Bway. About $250,000.

Wis., Milwaukee—Until Dec. 14, by P. Braman, comr. Pub. Wks., building 1 story, 50 x 160 ft., rein.-con. and brick repair shop, rein.-con. flooring, concrete foundation, on Market St. About $50,000. C. E. Malig, City Hall, archt. and engr.

Tex., Ft. Worth—Until Dec. 15, by Comrs. Tarrant Co., constructing 2 story, 60 x 90 ft., equipment building and shops, brick, rein.-con. and stone, brick and concrete foundation, for housing county road and bridge machinery. About $25,000. R. A. Nicolais, Ft. Worth Natl. Bldg., archt.

N. D., Bismarck—Until Jan. 15, by F. W. Keith, archt., Bismarck, building 2 story, 52 x 64 ft., rein.-con., brick and tile power plant. About $90,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

★**Mass., Cambridge**—Whittemore Bros. Corp. let contract building 3 story, 43 x 63 ft., rein.-con. storehouse, rein.-con. flooring, concrete foundation, on Albany St., to Evatt Constr. Co., Devonshire St., Boston. About $150,000.

Indusrial Works (Continued)

★**Mass., East Springfield** (Springfield)—New England Westinghouse Co., Chicopee Falls, let contract building 1 story, 112 x 250 ft., brick and steel factory, rein.-con. flooring, concrete foundation, here, to E. F. Carlson, 310 Main St., Springfield. About $85,000. Noted Sept. 25.

★**Mass., Fall River**—Amer. Thread Co., foot of Kerr St., let contract building addition to boiler house, to Aberthaw Constr. Co., School St., Boston. About $40,000.

★**Mass., Fall River**—Mexican Petroleum Co., 164 Allens Ave., Providence, R. I., let contract building distributing plant, office, pump house and garage, on Providence Ave., here, to T. I. Ellis, 17 Exchange St., Providence. About $100,000.

★**Mass., Fall River** Sanford Spinning Co., 206 Globe Mills Ave., let contract building 3 story, 120 x 350 ft., rein.-con. addition to mill, rein.-con. flooring, concrete foundation, to New England Concrete & Constr. Co., 201 Devonshire St., Boston. About $400,000.

★**Mass., Holyoke**—Prentiss Wire Mills, 439 Dwight St., let contract remodeling 60 x 100 ft. storage building and 30 x 48 ft. annealing building, also constructing 3 story addition, on Commercial St., to C. Ranger Constr. Co., 20 Bond St. About $50,000.

★**Mass., Holyoke**—Valley Paper Co., 2nd Level Canal, let contract building 2 story, 50 x 350 ft., brick and steel addition to factory, concrete foundation, to P. J. Kennedy & Co., 464 Maple St. About $70,000.

★**Mass., Lynn**—Hilliard & Merrill, 83 South St., Boston, let contract building 5 story, 50 x 500 ft., and 60 x 139 ft. rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Eastern Ave., here, to W. M. Bailey & Co., Broad St., Boston. About $400,000.

★**Mass., New Bedford**—C. A. Best, 61 Locust St., let contract building 1 story, 100x100 ft., brick warehouse, on Nausett St., to Savoie Quarry & Constr. Co., Savoie Ave., Fall River. About $40,000.

★**Mass., Worcester**—C. H. Tenny & Co., 201 Devonshire St., Boston, will build 10 story, 100x140 ft., concrete and steel plant, wood block flooring over concrete. About $500,000. Work will be done by day labor.

★**Mass., Worcester** — Worcester Cold Storage Co., Hygeia St., let contract building 8 story, concrete and steel factory, to C. H. Tenney & Co., 201 Devonshire St., Boston. About $300,000.

★**R. I., Central Falls**—(Pawtucket P. O.)—Fortune Silk Mill, Clay St., let contract building 4 story, 40 x 175 ft., brick and mill construction addition to mill, concrete foundation, to C. I. Bigney Constr. Co., 898 Westminster St., Providence. About $100,000.

★**R. I., Providence**—J. Alix, 1295 North Main St., will build 1 story, 100 x 100 ft., brick and concrete garage, concrete flooring and foundation. About $30,000. Work will be done by day labor.

★**R. I., Providence**—C. B. Bullock, 36 Nesbet St., will build 1 story, 100 x 120 ft. brick and concrete garage, concrete flooring and foundation, on Seekonk St. About $30,000. Work will be done by day labor. Noted Aug. 7.

★**R. I., Providence**—General Baking Co., 207 Brook St., let contract building 2 story, 95 x 115 ft., brick addition to Arnold Bakery, concrete foundation, on John and Williams Sts., to N. U. Lavoie, 698 Warren St., East Providence. Noted Sept 18

★**R. I., Riverpoint**—H. T. White let contract building 2 story, 60 x 120 ft., brick and timber mill, concrete foundation, at Pastime Park, to F. G. Rowley Co., 260 Central Ave., Pawtucket. About $50,000. Noted July 3.

★**R. I., Valley Falls** (Pawtucket P. O.)—Penikees Mills let contract building 2 story, 40 x 100 ft. mill construction addition to weave shed and 3 story, 85 x 100 ft brick addition to main plant, concrete foundation, to O. D. Purington & Co., 626 Industrial Trust Bldg., Providence.

★**Conn., New Britain**—Landers, Frary & Clark, Commercial and Center Sts., let contract constructing plant to include 6 story, 80 x 160 ft., 1 story, 46 x 155 ft., 3 story, 40 x 68 ft. and 1 story, buildings, brick and mill construction, on South Stanley St., to Torrington Bldg. Co., 197 Water St., Torrington. About $150,000, $16,000, $15,000 and $8500 respectively.

★**Conn., New London**—Sheffield Dentifrice Co. let contract building 3 story, 63x101 ft., brick and mill construction addition to factory, to H. Wales Lines Co., 134 State St., Meriden

★**Conn., Torrington**—Torrington Co., 59 Field St., let contract building 2 story, 56x340 ft., brick and mill construction addition to factory, concrete foundation, on North Elm St., to Torrington Bldg. Co., 197 Water St.

★**N. Y., Brooklyn**—Callan Bros., 214 East 135th St., New York City, will build 2 story, 85 x 200 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 19th St. and 3rd Ave., here. About $40,000. Work will be done by day labor.

★**N. Y., Brooklyn**—S. Eisenberg, 1499 Lincoln Pl., will build 1 story, 115 x 160 ft., brick and steel garage, rein.-con. flooring, concrete foundation at 342-352 Coney Island Ave. About $50,000. Work will be done by day labor.

★**N. Y., Brooklyn**—H. B. and H. L. Realty Co., 735 Greene Ave., will build 1 story, 95 x 120 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 38th St. and 13th Ave. About $40,000. Work will be done by day labor.

★**N. Y., Brooklyn**—C. Magid, 56 Boerum Pl., will build 1 story, 75 x 160 ft., brick and steel warehouse, rein.-con. flooring, concrete foundation, on Flushing and Irving Aves. About $40,000. Work will be done by day labor.

★**N. Y., Brooklyn**—A. Ullrich, archt. and engr., 371 Fulton St., let contract to Burke Bros. Constr. Co., 62 West 45th St., New York City, building brick and steel factory, rein.-con. flooring, concrete foundation, on Tillery and Raymond Sts., for Metal Tube & Hose Co., c/o architect. About $70,000. Noted Sept. 25.

★**N. Y., Brooklyn**—Rell Realty Co., 39 West 113th St., New York City, will build 1 story, 140 x 140 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Albermarle Rd. and Bedford Ave. About $30,000. Work will be done by day labor.

★**N. Y., Brooklyn**—M. Rothschild, 833 Saratoga Ave., will build 1 story, 75 x 100 ft., brick and steel garage, rein.-con. flooring, brick foundation, on Schenectady Ave. and Herkimer St. About $25,000. Work will be done by day labor.

★**N. Y., Long Island City**—Deed Realty Co., 68 Broad St., New York City, let contract building 6 story, 80 x 253 ft., brick and steel factory, rein.-con. flooring, concrete foundation on Queens St. and Jackson Ave., here, to F. T. Ley, 19 West 44th St., New York City. About $400,000.

★**N. Y., Long Island City**—W. P. White, c/o Ballinger & Perrott, archts. and engrs., 47 West 34th St., New York City, let contract building 10 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Queens St., to F. T. Ley, 19 West 44th St., New York City. About $1,000,000.

★**N. Y., Middleport**—Niagara Sprayer Co. will build 1 story, 60 x 250 ft., brick and concrete factory. About $40,000. Work will be done by day labor.

★**N. Y., New York**—Two Hundred Fifty-five 5th Ave. Corp., 939 Southern Blvd., will alter 5 story, brick and steel factory, at 255-257 5th Ave. About $25,000. Work will be done by day labor.

★**N. Y., Niagara Falls**—Shredded Wheat Co., 424 Buffalo Ave., let contract building 4 story, 75 x 257 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation on Erie Ave., to Monarch Eng. Co., Chamber Commerce Bldg., Buffalo. About $150,000

★**N. J., Newark** P. Ballantine & Sons, Oxford St., let contract building power house and 48 x 63 ft. reservoir with 250,000 gal. capacity of fuel oil, to Essex Constr. Co., 85 Academy St. About $50,000.

★**Pa., Bloomsburg**—C. Housnick, c/o W. H. Lee, archt., 32nd and 17th Sts., will build 2 story, 112 x 117 ft., concrete and steel garage and dance hall, here. Cost between $40,000 and $50,000. Work will be done by day labor.

★**Pa., Manayunk** (Phila. P. O.)—Phila. Paper Mfg. Co., River Rd., let contract building 2 story, 60 x 200 ft., rein.-con. and brick factory, on Nixon St., to Brown Constr. Co., 4600 Main St. About $72,000

★**Pa., Phila.**—E. G. Budd Mfg. Co., 25th St. and Hunting Pl., let contract building 4 story, 100 x 300 ft. rein.-con. and steel factory, to Warren, Moore & Co., 13th and Market Sts. About $500,000.

★**Pa., Phila.**—Concordia Silk Hosiery Co., A and Courtland Sts., let contract building 2 story, 45 x 125 ft., brick addition to factory, to H. P. Schneider, 3713 Old York Rd. About $25,000.

★**Pa., Phila.**—J. Furlong, 9th and Green Sts., let contract building 1 story, 60 x 157 ft., brick garage, at 3545 North 8th St., to J. A. Codori, 1235 Arch St. About $25,000.

★**Pa., Phila.**—M. E. Hecht, Empire Bldg., let contract building 4 story, 56 x 86 ft., rein.-con. storage plant and garage, at 1342 Brown St., to Lam Bldg. Co., 1001 Wood St. About $68,000.

★**Pa., Phila.**—Phila. Electric Co., 10th and Chestnut Sts., let contract building 5 story, 150 x 300 ft., rein.-con. and brick, power house, on Beach and Palmer Sts., to Stone & Webster, 16th and Walnut Sts.

★**Pa., Phila.**—Pottash Bros., 504 North Amer. St., let contract building 2 story, 200 x 301 ft. brick and stone factory, on Water and Wolf Sts., to M. Cotler, 1220 North 42nd St. About $150,000.

★**Pa., Phila.**—N. H. Dickinson, archt., 1705 Chestnut St., let contract to J. S. Rogers, Drexel Bldg., constructing 2 story, 50 x 327 ft. brick and rein.-con. factory, for Rockland Hosiery Co., Kensington Ave. and North St. Noted Aug. 28.

★**Md., Baltimore**—S. Friedberg, Norfolk, Va., let contract remodeling 3 story, 100x130 ft., rein.-con. and steel garage and stores, rein.-con. flooring, concrete foundation, at 602-10 North Howard St., to Consolidated Eng. Co., 243 Calvert Bldg. About $60,000.

★**O., Akron**—Goodyear Rubber Co., East Market St., let contract building 3 story, 150 x 800 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Massillon Rd., to Hunkin-Conkey Constr. Co., Century Bldg., Cleveland. About $500,000.

★**O., Cincinnati**—Ruehlmann Flour Co., West 6th St., let contract building 84 x 135 ft. mill, to D. Meinken, Western Ave. About $50,000.

★**O., Cleveland**—Dangler Stove Co., 5017 Perkins Ave., let contract building 1 story, 50 x 200 ft., brick and timber addition, to Boldt Constr. Co., 6110 Euclid Ave. About $50,000.

★**O., Cleveland**—Glidden Varnish Co., Berea Rd., let contract building 3 story, 60 x 100 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to Hunkin-Conkey Co., Century Bldg. About $600,000.

★**O., Cleveland**—Midwest Box Co., West 106th St. and Western Ave., let contract building 2 story, 100 x 405 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to J. A. Moffet Constr. Co., Union Bldg. About $300,000. Noted Nov. 27.

★**O., Cleveland** — Overland Larick Co., 18526 St. Clair Ave., let contract building 2 story, 65 x 150 ft., stone and brick garage, brick foundation, on East 152nd St. and St. Clair Ave., to H. G. Claxton, 6522 Euclid Ave. About $50,000.

★**O., Cleveland**—Rubay Co., 1378 West 78th St., let contract building 3 story, 100 x 120 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on West 78th St., to Watson Eng. Co., 1101 Hippodrome Bldg. About $200,000. Noted Nov. 27.

★**O., Cleveland**—W. H. Smith, 66 Taylor Rd., let contract building 1 story, 140 x 140 ft., concrete, steel and brick foundry and machine shop, rein.-con. flooring, concrete foundation, at 16601 Euclid Ave., to Bolten-Pratt Co., Columbia Bldg. About $50,000

★**O., Columbus**—Brunt Tile & Porcelain Co., The Chaseland, let contract building 1 story, 65 x 150 ft. brick factory, north of here, to G. Sandbrick, 774 South Ohio Ave. About $30,000

★**O., Columbus**—Columbus Mill & Mine Supply Co., North Front St., let contract building 1 story, 90 x 350 ft., concrete and brick warehouse and machine shop, on Marion Rd., to R. H. Evans & Co., Columbus Savings & Trust Bldg. About $100,000.

★**O., Lorain**—Aetna Steel Castings Co., 2884 Scranton St., Cleveland, let contract repairing steel and brick factory, brick foundation, here, to W. L. Thompson, 5193 Euclid Ave., Cleveland. About $25,000

★**Ind., Indianapolis**—Polar Ice & Fuel Co., 20th and Northwestern St., let contract building 2 story, 47 x 90 ft. brick, steel

Industrial Works (Continued)

and concrete, storage plant, rein.-con. flooring, concrete foundation, to W. P. Junglass, Indianapolis. About $50,000.

★**Ill., Chicago**—Amer. Fdry. & Equipment Co., c/o Mundie & Jensen, archts., 39 South La Salle St., let contract building 2 story, 100 x 200 ft., brick and rein.-con. factory, rein.-con. flooring, concrete foundation, on 47th and Richmond Sts., to C. A. Moses Constr. Co., 133 West Washington St. About $150,000.

★**Ill., Chicago**—Brennan Packing Co., 4013 Normal Ave., let contract building 2 story, 75 x 140 ft., brick and rein.-con. packing plant, rein.-con. flooring, concrete foundation, to Wells Bros. Constr. Co., 53 West Jackson Blvd. About $100,000.

★**Ill., Chicago**—Cadillac Motor Car Co., 1343 Cass St., Detroit, Mich., let contract building 6 story, 100 x 160 ft., brick and rein.-con. repair. shop, rein.-con. flooring, concrete foundation, on 23rd St. and Indiana Ave., here, to Thompson-Starrett Co., 175 West Jackson Blvd. About $500,000.

★**Ill., Chicago**—Central Mfg. Dist., 38 South Dearborn St., let contract building 6 story, 200 x 200 ft., brick, terra cotta and rein.-con. warehouse, rein.-con. flooring, concrete foundation, on 39th and Winchester Sts., to E. W. Sproul Co., 2001 West 39th St. About $800,000. Goodyear Tire & Rubber Co., East Market St., Akron, O., lessee.

★**Ill., Chicago**—Chicago Electric Mfg. Co., 2817 South Halsted St., let contract building 2 story, 100 x 135 ft., brick and rein.-con. factory, rein.-con. flooring, concrete foundation, on Halsted and 28th Sts., to Stresenreuter Bros., 3020 South Halsted St. About $75,000.

★**Ill., Chicago**—Cuneo-Henneberry Co., 455 West 22nd St., let contract building 2 story, 90 x 125 ft., mill construction, printing plant, concrete foundation, on 22nd and Cottage Grove Sts., to Leyden-Ortseifen Co., 809 Windsor Ave. About $85,000.

★**Ill., Chicago**—Fairbanks, Morse & Co., 900 South Wabash Ave., let contract building 3 story, 150 x 210 ft., brick and rein.-con. warehouse, rein.-con. flooring, concrete foundation, on 38th and Loomis Sts., to E. R. Sproul Co., 2001 West 39th St. About $325,000.

★**Ill., Chicago**—Lincoln Ice Co., 317 North Elizabeth St., will build 2 story, 75 x 150 ft. ice plant, rein.-con. and brick, rein.-con. flooring, concrete foundation, at 329 North Elizabeth St. Work will be done by day labor. Concrete work let to Barton Spiderweb System Co., 304 South Wabash St. Total cost, $60,000.

★**Ill., Chicago**—L. Peterson & Co., 1234 Fullerton Ave., let general contract building 2 story, 60 x 150 ft., mill construction factory, brick foundation, at 1226 Fullerton Ave., to B. J. Reguell & Co., 19 South La Salle St., masonry, to Johnson, Borg & Co., 35 North Dearborn St. Total cost, $45,000.

★**Ill., Cicero**—Hubbard & Co., 306 South Wabash Ave., Chicago, let masonry, carpentry and concrete work, building six 1 or 2 story, brick, terra cotta and rein.-con. factories, on 200 x 565 ft. site, on 12th St. and 54th Ave., to A. Brundage, 110 South Dearborn St., Chicago. About $350,000.

★**Ill., Rockford**—Ziock Paper Box Co., South Wyman St., let contract building 13 story, 70 x 104 ft., concrete addition to factory, concrete foundation, on South Main St., to Holm-Page Co., Kishawaukee St. About $150,000.

★**Mich., Bay City**—C. R. Wilson Boyd Co., 26th and Farragut Sts., let contract building 1 story, 100 x 316 ft., concrete, brick and steel factory, rein.-con. flooring, concrete foundation, to include finishing room and 50 x 150 ft. brick and hollow tile kilns, to H. C. Weber Constr. Co., Center Ave. and Pere Marquette R. R. About $450,000. Noted Sept. 11.

★**Mich., Detroit**—Fisher Body Co., Oakland and Piquette Aves., let contract building 1 story, 57 x 64 ft., rein.-con., brick and steel power house, concrete foundation, on Theodore and Riopelle Sts., to G. A. Fuller Co., 540 Penobscot Bldg., cost $45,000; 1 story, rein.-con., brick and steel power house, rein.-con. flooring, concrete foundation, on Trombley St., to Montague & Forney, 813 Ford Bldg., $80,000; 6 story, 66 x 217 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on St. Antoine St., to H. C. Christman Co., 315 Stevens Bldg.

★**Mich., Detroit**—J. Green, Michigan Ave. and 8th St., let contract building 1 story, 50 x 195 ft., concrete and brick garage, rein.-con. flooring, concrete foundation, on Michigan Ave., to J. B. Curren, c/o H. T. Millar, archt., 320 Lightner Bldg. About $40,000. Noted Nov. 27.

★**Mich., Detroit**—J. Kalbfleisch, 293 Commonwealth Ave., let contract building 2 story, 60 x 100 ft., brick and steel laundry, brick foundation, on McGraw Ave., to H. Zens, 471 Reddig St. About $45,000.

★**Mich., Detroit**—Mutual Electric & Machine Co., 232 Fort St., let contract building 1 story, 75 x 130 ft., brick and steel machine shop and office, concrete foundation, on Porter St., to Daigle Iron Wks., 549 Lafayette Ave., masonry, to Stokes & Whittingham, Penobscot Bldg.

★**Mich., Detroit**—C. E. Rodgers, 34 Goldsmith St., let contract building 1 story, 100 x 214 ft. brick and steel factory, concrete foundation, on West Fort St., to E. Monaghan, West Fort St. About $80,000. Noted Aug. 14.

★**Mich., Detroit**—F. J. Towar, Dime Bank Bldg., let contract building 2 story, 50 x 150 ft., rein.-con., brick, steel and tile garage, rein.-con. flooring, concrete foundation, on Cass Ave. near Davenport St, to W. S. Pocock, 515 Hammond Bldg.

★**Mich., Detroit**—Wadsworth Mfg. Co., Jefferson Ave., let contract building 6 story, rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, to F. E. Walters, Jefferson Ave. and Connors St. About $450,000.

★**Mich., Detroit**—C. R. Wilson Body Co., Clay Ave., let contract building 2 story, 45 x 100 ft., rein.-con., brick and steel power house, rein.-con. flooring, concrete foundation, to A. A. Albrecht Co., 1130 Penobscot Bldg.

★**Wis., Ft. Atkinson**—Creamery Package Mfg. Co., Ft Atkinson Bldg., let contract building 2 story, 40 x 90 ft. rein.-con. and brick plant, rein.-con. flooring, to Raulf Co., Patton Bldg., Milwaukee. About $25,000.

★**Wis., Milwaukee**—J. Benesch & Co., 1264 South Pierce St., let contract building 3 story, 67 x 112 ft. rein.-con. and brick warehouse, rein.-con. flooring, concrete foundation to E. Steigerwald & Sons, 2303 Galena St. About $60,000; cost plus percentage basis.

★**Wis., Milwaukee**—Nordberg Mfg. Co., Chicago and Oklahoma Sts., let contract building 1 story, 100 x 120 ft., brick and steel addition to machine shop, rein.-con. flooring, concrete foundation, to Dahlman Constr. Co., Majestic Bldg. About $60,000.

★**Wis., Milwaukee**—A. O. Smith Corp., 27th and Keefe Aves., let contract building 1 story, 160 x 740 ft., brick and steel machine shop, concrete foundation, on Hopkins St., to E. S. Steigerwald Co., 3607 Vliet St. About $300,000.

★**Ia., Des Moines**—Granette Products Co., 725-2nd St., let contract building 80 x 120 ft. rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 9th and Murphy Sts., to J. E. Lovejoy, 1006 Mulberry St. About $30,000; cost plus percentage basis. A. Clemens, chn. bldg. com.

★**Ia., Muscatine**—Muscatine Packing Co. let contract building 5 story, brick, rein.-con. and steel plant, rein.-con. flooring, concrete foundation, to Federated Constr. Co., Sioux City. About $1,000,000; cost plus percentage basis.

★**Ia., Sioux City**—Woodbury Co. let contract building 3 story, 100 x 112 ft. brick, rein.-con. and steel warehouse, rein.-con. flooring, concrete foundation, to Riesche & Sanborn, Leech and Floyd River Sts. About $100,000.

★**Ia., Waterloo**—Waterloo Constr. Mchy. Corp., Park Rd., let contract building story, 60 x 141 ft., brick, concrete and steel factory and foundry, concrete foundation, to Currie Simpson Co., Waterloo. About $60,000; cost plus percentage basis.

★**Minn., Minneapolis**—Hewitt & Brown, archts., 716 4th Av., S., let general contract to H. N. Leighton, 125 10th St., S., building 6 story, 150 x 300 ft., rein.-con. factory, on Washington Ave., N., for Northern Bag Co., 101 3rd Ave., S. About $600,000; cost plus percentage basis. Noted Nov. 6.

★**Kan., Atchison** — Cooper Fdry. Co. let contract building 1 story, 120 x 350 ft. brick, rein.-con. and steel foundry, rein.-con. flooring, concrete foundation, to Harris Bros. Co., Chicago, Ill. About $50,000; cost plus percentage basis.

★**Kan., Topeka**—Railway Ice Co. let contract building 1 story, 44 x 80 ft. and 54 x 87 ft. hollow tile, concrete, brick and steel addition to ice plant, concrete foundation, to E. Drier & Son, Kansas City. About $60,000.

★**Kan., Topeka**—Topeka Tent & Awning Co., 304 Kansas Ave., let contract building additon to factory, to G. Senne, Topeka. About $25,000.

★**Mo., St. Charles**—C. P. Maloney, 7th and Olive Sts., let contract building 2 story, 40 x 96 ft., concrete and brick machine shop with 11 concrete machine bases, rein.-con. flooring, rock foundation, to Robinson Constr. Co., Ry. Exch. Bldg., St. Louis. About $45,000.

★**Mo., St. Louis**—R. H. Haenel, 1812 Sidney St., let contract building 3 story, 60 x 65 ft., concrete and brick abattoir and office, rock foundation, to H. H. Johnson, c/o owner. About $50,000.

★**Tex., Houston**—H. F. House let contract building 2 story, rein.-con. warehouse, on Washington Ave. and 10th St., to Horton & Horton, McKinney and Velasco Sts. About $206,000.

★**Colo., Denver**—Denver Post Printing & Publishing Co., 1544 Champa St., let contract building 4 story, 50 x 125 ft. plant, to F. Kirchloof Lumber Co., 1220 7th St. About $150,000; cost plus percentage basis. Noted Sept. 11.

★**Wash., Seattle**—Whiton Hardware Co., 108 1st Ave., S., let contract building 1 story 120 x 150 ft., rein.-con. and brick wholesale house, on 1st Ave., S., to H. J. Allen, 1420 East John St., About $75,000.

★**Que., Montreal**—Alaska Feather and Down Co., 300 St. Ambrose St., let contract building 3 story, 80 x 280 ft., steel, brick and concrete factory, rein.-con. flooring, concrete foundation, on St. Ambrose St., to E. G. Cape Co., 10 Cathcart St. About $200,000.

★**Ont., Port Credit**—St. Lawrence Starch Co. let general contract building 4 story, 60 x 150 ft., brick factory, concrete foundation, to Wells & Gray, Confederation Life Bldg., Toronto. About $90,000.

★**B. C., New Westminster**—Canada Western Cordage Co., 402 Pende St. W., Vancouver, let contract building 1 story, 150 x 200 ft. mill construction factory, concrete foundation, on Brunette River, here, to E. J. Ryan Constr. Co., Ltd., 445 Granville St., Vancouver. About $75,000.

★**B. C., Port Coquitlam**—Gregory Tire & Rubber Co., Standard Bank Bldg., Vancouver, will build 3 story, 70 x 180 ft., factory and 60 x 80 ft. boiler house, concrete, here. About $75,000. Work will be done by day labor.

Buildings

PROPOSED WORK

Mass., Lynn — Parish — St. Stephen's Church plans to build brick and steel, on Common St. About $50,000. H. F. Kellogg, 93 Federal St., Boston, archt.

Mass., Marlboro—Almshouse—City plans to build concrete almshouse. About $50,000. Architect not selected.

Mass., New Bedford—Theatre—Smith Bros., 1821 Purchase St., plan to build brick and rein.-con. (1500 seating capacity). About $125,000.

Mass., Plymouth—Hall—J. W. Churchill, chn. bldg. com., receives bids in spring building 2 story, 80x150 ft., brick and concrete, concrete foundation, on Court St. for town. About $300,000. Little & Russell, 45 Bromfield St., Boston, archts.

Mass., Springfield—Business—Forbes & Wallace, 392 Main St., plans to build 8 story, 80x100 ft., brick, concrete and steel, on Main and Vernon Sts. About $250,000. Kirkham & Partlett, 25 Harrison Ave., archts.

R. I., East Providence (Providence P. O.)—Bank—Jackson, Robertson & Adams, archts., 1216 Turks Head Bldg., Providence, soon receive bids building 1 story, brick and marble, concrete and tile flooring, concrete foundation, on Warren Ave., for Industrial Trust Co., 49 Westminster St., Providence. About $100,000. Noted Aug. 28.

R. I., Newport—Schools—School Com. plans to build school on Bway. and large addition to Rogers High School. About $150,000 and $500,000 respectively. Architect not selected.

Buildings (Continued)

R. I., Pawtucket—Theatre—Broad St Power Co. soon receives bids building 3 story, 110x115 ft., brick and rein.-con. J. F. O'Malley, Central Falls, archt.

Conn., Bridgeport—Bowling Alley—C. J. Lewis, 166 Fairfield Ave., having plans prepared by Davis & Dane, archts., 1024 Main St., for remodeling present plant on Fairfield Ave. and building 3 story, 67 x 87 ft., brick and steel addition in rear, to face on Elm St. About $100,000

Conn., Bridgeport—Theatre and Business—F. S. Cohen, 1115 Main St., having plans prepared by Reilly & Hart, archts., 749 5th Ave., New York City, for brick and concrete, concrete foundation, on East Main St. About $50,000.

Conn., Glenville—School—C. E. Bearn, 335 Greenwich Ave., Secy. Bd. Educ., Greenwich Twp., soon lets contract building 2½ story, 148 x 155 ft., brick and steel, concrete foundation, here. About $200,000. Noted Aug. 21.

Conn., Hartford—School—City having revised plans prepared by I. A. Allen, Jr., Inc., archts., 904 Main St., and will soon receive bids for 3 story, 108x139 ft. brick, concrete and steel addition to Brown School, on Talcott St About $300,000. W. E. Cone, 89 Asylum St., chn. com. Former bids rejected. Noted Aug 21.

Conn., Hartford—Store—C H. Talcott, 19 Woodland St., having plans prepared by Buchman & Kahn, archts., 56 West 45th St., New York City, for 5 story, 50 x 140 ft., brick and steel, brick foundation, on Main St. About $125,000.

Conn., Middletown—Armory—Payne & Griswold, archts., Manwaring Bldg., New London, receive bids about Dec. 15, building 2 story, 75x200 ft., brick, here, for State Armory Comn., Hartford. About $150,000.

Conn., Salisbury—Dormitories—C. Gilbert, archt., 244 Madison Ave., New York City, soon lets contract building four 3 story, brick, here, for Hotchkiss School.

Conn., Stamford—Club—Italian Social Institute, 76 South St., plans to build 2 story, 100 x 100 ft., brick, concrete and steel. About $100,000. F. Urso, 453 West Main St., archt.

Conn., Torrington — Hotel — Torrington Homes Corp., 68 Wilson Ave., plans to build hotel. About $250,000. Architect not selected.

N Y., Brooklyn—Bath House—Boro. plans to build brick, steel and rein.-con., rein.-con. flooring, concrete foundation, at McLarren Park, Greenpoint. About $200,000 H. Bacon, 101 Park Ave., New York City, archt. and engr.

N. Y., Brooklyn—Court—Boro. plans to build 2 story, brick and stone, brick foundation, on Snyder Ave. About $100,000. Private plans.

N. Y. Brooklyn — Synagogue - Temple Shaari Torah, care of Kelley & McCarthy, archts. and engrs., 16 Court St., having plans prepared for 1 story, 50 x 100 ft., brick, steel and stone, brick foundation, at 1607 Ave. R. About $175,000.

N. Y., Brooklyn—Theatre C G Cozine, c/o R. T. Short, archt., 370 Macon St., having plans prepared for 120 x 192 ft., brick and steel, brick foundation, on Crescent and Fulton Sts. About $400,000.

N. Y., Buffalo—Community House—Lafayette Presbyterian Church, Lafayette and Elmwood Ave., having plans prepared by M. B. Miller and R. C. Fayfield, archts., Iroquois Bldg., for memorial community house adjoining church. About $100,000. E. D. Emerson, 587 Ashland Ave. chn. finance com. Notd Mar. 13.

N. Y., Coney Island—Bath House—Brooklyn Boro. having plans prepared by J. S. Kennedy, archt. and engr., 157 Remsen St., Brooklyn, for brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, here. About $150,000.

N. Y., New Rochelle—Theatre—A W. Johnson, archt. and engr., 24 East 42nd St., New York City, receives bids about Jan. 2, building brick and steel, brick foundation, here, for Columbia Realty Bldg. Co., Poughkeepsie. About $140,000

N. Y., New York—Bank, Office and Store—Bank of United States, 5th Ave and 32nd St., soon lets contract altering 11 story, brick and steel. About $50,000. Schwartz & Gross, 681-5th Ave., archts and engrs.

N. Y., New York—Bank and Office—New Pine St. Realty Co., 31-33 Pine St., having plans prepared by Schwartz & Gross, archts. and engrs., 681-5th Ave., altering 4 story, brick and steel. About $200,000

N. Y., New York—Hall—Victory Hall Assn., 32 Nassau St., having plans prepared by Herts & Robinson, archts. and engrs., 331 Madison Ave., for 4 story, 197 x 100 ft., brick, steel, stone and marble, brick foundation, on Pershing Sq About $10,000,000. G. W. Wingate, chn

N. Y., New York—Office—Frazer & Co., 30 Church St., having plans prepared by G. B. Post, archt. and engr., 101 Park Ave., for 34 story, 41x51x104 ft., brick, steel and stone, brick foundation, at 72-76 Trinity Pl

N. Y., New York—Store and Office—R Barclay, 299 Bway., having plans prepared by G and E. Blum, archts. and engrs., 505 5th Ave., altering 5 story, brick and steel. About $50,000.

N. Y., New York—Theatre—C Davies, 51 East 42nd St., having plans prepared by De Rosa & Pereira, archts., 110 West 40th St., for brick and steel, brick foundation, on Walton and Burnside Aves. About $200,000

N. Y., New York—Theatre—W Fox Amusement Co., 126 West 46th St., having plans prepared by Carlson & Wiseman, archts. and engrs., 226 Henry St., Brooklyn, for brick and steel theatre, brick foundation, on Tremont and Washington Aves., (3500 seating capacity) About $100,000

N. Y., Niagara Falls—Store—Jenss Bros., Division Ave. and Main St., had plans prepared by S. Larke, archt., 719 Main St., and soon receive bids building 4 story, 70 x 140 ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on Main St. About $100,000.

N. Y., Poughkeepskie—Asylum—C. P. H. Gilbert, archt. and engr., 1123 Bway., New York City, preparing preliminary plans for 3 story, brick and steel, brick foundation. About $300,000. Owners name withheld.

N. Y., Watertown—Theatre—A W. Johnson, archt. and engr., 24 East 42nd St., New York City, receives bids about Jan. 2, building brick and steel, here, for Columbia Realty Bldg. Co., Poughkeepsie. About $200,000.

N. J., Asbury Park—Bank—Seacoast Trust Co. 701 Madison Ave., plans to construct bank on Cookman Ave. and Emory St. About $100,000.

N. J., Bayonne—School—J. A. Jackson, archt., 1123 Bway., New York City, preparing plans for 3 story, brick and steel, here. About $125,000. Owner's name withheld.

N. J., Bayway—Elizabeth P. O.—School—J. A. Jackson, archt., 1123 Bway., New York City, preparing plans for 2 story brick and steel. About $75,000. Owner's name withheld.

N. J., Camden—Club House—W. W. Sharpley, archt., 1713 Sansom St., Phila., soon lets contract building 3 story, 40 x 145 ft., rein.-con., brick and limestone, for Ottawa Tribe of Red Men. Cost to exceed $50,000.

N. J., Elizabeth—School—J. A. Jackson, archt., 1123 Bway., New York City, preparing plans for 3 story, brick and steel, here. About $125,000. Owner's name withheld.

N. J. Jersey City—Hospital—Dirs. Greenville Hospital plan to enlarge hospital, also build nurses home. About $50,000. Architect not selected.

N. J., Jersey City—Office—I. T Ryerson Co., 203 Westside Ave., plans to construct office building adjoining foundry About $200,000.

N. J., Lakewood — Theatre — Farber Amusement Co., 109 Clifton Ave., plans to build brick and steel, brick foundation About $100,000. J. D Harrison, 52 Vanderbilt Ave., New York City, archt

N. J., Newark—Bank—City Trust Co., Roseville Ave., plans to construct bank on Roseville and Orange Aves About $100,000 Holmes & Winslow, Newark, archts. Noted June 5.

N. J., Red Bank—Y. M C. A., 2 West 45th St., New York City, having plans prepared by Jallade & Lindsey, archts., 37 Wall St., New York City, for 4 story, brick, steel and stone, brick foundation, here. About $65,000.

N. J., Union—School—Bd Educ having plans prepared by Rasmussen & Wayland, archts., 1133 Bway., New York City, for 2 story, brick and steel, brick foundation. About $60,000.

Pa., Allentown — Theatre — M. Spiegel, Strand Theatre Bldg., New York City, having preliminary plans prepared by D Levy, archt., 949 Hamilton Ave., for brick and steel, brick foundation, here. About $250,000.

Pa., Chester — Bank — B. R. Stevens, archt., 1737 Filbert St., Phila., soon receives bids for 1 story, 13 x 26 ft., concrete, brick and stone addition, also extensive interior alterations to 1st Natl. Bank, 5th and Market Sts. Cost to exceed $50,000.

Pa., Chester—Club—C. W Brazer, archt., Crozer Bldg., soon lets contract constructing 3 story, 60 x 61 ft., brick, steel and terra cotta, for Amer. Club Cost to exceed, $50,000.

Pa., Easton—Y. M. C. A. plans to construct building. About $300,000.

Pa., Harrisburg — Hospital — Polyclinic Hospital Assn., Front and Harris Sts., plans to build 3 story, 80 x 100 ft., concrete, steel, stone and brick, rock foundation About $150,000 M. I. Kast and T. M Kelker, 222 Market St., archts.

Pa., Indiana—Theatre and Office—Jefferson Theatre Co., North Findley St., Punxsutawney, plans to construct concrete and steel, on Philadelphia St., here. About $100,000.

Pa., Jeanette—High School—Boro voted $250,000 bonds to build high school on 4th St. Noted July 31.

Pa., Johnstown—Office, etc—Johnstown Poster Advertising Co plans to build 3 story, 90 x 90 ft. brick, on Central Ave. and Osborn St. About $75,000. J. T. Kelly, pres. Architect not selected.

Pa., Johnstown—School—Bd Educ. rejected bids building 2 story, 80 x 100 ft. concrete and brick school, at Walnut Grove, 17th Ward. Noted Sept 25.

Pa., Lansdowne — Office and Store — R. Brewster having plans prepared by Heacock & Hohansen, archts., 1218 Chestnut St., Phila., altering and constructing brick addition to Brewster Bldg. About $50,000.

Pa., McKeesport — High School — School Bd plans to issue $200,000 bonds to build addition to Technical High School.

Pa., Milton—Housing—Dirs Milton Housing Co. soon receive bids building dwellings. About $300,000. Hersh & Shollar, Altoona, archts.

Pa., Oil City—Theatre—A W Johnson, archt., 24 East 42nd St., New York City, receives bids about Jan. 2, building brick and steel, brick foundation, here, for Columbia Realty Co., Erie. About $200,000.

Pa., Phila.—Auditorium—University of Pennsylvania, 34th and Woodland Sts., plans to build auditorium or School of Mining. About $750,000. Architect or engineer not selected.

Pa., Phila.—Bank—Heacock & Hohansen, archts., 1218 Chestnut St., soon let contract building 2 story, 23 x 96 ft., brick and stone, on 60th and Market Sts., for Mutual Trust Co., Bourse Bldg. Cost to exceed $50,000. Noted Aug. 28.

Pa., Phila.—Hospital—Miseracordia Hospital, Cedar Ave. and 54th St., having plans prepared by F. F. Duranz, archts., 1220 Locust St., for 6 story brick and steel. Cost to exceed $50,000.

Pa., Phila.—Office—Atlantic Refining Co., 3144 Passyunk St., having plans prepared by C. Gilbert, archt., 244 Madison Ave., New York City, for 20 story, 80 x 120 ft., brick, steel and stone, brick foundation, on Broad and Spruce Sts. About $1,000,000.

Pa., Phila.—Schools—Bd. Educ. preparing plans for two 3 story, 115 x 165 ft., concrete and brick grade schools, 1 on 70th and Buist Sts. and another on 9th and Oregon Sts. Cost between $440,000 and $500,000 each.

Pa., Pittsburgh—Office, etc.—Chatfield & Woods Co., 338 3rd Ave., having preliminary sketches prepared by Toupet-Beil & Conley, archts. and engrs., 127 North Highland Ave., for 7 or 8 story, 100 x 160 ft., rein.-con. and steel, office and warehouse, rein.-con and steel, office and warehouse, 2nd Ave. About $400,000.

Pa., Ridgeway—Y M C. A., New York City, having plans prepared by Jallade & Lindsey, archts. and engrs., 37 Liberty St.,

Buildings (Continued)

New York City, for brick, steel and stone addition to present building here. About $50,000.

Pa., Sharon—Theatre—A. W. Johnson, archt., 24 East 42nd St., New York City receives bids about Jan. 2, building brick, and steel, brick foundation, for Columbia Realty Co., Erie. About $200,000.

Pa., Steelton — Laboratory — Bethlehem Steel Co. had plans prepared by Bissell & Sinkler, archts., Otis Bldg., Phila., for 3 story, 61 x 114 ft., concrete, stone and brick.

Pa., Sunbury—Schools—City plans election to vote on $180,000 bonds to build new ward school and improve high school. S. Stroh, pres. school bd. A. H. Herr, Wilkes-Barre, archt.

Pa., West Hazleton—School—Bd. Educ. receives bids about Dec. 10, building 2 story, 84 x 132 ft. About $60,000. L. E. Eden, 1170 Bway., New York City, engr. J. T. Simpson, 31 Clinton St., Newark, N. J., archt.

Md., Baltimore—Bank and Office—Mercantile Trust & Deposit Co., Calvert and Redwood Sts., soon lets contract remodeling 2 story, rein.-con., steel and brick. About $60,000. Trowbridge & Livingston, 527 5th Ave., New York City, archts. Noted Aug. 14.

Md., Cambridge—Hotel—Dixon Co., c/o R. L. Harris, archt., 2027 Kennedy Ave., Baltimore, having plans prepared for 50 room, brick, here. About $50,000.

Md., Rock Hall—Terminal—R. J. Aydlotte, engr. for Baltimore & Eastern Shore Ferry Line, Inc., 613 Lexington Bldg., Baltimore, preparing plans for terminal, here. S. A. Tubman, vice pres. and genl. mgr.

D. C., Washington—Hotel—D. Candler, engr. and archt., 753 5th Ave., New York City, soon lets contract building 7 story, brick, steel and stone, brick foundation, here, for War Work Council Natl. Bd. of Y. M. C. A., 347 Madison Ave., New York City. About $800,000.

W. Va., Huntington—School—City voted $405,000 bonds to build new schools and extensions. Noted Nov. 27.

N. C., Concord—Hospital—Cabarrus Sanitarium plans to build hospital. About $75,000.

N. C., Greensboro—Hotel—General Green Hotel Co. plans to build 10 story, 113 x 125 ft. About $500,000.

N. C., Greensboro—Office—Cone Export & Comn. Co. plans to build 3 story, fireproof. About $250,000. Architect not selected.

N. C., Wilmington—School—New Hanover Co. soon lets contract building 3 story, brick, also rein.-con. additions to 4 other buildings and 2 smaller buildings. T. E. Cooper, chn. W. J. Wilkins & Co., Wilmington, archts.

S. C., Columbia—Exchange—North Carolina Telephone Co. soon lets contract building 3 story, 55 x 135 ft., brick and terra cotta, concrete foundation, on Summer St. W. C. Skilser, Chandler Bldg., Atlanta, Ga., engr.

Ga., Savannah—School—Chatham Co. voted $500,000 bonds to build school.

Fla., Key West—School and Auditorium—City soon receives bids building 2 story, 75 x 120 ft. rein.-con. school and auditorium on Division St. About $50,000. R. L. Thomas, 806 Littlefield Bldg., Austin, Tex., archt.

Ala., Florence—School, etc.—Bd. Educ. plans to build 14 room school and auditorium in northern section of city. About $60,000. Noted Aug. 28

O., Cleveland — Churches — Episcopal Churches of Cleveland receive bids about May, building three 1 story, concrete, steel, brick and stone, rein.-con. flooring, concrete and brick foundation. About $300,000. R. W. Woodroofe, 2669 Euclid Ave., chn. Architect's name withheld.

O., Cleveland—Hotel—G. A. Tenbusch, Union Bldg., receives bids about Mar. 1, building 6 story, 110 x 200 ft., concrete, steel and brick, hotel and garage, rein.-con. flooring, concrete foundation, on East 61st St. and Euclid Ave. About $500,000. W. S. Ferguson Co., 1900 Euclid Bldg., archts.

O., Cleveland—Theatre and Store—J. Spielman, Engineer's Bldg., soon lets contract building 2 story 50 x 154 ft., concrete, steel and brick, rein.-con. flooring, concrete and brick foundation, on Kinsman Rd. and East 117th St. About $60,000. M. Altschuld, 5100 Woodland Ave., archt.

O., Hiram—Science and Dormitory—Hiram College starting campaign to raise $600,000 to build 4 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. F. A. Henry, 405 Sloan Bldg., Cleveland, in charge of campaign. A. Garfield, Natl. City Bank Bldg., Cleveland, archt.

O., Lakewood — Cleveland P. O. — High Schools—Bd. Educ. having preliminary plans prepared by C. W. Hopkinson, archt., Rose Bldg., for two 3 story, concrete, steel and brick. About $300,000 each. P. T. Harrold, clk.

O., Lakewood (Cleveland P. O.)—School—Bd. Educ. receives bids about Mar. 15, building 3 story, 112 x 148 ft., concrete, steel and brick, concrete and brick foundation, on Jackson St. About $200,000. C. W. Hopkinson, Rose Bldg., Cleveland, archt.

O., Warrensville—School—Bd. Educ. having plans prepared by W. H. Nicholas, archt., 1900 Euclid Bldg., Cleveland, and receives bids in February for 2 story, 60 x 120 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $65,000.

O., Youngstown — Church — St. Johns Greek Orthodox Church soon lets contract building 1 story, 50x95 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Woodland Ave. About $50,000. J. K. Katsary, Erie Bldg., Cleveland, archt.

Mich., Detroit—Commercial—M. Strauss, 803 Real Estate Exch., plans to build 4 story, fireproof. Architect not selected.

Mich., Detroit—Hotel—S. E. Sallan, Sallan Bldg., having plans prepared by R. Marr, archt., 1201 Kresge Bldg., for 7 story, rein.-con., brick and steel, concrete foundation, on East Adams and John R. Sts. About $150,000.

Mich., Halfway—School—School Dist., Gratiot Ave., R. F. D., Mt. Clemens, voted $65,000 bonds to build 2 story, brick and steel, brick foundation, on Gratiot Ave., here. T. Van Damme, Gratiot Ave. Mt. Clemens, archt.

Ill., Rockford—Bank—Third Natl. Bank, East State and 1st Sts., having plans prepared by Perkins, Fellows & Hamilton, archts., 814 Tower Court, Chicago, and receives bids about Jan. 1, building 3 story, 69 x 122 ft., on East State St. About $250,000.

Ill., Rockford—Business and Office—J. H. Camlin, Brown Bldg., plans to build 5 to 8 story, 66 x 150 ft., on North Main St. About $200,000.

Ill., West Frankfort—School—School Bd. soon receives bids building 2 story, 94 x 215 ft., brick and concrete. About $200,000. Architect and engineer not selected.

Wis., Argyle—School—Bd. Educ. plans to build 2 story. About $60,000. L. L. Nelson, clk. Claude & Starck, Badger Annex, Madison, archts.

Wis., Clear Lake — School — Bd. Educ. having plans prepared by W. L. Alban, archt., 347 Endicott Bldg., St. Paul, for 2 story, 53 x 94 ft. brick and stone. About $60,000.

Wis., Milwaukee — Lodge — Knights of Pythias, 82 Wisconsin St., plans to build 8 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation. About $500,000. R. A. Messmer & Bro., Majestic Bldg., archts. and engrs.

Wis., Owen—School—Bd. Educ having plans prepared by W. D. Alban, archt., 347 Endicott Bldg., St. Paul., for 2 story, 63x 81 ft. brick and stone. About $50,000.

Ia., Fairfield—School—Bd. Educ having plans prepared by W. Gordon, archt., 319 Hubbell Bldg., Des Moines, for 3 story, 75 x 122 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. Noted Nov. 27.

Ia., Iowa Falls—Music Hall and Gymnasium—Ellsworth College having plans prepared by W. L. Pedicord, archt., Iowa Falls, for 2 story, brick, concrete and steel, rein.-con. flooring, concrete foundation. About $75,000.

Ia., Jay—School—A. Voris, secy. Bd. Educ., having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 54 x 70 ft., brick, rein.-con. and stone, concrete foundation. About $50,000.

Ia., Morley—School—Bd. Educ. receives bids about Dec. 31, building 2 story, 45 x 136 ft. brick, concrete and steel, concrete foundation. About $60,000. W. J. Brown, 604 Amer. Trust Bldg., Cedar Rapids, archt.

Ia., Nevinville—School—S. M. Mose having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 2 story, 54x70 ft. rein.-con. and brick, concrete foundation. About $50,000.

Ia., Olds—School—Bd. Educ., Consolidated Dist., receives bids about Jan. 1, building 2 story, 63 x 150 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000. Keffer & Jones, 201 Hubbell Bldg., Des Moines, archts. Noted Nov. 27.

Ia., Varina—Church—J. H. Craddock & Co., archts., 504-5 Farnam Bldg., Omaha, Neb., soon let contract building 1 story, 54 x 116 ft. brick, concrete and steel, concrete foundation, for Roman Catholic Church. About $70,000.

Ia., Washington — Hotel — Washington Hotel Co. having plans prepared by C. A. Dieman & Co., archts., 408 Granby Bldg., Cedar Rapids, for 4 story, 60 x 120 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, here. About $100,000. J. M. Wilson, pres.

Ia., Woodbine—School—Bd. Educ., Consolidated Dist., plans to build brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. W. E. Hulse & Co., Hutchinson, archts.

Minn., Bronson—School—Bd. Educ. having plans prepared by Sund & Dunham, archts., Essex Bldg., Minneapolis, for 2 story, 57 x 80 ft., brick. About $52,000. A. Vick, clk.

Minn., Lafayette—School—Bd. Educ. having plans prepared by K. T. Snyder, archt., Plymouth Bldg., Minneapolis, for 2 story, 64 x 90 ft., brick. About $65,000.

Minn., Richfield — School — Independent School Dist. No. 143 having plans prepared by Stebbins & Haxby, archts., Auditorium Bldg., Minneapolis, for 3 story, 57 x 174 ft., with 73 x 90 ft. wing, brick and hollow tile. About $200,000.

Minn., St. Paul—High School—Bd. Educ. having preliminary sketches prepared by C. A. Hausler, archt., City Hall, for 4 story, rein.-con. and brick, to be known as Central High School.

Minn., St. Paul—High School—Bd. Educ. having plans prepared by C. A. Hausler, archt., City Hall, for 3 story, 197 x 272 ft., rein.-con. and brick, to be known as Westside Junior High School. About $450,000.

Minn., St. Paul—High School—Bd. Educ. having plans prepared by C. A. Hausler, archt., City Hall, for 3 story, 160x239 ft., rein.-con. and brick, to be known as the Westside High School. About $250,000.

Minn., St. Paul—School—Bd. Educ. having plans prepared by C. A. Hausler, archt., City Hall, for 3 story, 67x117 ft., rein.-con. and brick, on Edwards St., to be known as Gaultier School. About $100,000.

Minn., St. Paul—School—Bd. Educ. having plans prepared by C. A. Hausler, archt., City Hall, for 3 story, 64 x 96 ft., rein.-con. and brick addition to Drew School. About $90,000.

Minn., St. Paul — Hotel — M. P. Ryan, 512 St. Peter St., having plans prepared by M. Fitzpatrick, archt., 17 West 9th St., for 10 story, 100 x 102 ft., rein.-con., brick and steel addition, to St. Michael Hotel, 510 St. Peter St. About $200,000.

Kan., Ft. Scott—School—Bd. Educ. having plans prepared by W. T. Schmitt, archt., 1634 West 10th St., Oklahoma City, Okla., for 2 story, brick, rein.-con, and steel, rein.-con. flooring, concrete foundation. About $50,000.

Kan., Marion—School—Bd. Educ. plans to build 2 story, 87 x 126 ft. brick, rein.-

Buildings (Continued)

con. and steel, rein.-con. flooring, concrete foundation. About $130,000. T. W. Williamson & Co., 418 Central Natl. Bank Bldg., Topeka, archts.

Kan., Salina—School—Bd. Educ. having plans prepared by W. T. Schmitt, archt., 1634 West 10th St., Oklahoma City, Okla., for 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $55,000.

Neb., Bridgeport — Temple — Masonic Lodge plans to build 2 story, 75 x 125 ft., brick, steel and concrete, concrete foundation. J. C. Pederson, Gering, archt. About $55,000.

Neb., Kearney — Memorial Hospital — Buffalo Co. having plans prepared for 3 story, 38 x 76 ft., concrete, steel and brick, rein.-con. flooring, brick foundation. About $60,000. J. C. Stitt, Norfolk, archt.

Neb., Norfolk—High School—Bd. Educ. having plans prepared for 3 story, brick and steel, rein.-con. flooring, concrete foundation. About $300,000. J. C. Stitt, Norfolk, archt.

Neb., Omaha—Jail—W. J. Hunter, city clk. soon lets contract building 4 story, 86 x 132 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation, on 11th and Dodge Sts. About $200,000. G. L. Fisher, 1529 City Natl. Bank, archt. Noted July 10.

Neb., Osceola—Court House—Polk Co. having plans prepared for 3 story, 64 x 98 ft. concrete, steel and brick, rein.-con. flooring, concrete foundation. About $100,000. W. F. Gernandt, 634 Keeling Bldg., Omaha, archt.

Neb., Loup City—Court House — Sherman Co. soon lets contract building courthouse. About $150,000. Architect not selected.

Wyo., Cheyenne—Hospital—A. A. Boernsen, archt., Cheyenne, soon receives bids building 4 story, 200 x 200 ft., brick and steel, rein.-con. flooring, concrete foundation, on 23rd and House Sts., for Larimer Co. About $300,000.

Mo., St. Joseph — Hospital — Methodist Hospital Assn., having plans prepared by Echel & Aldrich, archts., Corby Bldg., for 4 story, 120 x 180 ft., rein.-con., steel and brick, rein.-con. flooring, brick foundation. About $500,000.

Mo., St. Louis—College—Poro College, 4300 St. Ferdinand St., plans to build 2 and 3 story, 30 x 105 ft., brick addition, at 3100 Pine St. About $50,000. Architect not selected.

Tex., Abilene—College—Simmons College plans to construct 5 buildings, concrete or brick. About $750,000. Architect and engineer not selected.

Tex., Dallas — Business — Advance Rumely Thresher Co., 1105-1107 Patterson Ave., plans to build 2 story, brick, concrete and iron, on Market St. About $50,000. Architect and engineer not given.

Tex., Ft. Worth—Office—Republic Supply Co., 419 North St., has purchased site on North and Lamar Sts., here, and plans to build 6 story, 100 x 100 ft. office and warehouse. About $200,000. Architect not selected.

Tex., Ranger—Hotel—Wilson Hotel Co. having plans prepared by Beshgetoorian & Cabelli, archts., Box 529, for 5 story, 85x 140 ft. rein.-con., rein.-con. flooring, on Main St. Abot $250,000. Walsh & Burney, Littlefield Bldg., Austin, engrs.

Tex., San Antonio—Hotel and Theatre—J. A. Robertson and Smith Estate plan to build hotel and theatre, probably concrete, at 213 St. Mary St. About $1,000,000. Architect and engineer not selected.

Okla., Duncan—Court House and Jail—Stephens Co. having plans prepared by J. Hicks, archt., Oklahoma, for 4 story, 70 x 84 ft. brick, rein.-con. and steel, rein-con. flooring, concrete foundation. About $150,000. Noted Sept. 4.

Okla., Kingfisher—Memorial Hall—City having plans prepared by Layton, Smith & Forsythe, archts., 701 Majestic Bldg., Oklahoma, for 2 story, 110 x 125 ft., brick, rein.-con. and steel, rein.-con flooring, concrete foundation, here. About $75,000. Noted Nov. 27.

Okla., McAlester—Church—Presbyterian Church plans to build church. About $75,000. Architect not selected.

Okla., Norman—Dormitory—Indian Consistory No. 2 Masons, c/o W. P. Freeman, McAlester, plans to build 3 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000. W. T. Schmitt, 1634 West 10th St., Oklahoma, archt.

Okla., Okmulgee — Home — A. F. & A. O. M. plan to build 5 story home, opposite new post office. About $175,000. Engineer not selected.

Ore., Eugene—Hotel—Osborne Hotel Co. having plans prepared by J Hunzicker, archt., Eugene, remodeling and building 1 story, brick addition. About $50,000.

Ore., Marshfield—Hotel—Coos Bay Hotel Co. plans to build 3 story, brick or concrete addition to Chandler Hotel. About $50,000. W. G. Chandler, Marshfield, archt.

N. S., Halifax — Telephone — Maritime Telegraph & Telephone Co. soon lets contract building 3 story, 30 x 50 ft., brick and concrete, rein.-con. flooring, concrete foundation. About $58,000.

N. B., Moncton — Theatre — Eastern Amusement Co., N. S. Bank Bldg., having plans prepared by R. A. Frachette, 30 Bonnacord St., building 50 x 110 ft., concrete, steel and brick, rein.-con. flooring, on King St. About $300,000.

Que., Montreal—Club—Montreal Amateur Athletic Assn., 259 Peel St., having plans prepared for 3 story, 50 x 110 ft., stone and brick addition, concrete foundation. About $100,000. W. R. Grainger, c/o owners, engr.

Que., Montreal—Hospice—Trustee, Loyola Convalescent Home, 26 Overdale Ave., plans to build 3 story, 75 x 100 ft., concrete, steel and brick, concrete foundation. About $75,000. Architect not selected.

Que., Montreal — Hospital — Children's Main Hospital, Cedar Ave., plans to build 3 story, 60 x 100 ft., concrete and brick extension, concrete foundation. About $100,000. Private plans.

Que., Verdun—Church—Chalmers Presbyterian Church plans to build 50 x 70 ft., stone, steel and brick, concrete foundation, on Church and Ross Sts. About $70,000. S. S. Burns, 444 Lasalle Rd., pastor. Architect not selected.

Ont., Campbellford—High School—Pub. School Bd. plans to submit $69,000 by-law to build 2 story, brick and steel, concrete foundation. Architect not selected.

Ont., Carleton Place—Collegiate Institute—City plans election in January to vote on $180,000 by-law to build 2 story, brick and steel. F. B. Caswell, chn. Architect not selected.

Ont., Fairbank—School—Bd. Educ. York Twp., 57 Adelaide St. E., Toronto, soon lets contract building two 2 story, 11 roomed, concrete, steel and brick, rein.-con. flooring, concrete foundation, near Eglinton Ave. and Vaughan Rd., S.S. No. 15. About $210,000. S. B. Coon & Sons, 810 Excelsior Life Bldg., Toronto, engrs.

Ont., Ft. William—School—Bd. Educ. plans to build technical school, concrete, steel and brick, rein.-con. flooring, concrete foundation, probably 3 story. About $350,000. Architect not selected.

Ont., Hamilton — Post Office — Post Office Dept., Ottawa, plans to build 2 story, 45x60 ft., stone, brick and steel, concrete foundation, on Barton St. About $55,000. R. C. Wright, Parliament Bldg., Ottawa, archt.

Ont., Hamilton—Store—Arcade Ltd., 43 James St., N., plans to build 6 story, 80 x 120 ft. steel and brick, rein.-con. flooring, concrete foundation. About $300,000. Architect not selected.

Ont., Hamilton—Theatre—Pantages Ltd., Temple Bldg., Toronto, plans to build 2 story, steel, brick and concrete, rein.-con. flooring, concrete foundation, here. About $300,000

Ont., Kitchener—Theatre—F. McCutcheon, Star Theatre, plans to build 1 story, 80 x 100 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation. Architect not selected.

Ont., Niagara Falls—Schools—School Bd. had plans prepared by C. M. Borter, archt. Main St., for 2 room addition to Glenview School and 4 room addition to Kitchener School, concrete, steel and brick, concrete foundation. About $23,000 and $40,000 respectively. W. J. Seymore, clk.

Ont., Ottawa—Bank—La Banque Nationale, 77 St. Pierre St., Quebec, Que., having plans prepared by W. Lacroix, archt., 151½ Cartier Ave., Quebec, building 3 story, 60 x 80 ft. brick, concrete and steel, rein.-con flooring, concrete foundation. About $80,000.

Ont., Ottawa—Hospital—Hospital Bd. recommended that Bd. Control appoint Stevens & Lee, archts., 2 college St., Toronto, to prepare plans for new hospital. About $1,500,000. D. M. Finnie, chn. Noted Mar. 6.

Ont., Ottawa—Libraries—Carnegie Pub. Library Bd. plans to build library in southern section of city and on King Edward Ave., brick. About $25,000 and $35,000 respectively. W. G. Black, chn. Architect not selected.

Ont., Port Stanley—Dance Hall—London & Port Stanley Ry., Colborne St., London, plans to build 2 story, brick and steel, concrete foundation. About $100,000. Watt & Blackwell, Bank of Toronto Bldg., London, archt.

Ont., Riverdale—Technical School—Bd Educ., Toronto, plans to build 3 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Greenwood Ave., here.. About $450,000. Architect not selected.

Ont., St. Catharines—High School—School Bd. having preliminary plans and estimates prepared by A. E. Nicholson, archt., 51 Queen St., building 2 story, concrete, steel and brick, concrete foundation. About $80,000. C. T. McBride, secy.

Ont., Sarnia—Sunday School—Methodist Sunday School having preliminary plans prepared by E. A. James Co., Ltd., archt., 36 Toronto St., Toronto, for 2 story, brick and steel, concrete foundation. About $80,000.

Ont., Smith Falls—Church—Westminster Presbyterian Church had plans prepared by A. M. Baydon, archt., Riverdale and Belmont Sts., Ottawa, for 1 story, brick and stone, concrete foundation. About $75,000.

Ont., Toronto — Exhibition—Bd. Dirs Canadian Natl. Exhibition, 38 King St. E., plans to extend art gallery, transportation building and grand stand on grounds; also construct arena, cattle barns, restaurant, hospital, and other buildings, all 1 story, brick and steel, concrete flooring. About $3,500,000. J. Kent, Kent Bldg., mgr.

Ont., Toronto—Lunch—Bowles Lunch, Ltd., 149 Yonge St., having plans prepared by Harris & Merrit, archts., 53 Yonge St., for 2 story, 50 x 100 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation, on Yonge St. About $125,000.

Ont., Toronto—Office—Engineering Dept. of Hydro Electric Power Comn., University Ave., preparing plans for 6 story, 70 x 120 ft., structural steel addition, rein.-con. flooring, concrete foundation, for Hydro Electric Power Comn., University Ave. About $130,000.

Ont., Toronto—Post Office—Post Office Dept., Ottawa, soon receives bids building 3 story, 60x80 ft., stone and brick, concrete foundation, on Danforth and Carlaw Aves. About $70,000. R. C. Wright, Parliament Bldgs., Ottawa, archt.

Ont., Toronto—School—Bd. Educ. soon lets contract building 2 story, 8 roomed, brick, steel and concrete, concrete foundation. About $100,000. E. G. Bird, 6 King St., W., archt. Noted Jan. 9.

Ont., Toronto—Stores and Offices—Wood, Gundy & Co., Canadian Pacific Ry. Bldg., purchased 5 story, 60 x 135 ft., steel and brick building on King and Victoria Sts and plans to make interior alterations. About $70,000. Architect not selected.

Ont., Toronto—Studio—Canadian Photo Plays Productions Ltd., 33 Canadian Pacific Ry. Telegraph Bldg., Montreal, plans to build 2 story, 100 x 400 ft., stone, brick and steel studio, here, to include 65 x 120 ft. stage, laboratory, carpentry shop, power house, etc. Cost to exceed $300,000.

Ont., Walkerville—Exchange—Bell Telephone Co. of Canada, 118 Notre Dame St., W. Montreal, plans to build 3 story, 80x100 ft., brick, steel and concrete, concrete flooring and foundation. W. J. Carmichael, 22 Hospital St., Montreal, archt. Cost between $150,000 and $200,000.

Ont., Windsor—Club House—All Saints Church having plans prepared by A. H McPhail, archt., Bd. Trade Bldg., for 3 story, 45 x 60 ft. brick and timber, concrete foundation. About $75,000. Noted Mar. 20.

Buildings (Continued)

Ont., Yorktown—Theatre and Office—J. and J. J. Allen, Richmond and Victoria Sts., Toronto, purchased site here and plans to build 2 story, 100 x 150 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $125,000. C. H. Crane, 2325 Dime Bank Bldg., Detroit, Mich., archt.

B. C., Vancouver — Bank — Merchants Bank of Canada, 500 Granville St., plans to build 3 story, 50 x 120 ft., rein.-con. stone and brick, concrete foundation, on Granville St., near Sobson St. About $250,000.

B. C., Vancouver—Hotel—Twizell, Birds & Twizell, archts., 1019 Metropolitan Bldg., drew sketches for 9 story, 300 x 416 ft. rein.-con. hotel, concrete foundation, on Beach Ave. and Denman St. About $500,000. Owner's name withheld.

B. C. Vancouver—Office—Downing & Kayll, archts, 504 Yorkshire Bldg., receive bids about Dec. 21, building 3 story, 50 x 120 ft., rein.-con. and tile, concrete foundation, for Clark & Stuart Co., Seymour St. About $60,000.

Cuba, Havana—Theatre—Liberty Film Co., c/o De Rosa & Pereva, archts., 110 West 40th St., New York City, having plans prepared for brick and steel, here. About $300,000.

Uruguay—Montevideo—(South America) Cathedral—Montevideo Roman Catholic Church had tentative plans prepared by Barnett, Hayes & Barnett, archts., Century Bldg., St. Louis, Mo., for steel and brick cathedral, concrete foundation, 300 ft. high, 820 ft. long. to include 4 chapels, 4 shrines, isolated tower, etc. About $1,520,000. G. D. Barnett, Sr., Century Bldg., St. Louis, Mo., engr.

BIDS DESIRED

Mass., New Bedford—Hospital—Until Dec. 16, by city, building 3 story, 46 x 175 ft. ward building, 2½ story, 46 x 180 ft. operating building, 2 story, 50 x 160 ft. laundry, brick and rein.-con. flooring, concrete foundation, on Mt. Pleasant St. About $700,000. J. S. McIntyre, Cummings Bldg., archt. Noted Apr 24.

Mass., Swampscott—School—Until Dec. 11, by School Bd., building 1 story, 78 x 164 ft., brick and 2nd class mill construction, concrete foundation. About $50,000. W. H. McLean, 110 Tremont St., Boston, archt.

Conn., Ansonia—Armory—Until Dec. 10, by State Armory Comn., Hartford, building 2 and 3 story, 75 x 140 ft., brick, here. About $150,000. Former bids rejected.

Conn., Bridgeport—School—Until Dec. 8, by Bd. Educ., building 2½ story, 118 x 130 ft., brick and steel addition to McKinley School (some rein.-con. flooring), concrete foundation, on Kelsey St. About $155,000. F. A. Cooper, 1024 Main St., engr.

N. Y., Wards Island—Hospital—Until Dec 17, (change of date) by State Hospital Comn., Capitol, Albany, building 2 story, 58 x 98 ft., brick and rein.-con., concrete foundation, for Manhattan State Hospital, here. About $100,000. L. F. Pilcher, state archt.

Pa., Chester—Theatre, Store and Dance Hall—Until Dec. 8, by H. C. Hodgens, archt., 130 South 15th St., Phila., building 2 story, 120 x 160 ft., concrete, brick, steel and terra cotta, here. About $110,000. Noted Sept. 11.

Pa., Pittsburgh—School—Until Dec. 18 by G. W. Gerwig, secy. Bd. Educ., 725 Fulton Bldg., constructing Westinghouse High School, Monticello St. and Murtland Ave

N. C., Smithfield—Court House—Until Jan. 1, by Comrs. Johnstown Co. building 3 story, court house. About $100,000. H. Barton, Greensboro, archt.

O., Carlisle—School—Until Dec. 19, by G. Trostel, clk., Bd. Educ., building 3 story, 85 x 110 ft., rein.-con., brick and steel, concrete foundation. About $115,000. Walker & Norwick, 1300 Conover Bldg., Dayton, archts. Noted Aug. 14.

O., Cleveland—Hall—Masonic Bldg. Co., 3515 Euclid Ave., receiving bids building 6 story, 118x298 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. at 3515 Euclid Ave. About $700,000. F. Miner, dir. Hubbell & Benes, 4500 Euclid Ave., archts.

O., Cleveland—Hotel—Until Dec. 17, by S. H. Strauss, 14,505 Woodworth Rd., building 2 story, 35 x 190 ft., brick and terra cotta, brick foundation, at 113 Euclid Lane. About $140,000. M. Weis, 618 Union Bldg., archt.

O., Cleveland—School—Until Dec. 29, by Bd. Educ., East 6th St. and Rockwell Ave., building 2 story, 98 x 156 ft., brick, steel and concrete addition, rein.-con. flooring, concrete foundation, on Warner Rd. About $200,000. F. G. Hogan, dir. W. R. Mc Cormack, East 6th St. and Rockwell Ave., archt.

O., East Cleveland—(Cleveland P. O.)—Church—Until Dec. 15, by Trinity English United Brethren Church, Alder Ave., building 1 story, 50 x 60 ft., brick and stone, concrete and brick foundation, on Hayden and Alder Aves. About $50,000. E. J. Erwin, 3161 Corydon Rd., Cleveland Heights, archt.

O., Fairport—School—Until Dec. 23, by Bd. Educ., building 2 story, 84 x 126 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on 4th and Vine Sts. About $100,000. K. W. Farley, pres. C. W. Bates, 701 Natl. Bank Bldg., Wheeling, W. Va., archts.

O., Oxford — Dormitory—Until Jan. 15, by Dittoe, Fahnestock & Farber, archts., 18 West 7th St., Cincinnati, building rein.-con. and stone, on Oxford College grounds, for Miami University. About $300,000. W. Franz, 1703 Union Trust Bldg., Cincinnati, engr.

Mich., Detroit—Theatre—Until Dec. 10, by C. H. Crane and E. G. Kiehler, archts., Huron Bldg., building 2 story, 133 x 200 ft., rein.-con., brick, steel and terra cotta, rein.-con. flooring, concrete foundation, on Woodward Ave., for Allen Theatre Enterprises, Richmond St., Toronto, Ont. Noted July 31.

Ill., Chicago—Bank—J. S. Flizikowski, archt., 4848 Barry Ave., receiving bids altering and building 1 story, 80 x 120 ft., brick and timber addition, on Milwaukee Ave. and Division St., for Northwestern Trust & Savings Bank. About $100,000.

Ia., Livermore—Bank—Farmers Savings Bank receiving bids building 3 story, 23 x 58 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000. J. H. Albright, Ft. Dodge, Kan., archt.

Ia., Macksburg—School—Until Dec. 19, by R. M. Wilder, secy. Bd. Educ., c/o W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, building 3 story, 50 x 100 ft. rein.-con. and brick, concrete foundation. About $70,000.

Ia., Stennett—School—Until Dec. 16, by R. Davidson, secy. Bd. Educ., building 2 story, 44x81 ft. rein.-con. and brick, concrete foundation. About $50,000. W. Gordon, 319 Hubbell Bldg., Des Moines, archt.

Ia., Storm Lake—School—Until Jan. 13, by Bd. Educ., building 2 story, 75 x 103 ft., brick, concrete and steel, concrete foundation. About $55,000. Martin & Sutherland, Storm Lake, archts.

Kan., Independence—Bank—Until Dec. 20, by Commercial Natl. Bank, building 6 story, 70x140 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000. Weary & Alford Co., 1907 South Michigan Ave., Chicago, Ill., archts. Noted Aug. 14.

Kan., Ness City—Until Dec. 20, by Bd. Educ., building 3 story, 74 x 102 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $65,000. R. A. Curtis, Kansas City, Mo., archt. Noted July 17.

Kan., Pittsburgh—High School—Until Dec. 15, by Bd. Educ., building 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $275,000. W. T. Schmitt, 1634 West 10th St., Oklahoma, archt. Noted Aug. 14.

Okla., Cherokee—Until Dec. 9, by Bd. Educ., building 3 story, 60 x 120 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $75,000. H. G. Noble, Kansas City, Mo., engr. Mann & Gerson, Hutchinson, Kan., archts.

Ariz., Yuma—School—Until Dec. 22, by Trustees Crane School Dist. No. 13 building 1 story, rein.-con. About $50,000. F. A. Noyes, Jr., 522 Amer. Bank Bldg., Los Angeles, archt.

Wash., Seattle—Hall—Until Dec. 15, by Bd. Regents of University of Washington, building 3 story, 57x180 ft., rein.-con., brick and terra cotta, on campus. About $250,000. Bebb & Gould, Securities Bldg., archts.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

★**Mass., Boston**—Jail—City let contract building 3 story, 60x100 ft., brick and concrete annex, concrete foundation, on Charles St., to Langan & Shaw Co., Boston. About $248,500.

★**Mass., Brookline**—Hotel—D. Fineberg, Scollay Bldg., Boston, will build 8 story, 75 x 116 ft., concrete and steel, rein.-con. flooring, concrete foundation, on Beacon St. About $225,000. Work will be done by day labor. Noted Sept. 11.

★**Mass., Fall River**—Office—See "Industrial Works."

★**Mass., Framingham**—Dormitory—State Bd. Educ. let general contract building 3 story, 104 x 147 ft., brick, steel and concrete, concrete foundation, for State Normal School, here, to Crawley & Hickey, 18 Tremont St., Boston, heating, to J. J. Hurley Co, 104 Bway., Boston, plumbing, to F. J. Lowe, Boston, and electrical work, to E. C. Lewis, Inc., 121 Federal St., Boston. Total cost, $156,000.

★**Mass., Framingham** — School—School Comn. let contract building 2 story, 157 x 201 ft., brick and stone, some rein.-con. flooring, concrete foundation, on Lincoln St., to C. S. Cunningham & Sons Co, 23 Central Ave., Lynn. About $160,000.

★**R. I., Thornton** — School — Hoppin & Field, archts., 32 Westminster St., Providence, let contract to Hope Bldg. Co., 87 Weybosset St., Providence, building 2 story, 60 x 93 ft., brick and concrete, concrete foundation, for Johnston Twp. About $100,000. Noted June 26.

★**Conn., Torrington**—Club and Auditorium—St. Francis T. A. B. Society, Spear St., let contract building 3 story, 31 x 54 ft. clubhouse and 2 story, 58 x 106 ft., auditorium, brick, concrete and stone, concrete foundation, to F. W. Fuller, 9 Main St. About $75,000. Noted Oct. 30.

★**N. Y., Brooklyn**—Home—New York Congregational Home for Aged, 123 Linden Ave., let contract building 3 story, 38x65 ft., brick, steel and stone addition, brick foundation, to Burke Bros. Constr. Co., 62 West 45th St., New York City. About $65,000

★**N. Y., Buffalo**—Office, etc.—Simmons Co., 17 Ellicott Sq., let contract building 2 story. 81 x 256 ft., brick and steel office and warehouse, rein.-con. flooring, concrete foundation, to Kenwood Bridge Co., 38 South Dearborn St., Chicago. About $50,000, cost plus percentage basis.

★**N. Y., Mechanicsville**—School—Bd. Educ. let contract building brick and concrete, in School Dist. No. 1, to M. E. Ryan Co., Schenectady, $157,777. Noted June 16.

★**N. Y., New York**—Loft—G. Schirmer, 3 East 43rd St., let contract building 7 story, 25 x 100 ft., brick and steel, brick foundation, at 10 East 44th St., to Niemann & Co, Inc., 25 West 42nd St. About $90,000.

★**N. Y., New York**—Office—Bush Terminal Co., let contract building 1 story, brick and steel addition, at 133 West 41st St., to W. Werner Eng. Co., 50 Court St. Brooklyn. About $60,000.

★**N. Y., New York** — Office — Munson Steamship Co., 82 Beaver St., let contract constructing 20-25 story, at 67-73 Wall St., to G. A. Fuller Co., 175-5th Ave.

★**N. Y., New York**—Stores and Loft—Greenwich Assn., c/o Ames & Co., 31st St., will build 6 story, brick, steel and stone, brick foundation, on Madison Ave. About $75,000. Work will be done by day labor.

★**N. Y., New York**—Theatre—Trepark Realty Co., Inc., 45 Cedar St., will build 2 story, 117x229 ft., brick and steel, brick foundation, on Tremont and Washington Aves. About $300,000. Work will be done by day labor.

★**N. Y., Thiells**—Cottages, etc—F. A. Vanderlip, pres bd. mgrs. Letchworth Village, 7 Wall St., New York City, let general contract building 8 cottages for girls' group and industrial buildings for boys' group, also building underground tunnel, conduit, hot water and steam connections, distributing equipment, sewer and water connections, electric service connections

Buildings (Continued)

for girls group, etc., to P. Keeler Bldg. Co., 425 Orange St., Albany $426,800; heating, to J. C. Williams, Inc, Woolworth Bldg., New York City, $132,872; plumbing, to C. H. Darmstadt, Inc., 352 West 43rd St., New York City, $35,077; laundry equipment, (Proposal No. 1 and No. 2) to Troy Laundry Mach. Co., 133 Center St., New York City, $3000 and $9707 respectively.

★**N. J., Asbury Park**—Theatre—W. Rosenberg, Savoy Theatre, 34th St. and 6th Ave., New York City, will alter brick and steel theatre, here, on Cookman Ave. and St. James Pl. About $100,000. Work will be done by day labor. Noted Sept. 18.

★**N. J., Orange**—Hospital—Crow, Lewis & Wick, archts., 200 5th Ave., New York City, let contract building 4 story, brick and steel addition, brick foundation, to E. E. Paul Co., 101 Park Ave., New York City, for Orange Memorial Hospital. About $250,000. Noted Oct. 23.

★**Pa., Altoona**—Hotel—Blair Hotel Co., Commerce Bldg., let contract building 5 story, 120 x 144 ft., concrete, steel and brick, on 13th Ave. and 12th St., to H. L. Stevens & Co., 30 North Michigan Ave., Chicago, Ill. About $800,000.

★**Pa., Bethlehem** — Laboratory — Lehigh University, Packer Hall, let contract building 3 story, 38 x 60 ft., sandstone, extension to chemistry laboratory, to B. Birkel, 106 East 4th St., South Bethlehem. About $75,000.

★**Pa., Harrisburg** — Synagogue — Ohev Sholom Reformed Jewish congregation let contract building 2 story, Indiana limestone, on Front and Seneca Sts., to Central Constr. Co., Commonwealth Trust Bldg About $90,000. Noted Aug. 14.

★**Pa., Indiana**—Office—Rochester & Pittsburgh Coal & Iron Co. let contract building 3 story, 50 x 160 ft. and 50 x 52 ft. concrete, brick, tile, slate and marble, to Irwin & Leighton, 126 North 12th St., Phila. About $300,000.

★**Pa., McKeesport**—Office—Natl. Tube Co. let contract building 2 story, 47 x 64 ft. and 3 story 46 x 90 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, to W. Nowell, 6th St.

★**Pa., New Brighton**—High School—Bd. Educ. let contract building 2 story, 82 x 98 ft. and 3 story, 91 x 135 ft. rein.-con., steel and brick, rein.-con. flooring, brick, rock or concrete foundation, on Pierce and East 4th Sts., to H. Weimer, Butler. About $182,500. Noted Sept. 11.

★**Pa., Phila.** — Bank — Broad St. Bank, Broad and Diamond Sts., let contract building 1 story, 37 x 65 ft. marble and brick, to Standard Constr. Co., 1713 Sansom St. About $50,000. Noted Sept. 18.

★**Pa., Phila.** — Bank — J. T. Brugger, archt., 505 Chestnut St., let contract to Roydehouse-Arey Co., 112 North Broad St., for altering and building 3 story, 60 x 75 ft. concrete and stone addition, on 3rd and Arch Sts., for Union Natl. Bank. About $100,000. Noted Sept. 18.

★**Pa., Phila.** — Club House — G. Woodward, St. Martins St., let contract building 2 story, 65 x 85 ft. stone, on Hartville Lane and Ardleigh St., to Pringle-Borthwick, 8018 Germantown Ave. About $60,000.

★**Pa., Phila.**—Hospital—Dept. Health & Charities let contract building 2 and 3 story, 30 x 50 ft. and 50 x 60 ft., brick additions to observation and refectory buildings at Phila Hospital for Contagious Diseases, Luzerne and 2nd Sts., to W. R. Dougherty, 1608 Sansom St. About $200,000. Noted Aug. 7.

★**Pa., Phila.** — Theatre — Stanley Co. of Amer., 1214 Market St., let contract building 1 story, 143 x 176 ft., brick, terra cotta and steel, on 19th and Market Sts., to Keystone State Constr. Co., Franklin Bank Bldg. About $1,000,000.

★**Pa., Pittsburgh**—Nurses' Home — St. Margaret Memorial Hospital, 46th and Davidson Sts., let contract building 4 story, 36 x 141 ft., brick, tile and concrete, to Cuthbert Bros., Bessemer Bldg. About $95,000.

★**Md., Baltimore**—Dormitory—St. Mary's Industrial School, Wilkens Ave., let contract building 2 story, 43 x 44 ft., concrete and stone, concrete and rock foundation, to Price Constr. Co., Maryland Trust Bldg. About $50,000; cost plus percentage basis.

★**N. C., Wilson**—Bank and Office—Planters Bank let contract building 4 story, 54 x 92 ft., to J. L. Crouse, Greensboro. About $69,000.

★**Ga., Swainsboro**—Court House—Comrs. Emanuel Co. let contract building 3 story court house, to Holley Constr. Co., Swainsboro. About $150,000.

★**Ala., Montgomery** — Memorial Hospital—City let contract building memorial hospital, to T. Purvis, Montgomery, $122,727.

★**La., New Orleans** — Bank and Office — Ouachita Natl. Bank, Monroe, let contract building 4 story, 82 x 119 ft. brick and steel, brick foundation, here, to Underwood Contg. Corp., New Orleans.

★**La., Shreveport** — Church and Sunday School—Highland Baptist Church let contract building 3 story, brick and stone, to Central Constr. Co., 518 Beatty Bldg., Houston, Tex. About $125,000. Noted Mar. 6.

★**O., Cleveland**—Church—Greek Orthodox Church, West 14th St. and Fairfield Ave., let contract building 1 story, 46x85 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Fairfield Ave., to W. Dunbar Co., 8201 Cedar Ave. About $50,000.

★**O., Cleveland**—Office—Forest City Machine & Forge Co., 5101 Lakeside Ave., let contract building 3 story, 42 x 80 ft., brick addition, brick foundation, to Serv. Constr. Co., 6110 Euclid Ave. About $50,000

O., Cleveland—Schools—Bd. Educ. received bids building three 2 story, 60x120 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, in Parma Heights, from C. Peterson, Engineers Bldg., $269,700; Drummond & Miller, Guardian Bldg., $299,700.

★**Mich., Alma**—Theatre—C. A. Miller let contract building 2 story, 53 x 132 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Main St., to F. Broughton & Son, Alma. About $60,000.

★**Mich., Detroit**—Hotel and Commercial—J. J. Barlum, 3061 West Grand Blvd., let contract building 10 story, 30 x 36 ft., rein.-con., brick and steel, rein-con. flooring, concrete foundation, on Farmer and John R Sts., to O. Misch, Chamber Commerce Bldg About $125,000.

★**Mich., Detroit** — Mercantile—Bingham-White Co., Fort St. and Junction Ave., let contract building 4 story, 75 x 100 ft., brick and steel addition, to Hazleton & Clark, Book Bldg. About $75,000. Noted July 3.

★**Mich., Detroit**—Mercantile — Crowley Milner Co., Gratiot Ave., let contract building 1 story, 90 x 200 ft., brick, steel and terra cotta addition, to Montague-Forney, 813 Ford Bldg. About $50,000. Noted Aug. 14.

★**Mich., Detroit**—Mercantile—Moore Realty Co., 512 Holden Bldg., let contract building 2 story, 75 x 100 ft., rein.-con., brick and steel, brick foundation, on Grand River and Vinewood Aves, to W. Johnson, 400 Penobscot Bldg. About $100,000. Noted July 31.

★**Mich., Detroit**—School—Bd. Educ., 50 Bway. Ave., let masonry contract building 2 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Kenilworth Ave., to Culbertson & Kelly, 803 Ford Bldg., $72,985, carpentry, Harcus & Co., 774 Russell St., $14,126, heating, ventilating and plumbing, Irvine & Meier, 2289 Woodward Ave., $32,488.

★**Ill., Chicago**—Home—A. Foster, archt., 155 North Clark St., let contract to Anderson & Windblad, 6235 Michigan Ave., building 3 story, 40 x 160 ft., brick and rein.-con., rein.-con. flooring, concrete foundation, on 47th St. and Sacramento Blvd. for Archbishop Mundelein, Chicago Ave. and State St. About $100,000. Noted June 19.

★**Ill., Chicago**—Office—D. H. Burnham & Co., archts., 209 South La Salle St., let contract to W. Mavor Co., 72 West Adams St., building 3 story, 120 x 210 ft. brick, stone and steel concrete foundation on Cass and Erie Sts., for A. W. Shaw Co. 5 North Wabash Ave. About $225,000. Noted Oct. 23.

★**Ill., Chicago**—Office—Chicago Title & Trust Co., 69 West Washington St., let contract building 1 story, 40 x 95 ft., steel and tile arch construction addition, to McCarthy Bros., 105 West Monroe St. About $75,000.

★**Ill., Evanston** — Parish House — Tallmadge & Watson, archts., 189 West Madison St., let masonry contract to G. King & Son, Evanston, for 2 story, 45 x 140 ft. timber and stone, rock foundation, ... Homan and Lee St... St. Luke's Episcopal Parish, 404 Lee St. About $50,000. Noted Aug. 21.

★**Ill., Urbana**—College—Wesley Foundation let contract building 2 story, 150 x 170 ft., concrete and stone, rein.-con. flooring, concrete foundation, to include auditorium, lecture rooms, laboratory, etc., to English Bros., Champaign. About $250,000.

Wis., Madison—Vocational School—F. L. Kronenberg, archt., 18 North Carroll St., received lowest bid building brick addition on Johnson and Carroll Sts., for Bd. Educ., general contract (including masonry, carpentry and hardware), from J. H. Findorff, 601-607 West Wilson St., $269,962; masonry only, L. B. Gilbert, 23 North Pinckney St., $212,129. Noted April 17.

★**Ia., Martensdale**—School—J. M. Archer, Secy Bd Educ., let contract building 3 story, 56 x 86 ft., rein.-con and brick, concrete foundation, to J. Maine & Sons, 119 8th St., Des Moines, $52,597.

★**Ia., Ottumwa**—Club—Ottumwa Country Club let contract building 1 story, 60 x 72 ft., concrete and stucco, rein.-con. flooring, concrete foundation, to Salters & Salters, Ottumwa. About $65,000.

★**Minn., Biwabik**—Recreation—City let contract building 2 story, 106x111 ft., rein.-con., steel and brick, rein.-con flooring, concrete foundation, to L. J. Klippen, 1832 East 6th St., Duluth, $103,250.

★**Minn., Minneapolis**—School—Bd. Educ let general contract building 1 story, 60 x 194 ft. addition to Whitney School, on 19th Ave., N. E., to C. A. Davis, 2632 Dupont Ave., S., $56,923. Noted Sept. 25.

★**Minn., Montevideo**—Theatre and Office—Home Bldg. Co. let general contract constructing 3 story, 50 x 120 ft., concrete, brick and terra cotta, to Victorson Constr. Co., Andrews Exch. Bldg., Minneapolis. About $65,000, cost plus percentage basis Noted Sept. 4.

★**Minn., St. Paul**—Business—C. H. Johnston, archt., Capital Bank Bldg., let contract to Butler Bros., New York Life Bldg., constructing 2 story, 130 x 225 ft., rein.-con. and stone addition, on 4th St. and Bway., for Lindeke, Warner & Sons, Capital Bank Bldg. About $100,000, cost plus percentage basis.

★**Minn., St. Paul**—School—Bd. Educ. will build 2 story, 40 x 90 ft., on University Ave. About $55,000. Work will be done by day labor.

★**Kan., Isabell**—School—Bd. Educ. let contract building 2 story, 50 x 75 ft. brick, concrete and steel, concrete foundation to M. C. Foy, Hutchinson, $53,992.

★**Kan., Norwich**—School—Bd. Educ. let contract building 3 story, 55 x 90 ft., brick, concrete and steel, concrete foundation, to W. W. Doze, Norwich. About $60,000; cost plus percentage basis

★**S. D., Hoven**—Church—St. Bernard's Church let contract building 60 x 160 ft., brick and steel, concrete foundation, to A. Zwack, 1301 Clay St., Dubuque, Ia. About $200,000.

★**Mo., St. Joseph**—Bank—Tootle-Lacy Natl. Bank will remodel interior of rein.-con., steel and brick, rein.-con flooring, brick foundation About $60,000 Work will be done by day labor under supervision of W. Boschen, archt., Tootle-Lacy Natl. Bank Bldg.

★**Mo., St. Joseph**—Hospital—St. Joseph's Hospital, 923 Powell St., let contract building 5 story, 89 x 116 ft., rein.-con., steel and brick, rein.-con. flooring, brick foundation to P. P. Buddy Bldg. & Constr. Co., 501 North Main St. About $300,000, cost plus percentage basis.

★**Mo., St. Louis**—Office—See "Industrial Works."

★**Tex., Wharton**—School—City let contract building 2 story rein.-con. and steel, rein.-con. flooring, to C. E. Joplin, Wharton. About $80,000 Noted Aug. 14

★**Okla. Muskogee**—High School—Bd. Ed. let contract building 2 story, 103 x 284 ft. brick, rein.-con and steel, rein.-con flooring, concrete foundation, to Manhattan Constr. Co., 3rd and Fondulac Sts., $229,700.

★**Okla., Norman**—Church—Baptist Church will build 2 story, 50 x 80 ft. brick, concrete and steel, concrete foundation. About $55,000. Work will be done by day labor W. C. Weir, chn.

★**Colo., Denver** — Office — State Bldg. Comn., Capitol Bldg., let contract building 5 story, 112 x 114 ft., on Colfax Ave.

Buildings (Continued)

and Sherman St., to Seerie & Varnum, 606 Interstate Trust Bldg., $459,110.

★**Ore., Heppner**—Hotel—Heppner Hotel Co. let contract building 3 story, 62 x 126 ft., brick, brick foundation, to Snook & Travers. About $82,000. Noted June 5.

★**Ore., Mt. Angel**—School—St. Mary's Parish, 345 4th St., Portland, let contract building 1 story, 40 x 270 ft. with 2 side wings each 38 x 102 ft. and center wing, 60 x 135 ft., brick, here, to F. X. LeDoux, Henry Bldg., Portland. About $100,000.

★**Que., Montreal**—Exchange—Bell Telephone Co., Bell Telephone Bldg., let contract constructing 2 story, 50 x 75 ft., stone, brick and steel, concrete foundation, on Westminster and Sherbrooke Sts., to A. F. Byers & Co., 340 University St. About $77,500. Noted June 12.

★**Ont., Ford City** — School — Separate School Bd. let contract building 2 story, brick and steel, rein-con. flooring, concrete foundation, to Wells & Gray, Confederation Life Bldg., Toronto. About $140,000.

★**Ont., London** — Medical College — London or Western University let contract building 3 story, 100 x 220 ft., brick and steel, concrete flooring and foundation, to J. Putherbough, 1006 Wellington St. About $305,000.

★**Ont., London**—Military Hospital—Dominion Government, Ottawa, let contract to W. H. Harvey, Kingston, building hospital here, to consist of isolation hospital, pavilion, recreation hall, etc., $167,844.

★**Ont., London**—Theatre—J. & J. J. Allen, Richmond and Victoria Sts., Toronto, let contract building 1 story, 100 x 180 ft. brick, steel and concrete, rein-con. flooring, concrete foundation, here, to N. McLeod, 612 Kent Bldg., Toronto. About $200,000.

★**Ont., New Toronto**—Studio—Canadian Photo Plays, Ltd., Kent Bldg., Toronto, let contract building 3 story, 80 x 150 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation, Hamilton Highway, to Dunbar Eng. Co., Kent Bldg., Toronto. About $150,000.

★**Ont., Niagara Falls** — Collegiate Institute—High School Bd. let contract building 2 story, brick and steel, rein.-con. flooring, concrete foundation, to Canadian Eng. & Contg. Co., Bank of Hamilton Bldg., Hamilton. About $104,500.

★**Ont., Peterboro** — Collegiate Institute — Bd. Educ. let general contract building 3 story, brick, steel and concrete, to Graham & Hayes, Peterboro, $159,963; heating and ventilating, to R. C. Sturgeon & Co., Peterboro, $32,145; plumbing and draining, to G. Brenton, Peterboro, $13,000. Contracts for grading walks, chemical laboratory, manual training equipment, etc., will be let later.

★**Ont., Peterboro**—School—Bd. Educ. let contract building 2 story, brick and steel, rein.-con. flooring, concrete foundation, to R. Sheehy, 751 George St., $167,953. Noted Aug. 14.

★**Ont., Richmond Hill** — Greenhouses — Bedford Park Floral Co., Lawrence Ave. E., Toronto, let contract building greenhouses, here, to King Constr. Co., Ltd., 40 Dovercourt Rd., Toronto. About $50,000.

★**Ont., St. Thomas** — School — Bd. Educ. let contract building 2 story, brick, concrete foundation, to A. E. Ponsford, 605 Talbot St., $50,830. Noted July 31.

★**Ont., Toronto**—Bank—Darling & Pearson, archts., 2 Leader Lane, let contract to Witchall & Son, 156 St. Helens St., building 2, 3 and 4 story, 85 x 93 ft., brick and steel, rein.-con. flooring, concrete foundation, on Queen and Bay Sts., for Dominion Bank, Dominion Bank Bldg. About $100,000. Noted July 10.

★**Ont., Toronto**—Engineering—University of Toronto, Queens Park, let contract building 3 story, 50 x 190 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation, to W. S. Henry, 35 Albertus Ave. About $350,000.

★**Ont., Toronto**—Office—Canadian General Electric Co., 212 King St. W., let contract building 6 story, 50 x 200 ft., brick, concrete foundation, to Holtby Bros., 212 King St. About $200,000. Noted Sept. 25.

★**Ont., Windsor** — Schools — Separate School Bd. let contract building three 2 story, brick and steel additions to St. Edmund, St. Joseph and Sacred Heart Schools, concrete flooring, to J. V. Gray Constr. Co., Confederation Life Bldg., Toronto. About $140,000. Noted Sept. 18.

★**Ont., Toronto**—Store—W. Steele & Sons, archts., Ryrie Bldg., let general contract to Frid Constr. Co., 61 Adelaide St., E., building 7 story, 90 x 200 ft., steel and brick, concrete flooring and foundation, on Yonge St., for Adams Furniture Co., Ltd., Queen St., E. About $325,000. Noted Sept. 10.

Ont., Toronto—Theatre—Eastern Theatres, Ltd., Adelaide St., E., let contract building brick and steel, concrete flooring and foundation, (seating capacity 3500) on Victoria St., to Jackson Lewis & Co., Ltd., Bell Telephone Bldg. About $650,000; cost plus percentage basis.

B. C., Sapperton—Administration—Canada Western Cordage Co. let contract building 2 story, 150 x 200 ft., tile and rein.-con., to E. J. Ryan Contg. Co., Ltd., Vancouver. About $76,000.

Federal Government Work

PROPOSED WORK

Mass., Fall River—Altering Post Office—Treas. Dept., Wash., D. C., rejected bids received Nov. 18, altering post office, here. Work will be readvertised. J. A. Wetmore, superv. archt.

D. C., Wash.—Electric Traveling Cranes—Spec. 4094—Bureau Yards & Docks, Navy Dept., plans to install electric traveling cranes at proof shop. About $11,000.

O., Akron—Post Office—Treas. Dept., Wash., D. C., had plans prepared by Stoddard & Hopkinson, archts., 1215 Citizens Bldg., Cleveland, for 1 story, 90 x 115 ft., brick and steel, rein.-con. flooring, concrete foundation, on Main St., here. About $75,000.

Minn., Walker — Road Work — Bureau Pub. Rds., Portland, soon receives bids grading and graveling 31 mi. road through Minnesota Natl. Forest, from Cass Lake to Ball Club Sta., 24 ft. wide. About $155,000. E. O. Hathaway, 224 Post Office Bldg., Minneapolis, engr.

Idaho, Grangeville—Road Work—Bureau Pub. Rds., U. S. Dept. of Agriculture, Portland, Ore., having plans prepared for location of highway for South Fork of Clearwater River from Meadow Creek to Rock Point. About $135,000 available from Forest Serv. Bur. and $50,000 from bond issue voted by city highway dist. W. E. Adamson, Grangeville, engr. Noted Aug. 7.

Wash., Yakima—Road Work—Bureau Pub Rds., Portland, Ore., had plans prepared by F. H. Brundage, forest superv., Portland, for 30 mi. Yakima-Bird Creek Meadows Rd., here. About $30,000.

Ore., Astoria—Naval Station—Bureau Yards & Docks, Navy Dept., Wash., D. C., having preliminary plans prepared for naval base on Columbia River, at Tongue Pt., here. Cost site $100,000. Congress will be asked to appropriate $1,500,000 for establishment of base. A. McArthur, Wash., D. C., rep.

Ore., Eugene—Roads—U. S. Dept. Agriculture, Bureau Pub. Rd., 204 Post Office Bldg., Portland, soon lets contract building 15 mi. Blue River Sect. of McKenzie River Natl. Forest Rd., Lane Co., involving 44,000 cu.yd. common and 6000 cu.yd. rock excav., 900 ft. log or pipe culvert, 47 acres clearing. Cost to exceed $75,000 (360 working days). C. H. Purcell, 204 Post Office Bldg., Portland, dist. engr.

BIDS DESIRED

Pa., Phila.—Cranes—Spec. 4092—Until Dec. 17, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building two 5-10 ton hammer head cranes, here. Cost $100,000; $10 deposit required for plans and spec.

D. C., Wash.—Animal House Extension—Until Dec. 23, by Treas. Dept., furnishing materials and labor for building extension to animal house for Hygienic Laboratory, U. S. Pub. Health Serv. J. A. Wetmore, superv. archt.

Va., Norfolk—Cranes—Spec. 4092—Until Dec. 17, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building one 5-10 ton hammer head crane, here. Cost $50,000; $10 deposit required for plans and spec.

W. Va., Wheeling—Lock Gates—Until Dec. 26, by U. S. Engr. Office, furnishing and erecting lock gates for Dams Nos. 23, 25 and 27, Ohio River; advertised in this issue.

S. C., Charleston—Heating—Spec. 4091—Until Dec. 17, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing heating system for torpedo storehouse building No. 101 and building boiler house addition to same, at Naval Ammunition Depot, here; $10 deposit required for plans and spec.

S. C., Charleston—Quay Wall—Spec. 4078—Until Dec. 10, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building about 830 ft. quay wall, here. About $180,000; $10 deposit required for plans and spec.

S. C., Paris Island—Concrete Walls—Spec. 4096—Until Dec. 17, by Bureau Yards & Docks, Navy Dept., Wash., D. C., for about 361 and 181 ft. concrete walls, 6 ft. and 3 ft. high, $10 deposit required for plans aand spec.

Tenn., Memphis—Earthwork—Until Dec. 8, by Mississippi River Comn., 1st and 2nd Dists., Custom House, building 650,000 cu. yd. earthwork in Lower St. Francis and White River Levee Dists.; advertised in this issue.

Wash., Seattle—Dredging—Until Dec. 19, by U. S. Engr. Office, dredging and rock excavating in Willapa River and Harbor; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y. Staten Island**—Aerial Defense Station—Constr. Div., War Dept., Wash., D. C., let contract building aerial defense station, here, to Smith, Houser & McIsaacs, 18 East 41st St., New York City. About $1,000,000. Noted Sept. 25.

Pa., Chester—Remodeling Post Office—Treas. Dept., Wash., D. C., received bids Nov. 24, remodeling post office, here, from F. W. Van Loon, Denckla Bldg., Phila., $6568; C. H. Dading, Bellevue Court Bldg., Phila., $9345; W. McDonald Constr. Co., St. Louis, Mo., $9876.

★**D. C., Wash.**—Proof Shop—Spec. 4054—Bureau Yards & Docks, Navy Dept., let contract building, here, to Stang & Mitchell, 733 Real Estate Trust Bldg., Phila., Pa., $176,070 (365 days).

Va., Richmond—Post Office Alterations—Treas. Dept., Wash., D. C., received bids Nov. 24, altering post office, here, from W. McDonald Constr. Co., St. Louis, Mo., $11,513; W. P. Thurston, Merchants Natl. Bankfl, $17,600.

★**S. C., Charleston**—Chimney—Spec. 4061—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract furnishing material and building radial brick chimney, 250 ft. high and 12½ ft. inside diameter at top, on foundation provided by Government, to M. W. Kellogg Co., 90 West St., New York City. About $19,000 (120 days).

Miss., Meridian—Remodeling Post Office—Treas. Dept., Wash., D. C., received bids Nov. 24, remodeling post office and court house, here, from W. McDonald Constr. Co., St. Louis, Mo., $22,854; W. Wilby, Selma, Ala., $23,975.

La., Monroe—Post Office—Treas. Dept., Wash., D. C., received only bid Nov. 21, remodeling post office here, from G. E. Wright, Inc., Chicago, $6850.

★**Nebraska**—Dam—U. S. Recl. Serv., Wash., D. C., let contracts for 1 sluice gate and 2 balanced needle valves in connection with Pathfinder Dam, North Platte Irrigation Project, Nebraska-Wyoming to Joshua Hendy Iron Wks., 75 Fremont St., San Francisco, $7967 and $45,720 respectively; 2 high pressure emergency gates, to Rock Island Arsenal, Rock Island, Ill., $31,145.

★**Cal., Los Angeles**—Fuel Oil—U. S. Engr. Office, War Dept., Wash., D. C., let contract furnishing fuel oil for U. S. Dredge "San Pedro," here, to Union Oil Co., Union Oil Bldg. Cost $22,400.

Miscellaneous

PROPOSED WORK

Arch — Stamford, Conn. — City having plans prepared by G. A. Freeman, archt., Spelke Blk, for memorial arch in St. Johns Park, marble and bronze on granite base. About $50,000. W. G. Daskam, chn. memorial com.

Miscellaneous (Continued)

Gateway—New Haven, Conn.—Yale University soon lets contract building stone gateway on High St. About $100,000. Private plans. A. T. Hadley, pres.

Piers—Clifton, N. Y.—Dept. Docks, Pier "A," North River, New York City, plans to build 12 piers, each 1000 ft. long, from here to Stapleton. About $15,000,000.

Bulkheads — Hoboken, N. J. — Wilson Steamship Line Co., foot 7th St., plans to build a number of bulkheads on water front, here. Cost over, $50,000.

Beach and Bathhouses—Harrisburg, Pa.—City having plans prepared by E. Z. Gross, comr., and W. H. Manning, park expert, for bathing beach and bathhouses. About $40,000.

Garbage Disposal Plant—New Brighton, Pa.—City plans to build garbage disposal plant. R. W Pratt, Hippodrome Bldg., Cleveland, O., engr.

Storage Bins and Coal and Ash Handling Machinery—Cleveland Heights, O. (Cleveland P. O.)—Bd. Educ. receives bids about Feb. 23, building storage bins and coal and ash handling machinery, at Lee Road School. J. H. Herron, 1360 West 3rd St., engr.

Pipe and Fittings—Detroit, Mich.—Comr. Purchases and Supplies, Municipal Bldg., soon lets contract furnishing 5280 ft. 8 in. class 175 Universal pipe, eleven 6 x 6 in. tees, five 8 x 8 in. and five 8 x 6 in. crosses, sixteen 6 in. and five 8 in. Bell couplings, five 6 in. and five 8 in. plugs, all Universal fittings. T. H. Leisen, 232 Jefferson Ave., engr.

Subway—Detroit, Mich.—City soon receives bids building subway under Jefferson Ave., at approach to Belle Isle bridge, 36 ft. roadway with portal each side of Jefferson Ave., and rein.-con. retaining wall to protect each side of cut. C. F. Hubbell, city engr. Noted July 31.

Ornamental Lighting System—Austin, Minn.—City having surveys made of lighting system and plans prepared for installation of ornamental lights in business district. Cost between $15,000 and $20,000. Vaughn & Meyer, Security Bldg., Milwaukee, Wis., engrs.

Park—Williston, N. D.—City plans election to vote on $20,000 bonds for park. A. Jack, city engr.

Memorial Park—Boulder, Colo. — City voted $100,000 bonds to build memorial park, to include swimming pool, bath house with heating plant, band stand, play grounds for children and tennis courts. J. Randolph, Boulder, dir.

Harbor Improvement—Warrenton, Ore.—City voted $500,000 bonds to improve and extend harbor, also purchase 100 acres on Columbia and Skipanon Rivers for erection of piers and docks and installation of cranes and necessary apparatus for speedy cargo handling. J. Evenden, aud.

Breakwater—Santa Barbara, Cal.—Municipal Breakwater Comn had plans prepared by J. R. Chapman, engr., for 1st unit of breakwater plan, this unit to afford protection for pleasure craft, and will be followed by other units to be carried out to deeper water to protect heavier vessels. About $500,000. Noted April 24.

Stadium—El Centro, Cal.—City plans election to vote on $50,000 bonds to build stadium. J. K. Hermon, pres Security Bank and chm of committee of Chamber Commerce is handling preliminaries.

Arena—Montreal, Que.—Arena Co., Ltd., plans to build 150 x 200 ft. rein.-con arena, 35 ft. high, rein.-con. flooring, concrete foundation, on St. Lawrence and Sherbrooke Sts. About $250,000. Architect not selected.

Garbage Incinerator—Bellevue, Ont.—Ontario Oakvale Co., Ltd., Toronto, plans to build 2 story, 40 x 50 ft., brick and steel, concrete flooring and foundation. About $40,000.

Tower—East Toronto, Ont.—York Co., 57 Adelaide St., having plans prepared by E. A. James Co., Ltd, 36 Toronto St., Toronto, for memorial tower, 100 ft. high, 14 ft. diameter, stone facing on concrete, spiral stairways, bronze figure, lightning provision, also building two 1 story, 20 x 25 ft., stone museums. About $120,000.

Rink—Guelph, Ont.—Chamber of Commerce purchased site on Cambridge St. and plans to build 1 story, steel and brick, skating rink, concrete foundation. About $60,000. Engineer not selected.

Stadium—Hamilton Ont.—City had plans prepared for wood and concrete stadium, with 20,000 seating capacity. About $100,000. Bylaw will be voted on at next council meeting. E. R. Gray, city engr.

Cars, Locomotive, Etc.—London, Ont.—London & Portland Stanley Ry., Phillip St., plans to purchase 3 electric cars and 1 electric locomotive, cost, $95,000, weigh scales, $9500; also build concrete platforms, $2000, sidings $15,000, concrete overhead crossing, $6000, steam heating system for depot, $4500, comfort stations, $4000, freight shed at dock, $2500, store room, $6000. lockers, $1500, extensions to present buildings, $4500, blacksmith shop, $7000. J. E. Richards, Phillip St., ch. engr.

Skating Rink—Port Arthur, Ont.—Town plans to build 1 story, 200 x 360 ft. steel and brick, concrete foundation. About $100,000.

Stadium—Toronto, Ont.—City plans to build wood stadium with seating capacity of 10,000. About $110,000. R. C. Harris, City Hall, engr. Noted June 12.

Pages 320 to 326, which follow, carry news of proposed work gathered during the last three weeks and published now for the first time.

BIDS DESIRED

Heating, Plumbing, etc.—New Bedford, Mass.—Until Dec. 9 by city, furnishing and installing plumbing, heating, ventilating and electric work for 3 story, 46 x 175 ft. ward building, 2½ story, 46 x 180 ft. operating building, 2 story, 50 x 160 ft. laundry, brick and rein.-con., rein.-con. flooring, concrete foundation, on Mt. Pleasant St. Total cost of buildings $700,000. J. C. McIntyre, Cummings Bldg., archt. Noted Apr. 24 under "Buildings."

Jib Cranes—New York, N. Y.—Until Dec. 23 (change of date), by E. S. Walsh, supt. pub. wks., Capitol, Albany, furnishing and installing two 3-ton electric semi-portal revolving jib cranes on barge canal terminals, at West 53d St., and two at Greenpoint, Contr. 116 Revised. About $61,000; advertised in this issue.

Tractor—Hollidaysburg, Pa.—Until Dec. 17, by T. W. Tobias, controller Blair Co., for purchase of 1 tractor, class 12-20.

Block Flooring—Cleveland, O. — Until Dec. 13, by Comrs Cuyahoga Co., building floor for bridge over Cuyahoga River, involving 1705 sq.yd. creosoted wood block and 2800 ft. creosoted wood plank. W. A. Stinchcomb, co. engr.

Pump—Cleveland, O.—Until Dec. 19, by city, for purchase of one 20,000,000 gal high service steam turbine reduction gear driven centrifugal pump. R. Hoffman, city engr.

Timber—Bemidji, Minn.—W M Everts, engr. Beltrami Co., receiving bids for 123,000 ft. sawed timber, various sizes, for building bridges on Judicial Ditches Nos. 30 and 36, near Rapid River.

Grain Conveyor Equipment—St. John, N. B.—Until Dec. 9, by Dept. Pub. Wks., Ottawa, building grain conveyer equipment, at Berth 15, here.

Wharf—Owen Sound, Ont.—Until Dec. 12, by Dept. Pub. Wks., Ottawa, rebuilding wharf here. About $86,000. E. Lafleur, Dept. Pub Wks., engr. Noted July 17.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

★**Foundation — Worcester, Mass.** — St. Vincents Hospital, 83 Vernon St., let concrete foundation contract for 4 story, 50 x 120 ft. hospital with 46 x 60 ft wing, brick, concrete and steel, on Vernon St., to M. J. Kane, 9 Wade St. Total cost, $200,000.

★**Coal Pocket—New Haven, Conn.**—H. W. Walker, 421 Housatonic Ave., Bridgeport, let contract building 17 x 40 ft. frame coal pocket, on Canal St., to Sullivan & McKeown, 843 Dixwell Ave. About $18,000.

Docks—New York, N. Y.—Dept. of Correction, Municipal Bldg., let contract furnishing material and labor for repairing docks, to A. N. Hazell Inc., 26 Cortland St., $27,242.

Structural Steel—Allentown, Pa.—Victor Talking Machine Co. let contract furnishing about 200 tons structural steel for new lumber shed, to Lehigh Structual Steel Co., foot Allen St.

★**Garbage Incinerator—Monessen, Pa.**—Boro. let contract building incinerating plant, to J. T. Barr, 434 Diamond St., Pittsburgh, $23,650. Noted Sept. 18.

★**Pumps—Osceola Mills, Pa.**—Osceola Water Co. let contract furnishing two 400 gal. Booster pumps and force mains from pumps to tanks, to Bravo-Doyle Co., Diamond Bank Bldg., Pittsburgh.

Conduit and Cable—Cleveland, O.—City let contract furnishing 200,000 ft. 2½ x ¼ in. fibre conduit, to Western Electric Co., 413 Huron Rd., cost, $10,547; 40,765 ft. lead encased cable, to Safety Insulated Wire & Cable Co., 700 West Jackson Blvd., Chicago.

★**Pavilion—Norfolk, Neb.**—Norfolk Live Stock Sales Co. let contract building 1 story, 100 x 100 ft. brick and steel, rein.-con. flooring, brick foundation, to T. Eastergaard, Norfolk. About $55,000.

★**Steel—Omaha, Neb.**—Chamber of Commerce, W. O. W. Bldg., let steel contract for 1 story, 115 x 127 ft. wood and steel hangar for airplanes, concrete foundation, on Chamber of Commerce Field, to Omaha Steel Works, 4802 Leavenworth St., $9984.

★**Oil Pipe Lines, etc.—Houston, Tex.**—White Oil Corp., 501-5th Ave., New York City, let contract building about 400 mi. oil pipe lines, pumping stations and tankage, from here to Burkburnett, Wichita Co., to J. G. White Eng. Co., 43 Exch. Pl., New York City. About $5,000,000.

★**Transmission Line—Los Angeles, Cal.**—Bd. Pub. Serv. will build 15 mi. transmission line from Los Angeles to San Pedro, 100,000 volt. Work will be done by day labor. E. F. Scattergood, 645 South Olive St., ch. engr.

★**Levee—Meridian, Cal.**—Reel Dist. No. 70 let contract rebuilding south and portion of river levees and raising east levee, to A. L. Pulford, Colusa, $13,916.

★**Heating and Vacuum Systems—Guelph, Ont.**—Northern Rubber Co. let contract installing heating and vacuum steam systems, in 4 story factory on Metcalfe St., to Frank & Shuett, 92 Macdonnell St. Cost $11,250.

★**Wharf—Hamilton, Ont.**—City let contract building wharf, at Wabasso Park, concrete and wood cribwork, to Canadian Eng. & Contg. Co., Bank of Hamilton Bldg. About $34,100.

★**Wharf—Naramata, B. C.**—Dept. Pub. Wks., Ottawa, Ont., let contract building wharf here, to S. Mays, 1029-5th Ave., New Westminster. Noted Aug. 28.

★**Derricks, etc.—North Vancouver, B. C.**—Wallace Shipyard Ltd., let contract building derricks and extending ship berths at yard to Hobsson, Kane & Marble, 508 London Bldg. About $60,000. Work involves 20,000 lin.ft wood piling and 100,000 ft. timber.

Buildings (Continued)

Mass., Williamstown—Community, etc. —Town Memorial Comn. plans to construct memorial building. About $75,000. Architect not selected.

Mass., Worcester—Nursery—St. Agnes Guild plans to build addition to day nursery, on Vernon St., as memorial to W. F. Davitt. About $50,000. Architect not selected.

R. I., Kingston — Agriculture — Rhode Island State College having plans prepared by E. B. Homer, archt, 87 Weybosset St., Providence, for 3-story, 54 x 120 ft., brick, granite and concrete, on campus. About $65,000.

R, I., Newport — School — St. George's School, Purgatory Rd., having plans prepared by McKim, Mead & White, archts., 101 Park Ave., New York City, for 2-story, memorial school. About $150,000.

R. I., Pascoag — Church — St. Joseph's Roman Catholic Church, plans to build church on Sayles Ave. to replace one recently destroyed by fire. About $50,000. Architect not selected. J. F. Dunn, pastor.

R. I., Providence—College—Brown University, College St., plans to build college, for modern languages. About $150,000. Architect not selected.

R. I., Providence—Gymnasium—Brown University, College St., plans to build brick and steel, on campus. About $75,000. Architect not selected.

R. I., Providence—Hotel—Chamber of Commerce, Bd. Trade Bldg., plans to build hotel on Washington St. About $3,000,000. C. A. Cotton, secy.

R. I., Woonsocket — Church — Notre Dame Roman Catholic Congregation, 253 Social St., plans to build brick and stone church. About $125,000. L. Giroux, pastor. Architect not selected.

R. I., Woonsocket—Church—Universalist Church, Congregational, Main and Church Sts., plans to build 1-story, brick and steel church. About $150,000. E. D. Ellenwood, pastor. Architect not selected.

R. I., Woonsocket—Theatre and Office —A. A. Spitz, Caesar Misch Bldg., Providence, plans to construct 3-story brick building on Main St., here. About $250,000. Architect not selected.

Conn., Bridgeport—Store—Polish Business Men's Assn., 31 Hallett St., plans to construct department store building. About $100,000 J. A. Rutkowski, pres. Architect not selected.

Conn., Bristol—Club—Chamber of Commerce, 244 Main St., plans to build country club and golf course. About $50,000. Architect not selected.

Conn., Bristol—Hospital—Chamber of Commerce, 244 Main St., plans to build hospital. About $125,000. Architect not selected.

Conn., Bristol—Hotel Chamber of Commerce, 244 Main St., plans to build hotel on Prospect St. About $200,000. Architect not selected.

Conn., Bristol—School—School Bd. No. 5 having plans prepared by H. Hayden, archt., 175 Main St., for 2-story, 10-room, brick and steel, in eastern section of city. About $100,000. I. E. Pierce, chn.

Conn., Bristol—School—School Dist No. 1 having plans prepared by W. Potter, archt., 22 east 17th St., New York City, for 2-story, brick, steel and concrete, on Burlington Ave. About $125,000. Address A. F. Woodford, 201 North St. Noted Sept. 18.

Conn., Collinsville — Business—Fradin & Kavaeler having plans prepared by Berenson & Moses, archts., 1026 Main St., Hartford, for 2-story, 60 x 80 ft. brick building, to include stores and bowling alleys. About $50,000.

Conn., Derby—Exchange—Southern New England Telephone Co., 114 Court St., New Haven, plans to build 3-story, brick and steel, on Elizabeth St. About $50,000. Private plans.

Conn., Derby—School—City voted $80,000 bonds to build grammar school, 2nd Ward. Architect not selected. G. P. Sullivan, mayor.

Conn., Elmwood — Housing — New Departure Mfg. Co., 269 North Main St., Bristol, plans to build several houses for workmen, here. About $100,000. Architect not selected.

Conn., Fairfield—Hall—Town plans to build memorial hall. About $100,000. Architect not selected.

Conn., Forestville — Office — Sessions Clock Co., East Main St., having plans prepared by H. Hayden, archt., 175 Main St., Bristol, for 2-story, 50 x 75 ft. brick, concrete and steel building. About $50,000.

Conn., Greenwich — Club—Indian Harbor Yacht Club, Indian Harbor, plans to build clubhouse, to replace one recently destroyed by fire. About $75,000. Architect not selected.

Conn., Hartford — Club — Touro Club, 1003 Main St., plans to build clubhouse. About $50,000. A. Newfield, pres. Architect not selected.

Conn., Hartford—Exchange—South New England Telephone Co., Pearl St., plans to build 6-story, 40 x 100 ft., brick, rein.-con. and steel addition, rein.-con. flooring, on Hicks St. About $200,000. Private engineer.

Conn., Hartford — Schools — Bd. Educ. plans to build school on Greenfield and Redfields Sts. and on Maple Ave. and Benton St. W. H. Scoville, chn. school bd. Architect will soon be selected from competitive drawings.

Conn., Hartford—Ward—Hartford Hospital, 20 Hudson St., plans to construct ward building on Hudson St. About $150,000. Architect not selected.

Conn., Lyme — Gallery — Lyme Art Society, et al, plans to build 1-story memorial art gallery. About $50,000. Architect not selected.

Conn., Meriden—Gymnasium, Hall. etc. —St. Rose Roman Catholic Church, 35 Center St., plans to build gymnasium, assembly hall, meeting and club rooms, on Center St. About $50,000. J. Neale, pastor. Architect not selected.

Conn., Middletown — Armory — State Legislature, Hartford, plans to build 3-story, brick, concrete and steel, on Main St., here. About $150,000. Address W. W. Wilcox, chn. armory bldg. com., 143 High St. About $150,000. Will announce architect later.

Conn., New Britain — Church — Holy Trinity Greek Catholic Church plans to build brick church. About $60,000. A. Borachorich, pastor. Architect not selected.

Conn., New Britain—Exchange—Southern New England Telephone Co., 114 Court St., New Haven, plans to build 40 x 80 ft., on Court St. About $50,000. Architect not selected.

Conn., New Haven—Bank—Mechanics' Bank, Church and Center Sts., having plans prepared by C. S. Palmer, archt., 191 Church St., for 1-story, brick, steel and stone, rein.-con. flooring, concrete foundation, on Church, Center and Gregson Sts. About $150,000. Noted Aug. 28.

Conn., New Haven—Business—Kusterer & Smith, 376 Yale Ave., having plans prepared by F. E. Brown, archt., 11 Autumn St., for brick and steel building, rein.-con. flooring, concrete foundation, on Court St., 6 story, 1st story, 80 x 116 ft. and upper ones 60 x 80 ft. About $100,000.

Conn., New Haven—Loft—J. Kilfeather, 120 Meadow St., having plans prepared by Brown & Von Beren, archts., 185 Church St., for 4-story, 80 x 82 ft., brick and concrete, concrete foundation, on Meadow and Commerce Sts. About $40,000.

Conn., New Haven—Police Station—Bd. Police Comrs. plans to build police station in Cedar Hill Dist. and one on Grand Ave. About $50,000 and $60,000 respectively. Architect not selected.

Conn., New London—Business—A. H. Burr, Alger St., having plans prepared by Bilderbeck & Langdon, Inc., archts., Barrows Bldg., for brick building, on Bank and Montauk Sts. About $50,000. Noted June 12.

Conn., Shelton—High School—Bd. Educ. having plans prepared by Brown & Von Beren, archts., 185 Church St., New Haven, for 2-story, brick and steel. About $125,000. Noted July 24.

Conn., Stafford — High School — Town plans to build brick and steel. About $200,000. Architect not selected.

Conn., Strafford (Bridgeport P. O.)— School—Town plans to build 2-story high school on North Parade St. About $100,000. Architect not selected.

Conn., Torrington — Church—Calvary Baptist Church, Prospect St., having plans prepared by E. H. Waterbury, archt., 60 Main St., altering and building brick addition. About $50,000. W. T. Aiken, pastor.

Conn., Torrington — School — Town plans to build brick and steel, grammar school. About $80,000. C. S. Newcomb, 1st selectman. Architect not selected.

Conn., Torrington—Y. M. C. A., Prospect St., having plans prepared by W. E. Hunt, archt., 197 Water St., for 3-story, brick, concrete and steel building. About $250,000. H. J. Wylie, pres.

Conn., Vernon—High School—Town having plans prepared by W. Potter, archt., 22 East 17th St., New York City, for remodeling 2-story, brick, steel and concrete, on School St. About $85,000. Noted Sept. 18.

Conn., Vernon — School—Town having plans prepared by W. Potter, archt., 22 East 17th St., New York City, for 2-story (10-room) brick and concrete, in west district. About $100,000.

Conn., Wallingford — Armory — State Armory Bd., Hartford, purchased site on Main St. here, and plans to build 2-story armory. About $100,000. Architect not selected.

Conn., West Haven (New Haven P. O.) School—Town having plans prepared by D. E. Smith, archt., West Haven, for 2-story, 8-room, brick, concrete and steel school and assembly hall, on 1st Ave. and Lamson St. About $100,000. J. A. McLoughlin, 241 Spring St., chn. Noted Sept. 18, under "Orange."

Conn., Westport—Y. M. C. A., Greens Farms, plans to construct building on State St., here. About $100,000. Address E. T. Bedford, c/o Y. M. C. A., Greens Farms. Architect not selected.

Conn., Willimantic—Synagogue—Sons of Israel Congregation plans to build 2-story brick and steel synagogue, on Temple St. About $50,000. Architect not selected.

Conn., Windham—School—Town plans to build grammer school on Lockman lot. About $60,000. Architect not selected.

N. Y., Brooklyn—Bank—South Brooklyn Savings Institution, 160 Atlantic Ave., plans to build 80 x 175 ft., brick and stone, brick foundation, on Court St. and Atlantic Ave. Architect or engineer not selected.

N. Y., Brooklyn — Store — Bailey's Department Store, 502 Fulton St., plans to build 10-story, 100 x 200 ft., brick and steel, brick foundation, at 302 Livingston St. About $500,000. Architect or engineer not selected.

N. Y., Frewsburg — School — Bd. Educ. having plans prepared by F. Gruninga, archt., Warren, Pa., for 3-story, 79 x 83 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation. About $80,000. R. A. Freeburg, Jamestown, associate archt.

N. Y., Geneva—Theatre—L. G. Brady plans to build brick and rein.-con., on Castle St About $60,000.

N. Y., Massena—Hotel—F. A. Empsall, Roth Bldg., Watertown, purchased White's Hotel, here, and plans to build 2 and 3-story brick addition. Cost between $75,000 and $85,000.

N. Y., New Rochelle—Theatre—Loews Theatres, 1492 Bway., New York City, having plans prepared by T. W. Lamb, archt., 644-8th Ave., New York City, for altering brick and steel, here. About $100,000.

N. Y., New York—Club—Ameri. Legion, 19 West 44th St., plans to build 4-story, 50 x 100 ft. brick, steel and stone, brick foundation. About $100,000. P. Tillion & Sons, 103 Park Ave., archts. and engrs.

N. Y., New York—Hall—Victory Hall Assn., 32 Nassau St., plans to build 4-story, 197 x 400 ft., brick, steel, stone and marble memorial hall, brick foundation, on Pershing Sq., to include shooting galleries, auditorium, swimming pool, etc. About $5,000,000. G. W. Wingate, chn. Architect not selected.

N. Y., New York—Hospital—Broad St. Hospital, 27 Broad St., having plans prepared for 10-story, 45 x 75 ft., brick, steel and stone addition, brick foundation, at 123-125 Broad St. About $300,000. W. N. Smith, 101 Park Ave., archt. and engr.

N. Y., New York — Hotel — Monterey Hotel, Bway. and 94th St., having plans prepared by Schwartz & Gross, archts. and engrs. 347 5th Ave., for 62 x 100 ft., brick and steel addition, brick foundation, on Bway. and 95th St.

N. Y., New York — Salesroom — Bush Terminal Co., 130 West 42nd St., having plans prepared by Helmle & Corbett, archts. and engrs., 190 Montague St., Brooklyn, altering 9 and 30-story, steel and brick building, at 137 West 41st St. About $400,000.

Buildings (Continued)

N. Y., New York—Stores and Loft—M. J. Harrison, archt. and engr., 63 Park Row, preparing plans for 6-story, brick and steel, brick foundation, on Madison Ave. About $75,000. Owner's name withheld.

N. Y., New York—Store and Loft—S. Well, 194 Franklin St., having plans prepared by C. B. Meyers, archt. and engr., 1 Union Sq., for 9-story, 60 x 100 ft. brick and steel, rein.-con. flooring, concrete foundation, at 502-508 Canal St.

N. Y., New York—Theatre and Office—B. S. Moss, 729 7th Ave., having plans prepared by De Rosa and Pereira, archts and engrs., 110 West 40th St., for 3-story, brick and steel, brick foundation, on Tremont Ave., 176th St., Carter and Webster Aves. About $750,000.

N. Y., Onondaga Hospital Onondaga Co., Syracuse, plans to build 1 and 2-story, 40 x 150 ft. concrete and steel, concrete foundation, at Hoppers Glen, here. Cost between $90,000 and $100,000. M. L. King, Snow Bldg., Syracuse, archt. and engr.

N. Y., Poughkeepsie Alumnae House —Vassar College plans to build alumnae house on campus. About $100,000. Architect not selected.

N. Y., Rochester—Salesroom and Office —S. A. Cooper, pres. Star Wall Paper Co., 17 Elm St., plans to build 2-story, 55 x 200 ft. brick, concrete and steel, at 29-31 Elm St. About $100,000.

N. Y., Schenectady — Office — General Electric Co., River Rd., plans to construct 5-story, 54 x 229 ft., fireproof building, across street from present general offices.

N. Y., Southhold — School — Bd. Educ. having plans prepared by Tooker & Marsh, archts. and engrs., 101 Park Ave., New York City, for brick, steel and stone, brick foundation. About $75,000.

N. Y., Utica—Theatre—B. S. Moss, 729 7th Ave., New York City, plans to build 100 x 100 ft., brick, steel and stone, brick foundation, here. About $400,000. De Rosa & Pereira, 110 West 40th St., New York City, archts. and engrs.

N. Y., Watertown—Store and Office—F. A. Empsall, Roth Bldg., purchased site adjacent to Y. M. C. A. on lower Washington St., and plans to construct 4-story brick, concrete and steel. Cost between $150,000 and $200,000.

N. Y., Watertown — Store and Office—B. B. Taggart, 341 Washington St., plans to build 5-story concrete and steel building, to replace one recently destroyed by fire. About $400,000.

N. Y., Watertown—Y. W. C. A. plans to extend and construct concrete, brick and steel addition to present building, at Franklin Arcade. About $250,000.

N. J., Asbury Park—Theatre and Dance Hall—A. Pryor, c/o Mann & McNeill, archts., 70 East 45th St., New York City, having plans prepared for brick and steel, here. About $500,000.

N. J., Atlantic City—Hotel—D. M. Linnard, c/o Warren & Wetmore, archts. and engrs., 16 East 47th St., New York City, plans to build brick, steel and stone, brick foundation, here. About $15,000,000.

N. J., Bordentown—School—State Bd. Educ., Trenton, plans to build school, here. About $160,000.

N. J., Newark Store and Office—U. S. Cigar Stores, 44 West 18th St., New York City, having plans prepared by L. E. Denslow, archt. and engr., 44 West 18th St., New York City, for 2-story, brick and steel, brick foundation, on West Market, Canal and Broad Sts. About $65,000.

A. J., Pennsgrove—Hall—Borough plans to build hall on Main St. About $60,000.

Md., Baltimore — Fire Station — City having plans prepared by A. Osburn, bldg. inspector, City Hall, for 1-story, rein con., concrete foundation, on Lexington St., near Gay St. About $150,000. Work will be done under supervision of Bd. Fire Comrs.

Md., Baltimore—Hall—Lithuanian Hall Assn. having plans prepared by S. Russell, archt., 11 East Lexington St., for 3-story, 66 x 137 ft., brick and terra cotta, rock foundation, on Parkin and Hollins Sts. About $55,000. A. Lankaitis, 112 North Greene St., chn. bldg. com.

Md., Baltimore—Hospital—Union Memorial Hospital Trustees having plans prepared by J. E. Sperry, archt., 409 Calvert Bldg., for 4-story, 350 x 400 ft., rein-con., steel and brick, concrete and rock foundation, on 34th, 35th and Calvert Sts. and Guilford Ave. About $750,000. S. Rowland, Calvert Bldg., chn.

Md., Baltimore — Office — W. F. Spice, 316 Chamber of Commerce Bldg., plans to build 3-story, 37 x 88 ft., steel, brick and marble, concrete foundation, on South and Water Sts. About $75,000. Smith & May, 1133 Calvert Bldg., archts.

Md., Baltimore Store—United Woolen Mills Co., Coca Coca Bldg., plans to alter and build 2-story, 40 x 70 ft., steel and brick addition, on Calvert and Baltimore Sts. About $60,000. C. M. Anderson, 324 North Charles St., archt.

Md., Baltimore — Synagogue Misken Israel congregation having plans prepared by S. Russell, archt., 11 East Lexington St., for 1 and 2-story, 50 x 130 ft., concrete, brick and granite, concrete foundation, at 2310 Madison Ave. About $150,000. A. Kress, 2318 Eutaw Pl., pres.

Md., Baltimore—Theatre—D. Schwaber, 809 Pennsylvania Ave., plans to build 1-story, 92 x 200 ft., rein.-con. and brick, concrete foundation, at 811-19 Pennsylvania Ave. About $50,000. E. G. Blanke, 13 North Calvert St., arch.

D. C., Washington — Theatre — B. S. Moss, 729 7th Ave., New York City, plans to build brick and steel, here. About $300,000. De Rosa & Pereira, 110 West 40th St., New York City, archts. and engrs.

Va., Portsmouth — Temple — Central Labor Union having plans prepared by R. E. Mitchell & Co., Ltd., archts., Flatiron Bldg., Norfolk, for 6-story, 55 x 104 ft., brick and terra cotta, on Washington and King Sts. About $75,000. W. H. Colein, Jr., 323 Owens Ave., pres.

Va., Richmond—Bank—Bank of Commerce & Trusts, 901 East Main St., plans to build bank, at 517 Hull St. About $75,000. Architect not selected.

Va., Richmond Church — Broad St. Methodist Episcopal congregation plans to build 1-story church, on 10th and Broad Sts. About $250,000. Architect not selected.

Va., Richmond Church and Sunday School—St. John's Lutheran Church, 8th and Marshall Sts., plans to build 1-story, on Lombardy and Franklin Sts. About $200,000. Address O. Guthe, 501 North Lombardy St., pastor. Architect not selected.

Va., Richmond Hospital—Stuart Circle Hospital, Lombardy and Franklin Sts., having plans prepared by C. M. Robinson, archt., Times Dispatch Bldg., for 6-story, 40 x 60 ft., rein.-con. and brick addition. About $75,000.

Va., Rivermont — Hospital — Marshall Lodge of Masons having plans prepared by Craighill & Cardwell, archts., Lynchburg, for home and retreat hospital, brick, here. About $150,000.

Va., Suffolk — Hotel — Tidewater Hotel Corp. having plans prepared by Peebles & Ferguson, archts., Law Bldg., Norfolk, for brick hotel, here. About $150,000.

W. Va., Huntington — School — City plans election to vote on $405,000 bonds to build schools.

W. Va., Morgantown—Law—State Bd. Control, Charleston, had plans prepared by C. M. Bates, archt., Wheeling, for 2-story, brick. About $125,000. J. Lakin, secy. Noted Feb. 27.

N. C., Asheville — Hotel — S. Sternberg plans to build hotel. About $350,000. Architect not selected.

N. C., Dunn Hotel — Dunn Hotel Co. plans to build 4-story hotel. About $100,000. Architect not selected.

N. C., Forest City Hotel—J. F. Alexander plans to build hotel. About $50,000. Architect not selected.

N. C., Greenville - College State Bd. Educ. Raleigh, plans to construct dormitory and extend administration building, brick, at Eastern Carolina Training School here. About $200,000. J. A. Salter Raleigh, state archt.

N. C., Greensboro Office — Jefferson Standard Life Insurance Co. plans to construct office building. About $1,000,000. Architect not selected.

N. C., Lexington—School—City plans to build school. About $75,000. Architect not selected.

N. C., Morganton — Hospital — State Health Comm., Raleigh, plans to construct receiving building and refrigerator plant, at State Hospital for Insane, here. About $100,000. J. A. Salter, Raleigh, state archt.

N. C., Morganton — Hotel — Morganton Hotel Co. plans to build hotel. About $100,000. L. H. Asbury, Realty Bldg., Charlotte, archt.

N. C., Raleigh—College—State Bd. Educ. plans to construct addition to agricultural building, and remodel assembly hall and new dormitory, brick, at A. & E. College, here. About $400,000. J. A. Salter, Raleigh, state archt.

N. C., Roxboro—Court House and Jail—Comrs. Person Co. having plans prepared by H. Barton, archt., Greensboro, for 4-story brick, rein.-con. flooring. About $200,000.

N. C., Scotland Neck — Hotel Burroughs Peltman Wheeler Co. plans to build hotel. About $100,000. Architect not selected.

N. C., Wilmington Church First Baptist Church plans to build addition to church. About $75,000.

N. C., Wilmington Office—H. L. Vollers plan to build 1-story, 60 x 80 ft. About $7,000. H. E. Bonitz, Wilmington, archt.

N. C., Wilson—Bank and Office Planters' Bank of Wilson had plans prepared by F. A. Bishop, archt., Petersburg, Va., for 3-story, 54 x 92 ft., concrete, granite, marble, limestone and brick, on Nash and Goldsboro Sts. About $75,000.

S. C., Charleston Bank Dime Savings Bank having plans prepared remodeling 3-story, 50 x 107 ft. building, on King and Wentworth Sts. About $60,000. J. D. Newcomer, Charleston, archt.

S. C., Charleston — Infirmary — Todd-Simmons-Todd, archts., preparing plans for Thompson Memorial Infirmary, on Calhoun and President Sts., 3-story brick. About $60,000.

Tenn., Knoxville — Theatre — Loew's Theatres, 1492 Bway., New York City, having plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, altering brick and steel, here. About $150,000.

Tenn., Memphis—Church—Linden Ave. Christian Church plans to build church, probably 2-story. About $200,000. Address B. M. Brown, Madison Ave., chn. bldg. com. Architect not selected.

Tenn., Memphis—Church—Sacred Heart Congregation plans to build church. About $85,000. P. A. Canale, Exch. Bldg., chn. bldg. com, Hanker & Cairns, Scimitar Bldg., archts.

Tenn., Memphis—Club—Civic Clubs of Memphis to build 6 or 8-story, probably 200 x 200 ft. About $500,000. Address C. C. Hanson, pres. City Club.

Tenn., Memphis Exhibit Halls, etc.—Tri State Fair Assn. Fair Grounds, plans to construct new exhibit halls and grand stand, and reconstruct existing buildings, on Parkway. About $150,000. F. D. Fuller, secy. Architect not selected.

Tenn., Memphis—Hospital—Jewish residents of Memphis plan to build hospital. About $350,000. E. Gates, Exch. Bldg., chn. building com. Architect not selected.

Tenn., Memphis Hotel Local business men formed syndicate to build 6 or 8-story hotel, on Main and Adams Sts. About $750,000. Address J. I. Sele, Arlington Hotel, Main and Adams Sts. Architect not selected.

Tenn., Memphis—Office—Doctor's Bldg. Co., c/o C. G. Smith, Exch. Bldg., plans to build 16 to 20-story on Court St. About $1,000,000. Architect not selected.

Tenn., Nashville — Theatre — Loew's Theatres, 149 Bway., New York City, having plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, altering brick and steel, here. About $150,000.

Tenn., Ripley—Hotel—Ripley Hotel Co. plans to build hotel on Main St. About $100,000. Address W. Hackett, secy. Architect not selected.

O., Canton—Church—Martin Lutheran Church having plans prepared by Albrecht, Wilhelm & Kelley, architects, 1906 Euclid Ave., Cleveland, for 1-story, 100 x 137 ft., concrete, steel and brick, at 625 Walnut St. About $60,000.

O., Canton—Commercial—Canton Associated Realty Co., 104 3rd St., S. W., having plans prepared by W. Hirsh, archt., 1900 Euclid Ave., Cleveland, for 2-story, 54 x 56 ft., concrete, steel and brick, at 817 5th Ave. About $50,000.

O., Chesterland—Sanitarium—St. Andrew's Benevolent Society, 1451 Hopkins Ave., Cleveland, plans to build 3-story, rein.-con., steel and brick, on 84-acre site, here. About $100,000. Architect not selected.

O., Cincinnati—Lodge—Cincinnati Elks' Lodge No. 5, Elm St. near 9th St., considering site and plans to construct lodge building. About $250,000. Architect and engineer not selected.

Buildings (Continued)

O., Cleveland—Bank and Office—Citizens Savings & Trust Co., Citizens Bldg., having plans prepared by Graham, Anderson, Probst & White, archts. and engrs., Ry. Exch. Bldg., Chicago, for 20-story, 258 x 383 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on Euclid Ave. and East 9th St. About $8,000,000.

O., Cleveland—Church—Plymouth Congregational Church, 3048 Chadbourne Ave., having plans prepared by C. S. Schneider, 258 Euclid Ave., for 2-story, 100 x 200 ft., rein.-con., steel and brick, on Drexmore Rd. About $250,000.

O., Cleveland — Commercial — Hinning Bldg. Furniture Co., St. Clair Ave., having plans prepared by D. T. Oliver, archt., 2851 Euclid Heights Blvd., for 3-story, 79 x 84 ft., rein.-con., steel and brick. About $75,000. Noted Sept. 18.

O., Cleveland—Commercial—A. A. Newman, 9492 Lorain Ave., having plans prepared by R. M. Hullett, archt., 419 Erie Bldg., for 3-story, 59 x 125 ft., rein.-con., steel and brick, on West 95th St. and Lorain Ave. About $75,000.

O., Cleveland — Commercial — M. Striebinger, 6520 Euclid Ave., plans to build 2-story, 46 x 97 ft., concrete, steel and brick, at 1402 West 25th St. About $50,000. Architect not selected.

O., Cleveland — Commercial — Wilbrand Co., 2031 Euclid Ave., plans to build 2-story, 150 x 200 ft., concrete, steel and brick, at 1910 East 21st St. About $250,000. Architect not selected.

O., Cleveland—Hotel—M. Jacobson, 3131 Carnegie Ave., plans to remodel 6-story, 87 x 125 ft., rein.-con., steel and brick, on Payne Ave. and 14th St. About $75,000. Architect not selected.

O., Cleveland—Jail—Cuyahoga Co. defeated $3,500,000 bond issue to build 4-story, 100 x 200 ft., concrete, steel, brick and stone, rein.-con. flooring, concrete foundation, on Lakeside Ave. and West 3rd St. Plans will be revised and another election held about February. W. S. Lougee, Marshall Bldg., engr.

O., Cleveland—Market—Erie Realty Co., Erie Bldg., plans to build 1-story, 78 x 150 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, in rear of Bangor Bldg. About $150,000. Walker & Weeks, Euclid Bldg., archts.

O., Cleveland — Market—Woodland-55th St. Co., 510 Amer. Trust Bldg., having plans prepared by S. H. Weis, archt., Schofield Bldg., for 3-story, 200 x 273 ft., rein.-con., steel and brick, on East 55th St. and Woodland Ave. About $500,000. Noted May 29.

O., Cleveland—Office and Sales—J. O. Hahn and A. De Roy, 2020 Euclid Ave., plans to build 6-story, 80 x 199 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, at 3436 Euclid Ave. About $750,000. Architect not selected.

O., Cleveland — Office — A. L. Newman, 617 Euclid Ave., having plans prepared by W. H. Nickas, archt., 1900 Euclid Ave., for 1-story, 70 x 100 ft., rein.-con. steel and brick addition, at 1126 Euclid Ave. About $60,000. Noted Sept. 18.

O., Cleveland — Office — F. W. Wallace, Citizens Bldg., plans to build 14-story, 101 x 146 ft., rein.-con., steel and brick, on East 4th St. and Euclid Ave. About $1,500,000. Architect not selected.

O., Cleveland—Store—G. W. Koch & Son Co., 10300 Euclid Ave., plans to build 3-story, 60 x 180 ft., concrete, steel, brick and terra cotta, rein.-con. flooring, concrete foundation, on 100th St. and Euclid Ave. About $150,000. Private plans.

O., Cleveland—Theatre and Office—Euclid-17th Co., 214 Williamson Bldg., having plans prepared by T. W. Lamb, engrs. and archts., 1323 Euclid Ave., for 4-story, 86 x 132 ft., concrete, steel and brick, on East 17th St. near Euclid Ave. About $200,000.

O., Cleveland — Theatre — Euclid 17th Co., 214 Williamson Bldg., having plans prepared by T. W. Lamb, archt., 1323 Euclid Ave., for 3-story, 124 x 176 ft., rein.-con., steel and brick, on East 17th St. and Euclid Ave. About $350,000.

O., Cleveland—Theatre—Euclid 102nd St. Impvt. Co., Electric Bldg., plans to build 4-story, 101 x 134 ft., rein.-con., steel and brick, at 2001 East 102nd St. About $250,000. Architect not selected.

O., Cleveland—Theatre and Stores—Gordon Square Co., West 65th St. and Detroit Ave., plans to build 3-story, 150 x 225 x 267 ft., concrete, steel, brick and terra cotta, rein.-con. flooring, concrete foundation. About $700,000. W. G. Caldwell, 1206 Williamson Bldg., archt.

O., Cleveland Heights (Warrensville P. O.)—Schools Bd. Educ., 340 Leader News Bldg., Cleveland, having plans prepared by F. C. Warner, archt., 768 Hippodrome Annex, Cleveland, for 2-story, 140 x 175 ft., rein.-con., steel and brick addition, on Noble Rd., cost $125,000; 2-story, 100 x 230 ft., rein.-con., steel and brick addition, on Fairfax Rd., $150,000.

O., Columbus—Home—Salvation Army, 584 South High St., having plans prepared by Ohio State University, under direction of J. N. Bradford, for 2 and 4-story, 50 x 187½ ft., concrete and brick, on West on Broad St. About $90,000.

O., Dayton — Bank and Office—Amer. Natl. Bank, 30 South Main St., plans to build 6-8-story, 50 x 200 ft., rein.-con., brick or tile, rein.-con. flooring, concrete foundation, on South Main St. About $500,000. Architect not selected.

O., Dayton — Bank and Office—Third Natl. Bank, Main St., plans to build 116 x 180 ft., rein.-con. stone and brick, rein.-con. flooring, concrete foundation, on North Main St. About $400,000. Architect not selected.

O., Dayton—Office—Fidelity Bldg. Assn., 5th and Main Sts., plans to build 6-story, 37 x 100 ft., rein.-con. and brick addition, rein.-con. flooring, concrete foundation. About $200,000. Architect not selected.

O., Dayton—School—City plans to build 4-story, rein.-con., steel and brick, rein.-con. flooring, concrete foundation, on Eaton Ave. Plans include auditorium, gymnasium, shops, etc. About $400,000. Architect not selected.

O., Dayton—School—St. James' Parrish, Edgemont, plans to build 2-story, 60 x 130 ft., rein.-con., brick and stone, rein.-con. flooring, on Heck Ave. About $150,000. E. Koch, pastor. W. L. Jaekle, 1300 U. B. Bldg., archt.

O., Defiance—School—Bd. Educ. Tiffin Twp., Defiance Co., having plans prepared by McLaughlin & Hulsken, archts., Lima, for 1-story, 150 x 200 ft., brick, here.

O., Franklin—School—Bd. Educ. plans to build 3-story, concrete and brick. About $100,000. G. Hildebrand, clk. Architect not selected.

O., Hamilton—Library—City plans to build 2-story, rein.-con., faced with stone or terra cotta. Cost between $50,000 and $75,000. Architect not selected. Boosters Club now arranging campaign to raise funds.

O., Hamilton—School—Bd. Educ. plans to build 3-story, rein.-con. and brick, concrete foundation, in southern part of city. About $160,000. Architect not selected.

O., Kent—School—Bd. Educ. having plans prepared by Mills & Millspaugh, archts., Marshall Bldg., Cleveland, for 2-story, 50 x 125 ft., concrete, steel and brick, here. About $50,000.

O., Lakewood (Cleveland P. O.)—Church—Lakewood Lutheran Church plans to build 1-story, 46 x 94 ft., concrete, steel and brick, rein.-con. flooring, concrete and brick foundation, on Detroit and Hall Aves. About $50,000. H. A. Kurth, 1281 Nicholson Ave., chn. Architect not selected.

O., Mansfield—Parish House—First Congregation Society having plans prepared by E. B. Caldwell, Jr., archt., 886 Main St., Bridgeport, Conn., for 2-story, brick and steel. About $75,000.

O., Perry—School—Bd. Educ. having revised plans prepared by R. H. Hinsdale, archt., Bangor Bldg., Cleveland, for 2-story, 100 x 150 ft., concrete, steel and brick, on Wilson St. About $100,000. Former bids rejected. Noted July 24.

O., Sidney—Theatre and Store—N. C. Deweese & Co., Poplar St., plans to build 3-story, 75 x 125 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on West Poplar St. About $150,000. Architect not selected.

O., Springfield — Court House — Clark Co. plans to remodel court house, add 1 story, refinish interior, etc. About $95,000.

O., Springfield—Store and Office—Boston Store, 42-50 South Limestone St., plans to build 5-story, 70 x 130 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on South Limestone St. About $300,000. C. E. Dahlgren, mgr. Architect not selected.

O., Youngstown — Church — St. Paul's Reform Church, West Boardman St., plans to build 1-story, on Glenaven and Oak Hill Aves. About $50,000. Architect not selected.

O., Xenia—Hospital—Greene Co. plans to build 3-story, rein.-con. and brick, rein.-con. flooring, concrete foundation, here. About $200,000. Address W. H. Galloway, Xenia. Architect not selected.

Mich., Alpena — Hall — Ameri. Legion having plans prepared by A. H. Gould & Sons, archts and engrs., 611 Empire Bldg., Detroit, for 2-story, rein.-con., brick and steel memorial hall, rein.-con. flooring. About $60,000.

Mich., Detroit—Club House—Metropolitan Club, Local No. 1, Elks Temple, Lafayette Blvd., plans to build 3 or 4-story, rein.-con., brick and steel, rein.-con. flooring, on Jefferson Ave. About $100,000. Architect not selected.

Mich., Detroit — Jail—Bd. Supervs. Wayne Co. plans to build brick and steel, on Clinton and Raynor Sts. About $400,000. Address J. C. McCabe, County Bldg., chn. bldg. com. Architect not selected.

Mich., Detroit—Stores—Stahl & Kinsey, archts., 435 Woodward Ave., preparing plans for 2-story, 77 x 110 ft., brick, steel and stone, brick foundation, on Gartner Ave. About $60,000. Owner's name withheld.

Mich., Grand Rapids—Church—Trinity Methodist Episcopal Church having plans prepared by W. E. N. Hunter, archt., 1306 Chamber of Commerce Bldg., Detroit, for 2-story, 180 x 180 ft., brick and steel, concrete foundation. About $200,000.

Mich., Grand Rapids—Home—Comrs. Kent Co. had tentative plans prepared by Osgood & Osgood, archts. and engrs., 8-10 Fulton St., E., for Juvenile Home, 2 story, 125 x 200 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation. About $150,000.

Mich., Grand Rapids—School—School Dist. No. 6 had plans prepared by F. P. Allen & Son, archts., 463 Houseman Bldg., for 2-story, concrete and brick, on Knapp St. About $50,000.

Mich., Owosso—Hospital—City plans to build memorial hospital, on West King St. About $150,000. J. H. Robbins, member of bd. trustees. Architect not selected.

Mich., Port Huron—Armory—City and State plan to build 2-story, brick and steel, concrete foundation, on Park and Ontario Sts. About $60,000. C. W. Haensel, chn., Bd. of Commerce. Architect not selected.

Ill., Alton—Hospitals—Alton State Hospital plans to construct 12 brick hospital additions, rock foundation. About $510,000. Architect not selected.

Ill., Chicago — Office — Bd. Trade had plans prepared by Holabird & Roche, archts., 104 South Michigan Ave., for 17-story, 125 x 125 ft. steel, concrete foundation, on Jackson and La Salle Sts. About $5,000,000. Plans may be revised.

Ill., Chicago — School — Imaculate Conception Church, 44th and Garfield Sts., had plans prepared by E. Brielmaier & Sons Co., archts. and engrs., University Bldg., Milwaukee, Wis., for 2-story, 67 x 165 ft., brick and rein.-con., rein.-con. flooring, concrete foundation. About $60,000.

Ill., Chicago—Theatre—Lubiner & Trinz, 25 East Jackson St., having plans prepared for 1-story, 170 x 225 ft. rein.-con. and steel, rein.-con. flooring, concrete foundation, on Milwaukee and Sawyer Aves. About $900,000. W. W. Ahlschlager, 111 West Washington St., archt.

Ill., Chicago—Theatre and Offices—W. W. Ahlschlager, archt., 111 West Washington St., head of company being formed, plans to build 18-story, 100 x 151 ft., on Michigan Blvd. and Grand Ave. About $3,000,000.

Ill., East St. Louis—Hotel and Theatre—J. Brennan, Natl. Bank Commerce Bldg., St. Louis, plans to build 3 and 13-story, 133 x 375 ft. brick and steel, rein.-con. flooring, rock and stone foundation, on Collinsville Ave. About $2,000,000. Private plans.

Ill., Evanston — High School — High School Dist., 1217 Ridge Ave., plans to build 3 or 4-story, brick and rein.-con., rein.-con. flooring, concrete foundation, on Elmwood Ave. and Dempster St. About $1,000,000. Architect not selected.

Ill., Homewood—Club—Calumet Country Club having plans prepared by Puckey & Jenkins, archts., 6 North Michigan Ave., Chicago, for 2-story, 150 x 150 ft., stucco, tile and rein.-con., rein.-con flooring, concrete foundation, on 175th St. and Dixie Highway. About $300,000.

Wis., Appleton—Office—Aid Assn. for Lutherans, 1st Natl. Bank Bldg., plans to build 5-6-story, brick and stone. About $200,000

Wis., Chippewa Falls—Office—E. G. Pannier & Son, 916 Prairie St., having plans prepared by Schling & Bailey, archts., 53 West Jackson Blk., Chicago, for 2-story, 130 x 200 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation. About $125,000.

Buildings (Continued)

Wis., Dousman — Hospital and Home —Wisconsin Masonic Home Com. having plans prepared by A. D. Koch, archt., Wells Bldg., Milwaukee, for 2-story hospital and 2-story, 100 x 200 ft. home, here, both rein.-con. and brick, rein.-con. flooring, concrete foundations. About $50,000 and $250,000 respectively. Address A. E. Matheson, 624 St. Lawrence Ave., Janesville, chn.

Wis., Janesville — High School — Bd. Educ. plans to build 3-story, 180 x 210 ft. rein.-con. and brick, rein.-con. flooring, concrete foundation. About $300,000. Van Ryn & De Gelleke, Caswell Blk., Milwaukee, archts.

Wis., Kenosha—Theatre—C. Pacini, 258 Main St., having plans prepared by H. Crane, archt., 2323 Dime Bank Bldg., Detroit, Mich., for 3-story, 32 x 125 ft., brick and terra cotta, on Main St. About $200,000. Noted Feb. 6.

Wis., La Crosse — School — Common Council plans to issue $300,000 bonds to build new schools.

Wis., Manitowoc — High School — Bd. Educ. having plans prepared by Perkins, Fellows & Hamilton, archts., 814 Tower Court, Chicago, Ill., for 3-story, brick, timber and stone, rein.-con. flooring. About $150,000.

Wis., Manitowoc — Theatre — George Bros., 913 South 8th St., plan to build 100 x 125 ft. brick, concrete and steel. About $150,000.

Wis., Mauston—Theatre—L. A. Hasse and F. L. Van Wie plan to build 2-story, 110 x 200 ft. brick, concrete and stone, theatre, auditorium, billiard hall and bowling alley.

Wis., Middleridge (Bangor P. O.)—Church—St. Peter's Catholic Church having plans prepared by Liebert & Liebert, archts., 1st Wisconsin Natl. Bank Bldg., Milwaukee, for 46 x 114 ft., brick and steel, concrete foundation. About $50,000.

Wis., Milwaukee — Church — German Baptist Church having plans prepared by Leiser & Holst, archts., 105 Wells St., for 2-story, brick, on Kilbourn and Pine Sts. About $65,000.

Wis., Milwaukee — Home — St. John's Home for Aged Women, 640 Cass St., plans to build 3-story, rein.-con. and brick, rein.-con. flooring, concrete foundation, on Farwell and Bradford Sts. About $100,000. Kirchhoff & Rose, Majestic Bldg., archts.

Wis., Neilsville — Hospital — Clark Co. plans to build hospital for insane. About $225,000.

Wis., Racine — School — City plans to build 2-story, 92 x 246 ft. rein.-con. and brick addition, rein.-con. flooring, concrete foundation, on Center St. About $100,000. E. B. Funston Co., Robinson Bldg., archts.

Wis., Reedsburg — High School — City Council adopted resolution to build addition. About $60,000.

Wis., Sheboygan—Store and Office—A. Imig, North 8th St., having plans prepared by Juul & Smith, archts., Imig Bldg., for 3-story, 50 x 90 ft. brick, rein.-con. and tile, brick foundation, on New York Ave. About $50,000. Noted Sept. 11.

Wis., Tomah—High School—Bd. Educ. having plans prepared by H. C. Haseure, archt., Colby-Abbot Bldg., Milwaukee, for 3-story, 50 x 60 ft. brick addition, concrete foundation. About $60,000. C. B. Browatski, clk.

Wis., Wauwatosa—Church—Methodist Episcopal Church plans to build brick and stone on Wauwatosa Ave. About $50,000. Herbst & Kuenzli, Caswell Blk., Milwaukee, archts. and engrs.

Ia., Bondurant—School—Bd. Educ. Consolidated Dist. plans to build 2-story, rein.-con. Bonds for $100,000 voted for project. Bird & Rawson, Des Moines, archts.

Ia., Calamus—School—Bd. Educ. having plans prepared by C. A. Dieman & Co., archts., 408 Granby Bldg., Cedar Rapids, for 3-story, 65 x 85 ft., brick, concrete and steel, concrete foundation. About $60,000.

Ia., Des Moines—Office—Des Moines Duplication Co., Securities Bldg., had plans prepared by Hraetsch & Hraetsch, archts., St. Louis Bldg., for 8-story, 66 x 132 ft., brick, rein.-con. and stone, on Grant Ave. About $200,000.

Ia., Ft. Dodge—Y. W. C. A., c/o F. Adams, having plans prepared by Damon & O'Meara, archts., Ft. Dodge, constructing 4-story, brick, rein.-con. and steel addition to building, rein.-con. flooring, concrete foundation. About $100,000.

Ia., Iowa City — Armory — State Bd. Educ., Des Moines, having plans prepared by Proudfoot-Bird & Rawson, archts., Hubbell Bldg., Des Moines, for 3-story, 90 x 180 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, here. About $200,000.

Ia., Marshalltown — City Hall — City having plans prepared by H. E. Reimer, archt., Marshalltown, for 2-story, 40 x 136 ft., concrete, brick and steel, rein.-con. flooring, concrete foundation, here. About $50,000. Noted Sept. 11.

Ia., Newton — Hotel — Commercial Club having plans prepared by J. J. Cooper, archt., Des Moines, building 3-story, brick, rein.-con. and steel, here. About $150,000.

Ia., Sioux City—Hotel—F. Davis, 302 Nebraska St., J. S. Casey and Howard Realty Co. plan to build 10-story, brick, on Jackson and 4th Sts. About $250,000. Architect not selected.

Ia., Sioux City—Hotel—Sioux City Hotel Co., c/o W. Gordon, having plans prepared by Marshall & Fox, archts., 721 North Michigan Ave., Chicago, for 8-story, 150 x 150 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on 7th and Pierce Sts., here. About $1,500,000.

Ia., Sioux City—Temple—Scottish Rite Templars having plans prepared by H. Holmes, archt., 30 North Michigan Ave., Chicago, Ill., for 3-story, 140 x 255 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on 12th St. About $750,000. Westcott Eng. Co., 111 West Washington St., Chicago, engrs.

Ia., Stuart — School and Convent — Roman Catholic Church having plans prepared by Damon & O'Meara, archts., Ft. Dodge, for 3-story, 60 x 100 ft., brick, concrete and steel, concrete foundation. About $55,000.

Minn., Arco—School—Bd. Educ. having plans prepared by W. Macomber, archt., Essex Bldg., Minneapolis, for 2-story, 60 x 140 ft., brick and stone. About $60,000. G. Christenson, clk.

Minn., Crosby — High Schools — City voted $100,000 bonds to build high school and $35,000 for addition to Jefferson School. H. Olts, clk.

Minn., Duluth—Business—J. D. Howard & Co., Providence Bldg., having plans prepared by Holstead & Sullivan, archts., Palladio Bldg., for 2-story, 50 x 140 ft., rein.-con. and brick, rein.-con. flooring, brick foundation, on Superior St., near 3rd Ave., W. About $80,000.

Minn., Minneapolis—Bank and Office—E. C. Haley, archt., 604 Wilmac Bldg., preparing preliminary plans for 3-story, 60 x 95 ft., steel and brick, in Camden Place. About $50,000. Owner's name withheld.

Minn., Minneapolis — Temple — United Holding & Investment Co., Security Bldg., plans to build 8-story, 132 x 157 ft., rein.-con. and brick labor temple, on 5th Ave., S. and 7th St. About $500,000. Architect not selected.

Minn., Minneapolis—Theatre and Office—Industrial Investment Co., 807 Hennepin Ave., having plans prepared by J. E. D. Pridmore, archt., 38 South Dearborn St., Chicago, for 12-story, 200 x 230 ft., with 50 x 60 ft. wing, rein.-con. and granite, on 8th St. and Hennepin Ave. About $400,000.

Minn., Morton—School—Bd. Educ. having plans prepared by K. T. Snyder, archt., Plymouth Bldg., Minneapolis, remodeling 2 story, brick and stone. About $52,000.

Minn., Rochester—Hotel and Cafeteria—C. Grassie, 110 South Bway. St., having revised plans prepared by A. Rose, archt. and engr., 632 Builders' Exch., Minneapolis, for 5-story, 80 x 88 ft., brick. About $175,000. Former bids rejected. Noted July 3.

Minn., St. Cloud — Court House — Stearnes Co. plans to build 208 x 225 ft., court house, here. About $400,000. Architect not selected.

Minn., St. Paul—Hotel—T. Curtis, Curtis Hotel, Minneapolis, having plans prepared by Long, Lamereaux & Long, archts., Andrus Bldg., Minneapolis, for 15-story, 200 x 350 ft., rein.-con. and brick, on Summit Ave. About $2,000,000.

Minn., St. Paul—Office—Daily News Publishing Co., 94 East 4th St., having plans prepared by Toltz, King & Day, archts. and engrs., 1710 Pioneer Bldg., for 75 x 135 ft., rein.-con. and brick, on 4th St. between Cedar and Minnesota Sts. About $200,000.

Minn., St. Paul—Store—Emporium Merc. Co., 7th and Robert Sts., having revised plans prepared by Buechner & Orth, archts. Shubert Bldg., for 5-story, 75 x 100 ft. addition. About $150,000. Noted Aug. 28.

Minn., Waubun — High School — Bd. Educ. having plans prepared by K. T. Snyder, archt. and engr., 933 Plymouth Bldg., Minneapolis, for 2-story, 65 x 130 ft., rein.-con. and brick. About $100,000.

Kan., Baldwin—School—Bd. Educ. plans to build 2-story school. Abount $70,000. W. E. Hulse & Co., Hutchinson, archt.

Kan., Hutchinson—Theatre—Columbia Realty & Amusement Co., c/o M. B. Shamberg, 1818 Grand Ave., Kansas City, Mo., having plans prepared by F. McIlvain, archt., Kansas City, Mo., for 2-story, 50 x 150 ft., brick, rein-con., flooring, concrete and rock foundation, on Sherman and Main Sts., here. About $160,000.

Kan., Junction City—Temple—Masonic Order plans to build 2-story, rein.-con., steel and brick, concrete foundation. About $55,000. S. D. Turnbull, Junction City, archt.

Kan., Lawrence — High School — Bd. Educ. having plans prepared by W. B. Ittner, archt., Bd. Educ. Bldg., St. Louis, Mo., building, 3-story, stone, memorial high school, rein.-con. flooring, concrete and rock foundation. About $230,000. Noted Mar. 13.

Kan., Ness City — High School — Bd. Educ. having plans prepared by R. A. Curtis, archt., Kansas City, Mo., for 3-story, brick and rein.-con., rein.-con. flooring. About $65,000. Noted July 17.

Kan., Wichita — Bank — Kansas Nat'l Bank, Main and Douglas Sts., having plans prepared by Richard, McCarthy & Bulford, archts., Hartman Bldg., Columbus, O., for 11-story, 93 x 96 ft., rein.-con. and brick, rein.-con. flooring, rock and concrete foundation. About $1,000,000. Noted Sept. 25.

Kan., North Topeka — Church — First Baptist Church raising funds to build new 2-story church. About $50,000. Architect not selected.

Neb., Clay Center—High School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., Hutchinson, Kan., for a 2-story, 85 x 150 ft., rein.-con., steel and brick, rock and concrete foundation. About $125,000. Noted Aug. 28.

Neb., Columbus Court House—Comrs. Platt Co. had preliminary plans prepared by C. W. Wurdeman, archt., Columbus Bldg., 4-story, 70 x 160 ft., rein.-con., steel and brick, rein.-con. flooring, rock foundation. About $225,000. Noted Aug. 7.

Neb., Norfolk —High School—City voted $450,000 bonds to build senior High School and addition to Washington School, etc.

Neb., Norfolk—Hotel—Norfolk Hotel Co. plans to build 4-story, on 4th St. and Norfolk Ave. About $80,000. Architect not selected.

Neb., Norfolk—Kitchen—State Hospital for Insane having plans prepared by J. C. Stitt, archt., Norfolk, for 1-story, 75 x 150 ft. rein.-con., steel and brick, rein.-con. flooring, rock foundation. About $80,000.

Neb., Omaha — Court House — Douglas Co. having plans prepared by J. Latenser & Sons, archts., 632 Bee Bldg., remodeling court house, partially destroyed by fire. About $250,000.

Neb., Omaha—Home—Salvation Army, 1711 Davenport St., had preliminary sketches prepared for 5-story, 99 x 132 ft., concrete and brick, on 18th and Cass Sts. About $250,000. G. B. Prinz, 1037 Omaha Natl. Bank Bldg., archt.

Neb., Ord—Court House—Comrs. Valley Co. plans to build 3-story, 78 x 101 ft. rein.-con., steel and brick, rein.-con. flooring, rock and concrete foundation. About $140,000. W. F. Gernandt, 634 Keelins Bldg., Omaha, archt. Noted Aug. 7.

Neb., Oshkosh—Court House—Garden Co. will vote on $75,000 bonds to build new court house.

S. D., Brookings Hotel—P. Hall having plans prepared for 4-story, 75 x 165 ft., stone, granite and marble. About $175,000. C. E. Bell, 900 Andrus Bldg., Minneapolis, Minn., archt.

S. D., Mickling—High School—Bd. Educ. Consolidated Dist., having plans prepared by W. E. Hulse & Co., archts., Hutchinson, Kan., for high school. About $65,000.

N. D., Fargo—Business—Union Investment Co. having plans prepared by W. F. Kurke, archt., Equity Bldg., for 3-story addition, on Bway. and 1st Ave. About $75,000. A. E. Bestic, mgr.

N. D., Killdeer —Home—I. O. O. F. plan to build home. About $60,000. Architect not selected.

Wyo., Casper—Bank and Store—Richards & Cunningham and Casper Natl. Bank plan to build 1-story addition to department store and alter bank. About $150,000.

Buildings (Continued)

Mont., Choteau — High School — Teton Co. voted $1,0?0 bonds to build high school. F. Daly, Choteau, engr. Noted July 3.

Mont., Columbus Court House—Stillwater Co., voted $75,000 bonds to build court house. G. N. Cardoza, Columbus, engr. Noted May 23.

Mont., Forsyth—Hospital—Rosebud Co. voted $75,000 bonds to build hospital. J. N. Edy, Helena, engr. Noted July 10.

Mont., Plentywood — School Dist. No. 20 plans to build 2-story, 200 x 200 ft. school. About $60,000. F. F. Bousset, Havre, archt.

Mo., Desloge—Schools Consolidated Bd. Educ. having preliminary plans prepared by R. H. Sanneman, archt., 519 Reserve Bank Bldg., Kansas City, for 2 concrete, steel and brick schools. About $100,000.

Mo., Joplin—Church Roman Catholic Church plans to build 2-story, concrete, steel and brick, concrete foundation, on 23rd and Bird Sts. About $75,000. D. J. O'Driscoll, priest. Architect not selected.

Mo., St. Charles—Dormitories—Lindenwood College had plans prepared by La Beaume & Klein, archts., Chemical Bldg., St. Louis, for two 4-story, 35 x 60 ft. additions, and various other improvements. About $60,000.

Mo., St. Louis—Mercantile and Office—G. F. Towers, c/o Holbrook, Blackwelder Co., engrs., 812 Chestnut St., plans to build 6-story, 100 x 150 ft., brick, rock foundation, on 6th and Olive Sts. About $500,000. Architect not selected.

Mo., St. Louis Sanitarium—City plans to build 4 or 5 story, 100 x 150 ft., concrete and brick, rock foundation, on Arsenal St. About $75,000. C. E. Smith, city engr.

Mo. Springfield—Temple—Masonic Bldg. Assn., East Walnut St., had preliminary plans prepared by Heckenlively & Mark, archts., Landers Bldg., for 3-story, 140 x 200 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $300,000.

Tex., Amarillo—Hotel—Amarillo Hotel plans to build 100-room addition. About $200,000.

Tex., Ft. Worth—Theatre—E. H. Hulsey, 3900 Euclid Ave., Dallas, plans to build theatre, here. Architect and engineer not selected.

Tex., Harrisburg—School—Independent School Dist. voted $100,000 bonds to improve buildings and construct school near Sinclair Gulf Refinery. Address Harris Co. Bd. Educ.

Tex., Mercedes — School — School Bd. having plans prepared by H. F. Kuehne, archt., 826 Littlefield Bldg., Austin, building 1-story, 150 x 217 ft., brick, rein-con. flooring, brick and concrete foundation, on 10th St. About $70,000.

Tex., Wichita Falls Ft. Worth & Denver Co., Denver-Record Bldg., Ft. Worth, plans to construct 2-story, rein.-con. office building and freight depot at corner of 7th and Michigan Sts., here. About $200,000.

Tex., Yoakum—Lodge and Theatre—B. P. O. E. plan to build 3-story, 50 x 150 ft. About $60,000. L. Harrington & Co., Frost Bldg., San Antonio, archts.

Okla., Altus — Auditorium — City voted $60,000 bonds to build brick auditorium. Architect and engineer not selected.

Okla., Altus—Hospital—City voted $55,000 bonds to build hospital. Architect and engineer not selected.

Okla., Bigheart—Theatre—C. A. Runyon having plans prepared by G. Winkler, archt., 414 Palace Bldg., Tulsa, for 50 x 120 ft. rein.-con., rock and brick foundation, on Main St. About $50,000.

Okla., Enid — Temple — Masonic Assn., 202½ West Main St., having plans prepared by R. W. Shaw, archt., Beck Bldg., for 3-story, 100 x 150 ft. brick, rein. con. and stone, rein.-con. flooring. About $200,000.

Okla., Fairfax—City Hall—City voted $50,000 bonds to build 57 x 70 ft. brick, rein.-con. flooring. J. O. Bradley, Pawhuska, archt. Noted Sept. 4.

Okla., Hartshore Community—Methodist Episcopal Church having plans prepared by Hawk & Parr, archts., 501 Security Bldg., constructing 2 story, 32 x 80 ft. stone, rein.-con. flooring, concrete foundation. About $75,000.

Okla., McAlester Church—Methodist Episcopal Church plans to build 2-story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. Architect not selected.

Okla., Muskogee—Temple—I. O. O. F. plans to build temple. About $500,000. City appropriated $100,000 toward cost.

Okla., Norman — Church — Methodist Episcopal Church having plans prepared by Monnott & Reid, archts., Oklahoma, for 2-story, 48 x 82 ft. rein.-con., steel and brick, concrete foundation. About $55,000.

Okla., Oklahoma—Bank, Club and Office—Oklahoma Club, Terminal Bldg., and Farmers Natl. Bank, Grand and Hudson Sts., having plans prepared by Hawk & Parr, archts., 501 Security Bldg., for 10 or 12 story, 125 x 140 ft., rein.-con. or steel, brick and stone, rein.-con. and tile flooring, concrete foundation. About $600,000.

Okla., Oklahoma—Cathedral—Scottish Rite Consistory, Guthrie, having preliminary plans prepared by Hawk & Parr, archts., 501 Security Bldg., for 2 or 3-story, rein.-con., steel and stone, or granite, rein.-con. flooring, concrete foundation, on 10-acre site, old capitol grounds. About $3,000,000; cost plus percentage basis.

Okla., Oklahoma—Coliseum—City plan to build coliseum. About $200,000. Local business men appropriated $100,000 toward cost. M. D. Scott, member bldg. com.

Okla., Okmulgee — Business—E. R. Black having plans prepared by Smith, Rea, Lovitt & Senter, archts., Okmulgee, for 3 story, 60 x 180 ft., on Main St. About $100,000.

Okla., Okmulgee—Business—McCracken Mitchell Hardware Co. plan to build 3-story, 50 x 140 ft., on 7th and Grand Sts. About $75,000. Architect will be selected at once.

Okla., Okmulgee—Business—Mathews, Baker & Stuart plan to build 2-story, 100 x 100 ft. brick, concrete foundation. About $80,000. Architect to be selected at once.

Okla., Pawhuska—Hospital—City plans to build 2-story, brick. Bonds for $50,000 voted for project.

Okla., Pawhuska—Office—Marland Refining Co. plans to construct office building. About $500,000. Architect not selected.

Okla., Ponca City — City Hall — City plans to build 3-story, on South 1st St. About $150,000. Architect not selected.

Okla., Ponca City—Church—Presbyterian Church plans to build church. About $55,000. Architect not selected.

Okla., Sand Springs — Office — C Page having plans prepared by D. Eichenfield, archt., 830 Mayo Bldg., for 3-story, 40 x 147 ft., brick, brick foundation, on Main St. About $50,000.

Okla., Stillwater—Library and Economics—Oklahoma A & M. College having plans prepared by F. W. Redlich, archt. and engr., Stillwater, for 2-story, 50 x 145 ft., library and 2 story, 60 x 175 ft., economics building, brick and concrete, rein.-con. flooring, on Main St. About $100,000 and $115,000 respectively.

Okla., Tulsa — Hall — Loyal Order of Moose No. 414 plans to build hall. About $100,000. C. H. Hubbard, mayor, member of bldg. com. Engineer and architect not decided.

Okla., Tulsa—Hospitals—Sisters of Sorrowful Mother, Wichita, having plans prepared by Wight & Wight, archts., 1st Nat'l Bank Bldg., Kansas City, Mo., building, 4 to 6 story, rein.-con. steel and brick, rein.-con. flooring, rock foundation. About $500,000. W. E. Gillham, Kansas City, Mo., engr.

Okla., Tulsa — Store — Rosser-Casebeer Furniture Co. having plans prepared by Blair Bros., archts. and engrs., 617 Unity Bldg., for 5-story, 50 x 140 ft. rein.-con. and brick, at 500 South Main St. About $125,000.

Idaho, Caldwell—Theatre—R. E. Field, archt., Little Bldg., preparing plans for 2-story, 120 x 150 ft., brick, on Arthur St. About $60,000. Owner's name withheld.

Idaho, Payette — Hotel — C. H. Nelson plans to build 3 or 4-story, brick, on Sylvan Beach. About $75,000. Architect not selected.

Idaho, Pocatello—Schools—Independent School Dist. No. 1, plans to build 2 concrete and brick schools, concrete foundation, 8 rooms each. About $50,000 each. T. H. Jaragie, 219 Portneuf Bldg., Pocatello, archt.

Nev., Lovelocks — School — Bd. Educ. having plans prepared by G. C. Sellon & Co., archts., 1005 8th St., Sacramento, Cal., for 1 story brick. About $60,000.

Ariz., Bisbee — High School — School Trustees retained N. F. Marsh, archt., 211 Bway. Central Bldg., Los Angeles, Cal., to prepare plans for 2 story, 60 x 80 ft., rein.-con. addition to manual training dept., concrete foundation. About $50,000.

Ariz., Prescott — School — Yavapai Co. School Dist. No. 1 voted $60000 bonds to build school. J. H. Blain, clk.

Wash., Aberdeen—Hospital—Dominican Sisters having plans prepared by Beezer Bros., archts., Seaboard Bldg., Seattle, for 4 story, 40 x 108 ft., brick, concrete foundation, near St. Joseph's Hospital. About $100,000.

Wash., Aberdeen—Hotel—B. P. O. E. Lodge authorized committee to purchase 50 ft. site adjoining club and proceed with preliminary plans for 3 or 4-story, concrete or brick. About $400,000. Architect not selected.

Wash., Cashmere—Community Center and High School City having preliminary plans prepared for 2-story, 75 x 102 ft., concrete and brick, concrete foundation. About $75,000. Architect not selected.

Wash., Olympia—Office—State Capitol Comm., Olympia, having preliminary plans prepared building 2 or 3-story, brick or stone, on state grounds. About $600,000. This is first unit of group of buildings to be erected at cost of $1,000,000.

Wash., Raymond—Theatre—G. Reisner plans to build 1-story, brick or stone, concrete foundation. About $50,000. Private plans.

Wash., Seattle—Hospital—Washington State Homeopathic Hospital plans to build 3-story, 60 x 120 ft., concrete. About $100,000. Architect not selected.

Wash., Seattle—Office—Doctors Medical Bldg. Corp., Cobb Bldg., plans to build 10-story, 120 x 120 ft., on Madison and Minor Aves. About $500,000. Architect not selected.

Wash., Seattle — Sales — W. Bebb, c/o H. Bittman, engr., Securities Bldg., plans to build 2-story, 120 x 180 ft., concrete and brick, rein.-con. flooring, concrete foundation, on 9th and Union Sts. About $150,000.

Wash., Seattle — Sales — T. J. Nestor, Hoge Bldg. plans to build 3-stry, 108 x 180 ft., rein.-con. and brick, covering 80,000 sq.ft. floor space, on Westlake St. and Denny Way. About $65,000. Architect not selected.

Wash., Seattle—Store—J. T. Hefferman, 108 Railroad Ave. So., plans to build 2-story, 108 x 120 ft., concrete and steel, rein.-con. flooring, on 6th and Pine Sts. About $60,000. J. T. Graham, Green Bldg., archt.

Wash., Spokane — Detention Home — Comrs. Spokane Co. having preliminary plans prepared for 2 or 3-story, brick or stone. About $85,000. A. W. Burch, co. aud. Architect not selected.

Wash., Spokane — High School — Bd. Educ. preparing preliminary plans building 2 story brick or stone, concrete foundation. About $250,000. O. C. Pratt, supt. Architect not selected.

Wash., Spokane—Office—A. D. Jones & Co., North 125 Lincoln St., plans to build 5-story, 90 x 100 ft., rein.-con., brick and terra cotta, on Main Ave. About $150,000. Riggs & Van Tyne, Peyton Bldg., archts.

Wash., Spokane — Store — Culbertson, Grote, Rankin Co., Main and Howard Sts., having preplriminary plans prepared for 9-story, 90 x 90 ft., brick or stone addition, on Howard St. About $100,000. Architect not selected.

Wash., Tacoma—Business—S. B. Asia, 6th and Washington Sts., Portland, having plans, specifications and estimates prepared for remodeling 3 story, brick and concrete, here. Plans include placing glass fronts, marble trimmings and extensive interior changes. About $50,000. Sutton & Whitney, Lewis Bldg., Portland, and E. Dugan, Natl. Realty Bldg., Tacoma, archts.

Wash., Tacoma—Church—Rosary Catholic Church plans to build 64 x 180 ft. brick and stone, with tower and spire 210 ft. high, brick foundation, on 13th St. and Tacoma Ave. About $60,000. Architect not selected.

Wash., Union Gap (Yakima P. O.)—Cottages—Utah-Idaho Sugar Co., Yakima, plans to build several 1-story, frame, concrete foundations, here. About $50,000. M. Nibley, asst. genl. mgr.

Wash., Vancouver—Temple—F. & A. M. Lodge, 8th and Main Sts., plans to build 4-story, 100 x 100 ft., brick or cement, brick or cement foundation, on 10th and Main Sts. About $50,000. Architect not selected.

Wash., Yakima — Bank — Yakima Nat'l Bank having plans prepared by A. E. Doyle, archt., Worcester Bldg., Portland, remodeling bank. Plans include 40 ft., terra cotta front, 16 x 54 ft. reception room, 30 ft. high, public lobby, kitchen and dining-room for employes, 12 cages, shower baths, bookrooms, etc. About $100,000.

Buildings (Continued)

Wash., Yakima — Theatre — F. Mercy plans to build 1-story, brick, on Yakima Ave. About $150,000. Private plans.

Ore., Astoria — Hotel — H. R. Hoefler plans to build 3 or 4-story, 100 x 125 ft., on 14th and Commercial Sts. About $75,000. Architect not selected.

Ore., Astoria—Theatre—J. D. Strauss, W. Madison and S. Danz plan to build 1-story, 50 x 125 ft. brick and concrete, on Liberty Theatre site. About $50,000. Architect not selected.

Ore., Coquille—School—Bd. Educ. having plans prepared by Tourtelotte & Hummel, archts. McKay Bldg., Portland, for 2-story, hollow tile, on concrete foundation. About $50,000.

Ore., Corvallis—Dormitory—State Agricultural College having preliminary plans made in School of Architecture for remodeling and converting Federal military barracks into dormitory, 2-story concrete and timber, concrete foundation. About $60,000; half of cost to be borne by Emergency Bd. O. P. Hoff, Salem, state treas.

Ore., Klamath Falls — Business — Collins & Stilts having plans prepared for 3-story, 70 x 100 ft. brick business block, brick and concrete foundation, on 5th and Main Sts. About $60,000. Architect's name withheld.

Ore., Pendleton—Theatre—Greulich & Matlock having plans prepared by R. Grace, archt., Bates-Dock Bldg., Portland, for enlarging Alta Theatre and building 1-story addition, brick, on concrete foundation. About $50,000. C. G. Matlock, mgr.

Ore., Portland—Store—W. L. and T. B. Erwin, 6th and Glisan Sts., plans to build 1-story, 100 x 100 ft., bicycle store and machine shop, concrete, rein.-con. flooring, concrete foundation. About $50,000. Architect not selected.

Ore., Salem—Hotel—T. G. Bligh, 445 State St., plans to build 3-story, 98 x 165 ft., brick, on Cottage and Chemeketa Sts. About $100,000. Architect not selected.

Ore., Seaside — Church, etc. — Calvary Parish (represented by A. Sumner, bishop of diocese of Oregan) purchased 12 lots in Caldwell Park and plans to build church, rectory, guild house, etc., ranging from 1 to 3-story, brick and concrete, brick and concrete foundation. About $100,000. Architect not selected.

Ore., Union—Hotel—W. R. Hutchinson, S. E. Miller, et al., Union, making preliminary plans for purchase of site for 2 or 3-story, brick or concrete. About $75,000. Architect not selected.

Cal., Avalon — Hotel — Boos Bros., 460 South Hill St., Los Angeles, plan to build 6-story, here. About $300,000. Architect not selected.

Cal., Bishop—Hotel—A. J. Morrill, et al, having plans prepared by Eng. Serv. Co., engrs., 816 Washington Bldg., Los Angeles, for 2-story (containing 100 rooms), rein.-con., concrete foundation.

Cal., Clovis—High School—Clovis Union High School Dist. voted $100,000 bonds to build high school.

Cal., Grass Valley — School — School Trustees plan to build 2-story, concrete or brick. About $150,000. W. Mooser and H. B. Simpson, Nevada Bank Bldg., San Francisco, archts.

Cal., Healdsburg — Bank — Healdsburg Natl. Bank having plans prepared by F. H. Meyer, archt., Bankers Investment Bldg., San Francisco, for 1-story, brick and terra cotta. About $75,000.

Cal., Jacumba—B. L. Baughn, Barbara Worth Hotel, El Centro, purchased Jacumba Hot Springs resort and 200 acres adjoining and plans to build hotel. About $50,000. Architect not selected.

Cal., Los Angeles—High School—School Trustees voted $150,000 bonds to construct four 2-story, hollow tile buildings, concrete foundation, to include administration, domestic science, manual training and gymnasium buildings. Allison & Allison, 1405 Hibernian Bldg., archts.

Cal., Los Angeles—Store—F. B. Silverwood, 6th St., and Bway. Ave., having plans prepared by Walker & Eisen, archts., 1403 Hibernian Bldg., for 5-story, 77 x 119 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation. Steel frame will be furnished and erected by Llewellyn Iron Wks., North Main and Ord Sts. About $300,000.

Cal., Montague — Hall — Siskiyou Co. Memorial Bldg. Assn. had preliminary plans prepared by Woollett & Lamb, archts., Physicians Bldg., Sacramento, for 2-story, brick, memorial hall. About $50,000.

Cal., Oakland — Schools — City voted $4,975,000 bonds to build 12 schools, estimated cost of which will range from $100,000 to $500,000 each, and 2 to cost $50,000 each, also additions to 8 to cost from $50,000 to $100,000 each.

Cal., Oakland—Temple—Labor Temple Assn. plans to build 5-story, 100 x 150 ft. About $500,000.

Cal., Sacramento — Store — Weinstock, Lubin & Co., Balboa Bldg., San Francisco, purchased site on 11th and J Sts., and plans to build 160 x 220 ft. About $1,000,000. Architect not selected.

Cal., San Diego — High Schools — City plans election to vote on $1,500,000 bonds to build 2 intermediate high schools. Address Bd. Educ., Southern Title Bldg.

Cal., San Francisco—High School—City having plans prepared by J. Reid, Jr., archt., 1st Natl. Bank Bldg., for high school on Van Ness Ave., Polk, Bay and Francisco Sts., to be known as North Beach High School. About $500,000.

Cal., San Francisco—Hospital—Federated Italian Societies, 678 Green St., plans to build hospital. W. Torchia, secy., 2 Columbus Ave., conducting drive to raise $1,000,000 to finance project. Architect not selected.

Cal., San Francisco—Office—Ames-Harris Neville Co., 100 Potrero Ave., having plans prepared by J. R. Miller, archt., Lick Bldg., for 5-story, 150 x 155 ft., on 5th and Pine St., near Front St. About $100,000.

Cal., San Francisco — Office — Pacific Gas & Electric Corp., 445 Sutter St., having plans prepared by W. Knowles, archt., Hearst Bldg., for 5 story, 150 x 155 ft., on 5th and Howard Sts. About $200,000.

Cal., San Francisco—Store and Lofts—J. C. Brickell, Lick Bldg., purchased site on Market St. near 2nd St and plans to build 3-story, 25 x 92 ft., rein.-con. or brick. About $100,000. J. R. Miller, Lick Bldg., archt.

Cal., San Francisco—Store and Loft—W. H. Sullivan, 129 Sutter St., having plans prepared by L. Devlin, archt., Pacific Bldg. for 2-story, 50 x 150 ft., on California St., near Front St. About $60,000.

Cal., San Francisco — Theatre and Store—S. Mariani having plans prepared by Reid Bros., archts., Mills Bldg., for 75 x 125 ft. and 60 x 85 ft., concrete and steel, on Mission and 29th Sts. About $78,000.

Cal., Santa Ana—Auditorium—School Trustees retained N. F. Marsh, archt., 211 Bway. Central Bldg., Los Angeles, to prepare plans for, brick, concrete or hollow tile, at high school, here. About $50,000 available

Cal., Santa Barbara—Church—Carmelo Catholic Church having plans prepared by B. Goodhue, archt., 2 West 47th St., New York City, for church in Montecito Dist., here. About $75,000.

Cal., Strathmore — High School — Trustees Strathmore Union High School Dist. plan election soon to vote on $85,000 bonds to build high school. Architect not selected

Cal., Woodland — Sanatorium — Woodland Sanatorium having plans prepared by W. H. Weeks, archt., 75 Post St., San Francisco, for timber and plaster, concrete foundation. About $60,000.

Federal Government

PROPOSED WORK

Mass., Boston Foundry Extension and Machine Shop—Spec. 4053—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build extension to Bldg. No. 42, here. About $160,000.

Mass., Cambridge—Post Office—Treas. Dept., Wash., D. C., plans to build 2-story, 71 x 110 ft. post office, on Harvard Sq., here. about $150,000. G. N. Jacobs, 209 Washington St., Boston, archt.

Mass., Fall River — Moving Machine Shop and Boiler Shop Annex—Spec. 4064—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to move machine shop and boiler shop annex from Fall River to Atlantic. About $40,000.

R. I., Newport—Laundry—Spec. 4081—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $60,00.

R. I., Newport Torpedo Storage Racks Spec 4060—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $20,000.

N. Y., Buffalo—Channel Extension—U. S. Engr. Office., Buffalo, having specifications prepared for 21 ft. channel extension at Tonawanda Harbor. About $125,000 available for project

N. Y., Dunkirk —Maintenance Repairs—U. S. Engr. Office, Buffalo, having specifications prepared for maintenance repairs to harbor, here.

N. Y., New York Deepening Channel—U. S. Engr. Office, 39 Whitehall St., having plans prepared for deepening channel from deep water in Upper Bay to deep water in East River.

N. Y., New York Dredging U. S. Engr. Office, 39 Whitehall St., plans to dredge in Bronx River.

N. Y., New York—Dredging—U. S. Engr. Office, 39 Whitehall St., had plans prepared for dredging East Chester Creek.

N. Y., New York—Drilling Plant—U. S. Engr. Office, 39 Whitehall St., having plans prepared for drilling plant.

N. Y., New York — Widening and Straightening Channel U. S. Engr. Office, 39 Whitehall St., having plans prepared widening and straightening channel opposite Newtown Creek. About $770,000.

N. Y., Rockaway—Tennis Courts—Spec. 4052—Bureau of Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $3,000.

N. J., Cape May—Dirigible Hangar—Spec 4080—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build steel, corrugated asbestos-wood frame and sash, here. About $470,000.

N. J., Cape May—Dismantling and Re-Erecting Gas Holder Spec. 4074—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans, here. About $13,500.

N. J., Lake Denmark -Shell Loading Plant—Constr. Div., War Dept., Wash., D. C. plans to build, here. About $3,000,000.

N. J., Lakehurst—Buildings, etc. -Spec. 4082—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct additional buildings to include brick power house, railroad, roads, landing field, grading and clearing 1000 acres of land for site, water supply, sewerage system, frame quarters for officers and steel frame machine shop, here. About $1,126,000.

Pa., Phila.—Smithery Annex—Spec. 4051—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build annex to smithery, here. About $30,000

Pa., Pittsburgh Locks and Dams—U. S. Engr. Office, Pittsburgh, having preliminary plans prepared for locks and dams 6 to 8. About $190,000 available for project.

Del., Wilmington—Jetty Repairs—U. S. Engr Office, Old Federal Bldg., plans to repair jetty in Cold Spring Inlet, N. J.

Md., Baltimore—Dredging—U. S. Engr. Office, Baltimore, had specifications prepared dredging 9-ft. channel, 100 ft. wide, at Wicomico River

D. C., Wash., Fireproofing Storehouse—Spec 4076 Bureau Yards & Docks, Navy Dept., plans to fireproof storehouse No. 10. About $15,000.

D. C., Wash.—Kitchen, Mess Hall and Barracks. Constr Quartermaster, Walter Reed Hospital, plans to build, here. Estimated cost, $12,000.

D. C., Wash. Raising Roof and Additional Cranes Spec. 4075 Bureau Yards & Docks, Navy Dept., plans to raise roof of open-hearth shop and install additional cranes. About $40,000.

Va., Norfolk - Dredging — U. S. Engr. Office, Norfolk, having plans and specifications prepared dredging James River, involving deepening channel to 22 ft. at mean low water, from present depths, which between river's mouth, at Hampton Roads and City Point are from 16½ to 20 ft., and between City Point and City Wharf at Richmond, 18 ft., widening parts of channel in latter reach to project widths of 200 and 300 ft.; also building regulation works for maintaining improved channel after enlargement. About $226,833.

Va., Norfolk—Pattern Shop—Spec. 4041—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $350,000.

Federal Government (Continued)

Va., Petersburg—Conduit U. S. Engr. Office, Petersburg, plans to buil conduit of earth and rock dam above navigable channel and conduit to extend from diversion channel to navigable channel, also flushing navigable channel.

Va., Yorktown—Buoys -Spec. 4068—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to moor buoys, here. About $7,000.

N. C., Moorehead—Hangar and Fire Protection System Spec. 4073 Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to complete hangar and fire protection system, here. About $10,500.

S. C., Charleston — Quay Wall — Spec. 4078—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $180,000. Noted Sept. 11 under Spec 3773.

S. C., Paris Island—Curbs and Gutters —Spec. 4065 –Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build concrete curbs and gutters, here.

S. C., Paris Island—Sheathing Buildings—Spec. 4069 Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to sheath buildings at Post Exchange, here. About $12,000.

Fla., Jacksonville — Channel — U. S. Engr. Office, Jacksonville, plans to build channel from Tampa Bay to Sarasota, via Long Key Route, 7 ft deep and 100 ft. wide. About $92,000 available for project.

Fla., Jacksonville—Lock and Dam and Dredging—U. S. Engr. Office, Jacksonville, having plans prepared building lock and dam at Moss Bluff, remainder of funds will be expended in dredging in channel from Moss Bluff to Silver Springs Run. About $95,000.

Fla., Pensacola—Heating System—Spec. 4071—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to install heating system at Torpedo Storehouse, No. 100, here. About $15,000.

O., Cleveland—Deepening Channel, Jetty Extension, Pierhead, Dredging, etc.—U. S. Engr. Office, Cleveland, plans to deepen channel, extend east jetty 6000 ft., build pierhead, dredge West Dock Channel, repair of floating plant and general administration, at Sandusky Harbor. About $191,000.

O., Cleveland—Widening River—U. S. Engr. Office., Cleveland, plans to widen Cuyahoga River at New York Central R. R. Bridge. About $42,273 available for project.

Mich., Detroit—Dam—U. S. Engr. Office, Detroit, having plans and specifications prepared for emergency dam in St. Mary's River. About $250,000.

Tex., Brownsville — Flood Protection, Roads, Walks, Wharves, and Drainage Work —U. S. Engr. Office, Galveston, received $17,000 allotment from Secy. of War, for flood protection, roads, walks and drainage, here

Tex., Galveston—Dredging—U. S. Engr. Office, Galveston, considering plans for dredging channel 18 ft deep, 400 ft wide, at Brazos Island About $66,000 for 1st year and $25,000 each succeeding year for 5 years

Wash., Keyport — Storehouses — Spec. 4048—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build torpedo and warhead storehouses, here. About $60,000.

Wash., Puget Sound—Radio Buildings Spec. 4050—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct, at Ft. Stevens and Ocean Park, here.

Wash., Seattle—Dredging—U. S. Engr. Office, Seattle, plans to dredge inner portion of Gray's Harbor, between entrance of harbor and Chehalis River; also re-dredging in waterway connecting Port Townsend Bay and Oak Bay.

Ore., Toledo—Road Work—Bureau Pub. Rds., U. S. Dept. of Agriculture, 204 Post Office Bldg., Portland, plans to build 4.05 mi. Alsea Natl. Forest Rd., Suislaw Natl. Forest, Lincoln Co., involving 44,000 cu.yd. common and 15,000 cu.yd. rock excav., 17 acres clearing, 10 acres grubbing and 1850 lin.ft. log or pipe culvert.

Cal., Los Angeles — Dredging — U. S. Engr. Office, Los Angeles, plans to dredge areas A and C and middle ground, San Diego Harbor. About $400,000 available.

Cal., Los Angeles—Levee Repairs—U. S. Engr. Office, Los Angeles, plans to make additional repairs to levee in Colorado River, Ariz.

Cal., San Diego — Hospital — Bureau Yards & Docks, Navy Dept., Wash., D. C., having plans prepared by B. Goodhue, archt., 2 West 47th St., New York City, building hospital at Balboa Park, here, to include administration building with 120 ft. tower, 4 ward buildings, each to accommodate 300 patients, officers and nurses' quarters, surgery, laboratory, power house, laundry, garage and commander's residence. About $2,000,000. Noted Sept. 4.

Cal., San Francisco—Extending and Rebuilding Jetties—U. S. Engr. Office, San Francisco, plans to extend North Jetty about 500 ft. seaward and rebuild inshore of 2 jetties.

Guam — Ice Making and Cold Storage Plant—Spec. 4063 Bureau Yards & Docks, Navy Dept., Wash., D. C., plan sto build, here. About $35,000.

P. R., San Juan—Dredging—U. S. Engr. Office, 39 Whitehall St., New York City, plans tidal investigation in view of dredging 5,122,000 cu.yd., here.

Miscellaneous

PROPOSED WORK

Monument—New Haven, Conn.—Yale University Alumni Advisory Bd. plans to build memorial monument at Quadrangle. About $150,000. Sculptor not selected.

Arch—Stamford, Conn.—City plans to build stone memorial arch in St. Johns Park. About $50,000. W. T. Daskam, chn. memorial com. Architect not selected.

Coal Pocket—Rochester, N. Y.—Elwood Coal Serv., Powers Bldg., plans to build steel and concrete coal pocket, on Driving Park Ave. Cost between $20,000 and $25,000.

Park—Trenton, N. J.—City plans to build park in eastern section of city. About $35,000.

Amusement Park—Sparrows Point, Md. (Baltimore P. O.)—S. Getzler c/o Sofir, Braun & Getzler, 1057 Calvert Bldg., Baltimore, and others, plan to build amusement park at Sandy Beach on Chesapeake Bay, near here. About $1,000,000.

Dry Dock—Sparrows Point, Md. (Baltimore P. O.) Md.—Bethlehem Shipbuilding Corp. plans to build dry dock of wooden pontoons with continuous steel side walls, 80 ft. wide, 400 ft. long, and 20 ft. depth over sills. Private plans.

Improving Yacht Basin—St. Petersburg, Fla.—City plans to vote $75,000 bonds to improve Yacht Basin, build boat slips, sidewalks and rest houses, etc.

Subway — Cleveland, O.—City plans election Feb. 10 to vote on $15,000,000 bonds to build double-deck subway system. Preliminary surveys prepared by Barclay, Parsons & Klapp, engrs., Leader News Bldg., include steel, concrete and brick tube from High Level Bridge east on Superior Ave. to East 22nd St., and on Ontario St. from Lakeside Ave. to Central Market House, with 4 tracks in each.

Pavilion—Columbus, O.—Franklin co. voted $150,000 bonds to build pavilion at Franklin Co., Tuberculosis Hospital.

Docks, etc. — Detroit, Mich. — City Comrs., Farwell Bldg., instructed City Plan Comm. to engage engineers to make survey of water front and prepare tentative plans for docks, warehouses, etc., for industrial port, together with facilities for unloading, handling and storing coal.

Tank—Davenport, Ia.—Amer. Hominy Co. plans to build rein.-con grain storage tank. About $50,000. Private plans.

Electric Light and Power Line—Westbrook, Minn. -Village voted $10,000 bonds to build electric light and power line from here to Jeffers.

Transmission Line—Hazelton, Kan.—City having plans prepared and soon lets contract building transmission line. About $12,000. W. B. Rollins & Co., 209 Ry. Exch. Bldg., Kansas City, Mo., engrs.

Transmission Line — Lane, Kan.—City voted $15,000 bonds to build transmission line from here to Ossawatomie Engineer to be selected at once.

Transmission Line—Richmond, Kan.—City voted $20,000 bonds to build electrical transmission line from Ottawa to here.

Switchboard, Generators, etc.—Bismarck, N. D.—City plans to install switchboard, 75 k.w. generator, 125 h.p. engine, pumps, accessories and appurtenances for 600 h.p. electric plant. About $40,000. F. Tustison, Auditorium Bldg., Minneapolis, Minn., engr.

Subway—Fargo, N. D.—Great Northern Ry., St. Paul, Minn., plans to build subway at 10th St. About $10,000.

Park—Billings, Mont.—City voted $75,000 bonds to improve parks. E. M. Sneckenberger, city engr. Noted Sept. 18.

Retaining Wall—Missoula, Mont.—City plans to build retaining wall, in Impvt. Dist. No. 44, along Blk. No. 4, original townsite of Missoula, to keep water of Missoula River from overflowing on street. About $23,000. T. G. Hatheway, city engr.

Dam—Wilsall, Mont.—Kistner & Hardie Ranch Co. plans to build 600 ft. irrigation dam, 50 ft. high, to reclaim 2800 acres. About $40,000. W. S. Hartman, Wilsall, engr.

Concrete Posts and Walls—St. Louis, Mo.—St. Louis Co. River Impvt. Assn. plans to place hollow concrete posts secured with heavy cables, in Missouri River bed along farms in St. Louis Co.; also build concrete walls where needed. Cost several hundred thousand dollars. E. Bagnell, Lincoln, engr.

Park — Chickasha, Okla — City voted $100,000 bonds to purchase and improve park sites.

Exposition Park—Tulsa, Okla.—Livestock & International Exposition Co. plans to purchase 600 acre site and construct brick and concrete exposition buildings and amusement park, containing swimming pool and usual features incident thereto. About $500,000. Engineer not selected.

Cables — Lewistown, Idaho—Pacific Telephone & Telegraph Co. plans to build extra cables and general extension to city service. About $18,000. A. P. Johnson, mgr.

Lighting System—Mackay, Idaho—City plans to build ornamental street lighting system. About $20,000. L. A. Hansen, clk.

Dam—St. Anthony, Idaho — Fremont-Madison Reservoir Co. had preliminary surveys prepared, for earth fill dam, in Fall River basin, for irrigation. Work involves 1,400,000 cu.yd. earth excav. About $1,000,000. J. B. Hays, Boise, engr.

Lighting System, etc. — Chehalis, Wash.—City plans to extend lighting system and erect steel or concrete standards at 75 ft. intervals on main streets of business section. About $10,000. A Donahoe, city atty.

Pier—Seattle, Wash.—Lake Union Dock Co. plans to build pier, 46,000 sq.ft. in area, involving 700 piles. Plans also include 50 x 200 ft., heavy timbered warehouse. J. E. Blackwell, Hoge Bldg., engr.

Impriving Canal—Yakima, Wash.—City plans to improve Naches-Selah Canal by concreting 1.5 mi. main canal and installing one 48-in. and one 42-in. creosoted wood pipe siphon, 3400 ft. long. About $125,000. C. F. Wilson, city engr.

Dam—Astoria, Ore.—Crown Wilamette Paper Co. having preliminary plans prepared for 60 ft. concrete and timber dam to form Reservoir, covering 3000 acres at Youngs River Falls.

Dock—Portland, Ore.—Balfour, Guthrie & Co., 353 Oak St., plans to repair dock below Bway. bridge. Work includes placing beams, sawing off dock piling at water level and heavy grill work from deck to dock. About $25,000.

Park Improvement—Portland, Ore.—City plans to buy additional park sites and improve same by grading, seeding to grass, draining, installing water, light and sewerage systems. City will issue and sell $500,000 bonds to cover cost of project. O. Laurgaard, city engr.

Gas Holder — Long Beach, Cal.—Southern Counties Gas Co., 724 Spring St., Los Angeles, has asked permission to build 2,000,000 cu.ft. steel gas holder. About $200,000. J. D. Thompson, ch. engr.

Harbor Improvements — Monterey, Cal.—City retained T. H. Tibbitts, engr., Alaska Commercial Bldg., San Francisco, to make preliminary survey for harbor improvements. About $300,000.

Dam—Porterville, Cal.—Pleasant Valley Ditch Co. plans to build dam to impound waters of upper Tule River. About $4,000,000. P. A. Morrison, pres.

Pier, Wharf, etc. — San Francisco, Cal.—State of California had plans prepared by Engineers of State Harbor Comm., Ferry Bldg., for extension of Pier No. 27, involving 500 creosoted wood piles, 25,000 sq.ft. timber floor and timber shed covering 18,000 sq.ft.; also 900 sq.ft. rein.-con. bulkhead wharf at Pier 5 and 5000 sq.ft. rein.-con. wharf at Pier 19, all at foot of Lombard St.

Pipe Line—Santa Paula, Cal.—Southern Counties Gas Co., 724 Spring St., Los Angeles, has asked permission to lay pipe line from here to Oak Ridge, cost $16,200; from here to Fillmore, $48,000; pipe line near Chino, $53,100, and 1600 meters, $19,500. J. D. Thompson, ch. engr.

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Dangers Besetting the Highway Program

ONE cannot expect in these crowded days to devote a large amount of time to topics outside his particular specialty. All engineers and contractors, however, are accustomed to give some attention to those features which for the moment occupy the centre of the constructional stage. At the minute highways form the central figure in the engineering drama. They have come into the lime-light suddenly, and are nearly forcing all other specialties into a dim background. But not for that reason alone does highway work merit general attention from engineers and contractors. They have a citizen's interest in it, as well as that of professional and business men. The situation is a serious one. Let those who have not followed highway work closely read the story in the presidential address of A. R. Hirst before the American Association of State Highway Officials, printed elsewhere in this issue. With appropriations for construction of $600,000,000 as against a previous maximum of $200,000,,000 ($150,-000,000 would likely be near right) we find ourselves with totally inadequate organizations. How serious that is we learned from the inefficiencies of the war. From it may lead a chain of consequences that may bring a serious revulsion against highway expansion. One noted highway engineer expressed the feeling recently by saying that "we have gone highway mad." Millions are appropriated where there were but thousands before—which would not be serious if we had adequate organizations to handle the work. All of which is sound reason why engineers and contractors as citizens, as well as professional and business men, should support the pleas of highway engineers for organizations adequate in size and compensated at a rate that will insure the securing and retention of men of high ability. The penalty for failure to secure adequate organizations is the inefficient expenditure of the huge sums available and the checking of the progress toward building an adequate highway system.

Marking an Epoch

THOSE who recall the eventful March days of 1913, when the waters came down on the great Central States basin and wrought devastation throughout cities and countryside, should experience a distinct feeling of satisfaction at learning of the first definitely achieved curbing of one of the torrent-channels responsible for the great destruction. In October just past, the valley of Twin Creek, near Dayton, Ohio, was finally closed by the growing earth embankment of the Germantown dam; and soon afterward energetic work had brought the closure up to a height that assured its permanence and the protection of the lands downstream against even a large flood. This comes after six years of work: five of study and planning, and one year of construction. The present result is the first actual flood-protection secured, and thus it ranks as marking an epoch. Henceforth, each further step in the execution of the Miami Valley enterprise, of which Germantown forms a part, will bring increase of protection.

Dam Closure Risks

THE remaining valley closures of the Miami project are larger in size than that at Germantown, but they will be less difficult and formidable. All of them involve flood risks of decidedly unusual character, the result of building a dam in the lower rather than in the upper part of a valley. At Germantown especially the flood-flow possibilities were serious, and the resulting necessity of building up the hydraulic-fill core as fast as possible involved unknown difficulties. Only the short autumn season was available for the closure, to be followed by several months of high-water probabilities. Any hitch or delay would create risk of overtopping. The stream-control problem, which was recognized as a serious one from the earliest period of planning, and which governed the succession of working steps, has now been mastered in the case of Twin Creek. From the standpoint of engineering calculation, of course, it should be understood that the maximum degree of security will not be attained for some time to come, indeed not until the dam has been raised to crest elevation. A measure of risk from abnormal rainfall and flow conditions must inevitably exist through the coming high-water months, therefore. But within the range of human foresight the primary difficulties and dangers of the Germantown dam work have been disposed of. One of the most important means of assuring safety in the closure work is a new and excellent system of studying the physical character of the dam structure. But this is another story.

The Lugless Standard for Paving Brick

AT THE New Orleans convention of the American Society for Municipal Improvements the National Paving Brick Manufacturers Association made the first public announcement of the adoption of a lugless brick as its standard. The specification actually calls for a wire-cut brick with square edges, but the explanatory matter calls the new standard a "plain wire-cut, square-edged brick." The size is to be reduced from 3½ x 4 x 8½ in. to 3 x 4 x 8½ in. The reasons assigned for the changes are manufacturing ones—the economies resulting from reducing the number of styles of brick and from increasing the No. 1 output of the kilns. The bearing of these economies on cost of finished pavements is pointed out.

We do not anticipate that there will be much objection from engineers to the reduction in the size of brick, but we do expect a very wide disagreement regarding the adoption of a lugless standard for use with all types of filler. The manufacturers have been party to the creation of a standard brick with lugs, and they cannot turn their backs on the practice of the past without giving sound technical reasons. We believe that they made a tactical error at New Orleans when they supported the new standard on commercial grounds, even though an attempt was made to translate these commercial swings into terms of economy in the finished pavement. The primary responsibility of the engineer is to secure good work, and though the manufacturers sponsoring the new lugless standard claim that they can make a thoroughly sound engineering case, they failed to present the facts at New Orleans. We, ourselves, have seen excellent old-time pavements built of lugless brick, but we are not prepared, without full study to say that the lugless evidence available is sufficient to counterbalance all that we have done in recent years with the lug type.

We know, too, from the expressions of opinion received from a dozen engineers of big cities that the new specification is not going to be accepted until there is a clear engineering demonstration of the superior advantages of the new standard. Some of the officials of the National Paving Brick Manufacturers Association appreciate the need for this enginering presentation of the case and promise that it will be made. Until then, however, the new standard is nothing more than a target to shoot at and an invitation to those with experience to present their case.

Model Registration Laws

UNITY on the license question by engineers and architects is essential if headway is to be made without friction. The problem of drafting a model law is being attacked by several states and national organizations. Until now they have worked separately but it is high time that there be coöperation.

Recently the American Institute of Architects wrote a model registration law for architects, and at the last annual meeting chapters were urged to work for its enactment, and the inclusion of its features in revisions of existing laws. Engineering Council's committee has practically completed its draft of a model law for professional engineers, architects and land surveyors. The architects do not believe in such a combination law. Their objection, that a board might be made up of a majority of engineers or of architects is answered in the engineer's law by the requirement for a minimum number of each on the board and a majority of each to pass on applicants in their respective professions.

The architects define the practice of architecture as the planning or supervision of the erection, enlargement or alteration of any building or any appurtenance thereto. Buildings are defined as structures consisting of foundation, floors, walls, columns, girders and roof, or a combination of any number of these parts, with or without other parts or appurtenances. A foot-note states that it is unwise and unnecessary to define these terms. The engineers left them out. Rigid examinations are prescribed by the architects, whereas only evidence of qualifications, submitted under oath, is required by the engineers.

The following significant statement is made by the architects in connection with their model law: "There are many structures which an engineer can properly care for without the assistance of an architect, and there are many cases of small structures, drawings for which can be made by the contractor. We should rely on this attitude to enable us to coöperate on a friendly basis with the engineering profession and with contractors, who will ultimately concede the moral right of the architect to take care of all work within his province provided the architect maintains high standards of qualifications. Great importance is attached to this view of the matter, inasmuch as it is based on the unsatisfactory experience of the profession in two or more of the states." The engineers cover this point by letting registered engineers practice architecture or registered architects practice engineering on the supposition that a professional man of the high standards required will call in competent help if the problem requires it. Other differences exist, but certainly the engineer's combination bill is the more likely to create a feeling of friendliness and so present a united professional front to the laymen. An agreement should be reached before either bill is actively promulgated. That there is need for a model bill requires little argument, for engineers now have restricting legislation in ten states and architects in seventeen.

The Development Committee's Report

ABOUT two weeks ago the American Society of Civil Engineers placed in the hands of its members the long-awaited report of the Committee on Development. The document, while formally a report to the Board of Direction, is placed in the hands of the members for their study and criticism. Presumably, it will be one of the subjects for discussion at the annual meeting in January. The report falls naturally into two sections, that relating to the affairs and management of the society itself, and that covering coöperation with other bodies through the medium of a general federation. The first part follows in the main the recommendations made in the preliminary report last June, and published in full in this journal, while the second portion was abstracted on p. 835 last week.

While the report is directed to the board and there may thus be some defense of its form, it is none the less regrettable that it has been published to the membership as it now is. It contains some sixty recommendations mixed together irrespective of their importance, without separation of those that are of an essential character from those that relate to detail, without pointing out those that require constitutional amendment and those that may be expected to be put into effect automatically after new machinery is arranged. One leaves off the reading of the report in a confused state of mind that does not encourage analysis and study. With respect to form, the Joint Conference Committee's report is far superior to the rest of the document, for it lays down a set of conditions to be met and then spreads out a plan for meeting those conditions. This feature is not followed in the main report. There is no setting forth of aims, there is no explanation of what is to be accomplished through the adoption of the various suggestions.

It is understood that the Committee on Development did submit to the board a statement indicating the es-

sential features, but unfortunately this statement, if of a clarifying nature, was not sent to the members.

We stress so strongly the form of the report because we believe that it inhibits study of the document. We fear that it will not bring forth that volume of discussion and that intensity of interest which is necessary if the recommendations are to be adopted.

Turning to the matter of the report, the fundamental finding is that the society should confine itself to technical work and that while committing itself to the principle of becoming "an active national force in economic, industrial and civic affairs," should participate in these non-technical activities through delegate membership in a separate body—an enlargement of the Engineering Council idea. This view of the separation of functions will, we believe, receive general approval.

The individual recommendations fall into three classes: Those relating to (1) the change in the management of the society itself, (2) the broadening of its technical activities, and (3) the recommendations as to the type of federation in which the common work of all engineering societies may be joined.

The recommendations looking to the reorganization of the society are based on the theory that local strength in every section of the country is the real foundation of national strength. Each geographical district, under the recommendations, would nominate and elect its own members of the board of direction, local sections would be so organized as to cover every part of the country, each member of the society would be assigned to a section, each section would receive financial support from the parent body, and representatives of the sections would meet in annual conference to discuss the welfare of the society and to nominate candidates for the offices of president, vice president, and treasurer.

There can be no doubt that the demand for district organization is widespread. Legal obstacles must be met in making the board elective by individual districts, but certainly the membership will not be satisfied until this is done. The members outside of New York take the point of view that "where there is a will, there is a way," and that in some fashion, there can be devised a method by which the geographical districts shall have full control over the nomination and election of their own representatives.

There is a call, also, for the strengthening of local sections, but whether there will be support of the plan of the committee remains to be seen. There are some 6500 members (not counting those in New York City) who are not members of sections, and a considerable number of them must display enthusiasm for the plan. The subject is important and warrants fuller discussion than can be given here. Before leaving it, though, it must be remarked that its feasability is bound up with the matter of society finances.

With reference to the strengthening of the society's technical activities, the recommendations regarding papers should have general approval. There needs to be a broadening of the papers submitted, so that they will cover well the major advances in every one of the principal fields of civil engineering, while construction and financial subjects, hitherto receiving meager attention, need to be covered.

The committee work is built upon the local section framework, committees on important technical subjects being created in each local section. This is obviously an experiment, but one worth trying. As we look on the society, its greatest usefulness to the profession can be brought about through high-grade committee work. A complete abandonment of the idea of nationally formed committees would seem to be inadvisable until such time as the local-committee system had demonstrated its feasibility and strength.

Looking to the bettering of the society's technical service there are recommendations of additional general meetings, during which technical and "broad economic problems" are to be discussed, and of plans for recognizing the young members of the society. Space, however, will not now permit of the discussion of these matters.

With reference to the Joint Conference committee's report it should be remembered that the national engineering societies cannot divest themselves—and do not desire to divest themselves—of responsibility of seeing that civic and welfare work is actively taken up by the engineers of this country. Obviously, the logical method is to do it through some form of federation, hoping that we may work out a point of view that will enthuse the locals and bring them into active coöperation.

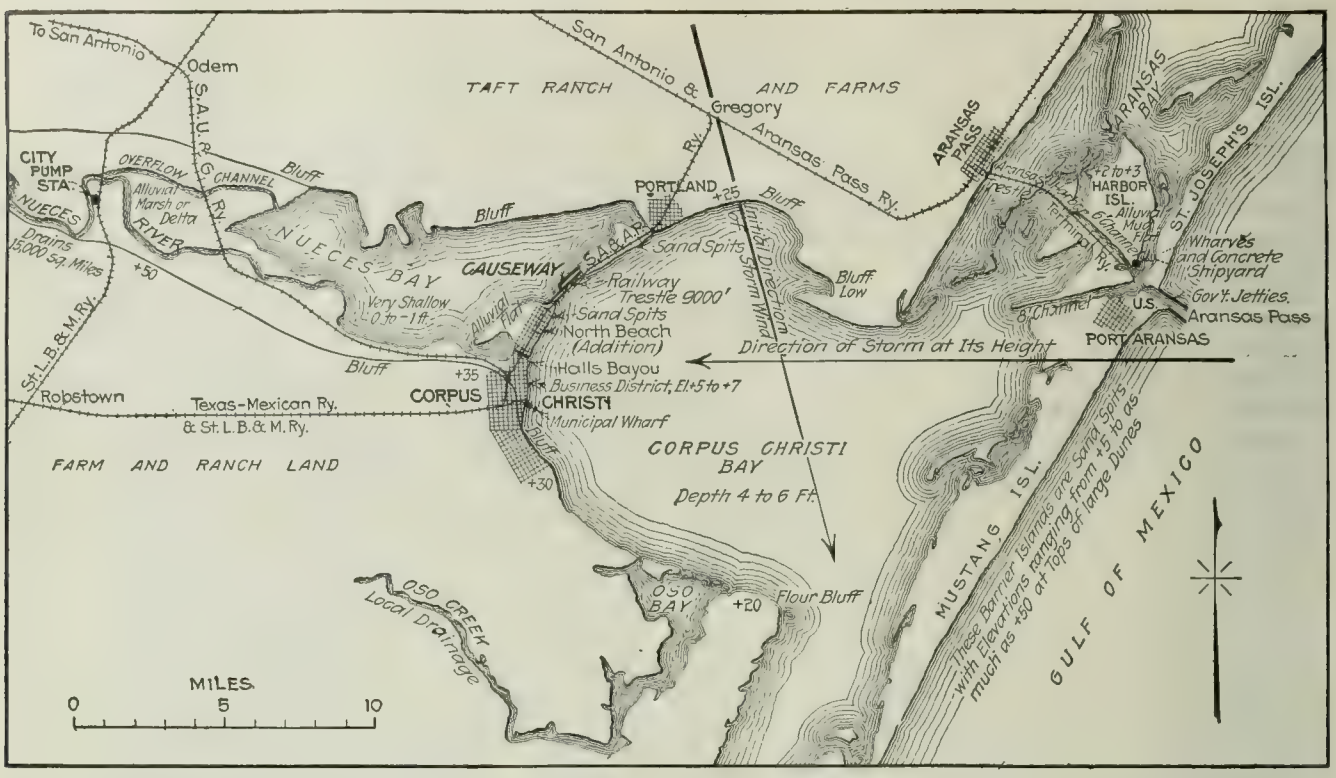
It should be recognized, however, that there must be strong propaganda to put the idea into effect. If we read the sentiment of engineers of this country correctly there is no enthusiasm existing for a federation. Engineering Council has failed to grip the sympathy of engineers. That was due largely to its detachment. The new body would overcome that in part but unless the proposed federation can put forth an inspiring program we foresee great difficulty in organizing it. There is nothing inherent in the idea of a federation that inhibits its success, but so far we have failed to find the method of doing it. The program as presented by the Joint Conference Committee does not strike us as being of the type that will appeal to engineers generally. Out of eleven activities recommended, two only have that personal-appeal character that is liable to excite much enthusiasm, and those relate to personal service work and to licensing.

Strong criticism has already been made of the proposed financing of the organization, through an assessment of $1.50 per member on the national societies and $1 per member on the locals. The revenues confessedly are inadequate for a broad prosecution of the manifold activities that might be taken up, but the belief of the Committee is that they would insure a good start and the possibility of so demonstrating what could be accomplished that larger funds would be forthcoming.

Taken as a whole, the recommendations of the body of the report appear to us sound. Some of them we propose to discuss in detail later.

As to the Joint Conference report, we believe that an enlarged type of federation should be proceeded with; but we feel confident that such an organization, to be made successful, will have to be dominated by a point of view quite different from that which dominates Engineering Council or is expressed in the Joint Conference Committee's report. Moreover, it will need not merely a change in point of view, but a very active propaganda among the local engineering societies to put the plan through.

Finally, one very important matter must have a forward place in the discussion—the recommendation that the dues of the society be increased. Unless larger funds are available the new activities recommended cannot be carried out.



LOCATION MAP OF CORPUS CHRISTI AND VICINITY SHOWING POINTS OF GREATEST STORM DAMAGE

The Tidal Storm at Corpus Christi and Its Effect on Engineering Structures

High Water Sweeps Over Barrier Islands, Relied Upon for Protection — Buildings Demolished — Serious Damage Done to Concrete Causeway

By Terrell Bartlett
of Bartlett & Ranney, Engineers, San Antonio, Tex.

THE most severe tropical storm and tidal wave known in the history of the Texas gulf coast on the morning of Sept. 14, 1919, struck and passed over the barrier islands and spent its full fury against the shores of the landlocked inner bays, overwhelming and sweeping away portions of the City of Corpus Christi, and the towns of Port Aransas, Aransas Pass and Rockport, and causing a property loss of many millions and a loss of life estimated at 350. The greatest loss of life and property was at Corpus Christi, the metropolis of the region, a beautifully situated and well improved city of 20,000 population.

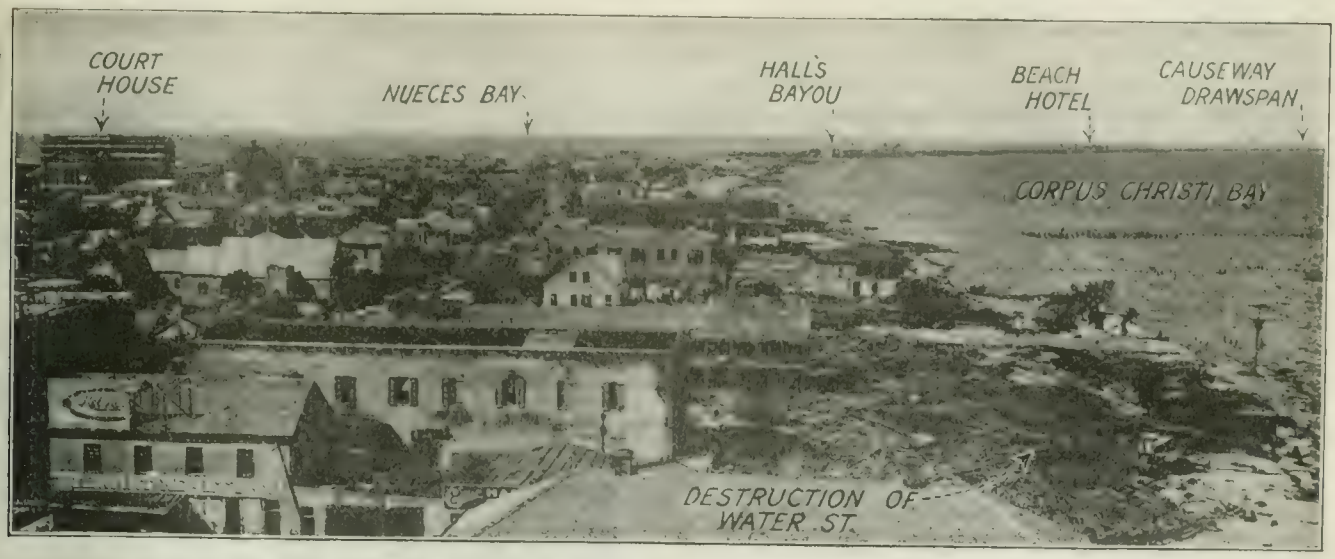
The large loss of life and great property damage was due to the unprecedented character of the storm and the great tidal height which surmounted the chain of coastal islands, hitherto relied upon to protect the towns built upon the shores of the shallow inshore bays many miles inland from the gulf. The loss of nearly 300 lives at Corpus Christi was entirely needless, as the Bluff portion of the city, where the principal residential section is located, 35 ft. above sea level, afforded opportunity for entire safety to the dwellers on the low ground, had they had any conception of the necessity for seeking refuge there. This false sense of security was accentuated by the report of the United States Weather Bureau observer that the storm would be of less intensity than that of 1916. This report was correct as respects the wind velocity, which reached a maximum of only 80 miles per hour as against fully 100 miles per hour in 1916.

The unprecedented feature of the recent storm was in the extreme tidal height which, at Corpus Christi, reached a level of 12.4 ft. above mean low tide as against 5.9 ft. in 1916. The ordinary tidal range is from 1.0 to 2.0 principally from wind action, which largely obliterates the small lunar tides. The storm was a typical West Indian hurricane, with a comparatively moderate wind intensity, but covering a large area, which doubtless accounts for the extreme tidal height.

The storm was undoubtedly much more severe than the Galveston storm of 1900, for its effect after passing the outer islands, which must undoubtedly have partly broken its force, was comparable with or more severe than the one at Galveston, situated on an island similar in all respects to Mustang Island. The town of Aransas Pass, on Mustang Island, was entirely destroyed. The loss of life there was small because it was deserted upon warnings of the approach of the storm.

The first indication of the storm was a wind from west of north. Its intensity became threatening at about 10 a.m. on the morning of Sunday, Sept. 14. At 9.45 a.m. the United States Weather Bureau observer, acting because of rapid barometric drop, issued a warning to all persons in low places to seek refuge on high ground. The low barometer reading was 28.65.

By 10.30 a.m. the wind had reached a velocity of 70 miles per hour, and the water had commenced to flow over the bay front in Corpus Christi. From then



LOOKING NORTH FROM NUECES HOTEL—PRACTICALLY ALL RESIDENCES BEYOND LINE FROM COURT HOUSE EAST TO BAY ARE TOTAL LOSS



LOOKING SOUTH FROM NUECES HOTEL—WATER STREET DESTRUCTION (CENTER) AND MUNICIPAL WHARF (BACKGROUND)

until 12.30 or 1 p.m. the wind increased in intensity and gradually veered to the east, reaching a maximum of 80 miles per hour, which was maintained until about 4.30 p.m., when the wind commenced to abate and to veer to the southeast, and finally to the south. The water rose rapidly until 1.45 p.m., when it was nearly at the greatest height; the final maximum water level was reached at 4 p.m. and remained until about 4 a.m. the next morning, when it started to recede slowy. The water was not out of the streets in Corpus Christi until the morning of Tuesday, the third day. The storm was accompanied by a driving rain and mist of salt spray. The rainfall was 3.3 in. during the first day.

The tidal wave which swept over Mustang Island and Harbor Island brought with it large quantities of beach logs, wreckage of buildings from Aransas Pass and heavy timbers from the wharves and shipyards on Harbor Island and the trestle of the Aransas Harbor Terminal Ry. Surfaces were covered with heavy asphaltic oil from steel storage tanks which were wrecked at Harbor Island. This oil somewhat abated the sharpness of the waves but made difficult the task of identifying the dead.

The damage done was the result of the combined force of waves, floating timbers and wind, all acting jointly and with progressively increasing effect as successive destruction added to the mass of driven wreckage. The damage from wind alone was limited to breakage of windows and other minor results of flying débris. The height of waves, trough to crest, is estimated by seafaring men in Corpus Christi at from 10 to 12 ft.

At the southern extremity of Corpus Christi, where there was only a narrow beach and where all improvements were on top of the 30-ft. bluff, there was no damage to buildings. However, we find here and likewise on the bluff each of Portland, on the north shore of Corpus Christi Bay, the most striking evidence of the fury of the storm, for these clay bluffs were cut away wholly and bodily for depths as great as 100 ft. and for an average of at least 50 ft. Houses which were back from the edge of this bluff by the width of a roadway and yard now stand on the brink. Northward along the shore to the municipal wharf (see map) a point is reached where the beach is two blocks wide, and thence northward to the point of the bluff where

it swings west the beach is four blocks wide. In this area, approximately three blocks wide by 10 long, were located all of the warehouses, all of the business district, the hotels, the electric-light plant, the steam laundry, two ice plants, and many residences. This district lay at a level of from 5 ft. above mean low tide at the shore to 8 ft. at the foot of the bluff, three blocks back. On the bay side of Water St., which closely followed the shore line, were numerous resort pavilions, fishing and other light wharves, and on fills inclosed by light sheet piling, one large brick building, one of the ice plants and several resort pavilions. All of these were totally destroyed, although the heavy machinery of the ice plant stands on its concrete pile-supported footings. Practically all of the round piling under these structures remains. In the first block back from the shore nearly all frame buildings were destroyed as well as several substantial residences built from shell concrete and which had been there three generations.

With the exception of two one-story brick buildings fronting east on Water St., and the power plant of the Nueces Hotel, which were not structurally damaged, everything in the first half block, or 200 ft. from the shore line, was totally destroyed, not including the light plant, from which some machinery can be salvaged. The brick business houses and the Nueces Hotel, a six-story reinforced-concrete structure on pile footings, on the inner half of the first block and fronting west on Chaparral, the second street, were not structurally damaged, but all the lower floors were flooded and many of the back or east walls were destroyed.

The wreckage was thrown up in Chaparral St. in a great drift pile which evidently protected to some extent the second and third blocks back, where the damage was limited, in the business district, to that done by the water, the heavy oil and the breakage of glass store fronts.

Municipal Wharf Damaged

The municipal wharf at the shore end consisted of a sand fill inclosed in a heavy Wakefield-pile sheeting, with heavy waling and round pile supports at intervals stayed to deadmen under the fill. At the outer end it was inclosed by concrete construction, consisting of 4-ft.-diameter, grooved cylinders which were constructed



DEMOLISHED CONCRETE BLOCK CONSTRUCTION 150 FEET INLAND

inside steel forms, sunk several feet below the old bottom and concreted. Between these cylinders were tightly joined driven concrete sheet piles whose tops were held in place by a heavy concrete waling girder or coping fitting into the cylinders. This fill, about 200 ft. wide, extended out into the bay 600 ft. The timber sheet piling was left intact, as well as the concrete sheeting along the sides. Across the outer end the concrete waling was largely destroyed, and many of the concrete piles were broken off down to the bottom. Beyond the filled portion at the outer end was a timber T-head landing wharf of heavy creosoted timber construction on piles. The deck and caps are entirely gone, the piles only remaining. The floor of the entire municipal wharf structure was at about El. 6.0.

On the filled portion of this municipal wharf were located a cotton compress, a railway spur and a large framed sheet-iron-covered cotton warehouse. None of the buildings remain. The heavy compress machine itself still stands, as does the boiler, whose brick incasement is practically gone. The 14,000 bales of cotton which were on the wharf were scattered everywhere



DEBRIS AT SITE OF ELECTRIC LIGHT AND ICE PLANT

along the shores of Corpus and Nueces Bays. They undoubtedly caused considerable damage.

Further northward along the shore, from a point opposite the angle in the bluff to Halls Bayou, all residences in the first block from the bay were destroyed, practically all having been floated off and damaged beyond repair. A concrete-frame brick schoolhouse just south of Halls Bayou is structurally intact, although its brick walls are badly battered in the lower story. Through this stretch a ridge of shell some 6 or 8 ft. high was thrown up along the beach.

Halls Bayou is an old channel or break through the beach carrying water, at times of ordinary high tide, to a depth of possibly 2 ft. and a width of 20 or 30 ft. It had been filled and the low ground covered with



BACK OF BRICK HARDWARE STORE 300 FEET FROM BAY

frame cottages. The North Beach Addition, so called, had been built up during recent years, with three or four hundred residences, mostly cottages, scattered over the three or four blocks next the beach on Corpus Bay—the highest land. The level of this sand spit ranged from El. 5 at the beach crest to El. 2 at the back shore line.

From Halls Bayou to the foot of the bluff at Portland, across the bay, the storm exerted its greatest destructive force, for to all of the forces acting along the shore in the business district of Corpus Christi below the bluff was added the suddenly rushing current of water across the low sand spits and through the shallow channel between them into the basin of Nueces Bay, lying between the bluffs on either side. At the upper end of this funnel-shaped basin the rush of waters raised the level at the city pumping plant to El. 13.9, which was 1.5 ft. higher than at Corpus Christi. The current swept on up the river channel meeting the flood from the rainfall dropped inland by the storm over the entire Nueces watershed and causing unprecedented flood levels in the lower river valley.

The North Beach Addition was swept clean. From Halls Bayou north there remained, with three exceptions, no vestige of a house, not even a brick footing block. There still exist a part of a two-story frame sanitarium, the badly battered remains of another two-story frame house, and the four-story, concrete-frame hotel building now occupied as a Government hospital—all situated on the crest of the beach. The first story front (east) and rear brick walls of the last building were totally destroyed, while the concrete columns were left apparently intact.

All three of these buildings served as a refuge. The greatest loss of life occurred in this section of the city. During the later hours of the morning of the storm many persons were taken out of this section in automobiles sent for that purpose, but many refused to leave their homes and others were cut off early in the storm by the breaking of the water through Halls Bayou.

The bodies from this section were mostly recovered along the north shore of Nueces Bay. A few persons were carried across on floating wreckage and rescued there. There were no buildings and no improvements on the beach or sand spit on the Portland side save the San Antonio & Aransas Pass Ry., and the highway.

Municipal and Railway Improvements Affected

The loss suffered by the municipality of Corpus Christi was confined to one block of paving undermined and destroyed on Water St., the damage of many fire hydrants by wreckage, and the washing out of sections of storm sewers which lead down the badly eroded South Bluff.

The track and ties of the San Antonio & Aransas Pass Ry., from a point south of Halls Bayou to the foot of the bluff at Portland, a distance of seven miles, were entirely swept away. The railway's embankment across the sand spits was for the most part destroyed. All stringers and many caps and a few of the pile bents in the railway's trestle were swept away. The San Antonio, Uvalde & Gulf crossing of Nueces Bay further west was similarly destroyed for 12 miles. The 30-ft. bascule draw span in the S. A. & A. P. trestle was on a deep concrete pier and was not damaged.

Causeway Nearly Complete Ruin

The causeway connected the two sand spits across the inlet between Corpus and Nueces Bays. This structure was completed in 1915 under the plans and supervision of the writer's firm, Bartlett & Ranney, engineers, San Antonio, Tex. Following the experience of the Texas coast for a century, which indicated that gulf hurricanes spent their force on the outer islands, and in common with the practice along the low interior waterfronts for several generations, reliance was placed on the supposedly protected location. A comparatively low and light concrete structure was therefore, built across the 8500-ft. gap of shallow water at a cost of $160,000. This structure was described in *Engineering Record* of Mar. 18, 1916, p. 390. It consisted of 2500 ft. of reinforced-concrete girder spans at the south end over water 4 ft. deep at high tide, and 6000 ft. of unprotected shell embankment across the somewhat shallower northern end. The structure paralleled the San Antonio & Aransas Pass Ry. trestle on the west side at a distance of 120 ft.

The causeway was almost totally destroyed. The draw, a Strauss bascule of 35-ft. span seated on pile-supported piers carried well below the old bottom, is intact. There still remain 22 out of 75 of the concrete-capped supporting bents. The remaining concrete girders—in many cases two or three of the continuous spans are still more or less integral—now lie from 125 to 200 ft. west of the original location. There appears to be very little of the destroyed concrete under the

old location. The floor was at El. 9.0, with a light concrete rail a little more than 3 ft. higher. The floor and rail were therefore at the level of the waves.

The girders were supported on bents of heavily creosoted piling, seven piles to a bent, cut off at low water, with a heavy concrete cap 2.5 ft. wide covering and incasing the pile heads from El. 3.0 down to the old bottom level at El. 2.5 to 3.0. The piles were of the same length as those in the S. A. & A. P. trestle alongside, which have stood some 30 years, but were driven 6 ft. deeper. At points where the penetration under driving was not satisfactory the piles were spliced and two lengths driven and jetted down. In all cases the splices were at least 20 ft. below the original bottom.

The girders and floor were built in continuous series of five spans of 32 ft. each, separated by an open joint over the center of each fifth pier or bent. The load on these expansion joint piers was exactly the same as on the intermediate piers, and the adjacent girders were the same as in the intermediate fully continuous spans, except for the necessary increased reinforcing. The girders were not tied in any way to the concrete pier caps, the concrete being simply run directly against the previously placed cap except at the expansion joints, where a horizontal layer of tarred paper entirely separated the bearing surface of the girders from the concrete pier cap. The structure had an unexpected and severe test in the storm of 1916, which was itself unprecedented, without the development of any evidences of settlement or cracks whatsoever. The bottom under the filled portion, which was undoubtedly swept away early in the storm, is at substantially its original level, while under the bridging there is an average scour of approximately 5 ft., notwithstanding that there is no considerable change in the original bottom under the adjacent railway trestle.

From these facts and the further rather surprising evidence that all of the bents and pier caps, which were under expansion joints remain practically intact without sign of settlement, whereas practically all of the other bents have totally disappeared—cap, piles and all—what happened to the structure seems fairly evident.

Apparently the railway trestle, deck and rails which were at El. 7.0, went out first, and the filled portion of the causeway, railway stringers and track, together with drift and wreckage from a distance, were thrown against the concrete deck, forming with the structure a considerable obstacle to the force of the storm and thus forcing a strong current under the bridge, which remained long enough for the deep scour to take place. The lowering of the bottom increased the leverage strain on the piling below the concrete cap, and the force of waves and current acting obliquely against the structure and the collected wreckage broke the piling and forced the bents over longitudinally with the bridge. The bents at expansion joints were saved by the ease with which the ends of the girders could be pushed off the supports.

A detailed survey of the conditions will be made shortly by the county engineer, which will doubtless bring to light many interesting facts concerning the failure of the structure. A highway crossing of a type as yet undetermined will be built at once by Nueces County.

The principal lessons to be learned from this storm are the great tidal height possible with one of the West Indian hurricanes, and—what has never before been demonstrated—the fact that the outer or barrier islands do not afford certain protection to the inner shore line.

Plans had been prepared and funds provided by the City of Corpus Christi to the extent of $600,000 for a sea-wall to afford protection against such a storm as that of 1916, which until last month was considered the worst to be anticipated. Fortunately, this construction had not been begun, for the work proposed would have availed nothing against the recent storm.

Many suggestions as to the future development of the city have been made, but as yet no definite policy has been crystallized. It seems certain that no new residences, except cheap summer camp cottages and amusement pavilions, will be built in future on low ground and that probably the new business construction will likewise be placed on the high ground of the bluff, where there is unlimited space for the development of a city of any size. Whether an effort will be made to protect the considerable remaining business property by a massive, high, sea-wall, with or without grade raising, has not been determined. Repairs to damaged stores and residences are proceeding rapidly and business is now going on in the city practically as usual. Many shopkeepers and people of moderate means have lost everything. The liberal relief funds which have been donated to the stricken community have been



NORTH BEACH HOTEL, SHOWING WAVE DAMAGE TO BRICK RAIL ON SECOND FLOOR AND WIND DAMAGE TO ROOF COPING

sufficient to prevent destitution, but not enough as yet to aid the community materially in its effort to start rehabilitation to its former condition of prosperity.

The writer wishes to express his appreciation of assistance rendered him in preparing this article by H. A. Stevens, county engineer of Nueces County, and C. J. Howard, city engineer of Corpus Christi.

Tests on Structural Gypsum Reported

In a paper entitled "Tests of Plain and Reinforced Gypsum Specimens," presented by W. A. Slater and J. J. Whitacre, published in the *Journal of the Western Society of Engineers* of September, 1919, there is an elaborate report of a series of tests made on plain and reinforced gypsum. The paper is quite lengthy and contains a vast amount of information regarding the physical properties of gypsum when used as a structural material.

First Valley Closure of Miami Flood Protection System Completed

CLOSURE of the Twin Creek Valley, 15 miles southwest of Dayton, Ohio, by the earth embankment of the Germantown dam, was accomplished successfully two months ago, and more completely by Nov. 1, when the closure section had been brought up level with the previously constructed main part of the embankment. Hydraulic-fill work is now proceeding at maximum rate, two 10-hour shifts being worked, in order to raise the height of the embankment as much as practicable before pumping is interrupted by winter weather. There was some apprehension that the rapid progress of the core-fill work might create a dangerous hydrostatic head within the embankment, but observations on the core material have dispelled this; the core has very satisfactory solidity. Moreover, an ample factor of safety is provided by limiting the width of core and thus obtaining plenty of stable, coarse material in the outside slopes. At present the embankment is about 35 ft. high above the stream bed. The volume of the reservoir and the discharging capacity of the outlet conduits at present will take care of a run-off of about 2½ in. in 24 hours over the entire drainage area of Twin Creek above the dam, corresponding to an unusually severe flood.

This dam is to be an earth embankment of 107-ft. maximum height of 1210-ft. length, pierced by a permanently open twin outlet conduit of which each half has an arched section 9 ft. 5 in. by 12 ft. 3 in. A spillway through a natural gap near one end of the dam, 10 ft. below the dam crest, defines maximum water level in the reservoir. The outlet conduits, founded on rock, were completed by April of the current year; in order to double their discharge capacity as a safety measure during construction, they were built twice their final height, having their present floor 10 ft. below the future permanent floor. After they were completed, embankment construction began on the full length of the dam except at the creek crossing, the embankment being terminated here for the time being by a low cross-dike. The creek gap provided a safe flood channel during the slow work of building the main part of the embankment to a height safe against overtopping, and closure of this gap could then be carried out rapidly.

In order to accomplish the closure this season, preparations were begun in September. Under protection of a light earth dike thrown across the creek upstream of the dam, a cutoff trench was dug along the center line of the dam; the creek bottom was cleaned off and then covered with a 4-ft. layer of rolled and puddled fill upstream from the cutoff trench. This work, interrupted by freshets, required a month, after which embankment construction in the gap was started and carried along rapidly. The protection dike along the upstream toe of the dam was first brought to a height of 15 or 20 ft. by dragline dumping; between this and a lower dike at the downstream toe, hydraulic fill was pumped, pumping into the main part of the embankment being stopped for the time being. About six weeks' pumping brought this closure section to the height of the rest of the embankment, or 35 ft. above stream bottom.

The rapid rate at which filling is required to progress in this closure section, because of the relatively small basin area and the fact that the watershed is steep and therefore more subject to high water than the other streams, made the Germantown dam the most difficult of the district's five dams with respect to valley closure. However, a very satisfactory degree of consolidation of core material has resulted even in the rapidly built-up closure section, and the dam has now been carried to a height where it cannot be topped by a flood of even the magnitude of that of 1898.

The Germantown dam is being built under the immediate direction of Arthur L. Pauls, division engineer; C. O. Shively, assistant division engineer, and Albert Armstrong, superintendent.

Year's Work in Reclamation Service

DURING the fiscal year ended June 30, 1919, the United States Reclamation Service, according to the recently published annual report of the Secretary of the Interior, accomplished the following results:

1. Continued the construction and operation of irrigation works capable of furnishing water to 1,602,000 acres of arid land and actually irrigated in 1918 nearly 1,120,000 acres, covered by project statistics, producing crops valued at over $66,000,000.

2. Increased the area irrigated and covered by crop census 93,000 acres over that of the previous year.

3. Operated irrigation works including 40 reservoirs, several power and pumping plants, over 12,000 miles of canals and drains, as well as pipe lines, flumes, and tunnels and thousands of structures, such as dams, headgates, weirs, checks, drops, etc.

4. Continued the extension of the projects, including the construction of 396 miles of canals, 179 miles of drains, and nearly 8000 canal structures, and excavated 14,000,000 cubic yards of earth and rock.

5. Continued the standardization of the numerous irrigation structures in the interest of economy and the efficient operation of projects.

6. Continued the policy of stimulating crop production by expending construction funds where they would most quickly increase the productive area of the projects, by active coöperation with the farmers in leveling and otherwise preparing their lands for cultivation, by temporary leasing of withdrawn lands not yet ready for irrigation for dry farming and grazing purposes, by disposal of stored water to lands outside of the projects whenever it would result in increased production and would not jeopardize the project supply, and by encouraging better storage and marketing facilities.

7. Coöperated with other departments of the Government, with other bureaus of the Interior Department, with state governments and with numerous local project organizations in the furtherance of reclamation work and the interests of the water users.

8. Carried on a survey of soldier-settlement possibilities throughout the United States resulting in the location of probably feasible projects in practically every state, ranging in area from 5000 acres to over 200,000 acres.

Rapid Seasoning of Timber by Kiln Drying

Seasoning wood quickly by kiln drying is an important matter in many wood-using industries, but the United States Forest Products Laboratory finds that few kiln operators attain the fastest safe rate of drying, and that quick satisfactory drying depends more on the operator than on the kiln. It is found within the limit of commercial possibility for 1-in. lumber to be kiln-dried from 18% moisture content (as reached in three months' yard seasoning) to 5% moisture and conditioned for use in 5 to 7 days for hard maple and birch, 6 to 8 days for red gum, walnut and mahogany, and 8 to 10 days for plain sawed oak.

Paving Brick Manufacturers Seek Specification Changes

Lugless Brick, Standard Sand Cushion for Bituminous Fillers and 4-Inch Base, Are Among Features Proposed

THE National Paving Brick Manufacturers' Association has adopted new specifications for standard vitrified paving brick that contain two new features. The first is that the brick "shall be wire-cut and shall have square edges," and the second provides for a reduction from the standard 3½ x 4 x 8½-in. brick to 3 x 4 x 8½ in. While the language of the specifications with reference to the kind of brick specifies that they "shall be wired-cut and shall have square edges," the association explains that its intent is a standard plain—that is, a lugless, brick.

In the specifications covering the laying of pavements, the association recommends that sand cushions be made standard for bituminous fillers, a cement-sand bed, however, being retained for use with cement fillers. Recommendation is also made that the minimum depth of concrete base be reduced from 6 to 4 in.

These four recommendations, two relating to the brick itself, one to the type of cushion, and the fourth to the base, were presented by the association to the Brick Committee of the American Society for Municipal Improvements at its New Orleans convention Nov. 13. The proposed specifications, however, were not acted upon by the committee or, at least, were not reported out to the floor of the convention.

In presenting the matter to the American Society of Municipal Improvements, the association gave the following reasons for the recommended change:

"1. Economy in manufacturing costs by eliminating higher cost incident to producing many varieties of the same article.

"2. Insuring the production of the highest possible percentage of No. 1 brick, uniformly and thoroughly vitrified beyond all service requirements.

"3. Convenience, by affording a uniform brick available from any and all manufacturers.

"4. Providing a larger possible measure of economy in brick pavement construction by reducing the weight of brick per square yard approximately 25%, when laid flat."

Need for standardization is due, says the association, to the following facts:

"The paving-brick industry is now producing more than 12 different styles of brick for street and highway surfaces.

"The capacity of the industry is approximately 3,250,000 tons annually. Coal consumption amounts in round numbers to 6,000,000 tons in a year.

"Even a comparatively slight relative economy applied to these figures means much in absolute value.

"The need for utmost economy, as measured by the lowest possible production costs, is vital as a national service. This applies to all industries, paving brick included."

Added service value can be secured, says the association, because "careful grading of product to meet the standards of quality for street surfaces leaves off grade material," inasmuch "as the percentage of off-grade material is reduced by a larger proportion of No. 1, manufacturing costs are lowered."

Added reasons for the proposition of changes in specifications are, says the association, that the "size and character of standard brick we propose to the society is the one that lends itself to uniformity in structure and vitrification with minimum weight. While standardization of product is conceded to be essential, it naturally should not be accomplished at the cost of loss in service value. It should (and in this instance, will) bring added service value.

"The convenience to buyers of being able to secure the same size and character of product from any manufacturer is evident on the face of it.

"Reduction in weight per square yard wherever transportation and handling are involved is a readily recognized advantage in aiding more economical construction."

Continuing, the association proposes "that it clearly be stated in the specifications of the society that sand is preferred as a cushion material, jointly with granulated slag and stone screenings (as representative of the same type of cushion) when bituminous fillers are used.

"This recommendation is in effect a positive statement that would define the usefulness of sand as a cushion material, lest the fact that general usage of the sand cushion and cement grout filler has been abandoned be construed as discrimating against sand cushions.

"It opens the door to the next logical recommendation, that a specification be admitted for the cement-sand bed to accompany the use of cement filler.

"The amendments are proposed in accord with general practice now prevailing in all sections of the country.

"The proposed reduction in the minimum depth of concrete base for brick pavements is made, believing that it is the desire of the society to place its specifications at the service of engineers in all communities, large and small.

"Without question, there ar streets in cities that logically require bases as deep as 6 in. when concrete is used.

"But there are many more conditions where 4 in. is quite sufficient for all requirements. Using 6 in. would then be an extravagance.

"Must we not think in terms of the combined subgrade and artificial foundations? May we not say that first attention should be paid to secure a thoroughly well drained and stable subsoil?

"With that assured, the function of the base is more to distribute loads than to support loads.

"If for no other reason, the fact that 4-in. bases are now and have been for many years in actual service, without the slightest question as to adequacy, would supply all the evidence needed in support of this recommendation. After all, we are merely speaking of minimum depth."

Fairbanks District Gold Yield

The Fairbanks district, in the Yukon basin, has produced over $70,000,000 in gold and has been a source of considerable silver, lead, tungsten and antimony.

Stacking Elevator Simplifies Freight Handling

Heavy Bales and Boxes Lifted Into Place at Low Cost by Self-Driven Electrical Machine Developed at Seattle

GUNNY bales, weighing from 1400 to 2000 lb., are received in large shipments on the piers of the Port of Seattle. So long as these did not need to be piled, no freight-handling problem was involved, because one man unaided, with a two-wheeled truck, could deliver the bales at the desired place and at a very low cost. As floor space became more valuable, however, it was necessary to pile the bales two high. The labor cost then increased enormously, because it took 10 men to lift the bales to the second tier.

A study of the problem undertaken by G. F. Nicholson, chief engineer, and G. Whitestone, electrical and mechanical engineer of the Port of Seattle, resulted in the development of a portable stacking elevator which has greatly reduced the cost of unloading cargo of this character. The device resembles a miniature motor-driven piledriver with a steel platform operated in the leads in place of a hammer, the entire apparatus being mounted on an electric truck. The truck is of standard type, operated by storage battery, and when it is desired to use the truck separately the clamps which hold the steel frame to the truck body are removed and the pair of pivoted struts at the rear is swung down to bear on the floor. The truck can then be run out from under the elevator mechanism proper.

The mechanism consists of an electric motor geared to a pair of drums on which are wound the hoisting cables that operate the platform. The gear ratio can be suited to the speed required. For handling gunny bales and general freight, a lifting rate of 60 ft. per minute has been found suitable. The lifting capacity is about 3000 lb. The motor is served by an extension cord from the nearest outlet in the power circuit, but if desired a motor could be used which would be operated by the storage battery. The controller for the hoisting motor is provided with an automatic cutoff actuated by a cable carrying adjustable stops. This arrangement shuts off the power and sets the brake at a predetermined point. The leads are hinged, so they can be laid back to permit the machine to go through doorways. For use in narrow aisleways a turntable has been designed to be placed between the truck and the elevator proper. This allows the elevator to be swung around at right angles to the truck, in which position it can handle freight equally well.

For handling gunny bales the machine is placed in the center of the shed floor, and truckers with their two-wheeled trucks deliver the bales to the machine platform. In this way the machine can work as many as six piles at a time. The steel platform comes to rest on the floor, and onto this the man with the two-wheeled truck dumps his load without help. The platform then elevates the bale, the machine is moved to the desired location, and the platform is thrust over the lower tier of bales. While the bale is held in position over the pile the machine backs off. To aid further in finally placing the bale, the platform is slightly elevated and pushed against the bale while the men guide it into place. This operation is very rapid and is said to eliminate at least six men from each crew engaged in putting gunny bales on the second tier. The machine also makes it possible to extend the piles several tiers if desired at practically the same cost as for the second tier. Piling gunny bales in three tiers by man-power would be impracticable because of the excessive labor cost.

An ordinary storage battery truck in this service is found to operate approximately 12 hours without recharging. When a direct-current motor is used on the elevator and draws energy from the truck battery, the length of service for each recharge is reduced by about



LIFTING 2000-POUND BALES WITH A MECHANICAL STACKER AT PORT OF SEATTLE

25%. However, the use of a motor connected to the storage battery is recommended by the Port of Seattle authorities, because it eliminates the extension cords and the need for power wiring.

When the first stacker was put in operation on a gunny-bale cargo, a record of cost data showed a saving of about one-half over the usual cost of handling the bales. The cost of unloading this cargo was $5000. If five stackers had been available, one for each of the boat's five hatches, port authorities stated the cost would have been reduced to $2500. Enough machines are to be added to the two now in service to permit the handling of an entire cargo by this means.

The machine has been effectively used for stacking canned salmon, with the aid of four wheel trailers on which the salmon cases are loaded, a light wooden bottom being placed first and the stack piled on this. These trailers are loaded at shipside and drawn by electric trucks to the stacker. The steel platform of the elevator is run underneath the wooden bottom, and the load is lifted to the desired height, whence the cases are removed by hand. This method releases the trailer as soon as it reaches the stacker and is relieved of its load.

The American Highway Problem

President A. R. Hirst's Address Before the American Association of State Highway Officials, Louisville, Kentucky, December 8, 1919

WE COMMENCE today, in this our annual meeting, what I sincerely feel is the most momentous highway gathering ever held in America. For the past few years the overwhelming shadow of the world war has hung over all our deliberations. Everything else was so secondary to the issues fought for and won in that great struggle that even those of us who most implicitly believed in the importance of highway work in America felt that highways and work upon them should be subordinated to the other and greater world purposes.

We did, however, fight, and fight successfully, in order that the great highway movement be not utterly crushed in the midst of the manifold demands of war, because we felt that by keeping together the nucleus of a highway organization, despite many shortsighted attacks, we were doing the American people a real service. It was not pleasant work, or profitable, to those of us who were in the midst of the storm. But it was worth while, and the fight was won, even though for a time the production of ukuleles was ruled, by the powers that be, to be more important than the production of highways.

The New Era

But now all is changed. The American people, almost as one man, are demanding, and that instantly, a modern and comprehensive system of highways, and are willing to pay the price. They have at last realized that the price of building highways which will serve the needs of the present and of the logically to be expected traffic is far less than the price they must pay if the present embargo of mud continues. Never, I believe, since the days of early railroad development have the American people been so determined to change instantly their means of transport, and not even then were they so willing to pay the cost, provided they could get the results. What are the results they are now demanding, and what are some of the problems that grow from these demands?

They are expecting the states which had no highway organizations three or even two years ago, which had done no preliminary work and in some of which hardly a mile of modern rural highway had ever been built, to create an organization full-sprung from the earth (as our imaginary defensive and aggressive Army was to spring) and to build instantly hundreds of miles of modern roads costing millions upon millions of dollars. In the older states in the highway game, better prepared with organizations and contractors, and with some knowledge of material and construction conditions, they are asking us to double, triple or quadruple our annual output of roads. It is probably fair to estimate that the expenditure for modern highways in rural America in 1919 was about $200,000,000 and that the sum desired to be expended for them in 1920 exceeds $600,000,000. In other words, the people of America desire to triple their highway expenditures and to do it in one year.

We are wont to think of the era of railroad building in America as presenting the greatest of engineering problems and that its solution was an astounding exhibition of the capacity of American engineering genius. However, the problem confronting American highway engineers today far exceeds the old one in magnitude. In the record five years of railroad development (1879 to 1883, inclusive) there were built 40,000 miles of railroad costing, as nearly as I can ascertain, about $20,000 a mile, on the average, or $800,000,000 in all. In the five years from 1920 to 1925, inclusive, the American highway engineer will be expected to build probably 100,000 miles of highway costing not less than $3,000,000,000. Even allowing for the depreciated dollar, the yardage of earth to be moved, the amount of materials to be furnished and transported, and the labor required are probably at least double those required in the former enterprise.

Some of Our Problems

It may be of interest to list some of the tremendous problems facing the executives of state highway departments in this work of speeding up the national highway program to meet the American demand:

1. *Trained Engineering Help*—The problem of trained engineering help to make the surveys and plans, the preliminary investigations and to perform the inspection is one largely for American educators, but with the present shortage and the very restricted output of young engineers, due to the war, it is an acute one demanding immediate attention. I might add that, in my opinion, a four-year course is longer than is necessary for the preparation of much of the help that is needed, and a solution should be sought along the lines of the winter short courses of our agricultural colleges. We must have hundreds—yes, thousands—of trained men at the earliest possible date and four or five years hence will not do.

2. *Materials of Construction*—Nothing is more certain than that there will be an acute shortage of materials in 1920 and thereafter, unless there is substituted in place of the present hit-and-miss methods an intensive study of all available road materials in every state, and unless the most strenuous methods are used to develop every available source of supply. The expensive production and delivery of road materials during the winter season is going to be necessary, especially in the northern states with short construction seasons. Every state must establish a road-materials department, the sole function of which will be to locate, test, develop and arrange for the proper delivery of all available materials. Already there are rumors of combinations of material men to purchase and control all sources of highway materials. It is up to the states to protect their people by getting sufficient material sources in state and county hands before it is too late.

3. *Cement*—It seems obvious that much, if not all of the so-called permanent surfacing will be either cement concrete or other surfacings on a cement concrete base, and that practically all drainage structures will be built of concrete. Unless there can be had the most absolute and fair Federal control of the price of cement, the bidding between municipalities and states

and between contractors for cement is apt to drive the price up to the point of impossibility. In lack of Federal control, the erection or purchase by the states of cement mills or state control of the output of certain mills would seem to be only a rudimentary conception of the duty of protecting the public against unduly inflated prices. The present unfair arrangement between manufacturers and dealers whereby dealers who never see or handle the cement must be paid hundreds of dollars for every mile of road built of concrete or with a concrete base must also be controlled effectively. States which buy millions of barrels of cement annually and pay always (no bad accounts) must get at least the dealer's price.

4. *Car Service*—Car service has been execrable on practically every railroad. We have been handicapped day after day and month after month by the criminal neglect of the present railroad officials to recognize the fact that highway building is a great American industry. If construction is to be carried on with materials delivered by rail, better car service, and, in the northern states, a longer season for shipments, are necessary. Possibly the time will soon return when freight revenues will mean something to American railroads and when it will not be an insult to a railroad man to offer his company freight business. I sincerely hope so. Until then we ought not depend on materials involving a railroad haul except where no other source of supply is humanly possible. If the railroads are allowed to come out of their present state of coma and will give us the proper type of cars, enough of them, and reasonable service at fair prices in the installation of unloading sidings conveniently near the work, their revenues can be very materially increased, our costs decreased, and our work speeded up.

Railroad Problem Demands Attention

Who but a hopeless theorist could have devised the present system of railroad control wherein it is no one's business to get business, and the less business a railroad does the less the wear and tear on its roadbed and equipment and the greater its real profit? If you guarantee a man a fixed income for a term of years, whether he does much, or little, or nothing, what is the inevitable result?

And yet it is seriously proposed to continue the present soporific arrangement, which has killed all railroad initiative, hamstrung all legitimate business and left us a nation with its primary circulatory system fitted with a tourniquet on every artery. The latest farseeing exhibition of genius is the granting of time and a half for overtime on slow freights, whereby it is happily made possible for every freight train crew to increase its earnings greatly by making slower time!

Even in this railroad problem we must interest ourselves because we can never build our roads unless this American "sleeping beauty," our railroad system, is given an injection of dynamite and made to live again.

5. *Efficient Construction Organizations and Fair Prices*—The contracting problem we always have with us. We need every competent highway builder available and we need immediately to multiply his number two to five times in the various states. We must encourage those good contractors who are now available and develop many new ones. To do this, good prices will have to be paid and fair treatment given. On the other hand, we must not hand over our clients' pocketbooks to the contractors with the injunction, "Take what you think is right, but please return us the cover." Unless some restraint is exercised, with the amount of work there is to be done and with the universal feeling existing that "my road must be built no matter what it costs" prices will be driven up and up, without regard to proper cost, values or profits.

In this connection, it is my belief that each state should immediately develop a moderately large construction organization fully equipped to do a portion of all classes of its work. Then in case prices on certain work are extortionate, the work may be done by force account. This plan has the advantage of developing and training the nucleus of a larger day-labor organization if one should later prove necessary. It also gives at all times a true index of the cost of various kinds of work on the basis of actual and recent state experience. We cannot know the actual cost of work unless we are actually in the construction game.

Interstate Co-operation Necessary

Every state has availed itself, I believe, of the offer of war equipment from the Federal Government. Large supplies of many things useful in highway work, especially motor trucks, have been or will be received. The organization of a proper department to receive, fit for use, and handle this equipment is no mean problem. The states should carefully consider whether this equipment should not be made the basis of building up a permanent, thoroughly well equipped day-labor organization as a means for protecting itself now and in the years to come.

I also believe it necessary for adjoining states to coöperate with a view of keeping prices for work fair and uniform under the same conditions. If adjoining states are going to bid against each other, the cost of work in all of them will be sent up to the prohibitive point, without any ultimate advantage to any state. It should be possible for the states to get together on this matter. Costs are quite figurable for each job, and with a uniform system of allowances for the use of machinery, profits, and contingencies it should be possible to put work in all states on an approximately equal basis of attractiveness. These allowances must be generous, because we must attract the best contractors, but they need not, and should not, be wasteful. This problem is the most acute of all our problems and should be given immediate and serious attention by every state. I can think of no way in which more millions can be unnecessarily spent in the next few years than by allowing unbridled and useless competition for contractors and materials to prevail between municipalities.

6. *Labor*—We speak blithely of millions of dollars for the construction of thousands of miles of road. This program means men, far more men than have ever been employed in this work before. But men are scarce, and other productive labor must not be raided. Our farms, our mines, our factories, and our mills must be allowed to produce largely and at a reasonable cost. We should not pay our labor, or allow such prices to contractors as will enable them to pay their labor, a sum per day greatly in excess of the going wage for like work in that vicinity. Whether we pay high prices for labor or whether the contractor does, it is our responsibility, because the prices we pay for work determines the

prices which can be paid for labor. In other words, we must not bull the labor market to the disadvantage of other production. This is public work, its continuance depends upon the support of the whole public, and we must be careful not to alienate this support for forcing our work at undue prices, thus upsetting local labor situations. This policy is not only right from the standpoint of expediency, but is also economically sound.

7. *Improved Location and Alignment*—We have, in the past, been too prone to build along the old-established lines of highways. This has been the easy course, and it has been taken. But the new traffic conditions are so different and so intense that in considering the construction of a main trunk highway all of the old governing considerations—such as saving the buying of new lands for right-of-way, utilizing old cuts and fills, saving an existing bridge or a few good culverts—no longer bind us to the old locations. We must connect the centers of population, because they are the points from which things and persons come and to which they wish to go. In building a modern highway between these fixed points we can feel free to exercise our untrammeled judgment and build where the road will ultimately cost the public the least. Shortness of distance, freedom from dangerous curves and from railroad grade crossings, and reasonable grades, are now the principal ends to be sought, and practically nothing else counts.

Cost of construction has become secondary. If the very conservative sum of 10c. per mile is allowed for each mile of travel saved, the saving of a mile in distance on highways carrying the following average number of vehicles per day will save the traveling public the given amount per year, which is the interest at 5% on the amount given in the third column.

VALUE OF A MILE IN HIGHWAY DISTANCE SAVED

Average Number of Vehicles per Day	Saving to Owners per Year	Saving Capitalized at 5% Equals
100	$3,650	$73,000
250	9,125	182,500
500	18,250	365,000
750	27,375	547,500
1000	36,500	730,000
2000	73,000	1,160,000
5000	182,500	3,650,000
10000	365,000	7,300,000

I believe that these figures are unassailable and that they demonstrate that when building our main highways for all the years to come, saving in distance in the layouts is the supreme consideration and should receive much more attention.

Many other important problems could be named and briefly commented on, but this paper will be too long if continued along these lines. I cannot, however, resist naming without comment some of the other things with which an efficient state highway department must also concern itself:

8. A proper system of records of the cost of all construction and of accounting for all funds available.
9. Proper publicity of plans and results, not only in the local press, but in the national press.
10. Proper care of traffic during reconstruction.
11. Proper touring maps for the information of the people of the state and of other states.
12. Proper marking of the main traveled roads, keyed to the state maps.
13. Proper accommodations for the traveling public in the way of garages, hotels, public parking places, and comfort stations.
14. Complete knowledge and study of, and, if necessary, the design of labor and time-saving devices and equipment.
15. A study of plant layouts and equipment for various types of construction under varying conditions.
16. A study of the grade-crossing situation and a strong campaign for improved conditions.
17. The holding of road schools and short courses for the instruction and inspiration of all classes engaged in supervising and constructing highways.
18. Helping to formulate and pass adequate highway legislation so that the state may keep pace with other states.

The Coming Battle

It may readily be seen from this hasty survey of some of the attendant problems that these changed highway conditions and this spirit of getting hitherto unheard of results have, instead of making our task easier, but served to increase tremendously our problems and responsibilities. We are on the threshold of a new epoch in highway construction in America, but instead of congratulating ourselves today that the long fight for highways is won, we should rather gird our loins for the impending battle. Added responsibilities bring added fears to the executive who thinks, and spur him on to new efforts and new devices for developing himself and his organization to meet the new conditions.

The coming battle is all the more serious, because from time immemorial the American people, while always willing to pay the price for the work they desire, have never been willing to pay the price of the proper supervision of it. "Millions for public works, but a pittance for those who must design and supervise the building of them," seems to be the American spirit. Our national and state legislative halls are filled with men who appropriate millions and tens of millions with very little thought of the organizations necessary to expend them properly, and with much less desire to provide proper supervision than to further the prestige of themselves or of their political party.

As a case in point: It was with the greatest difficulty that the present Congress could be induced to fix the salary of the very competent present head of the Federal Bureau of Roads at $6,000 a year, although this bureau will in the years 1919 to 1922, inclusive, supervise from the Federal standpoint and protect the Federal interest in the expenditure of probably $200,000,000 of Federal money and with it the expenditure of $300,000,000 more from the states and local units. When a Federal highway commission is proposed, to expend billions in the layout, construction, and maintenance of the proposed Federal highway system, the salaries of the commissioners and of the chief engineers are fixed, under protest, at $10,000 each per year, and we are told that Congress will never "stand for" these salaries and that they will probably be cut to much less before the bill becomes a law, if it should become a law. The national Congress is probably the most niggardly employer in America, unless some of the states bear off the unenviable palm. It seems hopeless to expect a continuously efficient organization in any Federal bureau unless Congress shall see a new light and fix public salaries to fit the imposed responsibilities.

It is interesting, although disconcerting, to note the almost total lack of interest on the part of road-promoting organizations in the fundamental problem of getting proper administrative bodies to control the highway programs. We have good-roads associations, trail associations, highway councils, etc., *ad infinitum*,

all seeking to promote the construction of roads in detail or in mass, and urging the nation, the states and the counties to spend millions or billions on highways of all kinds, classes, sorts and conditions.

The sole idea seems to be to get money, and more money, to build highways. It does not appear to matter to them what kind of highways, who builds them, or whether the people get a dollar's worth or a dime's worth for a dollar. Men are in these associations who make millions every year, who control organizations which are solely designed to get efficient dollar for dollar results, and who pay their executives what they are worth. Yet when they get into the field of public service they seemingly forget all the rules which made their own business a success, and expect a thousand-dollar man to be the eighth wonder of the world, and world-beating organizations to grow overnight; with no possible financial encouragement. Unless business men of this class wake up and devote more thought to the basic problem of getting efficient organizations to spend the money, I fear a real disaster to our highway programs.

Politics and Salaries

All of us have probably in the past derided the possibility of getting effective results out of town and county highway efforts because, we said, politics had too great a part in road work in those units and that they would never pay the salaries necessary to get competent planning and supervision of the work. And yet in 34 of the 48 states which now have state highway departments, the Governor may change the personnel of the state highway department so as to control it during his term of office. In many of these states the highway law is deliberately so framed that a new Governor may make a clean sweep of the state highway department the minute he assumes office, if he so desires. In most cases he seems to have desired it. There have been at least 127 different executive highway officials in these 34 politically organized state highway departments in the grand total of 296 years of their existence, or a change every 2⅓ years, on the average, in each state. The oldest executive officer in charge of highway work in any American state has served his state nine years in that capacity.

A state highway department is not right or it is not wrong just because it has a Republican or a Democrat at its head, or because one brand of Republican or Democrat is in control when another brand of the same political party comes into power. A state highway department is right when it is well organized to get efficient and economical results, and is wrong when it is organized or unorganized to produce inefficient and uneconomical results.

Let us consider the salaries paid the executive officers of the state highway departments. There is one who is paid $20,000 per annum; two, $10,000; one, $8000; two, $7000; two, $6000; and eight, $5000, while 32 of them are paid less than $5000, and 20 receive $3600 or less. In this connection it should be remembered that the highway work which it is expected a state highway department should supervise is now in few cases less than $3,000,000 a year and in many states it has reached, or will soon reach as much as fifteen, twenty, or twenty-five millions. What business organization in the world would pay on a similar scale for similar responsibilities or would expect to receive adequate results under such conditions?

I speak of these matters not in a spirit of fault-finding but in order to interest you in the great problem of building up public opinion to the point where, for its own protection, it will insist upon the proper organization of every agency which deals with the expenditure of these great aggregations of highway funds.

Clean-cut Efficiency

We must, by every means in our power, by precept and example, preach the doctrine of clean-cut business efficiency in American highway administration. In doing so we will go up against the age-long prejudice of the American people against paying their public servants a living or a proper wage. From top to bottom the scale of public salaries is wrong. The constitutional and other officers of the nation, of the states, of the counties, and of all other municipalities are, practically without exception, being paid, not on the basis of what their services are or should be worth, but on a basis fixed (in most cases long years ago) with due regard to the "honor" which must accrue to the holder of a public office. The universal custom was, is, and possibly always will be, to figure that the prospective holder of the job will be a politician with other interests or means and that the salary won't matter, or that joy at getting the "plum" of public office will dwarf all material considerations.

There is or should be an honor in being selected for public service—and worthy public servants appreciate and feel that honor. It may be, although I doubt it, worth while for the American people to penalize consistently those who work for them by paying them less than a living wage or less than the work would command if done for a corporation, or if done for the individual citizen in his private capacity. But the trouble with the system is that when the American people have before them a piece of really constructive work, like their present highway program, the policy falls down absolutely.

We must help the American people by making them realize that with hundreds of millions, even billions, to be expended in the next few years, the building of highways is a profession and a business and not a political football to be kicked around like the proverbial pup. This is not selfishness. Most of us are in this highway business because we love the work and because we want to help build up the states and the nation. I doubt if there is one man here who has made good or who is capable of making good who cannot leave his present state position and make more money working for himself or in employment in commercial lines. But the work must go on and it must go on well, and we must feel an interest above a mere financial interest in the jobs we hold, if we are worthy of them.

Money is not all—the satisfaction of creating, of building; of creating and building well; of helping to build a county, a state, or a nation, is worth more than a few hundred or a few thousand dollars a year if one can manage to live. We can't afford to pinch pennies and bandy words just for ourselves, but in the interest of the competent and "up and coming" highway organization which must be created in every state to protect the interests of the people of the state, we can afford to fight for the right.

Unless there appears a radical change in the American spirit of expecting much from their public servants and giving little, not one of us here will ever get rich or even attain a competence in the public service. We will, on the contrary, fight on and on until disgruntled politicians finally get us, or a younger and better qualified man supplants us. With the best of our youth, our enthusiasm and our strength gone, we will retire full of wounds, without money, and without honors to make a new start in middle age. Such is the almost inevitable fate of the servants of the American people. But we can retire with honor unsullied and with our flags still flying. Later those who now fight the good fight for right standards, and thus help make the path of their successors easy, may be recognized as public benefactors. When these pioneers are dead and buried, as is the custom here, they will be acclaimed as, after all, worth while, and possibly even monuments will be erected to some of them.

I trust that nothing I have said in regard to state highway organizations will be wrongly construed. The present organizations, with very few exceptions, are and have been doing effective work with limited opportunities. Where there is trouble it is in most cases due principally to the damnable political obsession of our American commonwealths. In too many states it is not even debated that the old political motto "to the victor belong the spoils" is the law and the gospel, and the idea that the victory of any political party or of a faction of any political party should not carry with it the transfer of all offices within the Governor's control is not even considered, but a total overturn is taken as a matter of course. County and state officials without number have been thrown out of office for no other reason than that "they have held the job long enough; someone else should be given a chance." If a bank or a railroad, or any other corporation, adopted the idea that political belief was the hallmark of efficiency, or that long-continued service was a valid reason for discharging its personnel, public confidence would be lost, its stock would be a drug on the market and the corporation itself would become bankrupt.

Well Paid Efficiency Only Basis

In fairness to my home state, Wisconsin, it should be stated that we have a nonpolitical highway commission, the operations of which have been entirely free from political interference by the Governor or anyone else. I state this because there may be some idea that my remarks originate from dissatisfaction with conditions in my own state, which is not the case. Conditions, laws and public sentiment there are good and improving fast. I have, however, long been a student of American highway administration, have followed changing state laws and personnels, and have attended practically all national highway meetings for years. As a result of these observations, I believe I can safely say that the great American highway problem will never be solved rightly until we get our state and county organizations safely established on the sole basis of well paid efficiency.

The American public must be convinced that if they will play politics with their public officials they should confine themselves to routine offices where almost anybody can "get by" because someone else does the work anyway. They must be convinced, on the other hand, that the highway departments of the states and of the counties come into a different class and that here merit and knowledge should be the sole criterion in selecting and keeping their officials, and that here at least, length of training and service is of tremendous value and a necessity if efficient and economical results are to be secured.

The professions of highway engineering and of highway building must be dignified so that they shall attract the best engineers and the best construction men in America. This is important not only for the immediate future, but especially so for the years to come. Not only must we strive to attract and keep the best we have, but we must get the coming men. We need all the brains and all the talent we can muster. To attract the best young men, good working conditions, a clean atmosphere in public service, adequate compensation and a reasonable chance of advancement must be offered. Less than this will not serve.

Therefore, let us dedicate ourselves to this work of helping to make all highway organizations efficient instruments, able and competent to carry out the American purpose of building a highway system befitting the greatness of the American nation. Than this, we can do the American people no greater service.

Purchase of Toll Bridges by New York and Pennsylvania

Active work was initiated recently by a joint commission of the States of New York and Pennsylvania for the purpose of purchasing the toll highway bridges across the Delaware River between the two states. While the subject has been under consideration since 1905, no progress was made, except for a preliminary report rendered in 1911, until authorizing legislation was passed in 1916. Commissions were named during the present year by both states, and these have now organized as a joint commission, of which Gov. W. C. Sproul of Pennsylvania is chairman, Frederick Stuart Greene, highway commissioner of New York State is vice-chairman, and E. A. Lamb is engineer-secretary. It was decided that a valuation of all the bridges and the collection of other data concerning them be undertaken at once by E. A. Lamb and Willis Whited, and that the commission then give first consideration to the purchase of the Port Jervis-Matamoras bridge, the Barryville-Shohola bridge, and the Hancock-Buckingham bridge. This work is now under way.

Eleven bridges are in question, all privately owned structures except that at Pond Eddy, N. Y., which is owned by the town of Lumberland, Sullivan County, New York. Six of the structures are steel truss bridges with plank floor (at Port Jervis, Pond Eddy, Narrowsburg, Skinner Falls, Cochecton, and Callicoon, N. Y.), the other five being suspension bridges (at Barryville and Hancock, N. Y., and at Lackawaxen, Kellam, and Equinunk, Penn.).

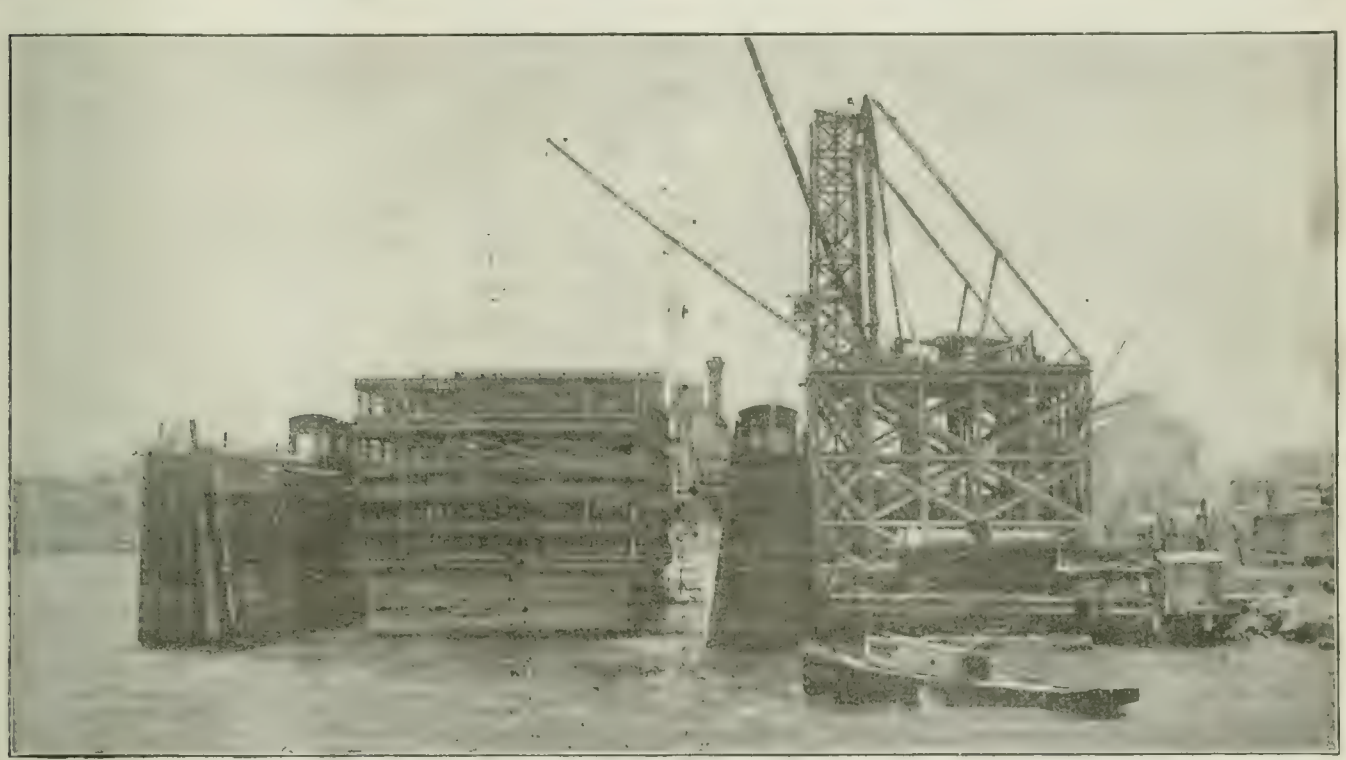
Some of these toll bridges have been maintained as such for about one hundred years. The Cochecton Bridge Co. was incorporated in 1817, the Narrowsburg Bridge Co. in 1823, the Chehocton Bridge Co. (Hancock, N. Y.) and the Lordville & Equinunk Bridge Co. in 1869. Two engineers are represented on the joint commission, Frank M. Williams, state engineer and surveyor, and Frederick S. Greene, state highway commissioner, New York.

Pearl Harbor Dry Dock Pump Well Large Precast Unit

Base of Concrete Box 96 by 45 Feet in Plan and 60 Feet Deep Cast on Float — Upper Part Poured in Attached Cofferdam

By R. W. Gaylord
Assistant Engineer, San Francisco Bridge Company on the Pearl Harbor Dry Dock, Honolulu, H. I.

FOLLOWING the practice in the construction of the main sections of the Pearl Harbor Dry Dock at Honolulu, H. I., the large pump well of the dry dock, a concrete chamber 96½ ft. in plan, 45 ft. wide and 60½ ft. high, was precast and floated into place. As described in *Engineering News-Record* of July 25 1918, p. 173, the main sections of the dry dock were built on a temporary floating dock to a certain height, above which the walls were carried up inside a cofferdam attached to the concrete base, which by that time had been floated.



PRECAST PUMP WELL IN FLOATING DRY DOCK JUST BEFORE LAUNCHING

The pump well is located 6½ ft. outside of the west wall at the entrance end of the dock, and rests on a combined pile and crushed-rock foundation 52½ ft. below low water. The floor is 3 ft. thick and the side-walls 5½ ft. at the bottom tapering to 3 ft. at the top. A longitudinal wall extending to the top of the pump well separates the pump compartments from the suction and discharge culverts. Four cross-walls extending to within 22½ ft. of the top act as struts to carry the pressure of the water and backfill through the compartments, in which are located four 54-in. and two 15-in. vertical centrifugal pumps capable of unwatering the dock in slightly less than two hours. Steel beams set in the walls above the pumps carry the 6-in. concrete floor and the motors. They also act as struts for that part of the wall above the cross-walls.

Three 6 x 6-ft. emptying conduits lead from the floor of the dock under the west side wall into a suction culvert 7 ft. 3 in. x 10 ft., which extends the entire length of the pump well with a 3 ft. 3 in. roof separating it from the discharge culvert. Set in the concrete wall of the suction culvert are four 54-in. flared pipe castings and one 22-in. pipe to which the pumps are connected; 9 ft. 9 in. above these castings are four similar ones through which the 54-in. pumps discharge, the 15-in. pumps discharging through a 22-in. pipe in the end wall.

As shown on the drawing, the discharge water must pass up and over the cross-walls which extend through the discharge culvert. This culvert extends the length of the pump well, with an opening to the sea 12 x 15 ft. protected by five sliding screens.

For filling the dock, there are three 4½ x 6-ft. conduits leading from the discharge culvert through the walls of the pump well and dock. These openings are controlled by electric-driven gate valves.

The pump well is located 6½ ft. from the dock, to give clearance for handling to place. This space is filled with concrete, forms being first placed for filling and emptying conduits.

The site for the pump well was dredged to a depth of 53½ ft. below low water. Wooden piles were driven on about 4-ft. centers and cut off 53 ft. below low water by means of a circular saw suspended from a floating piledriver. A 12-in. layer of 2½-in. rock was then spread around and over the tops of the piles and leveled by means of a heavy steel drag to within 0.1 ft., plus or minus, of theoretical grade.

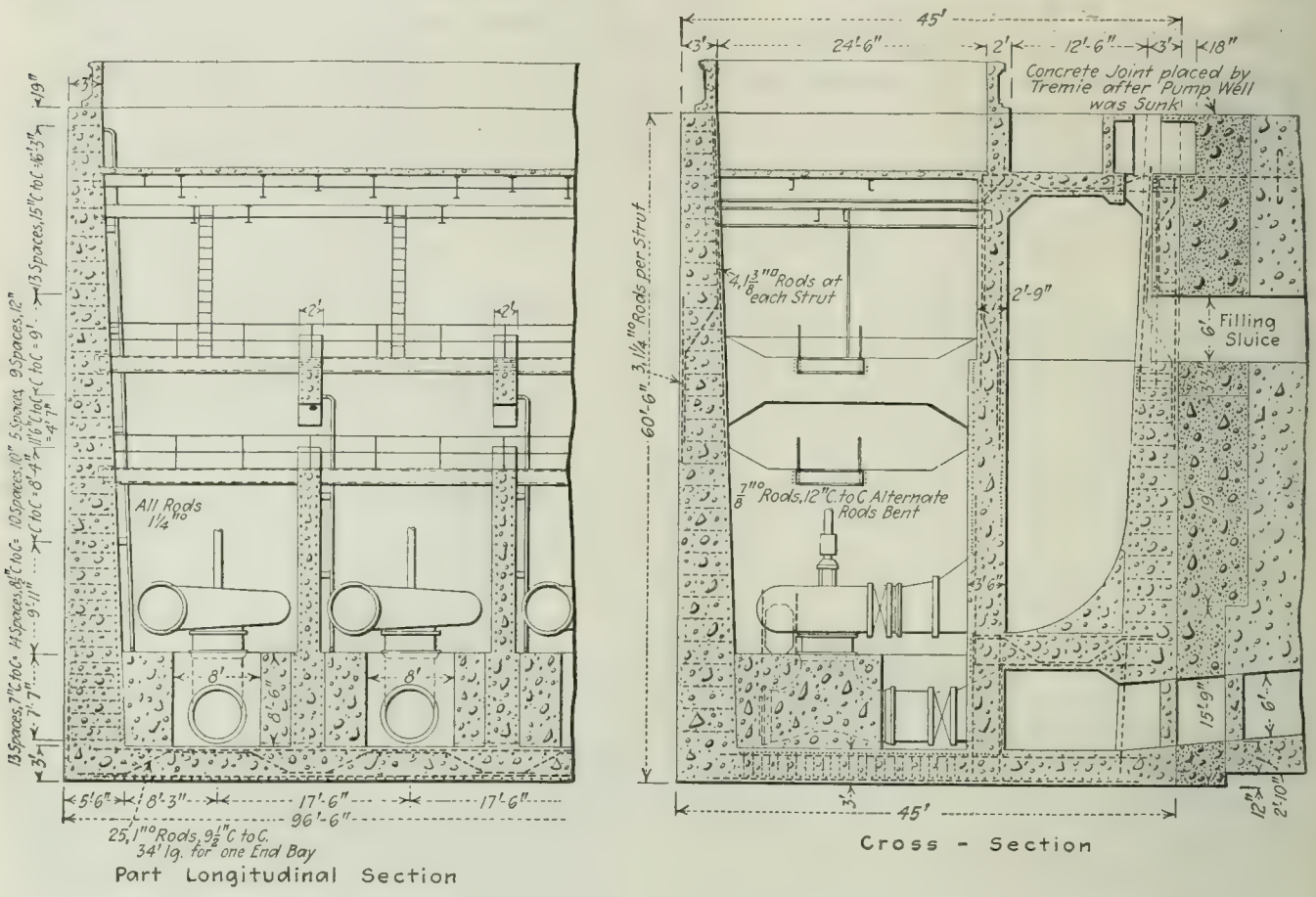
The excess weight of the walls near the bottom made it impossible to erect a part of the structure on shore or on a floating dock and, after launching, to sink the same as the walls were poured. Therefore it was necessary to add a wooden crib to increase the height of a section of the pump well so it would float. The crib was built to a sufficient height so that in case the structure filled with water and sank, 4½ ft. would still be above

water. This would have been of great assistance in salvaging.

The first 18 ft. of the pump well were poured on the 3500-ton floating dock which had been used in connection with the construction of the 16 pontoon sections of the dry dock. As shown on the drawing, the regular section of the pump well was built with the addition of a concrete shoulder along one side and the two ends and brackets on the other side. These were constructive features added to make provision for anchoring the sheathing of the crib to the concrete section. Six by 12-in. timbers on edge were bolted 6 in. from the outer edge of the shoulder, and a concrete backing was poured behind these timbers. On the side where the brackets are, built-up timbers were bolted, providing a bearing for the sheathing at the same distance from the wall of the pump well as on the other side and ends.

The inside dimensions of the crib were: Width, 48 ft. 8 in., length 100 ft. 2 in.. and height 40 ft. The bracing consisted of five courses of 12 x 12-in. combined timber and concrete struts, with supporting posts between courses. The concrete sections were placed where the struts ran through the walls of the pump well, and made it unnecessary to stop the pouring of the walls at any particular place to remove struts. A sixth course of all-wood struts was erected to be used as a working deck and was removed when the walls reached that height. The walings were made up of 12 x 22-in. timbers as shown in the drawing; 6-in. sheathing in 40-ft. lengths took bearing on these walings.

The six courses of struts with the vertical and horizontal cross-bracing were first erected. The sheathing, which had previously been bolted together in 4-ft. widths with spun-yarn calking between, was swung into place and fastened top and bottom by 6 x 12-in girts, as shown on the drawing. This sheathing was also held in place by tie-wires, from end to end and side to side, fastened on the outside to 6 x 12-in. girts.



DETAILS OF CONCRETE PUMP WELL FOR PEARL HARBOR DRY DOCK

The joints between sections of the sheathing were calked and pitched in place.

The combined concrete and timber structure, drawing 28 ft. of water, was floated off the floating dock and anchored over its final location. The concrete walls were then poured in 5-ft. courses. Water ballast had to be added at times to keep an even trim, since the line of the center of gravity did not coincide with the center of the structure.

Drainage back of the walls was provided for by pipes cast in the concrete near the top of the 18 ft. concrete section. These were later plugged on the outside by a diver and filled with concrete and capped from the inside.

The concrete is a 1:2:3½ mixture made up of two parts of crusher dust to one part of river sand brought from Puget Sound and 1-in. rock. Only a few small leaks were found, and those were easily stopped from the inside by drilling 6-in. holes into the concrete where the leaks were and driving in small pipes. These were grouted up around the outside to force the water through the pipes and, when the grout had set, the pipes were plugged.

Practically all the construction was done while the structure was afloat. This prohibited taking levels by ordinary methods. The form on the floating dock for

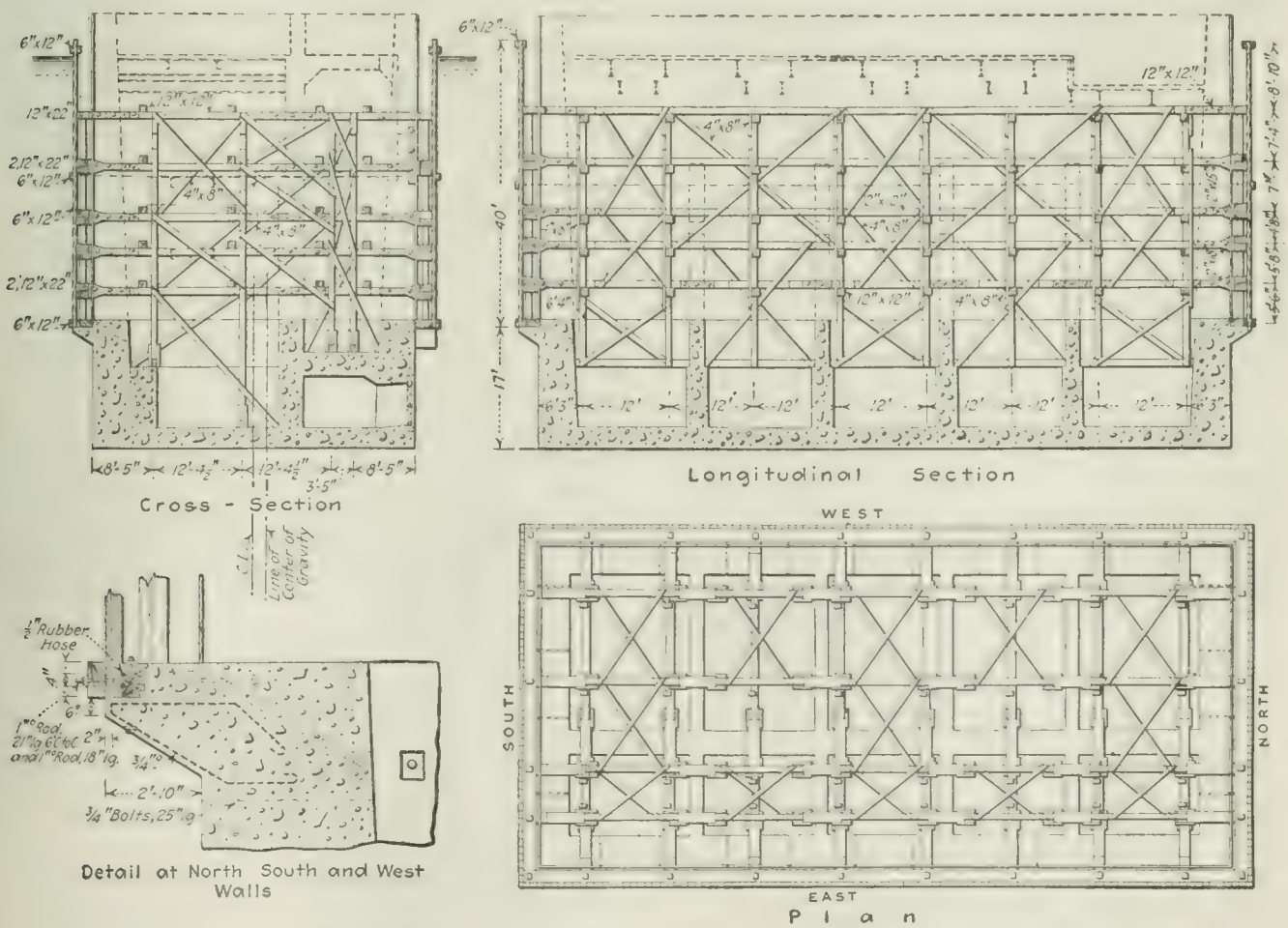


CONCRETE PUMP WELL SUNK IN ITS FINAL POSITION

the bottom of the pump well was practically one plane. An engineer's level was set up, the height of instrument measured from a point on the floor directly below the level, and elevations 3 ft. 3 in. above the form were established on three bolts. Any slight uneveness of the floor was taken care of, so the marks on the three bolts were in the same plane. Other bolts were then set and marked to act as checks. With the plane fixed, a level could be set up at any time, brought into the plane of three marks, and elevations set where needed. This plane was carried up as the walls were poured. Points on brackets fastened to the walls at the same elevations and at definite distances from the outside of the walls were used for locations and for keeping the work perpendicular to the floor.

As temporary bulkheads, precast concrete slabs were set in the emptying conduits and also in the filling conduits. The former came into use as soon as the structure was floated, and the latter when the crib was removed. A timber shutter was also placed over the discharge culvert opening, since all parts of the pump well had to be kept dry for some time after the crib was removed.

The removal of the sheathing and walings was done by divers. To facilitate the removal of the walings, $\frac{3}{4}$-in. rods were fastened to the concrete shoulder of the first 18-ft. section. These rods extended up through the bottom course of walings. Rods were fastened through this bottom waling to the one above, and so on up. In removing the walings, the rods between



GENERAL OUTLINES OF CONCRETE PUMP WELL WITH COFFERDAM SUPERSTRUCTURE

the top two courses were first taken out, leaving only one course loose at a time. This arrangement made it much safer for the divers and prevented the walings from floating up in a jam.

The concrete between the pump well and the dock was poured through a tremie pipe in five courses. The brackets described before, which were constructed on the dock side of the pump well, were for the purpose of allowing clearance for the tremie pipe to reach the bottom of the space between the dock and the pump well. Forms made up of bags of concrete placed by divers made pockets about 16 ft. long and 10 ft. high. This proved to be a very cheap method of constructing forms, especially as all pockets in a course could be poured without removing forms.

There were 1733 cu.yd. of concrete in the section of the pump well poured on the floating dock, and the crib contained 240,000 ft. b.m. of timber. The total weight of the combined structure as erected on the floating dock was 8,200,000 lb. The pump well complete contains 4500 cu.yd. of concrete, 250,000 lb. of reinforcement and 97,000 lb. of structural steel.

The pump well was designed by the Bureau of Yards and Docks of the Navy and erected by the San Francisco Bridge Co., which has the contract for the dry dock complete with pump well. Commander George A. McKay, public-works officer for the Pearl Harbor Navy Yard, is in charge for the Navy, and Francis B. Smith is chief engineer in charge of the work for the San Francisco Bridge Company.

Safety Engineering Reduces Cost of Construction

Statistics of Expenses and Savings From Actual Construction Operations Show Economy of Accident Prevention

ACCIDENT prevention has proved highly profitable in the construction operations of the E. I. du Pont de Nemours Co. General statistics of expenses and savings due to accident prevention on two of these operations are given in a paper by F. L. Hurlbutt, safety engineer, before the construction section of the National Safety Council.

Early in 1918 the company undertook its largest construction project, the complete design and erection of a smokeless-powder plant for the United States Government. An average working force of 25,000 men was maintained. Shortly after the start of construction in March, the safety engineer began building up his organization, which had by the latter part of April assumed working proportions.

During March and April, the period of organization for the department, the "lost-time rate" expressed in days had steadily increased until it stood at 2.27 days lost per man per year. By May 31, one month after safety activities had been begun in earnest, this figure was reduced to 1.28, the next month saw it lowered to 0.744, the following month it stood still, but the next month saw a further reduction to 0.684, then came a drop to 0.351. In the next 30 days occurred the only upward trend in the curve, when the figure went from 0.351 to 0.441, really an excellent figure in itself. But again, with the last month of activity, the downward tendency was resumed, with the result that the lowest figure of all was attained—namely, 0.216.

In the seven months of the safety department's activities the lost-time rate had been reduced from 2.27 to 0.216, a 90% reduction, which is regarded as a truly remarkable record, when it is considered that it was made in the face of a very high labor turnover and with a working force almost entirely new to the company. The total frequency rate, calculated on the annual basis after the Federal practice, was 58.9. The fatality frequency rate, calculated on the same basis, was 1.0.

When this project was first conceived, a rate was quoted the company for carrying liability insurance on all the construction employes. Using this rate, the cost of insurance against injuries, both fatal and nonfatal, to the company, would have been $452,752 as against the actual cost of $66,101, a saving of $386,651. Deduct from this the cost of maintaining the safety department, $50,000, and a net saving of $336,651 is seen.

On the construction of a large shell-loading plant, where similar safety efforts were carried out by the company, though on a scale not quite as large, equally impressive figures are available. Here the success of the safety work resulted in the actual cost of injuries being $5733, as against a figure of $103,545, if liability insurance had been carried with an outside firm. This gives a saving of $97,812, from which the cost of maintaining the safety department, $10,500, must be deducted, giving a net saving of $87,312. Here the total frequency rate was 47.8 and the fatality frequency rate was zero.

In May, 1916, during a temporary lapse in construction activities in his particular line, one of the company's best construction engineers was made safety engineer on one of its largest plants, where an average operating force of 12,000 men and a construction force of 700 men was then maintained. For two years he acted in this capacity, and became a real convert to the safety cause. When construction work was started on the Government powder plant, this individual was made a division engineer in charge of the "Miscellaneous Division," which comprised a force of from 2500 to 2800 men. This was exactly the opening he wanted—an opportunity to practice as an engineer on construction what he for two years had been preaching to other construction engineers. Were his preachings vindicated? His record will answer that question. From Mar. 16, 1918, to Sept. 1, 1918, his working force of 2500 to 2800 men had but one major injury.

To many, the examples cited may seem to be of so unusual a character, and the work carried on under such abnormal conditions, that it is not fair to use the results obtained therefrom in arriving at a decision whether safety work pays on construction. To allay such doubts, let the accident-prevention work and safety campaign, with the excellent results attained, which has been carried on during the construction of a large chemical plant these past eight months, be considered.

On this job the effectiveness of the safety work was shown in the difference between the actual costs, including compensation, plant-hospital maintenance, doctor's salaries and the cost of maintaining the safety department, amounting to $8695 for seven months, and the premium of $16,768 which would have been paid on employees' liability insurance carried outside—a net saving of $8073 for the period. An average annual frequency rate of 100.1 and an average severity rate of 0.5, calculated on the Federal basis, was maintained for the first eight months of the work.

Baltimore's Paving Recorded by Map and File System

Complete Data of Even the Oldest Pavements Are Being Compiled—Special Colored Maps and Supplementary Card System Used

By R. Keith Compton
Chairman and Consulting Engineer, Baltimore Paving Commission

COMPLETE record of all paving laid in the City of Baltimore, Md., is being made by means of a map and file system. The types of paving are indicated by various colors on the maps, while the details are kept on cards. The system makes it possible to obtain, in a short time, complete information regarding the paving on any street in the city.

Public street paving of Baltimore previous to 1905 was done entirely under the jurisdiction of the city engineer, now known as the highways engineer. Since that date the paving has been done under the jurisdiction of several agencies: The Annex Improvement Commission, whose work is confined to a belt annexed to the old city in 1888, and which is operating under a special tax scheme; the State Roads Commission, paving streets selected by the city authorities from an apportionment of state roads funds; the Highways Engineer, who frequently handles new paving under special appropriations and who handles the paving of all private alleys, and, finally, the Paving Commission, authorized under an act of the legislature passed in 1906 and amended in 1908. The last-named body can exercise jurisdiction over the entire city, but has confined itself so far to the old section as it existed up to the year 1888. However, no matter which agency does the paving, the funds accruing therefrom under the paving tax accure to the amount of the Paving Commission and are expended by that body.

In addition to the agencies outlined above, private streets are improved either by the abutting owners or by building contractors, and the record of these streets is also included in those compiled by the Paving Commission.

Previous to 1913, the records were compiled and maintained by the city engineer, and consisted of maps in atlas form, on 200-ft.-scale mile-square sheets. On these sheets were indicated, by conventional colors, the various kinds of paving only. No other records were kept except the usual construction drawings, and we had to refer to annual reports of the particular department which had jurisdiction over the paving. While the records of some departments were very much in detail and accurate, the information contained in those of other departments was more or less obscure and inaccurate in detail. Accurate paving records of new and old work are absolutely necessary, and, in order to secure this information and make it available for quick reference, the Paving Commission has assumed jurisdiction over the compilation and maintenance of these records.

On the 200-ft.-scale mile-square sheets, the various classes of paving are indicated by the conventional colors. On each section of work, the limits being marked by arrow points, is placed a small paster, in-

INTERMEDIATE LENGTHS AND WIDTHS OF STREET

FROM	TO	Width Feet	Length Feet
E.B.L. Shields Place	W.B.L. Druid Hill Ave.	38 63	1378. 40
E.B.L. Druid Hill Ave.	W.B.L. Linden Ave	38 69	1245. 60
E.B.L. Richmond St.	W.B.L. Park Ave.	36. 50	599. 60
E.B.L. Park Ave.	W.B.L. Brevard St.	37. 50	153. 70

DISTRIBUTION OF RETURNS AT INTERSECTIONS

STREET RETURN	Side of Street	Kind of Paving	Kind of Base	Width Feet	Length Feet
Pine St	N.S.	V. B.	6" Con.	11 7	13. 4
					13. 15
Argyle Ave.	N.S.	S. A.	" "	36. 4	13. 15
Alley East of Argyle Ave & Elmer Alley	N.S.	V. B.	" "	12. 2	13. 60
	N.S.	"	" "	12. 0	13. 0
	S.S.	"	" "	14. 6	13. 1
Penna. Ave.	N.S.	S. A.	" "	36. 3	14. 7
	S.S.	" "	" "	35. 4	12. 6
Clear St.	N.S.	V. B.	" "	12. 6	13. 5
Fusser St.					
	S.S.	S. A.	" "	23. 7	14. 0
Alley west of Druid Hill Ave	N.S.	V. B.	" "	5. 8	15. 0
Linden Alley					
	S.S.	V. B.	" "	8 5	13. 4
Alley east Druid Hill Ave.	S.S.	V. B.	" "	11. 8	13. 5
McCulloh Ave.	N.S.	S. A.	" "	34. 9	13. 6
	S.S.	" "	" "	34. 1	14. 3
Alley east of McCulloh St.	N.S.	V. B.	" "	11. 2	13. 3
	S.S.	" "	" "	10. 9	13. 6
Madison Ave.	N.S.	S. A.	" "	38. 9	14. 45
	S.S.	" "	" "	39. 1	11. 85
Alley east of Madison Ave	N.S.	V. B.	" "	12. 0	13. 40
	S.S.	" "	" "	9. 9	13. 20
Eutaw Place	N.S.	S. A.	" "	38. 4	13. 85
	S.S.	" "	" "	104. 6	13. 90
Alley east of Eutaw Place	N.S.	V. B.	" "	11. 9	12. 70
	S.S.				
Preston Alley					
	S.S.	V. B.	" "	10. 0	14. 30
Bolton St.	N.S.	S. A.	" "	39. 9	13. 20

Record of Paving Laid by the Paving Commission

Biddle St. from E.B.L. Shields Place to W.B.L. Brevard St. Contract No. 103

Contractor Balto Asphalt Block & Tile Co. Engineer in Charge H. D. Williar Jr.

Length of Street 3377. 30 Feet .64 Miles. .51 Miles Average 30 Ft. Wide. Width of Street 3778 Feet 90298 1 Sq. Yds.

Length of Returns 385 30 Feet. .07 Miles. .33 Miles Average 30 Ft. Wide. Railway 5760 75 Sq. Yds.

Name of Material Used	Kind of Paving	Wearing Surface or Filler	Binder or Cushion	Base	Area	Sq. Yds.	Unit Price
Montezuma	Sheet Asphalt	1/2" Topo	2" Binder	5" Conc.	Sty	7033 35	1. 53
"	" "	" "	" "	" "	Ry	836 88	1. 53
Woodstock	Granite Block	Cement Bituminous	3/4" Sand Mortar	-	Sty	11. 11	3 45
"	" " Liners	" "	" "	"	Ry	452. 22	4 40
Mack	Vit Block Gutters	Cement	" "	"	City	837. 12	2 20
Woodstock	Granite Block	"	3/4" Sand	"	Ry	3540 82	3 45
Mack	Vitrified Block	"	" Mortar	"	Ry	680 83	2. 27
"	" "	"	" "	"	City	278. 23	2 25

Date of Contract 2-6-15
Date of Starting: 5-11-15
Date of Completion 7-20-15 on Contract 103
Working Days Consumed
Date Guaranty Expires 9-29-20
Date Assigned Appeal Tax Court 8-2-15
Date Assigned City Eng's Dept. 10-7-15

Other Prices A C C 57¢ Grading City 75¢ Grading Ry - 90¢

Remarks:
Prev. Paving - Cobble 13038 56 S Yds.
" " Asphalt Block 1032 00 " "
" " Granite Block 660.00 " "

(over)

dicating the department in charge of the work, the contract number, the date of completion and general reference to the details of the paving. These sheets are mounted on heavy cardboard filed vertically as swinging leaves in a metal filing cabinet, and immediate reference may be had to any section of the file by swinging back the leaves.

The color scheme used on the maps is as follows: Asphalt block, orange; bitulithic, dark green; bituminous concrete, purple, cement concrete, gray, granite block on concrete base, greenish blue; granite block on sand, blue crayon pencil hatched; macadam, light blue; scoria block, pink; sheet asphalt, light brown; vitrified brick, red, and wood block, yellow..

Further records, filed in drawers in the lower portion of the map case, are made on 5 x 8-in. cards, and give all details of the construction, such as the paving agency, the contract number, the length and the total area of work, details of contract, the beginning and completion of work, the quantities of the various items of the work with the unit prices, the various brands of paving material and the previous paving of the area. Reproductions of the data cards are shown. The tables of intermediate lengths and widths of street and street returns are on the back of the paving record card. On the maps details are shown of even some of the oldest paving in the city, notably Eutaw Place, paved in 1883. The data on this old paving were obtained by reference to the annual reports for that year. In all cases where such reports did not give this information someone familiar with the paving was consulted for such details and, failing in this, a physical examination was made of the actual paving. With reference to work done by private parties and builders, if this was done under the jurisdiction of the city, the records were accessible; if not, it was simply a matter of "digging for it." Since 1914 the records have been recorded as rapidly as the construction has been executed.

Previous to 1918 the area of Baltimore was 31.5 square miles, and the paving records so far cover this area. In 1918 approximately 60 square miles were added, which addition included many small towns and villages all containing various kinds of improved paving. These records will be extended this autumn and winter so as to include the paving in the new addition, and the same procedure will be followed; that is, reference to annual reports of town and county engineers, the county commissioners seeking, where necessary, personal interviews with those who have knowledge of the construction and physical examination of the streets.

New Type of Wood and Asphalt Flooring for Chicago Bridges

Transverse Planks on Edge Form Surface Grooves to Hold Asphalt Surfacing—Light Weight and Low Cost

By F. H. Avery
Engineer of Bridge Construction and Repair, Department of Public Works, Chicago

A LIGHT-WEIGHT combination wood and asphalt paving for bridges has been developed in Chicago, owing to the high cost of wood and the advantages of this material where weight is a prime factor, especially in the case of bascule bridges. Its cost is materially lower than that of the ordinary wood floor.

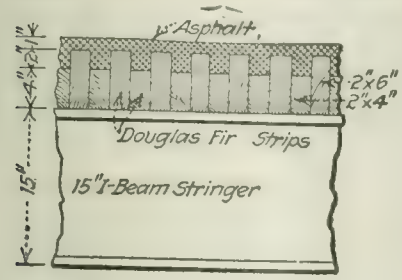
Flooring for the Chicago River bridges consisted originally of a wearing surface of 3 x 12-in. oak plank on 4 x 6-in. yellow-pine planks spaced 12 in. on centers and laid diagonally across the steel stringers. This form of construction was changed to 6 x 12-in. yellow-pine planking laid solid at right angles to the stringers and carrying 4-in. hexagonal blocks, all material being creosoted. In cold weather this flooring afforded poor footing, and caused congestion of traffic. This defect is so serious that its elimination was considered to warrant the use of a pavement more expensive in both first



LAYING PLANKS FOR WOOD AND ASPHALT DECK OF CHICAGO BRIDGE

cost and maintenance. The new floor, however, gives better footing and lower cost.

An experiment was made with short sections of pavement built up of 2 x 4-in. and 2 x 6-in. strips placed alternately and nailed together, the slots or grooves thus formed being filled with asphalt containing different percentages and sizes of emery. With an iron block placed at one end and the section tipped until sliding started, it was found that "angles of repose" could be obtained much greater than that given by sandstone blocks, and accordingly this method was used in refloor-ing the Van Buren St. bascule bridge. That floor has been in service about six months, but, though it gives a great increase in tractive effort, it wears too rapidly on the exposed side grain of the 2 x 6-in. strips.



PLANKS FORM CORRUGATED DECK FOR ASPHALT SURFACE

The filling in the slots was composed of 100 lb. of asphalt mastic, 50 lb. of sand and about 20 lb. of No. 14 emery, making a very hard material. The wood was thoroughly mopped with hot asphalt flux, and then the filler was rammed into the slots. The flooring was built up in the field, the strips being nailed to each other with 20-d. nails spaced about 1 ft. on centers and then face bolted with ¾-in. bolts spaced 4 ft. on centers along the bridge and about 5 ft. transversely. It is important to have plenty of these bolts and to pull them up tight before asphalting, as any springing of the floor in cold weather will crack the filler. The bolts are placed in the grooves so as to cover them with asphalt. Vertical bolts through the flanges of the stringers anchor the wood deck in place.

For similar flooring on the Clark St. swing bridge the emery was omitted and regulation sheet asphalt was used, as furnished by the Bureau of Streets. This surfacing was laid, however, for a thickness of 1½ in. over the top of the 6-in. strips, and granite chips were rolled in by a five-ton roller. The floor has been in service three months and has proved satisfactory. It prevents the accumulation of dirt between the subplank and nailing strips, whereas when the old floor was torn out more than 40 tons of this dirt was removed. It is waterproof to a remarkable extent, so that its use on bascule bridges is expected to avoid the present annual expense of taking off counterweight in dry weather and adding it in rainy seasons. On the other hand, it is feared that in extremely hot weather the asphalt may soften to so great an extent as to allow the deflection to become uncomfortably noticeable. However, if this occurs the floor will be wetted by hose from a hydrant during such hot spells.

The mixture used on the Clark St. bridge was composed of 10.9% of bitumen, 13.3% of 200-mesh stone dust, 18% of 80-mesh, 48.4% of 40-mesh and 9.4% of 10-mesh. This was rammed by hot irons about 1 ft. long and 1 in. thick, which were drawn along the slot by a handle and struck with sledges in order to give as dense a filler as possible. The granite chips were rolled in, but this was not satisfactory for the Erie St. bascule bridge, as the raising of the bridge allowed all the excess stone to roll off, while traffic had been relied upon to drive this down into the asphalt. The sheet asphalt cost 9c. per square foot, delivered hot on the floor and 23c. for labor to lay, or a total of 32c. For the next work it is planned to use the following mix: Bitumen, 8.5%; cement, 9.5%; stone (from ½-in. down to No. 10 mesh) 25%; sand, 57%. This will do away with the top dressing and the trouble due to rolling off of the stone. To secure a good bond between the wood and asphalt the strips were surfaced on one side and edge so as to give a rough surface.

When this type of floor was first discussed, no attempt was made to figure its strength or stiffness, as there was no way of guessing how the asphalt and wood would act under load. On the Erie St. bascule bridge the wood strips were laid directly across steel stringers about 2 ft. 8 in. apart, this span being much greater than any previously employed in this construction. When an asphalt truck weighing about nine tons was backed out to unload, the deflection of the bare wooden strips was such that the wheels were kept over the stringers for fear of breaking through. After the asphalt surfacing was completed, a coal motor truck weighing 28,380 lb. went over at about 12 miles per hour, and the deflection was hardly noticeable.

This floor almost eliminates vibration, which with the old plank flooring caused continual expense for replacing light bulbs and renailing loose plank. It is free from the danger of fires caused by cigar stumps igniting the dry road dust and manure lying along the curb. At times these fires got so great a hold on the road plank and subplank as to require the fire department to put them out, but the fire now burns out on top of the granite chips and does no harm.

When one of these floors has been in service a year we shall know how heat and cold affect the asphalt, but changing floors in 75 bridges at a cost of from $12,000 to $15,000 each entails much responsibility, so helpful suggestions or criticisms will be welcome. As to cost, the new type is much cheaper than 6-in. creosoted plank and 4-in. creosoted blocks. For the latter the material alone costs $1.20 per square foot and, allowing nothing for labor, this is 50% more than the new type costs in place. The cost per square foot for flooring the Erie St. bridge was 82c., divided as follows: Eight cents for carpenter, at $1 per hour; 1c. for carpenter foreman, at $8.50 per day; 3c. for bolts in place, at 60c. per bolt; 38c. for select Douglas fir lumber, at $54 per 1000 ft. bm.; 32c. for asphalt in place, including material and labor. The new type weighs 15 lb. per square foot for lumber and 14 lb. for asphalt, or 29 lb. (figuring 3 lb. per board foot for fir and 110 lb. per cubic foot for asphalt). This compares with 43 lb. for the old type.

This floor design was worked out by the writer and O. W. Hansen, under direction of T. G. Pihlfeldt, city bridge engineer, and P. S. Combs, now city engineer.

Sand and Gravel Produced in 1918

According to reports received from the United States Geological Survey, 2800 producers showed an output of 61,824,426 short tons of sand and gravel in 1918. Although this production was 14,894,899 tons less than that of 1917, the average price per ton was 15c. higher, making the 1918 output worth $37,927,079, an increase over 1917 of $2,630,147. The production of sand used in building and for paving work amounted to 22,409,029 short tons, 2,722,144 short tons being used for paving.

A Diagram Adaptation of the Rational Method of Storm-Water Drain Design

Review of Maps, Population Estimates, Rainfall Intensities, Probability Charts and Various Instruments and Methods Associated With Storm-Sewer Design, and Illustration of How Diagram Is Used

By Harold G. McGee
Hydraulic and Sanitary Engineer, Des Moines, Iowa

TO INSURE accuracy, and yet simplify and expedite storm-water drain and combined sewer computations sufficiently to permit the routine determination of the costs of comparative designs, the following scheme of application of the rational method has been developed. Equipment, supplies and operations listed on the accompanying instruction card (Table I.) are described below:

TABLE I. INSTRUCTION CARD: STORM-SEWER DESIGN COMPUTATIONS

Equipment and Supplies

Topographic map	Design diagram
Development map	Computation form
Planimeter	Straight-edge
Scale	Pencils, black and red
Slide rule	Ink and lettering pens

Operation	No. of Units	Unit	Unit Time, Min	Total Time, Min.
1. Get out equipment				5.00
2. Sketch watersheds		Section	1.00	
3. Lay out sewer lines		Section	3.00	
4. Planimeter watersheds		Section	2.00	
5. Compute quantity, size, grade		Section	9.30	
6. Check computations		Section	6.60	
7. Ink computations		Section	4.50	
8. Replace equipment				10.00
Total productive time				
Allowance for lost time, interruptions, rest, etc., 30%				
Total time allowed				

Topographic Map.—The most effective uses of a topographic map in sewer design require it to be on such a scale and contour interval as will indicate: (1) Drainage areas and subareas down to one block; (2) elevations of low spots within blocks which must be drained; (3) elevations of block corners and other manhole points, and (4) the extent of drainage areas above the district to be served.

An excellent map for this purpose, in country that is not unusually rough, has a 1-ft. interval and a scale of 1 in. to 200 ft., of which the plane-table sheets for Dayton, Ohio, Jackson, Mich., and portions of Lucas County, Ohio, topographic surveys are representative. An ordinary street map in which watersheds are sketched by field inspection, with the occasional aid of a hand level, and with block corner elevations transferred from available profiles or from preliminary reconnaisance, has served well; but when drainage areas extend beyond districts well marked by streets or are bounded by very flat apex marshes, such maps have proven misleading. While the economies to be effected in topographic mapping are not always applied, methods of mapping are known well enough not to require explanations here.

Development Map—The development map is simply a picture of the city to be, its probable residential, industrial, commercial, park, railroad and waste areas, their populations, their values and their degrees of imperviousness. Such a map is an essential requirement for economical and effective drainage plans. Obviously, the densely built-up and impervious commercial areas at one extreme will contribute more water per acre, and suffer more costly damage from insufficient drainage facilities, than the grassy areas of parks and cemeteries at the other. An analytical study of past changes in and growth of population, industries, various classes of residential districts, railroads, and general land values, gives a more reasonable and scientific basis for such plans than the not unusual mere guesses or absolute neglect of everything beyond existing developments.

Information for such studies has been obtained as follows: For population, from federal and state census, directories, school census, also death, postoffice, telephone, and gas and electric companies' records; concerning industries, from field inspections, conferences with realty operators, transportation, and Sanborn maps; concerning commercial areas, same as for industries; for land values, from assessed valuations per front foot and for totals for city, from conference with realty operators and from transportation facilities; concerning imperviousness, from field inspections, Sanborn maps.

Each of these factors varies with, although not always as, the others. Relations for individual cases, however, become somewhat readily apparent; and having projected population by the usual methods, the probable coincident values of the other factors can be determined and checked with some degree of reason. Based on one such study, a realty company for which the writer was asked to prepare plans for immediate sewer construction abandoned a considerable subdivision project which seemed not to be in an economical direction for expansion of a prosperous, growing city.

Population studies are based on the usual growth curves, determined by past enumerations and extended along the lines of other and larger cities with comparable locations and development factors. At Jackson, Mich., the location of population was determined by plotting each name in the directory in its proper block and then multiplying by a factor to obtain the total population of the block. This factor was determined by comparison of directory and census, for census years, and varied as follows, showing no apparent relation to the factors offered in the directories themselves:

TABLE II. COMPARISON OF CENSUS ENUMERATION AND NAMES IN DIRECTORY

Year	Census Enumeration	Names in Directory	Ratio	Ratio Given in Directory
1890	20,798	10,503	1.942:1	2.75:1
1900	25,180	14,472	1.783:1	2.25:1
1910	31,438	12,738	1.715:1	2.50:1

The number of names in the directory was obtained by counting every eleventh page, adding these figures together, and multiplying by eleven. For one directory this method was checked by counting all names as well, resulting as follows:

TABLE III. COMPARISON OF DIRECTORY ESTIMATES AND COUNTS

Estimated number of names by counting every eleventh page	29,800
Actual count of names	29,363
Error	1.8%

A rodman who knew the city was used to spot the directory locations for each name, and he averaged 900 persons or names per eight-hour day. The location

of directory names being known, the determination of densities requires simply a multiplication by the determined directory factor, and dividing the result by given block areas. Once the densities for several decades have been established and rates of growth or decay determined, field inspections and conferences with utility and realty operators permit density predictions with some show of reason.

Sanborn maps, census statistics, and field measurements, are available as aids to the determination of the extent of impervious areas. Results of an investigation of eleven residential blocks by the latter method are shown in Table IV. Because of the usual insufficiency of roof gutters on ordinary houses, only two-thirds of the roof area was considered as comprising impervious area for sewer design; and sidewalks, house walks, with grass on each side, detached barn and shed roofs without gutters were added as one-third of their area.

Planimeter—In spite of its utility, many offices do not possess a planimeter; and for the past three years such instruments have been scarce and high-priced. As a substitute, good results can be obtained from the "hatchet" planimeter, consisting essentially of a knife-edge with a point in the same plane, described in McCullough's "Practical Surveying," p. 50. Naturally cheaper, it is more portable and less liable to breakage than the Swiss instruments. Its use requires more time than the use of the usual instrument, however, due to the necessity for repetitive checks.

Slide Rule and Scale—An ordinary 10-in. slide rule and a white-edged scale to fit the scale of the topographic map meet the requirements of these two items.

TABLE IV. PROPORTION OF IMPERVIOUS AREAS IN RESIDENTIAL BLOCKS; MEASUREMENTS IN JACKSON, MICH., 1917

1. Block numbers	SW-85	NE-3	R-8	M	E-13	NE-2	NE-14	E-16	E-11	E-15	NE-4
2. Area, acres	7 52	5 00	5 00	5 00	7.08	5.00	6.40	5 15	7 69	5.79	5 00
3. Population, persons	96	77	86	93	165	127	175	155	240	187	96
4. Density, persons	12 8	15 4	17 2	18 6	23.3	25 4	27.3	30 1	31 2	32 3	1 92
5. Impervious area, acres	2 636	1 732	1 370	1 376	2 248	1 648	2 078	1.588	2 455	1 241	1.705
6. Impervious area, percent of total	35 0	34 6	27 4	27 5	31 8	32 9	32 5	30 8	31.9	30 1	34 1
7. Street surface, acres	0 709	0 546	0.546	0.546	0 734	0 546	0 728	0 607	0.803	0.676	0 546
8. Alley surface, acres	0.099	0 307				0 307					0 307
9. Sidewalk surface, acres	0.272	0 209	0.209	0.209	0.277	0.209	0 257	0 216	0 298	0.237	0 209
10. Roofs, direct to sewer, acres	0 196	0 021			0 272		0.094				0 023
11. Roofs, cistern to sewer, acres	0 250			0 033	0 041		0 110	0 0602	0 200	0 034	0 065
12. Roofs, cistern to ground, acres	0 367	0.343	0.353	0 310	0 564	0 382	0 418	0 414	0 580	0.398	0 308
13. Roofs and housewalks to ground, acres	0 743	0.306	0 262	0 278	0 360	0.204	0 471	0 291	0.584	0 396	0 247
14. Impervious area for sewerage, (7 + 8) + ⅓ (9 + 13) + ⅔ (10 + 11 + 12), acres	1 688	1 268	0 938	0 938	1.53	1 246	1 387	1 092	1 497	1 175	1 268
15. Percent of total	22.4	25.4	18.8	18.8	21.6	24.9	21 7	21 2	19 5	19 3	25.4

Average percent impervious without alleys, 20.1.
Average percent, impervious with alleys, 24.5.

Design Diagram—Planned to eliminate unnecessary multiplications and the use of a series of flow diagrams or tables, the accompanying diagram (Fig. 1) gives the essential features of run-off, capacity, grade, size, velocity head, and time of flow through each section,

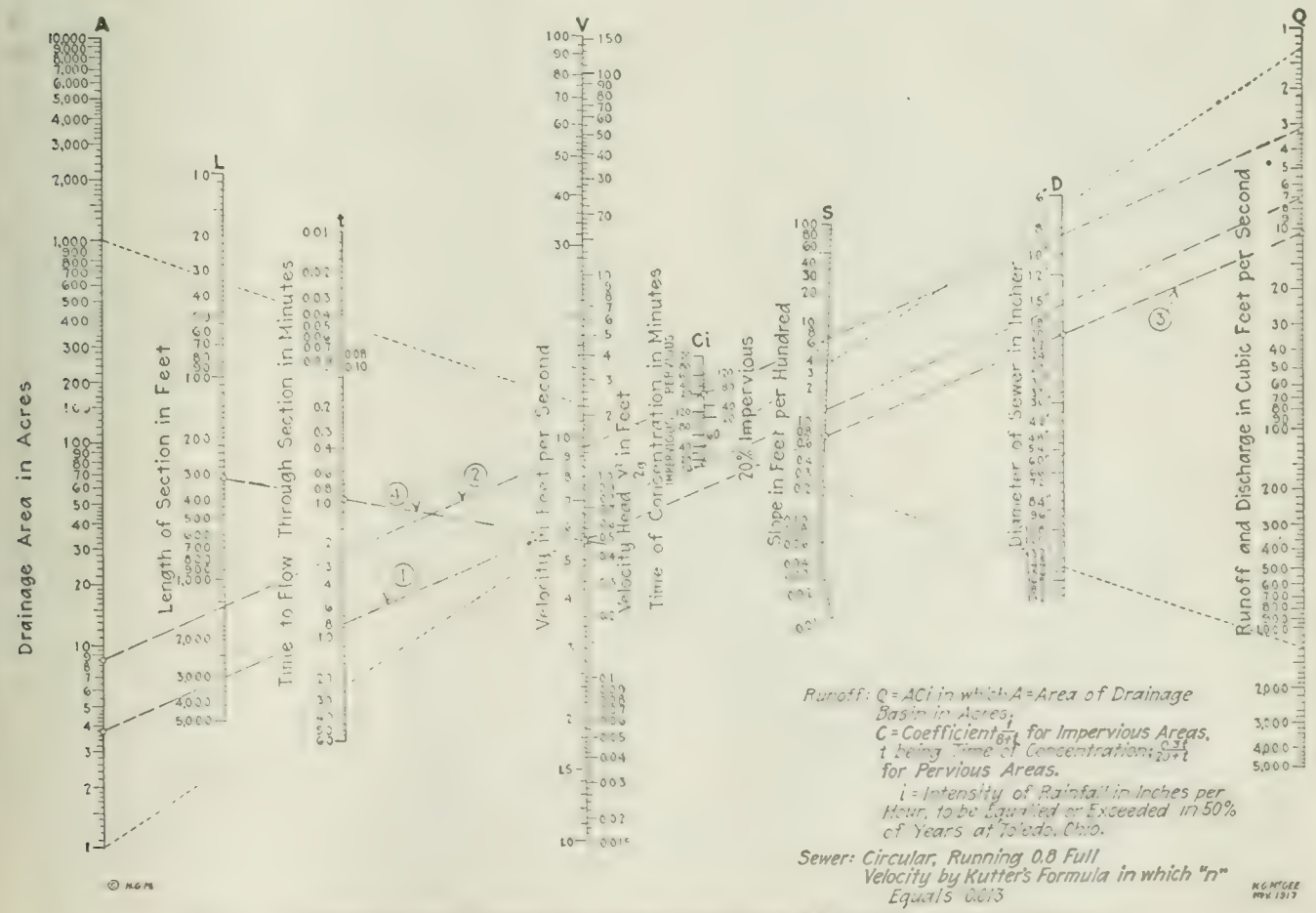


FIG. 1. DIAGRAM FOR DESIGNING STORM SEWERS BY THE RATIONAL METHOD

with three or four settings of the straight-edge. It is based on the usual rational formula, $Q = ACi$, and has but three scales subject to change for any combination of rainfall intensities, run-off coefficients and velocity coefficients of channels. The method of preparing this type of chart is described by R. C. Strachan, in "Nomographic Solutions for Formulas of Various Types," *Trans.* Am. Soc. C. E., Vol. LXXVIII., 1915, p. 1359.

If sewers are to be designed as economic structures, they must be built for less frequent gorging in high-value, congested districts, than in open residential or park areas. For this reason, the following analysis of the *Ci* factor was used:

Run-off Coefficient—A series of values of the run-off coefficient *C*, developed by several engineers, with a few points computed from published gagings, are shown on Fig. 2. For the sample chart, Curves I and III were

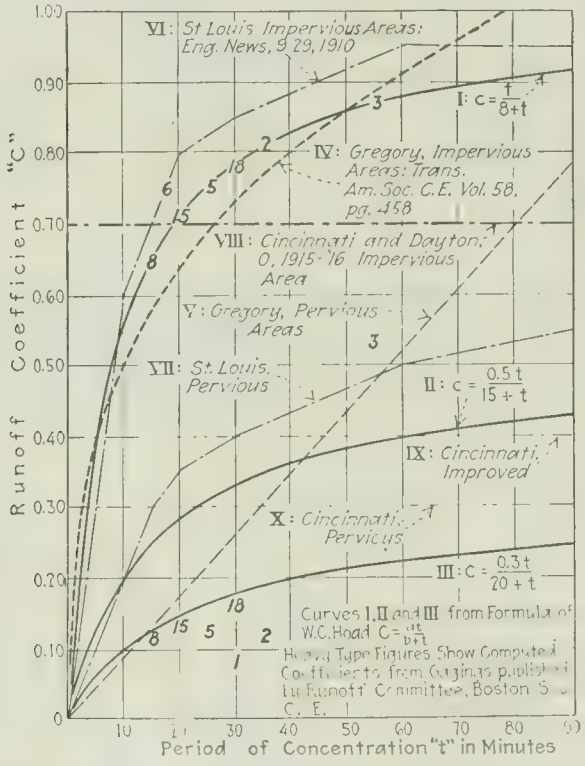


FIG. 2. COMPARISON OF RUN-OFF COEFFICIENTS FOR STORM-SEWER DESIGN

used for impervious areas and pervious areas, respectively.

Intensity of Rainfall—Rainfall intensities to be expected at various frequencies, were found as follows:

Table V is an abstract of Weather Bureau records showing maximum intensities for different short-time intervals at Toledo, Ohio. From these maxima, during the fourteen years of record, the probability chart, Fig. 3, was constructed according to the procedure described by Allan Hazen in "Storage To Be Provided in Impounding Reservoirs," *Trans.* Am. Soc. C. E., Vol. LXXVII, page 1539; and, from this probability chart, Table VI was prepared to show rates which may be expected to be equalled or exceeded during the maximum storm occurring in periods of from 2 to 20 years. Table VI is the basis of Fig. 4, showing the same expected storm intensities with some slight irregularities ironed out by a smooth logarithmic curve, Fig. 4, as a basis of design, will result in a series of sewer capacities which, it may reasonably be expected, will be ex-

TABLE V. MAXIMUM PRECIPITATIONS FOR SHORT-TIME INTERVALS AT TOLEDO, OHIO, 1903-1916, IN INCHES

Year	5-Min	10-Min	15-Min	30-Min.	60-Min.	120-Min
1903	0 38	0 54	0 62	0 77	1.19	1.61
1904	0 41	0 59	0 65	0.84	1.07	1.07
1905	0 35	0 66	0 77	0.77	0.78	1.12
1906	0 27	0 44	0.55	0 83	1.11	1.44
1907	0.52	0.72	0.81	1.04	1.22	1.25
1908	0.46	0.72	0.88	1 19	1.64	1.80
1909	0 54	0 91	1 08	1.38	1.52	1.63
1910	0 34	0 49	0.61	0.68	0.89	1.04
1911	0 45	0 80	1.02	1.89	2.14	2.24
1912	0 35	0 57	0.66	0 89	1 01	1.02
1913	0 37	0 54	0 60	0.83	0 95	1.20
1914	0 47	0 74	0 91	0.96	1 34	1.47
1915	0 45	0 70	0 75	0.76	0.82	1.07
1916	0 23	0.34	0 36	0 51	0.53	0.73

TABLE V. PRECIPITATION IN INCHES PER HOUR TO BE EQUALED OR EXCEEDED ONCE IN FROM 2 TO 20 YEARS

Period	5-Min.	10-Min.	15-Min.	30-Min.	60-Min.	120-Min
2 years	4 80	3 77	2.93	1 60	0.98	0.60
3 years	5.26	4.15	3.30	1 90	1.20	0.72
5 years	5 74	4 50	3 60	2 30	1.40	0.80
10 years	6.21	4.92	3 94	2.87	1.68	0.91
20 years	6 64	5 25	4.24	3.45	1.96	1.09

ceeded at approximately predetermined frequencies.

Determining the unit run-off, *Ci*, for any frequency of intensity requires but a simple multiplication of the intensity for the given period of concentration by the run-off coefficient for the same time. Any such point

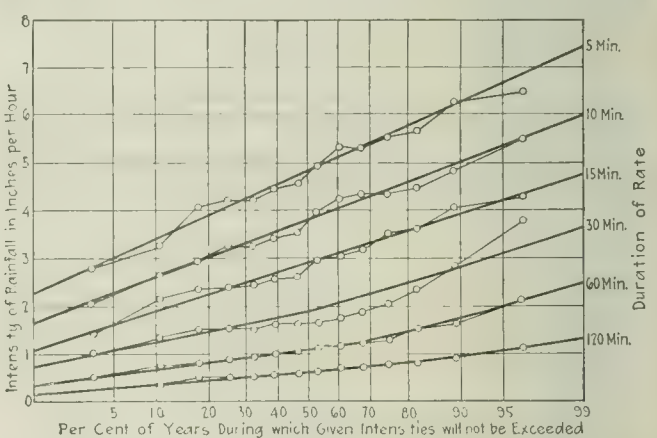


FIG. 3. PROBABILITY CHART FOR RAINFALL INTENSITIES

is located on the chart by a simple intersection and marked with the time of concentration it represents. For example: The 40-minute intensity of a two-year storm—that is, one to be equalled or exceeded once in two years—is 1.52 in. per hour; the run-off factor for

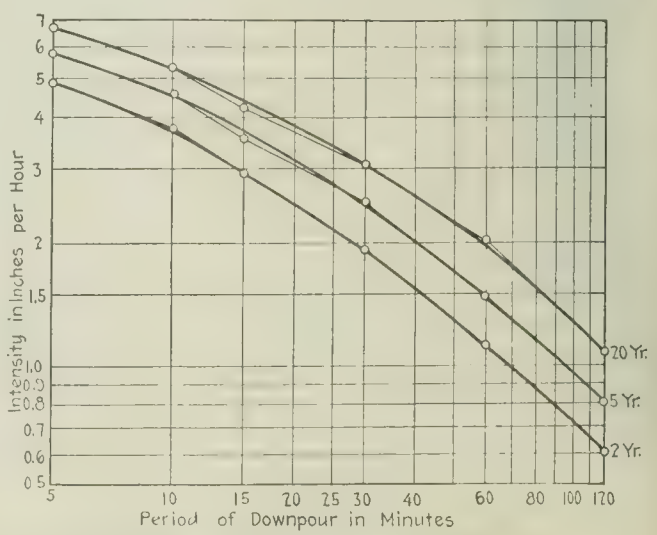


FIG. 4 EXPECTED STORM INTENSITIES

a 100% impervious area is 0.833; the resultant run-off is 1.27 sec.-ft. per acre; and the scheme of location of this particular point on the diagram is indicated. The 20% impervious scale is obtained by adding 0.2 of the run-off from one impervious acre to 0.8 of that from one pervious acre.

Ci Probability Direct—An examination of excessive precipitation records reveals the fact that excessive rates, particularly for intervals less than about 30 min., do not necessarily appear in the first period of the

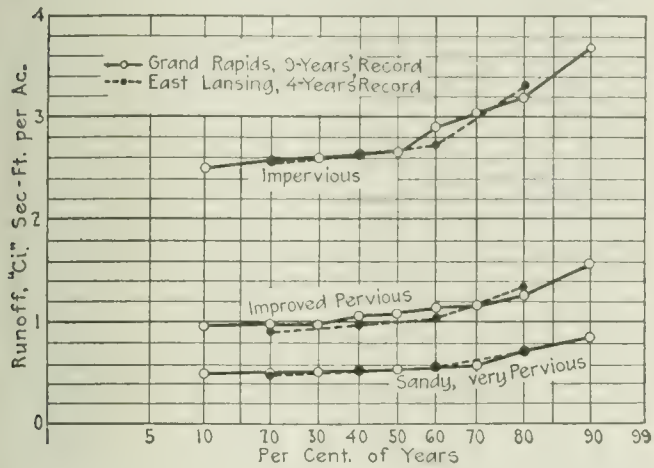


FIG. 5. PROBABLE FREQUENCIES OF FIVE-MINUTE RUN-OFFS AT GRAND RAPIDS AND EAST LANSING, MICHIGAN

downpour. Run-off coefficients increasing with the time of concentration may, therefore, be low for areas having a quick run-off. The short-time coefficients used at Dayton and Cincinnati allow for this fact. On the other hand, longer excessive rates—that is, for from 30 to 120 min.—nearly always commence near the beginning of the downpour, a fact which the variable coefficient formulas recognize. It is believed, then, that a run-off coefficient based on the total amount of precipitation prior to the excessive rate would, therefore, be more exact than either. Incidentally, discharge being a product of two variables, intensity and percentage of immediate run-off, the chances are that a probability curve derived from the consideration of both intensity for any concentration period and the run-off conditions as evidenced by the preceding rainfall would more nearly approach conditions which might be expected to recur. A comparison of three such probability curves for Grand Rapids and East Lansing, Mich., using a run-off coefficient, K, based on curves I, II, and III, Fig. 2, multiplied by the intensity curve $I=1.75\frac{80}{t+20}$ with which these curves have been developed is shown on Fig. 5. While for so short a time interval as to be useless for sewer design, these curves indicate three significant things:

1. That the run-off for short-time intensities is not as low as the variable coefficient curves of Fig. 2 indicate;

2. That excessive run-offs may occur with comparatively moderate intensities late in a storm, and

3. That consideration of a second variable in run-off decreases the number of years of record necessary to obtain a reasonably good estimate of the frequency with which certain run-offs may be expected.

Capacity, Size and Velocity—Circular sections running 0.8 full, the point of maximum velocity and minimum time of concentration, were used as the basis of the capacity, Q, size, D, slope, S, and velocity, V scales. The relations between Q, D, and V are geometric, since $A=0.6736\ D^2$, *and* $Q=AV$. These scales are, therefore, logarithmic. But, using Kutter's coefficient for the Chezy velocity formula, S bears a varying relation with D and V. The location of the S-scale was determined as follows: For a given slope, V was computed for a range of sizes, 12-, 24-, 48-, 96-, and 192-in. Lines were drawn connecting the chosen sizes and the computed velocities; these lines failed to intersect at a point; so, after neglecting the effect of very large sizes on steep slopes and very small sizes on flat slopes, the center of gravity of the significant intersections was chosen as the point to represent the given slope.

These points, determined in multiples of 10, were connected, giving a canted scale with curved lower end, and the intermediate points were located by logarithmic subdivision. A test of this scale, with the sizes and slopes originally computed, indicated an average excess of velocity of 1.08% (—3.0% to +9.3%) over that found by exact computation. A similar test of a 20-in. slide rule designed to solve the same problem, and which was in use in the office prior to the construction of the diagram, indicated an average excess of about 8.5% (+3.7 to +16.7%) over the same range.

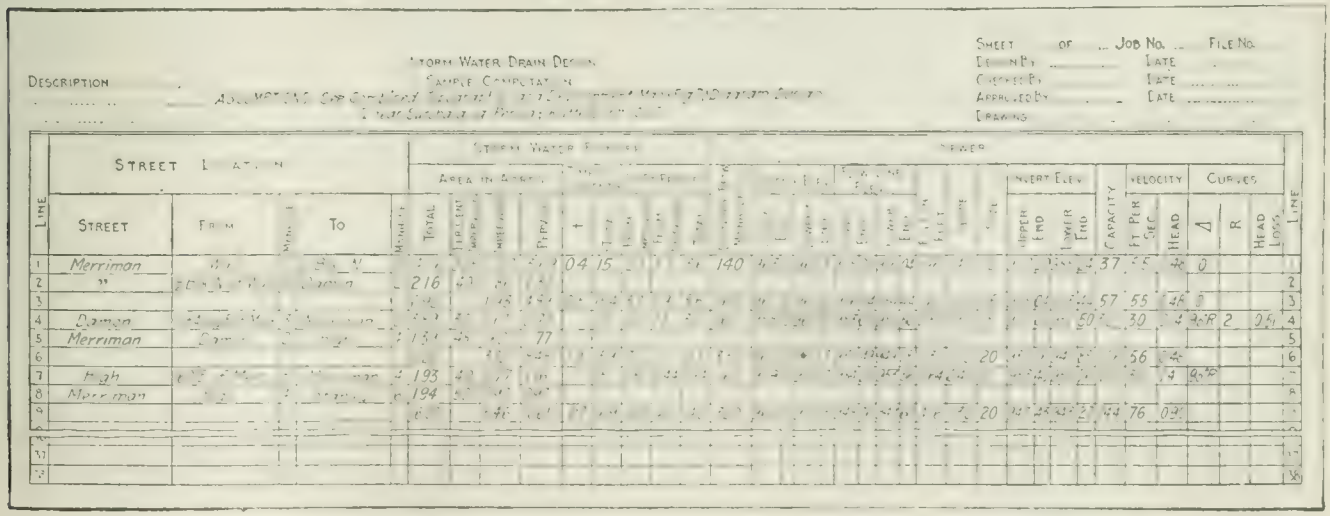


FIG. 6 SAMPLE COMPUTATION SHEET FOR STORM-SEWER DESIGN

Time to Flow Through Section—Having given the velocity in feet per second, the time in minutes to flow from end to end of the section requires the construction of two simple logarithmic scales, as shown.

Computation Form—As an aid to complete, orderly and systematic records of design calculations, the accompanying computation sheet (Fig. 6) was prepared. Of the three divisions of this sheet, the "location" columns are similar to many others; the "storm-water run-off" sections are somewhat simplified for the diagram design; and the "sewer" columns appear somewhat more complicated than usual, as they provide for basing designs on the water surface rather than the invert elevations. Printed on thin paper or vandyke paper these computation sheets can be blueprinted to turn over to draftsman or attached to reports.

Straight-Edge or Isopleth—For a straight-edge, or isopleth, a 12-in. celluloid triangle, with a straight line scratched along one side and used on the diagram scratch side down, avoids parallax and does not obscure figures on one side, as do ordinary opaque straight-edges.

The accompanying example illustrates the operations required in the instruction card. For the sake of simplicity only one diagram, for a two-year gorging period, for storm-water only, has been used throughout.

Sketch Watersheds—With a detailed topographic map, Fig. 7, the picking out of watershed limits requires simply a following out of ridge lines. The subareas may be divided as shown or split down the center of each block, without affecting materially the sewer capacities required.

Layout Sewer Lines—Once the watersheds are laid out, the logical locations for drains are usually apparent. If not, all alternative locations ought to be studied to determine which is best.

Planimeter Watersheds—The records of watershed measurements are made on the map, within each watershed.

Compute Quantity, Size, Grade, Etc.—Records of computations for a drain are shown on the accompanying computation sheet, Fig. 6.

The positions of the isopleth for computing line 5 of the sample computation sheet are indicated on the diagram as follows:

Position 1. Set isopleth on Scale A at 3.72 acres and on Scale Ci at 15.9 min. for impervious area; under this line, extended to Scale Q, read 7.1 sec.-ft. run-off from impervious area.

Position 2. Set isopleth on Scale A at 8.48 acres and on Scale Ci at 15.9 min. for pervious area; under this line, extended to Scale Q, read 3.2 sec.-ft. run-off from pervious area. Add run-off from pervious and from impervious areas: 7.1 ÷ 3.2 = 10.3 second-feet.

Position 3. Set isopleth on Scale D at 20 in. and on Scale S at 0.7%, under this line, extended to scale Q, read 10.6 sec.-ft. capacity; and, under this line, extended to Scale V, read 5.6 sec.-ft. velocity and 0.48 ft. velocity head.

Position 4. Set isopleth on Scale V at 5.6 sec.-ft. and on Scale L at 32.0 ft.; on this line, at Scale T, read 1.0 min. to flow through section.

Acknowledgments—This opportunity is taken to acknowledge the courtesy of F. F. Longley, of Hazen, Whipple & Fuller, in supplying sheets of probability paper, and of W. C. Hoad in permitting the publication of his run-off formula.

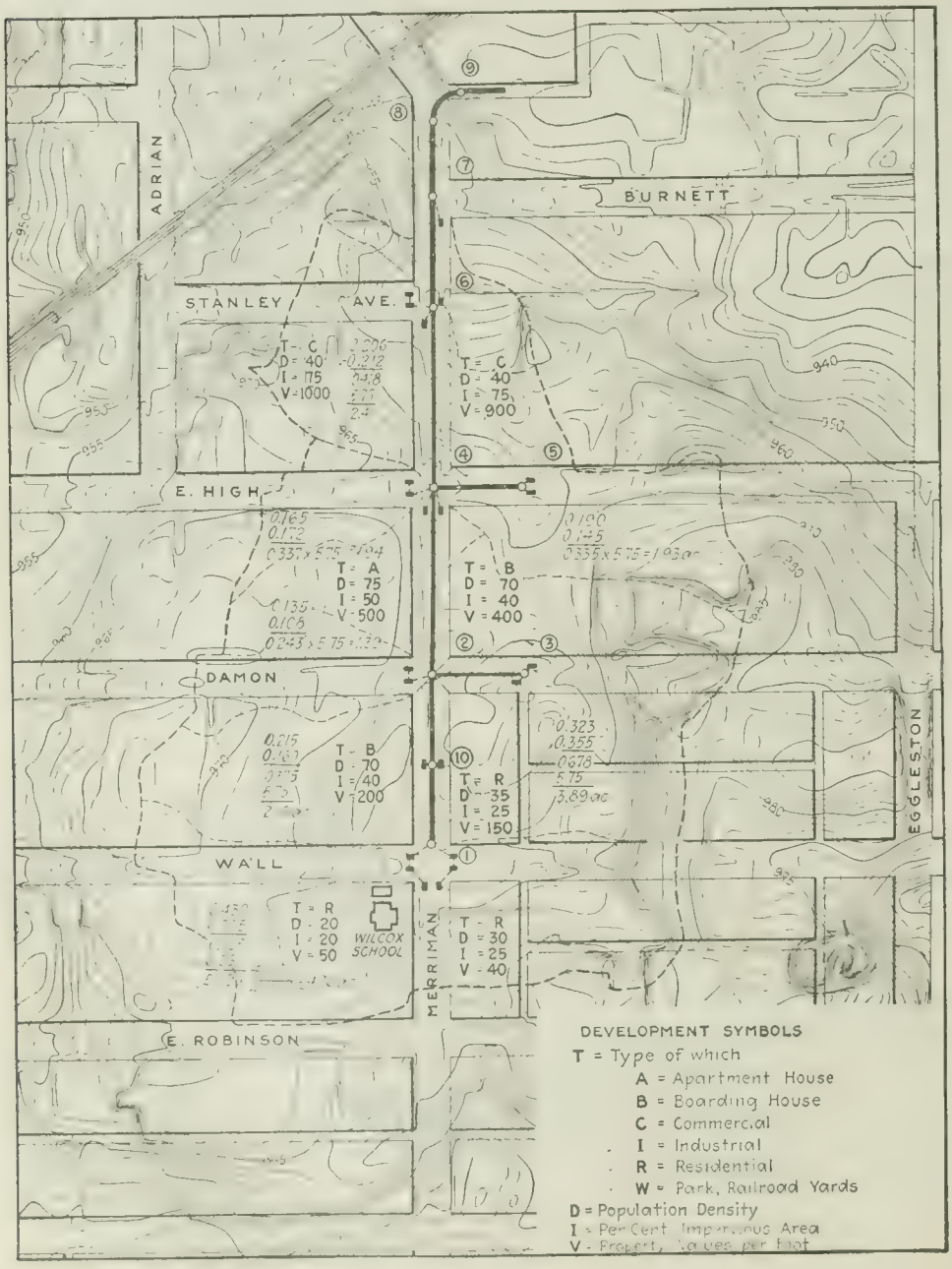


FIG. 7. COMBINED TOPOGRAPHIC AND DEVELOPMENT MAP

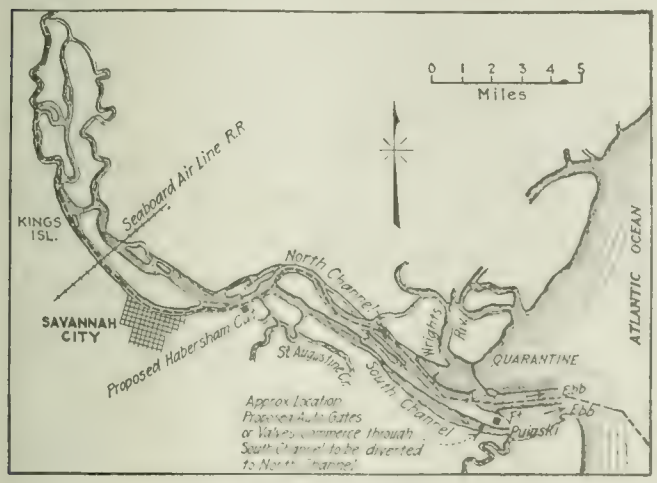
Floodgates Proposed for Control of Savannah River

Movable Dam at Mouth of Unused Channel Would Permit Concentration of Ebb To Scour the Main Ship Channel

By E. C. Garvin
Brunswick, Ga., formerly Assistant Engineer, United States Engineer Department, Savannah, Ga.

CHANNEL control in the Savannah River is becoming an important problem. For that reason there is submitted here a proposed solution of the difficulties; it differs in detail from that now officially proposed.

Savannah Harbor comprises the lower 20 miles of the Savannah River estuary and the improved channel across the knoll, the roads and the bar. The river is heavily silt-bearing. Throughout the lower 30 miles there are two main branches formed by a series of islands of alluvial formation. The right branch above Savannah and the left branch below the city are under improvement for navigation. The harbor has three project



CHANNEL CONDITIONS AT MOUTH OF SAVANNAH RIVER, BELOW SAVANNAH, GA.

depths: Thirty feet from the sea to Quarantine, a distance of 10½ mi.; thence 26 ft. to the Seaboard Air Line railway bridge, a distance of 15½ miles; thence 21 ft. to Kings Island, a distance of 1½ mi. These depths refer to mean low water. The mean tidal range varies from 6.5 ft. on the bar to 6.0 ft. at Kings Island. The width of the improved branch, as defined by the banks or the regulating works, varies from 600 ft. at Savannah to 1800 ft. at the mouth of the river.

Prior to improvement, the channel was in places not more than 9 ft. deep at mean low water. Since improvement, material increase in depth has been obtained in part by the use of contraction works and closing dams, and in part by dredging. The contraction works have been gradually extended in elevation to high water, and in plan to the mouth of the river. The closing dams have forced a larger part of the flow into the main channel. In order to secure the greater depth provided in each new project, increasing reliance has been placed on dredging.

On account of the jetties at the mouth of the river, probably little if any material is now carried into the estuary by the littoral drift. Judging from the character of the material dredged, the amount rolled along the bed of the estuary may be as much as 20% of the total deposit. From data concerning the Savannah River at Augusta, collected by the Geological Survey, it is estimated that the total amount of matter carried annually in suspension and solution into the lower reaches of the river is 7,500,000 cu.yd. (Augusta is 201 miles by river above Savannah.) Annual hydrographic surveys of the harbor have been made for a number of years. These show a persistent tendency to fill at some localities and occasionally to scour at others.

The surveys show that about 8% of the annual shoaling occurs between the upper limit of the improvement and the upper mouth of South Channel, about 51% between the latter point and the mouth of the river, and about 41% from here to deep water beyond the bar. As applied to Savannah Harbor, the rate of shoaling seems to bear some relation to the mean channel depth or cross-sectional area of flow, which may be expressed most easily in terms of cubic yards of material remaining to be removed to accomplish specific project dimensions. The annual shoaling has increased so enormously in recent years, as the 26-ft. project approaches completion, that the economical removal of this deposit is causing some concern. Each additional foot of depth costs more to obtain and to maintain than the preceding foot. Savannah Harbor offers ideal conditions for a control of tidal and fresh water flow.

Tidal observations indicate (1) that the improvement of the harbor has had little or no effect on the mean height of the high-water plane: (2) that the gradual extension of the dredging up stream has depressed the mean low-water plane in proportion to the distance from the mouth of the river at which place the mean low-water plane is unaffected; (3) that the volume of fresh-water flow affects both the high-water and low-water planes, the latter to a greater extent than the former.

In 1889 Assistant Engineer Gieseler made elaborate tidal investigations of Savannah harbor. The data then obtained are here (Table I) (see next page) modified to conform more closely to present conditions, so it is to be understood they are only approximate. Synchronous mean tidal curves at Fort Jackson and Fort Pulaski show that the maximum difference in elevation of the water surface at the two gages is 1.82 ft., which remains constant for a period of 55 min. (1 hour 35 min. to 40 min. before low water at Fort Pulaski or 2 hours 55 min. to 2 hours before low water at Fort Jackson).

The present plan of improvement of Savannah Harbor provides for a closing dam in South Channel apparently above St. Augustine Creek, for it further provides for a cut connecting Habersham Creek with Savannah River in the vicinity of Fort Jackson for the purpose of maintaining the continuity of the inside waterway which would be interrupted by the closing dam in South Channel. This dam is to be of the rock-fill type. Its purpose is to prevent the fresh-water flow from entering South Channel and to force it into the main North Channel, thus strengthening the ebb flow and inducing scour.

On both the ebb and flood tides certain volumes of water now pass through South Channel and St. Augustine Creek without contributing in any way to the improvement of the harbor below Fort Jackson. The rock-filled closing dam would prevent the escape of any proportion of the fresh-water flow into these auxiliary channels and would thus promote the improvement and maintenance of the dredged channel below the dam, but this structure would offer an effective barrier to the flood-tide flow of South Channel and St. Augustine Creek which it is desired to capture and divert to the

North Channel on the ebb tide. Under conditions of a solid dam, the ebb, flood and fresh-water flow would be confined to the North Channel and the tidal prism above Fort Jackson reduced by the amount that previously passed through South Channel and St. Augustine Creek. This would be a violation of the cardinal principle governing the improvement of estuaries, that the tidal prism shall not be obstructed in flow and shall not be diminished in volume.

Therefore the writer proposes to substitute for Habersham Cut and the solid dam at the upper end of South Channel a restricted cross-section for St. Augustine Creek which will conform to the proposed dimensions of Habersham Cut, and at the lower end of South Channel a movable dam of the ordinary automatic floodgate type or a more elaborate mechanically operated structure which will freely admit the flood flow and prevent the escape of the ebb. By this means the flow lost to St. Augustine Creek would approximate the loss which would result from the opening of Habersham Cut, and the troublesome subjects of free right of way, new railway bridge, and division of land would be eliminated. The total volume of flood flow entering South Channel and a proportion of the flood entering St. Augustine Creek would be captured and forced to escape through North Channel, increasing the ebb flow by an amount exceeding half the mean fresh-water discharge, and this increase would be applied to that portion of the harbor in which more than 50% of the annual shoaling occurs.

Comparison of Various Railroad Bills

THE comparison of railroad bills now before Congress, shown on the opposite page, reproduced from a chart prepared by the Equitable Trust Co. of New York, readily displays the practical unanimity of opinion in Congress as regards ownership, the broadening of Federal control, and the desirability of effecting mergers into large operating units. All but the Sims bill, representing the so-called Plumb plan of the railroad brotherhoods, provide for private ownership; all provide for the broadening of Federal control, and all but one make various provision for mergers of present operating units. There is wide divergence in the provisions for ratemaking, finances and distribution of earnings.

area of flow with a consequent decrease in shoaling and increase in depth, the latter two being the prime objects of harbor improvement. The cross-section of North Channel is ample to receive the increased ebb volume resulting from this improvement without affecting the stability of the banks or the existing regulating works.

It is not proposed to provide for navigation past the automatic gates. South Channel is now used but very little for navigation, having a 5-ft. controlling depth.

The general principle here outlined may be readily applied to the reaches above Savannah where the pondage area and tidal range are relatively large, but it would seem advisable to proceed with some caution,

TABLE I. VARIATION IN WATER PLANE DUE TO RIVER IMPROVEMENT

Year	Water Works, Savannah — Mean High-Water	Water Works, Savannah — Mean Low-Water	Water Works, Savannah — Mean Range	Savannah River, Augusta City Gage*	Fort Jackson (Five Miles Below Water Works) — Mean High-Water	Fort Jackson (Five Miles Below Water Works) — Mean Low-Water	Fort Jackson (Five Miles Below Water Works) — Mean Range	Fort Pulaski (Eleven Miles Below Fort Jackson) — Mean High-Water	Fort Pulaski (Eleven Miles Below Fort Jackson) — Mean Low-Water	Fort Pulaski (Eleven Miles Below Fort Jackson) — Mean Range
1878	....	....	....	7.3	7.25	0.85	6.40	....	....	...
1889 } 1890 }	7.18	2 00	5.18	9.6	7 05	0.59	6.46	6.75	0.00	6.75
1894 } 1895 }	7.01	2.20	4.81	9.0	6 89	0.88	6.01	6.63	0.00	6.63
1903	7.12	1.57	5.55	11.1	7.20	1.19	6.01	6.78	0.14	6.64
1904	6.93	1.00	5.93	7.8	7.03	0.71	6.32	6.82	0 05	6.77
1905	...	...	...	8.9	7.18	0.70	6.48	6.78	0 07	6.71
1906	7.34	1.51	5.83	12.0	7.27	0 80	6.47	6.87	0.08	6 79
1907	7.13	1 16	5.97	9.2	6 81	0.82	5.99	6.74	0.01	6.73
1908	7.31	1.89	5 42	11.6	7.13	0.87	6.26	6.77	0.17	6.60
1909	7.25	1.60	5.65	11.6	7.24	1.03	6.21	6.83	0.27	6.56
1910	7.08	1 12	5.96	9.8	6.87	0.65	6.22	6.55	0.17	6.38
1911	7.04	0 94	6.10	8.9	6.94	0.59	6.35	6.46	0.15	6.31
1912	7.51	1 48	6 03	12.9	7.07	0 79	6.28	6.79	0.20	6.59
1913	7.05	0 91	6 14	10.6	6.93	0 71	6.22	6.63	0.17	6.46
1914	7 06	0 62	6.44	9.1	6 91	0.58	6.33	6.53	0.01	6.52
1915	7.28	1.03	6.25	11 3	7.12	0.85	6.27	6.77	0.31	6.46
1916	7.22	0.91	6.31	10.4	7.03	0.71	6.32	6.66	0.05	6.61
Mean 1903-1916	7.18	1 21	5 97	. .	7.05	0 79	6.26	6.71	0.13	6.58

* Add 110.8 ft. to reduce to height above Pulaski mean low water. Augusta is 201 mil. by water above Savannah.

The exact effect of this improvement cannot be predicted; probably the low-water plane would be slightly raised, possibly the duration of the ebb tide would be increased and the period of slack water correspondingly decreased; certainly, the voulme of ebb flow in the improved channel would be increased, which would be reflected in an adjustment between increased velocity and owing to the fact that the main channel is somewhat narrow and any large increase in velocity might necessitate bank revetment to prevent undue widening. The effect of the South Channel automatic dam should be well determined from systematic observations, after which the extension of the system may proceed with a degree of certainty not warranted now.

TABLE II. TIDAL RANGES IN SAVANNAH RIVER

Locality	Mean Cross-Sectional Area of Flow, Sq.Ft.	Mean Ebb Velocity Ft. per Sec.	Duration of Ebb Flow, Hours-Min.	Mean Flood Velocity, Ft. per Sec.	Mean Flood Duration, Hours-Min.	Mean Ebb Flow (Tidal and Fresh Water), Cu.Ft.	Mean Flood Flow, Cu.Ft
Wrights River	....	....	....	....	....	250 000,000	210,000,000
Maine channel at Fort Pulaski	49,000	1.72	6–39	1.15	5–46	2,000,000,000	1,230,000,000
South channel at Fort Pulaski	....	....	....	....	....	800,000,000	460,000,000
Fort Jackson	30,000	1.80	7–12	1.40	5–13	1,400,000 000	790,000,000
South channe just below St. Augustine Creek	.....	.....	.....	.....	.....	350,000,000	160,000,000
St Augustine Creek	10,000	1 61	6–20	1.22	6–05	365,000 000	265,000 000

NOTE.—(South Channel: Length 50,500 ft., mean width 1,360 ft., area 68,700 sq.ft.). The total ebb flow of the harbor is increased by the accumulation of half a lunar day's fresh-water flow, amounting to about 610,000,000 cu.ft., which enters both North Channel and South Channel, a portion of the latter flow passing into St. Augustine Creek.

RAILROAD BILLS NOW BEFORE CONGRESS

FEATURES OF PLANS	THE ESCH-POMERENE BILL *Interstate Commerce Commission Plan* NUMBER OF BILL: H. R. 4378—S. 1256 DATE INTRODUCED: JUNE 2, 1919	THE SIMMS BILL *Railroad Brotherhoods or Plumb Plan* [INTRODUCED BY REQUEST] NUMBER OF BILL: H. R. 5167 DATE INTRODUCED: AUGUST 12, 1919	THE LENROOT BILL *The National Railroad League Plan* NUMBER OF BILL: S. 2879 DATE INTRODUCED: AUGUST 27, 1919	THE CUMMINS BILL *Plan of Senate Committee Chairman* NUMBER OF BILL: S. 2966 DATE INTRODUCED: SEPTEMBER 2, 1919	THE FRELINGHUYSEN BILL. *A Modification of the Cummins Bill* NUMBER OF BILL: S. 2998 DATE INTRODUCED: SEPTEMBER 15, 1919
OWNERSHIP AND OPERATION	Private, by existing organizations.	Government ownership. Operation by corporation controlled wholly by employees and paying out of operating receipts a rental equal to the fixed charges on capital employed.	One privately owned corporation under supervision of the Interstate Commerce Commission, the directors of which are to be selected as shown below.	Private ownership under Federal incorporation and control.	Private ownership and operation by "National" companies under Federal charter.
MERGERS	Mergers permitted if in the public interest and if approved by the Interstate Commerce Commission.	All roads to be operated by one corporation for "public service and not for profit."	No provision.	Present railroad systems to be merged into not less than twenty nor more than thirty-five separate and distinct corporations.	Mergers and consolidations to be under supervision of Federal Transportation Board.
REGULATION OF SECURITIES	Federal regulation of the issuance of securities.	Government bonds to replace railroad securities now outstanding on the basis of an official appraisal.	To be controlled by Federal regulating body.	Control and regulation by Interstate Commerce Commission.	To be controlled by Federal Transportation Board.
CONTROL	Federal control to be broadened and intensified.	Continuation of powers of Interstate Commerce Commission. Directors of operating corporation to be elected, one-third from men appointed for "classified" employees, one-third by appointees of the Interstate Commerce Commission, and one-third by the President by and with the advice of the Senate.	Eleven directors appointed by the President of the United States from a limited number of candidates presented by boards, bodies and various organizations [agricultural organizations, Interstate Commerce Commission, National Association of Railway Commissioners, U. S. Chamber of Commerce and railroad employees].	Board of Directors of each corporation, in addition to private ownership representation, required to have at least two members representing the "classified" employees and two members representing the Government (the latter to be appointed by a newly created Transportation Board).	National railroad companies to have twelve directors, two of whom shall be employees representing brotherhoods, the remaining members to be elected by the stockholders, two of whom are to be nominated by the Transportation Board.
RATES AND RETURN ON CAPITAL	Interstate Commerce Commission to [illegible] just and reasonable rates. Commission may establish [illegible] and a reasonable rate. No guarantee of or limitation on return on capital.	Under regulation of Interstate Commerce Commission. When the Government's share of the net [illegible] exceeds 6% of the [illegible] operating expenses, and taxes, reduction in rates is to be effected to absorb the excess.	Existing Federal control over rates. Dividends to [illegible] lower than 4½% nor higher than 6%. Government to guarantee no less than 3½% and [illegible] more than 4½% on capital stock of corporation.	The Interstate Commerce Commission to divide the country into rate districts, and, after hearings, to establish a schedule of rates adequate to furnish a fair return on capital in each district. A Railway Transportation Board of five members to make continuous inquiry and report to Interstate Commerce Commission respecting adequacy of rates, transportation needs and facilities, rates of railroad credit, etc.	Traffic sections created for determination of rates. One-half of net earnings in excess of 6% on fair value of property to be applied to a company contingent fund and the remainder to a general railroad contingent fund. When the company contingent fund amounts to more than 6% of the fair value of its property, it is to retain only one-third of the excess above this 6%.
DISTRIBUTION OF PROFITS	No provision regarding distribution or apportionment of profits.	Net earnings after payment of rental are to be [illegible] and one-half [illegible] to the Government [illegible] maintenance, depreciation, etc., account, [illegible] and one-half to employees as additional wages [illegible] and employees in proportion to their annual wages.	After deduction of all fixed charges earnings in excess of maximum dividend requirements to be shared [illegible] labor, [illegible] Government, [illegible] to be used for [illegible] purposes for [illegible] corporation, any portion not to exceed [illegible] held in trust by corporation as [illegible] reserve fund for [illegible] dividend or interest requirements.	"Excess" earnings over a fair return to be paid to the Railway Transportation Board, one-half of which is to be used for the betterment of [illegible] of railway employees, and the remainder to be used for purchase of equipment or for loans to other railroads.	Whenever a company fails to earn 6% on its fair value as drawn from its contingent fund for the purpose of paying interest and dividends. The general railroad contingent fund is to be used for the purpose of making good any deficiency in any year on the aggregate annual earnings in the several contingent fund sections below 6% per annum on fair value of properties.
FINANCING	All financing (except issues of notes maturing in less than two years) to be approved by the Interstate Commerce Commission.	All financing is to be undertaken by the Government.	Existing bonds may be assumed by corporation. New stock with maximum dividend conditions of [illegible] exchanged for existing stock as appraised by the Commission.	All financing to be authorized by the Interstate Commerce Commission with the recommendations of the Railway Transportation Board.	Funds in excess of $[illegible],000,000 accumulated in general railroad contingent fund to be used in national railroad development. A reserve fund of $[illegible],000,000 to be appropriated to finance railroad improvements in the contingent fund provided from earnings for this purpose [illegible] Provisions to be made for advances by [illegible] Government to companies with weak credits on a [illegible] basis.
JOINT USE OF TERMINALS, ETC.	To be under the direction and authority of the Interstate Commerce Commission.			To be under the direction and authority of the Transportation Board.	To be subject to the direction of the Transportation Board.
WAGES	No provision.	Wages to be adjusted by district boards composed equally of "classified" employees and appointed officials. A central wage board to be provided with final jurisdiction over the broad questions of wages and working conditions.	Creation of labor mediation boards with equal representation for labor. Labor guaranteed the right to organize and bargain collectively.	A committee on wages and working conditions, composed of an equal number of representatives of the wage earners and of the companies to consider labor disputes. Its decisions to be certified to Transportation Board. Decision of Transportation Board to be final.	Wages to be adjusted by boards composed of an equal number of representatives of the railroad companies and the employees. Recommendations of such board to be binding, but in case of deadlock to be referred to Federal Transportation Board.

Continuing a series of interviews with contractors:

Construction Labor's Instability

An Analysis—

III—In which E. S. Skillin, vice-president of the Snare & Triest Company suggests increased production by greater use of labor-saving machinery as a palliative.

IF THERE were two men for every job instead of two jobs for every man, labor's restlessness would be materially quieted. The labor shortage is largely responsible for the difficulties in dealing with the various questions arising between employer and employees. E. S. Skillin, vice-president of the Snare & Triest Co., New York City, thoroughly believes that many questions concerning the present labor situation would clear should there suddenly become available more men than jobs to put them on.

"There has been little or no immigration into the United States during the past five years," says Mr. Skillin. "Before that time an annual influx of approximately 300,000 foreigners gave us plenty of common labor. At the outbreak of the war many of these men were called to serve in the armies in their respective countries. The ranks of labor began to be depleted at that time, and when the United States entered the war many of our own men were mobilized. The shortage of labor was felt considerably, even while the war was in progress, but it is now becoming daily more acute, due to the departure from this country of men of foreign birth who are returning to their European homes. Emigration from this country now amounts to approximately 10,000 per month, or a greater number than were counted as immigrants during the pre-war period."

With this decrease in the number of laborers and building-trades men available goes a marked fall in the efficiency of workmen in general.

Another reason why there is such a labor shortage, particularly among building tradesmen, is due to the fact, says Mr. Skillin, that comparatively few young men, either of American or foreign parentage, are entering the building trades.

Contributing to the instability of labor is the uncertainty as to what living costs will be from month to month. Superintendents of the Snare and Triest Co., in talking with their men, have tried to impress upon them the dignity of the contracts with their employers. The contractor has indicated to the labor leader that when he cannot rely upon his contracts for labor the resulting conditions militate considerably against bidding for contract work. The reply to the contractor has always been the same, "If you will guarantee us that the cost of living will not increase during the life of the contract we will guarantee that no wage increase will be demanded." The guarantee naturally cannot be given, and the prices of labor and of materials produced by labor remain indeterminate.

Mr. Skillin does not believe in the efficacy of any scheme admitting the laborer to constant share in the profits that he may aid his employer in securing. "Such a scheme may be applicable to organized industry, where personnel is a constant factor," states Mr. Skillin. "In contract work but a small percentage of your working forces ever approach a constant figure. With the labor turnover so great and with the adjustment of your working forces to each individual job, it is obvious that a system whereby the laborer shares in the profit or loss of a contract job is not feasible." Mr. Skillin did agree, however, that on wartime construction bonuses had secured beneficial results. The extension of the system on certain classes of work would, in his judgment, be of advantage to both labor and contractor, but it is not applicable to many classes of work, and in any event, where prize giving or bonus giving are frequently indulged in, it resolves itself merely into an increase in wages. Piecework as well has been tried. On urban construction, where unions exercise vigilant control, both these systems are practically impossible, being in opposition to the fundamental of unionism that each man is supposed to do the same amount of work for the same compensation when employed in the same line of work.

Several possibilities present themselves to Mr. Skillin as solutions of the shortage of labor which, if corrected, would, in his judgment, solve many incidental difficulties. In order to reverse the present condition, so that, instead of there being two jobs for each man, there will be two men for every job, there is but one alternative if the Federal restriction upon the importation of foreign labor continues—increased production.

Evidently, then, the shortage of labor demands extensive use of labor-saving machinery on construction work, in order to secure that increased production. The accomplishment of such a task is further hampered by labor's almost universal demand for shorter hours of employment.

Mr. Skillin's answer to the question, "What is the matter with labor?" is, therefore, "Decrease the necessity for it."

"Engineering News-Record" has undertaken this series of interviews with a single aim—to aid the contractor. Contractors' difficulties with construction labor, and their suggestions as to corrective measures are presented with the idea of evoking a general discussion from which may crystallize some concrete plan for the settlement of this absorbing question. We invite discussion of these articles and additional comment or suggestions on the labor problems by those contractors with whom we are unable to communicate personally through our editorial representatives.—EDITOR.

Cincinnati Completing Its Meter Program

About 98% of the water consumers of Cincinnati were metered Dec. 1. Two years ago orders were given that meters must be installed on all unmetered taps by the close of 1919. Since then about 16,000 meters have been set, leaving about 1000 more to be placed. Consumers pay the first and maintenance costs of meters. The meter rate is now 12c. per 100 cu.ft., regardless of the quantity used. There has been a 50% advance in the meter rate within a year or two. J. A. Hiller is engineer and superintendent of water-works.

Niagara Railway Arch Reinforced for Heaviest Traffic

Capacity Increased To Meet Increasing Traffic Demands—Stresses in 550-Foot Arch Span Redistributed by Changing Crown Shims—Floor Reconstructed for E70 Loading—Bracing and Reinforcement

STRESS readjustment in the 550-ft. steel arch of the double-track railway bridge crossing the Niagara Gorge at Niagara Falls, N. Y., was carried out successfully Oct. 1, 1919. This operation was virtually the last step in an extensive repair enterprise which in its entirety was based on strain-gage measurements of primary stresses, secondaries and impact. Various important studies of fundamental questions in bridge design were necessary accompaniments of the investigations.

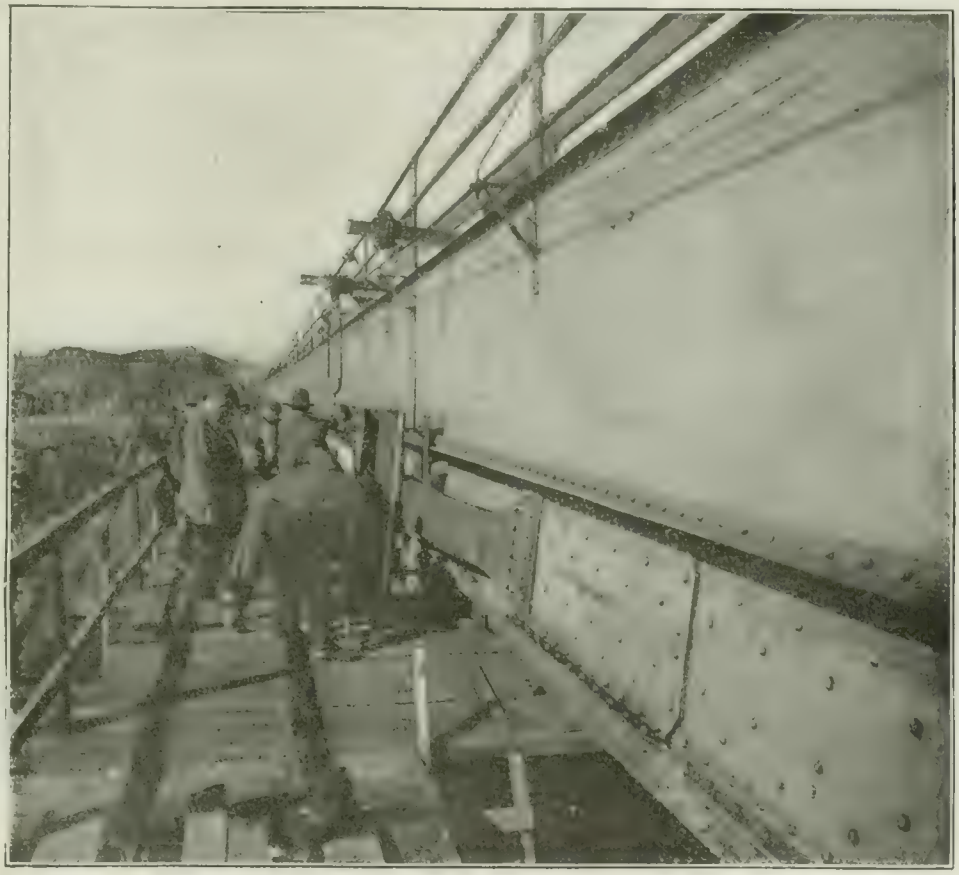


FIG. 1. NIAGARA RAILWAY ARCH: FORCING APART THE CROWN JOINT OF THE TOP CHORD BY TOGGLE

Broadly speaking, the result of the reinforcement has been to convert a bridge built 22 years ago, and then intended to be capable of carrying a traffic equivalent to about Cooper's E37 loading, into a structure equal to one designed and built today. The floor has been rebuilt with strength sufficient to carry E70 loading on both tracks. The main members of arch and approach spans are adequate for E60 loading on both tracks, or singleheaded E70 loading on both tracks, or doubleheaded E70 loading on a single track; and with speed restrictions even heavier trains may be moved over the bridge.

Reference to drawings of the bridge (See *Transactions*, Am. Soc. C. E., 1898, Vol. XL., p. 125) will show that the bridge was originally designed with low unit stresses and an excellent, robust makeup of members and details; these were the main factors that made it possible to increase the capacity of the bridge so greatly in the present work. No deterioration whatever had taken place in any part of the arch, except for heavy corrosion of the railway floor members through salt-water drip from trains. A large number of bad and loose rivets was found, but it is uncertain whether these became loose during the service of the bridge or were bad and did not fill their holes from the beginning. After taking care of these two matters, the remaining reinforcement was based on a careful survey of the structure with regard to the metal cross-sections available and the distribution of stresses. One outstanding result was that the main arch proved to be amply strong (when properly adjusted) for the much higher loading of modern design, though its crown closure, the arch being statistically indeterminate, was of such nature that the stresses in some members were excessive and a readjustment had to be undertaken to distribute the stresses more equally to the various members.

In the original design of the bridge a moving load of 10,000 lb. per lineal foot was provided for. This includes the loading on both decks (the lower carrying a highway, the upper deck two railway tracks). At the beginning of the investigation of strength, made last year, the conclusion was reached that this loading allowance corresponded to approximately E37 on the railway tracks. For a year past train speeds have been limited on the bridge, in view of the known increase of locomotive and car weights since the construction of the bridge. Charles E. Fowler, called in to investigate the condition of the bridge, concluded at the outset that because of the probable overloading of the structure, as well as because of its statically indeterminate nature, a reliable determination of the capacity of the bridge would have to be based on measurements of actual stresses existing in the members under known loading. It was found in the course of speed tests that the bridge had a rather excessive amount of side sway, but the importance of impact effects could not be known without stress meas-

urements. Because all connections of the main members of the bridge are riveted, it was thought that secondary stresses might be high, and the conclusion was was reached that their amount should be measured before attempting to fix upon the maximum safe stresses which the various members would bear.

A campaign of strain-gage measurements for this purpose was authorized by the directors of the company owning the bridge, more than a year ago. The measurements were made by Mr. Fowler, assisted by Prof. C. T. Morris and Prof. A. H. Fuller. (See a summarized statement of the work in *Engineering News-Record* of Dec. 26, 1918, p. 1172.) Impacts up to 50% were observed in the arch members, though the values as a rule were far below this amount. From the observations, curves for the variation of both impact and

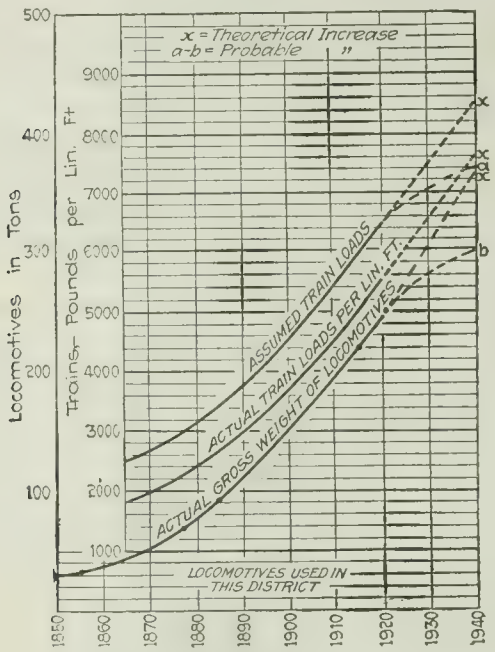


FIG. 2. RAILWAY LOAD INCREASE AT NIAGARA CROSSING DURING SEVENTY YEARS

secondary percentage with loaded length were plotted, and these after fairing were averaged for a given class of member to give a mean curve for the final calculations.

One of the byproduct results of the strain-gage work was the discovery that the wrought-iron sway rods between the long posts of the arch web-system were quite unevenly stressed; immediately on the completion of the measurements, therefore, these rods were readjusted to strain-gage readings. Auxiliary transverse struts were also riveted between four sets of posts to reduce the free length of compression member in cases that appeared critical. Furthermore, about 11,000 rivets in main truss connections that were found to be bad or loose were cut out and redriven. General reinforcement, however, was only planned at that time, and it was not undertaken until the current year.

Loads and Stresses

One of the first and most gratifying conclusions of the strain-gage work and the coördinated study of the bridge stress sheets was the discovery that the main arch had been built originally with such ample section of members as to be capable upon readjustment of carrying far more than the designed live load. In fact, it seemed possible to adapt the arch to live loads heavy enough for a considerable period of future service, and on this account a study of railway live loads was made to determine what might be looked for as the future maximum. Mr. Fowler's conclusion was that a locomotive weighing about 300 tons and trains weighing about 7500 lb. per linear foot of track might be looked for at the end of a period of about 20 years, as maximum railway rolling loads of that time; and that for the terminal traffic on this bridge (which is located within the switching limits of large terminal yards on both American and Canadian banks) an E60 locomotive loading with somewhat lighter train loading than 6000 lb. per foot would be fairly representative for many years to come. Local concentrations, of course, would have an effect upon the floor without being of material influence on the trusses. For these reasons a loading of E70 was decided upon for the entire floor and for the plate-girder approaches, and E60 for the main parts of the structure.

It was necessary to determine also what unit stresses might safely be allowed in the main members of the bridge. Stress analyses showed that with unit stresses —impact and secondary stress being allowed for as noted below—of 20,000 lb. in tension on built members and approximately 19,000 lb. in compression (reduced for length of member), the full desired loading could be accommodated both on the arch and on the approach spans, provided a few weak spots of the approach spans were reinforced. In the case of the floor of the main arch span, the floor of the 115-ft. spans, and the whole of the plate-girder approaches, lower unit stresses were applied, as the extensive renewal and repair of parts here, made necessary by corrosion, allowed the stringers to be given ample section. With respect to the floor-beams, other means of reinforcing were devised, as will be related.

From the strain-gage measurements it was determined that, while impact effects seemed to vary somewhat erratically, they were in general well taken care of by allowances based on the Pencoyd or Schneider formula. The amounts actually used in the final calculations were for most load lengths considerably less than given by this formula, however, because a low maximum speed, 17 miles per hour, was decided upon, the stress measurements having shown that at speeds much beyond this the impact effects increased.

Secondary stresses were determined by the measurements to range from about 10% to 200%. The amounts adopted for the final calculation of the top chord varied from 20% to 200%; those for the web members of the main arch from 15% to 60%; for the bottom chord 10% was used and for the main members of the approach spans 23%. These percentages were applied to the live-load stresses alone, on the assumption that dead-load secondaries were neutralized by adjustments before erection was completed.

Reconstruction and Reinforcement

First and in some respects largest of the reconstruction items to be undertaken was the rebuilding of the floor. This consisted of renewal of flange plates and to some extent flange angles of the stringers, an operation that was carried on for one track at a time. In connection therewith a shelter or drip plate was built in under the ties, an ingenious new design that was described in *Engineering News-Record* of Sept. 25, 1919, p. 620. No

additional flange metal was found necessary in the floor-beams, in spite of the very greatly increased train loading, because it was possible to give these added support from below by strengthening the large curved knee-brackets between posts and floor-beams. In the cross-section in Fig. 3, taken from the 1898 description of the original bridge, the form of these brackets as originally applied is clearly shown. They were extended about 18 in. toward the middle of the floor-beams, by riveting extension clips to the floor-beam flanges, and a full-length additional cover plate was riveted over these clips and the original knee-brackets. An analysis of the stresses in the square frame formed of upper-deck and lower-deck floor-beams, arch posts and brackets showed the function of the brackets to be so important as to make the upper floor-beams nearly adequate, and wholly so if the brackets were extended.

In spite of full upper and lower lateral systems (the lower laterals consisting of rigid members and the upper laterals of crossed diagonals of angles in the plane of the railway floor), the bridge had more side sway than was considered safe for modern loads. This was traced to the use of very light rod bracing between the high arch posts; it was therefore decided to remove the rods and put in rigid bracing. The substitution actually brought about a marked reduction in the vibration of the bridge under railway traffic.

A minor item of the floor work was the replacement of the wood joists of the highway floor by steel joists having a capacity for 15-ton trucks. These joists are 9-in. I-beams, placed transverse to the axis of the bridge, 2 ft. 4 in. apart. The new planking of 3½ in. oak was laid longitudinal, as in the original floor.

While no reinforcement of individual members was

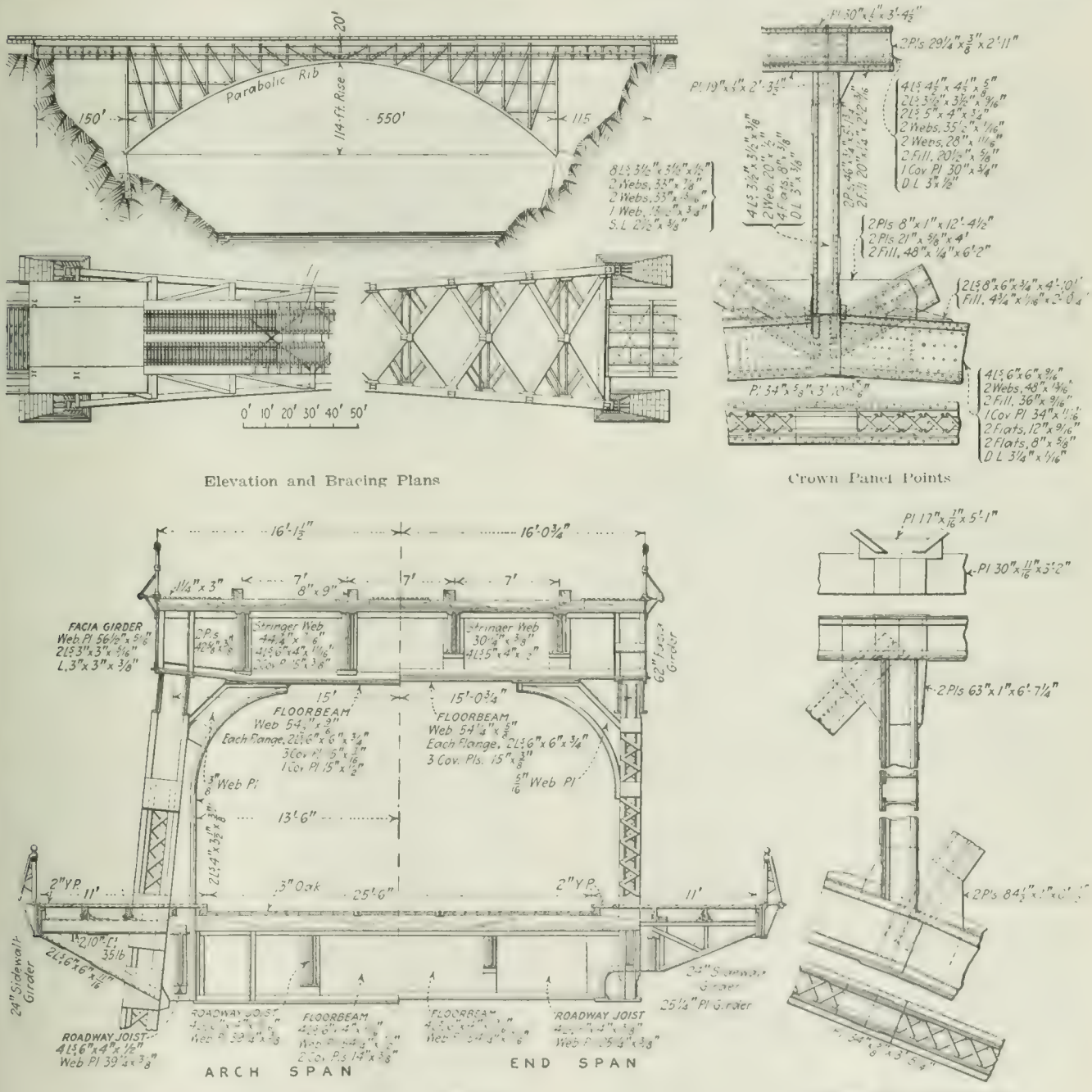


FIG. 3. TYPICAL SKETCHES OF NIAGARA RAILWAY ARCH AS ORIGINALLY BUILT

necessary in the arch, the approach span presented an interesting problem in this regard. The chords of these spans were originally built with a large excess of section, the top chords having been used as parts of the anchor chain in cantilever erection of the main arch, and the bottom chord eyebars (these spans are pin-connected) having been proportioned for very low unit stresses. The diagonals also were ample, except the counters. The posts, on the other hand, called for some addition of section and for stiffening laterally, to resist the transverse bending imposed by the knee-brackets of the railway floor. For this purpose two vertical angles were riveted along the face of the posts, on the side facing the center line of the roadway. To apply these angles in such a way that they would share the total stress with the original metal of the posts, the posts were relieved of their load by placing a powerful toggle between upper and lower chord, and by this means spreading the chords apart just sufficiently to slack off the pressure on the post pins, as described in *Engineering News-Record* of Oct. 16, 1919, p. 743.

A number of other items of reconstruction and repair were carried out in connection with the work described, but of wholly auxiliary character. One of these was raising the level of the railway tracks near the American end of the bridge by 18 in., to eliminate a sag in the profile originally built in. This required raising of the American plate-girder viaduct approach to the bridge and other rearrangement.

Stress Readjustment in the Arch

In the original investigation of the bridge by strain-gage, last year, it was necessary to determine the dead-load stresses by measuring the stress in one member. Without such a datum-point the amount of constraint existing in the statically indeterminate structure would have remained unknown. A toggle was therefore built, by means of which the top chord of one arch truss was spread apart at its crown joint after removing the splice plate; the increase of length of a measured gage length of top chord inside the reach of the toggle, while the original dead-load stress in it was being reduced to zero through the operation of the toggle, was a measure of the dead-load stress. The amount of stress so found was 689,000 lb. in the middle section of the top chord (of one arch truss).

Stress calculations based on this figure led to the conclusion that the top chord and the web members of the arches were relatively overstressed, while the bottom chord or rib could carry more stress with safety. Undoubtedly one of the reasons for this condition is that, in the original design of the structure, the rib section was increased over that required by the stress calculations for the two-hinged arch, to areas representing the mean between the two-hinged and the three-hinged conditions. This was done "to meet any inaccuracy of adjustment."

The original stresses in the arch corresponded to a dead-load stress in this member of 572,000 lb.; the fact that a larger amount was found was undoubtedly due, says Mr. Fowler, to the fact that in the closure of the arch, when the top chord was forced apart at the crown by the anchorage toggles and adjusted with a small crown toggle, and shims of the thickness calculated as desired were inserted, the amount of stress introduced into the chord by the toggle was more than the required amount.

Without regard to the original stress-sheet, however, recalculation of the arch was carried through on the basis of the new live load and the new unit stresses considered allowable; and several degrees of constraint in the arch were assumed for this purpose, in order to determine whether any gain could be made by different degrees of redistributing the stresses. It was found that if the constraint introduced by the shim at the top-chord crown joint could be reduced to less than half its existing amount, the top chord and the web members would be favored by relief of their excessive stress, while the bottom chord would be subjected to an increase of stress, which, however, it could take care of. It was therefore concluded to readjust the top chord closure in such a way as to put a dead-load stress of 300,000 lb. into this member, in place of the actual 689,000 lb. or the 572,000 lb. contemplated by the original stress sheet. Elastic calculations showed that this reduction of top-chord stress would be brought about by removing the 1-in. shims in the top-chord crown joint and replacing them by shims about $\frac{5}{8}$ in. thick (varying from 37/64 to 43/64).

To force the top chord apart for the readjustment indicated, two sets of powerful toggles were constructed, each consisting of two sets of three bars engaged at their hip points by vertical toggle-beams serving as pulling heads for four screws, one above and one below the toggle bars at each hip point. These parts may be seen in the view Fig. 1, showing the toggle in place and under operation for readjustment. The ends of the toggle were butted against abutment plates originally riveted to the chord at the time the arch was closed, and strengthened by extra plates at the abutment edge to protect it against curling up under the pressure.

The toggles were operated simultaneously on both trusses. Traffic over the bridge was stopped at 8 a. m., Oct. 1, 1919, and the work on the screws began at 10 a. m. On a whistle signal, a pair of workmen at each end of the screws proceeded as rapidly as possible to give the nut at that end four turns. By thus carrying the work on according to signal, all working points were kept abreast of one another. By noon, the stress had been fully transferred from the chord joints to the toggle and the shim was loose. After noon the old shim pieces were taken out, and the toggles then slowly slacked off until the new shims were in and were gripped, after which the toggle nuts were slacked off as rapidly as possible to bring the joint to full bearing. At 4 p. m. the joints had been bolted up and traffic across the bridge was resumed.

Stress measurements in the top chord immediately afterward showed a large stress deficiency as compared with that aimed at. One of the top chords showed only 100,000 lb., and the other about 200,000 lb. stress (instead of 300,000), the total deficiency thus being about 50%. By the next morning, after a heavy traffic of accumulated trains had gone over the bridge during the night, this deficiency had been largely corrected, and it decreased still further during the following two days, so that the stress varies less than 6% from that required. It was evident that the larger part of the stress which should have appeared in the top chord remained as compression in the railway stringers and the track rails and guard rails of the upper deck (100-lb. rails laid with joints tightly butted), and that the rolling action of the trains gradually worked the stress out of the stringers and rails.

In view of the deep chord and gusset-plate connection at the crown of the bottom chord (see Fig. 2) it was feared that the ⅜-in. shortening in the top chord by the change of shims would introduce very heavy secondary stresses in the members surrounding this joint.

To forestall this, the lower half of the splice and gusset connection was disconnected by cutting out the rivets, and the upper edges of the gussets were cut back in a sweeping curve by flame burning. The final closure of the splice by re-riveting was not made until some



FIG. 4. ROD BRACING BETWEEN POSTS, NOW REPLACED BY STIFF MEMBERS

weeks after the shim adjustment, in order to give full opportunity for the parts to adapt themselves to the new conditions without elastic distortion.

The entire operation was carried out by the Terry Tench Co., contractors, in coöperation with H. G. Dickinson, superintendent of the Niagara Railway arch bridge, under the direct superintendence of the consulting engineer.

Masonry and General

The masonry of the skewbacks, pedestals and abutments was generally in good condition, but there was a rather alarming eccentricity of stress at the base of the arch skewback piers. Incidentally, the masonry of the abutment of the Canadian approach (four 52-ft. plate-girder spans) was badly shattered under the bearings. This was the original abutment and anchorage of the Roebling suspension bridge built 64 years ago, remodeled into an ordinary abutment when the arch bridge was built in 1897. The shattered masonry was removed and a new concrete facing constructed by erecting forms in front of the old masonry and pouring the concrete against the old stone wall. Two of the approach viaduct pedestal caps also were found to be cracked, and they were removed and built steel shoes were substituted. The old capstones were found to be badly shattered upon removal.

The skewbacks of the 550-ft. arch span were built of limestone masonry, with granite coping or capstones. This masonry was just beginning to show weathering, and it was found to be necessary to protect it in an efficient manner. Triangular mesh reinforcement was placed over all the surface, and an armored coating formed over the mesh by cement gun. The coating was made about 4 to 6 in. thick at the top and from 6 to 12 in. thick at the bottom. The eccentricity of the pressure lines within the skewback masonry and the heavier loads to be carried by the structure made it necessary to connect the separate skewbacks by a 4-ft. reinforced concrete thrust and tie wall, reinforced diagonally with sixteen 1-in. rods hooped as a column, to carry the thrust from the top to the rock at the base.

Land Values Raised by Drainage

Engineer Cites Cases Where Drained Lands Sell at $200 to $300, While Former Value Was $10 to $20 per Acre

THE important commercial results of engineering work for land drainage are illustrated by examples of the great increase of land prices in drainage districts, as mentioned in a paper read at the recent meeting of the National Drainage Congress by Isham Randolph, consulting engineer, Chicago. In the Little River District of about 800 square miles, in Missouri, the best lands were sold at an average price of $16 per acre before the drainage was begun, although the district had been organized.

During 1918 and 1919 the average price was $55 per acre, and some of the drained land has sold as high as $75 per acre.

Concerning smaller districts in Missouri, the following figures may be cited: District No. 1 in New Madrid County, was organized in 1898, and during 1899 several thousand acres of the best lands on the higher ridges were sold at an average of $6.30 per acre. Drainage work was completed about 1902, and during 1902 and 1903 land was sold at an average of $9.70 per acre, while a fair average at the present time would be $125 per acre, and some sales have been made at close to $200 per acre.

In the Spring Lake District, in Illinois, before reclamation, the fair market value was about $3 per acre, but now the price is firm at $300. In the Banner Special Drainage and Levee District, in Illinois, with 46,000 acres, the price before reclamation was about $3.60 per acre, while now it is $275 to $300, and in a partition suit the commissioners have appraised uncleared property on the basis of $300 per acre. One year after drainage a tract formerly valued at $25 per acre produced onions which sold for more than $800 per acre. As the cost of raising the crop was something over $200, the net return on the land was $600 per acre for that year.

Concerning Arkansas, Mr. Randolph quoted from a letter by Willis Ayres, consulting engineer, Memphis, Tenn. In Mississippi County, Arkansas, approximately $5,000,000 has been expended for drainage in the past 10 years. Cut-over land, where all merchantable timber has been removed, was unsalable at $10 an acre 10 years ago. Today that same land is selling at $150 to $200 per acre.

In Crittenden County, Arkansas, next year practically the entire county will have been drained at a total expenditure of approximately $3,000,000. Undrained, cut-over land was selling at $5 to $10 per acre in 1912-1913 and developed property at $30 to $50. Now land of the same type, properly drained, is bringing $50 to $75 per acre if undeveloped and $150 to $250 per acre if developed.

Various Current Phases of Sanitary Engineering

Brief Abstracts of Papers, Reports and Resulting Discussions at the New Orleans Meeting of the American Public Health Association

ENGINEERING and allied technical subjects received much attention at the 47th annual meeting of the American Public Health Association, held at New Orleans, Oct. 27–30, 1919. The news features of the convention were reported in the issue of Oct. 9, p. 714. Below are brought together brief abstracts of some of the papers and reports on drainage and mosquito control, engineers as health officers, water-supply, sewage treatment, refuse disposal, milk pasteurization, and the sanitary control of swimming pools. More extended abstracts of a few papers may be published in later issues.

The importance of drainage as an antimalarial measure, and the need of having health officers supervise drainage for land reclamation in order that conditions favorable to mosquito breeding might not be created, were urged by J. A. LePrince, senior sanitary engineer, United States Public Health Service, Memphis, Tenn. Some figures of cost of malaria control, based on experience in the United States, were given by H. R. Carter, assistant surgeon general, United States Public Health Service, who said the best method of control is the one that costs the least. In some sparsely settled localities control by drainage might be prohibitive in cost, so that screening and quinine would be the only available means of combating malaria.

W. G. Stromquist, assistant sanitary engineer, United States Public Health Service, Memphis, Tenn., spoke of the need for ditching machines that will cut small trenches with V-shaped bottoms. To prevent aquatic growths in ditches, the slopes may sometimes be lined with cement shot onto wire. Mosquito control is vital to agriculture, lumber, steel, railway and other industries in the South. Both the Tennessee Coal, Iron and Railway Co. and the Cotton Belt Railroad have done effective work against mosquitos. Continuing this line of discussion, Mr. Le Prince said that malaria control in the South is a vital question to the North as well, since malaria hampers Southern industry and swells the cost of Southern products.

Engineers for Health Officers

Renewing a topic presented before the association seven years ago by Morris Knowles, a paper entitled "New Specifications for Health Officers," by Mr. Knowles and Morris R. Scharf, was presented by the latter. The paper had much to say of the work of the sanitary engineer in protecting public health. It urged that local, state and Federal health officers be trained and experienced in "sanitation, public health and public health administration"; advocated a permanent sanitary corps and sanitary reserve corps in the United States Army and that sanitarians should be commissioned in the United States Public Health Service. Dr. A. W. Freeman said the paper was timely, since in Ohio 102 full-time health officers must start work Jan. 1. For the larger cities, these administrative positions may be filled with doctors or with sanitary engineers trained in public-health work; in the smaller places, doctors will probably be needed, since the health officers there will have medical functions. C. A. Emerson, Jr., engineer, Pennsylvania State Department of Health, thought that to fight disease a medical officer is needed, but one with special training. M. N. Baker, New York City, expressed particular interest in the paper, because he had taken a part in securing a succession of engineers and men with allied training for health officers at Montclair, N. J., including Theodore Horton, M. O. Leighton, H. N Parker and C. H. Wells. When the last-named left Montclair to become health commissioner of Delaware he was succeeded by John Gaub, at that time chemist of the Washington water-filtration plant. Ultimately, Mr. Baker thought, neither a full medical nor a full sanitary engineering course will be considered essential for a health officer, but a course made up from both. Eventually, sanitary engineering work may be taken from boards of health, state and local, and placed in well planned engineering departments. In that event it will matter less if the main training of the health officer be medical, provided it be grounded in public health instead of private medicine.

Water-Supply and Purification

In his report as chairman of the committee on water-supply, George G. Earl, general superintendent, Sewerage and Water Board, New Orleans, first urged that neither privately nor publicly owned water-works can be properly operated unless every one benefited pays his fair share of the cost of the service. After mentioning the dangers of permitting the use of impure secondary water-supplies, Mr. Earl reviewed the beneficial effects of improved water-supply, sewerage and drainage on the health of New Orleans. From 1899 to 1918 (eliminating the influenza toll from the latter year) the general death rate of New Orleans fell from 27 to 19. In the same period, malaria dropped from 104 to 4 per 100,000 and typhoid fever from 39 to 18 (the latter the average for the past seven years). There is no reason to think, Mr. Earl stated, that the water-supply has or ever did have any relation to typhoid in New Orleans, typhoid reduction being due to the elimination of privies and cesspools and also to the activities of the health department.

In a paper on "Water Purification in Ohio," W. H. Dittoe, chief engineer, Ohio State Department of Health, stated that of 81 surface water-supplies 51 are filtered and 9 rely on chlorination. The population dependent on the 21 untreated supplies totals 100,000, compared with 3,000,000, or 56% of the population of the entire state, dependent on treated supplies. When the department began the supervision of water treatment in 1916 only 8 of 38 filtration plants were in charge of trained operators and only 1 of 8 chlorination plants. Each of the 15 new plants built in the last 3½ years is in charge of a competent operator. Today 21 water-treatment plants in Ohio are under the supervision of technically trained men; 22 plants have the part-time supervision of such men, and only 8 are operated without proper supervision—but the largest of these furnishes no more than 800,000 gal. a day. Of 9 chlorination plants, 8 are under trained men. In many cases the saving in operation effected by having competent men in charge exceeds the salaries paid.

A typhoid outbreak due to the negligent operation

of the water purification plant at Charleston, W. Va., in 1917, was described by Mayo Tolman, lately engineer of the West Virginia State Department of Health. The plant lacked accessories and was out of order. No coagulant was used when the water was clear. On various dates the filter was bypassed and only a slight dose of chlorine was used. In discussing the paper, Dr. A. W. Freeman, who was detailed to Charleston by the United States Public Health Service, said that the negro in charge of the filter plant determined the amount of coagulant to use by looking out the window at the river water. The plant had no intelligent supervision. Bacterial counts were made by a local druggist. At intervals, samples for bacterial examination were sent to the state laboratory, but they were 24 to 72 hours en route.

In the course of a paper on "Causes of Typhoid Fever in Massachusetts," by George T. O'Donnell, it was stated that since 1896 public water-supplies had not caused any considerable number of cases of typhoid fever in Massachusetts. In one instance, a frozen water-filter bed gave rise to some typhoid. The typhoid mortality for the state has fallen from 12.2 per 100,000 in 1910 to 4 per 100,000 in 1918. Over 90% of the population has a public water-supply. The author thought the time will come when no typhoid case will be released until two negative cultures from both the feces and the urine have been obtained.

The pollution of deep wells from a sewage pump well at Lansing, Mich., was described by E. D. Rich, state sanitary engineer of Michigan. The pollution caused an outbreak of diarrhœa which affected thousands and crippled industrial plants for a few days.

Edward E. Wall, water commissioner of St. Louis, outlined the history, methods and results of treatment of water at St. Louis. Figures showing large sums of money saved by typhoid reduction, and by a lessening of soap consumption due to purer and softer water, were presented. The muddy character of the untreated water was illustrated by Mark Twain's statement that a tumblerful of Mississippi River water contains an acre of land in solution.

Sewerage and Sewage Disposal

For the committee on sanitary control of waterways, Harrison P. Eddy, consulting engineer, Boston, said that a study of the disposal of industrial wastes is proposed. As a preliminary, the committee submitted a bibliography on the treatment of industrial wastes.

The committee on sewerage and sewage disposal, Kenneth Allen, New York City, chairman, submitted a detailed report on the disposal of human excreta, garbage and manure in rural districts. Several members of the sanitary engineering section dissented from the committee's approval of earth-pit closets, and some thought the report contained proposals too elaborate and too technical for rural sanitation. A resolution was passed expressing appreciation of the work done on the report, but requesting the committee to postpone its final report until the United States Public Health Service completes its investigations of privies.

The report of the committee on sewage-works operation, submitted by C. B. Hoover, Columbus, Ohio, discussed methods and standards of sewage treatment to produce effluents which will not require dilution and also effluents subject to dilution. An abstract of this report will be printed later. W. H. Dittoe, engineer, Ohio State Department of Health, said he would like to see the expectations of various processes of sewage treatment tested in comparison with actual results. C. A. Emerson, Jr., engineer, Pennsylvania State Department of Health, said that during the war his staff was reduced and the inspection of sewage-works cut by half. On resuming full work it was found that only 20% of the works were being properly maintained. This was brought up to 60% after a force of 15 to 20 inspectors had been in the field.

A paper on the "Treatment of Wastes from Sugar Refineries," by S. A. Greeley, Chicago, described at length a beet sugar plant at Coro, Mich., and some experiments on sugar-waste treatment elsewhere. The conclusion drawn from the tests was that fine screens and settling tanks are likely to be needed at any plant and that the effluent could be treated on sprinkling filters or on sand filters.

Refuse Disposal

Through E. D. Rich, engineer, Michigan State Board of Health, the committee on refuse collection and disposal submitted a report which was designedly a compilation of material made public during the year. Included in the report were some useful data on feeding garbage to hogs, in the form of a tabular summary of the Baltimore, Buffalo and Newark contracts. The report stated that at some feeding plants much garbage is wasted because of failure to collect it until it is so stale the hogs will not eat it or because an insufficient number of hogs is kept. In the discussion of the paper, M. N. Baker, New York City, said that with present high costs for constructing reduction works and uncertainties as to the prices of grease and tankage there was much to be said for disposal by feeding to hogs, even if regarded as a temporary method. H. A. Whittaker, director division of sanitation, Minnesota Health Department, stated that there had been suits for nuisances on account of hog ranches at Minneapolis and other Minnesota cities. Mr. Baker replied that it required no more skill so to design and operate feeding plants as to avoid a nuisance than to design and operate reduction works.

Valuable contributions to public-health literature in a field but little surveyed heretofore were an extensive and detailed report by the committee on milk pasteurization, presented by H. A. Whittaker, director of sanitation, Minnesota State Department of Health, and a paper on control of pasteurization, by F. O. Tonney, director of laboratories, Chicago Health Department. Mr. Whittaker's report summarized reports received from various states on rules for control of pasteurization, and described at length the apparatus and methods employed. He estimated that there are now 4000 milk-pasteurization plants in the United States and Canada which are operating on domestic milk. The committee believes that pasteurization plants should be under the control of state boards of health except where there is competent local control.

The committee on swimming pools, through C. W. Simons, chief engineer, Florida State Board of Health, submitted a progress report. California and Florida are the only states that have placed swimming pools under the control of their state boards of health, and but few cities attempt control, only six having covered the matter by ordinance. The latter point is significant because nearly all the swimming pools are in cities.

Impressions Here and There

In The Pacific Northwest

RECENTLY quite a stir developed among the engineers of Portland, Ore., when it became known that an outside firm had made an offer to the city to undertake its bridge-inspection work. "Shall the city contract for semi-annual inspections of all the city's bridges at the absurdly low figure of $500 per annum and agree to turn over to the same firm all the engineering work on new bridges at the usual percentage rate?" "No," said two groups of engineers after they were called together by their respective societies. And then they told the city fathers in a very emphatic way just how they felt about it.

They pointed out that "local engineers are best qualified to analyze local traffic growth and needs, and talent from other states should not be called in until problems justifying that course arise." After all, engineers *can* pull together effectively. The way they got together in this instance, and the publicity they secured for their views showed that very clearly.

Following the "paving boom," when Portland paved far beyond its rate of growth, the city became the unwilling owner of many lots on which assessments could not be paid—vacant, grass-grown lots bordered by unused but paved streets. For awhile no more paving was done, but of late the tide has changed again, this time to the sound policy of paving first on the more heavily traveled thoroughfares. This year the city has put in operation its own paving plant and has "declared independence."

Seattle—In Seattle, municipal ownership looms big. In addition to the city's hydro-electric project on the Skagit River, for which $5,500,000 has been voted, the street-railway system was recently purchased by the city for $15,000,000. Many ideas about up-to-date electric-railway operation new to Seattle are being tried, such as the pay-as-you-leave plan, a power-saving campaign among motormen, a merit and demerit system for platform men, etc. No municipal venture is without its opposition, and plenty of this is current in Seattle. "Why trust an entire hydro-electric development like the Skagit to a city where Cedar Falls dam stands as a monumental blunder?" "The sealing of Cedar Falls reseroir could be done better by contract than by the city." These are two of the comments. However, the way in which Skagit plans are being laid out indicates a determination to make no fundamental mistakes there. Dam borings are being made extensively at the three proposed sites, and comparative studies are under way to show the relative merits of steam railway vs. truck or tractor haul for the 26 miles between the nearest railroad and the dam site.

It is notable that the three largest cities on the Pacific Coast are now committed to municipal hydro-electric projects. San Francisco is developing power on the Hetch Hetchy and Los Angeles has in the aqueduct great water-power potentialities. In both these cases, however, water was the primary consideration. Seattle, on the other hand, has undertaken the Skagit project solely for the power involved—and counts on getting a good, big supply that can be sold at a rate attractive to manufacturers.

Pioneering is one of the things for which Washington is noted. It is not surprising to hear that the office of state hydraulic engineer has been created. (It is being ably filled by Marvin Chase.) Or that the new Pier B which the Port of Seattle is building will use timbers as large as 18 x 30 in. in section and 40 ft. long. But I must not bring forward only the favorable comment. A subject for the contrast comes to mind at once in one of the recently constructed bascule bridges over Lake Washington Canal. Picture the shapely steel truss, the carefully designed, massive masonry towers at each end, and then an unsightly high-level approach *supported on long wood piles with short bents.* The effect is one to make our architect friends weep.

British Columbia—Over the line in British Columbia it is indeed refreshing to see Vancouver "coming back." The slump wasn't caused by the war. Vancouver simply grew too fast, and in 1913 suffered from malnutrition—there wasn't enough incoming business to support her on the ambitious scale laid out. How does the recovery manifest itself? Well, take the electric-railway situation. The street cars are now carrying as many passengers as they did in the halcyon days (about 120,000 daily) and the company is making a short extension—an insignificant addition to the system, to be sure, but significant in that it is the first new construction required in five years or more

It seems that the city has learned its lesson. Growth of a more steady and stable nature is indicated from now on. Despite the way conditions have improved of late, not a word is heard about the once proposed North Vancouver bridge or a tunnel under the first narrows. Rather the tendency is to foster industrial development and live within the assured income, so to speak. This is just as it should be.

British Columbia University, a $10,000,000 investment in the young people of the province, is making progress, and considerable work has been done on the attractive site out at Point Grey. Meantime the institution has been holding classes in temporary buildings within the city limits.

Over in the east end of Vancouver, two new and imposing railroad depots stand side by side. The Great Northern and the Canadian Northern lines have finally settled the question of where to locate their passenger terminals. The location is somewhat outside the present central zone of the city, to be sure, but it is easy to foresee that the city will soon grow around them. In fact, one has only to talk with H. J. Cambie, the white-haired consulting engineer of the Canadian Pacific Railway, to contrast the future Vancouver with the "Gas Town" of former days.

Our own vision, mind you, not Mr. Cambie's. He is too busy to speculate seriously in visions. Cambie is a fine example of the active practical engineer, and a mighty interesting character. It was he who located the Canadian Pacific main line across the Rockies in the early '80s. I missed him this trip. He wasn't in his office. Must be getting old, you say. He is. Somewhere past 80—84, I think—but you're wrong if you think he's out of the running.

I missed him because he was away on Vancouver Island *examining a new location in rough country!*

Nov. 4, 1919. SEATTLE.

An Analysis of the Esch Railway Bill

By Representative E. E. Denison
of Illinois

The debate in the House of Representatives on the Esch bill developed the fact that Representative Denison of Illinois possessed a better grasp on the questions at issue than did most of his colleagues. He has prepared the following digest of the measure, especially for "Engineering News-Record."—Editor.

THE Esch bill that has passed the House provides for: (1) Immediate return of the railroads to their owners; (2) financing the railroads during the transition or reconstruction period; (3) tribunals for the voluntary adjustment and conciliation of labor disputes, and (4) amendment of the Interstate Commerce Act in numerous instances which are of great importance both to the railroads and to the country.

The bill does not embody any new or untried theories of railroad economics. It is based upon the fundamental principles of legislation and policies of Government heretofore provided, which gave the country the finest transportation system in the world. It continues rates established during Government control until changed in accordance with law by state tribunals or the Interstate Commerce Commission. It guarantees to the railroads, for a period of six months following their return, an income equal to the average railway earnings of the roads during the corresponding six months of the three years immediately prior to the war. It authorizes the President to make loans to the roads at 6% for a period of two years whenever such loans may be found to be necessary and provides for funding the amount which the railroads now owe to the Government.

The Government has lost about $650,000,000 in the operation of the roads during Government control. When the accounts between the railroads and the Government are settled according to the terms of the bill, the railroads will be indebted to the Government in the sum of about $775,000,000.

The total amount of the requirements for the railroads in the way of losses, loans and advances up to the time the roads shall be relinquished will amount to about $1,421,020,000, for which there has already been appropriated by Congress $1,250,000,000, leaving about $171,020,000 to be appropriated by Congress.

The bill appropriates $250,000,000 as a revolving fund out of which to make loans to the railroads if necessary. It amends the present Interstate Commerce Acts in practically all particulars recommended by the Interstate Commerce Commission as necessary or desirable in order to give the country an efficient and adequate transportation system. Among the important new provisions of the law under the Esch bill will be the following:

It authorizes the Interstate Commerce Commission to establish minimum as well as maximum rates.

It gives the Interstate Commerce Commission authority to supervise and approve all issuance of stocks and securities for railroad purposes.

It coördinates rail and water transportation by giving the Interstate Commerce Commission enlarged and extended powers to compel rail and water carriers to install water terminals.

It enlarges the powers of the Interstate Commerce Commission under the car-service act, and gives the commission plenary powers with reference to the distribution of cars and other facilities in cases of emergency and congestion of traffic.

It authorizes the commission to compel joint use of terminals when in the public interest.

It allows pooling of traffic and equipment, in the public interest.

It enacts into statute law the decision by the Supreme Court in the Shreveport case, by giving the commission the right to require readjustment of intrastate rates whenever they cause unjust discrimination.

It enlarges the commission to 11 members and increases the salary of a member to $12,000 per year.

It authorizes the commission to compel interstate carriers to furnish equipment or other facilities when needed in the public interest.

There are several provisions in the bill which are expressly intended to benefit the so-called weak roads or short lines, and these provisions will have the further tendency to promote voluntary consolidation of the weak lines or feeders with the trunk lines.

The House struck out of the bill the rule for ratemaking which had been recommended by the committee on interstate commerce, and which would have been of material benefit in the future rehabilitation of the railroads by strengthening their credit. As the bill finally passed, it leaves the powers of the Interstate Commerce Commission as to ratemaking as heretofore—namely, that all rates must be just and reasonable.

Proposed Water-Works Enlargements at Columbus, Ohio

THE $3,000,000 of water bonds authorized by the voters of Columbus, Ohio, Nov. 4, are to be used to increase the present storage capacity on the Scioto River so as to provide 55,000,000 gal. daily and to enlarge the purification and pumping works to supply 35,000,000 gal. daily, besides reinforcing the distribution system, all in accordance with a recent report by Prof. John H. Gregory, consulting engineer, Baltimore.

The safe daily yield of the Scioto River, with the storage provided by the present dam, is 24,000,000 gal. (or somewhat more with the flashboards recently provided), against a daily water consumption of 22,534,000 gal. in 1918. The per capita consumption in 1910, with 91.31% of the taps metered, was 75.4 gal., compared with 99.7 gal. in 1918 with 99.6% of the taps metered.

To provide 110 gal. per capita for 500,000 persons, or 55,000,000 gal. a day, would require 57,750,000 gal. of raw water, or a yearly total of 11,665,000,000 gal. Deducting 3,588,000,000 gal. for the total river flow that can be utilized without storage leaves 8,077,000,000 gal. to be provided by storage. The present Scioto River dam affords 1,487,000,000 gal. This would be increased to 2,244,000,000 gal. by raising the dam 6 ft., as proposed by Professor Gregory. A masonry dam 67 ft. high from the river bed to the spillway, located two miles north of Dublin, would give 5,833,000,000 gal. storage, thus making up the total storage required. Professor Gregory estimates that the old dam could be raised for $123,200; that the proposed Dublin dam would cost $1,250,700 and the Dublin reservoir, $635,000. Increasing the water-softening and filtration works by adding six 3,000,000-gal. filter units, and making associated extensions, would cost $297,000. New pumping equipment would require an outlay of $135,300, and to raise the intake dam would cost $5000. All this, with $550,000 to reinforce the distribution system, makes a total of $2,997,000.

Lowering a 400-Ton Dock Caisson Gate With Sand Jacks

Tests on Manipulation of Sand Jacks Led to Their Use in Placing Gate to Navy's Puget Sound Shipbuilding Dock

By G. W. Plaisted
Lieutenant, Corps of Civil Engineers, United States Navy, Puget Sound, Wash.

FEW records of the use of sand jacks are available. There are several instances where this type of jack has been used to lower arch forms instead of using drive wedges, and in some instances they have been used to lower bridge spans into final position. It is believed, however, that no attempt has ever been made to analyze the many advantages of sand jacks in lowering very heavy structures through comparatively great distances. It is the purpose of this article, in its primary object of describing the lowering of the 400-ton caisson gate of the new shipbuilding dock at the Puget Sound Navy Yard, first, to outline the fundamentals of the design of sand jacks; second, to prove the advantages of certain types; third, to determine within the limits of practical use the following factors: (a) The amount of settlement of sand upon application of a unit pressure for a given diameter and given height of jack; (b) The rate of flow of foundry quartz sand for a given-sized steel cylinder at a given unit pressure, the jack being equipped with four outlet holes of a given diameter; (c) The relation between the theoretical stress in the steel for a given size of jack and with a given unit load and the stress which actually occurs.

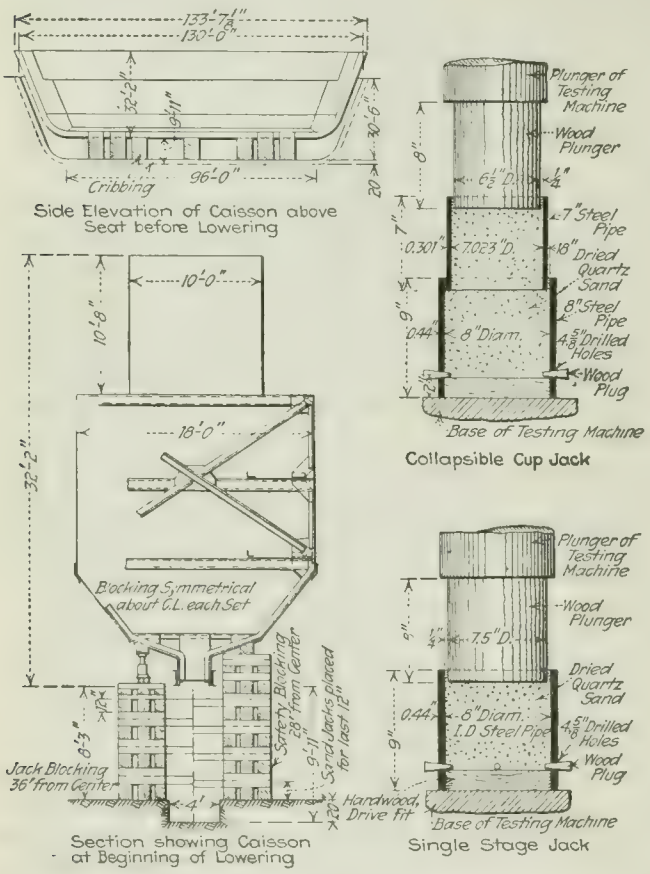


FIG. 1. 400-TON CAISSON TO BE LOWERED BY JACKS AND (ON RIGHT) DETAILS OF TEST JACKS

The general details of the caisson for dry dock No. 3, at the Puget Sound Navy Yard, when ready for lowering is shown in Fig. 1. The length of the upper deck is 133 ft. 7⅛ in.; the length of the base line 96 ft.; depth 32 ft. 2 in.; extreme width 18 ft.; total weight, ready for lowering, 400 tons.

The caisson was constructed on a series of blocking, and the base line in erection was 9 ft. 11 in. from the base line of the caisson seat. The only engineering problem in the lowering occurs from the point where the caisson is 12¾ in. from its final seat, as shown in Fig. 6. At this point it becomes necessary to use one of the following solutions:

1. To remove 12 in. of the concrete under the screw jacks, thus allowing the use of them for the final seat.
2. The use of two or more stages of drive wedges and blocking.
3. The substitution at the 12¾-in. point of short-stroke oil jacks for the screw jacks.
4. The use of some restrained material, such as sand, which can gradually be removed, thus lowering the caisson by displacement.

Each of the above possible solutions received proper consideration. The first was discarded as too expensive and as an improper and unsatisfactory engineering solution. The second depends too largely upon the personality feature in the driving of the wedges and the time element is also too great. A considerable amount of time was devoted to the consideration of the oil jack, and experiments were made with one of 50-ton capacity, with the following results:

The speed of lowering was found to be about ⅛ in. per minute, and leakage around the piston upon the application of the load was excessive. This solution was therefore discarded on account of the inconvenience of operation of the jack and the unsatisfactory speed in lowering, and also on account of the expense of construction of sixteen 50-ton jacks, in comparison with the construction of sand jacks.

The many disadvantages of the above methods and the simplicity of operation of the sand jacks brought considerable favor to that solution, which was next considered.

The original type of sand jack submitted was designed on the basis of allowance of 6.2 tons per square foot, or 86.5 lb. per square inch, pressure on the sand. The sand was to be relieved by the removal of consecutive sections of the sides from the top down.

This design was not sufficiently compact to insure proper operation, and the method of control of the sand was considered unsatisfactory. The original design of the restraining surface was made on the basis of complete transfer of equality of pressure. On this basis, an imposed pressure of 8 to 10 tons per square foot was the limit, using wood as the restraining material; above this pressure the side timbers become too unwieldy, and considerable difficulty is experienced in the design of the connections between the sides and the ends. The disadvantages of the wood sand jack were found to be (1) lack of compactness; (2) im-

proper method of control of sand, and (3) unnecessary expense of construction. These somewhat crude jacks, however, had very marked advantages over the first three methods as outlined above. These advantages were shortening of the time element, lessening of the cost element, and elimination in a large measure of the personal factor, which in such work is essential to assure proper operation.

The limit of vertical action of the sand jack is determined by the relation of the plunger to the length of the cylinder, as is evident from Fig. 6. In the lowering of this caisson two types of steel cylinder jacks were considered: First, the collapsible cup type, as shown in Fig. 1 at the top; and, second, the single-stage type jack as shown in Fig. 1 at the bottom.

A test collapsible-type jack was made up. The objects of the test were, primarily, to discover the proper

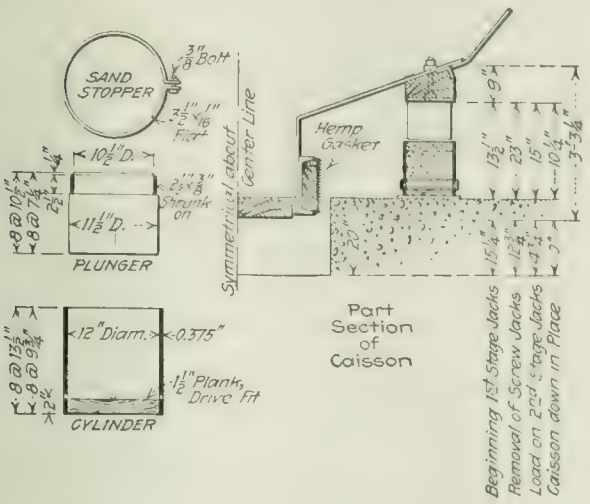


FIG. 2. DETAILS OF JACKS USED IN ACTUAL LOWERING

clearance between the plunger and the upper steel section and the clearance between the two steel sections. The general operation of the jack was satisfactory, and it was found that a clearance of $\frac{3}{16}$ in. on all sides gave satisfactory results. A slight amount of trouble was experienced in maintaining the proper relation of movement of the two parts of the cup, as compared with the plunger, and this type of jack was displaced by the single-stage jack, which eliminated one element of difficulty.

The method of operation of the single-stage jack as shown in Fig. 1, is self-explanatory. A piece of 8-in. steel pipe was selected as the restraining surface, and the details of the resulting jack were used for test purposes. Loads varying from 14.4 tons per square foot (200 lb. per square inch), to 144 tons per square foot (2000 lb. per square inch) were applied, and the following factors noted for each load: (a) Rate of flow of sand, in inches per minute; (b) compression upon application of the load, in inches.

A table showing the results of this test is given at the top of the next column.

From the data as above given the following conclusions were drawn: First, the amount of settlement of the sand upon application of the load varies from $\frac{1}{4}$ in. with a unit pressure of 14.4 tons per square foot (200 lb. per square inch) to 1 in. with a unit pressure of 144 tons per square foot (2000 lb. per square inch); second, the rate of flow of foundry quartz sand with

TABLE SHOWING COMPARATIVE COMPRESSION AND RATE OF FLOW OF FOUNDRY QUARTZ SAND FOR UNIT PRESSURES VARYING FROM 200 POUNDS PER SQUARE INCH TO 2000 POUNDS PER SQUARE INCH—RESTRAINING SURFACE EIGHT-INCH STEEL PIPE

Unit Pressure in Pounds per Square Inch	Unit Pressure in Tons per Square Foot	Total Load in Pounds	Compression of Sand in Inches on Application of Load	Theoretical Tensile Stress in Steel in Pounds per Square Inch	Rate of Lowering in Inches per Minute
200	14 4	10,100	$\frac{1}{4}$	1,820	1
400	28 8	20,200	$\frac{5}{16}$	3,640	1
600	43 2	30,300	$\frac{7}{16}$	5,460	1
700	50 4	35,400	$\frac{7}{16}$	6,370	1
800	57 6	40,400	$\frac{1}{2}$	7,280	1
900	64 8	45,600	$\frac{9}{16}$	8,190	1
1,000	72 0	50,500	$\frac{5}{8}$	9,100	1
1,200	86 4	60,600	$\frac{11}{16}$	10,920	1
1,600	115 2	80,800	$\frac{7}{8}$	14,560	1
2,000	114 0	101,000	1	18,200	1

the cylinder as above described varies from $\frac{3}{4}$ in. per minute at 200 lb. per square inch to 1 in. per minute at 2000 lb.; third, at a pressure of 2000 lb. per square inch the theoretic tension in the steel shell is 18,200 lb. per square inch, yet the sand is easily controlled by a friction plug or by the finger. The above experiment was most satisfactory. The piece of 8-in. steel pipe gave a jack, of a satisfactory compactness, of 50-ton capacity, as shown by the accompanying table, under absolute control, and at practically no expense, while the amount of settlement upon application of the load was unexpectedly small.

At this point of the investigation the question arose in regard to the absence of pressure at the outlet holes for the sand. Theoretically, there was a pressure of 2000 lb. per square inch on the sand, and yet the flow of sand from a $\frac{3}{8}$-in. hole was stopped by the finger half turned. Obviously, at the holes at least there was not a pressure of 2000 lb. per square inch. In fact, the pressure was practically negligible in amount. The conclusions drawn were as follows: First, that the pressure on the sides of the cylinder is much less than the theoretical pressure due to the friction between the various particles of sand and the consequent transferral directly to the base of the cylinder; second, pressure at the holes is practically nothing, due not only to the reduced side pressure, as above described, but to constantly forming arches.

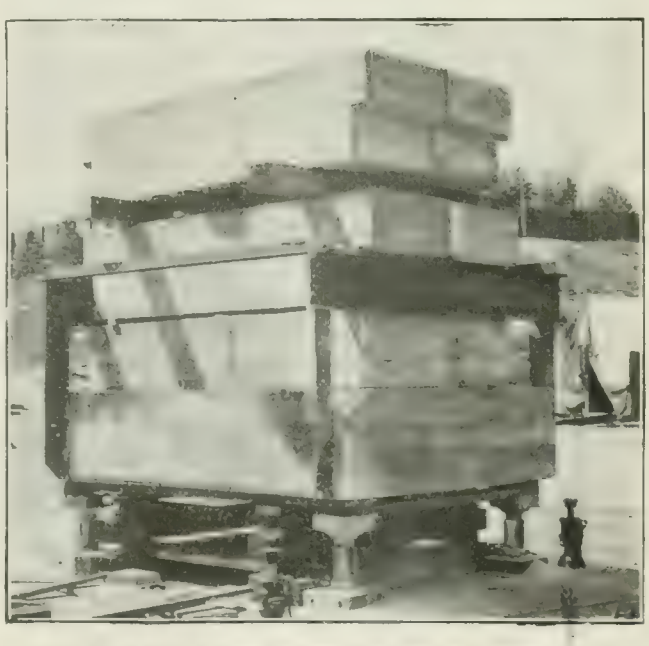


FIG. 3. SAND JACKS IN PLACE UNDER TEST LOAD

The following experiments were conducted with the major purpose of ascertaining within practical limits the ratio between the pressure as actually existing on the sides of the cylinder at a given unit pressure and the theoretical pressure, assuming the application of the hydraulic theory. A piece of annealed copper pipe, 7½-in. inside diameter, 0.095 in. thick, 8⅝ in. in height, was subjected to a total load of 95,000 lb., with the purpose of determining the ratio as above noted, and also

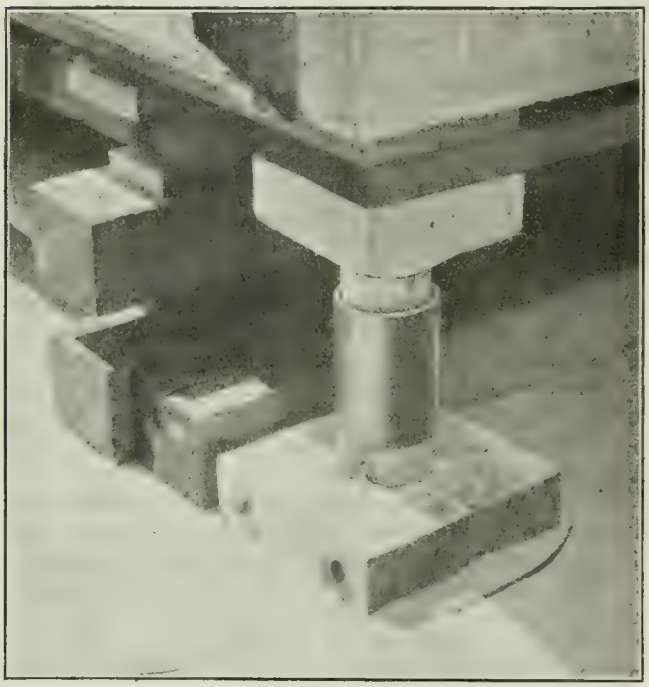


FIG. 4. CLOSE VIEW OF ONE OF THE TEST SAND JACKS

to make a study of the deformation curve of the cylinder at various pressures. Fig. 5 shows clearly the deformation curve at a total imposed load of 50,000 lb.; two inactive areas are shown, as expected, at the top and bottom, and practically uniform distribution of pressure on the sides of the cylinder. For greater loads than 50,000 lb. the cylinder assumes the general form as shown, Fig. 5, total load 70,000 lb.

The first conclusion drawn from the condition as shown was that the distribution of pressure was unequal, being considerably greater at the base. Upon removing the sand from the cylinders, however, it was noted that the inside was highly polished by sand friction, and the conclusion was drawn that the pressure was equally distributed, and that above the imposed load of 50,000 lb. the sand friction on the sides of the cylinder was sufficient to cause the jack to act as a column, giving telescopic failure as shown.

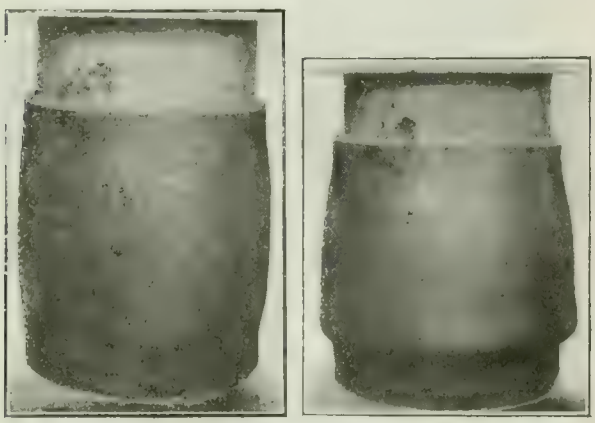


FIG. 5. DEFORMATION OF SAND-FILLED, ANNEALED COPPER PIPE, 7½ INCHES INSIDE DIAMETER; AT LEFT UNDER 50,000 POUNDS; AT RIGHT UNDER 70,000 POUNDS

A brass tube 6⅝ in. in height, 7½ in. inside diameter, 0.037 in. thick, was next tested, with lap-riveted joint. Five tests gave a total average load of 707,000 lb. necessary to disrupt the cylinders under sand pressure. As shown below, this gives a theoretic tension in the brass of 110,000 lb. per square inch. Actual tension test on five specimens gave an actual ultimate strength of 43,400 lb. per square inch. The factor, as determined by the above, is $110{,}000 \div 43{,}400 = 2.55$.

The calculations in detail are as follows:

Total force to disrupt $= 2\,S\,T\,H$

$$2\,S\,T\,H = pd\,h$$

S = Stress in tube in lb. per square inch.
T = Thickness of metal in inches.
H = Height in inches.
h = Distance in inches from bottom of plunger to top of plug.
p = Imposed vertical pressure in pounds per square inch.
d = Diameter of cylinder in inches.

Area of 7.5-in pipe = 442.2 sq.in.

$p = 70{,}000/44.2 = 1{,}590$ lb. per square inch.

$pdh = 1{,}590 \times 7.5 \times 4.5 = 53{,}700$ lb.

$2STH = 53{,}700 = 2S\ (0.037 \times 6.625)$

$$S = \frac{53{,}700}{2 \times 0.037 \times 6.625} = 110{,}000 \text{ lbs. per square inch}$$

(*theoretic*).

It is not considered practical to use the above factor in design of sand jacks. The actual capacity and design as given by the hydraulic theory is safe, and the material involved by such assumption is not extravagant. The results of the experiments conducted show that with the ordinary factor of safety of 4, in accordance with the hydraulic theory, an actual factor of 10 or thereabouts is secured.

The next question of interest in development of the method of lowering the 400-ton caisson into position was the organization of the labor force and the coördination of all elements to secure equal lowering at each corner, thus insuring the safety of the operating force. In view of the importance of satisfactory operation, it was considered essential to duplicate as nearly as possible the conditions of lowering the caisson, and actually to lower some other comparatively heavy weight with similar equipment. At this time the counterweights for the four hammerhead cranes for the new shipbuilding dock had been completed, and sufficient of them were selected to make a total imposed load of 98,280 lb. The test was conducted in the following manner: One screw jack was placed at each corner of the counterweights and one sand jack at each corner, just outside of the screw jacks, as shown in Fig. 3. No weight was superimposed on the sand jacks at the beginning of the test; the load was supported entirely by the screw jacks. The steel cylinders were filled absolutely full, and the bottom of the pistons at the beginning of the test were at the same level as the top of the steel cylinder. At this point in the test the weight was gradually placed upon the sand jacks by lowering the screw jacks. The sand showed a compression of ⅜ in. uniformly at all corners before the weight was entirely sustained by the sand

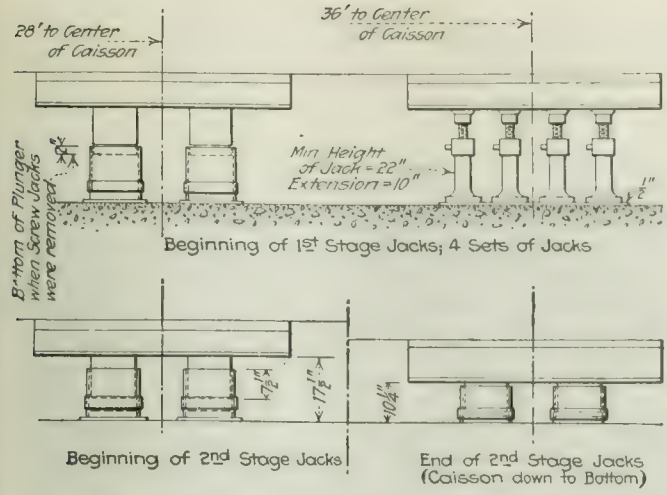


FIG. 6. DETAILS OF LAYOUT OF SAND JACKS USED TO LOWER 400-TON CAISSON

jacks, leaving the screw jacks loose. From this point the screw jacks were used simply as a safety device to follow the sand jacks in lowering. All plugs were loosened, but not withdrawn. Two men were stationed at each corner, one in control of the screw jacks and one in control of the sand jacks. The signal to pull the sand jack plugs was a single whistle; and to replace at the end of an interval of test there was given the same signal. Plugs were withdrawn and sand was allowed to flow for two minutes.

The readings at the end of this time at the four corners, were 2¼ in., 2⅜ in., 2¾ in. and 2⅜ in. The discrepancy at the corner reading 2¾ in. was caused by a slight sticking of the screw jack on the opposite corner, which did not allow the sand jack to settle into position in accordance with the flow which had taken place. The ease of leveling up sand jacks under conditions as just cited was shown when the screw jack on the corner which had gone down too far was elevated sufficiently to take the weight at that point, while the men at the other three corners were notified to plug in until a reading of 2⅞ in. was obtained. This was done, and the apparatus was again in equilibrium for a second test run. The time consumed in the lowering of the counterweights 2 in. was exactly two minutes.

The third stage of the test was conducted with the object of running all jacks to a reading of 8 in. The first corner reached 8 in. four minutes after the start, having traveled in this period of the test 5¼ in. An average rate of flow, or rate of lowering of the counterweights throughout this period, as well as throughout the first part of the test, was 1 in. per minute. The results of the above experiment substantiated in general previous experiments made on the testing machine, and the actual practical operation of sand jacks was pronounced successful. The use of the single-stage steel-cylinder sand jack was finally adopted as the proper method of lowering the caisson to final seat.

Fig. 1 shows the method of lowering by screw jacks and auxiliary blocking to the level of the first-stage sand-jack operation. This period of lowering the caisson passed without event. A level was mounted on the platform of an adjacent piledriver, just east of the caisson, and throughout the lowering the readings were taken to maintain the same elevation on the four corners.

The caisson seat was extended by a temporary timber structure, so that no movement of the caisson laterally during lowering was possible. There was a sufficient leakage through the cofferdam to cause overflow of the caisson seat, thus endangering wetting of the sand in the sand jacks. To prevent this possibility, galvanized-iron pans, as shown in Fig. 7, were employed, and satisfactory operation under the existing conditions was assured. The operation of the jacks was in general exactly as was expected. The penetration upon application of total load on the sand jacks was about ¾ in. and the speed of lowering was about ¾ in. per minute. The method in general proved inexpensive, simple of operation and absolutely safe.

From the tests conducted, and from the experience

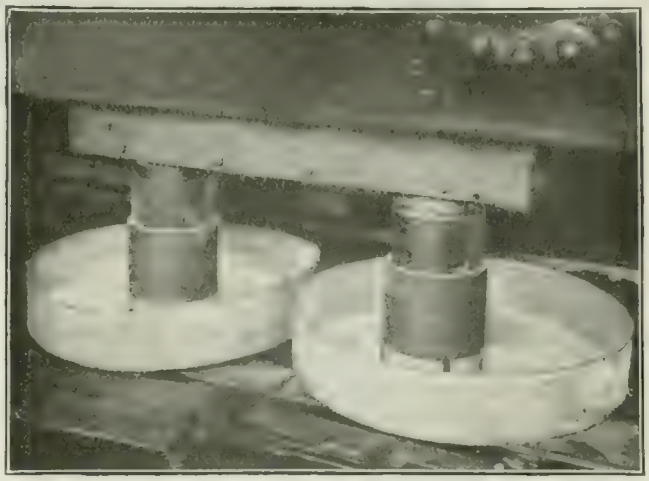


FIG. 7. SAND JACKS IN POSITION BENEATH CAISSON

of actual lowering of the 400-ton caisson, the following conclusions were drawn:

1. Sand jacks are applicable not only under conditions similar to those in lowering the caisson as above outlined but in lowering all heavy weights.

2. They are absolutely dependable and simple of operation.

3. Their speed of operation is greater than the ordinary beveled-gear jack.

4. Their cost is negligible.

5. In all cases where the operation of lowering the object in question is similar to that above described, allow 1 in. for safety for settlement upon application of load up to 200 lb. per square inch and 2 in. additional to follow sand jacks with screw jacks before the removal of screw jacks.

6. The following table is recommended for practical use to ascertain the relation between the size of outlet hole and the size of the cylinder for a pressure of 1000 lb. per square inch, and for a speed of lowering of 1 in. per minute, as well as the capacities of various sizes of jacks:

Size of S S W. I Steam, In.	Diameter of Outlet Holes, In.	Capacity of Jack at 1000-Lb Pressure, Ton	Theoretic Stress in Steel, Lb. Sq In
6	½	15	10,700
8	⅝	25	12,400
10	1½	40	13,600
12	1¾	58	16,000

The investigations in connection with the final development of the sand jacks used in the lowering of the caisson were conducted under the direct and personal supervision of the author, at the original suggestion of Capt. L. E. Gregory, Corps of Civil Engineers, United States Navy, public works officer, who was in general



FIG. 8. DRY-DOCK CAISSON AS IT WAS LOWERED INTO PLACE

charge of this work, in connection with the construction of the shipbuilding dock. The author wishes to thank Commander Whitford Drake, Corps of Civil Engineers, United States Navy, for several valuable suggestions, as well as H. A. Sylvester and V. E. Hulteen, who assisted personally.

Transitory Protection Measures Asked By French Railroads

BECAUSE they feel unable to return to normal running conditions prevalent in times of peace without first recruiting a full operating staff, reconstituting their material and rolling stock, and adapting themselves to the new difficulties which have recently arisen, the French railroads are asking the Minister of Public Works that a certain number of measures in force during the control of railroad lines by the Government be retained when the transition from Federal to private control takes place upon a Presidential decree that a state of war has ceased to exist.

The railroad administrations are not claiming a prompt return to entire liberty of action, says a report from Consul General Thackara, in Paris, but they ask for the maintenance of a certain number of regulations at present in force and particularly those respecting priority of transportation for certain essential products. They also ask that the regulations governing delivery of goods be modified to a certain degree.

In accordance with these requests, the Minister of Public Works has prepared a decree making various modifications in the regulations for the working of French railroads between the date of cessation of hostilities and Dec. 31, 1920. The decree was signed by the President of France, Oct. 15, 1919. The following are some of the more important provisions of this decree:

The principal railroads must give priority in the following cases: (a) To the transportation of goods destined for the reconstitution of the liberated regions, along the lines of the program laid down by the Ministry for the Liberated Regions; (b) to slow freight in carload lots along the lines recommended by the Ministeries of Revictualing and Industrial Reconstitution in regard to the supply of fuel and revictualing of the whole country.

A provisional committee will be formed to decide upon the necessary measures to insure the proper compliance with these provisions and the satisfactory working of the great railroad systems. Its decisions are final and obligatory for all the systems.

Another committee will be appointed to deal with questions relating to railroad supplies and rolling stock, and to coördinate the action of the railroads in respect to such matters.

This latter committee will include among its members three manufacturers of railroad material designed by the Ministry of Public Works. Its decisions are final, with the exception of measures relating to closing stations, suppression of trains, or limiting shipments. In such cases its decisions are subject to revision by the ministry.

Hydro-electric Work in Ontario

In addition to the huge Queenston-Chippawa power project which will develop 350,000 to 400,000 hp. at Niagara, the Hydro-electric Power Commission of Ontario has several other projects under way. The largest of these is the Nipigon River project, at a point about 60 miles northeast of Port Arthur, where 72,500 hp. are being developed. Six 12,500-hp. units will eventually be installed. At High Falls, on the Mississippi River (which is not "the Father of Waters," but a small stream in eastern Ontario) there are being developed 3000 hp. in three equal units, and near Owen Sound, on the Eugenia Falls plant, an extension of one 4000-hp. unit is being made to the two 4000-hp. units already installed. This is the highest-head turbine in Canada, with a head of 550 ft. The chief engineer of the commission is F. A. Gaby of Toronto.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Teaching Engineering English by Example

ENGINEERING EDUCATION: Essays for English Selected and Edited by Ray Palmer Baker, M.A., Ph.D., Professor of English in the Rensselaer Polytechnic Institute. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 5 x 8 in.; pp. 185.

Three features, "largely original," are claimed by the author for this volume of selections for use in elementary courses in exposition for engineering students: (1) Character; (2) authoritativeness and (3) arrangement of the selections. The essays and addresses are recent and are calculated to appeal to the student. They are all written by technical men. They are so arranged as to "present an ideal of engineering education which cannot be found elsewhere." The selections fall in three groups, having to do with the origins, the types and the bases of engineering education. Under origins we have Simon Newcomb on the "Evolution of the Scientific Investigator" and J. J. Thomson on "The Relation of Pure Science to Engineering." Under types, J. B. Johnson's "Two Kinds of Education for Engineers" and Howard McClenahan's "The Classical-Scientific vs. the Purely Technical Engineering Course" are presented. Under bases there are five pairs of essays dealing with language, mathematics, physics, chemistry and imagination. Of these specific mention may be made of "The Value of English to the Technical Man," by John Lyle Harrington; "The Value of Classics in Engineering Education," by Charles Proteus Steinmetz (see *Engineering Record* of Aug. 9, 1913, p. 158); and "The Imaginative Faculty in Engineering," by Isham Randolph. Most, if not all, of the selections have been abridged by the editor. Each is not only well chosen for its primary purpose of use in engineering schools but might also be read, or read anew, by engineers in practice.

Use of Southern Yellow Pine

SOUTHERN YELLOW PINE: A Manual of Standard Wood Construction.—New Orleans, La.: Southern Yellow Pine Association. Cloth; 5 x 7 in.; pp. 136; illustrated.

While there is no substantial difference between this and the preceding (sixth) edition of "Standard Wood Construction," it may be pointed out that the book is a compilation of tables analogous to those of the rolling-mill handbooks and should prove just as necessary to the designer in wood as do the latter to the designer in steel. Nominally, the tables and information apply only to yellow pine, but as the beam tables, which make up a large part of the whole, are figured for various fiber stresses from 1200 to 1800 lb. per square inch, the book should be adaptable to most structural woods.

Against Socialism

SOCIALISM AND AMERICAN IDEALS—By William Starr Myers, Ph.D., Professor of Politics, Princeton University. Princeton, N. J.: Princeton University Press. London: Humphrey Milford, Oxford University Press. Cloth; 5 x 8 in.; pp. 89.

Un-American, undemocratic and in conflict with the tenets of both the Christian and Jewish religions, is Professor Myers' opinion of Socialism. He defines Socialism as "collective ownership (exerted through the government or society as politically organized) of the means of production of all forms of wealth." Otherwise stated, "Socialism means the substitution of governmental judgment for that of the individual and for individual ambition as well." The book is a reprinting of articles contributed at intervals to the New York *Journal of Commerce and Commercial Bulletin*. Although other writers have made a more coherent and forcible case against Socialism, Professor Myers' little book will doubtless be welcomed by many as a more recent statement of the subject.

Astronomy for Surveyors

THE ELEMENTS OF ASTRONOMY FOR SURVEYORS—By R. W. Chapman, M.A., B.C.E., F.R.A.S., Professor of Mathematics and Mechanics in the University of Adelaide. London: Charles Griffin & Co., Ltd. Philadelphia, Pa.: J. B. Lippincott Co. Cloth; 5 x 8 in.; pp. 247; illustrated.

REVIEWED BY HECTOR JAMES HUGHES

Professor of Civil Engineering, the Harvard Engineering School of Harvard University, Cambridge, Mass.

Astronomy to the extent ordinarily assumed to be prescribed for students of engineering is covered in this book; and it has been treated from the standpoint of the engineer. Actually, its scope extends somewhat beyond the subject matter contained in the chapters on astronomy usually given in textbooks on surveying, and falls somewhat short of the treatment given in books on geodesy or higher surveying. Such astronomical observations as can be made by the use of surveying instruments are treated concisely and clearly; and the methods of making the necessary reductions are explained in every case with worked-out problems for the purpose of illustration or guidance. The degree of precision that should be attained in the observation, and is to be expected from the resulting computations, is indicated definitely and simply.

The author, like many other teachers and some students, evidently objects to the prevailing rule-of-thumb methods commonly used in teaching this subject, and believes that students should understand what they are doing. Usually it is difficult to insure this without too much elaboration, but the reviewer, looking at the book from the standpoint of an engineer who does not know much about astronomy, is of the opinion that the author has succeeded in making the fundamental astronomical phenomena unusually clear.

There is no royal road to the understanding of astronomy, and in an engineering school one of two methods must be followed. Either the subject must be treated with the utmost brevity and by the use of computation forms, with the expectation that only a few students will understand the work, or else a fairly comprehensive treatment of astronomy must be given. The former method is usually followed, chiefly because there is not time for more; and for the majority of engineers such procedure serves the necessary purpose. In many instances, however, students who have had only the minimum amount of instruction in the subject frequently have, in practice, to make astronomical observations of a simple character, and are not satisfied

to proceed without understanding the processes. For such men, and for schools that can give sufficient time to the subject, the book will well serve a useful purpose. It is a simple, straightforward, excellent, brief text on exactly what it claims to be, namely, a course in astronomy for surveyors, and the reviewer thinks it is worthy the consideration of those who have need for such a book.

For Automobile Owners and Drivers

THE GASOLINE AUTOMOBILE: Prepared in the Extension Division of the University of Wisconsin by George W. Hobbs, B.S., and Ben G. Elliott, M.E. Second Edition, Completely Revised and Rewritten by Ben G. Elliott, M.E., Assistant Professor of Mechanical Engineering, The University of Wisconsin, and Earl L. Consoliver, M.E., Assistant Professor of Mechanical Engineering, The University of Wisconsin. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 483; illustrated.

Based largely on a series of lectures given in 23 cities of Wisconsin in the winter of 1914-15, this book was first published in 1915 as a volume of 10 chapters (reviewed in *Engineering News* of Feb. 17, 1916, p. 322). The volume is now nearly double the size of the first edition. It contains entirely new chapters on "Principles of Electricity and Magnetism," "The Automobile Storage Battery," and "Wheels, Rims and Tires," and in addition, portions of the chapters in the original editions have been expanded into separate chapters. The book has been rewritten. The 544 carefully selected and presented illustrations add materially to the clearness of the presentation of the subject.

"Hydraulics" by Daugherty, Second Edition

HYDRAULICS—By R. L. Daugherty, A. B., M. E., Professor of Hydraulic Engineering, Rensselaer Polytechnic Institute, Etc. Second Edition, Revised and Enlarged. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 267; illustrated.

New material in this edition "consists principally of graphical methods of solving certain practical problems, the determination of the economic size of pipe, and problems of flow through compound pipes, branching pipes, pipes with laterals, and through rotating channels." Extensions have been made elsewhere and some portions have been rewritten "for greater effectiveness." The first edition was favorably noticed by Robert E. Horton in *Engineering News* of July 20, 1916, and by A. G. Hillberg in *Engineering Record* of July 22, 1916. Mr. Horton characterized the volume as "primarily a textbook for use in engineering schools where the time that may be devoted to hydraulics proper, aside from its applications, is rather limited."

Report on the Chinese Railways

STATISTICS OF GOVERNMENT RAILWAYS IN CHINA, 1917—Report to the Ministry of Communication, Department of Railways. Peking, China: The Minister. Paper; 9 x 13 in.; pp. 133; illustrated.

This report for the calendar year 1917 covers only the Government railways, including 14 separate lines. These, with branches and some private lines, make 4350 miles under control of the Ministry of Communications. while other lines operated under concessions bring the grand total of railways in China to 6740 miles. Operating methods, conditions and results are dealt with in 74 pages, the balance of the report consisting of statistical tables and diagrams.

The accounts of the Government lines are based upon a uniform classification which became effective in January, 1915, and follows the general principles of accounting adopted in other countries. Metric and British systems of weights and measures are used by different lines, but all distances are converted into kilometers. The two ton weights, however, are so nearly alike that no conversion has been thought necessary for such general figures as are given in the report. The terminology is English rather than American.

It is pointed out that China's extensive waterways will always serve to keep low the railway mileage per unit of area and population, but that, on the other hand, railways tend to become more and more an integral part of the industrial machinery of the nation. The equipment is relatively small, comprising only 648 locomotives, 1315 passenger cars and 10.659 freight cars, but many freight cars are uesd also for passenger service. Operating expenses represent nearly 90% of operating revenues.

Garden Cities and Back to the Land

NEW TOWNS AFTER THE WAR: An Argument for Garden Cities—By New Townsmen. London, Eng.: J. M. Dent & Sons, Ltd. Paper; 5 x 7 in.; pp. 84.

Assuming that England needs a million houses at once and a hundred thousand yearly, that both urban and rural districts share in the need, that a new sort of town, better suited to industry and home life, is needed, and that encouragement should be given to agriculture, the authors propose the creation of a large number of garden cities. Towns of 30,000 to 50,000, surrounded by belts of open land reserved for farming, are advocated. Some of the arguments in support of garden cities are perhaps as applicable to America as to England, but, badly as we need better housing facilities here, the need is nothing like as acute as it is in England.

New Publication on Labor Conditions

A new weekly publication, beginning with the issue of Oct. 18, 1919, has been issued by Bloomfield's Labor Digest, 6 Beacon St., Boston, Mass., under the title, *Industrial Relations*. It contains reports of current labor events in the United States and other countries, including a review of labor activities, industrial relations, wage and hour movements, a summary of the contents of the radical press and the trade union press, foreign labor news, and charts analyzing plans and methods in operation for promoting industrial relations. The new publication is issued as a "service" and not as a regular periodical. It is furnished in letter size in convenient form for loose-leaf binding.

Press Bulletin Service on Public Health

A press bulletin service, to supply weekly news stories and articles of information on public health, hygiene and sanitation, has been established by the department of hygiene and public health of the University of Illinois, Urbana. It is expected that the material will be used by the newspapers of Illinois in a health advice column.

Budget Promotion

A four-page publication entitled *The National Budget* is being issued at Washington, D. C., by the National Budget Committee. The New York offices of the committee are at 109 Liberty Street.

PUBLICATIONS RECEIVED

Under a Postoffice Department ruling made applicable to *Engineering News-Record* in July, 1919, it is no longer possible to give the prices of new publications announced under this head or of books reviewed in the preceding columns. Readers will therefore have to obtain this information as best they can. Most of the public documents and of the pamphlets announced may be obtained free on application, or at least by paying postage. So far as possible, the name and address of the publisher of each book and pamphlet are given in each entry.

AMERICAN SOCIETY FOR TESTING MATERIALS: Standards and Tentative Standards, 1919—Philadelphia, Penn.: The Society. Paper, 6 x 9 in.; pp. 63; illustrated.

APPRAISALS AND RATEMAKING—By Cecil F. Elmes, of the Sanderson & Porter Engineering Staff. New York, Chicago, San Francisco: Sanderson & Porter. Paper; 8 x 11 in.; pp. 25; illustrated.

CHEMICAL AND BACTERIOLOGICAL EXAMINATION OF the London Waters: Report for 1918-19—By Sir Alexander Houston, Director of Water Examination, Metropolitan Water Board. London, Eng.: The Board. Paper; 8 x 13 in.; pp. 30; illustrated.

COAL IN 1917: PART A, PRODUCTION—By C. E. Lesher. Washington, D. C.: U. S. Geological Survey. Paper; 6 x 9 in.; pp. 146; illustrated.

COKE AND BY-PRODUCTS IN 1916 AND 1917—By C. E. Lesher and W. T. Thom, Jr. Washington, D. C.: U. S. Geological Survey. Paper; 6 x 9 in.; pp. 64; illustrated.

COST KEEPING AND CONSTRUCTION ACCOUNTING: Adapted to any Work Consisting of Numerous Items, Department or Divisions on which Detailed Unit Costs are Desired—By G. Ed. Ross, Associate Member, Northwest Society Highway Engineers. Second Edition. Salem, Ore.: The Ross System Co. Cloth; 5 x 8 in.; pp. 171; illustrated.

DEVELOPMENT OF IRON ORE INTO IRON AND STEEL—By S. C. Dickerhoff, Jr. Bethlehem, Penn.: The Author. Chart; 22 x 13 in.

ELECTROLYSIS IN CONCRETE—By E. B. Rosa, Chief Physicist; Burton McCollum, Associate Physicist; and O. S. Peters, Assistant Physicist, Bureau of Standards. Technologic Papers of the Bureau of Standards, No. 18. Washington, D. C.: The Bureau. Paper; 7 x 10 in.; pp. 142; illustrated. 35c. from Superintendent of Documents.

THE ENGINEER SCHOOL AT CAMP HUMPHREYS: A Report on Methods of Teaching Engineering—Washington, D. C.: War Department Committee on Education and Special Training. Paper; 6 x 9 in.; pp. 76.

ENGINEERING PROBLEMS OF REGIONAL PLANNING—By Morris Knowles, Chief Engineer, Housing Department, Emergency Fleet Corporation, United States Shipping Board. Pittsburgh, Penn.: The Author. Paper; 6 x 9 in.; pp. 24.

FINAL REPORT OF THE INTERNATIONAL JOINT COMMISsion on the Lake of the Woods Reference. Washington, D. C.: The Commission. Cloth; 7 x 10 in.; pp. 261; illustrated.

FINANCIAL STATISTICS OF STATES, 1918. Washington, D. C.: Bureau of the Census. Cloth; 9 x 12 in.; pp. 123.

GROUND WATER IN THE SAN JACINTO AND TEMECULA Basins, California—By Gerald A. Waring. Prepared in Coöperation with the Department of Engineering of the State of California. Washington, D. C.: U. S. Geological Survey. Paper; 6 x 9 in.; pp. 113; illustrated. 40c. from Superintendent of Documents.

THE HEALTH OFFICER—By Frank Overton, A. M., M. D., D. P. H., Sanitary Supervisor, New York State Department of Health, and Willard J. Denno, A. B., M. D., D. P. H., Medical Director of the Standard Oil Co., formerly Secretary, New York State Department of Health. Philadelphia and London: W. B. Saunders Co. Cloth; 6 x 9 in.; pp. 512; illustrated.

HUMAN RELATIONS IN INDUSTRY: A Clarification of the Principles and Factors Involved. Chicago, Ill. L. V. Estes, Inc. Paper; 4 x 7 in.; pp. 15; illustrated.

HYDROLOGY: The Fundamental Basis of Hydraulic Engineering—By Daniel W. Mead, M. Am. Soc. C. E., Consulting Engineer, Professor of Hydraulic and Sanitary Engineering, University of Wisconsin. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 647; illustrated.

IRON-DEPOSITING BACTERIA AND THEIR GEOLOGIC RElations—By Edmund Cecil Harder. Washington, D. C.: U. S. Geological Survey. Paper; 9 x 11 in.; pp. 89; illustrated. 25c. from Superintendent of Documents.

Crenothrix and some other bacteria of interest to the water and sewage specialist are considered in this paper, but with no direct, practical conclusions. The studies were made largely in the bacteriological laboratory of the Agricultural Experiment Station, University of Wisconsin, Madison.

MANUAL OF INSTRUCTIONS TO DEPARTMENT EMPLOYEES: Oregon State Highway Department, 1919—By Herbert Nunn, State Highway Engineer. Salem, Ore.: The Department. Paper; 5 x 7 in.; pp. 107.

Instructions given in nearly every phase of the highway employee's, work, including general reports, attention to state equipment, auditing claims, preparation of payrolls and expense accounts; cost keeping, survey methods, mapping and general construction work. Interesting to supervising highway engineers as a guide in preparing similar instructions.

LES METHODES MODERNES DE LA RESISTANCE DES Materaux -By Bertrand de Fontviolant Professeur a l'Ecole Central des Arts et Manufactures. Paris, France: Gauthier-Villars et Cie. Paper; 7 x 10 in.; pp. 82.

MINERAL RESOURCES OF THE UNITED STATES: Preliminary Report, 1918; Introduction by Edson S. Bastin; Statistics Assembled by Martha B. Clark from Data Furnished by Specialists of the Division of Mineral Resources. Washington, D. C.: U. S. Geological Survey. Paper; 6 x 9 in.; pp. 106.

NATURAL GAS AND NATURAL-GAS GASOLINE IN 1917—By John D. Northrop. Washington, D. C.; U. S. Geological Survey. Paper; 6 x 9 in.; pp. 85; illustrated.

THE NEW SEWAGE-TREATMENT PLANT AT MONTEZUMA, Iowa—By J. H. Dunlap, Associate Professor of Hydraulics and Sanitary Engineering, College of Applied Science, State University of Iowa, Iowa City: The Author. Paper; 6 x 9 in.; pp. 19; illustrated.

Description of an Imhoff tank, a siphon chamber, a sand filter and sludge beds for a future estimated population of 2,000. Conditions determining amount of bonds legally permitted are reviewed, and unit cost data are given.

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMways: Report of the Railway Commissioners for the Year Ended June 30, 1919. Sidney, N. S. W.: The Railway Commissioners. Paper; 8 x 13 in.; pp. 92; illustrated.

That this report was issued within about two months after the close of the period which it covers is commendable. It records progress and conditions as well as statistics. Freight rates were increased about 27½% in November, 1918, owing to the rise in wages and cost of materials.

OIL PIPE LINES OF THE YARHOLA PIPE LINE CO.: Oklahoma Oil Fields to East St. Louis, Ill. New York: Sanderson & Porter. Paper; 8 x 11 in.; pp. 17; illustrated.

Describes construction of a long pipe line, and outlines Diesel engine pumping equipment.

THE OKLAHOMA PUBLIC-HEALTH SURVEYS: Oklahoma City—By Murray P. Horowitz, M. S., Department of Biology & Public Health, Massachusetts Institute of Technology; Jules Shevitz, B. S., General Secretary, Oklahoma Tuberculosis Association. Oklahoma City, Okla.: The Association. Paper; 6 x 9 in.; pp. 155; illustrated.

A comprehensive survey, including water-supply, sewerage, and garbage and refuse disposal. The field work was done in June, 1918.

OREGON STATE HIGHWAY DEPARTMENT: Important Statutes Compiled in April, 1919. Salem, Ore.: The Department. Paper; 6 x 9 in.; pp. 80.

PRECAUTIONS AGAINST FREEZING OF FIRE-EXTINGUISHing Appliances. Boston, Mass:. National Fire Protection Association. Paper; 8 x 11 in.; pp. 3.

PRICES OF IRON, STEEL, AND THEIR PRODUCTS—By Walter W. Stewart. Washington, D. C.: War Industries Board. Paper; 6 x 9 in.; pp. 46; illustrated.

PROBLEMS IN PHYSICS: Derived from Military Situations and Experience. Washington, D. C.: War Department, Committee on Education and Special Training. Paper; 6 x 9 in.; pp. 154; illustrated.

REPORT ON HOUSING: Including Act, Rules and Regulations, Housing Standards, Provisions to be Considered, and Forms. Toronto, Can.: Bureau of Municipal Affairs. Paper; 6 x 9 in.; pp. 134.

ROAD-MATERIAL SURVEYS IN THE CITY AND DISTRICT of Montreal, Que.—By Henry Gauthier. Ottawa, Can.: Geological Survey. Paper; 7 x 10 in.; pp. 52; illustrated.

SCIENCE REPORTS OF THE TOHOKU IMPERIAL UNIVERsity, Vol. VIII, No. 2. Contents: On the Analytic Function of z-x-yi, Whose Modulus is a Rational Integral Function of x and y; On Characteristic Properties of the Conic and Quadric; On the influence of Manganese on the Physical Properties of Carbon Steels; On Some Physical Constants of Tungsten Steels; On the Variation of the Specific Heat During Melting and the Heat of Fusion of Some Metals. Tokyo, Japan: Maruzen Co., Ltd. Paper; 7 x 10 in.; pp. 52; illustrated.

STORAGE BATTERIES FOR TRUCKS: A Job-Sheet Manual. Washington, D. C.: War Department Committee on Education and Special Training. Paper; 6 x 9 in.; pp. 82.

SURFACE WATER SUPPLY OF HAWAII, 1918—By Nathan C. Grover, Chief Hydraulic Engineer, and C. T. Bailey, Acting District Engineer. Prepared in Coöperation with the Territory of Hawaii. Washington, D. C.: U. S. Geological Survey. Paper; 6 x 9 in.; pp. 172. 15c. from Superintendent of Documents.

SURVEYING: With Sections on Map Reading, Military Sketching and Topographic Drawing. Washington, D. C.: War Department Committee on Education and Special Training. Paper; 8 x 11 in.; illustrated.

TECHNICAL BOOKS OF 1918: Compiled by Donald Hendry, Head of the Applied Science Reference Department, Pratt Institute Free Library, Brooklyn, N. Y.: The Institute. Paper; 5 x 7 in.; pp. 28

TECHNO-CHEMICAL RECEIPT BOOK: Containing Several Thousand Receipts and Processes, Covering the Latest, Most Important and Most Useful Discoveries in Chemical Technology and Their Practical Application in the Arts and the Industries—Compiled and Edited by William T. Brannt, Author of "Metallic Alloys," Etc., and William H. Wahl, Ph. D., Author of "Galvanoplastic Manipulations." Philadelphia: Henry Carey Baird & Co., Inc. Cloth; 5 x 7 in.; pp. 516; illustrated.

TRAINING COURSES IN SAFETY AND HYGIENE IN THE Building Trades: Issued by the Federal Board for Vocational Education. Trade and Industrial Series No. 6. Washington, D. C.: The Board. Paper, 6 x 9 in.; pp. 127; illustrated

USE AND WASTE OF IRRIGATION WATER—By G. E. P. Smith. Tucson, Ariz: Agricultural Experiment Station. Paper; 6 x 9 in.; pp. 16, illustrated

THE WEATHER AND DAILY STREAM FLOW FOR HYDROElectric Plants—By Cecil Alter. Reprinted from *Monthly Weather Review*, May, 1919. Washington, D. C., Weather Bureau. Paper; 9 x 12 in.; pp. 3

ZONING AND CITY PLANNING FOR PORTLAND, OREGON —By Charles H. Cheney, Consultant, City Planning Commission, Portland, Ore. The Commission. Paper; 6 x 9 in.; pp. 65; illustrated

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

Local Council Idea Spreads on Pacific Coast

In each of six centers of engineering society activity on the Pacific Coast—namely, Vancouver, Seattle, Spokane, Portland, San Francisco and Los Angeles—some form of an engineering council to coördinate local society activities has been formed or is in process of formation. No two have the same plan of organization—in fact, the point of view is often radically different—but all have the common purpose of broader and more effective service to the profession.

The Vancouver plan is to use the executive committee of the British Columbia Technical Association as a clearing house for matters of general interest to local engineers. This is made possible by making the committee large and having each technical society represented on it by one or more members. Membership in the association is open to technical men of all classes, and does, in fact, include a very large majority of all engineers in the vicinity.

Seattle has long had its Associated Engineering Societies which has done what it could to keep the many organizations pulling together. In that city the multiplicity of technical societies has made it hard to get best results in concerted moves. Within the past two years, however, an engineers' club, where technical men of all branches could lunch together, has done much to develop common ground.

Spokane has a remarkably successful plan for getting action on matters of general importance to engineers. It centers in the organization known as the Associated Engineers, and the real secret of its success is that capable, energetic men have taken an active interest in it. As an example of their work, it may be said that when to the newly formed office of county highway engineer was about to be allotted a salary of $200 per month, the association engineers presented such convincing arguments for a higher salary that $5400 per year was finally allotted.

In Portland there are only sections of national societies to be reckoned with, and organization of the proposed joint council should have been easy. It was unfortunately delayed, however, by a split over the question of including representatives of local organizations affiliated with the American Federation of Labor. Individual engineering societies of Portland have shown their mettle of late, as witness the following: Through society committees, the collection of funds throughout the state for promotion of the national Department of Public Works has been organized very thoroughly. The workers do not confine themselves to the profession, but appear before clubs and luncheon gatherings wherever opportunity offers. When a society passes resolutions indorsing a move a live publicity committee gets notices in the daily papers and then sends clippings to the Congressmen representing Oregon. Two Portland societies vigorously waged a campaign against a proposed city bridge contract recently, and on another occasion the demand of union delegates that the label be put on blueprnts was refused most emphatically and with a clear statement of the reasons therefor.

In San Francisco five sections of national societies and one local are represented in a joint council. This organization found so much to do of state-wide, rather than local importance, that it proposed to the societies of the state that a state council be formed. This met with general and hearty approval; delegates have been appointed and the first meeting of the state council will be held soon. This state-wide plan was discussed in *Engineering News-Record* of Aug. 7, 1919, p. 284.

In Los Angeles the coördination of society activity is effectively accomplished through the Joint Committee, on which are represented seven Los Angeles organizations, all of which are sections of national societies.

Engineering Societies' Paramount Problem

No engineer disputes the present need for unity—the vital necessity of a united political front. No thinking man will deny the engineer his right to the benefits to be derived from such unity. No public man would do other than welcome a united profession that could work out, for him, his economic and civic problems. This is the viewpoint of C. M. Lightburn, past president of the Colorado Society of Engineers, and his conclusion is that the modern society's purpose is one of unity and service not merely for the benefit of members of the organization, but for that of the community of which it forms a part—a bringing together again of that which has been rent asunder by specialization, for the solution of the great problem of reconstruction.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

What Will Engineers Pay To Improve Their Status?

Sir—I was very much interested, and somewhat amused, by the letter of R. B. Shepherd, Jr., valuation engineer, Atlantic Coast Line R. R., which appeared in your issue of Oct. 16, and in which that gentleman passed a few remarks upon the weighty subject of "What Will Engineers Pay To Improve Their Status?" I was interested because I had supposed that the attitude of mind exemplified by Mr. Shepherd was rapidly becoming extinct, and I was amused by the puerility of his remarks.

Mr. Shepherd says:

> Personally, I feel that the engineering societies should confine their *conscious* [sic] efforts to the advancement of engineering knowledge and good practice and to the establishment and maintenance of a high moral and ethical status for the engineering profession. The improvement in status to which your editorial is addressed should result from the spontaneous and voluntary recognition of the beneficial activities of the engineers and of work well done.

Viewed as a detached ethical statement, this is fine; but as a practical proposition it is rank nonsense. I am not in the habit of indulging in games of chance, but I am willing to bet a hundred dollars to a lead

nickel that the extent of Mr. Shepherd's recognition of "work well done," so far as his subordinates are concerned, has been confined to praise, which costs nothing, and that any effort on their part to bring back to parity the fifty-cent dollars with which they are paid would be looked upon by him with horror, as savoring of "labor-union methods." I say this because I know the breed.

It is all very well for engineers, who, during their years of youth and upward struggling, lived in an age when a dollar was worth one hundred cents, to point to the time when they sold their valuable services for two, three and four dollars a day, but they show decided lack of vision, and a most regrettable narrowness of mind, when they fail to coördinate that fact with the present-day conditions of high prices and high wages for all forms of manual labor. They show a further lack of grasp of fundamental principles when they assume that the public, which really knows very little of the functions of the engineer, and his relation to society, will show any respect, let alone accord any recognition, to a profession, the members of which have not enough sense to earn for themselves as high a wage as the unlettered artisan.

If Mr. Shepherd, and others of his kind, expect to advance the status of engineers by confining their activities to the discharge of their duties, and the reading of abstruse and learned papers within the cloisters of their professional societies, they are further showing an ignorance of facts, because the national engineering societies have never, to this day, secured anything like adequate recognition of the value of the services of the engineering profession to the public.

The majority of engineers, of high and low status, are unalterably opposed to affiliation with labor unions, or the employment of labor-union methods in obtaining for themselves adequate compensation for their services. Unfortunately, however, they must live if the engineering profession is to continue to exist, for the youth of the land will not continue to fill the engineering colleges if the career that is thus opened to them does not promise a wage—in its earlier years, at least—exceeding that of the unskilled laborer, and a promise that, if they attain at least a moderate proficiency, they will earn a compensation large enough to enable them to live among their fellow men upon a plane equal to that of others who are doing work requiring similar intellectual capacity. That is the condition which confronts us today, and that is the reason why many engineers in the lower ranks of the profession have become desperate enough to ally themselves with labor-union organizations, and to use labor-union methods to put their pay upon a basis at least comparable with that of the skilled mechanic.

The national engineering societies have at last awakened to the fact that the public is not going to give the engineer his just due unless he goes after it, and Engineering Council is an evidence of that awakening. Engineering Council, however, is not a democratic body, and does not and cannot, as now constituted, represent the vast majority of engineers. The national societies were instituted primarily for professional and technical work. Their standards of membership, admirable for such work, do not represent the rank and file of the profession, and it is the rank and file which constitutes the majority of the profession. Furthermore, it is from the rank and file that the future leaders must come. If there were today no choice between the aid of Engineering Council and that of organized labor, it is probable that a majority of engineers would swallow their pride and affiliate with the latter, for organized labor certainly does get results, however we may disapprove of the methods used.

Fortunately for the welfare of the majority of engineers, and for the future glory of the profession, there exists an organization which is not affiliated with organized labor, and which does not countenance the use of labor-union methods, yet is obtaining results in the recognition and adequate compensation of engineers. This organization now numbers nearly 10,000 members, representing all branches of engineering, and all grades of professional standing, from chief engineers to rodmen. No organization of engineers has ever shown so rapid a growth, or such satisfactory results of accomplishment within so short a period. No organization exists which possesses such means and ability to place the engineering profession upon the high plane to which it is entitled. The American Association of Engineers is unique in these respects, and if its present rate of growth is any indication of its future, we may soon expect even such standpatters as Mr. Shepherd to be asking for admission to its precincts and to its activities, as men of equal standing, and broader understanding, have done before now.

KENNETH P. ARMSTRONG,
Senior Civil Engineer, Interstate Commerce Commission, Bureau of Valuation.
Washington, D. C.

Water-Ratio as Affected by Rodding

Sir—Prof. F. E. Giesecke's tests on rodded concrete, reported in *Engineering News-Record* of Sept. 11, 1919, p. 528, are of interest in showing the increased strength due to this treatment, and in illustrating the extent to which fresh concrete may be disturbed without adversely affecting its strength. The author properly attributes the increase in strength to the removal of the excess water by rodding.

The writer believes, however, that Professor Giesecke is not on safe ground when he compares his tests directly with certain results obtained in this laboratory, and depends on that comparison for a measure of the effect of rodding when using concrete of different consistencies. It is unfortunate that he did not make a parallel group of tests from which the water ratio-strength relation could have been platted for the unrodded concrete. (The water-ratio is the ratio of the volume of water in the batch to the volume of cement, considering cement to weigh 94 lb. per cubic foot.) The strength of his concrete was probably different from ours, due to many factors which had no relation whatever to the effect of rodding. In other words, in his Fig. 2 the water ratio-strength curve for unrodded concrete may have been entirely different from the curve shown (which is based on certain of our tests), due to differences in the quality of the cement, differences in temperature, curing conditions, time of mixing, or numerous other variations which affected all tests alike. The comparison of his earlier tests with our curve is not very convincing.

In our discussions of the water ratio-strength relation for concrete we have pointed out that the constants in the formula quoted by Professor Giesecke ($14{,}000/7x$

(where x is the water-ratio, an exponent) depend on the quality of the cement, age of concrete and other conditions of the test. Other tests made in this laboratory give different values of these constants, although the general relation between water-ratio and strength has been found to hold true for different proportions of given materials, so long as the concrete has water enough to make it plastic and the aggregate is not too coarse for the quantity of cement used.

Professor Giesecke has fallen into an error in plotting his tests in Fig. 2, since no allowance was made for the reduction in the water-ratio of the concrete as a result of rodding, due to one or more of the following factors:

(1) Working water to the surface which escaped and consequently did not influence the final water-ratio.

(2) Evaporation due to long exposure of the cylinder during rodding.

(3) Absorption of water by the aggregate during rodding. Concrete which was originally mixed with a water-ratio of 1.00 may after rodding have a water-ratio of 0.7, consequently the strength should be plotted with reference to the latter figure and not the former. In other words, the curves from Professor Giesecke's tests should all be moved to the left, the exact position being unknown on account of the uncertain effect of rodding on the final water-ratio. If this were done we should find a very different relation from that given by the original figure, and at the same time attribute the increase in strength to the proper cause—that is, the artificial reduction in the water-ratio.

The time of setting of the cement used in Professor Giesecke's tests would have been of interest. Undoubtedly, the plastic condition was quite different for the concrete which had been rodded for long periods from the condition at the beginning. This should be borne in mind in considering applications of this method. It seems probable that the strength would have been quite similar had the concrete been permitted to stand for the periods shown, before being placed in the forms, provided that sufficient water were used in the beginning to provide a plastic mix after the absorption and evaporation had occurred.

In a series of tests carried out by the writer several months ago a study was made of the effect on the strength of the concrete of using different methods of molding the specimen. We were interested only in methods which could be used in molding test cylinders in the laboratory. Compression tests were made on 6x12-in. cylinders at the age of 28 days, using sand and pebbles graded up to 1½ in. A 1:5 normal-consistency mix was used with a water-ratio of 0.87. For 12 strokes of the ⅝-in. steel bar on each 4-in. layer of concrete we secured a strength of 2680 lb. per square inch; for 25 strokes 2780, and for 50 strokes 2810, an increase of about 4% for 25 strokes as compared with 12, and an increase of about 5% for 50 strokes as compared with 12. The first and third values were the average of five tests; the second the average of 15 tests made on different days. Puddling was done during the molding of the specimen and the concrete was not subsequently disturbed. These tests showed a comparatively slight effect due to the different number of strokes used on each layer. Twenty-five strokes for each 4-in. layer is the number regularly used in making our test pieces. It will be noted that the water-ratio of this concrete was not changed, consequently we would expect little effect due to the number of strokes, so long as the minimum number of strokes gave compact concrete. Several methods of tamping were also used. The same series covered a study of the effect of vibration, jigging and pressure.

These tests brought out clearly that the increase in strength due to pressure on fresh concrete may be measured by the quantity of water which is forced out by the pressure. In other words, *it is the reduction in the water-ratio of the concrete which increases the strength.* Complete data will be found in a forthcoming bulletin of this laboratory reprinted from a paper read before the American Concrete Institute, June, 1919, and published also in the "Proceedings" of the institute for 1919.

It is the writer's belief that much of the effect due to workmanship in handling and placing concrete can be traced to the influence of any particular practice on the final water-ratio of the mixture.

D. A. Abrams,
Professor in Charge, Structural Materials Research Laboratory, Lewis Institute,
Chicago, Ill.

Experience With Bolted Steel Structures

Sir—I have read with a great deal of interest the article in *Engineering News-Record* of Aug. 14, 1919, entitled "Bolts in Field Connections and Steel-Frame Buildings: a Study of Data and Experience," by R. Fleming, with which my experience leads me to agree in practically all particulars. I was particularly interested in the observations headed "Recommended Clause for Field Bolting," and concerning the use of washers and nut locks.

During the past ten years I have designed and erected several thousand tons of steel structures in the Argentine Republic, principally office buildings in the City of Buenos Aires, and it is in connection with the erection of this work that I comment below regarding the use of ordinary bolts in place of field rivets.

In the case of a building erected in Buenos Aires several years ago the architect specified that field connections, with the exception of ordinary floor-beam framing, should be riveted. The building has about 20 m. frontage, and for a depth of about 25 m. is thirteen stories high. For a further depth of 20 m. it has nine stories. The 13-story portion of the building is about 210 ft. in height above the street, and at one corner has a circular tower 40 ft. higher, making a total of about 250 feet.

In the design of the building, wind stresses were taken care of in the usual manner. The erection proceeded rapidly, for this country, but it was found almost impossible at that time to obtain good field riveting. I was so impressed by the poor results obtained that I suggested to the architect and engineer representing the owners that we would obtain much better results if the building should be properly bolted; and finally that plan was adopted, using ordinary structural bolts, with the exception of the framing below the tower and the elevator shafts in the high portion of the building. The nine-story portion had all field connections bolted.

Owing to a delay in letting the general contract and the fact that the steelwork was erected much more

rapidly than was anticipated, the entire steel frame was completed before any mason work was begun and when only a portion of the concrete floor arches had been constructed. The usual system of plumbing the structure by means of wire ropes had been followed and a final adjustment made, which by careful measurement indicated that in no place was the building more than ¾ in. out of plumb. Just as the work had been completed a violent wind storm, called in this country a "pampero," struck the city, the wind attaining a velocity as high as 110 km. an hour, which carried away practically everything loose on the building, among other things 2 x 12-in. planks 10 to 12 ft. long. As soon as the storm passed investigation was made, and the structure was found to be out of plumb about 4 in. This was easily corrected, and no other similar test occurred before the completion of the walls.

Under the somewhat severe test mentioned, no evidence could be discovered of weakness at any bolted connection, but it was found that a good many field rivets showed signs of looseness, and these were removed and replaced with bolts.

Several years ago I had occasion to erect a four-legged shot tower 210 ft. high, and because it was necessary to save both time and expense, field bolting was resorted to instead of field riveting. The base of the tower is 33 ft. square, with the first forty feet above the ground sharply battered to about 20 ft. square, and from that point to 12 ft. square at the top, at which is located a small house for the operating workmen. In this instance the bolts were locked by cutting the screw threads with a chisel, and although the tower is in an exposed position and has been tested by many high winds no weakness has been noted.

The other buildings and structures referred to earlier, while not as high and perhaps not as severely tested as the two specifically mentioned, were field-bolted in all instances and have proved entirely satisfactory.

While I do not advocate the promiscuous use of ordinary bolts in place of field riveting, it appears clear that well bolted connections are better than poorly riveted ones and for the conditions that had to be met with in the Argentine, at least a few years ago, and where there was little vibration, field-bolted connections have given entire satisfaction. HUGH B. TABOR,

Representante General, United States Steel Products Company.

Buenos Aires, Argentine Republic.

Sir—We are much interested in the subject of the articles on the use of bolts on structural steelwork, in your issues of Aug. 14, 1919, p. 298, and Sept. 11, p. 529, as we have felt for a long time that many classes of steel structures were made needlessly expensive by the use of rivets where bolts would have served the purpose just as well at much less cost. Some years ago someone defined engineering as the "art of obtaining the most from a dollar." If this definition is true, there has been a great deal of poor engineering done in regard to the use of bolts and rivets, because there are countless places in the structures of this country where a bolt would have given just as good results as a rivet.

We believe, as you say in your editorial of Aug. 14, that "precedent, instead of experience, plays a large part in this particular item of engineering practice." We also agree with you that "experience" in regard to the subject "will be developed by the piecing together of a multitude of small scattered items of observation, very few of which can come under one man's eye." Therefore, we are glad to aid as much as possible in constructing what might be called the "experience structure" of the art by contributing our little item of experience.

That we have been alive to the possibilities in the use of bolts is shown by the specifications which we have been using for some time covering the use of bolts and rivets on certain classes of our work, where we are the engineers. We attach a copy of these specifications, and while you will note that they allow a much more extensive use of bolts than is the usual practice, they are not as radical in this respect as they would have been had they not been drawn to meet the current idea of good practice.

In our experience we have had occasion to use bolts in all kinds of structures. In many of them the complete structure has been bolted and, so far as we know, there has been no loosening of the bolts or failure of the connections in any of them. When we first started to build highway bridges we thought it necessary to rivet all but the simplest connections. Later we found on examination that bolts were perfectly satisfactory, as the nuts had no tendency to loosen. Before we discontinued highway bridge work we had built a great many bridges where the field connections were all bolted.

The coal tipples, shaker houses and other structures of this class that we have field-bolted have all given first-class results. About eight years ago we built and erected a pipe shop having an overhead crane which had to clear some high furnaces, making it necessary to make the building higher than the ordinary structure of this kind. The walls were simply curtain walls and the windows were made with steel sash, so that there were no masses of brick or masonry of any kind to absorb vibration. All of the connections in this building were bolted, and the results have been as good as could possibly have been obtained with rivets.

The writer has been watching for a great many years one job in particular at our own plant on which all the connections are bolted. It is a runway for an outside crane, 10-ton capacity, 80-ft. span. The track is supported by latticed girders. The columns have a wide base, rear flange angles battered, and are laced with angle lacing coped so as to connect in between the web legs of the flange angles. The vibration on this structure has been heavy enough to crack some of the coped ends of these lacing angles, but the writer has never been able to find a loose nut or even a crack in the paint around the nut.

In addition to the work which he did in repairing the bridge for the Chicago & Western Michigan R. R., described in the *Journal of the Western Society of Engineers*, December, 1913, by our Mr. Curtis, and mentioned in Mr. Fleming's article, we have repaired and removed a great many bridges and other structures in the past 25 or 30 years in which the field connections were made with bolts. We took down some bridges for a Southern railroad that had been overloaded for some time; it finally became necessary to replace them by heavier bridges. The field connections were all made with bolts, and when the bridges were taken down we

found the bolts in all of the connections so tight that it was necessary to knock the heads off before they could be removed.

A building which came under the observation of one of our engineers a few years ago was an excellent illustration of the efficiency of bolts for work of this character. It was a cement mill that had been in operation so long that the roof and its supporting steel had become so loaded with cement that the trusses finally collapsed. The points of failure were all found to have occurred either in the body of the member or in the first bolt hole at the connection.

We could give a great many more illustrations in regard to the efficiency of bolts, but it seems that those cited should help to convince anyone that the use of bolts in steel structures could be greatly extended.

E. D. CODDINGTON,
Vice President, Wisconsin Bridge and Iron Company.
North Milwaukee, Wis.

SPECIFICATIONS FOR FIELD BOLTING AND RIVETING ON STRUCTURAL WORK (WISCONSIN BRIDGE AND IRON WORKS)

It is our purpose to do as much field bolting as possible on all structures except railroad bridges. When the customer desires it, or conditions are such as make it desirable to do riveting on a structure, the riveting must be confined if possible to main members as defined below, and the values to be used for bolts and rivets in all cases, unless specifically changed by the specifications covering the contract, will be in accordance with the table shown.

The specifications, strain sheet or information will in all cases state whether riveting will be required on any particular job. The values in pounds per square inch to be allowed for shop and field rivets and bolts are as follows:

	Shearing	Bearing
Shop rivets	12,000	25,000
Power-driven field rivets	12,000	25,000
Hand-driven field rivets	10,000	20,000
Ordinary bolts	10,000	20,000

Stresses will be shown on strain sheets for all main members and their connections shall be fully bolted up or riveted for carrying these stresses. In coal tipples, head frames, rock houses and similar work, members that get stresses from cable pull, dumping skip, machinery vibration, etc., will be classed as main members. In building work, columns, chords of trusses and all members carrying live load will be classed as main members. If any portion of the stress in main members is due to live load suddenly applied, as in trolley beams, crane girders, dumping girders, etc., 50% of that stress will be added to provide for impact.

In case of members where the stresses are indeterminate, and minor members where the stresses are unimportant, the connections shall be bolted or riveted in accordance with our usual practice; that is, the connection shall be proportioned to the size of the member.

Another Chart for Railway Resurvey

Sir—On p. 506 of your Sept. 11 issue is a curve chart, by J. G. Wetherell, for railway resurvey. It is very good as far as it goes, and no doubt the external-distance method is not applicable for much larger central angles than 9°, in the locality for which Mr. Wetherell constructed the diagram. This method does not disclose whether the curve is simple or compound, or yield any data relative to transition curves.

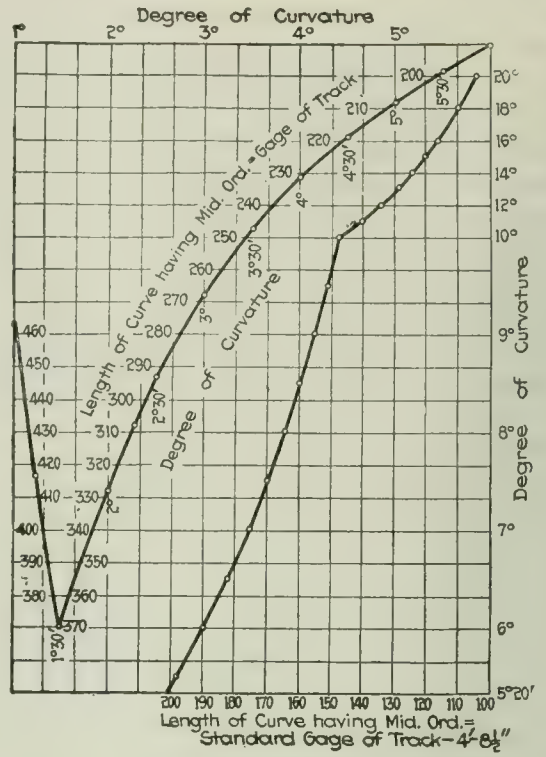


CHART USED FOR RESURVEY OF CURVES

When the writer was engaged on railroad bridge renewal surveys in 1901-04, he often used a simple method of determining approximately the degree of curve without a transit survey. If no change of alignment were contemplated in connection with the construction of a permanent bridge, replacing a timber-trestle or Howe-truss bridge, usually there was no occasion to take a transit to the structure until needed for construction layout.

The method used was to measure the length of curve having a mid-ordinate equal to the gage of track, 4 ft. 8½ in. A point was selected on the gage line of the outer rail, and an assistant lined in on the same gage line at such a point that the connecting line of sight was tangent to the gage line of the inner rail. The length of curve included was chained and recorded. By measuring several such chords overlapping each other, the regularity of the curve was tested.

The determination of the corresponding degree of curvature is simple by the use of a table of "Functions of a 1°" curve and still simpler by such a diagram as the one inclosed. This method is not precise, as the lining in it is done by eye, and a chord of the outer rail instead of the center line of track is used; also, the gage may be widened on the curve. But, even without correcting for these inaccuracies, the results are close enough for some purposes. Where one or both ends of the curve come within the limits of the survey, tangent offsets should be taken for several stations, if convenient. On old track, where centers have not been rerun for several years, irregularities in curvature are sure to be found, as is best realized by those who have had experience in spiraling railroads originally built without spirals.

H. P. BOARDMAN,
Professor of Civil Engineering, University of Nevada.
Reno, Nev.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Turnbuckle Adjustment for Hammer Clutch

BY E. EARL GLASS
Los Angeles, Calif.

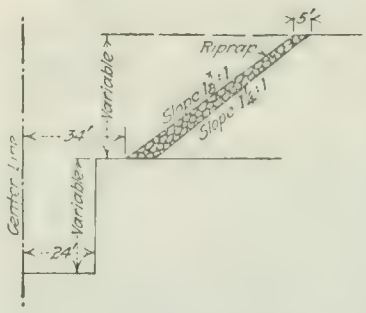
GOOD work with a light shop hammer depends very much upon perfect control. The action of a small power hammer in the shop of the Los Angeles County road department was greatly improved by cutting and threading the rod connecting the tread and clutch and inserting a turnbuckle. By a slight aljustment of the turnbuckle the clutch may be kept sensitive to a touch for light, painstaking work or set up for hard hammering on heavy work. The improvement is well worth the slight trouble of fitting the turnbuckle.

Wood Cribs Hold Toe of Riprap on Slopes

MOST of the rock section of the new power canal around Niagara Falls which is being built for the Queenston-Chippawa Canal of the Ontario Hydro-electric Power Commission is a rectangular cut 48 ft. wide and varying in depth to 60 ft. This cut, however, is in the ledge rock which itself lies a number of feet below the ground surface, and the upper part through the earth has a side slope of $1\frac{1}{4}$:1 paved with a heavy riprap to a slope of $1\frac{3}{8}$:1. As shown in the accompanying cross-section, the edge of this riprap slope is brought to within about 10 ft. of the inner edge of the rock face.

The general scheme of procedure followed is to excavate the overburden to its proper slope with steam shovels, dump the riprap fill over the side in order to hold the earth at its proper slope, and then to start the channeling and drilling operations in the rock thus exposed.

In one section, shown in the accompanying view, the earth tends to slide and the riprap could not be held to the slope, but tailed over into the rock-cut area. To prevent this, a series of wood cribs, as shown in the view, was built and anchored by through bolts to the rock. These cribs, which are about 6 ft. wide and 12 ft. long, are made of a floor of 10 x 10-in. sticks laid solid between longitudinal 12 x 12's on the outer faces and tied together with three 6 x 6-in. sticks as shown. The frames are placed close together and serve admirably to hold the toe of the rock slope.



CANAL SECTION WHERE CRIB IS USED

Land Drill on Barge Drills Test Hole in Tidewater

BY ADELBERT J. NEWMAN
Los Angeles Shipbuilding and Dry Dock Company, Los Angeles, Calif.

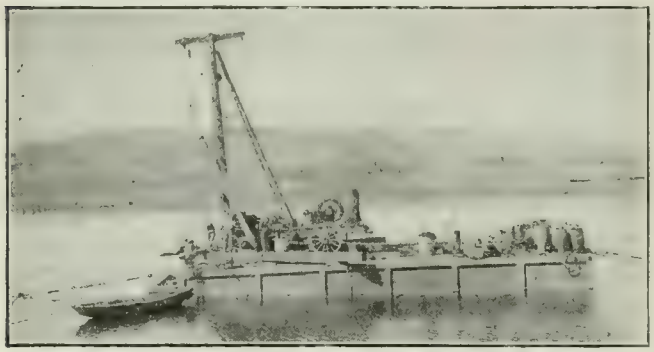
SUCCESSFUL test-hole drilling in deep water having considerable fluctuations of tide level was accomplished from a barge, with improvised fittings, in constructing the foundations for the new 10,000-ton dry dock of the Los Angeles Shipbuilding & Dry Dock Co. After one test hole on land, using a portable California well driller, was drilled, the rig was transported to fitting-out wharf No. 2 and placed on a barge by one of the company's steam cranes. The barge was 25 x 50 ft., and was capable of supporting 65 tons evenly distributed and retain a freeboard of 2 ft. Two 10 x 10-in. timbers 30 ft. long were placed under the barge at one end and two 12 x 12-in. timbers 30 ft. long were placed directly over the 10 x 10-in. timbers in a V-shape on the deck. These timbers were bolted together with $1\frac{1}{2}$-in. steel rods at each end with $\frac{1}{2}$-in. plates and jamb nuts. On the end of the V two 4-in. hydraulic jacks were strapped with $\frac{5}{8}$ x 4-in. iron bands. A counterweight of twenty 42-gal. oil barrels filled with sea water, 4 tons, was placed on the rear end of the barge, and the drill was lashed to the decking and guyed four ways. The barge with equipment was towed by a launch to location



TIMBER CRIBS ARE PLACED AT FOOT OF HEAVY RIPRAP SLOPE

of the test hole in the channel and was fastened by eight mooring lines, which were equipped with a set each of double blocks to enable tightening by hand to be done. An armor casing of 10-in. water pipe 37 ft. long was suspended from the barge by large pipe clamps fastened to the 10 x 10-in. timbers, and used to protect the well casing from bending.

The elevation at the beginning of the bore was —31.2 ft., and the hole was drilled to an elevation of —98.0 ft., making an actual drilling length of 66.8 ft. As



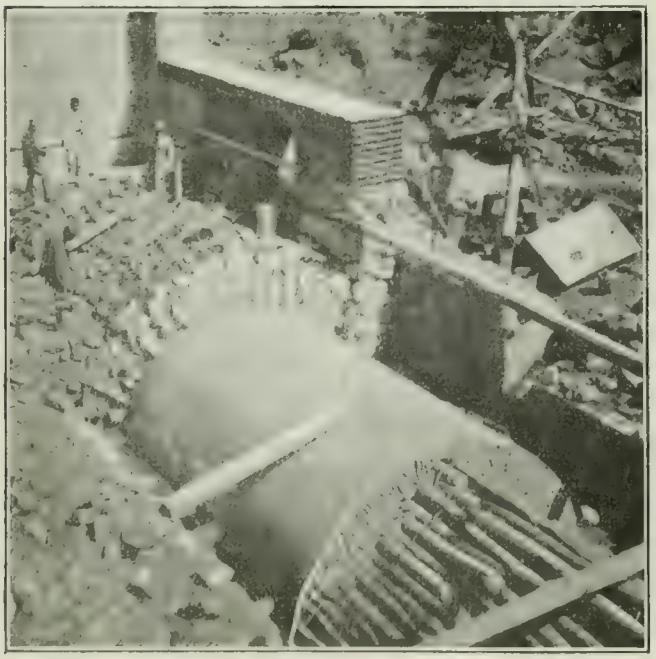
WELL DRILL ON BARGE DRILLS SUBMARINE TEST HOLE

the drilling was done through an average depth of 36 ft. of water, a total length of 102.8 ft. of 8-in. double-ply well casing was required. Working on a barge and taking the necessary precautions made the progress very slow, but no difficulty was encountered that was caused by the tide or motion of the rig. After completing the drilling, the casing was pulled by hydraulic jacks, using 1000 lb. pressure per square inch.

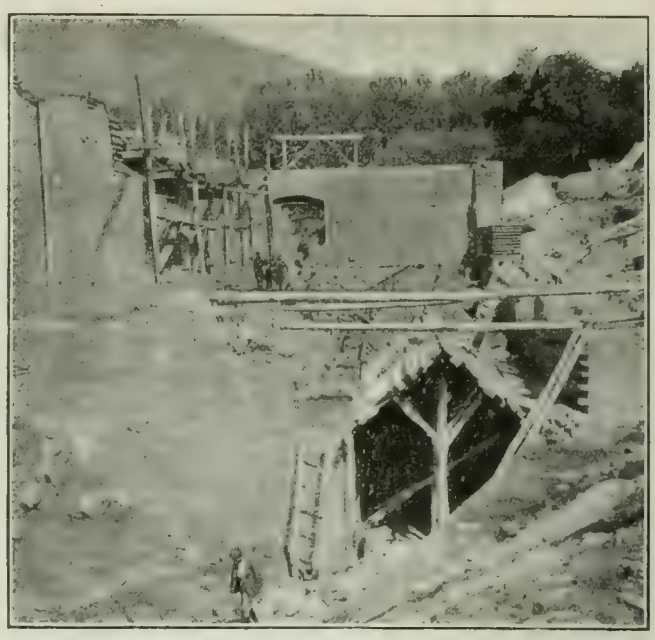
Clampitt & Moss, Los Angeles, Calif., were the contractors, and the drilling was done by W. A. Borden, Artesia, Calif., with his own rig.

Building Arch With Primitive Centers

IN THE construction of a hydro-electric power house north of Kabul, Afghanistan, A. C. Jewett, a California engineer, was forced, by the lack of any timber



ARCH FORMS MADE OF MUD ON BRICKS ON POLES



CENTER POSTS WITH BRACKETS CARRY CENTERING

of fair size or strength, to devise a number of special methods. In forming the arch over the wheel pits, for instance, he could not get timber to make the arch centers, and had to adopt the scheme shown in the accompanying two views. A supporting framework of poles set up in rough branching-arm shape carried a triangular rooflike centering. This centering was then covered with a built-up solid mass of longitudinally laid poles, which was in turn covered with sun-dried thin, flat bricks. These bricks were plastered with mud to form the curve of the arch on which the cut-stone arch voussoirs were laid.

Old Boiler Flues for Coffer Plates

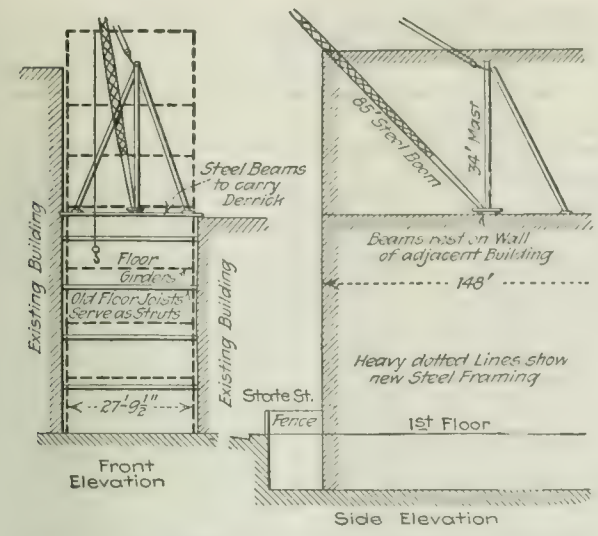
By G. W. McAlpin
Point Pleasant, W. Va.

OLD boiler flues, flattened out with the automatic hammer in the blacksmith shop, cut to desired length and drilled, recently formed a cheap substitute for plates for plating the ends of cofferdam waling on the work of the National Contract Company at Dam No. 25, Ohio River. Plates are usually used to prevent the tie-rods from pulling out through the ends of the waling.

The flattened boiler flues, cut to 15-in. length, drilled for one rod hole and several smaller holes for spiking to waling with boat spikes, have proved entirely satisfactory and have been cheaply made from old flues of no use for original use.

Erection Derrick Straddles Site of Narrow Building

RESTRICTED working space for the erection of the seven-story steel-frame Waterman Building, State St., Chicago, necessitated an unusual arrangement for the support of the stiff-leg derrick which handled and placed the material. The building is only 27 ft. 9½ in. wide, and had to be erected between two other structures. It is 148 ft. deep, with a crowded street in front and a narrow alley at the rear. When the old building was torn down, several of the old wooden floor joists



DERRICK IS SUPPORTED OVER BUILDING SITE

were left in place as struts to support the walls of the adjacent buildings; one of these walls was a party wall. The erection derrick was mounted directly over the site, being supported on steel beams spanning the narrow space and carried by the walls of the adjacent buildings at about the fifth floor lever. It was mounted in such position that it could pick up material delivered in the street, and either place it in the sidewalk basement for storage or set it directly in place in the structure. This derrick had a 34-ft. mast and an 85-ft. steel boom, with a hoisting capacity of 15 tons. Holabird & Roche were the architects; the Dahl-Stedman Co. was the general contractor and Nils J. Johnsen & Co. had the contract for erection of the steel frame.

Reinforced-Concrete Boards Straightened

A NUMBER of precast reinforced-concrete boards forming the compartments of the sludge-drying beds of the new sewage-works of Austin, Tex., were straightened after having been bent by an earthslide. The boards are 2x18 in., 15 ft. long, reinforced longitudinally by six ⅜-in. twisted bars. They were cast flat on a solidly built floor, 10 at one time.



REINFORCED-CONCRETE BOARD BENT BY LANDSLIDE

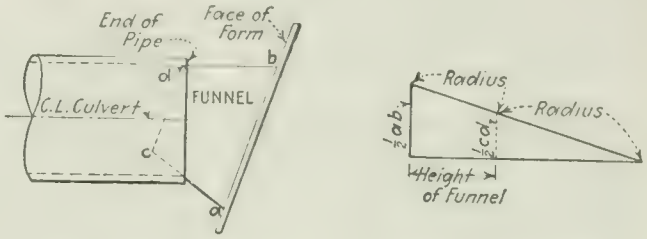
The tops of the boards, as cast, were trowelled. Earth pressure from a landslide bent a number of the boards, some of them being 8 in. out of line. The bent boards were removed, laid flat on the ground and weighted slightly. For the most part they straightened by their own weight. Some still show a slight curve. Not one board failed. Light cross cracks exist at intervals of about 3 in., distributed in the inner three-fourths of the length of the board.

The contractors for the sewage-works were R. J. Potts, C. E. Moore and W. H. Prentice, Waco, Tex., with T. J. Palm as superintendent of construction. C. E. Leonard is city engineer of Austin. Prof. John H. Gregory, Baltimore, Md., designed the works and is serving the city as consulting engineer.

Universal Form for Skew Culvert Ends

By Samuel P. Baird
Engineer and Contractor, Columbus, Ohio

CULVERTS must of necessity be laid with a grade, and often on a skew with the road. The head walls should always be built plumb and parallel with the center line. It is apparent that the formwork for a concrete head wall for a pipe culvert will necessitate some extra work cobbling up a closure for the gap



END FORM ADJUSTABLE TO SKEW OF CULVERT

between the end of the pipe and the form. When the grade of the culvert is slight and the culvert is square with the center line, this gap can usually be filled with stiff clay. But if the culvert has a good grade or is on any skew, it requires patience and skill to make a form that will be concrete-tight and produce a good-looking job when finished.

The writer has successfully used galvanized-iron funnels of various diameters, 8, 10, 12 and 14 in. at the small end, and 18, 20, 22 and 24 in. at the large end, by 15 in. high. These funnels were made in four parts and bolted together with short stove bolts, the nuts being on the outside and the bolts being of such length as to give not quite a full nut. In use, a cone of suitable size is inserted in the end pipe of a culvert, and the base of the cone is adjusted so as to fit squarely the form for the face of the head wall. The cone acts as the ball and the pipe as the socket as in a ball-and-socket joint.

No trouble is experienced in taking care of a skew of 20°. The funnels cannot be made of heavy-gage material, as an oblique section of a cone is not circular, and since we are to joint a cone into a circular pipe on a skew there is some distortion. No. 20- to 24-gage material has been found satisfactory. It is to be understood that the funnels are to be removed as part of the form and re-used.

The rule for cutting a funnel is simple. On a straight line lay off two lines at 90° and a distance apart equal to the proposed vertical height of the funnel. On one of these lines lay off a distance equal to the radius of the large end of the funnel, and on the other line a distance equal to the radius of the small end of the funnel.

Draw a line connecting the two last-mentioned points and extend it to intersect the center line. This intersection point is the center to be used, the radii being the distances to the two points that have been mentioned.

NEWS OF THE WEEK

New York, November 13–20, 1919

Delay Probable in Naming New Chief of Engineers

(Washington Correspondence)

The nomination of the Chief of Engineers was not contained in the early list sent to the Senate by the President. It is understood that the Secretary of War will not make his recommendation until he has had an opportunity to discuss the matter with the President. Secretary Baker regards the present situation with regard to the Chief of Engineers as an unusual one, it is said, and has no intention of hurrying the recommendation.

Considering Revision of Townsend Highway Bill

In a conference with the highway committee of the National Automobile Chamber of Commerce, Senator Townsend admitted that a redraft of his highway bill would be necessary. As revised, the bill will provide a minimum width of 20 ft. for the wearing surface of all highways to be constructed under the act, with the exception of points where physical obstacles make such a width impracticable. In the new bill, the national highway mileage is limited to 1% of the highway mileage of the states, except in cases where such percentage will not allow the two main highways to be extended to the borders of the state. A number of definitions contained in the first bill will be revised. Five commissioners will be provided instead of three, so as to allow better geographical representation on the highways commission. Senator Townsend hopes to begin hearings within the next month or two.

In addition to Senator Townsend and the members of the highway committee of the Automobile Chamber of Commerce, there were present at the meeting H. G. Shirley, of the Federal Highway Council; A. M. Loomis, of the National Grange; A. G. Batcheler and N. O. Eldridge, American Automobile Association, and Pyke Johnson, National Auto Dealers' Association.

Builders Again Press Coal Priority Claims

A committee of the National Federation of Construction Industries appeared before B. P. Phillippe, fuel distributor, United States Railroad Administration, in Washington, Dec. 1, to press their claims for priority rating in the distribution of coal. The committee was composed of representatives of the brick, cement, lumber, lime, sand and gravel and gypsum industries.

In answering the claims of the industries for a higher priority rating, Mr. Phillippe declared that the construction industries now occupied the same status as they did during the war, and suggested they present their claims for a higher rating to Dr. Garfield. Representatives of the industries argued that failure to grant the construction industries a higher rating than they enjoyed during the war would throw a large number of workers out of employment and add to the industrial unrest which is now prevalent throughout the country.

The committee of the National Federation of Construction Industries will hold further meetings with officials of the Railroad Administration, in which they will submit to the coal officials what they believe to be a proper priority rating for the construction industries.

This Week's News

This issue carries news current for the week ending Dec. 10. It is dated Nov. 13—Nov. 20, to preserve the sequence of numbers in the volume.

$284,000,000 for Federal Public Works Planned for 1921

Federal expenditures for public works during the fiscal year which will end June 30, 1921, as such expenditures have been approved by the Secretary of the Treasury and forwarded to Congress, reached the unusual total of $283,921,810.17. This compares with $93,872,092 appropriated for public works during the fiscal year which will end June 30, 1920. The principal engineering items contained in the annual estimates are as follows: Construction of custom houses and other buildings, including the sites and extensions, $1,332,775; marine hospitals, $2,626,000; quarantine stations, $2,776,621; arsenals and powder depots, $7,278,259; fortifications, $117,793,330; military posts, $14,225,251.67; rivers and harbors, $53,659,265; Panama Canal, construction and maintenance, $18,245,391; navy yards and stations, $20,606,000; naval training stations, $2,335,000; depots for coal and other fuel, $2,335,000; marine barracks, $1,019,000; submarine base, San Pedro, Calif., $1,500,000; submarine and destroyer bases, Port Angeles, Wash., and Columbia River, $2,000,000; Reclamation Service, $20,134,000; lighthouses, beacons, and fog signals, $6,759,900.

Am. Soc. C. E. Discusses Development Report

Yearly Dues of $1.50 per Member for Civic and Welfare Work Held To Be Ridiculously Low

Discussion of the report of the Development Committee of the American Society of Civil Engineers, presented at a meeting in New York City, Dec. 3, indicated a strong general sentiment in favor of the recommended expansion of the society's activities to include participation with other engineering organizations in civic and public-welfare work. The committee's recommendations—that the society preserve the integrity of its original purpose to advance the science of engineering; that a reorganization of the society be effected, whereby each of its geographical districts shall be subdivided into local sections, to one of which every society member shall be assigned and whose members shall elect the district representative on the Board of Direction, and that a readjustment and increase of dues be effected—were indorsed by those taking part in the discussion.

The Development Committee's report, introduced by Paul G. Brown, committee member, included the report of the Joint Conference Committee—composed of the development committees of the founder societies—recommending the formation of a comprehensive national association of engineering and allied organizations. This plan was described in *Engineering News-Record* of Oct. 30-Nov. 6, 1919, p. 835.

Mr. Brown's presentation of the committee's recommendations gave the impression that the committee was not very strongly convinced of the value of its own recommendations. Charles Hansel corrected this impression, however, by saying that four of the committeemen, including Mr. Brown, did not favor the inclusion of the conference committee's plan for a single comprehensive organization in the Development Committee's report, but that the vote for the remainder of the report was unanimous. Continuing, Mr. Hansel described the great amount of time and effort which the completion of the report represented.

In reference to the application of $1.50 from the yearly society dues of each member to a fund for the support of the proposed comprehensive national body, Mr. Hansel pointed out that the amount was ridiculously small and should not be less than $5, which opinion was concurred in by several other speakers. Daniel Bontecou, head of the subcommittee on budget, explained that the proposed dues of $1.50 had been considered sufficient to

start the comprehensive organization, as they would produce approximately $60,000 from the four national engineering societies, whose members must necessarily comprise its first membership.

Although F. C. Noble said that the four societies' representation on the National Council of the proposed comprehensive organization would be not more than 11 per cent, E. J. Mehren expressed his belief that it would be more than 60 per cent, and for that reason, he predicted, local associations would not apply for admission. Mr. Mehren criticised the form rather than the substance of the committee's report. With the exception of the conference committee report, he said, it consisted of a mass of indefinite recommendations, arranged in no logical grouping which would allow the reader of the report to gain a clear-cut idea of its object. He had no doubt, he asserted, that most of the recommendations were satisfactory, but that the report should have contained definite plans for their consummation.

Daniel L. Turner, too, urged that action be put on a definite basis and started as soon as possible. The report, however, must first be considered by the Board of Direction. Then definite means for carrying out such of the propositions as gained its approval may be undertaken, involving, of course, a letter ballot to the membership.

The sense of the remainder of the discussion was to urge careful consideration and certain definitions of the proposed changes in the society's organization and affiliations, the encouragement of local sections of the society, and the enrichment of engineering literature by soliciting and publishing more technical papers prepared by local section members.

Sixty Ohio Counties Vote Levies For Better Highways

At the recent state election 60 of 68 Ohio counties voted levies for better roads. Only six counties voted down good-roads projects. The 60 counties voted to spend $6,943,000 on highways during 1920.

Booth & Flinn Get Pittsburgh Tunnel Contract

Contract for building the South Hills tunnel at Pittsburgh for Allegheny County was awarded to Booth & Flinn, of Pittsburgh, as low bidders, following opening of bids Dec. 2. There were five bids, ranging from $4,593,258.50 to $5,658,385.75. The work to be done is the driving and lining of two parallel 25-ft. tunnels 35 ft. apart, 5700 ft. long, through shale rock. A time of 2½ years is allowed for completion. While the bids were far higher than the county commissioners had expected, inquiries made it appear that the cost of labor is not likely to drop for some time, and the contract was then awarded.

Small Salaries Forcing Engineers Out of Government Service

Inadequate compensation is depleting the scientific and technical forces in the Government service at an alarming rate, according to the annual reports of nearly every engineering bureau in Washington.

In explaining why 17% of his scientific force has resigned during the past 12 months, George Otis Smith, director of the United States Geological Survey, reviews the annual record of 29 geologists who have left the Survey to enter private employ. In the Survey, their average salary was $2271. The average initial salary of these men, according to Dr. Smith's calculation, in private employ was $5121. After two years of service this compensation averaged $7804. Eight of these geologists each now receive $10,000 or more.

"That the value of these men as specialists and consulting geologists is far greater to the country at large than to private corporations is undeniable," says Dr. Smith. "With nearly 60% of the area of the country totally unmapped, there is a nationwide demand for more speed in mapping. If these maps are to serve their full purpose in promoting national development, the whole country must be mapped within this generation—or, even better, within the next decade. The estimated cost of this mapping program is $40,000,000, including the cost of revising the older survey. To accomplish this work within the period desired, however, would involve more than the appropriation of this amount of money by the Federal and state Governments. An organization of specially trained engineers must be built up by means of gradually increased appropriations, beginning with $700,000 for the field season of 1919, and reaching a maximum of $4,500,000 in 1928. It is believed that on such a scale of expenditure the field surveys could be both economically and effectively executed, and the work could be completed in 1932."

A. A. E. Announces Attitude on Trade Unionism

After being pressed on many occasions to state its position with reference to its stand on the present situation of industrial unrest, the American Association of Engineers, through its executive committee and past officers, has issued a signed statement under the caption "Statement of the American Association of Engineers on Trade Unionism." The statement follows:

Responsibility—The American Association of Engineers is an incorporated organization responsible for its acts.

Economic Position of the Engineer—The engineer is the medium through which both capital and labor are used in production and in industrial development. The aim of the profession is to advance civilization and render the highest service to society. Except when their acts further this aim, it is an advocate of neither capital nor labor.

Increased Production—Production should be increased—not limited. The profession cannot support strikes or lockouts or any other methods that may benefit any class at the expense of the nation as a whole. They are unsound and must inevitably lead to economic disaster. The law of supply and demand for men or material must ultimately prevail. Attempts may be made to limit the supply of either, but looking toward the upbuilding of civilization we believe rather in increasing the demand through the promotion of legitimate enterprises.

Reward According to Merit—Rewards should be according to ability, initiative and constructive effort. Men are not equal in these respects. Each man should be encouraged to do his utmost and be given compensation according to ability and will to increase production and to achieve large results.

Methods—The engineer, as an educated professional man, believes in basing his claims for proper and just reward for his services upon the justice of the facts presented, upon enlightenment of public opinion, upon loyalty between employer and employee, and upon the underlying fundamental desire of the great majority to do what is fair and right when the merits of the case in question are clearly presented and demonstrated. We believe in organized representation for the correction of wrong, the advancement of the profession and service to the public, but are opposed to methods inconsistent with the dignity of the profession and which would lessen public confidence.

Conclusion—The American Association of Engineers, through its board of directors, who have signed this statement, recognizing the many fundamental differences between the principles and objectives of the trade union and of an organization of professional men, expresses the opinion that an engineer cannot subscribe to the tenets of both.

Program for Highway Transport Conferences Ready

Problems dealing with the operation of motor trucks from the standpoint of efficient service, heavy haulage by farmers, intercity express operation, and a consideration of transportation legislation, are among the subjects to be discussed at the Highway Transport Conferences to be held in connection with the National Motor Truck Show in New York City beginning Jan. 5, 1920. Speakers for the several programs, to be given at afternoon and evening sessions the entire week beginning Jan. 5, 1920, are to be chosen from among those not only interested in the construction and distribution of heavy motor trucks, but also from men engaged in the construction of highways and in the solution of various highway transportation problems.

The program of the Highway Transport Conferences provides for an inaugural session on the opening night, when general subjects of highway and motor transportation will be discussed with special reference to the economics involved. During the remaining six days' conference, sessions will be held in the afternoon, primarily intended for those engaged in the motor-truck business—including manufacturing, distribution and service—and in the evening primarily for motor-truck owners, operators, shippers and any others interested in motor transportation. On the closing day there will be a single joint session in the afternoon. The conferences will be repeated in Chicago in connection with the National Motor Truck Show there, the sessions to begin on Jan. 24, 1920.

One of the features of the confer-

ence sessions will be the liberal use of illustrations, both stereopticon slides and motion-picture films. A collection of films, dealing with motor transportation in all its varied phases, is now being made, several such being obtained from abroad.

Los Angeles Starts To Construct Owens Gorge Power Plants

Camps are being established and construction is under way on the water-power plants to be built in the Owens River Gorge which is part of the Los Angeles water-supply system. This section of the city's holdings is about 300 miles north of Los Angeles. The gorge is the outlet from the higher level part of the Owens River basin, known as Long Valley. The river falls about 2400 ft. in the 12 miles between Long Valley and the lower end of the gorge, and all of this head is to be utilized. Whether three or four plants will be built is to be decided later. By Dec. 15, 1919, 150 men are to be in the camps, and this number will be doubled when all seven camps are established early next year.

The chief item in the construction program is the tunnel work, of which there will be a total of 12 miles. This is to be carried on from eight headings simultaneously.

The diversion dam is to be a rock-fill structure faced with concrete. At the site selected, a dam 100 ft. high will retain 98,000 acre-ft. Owing to the volcanic formation in the reservoir site, however, the height of the dam will not be built up rapidly, but water will be stored as the work progresses, and the dam will be carried up only so far as the reservoir is found to be reasonably tight.

It is part of the plan to get power for construction purposes out of the sections of the permanent construction that can be built at the outset. The first work was a timber crib diversion dam which would have been needed, anyway, to unwater the dam site. With only a short section of temporary flume, the diverted water is conveyed into the permanent concrete flume leading to the first tunnel portal. When the tunnel portal is reached a head of 18 ft. has been developed, and this is used to drive an 80-kw. generator. This has been providing power with which to drive the adjacent 7400-ft. tunnel.

When this first tunnel is completed, a construction power house will be put in to utilize the 50-ft. head between the natural channel of the river and the lower end of the tunnel. A 600-kw. generator here will supply power for all the construction camps. Thus, by carrying out some of the upper construction first the necessary power is being produced with least outlay.

William Mulholland is chief engineer of the Los Angeles Bureau of Water Works and Supply and H. A. Van Norman is superintendent of the northern division.

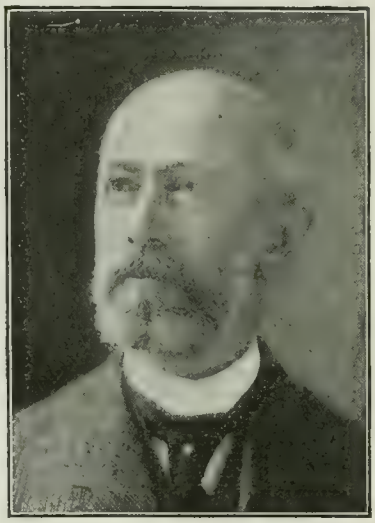
An Appreciation of F. P. Stearns

By Allen Hazen

Consulting Engineer, New York City

For many years Mr. Stearns has been a leader of water-works engineers. More than thirty years ago, as engineer of the Massachusetts State Board of Health, his exhaustive studies of the qualities of the water-supplies of the state, and the means of controlling and improving them, not only established the practice in Massachusetts and other states, but set a new standard for scientific investigations. In a similar way, and at about the same time, his study of stream flow and storage led to establishing the principles of economical development, since used by the engineers of New England. Later, as chief engineer of the Metropolitan Water Board, and afterward in his wide consulting practice, he had occasion to develop and to apply these principles in ever-widening circles.

Past-President, Am. Soc. C. E., and Noted Water-works Engineer, Who Died Last Week



FREDERIC P. STEARNS

Mr. Stearns was one of the men with whom one could discuss differences of opinion on professional matters in the most vigorous way, but with the utmost fairness and without risk to cordial personal relations. No one was more ready than he to recognize the force of new data or of changed conditions; and, on the other hand, no one would stand up more strongly for points that he was supporting.

There can be no better evidence of the fairness of his disposition than is found in the record of the great volume of contract work handled without litigation, and of the innumerable settlements with owners of land and riparian rights and other claimants in the large enterprises that were entrusted to his care.

The writer first met Mr. Stearns more than thirty years ago when he entered a coördinate department of the work of the State Board of Health. He remembers with great pleasure the frequent meetings with Mr. Stearns, and his cordial appreciation of good work and new methods of attacking the difficult problems that were presented.

In recent years, and since the larger activities of the Metropolitan Water Board have passed to other hands, Mr. Stearns has been in the enviable position of being able to select for his professional work problems in which he was particularly interested. He has often expressed to the writer his preference for doing only so much work as he could attend to in his own way and to his own satisfaction and without feeling crowded in doing it. The mark of careful and thorough study that he was able to put on the problems that he did take up may be seen in the many water-works systems with which he had to do, in the construction of the Panama Canal, and, indirectly, through a far wider field by its effect on the engineers with whom he came in contact and who knew him well.

[*An outline of Mr. Stearns' professional career will be found in the obituary column of this issue.*—Editor.]

Proceed With Desgins for $3,000,000 Bridge at Detroit

A bill authorizing the City of Detroit to construct and operate a bridge across the American channel of the Detroit River to Belle Isle was passed by the United States Senate Dec. 2.

Approval of the construction of the new $3,000,000 Belle Isle bridge at Detroit, Mich., without a drawspan, was granted by the United States Engineer Office, and plans were sent to Washington for the final approval of the War Department. At Washington approval was denied, a drawspan being required regardless of the height of the bridge. The Congressional grant for the original bridge across the American channel at this point specified a drawspan. In order to carry out the design of the bridge as planned with a solid span which will close the American channel to vessels larger than pleasure craft and scows, action by Congress at as early date as possible will be asked.

In the meantime the engineers in charge of the bridge construction, Esselstyn, Murphy & Handford, Detroit, are proceeding with the design of approaches to the bridge. A subway under Jefferson Ave. is planned to separate traffic at this point, where the boulevard crosses Jefferson Ave. near the north approach to the bridge. This subway will have a roadway approximately 36 ft. wide and will have a grade of about 3½ per cent.

It is planned to proceed with work on this approach, in view of the fact that when completed this dip will relieve congestion at the approach of the present temporary bridge, while action is being awaited with regard to the main span of the bridge.

Building Trades Employers and Employees Sign Two-Year Wage Agreement

Representatives of the Building Trades Employers' Association and the Building Trades Council in the City of New York have signed an agreement providing for a fixed scale of wages from Jan. 1, 1920, to Dec. 31, 1921, establishing a 44-hour week and providing that at all times unions, parties to the agreement furnish sufficient men to man the work of Building Trades Employers' Association members. The agreement is entered into "in order to secure continuity of employment and uninterrupted production." Approximately 150,000 building trades workers, members of more than 40 unions of 33 classes of mechanics, are affected by the agreement.

Provision is made for the readjustment of the wage schedule during the calendar year 1921, should the cost of living materially change, notice of a desire for readjustment being made by either party five months prior to Jan. 1, 1921. It is also provided that existing trade agreements between association members and unions representing their trades shall be continued under their present terms and conditions until the expiration of the new agreement, unless changed by the mutual consent of the parties concerned. However, the working week and the wage schedule above provided for shall be binding on existing agreements.

Regular or consecutive overtime is allowed only through the consent of a joint committee consisting of the chairman of the Board of Governors of the Building Trades Employers' Association and the chairman of the Building Trades Council. However, occasional overtime made necessary through the exigencies of the work is allowed. The unions either in whole or as a single union are forbidden to strike against any member of the Building Trades Employers' Association, nor are any number of union men allowed to leave the work of a member of the Building Trades Employers' Association. Lockouts on the part of the Building Trades Employers' Association members are also forbidden. In case of the violation of the contract upon the part of union men, employers are allowed to man the work with such men as can be obtained.

A closed shop among building trades employers is indicated in the agreement, which provides "that if workmen not members of the union parties hereto are alleged to be employed on any job whereon any member or members of the Building Trades Employers' Association are doing work, it shall be brought immediately to the attention of the board of arbitration . . . and if the facts are found by said board to be as alleged, it shall not be deemed a violation of this agreement or of any trade agreement for any member of the unions above mentioned to refuse to work on the job in question, unless such workmen are justifiably employed in the case" wherein union men have already violated the contract through strike or through absenting themselves from the job for several days' time.

A permanent board of arbitration is provided for, consisting of five members each of the executive committee of the Board of Governors of the Building Trades Employers' Association and of the executive committee of the Building Trades Council. Disputes arising relative to alleged violations of the agreement or the intent or meaning of any part of it are to be referred to the arbitration board, and if no decision is reached after three days of consecutive meetings the board of arbitration is to select an umpire and his decision in the case shall be final and binding upon all parties.

The following is the wage scale named in the contract:

Class of Work	Dollars Per day, eight hours
Art glass workers	
Asbestos workers and insulators	8.00
Bluestone cutters	8.00
Carpenters	8.00
Dockbuilders, house shorers and sheathpilers	7.50
Cement masons	8.00
Cement and concrete workers (laborers	
Composition roofers and waterproofers	7.00
Composition roofers and waterproofers (foremen)	7.50
Electrical workers	8.00
Electrical workers' helpers	4.50
Elevator constructors	8.00
Elevator constructors' helpers	6.00
Granite cutters	8.00
Hoisting engineers by the week	46.75
Hoisting engineers by the day	9.00
Hoisting engineers running compressors extra per week	7.00
Housesmiths' and Bridgemen's Local No. 40	8.00
Housesmiths' finishers, Local No. 52	8.00
Housesmiths' helpers	6.00
Marble cutters and setters	8.00
April 1, 1920.	
Marble carvers	9.00
April 1, 1920.	
Marble polishers, bed rubbers and sawyers	7.50
April 1, 1920.	
Marble cutters' helpers, riggers, crane and derrickmen	6.00
Mosaic and terrazzo workers	7.00
Mosaic and terrazzo workers' helpers	
Metallic lathers	8.00
Painters and decorators	8.00
Plasterers	8.50
Plasterers' laborers	6.00
Plumbers and gasfitters	8.00
Roofers and sheet-metal workers	8.00
Steam and hot-water fitters	8.00
Steam and hot-water fitters' helpers	6.00
Tilelayers	8.00
Tilelayers' helpers	6.00
Upholsterers	9.25
Wood lathers	8.00

Civil Service Examinations

Canada.—Assistant in wood preservation, Forest Products Laboratory, Montreal, Department of the Interior, $1320 per year. File application with Civil Service Commission of Canada at Ottawa before Dec. 18.

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Town manager, $2400 per year, Dec. 16. To fill vacancy in Ordnance Department, Nitrate Plant No. 1, Muscle Shoals, Ala. File applications before Dec. 16.

Structural steel inspector, Naval Ordnance Plant, South Charleston, W. Va., $7.04 per diem, Dec. 23. File applications before Dec. 23.

Civil engineer, Philippine service, $2500 to $3000 per year. Applications received until further notice.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

BRIDGE BUILDERS' & STRUCTURAL SOCIETY, 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

ENGINEERING INSTITUTE OF CANADA; General Secretary, Fraser S. Keith, 176 Mansfield St., Montreal; Jan. 27-29, Montreal.

AMERICAN ROAD BUILDERS' ASSOCIATION, 150 Nassau St., New York City; Feb. 9-13, Louisville, Ky.

AMERICAN WOOD-PRESERVERS' ASSOCIATION; Secretary-Treasurer, F. J. Angier, Mt. Royal Station, Baltimore; Feb. 10-12, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle St., Chicago; Feb. 20-21, Chicago.

The Engineers' Club of Philadelphia will hold a regular meeting Dec. 16, at which Capt. Fred Place, director, United States Army School of Aërial Photography, Langley Field, Virginia, will speak on "The Engineering Possibilities of the Airplane and the Progress of Aërial Photography in the Recent War." At a junior meeting held Dec. 9 H. A. Hoffer, of the United States Cast-Iron Pipe & Foundry Co., spoke on "The Manufacture and Uses of Cast-Iron Pipe." At the weekly luncheon Dec. 9, T. E. Mitten, president of the Philadelphia Rapid Transit Co., spoke on "Philadelphia's Transit Problem."

The American Association of Engineers has recently organized chapters or clubs in the following cities: Globe and Phoenix, Ariz.; Terre Haute, Ind.; San Antonio, Tex.; Tulsa and El Reno, Okla.; Joliet, Rock Island, Moline and Springfield, Ill.; Butte, Mont.; Davenport, Iowa; Morgantown, W. Va.; Pocatello, Idaho; Arkansas City, Ark.; Akron, Ohio.; New Orleans, La.; Newell, S. Dak.; and at the Universities of Minnesota, Arizona and Michigan.

The Detroit Engineering Society held a meeting Dec. 5 at which Lieut. Col. Alfred H. White, Nitrate Division, U. S. A., and professor of chemical engineering, University of Michigan, spoke on "The Engineer's Problem in Nitrogen Fixation." At the meeting Nov. 28 Charles Whiting Baker, consulting editor, *Engineering News-Record*, and David A. Molitor spoke on the Jones-Reavis bill providing for a national Department of Public Works.

of Michigan, also commented on the proposed bill. A resolution in favor of the proposed Federal Public Works Department was presented by Gardner S. Williams, seconded by David A. Molitor and unanimously indorsed by a representative attendance of the society and associated organizations. The resolution provides that the Detroit Engineering Society and other interested organizations of Detroit request and urge the representatives of Michigan in Congress to give the bill their earnest and continuing support. A copy of the resolution has been forwarded to each of the Senators and Representatives of Michigan in Congress.

PERSONAL NOTES

COL. HENRY C. JEWETT, formerly chief of staff to Maj. Gen. William H. Johnston, 91st Division, has been placed in charge of the St. Paul United States Engineering District, relieving Maj. George W. Freeman, who was one of the few civilian assistants to be put in charge of a district during the war. When war was declared Colonel Jewett was stationed at Portland, Ore., and afterward organized the 316th Engineers. Major Freeman has been transferred to the Chicago district.

CLAUDE H. BIRDSEYE, who was discharged from military service last June with the rank of lieutenant colonel, has been appointed chief geographer of the United States Geological Survey, succeeding R. B. MARSHALL, resigned, as noted elsewhere. Mr. Birdseye has been connected with the Geological Survey since 1901, and has been in charge of work in Hawaii and the Rocky Mountain division. Early in 1917 he became captain of engineers, and soon afterward was sent to France with the rank of major. He served as topographic officer with the First Army and with the Chief of Artillery of the A. E. F., and was promoted to the rank of lieutenant colonel in 1918.

H. W. HOUGHTON, who recently resigned from the engineering department of the Kansas City Southern R.R., has become associated with the Nebraska State Highway Engineering Department as designer, with headquarters in Lincoln.

LINN BROWN, recently in military service, has been appointed city engineer of Jefferson City, Mo.

B. L. TAYLOR has been appointed county engineer, Woodbury County, Iowa, with headquarters at Sioux City.

H. S. ALLEN, who was recently connected with the Portland Cement Association in Kansas territory, has been appointed resident engineer of Federal-aid road projects in Barton County, Kansas, with headquarters at Great Bend.

W. A. WHEELER has engaged in private practice, with office at 2335 Olive St., Kansas City, Mo.

J. O. HACKENBERG, division engineer, Pennsylvania Lines East, with headquarters at Wilmington, Del., has been appointed principal assistant engineer of the southern division, succeeding J. C. AUTEN, who has received a leave of absence.

F. M. SLOANE has been appointed district engineer, Rocky Mountain, Missoula and Idaho divisions of the Chicago, Milwaukee & St. Paul R.R. west of Mobridge, with headquarters at Butte, Mont., succeeding C. T. JACKSON.

COL. E. B. CUSHING, who has received his discharge from military service, has resumed his position as engineer maintenance of way, Southern Pacific Lines in Texas and Louisiana, under Federal management.

F. LAVIS, consulting engineer, American International Corporation, New York City, has been reappointed special lecturer on railway engineering, Sheffield Scientific School, Yale University, and will resume his course of lectures, which was interrupted during the war.

GEORGE E. RENDIGS, building commissioner of Cincinnati, and his two principal assistants, R. R. PANZER and JAMES A. MARTIN, have resigned to become associated in partnership in the practice of architectural engineering.

J. F. COLEMAN, who has completed the construction of the shipyard at Mobile, Ala., for the Chickasaw Shipbuilding & Car Co., and E. H. COLEMAN, who has received his discharge as captain of Engineers, have resumed private practice with office in the Hibernia Bldg., New Orleans, under the firm name of the J. F. COLEMAN ENGINEERING COMPANY.

S. K. YOUNG, formerly field engineer, Miami Conservancy District, at Dayton, Ohio, has resigned to become chief engineer, Upper Scioto Conservancy District, with headquarters at Kenton, where the work involves the improvement of 20 miles of the channel of the Scioto River through Hardin County.

C. S. BENNETT, who has been with the Miami Conservancy District for the past two years, has been appointed field engineer at Dayton, Ohio, succeeding S. K. YOUNG, resigned, as noted above. Mr. Bennett was previously connected with the Department of Public Roads of Kentucky.

FRANCIS DONALDSON and PAUL M. KUDER have organized the American Contracting Co. with offices in the Commercial Engineers' Bldg., 35 W. 39th St., New York City.

MARCUS M. FARLEY will be in charge of the engineering work of the American Contracting Co., 35 W. 39th St., New York City, which has been formed by FRANCIS DONALDSON and PAUL M. KUDER, as noted above.

J. HENRY MILLER, of J. Henry Miller, Inc., contractors, Baltimore, has been elected president of the Baltimore building code committee, with G. R. MORSE, 533 Title Bldg., Baltimore, as secretary.

AMOR KISTNER, engineer, building commissioner's office, Cincinnati, has resigned to become associated with the Ferro-Concrete Construction Company.

RUSSELL EASTON has been appointed engineer, building commissioner's office, Cincinnati, succeeding AMOR KISTNER, resigned, as noted above.

H. P. HAYES, county engineer, Tarrant County, Texas, has been placed in charge of all maintenance and highway work in the county, in addition to his other duties.

MERRITT DRAIN, road engineer, Jefferson County, Kentucky, has been elected president of the State Highway Road Engineers' Association.

L. L. STONE, chief engineer, Pike Light & Power Co., Pikeville, Ky., has become chief engineer, Peerless-Elkhorn Coal Co., with headquarters at Elkhorn City, Ky.

A. T. SMITH, who recently returned from service overseas, has become engineer of roads, Pike County, Kentucky.

W. F. B. HAYNSWORTH, for the past four years city engineer of Greenville, S. C., has resigned to become assistant commissioner of public works of the City of Winston-Salem, N. C., and will become commissioner on the first of the year.

S. HERBERT GRIFFITH has resigned as road engineer of Talbot County, Maryland.

HOWARD M. TURNER, who has been engaged in private practice since his discharge from the United States Engineers, has opened a consulting office at 70 State St., Boston. Before entering military service Mr. Turner was assistant to the president and hydraulic engineer, Turners Falls, Mass., Power and Electric Company.

H. BURDETT CLEVELAND, who has been connected with the sanitary engineering division of the New York State Department of Health for the past 14 years, has resigned as principal assistant engineer of the department, to become a member of the BARTH ENGINEERING & SANITATION CO., INC., New York City.

JOHN WALTER LEDOUX, consulting engineer, Swarthmore, Penn., has been awarded the Edward Longstreth medal of the Franklin Institute for his invention of the "Simplex" venturi meter.

R. B. MARSHALL has resigned as chief geographer of the United States Geological Survey, to undertake the active management of a ranch in the San Joaquin Valley in California, but

will continue his relationship with the Geological Survey in a consulting capacity. He is succeeded by CLAUDE H. BIRDSEYE, as noted elsewhere.

J. N. LEECH has resigned as city engineer of Steubenville, Ohio, and has been appointed county surveyor.

PAUL BURNS EATON has been appointed instructor of mechanical drawing, Carnegie Institute of Technology.

W. W. JAMES has been appointed assistant valuation engineer, Central Railroad of New Jersey and the New York & Long Branch Railroad.

WILLIAM Z. PRICE has been appointed assistant professor of civil engineering, Carnegie Institute of Technology. Mr. Price was formerly assistant editor of *The Collier*.

R. D. COLEMAN, county engineer, Atchison County, Kansas, has been appointed resident engineer in charge of hard-surface road construction in Atchison County.

FREDERICK D. WOODRUFF, New Jersey State Highway Commission, has been appointed instructor of surveying in a new class organized at the Trenton School of Industrial Art.

D. W. WEBSTER, district state highway engineer, Lyon County, Minnesota, has been appointed divisional engineer, with headquarters at the Minnesota Highway Commission offices in St. Paul.

C. W. ANDERSON has been appointed district state highway engineer, Lyon County, Minnesota, with headquarters at Marshall, succeeding D. W. WEBSTER, appointed divisional engineer, as noted above.

E. Y. ALLEN has been appointed valuation engineer, Philadelphia & Reading R.R., Central Railroad of New Jersey and associated lines under Federal management.

C. R. SEABROOK, structural engineer, H. M. Lane Co., Detroit, has been made chief engineer of the company.

CHARLES T. ABRAHAM, engineer, rate and statistical department, United Gas & Electric Engineering Corporation, Memphis, Tenn., and later associated with J. H. PERKINS, consulting engineer, Birmingham, Ala., is now engaged in the appraisal of the Memphis Street Railway Company.

HENRY L. LIDDELL has been appointed instructor in the civil engineering department of the Massachusetts Institute of Technology.

H. L. LANING has been appointed assistant valuation engineer, Philadelphia & Reading R.R., Atlantic City R.R., and Port Reading Railroad.

WILLIAM W. MCCLENDON and A. B. PURNELL have become associated under the firm name of MCCLENDON & PURNELL, and will engage in private practice at Mineral Wells, Tex., specializing in municipal and highway work. Mr. McClendon will continue his work as city engineer of Mineral Wells.

T. REDMOND BURKE, former district engineer, Lewisburg district, Greenbrier County, West Virginia, has been appointed superintendent and general manager of the Duncan Construction Co., Marlinton, W. Va.

G. B. ROBERTS, PAUL STEENSTRUP, and BEN CROSS have entered private practice in Charleston, W. Va., under the firm name of the ROBERTS ENGINEERING CO., and will specialize in municipal work.

JOHN. B. BABCOCK, formerly instructor in civil engineering, Massachusetts Institute of Technology, has been appointed assistant professor of civil engineering.

OBITUARY

FREDERIC P. STEARNS, consulting engineer, Boston, and past president of the American Society of Civil Engineers, died in Boston Dec. 1. Mr. Stearns had been engaged in engineering work for 47 years, and achieved international recognition as a specialist in water-supply, hydraulics, and dam construction.

He was in charge of a great part of the development of the Metropolitan Water-Supply System of Boston and acted as a consultant in water-supply for many other cities. He was recognized as an authority on the design and construction of large earth dams and foundation work. In the administration of President Roosevelt he was a member of the board of consulting engineers for the Panama Canal, and later accompanied Secretary of War Taft to the isthmus to pass upon the stability of foundations for the proposed locks.

Mr. Stearns was born at Calais, Me., in 1851, and received a common-school education. At 18 he went to Boston and began his career as an engineer by obtaining employment in the office of the city surveyor. Three years later he became a member of the engineering staff of the Boston water-works, first as assistant engineer on preliminary surveys and investigations, and, two years later, as engineer in charge of the construction of a portion of the Sudbury aqueduct. At this time he became associated with Alphonse Fteley in experiments relating to the determination of flow of water, and, in 1882, in collaboration with Mr. Fteley, he wrote the paper, "Description of Some Experiments on the Flow of Water Made During the Construction of Works for the Conveying of Water of the Sudbury River to Boston," which was published in Volume XII of the *Proceedings* of the American Society of Civil Engineers. For this the authors received the Norman medal.

From 1880 to 1886 Mr. Stearns was identified with the construction and maintenance of drainage works in the City of Boston, and had charge of the construction of the outlet tunnel under Dorchester Bay, as well as the reservoir and outfall works at Moon Island. From 1886 to 1895 he was chief engineer of the Massachusetts State Board of Health, and had charge of investigations concerning the disposition of sewage from the Charles River and Mystic River valleys, and a new water-supply for Boston and vicinity. It was during this period that the classic experiments on water and sewage treatment at the Lawrence experiment station were begun — experiments with which the names of Mills, Drown, Sedgwick, Hazen, Fuller and others are also associated.

From 1895 to 1901 he was chief engineer of the Boston Metropolitan Water Board, from 1901 to 1907 of the Metropolitan Water and Sewerage Board, and from 1907 until his death he served as consulting engineer of the latter board. As chief engineer of the Metropolitan Water Board, Mr. Stearns was responsible for the design and construction of the Wachusett dam and reservoir, with its notable earth dike, and the design and construction of the Nashua aqueduct and accessories which now supply Boston and 10 other cities and towns. He was one of the first American engineers to employ landscape design on a large scale in connection with municipal water-supply systems and to secure the collaboration of landscape architects to that end.

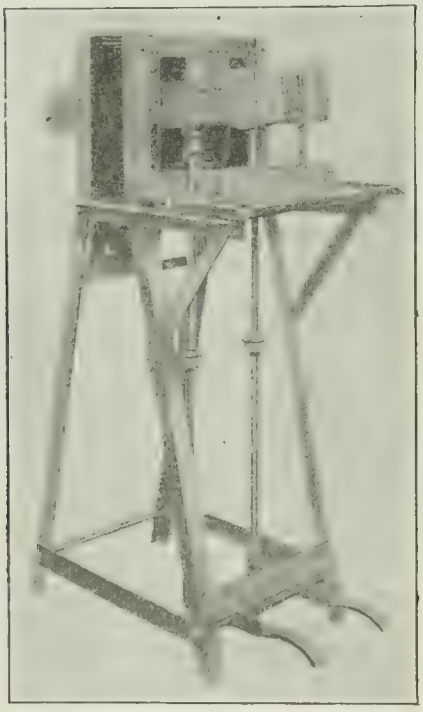
Mr. Stearns' services as a consulting engineer were widely sought. He was retained to advise in water-supply and sewage-disposal matters at Baltimore, Los Angeles, Winnipeg, Seattle, Hartford, Denver, Rochester, Pittsburgh, the District of Columbia, and elsewhere. He had been consulting engineer for the new water-supply of Providence since 1914 and for the Board of Water-Supply of New York City since 1905. He was also called in on the construction of the Chicago Drainage Canal, the Mississippi power dam, and numerous projects in the West and in Mexico.

He had been a member of the American Society of Civil Engineers since 1878. He was a director from 1893 to 1895, vice-president in 1898 and 1899, and was elected president of the society in 1906. He had also served as president of the Boston Society of Civil Engineers. In recognition of his contributions to the advancement of engineering, he received the degree of Master of Arts from Harvard University in 1905 and in 1906 received the degree of Doctor of Science from the University of Pennsylvania. At the Paris Exposition in 1900 he received a gold medal in recognition of his work in water-supply engineering. He was a Fellow of the American Academy of Arts and Sciences and an honorary member of the New England Water Works Association.

MASON R. STRONG, consulting engineer, New York City, died in Passaic, N. J., Dec. 2. Mr. Strong received his education in the School of Architecture and the School of Mines of Columbia University, from which he was graduated in 1889. In 1890 he became connected with the New York, Lake Erie & Western R.R. in masonry and bridge work, and afterward with its successor, the Erie R.R. Three years later he became assistant engineer in charge of structural plans, and in 1895 was appointed assistant engineer for the Erie R.R. on plans of grade-crossing work at Buffalo. In the following year he was in charge of the design and construction of a large amount of bridge work, and in 1900 was in charge of the reconstruction of the Kinzua viaduct and the Chenango Street viaduct at Binghamton, N. Y. Following this work he became bridge engineer of the Erie R.R. He resigned several years ago to enter private practice in New York City.

Heating Rivets Electrically

The General Electric Co. is the designer of an electric rivet heater which has recently been placed on the market. The chief claims for the new device include simplicity of operation, low



ELECTRIC RIVET HEATER

first cost, and maximum efficiency. The general design of the machine is as follows:

A transformer rated at 15 kw. is mounted on angle-iron legs, which may be fitted with wheels. At the front of the transformer, two copper bars are fitted with heavy air-cooled electrode blocks of cast copper, and under these is another copper block which acts as a support and electrical connection for two rivets in series. When the rivets are ended up on the block and the electrodes are allowed to drop on their heads, the circuit is completed and the heating begins. The two electrodes may be raised independently by two foot-pedals. A primary tap switch mounted on the back legs of the machine gives all the variation needed for different lengths and diameters of rivets and the rate of heating desired.

Heaters of the sizes so far developed are a 5-kw., two-jaw heater for rivets up to ½ in., and a 15-kw., two-jaw machine for rivets up to ⅞ in. in diameter. The two-jaw heaters are intended for one-gang use; however, in actual test the 15-kw. machine heated five hundred ½-in. by 1¼-in. rivets in one hour, which is ordinarily enough for two gangs of gun riveters. A number of obvious advantages present themselves in the use of the electric heater.

Asphalt Association Establishes Office in Washington

Washington has been chosen as a district headquarters by the Asphalt Association, whose main office is in New York City. The office will be in charge of Maj. Harry D. Williar, who served overseas with the First Division. Before entering the service Major Williar was an engineer on the Maryland State Road Commission and later with the Baltimore Paving Commission. Included in the Washington district are the States of Maryland, Pennsylvania, Delaware, Virginia and West Virginia.

BUSINESS NOTES

W. E. MOORE & CO., Pittsburgh, Penn., is designing a new carbide plant which will involve the development of a water power of 3700 hp., utilizing a 46-ft. fall of the Saranac River. G. A. Stromblad is president of W. E. Moore & Company.

THE WISCONSIN BRIDGE & IRON CO., North Milwaukee, Wis., has engaged E. P. Rankin, Jr., as representative in the Southwest, with headquarters at El Paso, Texas.

THE STANDARD ASPHALT & REFINING CO., Chicago, has made arrangements with the Insulite Products Co., Inc., of Portland, Ore., to act as its agent for the Pacific coast. The Insulite company was recently organized by F. B. Gilman, with offices in Spokane, Tacoma, Seattle, San Francisco and Los Angeles.

THE REDWOOD MANUFACTURERS' CO. has received the contract for $400,000 worth of "Remco" pipe by the Butte Water Co., Butte, Montana.

ALEXANDER C. BROWN, president of the Brown Hoisting Machinery Co., Cleveland, has been elected president of the Northeastern Ohio division of the National Safety Council.

W. D. WARD has been transferred from the San Francisco office of the Pelton Water Wheel Co. to its New York office, where he will have the title of manager of the Atlantic department, which includes the territory east of the Mississippi, Europe and South America. Mr. Ward has been with the Pelton company for 25 years, and of late has held the position of contract and sales engineer. In New York he succeeds F. W. Gay.

TRADE PUBLICATIONS

The following companies have issued trade publications:

THE J. G. WHITE ENGINEERING CORPORATION, New York City, booklet 8 x 11 in., 24 pages, illustrated, describing "Nitrate Plant No. 1," on which the White Corporation performed the engineering and construction work.

THE WHEELER CONDENSER & ENGINEERING CO., Carteret, N. J., bulletin 112-B, 8 x 10½ in., 36 pages, illustrated, describing condensers, pumps and cooling towers.

THE BALL ENGINE CO., Erie, Penn., pamphlet, 8½ x 11 in., illustrated, entitled "Loading Rock With the Erie Shovel."

THE BUCYRUS CO., South Milwaukee, Wis., bulletins G-1002, G-91, G-141, G-351, G-201, G-141 and G-1751, 8½ x 11 in., eight pages each. They describe various types of "Bucyrus" equipment, including trench excavators, revolving shovels and dragline excavators.

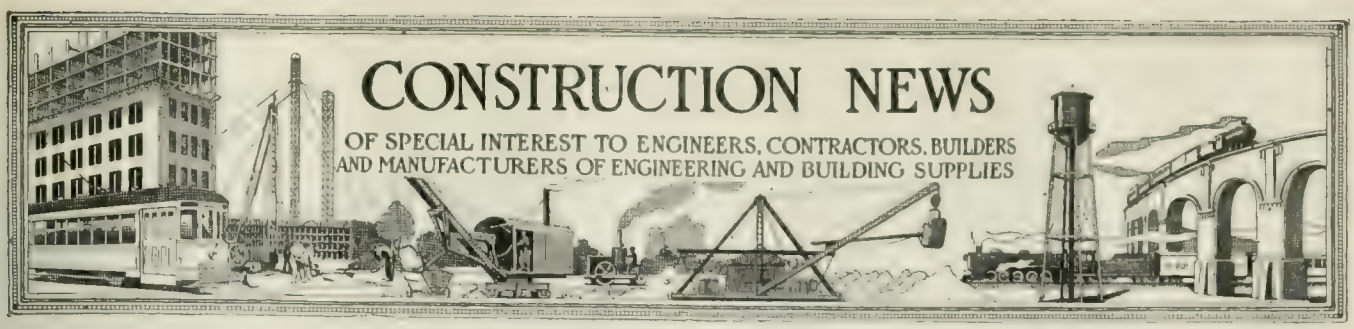
THE ROBBINS ENGINEERING CO., Chicago, Ill.; booklet, 8 x 10½ in., 16 pages, illustrated; shows various forms of portable conveyors and stackers for warehouse and industrial purposes and for loading railway cars.

THE BACHARACH INDUSTRIAL INSTRUMENT CO., Pittsburgh, catalog F and pamphlet P, 6 x 9 in., four pages, illustrated, describing pressure volume indicators and Pitot tubes and orifices for measuring the flow of gases.

THE AMERICAN STEAM CONVEYOR CORPORATION, Chicago, pamphlet 4 x 6½ in., entitled "A Yard of Installations," showing equipment installed by the company in various buildings and industrial plants.

THE WARREN & IRRGANG CO., Springfield, Mass., bulletins numbers 19-1 to 19-4, 8½ x 11 in., illustrated, describing various types of hand trucks for industrial plants.

N. B. PAYNE & CO., New York City, bulletin No. 1, 9 x 11 in., illustrated, 16 pages, showing various types of cargo cranes.



CONSTRUCTION NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

Price advances are indicated by **heavy type**, declines by *italics*

PIG IRON—

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$36 60	$32 60
Northern Basic	34 00	31 05
Southern Ohio No. 2	36 55	31 55
NEW YORK, tidewater delivery		
2X Virginia (silicon 2.25 to 2.75)	39 40	35 65
Southern No. 2 (silicon 2.25 to 2.75)	41 40	36.50
BIRMINGHAM		
No. 2 Foundry	33 00	30 00
PHILADELPHIA		
Eastern Pa	38 10*	33 00*
Virginia No. 2	39 10*	34 40*
Basic	34 60*	29 00†
Grey Forge	34 60*	29 40*
CHICAGO		
No. 2 Foundry Local	36 25	31 40
No. 2 Foundry Southern	38 00	34 10
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley		32.40
Basic	34 40	28.40
Bessemer	35 40	29.35

* F. o. b. furnace. † Delivered

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	$45 00	$55 00	$45 00	$65 00
Standard openhearth rails	47 00	57 00	47 00	67 00
Light rails, 8 to 10 lb	2.58½*	3.13*	2.585*	3.13*
Light rails, 12 to 14 lb	2 54*	3 09*	2 54*	3 09*
Light rails, 25 to 45 lb	2.45*	3.00	2.45*	3.00*

* Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				
	Current	One Year Ago	Chicago	St. Louis	San Francisco
Standard spikes, $\frac{5}{16}$-in and larger	$3 35	$3 90	$4 27	$4 44	$5 65
Track bolts	4 35	4 90	5 17	Premium	6 65
Standard section angle bars	3 00		4 22	Premium	4 60

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

		7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	$1 48	$1.33
San Francisco	Douglas Fir—Green	1 42	1 00
San Francisco	Douglas Fir—Creosoted	2 13	2 00

Prices per tie at Missouri mills. St. Louis prices about 25c. higher.

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0 70	No. 1	$0 55
No. 2	.80	No. 2	65
No. 3	.90	No. 3	75
No. 4	98		
7x9x8 white oak			1 05
7x9x8 red oak (No. 4)	$0 80	No. 5	87

Note.—Add 36c. each for treatment.

PIPE

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
¾ to 3 in. butt welded	47%	57 5%	45%
2½ to 6 in. lap welded	42%	53 5%	41½%
	Galvanized		
	New York	Chicago	St. Louis
¾ to 3 in. butt welded	31%	44%	30½%
2½ to 6 in. lap welded	27%	41%	27½%

Malleable fittings, Class B and C, from New York stock sell at +12½% list prices. Cast iron, standard sizes, 10% off.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York						
	Current	One Month Ago	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4 in.	$61 30	$57 30	$70 70	$62 80	$61 00	$82 55	$70 30
6 in. and over	58.30	54 30	67 70	59 80	58.00	79.55	67 30

Gas pipe and 16-ft. lengths are $2 per ton extra

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh: basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Steel			Iron		
Inches	Black	Galvanized	Inches	Black	Galvanized
⅛, ¼ and ⅜	50½%	24%	¾ to 1½	30%	23½%
½	54½%	40%			
¾ to 3	57½%	44%			

LAP WELD

2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 6	34½%	21½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	46½%	29%	¾ to 1½	39½%	24½%
½	51½%	39%			
¾ to 1½	55½%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2½ to 4	35 %	23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Malleable fittings Class B and C, banded from New York stock sell at list 2% off. Cast iron, standard sizes, 20% off.

CLAY DRAIN TILE—The following prices are per 1000 lin ft.:

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35 00	$35 00	$22 50	$50 00		$33 44
4	51 00	51 00	27 00	60 00	$45 00	50 16
5	65 00	65 00	45 00	70 00	65 00	62 70
6	90 00	90 00	55 00	80 00	90 00	83 60
8	130 00	130 00	100 00	120 00	150 00	133.76

SEWER PIPE—The following prices are in cents per foot for carload lots:

	New York					
Size, In.	Current	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$0.09	$0.117		$0 12		$0 15
4	.09	.117		12	$0 16	15
5	.135	.1755		18	.20	.21
6	135	.1755	$0.16	18	.24	.21
8	.21	.273	21	28	.34	30
10	.315	.4095	.29	42	.47	.42
12	405	5265	.37	54	64	.54
15	.54	.702	56	72	1 00	78
18	.75	.975	91	875	1 35	1 02
20	90	1 17	1 14	1 05	1 80	1 38
22	1 20	1 56	1 46	1 40		1 80
24	1 35	1 755	1 56	1 80	2.24	2 70
27	2 145	260	1 90	2 75		3 30
30	2.376	.288	2 57	3 45		4 20
33	3 15	.378	3 09	4 00		4 025
36	3 5875	4 305	3 37	4 35		4 80
	3	5	8	12	24	36
Boston	$0 105	$0 1575	$0 245	$0 4725	$1 575	$5 0225
St. Paul	125	185				
Denver	.12	18	27	45	1 65	
Seattle			.36			
Kansas City	.12	.18	25	50	1 80	4 60
Los Angeles	.0825†	.1375†	2475	44	1 50	
New Orleans			40 per Cent. off			
Cincinnati	.105	1575	245	4725	1 575	3 5875
Atlanta			34	55	2 00	
Montreal			45 per cent. off			
Detroit	.111	1665	.259	4995	1 935	4 8175
Baltimore	.105	.1575	.245	.4725	1 575	

4-in., 6-in., 30-in. respectively

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices per gallon in tank cars 8000 gal. minimum f.o.b. place named.

	Current	One Month Ago
New York, 45-65% asphalt	$0 04½	$0 04½
New York, liquid asphalt	06	06
New York, binder	06½	06½
New York, flux	04½	04½
St. Louis, 40% asphalt	0424	.0412
Chicago, 40-50% asphalt	035	10
Chicago, 60-70% asphalt	0575	.11
Dallas, 40–50% asphalt	07	07
Dallas, 60–70% asphalt	.08	.08
Dallas, 75–90% asphalt	10	10
San Francisco, asphalt base, per bbl.	2 25	2 10

ASPHALTUM—Price per ton in packages and bulk in carload lots:

	Brand	Package	Bulk
New York	Texaco	$22 00	$14.00
Chicago	Mexican	*22.00*	*16.50**
San Francisco	California	17.00	13.75
Dallas	Texaco and Mexican	32.00	30.00
Seattle	D grade	**25 00**	.....
Denver	Trinidad	45.00	.....
Denver	California	38.00	.....
St. Paul	Mexican	21.00	....
Kansas City	Mexican	*25.00*	*23.00*
Atlanta	Standard	**25 00**	**20.80**
New Orleans		16.50	
t. Louis	Stanolind	24.90	18.40
Detroit	Bermudez	**50 00**	....
Baltimore	Manco	43.00	
Los Angeles	D grade		**15.00**
Montreal			**19.00**

*f.o.b. Whiting, Ind.

PAVING STONE—

Chicago	About 4x8x4 dressed	$2.45	sq.yd.
	About 4x8x4 common	2.20	sq.yd.
San Francisco	Basalt block 4x7x8	**65.00**	per M
Kansas City	Granite	3.00	sq.yd.
Boston	5-in. granite	110.00	per M
St. Paul	Sandstone	2.45	sq.yd.
Atlanta	Granite	**2.00**	sq.yd.
Detroit	Granite, small	**4.10**	sq.yd.
Baltimore	Common	2.30	sq.yd.
Montreal	Granite	5.90	sq.yd.

FLAGGING—

New York	Bronx	$0.21	sq.ft.
	Manhattan	.22	sq.ft.
	Queens, 5 ft. square	.23	sq.ft.
	5x20-in. cross-walk	.75	lin.ft.
Chicago	18 in. wide	.70	lin.ft.

WOOD BLOCK PAVING—

	Size of Block	Treatment	Per Sq.Yd.
New York	3½	16	**$3.35**
New York	4	16	**3.65**
Chicago	4	16	**4.50**
Chicago	3½	16	**3.50**
Chicago	City specifications		5.00
St. Louis	3½	16	**2.90**
St. Louis	4	16	**3.32**
Seattle	4	16	2.55
Kansas City	4	16	3.00
St. Paul	3½	..	**2.45**
Atlanta	3½	16	**2.30**
New Orleans	3½	16	2.63
New Orleans	4	16	**3.00**
Dallas	3½	18	*2.92*
Dallas	4	18	*2.98*
Baltimore	3½	16	**3.60**
Montreal	4	16	*4.60*

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd.:

	Gravel 1½ In. Current	Gravel 1½ In. One Yr. Ago	Gravel ¾ In. Current	Gravel ¾ In. One Yr. Ago	Sand Current	Sand One Yr. Ago
New York	$2 00	$2 00	$2.00	$2 00	$1 25	$1.25
Denver	1 60	1 60	1.60	1 40	1 25	1.10
Chicago	**2 00**	2.00	**2 00**	1.40	**2 00**	1 95
Kansas City	2 50	2 15	3 00	2 60	1 00	1 00
St. Louis	1 78	1 87	1.82	1 35	1 68	1 45
Seattle, per ton	1 25	1 25	1.25	1 25	1 25	1 25
Dallas	**3 50**	2 00	**3.50**	2 00	*2.25*	1.40
St. Paul	1.25	1.25	1.35	1.50	.60	.60
Cincinnati	....	....	....	....	1.30	....
San Francisco	1 15	1.20	1.15	1 20	1 15	1 20
Boston	1.60	2.00	1.60	1 75-2	1 00	1 00
New Orleans	2.40	4.00	2.40	1 80	1.20	2.25
Los Angeles	....	....	....	....	.85	....
Atlanta, per ton	**2 25**	..	2.25		**1 15**	..
Detroit	**2 50**	..	2 00		**2 50**	..
Baltimore	1 54	..	1.75	..	.65	..
Montreal, per ton	1 20	..	..	..	1.10	....

CRUSHED STONE Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In. Current	1½ In. One Year Ago	¾ In. Current	¾ In. One Year Ago
New York	$1 75	$1 70	$1 85	$1.85
Chicago	**2 00**	1 60	**2 00**	1 70
St. Louis	1 65	1 08	1 65	1.08
Dallas	2 90	2 05	**2 90**	1.55
San Francisco	1 15	1 20	1 15	1 20
Boston	2 75*(del)	1 75	2 75*(del)	1 75
St. Paul (lime)	1 15†	1 15	1 25	1 45
Denver		1 60	1 60	1 40
Kansas City	**2 25**	1 70	**2 35**	1.70
Seattle	**2 00**	1 20	**2 00**	1 20
Atlanta	**2.55***	3.36	**2.65***	
New Orleans	4 00		4 35	1 28
Los Angeles	1 20	1 50	1 20	1 60
Detroit	*1.75*	....	*1.75*	..
Baltimore	1 25	....	1 50	....
Montreal	*1.90**	....	**2.15***	....

* Per ton † Limestone; traprock, $1.60 and $1.80 per ton for 1½ and ¾-in.

LIME—Warehouse prices:

	Hydrated per Ton Finished	Hydrated per Ton Common	Lump per 200-Lb. Barrel Finished	Lump per 200-Lb. Barrel Common
New York	$17 50	$14.50	$2.90*	$2 65*
Kansas City	21 00	21 00	2 30	2 20
Chicago	18 00	17 50	1 80	1 10
St Louis	22 00	18 00		2 00
Boston	22 00	18 50	3 70*	3 40*
Dallas	30.00	....	2.75	
Cincinnati	14 70	*11.50*	12 95‡	10 70‡
San Francisco	30 00	19 00		**2 30**
St Paul	23 00	20 00	1 60	1 50
Detroit	**20 00**	**18 00**	**2 00***	1 80*
Seattle	*27 00*		*2 85*†*	2 80†
Los Angeles	2 75†	2 20	*2 75*†*	*2.00*†
Baltimore	19 25	16 75		11 37‡
Montreal	20 00	20.00	15 00‡	15.00‡

* 300-lb barrels. †Per 180-lb. barrel ‡ Per ton.
NOTE—Refund of 10c. per barrel

NATURAL CEMENT—Price to dealers for 500 bbl. or over, f. o. b., exlusive of bags:

	Current	One Year Ago
St. Paul (Austin)	$1.50	$1 93
Kansas City (Ft. Scott)	**1.50**	**1.70**
New Orleans	2.52	....
Atlanta (Magnolia)	**1.90**	....
Cincinnati (Louisville)	1 35	1.80

PORTLAND CEMENT Current prices are for barrels in carload lots, without bags, to contractors:

	Current	One Month Ago Without Bags	One Year Ago With Bags
New York (del.)	$2.80*	$2.80	$4.00
Jersey City (del.)	**2.47**	2.47	4.64
Boston	2.42	2.42	3.67
Chicago	2.00	2.00	2.45
Pittsburgh	2.05	2.05	2.55
Cleveland	2.32	2.32	2.72
Detroit	2 08	2 08	2.68
Indianapolis	2.27	2 27	2.62
Toledo	2 12	2.12	2.62
Milwaukee	2 11	2 11	2.56
Duluth	2 10	2 10	2.60
Peoria	2 12	2 12	2.56
Cedar Rapids	2 18	2 18	2.68
Davenport	2.14	2.14	2.64
St. Louis	2.20	2.20	3.30
San Francisco	2.43	2 43	3.48
New Orleans	2.36	2.36	3.77
St. Paul	2 22	2.20	3.40
Denver	3.12	3.12	3.67
Kansas City	2.26	2 26	3.30
Seattle	**2 68**	2.53	3.33
Dallas	2.03	2.03	2.90
Atlanta	2.50	2.50	....
Cincinnati	**2.35**	2.30	2.80
Los Angeles	2.78	2.78	2.38
Baltimore	**2 90**	2 30	..
Detroit	**2 23**	2 00	..
Montreal	*2.50*	..	..

NOTE—Bag charge is generally 15c each. *Delivered Manhattan, The Bronx or Brooklyn.

TRIANGLE MESH—Price per 100 sq.ft. in carload lots:

PLAIN 4-INCH by 4-INCH MESH

Style Number	Sectional Area Square Inches per Ft.	Width	Pitts-burgh	New York	Chicago	St. Louis	Dallas	San-Fran-cisco
032	0 032		$0 92	$1 16	$0 98	$0.99	$1.13	$1.32
049	0.049	1 18		1 48	1.26	1.26	1.43	1.67
068	0 068	1.44		1 86	1.53	1.56	1.79	2.06
093	0 093	1.85		2.39	1.97	2 00	2.41	2.65
126	0.126	2 28		3.02	2.43	2.47	2.92	3.28
153	0 153	2.72		3.59	2.90	2.95	3.48	3.93
180	0.180	3.12		4.13	3.33	3.39	3.99	.....
245	0.245	4 12		5.44	4 40	4.47	5.27	.....
287	0 287	4.76		6 29	5 08	5.16	6.10	6.86
336	0 336	5.52		7 30	5 89	5.99	7.06	.....
395	0 395	6.40		8.45	6.83	6.94	8.19	.....
PAVING								
036P	0 036		$0 71	$0 92	$0 76	$1 77	$0.80	.....
053P	0.053	1.00		1.28	1 06	1.08	1.12	.....
072P	0.072	1 26		1.66	1.34	1 37	1.46	.....
097P	0.097	1.62		2.12	1.73	1 76	1.88	.....
049R	0.049	1 00		1.28	1 06	1 08	1.12	.....
067R	0.067	1.26		1 65	1.34	1 37	1.46	.....
089R	0 089	1.62		3 11	1 73	1 76	1.88	.....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths. Galvanized is about 10% higher.

EXPANDED METAL LATH—Prices in carload lots per 100 yd. for painted are as follows:

Gage	Weight	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
27	233	$29 10	$34 07	**$29.10**	$29.00	**$32.75**	*32.75*
26	250	30.45	35 23	*30 45*	30.00	**34 50**	34.50
25	300	31 90	36 51	*31.90*	..	**36 75**	36 75
24	340	33 50	37 73	**33.50**	33 00	**39.25**	39.25
22	450	36 60	40 48	..	..	**43.30**	43 30

About 10% additional for smaller quantities.

BARS, CONCRETE REINFORCING—Following quotations are per 100 lb.:

ROLLED FROM BILLETS

In.	Mill Pittsburgh	New York Current	New York One Year Ago	Warehouse, Uncut Chicago	St. Louis	Dallas	San Francisco
¾ and larger	$2.35	$3.52	$4.17	$3.37	$3.84	$4.75	$4.60
⅝	2 40	3 57	4 23	3 42	3.90	4.80	4.65
½	2 45	3 62	4.27	3.47	3.95	4.95	4.70
⅜	2 60	3.77	4.42	3.62	4.20	5.00	4.85
¼	2 85	4 02	4.67	4 87	..	5.05	5.10

Twisted bars cut to length take extra of 29½c. per 100 lb.

ROLLED FROM RAILS

	Chicago	St. Louis	Dallas		Chicago	St. Louis	Dalla
¾ in. and larger	*$3.00*	**$3 65**	$4 25	⅝	*$3.25*	**$3.90**	.
⅝	*3.05*	**3.70**	4 30	¼	*3.50*		
½	*3 10*	**3.75**	.				

BRICK—To contractors price per 1000 in cargo or carload lots is as follows:

	Common Current	Common One Month Ago	Common One Year Ago	Paving Brick	Paving Block
New York	**$24 70**	$15 00	$14.00	No Quotations	
Chicago	12 00	12 00	11 00	.....	.....
St. Louis, salmon	12 00	10 00	12 00	.....	.....
Denver, salmon	14.00†	13.00	9.50	.....	38.00
Dallas	18.57	18.00	16.03	**27.30**	.....
San Francisco	12.50	12 50	12.00	.....	.....
Boston	**27.00**	18.00	16.25	**35.00**	.....
St Paul	14 50	13.00	10.25	.....	40.00
Kansas City	**18.00**	15.00	13.00	**44.50**	.....
Seattle	15.00	15.00	15.00	.....	42.00
Cincinnati	17.00	16.00	16.50	**36.00**	.....
Montreal	**21 00**(del.)	15.00	.....	**75.00‡**	.....
Detroit	**20.00**	19.00	.....	**38.00**	.....
Baltimore (del.)	18.00-20.00	18.00	.....	**25.00**	45.00

†Hard red is $16 in Denver. ‡Not delivered.

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas	Factory Perth Amboy, N. J.
4x12x12	$0.11475*	$0 11925	$0.09	$0 08	$0.1125	$0.1088	
6x12x12	.153*	.159	.1268	.105	.15	.09	$0 1512
8x12x12	.204*		.183	.15		.1152	1944
10x12x12			.19	.173		.2546	2268
12x12x12			.208	.208		.3082	.2916

*Delivered below 72nd St.

	4x12x12	8x12x12	12x12x12
Boston	$0.15	$0.25	$0.44
St. Paul	.087	.158	248
Cincinnati	.08705	1623	2416
Kansas City	.0786	.15	205
Denver	.12	.18	.25
Seattle	.09	.175	.30
Atlanta	.115	.19	.28
Los Angeles	.082	.154	
New Orleans	.165	.22	.325
Detroit	.088	.1674	.2399
Baltimore	.115	.21	2875
Montreal	.19	28	35

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh, together with quotations per 100 lb. from warehouses at places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in	$2 45	$3 47	$4 27	$3.54	$3 47	$4.45	$5 50
Channels, 3 to 15 in	2 45	3 47	4 27	3.54	3 47	4.45	5.50
Angles, 3 to 6 in., ¼ in. thick	2 45	3.47	4.27	3.54	3.47	4.45	5.50
Tees, 3 in. and larger	2 45	3 52	4.27	3 54	3.47	4.45	5.50
Plates	2.66	3.67	4.52	3.54	3.67	4 90	5.75

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	New York Current	New York One Yr. Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
¾ in. and larger	$4.20	$5.00	$5.65	$4.72	$4.99	$6.15	$7.50

CONE HEAD BOILER

¾ in. and larger	4.30	5 10	5.75	4 82	5 09	6 25	7.50
⅞ and 1 1/16	4 45	5 25	5.90	4.97	5.24	6.40	7.50
1 and 1 9/16	4.70	5.60	6.25	5.32	5.49	6.75	7.75

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Chicago	San Francisco	Dallas
Wire	$3 50	$3 90	no stocks	$5.25	$6 90
Cut	4.25	5 85	no stocks	6 65	6.40

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.
No. 1 grade	$1.50	$1 75	$1 90	$2 15	$2.30	$2.55
No. 2 grade	1 35	1.60	1 70	1.95	2.05	2.30

Asbestos asphalt-saturated Felt (14 lb. per square) costs $156 per ton.

Slate-surfaced roofing (red and green) in rolls of 108 sq ft costs $2.25 per roll carload lots and $2.50 for smaller quantities.

Shingles, red and green slate finish, cost $6.00 per square in carloads; $6.25 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq ft)	$70 00	$70.00	$71.00	$71 00
Tar pitch (in 400-lb. bbl)	21.00	18 00	22 00	19 00
Asphalt pitch (in barrels)	34.00	34.00	37 50	37 50
Asphalt felt	68.00	48 00	72.50	72.50

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	3.55	4 64	4.57	5 70	4.82	5 52
No. 12	3.60	4.69	4.62	5.75	4.87	5.57
No. 14	3.65	4.74	4.67	5.90	4 92	5 62
No. 16	3.75	4.84	4.77	6.00	5.02	5.72
Black						
*Nos. 18 and 20	4.15	5.24	5.42	6.75	5.80	6.32
*Nos. 22 and 24	4.20	5.29	5.47	6.80	5.85	6.37
*No. 26	4.25	5.34	5.52	6.95	5.90	6.42
*No. 28	4.35	5.69	5.62	7.05	6.00	6.52
Galvanized						
No. 10	4 70	5 79	5 97		6 25	6 87
No. 12	4 80	5 89	6 07	7.30	6 30	6 92
No. 14	4 80	5 89	6.07	7.30	6 35	6 97
Nos. 18 and 20	5 20	6 19	6.37	7 60	6 65	7 27
Nos. 22 and 24	5.25	6 34	6.52	7.75	6 80	7 32
*No. 26	5.40	6.04	6.67	7.90	6 95	7.47
*No. 28	5.70	7.04	6.97	8.20	7.25	7.77

*For painted corrugated sheets add 30c. per 1000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

LINSEED OIL—These prices are per gallon:

	New York— Current	New York— One Year Ago	Chicago— Current	Chicago— One Year Ago
Raw in barrel (5 bbl)	$1 75	$1 67	$1 92	$1 65
5-gal cans	1 90	1 76	2 07	1 05

WHITE AND RED LEAD—Base price per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Yr. Ago Dry and In Oil
100-lb. keg	13 00	14 50	14 00	14 50	13 00	14 00
25 and 50-lb. kegs	13 25	14 75	14 25	14 75	13 25	14 25
12½-lb. keg	13 50	15 00	14 50	15 00	13 50	14.50
5-lb. cans	15 00	16 50	16.00	16.50	15 00	16 00
1-lb. cans	16.00	17 50	17 00	17 50	16 00	17 00

500 lb. lots less 10% discount; 2000 lb. lots less 10-2½% discount.

LUMBER

San Francisco—Prices of rough Douglas fir No. 1 common, in more than carload lots.

	Lumber Prices in Yards at San Francisco 6-8-12 and 14 Ft	10-16-18 and 20 Ft	22 and 24	25 to 32 Ft
3x3 and 4	$35 00	$35 50	$36 50	$38 50
3x6 and 8	36 00	36 50	37 50	39 50
4x4-6 and 8	36 50	37 50	38 50	40 50
3x10 and 12	36 50	37 50	38 50	40 50
3x14	37 00	38 00	39 00	41 00
4x10 and 12	36 50	37 50	38 50	40.50
4x14	37 50	38 50	39 50	41 50

	24 Ft and Under	25 to 32 Ft	33 to 40 Ft
6x10	$36 00	$38 00	$39 00
6x14	37 50	39 50	40 50
8x10	36 00	38 00	39 00
8x14	37 50	39 50	

New York, Chicago and St. Louis

	Southern Pine New York* 20 Ft. and Under	Southern Pine New York* 22-24 Ft.	Southern Pine Chicago 20 Ft. and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft. and Under	Yellow Pine St. Louis 22-24 Ft
3x 4 to 8x 8	$48 00	$49 00	$55 00	$57 00	$44.00	$45.00
3x10 to 10x10	52 00	52 00	60 00	62 00	48 00	49.00
3x12 to 12x12	56 00	57 00	63 00	65 00	52.00	53 00
3x14 to 14x14	60 00	61.00	68 00	70 00	57.00	58.00
3x16 to 16x16	68 00	68 00	70 00	72 00	63.50	64 50
3x18 to 18x18	74 00	74 00	75 00	77 00	68.00	69 00
4x20 to 20x20	79 00	80 00				

*Prices from Lumbermen's Bureau.

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Other Cities

	8 x 8-In x 20-Ft and Under P.	Fir	Hemlock	Spruce	12 x 12-In. 20 Ft and Under P.	Fir
Boston	$60 00	$55 00	$52 00	$55 00	$65 00	
Kansas City	49.00	49 50	49 50	$49 50	55 00	49.50
Seattle		30 00				31.00
New Orleans	45 00				48.00	
St Paul	60 00	59 00	59.00	46 00	42.00	56.00
Atlanta	62 50	64 50	66 00	76 00	79.50	82.00
Baltimore	48 00				60.00	
Cincinnati	50 00	50 00	47 00		53 00	53.00
Montreal	60 00	65 00	65.00	60.00	73 00†	73 00
Los Angeles*		50 00				51 00
Denver		40 00				40.00

	1-In Rough, 10 In x 16 Ft and Under P.	1-In Rough, 10 In x 16 Ft and Under Fir	1-In Rough, 10 In x 16 Ft and Under Hemlock	2-In T. and Gr. 10 In. x 16 Ft P.	2-In T. and Gr. 10 In. x 16 Ft Fir
Boston	$50 00	$52 00	$52 00	$55 00	$55 00
Kansas City	89 50	81 75	81.75	97 25	84 25
Seattle		33 50			33 50
New Orleans	54 00			55.25	
St Paul	53 00	53 00	53.00	63 00	57.50
Atlanta	85 00	90 00		77 50	87 50
Baltimore (box)	40–42.00			38–42 00	
Cincinnati	50 00	48 00	47 00	50 00	50 00
Montreal	65 00	65 00	65 00	66 00	66 00
Los Angeles*		49 00			
Denver		43.00	43 00		42.00

*Base price, 2x4's, is $45 Los Angeles.

Detroit—2x4x16 Y.P. is $48.00. For other sizes add freight to Chicago quotations.

†Montreal—Up to 32 ft. over which, $3.00 per M increase up to 30 ft.

Dallas—Yellow pine. Price per M:

2x4 to 2x12—12, 14 and 16	$57 00
2x4 to 2x12—10, 18 and 20	59.00
2x4 to 2x12—22 and 24	64.00
4x4, 4x6, 6x6, 8x8 and 3x8	57.50
8x00, 10x00 and 3x10	60.00
12x12 and 3x12	65.00

FREIGHT RATES

On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	$0.30	New Orleans	$0.38½
Buffalo	.17	New York	.27
Chicago	.27	Pacific Coast (all rail)	1.25*
Cincinnati	.23	Philadelphia	.24½
Cleveland	.17	St. Louis	.24
Denver	.99	St. Paul	.49½
Kansas City	.59	Detroit	.33
		Baltimore	.33

Note—Add 3% transportation tax. * Minimum carload, 80,000 lb.

CONTRACTORS' SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55	$2.55	$4

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand, iron rope	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized, less 5%, bright, less 25%.
Chicago, +17½ on galvanized, 35 off on bright.

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ¼-in., 8 ft., ⅜-in., 6; ½-in., 4½; ⅝-in., 3½; ¾-in., 2 ft. 10 in.; ⅞-in., 2 ft. 4 in. Following is price per pound for ¼-in. and larger, in 1200-ft. coils:

Boston	$0.27½	Kansas City	$0.26½
New York	.27	New Orleans	.25½
Chicago	.27	Los Angeles	.28
St. Paul	.26	Seattle	.25
San Francisco	.24	St. Louis	.26½
Atlanta	.29½	Montreal	.32
Denver	.27½	Detroit	.26
Cincinnati	.27½	Baltimore	.25

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder.

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	80%	Black Powder
New York	.....	$0.27½	$0.30	.....	$2.40
Boston	$.2225	.2425	.2675	$.3100	2.20
Kansas City	.185	.2275	.2525	.29	2.45
New Orleans	.2375*	.2275	.2475	.....	.....
Seattle	.1375	.180	.2050	.2475	1.70
Chicago	.1825	.2075	.25	.2925	2.15
St. Paul	.185	.2275	.2525	.....	2.25
St. Louis	.185	.2275	.2325	.2950	1.80
Denver	.1725	.215	.240	.2825	2.25
Dallas	.....	.....	.288	.342	2.75
Los Angeles	.25	.30	.35	2.75	3.00
Atlanta	.22	.245	.265	.....	2.55
Baltimore	.19	.23½	.28½	.30	2.35
Cincinnati	.1825	.2075	.2275	.....	2.10
Montreal	.28	.31	.34	.38	3.90

* For 50%.

POLES—For plain pine poles, delivered New York, the price is as follows:

10-in. butts, 5-in. tops, length 20-30 ft.	$9.00
12-in. butts, 6-in. tops, length 30-40 ft.	11.50
12-in. butts, 6-in. tops, length 41-50 ft.	12.50
14-in. butts, 6-in. tops, length 51-60 ft.	21.00
14-in. butts, 6-in. tops, length 61-71 ft.	23.50

Note—At the present time it is almost impossible to give accurate prices on poles. The above are only nominal.

	Dallas Aug. 1, 1919
6-in. x 20-ft.	$4.60
6-in. x 30-ft.	7.10
8-in. x 30-ft.	8.45
8-in. x 35-ft.	10.38

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges.

	New York	Chicago	St. Louis
No. 1 railroad wrought	$24.00	$23.00	$25.00
Stove plate	17.50	24.00	26.50
No. 1 machinery cast	25.50	29.75	30.00
Machine shop turnings	12.00	10.85	15.50
Cast borings	14.00	11.85	15.00
Railroad malleable cast	16.50	24.00	25.00

SHIP SPIKES—Current prices per 100 lb.

In.	San Francisco Galv.	San Francisco Black	Seattle Black
½	$9.20	$8.50	$8.55
⅜	8.75	6.75	8.25
¼	8.60	6.60	8.30

Pittsburgh base, $3.85 to $4 per 100 lb.

LABOR RATES AND CONDITIONS THROUGHOUT THE COUNTRY

S means scarce; E, enough; P, plentiful

Cities	Brick-layers	Car-penters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor	Remarks
Atlanta	$0.90S	$0.60-75P	$0.50-65P	$.40-.45P	$0.60-.65	$0.75	$0.35P	Atlanta—Some bricklayers are receiving $1.10 to $1.25 an hour. Some shortage of skilled labor. No strikes.
Baltimore	1.00E	.80-90E	.87½E	.46-.54E	.74E	.87½E	.35-.45P	Baltimore—Labor sufficient in all trades.
Boston	.90-.92P	.85-.92½P	.90-1.00P	.60-.70S	80-90P	1.00P	.52½-.62½E	Boston—Degnon Construction Co. is advertising for common labor for tunnel work at Kingston, 45 to 60c. Labor agencies supplying lumber camps offer 50c. for long jobs. Labor generally plentiful.
Cincinnati	.....	.....	.70	.....	.50	.....	.....	
Dallas	1.00E	.87½S	.87½E	.37½-.40S	.....	.75S	.35S	Dallas—Common labor very scarce.
Denver	1.00E	1.00E	.87½E	.72	.....	.87½E	.56½E	Denver—Hod carrier's strike settled with 50c. per day increase, effective Jan. 1.
Detroit	1.10S	.85E	.90.1E	.65-70E	.90P	.85-.90E	.60-.65E	Detroit—Bricklayers receive as high as $1.40 on residence work. Labor shortage clearing up. No general strikes, but construction is retarded by shortage of building materials.
Kansas City	1.12½E	1E	1.12½E	.92½E	1E	1.12½E	.50E	Kansas City—All trades busy.
Los Angeles	.87½E	.75E	.75P	.56-.75S	.75P	.75P	.50-.62½E	Los Angeles—These figures are of Oct. 1.
Montreal	.75	.75	.65S	.50-55S	.55P	.45-.55S	.30-.45S	Montreal—Good labor scarce account of exodus of foreigners, which comprise 75 per cent. of Canadian labor.
New Orleans	.87½S	.75	1.00	.60	.80-1.00	.75	.30-.35	
New York	.87½	.81¼	.87½	.57½	.81¼	.87½	.56¼	New York—New agreement effective Jan. 1.
Pittsburgh	1.00	.90	.90	.60	.60	1.00	.40-.45S	Pittsburgh—No strikes.
St. Louis	1.00	.87½	1.00-1.12½	.70	.80-.92½	.90	.45-.60	St. Louis—Skilled labor, 50c. to 75c. Bricklayers on sewers, $1.00.
St. Paul	.87½	.75	.80	.50	.80	.85	.47½	St. Paul—On Aug. 12, bricklayers asked for $1, ignoring agreement to work until May 1, 1920, at 87½c. Sewer diggers, 50c. an hour; paving-block layers, 50c.; teams, 90c.
San Francisco	1.25E	1.00E	1.00E	.87½E	1.00E	1.00E	.45-.50E	San Francisco—All lines busy. No strikes.
Seattle	1.12	.93½	.94	.75-.80	.90	1.00	.75S	Seattle—Considerable residence construction; building construction improved over last month. Street and road work booming. Labor situation easier, although there is a shortage in skilled labor.

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng News-Record
Dec. 16	Orange, Va.	Dec. 11
Dec. 17	Canton, O.	Dec. 11
Jan. 5	Galesburg, Ill. Adv. Dec. 11.	Dec. 11

SEWERS

Dec. 15	Okmulgee, Okla.	Dec. 4
Dec. 15	Muskegon, Mich.	Dec. 11
Dec. 18	Milwaukee, Wis.	Dec. 11
Dec. 19	Cleveland, O.	Dec. 4
Dec. 22	Euclid, O.	Dec. 4
Dec. 31	Grasse Pointe, Mich.	Dec. 11
Jan. 15	Duluth, Minn.	Dec. 11

BRIDGES

Dec. 15	Aspermont, Tex.	Dec. 4
Dec. 15	Morris, Minn.	Dec. 11
Dec. 19	Little Rock, Ark.	Dec. 11
Jan. 6	Owatonna, Minn.	Dec. 11
Feb. 7	Bethlehem, Pa.	Dec. 11

STREETS AND ROADS

Dec. 15	New York, N. Y.	Dec. 11
Dec. 15	Muskegon, Mich.	Dec. 11
Dec. 15	Ft. Scott, Kan.	Dec. 11
Dec. 16	Newark, N. J.	Dec. 4
Dec. 16	Rochester, N. Y. Adv. Dec. 4.	Dec. 4
Dec. 16	Washington, Ga.	Dec. 4
Dec. 16	Natchez, Miss.	Dec. 11
Dec. 17	Riverside, Cal.	Dec. 4
Dec. 18	Frankfort, Kan.	Dec. 11
Dec. 19	Versailles, Mo.	Dec. 11
Dec. 19	St. Louis, Mo.	Dec. 11
Dec. 19	Sylvester, Ga.	Dec. 4
Dec. 20	Waynesburg, Pa.	Dec. 11
Dec. 22	Eutaw, Ala.	Dec. 11
Dec. 22	Rapid City, S. D.	Dec. 11
Dec. 22	St. Louis, Mo.	Dec. 11
Dec. 22	Rapid City, S. D.	Dec. 11
Dec. 22	Wenatchee, Wash.	Dec. 4
Dec. 22	Macon, Miss.	Dec. 11
Dec. 23	Ventura, Cal.	Dec. 11
Dec. 23	Gaylord, Minn.	Dec. 11
Dec. 23	Henderson, Minn.	Dec. 4
Dec 26	Wauwatosa, Wis.	Dec. 11
Jan. 5	St. Louis, Mo.	Dec. 11
Jan. 15	St. Louis, Mo.	Dec. 11
Jan. 17	St. Louis, Mo.	Dec 11
Jan. 19	Finch, Ont.	Dec. 4
Jan. 28	St. Louis, Mo.	Dec. 11

EXCAVATION AND DREDGING.

Dec. 17	Portage, Wis.	Dec. 4

INDUSTRIAL WORKS

Dec. 15	Ft. Worth, Tex.	Dec. 4
Dec. 17	Brooklyn, N. Y.	Dec. 4
Dec. 19	Tahlequah, Okla.	Dec. 11

BUILDINGS

Dec. 15	Pittsburg, Kan.	Dec. 4
Dec. 15	East Cleveland, O.	Dec. 4
Dec 15	Three River, Mass.	Dec. 11
Dec. 15	Philadelphia, Pa.	Dec. 11
Dec. 15	Waynesboro, Pa.	Dec. 11
Dec. 15	Waterbury, Conn.	Dec. 11
Dec. 15	Baltimore, Md.	Dec. 11
Dec. 16	New Bedford, Mass.	Dec. 4
Dec. 16	Stennett, Ia.	Dec. 4
Dec. 17	Wards Island, N. Y.	Dec. 4
Dec. 17	Austin, Minn.	Dec 11
Dec. 17	Meckling, S. D.	Dec. 11
Dec. 17	Cleveland, O.	Dec. 4
Dec. 18	Pittsburgh, Pa.	Dec. 4
Dec. 18	Albany, Ga.	Dec. 11
Dec. 19	Macksburg, Ia.	Dec. 4
Dec. 19	Cleveland, O.	Dec. 4
Dec. 19	Carlisle, O.	Dec. 4
Dec. 20	Ness City, Kan.	Dec. 4
Dec. 20	Independence, Kan.	Dec. 4
Dec. 20	Indianapolis, Ind.	Dec. 11
Dec. 22	Yuma, Ariz.	Dec 4
Dec. 22	Lafayette, Minn.	Dec. 11
Dec. 22	Detroit, Mich.	Dec. 11
Dec. 23	Fairport, O.	Dec. 4
Dec. 29	Cleveland, O.	Dec. 4
Dec. 22	Santa Monica, Cal.	Dec. 11
Dec. 27	Chandle, Ariz.	Dec. 11
Dec. 30	Mt. Pleasant, Ia.	eDc. 11
Jan. 1	Bloomer, Wis.	Dec. 11
Jan. 1	Vancouver, B. C.	Dec. 11
Jan. 2	Duluth, Minn.	Dec. 11
Jan 3	McKeesport, Pa.	Dec. 11
Jan. 3	Woodbine, Ia.	Dec 11
Jan. 5	Gaza, Ia.	Dec 11
Jan. 10	Kenosha, Wis.	Dec. 11
Jan. 13	Storm Lake, Ia.	Dec. 4
Jan. 15	Jacksonville, Ill.	Dec. 11
Jan. 19	Lowell, Mass.	Deo. 11
May 15	Syracuse, N. Y.	Dec. 11

FEDERAL GOVERNMENT WORK

Dec. 17	Heating — Spec. 4091 — Charleston, S. C.	Dec. 4
Dec. 17	Cranes—Spec. 4092—Norfolk, Va.	Dec. 4
Dec. 17	Cranes—Spec. 4092—Philadelphia, Pa.	Dec. 4
Dec. 17	Concrete Walls — Spec. 4096—Paris Island, S. C.	Dec. 4
Dec. 19	Dredging—Seattle, Wash. Adv. Dec. 4.	Dec. 4
Dec. 23	Animal House Extension — Washington, D. C.	Dec. 4
Dec. 23	Cranes — Spec. 4092 — Norfolk, Va.	Dec. 11
Dec. 23	Cranes—Spec. 4092—Philadelphia, Pa.	Dec. 11
Dec. 26	Lock Gates — Wheeling, W. Va. Adv. Dec. 4.	Dec. 4
Dec. 30	Electric Elevators—Stapleton, N. Y.	Dec. 11
Dec. 30	Remodeling Custom and Court House—Toledo, O.	Dec. 11
Feb. 2	Tower and Dwelling—Rincon, P. R. Adv. Dec. 11.	Dec. 11

MISCELLANEOUS

Dec. 16	Foundation—New Bedford, Mass	Dec. 4
Dec. 16	Pipe and Castings, Newark, N. J.	Dec. 11
Dec. 17	Tractor — Hollidaysburg, Pa.	Dec. 4
Dec. 17	Transmission Line—Hollidaysburg, Pa.	Dec. 11
Dec. 19	Gas Distributing System—Avalon, Cal.	Dec. 11
Dec. 19	Pump—Cleveland, O.	Dec. 4
Dec. 22	Electric Pump—Sault Sainte Marie, Mich.	Dec. 4
Dec. 23	Jib Cranes — New York, N. Y. Adv Dec 4.	Dec. 4
Jan 22	Pipes, Valves, etc. — St. Louis, Mo.	Dec 11

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

Conn., Bristol—Bd. Water Comm., 235 Main St., having plans prepared by D. F. Crowley, engr., 192 Main St., for 60,000,000 gal. earth and concrete reservoir.

S. C., Williston—Comrs. Pub Wks. soon let contract laying water mains in various streets. Work involves 5000 ft 18 in., 50 ft. 10 in., 725 ft. 8 in. and 10,348 ft 6 in. pipe, 6.5 tons casting, 26 hydrants, 29 valve boxes, etc. Ryan Eng. Co., Sumter, engrs.

La., Shreveport—City voted $400,000 bonds to improve waterworks and sewerage system.

O., Dayton—City plans to build 15,000,000 gal. storage reservoir and 2 feed lines from reservoir, at Ohmer Park. About $175,000. F. O. Eichelberger, city engr.

O., Middlefield — Village plans to build pumping station and pipe line. About $30,000 E. Reed, clk.

Ind., Michigan City—City plans to build waterworks plant. About $150,000. C. Crossman, 1503 Merchants Bank Bldg., Indianapolis, engr.

Wis., Cedarburg—City plans to build waterworks system. About $75,000. T. Bechley, aud. Engineer not selected.

Wis., Rio—Village voted $28,500 bonds to improve waterworks system. W. G. Kirchoffer, 31 Vroman Blk., Madison, engr.

Minn., Hopkins—Village plans to build 750 ft well and install pumping machinery. About $20,000. J. W. Shaffer & Co., 591 New York Life Bldg., Minneapolis, engrs.

Kan., Aurora—City plans to build waterworks system, pumping plant, steel tank, etc. About $30,000. Engineer not selected.

N. D., Aneta—City having plans prepared improving waterworks system. Cost to exceed $10,000. T. R. Atkinson, Bismarck, engr.

N. D., Dunseith—State Bd. Control, Bismarck, preparing plans for water softening plant for State Tuberculosis Sanitarium, here. About $5000.

N. D., Mayville—City plans election soon to vote on $10,000 bonds to install water softening plant. A. Jorndet, city engr.

N. D., Ray—City having plans prepared for improving waterworks system. About $25,000. T. R. Atkinson, Bismarck, engr.

N. D., Williston—City plans to alter waterworks plant and install new filter bed. A. Jack, Williston, city engr.

Okla., Depew—City voted $45,000 bonds to extend waterworks and electric light systems. Engineer not selected.

Okla., Fairview—City voted $90,000 bonds to improve waterworks system. Engineer not selected.

Idaho, Newdale—Village plans to issue $25,000 bonds to build waterworks system. E. M. Stocks, chn.

Idaho, Preston—City election Dec. 16, to vote on $500,000 bonds to build waterworks system.

Wash., Tacoma—City plans to improve water system, involving 6 and 8 in. wooden water mains with necessary blowoffs, circulating connection gates, crosses, etc. About $8076. J. C. Manley, city engr.

Ore., Echo—City plans to improve waterworks system by extending it to side streets and replacing all wooden pipes with 8 in. c.i. mains. About $5000.

Ore., Klamath Falls—Klamath Irrigation Dist. plans election in January to vote on $175,000 bonds to build reservoir, dam, flumes, canals and laterals in Klamath Co. adjoining Klamath Falls. I. R. Struble, mayor.

Ore., Seaside—City Council adopted resolution to extend watermains in side streets. About $5000. E. S. Abbot, aud.

Cal., Glendale—City voted $260,000 bonds to extend water system and build power generating plant. E. M. Lynch, Central Bldg., Los Angeles, engr.

Cal., Hayward—City voted $200,000 bonds to build waterworks system. M. B. Templeton, clk. Noted June 12

Cal., Yucaipa—Redlands & Yucaipa Land Co. plans to construct waterworks system, to consist of several pumping plants, steel pipe lines and reservoirs. About $100,000. Engineer not selected.

BIDS DESIRED

Va., Orange—Until Dec. 18, by town, building c. i. water mains from town to Rapidan River and installing filtration plant and pumping station. Work will be let in 4 sections. (1) furnishing 3 mi. 8 in. c. i. pipe, (2) digging ditches and laying pipe, (3) furnishing and installing 1,500 gal. per hour filtration plant, (4) furnishing and installing pumping plant to include two 6 h. p. crude oil engines, two 250 gal. per min. centrifugal pumps, 150 ft. head, one 250 gal. per min. centrifugal pump, 50 ft. head. Saville & Claiborne, Inc., 7th and Main Sts., Richmond, engrs.; advertised in this issue.

O., Canton—Until Dec. 17, by W. I. Zink, dir. pub. serv., building re'n-con equalizing basin, 15,000,000 gal. capacity, including excav., piping, gate valves and sluice gates, and other appurtenances. R. W. Pratt, 716 Hippodrome Bldg., Cleveland, engr.; advertised in this issue.

Waterworks (Continued)

O., Toledo—Until Dec. 16, by D. H. Goodwillie, dir. pub. serv., laying 17,500 ft. 30 and 42 in. c.i. force main together with setting of 15 valves, also trenching, backfilling, repaving, and building gate chamber, etc. W. G. Clark, 1047 Spitzer Bldg., consult. engr.

Ill., Galesburg—Until Jan. 5, by city, building complete pumping unit. W. L. Boutelle, clk.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—Dept. Water, Gas & Electricity received lowest 3 bids, Nov. 25, laying water mains in East 167th St., etc., from Beaver Eng. & Contg. Co., 51 Chambers St., $376,406; Booth & Flinn, 17 Battery Pl., $388,000; F. L. Paino, Woodhaven, L. I., $385,689.

O., Silver Lake (Cuyahoga Falls P. O.)—Village received bids building two 1 story 17 x 17 ft., concrete, steel and brick pump houses, from Gangl Constr. Co., 2nd Natl. Bank Bldg., Akron, $10,238; Aljer & Tillman, Guardian Bldg., Cleveland, $11,478. Noted Dec. 4.

★**Mich., Detroit**—City will lay 14,185 ft. 6-in. mains in Dexter Blvd., Seven Mile Rd., Fairview, Blaine, Prairie, Scotte, Petoskey, Lark, Kern, Gladstone, Senator, Trenton, Holmer, Milner, Milton, Dalrymple, Florence, Warren, Beniteau, Shields, Clarion, Ilene and Elridge Aves.; 13,133 ft. 8-in. mains, 51st St., 8 Mile Rd., Vernon, Chalmers, Hildale, Martindale, Klinger, Montcalm, Elmdale, Algonquin, Casper, Burnette, Fayette, Bryden and American Aves.; 360 ft. 10-in. mains, Central Ave.; 1010 ft. 12-in., Livernois Ave., 1310 ft. 24-in. mains, Van Dyke Ave. Work will be done by day labor.

Wash., Seattle—Bd. Pub. Wks. received bids Nov. 24, building water mains in 80th St., et al, involving 2556 ft. 6-in. and 275 ft. 2-in. wood pipe, banded for 250 ft. head, from F. Agostino, 1335 21st St., S., $16,052; Coluccio & Co., Seattle, $17,109; Scalzo & Co., Seattle, $17,161.

★**Wash., Seattle**—Bd. Pub. Wks. let contract replacing water mains in West 45th St., et al, involving 29,920 lin.ft. 8-18 in. class "C" c.i. pipe, to S. A. Moceri, 1515 West Barrett St., $147,078; West 61st St., involving 33,112 lin.ft. 8-12 in. class "C" c.i. pipe, and West 50th St., involving 32,760 lin.ft. 8-16 in. class "C" c.i. pipe, to Jahn & Bressi, Seattle, $135,884 and $146,723 respectively.

Sewers

PROPOSED WORK

N. J., Weehawken—Town Council plans to build new sewer in West 18th St. About $10,000.

Pa., Hazelton—See "Streets and Roads."

Md., Hagerstown—City plans to build sewerage system and sewage disposal plant. About $270,000. J. McP. Scott, mayor.

La., Shreveport—See "Waterworks."

O., Ashtabula—City receives bids about March, building sewage disposal plant. L. A. Amsden, city engr.

O., Toledo—H. McClure, city engr., soon lets contract building 8000 ft. 8-18 in pipe sewers in Detroit and Sylvania Aves. About $12,000.

Ind., Huntingburg—City plans to build sewerage system and disposal plant. About 75,000. C. Brossman, 1503 Merchants Bank Bldg., Indianapolis, engr.

Mich., Adrian—State Bd. Charities, Lansing, having tentative plans prepared for trenching and laying vitr. crock sewerage system in grounds of Industrial Home for Girls, here. About $20,000. A. Jewell, c/o State Bd. Health, Lansing, engr.

Mich., Saginaw—City Council having plans prepared by H. H. Eymer, engr., City Hall, for sewers in Bay and Ames Sts. from State St. to north city line, Charles St. from Monroe to Cooper Sts. and Alger St. from Holland to Ruckle Sts., involving 12-24 in. vitr. crock pipe. About $30,000.

Wis., Cedarburg—City plans to build pipe sewer in Main St. and install gravity-flow sewage system. About $100,000. Engineer not selected.

Wis., Eau Claire—City having plans prepared building 9700 ft. sewers in North Side Dist. About $16,000. A. R. Garnock, city engr.

Wis., West Allis (Milwaukee P. O.)—State Sanitary Engineer, Madison, has recommended reconstruction of west end sewage disposal plant. About $10,000. A. Schneider, city engr.

Ia., Winfield—City receives bids in January, building 5 mi. sewers and sewage disposal plant. About $100,000. H. R. Green, 107 North 2nd St., Cedar Rapids, engr.

Neb., Gibbon—City plans to build new sewerage system. About $75,000. Architect not selected.

N. D., Aneta—City having plans prepared for improving sewerage system. About $15,000. T. R. Atkinson, Bismarck, engr.

N. D., Kenmare—City plans to install storm water sewer. About $15,000.

N. D., Ray—City having plans prepared improving sewerage system. About $45,000. T. R. Atkinson, Bismarck, engr.

Okla., Dilworth—City voted $20,000 bonds to build sanitary sewerage system.

Okla., Fairview—City voted $40,000 bonds to improve sewerage system. Engineer not selected.

Wash., Toppenish—City plans to build 6000 ft. 8- 15-in. trunk sewer in Swasey and Woodlawn Additions, to connect with existing sewer. About $15,000.

Ore., Portland—City Council adopted resolution to build East 33rd and Stafford Sts. sewerage system, vitr. or cement pipe, with necessary lampholes, manholes, catchbasins, sewer service pipes and branches. Cost $229,646. O. Laurgaard, city engr.

Ore., Portland—City soon receives bids building vitr. or cement sewers in Ainsworth and Mississippi Aves., $13,989; Webster and East 12th Sts., $24,957; Carlton Ave. from East 39th to Eastmoreland Sts., $1520; Glenn and Ainsworth Aves., $5089; East 29th St., $20,327; Ainsworth Ave. and East 29th St., $6465; Minnesota and Ainsworth Aves., $24,720; Jordan St. from Lombard to Butler Sts., $3932; Glenn Ave. from Ainsworth Ave. to North St., $8368; Wygant and East 29th Sts., $21,106. O. Laurgaard, city engr.

Ore., Portland—City Council soon lets contract building sewers in Glisan St. from 10th St. to Willamette River, cost $37,366; East 65th and Stanton Sts.; Division St. from East 7th to East 9th Sts., 5th Ave. from Nevada St. to sewer on south line of lot 14, Block J, Fulton Park; East 84th St. from East Burnside to East Stark Sts.; Bradford and Alta Sts. sewerage system, cement or vitr. pipe. O. Laurgaard, city. engr.

Ore., Seaside—City Council adopted resolution to extend sewerage system in side streets, vitr. or cement pipe. About $15,000. E. S. Abbot, aud.

Cal., Calipatria—City election Dec. 16 to vote on $40,000 bonds to build sewerage system. E. M. Lynch, Central Bldg., Los Angeles, engr.

Cal., Hayward—City voted $15,000 bonds to build outfall sewerage system. M. B. Templeton, clk.

BIDS DESIRED

Mich., Grosse Pointe—Until Dec. 31, by M. L. Brown & Son, engrs., 823 Chamber Commerce, Detroit, building storm sewerage system in Jefferson Ave., and sewer outlet to discharge into lake, involving 1100 ft. 36 in. rein.-con. or segmental block, and 2490 ft. 15-24 in. vitr. crock pipe. About $28,000.

Mich., Muskegon—Until Dec. 15, by B. H. Tellman, city recdr., building sewer in Western Ave., Special Sewer Dist. No. 30; Sect. 1, involving 200 ft. 48 in. c.i. pipe, 1245 ft. 24-48 in. rein.-con. or segmental block, 485 ft. 12 and 18 in. tile; Sect. 2, block, 485 ft. 12 and 18 in. tile; Sect. 2, furnishing and driving 100 piles in Muskegon Lake, placing 97 pieces 6 x 10 in. cross ties, 80 lin.ft. 6 x 12 in. timber, 1000 lb. iron, also furnishing and placing 980 ft. 48 in steel pipe with flanged ends and gaskets.

Wis., Milwaukee—Until Dec. 18, by J. H. Fowles, secy. sewerage comn., building sewerage system at east side of Jones Island, including 1800 lin.ft. pile and timber bulkhead, 2400 lin.ft. steel sheet piling cofferdam and 170,000 cu.yd. excav. T. C. Hatton, city engr.

Minn., Duluth—Until Jan. 15, by J. A. Farrell, city comr., building 2330 ft. rein.-con. sanitary sewer in 45th Ave. west to Traverse Alley thence to 49th Ave. W. About $15,267. L. Ayers, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Lynn**—City let contract tearing out and repairing 840 lin.ft. outfall sewer involving 8 brick manholes, 17 ton reinforcing steel bars, 250 cu.yd. concrete, 2900 cu.yd. earth and 10 cu.yd. rock trenching, to A. Baruffaldi, 5 Parker Pl., Somerville, $34,112.

★**Conn., Waterbury**—City let contract laying 1869 ft. 15 in. vitr. sewer in Bunker Hill Ave., to R. Diorio, 86 East Main St., $13,489; 640 ft. 24 in. vitr. pipe conduit in Beacon St. from Fleet to Crown Sts., to DeSimone, Mazzafero & Co., 32 Walnut St., $5669.

★**Conn., Waterbury**—City let contracts to R. Diorio & Co., 86 East Main St., building sewers in Buckingham and Lounsbury Sts., involving 602 ft. 8 in. vitr. pipe, $4.08 per ft., 2 brick manholes, $130 each, 100 cu.yd. rock excav., $20 per cu.yd., total cost, $4716; to A. Lambo, Box 939, in Hawthorne Ave., Geddes Terrace, Rutland and Russell Sts., 4450 ft. 8 in. vitr. pipe, $4.51 per ft., 250 ft. 9 in., $4.60, 22 brick manholes, $125 each, 70 cu.yd. rock excav., $15 per cu.yd., $25,020; to Barbara & D'Aurio, 63 Park St., in Clairmount Ave., Seymour, Addison and Francis Sts., 4699 ft. 8 in. vitr. pipe, $4.43 per ft., 19 brick manholes, $110 each, 75 cu.yd. rock excav., $19 per cu.yd., $24,382.

N. Y., New York—Acting President, Manhattan Boro., received bids Nov. 25, repairing barrel sewer in (a) Coenties Slip, (b) 5th St., East River, (c) 21st St., East River, (d) emergency repair to overflow at 129th St., from J. Riches, 23 Willow Pl., Brooklyn, (a) $10,680, (b) $9903, (c) $8721; J. F. Higgins, (a) $13,421, (b) $12,609, (c) $12,060; Reilly Contg. Co., Elmhurst, L. I., (a) $14,426, (b) $11,795, (c) $11,055, (d) $2430; J. J. Hademan, (b) $10,624, (d) $1610; H. E. Fox, 81 East 125th St., (d) $1650.

★**O., Cleveland**—Corrigan Realty Co., 909 Williamson Bldg., let contract building sewer in McKinley Ave., involving 2880 ft. 8-20 in. vitr. pipe, 12 manholes, etc., to Frederich & Hosine, 635 Bradley Court, $14,739.

O., Cleveland—E. W. White, East 79th St. and St. Clair Ave., received bids building sewer in Edgewood Ave., involving 1770 ft. 20-30 in. vitr. pipe, 10 manholes, etc., from D. Zullo, 10501 Hudson Ave., $14,657; B. W. Ernest, 14011 Madison Ave., $14,832.

Mich., Detroit—City received bids building sewers (a) No. 3165, (b) 3208, (c) 3209, (d) 3227, (e) 3235, from Wenzel Constr. Co., 54 Buhl Bldg., (a) $11,291, (b) $10,683, (c) $15,932, (d) $18,796, (e) $12,449; Western Constr. Co., 1208 Ford Bldg., (a) $9139, (b) $9923, (c) $13,923, (e) $10,531; Lennane & McIlvenna, 1205 Book Bldg., (a) $9875; Liberty Constr. Co., Penobscot Bldg., (b) $10,443, (c) $12,936, (d) $12,240, (e) $11,967.

★**Mich., Detroit**—City will build sewers Nos. 3218, 3230, 3231, 3237, 3240, by day labor under supervision of Dept. Pub. Wks.

★**Mich., Detroit**—City let contract building 2312 ft. egg shaped sewer in Raymond Ave., concrete or segmental block, varying in size from 3 ft. x 4 ft. 6 in. to 3 ft. 4 in. x 5 ft., to R. F. Baker, 485 Elmhurst Ave., $47,500; 1525 ft. sewer extension in Dexter Blvd., brick, concrete or segmental block, cylindrical section varying from 3 ft. 6 in. to 4 ft., to Lennane & McIlvenna, 1205 Book Bldg., $14,995.

★**Mich., Muskegon Heights**—City let contract laying and completing lateral and main sewerage system in Dist. No. 31, involving 22,000 ft. 10-24 in. vitr. crock pipe, to G. W. Clark, Muskegon.

Minn., St. Paul—H. W. Austin, city purch. agt., received bids Nov. 24, building sewers in Bway. between 4th St. and Miss-

Sewers (Continued)

issippi River, from O'Neil & Preston, 60 East 6th St., monolithic rein.-con., $103,-259; De Graff & Wolff, 985 Scheffer St., monolithic concrete, $107,000, brick, $110,-000, segmental block, $109,500

Ore., Portland—City Council received bids building sewers in (a) East 63rd St. from point 420 ft. south of Shaver St. to proposed sewer in East 33rd St., (b) East 13th St. from Ainsworth Ave. to North St., (c) East 69th St. from East Flanders to East Glisan Sts., (d) Girard St. from Haven to Newman Sts., (e) East 69th St from East Flanders to East Davis Sts., (f) improving 15th St. from south to north line of Hoyt St., (1) concrete pipe, (2) cement, (3) stone block pavement in roadway, (4) in track, (5) basalt stone block in roadway and track, from Warren Constr. Co., Journal Bldg., (a1) $34,832, (e1) $770, (d1) $2744, (e1) $813, (f3) $8 per sq.yd., (f4) $7.50, total $3428; J. Keating, Portland, (a) $36,749, (c2) $797, (d2) $2456, (f5) $7 per sq.yd., $3454; Azar & Co., Portland, (b2) $3028; Mehemarie & Co., Portland, (b2) $2953, (d2) $2388; Finnigan & Williams, Portland, (b2) $3086, (c2) $719; Cochran Bros., (e) $740; S. Dyoub, (e2) $795; K. G. Lundstrom, Worcester Bldg., (f3) $8.50 per sq.yd., (f4) $8, $3388

★**Cal., Long Beach**—See "Streets and Roads."

Bridges

PROPOSED WORK

N. J., Trenton—Bd. Freeholders Mercer Co. plans to build 369 ft. steel and concrete bridge, 32 ft. wide, over Canal and Pennsylvania R.R. tracks, at Southard st. About $155,000. F. H. Franklin, c/o Waddell & Son, Phila., engr.

O., Ashtabula—Comrs. Ashtabula Co (Jefferson) plan to build 1000 ft steel bridge, 30 ft. wide, here. About $250,000 State will appropriate toward cost Engineer not selected.

O., Conneaut—Comrs. Ashtabula Co (Jefferson) plan to build 1150 ft., steel bridge, 30 ft. wide, here. About $300,000. State will appropriate toward cost. Engineer not selected.

Wis., Racine—City plans to build State St. bascule bridge, cost, $250,000; 6th St. bridge and viaduct, $150,000; Milmine Bridge, concrete arch, $50,000. P. H. Connolly, city engr.

Kan., Girard—See "Streets & Roads."

N. B., Fredericton—Canadian National Rys., 27 Wellington St., E., Toronto, preparing plans for bridge over St. John River. About $1,000,000. A F Stewart, ch. engr.

BIDS DESIRED

Pa., Bethlehem—Until Feb. 7, by City building rein.-con. and steel bridge between here and South Bethlehem, 1 mi. long, 64 ft. wide. About $2,315,000. C. Hudson, 21 Park Row, New York City, engr. Noted March 20.

Minn., Morris—Until Dec 15, by C R. Wollthan, aud. Stevens Co., building 60 ft. low truss span, 20 ft. roadway, rein.-con. abutment, over Pommede Terre River, Sect 13, T. 124 N., R. 42 W., State Rd No 2

Minn., Owatonna—Until Jan 6, by C. J. Servatius, clk., building 124 ft. steel and concrete bridge over Straight River, at Bridge St., 34 ft wide, two 5 ft walks, lamp posts, etc. About $40,000 J H A Brahtz, Chamber of Commerce Bldg., St. Paul, engr.

Arkansas—Until Dec. 19, by State Highway Dept., Little Rock, building 10 steel bridges on Little Rock-Hot Springs Highway. Lund & Hill, 527 Southern Trust Bldg., Little Rock, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., New Haven**—City let contract building steel girder bridge encased, over Quinnipiac River, on Middletown Ave., to have two 55 ft. spans and one 43 ft. span, 22 ft. roadway, 10 ft. sidewalk, rein.-con. slab floor, etc., to C. A. Sibley, 902 Chapel St. About $90,000.

★**O., Columbus**—Norfolk & Western R.R., Roanoke, Va., let contract building 600 ft. bridge, 50 ft. wide, steel superstructure, concrete abutments, here, to Cummings Blair Co., 354 Leader-News Bldg., Cleveland. About $200,000.

★**Mich., Detroit**—See "Industrial Works"

★**Mich., Pontiac**—Oakland Co. let contract furnishing material and labor for 55 ft concrete and steel bridge over River Rouge, near Oakland Co line, 20 ft. wide, to G. F. Bristol, 213 California Ave., Highland Park. About $10,200

★**N. M., Los Lunas**—City let contract building 926 ft. rein.con., steel and concrete bridge over Rio Grande River, 25 ft wide, to Midland Bridge Co., El Paso, Tex. About $56,000

★**Wash., Yakima** Comrs. Yakima Co let contract building Piland Bridge, 112 ft steel span, to Union Bridge Co., foot Fenwick and Kenton Sts., Portland, $17,890. Noted Sept 18.

Cal., Long Beach Bd. Supervs. Los Angeles Co., (Los Angeles) received bids building 3 steel and timber bridges over flood control channel, here, (a) 7th St. Bridge, involving 700 tons steel, (b) Anaheim St. Bridge, 2 contracts (1) 190 tons steel, (2) 3420 cu.yd. excav., 104 creosoted piles, 39,400 ft. lumber and 111,700 ft. untreated lumber, (c) Ocean Blvd. Bridge, 596 tons steel, from C. W. Beverstok, 3710 South Alameda St., Los Angeles, (a) $109,414, (b-1) $31,460, (c) $94,666; Pennsylvania Bridge Co., Beaver Falls, Pa., (a) $118,915, (b-1) $36,124, (c) $105,898; Mercereau Bridge & Constr. Co., Pacific Electric Bldg., Los Angeles, (b-2) $22,594. Foundation Co., 58 Sutter St., San Francisco, bid on all bridges, cost plus 8%.

★**N. B., Hampstead**—Provincial Dept. Pub. Wks., Fredericton, let contract building 30 ft. span arch bridge over Little River, here, to Concrete Builders, Ltd., Fredericton. About $36,800.

Streets and Roads

PROPOSED WORK

N. Y., Buffalo—City plans to pave Humber Ave. from Delavan to Sussex Sts., Kermit Ave. from Bailey to Olympic Aves. and Warwick Ave. from Girder to Wyoming Ave., all 26 ft. wide. G. H. Norton, city engr.

Pa., Hazleton—City voted $500,000 bonds to grade, pave and lay sewers in various streets. J. Rough, city engr. Noted Sept. 4.

W. Va., Bridgeport—City voted $25,000 bonds to improve streets. T. Long, Clarksburg, engr.

W. Va., Grafton—Taylor Co. plans election to vote on $1,000,000 bonds to improve roads. J. A. Sincor, co. engr.

W. Va., Madison—Boone Co. plans election to vote on $146,000 bonds to grade and drain Class A Rd. up Spruce Creek to Clothier, and bridge across Spruce Creek, Washington Dist., also $142,000 bonds to grade and drain Class A Rd. near Fosten and Dist. Rd. down Little Coal River, Scott Dist. J. P. Blundon, Madison, engr.

North Carolina—State Highway Comn., Raleigh, plans to gravel 15 mi. road from Plymouth to Beaufort Co lines, Washington Co., cost $80,000; 46 mi. from Jones to Lenoir Co. lines, Onslow Co., $225,000; 42 mi. Wilmington-Charlotte Highway, Robeson Co., $200,000. W. S. Fallis, state highway engr.

N. C., Albemarle—Stanley Co. plans to gravel 10 mi. road. W. S. Fallis, c/o State Highway Comn., Raleigh, engr.

N. C., Danbury—Stokes Co plans to sand clay 6 mi. road. W. S. Fallis, c/o State Highway Comn., Raleigh, engr

N. C., Dobson—Surry Co plans to gravel 7 mi. road. W. S. Fallis, c/o State Highway Comn., Raleigh, engr

N. C., Salisbury—Rowan Co. plans to hard surface 3 mi. and sand clay 7½ mi. roads. W. S. Fallis, c/o State Highway Comn., Raleigh, engr.

N. C., Warrenton—Warren Co. plans to gravel 6 mi. road. W. S. Fallis, c/o State Highway Comn., Raleigh, engr.

N. C., Wilson—Wilson Co plans to gravel 8 mi. road. W. S Fallis, c/o State Highway Comn., Raleigh, engr

Ala., Birmingham—City plans to pave 13th Ave. S. from 20th to 21st St., cost, $6100; 14th Ave. S from 20th to 21st St., $3400; 10th Ave. S. from 28th to 29th St., $3750.

Ala., Decatur—City Council passed resolution to pave Church, Railroad, Vine, Walnut, Cherry, Cain, Davis, Canal and Oak Sts. About $300,000.

Miss., Rolling Fork—Highway Comn. Dists Nos. 3, 4 and 5, Sharkey Co., soon let contract improving 13.1 mi. Federal Aid Project No. 61, involving 1 acre clearing and grubbing, 78,132 cu.yd. embankment, 356 lin.ft. 18 in. and 114 lin.ft. 24 in. corrugated metal pipe, 207.8 cu.yd. class A and 40 cu.yd. class C concrete, 12,946 lb reinforcing steel and 107,293 sq.yd. concrete paving. ✕ A. Kramer, c/o State Highway Dept., Jackson, engr.

Louisiana—State Highway Dept., Maison Blanche Annex, New Orleans, soon lets contract constructing 7.75 mi. Sect. A, Franklin-Thibodaux Highway, St. Mary Parish, 15.39 mi. Sect. A and 11.53 mi Sect. B, Oberlin-Alexandria Highway, and 10.24 mi. Sect. C, Oberlin-Lake Charles Highway, Allen Parish. D. Buie, state highway engr.

Louisiana—State Highway Dept., Maison Blanche Annex, New Orleans, soon lets contract paving 8 mi. Sect. A, Lecompte-Forest Hill Rd. and 11.81 mi. Sect. B, Forest Hill-Allen parish line road.

O., Cincinnati—City plans to pave Bway., cost $74,400, Liberty St., $275,000, Main St., $37,200, Race St., $21,900, Baymiller St., $42,600, 2nd St., $129,000, all granite; Elm St., $109,600, Central Ave., $23,700, recut granite; McMillan St., $179,000, 4th St., $148,800, 7th St., $157,700, wood block, Madison Rd., $118,100, bitulithic or bitoslag, Hull St., $16,704, Bouinot St., $19,611, both 24 ft. wide, concrete, concrete curb and gutter. F. Krug, city engr.

O., Dayton—Montgomery Co. plans to pave 3 mi. Old Troy Pike; 2 mi. New Troy Pike; 4 mi. Covington Pike; 5 mi. Salem Pike; 3 mi. Germantown Pike; 3 mi. Lebanon Pike; 8 mi. Brandt-Bellefontaine Rd.; 16-30 ft. wide, brick, concrete or macadam. About $805,000. P. S. Bookwalter, co. surv.

O., Jefferson—Ashtabula Co. having specifications and estimates prepared paving 6.5 mi. Ashtabula-Austinburg Rd., monolithic brick, cost $150,000; also Richmond, Monroe and Pierpont Sects. of Conneaut-Youngstown Rd., 5 mi. each, monolithic brick or concrete; all 10 ft. wide. A. G Bixler, co. engr.

Michigan—F. F. Rogers, state highway comr., Lansing, soon lets contract crushing, screening and piling 2485 cords of stone on Federal Aid Rd. No. 1, Sects. B, C and D, Shelby and Hart Twps., Oceana Co., also grading, shaping and surfacing with gravel, 1.543 mi. State Trunk Line No. 12-11 Sect. B, Sagola Twp., Dickinson Co., 16 ft. wide.

Michigan—State Highway Dept., Lansing, preparing plans grading, draining, shaping and surfacing with concrete 14 mi. Telegraph Rd. from Flat Rock to Michigan Ave., 18 ft. wide, Wayne Co.

Mich., Bad Axe—F. F. Rogers, c/o Huron Co. Rd. Comn., Co. Bldg., soon lets contract grading, shaping and surfacing 1 mi. State Trunk Line Rd. No. 19-6, between Meade and Hume Twps., 16 ft. wide, Huron Co. Alternate bids on stone gravel, bituminous macadam or concrete

Mich., Detroit—Wayne Co plans to grade, shape, drain and surface with 8 in. concete, 15 mi. Warren Ave. Rd. from River Rouge to Washtenaw Co. line on west, 15 mi. Belleville Rd. from Belleville south and east to Huron River and Monroe Co line and 3 mi Livernois Rd. from Fenkell Ave., Detroit to Oakland Co. line. Work will probably be done by day labor.

Mich., Gaylord—Rd. Comn. Otsego Co. soon lets contract grading, shaping, draining and surfacing 9.169 mi. State Trunk Line Rd No 18-4, Corinth and Livingston Twps., involving 86,000 sq.yd gravel About $90,000.

Mich., Traverse City—F. F. Rogers, c/o Co. Rd. Comn., Co. Bldg., soon lets contract grading, shaping, and surfacing 0.992 mi. State Trunk Line Rd. No. 42-5, Mayfield Twp., Grand Traverse Co., 24 ft. grade, 16 ft. surface, involving 9411 sq.yd. gravel, about $12,000.

Streets and Roads (Continued)

Wis., Dodgeville—Iowa Co. plans to grade Schaff Hill Rd., Mineral Point Twp., grading and draining Arena Twp., Blanchardville-Blue Mounds Rd., Brigham Twp., Clyde Twp., Dodgeville Twp., Eden Twp., Highland Twp., Miffin Twp., Mineral Point Twp., Blanchardville-Blue Mounds Rd., Moscow Twp., Hatch Hill Rd., Pulaski Twp., Dodgeville-Hollandale Rd., Ridgeway Twp., Waldwick Twp., Wyoming Twp. and building Lavake Bridge, concrete, Linden Twp. About $23,751.

Wis., Eau Claire—City plans to grade, pave and curb 1320 ft. Garfield Ave. and Farwell St., 30 ft. wide. About $12,000. A. R. Garnick, city engr.

Wis., Eau Claire—City having plans prepared grading, paving, curbing and draining 2345 ft. Birch St. from Spring St. to Starr Ave., 30 ft. wide. About $24,800. A R. Garnick, city engr.

Wis., Elkhorn—Walforth Co. plans to improve East Troy-Mukwonago Rd., 18 ft. wide, concrete, East Troy Twp., cost $17,119; Richmond-Millard Rd., gravel, $20,542.

Wis., Green Bay—Brow Co. voted $2,500,000 bonds to build following roads:—West De Pere-Green Bay Rd., cost, $100,000, Green Bay-Manitowoc Rd., $300,000, Greenleaf-De Pere Rd. to Calumet Co. line, $220,000, Green Bay-Algoma Rd., to Kewaunee Co. line, $210,000, Green Bay-Sturgeon Bay Rd., $60,000, Green Bay-Allouez Rd., $50,000, Green Bay-Shawano Rd., $350,000, Green Bay-Menomonie Rd., $125,000, De Pere-Dixon Rd., $75,000, Denmark-Fontenoy Rd., $10,000, all 16 ft. wide, concrete; State Rd., Bellevue Twp., to connect with Manitowoc and Dixon roads, $80,000, Military Rd., Howard and Pittsfield Twps., $50,000, Blake Rd., from De Pere to Wayside, $225,000, Dixon-Glenmore Rd., $15,000, Eaton Rd., to county line, $90,000, Humboldt Rd. from Cedar Creek to New Franken, $100,000, Bay Shore-Benderville Rd., $15,000, Snidersville-Wrightstown Rd., $40,000, Wrightstown-West Holland Rd., $60,000, Greenleaf-Askeaton Rd., $60,000, Wrightstown-Greenleaf-Lark Rd., $165,000, Shirley-Denmark Rd., $90,000, all 9 ft. wide, concrete.

Wis., Madison—City Counc.. plans to improve Elmside Blvd., Schiller Court, Virginia Terrace, Rugby Rd., Washington, University, Commonwealth and Keyes Aves., Division, La Follette, Waubesa, Lakeland, Jackson, Marquette, Center, Evergreen, Johnson, Jenifer, Spaight, Ingersoll, Rutledge, Park, Warren and 7th Sts., concrete and asphalt. About $406,895.

Wis., Manitowoc—Manitowoc Co. plans to grade and pave 4 mi. Manitowoc-Sheboygan Rd., 18 ft. wide, Newton Twp., involving 21,000 sq.yd. concrete, cost $132,000; 7.8 mi. Manitowoc-Two Rivers Rd., 18 ft. wide, involving 45,000 sq.yd. concrete, $54,000. F. Muth, co. engr.

Wis., Merrill—Lincoln Co. plans to grade Merrill-Medford Rd., Scott Twp., Merrill-Antigo Rd., Pine River Twp., Dudley-Rhinelander Rd., Harrison Twp., Rib Lake Rd., Corning Twp., Skanawan-Bass Lake Rd., Skanawan Twp., Tomahawk-Harrison Rd., King Twp., Tomahawk-Spirit Falls Rd., Bradley Twp., Spirit Falls-Tripoli Rd., Somo Twp. and Grand Father-Tomahawk Rd., Rock Falls Twp., grade and build bridges on Tomahawk-McCord Rd., Wilson Twp and Spirit Falls-Tripoli Rd., Tomahawk Twp., build bridge and pave Trunk Line No. 10, concrete, Brock Twp., gravel Tomahawk-Bradley Rd., Bradley Twp., Dudley Rd., Merrill Twp., Tomahawk-Harrison Rd., Tomahawk Twp., Doering and Dudley Rds., Schley Twp., and Dudley Rd., Russell Twp., grade and gravel Dudley Rd., Merrill Twp. and Dudley Rd., Pine River Twp. About $96,275

Wis., Phillips—Price Co. plans to gravel and ditch Phillips Fifield Rd., Trunk Highways Nos. 13 and 14; grade and ditch Spirit Falls-Ogema Rd., Brannan Twp., Flambeau Rd., Elk Twp., Phillips-Kennan Rd., Georgetown Twp., Ogema-Spirit Rd., Hill Twp. About $16,659. B. M. Griffin, co. highway comr.

Wis., Sheboygan—City plans to grade and pave 1.1 mi. 12th St., 18 ft. wide, involving 7890 sq.yd. vitr. brick. About $12,000. C. V. Boley, city engr.

Wis., Sheboygan—Sheboygan Co. plans to grade and pave 7.8 mi. Lake Shore Rd. from here to Port Washington, 16 ft. wide, concrete, also build necessary bridges and culverts on same. Cost between $40,000 and $50,000. Private plans.

Wis., Sheboygan—Sheboygan Co. plans to grade and pave 2 mi. Lake Shore Rd., at south county line, 18 ft. wide, also build necessary culverts and bridges on same work, involving 50,000 sq.yd. concrete. About $120,000. G. W. Ubbelohde, c/o county highway comn., engr.

Wis., Wausau—Marathon Co. election Dec. 18, to vote on $4,250,000 bonds to improve various roads with concrete or gravel. J. H. Vogt, Court House, comr.

Ia., Clarion—Comrs. Wright Co. soon let contract grading and graveling 14.67 mi. highway, involving 76,858 cu.yd. earth excav., 36,679 cu.yd. gravel, 36,020 lin.ft. tiling and 10 tile intakes. J. K. Hilton, Clarion, engr.

Ia., Winfield—City having plans prepared paving 2 mi. various streets, 24 ft. wide, concrete.. H. R. Green, 107 North 2nd St.. Cedar Rapids, engr.

Minn., Faribault—Rice Co. having surveys made for grading and paving road between Faribault and Northfield, 18 ft. wide. About $420,000. F. W. Putman, 515 Ashland Ave., St. Paul, engr.

Minn., Luverne—City Council plans to pave 100 blocks, 18 ft. wide, asphalt, concrete and waterbound macadam. About $300,000. T. H. Johnson, 32nd and Myrtle Sts., Sioux City, Ia., engr.

Kan., Atchison—Atchison Co. having plans prepared grading and building concrete road on 9.38 mi. Parallel Whiteway, 18 ft. wide. About $400,000. R. D. Coleman, 418 North 7th St., engr.

Kan., Girard—Crawford Co. having plans prepared grading and paving 12 mi. Commercial Highway, 18 ft. wide, bituminous macadam, also building bridges and culverts on same. About $270,000. W. J. Arnold, Girard, engr.

Kan., Girard—Crawford Co. having plans prepared grading and paving 5 mi. Ringo-Edson Highway, 18 ft. wide, concrete or bituminous macadam, also building necessary bridges on same. About $270,000. W. J. Arnold, Girard, engr.

Neb., Central City—City receives bids about Jan. 1, for ½ mi. asphalt pavement, 25 ft wide. J. R. Moreaty, Grand Island, engr. About $10,000.

Neb., Cozard—City soon lets contract for 30,000 yd. 3 in. vitr. brick pavement on 5 in. concrete base. About $140,000. J. R. Moreaty, Grand Island, engr.

South Dakota—State Highway Comn., Pierre, plans to grade, gravel and drain 8.5 mi. Huron-De Smet Rd., Federal Aid Project No. 31, Beadle Co., involving 47,000 cu.yd. earth excav., 12,750 cu.yd. gravel, 950 lin.ft. corrugated culverts, 295 cu.yd. concrete for culverts and 22,000 lb. reinforcing steel, cost, $67,875; 11.1 mi. Madison-Howard Rd., Federal Aid Project No. 33, Miner Co., involving 50,000 cu.yd. earth excav., 1250 lin.ft. corrugated culverts, 16,650 cu.yd. gravel, 380 cu.yd. concrete for culverts, 30,000 lb. reinforcing steel, etc., $81,339.

Montana—State Highway Comn., Helena, plans to gravel surface 18 mi. Chinook-Hill Co. line Rd., cost $72,000, Blaine Co.; 12 mi. Bridger-Belfry Rd., $50,000, 13 mi. Red Lodge-Roberts Rd., $50,000, Carbon Co.; 45 mi Yellowstone Trail Rd., $150,000, Fallon Co.; 6 mi. Libby Rd., $12,000, 32.5 mi. Whitefish Rd., $65,000, 11.5 mi. Pablo-Polson Rd., $23,000, Flathead Co.; 8.5 mi. Bearmount-Nimrod Rd., $50,470, 12.5 mi. Philipsburg-Maxville Rd., $40,800, Granite Co., 13 mi., Cardwell-Whitehall Rd., $75,000, 10 mi. Boulder-Butte Rd., $60,000, Jefferson Co.; 13 mi. Yellowstone-Glacier Bee Line Rd., $30,000, Meagher Co.; 17 mi. Choteau-Browning Rd., $292,000, Pondera Co.; 7.5 mi. Mildred-Ismay Rd., $22,000, Prairie Co.; 40 mi. Sidney-Manrock Rd., $80,000, 60 mi. Fairview-Poplar Rd., $120,000, Richland Co.; 48 mi. Yellowstone Trail, $120,000, Rosebud Co.; 11 mi. Perma-Dixon Rd., $30,000, 3.5 mi. Weeksville Rd., $42,000, 7.5 mi. Belknap-Furlong Rd., $24,000, 6.5 mi. Plains-Hot Springs Rd., $28,000, Sanders Co.; 10 mi. Stillwater Rd., $10,000, Stillwater Co.; 40 mi. Yellowstone Trail, $160,000, Sweetgrass Co.; 20 mi. North and South Highway, $40,000, 20 mi. East and West Highway, $40,000, Toole Co. Federal Government asked to appropraite toward cost. J. N. Edy, state highway engr.

Missouri—State Highway Dept., Jefferson City, plans to build 5.3 mi. Southern Highway from Emmett Ave. and Bway., Sedalia, to Sedalia Special 12 mi. Rd. Dist., Pettis Co., involving 49,852 sq.yd. bituminous macadam or 112,167 sq.yd. asphalt surfacing, 4629 sq.yd. macadam and 49,852 sq.yd. rein.-con. base, 28,042 lin.ft. grading, 900 cu.yd. stone, 35 cu.yd. concrete and 1000 lb. reinforcing steel, cost $60,760; 19.5 mi. Kings Highway from Sikeston to New Madrid, New Madrid Co., 183,040 sq.yd. gravel surfacing, 102,960 lin.ft. grading, 72.6 cu.yd. concrete, 892 ft. 18 in. vitr. clay culverts, 4389 cu.yd. ditching, 6 drainage wells, 28 extensions to old wells and 11,312 ft. laterals to wells, $191,098; 1.66 mi. Natl. Old Trails Rd., St. Chares Co., 15,591 sq.yd. 2½ in. bituminous macadam, 5179 sq.yd. reconstructed base, 8770 lin.ft. grading and 100 cu.yd. stone; $22,714.

Mo., St. Louis—Bd. Pub. Serv. plans to pave Bellefontaine Rd., 24 ft. wide, bituminous concrete on concrete base. About $15,000. C. E. Smith, city engr.

Mo., Troy—Lincoln Co. plans to pave, repair and reconstruct 50 mi. Mississippi River Scenic Highway and other roads, 24-30 ft. wide. About $980,000. Federal Government and State appropriated $180,000 toward project. A. W. Graham, Jefferson City, engr.

Arkansas—State Highway Dept., Little Rock, soon lets contract paving and draining 27.5 mi. road, Pulaski and Saline Counties. Lund & Hill, 527 Southern Trust Bldg., Little Rock, engrs.

Ark., Ft. Smith—Sebastian Co. Highway Comn. had plans prepared for 72.5 mi. road, Greenwood and Ft. Smith Dists., 16 ft. wide, 25 ft. dump, penetration asphalt. Cost $1,425,178.

Tex., Fredericksburg—Gillespie Co. having plans prepared gravel surfacing and draining 18.1 mi. highway from Fredericksburg to Blanco Co. line, 14 ft. wide, involving 10 acres clearing and grubbing, 18 mi. machine grading, 10,000 cu.yd. earth excav., 39½ tons structural steel, 11 cu.yd. plain concrete and 290 cu.yd. rein.-con. About $113,314. A. F. Mounsang, Fredericksburg, engr

Tex., Hillsboro—Hill Co. having plans prepared scarifiying, draining and gravel surfacing 12.82 mi. Highway No. 22, known as Peoria-Brandon Rd., 16 ft. wide, involving 50,000 cu.yd. earth and 8000 cu. yd. rock excav., 2000 lin.ft. guard fence, 30,566 lb. steel, 238 cu.yd. class "A" and 140 cu.yd. class "B" concrete, cost $145,371; gravel surfacing and draining 17 mi. Highway No. 2-A, from here to Johnson Co. line, 18 ft. wide, involving 150,000 cu. yd. earth and 4000 cu.yd. rock excav., 202,365 lb. reinforcing steel, 4000 lin.ft. guard fence, 1141 cu.yd. class "A" and 1174 cu.yd class "B" concrete, $315,182. Bryant & Huffman, 211-217 Littlefield Bldg., Austin, engrs.

Tex., Kerrville—Kerr Co. voted $65,000 bonds to build Highways Nos. 27 and 41. L. Wallace, co. judge.

Tex., Liberty—Liberty Co. election Dec. 22, to vote on $1,664,000 bonds to build Highways Nos. 3 and 35 and laterals. H. O. Compton, Liberty, engr. Address, C. N. Smith, co. judge.

New Mexico—State Highway Comn., Santa Fe, plans to semi gravel surface 17½ mi. Sect. 2, Highway No. 5, Federal Aid Project No. 42, 20 ft. wide, between Magdalena and Datil Twps., Socorro Co. About $80,000. L. A. Gillett, state highway engr.

New Mexico—State Highway Comn., Santa Fe, rejected bids building 1.7 mi. Tijeras Canyon Co-operative Forest Aid Project, Bernalilo Co. L. A. Gillett, state highway engr. Noted Oct. 9.

Idaho, Moscow—Potlatch Highway Dist., Latah Co., voted $350,000 bonds to build and hard surface roads.

Wash., Chehalis—Lewis Co. plans to grade and pave 5 mi. Winlock-Cowlitz Prairie Rd., 18 ft. wide. About $138,524. E. C. Bechly, Chehalis, engr.

Streets and Roads (Continued)

Ore., Astoria—City soon receives bids paving Ocean Ave to 1st St, Marion Ave. to 1st, 3rd and 5th Sts., concrete or bitulithic. About $10,000. G. T. McClean, Astoria, engr.

Ore., Gearhart—Gearhart Park Co. having preliminary plans prepared building road from beach to Clatsop Co. Rd., gravel or concrete, 24 ft. wide. Work will include grading and clearing. About $10,000. O. W. Taylor, mgr.

Cal., Long Beach—City soon lets contract grading and paving 2560 lin.ft. Magnolia Ave., 51 ft. wide, involving 112,911 sq.ft. 2 in. asphalt on 4 in. cement concrete base, 87 lin.ft. cement concrete curbing, 165 sq.ft. cement concrete guttering and 2447 sq.ft. cement concrete sidewalks. About $28,500. A. de Ruiz, city engr.

Cal., San Francisco—City plans to pave 1736 ft. Army St. between Evans Ave. and Iowa St., to include retaining wall. Work involves 25,200 sq.yd. concrete, 1500 cu. yd. earth excav. and 52 ton reinforcing bars. About $40,000. M. M. O'Shaughnessy, city engr.

N. B., St. John—City plans to improve various streets. Work involves 50,000 sq. yd. pavement.

BIDS DESIRED

N. Y., New York—Until Dec. 15, by M. F. Loughman, pres. Manhattan Boro., regulating and repaving with wood block on concrete foundation roadway in and between tracks of Lexington Ave. from 53rd to 59th Sts., 66th to 69th Sts., 72nd to 73rd Sts., north of 95th to north of 98th Sts.; with granite block on earth foundation roadway in and between tracks from 59th to 66th Sts., 69th to 72nd Sts., 73rd to 75th Sts.; on concrete foundation, from north boundary line of 79th St. to point 104 ft. more or less of 79th Sts., center line of 82nd St. to point 60 ft. more or less north of center line, from 83rd to 92nd Sts.; with sheet asphalt on concrete foundation, roadway between rails, from 75th to point 25 ft. more or less south of south boundary line of 79th St.; with sheet asphalt on granite block foundation, roadway in dummy from 75th St. to point 25 ft. more or less south of south boundary line of 79th St.; with sheet asphalt on concrete foundation roadway in and between tracks from point 25 ft. more or less south of south boundary line to north of north boundary line of 79th St.; also with sheet asphalt on concrete foundation roadway in and between tracks from 53rd St. to point 104 ft. more or less north of 79th St., center line of 82nd St. to point 60 ft. more or less north of center line, north of 83rd St. to south of 92nd St., north boundary line of 97th St. to north of 98th St.; with granite block on concrete foundation roadway in and between tracks north of 95th St. to north boundary line of 97th St.

Pa., Waynesburg — Until Dec. 20, by Comrs. Greene Co. paving 7980 lin.ft. Smith Creek Rd., Franklin Twp., 16 ft. wide, rein.-con. and vitr. brick. D. Six, comr.

Ala., Eutaw—Until Dec. 22, by Comrs. Greene Co., grading, graveling and draining 2¾ mi. road. B. B. Barnes, judge of probate.

Miss., Macon—Until Dec. 22, by Highway Comrs. of Supervs., Dist. No. 3, Noxubee Co., grading and surfacing 5.2 mi. Macon and Louisville Rd., involving 9000 yd. grading and 32,449 cu.yd. surfacing material. S. A. Wells, co. engr.

Miss., Natchez—Until Dec. 16, by Bd. Supervs. Adams Co., improving 3.6 mi. Federal Aid Project No. 80, involving 4.3 acres clearing and grubbing, 30,000 cu.yd. excav., 5700 cu.yd. gravel, 60 cu.yd. concrete, 30 lin.ft. culvert pipe. N. A. Kramer, c/o State Highway Dept., Jackson, engr.

Louisiana—Until Dec. 15, by State Highway Dept., Maison Blanche Annex, New Orleans, paving 14 mi. Sect. A 1 and 9 mi. Sect. A 2, Franklinton-Pearl River Highway, 11.97 mi. Franklinton-Mississippi State Line Highway, Washington Parish; 6.23 mi. Baton Rouge-New Orleans Highway, St. Charles Parish. D. Buie, state highway engr.

Ind., Greenfield—Until Dec. 26, by Comrs. Hancock Co., graveling, grading, and building sewers in 2¾ mi. Henry Hawkins et al Rd., Buck Creek Twp., 1 mi. John Lain et al Rd., Vernon Twp., grading, building sewers and paving 1¼ mi. William Bade et al Rd., waterbound macadam, Buck Creek Twp.; grading, draining and paving, Earl R. Gibbs et al Rd., Brown Twp. and Franklin E. White et al Rd., Jackson Twp., 1 course concrete graveling, grading and paving 2¾ mi. Henry W. Eikman et al Rd., Sugar Creek Twp. C. Bocne, Co. engr.

Mich., Muskegon—Until Dec. 15, by B. H. Tellman, city recdr., repaving 3000 sq.-yd. Western Ave., 2½ in. asphaltic concrete on 8 in. concrete foundation. About $15,-000.

Wis., Wauwatosa—Until Dec. 26, by Bd. Pub. Wks., improving 8th Ave. from State St. to East Milwaukee Ave., involving 15,-000 to 25,000 cu.yd. earth grading. J. E. Lowther, city engr.

Minn., Duluth—Until Jan. 15, by J. A. Farrell, city comr., grading, surfacing and paving 6990 ft. Superior Ave. from 23rd Ave. east to 38th Ave., 45 ft. wide, asphalt on 6 in. concrete base. Work includes 13,-980 lin.ft. concrete curbing. About $187,-840. E. K. Coe, city engr.

Minn., Gaylord—Until Dec. 23, by F. Hoppenstedt, aud. Sibley Co., building 1 mi. State Rds. No. 6 and 8, Federal Aid Project No. 116, involving 68,000 cu.yd. excav., 2000 cu.yd. riprap, 1755 cu.yd. gravel surfacing and 130 ft. 25 and 30 in. portable culvert pipe.

Kan., Ft. Scott—Until Dec. 15, by Comrs. Bourbon Co., building 5.91 mi. Jefferson Highway, south to county lines, 16 ft. wide, 4 ft. dirt shoulders, rock bituminous macadam. About $140,000. B. Boyle, Ft. Scott, engr.

Kan., Frankfort—Until Dec. 18, by T. W. Snodgrass, city clk., furnishing labor and materials building various streets, involving 9830 cu.yd. excav., 39,841 sq.yd. pavement, 21,307 lin.ft. 24 in. curb and gutter, 1010 lin.ft. 12 in. and 1400 lin.ft. 18 in. storm sewers, etc. Shockley Eng. Co., 740 Reserve Bank Bldg., Kansas City, Mo., engrs.

S. D., Rapid City—Until Dec. 22, by P. J. Egan, city aud., paving 4.6 mi. streets, 18 ft. wide. Work involves 54,000 sq.yd. Portland concrete, asphaltic concrete, bitulithic, sheet asphalt or vitr. brick.

Mo., St. Louis—Until Dec. 22, by Bd. Pub. Serv., grading sidewalk spaces and paving Gannett St. from Morganford Rd. to Ridgewood Ave. Cost, brick, $29,600; asphalt, $27,350; asphaltic concrete, $24,-400; bitulithic, $25,800. C. E. Smith, city engr.

Mo., St. Louis—Until Dec. 19, by Bd. Pub. Serv., paving with vitr. brick and asphalt, building granite curbing, concrete guttering and granitoid sidewalk on Cabanne Ave., from Union Blvd. to Cabanne Pl.; Oakland Ave. from King's Highway to Skinker Rd.; Clayton Rd. from Skinker Rd. to city limits, Waterman Ave. from Skinker Rd. to Debalivere Ave.; Forest Park Blvd. from Grand to Newstead Aves.; Kingsbury Pl. from Skinker Rd. to Hamilton Ave. About $570,000. C. E. Smith, city engr.

Mo., St. Louis—Until Jan. 5, by Bd. Pub. Serv., paving Ellenwood Ave. from Morganford Rd. to Ridgewood Ave., and Russell Ave. from Bway. to 18th St., brick, cost $23,950 and $74,100 respectively; Douglas St. from river to Bway., wood block, $15,200; Northeast King's Highway from Euclid to West Florrissant Aves., asphalt, $125,750, all 30 ft. wide. C. E. Smith, city engr.

Mo., St. Louis—Until Jan. 15, by Bd. Pub. Serv., paving 1 block Whittier St. between Labadie and Ashland Sts., and 5 blocks Morganford Rd. between Chippewa St. and Eyler Ave., 24 ft. wide, vitr. brick, cost $14,550 and $75,050 respectively. C. E. Smith, city engr.

Mo., St. Louis—Until Jan. 17, by Bd. Pub. Serv., paving Page Blvd. between Vandeventer and Taylor Aves., brick. Compton Ave. between Chouteau and Park Aves., asphalt, both 24 ft. wide. About $91,500. C. E. Smith, city engr.

Mo., St. Louis—Until Jan. 28, by Bd. Pub. Serv., paving 9 blocks Kings Highway from Natural Bridge Rd. to Penrose St., 24 ft. wide, asphalt, granite curbing. About $126,000. C. E. Smith, city engr.

Mo., Versailles—Until Dec. 15, by J. L. Vaughan, engr. Morgan Co., paving roads, bituminous macadam on concrete base, and constructing several bridges. Bonds for $300,000 voted for project.

Cal., Ventura—Until Dec. 23rd, by Bd. Supervs. Ventura Co., paving 470,000 sq.ft. Vineyard Ave., near Oxnard Twp. and 180,000 ft. Nordhoff Rd. near Ojai Twp., concrete. L. E. Hallowell, clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Maine**—State Highway Comn., Augusta, let contract grading, draining and gravel surfacing 7.05 mi. river road, 16 ft. wide with 2½ ft. shoulders, Enfield Twp., involving 13,300 cu.yd. earth and 50 cu.yd. rock excav., 2450 cu.yd. borrow, 20,820 cu. yd. gravel, etc., to M. Seretto and W. D. Smith, 3 Tremont Row, Boston, Mass., $99,349.

★**Massachusetts**—State Highway Comn., Boston, let contract building 24,000 ft. road, 18 ft. wide, Littleton Twp., involving 98,400 gal. bituminous macadam, 17,100 cu.yd. earth and 1140 cu.yd. rock excav., 11,560 cu.yd. stone fill, and 7200 sq.ft. cribbing, to M. L. Carmarco, Lee, $192,664.

★**Mass., Worcester**—See "Buildings."

N. Y., Brooklyn—E. Riegelmann, boro. pres. received bids Dec. 5, regulating and paving with bituminous macadam, (a) East 13th St. from Ave. L to point 440 ft. on Ave. L, (b) paving with asphalt roadway of Ave. O from East 13th to East 5th Sts., (c) 81st St. from 6th Ave. to Ft. Hamilton Ave., from C. A. Myers, foot of Stagg St., (a) $3270; M. J. O'Hara, (a) $3196, J. Jennings, Belle Harbor, L. I., (a) $3934; Uvalde Asphalt Paving Co., 1 Bway., New York City, (b) $11,491, (c) $8332; Consolidated Asphalt Corp., 52 9th St., (b) $12,180, (c) $8470; Sicilian Asphalt Paving Co., 41 Park Row, New York City, (b) $12,240; (c) $8628.

★**N. Y., Buffalo** — City let contract to Rock Asphalt & Constr. Co., Morgan Bldg., paving Bidwell Parkway from Colonial Circle to Soldiers Pl., 31 ft. wide, involving 5500 sq.yd. asphalt and concrete on concrete base, etc., also Abby St., 28 ft. wide, 5680 sq.qd. asphalt on 6 in. concrete base, $27,688 and $28,480 respectively.

N. Y., New York — Acting President, Manhattan Boro., received lowest 3 bids Nov. 25, granite paving 34th St., etc., from Asphalt Constr. Co., 1297 Madison Ave., $21,830; Burnside Constr. Co., 270 Burnside Ave., $22,462; W. J. Fitzgerald, 547 West 45th St., $22,873; regulating and grading, etc., 34th St., from Cleveland Trinidad Paving Co., Flushing Ave., Brooklyn, $17,762; Sicilian Asphalt Paving Co., 41 Park Row, $21,094; J. L. Brustar, Harlem River and 150th St., $21,182.

New Jersey—State Highway Dept., Broad St. Bank Bldg., Trenton, received bids Nov. 26, improving 5.5 mi. Browns Mills-Lakehurst Rd., 20 ft. wide, Burlington Co., involving 13,170 yd. gravel surface, from Crammer & Parker, Mayetta, $33,885, A. W. Hopkins, Hornerstown, $36,720, Sutton & Corson, 9th and Simpson Sts., Ocean City, $37,390. Noted Sept. 4.

★**Md., Rockville** — Montgomery Co. let contracts to H. F. Voigt Co., 715 14th St., N. W., Wash., D. C., improving Brown's Lane, cost $12,000; 4.5 mi. Derwood-Redland Pike, $12,000.

O., Dayton—City and Montgomery Co. received only bid paving West 3rd St. from Baker St. to corporation line, 36 ft. wide, brick on concrete base, from Finke Eng. Co., 15 South St. Clair St. About $48,000.

★**Indiana**—State Highway Comn., Indianapolis, let contract building 5.574 mi. road between Osgood and Versailles counties, to Central States Constr. Co., Logansport, $223,147.

★**Mich., Hillsdale**—Hillsdale Co. let contracts grading and surfacing with class "D" gravel 2 mi. Assessment Dist. Rd. No. 43, Hillsdale Twp., 16 ft. wide, 24 ft. grade, to Bishop & Bowlson, Hillsdale, $22,054.

★**Mich., Midland**—Midland Co. Rd. Comn. let contract grading shaping and surfacing with class "D" gravel 5.085 mi. Assessment Dist. Rd. No. 168, 16 ft. wide, Larkin Twp., to H. A. Crane, Midland, $70,873.

Ill., Chicago—Bd. Local Improvts. received bids Nov. 10, paving (a) East 102nd St. from Ave. N to Indianapolis Ave.

(b) Eddy and Cornelia Sts. from North Cicero to North Long Aves., Newport St. from North Laramie to North Long Aves., Laverne St. Lorraine Ave. and Lockwood St. from Roscoe to Addison Sts.

(c) Alley between School, Melrose, Paulina Sts., and Ravenswood Ave.

Streets and Roads (Continued)

(d) Alley between Hamburg St., Garfield Blvd., Larrabee and Orchard Sts.
(e) Alley between West 57th, West 58th, South Green and South Peoria Sts.
(f) Alley between Rice St., Chicago Ave., Robey St. and Hoyne Ave., from Calumet Coal & Teaming Co., 9022 Commercial Ave., (a) $28,081; Contg. & Material Co., 3219 South Michigan Ave., (a) $30,688, (d) $4185, (e) $3087 Farr Bros. Co., 356 West 111th St., (a) $29,834; White Paving Co., 17 North La Salle St., (b) $177,508; R. F. Conway Co., 133 West Washington St., (b) $178,026; Amer. Asphalt Paving Co., 133 West Washington St., (b) $179,184; J. A. Ross & Co., 4561 Armitage Ave., (c) $3169, (f) $5167; J. Dillon & Co., 179 West Washington St., (c) $3425, (e) $3120, (f) $5271; Central Paving Co., 179 West Washington St., (c) $3459, (d) 4129, (e) $3153; P. J. O'Brien & Co., 29 South La Salle St., (d) $4202, (f) $5153. Noted Nov. 6 E. B.

★**Mo., St. Louis**—Bd. Pub. Serv. let contract widening from 24 to 100 ft. and resurfacing 1 mi. Washington Ave. from Jefferson to Teresa Aves., involving vitr. brick paving and 5280 lin.ft. curbing and guttering, to F. A. Stiers, 4512 Enright St., $236,583.

Tex., Boerne—Kendall Co. received bids Nov. 10, gravel surfacing with bituminous topping 5.788 mi. Highway No. 9, from here to Bexar Co. line, 16 ft. wide, from Finley Method Co., 703-4 Stewart Bldg., Houston, $38,397; Uvalde Rock Asphalt Co., Swearingen Bldg., San Antonio, $44,752. Work involves 2 acres clearing and grubbing, 4.77 mi. machine grader work and 1801 cu. yd. unclassified earth excav. Noted Sept. 11.

★**Tex., Ft. Worth**—City let contracts to Genl. Eng. & Supply Co., Burton Bldg., grading and paving 2355 ft. Calhoun St. from East Front to 9th Sts., 40 ft. wide, involving 10,867 sq.yd. vertical fibre brick and 5000 lin.ft. concrete gutter, $33,138; 4500 ft. Commerce St. between East Front and Weatherford Sts., 50 ft. wide, involving 29,593 sq.yd. vertical fibre brick and 10,000 lin.ft. concrete gutter, $104,939; 1000 ft. Daggett St. from Main to Taylor Sts., 40 ft. wide, involving 2570 sq.yd. vertical fibre brick, 2500 lin.ft. concrete gutter and 550 cu.yd. earth excav., $10,000. Noted Feb. 6.

★**Tex., Hemphill**—Comrs. Sabine Co. let contract grading, gravel surfacing and draining 13.69 mi. Highway No. 8A from here to Geneva, 15 ft. wide, to Smith Bros., Crockett, $118,374. Work involves 48.9 acres clearing and grubbing, 43,406 lb. reinforcing steel, 26,750 cu.yd. surfacing material, 517 sq.yd. class A concrete, 51,663 cu.yd. earth excav., 325 cu.yd. street and 250 cu.yd. rock excav. Noted Sept. 25.

Tex., McKinney—Collin Co. received bids gravel surfacing and draining 24.95 mi. Highway No. 6 between Grayson and Dallas Counties, 16 ft. wide, from F. D. Perkins, McKinney, $228,562; Womack Constr. Co., Sherman, $250,223; McElwrath & Rogers, Corsicana, $264,575. Work involves 51.8 acres clearing and grubbing, 3396 sq.yd. concrete pavement, 30,018 cu.yd earth and 1000 cu.yd. loose rock excav., 29,491 lb. reinforcing steel, 239 cu.yd. Class "A" and 821 cu.yd. class "B" concrete. Noted Aug. 28.

★**Tex., Palo Pinto**—Comrs. Palo Pinto Co. let contract building 3 mi. dirt road and grading 2 mi. Highway No. 1, 16 ft. wide, to Tibbett & Tibbett & Butler Bros., Mineral Wells, $34,625. Work involves 8 acres clearing and grubbing, 903 cu.yd. rock and 25,482 cu.yd. unclassified earth excav., 32,167 lb. steel, 283 sq.yd. class A and 347 sq.yd. class B concrete.

Tex., San Angelo—Comrs. Tom Green Co. received bids Nov. 16, building (a) 13.96 mi. Highway No. 4, from here to Schleicher Co. line, 15 ft. wide, involving 56.3 acre clearing and grubbing, 49,510 cu.yd. unclassified earth, 3378 cu.yd. rock and 407 cu.yd. street excav., 88,525 gal. 2 course asphaltic treatment, 78,267 lb. reinforcing steel, 917 sq.yd. class A, 510 sq.yd. class B and 507 sq.yd. concrete pavement, 49,180 cu.yd. crushed stone, (b) building gravel surfaced road on same, involving 49,510 cu.yd. unclassified earth excav., 49,180 cu.yd. crushed stone and 56.32 acres clearing and grubbing (does not include asphaltic treatment or drainage structures), (c) building rein.-con. drainage structures on same, involving 407 cu.yd structural excav., 78,267 lb. reinforcing steel, 52 lin.ft. 24 in. c.i. pipe, 691 lin.ft. bridge railing type, 917 sq.yd. class A, 510 sq.yd. class B and 507 sq.yd. concrete pavement, from Montgomery, Kuykendall & Thompson, San Antonio, (a) $377,842, (b) $258,763; Harrison, Potts & Prentice, Waco, (a) $420,918, (b) $310,904; Womack Constr. Co., Sherman, (a) $449,438, (b) $343,546, (c) $65,958; H. H. Hicks, Eldorado, (c) $60,485; McCall-Moore Eng. Co., 308-309 Amicable Bldg., Waco, (c) $62,392.

★**Idaho, Twin Falls**—City let contract paving various streets, bitulithic, to Warren Constr. Co., Journal Bldg., Portland, Ore., $733,628.

★**Wash., Bremerton**—City let contract grading and paving 4th Ave., concrete, to Bulette & Badolato, Seattle, $15,265.

★**Wash., Port Angeles**—City let contract grading, paving with concrete and building concrete curbs on 8th St. from Blvd. to Lincoln St., to Dahlberg & Olson, Port Angeles, $73,578.

★**Wash., Seattle**—City let contract paving West McGraw St., et al, involving 1890 sq. yd. 6 in. concrete paving and 1010 lin.ft. type "A" armored concrete curbs, to F. Agostino, 1335 21st St., $16,334.

Wash., Tacoma—Pierce Co. received lowest bid Nov. 28, clearing and grading 2 mi. East End Drive, involving 22,164 cu.yd. excav., from H. Pederson, Alaska Bldg., Seattle, $28,695.

★**Wash., Tacoma**—Pierce Co. let contract grading and paving 2.26 mi. Eatonville Highway, involving 21,600 sq.yd. concrete, 26,623 lin.ft. concrete curbing and 19,795 cu.yd. excav., to W. Hummon, Tacoma, cost $75,543; 12 mi. Spanway-McKenna Rd., 123,946 sq.yd. concrete, 137,895 lin.ft. concrete curbing and 30,780 cu.yd. earth excav., to Independent Asphalt Paving Co., 18th St. and Dock, $249,895; 4.5 mi. Gravelly Lake Rd., 12,041 sq.yd. concrete, 12,750 lin.ft. concrete curbing and 7752 cu.yd. excav., to J. Warter, Tacoma, $98,751.

★**Wash., Wenatchee**—City let contract grading, surfacing with crushed rock, curbing and building sidewalks on Yakima St. from Mission to Alaska Sts., to Burke & Songfelder, Wenatchee, $36,023.

★**Ore., The Dalles**—City let contract grading and surfacing 9 blocks of Elm Ave. and West 8th St., concrete, to United Contg. Co., Northwest Bank Bldg., Portland, $39,168.

Cal., Long Beach—City received bids grading, paving, and installing sanitary sewers in 4th St., involving 153,450 sq.yd. 5 in. concrete, 3222 lin.ft. cement concrete curbing, 9919 sq.ft. cement concrete sidewalks, 2749 lin.ft. vitr. clay pipe, etc., from Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $45,000, D. L. Gaskill, Long Beach, $47,000.

★**Cal., Los Angeles**—Bd. Supervs. Los Angeles Co. let contract paving 1.01 mi. Cypress Ave., Rd. Impvt. Dist. No. 142, near Covina, to Fleming Constr. Co., 105 North Park Ave., Pomona, $14,500.

Cal., Los Angeles—Bd. Supervs. Los Angeles Co. received bids improving 2.057 mi. North Pomona Blvd., Rd. Impvt. Dist. No. 146, from Rogers Bros. Co., 350 Merrick St., $86,400, Fleming Constr. Co., Pomona, $92,000. Work involves 17,375 cu. yd. earth excav., 33,905 sq.yd. 5 in. concrete paving, 10,864 lin. ft. shaping roadbed, 12,560 lin.ft. curbing, 760 cu.yd. class "A" concrete for drain, 12,262 lb. reinforcing steel and 412 ft. corrugated iron pipe.

★**Cal., Los Angeles**—City let contract improving Washington St., to G. H. Oswald, 405 O. T. Johnson Bldg., involving 316,316 sq.ft. grading at $0.03 per sq.ft. 316,316 sq.ft. asphalt paving $0.22½, 9464 sq.ft. concrete, guttering, $0.28, 4280 sq.ft. granite block guttering, $0.50, 57 ft. cement curbing, $0.60, 383 sq.ft. cement walks $0.18, house connection sewers, $1.30, storm drain, $5000, total, $92,228; Mayberry St., to M. S. Cummings, 1302 West 22nd St., 63,144 sq. ft. grading, oiling and rolling, $0.15½, 4913 ft. cement curbing $0.56, 21,441 sq. ft. cement walks, $0.18, 2 storm drains, $700, post and chain railings, $500, total, $19,946.

★**Cal., San Francisco**—City let contract curbing, paving and guttering 27th, 28th, 29th, 30th, 31st, 32nd, 33rd and 34th Sts. between Taraval and Ulloa Sts., involving 18,489 sq.yd. asphalt, 933 sq.yd. vertical fibre, 9600 lin.ft. concrete curbing, 5180 sq.ft. guttering and 5945 cu.yd. earth excav., to Fay Impvt. Co., 758 Phelan Bldg., $64,775.

★**Cal., Santa Barbara**—City let contract paving Santa Barbara and Arrellaga Sts., involving 4 in. concrete base, 1½ and 5½ in. Warrenite surface, cement curbs and gutters, and 6 in. house connection sewers, to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $19,772.

Railways

PROPOSED WORK

North Carolina—East Caroline Ry., Terminal Ave., Tarboro, plans to build short line railroad from here towards Halifax. About $100,000. H. C. Bridges, Tarboro, pres. and treas.

Excavation and Dredging

PROPOSED WORK

Mont., Harlowton—Irrigation—Harlowton Irrigation Dist. plans to build system to irrigate 6000 acres. About $10,000. A. Renshaw, Roundup engr.

Wash., Yakima—Drainage—Yakima Co. plans to build drainage ditch along Benton Co. line, cost $40,000; also ditch near Sunnyside, $50,000. Work involves excavation and concrete lining. T. Mac Cartneyl, Eugene, Ore., engr.

Ore., Grants Pass — Irrigation — Grants Pass Irrigation Co. plans to install 18 in. centrifugal pump in ditch, 33 ft. above sea level, driven by 125 h. p. electric motor. G. A. Hamilton, secy.

B. C., New Westminster—Reclamation—Provincial Government, New Westminster, having preliminary plans prepared for reclamation of 30,000 acres in Sumas Lake Dist. About $3,000,000. E. D. Barrow, New Westminster, minister of agriculture.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Fairport**—Excavation—E. S. Walsh, supt. pub. wks., Capitol, Albany, let contract completing prism excav. between here and King's Bend, Contr. 189, to Lathrop, Shea & Henwood Co., 428 Ellicott Sq., Buffalo. About $30,260. Noted Nov. 6, E. B.

N. Y., New York—Dredging — Dept. of Docks, Battery Pl., received lowest 3 bids Dec. 1, dredging North and East Rivers, from New Jersey Shipbuilding & Dredging Co., 50 Broad St., $47,885; Morris & Cummings, 17 State St., $48,068; H. DuBois Sons Co., 17 State St., $54,361.

★**Mont., Forsyth**—Ditch—Hammond Irrigation Co. let contract building 6 mi. ditch and siphon, involving 25,000 cu.yd. excav., to Schleuter Bros., Miles City, $11,250.

★**Cal., Calexico**—Levee—Imperial Irrigation Dist., El Centro, let contract raising 15 mi. Volcano Lake levee in lower California, south east of Calexico, involving 120,000 cu.yd. earthwork, to Crowley & Sherer, Pacific Electric Bldg., Los Angeles. About $87,000.

Industrial Works

PROPOSED WORK

Me., Augusta—Edwards Mfg. Co., Water St., having plans prepared by Lockwood Greene & Co., archts. and engrs., 60 Federal St., Boston, Mass., for 6 story rein.-con. storehouse. About $100,000.

Mass., Boston—H. L. Hildreth Co., 67 Batterymarch St., having plans prepared by J. R. Worcester & Co., engrs., 79 Milk St., for altering and building 2 story, 60 x 180 ft., brick addition.

Mass., Cambridge—C. T. Main, engr., 201 Devonshire St., Boston, soon lets contract building 2 story, 86 x 134 ft., brick, concrete and steel, boiler house, concrete flooring and foundation, for Lever Bros. Co., 176 Bway.

Mass., East Boston (Boston P. O.)—Boston & Lockport Block Co., 100 Condor St., soon receives bids building 2 story, 80 x 245 ft., brick and timber factory, concrete foundation. H. F. Bryant, 334 Washington St., Brookline, engr.

Mass., Medford—See "Buildings."

Mass., Medford (Boston P. O.)—Amer. Radio & Research Corp., Medford Hillside, soon receives bids building 1 and 2 story, 140 x 200 ft., brick and rein.-con. factory, concrete flooring and foundation. About $90,000. H. F. Bryant, 334 Washington St., Brookline, engr.

Mass., New Bedford—Wamsutta Mills, Wamsutta St., soon receives bids building three 3 story, 20 x 20 ft. brick lavatory towers, concrete foundation. About $25,000. Private plans.

Industrial Works (Continued)

Mass., Plymouth—Plymouth Buick Co. plans to build 1 story, 80 x 175 ft., rein.-con. garage and service station, rein.-con. flooring, on Sandwich St. About $65,000.

Mass., Roxbury—W. H. Lewis, 20 Providence St., Worcester, having plans prepared by J. A. Tuck, archt., 108 Intervale St., for 2 story, rein.-con. garage, rein.-con. flooring, concrete foundation, on Washington and Circuit Sts., here. About $25,000.

Mass., Worcester—Franklin Motor Car Co., 3 King St., having plans prepared by J. Rice, archt., 306 Main St., for 1 story, brick, concrete and hollow tile garage, sales and service station, concrete flooring and foundation. About $35,000.

R. I., Shannock—Columbia Narrow Fabric Co. plans to build brick and mill construction addition to mill. About $50,000.

Conn., Danielson—Goodyear Cotton Mills, Inc., plans to build 3 story, 146 x 366 ft. factory.

Conn., South Norwalk—J. C. Schaeffler, archt. and engr., 40 West 32nd St., New York City, preparing plans for brick, steel and concrete factory, rein.-con. flooring, concrete foundation, here. About $150,000. Owner's name withheld.

Conn., Thomaston—Seth Thomas Clock Co., Elm St., having plans prepared by Lockwood, Greene & Co., archts., and engrs., 60 Federal St., Boston, Mass., for 5 story, rein.-con. addition to plant.

Conn., Waterbury—E. E. Benedict, archt., 51 Leavenworth St., soon receives bids building 1 and 2 story, 72 x 110 ft., brick, concrete and steel garage and sales plant, rein.-con. flooring, rock foundation, for Bradford Auto Sales Co., 476 Meadow St. About $25,000.

N. Y., Bath—Bd. Trustees plans to enlarge and equip electric light plant. About $35,000. J. W. Taggart, clk.

N. Y., Churchville—Village had plans prepared by F. S. Tracy, engr., Middleport, for power plant. Election soon to vote on $26,000 bonds for project.

N. Y., Long Island City—C. E. Shepard, 311 Hudson St., New York City, soon lets contract building 2 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Van Alst Ave., here. About $250,000. H. Balcom, 10 East 47th St., New York City, archt. and engr.

N. Y., Mineola—Knickerbocker Ice Co., 1480 Bway., New York City, soon lets contract building 1 story, rein.-con. and steel plant, rein.-con. flooring, concrete foundation, here. About $110,000. W. Mortensen, 209 West 76th St., New York City, archt. and engr.

N. Y., New York—See "Buildings."

N. Y., New York—Advance Novelty Candy Mfg. Co., 511 East 72nd St., having plans prepared by Haven & Crosby, archts. and engrs., 220 Devonshire St., Boston, for 5 story, 100 x 225 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on 138th St. and Willow Ave. About $500,000.

N. Y., New York—E. J. Lang, archt. and engr., 477 5th Ave., soon lets contract altering brick and steel factory, rein.-con. flooring, at 244 East 52nd St., for E. C. DeWitt, 212 5th Ave. About $50,000.

N. Y., New York—R. W. Levitan, archt. and engr., 7 West 45th St., preparing plans for 2 story, brick and steel garage, rein.-con. flooring, concrete foundation, on Hawkstone Ave. About $70,000. Owner's name withheld.

N. Y., New York—Zipkes, Wolff & Kudroff, archts. and engrs., 25 West 42nd St., receive bids about Dec. 20, altering 6 story, brick, steel and rein.-con. factory, rein.-con. flooring, on Broome St., for Majestic Mills Paper Co., 464 Broome St. About $25,000.

N. Y., New York—E. Wilbur, archt. and engr., 507 5th Ave., preparing plans for 3 story, 50 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation. About $35,000. Owner's name withheld

N. Y., Peekskill—Baron de Hirsch School, 222 East 64th St., New York City, having plans prepared by E. I. Shire, archt. and engr., 373 4th Ave., New York City, for 1 story, rein.-con. and steel, power house, rein.-con. flooring, concrete foundation. About $150,000.

N. J., Asbury Park—Rydon Tire & Rubber Co., c/o E. A. Arend, archt., 105 West 40th St., New York City, soon lets contract building brick and steel factory, rein.-con. flooring, concrete foundation. About $100,000.

N. J., Jersey City—Des Lauriers Column Mould Co., Woolworth Bldg., New York City, having plans prepared by Funk & Wilcox, archts., Old South Bldg., Boston, for 8 story, 100 x 200 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, here. About $400,000.

N. J., Jersey City—Federal Shipbuilding Co., Kearny Meadows, Newark, plans to build addition to their plant, here, to consist of new corrugated iron warehouse About $59,500.

N. J., Newark—W. Lehman, archt., 738 Broad St., soon lets contract building 2 story, brick and rein.-con. garage, on Plane and Eagle Sts., for Roth & Co., 45 Market St. About $100,000.

Pa., Altoona—Altoona Overland Co., 900 Green Ave., plans to build 4 story, 50 x 133 ft., rein.-con. garage, salesroom and repair shop, at 814-16 Chestnut Ave. About $50,000. Architect not selected.

Pa., Hazleton—Hazleton Silk Throwing Co. plans to build 1 story, 35 x 60 ft., brick and timber factory, rein.-con. flooring, rock foundation. About $50,000. Architect not selected.

Pa., Johnstown—Turin Valley Motor Co. plans to build 3 story, 66 x 160 ft., rein.-con. brick and steel, garage and salesroom, at 206 Main St. About $50,000. Architect not selected.

Pa., Milton—Shippers Car Line Co., 4th St., purchased 25 acre site, and plans to build new plant, to include storage yards. Initial cost, $70,000. R. W. Moffett, resident engr.

Pa., Phila.—E. H. Yardley, archt., 1713 Sansom St., preparing plans for 5 story, 75 x 100 ft. rein.-con., brick and terra cotta, service building, on Broad and Girard Sts. Cost to exceed $50,000. Owner's name withheld.

Md., Baltimore—Dewitz & Webb, archts., 232 St. Paul St., preparing plans for 1 story, 60 x 350 ft., concrete, brick and steel foundry, rein.-con. flooring, concrete foundation, in northeastern section of city. About $100,000. Owner's name withheld.

Md., Baltimore—Harper & Bros., Franklin Sq., New York City, plan to build printing and bookbinding plant here, including workmen's houses, etc. Initial cost, $1,000,000.

Md., Baltimore—Terminal Warehouse Co., Davis and Pleasant Sts., having plans prepared by Owens & Sisco, archts., 1605 Continental Bldg., for 6 story, 120 x 600 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Boston St. near Clinton St. About $300,000. H. F. Dolleman, 507 North Charles St., engr.

Md., Cumberland—Merchants' Ice & Cold Storage Co., plans to construct 7 story cold storage building. About $80,000.

Tenn., Memphis—Sugar Products Co., 16 Exch. Pl., New York City, plans to construct molasses storage building, here, to house 500,000 gal. tank, power house, etc. Cost to exceed $50,000. Architect not selected.

O., Ashtabula—City plans to construct new buildings and install electrical machinery, at Municipal Lighting Plant. About $50,000. R. N. Case, Ashtabula, engr.

O., Cleveland—Detroit & Cleveland Navigation Co., Lake Front at foot East 9th St., plans to build 1 story, 300 x 720 ft., rein.-con., steel and brick warehouse, rein.-con. flooring, concrete foundation, also extend pier. About $300,000. Private plans.

O., Cleveland—L. M. Axle Co., 247 Colonial Arcade, plans to build 2 story, 90 x 210 ft., concrete, steel and brick factory, rein.-con. flooring, concrete and brick foundation, on East 49th St. and Newburgh & South Shore R. R. About $100,000 H. E. Shimmen, 2031 Euclid Ave., archt.

O., Dayton—Domestic Eng. Co., Taylor St., plans to build 6 story, 80 x 300 ft., rein.-con. and steel factory, rein-con. flooring, concrete foundation, on Webster St. About $200,000. Schenk & Williams, Mutual Home Bldg., archts.

O., Dayton—Standard Register Co., Albany St., plans to build 1 and 2 story, 80 x 100 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on Albany St. About $35,000 Architect not selected.

O., Dayton—Stanley Mfg. Co., Cannon St., plans to build 3 story, 40 x 80 ft., rein.-con. factory, rein.-con. flooring, concrete foundation. About $25,000. Frank Hill Smith Co., Inc., 1035 Reibold Bldg., archts.

O., Elyria—Winner Cord Tire & Rubber Co., 702 Natl. City Bldg., Cleveland, plans to build 3 story, concrete, steel and brick factory, rein.-con. flooring, concrete foundation, here. About $300,000. Engineer not selected.

Ind., Indianapolis—Dean Steam Pump Wks., 323 West 10th St., plans to build 2 story, brick and steel machine shop, rein.-con. flooring, concrete foundation. About $25,000. C. Brossman, 1503 Merchants Bank Bldg., engr.

Ind., Indianapolis—Vonnegut Mchy. Co., 43 South Meridian St., had plans prepared by Vonnegut, Bohn & Hueller, archts., Indiana Trust Bldg., for 2 story, 95 x 300 ft. rein.-con., brick and steel warehouse, rein.-con. flooring, at 43 South Meridian St. About $200,000.

Mich., Detroit—Buhl Sons Co., 103 West Woodbridge St., plans to build 5 story, brick, rein.-con. and steel warehouse, rein.-con. floooring, concrete foundation, at foot of Adair St. About $60,000. J. Scott & Co., 2326 Dime Bank Bldg., archts.

Mich., Flint—Van Leyen, Schilling & Keough, archts. and engrs., 201 Walsh Bldg. preparing plans for 1 story, 30 x 248 ft. rein.-con. storage plant, rein.-con. flooring, concrete foundation, on Industrial Ave. About $35,000. Owner's name withheld.

Mich., Jackson—Sparks-Withington Co., North St., having plans prepared by Withington-Roberts & Wright Co., archts., Swetland Bldg., Cleveland, building 4 story, 100 x 300 ft., rein.-con., brick and steel plant, rein.-con. flooring, concrete foundation, here. About $200,000.

Ill., Chicago—Arabol Mfg. Co., 100 William St., New York City, having plans prepared by A. Smith, archt. and engr., 7422 Parnell Ave., for brick and steel factory, rein.-con. flooring, concrete foundation. About $100,000.

Wis., Green Bay—J. Hoberg Paper Co., Elm St., plans to build 4 story, 60 x 250 ft. rein.-con. and steel mill, rein.-con. flooring, brick foundation, on 12th and Main Sts. About $250,000. Architect not selected.

Wis., Greenwood—Blum Bros. purchased site and plans to build 3 story, 60 x 200 ft brick, rein.-con. and steel factory, brick foundation, on Main St. About $50,000. Architect not selected.

Wis., Milwaukee—W. S. Seaman Co., 480 Virginia St., plans to build 1st unit of plant, 6 story, 50 x 70 ft. and 100 x 400 ft., brick, concrete and steel, probably rein.-con. flooring, concrete foundation, on Port Washington Rd. About $500,000. Engineer and architect not decided, may be private.

Wis., Milwaukee—Walsh Harness Co., 425 East Water St., having plans prepared by M. Tullgren & Sons, archts. and engrs., 425 East Water St., for 1 story, 50 x 200 ft. brick and mill construction factory, concrete foundation, on Keefe Ave. About $60,000.

Wis., Tomah—Tomah Rubber Wks., c/o L. Hofmeister, 176 16th St., Milwaukee, had plans prepared for 2 story, 96 x 100 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation. About $45,000. Private plans.

Minn., Minneapolis—C. L. Kinport, archt., Andrus Bldg., soon lets contract building 2 story, 100 x 120 ft., rein.-con. and brick garage, on Lincoln and Aldrich Aves., S., for Harris Realty Co., New England Bldg. About $52,000

Minn., Minneapolis—Northwestern Glass Co., 219 2nd St., N., plans to build 4 story, 66 x 162 ft., rein.-con. and brick addition to factory, on 2nd Ave. and 2nd St. N. About $100,000. Bertrand & Chamberlain, Northwestern Bank Bldg., archts.

Minn., New Ulm—City plans to build 90 x 90 ft. power plant. About $50,000. A. J. Mueller, supt. power plant

Minn., Rices Point (Duluth P. O.)—Northern Pacific R.R., St. Paul, preparing plans for 5 freight warehouses and rearrangement of trackage in yards, here. About $500,000. W. H. Strachan, Duluth, div. supt.

Kan., St. Francis—City having plans prepared by Hennington Eng. Co., engrs., 12th and Harney Sts., Omaha, Neb. for new electric light plant. Bonds for $55,000 voted for project.

Industrial Works (Continued)

Kan., Wichita — Emerson-Brantingham Co., 218 South Wichita St., plans to build 4 story, 120 x 264 ft., brick warehouse and office. About $150,000. Architect not selected.

Neb., Omaha—Baker Ice Machine Co., c/o J. L. Baker, 19th and Nicholas Sts., plans to build 2 story, 140 x 400 ft. factory and 140 x 155 ft. office, brick and steel, rein.-con. flooring, concrete foundation. Cost between $350,000 and $400,000. Architect not selected.

N. D., Grand Forks—Industrial Comn. of North Dakota, Bismarck, having preliminary plans prepared by C. L. Pillsbury Co., engrs., 805 Metropolitan Life Bldg., Minneapolis, constructing flour mill, 2000 to 3000 bbl. daily capacity, 1,500,000 bu. capacity elevator and 8 story, 40 x 160 ft. office building, concrete and mill construction. About $1,500,000.

Mo., St. Louis—Amer. Bakers Machy. Co., Clinton and 9th Sts., preparing plans building 2 story, 100 x 300 ft., concrete and brick factory, rock foundation, on Kings Highway. About $75,000.

Mo., St. Louis—Southern Car Wheel Co., Ry. Exch. Bldg., plans to build 1 and 2 story, 120 x 135 ft., concrete, steel and brick factory, rein.-con. flooring, rock foundation, on Euclid Ave. and St. Louis Belt & Terminal R.R. About $400,000. Architect not selected.

Tex., Navasota—Chamber of Commerce receives bids about Dec. 15, building 2 story, 86 x 110 ft., ice and cold storage plant, brick. About $75,000.

Okla., Sapulpa—C. R. Webb plans to build 1 story, flour mill and grain elevator. About $50,000. Architect and engineer not selected.

Wash., Aberdeen—Bishop Lumber Co., Montesano, acquired 400 ft. site on harbor front, here, and plans to build 2 story, concrete sawmill, 60,000 ft. daily capacity. About $100,000. E. K. Bishop, mgr. Architect not selected.

Wash., Seattle—Bd. Educ. plans to build 3 story, 250 x 250 ft. factory and warehouse, involving 40,000 sq.ft. rein.-con. flooring, on 8th and Dexter Sts. About $160,000. F. A. Narramore, Central Bldg., school archt.

Ore., Marshfield—I. Tower plans to build 2 story, 100 x 100 ft. concrete garage, concrete foundation. in Chinatown addition. About $50,000. Architect not selected.

Cal., Glendale—See "Waterworks."

Cal., Stockton—Kroyer Tractor Mfg. Co., 512 Farmers Bank Bldg., having plans prepared by F. V. Mayo, archt., 512 Farmers Bank Bldg., for group of factory buildings. About $1,000,000.

BIDS DESIRED

Md., Baltimore—R. C. Kolb, 10th and Reed Sts., Phila., Pa., receiving bids building 1 and 2 story, 60 x 200 ft., bakery, brick and stone, concrete foundation, on Pennsylvania and North Aves, here. About $200,000. W. W. Slack & Co., 142 State St., Trenton, N. J., archts.

Md., Baltimore—Until Dec. 15, by M. J. Reilly, agt. Fidelity Storage Co., 812 Equitable Bldg., constructing 6 story, 56 x 125 ft., rein.-con., brick and stone warehouse, concrete foundation, at 2104-2108 Maryland Ave. About $160,000. Morris & Dunford, Chicago, archts.

Mich., Detroit—R. H. Fyfe, 694 Woodward Ave., receiving bids constructing 2 story, 40 x 150 ft., rein.-con. and brick garage and sales building, rein.-con. flooring, concrete foundation. About $60,000. Smith, Hinchman & Grylls, 710 Washington Arcade, archts.

Ill., Chicago—Palatine Commercial Corp., 1114 Milwaukee Ave., receiving bids building 2 story, 75 x 125 ft., brick and rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Haddon and Milwaukee Aves. About $65,000. H. Schmidt, 1165 North Clark St., archt.

Ill., Chicago—T. R. Bishop, archt., 35 South Dearborn St., receiving bids building 3 story, 160 x 165 ft., mill construction factory, concrete foundation, on Lake St. and Kildare Ave., for Playerphone Talking Machine Co., 238 North Kedzie Ave. About $175,000.

Ill., Chicago—W. J. Quan, 1310 West 79th St., receiving bids building 1 story, 75 x 120 ft., brick and timber garage, brick foundation, at 1304 West 79th St. About $25,000. A. G. Lund, 453 West 63rd St., archt.

Ill., Chicago—W. Schulze, archt., 2009 West North Ave., receiving bids building 2 story, 60 x 125 ft., brick and rein.-con. garage and storage plant, rein.-con. flooring, concrete foundation, on Lincoln and Webster Sts. About $50,000. Owner's name withheld.

Okla., Tahlequah—Until Dec. 19, by J. W. Reig, mayor, building, electric light and power plant. Bonds for $200,000 voted for project. W. N. Gladson and E. M. Ratliff, Fayetteville, Ark., engrs. Noted June 19.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. H., Troy**—Troy Blanket Mills let contract building 4 story, 68 x 289 ft. factory, 2 story, 64 x 224 ft. pickerhouse and small addition to boiler house, brick and rein.-con., to E. D. Ward Co., 82 Foster St., Worcester, Mass. About $350,000.

★**Mass., Boston**—Snider & Rudnick, 18 Tremont St., will construct 1 story, 70 x 100 ft., brick and concrete, service and sales building, concrete flooring and foundation, on Commonwealth Ave. About $45,000. Work will be done by day labor.

★**Mass., Cambridge**—G. H. Dyer, 155 Brookline St., let contract building 2 story 55 x 100 ft. factory and 1 story, 30 x 40 ft. boiler house, brick and mill construction, concrete flooring and foundation, to F. J. Van Etten Co., 153 Milk St., Boston. About $30,000.

★**Mass., Dorchester** (Boston P. O.)—J. Meltzer & Co., 31 Beach St., Boston, will build 1 story, 135 x 200 ft., rein.-con. garage, rein.-con. flooring, concrete foundation, on Columbia Rd. About $80,000. Owner's name withheld.

★**Mass., East Boston** (Boston P. O.)—I. Young & Co., 85 Border St., let contract building 2 story, 74 x 80 ft., brick factory, concrete foundation, to P. Rich, 67 Byron St. About $28,000.

★**Mass., Jamaica Plain** (Boston P. O.)—Clifton Mfg. Co., 65 Brookside Ave., let contract building 2 story, 36 x 112 ft., brick and concrete plant, concrete flooring and foundation, to W. H. Whitcomb Constr. Co., 6 Beacon St., Boston. About $40,000.

★**Mass., Somerville** (Boston P. O.)—H. E. Steves, Willow St., let contract building 1 story, 110 x 120 ft., brick garage, concrete flooring and foundation, to F. J. Van Etten Co., 153 Milk St., Boston. About $40,000.

★**Mass., Springfield** — Natl. Equipment Co., North Main St., let contract building 1 story, 150 x 150 ft., brick and concrete addition to plant, concrete foundation, to Adams & Ruxton Constr. Co., 33 Layman St. About $75,000.

★**Mass., Three Rivers**—Otis Co., Ware, let contract building 5 story, 63 x 270 ft. repair shop and 2 story, 101 x 192 ft. dye house, brick and mill construction, concrete foundation, at Palmer Mills, here, to McNally Bldg., Co., Gardner. About $400,000.

★**Mass., Watertown**—Hood Rubber Co., Nichols Ave., let contract building 1 and 2 story, 60 x 220 ft. and 3 story, 32 x 96 ft., rein.-con. additions to plant, rein.-con. flooring, concrete foundaiton, to Aberthaw Constr. Co., 27 School St., Boston. About $80,000.

★**Mass., Willimansett** (Holyoke P. O.)—C. F. Church Mfg. Co. let contract constructing 1 story, 40 x 170 ft. manufacturing plant, 50 x 60 ft. storage plant and 37 x 51 ft. office building, brick, rein.-con. flooring, concrete foundation, to E. F. Carlson Co., 310 Main St., Springfield. About $40,000.

★**R. I., Auburn**—(Providence P. O.)—Universal Winding Co. let contract building 2 story, 102 x 103 ft., brick and steel foundry, rein.-con. flooring, concrete foundation, to C. I. Bigney Constr. Co., Inc., 898 Westminster St., Providence. About $100,000.

★**R. I., East Providence** (Providence P. O.) — Tidewater Oil Co., 34 Central Wharf, Boston, Mass., let contract building rein.-con. and steel distributing station, rein.-con. flooring, concrete foundation, at foot of Massasoit Ave., here, to include storage tanks, warehouses, etc., to J. G. White Eng. Co., 43 Exch. Pl., New York City. About $30,000.

★**R. I., Pawtucket**—Oswegatchie Textile Co., 1075 Main St., let contract building 2 story, 100 x 200 ft., brick and mill construction addition to mill, rock and concrete foundation, to Famiglietti Bros., 166 Bway., Providence. About $125,000.

★**R. I., Phillipsdale**—(Pawtucket P. O.)—Sayles Finishing Plants let contract building 1 story, 40 x 65 ft. and 45 x 100 ft, brick and mill construction factory, to Central Constr. Co., Slater Trust Bldg., Pawtucket. About $25,000.

★**R. I., Providence**—International Braid Co., Charles St., let contract building 2 story, 28 x 60 ft., brick and rein.-con. addition to mill, rein.-con. flooring, to O. D. Purington & Co., Industrial Trust Bldg. About $25,000.

★**R. I., Providence**—L. Vaughn Co., 1153 Westminster St., will build 1 and 3 story, 34 x 98 ft. and 20 x 40 ft., brick and mill construction, shop and garage. About $40,000. Work will be done by day labor.

★**Conn., Bridgeport**—Bridgeport Hardware Mfg. Co., 461 Iranistan Ave., let contract building 2 story, 40 x 125 ft., brick and mill construction addition to factory, concrete foundation, on Washburn St., to S. W. Hubbell Bldg. Co., Knowlton St. About $35,000.

★**Conn., Bridgeport**—Bryant Electric Co., 1421 State St., let masonry contract for building 1 story, 60 x 117 ft., brick and steel garage, concrete flooring and foundation, to W. Martin & Son, 164 State St. Balance of work will be done by day labor. About $25,000.

★**Conn., Bridgeport**—G. T. McCarthy, 929 Iranistan Ave., will build 1 story, 82 x 145 ft., brick garage, concrete flooring and foundation, on Fairfield Ave. and Auburn St. About $29,000. Work will be done by day labor.

★**Conn., Centreville** (New Haven P. O.)—Amer. Mills Co. let contract building 1 story, 38 x 137 ft., brick and rein.-con. factory, concrete flooring and foundation, to Sperry Eng. Co., 82 Church St., New Haven. About $25,000.

★**Conn., Elmwood** (Hartford P. O.)—New Departure Mfg. Co., 269 North Main St., Bristol, let contract building 2 story, 60 x 220 ft. factory, with 62 x 68 ft. el, rein.-con., rein.-con. flooring, concrete foundation, here, to Aberthaw Constr. Co., 27 School St., Boston, Mass. About $300,000.

★**Conn., Hartford**—H. Dragat, 340 Windsor Ave., will build 2 story, 50 x 72 ft., brick and mill construction warehouse, concrete foundation. Work will be done by day labor. Noted Sept. 18.

★**Conn., Hartford**—Hartford Electric Light Co., 266 Pearl St., let contract building 1 story, 76 x 104 ft., brick and concrete warehouse, concrete flooring and foundation, on Windsor Ave., to J. H. Grozier Co., 721 Main St. About $40,000.

★**Conn., Hartford**—Hartford Special Mchy. Co., Woodland Ave., let contract building 1 story, 60 x 200 ft., brick and concrete addition to factory, concrete flooring and foundation, on Homestead Ave., to Bent-Bartlett Co., 43 Ann St. Cost between $35,000 and $40,000.

★**Conn., Meriden**—Foster, Merriam & Co., 31 Cross St., let contract building 2 story, 58 x 100 ft., brick and steel addition to foundry and office, rein.-con. flooring, concrete foundation, to H. Wales Lines Co., 134 State St. About $35,000.

★**Conn., Meriden**—Manning, Bowman & Co., Pratt St., let contract building 5 story, 50 x 130 ft., brick and mill construction plant, concrete foundation, to J. H. Grozier Co., 721 Main St., Hartford. About $65,000.

★**Conn., New Britain**—New Britain Machine Co., 140 Chestnut St., let contract building 1 story, 32 x 320 ft. addition to factory, with 40 x 70 ft. el, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on Chestnut St., to M. O. Baker, 180 Black Rock Ave. About $40,000.

★**Conn., New Britain**—New Departure Mfg. Co., 269 North Main St., Bristol, let contract to Turner Constr. Co., 178 Tremont St., Boston, Mass., constructing 1 story, 100 x 220 ft. and 4 story, 110 x 220 ft. factories, 1 story, 50 x 92 ft. boiler house, 2 story, 40 x 130 ft. transformer house, 2 story, 30 x 30 ft. printing plant and 1 story, 50 x 65 ft. carriage shop addition.

Industrial Works (Continued)

all at main plant; 1 story, 40 x 120 ft. forge shop, 1 story, 45 x 60 ft. boiler house, 1 story, 70 x 240 ft. storage plant, 1 story, 70 x 265 ft. machine shop and 2 story, 40 x 80 ft. office, at north plant, all rein.-con., rein.-con. flooring, concrete foundation.

★**Conn., New London** — Tidewater Oil Sales Co., 11 Bway., New York City, let contract building brick, rein.-con. and steel, oil distributing station, rein.-con. flooring, to Flynt Bldg. & Constr. Co., Palmer, Mass. About $75,000.

★**Conn., North Adams**—Arnold Print Wks., Marshall St., will build 1 story, 75 x 90 ft., concrete addition to dye house, rein.-con. flooring, concrete foundation. About $35,000. Work will be done by day labor.

★**Conn., Plainville**—Atwater Mfg. Co. let contract building 1 story, 50 x 240 ft., concrete and steel addition to factory, concrete flooring and foundation, to Berlin Constr. Co., Berlin. About $40,000.

★**Conn., West Haven** (New Haven P. O.) —Kelley Tire & Rubber Co., 962 Chapel St., New Haven, let contract constructing 3 story, 75 x 260 ft. factory, 2 story, 40 x 40 ft. office, 1 story, 50 x 80 ft. power house and 2 story, 25 x 25 ft. spreader building, rein.-con., rein.-con. flooring, concrete foundation, on Elm St., here, to Westcott & Mapes, Inc., 207 Orange St., New Haven, About $400,000.

★**N. Y., Brooklyn**—Diana Chocolate Co., 382 Jefferson Ave., let contract building 5 story, 84 x 200 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Wykoff and Willoughby Aves., to Caye Constr. Co., 299 Bway., New York City. About $100,000. Noted Apr. 10.

★**N. Y., Brooklyn**—H. Frank, c/o Ebling, Magnusen & Kleinert, archts. and engrs., 52 Vanderbilt Ave., New York City, will build 1 story, 200 x 300 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Eastern Parkway. About $80,000. Work will be done by day labor.

★**N. Y., Brooklyn**—H. Hessner & Son, 33 Bartlett St., will build 1 story, 160 x 200 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on McKibbon and White Sts. About $65,000. Work will be done by day labor.

★**N. Y., Cohoes**—E. S. Walsh, supt. pub. wks., Capitol, Albany, let contract building extension to present dockwall and timber freighthouse, here, Contr. 36-A, to Holler-LaDu Corp., Holland Bldg., Albany. About $39,665. Noted Nov. 6.

★**N. Y., Coney Island**—F. Kelsey, care of Parfitt Bros., archts. and engrs., 26 Court St., Brooklyn, will build 1 story, 100 x 196 ft., brick and steel service station, rein.-con. flooring, concrete foundation, on West 8th St., here. Work will be done by day labor.

★**N. Y., Farmingdale** — Raymond Eng. Corp., 309 Lafayette St., New York City, will build 1 story, 60 x 120 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here. About $90,000. Work will be done by day labor.

★**N. Y., Flushing**—Knickerbocker Ice Co., 1480 Bway., New York City, let contract building 1 and 2 story, 120 x 140 ft., ice plant, on Collins Pl., here, to Post & McCord, 101 Park Ave., New York City. About $150,000.

★**N. Y., Flushing**—E. S. Walsh, supt. pub. wks., Capitol, Albany, let contract building barge canal terminal and timber freighthouse, here, Contr. 45, to Mohawk Dredge & Dock Co., Inc., Marion Blk., Herkimer, $255,275. Noted Nov. 6.

★**N. Y., Little Falls**—Barnet Leather Co., 598 East Mill St., let contract building 1 story, 40 x 50 ft. boiler house and 1 story, 15 x 40 ft. power house, brick and rein.-con., rein.-con. flooring, to Industrial Eng. Co., 30 Church St., New York City. About $50,000.

★**N. Y., Long Island City**—Perfect Window Regulator Co., 415 Greenpoint Ave., Brooklyn, let contract building 1 story, 95 x 240 ft., brick, steel and rein.-con. factory, rein.-con. flooring, concrete foundation, on Harris and Van Alst Aves., here, to Factory Bldg. Corp., 44 Court St., Brooklyn.

★**N. Y., New York**—Brooklyn Bridge Freezing & Cold Storage Co., Bridge Arch 11, let contract remodeling and insulating 6 story, 50 x 90 ft. building into fish freezing and storage plant, to Ophuls, Hill & McCreery, Inc., 112-114 West 42nd St. About $325,000.

★**N. Y., New York**—W. Gancler, 1360 Boston Rd., will alter 1 story, 50 x 75 ft., brick and steel laundry, rein.-con. flooring, on Bryant Ave. and 173rd St. About $30,000. Work will be done by day labor.

★**N. Y., New York**—L. Gold, 44 Court St., Brooklyn, will build rein.-con. and steel factory, rein.-con. flooring, concrete foundation, at 533 West 57th St., here. About $200,000. Work will be done by day labor.

★**N. Y., New York**—Jenphil Realty Corp., 1060 Findlay Ave., will build 1 story, 100 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Webster Ave. and 166th St. About $25,000. Work will be done by day labor.

★**N. Y., New York** — Mulberry Garage Corp., 299 Bway., will build 1 story, 93 x 99 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 52 West 46th St. About $40,000. Work will be done by day labor.

★**N. Y., New York** — New York Sheet Metal Wks., 413 East 91st St., will build 1 story, brick and steel factory, rein.-con. flooring, concrete foundation, at 509 East 80th St. About $25,000. Work will be done by day labor.

★**N. Y., New York**—E. S. Walsh, supt. pub. wks., Capitol, Albany, let contract building headhouse and installing watermains and electrical work on Pier 93, West 53rd St., here, Contr. 225, to Fox Reynolds Co., Inc., 81 East 125th St., $51,197. Noted Nov. 6.

★**N. Y., New York**—Zipkes, Wolff & Kudroff, archts. and engrs., 25 West 42nd St., let contract to Turner Constr. Co., 244 Madison Ave., altering 6 story, brick and steel factory, at 204-206 East 107th St., for B. Winer, c/o architects. About $40,000.

★**N. Y., Portchester**—T. R. Mallory, Inc., Fox Island Rd., let contract building 2 story, 40 x 112 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, to G. Mertz, Portchester. About $25,000. Noted Sept. 4.

★**N. J., Hoboken**—Owens & Traeger, 1400 Washington St., let contract building 5 story, 80 x 200 ft. rein.-con. factory, on 11th St., to Industrial Eng. Co., 30 Church St., New York City.

★**N. J., Newark**—Blanchard & Co., c/o W. Lehman, archt., 738 Broad St., let contract building 2 story, 50 x 97 ft., brick and mill construction factory, on Sussex Ave., to L. Weber Bldg. Co., 171 Madison Ave., New York City. About $50,000.

★**Pa., Phila.**—Federal Hosiery Mills, Janney and Cambria Sts., let contract building 2 story, 70 x 150 ft., brick factory, to H. E. Eaton, 1713 Sansom St. About $100,000.

★**Pa., Phila.**—J. R. Kendrick Co., 125 Herman St. let contract building 3 story, 60 x 125 ft. brick and steel factory, on Germantown and Pastorius Sts., to T. M. Peterson & Son, 5114 Germantown St.

★**Pa., Phila.**—Phila Storage Battery Co., Ontario St., let contract building 1 story, 50 x 220 ft. addition to factory, with 26 x 50 ft. wing, concrete and brick, to Stewart Bros. Co., 2528 North Orkney St. About $50,000.

★**Pa., Phila.**—Standard Tin-Foil Corp., let contract building 1 story, 130 x 260 ft. brick and steel factory, on Cedar and Tioga Sts., to Austin Co., Bulletin Bldg. About $85,000

★**Md., Baltimore** —Blumberg Bros. & Co., 223-225 West Baltimore St., let contract constructing 3 story, 50 x 125 ft. addition to wholesale house, to Consolidated Eng. Co., 243 Calvert Bldg. About $70,000

★**Md., Baltimore**—Howell Motor Car Co., Mt. Royal Ave. and Cathedral St., let contract constructing 2 story, 100 x 123 ft., rein.-con., steel and brick garage and service building, cement flooring, concrete foundation, at 913-27 Bolton St., to H. A. Markley, 3809 Clifton Ave. About $55,000; cost plus percentage basis.

★**Md., Curtis Bay** (Baltimore P. O.)— Standard Wholesale Phosphate Co., 1214 Continental Bldg., let contract building 1 story, 60 x 216 x 320 ft., rein.-con. and steel plant, rein.-con. flooring, concrete foundation, on Aspin St., to Whiting-Turner Co., Stewart Bldg., Baltimore. About $72,000.

★**W. Va., Parkersburg**—The Vitrolite Co., let contract building 1 story, 200 x 300 ft. brick and steel addition to factory, brick foundation, to Plate & Vogle, Parkersburg. About $300,000.

★**O., Cleveland**—See "Buildings."

★**O., Cleveland**—Cleveland Automobile Co., 300 East 132nd St., let contract building 4-story, 80 x 200 ft., brick factory, rein.-con. flooring, concrete foundation, on Euclid Ave and London Rd., to J. Gill & Son Co., Citizens Bldg. About $350,000.

★**O., Cleveland**—Cleveland Printing Ink Co., 1104 Prospect Ave., let contract building 2 story, 40 x 99 ft., brick, workshop, brick foundation, at 1106 Hamilton Ave., to H. Chakford, 8120 Decker Ave. About $50,000.

★**O., Cleveland**—Cream Cone Mchy. Co., 5454 Hough Ave., let contract building 2-story, 50 x 54 ft., rein.-con., steel and brick factory, at 5808 Hough Ave., to A. A. Lane Co., 1836 Euclid Ave. About $30,000. Noted Sept. 8.

★**O., Cleveland**—International Motor Co., 1325 West Front St., Plainfield, N. J., let contract building 1 story, 100 x 300 ft., concrete, steel and brick garage and salesroom, rein.-con. flooring, concrete foundation, on East 70th St. and Carnegie Ave., here, to P. F. Bennett, 1714 Columbus Rd. About $75,000.

★**O., Cleveland**—Ohio Blower Co., 9301 Detroit Ave., let contract building 5 story, 65 x 300 ft., concrete, brick and steel factory, rein.-con. flooring, concrete foundation, to S. W. Emerson Co., 1900 Euclid Bldg. About $300,000.

★**O., Cleveland**—W. G. Smith Co., 2191 West 110th St., let contract constructing 1 story, 90 x 260 ft., concrete, brick and steel storage building, rein.-con. flooring, concrete foundation, to Austin Co., 16112 Euclid Ave. About $75,000.

★**O., Columbus**—Belmont Casket Co., 330 West Spring St., let contract building 4 story, 45 x 73 ft. brick factory, to E. Elford, Commercial Bldg. About $28,000.

★**O., Columbus**—J. Immel & Sons Co., 31 East Livingston Ave., let contract constructing plant, including 250 x 350 ft., concrete and brick building, 1 story, 40 x 60 ft., concrete and brick office, 1 story power plant and brick dry kiln, on High St. and Innis Ave., to C. W. Schnelder & Sons, Pennsylvania R.R., south of Fair Grounds. About $400,000.

★**O., Columbus**—Ohio State Stove & Mfg Co., 899 Ingleside Ave., let contract building 3 story, 45 x 45 ft. addition to plant, to F. M. Bowman, 1012 Summit St.

★**O., Dayton**—Garford Dayton Sales Co., Main St., let contract building 1 story, 48 x 166 ft., brick and steel garage and sales room, rein.-con. flooring, concrete foundation, on North Main St., to Industrial Bldg. Co., 757 Reibold Bldg. About $60,000

★**O., New Lexington**—R. J. Thacker Co. let contract constructing 3 story, 62 x 122 ft., concrete and brick, wholesale building, to E. C. Fenimore, Brunson Bldg., Columbus. About $75,000. Noted Aug. 21.

★**O., Springfield**—Bauer Bros., Apple St., let contract building 3 story, 50 x 90 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, to Frank Hill Smith Co., Inc., 1035 Reibold Bldg. About $50,000.

★**Ind., Aetna**—Aetna Iron & Steel Co., Gary, let contract building 1 story, 75 x 400 and 225 x 600 ft. rolling mills, brick and steel, concrete foundation, here, to Northwestern Bridge & Iron Co., 32nd and Hopkins Sts., Milwaukee. About $350,000.

★**Mich., Bay City**—Fletcher Auto Sales Co., Saginaw St., let contract building 1 and 2 story, 75 x 100 ft. and sales service station, brick, steel and stone, rein.-con. flooring, brick foundation, on Saginaw and 4th Sts., to Sparling, Gilbert & Chevier, Saginaw St. About $30,000.

★**Mich., Detroit**—Anderson Electric Car Co., Milwaukee and Junction Aves., let contract building 1 story, 100 x 187 ft., rein.-con. addition to factory, rein.-con. flooring, on Aberle St., to H. G. Christman Co., 315 Stevens Bldg. About $45,000.

★**Mich., Detroit**—Detroit & Cleveland Navigation Co., foot of Wayne St., let contract constructing 1 and 2 story, steel and corrugated iron, freight shed and office building, to Bryant & Detwiler Co., 2336 Dime Bank Bldg. About $50,000.

Industrial Works (Continued)

★**Mich., Detroit** -Detroit Edison Co., David Whitney Bldg., let contract building 10 story, 150 x 250 ft., rein.-con., brick and steel service station, rein.-con. flooring, concrete foundation, on 2nd and Alexanderine Aves., to A. A. Albrecht Co., 1130 Penobscot Bldg.

★**Mich., Detroit** — Fisher Body Corp., Oakland and Piquette Aves., let contract to H. G. Christman Co., 315 Stevens Bldg., constructing 1 story, 123 x 678 ft., trainshed, shipping and press room, rein.-con., brick and steel, concrete foundation, rein.-con. loading platform with asphalt floors and 2 plate girder bridges over tracks, 26 and 45 ft. spans, on West End and Fort Sts.

★**Mich., Detroit**—General Carbonic Co., 542 5th Ave., New York City, let contract building 1 story, 100 x 120 ft. plant, 40 x 50 ft. boiler house, and 25 x 30 ft. garage, rein.-con. and steel, rein.-con. flooring, concrete foundation, here, to Austin Co., 217 Bway., New York City. About $75,000.

★**Mich., Detroit**—Pittman & Dean Co., 203 Griswold St., let contract building 2 story, 97 x 106 ft. brick, steel and tile, plant, rein.-con. flooring, concrete foundation, on Brush and Victor Sts., to Pine & Munnicke, 103 Marquette Bldg. About $70,000.

★**Mich., Grand Rapids**—Berkey & Gay Co., Monroe Ave., let contract building 5 story, 160 x 220 ft., rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, to include dry kilns, power plant, office and recreation buildings, to Owen-Ames-Kimball Co., Michigan Trust Bldg., 42 Pearl St. About $400,000.

★**Mich., Jackson**—Hup Motor Car Co., Park Ave., let contract building 1 story, 170 x 280 ft., rein.-con., brick and steel factory, concrete foundation, to E. Winter, Chamber Commerce Bldg., Detroit.

★**Mich., Lansing**—Detroit Beef Co., 1214 Washington St., let contract building 2 story, 30 x 92 ft. storage plant and 19 x 42 ft. garage, brick, concrete and steel, rein.-con. flooring, concrete foundation, on Washington St. and Grand Trunk Ry., to Pine & Munnicke, 103 Marquette Bldg., Detroit. About $50,000.

★**Ill., Chicago**—Doehler Die Casting Co., 4429 North Campbell Ave., let contract building 1 story, 150 x 300 ft., mill construction factory, concrete foundation, on 97th and Cottage Grove Sts., to W. McCumber & Son, 140 South Dearborn St. About $150,000.

★**Ill., Chicago**—Packard Motor Car Co., West Grand Blvd., Detroit, Mich., let contract building 2 story, 298 x 304 ft., brick and rein.-con. service and assembly station, rein.-con. flooring, concrete foundation, on West 37th St. and Princeton Ave., to E. L. Scheidenheim, 111 West Monroe St.

★**Ill., East St. Louis**—Morris & Co., Natl. Stockyards, will build 2 story, 30 x 112 ft., brick and steel power plant, rock foundation. About $50,000. Work will be done by day labor.

★**Wis., Kewaskum**—Kewaskum Aluminum Co. let contract building 2 story, 50 x 180 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, to J. L. Stanage, 144 Oneida St., Milwaukee.

★**Wis., Madison**—Madison Kipp Lubricating Co., Waubesa St., let general contract building 52 x 240 ft. rein.-con. and steel addition to factory, to G. C. Cnare & Son, 2000 Jenifer St., steel, to Lakeside Bridge & Steel Co., North Milwaukee St., Milwaukee. Total cost, $200,000.

★**Wis., Manitowoc**—A. H. Franke Co., 1119 Columbus St., let contract building 2 story, 30 x 160 ft. brick, rein.-con. and steel factory, brick foundation, on 12th St., to Blake Constr. Co., 627 South River St., Appleton. About $27,500. Noted Dec. 4.

★**Wis., Milwaukee**—Gemco Mfg. Co., 742 South Pierce St., let contract building 2 story, 50 x 150 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, to Universal Constr. Co., 97 Wisconsin St. About $50,000. Noted Dec. 4.

★**Wis., Milwaukee**—H. J. Esser, archt. and engr., Camp Bldg., let contract to P. Riesen Sons, 1018 Humboldt Ave., building 1 story, 100 x 300 ft. brick and steel factory, concrete foundation, on Keefe Ave. and Bremen St., for Manufacturers' Box Co., 130 Reservoir Ave. About $100,000.

★**Wis., Milwaukee** — Natl. Knitting Co., 905 Clinton St., let contract building 3 story, 72 x 146 ft. brick and mill construction factory, concrete foundation, to Meredith Bros. Co., 1044 Kinnicinnic Ave. About $75,000.

★**Wis., West Bend**—West Bend Aluminum Co. let contract building 4 story, 72 x 144 x 192 ft. and 1 story, 72 x 120 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, to Northern Constr. Co., Colby-Abbot Bldg., Milwaukee. About $100,000; cost plus percentage basis.

★**Ia., Maquoketa**—City let contract building power and light plant, to include installation of one 250 h. p. Diesel type engine, etc., to Busch-Selzer Bros. Co., Kansas City, Mo. About $61,000.

★**Ia., Sioux City**—Fairmont Creamery Co., 12th and Jones Sts., Omaha, Neb., let contract building 8 story, 75 x 150 ft. creamery, brick, rein.-con. and steel, rein.-con. flooring, brick foundation, here, to F. T. Hoox & Son, Sioux City. About $200,000; cost plus percentage basis.

★**Minn., St. Paul**—U. S. Bedding Co., Arundel and Minnehaha Aves., let contract building 2 story, 124 x 225 ft., rein.-con., steel, brick and stone factory and office, on Minnehaha and Western Aves., to O. H. Rundquist, 1466 Selby Ave. About $85,000, cost plus percentage basis.

★**Mo., St. Louis**—Bayer Steam Soot Blower Co., 282 La Salle St., let contract building 3 story, 120 x 140 ft., concrete and brick factory, rein.-con. flooring, on Thurman and Park Aves., to Ajax Constr. Co., 4600 Park Ave. About $125,000.

★**Mo., St. Louis**—Bridge & Beach Mfg. Co., 1st and Valentine Sts., let contract to Fruin Colnon Constr. Co., Merchants Laclede Bldg., constructing factory, on Union and Belt Sts., consisting of 7 story, concrete, steel and brick moulding shop, cost $135,000; 3 story, 152 x 200 ft., concrete and brick warehouse, etc., $107,000; 1 story, 25 x 60 ft., concrete and brick boiler house, $27,000; 4 story, concrete and brick, storage building, $21,000; 1 story, brick enameling and oven rooms, $12,000; 1 story, brick pattern shop, $9000; 1 story, 60 x 110 ft., brick, office building, $50,000.

★**Mo., St. Louis**—Sugar Products Co., 16 Exch. Pl., New York City, let contract building concrete, steel and brick storage plant, installing loading and unloading equipment and 10,000 ft. pipe, on Tesson and Van Buren Sts., to Murch Bros. Constr. Co., Ry. Exch. Bldg., $125,000; also installing and equipping 500,000 gal. storage tank, pumping station, transferring and oil engine power equipment, to P. A. Rohan, North 1st St., $30,000.

★**Mo., St. Louis**—Texas Co., 2414 De Kalb St., let contract constructing 80 x 115 ft. concrete storage building and installing steel storage tank, to E. Reicht, 2414 De Kalb Ave. About $100,000.

★**Tex., Houston**—Miller Bros., Jackson St. and Preston Ave., let contract building 3 story, rein.-con. factory to T. Telepson, 4510 Park Drive, $48,600.

★**Ont., Hamilton** — Spectator Printing Co., James St., let contract building 3 story, 60 x 120 ft., brick and steel factory and office, concrete flooring, to Stewart & Sinclair, 17 Jackson St. About $100,000.

Buildings

PROPOSED WORK

Me., Lewiston — Bank — Lewiston Trust Co. soon lets contract building 2 story, 50 x 110 ft., brick, stone and steel, concrete flooring and foundation. About $60,000. T. M. James, 3 Park St., Boston, Mass., archt.

Mass., Boston — Business — Codman & Street, 15 State St., having plans prepared by J. D. Leland, archt., 185 Devonshire St., for 7 story, 22 x 120 ft., brick, concrete and steel, on Washington St. W. F. Schrafft & Sons Corp., 160 Washington St., lessee.

Mass., Boston—Office—Amer. Mutual Liability Insurance Co., 245 State St., having plans prepared by F. F. Jousberg Co., archts. and engrs., 16 Central St., for 6 story, 64 x 120 ft., on Beacon St. About $500,000.

Mass., Fall River — Business — S. S. Kresge Co., Kresge Bldg., Detroit, Mich., plans to build 2 story, 84 x 111 x 133 ft., on South Main St., here. About $75,000.

Mass., Fitchburg — Memorial — S. Joseph's Roman Catholic Church, Columbus Ave., plans to construct memorial building. About $60,000. J. Moussier, secy. Architect not selected.

Mass., Medford — Office, etc. — Malden Electric Co., 201 Devonshire St., Boston, plans to build 1 and 2 story, 58 x 62 ft., rein.-con. office and sub-station, rein.-con. flooring, concrete foundation, on Salem St., here. C. H. Tenney & Co., 201 Devonshire St., Boston, engrs.

Mass., Needham (Boston P. O.)—Hospital—Glover Home & Hospital, Chestnut St., having plans prepared by Coolidge & Shattuck, archts., 122 Ames Bldg., Boston, for large addition to hospital.

Mass., North Adams—Home—I. O. O. F., Oneco Lodge, plans to build home, on Ashland and Summer Sts. About $150,000. Architect not selected.

Mass., Northampton—Theatre—Goldstein Bros. Amusement Corp., Bridge St., Springfield, plans to build large addition to Plaza Theatre, on Pleasant St., here.

Mass., Quincy — Administration — Children's Institution Dept., soon lets contract constructing 3 story, 95 x 115 ft., brick, concrete foundation, at Suffolk School for Boys, on Rainsford Island. About $200,000. J. Purdon, 8 Beacon St., Boston, archt.

Mass., Willimansett (Holyoke P. O.)—Housing—Stevens-Duryea Co., Chicopee Falls, plans to build about two hundred 2 story, brick and timber houses for workmen, at Driving Park, here.

R. I., Kingston—College—Rhode Island State College having plans prepared by E. B. Homer, archt., 89 Weybosset St., Providence, for 4 story, 54 x 120 ft. Bids will be received in about 3 months. About $200,000. H. Edwards, pres.

R. I., Lonsdale (Pawtucket P. O.)—School—Lincoln Twp. having plans prepared by J. F. O'Malley, archt., 75 Westminster St., Providence, for 2 story, 56 x 110 ft. with 45 x 70 ft. ell, brick and steel, concrete foundation, here. About $60,000. Noted July 24.

R. I., Westerly—Bank and Office—Washington Trust Co., Main St., soon lets contract building 3 story, 60 x 104 ft., brick and steel, brick foundation, on Broad and Main Sts. About $60,000. York & Sawyer, 50 East 41st St., New York City, archts. and engrs. Noted Jan. 2.

Conn., Ansonia—Bank—Mowbray & Uffinger, archts., 56 Liberty St., New York City, soon let contract building 1 story, 50 x 100 ft., brick, granite and limestone, concrete flooring and foundation, for Ansonia Natl. Bank, 165 Main St. About $75,000.

Conn., Manchester — School — F. Farley, archt. and engr., 15 West 38th St., New York City, soon lets contract building brick, steel and stone, brick foundation, on Spruce St., for town. About $150,000. Noted Aug. 28.

Conn., Middletown — Hospital — D. K. Perry, archt., 79 Golf Maple Hill, New Britain, rejected bids received building 2 story, 105 x 233 ft., brick, concrete and steel, rein.-con. flooring, concrete foundation, on South Farms, for Connecticut Hospital for Insane. About $175,000. Project postponed indefinitely.

Conn., New London—Business—Bilderbeck & Langdon, archts., Barrows Bldg., soon let contract building 2 story, 25 x 80 ft., brick, rein.-con. flooring, brick foundation, on Main St., for S. McMullen, 35 Main St. About $60,000.

Conn., Wallingford — Bank — First Natl. Bank, 33 South Main St., having plans prepared by R. W. Foote, archt., 185 Church St., New Haven, for brick and steel, on Main and Center Sts. About $100,000.

Conn., Waterbury—Theatre—J. S. Fernandez, 24 West Porter St., plans to build 3 story, 50 x 160 ft., brick and concrete, on East Main St. About $50,000. Private plans.

N. Y., Brooklyn—Theatre—J. Hilder, 271 75th St., having plans prepared by Carlson & Wiseman, archts., 226 Henry St., for 2 story, 157x175 ft., brick and steel, brick foundation, on Bway. and Chauncey St. About $175,000.

N. Y., Brooklyn—Theatre—Kingshighway Realty Co., c/o Carlson & Wiseman, archts., 226 Henry St., having plans prepared for brick and steel, brick foundation, on Kings Highway and East 12th St. About $300,000.

N. Y., Buffalo—Theatre—Loew's Enterprises, 1492 Bway., New York City, having plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, for brick and steel, brick foundation, on Washington and Mohawk Sts. About $400,000.

Buildings (Continued)

N. Y., Long Island City—Laboratory—Pathe Exch. Inc., 25 West 45th St., New York City, having plans prepared by Stone & Webster, archts. and engrs., 120 Bway., New York City, for rein.-con. and steel, rein.-con. flooring, concrete foundation, here. About $700,000.

N. Y., Newtown (Flushing P. O)—School—Bd Educ., 500 Park Ave., New York City, rejected bids received Oct. 28, building brick, steel and stone addition, brick foundation, on Etna Pl., Chicago and Parcell Sts. About $400,000. Work will be readvertised. C. B. G. Snyder, Municipal Bldg., New York City, archt. and engr.

N. Y., New York—Hotel Silver Lunch Co., c/o B. H. and C. N. Whinston, archts. and engrs., 2 Columbus Circle, having plans prepared for altering brick and steel, on 52nd St. and Bway. About $150,000.

N. Y., New York—Loft—J. C. Schaeffler, archt. and engr., 40 West 32nd St., preparing plans for brick and steel, brick foundation, at 539-549 Broome St. About $150,000. Owner's name withheld.

N. Y., New York—Lofts and Stores—L. M. Gerry, Newport, R. I., having plans prepared by F. J. Schefeick, archt., 4168 Park Ave., New York City, for altering 12 story, brick and steel, at 1115-1117 Bway., here. About $75,000.

N. Y., New York—Office—R. Goelet Estate, 1492 Bway., having revised plans prepared by J. H. Duncan, archt. and engr., 347 5th Ave., for altering brick and steel. About $100,000.

N. Y., New York—Office—Mfrs. Cloak & Suit Trade, 136 Madison Ave., plan to build 16 story, brick, steel and stone, brick foundation, on 36th and 38th Sts., 7th and 8th Aves. About $8,000,000. M. Kanner, pres. Architect or engineer not selected.

N. Y., New York—Office—Seventy-five Maiden Lane Corp., c/o A. F. Gilbert, archt. and engr., 80 Mainden Lane, soon lets contract building 12 story, brick and steel, brick foundation, at 73-79 Maiden Lane. About $1,200,000.

N. Y., New York—Store—B. Altman & Co., 5th Ave. and 34th St., plans to build 8 story, 60 x 100 ft., brick, steel and stone, brick foundation, at 1-3 East 35th St. St. Architect or engineer not selected.

N. Y., New York—Theatre, etc.—One Hundred Forty-fifth St. Theatre Corp., 120 Bway., having plans prepared by T. W. Lamb, archt. and engr., 644 8th Ave., for 2 story, 88 x 172 ft., brick and steel theatre and garage, rein.-con. flooring, brick foundation, at 246-262 West 145th St. About $300,000.

N. Y., New York—Theatre—S. S. and L. Shubert, 225 West 44th St., having plans prepared by H. J. Krapp, archt. and engr., 116 East 16th St., for brick and steel, brick foundation, on 49th St. west of Bway. About $500,000.

N. Y., Rochester—Y. M. C. A., 2 West 45th St., New York City, having plans prepared by J. F. Jackson, archt. and engr., 47 West 34th St., New York City, for altering brick and steel building, here. About $75,000.

N. J., Glassboro—Normal School—State Bd. Educ., Trenton, plans to build 3 story, 122 x 300 ft., with 60 ft. wing, concrete and brick, here. About $700,000. F. H. Bent, 142 West State St., Trenton, Archt.

N. J., Jersey City—School—Sacred Heart Church, Bedwell Ave., plans to build new school. About $100,000. Architect not selected.

N. J., Jersey City—Theatre—Knickerbocker Realty Co. plans to build theatre on Boulevard and Sip Aves. Cost to exceed $100,000. S. A. Lerner, pres.

N. J., Somerville — Hospital — Somerset Hospital plans to build brick, steel and stone addition. About $200,000. Crow, Lewis & Wick, 200 5th Ave., New York City, engrs. and archts.

N. J., Trenton—Capitol—State Administration plans to build 3 story, concrete, steel and stone addition, on West State St. About $500,000. F. H. Bent, 142 West State St., archt.

N. J., Trenton—Club House—Carteret Club, State and Montgomery Sts., plans to build new club house, here. About $100,000. F. Gilkyson, Trenton Jct., pres.

N. J., Trenton—Club House—Engineers' Club of Trenton, Trent Theatre Bldg., plans to build club house. About $60,000. F. C. Carstarphen, 901 Edgewood Ave., chn. Bldg. Comn.

N. J., Westfield—Church—First Baptist Church soon lets contract building 1 story, 92 x 117 ft., concrete, brick and stone, on Elm St. About $60,000. Ludlow & Peabody, 101 Park Ave., New York City, archts. Noted Sept. 25.

Pa., Dorranceton (Kingston P. O.)—Hall—Veterans of Foreign Wars plan to build 3 story, 30 x 40 ft., concrete, brick and steel, rein.-con. flooring, rock foundation, on Wyoming Ave. About $50,000. Architect not selected.

Pa., Harrisburg—Bank—J. T. Brugger, archt., 507 Chestnut St., Phila., receives bids about Jan. 1 building 1 story, 40 x 100 ft., steel and marble, on 13th and Market Sts., for Allison-Hill Trust Co. Cost to exceed, $50,000.

Pa., Hazelton—Citadel—Salvation Army plans to build 3 story, 40 x 40 ft., concrete, brick and steel, rein.-con. flooring, rock foundation, on Vine St. About $60,000. Architect not selected.

Pa., Hazelton — Nurses' Home — State Hospital plans to build 3 story, 30 x 45 ft. brick and steel, rein.-con. flooring, brick foundation, on Vine St. About $50,000. Architect not selected.

Pa., Scranton—Citadel—Salvation Army, 427 Penn Ave., plans to build 3 story, 50 x 80 ft., concrete, brick and steel, rein.-con. flooring, rock foundation, on Washington Ave. About $80,000. Architect not selected.

Pa., Sunbury—Bank—Sunbury Trust & Deposit Co., 4th and Market Sts., plans to build 6 story, 60 x 120 ft. Address W. H. Druckmiller, 31 North 4th St., chn. com.

Pa., Wilkes Barre—Bank—Luzerne Co. Natl. Bank, 27 Pub. Sq., plans to build 4 story, 50 x 100 ft., brick and steel, rein.-con. flooring, rock foundation. About $240,000. Architect not selected.

Pa., Wilkes Barre—Hospital—Wyoming Valley Homeopathic Hospital, Dana St., plans to build 4 story, 40 x 50 ft., brick, steel and stone, rein.-con. flooring, rock foundation. About $90,000. Architect not selected.

Del., Wilmington—Library—Wilmington Institute Free Library, 8th and Market Sts., soon receives bids building 4 story, 77 x 198 ft., concrete and brick. About $600,000. L. E. Eden, 1170 Bway., New York City, engr. Boring & Tilton, 52 Vanderbilt Ave., New York City, archts.

N. C., Gastonia—Bank and Office—Mowbray & Uffinger, archts., 56 Liberty St., New York City, soon receive bids building 4 story, 43 x 83 ft., stone, concrete and terra cotta, for Citizens Natl. Bank.

Ga., Columbus — Bank — Merchants & Mechanics Bank, 1205 Broad St., had plans prepared by Mowbray & Uffinger, engrs. and archts., 56 Liberty St., New York City, for brick, steel and stone. About $150,000.

Ga., Cordelle—School—City voted $50,000 bonds to build school.

Ala., Athens—Hotel—Athens Hotel Co. plans to build 3 story, 90 x 128 ft., brick. About $85,000. Architect not selected.

Ala., Birmingham—Record—Comrs. Jefferson Co. having plans prepared by H. B. Wheelock, archt., Steiner Bank Bldg., for 2 story, 40 x 132 ft., fireproof, record building, on 3rd Ave. and 21st St. Cost between $60,000 and $70,000.

Ala., Decatur—Bank and Office—Tennessee Valley Bank plans to build 5 story, 64 x 100 ft., on Vine and Bank Sts. About $100,000. Architect not selected.

La., Gonzales—School—Ascension Parish School Bd., Donaldsonville, soon lets contract building 3 story, brick, here. Nolan & Torre, Hennen Bldg., New Orleans, archts.

O., Cleveland — Armory — Ohio Natl. Guard, c/o Grays Armory, negotiating for site and plans to build 1 story, brick, stone and steel, rein.-con. flooring, concrete foundation. About $60,000. Address M. D. Schwimm.

O., Cleveland—Church—Our Lady of Peace Church, 2544 East 110th St., plans to build 1 story, concrete, steel and brick, rein.-con. flooring, concrete foundation. About $100,000. J. F. Cummins, pastor. Architect not selected.

O., Cleveland Club—Knights of Columbus, 404 Euclid Ave., having plans prepared by F. S. Fish, archt., Erie Bldg., for 3 story, 62 x 75 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, at 3422 Euclid Ave. About $100,000. J. E. Kelly, secy.

O., Cleveland Commercial—A. A. Chilcote Co., 733 Prospect Ave., plans to build 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 21st St. and Superior Ave. About $100,000. A. A. Chilcote, pres. Architect and engineer not selected.

O., Cleveland—Hospital—City plans election Feb. 10, to vote on $2,000,000 bonds to build 4 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Scranton Rd. F. A. Betz, 604 City Hall, engr.

O., Cleveland—Hospital—Grace Hospital, 2307 West 14th St., receives bids about spring, building 5 story, 100 x 280 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on West 14th St. About $500,000. W. S. Lougee, Marshall Bldg., archt.

O., Cleveland—Store—May Co. plans to build 2 story, 200 x 450 ft., concrete, steel, brick and terra cotta addition, rein.-con. flooring, concrete foundation, on East 1st St. and Euclid Ave. About $400,000. Graham, Anderson, Probst & White, 80 East Jackson Blvd., Chicago, archts.

O., Cleveland—Stores, Theatre and Office—Marshall Drug Co., Marshall Bldg., plans to build 2 story, steel and brick, brick foundation, on Fulton Rd. and Lorain Ave. About $100,000. W. S. Lougee, Marshall Bldg., archt.

O., Lakewood (Cleveland P. O.)—Hall—City plans to build 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Detroit Ave. About $100,000. A. O. Guild, mayor. Architect not selected.

O., Lakewood (Cleveland P. O.)— Memorial—Lakewood War Memorial Com., 1432 Wyandotte Ave., had sketches prepared by Bohnard & Parsons, archts., 1900 Euclid Bldg., Cleveland, for 2 story, 50 x 70 ft. concrete, brick and marble, in Lakewood Park. Cost between $50,000 and $75,000. A. G. Gutherty, chr.

Ind., Whiting — Exchange — Holabird & Roche, archts., 104 South Michigan Ave., Chicago, receive bids about Dec. 15, building 1 story, 40 x 90 ft. concrete, steel and tile, rein.-con. flooring, concrete foundation, here, for Chicago Telephone Co., 212 West Washington St., Chicago. About $65,000.

Mich., Battle Creek—High School—Bd. Educ. having plans prepared by J. B. Chubb, archt., 109 North Dearborn St., Chicago, for 3 story, 75 x 189 x 206 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation. About $400,000

Mich., Detroit—Church—Jefferson Ave. Presbyterian Church, c/o F. C. McMath, chn. bldg. com., East Jefferson Ave. and Rivard St., plans to build 2 story, rein.-con., brick and steel, on Jefferson Ave. near Parkview Ave. About $500,000. Architect not selected

Mich., Detroit—Club Room—Independent Order Odd Fellows, Lodge No 373, c o P Wilhemson, 1977 Kercheval Ave., having plans prepared by A. H. Gould & Son, archts. and engrs., 611 Empire Bldg., for 3 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Kercheval St. About $250,000.

Mich., Detroit—Office—United Brotherhood of Maintenance of Ways, Employees and Railway Shop Laborers, c/o W. Dorey, chn., 27 Putnam Ave., having plans prepared by A. H. Gould & Son, archts., 611 Empire Bldg., for 12 story, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Clifford and Columbia Sts. About $500,000

Mich., Ford City—School—Bd Educ. having plans prepared by J. G. Kastler & Co., archt., 523 Chamber Commerce Bldg., Detroit, for 3 story, brick, concrete and stone, rein.-con. flooring, concrete foundation, on Main St. About $150,000.

Mich., Pontiac—School, etc St. Michael's Parish plans to build school, church and parish house, 2 story each, rein.-con.,

Buildings (Continued)

brick and steel, rein.-con. flooring, concrete foundation, on Chamberlain and Edison Sts. About $150,000. Architects not selected.

Mich., Port Huron—Club House—Knights of Columbus, Military St., plans to build 3 story, 100 x 130 ft., rein.-con., brick and steel, on Superior and Broad Sts. About $100,000. Architects not selected.

Mich., Port Huron—Office—A. Fraser, Military St., plans to build 4 story, rein.-con. and brick, concrete foundation, on Military and Pine Sts. About $100,000. Architect not selected.

Mich., Redford—Church—Redford Methodist Episcopal Church having plans prepared by W. E. N. Hunter, archt., Chamber Commerce Bldg., Detroit, for 2 story, 60 x 85 ft., brick and steel, rein.-con. flooring, brick foundation, on Grand River Ave. about $70,000.

Wis., Elmwood—Auditorium—City plans to build 3 story, 60 x 150 ft., brick, rein.-con. and steel, brick foundation, on Main St. About $60,000. W. Neeley, clk. Architect not selected.

Wis., Janesville—Hotel—Janesville Hotel Co. plans to build 6 story (270 rooms) hotel. About $500,000. L. E. Hall, Carle Blk., interested.

Wis., Manitowoc—Store and Office—H. B. Kamschlute, archt., Natl. Bank Bldg., preparing plans for 3 story, 70 x 110 ft., brick, rein.-con. and steel, brick foundation on 8th St. About $50,000. Owner's name withheld.

Wis., Merrill—High School—Bd. Educ. plans to build 3 story, 70 x 125 ft. brick, rein.-con. and steel addition, brick foundation, on Main St. About $95,000. H. Allen, secy. Architect not selected.

Wis., Milwaukee — Club — Milwaukee County Nurses' Club, 566 Van Buren St., plans to build 3 or 4 story, brick and concrete addition, rein.-con. flooring, concrete foundation. About $60,000. Architect not selected.

Wis., Milwaukee—Exchange—R. Hess, 144 Grand Ave., plans to build 5 or 6 story 50 x 150 ft. film exchange, rein.-con. and brick, rein.-con. flooring, concrete and pile foundation, on Milwaukee St. About $175,000. M. Tullgren & Sons, 425 East Water St., archts. and engrs.

Wis., Milwaukee—Exchange—Wisconsin Telephone Co., 418 Bway., having plans prepared by A. C. Eschweiler, archt. and engr., Goldsmith Bldg., for 3 story, 40 x 60 ft., rein.-con. and brick addition, rein.-con. flooring, concrete foundation, on Wright St. About $50,000.

Wis., Milwaukee—Hotel—Martin Hotel, 210 Wisconsin St., had plans prepared by C. Barkhausen, archt. and engr., Iron Blk., for 4 story, 30 x 70 ft. rein.-con. and brick addition, rein.-con. flooring, concrete foundation. About $50,000.

Wis., Milwaukee—School and Social Center—B'ne Jeshurun Temple Sisterhood, 10th and Cedar Sts., plans to build 2 or 3 story, brick and concrete, rein.-con. flooring, concrete foundation. About $50,000. M. Sadak, 333 20th St., pres. Architect not selected.

Wis., Milwaukee—Terminal Station—Chicago, North Shore & Milwaukee Ry., Highwood, Ill., soon receives bids building superstructure for 1 story, 52 x 106 ft. rein.-con. and brick, rein.-con. flooring, on 6th and Sycamore Sts., here. R. Miller, engr. and A. W. Gerber, archt., both c/o owner.

Wis., Plain—Church—St. Luke's Catholic Church plans to build church. About $80,000. Liebert & Liebert, 425 East Water St., Milwaukee, archts.

Wis., Sheboygan—Office—F. Keli, North 8th St., plans to build 2 story, 60 x 125 ft., brick, rein.-con. and steel, brick foundation. Cost between $50,000 and $60,000. Architect not selected.

Wis., Stevens Point — Bank — Citizens Natl. Bank receives bids about Dec. 16, building 1 story, 24 x 108 ft. brick and concrete, rein.-con. flooring, concrete foundation. About $160,000. Hoggson Bros., 38 South Dearborn St., Chicago, archts.

Wis., Washburn—High School—Bd. Educ. having plans prepared by J. Chubb, archt., 109 North Dearborn St., Chicago, for 3 story, 80 x 100 ft. brick, stone, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000.

Wis., Whitehall—High School—Bd. Educ. rejected bids received Nov. 10, building 2 story, 50 x 73 ft. and 73 x 124 ft. brick and rein.-con., concrete foundation. About $80,000. A. V. Peterson, clk Oppenhamer, Speer & Obel, Wausau, archts.

Ia., Blencoe—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 3 story, rein.-con. and brick, concrete foundation. About $75,000.

Ia., Cedar Rapids—Store—E. C. Denecke Co., 117-121 South 2nd St., plans to build 2 story, 40 x 140 ft. addition, with 3 story, 60 x 80 ft. wing, brick. About $300,000. Architect will be selected at once.

Ia., Cushing—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 3 story, rein.-con. and brick, concrete foundation. About $107,000. A. H. Bullock, secy.

Ia., Dayton—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 3 story, rein.-con. and brick, concrete foundation. About $80,000. O. B. Larson, secy.

Ia., Iowa City—Psychopathic—State Bd. Educ., Des Moines, having plans prepared for 2 story, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on University campus, here. About $175,000. Private plans.

Ia., Treynor—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 3 story, rein.-con. and brick, concrete foundation. About $65,000.

Ia., Washta—School—Bd. Educ. having plans prepared by W. E. Hulse & Co., archts., 210 Masonic Temple, Des Moines, for 3 story, 58 x 102 ft., rein.-con., brick and stone, concrete foundation. About $100,000. J. K. McGonigae, secy.

Minn., Ada—High School—Bd. Educ. having preliminary plans prepared by Foss & Foss, archts., St. Cloud, for 3 story, 84 x 136 ft., brick. About $80,000. A. Jarvey, clk.

Minn., Boyd—High School—Bd. Educ. having plans prepared by Foss & Foss, archts., St. Cloud, for 2 story, 96 x 110 ft., brick and stone. About $55,000. O. J. Flaa, clk.

Minn., Coleraine—High School—A. King, secy. Bd. Educ., receives bids about March 1, building 2 story, 150 x 270 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, in Canisleo Dist. About $500,000. W. T. Bray, Torry Bldg., Duluth, engr. and archt.

Minn., Duluth—Church—S. T. Willis, chn. Bldg. Com. of 1st Christian Church, 4th St. and 12th Ave., receives bids about Feb. 1, building 2 story, 60 x 80 ft., brick, rein.-con. flooring, concrete and stone foundation. About $75,000. A. W. Terraberry, Palladio Bldg., engr. and archt.

Minn., Duluth—Store—German & Jenssen, archts., Exch. Bldg., receive bids about Jan. 15, building 3 story, 50 x 140 ft., brick, rein.-con. flooring, rein.-con. foundation, at 12-14 1st Ave., W. for E. Oreck, Superior St. and 1st Ave. W. About $50,000.

Minn., Lewiston—School—Independent Dist. 22 plans to build 2 story, brick and stone. About $75,000. W. F. Gensmer, clk. Architect not selected.

Minn., Minneapolis—Club— South Central Community Club, 4055 Pillsbury Ave., having preliminary sketches prepared by Gottlieb & Maganey, archts., 450 Builders Exch. Bldg., for 3 story, 180 x 190 ft., rein.-con. and brick, on Nicollet Ave. and 39th St. About $400,000. E. W. Cameron, pres.

Minn., Minneapolis—Store—L. S. Donaldson Co., 601 Nicollet St., having sketches prepared by Graham, Anderson, Probst & White, 1417 East Jackson Blvd., Chicago, for 6 story, rein.-con., brick and stone addition, on 7th St. and Marquette Ave. About $800,000.

Minn., St. Paul—Court House—Ramsey Co. plans to build court house, on block bounded by 3rd, 4th, Wabasha and St. Peter Sts. About $2,500,000. J. M. Clancy, co. bldg. inspector.

Kan., Mayetta—School—Bd. Educ. plans to build 2 story, brick, concrete and steel, concrete foundation. About $55,000. H. D. Pampel, Kansas City, Mo., archt.

Kan., Salina—Home—Salvation Army having plans prepared by C. W. Shaver, archt., Salina, for 2 story, 50 x 80 ft. brick, concrete and steel, brick foundation. About $60,000.

Kan., Topeka—Club—Womens' Club having plans prepared by F. C. Squires, archt., 628 Kansas Ave., for 3 story, 75 x 100 ft. brick, concrete and steel, brick foundation. About $75,000.

Kan., Wichita—Office—See "Industrial."

S. D., Webster—School—Bd. Educ. having preliminary plans prepared building 2 story, 94 x 140 ft. brick and rein.-con. About $145,000. O. Magnus, clk. Edwins & Edwins, 810 Northwestern Bank Bldg., Minneapolis, archts.

Mo., St. Louis—Hospital and Asylum—Sisters of Charity plan to build hospital and asylum, brick, rock foundation, on Page and Union Aves. About $100,000. J. J. Glennon, 3225 Montgomery St., archbishop. Architect not selected.

Mo., St. Louis—Club—St. Louis Riverview Club, 6500 South Bway., receives bids about Jan. 1, building club and concrete swimming pool, on Mississippi River. About $100,000. Address C. P. Van Graefeiland, 11050 Riverview Dr.

Mo., St. Louis—Sales—Nash Motors Co., 3205 Locust St., plans to build 2 story, 100 x 135 ft., concrete and brick, rock foundation, on Locust and Garrison Sts. About $50,000. Architect not selected.

Mo., University City (St. Louis P. O.)—School—L. T. Ward, pres. Bd. Educ., receives bids about Feb. 5, building 3 story, 175 x 225 ft., concrete and brick, rock foundation, on Bartmer and Etzel Sts. About $120,000. W. B. Ittner, Bd. Educ. Bldg., St. Louis, archt. W. Huenbuettner, University City, engr.

Tex., Galveston—F. B. & A. Ware, archts., 1170 Bway., New York City, receive bids about Dec. 15, building 3 story, 110 x 140 ft. rein.-con., steel and tile building for Y. W. C. A., here. About $125,000. L. E. Eden, 1170 Bway., New York City, engr.

Tex., San Antonio—Church—Methodist Church, Grant Ave. and Hyisache St., plans to build brick and stone. About $60,000. Adams & Adams, Gibbs Bldg., archts.

Okla., Mangum—High School and Auditorium—Bd. Educ. having plans prepared by Hawk & Parr, archts., 501 Security Bldg., Oklahoma, for 2 story, 80 x 114 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $140,000.

Okla., Oilton—Church—Baptist Church plans to build church. About $75,000. Architect and engineer not selected.

Okla., Pawhuska—High School—City election Dec. 23, to vote on $50,000 bonds to build addition to high school.

Okla., Tulsa—High School—City election soon to vote on $600,000 bonds to build high school. Architect and engineer not selected.

Okla., Kaw City—Community—Booster Club plans to build community house, to include auditorium, dining hall and recreation rooms. About $50,000. Architect and engineer not selected.

Colo., Alamosa—High School—School Dist. No. 3, Alamosa Co., having plans prepared by Mountjoy, French & Frewen, archts., 313 Chamber of Commerce Bldg., Denver, for 2 story, 120 x 140 ft. brick and stone. About $85,000.

Colo., Florence—High School—School Dist. No. 2, Fremont Co., having plans prepared by Mountjoy, French & Frewen, archts., 313 Chamber of Commerce Bldg., Denver, for 2 story, 120 x 140 ft. brick and stone. About $100,000.

Idaho, Caldwell—Lodge—I. O. O. F. Grand Lodge of Idaho, 7th and Main Sts., plans to build 2 story, brick or stone, brick or concrete foundation, on Canyon Hill. About $60,000. Tourtellotte & Hummel, McKay Bldg., Portland, Ore., archts.

Wash., Olympia—Office and Court House—State Capitol Comn. having plans prepared by Wilder & White, archts. and engrs., 50 Church St., New York City, for 3 office buildings and court house, here, all brick, steel and stone. About $500,000.

Ore., Astoria—Hospital—Finnish Brotherhood, Lodge No. 2, having preliminary plans prepared for 2 or 3 story, brick or concrete. About $100,000. S. Lonberg, grand secy. Architect not selected.

Buildings (Continued)

Ore., Bend—Temple—Bend Lodge of Elks plans to build 2 story, brick or concrete, brick and concrete foundation, on Oregon St. About $50,000. Architect not selected.

Ore., Forest Grove — Administration — Masonic Lodge having plans prepared by W. C. Kingston, U. S. Bank Bldg., Portland, for 2 or 3 story, brick or stone. About $85,000. W. T. Moore, chn. com. in charge.

Ore., Gearhart—Hotel—Gearhart Park Co. plans to build hotel, on beach. About $250,000. O. W. Taylor, mgr.

Ore., LaGrande—Hotel—M. Block, archt., LaGrande, soon lets contract building 3 story, 75 x 125 ft., brick, brick foundation. About $75,000. Owner's name withheld.

Ore., Myrtle Point — Business — Security Bank Co. plans to build 2 story, brick or concrete, on present site. About $70,000. Architect not selected.

Ore., North Bend — High School — Bd. Educ., North Bend and Marshfield Dists., having preliminary plans prepared for Union High School, brick or concrete. About $150,000. C. E. Mulkey, North Bend, Coos. Co. supt. schools.

Ore., Oregon City — Church — Methodist Church having preliminary plans prepared for rebuilding 1 story, concrete, concrete foundation. About $225,000. T. B. Ford, dist. supt. - Architect not selected.

Ore., Portland — Club — J. Jacobberger, archt., Bd. Trade Bldg., soon lets contract building 4 story, 50 x 100 ft., brick and concrete, on Park and Taylor Sts., for Knights of Columbus. About $100,000. Noted Sept. 25.

Cal., Avalon—Store and Hotel—Boos Bros., 440 South Hill St., Los Angeles, plan to build 4 story, 200 x 200 ft. rein.-con., pressed brick and terra cotta, here. Cost to exceed $50,000. C. F. Plummer, 1108 Story Bldg., Los Angeles, archt.

Cal., Long Beach—City Hall—City voted $350,000 bonds to build city hall, and selected W. H. Austin, 222 1st Natl. Bank Bldg., and H. H. Lochridge, Moody Bldg., archts., to prepare plans for same. H. G. Waughop, clk.

Cal., Los Angeles—School—Bd. Trustees, 607 Chamber Commerce Bldg., soon lets contract building 1 story, 102 x 114 ft., brick and hollow tile, in Fruitland School Dist. Cost to exceed $50,000. H. Hasenburger, 607 Chamber Commerce Bldg., archt.

Cal., Los Angeles—Theatre—S. Grauman, 301 South Bway., having plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City, for 154 x 240 ft., rein.-con. and steel, on 6th and Hill Sts. About $2,000,000. Noted Sept. 4.

Cal., Los Angeles — Theatre — J. Young, c/o C. S. Albright, archt., 5910 Hollywood Blvd., plans to build 2 story, 60 x 160 ft., brick, marble and tile, cement flooring, concrete foundation, on Holywood Blvd. near Wilton Pl.

Cal., Pasadena—Theatre—J. M. Root, mgr. Strand Theatre, plans to build rein.-con. theatre, (2500 seating capacity), on Colorado St. About $250,000.

Cal., Sacramento—Schools—City voted $3,500,000 bonds for 14 new schools. R. A. Herold, Forum Bldg., E. C. Hemmings, Strand Theatre Bldg., archts., and others, have been selected by Bd. Educ. to design same.

Cal., San Pedro—Bank and Office—First Natl. Bank of San Pedro having plans prepared by Edelman & Barnett, archts., 826 W. W. Hellman Bldg., Los Angeles, for 2 story, 50 x 100 ft., brick, steel and terra cotta, concrete foundation. About $100,000.

Cal., Santa Barbara — Hospital — St. Francis Hospital, East Arrellaga St., plans to build 3 story hospital, 200 ft. long, with two 2 story wings, rein.-con. About $175,000. Architect not selected.

Cal., Santa Monica—Mausoleum—Rosedale Mausoleum Co., Hass Bldg., Los Angeles, plans to build 610 crypts, rein.-con., granite facing, concrete foundation, at Woodlawn Cemetery, here. About $125,000.

Cal., Taft—Church, Community Center, etc.—First Methodist Episcopal Church having plans prepared by A. G. Lindley, archt., 904 Wright & Callender Bldg., Los Angeles, for 80 x 82 ft., frame and stucco church, 60 x 80 ft. community center, with concrete plunge, etc. About $75,000.

N. S., Digby—Station—Dominion Atlantic Ry., Kentville, soon receives bids building concrete and brick station, here. About $65,000. M. K. McQuarrie, engr.

Ont., Kitchener — College — Kitchener-Waterloo Collegiate Bd. soon lets contract building (20 room), brick, concrete and steel, rein.-con. flooring, concrete foundation. About $400,000. Architect not selected.

Ont., Ottawa—City Hall—City plans to construct fireproof building. About $500,000. Architect not selected.

B. C., North Vancouver—School—City plans election soon to vote on bonds to build 3 story, rein.-con., on Lynn Valley St. About $80,000. H. Blackadder, Carisbrook St., E., archt.

BIDS DESIRED

Mass., Lowell—High School—Until Jan. 19, by School Comm., building 3 story, brick and rein.-con. addition to High School, on Kirk St. About $750,000. H. L. Rourke, 525 Hildreth Bldg., engr.

Mass., Three Rivers—School—Until Dec. 15, by Palmer Twp. School Comm., building 1 story (6 room) brick and concrete, school and assembly hall, concrete foundation, here. About $55,000. W. H. McLean, 110 Tremont St., Boston, archt.

Conn., Waterbury—Hospital—Until Dec. 15, by Cross & Cross, archts., 681 5th Ave., New York City, building brick and steel, for Bd. Health. About $200,000. Noted July 31.

N. Y., Onondago Valley (Syracuse P. O.) Academy—Until May 15, by M. L. King, archt., Snow Bldg., Syracuse, constructing school for town, to be known as Onondago Academy. About $325,000. Noted May 1.

Pa., McKeesport—Until Jan. 3, by Jallade & Lindsey, archts. and engrs., 37 Liberty St., New York City, building, 4 story, 112 x 170 ft., brick and steel, brick foundation, on Sinclair and Ringgold Sts., for Y. M. C. A., 2 West 45th St., New York City. About $300,000. Former bids rejected.

Pa., Phila. — Bank — Mutual Trust Co., Bourse Bldg., receiving bids building 1 story, 23 x 96 ft. brick and stone, on Market and 60th Sts. Cost to exceed, $50,000. Former bids rejected. Heacock & Hohansen, 1218 Chestnut St., engrs. and archts.

Pa., Phila.—High School—Until Dec. 15, by P. Monaghan, archt., 1218 Chestnut St., building 3 story, 49 x 125 ft., stone, on 49th and Chestnut Sts., for West Philadelphia Catholic High School.

Pa., Waynesboro—Bank—Until Dec. 15, by People's Natl. Bank, 31 West Main St., building 1 story, 53 x 115 ft., limestone, Wyatt & Nolting, Keyser Bldg., Baltimore, archts.

Ga., Albany—Masonic Temple—Until Dec. 18, by R. H. Ferrell, pres. Masonic Lodge, constructing and heating of temple here. Each bid for construction of building must be accompanied with certified check of $5000, and each bid for heating with check of $1000, made payable to R. H. Ferrell, pres. Edwards & Sayward, 609 Chamber of Commerce Bldg., Atlanta, archts. Noted June 26.

Ind., Indianapolis — High School — Until Dec. 20, by G. C. Hill, business dir. bd. school comrs., Meridian and Ohio Sts., building 3 story, brick and rein.-con. About $700,000. Snider & Rotz, Merchants Bank Bldg., engrs. Vonneful, Bohn & Miller, Indiana Trust Bldg., archts.

Mich., Detroit—Schools—Until Dec. 22, by Bd. Educ. building Field School No. 1154, on Agnes and Field Aves., cost $200,000; Davison School No. 1147, Roman near Davison Aves., $200,000; also 2 story, 85 x 134 ft., rein.-con., brick, steel and terra cotta, on Vancourt and Milford Aves., $250,000. Malcomson, Higginbotham & Palmer, 405 Moffat Bldg., archts. Noted Aug. 21.

Ill., Jacksonville—High School—Until Jan. 15, by Bd. Educ., School Dist. No. 117, building high school. J. W. Royer, Flat Iron Bldg., Urbana, archt.

Wis., Bloomer—High School—Until Jan. 1, by C. Volkman, archt., 106½ Grand Ave., E., Eau Claire, building 2 story, 60 x 120 ft. brick, rein.-con. and steel, brick foundation, on Main St., for Bd. Educ. About $70,000. T. Preucher, pres. Noted May 15.

Wis., Kenosha—Court House and Jail—Until Jan. 10, by T. Fleming, chn. Kenosha Co. Bldg. Com., constructing 4 story, 114 x 154 ft. rein.-con., brick and steel, concrete foundation. About $800,000. White, White, White & Co., Pub. Serv. Bldg., archts. and engrs.

Ia., Gaza—School—Until Jan. 5, by Bd. Educ., Consolidated Dist., building 2 story brick, rein.-con and steel, rein.-con. flooring, concrete foundation. About $75,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts.

Ia., Mt. Pleasant—High School—Until Dec. 30, by C. Van Russell, secy. Bd. Educ., converting Y. M. C. A. building into high school. About $80,000. C. L. Lockhart, Endicott Bldg., St. Paul, Minn., archt. Noted Sept. 11.

Ia., Woodbine—School—Until Jan. 3, by Bd. Educ. Consolidated Dist., building 3 story, brick, rein.-con and steel, rein.-con. flooring, concrete foundation. About $100,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts.

Minn., Austin—Jail—Until Dec. 17, by Comrs. Mower Co., building 2 story, 44 x 50 ft., rein.-con. and brick addition. About $52,000. Alden & Harris, Exch. Bank Bldg., St. Paul, archts.

Minn., Duluth—Church—Until Jan. 2, by T. D. Whittles, chn. bldg. com. of 2nd Presbyterian Church, building 2 story, 70 x 134 ft., brick and stone, rein.-con. flooring, concrete foundation, on West 2nd St. About $100,000. Halstead & Sullivan, Palladio Bldg., archts.

Minn., Lafayette—School—Until Dec. 22, by F. V. Quist, clk. School Dist. No. 66, building 2 story, 64 x 90 ft., brick. About $65,000. K. T. Snyder, Plymouth Bldg., Minneapolis, archt.

Kan., Atchison—School—Bd. Educ. receiving bids building 2 story, 88 x 90 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $65,000. R. J. Kaaz, 719 Kansas Ave., archt. H. A. Noble, Kansas City, Mo., engr.

S. D., Meckling—School—Until Dec. 17, by Bd. Educ., building 2 story, 58 x 100 ft. brick, concrete and steel, concrete foundation. About $65,000. W. E. Hulse, Hutchinson, Kan., archt.

Mo., St. Louis—Temple—Until Jan. 20, by W. B. Ittner, archt., Bd. Educ. Bldg., constructing 8 story, 175 x 210 ft., concrete, brick and terra cotta, rock foundation, on Clayton Rd., for Masonic Temple Assn. of St. Louis. About $1,000,000. Address D. Jameson, 5330 Pershing Ave.

Colo., Boulder — Domitories — Until Dec. 31, by F. H. Walcott, secy. Bd. of Regents, 526 Kittredge Bldg., Denver, building 32 x 193 ft. and 58 x 162 ft., brick, steel and stone, rein.-con. flooring, concrete foundation, at university here. About $250,000. Pay & Klauder, 925 Chestnut St., Phila., archts.

Ariz., Chandler — School — Until Dec. 27, by A. T. Morgareidge, clk. High School Dist., constructing 3 brick buildings. About $130,000. Allison & Allison, Hibernian Bldg., Los Angeles, Cal., archts.

Cal., Santa Monica—School—Until Dec. 22, by Bd. Educ. building 6 room brick addition to McKinley School, also 4 room brick addition to Adams School. About $100,000. Allison & Allison, Hibernian Bldg., Los Angeles, archts.

B. C., Vancouver—Theatre—Until Jan. 1, by Regal Films, Ltd., 553 Granville St., building 4 story, 120 x 150 ft., steel, rein.-con. flooring, concrete foundation, on Seymour St. between Robson and Smythe Sts. About $500,000. T. Lamb, 644 8th Ave., New York City, archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Vt., Bellows Falls**—Bank—Bellows Falls Savings Institute let contract altering present bank, to G. C. Irwin & Co., 94 West Brookline St., Boston, Mass.

★**Vt., Windsor** — Housing, etc. — Natl. Acme Co. let contract constructing several 2½ story workmen's houses and addition to stock building, brick and timber, to L. A. LaFrance, 292 Maple St., Holyoke, Mass. About $250,000.

★**Mass., Framingham** — School — School Comm. let contract building 2 story, 115 x 225 ft., brick, concrete and steel brick and concrete foundation, on Hollis St., to J. E. Locatelli Co., Inc., 46 Churchill St., Boston. About $170,000.

★**Mass., Holyoke**—Theatre and Business—Goldstein Bros. Amusement Co., Bridge St., Springfield, let contract building 3 story, brick, rein.-con. and steel, rein-con. flooring, concrete foundation, on Suffolk and Chestnut Sts., here, to Casper Ranger Constr. Co., 29 Bond St. About $350,000

Buildings (Continued)

★**Mass., Malden**—Church—Christian Science Society let contract building 37 x 75 x 97 ft., terra cotta and concrete, on Main St., to H. F. Libby, 46 Churchill St., Boston. About $55,000.

★**Mass., Milton** (Boston P. O.)—Chapel—Milton Academy let contract building 1½ story, 30 x 100 ft., stone and concrete, rein.-con. flooring, on campus, to E. F. Miner Bldg. Co., 25 Foster St., Worcester. About $100,000.

★**Mass., Springfield** — High School — St. Michael Cathedral, Elliott St., let contract building 2 story, 80 x 148 ft., brick and steel, concrete flooring, to M. Moloney, 18 Bell Ave. About $175,000.

Mass., Waban (Boston P. O.)—School—Pub. Bldg. Comn., Newton, received bids building 2 story, 110 x 150 ft., brick, concrete and steel, concrete flooring and foundation, here, from A. Piotti, 98 Melville Ave., Dorchester, $233,652; C. S. Cunningham & Sons Constr. Co., 7 Water St., Boston, $234,140.

★**Mass., Worcester** — Housing — Indian Hill Co., Barbers Crossing, let contract constructing 100 workmen's cottages, community house, memorial building, 2 boarding houses and community store building, timber, concrete foundation, also laying out several new streets, at Indian Hill, to F. T. Ley & Co., Inc., 499 Main St., Springfield. About $500,000.

★**Mass., Worcester**—School—Independent Industrial School, c/o Frost & Chamberlain, archts., 390 Main St., let contract building 3 story, 90 x 145 ft., brick, concrete foundation, on High and Chatham Sts., to J. Miles & Son, 393 Main St. About $150,000.

★**Mass., Worcester**—School—St. Peter's Roman Catholic Church, 929 Main St., let contract building 2½ story, 70 x 130 ft., brick, concrete and steel, concrete foundation, on Main and Ripley Sts., to M. Maloney, 18 Bell Ave., Springfield. About $125,000.

★**R. I., East Providence** (Providence P. O.)—Bank—Jackson, Robertson & Adams, archts., 1216 Turks Head Bldg., Providence, let contract to William & Merchant, Inc., 86 Weybossett St., Providence, building 1 story, 50 x 100 ft., brick and marble, concrete and tile flooring, concrete foundation, on Warren Ave., for Industrial Trust Co., 49 Westminster St., Providence. About $100,000.

★**R. I., Pascoag**—Church—St. Joseph's Roman Catholic Society, Sayles Ave., let contract building 1 story, to Eastern Constr. Co., 660 Winter St., Woonsocket. About $50,000.

★**R. I., Providence**—Business—Gladding Dry Goods Co., 291 Westminster St., let contract building 5 story, 30 x 65 ft., and 1 story, 80 x 80 ft. brick and steel addition, rein.-con. flooring, concrete foundation, to O. D. Purington & Co., 626 Industrial Trust Bldg. About $50,000.

★**Conn., Hartford** — Exchange — South New England Telephone Co., Court St., New Haven, let contract building 7 story, 40 x 105 ft., brick and steel addition, rock and concrete foundation, on Hicks St., here, to Ellison Constr. Co., 96 Wellington Ave. About $200,000; cost plus percentage basis.

Conn., Hartford—School—Bd. Educ. received bids Dec. 1, building 3 story, 87 x 87 ft., brick and concrete, wood flooring, concrete foundation, on Wethersfield Ave. (general contract), from Wise & Upson, Main St., $187,241; heating, from Vines, Smith, Hartford, $13,495; plumbing, from Hanlon & Murphy, 538 Asylum St., $6298.

★**Conn., South Manchester**—Business—Watkins Bros., Inc., 1119 Main St., let contract building 3 story, 71 x 152 ft., brick and steel, concrete foundation, to W. A. Knofla, Middle Turnpike. About $60,000.

★**Conn., West Haven**—(New Haven P. O.)—Office—See "Industrial Works."

★**N. Y., Lockport**—Bank—P. A. Davis, archt., 1713 Sansom St., Phila., let contract to G. A. Fuller Co., Buffalo, building 1 story, 50 x 60 ft., stone, here, for Natl. Exch. Bank, 45 Main St. About $50,000.

★**N. Y., New Rochelle**—Grade School—Bd. Educ. let contract building Washington Grade School, 3 story, brick, stone and steel, brick foundation, to E. Diebitsch, 383 Madison Ave., New York City. About $300,000.

★**N. Y., New York**—Bank, Office and Store—Bank of United States, 5th Ave. and 32nd St., will alter 11 story, brick and steel. About $50,000. Work will be done by day labor.

★**N. Y., New York**—Bank and Office—New Pine St. Realty Co., 31-33 Pine St., will alter 4 story, brick and steel. About $200,000. Work will be done by day labor.

★**N. Y., New York** — Hospital — Hahnemann Hospital, Park Ave. between 66th and 67th Sts., let contract building hospital on 5th Ave. between 105th and 106th Sts., to M. Eidlitz & Son, 30 East 42nd St. About $2,000,000.

★**N. Y., New York**—Hotel—D. H. Knott, c/o F. F. French Co., archts. and engrs., 299 Madison Ave., let contract building 14 story, 106 x 137 x 169 ft., brick and steel, brick foundation, on 73rd St. and Bway., to F. F. French Co., 299 Madison Ave. About $4,000,000.

★**N. Y., New York** — Hotel — Monterey Hotel, Bway. and 94th Sts., will build 62 x 100 ft., brick, steel and stone, brick foundation, on Bway. and 95th St. Work will be done by day labor.

★**N. Y., New York**—Office—J. J. Astor, London, Eng., let contract building 31 story, 66 x 99 ft., brick and steel, brick foundation at 8-12 Wall St., here, to R. H. MacDonald, 29 West 34th St. About $1,500,000. Noted Feb. 6.

★**N. Y., New York**—Office and Bank—Bankers Trust Co., 16 Wall St., let contract building 15 story, brick and steel, brick foundation, on 57th St., to R. H. MacDonald, 29 West 34th St. About $400,000.

★**N. Y., New York**—Office—Bush Terminal Co., 100 Broad St., let contract building 50 x 196 ft., addition, at 137-141 West 41st St., to Thompson-Starrett Co., 49 Wall St. About $450,000.

N. Y., New York—Office—F. F. French Co., 299 Madison Ave., will build 16 story, 50 x 75 ft., brick, steel and stone, brick foundation, on Madison Ave. and 41st St. Work will be done by day labor.

★**N. Y., New York**—Office—E. Margolies, 19 East 33rd St., will build 16 story, 56 x 150 ft., brick, steel and stone, brick foundation, at 309-311 5th Ave. About $450,000. Work will be done by day labor. Noted July 3.

★**N. Y., New York**—Office—U. S. Food Products Corp., 40 Exch. Pl., will alter 13 story, brick and steel, at 56-58 Pine St. About $60,000. Work will be done by day labor under supervision of A. Hershfeld, engr., 110 West 40th St.

★**N. Y., New York** — Theatre — Siber Amusement Co., 654 Lenox Ave., will build 1 story, 50 x 189 ft., brick and steel, brick foundation, on 145th St. and 7th Ave. About $50,000. Work will be done by day labor.

★**N. Y., New York**—Theatre—B. S. Moss, 729 7th Ave., let contract building brick, steel and stone, brick foundation, on Tremont Ave., to Fleischmann Constr. Co., 531 7th Ave. About $400,000.

★**N. Y., Syracuse**—Office and Loft—S. F. Hancock, O. C. C. S. Bldg., let contract building 3 story, 67 x 130 ft., brick, rein.-con. and steel, concrete foundation, on South Salina St., to T. H. McHale & Son, Cahill Bldg. About $77,000.

★**N. J., Bayonne**—Hospital—Bd. Dirs. Bayonne City Hospital let contract building brick, steel and stone addition to Franklin-Rocks, 354 West 24th St., New York City. About $250,000. Noted Sept. 25.

★**N. J., Washington**—Office—Globe Indemnity Co., 45 William St., New York City, will build 6 story, 100 x 200 ft., brick, steel and stone, brick foundation, on Washington St. About $400,000. Work will be done by day labor.

★**Pa., Phila.**—Bank, Post Office and Store—Lansdowne Natl. Bank let contract altering bank and building 1 story addition to be used as store and post office, brick and stone, to J. S. Wilson & Co., 1125 Brown St. About $50,000.

★**Pa., Phila.** — School — G. I. Lovatt, archt., 418 Walnut St., let contract to T. J. and J. R. Whelan, 1011 Chestnut St., building 2½ story, 113 x 210 ft., stone and steel, on Sanger and Jackson Sts., for St. Bartholomew's Roman Catholic Church, Wissinoming St.

★**Md., Baltimore**—Bath House—J. J. Carlin, Liberty Heights Ave., let contract building 1 story, 75 x 200 ft., brick and timber bath house, concrete foundation, and concrete swimming pool, at Liberty Heights Park, to J. Miller, c/o owner. About $100,000.

★**Md., Baltimore** — Theatres — Century Theatre Co., c/o C. E. Whitehurst, Park Ave. and Lexington St., let contract building 120 x 178 ft., at 18 West Lexington St., and 178 x 200 ft., at 1-21 Clay St., both 2 story, rein.-con., stone and marble, concrete foundations, to J. H. Miller Inc., Eutaw and Franklin Sts. Cost between $750,000 and $1,000,000. Noted Aug. 14.

★**Ga., Columbus** — Bank — Third Natl. Bank, 12th Ave., let contract altering brick, steel and stone, brick foundation, to Bedford Impvt. Co., Columbus. About $60,000.

★**Ga., Fitzgerald** — Bank — First Natl. Bank let contract building 2 story, brick, steel and stone, to Bedford Impvt. Co., Columbus. About $75,000.

★**Miss., Greensville**—City Hall—City let contract building brick and stone, to D. J. Anderson, Shaw, $57,650.

★**O., Bucyrus**—School—Bd. Educ. let contract building 1 story, 113 x 118 ft., brick, to W. W. Knecht, Bucyrus. About $70,000.

★**O., Cleveland** — Market — Euclid East 46th St. Market House Co. let contract building 1 story, 115 x 250 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 46th St. and Euclid Ave., to Kamp Bldg. Co., East 46th St. and Euclid Ave. About $200,000.

★**O., Cleveland** — Store, Office, Etc.—Cleveland Land & Securities Co., Cuyahoga Bldg., let contract constructing 10 story, 100 x 250 ft., store, office and garage, concrete, steel and brick, rein.-con. flooring, concrete foundation, on 102nd St. and Euclid Ave., to Crowell, Little Co., 1951 East 57th St. About $750,000.

★**O., Columbus**—Business—J. S. Ralston, pres. Ralston Steel Car Co., East Columbus St., let contract building 2 story, 28 x 187½ ft., stone and brick, on East Gay St., to D. D. Livingston, 1370 East Main St. About $50,000.

★**O., Columbus**—Store—W. C. Moore, 270 South High St., let contract remodeling building on High and Cherry Sts., to D. D. Livingston, 1370 East Main St. About $50,000. Part of contract is on percentage basis.

★**O., Columbus** — Theatre — James Bldg. Co., 31 West Broad St., let contract building 5 story, 104½ x 187½ ft., steel, brick, stone and terra cotta, to Longacre Cnstr. Co., 180 North State St., Chicago. About $700,000. Noted June 26.

O., Dayton — Sales — See "Industrial Works."

★**Mich., Lansing**—Administration—Oldsmobile Div., Gen. Motors Corp., Isaac St., let contract building 4 story, 50 x 300 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Isaac and Logan Sts., to H. G. Christman Co., 302 Union Trust Bldg., South Bend, Ind. About $533,000.

Ill., Chicago—School—Bd. Educ. received bids for masonry work for building 3 story, 125 x 175 ft., brick, concrete, stone and steel, rein.-con. flooring, on Sacramento Blvd. and Berteau St., from F. Burke, $129,300, S. N. Nielsen & Co., 3059 Augusta St., $141,856, A and E. Anderson Co., 19 South La Salle St., $147,995; cut stone work, from J. A. Hagan, 1620 South Laramie Ave., $56,950, E. E. Skoglund, 5555 North Lincoln St., $64,935, Simpson & Davison, 2808 South Troy St., $75,416; structural iron work, from Hansell-Elcock Co., Archer and Normal Aves., $50,202, Vanderkloot Steel Wks., 2611 South Halsted St., $53,930, Wendnagel & Co., 600 West 22nd St., $57,868; carpentry, from B. J. Regnell Co., 19 South La Salle St., 53,794, H. Schrik & Co., 3722 West Chicago Ave., $53,854, Hanson Bros. Co., 127 North Dearborn St., $56,280.

★**Ill., Chicago**—Office—W. Wrigley, Jr., 5 North Wabash Ave., let contract building 16 story, 138 x 160 ft., steel and tile arch, concrete foundation, at 400 North Michigan Ave., to Lanquist & Illsley Co., 1100 North Clark St. About $2,000,000.

★**Ia., Cedar Rapids** — Office — Cedar Rapids Comn. Co. let contract building 3 story, 60 x 140 ft. brick, concrete and steel, brick foundation, to Loomis Bros., 319 South 3rd St. About $75,000.

Buildings (Continued)

★**Ia., Council Bluffs**—School—Bd. Educ. let contract building 2 story, rein.-con. and brick, rein.-con. flooring, concrete foundation, to J. Wickham Constr. Co., 19 Scott St., $332,750.

Ia., Des Moines—School—School Bd. received bids Nov. 21, building 1 story, 62 x 122 ft., rein.-con., brick and stone, rein.-con. flooring, brick foundation, on Southwest 30th and Park Sts., from J. E. Tusant & Sons Co., 583 7th St., $52,855; J. E. Howard, 3701 6th St., $53,502; N. D. Garmer, 1237 39th St., $55,850. Noted June 19.

★**Ia., Iowa City**—Hospital—Mercy Hospital, 516 East Market St., let contract building 1 story, 57 x 132 ft. brick, concrete and steel addition, rein.-con. flooring, concrete foundation, to J. W. Hopp Constr. Co., 403 Granby Bldg., Cedar Rapids. About $55,000.

★**Ia., Spencer**—Hotel—Spencer Hotel Co. let general contract building 4 story, 60 x 115 ft. brick and stone, rein.-con. flooring, concrete foundation, to Spencer Constr. Co., Spencer. About $129,500.

★**Minn., Hibbing**—Hotel—S. S. Rumsey, archt., Wolvin Bldg., Duluth, let contract to C. F. Haglin Sons Co., Minneapolis, building 4 story, 125 x 135 ft., brick, rein-con. foundation, on Howard St., for Oliver Mining Co., Wolvin Bldg., Duluth. About $375,000.

Minn., Willmar—Service—State Bd. Control, Capitol, St. Paul, received lowest 3 bids Dec. 2, building 3 story, 50 x 120 ft., rein.-con., brick and stone, at State Hospital for Insane, here, from J. H. Olson, Willmar, $77,756; E. Bjorklund, 786 Como Blvd., St. Paul, $82,600; J. Peterson, 3152 10th Ave., S., Minneapolis, $83,400.

★**Kan., Wichita**—School—J. L. Leland, secy. Bd. Educ., let contract building Roosevelt Intermediate School, 3 story, 97 x 248 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Hamler & Hamilton, Wichita, $207,144. Noted July 3.

★**Neb., Grand Island**—School—Bd. Educ. let contract building Jefferson School, 2 story, 52 x 70 ft., to R. G. Isdell, Grand Island. About $55,000; cost plus percentage basis. Noted Aug. 7.

★**N. D., Ashley**—Courthouse—McIntash Co. let contract building 2 story, 56 x 75 ft., to Garcleson & Ness, Minot. $74,365.

★**Mo., St. Louis**—Hotel—Claridge Hotel Co., 315 North 18th St., let contract building 11 and 12 story, 75 x 155 ft., brick, stone and terra cotta, rock foundation, on 18th and Locust Sts., to Claridge Hotel Bldg. Co., 901 Washington St. About $500,000.

★**Mo., St. Louis** — Office — See "Industrial Works."

★**Tex., Eastland** — City Hall — City let general contract building city hall, to J. M. Morgan, Big Springs, $83,815.

★**Colo., Denver**—Office—State let contract building 5 story, on Colfax Ave and Sherman St., to Seerie & Varnum, Interstate Trust Bldg. About $457,000.

★**Idaho, Nampa**—Natatorium—P. R. Randall and associates will build 2 story, 72 x 126 ft., brick and frame, concrete foundation. About $50,000. Work will be done by day labor.

Cal., Arcadia—School—Trustees Arcadia School Dist. received bids building 1 story, 60 x 180 ft., hollow tile and stucco, concrete foundation, from Daniels & Farris, 307 North Eleanor St., Pasadena, $52,715, J. Simpson Co., Grant Bldg., Los Angeles, $54,500, Willahr-Brent Co., Baker-Detwiler Bldg., Los Angeles, $54,899.

★**Cal., Long Beach**—Hotel—Seaside Investment Co. let contract building 4 story addition to Virginia Hotel (150 rooms), rein.-con., on Ocean Front, to C. T. McGraw, 1345 West Ocean Ave. About $125,000.

★**Cal., Burbank**—School—Bd. Educ. let carpentry and concrete contract for (10 room) concrete and brick, brick foundation, to P. A. and F. B. Farley, Burbank, $51,730, masonry, to H. Reimeos, Los Angeles, $17,900.

★**Cal., Los Angeles**—Mausoleum—Rosedale Mausoleum Co., Haas Bldg., let contract building 1720 crypts, 95 x 308 ft., rein.-con., concrete foundation, to Milwaukee Bldg. Co., Wright & Collender Bldg. About $206,000

Cal., Los Angeles—Nurses' Homes—Bd. Supervs. Los Angeles, received bids building six 1 story, brick and timber, concrete foundation on county hospital grounds, from F. R. Johnson, H. W. Hellman Bldg., $91,865, R. S. Martin, 509 North Marguerita Ave., Alhambra, $95,950, C. L. Edinger, Los Angeles, $111,095.

★**Cal., Pasadena**—School—Bd. Educ. let contract building 2 story, brick, on W. McKinley School Site, to Daniels & Farris, Passadena. About $106,000.

★**B. C., Vancouver**—Theatre—Allen Theatres, Inc., Toronto, let contract building 4 story, 75 x 120 ft., steel, concrete, brick and terra cotta, rein.-con. flooring, concrete foundation, on Georgia and Seymour Sts., to A. McDonald, 82 Leigh Spencer Bldg. About $300,000.

Federal Government Work

PROPOSED WORK

N. Y., New York—Dredging—U. S. Eng. Office, 39 Whitehall St., soon receives bids for maintenance dredging in Shoal Harbor and Compton Creek, N. J.

N. Y., New York—Widening Channel—U. S. Eng. Office, 39 Whitehall St., plans to widen channel in Newark Bay to 400 ft. from Kill von Kill to upper limit of bay and dredge side channel 400 ft. wide and 20 ft. deep from bay channel to pier headline, to connect with Port Newark Channel, N. J.

N. J., Cape May—Dirigible Hangar—Spec. 4080—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids altering and building addition to dirigible hangar, 708 ft. long, 155 ft. wide and 113 ft. high from floor to center, pin of arch at Naval Air Sta. and dismantling, 100,000 cu.ft. capacity gas holdes at Montauk, L. I., and transferring and storing here.

Pa., Emsworth—Dam—U. S. Eng. Office, War Dept., Wash., D. C., soon receives bids building dam at Lowery Run Culvert, also 2 locks, one 600 ft. long by 110 ft. wide and other 360 ft. long by 66 ft. wide. About $2,000,000 available.

Pa., Phila.—Extending Launching Ways—Spec. 4099—Bureau Yards and Docks, Navy Dept., Wash., D. C., plans to extend launching ways, Slip No. 3, here. About $25,000.

Pa., Pittsburgh—Lock and Dam—U. S. Eng. Office, Pittsburgh, having revised plans prepared for lock and dam No. 4, continue test borings to determine character of river bed at Schenley, decide location of Lock and dam No. 5. Bids will be received in January. Noted Sept. 11.

Pa., Pittsburgh—River Improvement—U. S. Eng. Office, War Dept., Wash., D. C., plans to improve Ohio River, below here.

Md., Annapolis — Water Tanks and Towers—Spec. 4103—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build one 2000 and one 12,000 gal. steel water tanks with 67 ft. steel tower and appurtenances, at Naval High Power Radio Sta., Greenbury Point, here. About $5500; $10 deposit required for plans and spec.

D. C., Wash.—Skylights—Spec. 4100—Bureau Yards and Docks, Navy Dept., Wash., D. C., plans to build skylights in erecting shop Bldg. No. 32. About $6000.

Va., Alexandria—Partitions—Spec. 4098—Bureau Yards and Docks, Navy Dept., Wash., D. C., plans to build in Torpedo Assembly Plant, here. About $25,000.

Va., Norfolk—Dispensary—Spec. 4101—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build, here. About $25,000.

Mich., Detroit—Dredging—U. S. Eng. Office, Detroit, rejected bids received Nov. 12, dredging in Beach Harbor.

Ill., Rock Island—Dredging—U. S. Eng. Office, War Dept., Wash., D. C., plans to dredge South Slough, near Milan.

Mo., St. Louis—Earthwork—Mississippi River Comn., 1311 International Life Bldg., rejected bids received Nov. 17, building 120,000 cu.yd. earthwork in East Cape Girardeau and Clear Creek D. D., Ill., same being too high.

Mo., St. Louis—Office—H. Bartholomew, engr., City Hall, soon receives bids constructing Federal Bldg. on 4th and Chestnut Sts., here, for Treas. Dept., Wash., D. C. About $1,000,000.

Cal., San Diego—Additional Buildings—Spec. 4102—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build at Marine Corps Base, here. About $15,000

Cal., San Diego—Building—Spec. 4017—Bureau Yards & Docks, Navy Dept., Wash., D. C., rejected bids received Nov. 26, constructing 1 story central building, covering 30,000 sq.ft. floor space, consisting of power house at center with ell shaped east and west wings for housing utilities, at Marine Corps Base, here. About $200,000.

P. R., San Juan—Dredging—U. S. Eng. Office, 39 Whitehall St., New York City, having preliminary plans prepared for dredging 5,122,000 cu.yd. from inner harbor and depositing same on swamp lands, here. Not decided whether work will be contracted for or done by hired labor.

BIDS DESIRED

N. Y., Stapleton—Electric Elevators—Until Dec. 30, by Treas. Dept., Wash., D. C., installing 2 electric elevators in kitchen and mess hall, at U. S. Marine Hospital, here. J. A. Wetmore, superv. archt.

Pa., Phila.—Cranes—Spec. 4092—Until Dec. 23 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building two 5-10 ton hammer head cranes, here. Cost $100,000; $10 deposit required for plans and spec.

Va., Norfolk—Cranes—Spec. 4092—Until Dec. 23 (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., building one 5-10 ton hammer head crane, here. About $50,000; $10 deposit required for plans and spec.

O., Toledo—Remodeling Custom and Court Houses—Until Dec. 30, by Treas. Dept., Wash., D. C., remodeling Custom and Court Houses, here. J. A. Wetmore, superv. archt.

P. R., Rincon—Tower and Dwelling—Until Feb. 2, by Lighthouse Supt., San Juan, building, for Point Jiguero Light Sta., here; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Hingham — Officers' Quarters — Spec. 4056—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Nov. 26, building at Naval Ammunition Depot, here, from Coleman Bros., 1 Marginial St., Chelsea, $22,400 (180 days); G. Howard, Brockton, $22,710 (165 days).

★**N. Y., Brooklyn**—Elevator—Spec. 4046—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract installing electric freight elevator in Bldg. "F", at hospital, here, to Otis Elevator Co., Metropolitan Bank Bldg., Wash., D. C., $3933 (70 days).

★**N. Y., New York**—Alterations to Rooms—Treas. Dept., Wash., D. C., let contract altering rooms at U. S. Custom House, here, to C. F. Mentzinger & Son, 354 Bway., $2572.

★**N. Y., New York**—Dredges—U. S. Eng., Office, 39 Whitehall St., let contract building 2 dipper dredges for East River, to V. R. Browning & Co., 17,701 Lake Shore Blk., Cleveland, O. About $1,165,000.

★**N. Y., New York**—Dredging—U. S. Eng. Office, 39 Whitehall St., let contract dredging in channel between Staten Island and Hoffman and Swinburne Islands, to P. S. Ross, 277 Washington St., Jersey City, N. J., $122,472.

★**N. Y., New York**—Flooring—Spec. 3705—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract for asphalt block flooring in light machine and electrical shop Bldg. No. 5, to Fleming, O'Brien & McEntegart, 401 West 59th St., $27,072 (40 days).

Pa., Lewistown — Post Office — Treas. Dept., Wash., D. C., received bids Nov. 20, for labor for building, here, from O. Gerlach, 14 North Water St., Frostburg, Md., $28,400; P. F. Gibbon, 1620 North Main Ave., Scranton, $35,421.

★**D. C., Wash.**—Walks—U. S. Eng. Office, War Dept., Wash., D. C., let contract building concrete walks, etc. at court house in Judiciary Park, here, to C. H. Tompkins, 1883-3rd St., $10,612.

Va., Norfolk—Quay Wall—Spec. 4044—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Nov. 26, building, here, (1) work complete, from H. P. Converse Co., 88 Broad St., Boston, Mass., (1) $71,053 (120 days), (2) add $36 deduct $8.50, (3) add $.65 deduct $.05, (4) add $75 deduct $35, (5) add $1.26 deduct $.10

Federal Government Work (Continued)

S. C., Charleston—Pump Well—Spec. 4089—Bureau Yards and Docks, Navy Dept., Wash., D. C., received bids Nov. 26, building pump well for Dry Dock No. 2, consisting of concrete structure, 204 ft. long, 87 ft. deep and 48 ft. 3 in. wide, etc., (1) work complete, from H. P. Converse, 88 Broad St., Boston, Mass., (1) $765,583 (360 days), (2) $.70, (3) $1.50, (4) $.06, (5) $100, (6) $.04, (7) $.06, (8) $.0275, (9) $.025, (10) $18; Underpinning & Foundation Co., 290 Bway., New York City, (1) $850,000 (300 days), (2) $1.50, (3) $.50, (4) $.08, (5) $200, (6) $.06, (7) $.06, (8) $.035, (9) $.03, (10) $20; Arnudel Corp., 409 Finance Bldg., Phila., Pa., (1) $883,000 (360 days), (2) $.70, (3) $1.40, (4) $.07, (5) $200, (6) $.015, (7) $.09, (8) $.028, (9) $.037, (10) $18.

★**Ga., Brunswick**—Dredging—U. S. Eng. Office, War Dept., Wash., D. C., let contract dredging in Academy Creek, Brunswick Harbor, here, to J. W. Fitzgerald, Natl. Bank Bldg., Savannah. About $2,250,000.

★**Fla., Jacksonville**—Dredging— U. S. Eng. Office, Jacksonville, let contract dredging and removing rocks in Sarosota Bay, to Seaboard Dredging Co., Durkee Bldg. Cost $128,930.

★**O., Cincinnati**—Hoistway and Hydraulic Lift—Treas. Dept., Wash., D. C., let contract installing hoistway and hydraulic lift in U. S. Custon House and post office building, here, to D. Gordon Bldg. & Constr. Co., 734 West 7th St., $10,000.

★**Mich., Alpena**—Radio Building—Spec. 4066—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract constructing brick and timber, wood flooring, concrete foundation, here, to Bradford Lumber & Planing Mill Co., Alpena, $9294 (210 days).

Mich., Detroit — Dike Reconstruction — U. S. Eng. Office, 337 Federal Bldg., received bids improving channel at St. Clair Flats Ship Canal by (1) removing 7270 lin.ft. old revetment and old crib, (2) dredging 165,000 cu.yd. sandy material, (3) furnishing and placing 20,000 ton riprap, from Dunbar & Sullivan, 2211 Dime Bank Bldg., (1) $2 per lin.ft., (2) $.18 per cu.yd., (3) $2 per ton, total $84,240; T. L. Durocher, De Tour, (1) $2.25, (2) $.23, (3) $2, $94,308; Duluth Superior Dredging Co., foot of West 45th Ave., Duluth, Minn., (1) $3.65, (2) $.33, (3) $2.10, $122,986.

Mich., Harbor Beach—Harbor Improvements—U. S. Eng. Office, 337 Federal Bldg., Detroit, received bids dredging main entrance to harbor to project depths of 21 and 23 ft, involving (1) 217,000 cu.yd. of sand, hard clay and shale with allowance over depth of 97,000 cu.yd., (2) Sect. A, 100,000 cu.yd., (3) Sect. B, 117,000 cu.yd., from M. Sullivan, 179 Iriquois Ave., Detroit, (1) $120,310, (2) $.70 per cu.yd., (3) $.43 per cu.yd.; Great Lakes Dredge & Dock Co., 104 South Michigan Ave., Chicago, (1) $159,350, (2) $.95, (3) $.55; Duluth Superior Dredging Co., foot of 45th Ave., W., Duluth, Minn., (1) $162,440, (2) $1.25, (3) $.32. Noted Apr. 10.

Tex., Gilmer—Post Office—Treas. Dept., Wash., D. C., received bids Nov. 28, for labor for building, here, from W. D. Lovell, 1415 South East 8th St., Minneapolis, $27,617; A. Motschman, Chicago, $40,500.

★**Colo., Lyon**—Gravel Road—Spec. 4095—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building gravel road at Naval Hospital, here, to Holly & Burshears, La Junta, $10,894 (90 days).

Wash., Keyport—Radio Towers—Spec. 4077—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Dec. 3, building 400 ft. self supporting radio tower with concrete foundations on wood and for modifications of out riggers on existing towers at Naval Radio Sta., here, (1) work complete, from Foundation Co., 2501 Smith Bldg., Seattle, (1) $42,468 (180 days), (2) $.50; Gerrick & Gerrick, 303 Central Bldg., Seattle, (1) $44,569 (120 days), (2) $.50; Pittsburgh Des Moines Steel Co., 951 Munsey Bldg., Wash., D. C., (1) $68,800 (210 days) bidders spec., $18,400 (210 days), (2) add $1.50 deduct $.75.

Wash., Puget Sound—Officers Quarters, Storehouse and Railroad Extension—Spec. 3983—Bureau Yards and Docks, Navy Dept., Wash., D. C., received bids Nov. 26, building 1 officers' quarters, 2 storehouses, concrete footings, foundations, platform and floors, built up and sheet metal roofing, copper and ti sheet metal work, etc., also railroad extension, (1) work complete, from Puget Sound Bridge & Dredging Co., Central Bldg., Seattle, (1) $51,350, (2) $1800, (3) $1200, (4) $1800 (60 days), (5) $32.60, (6) $2.10, (7) $400, (8) $51,350 (150 days); Dogan & Christman, c/o Pub. Wks. Office, San Diego, (1) $53,880 (200 days), (2) $1700; Foundation Co., c/o Pub. Wks. Office, San Diego, (1) $56,000 (180 days), (2) $2130, (3) $4600, (4) $2130, (5) $1600, (6) $2, (7) $242. Noted Nov. 6 E. B.

★**Cal., Mare Island**—Torpedo Storage and Compressor Building—Spec. 3991—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building at Naval Ammunition Depot, Item 5, of addendem omitting piles and fill, to Lange & Bergstrom, Sharon Bldg., San Francisco, $46,587 (210 days).

Cal., San Diego—Fuel Oil Tank, Water Pipe and Sewer Pipe—Pub. Wks. Officer of 12th Naval Dist., San Diego, received only bid for 70,000 gal. rein.-con. fuel oil tank, 8740 ft. 8 in., 140 ft. 6 in. and 2300 ft. 2 in. water pipe and 7800 ft. sewer pipe, from T. Haverty Co., 8th St. and Maple Ave., Los Angeles, $244,850.

Cal., San Diego—Power House—Spec. 4070—Bureau Yards and Docks, Navy Dept., Wash., D. C., received bids Nov. 26, extending existing power house at Naval Radio Sta., Chollas Heights, (1) work complete, from W. Slater, c/o Pub. Wks. Office, (1) $7500 (90 days), (2) $20; L. A. Geisler, c/o Pub. Wks. Office, (1) $8548, (2) $25. Noted Nov. 6, E. B.

★**Cal., San Diego**—Water Supply and Sewer System and Fuel Oil Reservoir—Spec. 4007—Bureau Yards and Docks, Navy Dept., Wash., D. C., let contract building, at Marine Corps Barracks, here, to H. D. Hallett, 132 Downer Pl., Aurora, Ill. (items 2a and 9a, $185,600 (110 days).

★**Cal., San Francisco**—Kitchen, Mess Hall, Quarters, Garage, etc.—Treas. Dept., Wash., D. C., let contract for labor for buildings at U. S. Marine Hospital, here, to Schultz Constr. Co., 46 Kearney St., $29,629; cement, to Old Mission Portland Cement Co., 435 Mills Bldg., $2799; lumber, to Olson-Mahoney Lumber Co., 5th and Hopper Sts., $6243; millwork, to Natl. Mill & Lumber Co., 318 Market St., $6087. Noted Oct. 16, E. B.

Miscellaneous

PROPOSED WORK

Road Machinery—Balsam Lake, Wis.—Polk Co. appropriated $10,000 for road machinery, to include 1 rock crusher, gravel screening machinery, 2 heavy trucks, one 12 ft. grader and several No. 3 wheelers. C. W. Nystrom, comr.

Road Machinery — Ellsworth, Wis. — Pierce Co. appropriated $4000 for machinery. W. H. Richards, Spring Valley, comr.

Graders—Hurley, Wis.—Iron Co. appropriated $5000 for 3 new patrol graders, planes and drags.

Road Machinery—Sturgeon Bay, Wis.—Door Co. appropriated $3000 for road machinery. J. M. Laurie, comr.

Pipe Line — Abilene, Tex. — City voted $450,000 bonds to build pipe line connection from here to Lake Abilene.

Dam—Eastland, Tex.—H. P. Brelsford and associates plan to build dam across Leon River capable of impounding 213,000 cu.yd. of water, to include reservoir, 35 ft. high, and result in lake ½ mi. long, 13 ft. deep and 1500 ft. wide. About $125,000. Texas & Pacific Ry., Eastland, engrs.

Power System — Astoria, Ore. — Port Comn. rejected bids installing underground electric power system through port property, and plans to construct 24 x 26 ft. concrete transformer house, 15 ft. high, instead. G. Walter, electrical investigator.

BIDS DESIRED

Pipe and Castings—Newark, N. J.—Until Dec. 16, by T. L. Raymond, dir. Dept. Streets & Pub. Impvts., for 335 tons (2000 lb.) 6 and 12 in. c.i. water pipe, 50 tons (2000 lb.) ordinary special castings 4-12 in. diameter, 1692 tons (2000 lb.) 20 and 24 in. c.i. water pipe, 25 tons (2000 lb.) ordinary special castings 20-24 in. diameter, 170 tons (2000 lb.) 12 in. high pressure c.i. water pipe and 17½ tons (2000 lb.) special castings for high pressure system; advertised in this issue.

Pipe, Valves, etc.—St. Louis, Mo.—Until Jan. 22, by J. B. Thomas, supply comr., furnishing c.i. pipe of various sizes, valves and fittings, for waterworks. About $150,000.

Gas Distributing System—Avalon, Cal.—Until Dec. 19, by F. M. Tidball, city clk., furnishing pipe valves, and other material, also labor for constructing gas distributing system. About $50,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Tank—Laconia, N. H.**—Scott & Williams, Inc., 266 Union Ave., let contract building rein.-con. oil tank, to Aberthaw Constr. Co., 27 School St., Boston, Mass. About $20,000.

★**Foundation—Hartford, Conn.**—Royal Typewriter Co., Inc., 150 New Park Ave., let contract for concrete foundation for 5 story, 50 x 310 ft. brick and concrete addition to factory, with 50 x 70 ft. el, to D. O'Brien & Sons Co., 118 Asylum St. Noted Aug. 14 under "Industrial Works."

Heating and Ventilating, etc.—New York, N. Y.—H. Bruckner, pres. Bronx Boro., received lowest 3 bids Dec. 1, installing heating and ventilating apparatus in P. S. No. 6, Tremont Ave., from D. J. Rice, 405 Lexington Ave., $61,393, E. Rutzler Heating Co., 404 East 49th St., $64,423, Gillis & Goeghagen, 537 West Bway., $67,269; temperature apparatus, from Fisher & Babcock, $3300, Natl. Regulator Co., 166 Lexington Ave., $3928, Johnson Serv. Co., 123 East 27th St., $4163.

★**Boardwalk—Seaside Park, N. J.**—City let contract building 8400 ft. boardwalk, to C. W. Mathis & Co., $44,691.

★**Freezing Tank—Phila., Pa.**—Kensington Hygeia Ice Co., Trenton Ave. and Huntingdon St., let contract building two 30 x 30 ft., one 31 x 100 ft. and one 20 x 80 ft. freezing tanks, cement, brick and concrete, stone foundation, to P. Haibach Contg. Co., 1261 North 26th St. About $25,000.

★**Tunnel—Pittsburgh, Pa.**—Comrs. Allegheny Co. let contract building Liberty Tunnel, through South Hills, to Booth & Flinn, Ltd., 1942 Forbes St., $4,593,258.

Swimming Pool—Baltimore, Md.—See "Buildings."

★**Cooling Tank—Ashtabula, O.**—City will build cooling tank, at Municipal Lighting Plant. About $15,000. Work will be done by day labor.

Screens—Detroit, Mich.—Water Bd. received bids furnishing 7 sets revolving screens for low lift pumping station at Waterworks plant, from Chain Belt Co., 11th Ave. Viaduct, Milwaukee, $26,850, Link Belt Co., 732 Dime Bank Bldg., $26,400.

★**Foundation—Milwaukee, Wis.**—Chicago, North Shore & Milwaukee Ry., Highwood, Ill., let contract building concrete foundation, for 1 story, 52 x 106 ft. terminal station, on 6th and Sycamore Sts., here, to Madson, Christensen & Ingbretson, 379 1st Ave. Total cost, $50,000.

★**Revetment—Milwaukee, Wis.**—P. Braman, comr. Pub. Wks. let contract building 1375 ft. pile and timber revetment. at west end of Jones Island, here, to Great Lakes Dredge & Dock Co., 216 West Water St., $99,483.

★**Piers and Dock—St. Louis, Mo.**—Sugar Products Co., 16 Exch. Pl., New York City, let contract sinking piers and building concrete and steel dock, here, to P. A. Rohan, North 1st St. About $50,000.

***Lighting System—Logan, Utah**—City let contract installing ornamental street lighting system, involving 66 light standards, 54 plain light standard and furnishing and laying 13,000 ft. parkway cable, to Inter-Mountain Electric Co., 43 East 4th St. S., Salt Lake City. About $34,000. Noted Aug. 14.

★**Bulkhead—Aberdeen, Wash.**—City let contract building concrete bulkhead, 400 ft. long, on East End Rd., to Grays Harbor Bldg. Co., Aberdeen, $20,291.

★**Tanks—Seattle, Wash.**—Port of Seattle Comn., Bell St. Dock, let contract building 4 steel oil tanks, 50,000 gal. capacity each, to Seattle Boiler Wks., 1132 West 45th St. About $10,000.

***Heating System—Spokane, Wash.**—St. Luke's Hospital Assn., Dean and A Sts., let contract installing steam heating system, including 110 ft. concrete stack, to F. Phair, 416 2nd St. About $30,000.

★**Screened Gravel—Coquille, Ore.**—State Highway Comn., Salem, let contract furnishing 25,000 yd. screened gravel, to be used for paving Marshfield-Coquille Rd., Coos Co., to A. C. Mathews, Marshfield. About $25,000.

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E. J. Mehren, Editor — Charles Whiting Baker, Consulting Editor

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Differing Views on Dues

APROPOS of our recent notice of the formation of the Indian Society of Engineers (p. 840, Oct. 30-Nov. 6) and of the comment on p. 846 of our last issue on the report of the Committee on Development of the American Society of Civil Engineers, a word is warranted on the dues of the new body in India. With a very few, if any, exceptions all the members of the new society are members of the leading English or American technical societies, and accordingly pay their annual dues and have paid their initiation fees. Yet in joining the new body they must pay admission fees of $67 (200 rupees) for members and $33 (100 rupees) for associate members, with annual dues (payable quarterly) of $20 and $16, respectively. Yet we place dues for national civic and welfare work at $1.50 per member. This low fee is set, it is true, as a beginning, but the significant feature is that the Indian society at its very beginning has viewed the matter quite differently.

Toronto's Water Filtration Experiment

THE third stage in Toronto's huge water-filtration experiment will afford the crucial test. Acceptance of the plant from the contractors after a long delay was the first stage. The second is marked, so far as interested outsiders are concerned, by the favorable report on the physical operating results given in the paper abstracted on p. 822 of our issue of Oct. 30-Nov. 6. The publication of data showing what it costs to treat a million gallons of water by the drifting-sand process will be the third stage. The cost data should take into account whether the amount paid by the city yielded the contractor a reasonable profit and if not how much of the deficiency should be charged up to the development of the process—to be recouped from other cities later on. The cost data should also include an ample allowance for the depreciation on any portions of the plant that must still be considered experimental and thus subject to replacement or heavy repairs.

Should Cities Take Such Risks?

TORONTO'S huge experiment noted in the foregoing paragraph and the ventures in sewage treatment apparently about to be made by New Jersey and Pennsylvania municipalities make it pertinent to raise the question, "Should cities take such risks?" So far as appears, Toronto made a contract for a water filtration plant of a relatively untried type on the assurances gained from the operation of a small working model at Toronto and reports of a few small working plants abroad, but without the advice of a single disinterested engineer versed in water treatment. Phillipsburg, N. J., and Allentown, Penn., propose to expend what for them will be large sums of money on a method of sewage treatment still so much in the experimental stage that the respective state departments of health have given only conditional approval to the plans, if indeed the New Jersey permit can be so characterized. Toronto, Phillipsburg and Allentown thus become partners in the risk attendant upon developing new processes. Is this a wise municipal policy. True, if someone besides the promoter does not join in the risks attendant on a new process then progress will be slow or nil. But this only raises the further question; Under what conditions should a city accept such risks, or how great risks of the sort should it assume? We will not attempt an answer further than to say that as a rule no material risks of the kind should be taken by a city without the approval of a competent, disinterested engineer.

Flying in the Face of Precedent

THE risks noted above have considerable engineering interest because they fly in the face of precedent and ignore sad experiences elsewhere. Thus, as regards the drifting-sand filters at Toronto, those who have watched the development of mechanical filtration will remember the battle royal between the early mechanical filter companies over the necessity of pre-coagulation and the disaster that befell one of the companies through installing a plant without pre-coagulation at New Orleans. True, it is a far cry between New Orleans and Toronto in distance, time, and character of the water, but in the long time-interval and the vast range of experience meanwhile recorded, the desirability if not imperativeness of pre-coagulation seemed to have been established. Is Toronto to show that, for some waters at least, pre-coagulation is unnecessary, even with an unusually high rate of filtration? Turning now to sewage treatment: For two decades or more the great effort has been to reduce the volume of sludge. On this and other accounts, chemical precipitation plants have been abandoned right and left. For three decades attempts to treat sewage by electrolysis have been made in America and in Europe—and there are today only a very few of the kind in operation and those of doubtful utility, while one has been scrapped at Danbury and two, of another type, at Oklahoma City. In the face of such a record, two cities within a short period have taken steps to provide themselves with plants that combine lime treatment and electrolytic action with some thousands of revolving paddles, and that against the advice of their state authorities! If this is not a partnership in experimentation and a flying in the face of experience, what is?

Standard Concrete Beam Sizes Wanted

NOT long ago a well-known contractor found in going over the drawings of a concrete factory he was about to build that there were upward of one hundred different sizes and details of straight beams and girders. Before the building was started his engineers managed to persuade the architect to accept changes in details which reduced the number of different beams to one-quarter of those in the original design, with a consequent saving in time, effort and money, a saving which would have been greater still had the standardization been studied out in the first place. Though this is probably an extreme case, there is altogether too much variety in concrete designing, too much effort to make the theoretical resisting moment precisely the same as the bending moment. If, as in structural steel practice, there were a sufficient number of accepted standardized sections with graded resisting moments, the saving in design and construction costs due to the greater simplicity of using the standards would undoubtedly outweigh the extra material required because of the variation between stock-size resistance and designed moment. If at the same time some qualified body recommended such a standardization they could also reduce the number of sizes of steel reinforcing bars normally used, they would render a great service to the concrete building industry.

The Churches and Labor

AN INTERESTING development in the current consideration of labor problems is the recent participation of the churches in the discussion. The Interchurch World Movement, an organization of Protestant denominations, some time ago put forth a social program and in November presented a memorandum of nine principles to the International Labor Conference, sitting in Washington. Last year the Catholic bishops of the United States enunciated a program, and one or two other religious bodies have openly advocated an advanced handling of the industrial situation. To our mind this is a good augury. We have no sympathy with the business man, who, when asked to aid in the industrial survey conducted by the Interchurch World Movement, replied that his business "was no Sunday school." Our churches have preached the doctrine of personal righteousness and of justice to our neighbor, but applications of general principles have been left to the individual. Evidently the need for becoming concrete is impressing itself on church leaders and they are now making the application of the principles to the problems of the day. The entry of the churches adds another strong champion to the ranks of those who are contending for social justice. They will bear influence in quarters not reached by other media. While this entry is belated, we hope that it will be followed with vigorous and sustained action. The mighty educational campaign now in progress needs all possible support.

An Old Problem to the Front

SOME day a commercially practicable process of recovering valuable products from sewage may be perfected. Thus far there is little but hope to go on. The difficulties of degreasing and dewatering sludge are presented on p. 948 of this issue, together with an outline of the methods and possibilities of adopting the Cobwell system of garbage treatment to sewage sludge.

No glittering promises of revenue are made by Mr. Wells. For the present, at least, he sees no likelihood of recovering either grease or fertilizer base of a sufficiently high grade to induce manufacturers to pay money for it, although they might take it away without charge. Some cities are so placed that even this might be an object, and the number will increase with the growth of urban population and of the demand for environmental amenities.

The altruistic motive of conservation of wastes, suggested by Mr. Wells, is not likely to appeal to many cities unless they can find no cheaper tolerable method of sludge disposal than converting it into grease and fertilizer base—to be given away. It is conceivable that ultimately society as a whole might finance sewage disposal as a matter of conservation; but would it be any more practicable for a state or the Federal Government to treat sewage for conservation purposes than for a city to do so? In the last analysis, the cost falls on the ultimate consumer. He will get no benefit from the recovery of grease and fertilizer base from sewage unless those materials can be produced as cheap or more cheaply that way than otherwise. When scarcity demands the use of as low-grade products as sewage-sludge grease and ammonia then the manufacturer can afford to pay cities for them.

If, however, Mr. Wells means that manufacturers may yet take the wet sludge without charge, that is quite another matter. Conceivably, the time will yet come when the grease and fertilizer interests will locate recovery plants at sewage-works, take sludge just as it comes from the tanks, and send the crude grease and fertilizer base to central refining and utilizing plants. At the start, cities might well pay for the service, with hope of early relief from payment and ultimate revenue.

In any event, Mr. Wells' paper is a notable one. His plea for hearty coöperation in the further study of sewage utilization possibilities deserves the attention of engineers, chemists, public authorities and the grease and fertilizer interests. The time for such coöperation was never more opportune than now.

The Architects of Buffalo

A VERY striking example of disinterested service to the public by a group of professional men—the most striking we can recall in the construction professions—is afforded by the manner in which the architects of Buffalo are carrying forward the building program of the Board of Education. The program included the alteration of three buildings and the construction of 15 new ones, at an estimated cost of $8,000,000. The purpose is well put in the words of the secretary of the Associated Buffalo Architects, Mr. Duane Lyman: "The architects of the city were of the opinion that an organization of the local profession, which would indicate a real capacity for a sympathetic and intelligent interpretation of the policy of the Board of Education, as well as insure a well considered application of the best experience among them, would lend itself to an effective and creditable execution of this school program, creditable not only to the Board of Education and the city of Buffalo, but to the architectural profession as a whole, and that the use of such an organization would eliminate much waste motion when compared

with the execution of the work by many individual architects."

In the spring of this year Mr. William B. Ittner, of St. Louis (note that a consulting architect was brought in from the outside), was retained by the Board of Education as consulting architect, and at a somewhat later date the architects of Buffalo, who had in the meantime formed a membership corporation known as the Associated Buffalo Architects, Inc., were retained to execute all of the architectural work of the entire program, with the exception of the part carried out by Mr. Ittner.

The purpose of the corporation is to obtain for the city the most satisfactory and rapid execution of the work and the best results possible in the buildings in question and to make the results obtained the collective achievement of the entire membership. Since many of the plans are to be identical, or at least very similar, the original or key plans will be prepared in a central office of the corporation, the member officers carrying out the remainder of the work in accordance with standardized data and details. The preliminary drawings and data for many of the buildings have been prepared by Mr. Ittner and approved by the Board of Education, and the actual execution of the architectural work is now in progress.

Summing up the situation, Mr. Lyman says: "The members of the Associated Buffalo Architects, Inc., feel that they have a rare opportunity through this plan to be of vital service to the community, and at the same time to improve the standing of the architectural profession in the minds of the public and to emphasize the value of architectural service."

We have long looked with admiration at the breadth of vision and the effectiveness of action displayed by the architectural profession in its organized procedure. Here is additional evidence not only of ability to cooperate effectively, but of a clear-cut and compelling conception of the obligations of a profession to the public. At Buffalo there were eighteen plums that might have been scrambled for. Professional obligation, however, was controlling rather than selfish interest—an example that may well be preached to all professions.

Capitalizing the Engineering Urge

WHATEVER are the pedagogical advantages or shortcomings of the so-called case system of teaching engineering, it has a very human appeal to the engineer who remembers his student days. Those engineers who do not appreciate this should read the report on the teaching methods at the Engineer School at Camp Humphreys, just issued by the Committee on Education and Special Training of the War Department. They will find, for instance, instead of the oldtime dry-as-dust text study of a uniplanar bridge truss, with its months of preceding study of force lines and load arrows, that the student of structures—in this case boys who had passed the two-year emergency course at West Point with only an elementary study of science—approaches first a living bridge and through a series of graduated questions is led by the instructor to consider it not merely as it has been to him before—a part of the landscape—but to see it with an engineering eye as a structure to carry a familiar load. Here is some life put in the dull business of study, some recognition early in the game of the ultimate field of the engineer as a designer and builder.

To those of us brought up on the old deductive method of teaching engineering the thing seems impracticable. How can a boy who never heard of the moment of inertia comprehend the design of a plate girder? What does uplift and overturning in a dam mean to one who does not understand the equation of moments? The answer is that at Camp Humphreys the scheme works and that the deduction of principles came readily enough from the structural facts. Astounding progress in sound engineering thinking is made.

But, it will be said, at the Army school the case system was an invention born of necessity. Engineering principles and methods had to be driven home to men grounded only in the fundamental engineering sciences. Every student officer had ahead of him the goal of the commission and the supreme urge of a present war. His mind had been rendered sufficiently agile to dispense with many of the intermediate steps of conventional instruction. There was no need to drive him to his studies. In other words, motivation was high.

All this is true. To develop the system in times of peace some other motivation must be sought, something beyond the mere desire to pass the course, which is at best a tenuous appeal. That something does exist, and it may be that it can be utilized by the deductive method of instruction. Practically every boy who goes to an engineering school does so because he wants to become an engineer, because there is something appealing to him in the profession. Few go because they figure there are riches in it; the occasional one who is driven to it against his will will soon drop out or will not count. The great majority, however vehemently they would deny it in public, are attracted to what for want of a better term we may call the romance of engineering. They want to build things; to see materialize under their own hands the structures and ideas which they themselves conceive.

This half-formed desire for expression is deadened by the long grind of technical-school instruction. Far, far ahead of them are the things they want to do; meanwhile they must work with the detail and the theory on which the completed structure rests. Long ago the pedagogues recognized this lack, but they went about supplying the application by way of illustration of theory rather than as the primary impulse of their courses. To the practicing engineer now who remembers the dreams of his early school days there seems to be a chance to utilize this groping after engineering knowledge as the motivation of this instruction.

Details are for the teaching expert. The profession will watch their development with more than ordinary interest. Camp Humphreys, to be sure, is turning out engineer-officers who admittedly do not have to be as thorough in detail as they are sound in principle. In the words of the report "the courses aim to lead the student to think out a decision in the face of a real situation." It is a fair assumption that details and principles are of equal importance to the civilian engineer, and the Humphreys system has not proved that it can guarantee their equal development. It has shown, though, that while there may be no royal road to learning, the ordinary traveler may in places pick out a scenic highway instead of a tunnel. In its beginnings it is entitled to serious consideration for that if for no other reason.

Concrete Shipping Pier at Panama Has Novel Design

Scarcity of Steel Leads to Long-Span Concrete Alternate Arches and Beams for Longitudinal Members of the Latest of the Four Terminal Piers at Cristobal

By G. W. True
Junior Engineer, Panama Canal, Balboa Heights, Canal Zone



FIG. 1. CRISTOBAL HARBOR WITH PIERS 6, 7, 8 AND 9, IN ORDER, LEFT TO RIGHT

STEEL scarcity on the Panama Canal during the war was such as to cause a radical change in the design of Pier 6, the latest of the shipping piers at Cristobal, one of the entrances of the canal. The foundations of this pier were placed for a long-span steel superstructure similar to those already erected, but by the time bids were asked steel was so high in price and deliveries were so uncertain that a concrete design was substituted. This consisted of alternate tied arches and beams spanning longitudinally the already placed pier footings with concrete cross-beams and deck. Both in computation and construction the pier presented enough novelty to warrant its description.

The natural growth of shipping since the canal was first opened to traffic in 1914 has resulted in a steadily increasing demand for terminal facilities, at both the Atlantic and Pacific entrances. Although there is a possibility, especially with the extension of South American trade, that the isthmus may be the logical place for storage warehouses, thus far the major function of the piers has been as a transfer point for freight, as it is uneconomical for smaller-sized vessels to pay tolls through the canal when cargo is less than a maximum. The port of Cristobal is especially favorable for pier construction in so far as tidal difficulties are concerned, for there is ordinarily less than 18 in. difference in elevation between average high and low water. On the other hand, the foundations have required considerable care both in construction and design, due to the nature of the subsoil and final distance to rock.

Three piers, Nos. 9, 8 and 7, have been built in Cristobal harbor, and the latest, Pier 6, is now under construction. The three completed piers have the same general characteristics of construction; namely, foundations of concrete cylinders to rock, structural-steel floor system incased with concrete for protection, and structural-steel shed. Details have slight variations, but the essential layout is the same in each case.

Due to the poor character of the subsoil as a foundation and the well known temporary character of wooden piles in tropical waters (owing to the action of the teredo), it was decided to drive steel cylindrical shells or caissons to rock, excavate, and fill with concrete. These caissons were composed of $\frac{3}{8}$-in. thick material in building the first three piers. The diameter of the caissons was increased from 4 ft. on the first construction to 6 ft. on Piers 8 and 7—this change, incidentally, proving to be more efficient in the use of material.

Serious construction difficulties, however, had previously been encountered, due to leakage when excavation was done, and collapse in certain instances. Seven cylinders collapsed on Pier 7. It was noticed that these failures occurred only when the shell had been distorted from its circular shape to that of an ellipse, and that the majority of the failures was not at the base of the cylinders, as would naturally be expected, but at depths varying from 70 to 90 ft. Total depths of the cylinders themselves varied from 75 to 127 ft. Calculations made, assuming a hydrostatic pressure of 100 lb. per cubic foot, showed that failures should occur in a 6-ft. diameter shell of $\frac{3}{8}$-in. material if the diameter was $1\frac{1}{4}$ in. greater or less than theoretical. Since some of the caissons were successfully driven and excavated to a depth of 120 ft. whose axes were 56 x 9 in. and 66 x 3 in., respectively, when stress calculations indicated that the fiber stress for such a section was several times beyond the elastic limit, it was apparent that other forces entered into the analysis that had evidently been neglected. An inspection of the chart made from borings revealed the fact that all failures occurred at the same elevation as a stratum of quicksand through which the caissons had previously been driven.

The most plausible explanation appeared to be that the passive pressure developed by the hard material kept the line of thrust within the steel shell, and very little bending, if any, resulted even when the circular section had been subjected to considerable distortion. This theory was, of course, corroborated by all failures occurring in the stratum of quicksand, which, as is well

known, is a material that develops very little passive pressure.

The caissons for Pier 6 were accordingly designed with the foregoing theory in mind, and special care was taken to maintain the circular section where quicksand was to be expected. The material for the caissons was accordingly $\frac{5}{8}$, $\frac{1}{2}$, and $\frac{3}{8}$ in. thick, the heavier material being used at the lowest depths. As a result of these precautions, no failures occurred in driving the caissons in Pier 6.

As stated, it was originally intended to follow practically the same designs for the floor system of Pier 6 as for Pier 7, and accordingly construction was started on the foundations a short time prior to the advertising of bids for the structural steel. When the bids were opened it was found that the total of item for structural steel was $639,000, as against $250,000 for similar material on Pier 7. Although a slight increase in cost had been anticipated, it was felt that the enormous excess did not fully justify the further consideration of structural steel if a possible saving might be effected by the use of concrete.

Scarcity of ships, in addition to the congested condition of the structural steel fabricating plants in the United States at that time, caused the bidders to state that no definite time of delivery could be guaranteed. The matter was therefore held in abeyance until investigations could be made of the feasibility of a reinforced-concrete floor system.

As sufficient cylinders had been driven to preclude any possibility of changing the original spacing (which was 45 ft. longitudinally and 26½ ft. transversely), this predetermined spacing, together with the live load of 750 lb. per square foot, made the proposed design a rather critical procedure. Naturally, the first method considered was to use continuous concrete girders longitudinally and smaller T-beams transversely. The span of these girders was 45 ft. and the approximate section 10½ ft. deep and 4½ ft. wide. No method of supporting the forms for girders of such unprecedented size and weight could be devised at that time, as the only apparent place to support the forms was on the cylinders, and the girders themselves were to be poured on the top of the cylinders, leaving but a few inches on each side to be used as a support. Piles could not be used on account of their excessive cost, as the average depth of water was about 41 ft. It was also desirable, from the standpoint of continuity, to pour more than one span at a time, and this further complicated the difficulties of supporting the forms. The vertical construction joint over the cylinders also appeared to be an objection, as it would tend to open when the spans were fully loaded, and previous experiences in this climate showed that a possible deterioration of negative-moment steel might ensue even though attempts were made to protect it. In view of these difficulties, it was considered unwise to attempt such a type of construction, as the success of the project depended upon the solution of numerous details, the cost of any one of which might be unduly excessive.

An ingenious method was then proposed; namely, of alternating arches and girders for the main members, using the small floor-beams practically as before. This design, which required a steel tie-rod in each arch, had certain construction advantages. The forms for the arch could be partially supported on the tie-rod. The unit of pouring could be one girder and two half-span arches. The construction joint at the crown of the arch would be in compression for maximum tensile stress in the tie-rod, and secondary stresses due to pouring half arches would be small. In the preliminary design it was attempted to use a girder of variable moment of inertia which would be similar in appearance to the arch, but this design showed unfavorable conditions of reversal of stress under certain loadings, and the haunched girder, as indicated in Fig. 3, was eventually adopted. The estimated cost of this type of construction was greater than continuous girders of reinforced concrete but less than that of the proposed structural-steel design, the choice being governed mainly by construction requirements.

A general plan of the entire pier is shown in Fig. 2 and a typical cross-section is indicated in Fig. 4. The arches and girders beneath the railroad tracks were designed for a live load of two cranes, spaced 45 ft. on centers, weighing 87 tons each and carrying a load of 68 tons per crane. These highly concentrated loads gave slightly smaller results in both moment and shear than was produced by the uniform live load of 750 lb. per square foot adopted elsewhere.

The triangular end is of the usual type of beam-and-girder construction. No great difficulties were en-

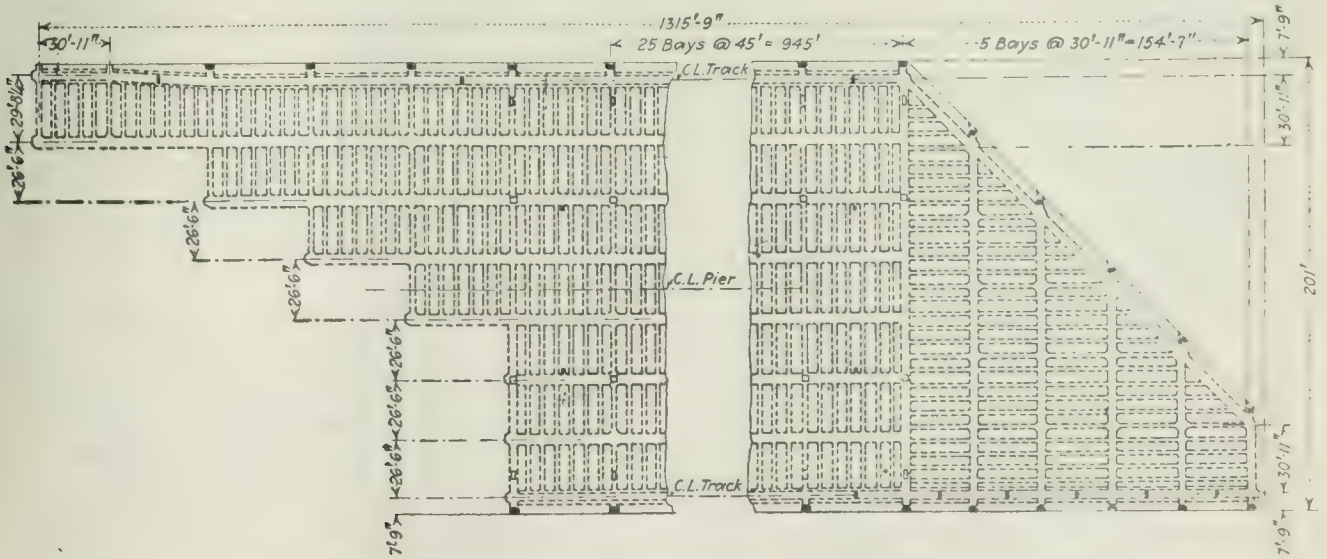


FIG. 2. GENERAL PLAN OF PIER 6 AT CRISTOBAL HARBOR, PANAMA CANAL

countered in supporting and pouring these girders, as the span lengths were not excessive. The forms were supported by trussed beams floated into place, which in turn rested on temporary steel brackets fastened to the cylinders. These brackets were removed after the completion of each girder.

A typical arch-and-girder unit of the main portion of the pier is shown in Fig. 4. The reinforcing consists mainly of 1¼-in.-diameter rods lapped in the diagonal portion. It will be noted that the construction joint at the crown of the arch is capable of taking either a positive or negative shear. The short rails in the joint were not included in the calculations, but were placed as an additional factor of safety. The steel tie-rod is composed of eight angles, 6 x 6 x ⅝ in., and two web members, 24 x ⅝ in., securely latticed by 2½ x ⅜-in. lattice bars.

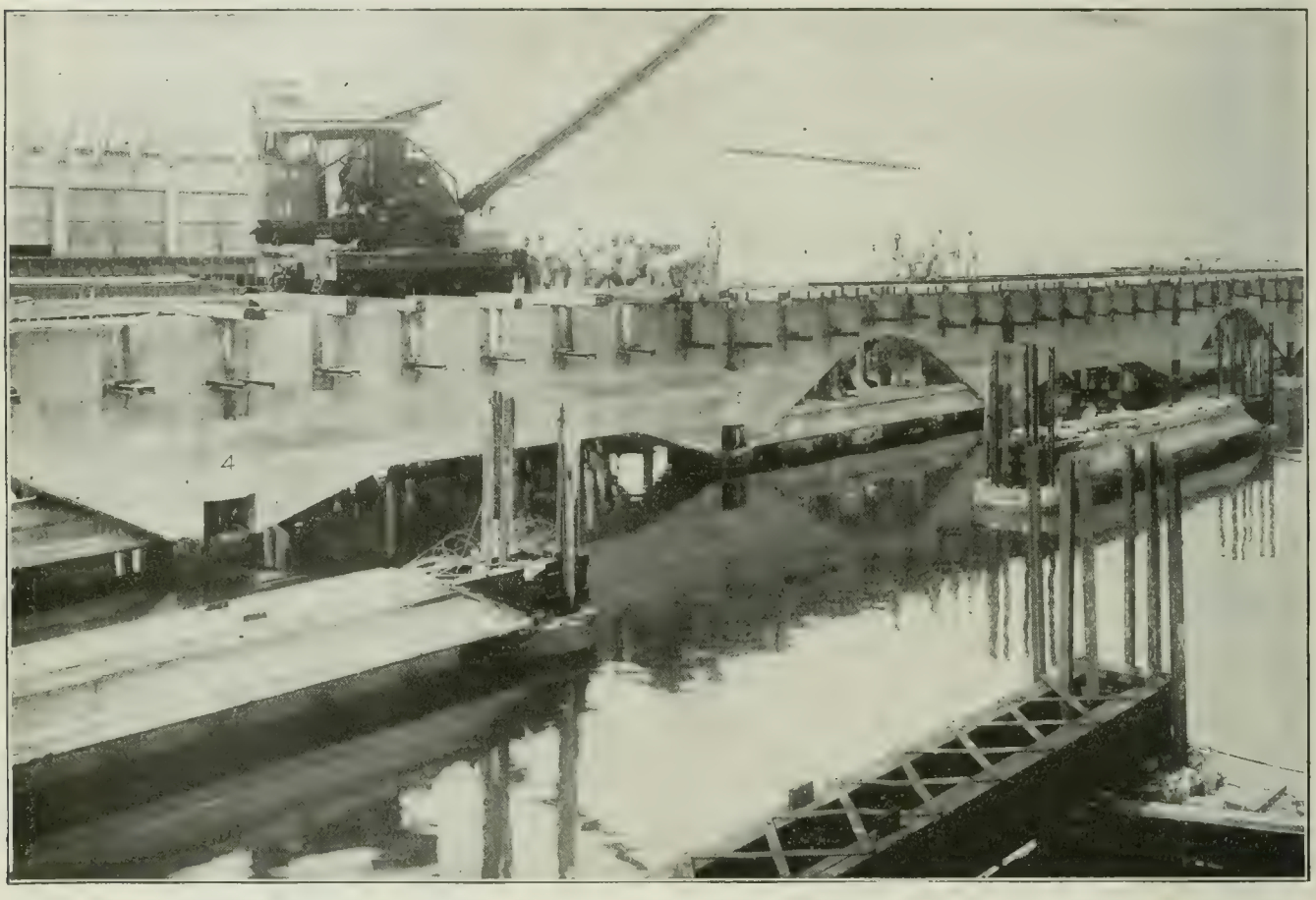


FIG. 3. MAIN LONGITUDINAL GIRDERS, PIER 6, CRISTOBAL, UNDER CONSTRUCTION

The horizontal rails over the cylinders were obtained at a low cost on the isthmus and, being placed nearer the neutral axis than the steel rods, developed a fiber stress of about 12,000 lb. per square inch.

Calculations showed that if one unit—that is, one girder and two half-span arches—were poured and the forms completely removed, the loss of arch action by such a procedure was sufficiently small to be disregarded.

The cross-beams were designed according to the usual theory of continuity. Particular care was taken to keep the bond stresses between the concrete and the steel low in that portion of the beam that developed negative moment. This was done by finding the magnitude and sign of the moment at each point coincident with the maximum shear found to exist at that point. Since this type of structure was anything but standard, the usual formulas for arch analysis, as given in the standard American textbooks, were not sufficient. Its exceptional character and cost, and repetition of each unit, together with the possibility of overloading the completed structure, seemed to justify calculations of more than the ordinary degree of accuracy. It was accordingly decided to obtain the best analysis possible, by a rigid application of the theory of elastic deformation.

The analysis of a structure of multiple indeterminateness requires certain assumptions to bring it within the reasonable limits of calculation, so the following general assumptions were adhered to in building up the theory of design:

All calculations were based upon formulas derived from a rigid application of the elastic theory, which presupposes that concrete is a homogeneous substance. Methods of analysis deviating from usual practice were made in strict conformity with the above-named accepted principles.

The variable moment of inertia of the girder, as well as of the arch, was taken into consideration. The extensibility of the tie-rod of the arch was included in the calculations. Pin connections were assumed at the tops of all cylinders—that is, the bending moment developed by the cylinders themselves was neglected in so far as the design of the arches and girders was concerned. The bending moment developed by the cylinders, however, was combined with the direct load in designing the cylinders themselves.

Stresses due to rib-shortening were neglected, because a rough calculation showed that these stresses would be balanced by the tendency of concrete incasement around the tie-rod to reduce the elongation of that member. The stresses in the arch and girder, due to settlement of supports because of the shortening of the cylinders under direct load, were also neglected. The usual assumptions in the beam theory, as recognized by current engineering practice, were followed.

The influence of a load on any span has been considered to extend over two spans on each side of the loaded span, or a total of five spans. This assumption necessitated calculations for a structure indeterminate in the seventh degree, the redundant conditions being moments over four supports and stresses in three tie-rods.

A brief review of the method of calculation of stresses may be of interest, as it was somewhat different from the usual manner of applying the elastic theory. The five-span structure considered was assumed to be cut by vertical planes over the four intermediate supports. This separated the structure into simple beams and two hinged arches. The solution of the two-hinged arch did not present many difficulties, as existing formulas could be easily adapted and applied. The angular deflection (or destortional rotation) for various types of loading was obtained for each end of the loaded span. The angular deflection at each end of every span was then calculated in terms of M, wherein M was a moment externally applied at one end of the span in question. This proved to be comparatively simple in considering the beam, but the two-hinged arch required the derivation of a formula which showed the relation between the horizontal thrust in the tie-rod and the moment M. Finally, the unknown moments over the four interior supports were calculated from the fact that the final angular change produced at any support is the same when the moments on the girder on either adjoining span are considered. In other words, the ends of two girders continuous over any support undergo the same angular change at that support. Two analyses were, of course, necessary, one with the arch as a loaded span and one with the girder as the loaded span.

The visualization of the moment areas involved will be aided by reference to Fig. 5, on which is indicated the manner in which the moment areas should be subdivided for a continuous beam of five spans.

The cylinders and the floor system of Piers Nos. 9, 8 and 7 were constructed by means of locomotive cranes supported on temporary trestles. Four trestles, each approximately 1000 ft. long, were used in the construction of Pier 7. The high cost of piling meant that the cost of this type of preliminary construction would be abnormal on Pier 6. For this reason the scheme adopted on Pier 6 was to use one trestle through the center line of the pier, and floating derrick barges for the outside portions.

The caissons were driven by means of a steam hammer, and excavated with an orange-peel bucket. Excavation at the bases of the cylinders was accomplished by hand labor, and the material was removed by means of a small hoisting engine. Two cylinders of average length could be poured in a little over one day.

In concreting the arches and girders, more care was required. The time of pouring and the possible deflec-

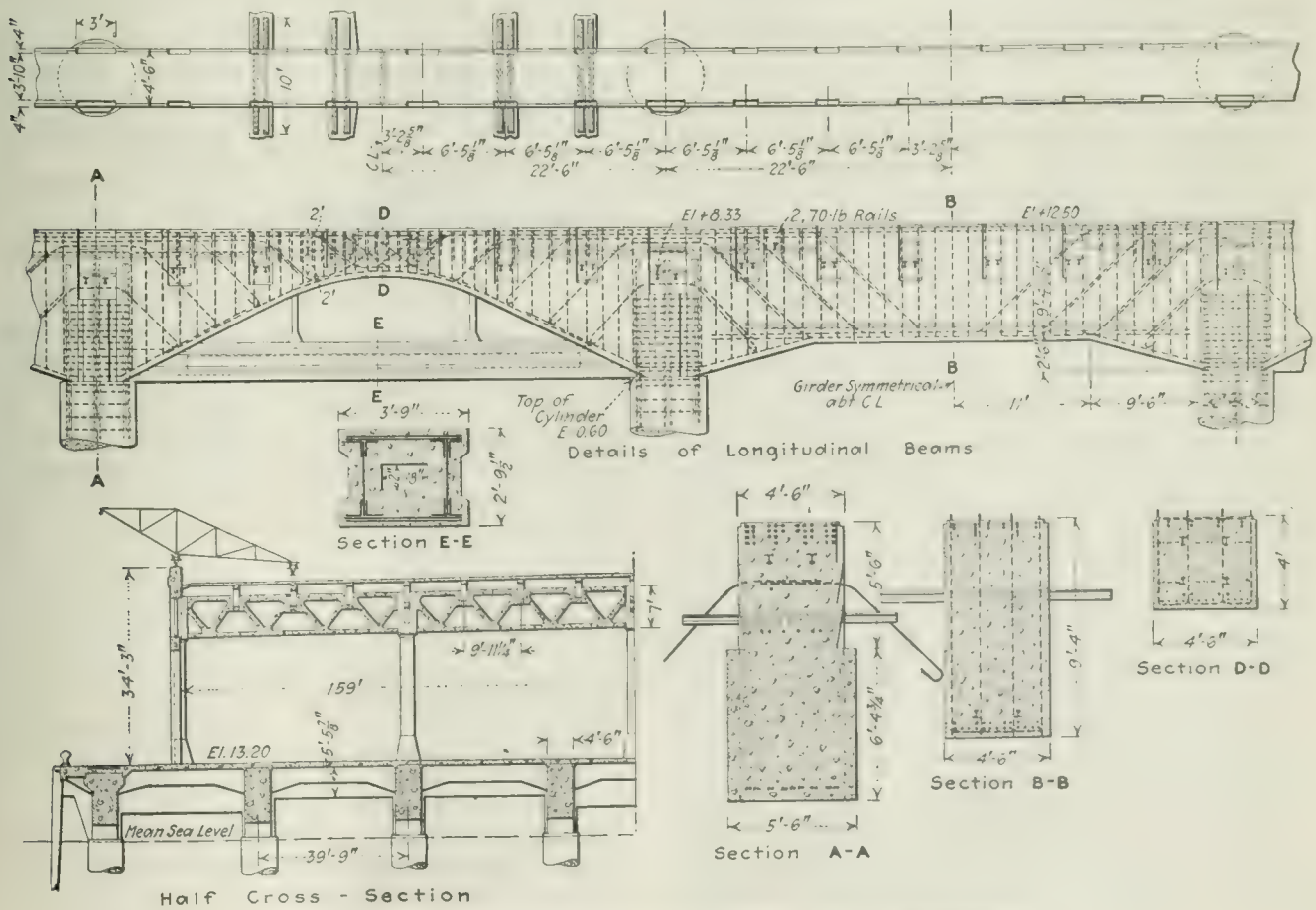


FIG. 4. DETAILS OF REINFORCED-CONCRETE PIER 6, CRISTOBAL

tions of forms before concrete was entirely set, in addition to the possible introduction of secondary stresses due to the manner of supporting the forms, demanded especial care and close coöperation of field and office. The tie-rods were first erected and then incased in concrete. Second-hand steel girders were obtained for supporting the forms for the heavy concrete girders, and rested upon 18-in. Bethlehem H-beams, which in turn were partly supported by adjacent cylinders and were normal to the second-hand girders themselves. The increased tie-rod itself served to assist in supporting the smaller steel beams which held in place the forms for the arch. The reaction for these small beams was placed near the ends of the tie-rod, to avoid deflection of that member and consequent introduction of secondary stresses at its ends.

The original requirements were obtained by this

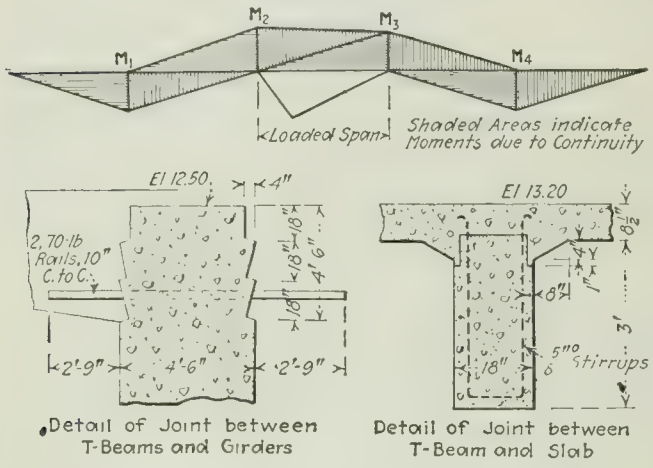


FIG. 5. SOME DETAILS OF DESIGN AND CONSTRUCTION ON CRISTOBAL PIER 6

method of supporting the forms, as field measurements of deflection were found to be negligible. Furthermore, the complete outfit of forms could be dismantled and set up again in a comparatively short time. Each form was used about 16 times during the course of construction of the floor system. The unit of pour was one girder and two half-span arches, which together consisted of 130 cu.yd. of concrete. After the completion of the arches and girders, 18-in. Bethlehem H-beams were placed transversely across them and from these H-beams the forms for the T-beams were suspended by wires.

The great weight of concrete when the slab and T-beams were included with the arches and girders precluded any possible attempt to pour all together, and since any type of connection that raised the final elevation of the pier 13 ft. above sea level could not be considered, it was evident that a joint between the supporting girders and the T-beams must be developed that would be sufficient to take the entire reaction without danger. The joint finally adopted, as indicated in Fig. 5, was chosen after tests had been made on a small model, wherein the efficiency was so high that it could practically be considered 100%. Its chief advantage is that the section of the supporting girder suffers a negligible reduction of strength, which would not be the case if the bases of the notches were not directly above each other. As an additional factor of safety, however, two short rails were placed through the main girders, which tied the T-beams together laterally and was, as well, of assistance to the concrete notches in bearing. Any variation of strength due to the joint is undoubtedly less than ordinary assumptions that enter into the theory of concrete design, and hence is amply taken care of by the high factor of safety which is ordinarily recommended.

Although the floor-beams have been previously referred to as T-beams and figured as such, they were not poured at the same time as the floor slab. The detail indicated in Fig. 5 was designed to insure sufficient bond between the top of the beam and the under side of the floor-slab by roughing its surface and allowing the stirrups to project into the slab about two inches.

The slight haunches on the slab itself, fitting into the recess on the sides of the beam, have a possible additional factor for bond, due to the pressure on the sides of the recess resulting from the negative moment in the floor slab.

The design for the various portions of the above structure was made on the basis of a 2000-lb. concrete. The greater portion of concrete structure on the isthmus has heretofore been built from an ungraded mixture of run-of-bank gravel from the bed of the Chagres River. Tests of concrete from this material instituted a short time after the beginning of construction indicated a rather low strength of the resulting concrete.

A washing plant, wherein the gravel descended by gravity down a screen of $\frac{1}{16}$-in. mesh sloping at 45 degrees was installed, and the concrete from this material showed a marked increase in strength, 2700 lb. per square inch being obtained in some cases at the end of twenty-eight days.

Pier construction on the Canal Zone is now being done under the supervision of the building division, Hartley Rowe, then resident engineer, and T. C. Morris, assistant engineer. The above design was completed by F. W. Blackwood, assistant engineer, G. W. True, junior engineer, and E. S. Randolph. C. A. Nelson was superintendent of construction.

Gasoline Tax for Road Funds

Three states, Colorado, Oregon and New Mexico, now have laws for raising road funds by a tax on gasoline. The theory underlying the laws is that road use and road wear are proportional to gasoline consumed. The prevailing systems of basing passenger-car and truck taxes on weight, horsepower or value are recognized as inequitable, since of two vehicles paying the same tax one might run only 2000 miles a year and the other 15,000.

In Colorado the tax is 1c. a gallon; in New Mexico, 2c. a gallon; in Oregon, 1c. a gallon on gasoline and ½c. on distillate. No difficulty has been found in collecting the taxes in Colorado and Oregon, and no objection has been raised to the laws. The New Mexico law, however, has been attacked on the basis of constitutionality, and the case is now before the Supreme Court of the United States. In the two former states the tax is collected from the wholesaler. The laws in these states have been in force about a year and are producing in each state a revenue running between $30,000 and $40,000 per month.

Treatment of Gas Waste to Prevent Water Pollution

Tar and Oil Separators, Aërators and Chemical Treatment in Some Cases, Coke Contact and Fine Gravel-Sand Beds

By E. J. Tully
Chemist, State Board of Health, Madison, Wis.

ILLUMINATING gas liquors present an increasingly urgent problem in the disposal of industrial wastes Because of their complicated and concentrated character gas wastes are liable to cause gross water pollution. This may be prevented by adequate treatment to reduce the organic matter as much as may be necessary to permit final disposal by dilution.

Planning a system of treatment to meet conditions involves combining effectiveness with simplicity of construction, reasonableness in cost and simplicity in operation, elimination of technical supervision, if possible, and recovery of waste products, such as tar, which may be used in connection with road work.

Water gas—or, more properly speaking, carburetted water gas—is made by decomposing steam in contact with incandescent coal or coke and enriching the gaseous compounds with oil, or rather oil gas, the byproducts being tar and light hydrocarbons. Coal gas is produced by the dry distillation of bituminous coal, giving coke, tar and ammonia as byproducts. In the case of water-gas manufacture, the gases passing from the generator, carburetor and superheater are discharged into the "seal" and thence to the preliminary scrubbers and the relief holder, from which they are pumped back through the works. During this process the gases are washed, cooled, purified and measured.

In passing through the "washer-cooler" the gas is subjected to a spray of water, and it is at this stage that most of the tar is removed from the gas, this tar constituting part of the industrial waste. The purifying boxes, which receive the gas from the washer-cooler, are filled with a mixture of wood shavings and iron oxide. The function of this material is to remove hydrogen sulphide, the hydrogen of the gas uniting with the oxygen of the iron oxide to form water, the water being drained off at the base of the boxes and going to form a part of the waste.

The volume of industrial waste proper resulting daily from the process of water-gas manufacture varies more or less directly with the capacity of the plant, and is also influenced by certain local conditions, the approximate relation as to capacity being 2500 gal. of waste per 100,000 cu.ft. of gas produced. Because of the peculiar and comparatively concentrated character of the liquor, being turbid and containing considerable floating oily compounds saturated with hydrocarbons and having an appreciable amount of tar, the waste requires, subsequent to removal of oils and tar, prechemical treatment in many instances, in order to obtain the best results. Simple chemical treatment, using either lime or ferrous sulphate and lime, is successful in coagulating and removing by sedimentation a large percentage of the suspended and dissolved matters in the waste, and such treatment makes possible subsequent rapid filtration.

General outlines of plans which have been developed for treating gas-plant wastes are shown herewith. They include a sedimentation unit, which functions as a gravity oil separator, for the retention of tar and light oils; aëration of the effluent from the tar tank by discharge in a thin film over several steps, when sufficient difference in elevation is available to allow of this procedure; chemical treatment, using a few pounds of lime per 1000 gal. of waste, or copper and lime if necessary, in case of coal-gas waste; sedimentation and double filtration through (1) coke contact beds and (2) gravel-sand filters. Differential outlets may be used to withdraw the light oils from the retention chamber, and the tar may be removed by utilizing the hydraulic head in the tank, where sufficient difference of elevation is available to permit the use of this method.

These methods of treatment will give satisfactory results if intelligent care is given to the system, including the removal of oils and tar when necessary, the re-

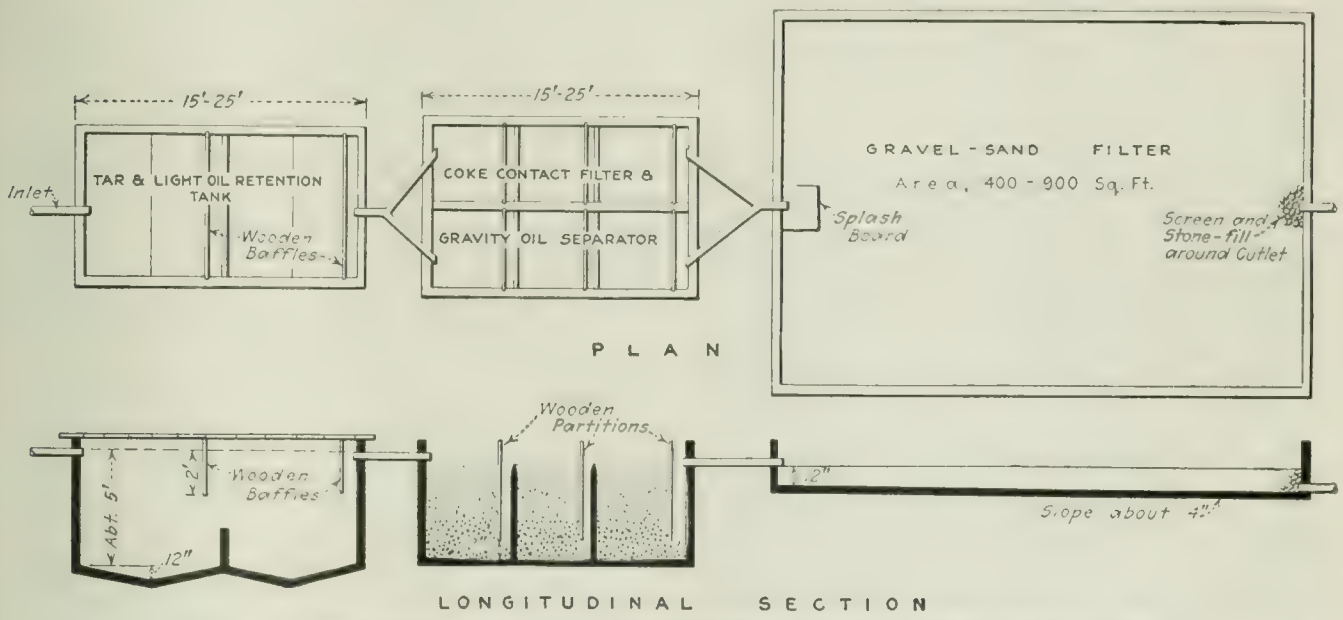


FIG. 1. PLANT FOR TREATING GAS WASTES WHERE LARGE DILUTION IS AVAILABLE
Coke filters: Bottom 1½ feet, 1 inch; middle 1½ feet, ½ to ¾ inch; top 2 feet, coke breeze. Gravel sand filter: Bottom of 1-inch stone; middle 3 inches, of ½- to ¾-inch stone; top, about 5 inches of gravel sand mixture. Filters covered with plank in winter

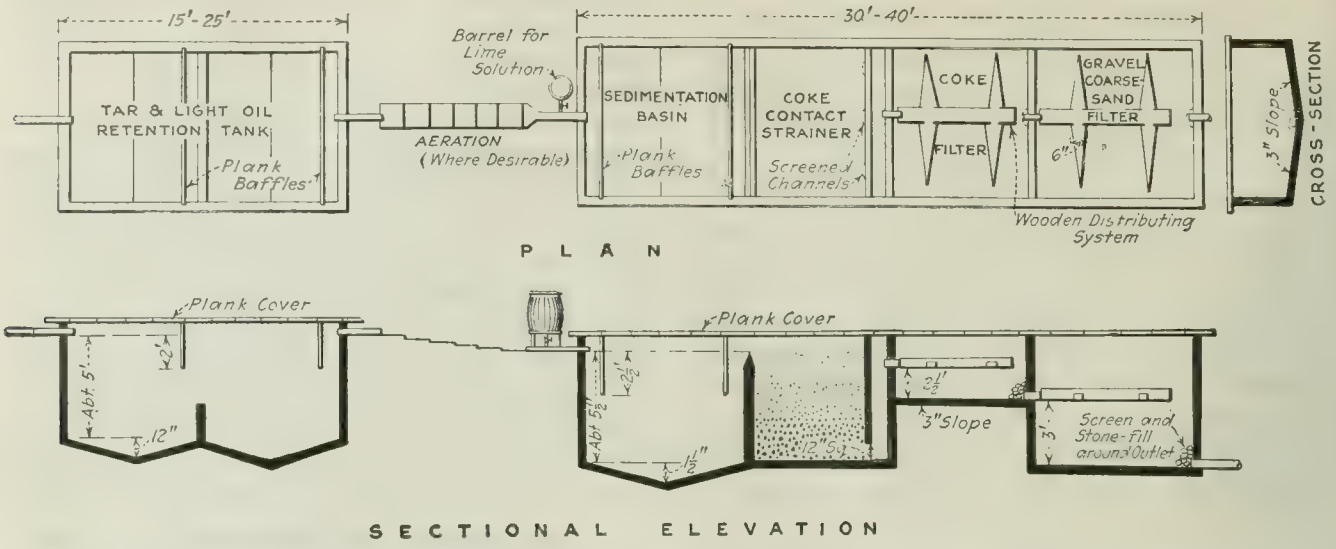


FIG. 2. GAS-WASTES TREATMENT PLANT FOR SMALL DILUTION OR PROTECTION OF WATER-SUPPLY

Coke contact strainer: Bottom 2 feet, 1 inch; top 3 feet, ½ to ¾ inch. Coke filter: Bottom 6 inches, 1 inch; middle 6 inches ½ to ¼ inch; top 1½ feet of coke breeze. Gravel sand filter: Bottom 6 inches, 1-inch stone; middle 6 inches, ½- to ¼-inch stone; top 2 feet, gravel-sand mixture. Where topography does not permit gravity coke filter, contact bed, like strainer may be used.

moval of precipitate every month or so, occasional renewal of coke in the contact filters, and frequent surface raking of the gravel-sand filter.

Fig. 1 shows a system which may be used successfully where available dilution is large. This type, without the tar-retention chamber, is used at the Madison gas plant to treat about 25,000 gal. of waste, and is giving excellent results, producing an effluent as clear as spring water, practically without odor and with but a slight taste.

Where the available dilution is small and either livestock or a domestic water-supply is to be considered, complete treatment, including chemical application, is indicated. Fig. 2 illustrates a system designed to meet such requirements. Modifications of these general plans may be employed to accomplish such results as may be indicated for any particular case.

Zone Law Proposed for Philadelphia

A PROPOSED ordinance which is receiving wide publicity in the press and which is furnishing a great deal of discussion in Philadelphia council meetings is one providing for the regulation of the height, uses and areas of buildings in Philadelphia.

The proposed zoning ordinance, as drafted by the Philadelphia Zoning Commission, provides for five height claasses, based upon the width of the street, those clasases being 1, 1½, 2, 2½, and 3 times the street width. In addition to this, in each district the buildings may not exceed a maximum height, varying from 40 ft. in the "one-times" district to 150 ft. in the three-times-the-street-width district. Above such heights building must recede from the building line at a certain proportion which is 1 ft. for every 1 ft. of elevation in the one-time district, and 1 ft. for every 3 ft. excess height in the three-times district.

There are four districts, classified according to the class of buildings, which may be erected—residential, commercial, industrial, and unrestricted. The unrestricted district will contain such industries as are obnoxious because of excessive emission of noise, odor or smoke. Public garages are not permitted in the residential districts, and the capacity of private garages is limited in proportion to the size of the lot.

There are five classes of area districts provided, known as A-, B-, C-, D-, and E-class districts. In the A-class district, buildings may not cover over 30% of the lots; in the B class, 50% of the lot; in the C class, 70%; in the D class, 80%; and in the E class, 90% of the lot. There are various other provisions, such as that the A-class districts provide for detached buildings, B-class districts for semi-detached buildings, while in the C-class districts buildings may be built in rows. This in general applies to houses.

The members of the commission that drafted this ordinance are: George E. Datesman, director, Department of Public Works; William H. Wilson, director, Department of Public Safety; Dr. Wilmer Krusen, director, Department of Public Health and Charities; E. T. Stotesbury, president, Fairmont Park Commission; Chester E. Albright, president, Board of Surveys; Joseph E. Widener, member of Art Jury; George S. Webster, member of Permanent Committee on Comprehensive Plans; LeRoy A. Worrell, Philadelphia Real Estate Board; John H. McClatchy, Philadelphia Operative Builders Association; Edgar V. Seeler, Philadelphia Chapter, American Institute of Architects; John Ihlder, Philadelphia Housing Commission, and Edgar S. McKaig, Chamber of Commerce. William C. Stanton is the engineer and George R. MacKenzie is his assistant.

Pipe Breaks in St. Louis

Four breaks in four years on a 30-in. main of class A cast-iron pipe laid in 1887 led the officials of the St. Louis water department to investigate the records to see whether the light pipe was accountable for the large amount of trouble experienced, since all of the breaks have occurred without apparent reason. The records indicate that 16 of 19 breaks in large mains, 30 to 48 in., in diameter, have occurred in the class A pipe. Pressures varied from 51 to 89 lb. One class C pipe broke under a heavy viaduct fill.

River and Harbor Estimates For Next Year

Chief of Engineers Specifies Extent and Location of Contemplated Improvements

MUCH of the current report of Major General W. M. Black, the recently retired chief of engineers, U. S. A., has to do with the river and harbor work which is carried on under the direction of his office. Specific reference is made to the various large projects under way.

In regard to the improvement of East River at New York, for which $3,200,000 is asked for continuing the work during the fiscal year ending June 30, 1921, General Black points out that the benefits derived from the improvement cannot be shown by its influence on freight rates or directly by the increase in tonnage, but that the commerce of the river is so enormous that every improvement which facilitates and lessens the dangers to navigation in this waterway is justified. The most obvious effect of the engineering work in East River is given as the increase in the number of vessels of large tonnage using the waterway. The improvement also has made navigation through Hell Gate safer for vessels up to 22 ft. draft. The improvement has as its object the opening of the channel with a mean depth of 40 ft. The program also includes the early removal of Shell Reef to a depth of 25 ft. in order to permit the better development of the Manhattan water front below Blackwell's Island.

Delaware River Requires Two Millions

For the next fiscal year $2,215,000 is asked for the continuance of the work on the Delaware River, from Philadelphia to the sea. The work thus far done on this river has greatly facilitated the movement of deep-draft vessels, says General Black. For the first time during the past year, ships drawing 34 ft. of water have navigated the channel without defficulty. He says that "the improvement of the river has enabled coastwise vessels to relieve greatly the congestion of railway traffic," and that "the economic value of the improvement to commerce has been very great." The new work to be prosecuted during the coming fiscal year proposes the continuation of dredging in Philadelphia Harbor and in the channel, as well as the removal of Mameluke Rock.

Improvement of the Chesapeake and Delaware Canal will require $2,000,000 during the next fiscal year, says General Black. This is a new project. The canal heretofore has been operated under private ownership. The $2,000,000 asked for is to be expended for dredging, purchase of land for right-of-way, and for contract work on the high-land elevation.

General Black asked for $1,200,000 to continue the work on Norfolk harbor. The work already done, he states, has resulted in the use of deeper draft vessels and a diminution in lighterage expenses, and navigation has been rendered easier, safer and better. The combined rail and water routes centering at Norfolk have resulted in lower freight rates between Southern and Eastern points. The next step to be taken in the work is to dredge an anchorage of about 64 acres to a depth of about 35 ft. at mean low water. The 40 ft. channel is to be widened further.

The continuation of the work in the harbor at Charleston, S. C., should have an appropriation of $1,400,000, the report sets forth. The work which has been done has influenced marine insurance rates and has greatly facilitated vessel movements. The port now has deeper water than any other port on the Atlantic or Gulf, south of Norfolk. Vessels drawing 32 ft. of water can now enter the harbor and dock on Cooper River. The expenditure during the next fiscal year is required, for the most part, for a continuation of dredging operations.

Mississippi River Work to Continue

An appropriation of $2,191,000 is asked for the passes of the Mississippi River. The depth of Southwest Pass has now been carried to 30.5 ft. over the bars at the head of that pass. Freight rates have been reduced and greater cargoes carried both for domestic and foreign commerce. The depth of South Pass has been increased to 33 ft., thereby "giving New Orleans high rank as a seaport."

The sum of $2,228,000 should be appropriated, General Black says, for continuing the work on the ship channel connecting Houston, Texas, with tidewater at Galveston. Work already done on this project has resulted in water rates being applied to Houston on a parity with Galveston although 50 miles further inland. Regular steamship service has been established between Houston and Philadelphia. Six oil ships visit the Houston refinery each month. The objective is a 30 ft. channel Most of the sum asked is for continuing dredging.

Funds asked for the continuation of the improvement of the Mississippi River between St. Paul and Minneapolis call for an estimate of $2,750,000. In July, 1917, navigation became possible for the first time over that portion of the Mississippi. Completion of the project will extend the head of navigation to the Washington Avenue bridge at Minneapolis to a low-water depth of 6 ft. This will make possible direct shipment of flour and grain from Minneapolis to the Gulf of Mexico by water.

An appropriation of $2,115,000 is asked for the work planned on the Missouri River from Kansas City to the mouth, during the next fiscal year. According to the report, the work already done on this portion of the river has made possible a regular service and has made available freight rates 20 per cent lower than rail rates.

Continuation of the improvement of the Tennessee River below Riverton will require $1,226,000 during the next fiscal year. The work already done has increased the depth so as to lengthen the navigable season for 6-ft.-draft boats by 3 months.

The sum of $5,000,000 is asked for continuing the work on the Ohio River below Pittsburgh during the next fiscal year. General Black points out that the benefit of this improvement will be felt only when the slack-water system has been extended far enough downstream to permit of continuous navigation over the section of the river connecting the large cities on the upper with those on the middle and lower sections. "The commercial effect of the series of completed dams on the upper river," says the report, "is reflected in the marked increase in general traffic and in the amount of coal shipped from the mines along the Monongahela

to industrial plants on the Ohio at Aliquippa and Midland, Penn., and Steubenville, Ohio." Coke in considerable quantities is being shipped from the Monongahela to steel plants at New Cumberland, W. Va. Coal is also being carried in important quantities.

The Mississippi River Commission asks that it be allowed to expend the full $10,000,000 authorized for flood control work during the next fiscal year. The leveeing of the lower Mississippi has now reached a point where the danger of floods has been reduced to a minimum in all except the most extreme cases of high water. The levee system, however, has not been brought to the standard indicated by the engineer corps as necessary to provide reasonable assurance against any probable stage of the river.

Civil Engineering and Public Health

By Robert J. Harding
General Manager of the San Antonio Water Supply Company, San Antonio, Tex.

Q. What is a civil engineer?

A. Generally, he is that which a college of civil engineering turns out.

Q. Has he ever had any particular function in the engineering world not enjoyed by other engineering professions?

A. Yes; surveying, bridges and structures and sanitation.

Q. But are not the courses in mathematics and mechanics required for the mechanical, electrical and civil engineer identical?

A. They are the same.

Q. Would it not therefore be possible for a graduate of the mechanical or electrical engineering course to enter the field of surveying and design of structures with little handicap as compared with the civil engineer graduate?

A. He could, and it is constantly done; in fact, the civil engineer often gets into the zone of activities of the mechanical and electrical engineer and melts into the work gracefully.

Q. Has the civil engineer any monopoly of the science of hydraulics?

A. This is shared by the other engineering courses, and we find in the field of hydraulic engineering—in fact, in power work—the civil, mechanical and electrical engineer working the same problems with equal ease.

Q. But in this apparent blending of the various engineering courses and professions, is there anything in common concerning sanitation?

A. There is not. Sanitary engineering is not covered by any of the other engineering professions, and belongs strictly to the profession of civil engineering.

Q. Then civil and sanitary engineers are really the same, and the sanitary features of the civil-engineering course are the only distinguishing features which are left to the civil engineer?

A. It may be said that courses in sanitary engineering determine, in truth, whether a man is a civil engineer.

Q. But sanitary engineering is an elective course, and is it then true that many young graduates from civil engineering colleges are really not civil engineers?

A. No, indeed! They are yet civil engineers.

These questions and answers are set up for the purpose of showing that there exists a great similarity in the courses prescribed by the various colleges of engineering. It is so marked that the engineering courses in most of the universities are in one general engineering division, and under one engineering head.

At a recent discussion at one of our large universities of a plan to place the engineering colleges under one head and in one division, it was conclusively brought out that there would be a considerable saving in the cost of instruction and administration, and therefore it was in accord with the economies as developed by the war. There can be no question of the soundness of the decision from the basis of reasoning, but may it not be possible that the great college of civil engineering of this institution is about to lose a good bet?

The question is: Is civil engineering what the college sets it out to be? Yes and no—and no, when there opens up a great opportunity of service in prescribing for the comfort of the people.

Public-comfort engineering, or sanitary engineering, or civil engineering, or social engineering, or what it may be called, is a field in itself. It is large enough to justify a college of its own; and independent enough so there could be absolute certainty of no overlapping and still leeway for plenty of vision. Such a college could be the great clearing house for the things that affect the pleasure and comfort of man, and extend right straight into the realm of public health. It goes so squarely from engineering to public health by way of the civil-engineering route that there seems very little necessity for any college of civil engineering combining with any college. It is an opportunity for humanity to be served through the development of civil engineering's distinctive sanitary field.

The civil engineer belongs in the center of the field of public-health work and should have a knowledge of engineering as at present conceived—all that goes to the sanitary engineer, and then some more. How much more, it is difficult to determine; however, enough to make the engineer perfectly at home in planning broad policies pertaining to the comfort of the people.

Activated-Sludge Plants in Texas

Besides the two large activated-sludge plants at Houston, smaller plants have been put in by Coleman, Gainesville, San Angelo, San Marcos and Quanah, Tex. The San Marcos plant (see *Engineering News*, Feb. 18, 1917, p. 249) has no attendance except for a daily visit. The San Angelo plant, which was put in operation early in 1919, is operated during the day only. The night flow is stored in an old septic tank and siphoned out and mixed with the day flow. Another old septic tank was converted into an activated-sludge tank by the building of troughs in the bottom and the putting of perforated pipes in each trough. The air pipes are ¾ in. in diameter and have two rows of $\frac{1}{16}$-in. holes, staggered, the holes being perforated on radii 30° from the vertical each side of the top of the pipe. The air is supplied at 5-lb. pressure by means of a blower driven by an oil engine. No special means of sludge disposal has been provided. The plant has a capacity of 400,000 gal. a day, and is now treating 250,000 gal., according to information supplied by H. H. Elrod, of the Elrod Engineering Co., Dallas, engineers for the plant.

Determination of Kutter's Roughness in a Drainage Ditch

Field and Office Work Described and Conclusions Drawn—Results Indicate Too Low a Value Formerly Used

By Ralph Bosard
With Morgan Engineering Company, Memphis, Tenn.

DETERMINATION of the value of n in Kutter's formula recently made on Ditch No. 40 in Grassy Lake and Tyronza Drainage District No. 9, Mississippi County, Arkansas, shows that n should be taken at 0.035 instead of 0.030, as has been commonly done for similar conditions in this section.

This district is situated in northeastern Arkansas and lies in the flat alluvial plain of the lower Mississippi River. Ditch 40 is one of the principal outlet ditches for the drainage system. Above the point where the measurements were made it drains 40 square miles. The soil through which this section of the ditch passes is a stiff, heavy gumbo, very rich and fertile, and the plant growth is quite dense and profuse. All of the perimeter of the ditch above the low-water level is covered with a heavy growth of vines and weeds extending into the ditch a foot or so. The ditch is free of all tree growth, as this is removed every year. At the time of the experiment there were no drifts obstructing the flow, except one large collection of débris at a point about 1200 ft. below the meter section.

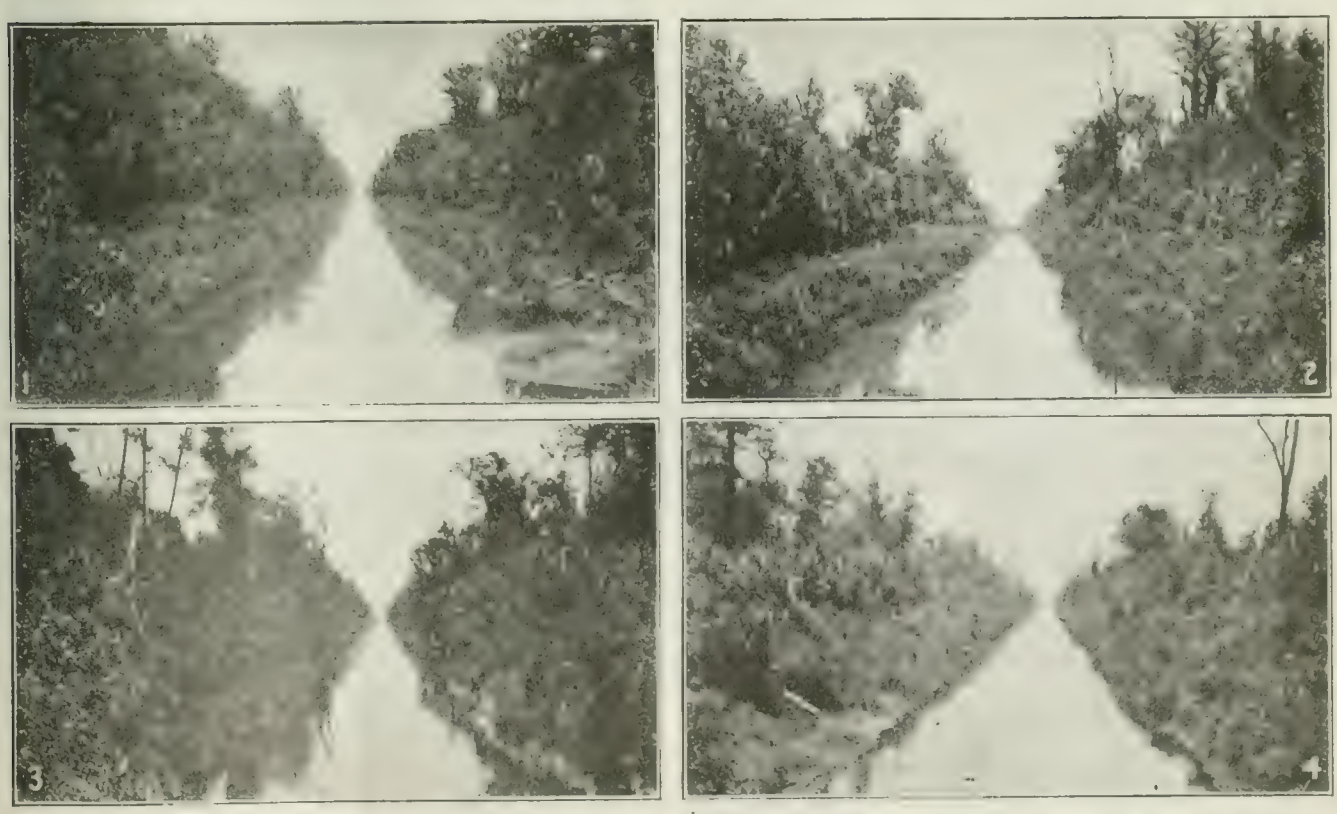
At this point a railway crosses the ditch on a pile trestle, the pile bents being driven at an angle of about 40° with the center line of the ditch.

The accompanying views show the conditions under which the measurements were made. Fig. 1 is a view of the ditch looking upstream from the meter section. Fig. 2 was taken looking downstream from the meter section and shows the railway trestle mentioned above. Fig. 3 was taken looking upstream from the trestle and shows the bridge from which the meter was suspended. Fig. 4 shows the ditch downstream from the trestle.

Field Work—The field work consisted of measuring the discharge of the ditch and the slope of the water surface, and taking cross-sections enough to determine the average area of cross-section.

In measuring the discharge, a Price meter was used. The ditch was divided into 10 vertical sections of equal width, and readings were taken by the two-point method. Duplicate readings were taken at each point. Three complete sets of measurements were made: two of them were taken on a falling stage of the ditch, the third being on a rising stage.

Measurement of the slope of the water surface involved extremely accurate work, considering the instruments used and the conditions under which the work was done. This may readily be realized, as the average fall of the surface was about ¾ ft. per mile. A section of ditch 5000 ft. long was laid off, the truss span highway bridge shown in Fig. 3 being at the center. The meter station was at the bridge. At 500-ft. intervals, benchmarks were set, and enough levels were run over them to determine the difference in elevation between each bench to the nearest 0.01 ft. An 18-in. wye-level and an engineer's transit were the instruments used on the level work. A number of the level readings were taken to thousandths. From the benchmarks, self-reading gages numbered from 1 to 15 consecutively, and graduated in the same manner as a Philadelphia level rod, were set. To measure the slope through the railway trestle, two extra gages above and two below the trestle were set. These were spaced about 50 ft. apart. In taking the gage observations, one complete round



FIGS. 1 TO 4. VIEWS SHOWING CONDITIONS UNDER WHICH KUTTERS' n WERE DETERMINED FOR DITCHES

trip from the upper to the lower gage and back to the upper was made; readings were taken constantly during the operation of the meter, and another complete round trip over the gages was made after the meter was stopped. Each individual observation included the gage height, and the time of observation. This program for taking the gage readings was repeated in full for each set of meter measurements, all three of which were taken on different days.

Cross-sections were taken at each gage point. Above the water surface, the points were selected at the break of the slopes. Below the surface, the points were taken at 2-ft. intervals horizontally.

Office Work—After the elevation of the benchmarks and the zeros of the gages were adjusted each gage reading was reduced to elevation. The observations were platted, elevation against time, for each set of meter measurements, and lines averaging the points for each gage were drawn. These lines were practically parallel in all cases, showing the difference in elevation of the water surface at each gage to be very nearly constant. A vertical, along the line representing the time at the middle of the meter operation, was then drawn, intersecting the line of each gage. An instantaneous profile of the water surface was then drawn, the elevations being taken from this plat. A separate hydrograph (Fig. 5) was drawn for each set of gage readings. It was found the slope of the surface was not uniform. Between the upper three or four gages, the

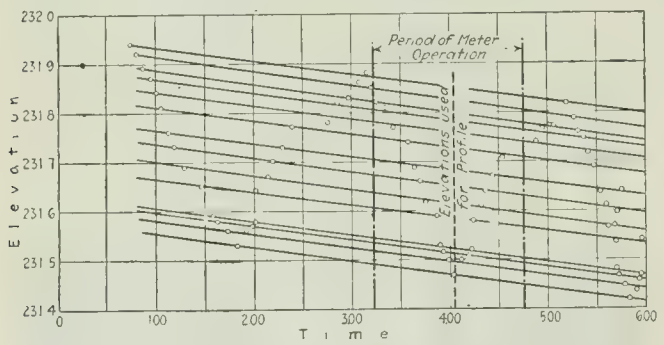


FIG. 5. HYDROGRAPH OF GAGES FOR FIRST SET OF DITCH MEASUREMENTS

slope was much flatter then between the next four, while below the eighth gage the continuity of the slope was broken because of the drift piled against the railroad trestle. Investigation showed, as would be expected, that the cross-sectional area was quite a bit larger where the slope was flat than where it was steep

Separate computations for n were made for the first set of meter measurements, as follows: For that section in which the flat slope occurred, using the average velocity obtained by dividing the discharge by the average area of cross-section and computing an average value of R; for that section in which the steeper slope occurred, using the average velocity; and for the entire section between the first eight gages, using the average slope radius and velocity. This was repeated for the other sets of meter measurements, except that only two computations were made for the second set. This made eight individual computations of Kutter's formula for n.

Results and Conclusion—The results of the various computations for n all fall within close range of each other. The accompanying table gives the value obtained in each computation. The average of the eight values is 0.0377. Four of the results are within about 5% of the average, and the remaining four are within 1 per cent.

TABLE SHOWING VALUES OF n FOR EACH COMPUTATION

Result No.	Gaging No.	Between Gages	Slope Ft. per 1000	Value of n
1	1	1–5	0.000045	0.0358
2	1	5–8	0.000072	0.0379
3	1	1–8	0.0000583	0.0379
4	2	4–8	0.00007	0.0398
5	2	1–8	0.0000552	0.0379
6	3	1–5	0.0000505	0.0356
7	3	5–8	0.000092	0.0392
8	3	1–8	0.0000666	0.0376

The values found are about in line with those given by the various authorities for channel conditions met in this set of experiments. It is not uncommon in the rich alluvial soil of the Mississippi delta to find ditch channels with the character of growth found on Ditch 40. From the results of this set of experiments, it would seem that for ditches in soil of this kind the value of 0.030, which is the one most commonly used, is not high enough. Instead, the value of 0.035 is probably the one more nearly correct.

Training Partition in Canal Inlet Increases Capacity

A SIX-INCH concrete partition in the discharge chamber at the head of pressure pipes from No. 2, one of the three main pumping stations of the Minidoka project of the United States Reclamation Service, has been used to good advantage in straightening out the threads of current, thereby reducing the velocity head lost. As noted in the photograph, each of the four outlets is supplied with a flap valve secured



PARTITION IN OUTLET SAVES THREE PER CENT HEAD

to a headwall set at right angles to the direction of the canal. Each outlet has a diameter of 5½ ft. and discharges 160 cu.ft. per second. When the pumps were run to capacity, before the training baffle was put in, water from the inlet on the inner side of the angle seriously disturbed the flow of the water on the outside of the curve, causing violent eddies and back currents. The partition simply divides the chamber in half from the headwall to the beginning of the tangent of the canal and prevents interference whereby a stream tends suddenly to transform velocity head into static head. The result has been a reduction of approximately 1 ft. in the head pumped against, a saving of three per cent.

The baffle was placed under the direction of Barry Dibble, manager of the Minidoka project.

Reduced Lime Feed Saves Money and Lessens Deposits

Grand Rapids Plant Now Lets Hardness Rise to Lake Michigan Softness, Reducing Help, Wash Water and Chemicals

SO FAR as evidence is available, the reduced lime feed process, which was put into operation last autumn at the Grand Rapids water-purification plant, in an effort to lessen troublesome deposit difficulties, has been successful. Walter Sperry, chief chemist, in the annual report (not printed) for the fiscal year which ended Mar. 31, 1919, indicates that there has been little complaint of the 25% increase in hardness over the former full treatment, the rate of deposition in stills and apparatus around the laboratory is materially smaller, and the savings in chemicals, wash water, labor and power have been large. At the annual overhauling in the winter the filter underdrain sand and gravel were found in better shape than ever before. There is not yet much evidence convincing to the layman, for many ⅝-in. service pipes are being removed due to cumulative clogging, the major deposition occurring in past years.

Lowered unit costs in the face of increased prices for materials and labor have been obtained, and Mr. Sperry hopes the alternative of returning to a full softening and a reduction of the normal carbonate akalinity by an additional dose of alum, much as is done at Columbus, Ohio, will not be necessary because of the added expense following the reductions the present treatment effects. Comparative data from the report follow:

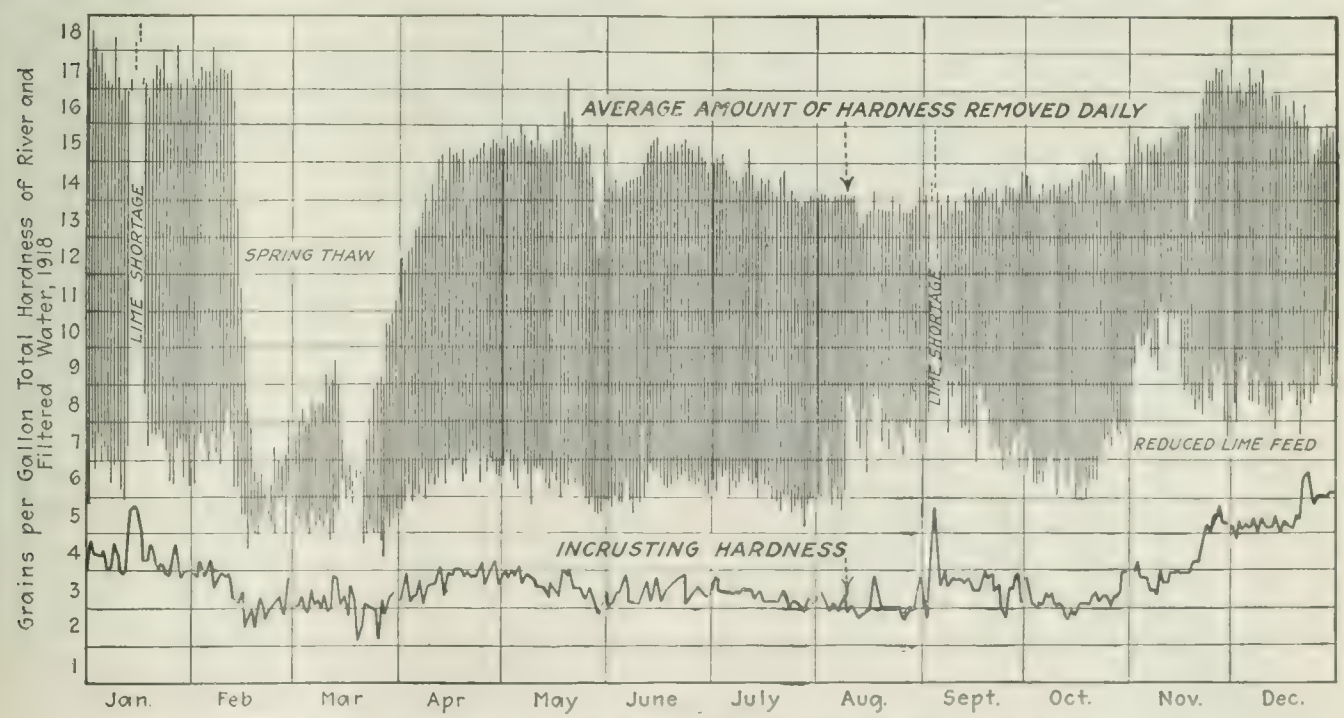
The total costs per 1,000,000 gal. for operation and maintenance of the plant for the year 1918-19 were $16.88—10.4% less than for the preceding year. Costs for chemicals still showed the effects of the war, lime being increased from $9.05 to $11.43 and alum from $24.52 to $32.03 per ton. Power costs were increased 27.3% from April to December and by an additional 54.5% (to 2c. per kilowatt-hour) for the remainder of the year. Notwithstanding these increases in unit prices, and also an increase in pumpage, the decrease in the amount of lime used after Aug. 10, 1918, resulted in a saving of $10,000 to $12,000, or about 3%. During the late autumn, winter and early spring months one filter attendant and one chemical feed man have been dispensed with. Wash-water percentages, beginning with 1915-16, have been as follows: 1.9, 2.1, 1.98 and 1.15% for last year. Corresponding quantities of water treated were 10,370,000, 11,760,000, 11,480,000 and 12,480,000 gal daily.

COSTS PER 1,000,000 GALLONS TREATED

Year	Wages	Chemicals	Power	House Water	Supplies and Repairs	Total
1915-16	$4.48	$5.10	$2.17		$1.11	$12.86
1916-17	4.26	7.37	2.26		.98	14.87
1917-18	4.86	10.06	2.23	$0.20	1.49	18.84
1918-19	4.32	8.16	3.29	.25	.86	16.88

The average prices for lime for the four years were $5.81, $6.40, $9.05 and $11.43 per ton, with the following quantities in tons used per month: 201, 272, 262 and 213. Similar data on alum indicate the tonnage used during the past year was about the same as four years ago: 20.2, 34.2, 40.8 and 19.7 tons being used, costing $19.98, $21.92, $24.52 and $32.03 per ton, respectively. Lime is now purchased on a penalty-bonus basis whereby 1% of the purchase price f.o.b. quarries at Bedford, Ind., is allowed for variation above or below 87% CaO content, the base price being $8 from June to December and $9 from January to March. The lime averaged 86.5% CaO.

Typhoid cases and deaths per 100,000 population in Grand Rapids for the period 1907 to 1912, before the



HARDNESS CONDITIONS AT GRAND RAPIDS WATER-PURIFICATION PLANT

The upper ends of the vertical lines show the daily hardness of the water for the year, which averaged 13.5 grains per gallon. The length of the vertical lines indicates the amount of hardness removed daily, which averaged 7.3 grains per gallon or 6.65 tons of lime rock per day from 12,500,000 gal. of water. The curve formed by the lower ends of the vertical lines shows the daily total hardness of the filtered water. The component parts of this residual hardness are indicated by the curve of incrustant hardness, the spaces between this curve and the black area indicating carbonate hardness, and that below sulphate hardness.

filters were installed, averaged 202 and 27. For the six-year period since then cases were 99 and deaths 15. A chart for the calendar year 1918, submitted by Mr. Sperry, indicates 33 cases of the disease and five deaths.

Bacteria per cubic centimeter in the river during the calendar year 1918 averaged 1524, with a maximum day of 35,000 and a minimum day of 125. Corresponding counts of the filtered water (on agar at 20°C) were 7, 200 and 0. B. coli were found 3.3% of the time in 1-c.c. samples, 23.5% in 10-c.c. and 28.5% in 50-c.c. samples.

Turbidity ranged from 5 to 285, averaging 16 p.p.m. in the river water. In the settled water it ranged from 2 to 84, with an average of 12. No turbidity got through the filters.

Previous to Aug. 10 there was nearly always caustic alkalinity left, varying from one to nine parts, but the filtered water contained only about 50 parts of alkalinity.

After Aug. 10 the caustic alkalinity was kept to zero, the total hardness going always above 100 parts, whereas it had been held previously considerably below 100 parts. Averages for the calendar year 1918 are as follows: Total hardness, river, 231, and filtered, 107; alkalinity, river, 191, and filtered, 60 parts. The chart reproduced herewith indicates the chemical conditions for each day of the year.

Arch Bridge With Ribs Anchored by Concrete Keys

Design for Concrete Viaduct at Rocky Point, Oregon, Has 113-Foot Arch Span—Steel Rib Rods Embedded at Abutments

By C. B. McCullough
Bridge Engineer, Oregon State Highway Commission, Salem, Ore.

A UNIQUE detail in the design of the reinforced-concrete viaduct over the Rogue River, Rocky Point, Ore., is the provision for anchorage at the end abutments of the ribs for the 113-ft. clear arch span. Wedge-shaped recesses are to be cut in the foundation rock, and the main rib bars embedded in concrete poured therein.

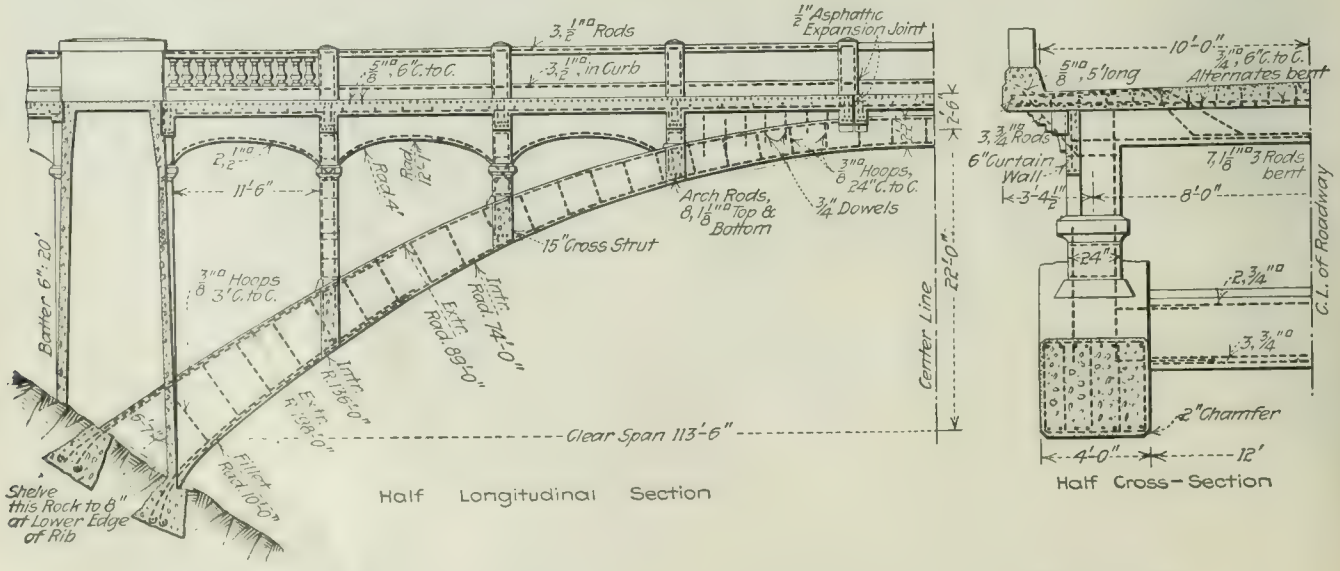
The new structure, 552 ft. long, will consist of a central open spandrel arch with clear span 113½ ft., flanked by 17 deck girder approach spans, each 23½ ft. long. The clear roadway width is 20 ft. The floor loading is to be carried by a longitudinal floor slab to transverse girders and thence to the vertical spandrel posts. The structure is designed for a live loading consisting of two 20-ton motor trucks plus a uniform live loading over the unoccupied portion of the deck of 80 lb. per square foot.

Sprung from solid rock cliffs, the main arch will span a rather deep rocky gorge. Two parabolic arch ribs 4 ft. wide, 26 in. deep at the crown and 79 in. deep at the springing line, will support the spandrel posts. Transverse struts are to be placed at each panel point, of width 15 in. and depth equal to that of the arch rib.

Anchorage for the rib bars is to be provided at the foundations by means of key openings cut in the solid rock, into which the anchor bars are securely concreted, provision being made for an embedment of 50 diameters. The concrete used for these rod anchor pits is to be 1:2½:3 mix., placed comparatively dry in layers of about 8 in., and well tamped before the next layer is placed. The rib rods are to be hooked under ¾-in. anchor rods, as shown in the drawing. Concrete is to set two weeks before any form work of the ribs or piers is started. No explosives are to be used in the rock work, the walls to be made jagged.

All concrete, except in railings, balusters, etc., is to be 1:2:4 mixtures. Exposed surfaces are to be finished with carborundum brick, and all corners are ¾-in. bevel. The balusters are precast 1:2½ mix., finished with carborundum before being placed, also with a brush coat of cement paste. The posts are to be constructed in the same way as the hand railing, but the concrete is to be of 1 : 2 : 4 mix.

The new structure is located at Rocky Point, near Gold Hill, Jackson County, Oregon, spanning the Rogue River. The contract was recently awarded by the Oregon State Highway Commission to the firm of Parker & Banfield, Portland, Ore.



DETAILS OF ARCH RIBS, ABUTMENTS AND ROD ANCHOR PITS, ROGUE RIVER BRIDGE

Engineering and Construction Prospects in Roumania

Much Work Needed on Railroads—Several Large Bridges To Be Rebuilt—Paved Streets Needed—Harbor Extensions Desirable

By Robert S. Doman
Of the American Red Cross

AMERICAN engineers, railroad men and oil experts would do well to investigate business prospects in Roumania. Bridges must be built, railways constructed or double-tracked, canals excavated, harbors extended and the oil wells reopened.

A few months ago Roumania had only 84 locomotives. She has since obtained others, but needs hundreds more. The present inefficiency of the Roumanian State railways is due to the lack of locomotives, passenger and freight cars and to insufficient trackage. The most important state lines are single-tracked and long before the war the Government considered installing a double-track between the principal cities. Traffic today on Roumanian roads is so heavy that passengers ride on the roofs of every train by the hundreds. The Government also is considering the electrification of the Bucarest-Predeal railway line, one of the most important in the country. The electrical power will have to be supplied from waterfalls near-by.

Roumania is traversed from the Carpathians to the Danube by innumerable streams which would greatly relieve the traffic problem if they were canalized. The project of a canal from Bucarest to the Danube is again receiving attention. The possibility of making the Sereth and Alt Rivers navigable also is being considered. The improvement of navigation on the river Pruth was contemplated before the war by a commission of delegates from Austria-Hungary, Roumania and Russia. The advisability of deepening the bed of the river was brought forward but the idea was abandoned on account of strong objections on the part of the Russian delegates.

Americans also have the opportunity of doing for Roumania what the French are doing at the headwaters of the Rhone in the way of developing water power. An idea of old Roumania's potential hydraulic power can be gained from the fact that the flow into the Danube averages 1023 cubic meters per second.

Bridges Must Be Rebuilt

Owing to the general destruction of bridges during the war there is an exceptional opportunity in Roumania for American bridge builders. A bridge over the Danube to connect Roumania with Serbia was being considered by the Roumanian government when war broke out. In addition the great bridge over the Danube at Cernavoda must be reconstructed.

It is now reported that the contract for the reconstruction of this bridge, in many respects the greatest structure in Europe, may go to a French firm. This bridge, known as the King Carol Bridge, is 1260 ft. long and 114 ft. above the water. One branch of the bridge crosses the Danube at Cernavoda and another at Fitesti. It is the only bridge between Novi-Sad in Hungary and the Black Sea.

The viaducts and embankments between Fitesti and Cernavoda are more than 11 miles in length. The bridge across the main stream is intact, but near Fitesti there is a broken section 600 ft. long. The movement of oil, grain, and miscellaneous freight to and from the sea to interior Roumania depends upon this bridge.

In addition to the contemplated bridges across the Danube there are 18 important bridges in other parts of Roumania to be rebuilt. American engineers should hurry, however, for British, French and German contractors are alive to the opportunities awaiting them.

Harbor extensions have been made necessary by Roumania's economical growth and the fact that there will be in the immediate future much more traffic between America and Roumania than before the war. American shipping interests should prepare to make use of the Danube, taking an example from the British, who plan to invade the Danube countries, from the Black Sea to Ratisbon in Bavaria.

Roumanians are much pleased at the announcement that an American shipping line will soon have vessels plying directly between New York and Constanza and Galatz. The present harbor at Constanza, however, is much too small and during rough weather this spring, the captains of a dozen American flour boats from Seattle, who put in there, were held up for days for fear of colliding in the narrow basin with other ships or with the sea walls at the mouth of the tiny harbor.

Capital and Other Cities Need Paving

American street-paving interests also have an excellent opportunity awaiting them in Roumania's larger cities. Most of the larger cities have a few streets paved with asphalt, but this paving has not been repaired in five years and the streets in Bucarest and elsewhere are in horrible condition. The work of asphalting Roumanian cities had only begun when the war broke out and usually there is only one or two of the principal streets in each city which have been favored with a smooth surface. The others are paved with cobblestones.

In Bucarest a new central railroad station will be built within the next three years. The existing one proved totally insufficient during the war. In addition to the building of the station, more trackage, signaling apparatus, etc., must be installed.

Roumania would welcome the investment of American capital in her undeveloped resources, for the coming of the American Red Cross into the country has created among the Roumanian people a great affection for everything American. Twelve shiploads and 19 trainloads of food, medicines and clothing have been distributed by American men and women throughout the country and typhus and smallpox have been stamped out. The gratitude of the nation toward America is sometimes pathetic.

Bussiness men have found much to admire in American ways of doing things and of getting results in a hurry. American office appliances as used by the Red Cross and the one hundred and fifty-odd automobiles and trucks used by the same organization have served to introduce American mechanical products to Roumanians.

American business men should hurry, however, for already the hotels of Bucarest are filled with German and French salesmen. One hears German spoken everywhere. In the fight to capture the Roumanian

market foreign salesmen are making great use of the American flag. For instance, shoes which from their short vamps are too obviously made in western European factories are displayed in Bucharest shop windows, each pair with an American flag peeping forth. "Made in New York," the signs read, although the modeling indicates German handiwork.

American business men are now flocking into Greece and Constantinople where one sees familiar brands of American toothpaste, soap and toilet articles for sale everywhere. But only a few salesmen have as yet reached Roumania, a country which needs everything and will soon have the money to pay for it. It would be well to give six months' or a year's credit in some cases. Roumania differs from Serbia, Montenegro, Albania, Bosnia and Macedonia, however, in that it will make a lightning recovery from the war and will have plenty of money to spend as soon as this year's grain crop and oil output are sold.

The country's greatest needs are for agricultural machinery, hardware of all sorts, window glass, soap, sugar, shoes and leather goods. But an American bringing over anything from pins to locomotives would be sure of sales.

Irrigation in the Fourteenth Census of the United States

Nature and Extent of Works, Capital, Operating and Cost Figures, Water Used, Drainage and Water Rights Covered

By R. P. Teele
Special Agent in Charge of Irrigation, Bureau of the Census, Washington, D. C.

Under the law providing for the Fourteenth Census of the United States, the inquiries relating to agriculture are to include the quantity of land reclaimed by irrigation, the crops produced, the location and character of irrigation enterprises, and the capital invested. The wording of the law and the general plan for the inquiry were suggested by a conference of persons interested in irrigation called together by the Director of the Census in December, 1917.

The preparation of definite plans for carrying out the law and the suggestions of the conference was begun July 1, 1919. A schedule of inquiries has been prepared, and plans for the field work are well under way. In suggesting inquiries the conference kept in mind three things: All inquiries should be contained in a single schedule; data should be collected to present comparisons with the results of preceding censuses; and such new inquiries as seemed particularly desirable should be added.

The conference also adopted certain definitions, some of which are fundamental and, consequently, are given below. The law calls for information regarding "irrigation enterprises," and the following definition of an enterprise was adopted:

"An irrigation enterprise, for the purpose of the census, is a canal or canal system, pumping plant, or reservoir supplying water for irrigation, or any combination of these, operated under a single management by either an individual, a partnership, a company or other organization."

As a guide in determining what land should be classed as irrigated, the classification printed below was adopted.

Land should be classed as irrigated which has water supplied to it for agricultural purposes by artificial means or by seepage from canals, reservoirs or irrigated lands, but land which has natural groundwater sufficiently near the surface to support plant life should not be classed as irrigated. Land which is flooded during high-water periods should be classed as irrigated if water is caused to flow over the land by dams, canals or otherwise, but should not be classed as irrigated if the overflow is due to natural causes alone.

The two leading inquiries, acreage irrigated and crops grown under irrigation, are carried on the general farm schedule, which goes to every farmer in the United States, so that this part of the irrigation census will apply to the whole country. It is not planned at this time to obtain additional data for irrigation in the East, but if the returns from the agricultural canvass in the East disclose the practice of irrigation to a large extent in any section, the question of collecting data as to equipment, etc., will be taken up later.

All inquiries regarding "enterprises," as distinguished from farms, are to be carried on an irrigation schedule. The subjects covered by this special schedule are as follows:

Description of Works.—This inquiry calls for a brief general description of the character of the works, which will help in interpreting the more specific data as to equipment. The items called for specifically are: Diversion dams, number and material; storage dams, number and material; main ditches, capacity, number, and length; laterals, number and length; pipe lines, size, length, and material; reservoirs, number and capacity; flowing wells, number and capacity; pumped wells, number and capacity; pumping plants, kind of power, capacity of power plant, kind of pumps, number and capacity, average lift. All of these items, except dams, were included in the census of 1910, so that comparisons can be made showing the expansion since that date. It is believed that the data regarding wells and pumping plants will be of special value, as indicating the possibilities of this type of development. The Western states contain millions of acres of fine land that must be supplied with water in this way if at all, and these figures will show where a water-supply has been developed by pumping from wells, the quantities developed and the acreage supplied.

Lands.—The points covered by this inquiry are: Number of farms supplied with water; acreage in project; area actually irrigated in 1919; area enterprise is capable of supplying in 1920; lands available for settlement covered by enterprise; prices of unimproved land suitable for agriculture covered by this enterprise; terms of payment and rates of interest; average cost of preparing land for irrigation. Similar data, except as to cost of preparing land for irrigation, were collected in 1910. The census of 1910 was taken toward the close of a period of very active construction of large-scale irrigation works by both the Government and private agencies, and disclosed the fact that there was a very large area of land for which water was available, that was awaiting settlement. Since that time there has been a decided check, or rather almost a cessation, in the undertaking of new enterprises of large size, and a gradual absorption of the unused lands for which water is available. The data to be collected in 1920 should show how far this process has gone, and how much need there is for further construction at this time. The inquiries as to

prices and cost of preparing land for irrigation will help to give prospective settlers on irrigated land an understanding of conditions to be met in the West. The whole inquiry has an important bearing on the question of state and Federal aid in land reclamation and settlement, which is so much discussed just now.

Capital Invested.—This inquiry calls for the capital invested in irrigation works and equipment and in water rights. The conference previously referred to discussed this inquiry more or less, and it was the general opinion that this inquiry should be considered from the public standpoint rather than from the standpoint of the present holders of enterprises, and consequently "capital invested" is defined for this purpose as "cost." It is evident that there would be a considerable difference in the case of enterprises which have been purchased by their present holders at much less than their cost. There are many such enterprises. Cost is divided between cost of works and cost of water rights, and cost of works is defined as including, in addition to the direct cost of the works themselves, the cost of engineering, legal and administrative expenditures, promotion, and lands, buildings, machinery, animals and tools for use in maintenance and operation. This definition corresponds to that used in 1910, and the results will be comparable. Other inquiries will make it possible to classify enterprises into size and age groups, segregating the large modern enterprises which are of particular value as indices of future possibilities. The instructions to enumerators and special agents will cover such points as the value of work done by owners, the value of other property exchanged for works or rights, etc.

Maintenance and Operation.—The only inquiry under this head is the cost of maintenance and operation in 1919. The instructions state that the cost of permanent improvements, even though paid from annual assessments, should not be included here but under capital invested. This item was included in 1910.

Cost of Water to Farmers.—This inquiry covers the cost of water rights, annual charges, and rates for water, with supplemental questions calling for average charges per acre in case charges are made on some other basis, and for information as to whether rates are fixed by public authority, as a railroad commission or county commissioners. It is hoped that these questions, with those regarding lands available for settlement, their prices, and terms, will give a sufficient basis for a tabulation showing lands to be had under existing irrigation enterprises and the conditions under which they can be obtained. This information should be very useful in outlining future land policies for the nation.

Quantity of Water Used in 1919.—This inquiry calls for the quantity of water received and the quantity delivered, with questions as to measurements and the length of the irrigating season. Similar inquiries were included in the 1910 schedule. Where water is measured the results should be valuable, and it is hoped that there will be enough reported to justify the inquiry.

Drainage.—The drainage inquiry on the irrigation schedule relates to irrigated land only—that is, to lands "that have been irrigated, are now irrigated, or are to be irrigated" by the irrigation enterprises reporting. The questions on the schedule call for the area for which drains have been installed and the additional area in need of drainage, the latter being subdivided into land wholly unproductive, land available for pasture only, and land producing partial crop. This inquiry is new, and the results should settle a much-discussed point—the extent to which land under irrigation has been injured by surplus water and the rise of groundwater. Estimates vary from 5 to 25%, and engineers will be glad to have definite figures covering the point. The prevalence of this condition and the necessity for constructing drainage works in addition to irrigation works have an important bearing on land settlement questions.

In addition to the statistical inquiries outlined above, the schedule contains several inquiries which will serve for classifying the data. These cover the following:

Source of Water-Supply.—The sources named on the schedule are: Streams, springs, pumped wells, flowing wells, lakes, stored stormwater, city water, sewage. The schedule calls also for the name of the stream or other source from which water is taken, and the drainage basin in which the land irrigated is located. In some of the previous censuses the acreage irrigated has been reported by drainage basins, and in some it has not; but this is considered a more logical basis for classification than states and counties. The results of the last census were classified by source of water-supply, and comparisons can be made.

Class of Enterprise.—The classes of enterprises used are: Individual and partnership, coöperative, irrigation district, Carey act, commercial, United States Reclamation Service, United States Indian Service, state and city. The schedule defines these classes and contains an instruction calling for a statement of changes in form if such changes have taken place. This is an important inquiry, because it gives a measure of the effectiveness of various laws which have been enacted for the promotion of irrigation development. Since the date of the last census the states have been very active in revising their irrigation-district laws, and these figures will show whether this has been effective.

Water Rights.—The inquiry regarding water rights also is principally for the purpose of classifying other data, although the amounts of rights are called for. The classes of rights used are: Notice filed and posted, riparian rights, rights adjudicated by courts, certificates or licenses from the states, permits from states, appropriation and use. This classification was used in 1910, and thus it will be possible to make comparisons. These data will indicate the effectiveness of state laws regulating acquirement of rights and providing for defining them as to date and extent.

The presentation of the results of the classification by type of enterprise, and by status of water rights, will require a synopsis of the Federal and state laws covering these subjects.

The time of making the enumeration for the coming census is the month of January, 1920, and the canvass of irrigation enterprises will begin at that time. It is not expected, however, that it will be completed during January, but it should be completed in time to permit the tabulation and publication of the general results, at least, in 1920.

This will be the fourth census to collect statistics regarding irrigation, this inquiry beginning in the census of 1890. In addition, a special census of irrigation was taken in 1902. In 1890 and 1900 the work was in charge of Dr. F. H. Newell; in 1902 in charge of C. J. Blanchard, now of the United States Reclamation Service; and in 1910 in charge of the writer.

Wide Bridge Built as Two Bridges Without Interval

Novel Materials Plant Derrick Designed To Meet Local Restrictions—Industrial Railway Distributed Concrete

USING the same equipment twice and two separate set-ups of the same centers, a four-track, six-arch railway bridge has been constructed by the Illinois Central R. R. at Kankakee, Ill., as two bridges, with no space between, in two successive seasons, ice danger to the falsework being completely avoided during the intervening winter. By careful planning, in the design, for construction in separate halves, and in fixing the time and sequence of operations in the field each season's major concreting operations were brought to a finish well in advance of winter, leaving for cold weather only such work as could be accomplished without special difficulty or extra precautions.

The Kankakee bridge has five 90-ft. and one 60-ft. barrel-arch spans, with spandrel walls and a deck of precast slabs. It is 64 ft. wide, face to face of arch rings. Including piers the structure required about 16,000 cu. yd. of concrete. A single-track, three-span steel truss bridge occupied the site and in respect to it the new bridge was so located that its piers did not interfere with the old bridge piers. The location permitted the full length of the new piers and 28 ft. of width of the superstructure to be built without disturbing the old structure or the railway traffic. Then the tracks were shifted to the completed half of the new bridge, the steel bridge was removed, and the remainder of the new bridge was constructed.

Office design of the bridge to accommodate the construction plans included first, of course, provision for a construction joint longitudinally of the entire superstructure. All piers except the one between the north end 60-ft. arch and the adjacent 90-ft. arch were designed to be stable under dead-load thrust from one arch ring when the adjacent arch ring was not in place, but not stable under such conditions for any considerable superimposed load on the arch ring. In construction, therefore, centers could not be removed from any 90-ft. arch until the adjacent arch ring had been completed. Incidentally, it was specified that no center could be removed until the concrete had been in place 42 days.

The design provided for concreting the arch rings in transverse sections and indicated the dimensions of each section; the sequence in which the sections should be concreted, and the form of the construction joint between sections as shown by the sketches of Fig. 1. The arch centers were also fully designed and the contractor was required to build exactly to designs. They were bolted, framed timber structures, and as a full set of centers, half width for six spans, was constructed, the framing operations were rather extensive. A great labor saver in framing was an electric boring machine operated in an improvised guide frame as described in the "Hints for the Contractor" section of this issue.

Construction proceeded from the south end, where the materials handling and the mixing plants were located as indicated by Fig. 2. Stone and sand coming in on a temporary side track were unloaded by derrick

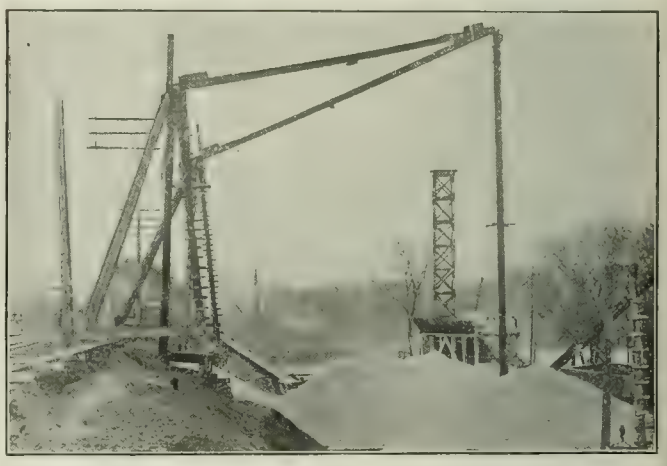


FIG. 2. STIFF-LEG-GUY DERRICK AT MATERIALS PLANT

into stock piles and then by derrick from stock piles into loading bins. From under the bins an industrial track circled around between the old abutment indicated and the rear lines of the new abutment on the water's edge. At bridge floor level a mixer was set with its charging skip guides extending down to industrial track level on the ground. Cars plying back and forth brought proportioned batches from the bins to the charging skip. The cement house, not shown, was located adjacent to the bins for aggregates.

Space for materials was restricted to a narrow strip between the high railway embankment and a parallel street and to complicate matters the property owners across the street refused to allow guy cables to be carried across their property. This necessitated the unusual derrick construction shown by Fig. 2 and explained in principle by Fig. 3, to enable the use of a

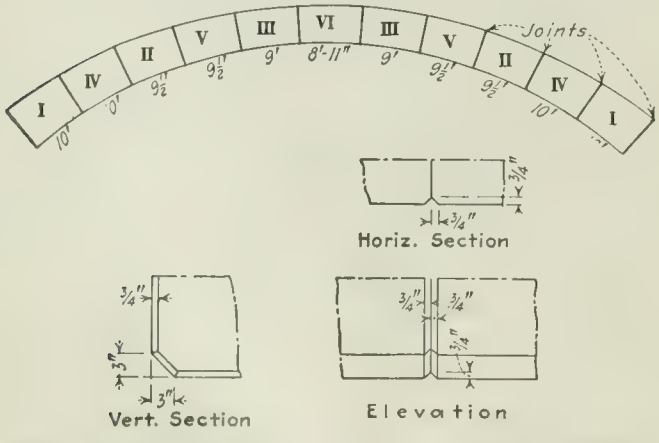


FIG. 1. SEQUENCE IN WHICH ARCH RING SECTIONS WERE CONCRETED AND JOINT DETAILS

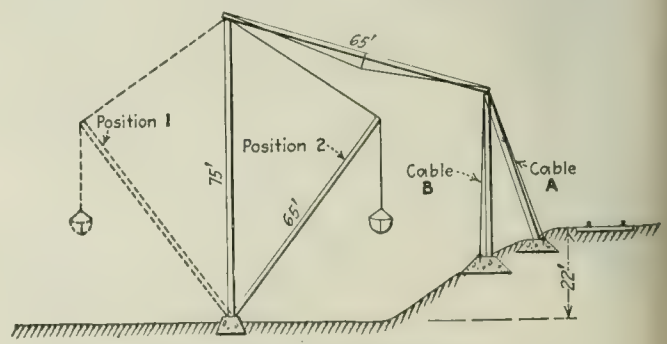


FIG. 3. PRINCIPLE OF OPERATION OF STIFF-LEG-GUY DERRICK

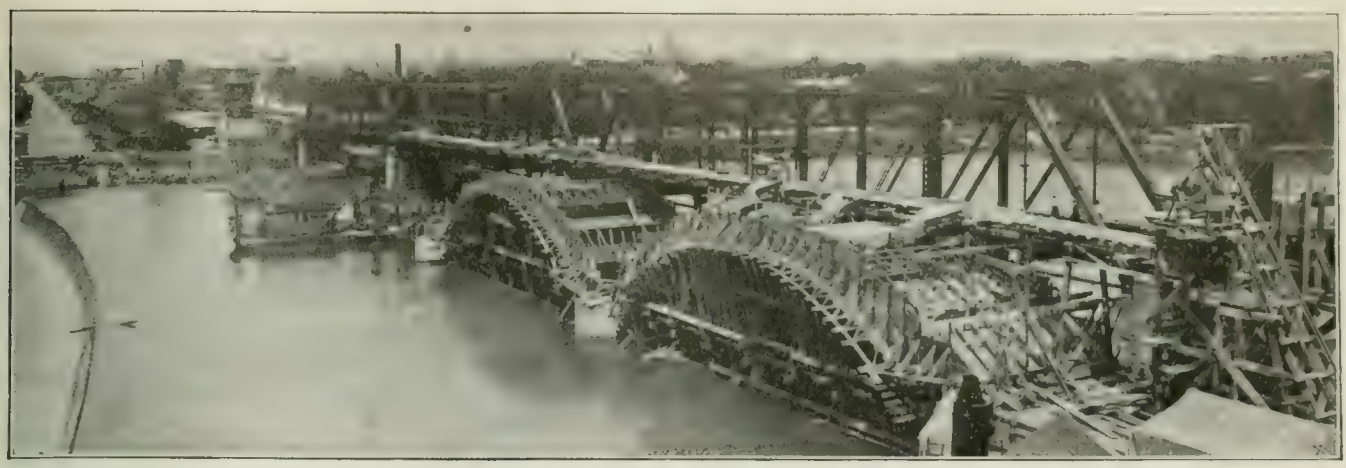


FIG. 4. PLANT ARRANGEMENT FOR CONCRETING FIRST HALF OF BRIDGE

derrick with 75-ft. mast and 65-ft. boom which was required to cover the complete circle of unloading operations.

Two four-post towers, Figs. 2 and 3, were erected on the shoulder of the embankment and 68 ft. from the mast. The posts of these towers were set in heavy concrete footings and their tops were about 60 ft. above the base of the derrick. From the top of each tower to the mast top a 12 x 12 in. x 68 ft. trussed timber was connected. As the towers were approximately 50 ft. apart, the angle between the two guy timbers was about 45°. From the mast head, wire cables A and B were run to a sheave at each tower top and then down the



FIG. 5. PLANT ARRANGEMENT FOR CONCRETING SECOND HALF OF BRIDGE

legs as shown to anchorages in the concrete footings. With this arrangement when the boom is in Position 1, cable A comes into tension and prevents the back legs of the tower from kicking up. With the boom in Position 2, cable B holds the front tower legs down in the same manner.

Constructed in the manner described and otherwise guyed as indicated by Fig. 2 the derrick was held stable without guy lines across the tracks or over the property from which they had been forbidden. This derrick operated a clamshell for handling materials.

Distribution of concrete from the mixer was by narrow-gage service railway and side dump industrial cars operated by hand. For concreting the first half as shown by Fig. 4, the service track was supported by the old steel bridge. On the second half of the bridge the track arrangement was as shown by Fig. 5. From one to five 18-cu. ft. cars were employed in delivering concrete. With a ½ cu. yd. mixer a maximum of 240 cu. yd. of concrete in place in 10 hours was attained.

The final operation was placing the deck slabs. A total of 312 slabs were precast at a yard located south of the bridge. The larger slabs were 10 ft. 2¾ in. x 6 ft. 11¾ in. x 1 ft. 6 in. and contained 3.7 cu. yd. of 1:2:4 concrete heavily reinforced. The slabs were cured a minimum of 30 days and placed by a derrick car running on the bridge.

The Kankakee bridge was designed by the engineering department of the Illinois Central R. R., C. C. Westfall, bridge engineer. J. H. Graham was resident engineer in charge of the work for the railroad. The contractors were the Gould Construction Co., and the Walsh Construction Co., Davenport, Iowa, with Alf. Lepard in charge.

Careful Census of Manufactures To Be Taken

According to a bulletin issued from the Bureau of the Census, Department of Commerce, Washington, D. C., a special effort is being put forth to make the manufactures section of the approaching 14th decennial census the most nearly complete and comprehensive inventory of the nation's manufacturing establishments ever taken. Schedules tabulating information concerning the country's industrial resources have already been prepared and printed. These schedules will be mailed to every manufacturing establishment in the United States during December, so that factory owners and managers can familiarize themselves in advance with the questions to be answered when the records of the past year's business have been compiled. In 1914, the year when the last manufactures census was taken, approximately 275,000 manufacturing establishments were listed. This time more than 300,000 establishments will be scheduled, and, in addition, it is expected that about 50,000 mines and quarries will be reported.

Developing Prices for Federal Valuation of Railroads

By Henry J. Saunders
Bureau of Valuation, Interstate Commerce Commission, Pacific District, San Francisco

THE Federal valuation act, passed by Congress in March, 1913, required the Interstate Commerce Commission to report the value of all property owned or used by every common carrier subject to the provisions of the act. As soon as the organization and procedure for determining the inventory of physical units of property were well under way, the question of prices to be used was of most importance. It was determined that prices as of June 30, 1914, and freight rates of the same date, would be used on the valuation. The exact price in force on that date for any article was not considered as a final price to be used unless it was also a fair average of prices for five to ten years previous. In other words, prices were generally to represent a fair average of prices paid for materials and labor during the period covering the years 1910-1914, inclusive.

In order to accumulate data on the cost of various commodities during the period, the commission on Feb. 9, 1915, issued Valuation Order No. 14, in which it was ordered that every common carrier should furnish the commission a schedule showing purchases made and net prices paid for such purchases, this information to be filed with the commission in a manner prescribed and on certain forms which were then designated. These purchases in many instances could represent only a few of the largest made by that carrier during this period.

The returns under this valuation order were filed in Washington, where a cost bureau was organized and the data were tabulated. The returns were also filed in the various offices in the district in which the reporting carrier happened to be located, and were there used as a basis for the determination of fair prices.

In the Pacific district, with headquarters at San Francisco, an organization was perfected, with a cost engineer as its head, which proceeded to tabulate cost data from various sources. Many carriers' offices were visited, and abstracts were made of all grading and other contracts which were available. The carriers' accounting records were examined, and a great deal of data, such as final estimates and cost records of company work, quantities for which were known, was secured. The commission's accounts, in their preparation of the accounting report and original cost to date, also obtained valuable items of detailed cost. This was especially true of such accounts as tunnels, bridges, and tracklaying and surfacing. A thorough analysis was made of all representative jobs which could in any way be used to develop unit cost. Valuation Order No. 14 was used by the cost engineer in determining a great many average unit prices, such as for ties and items of other track material. The cost bureau at Washington from time to time furnished representative prices on such items as rail, spikes, bolts, etc., which prices were adopted as basic unit prices in the district. This bureau also furnished a number of manufacturers' quotations on such items as pipe, cement, etc.

The district cost and pricing force collected and tabulated the data, as noted above. Grading contracts were segregated geographically, and various parts of the country covered were placed in separate zones where it was considered conditions were similar. Data covering cost of such material items as ties were tabulated, and weighted averages obtained. These weighted averages, however, were very seldom used exactly as obtained. They merely served as a guide for a fair price. The cost engineer would determine, from such data as he had tabulated, certain fair prices to be used for certain items in the valuation. These prices when obtained were accompanied by all supporting data obtained on the subject. A conference was then held, attended by the various district and staff officers, where the data and price were thoroughly discussed and a final fixed base price was formally adopted. These adopted prices were then compiled by accounts in regular book form and were used where applicable on all future reports. Whenever additional supporting data are secured, which, in the judgment of the conference, warrant revision in price, a revision is then carried through in the same manner as a new price.

Some idea of the enormous mass of data used may be gained when it is said that on one kind of cross-tie purchases of over 5,000,000 ties were used in obtaining a fair average price. Millions of pounds of spikes, bolts and angle bars were used as representing fair purchase prices of these items. Tracklaying and surfacing cost on 7000 or 8000 miles of track was used in obtaining a fair price for work under this account. Grading contracts for all lines in the Pacific district were obtained wherever they were still in existence. These data in themselves made a huge mass of information.

After the inventory units were finally collected and assembled ready for pricing, the work of developing prices for a particular carrier was then carried out. One of the first things determined upon was a feasible construction program for reproduction. This program was always drawn up in standard form and showed the following information:

1. Name of railroad.
2. Description of country traversed.
3. Statement of mileage by valuation sections.
4. Location of all connections with other carriers.
5. Transportation facilities.
6. Statement of assumed methods to be considered in reproduction of various accounts.
7. Table showing material yards, foreign connections, length of haul from material yard to section, and distance from nearest labor center.
8. Construction and interest periods.

This program was used by the pricing force as a basis for development all prices on the carrier concerned. The assumed material yards and f.o.b. points were considered in determining prices on material, and freight or haul by company train was figured from point of purchase of material to these yards. Base prices for materials were the same for all roads when materials were purchased at the same point. Final prices, however, would vary according to the amount of freight paid. In illustration of the above: It was determined to use a certain price for 7 x 8-8 redwood ties f.o.b. San Francisco. This price would then apply to all roads obtaining material from San Francisco. The price itself as finally used, however, would carry an addition of the necessary freight from San Francisco to the material yard of the carrier or valuation section being priced.

A brief description of the methods used for building up prices in the various accounts prescribed by the commission is as follows:

Account 1; Engineering—This account is determined as a percentage of road accounts Nos. 3 to 48, inclusive. Data for determining this basic percentage were obtained from nearly $400,000,000 worth of work. Engineering, as shown in the accounts of the carriers, consisted of salaries and wages, transportation expenses, subsistence, engineering instruments, tools, etc., and various sundry items. The percentage which these were of the total cost of the road accounts was considered as a fair representation of the probable cost of engineering on reproduction. In determining the final percentage to be used on a particular carrier, due consideration was given to the character of the territory traversed and the remoteness and difficulties of construction.

Account 3; Grading—Supporting data for base prices under this account were obtained almost entirely from actual contracts of work performed in the same vicinity and under similar conditions. To this base price as finally determined was added a definite percentage to cover miscellaneous expense. This miscellaneous expense was intended to take care of the cost of unmeasurable items, such as temporary roads and bridges, changes and repairs to ditches, removing logs from right-of-way, and all such items of unusual expense, usually covered on actual construction by force account or company work. This percentage varied with the conditions encountered. Data for this percentage were obtained from the cost of some $90,000,000 worth of work. To the above base price plus miscellaneous expense was also added a percentage to cover the cost of transportation of men, supplies and outfits. This percentage was determined on the basis of the distance which the valuation section being priced was from the nearest labor center. Data for the determination of this percentage were obtained from some $32,000,000 worth of work.

The main items of grading, such as earth and rock excavation, were priced in this manner: The item of haul of materials was divided into three classes; namely, team overhaul, train haul by contractors' outfit or dinky equipment, and train haul by standard equipment, using the company track, which was assumed as already constructed. The price of team overhaul was determined per cubic yard per 100 ft. in excess of 500 ft. free haul. The maximum distance under this class of haul was usually 2500 ft. These prices, of course, were determined from average contract prices paid in the territory priced. Train haul, using contractors' dinky equipment and contractors' track, included the cost of hauling the material from the point of excavation to the point of unloading, also the cost of unloading, shifting tracks and of temporary trestles where needed. The average haul under this heading usually did not exceed 1.5 miles. Prices were developed from the actual cost of a large number of jobs usually paid for on a flat price basis. The cost of train haul by standard equipment was computed on a basis similar to the above, except that in addition to the cost of haul the estimated cost of a temporary trestle was added.

Account 5; Tunnels—Supporting data for labor and material prices in this account were obtained from contractors' final estimates and original contracts and costs for this class of work. Owing to the different tunnel sections encountered, it was deemed necessary to price tunnel excavation on a cubic-yard basis. To the assumed base price for tunnel excavation was added a percentage to cover miscellaneous costs, which would necessarily be incurred in connection with the excavation. This included temporary wagon roads, which in some instances in particularly inaccessible country was a considerable item. This percentage necessarily varied with the character of the country and distance from other railroads. An additional percentage was added to this excavation price to cover transportation of men, supplies and outfits, this percentage being based on the total distance from some representative labor center.

The price used for material for lining tunnels included:

1. Base cost at point of purchase.
2. Commercial freight from point of purchase to point of delivery on carriers' lines.
3. Haul over carriers' line to material yard (if any).
4. Material-yard expense.
5. Team haul from material yard or end of track to tunnel site.
6. Miscellaneous expense to cover various incidentals.

Under 2, above, it is well to note that the regular tariff rate in effect June 30, 1914, was used to determine freight charges on material Under 3, above, a representative figure was obtained covering an average of carriers' costs for handling construction material. This figure was applied on a ton-mile basis. Under 4, material-yard expense was developed from a large amount of data showing the costs of handling various materials in material yards. Under 5, a price was obtained from various contracts which represented the average cost of team haul per ton-mile. This cost was adopted for all team-haul work. In this connection it was sometimes found feasible to consider that concrete linings were placed in a tunnel after the company track reached the structure. In these instances the cost of estimated team haul was omitted, but additional haul over carriers' line was allowed. The price of labor placing tunnel linings, both timber and concrete, was determined from an average of a number of contracts for this class of work. To this base price of labor was added a percentage to cover miscellaneous expense, and a percentage to cover transportation of men, supplies and outfits.

Account 6; Bridges and Culverts—Basic cost of materials used under this account was determined, as outlined in a previous paragraph, from various purchases of the carriers in this district. These purchases were tabulated and thoroughly analyzed, and a fair average price was adopted in all cases. This price necessarily was at point of manufacture or point of origin. To this base price of material was added the following:

1. Through commercial freight from point of origin to point of delivery on carrier's line.
2. Material-yard expense, varying with the kind of material used.
3. Haul by carriers' train from point of delivery on carriers' line to point of use.
4. In some instances a team haul for such items as culvert material and small bridges built ahead of tracklaying.
5. Labor, varying with the kind of structure constructed.
6. A percentage to cover cost of transportation of men, supplies and outfits from the nearest labor market to the valuation section in question.

7. A percentage to cover miscellaneous expense or in some cases, as in piles and timbers, to cover loss and waste.

The above additions to the base price were supported by data obtained from actual construction costs or from contracts. It was found in a great many instances that carriers' contracts for labor on similar work varied to so great an extent that it showed there was undoubtedly some other consideration not stated which governed the price paid. Contracts of this form receive only minor consideration. Enormous masses of data covering bridge contracts in the Northwest were used in connection with this account, and it is probable that the average prices used represent fairly the cost of this class of work.

Account 8; Ties—9, Rails—10, Other Track Material—Basic prices for the material under these accounts were obtained from data covering carriers' representative purchases, as noted in a previous paragraph. To these basic prices were added:

1. Commercial freight from point of origin to point of delivery on carriers' line.
2. A material-yard expense.
3. Haul over carriers' line from point of delivery to material yard.
4. Cost of inspection based on average prices paid by carrier for inspection of the kind of material being priced.

In a great many instances, base prices were furnished by the Washington cost bureau and were formally adopted by the engineering board for use in all districts. This covered such items as rail and the principal track fastenings. The material-yard expense allowance was determined from carriers' own costs. The cost of inspection was determined in like manner.

Account 11; Ballast—Base prices for the various kinds of ballast were determined from carriers' actual costs. In some instances very good data were developed and costs were found fairly uniform. The cost of a great many million yards was used in developing a fair price for various kinds of ballast. In determining a base price for a particular carrier the following subdivisions of the cost were considered:

1. Pit-development expense.
2. Work-train service at pit.
3. Rental of pit equipment.
4. Labor and steam-shovel expense.
5. Unloading expense.

To the assumed base price was added the cost of train haul which, when over the carriers' lines, was estimated on a yard-mile basis from data similar to that used in determining the price of train-haul material used in Account 3. An addition was also made on a percentage basis to cover the cost of transportation of men, supplies and outfits, from the nearest labor market to the center of the valuation section being priced. When ballast was purchased off from the carriers' line, the full commercial freight at tariff rates was added to the base cost.

Account 12; Tracklaying and Surfacing—This was one of the most difficult accounts to price fairly on a reproduction basis. It was determined to develop the basic cost per mile, which would include the following elements:

1. Labor laying track.
2. Train service.
3. Rental and repair of equipment.
4. Running surface (ballasted track only).
5. Full surfacing (unballasted track only).
6. Additional percentages to cover miscellaneous expense, use of tools, and liability insurance.

The basic price was developed in such a form that it could be applied to the cost of tracklaying for rail weighing under 61 lb., 61 to 90 lb., and over 90 lb. In addition to the above basic cost, an amount was added:

1. To cover the cost of curving rail when curves were 5° or over. This cost was added on a lineal-foot basis.
2. An addition was made for full surfacing on ballasted track where under the assumed construction program it was necessary to reach a ballast pit before the line in question could be ballasted.
3. An allowance based on the cost of hauling material where the distance to the center of the valuation section in question was more than the average distance from the assumed material yards.
4. An allowance based on the cost per mile per month to cover maintenance during construction. Under the construction program mentioned in a previous paragraph a period of construction was assumed which included the time that the track was in operation during construction. This average time for the valuation section was used as an assumed maintenance period.
5. A percentage allowance to cover the cost of transportation of men, supplies and outfits from the nearest labor center.

In addition to the prices developed for tracklaying and surfacing, prices were also built up for the following:

1. Placing ballast under ties, per cubic yard.
2. Placing such small items as tie-plates, rail braces, anti-creepers, etc.
3. Placing switches, derails, crossings, etc.
4. The framing and placing of bridge ties.

Account 13; Right-of-Way Fences—Owing to the fact that there are apparently an endless number of types of fences, it was early decided in the Pacific district to price fences as far as possible by the different items of material entering into their construction. Therefore, a price was developed to cover the cost of posts, wire, nails and staples, lumber, gates, etc. To this basic cost were added:

1. Commercial freight from point of origin to point of delivery on carriers' lines.
2. The necessary haul over the carriers' line on a ton-mile basis.
3. Material-yard handling varying with each kind of material used.

Labor prices were developed to cover:

1. The cost of stringing barbed wire per single wire-mile for various spacing of posts.
2. The digging of post holes and setting posts, varying with different kinds of soil.
3. The labor charged for placing lumber.
4. The cost of stringing woven wire per wire-mile for various spacing of posts.
5. The placing of stays.

Additions were made to the above basic labor costs to cover liability insurance and transportation of men, supplies and outfits. These additions were in percentage form applied in a manner illustrated in previous accounts.

Account 15; Crossings and Signs—Various signs and other material and labor entering into this account were essentially similar to the items priced in previous accounts, and the unit prices were built up in exactly similar ways.

Accounts 16 to 25, inclusive; "The Building Accounts."—Prices for the material entering into these accounts were built up in a similar manner to the prices used in Account 6; that is, to the base price

developed at the point of origin, from carriers' records of purchases and other sources, were added certain percentages and allowances to cover the various items of miscellaneous expense, transportation, etc. The price of labor in these accounts was usually based on carriers' records of original cost plus certain additions, such as transportation, etc. In many instances it was found in pricing particular structures that the carriers' record of cost represented a fair reproductive value.

From the information collected covering structures of various types, a number of diagrams and tables were developed to be used in pricing structures of similar design. One method of pricing buildings used was the square-foot-area method, and diagrams were developed to use in pricing where the units were square foot of floor, walls, roof, etc. Other diagrams were developed showing weights of buildings and accessories to buildings. Tables were used for pricing such items as doors, windows, lighting, heating, etc. The advantages of the diagrammatic form of estimating buildings were that detailed computations were eliminated except in some extreme cases. The diagrams permitted of easy interpolations or intermediate readings. Errors were more easily detected than when detailed computations were made.

Other Road Accounts—Other road accounts were priced in similar manner to all of the foregoing.

Accounts 51 to 58; Equipment—The carriers' report of the cost of equipment was generally used as a basis for pricing equipment of similar kinds. It was necessary, of course, to make different additions for freight and delivery charges than the carrier showed on its original cost records, but the main basis of pricing equipment of a certain kind was given in the carriers' statements furnished the commission.

Accounts 71 to 75 and 77; General Expenditures—A percentage was added to the sum of amounts shown under Accounts 1 to 48, inclusive, to cover the item of general expenditures.

Account 76; Interest During Construction—As stated in a previous paragraph, the construction program shows the number of months to be allowed for interest during construction. This period is generally considered to be one-half of the total period which the valuation section is assumed to require for complete construction. To this period is added an arbitrary time of three months. Interest on equipment is allowed for a total period of three months.

Tile and Concrete Flat-Slab Floor Being Tested

The United States Bureau of Standards is now conducting a test on a specially built floor structure of the type known as Schuster system, which is a girderless floor in which the slab proper is made up of two-way hollow-tile floor construction. Reinforced-concrete beams, running in both directions, are made by pouring concrete in the openings left between square tile, spaced uniformly across the slabs. The substructure has 6 panels 16 x 16 ft., 6 panels 16 x 19 ft. 3 in., and 6 panels 16 x 22 ft. 6 in. Control cylinders have been poured which will be tested at intervals so as to determine when the concrete attains a strength of 2000 lb. per square inch in compression. As soon as possible after this date the load tests of the slabs and strain-gage readings during loading will be taken.

Compressed Air Used to Clean Road Surface Before Oiling

Road First Swept with Brooms and Then Blown with Compressor—Cost of Cleaning and Application of Binder Given

By Major W. A. Welch
Chief Engineer and General Manager, Palisades Interstate Park

AN INTERESTING experiment has just been made, which may be of interest to highway engineers, in putting a new wearing coat on the main park drive in the Palisades Interstate Park. This roadway extends from Bear Mountain, on the Hudson River, five miles below West Point, back through the center of the Harriman section of the Palisades Park to Tuxedo, a distance of 12 mi. It was built four years ago, opened immediately, and has carried heavy traffic continuously ever since. Pleasure cars run over it at high speed; automobile trucks use it; and steel-tired wagons and trailers have been hauled over it with traction engines, drawing wood and lumber from the forests. Until this season, no repairs were made to the surface since the road was opened. The road is of bituminous macadam, penetration method, and was placed in three layers on a base of hand-laid telford, 15 in. deep. The stone was all granite, both telford and the macadam, and was quarried and crushed along the line of the road. The paving is 16 ft. wide, with 3 ft. stone shoulders on each side.

Construction Explained

In the building of the road, after the telford base was completed, a layer of 1½-in. stone was spread and rolled to 2 in. in thickness. On this was poured from hand pots 1 gal. per square yard of Standard Oil binder-B. A second layer of stone of the same size and thickness was then immediately spread and rolled, and a similar application of 1 gal. of binder-B was applied to this second layer. Over this was spread, immediately, a layer of stone 1 in. thick; this was at once rolled in thoroughly. An application of ¾-gal. per square yard of binder-B was then made and was covered with enough screenings to enable the roller to work.

No pockets had been formed and there were no signs of ravelling in the road, but its surface had worn down until the ¾-in. stone showed throughout its entire length. This stone had worn slightly, and the entire surface was much like that of a grindstone.

It was decided to place a wearing coat on the road last spring. In order to insure a proper bond of this coat with the base, the road was first swept with wire brooms. Then a small portable air compressor, of 75-cu. ft. capacity, was equipped with two hose fitted with ⅜-in. aperture nozzles; this compressor was hauled over the road behind the sweeping gang and all the dust was blown from the road surface. This compressed-air outfit was operated by three men. It covered about one-half mile of road per day and left the road perfectly clean. A seal coat of binder-B was then applied hot to the road surface by a sprinkling truck, and adhered perfectly. The truck was followed by a crew of men who spread granite screenings to a depth of about ¼ in. on the seal coat. These screenings were rolled in at once by a 10-ton roller. The binder was applied at a temperature of 350°, at the rate of ½ gal. per square yard. The

weather was very hot while the work was being done; the screenings were firmly embedded in the binder, and there was very little bleeding after the road was opened for traffic. Wherever bleeding did appear the screenings were swept back over it, and after the road had been opened for about a week the fast-moving cars had blown most of the remaining screenings to the shoulders. A careful examination shows that there is a practically perfect bond between this seal coat and the original road surface, and the road now has a splendid wearing surface.

It is difficult, for the following reasons, to give the exact cost of the application of this wearing surface: (1) The distribution of the screenings along the road was done by motor truck. The screenings were dumped at intervals of 50 ft. and the piles were staggered so that the shovelers would have no difficulty in covering the whole surface rapidly. The cost of the distribution of these screenings was much greater in some sections of the road than in others, on account of the length of haul, but the cost of hauling averaged about $1.10 per cubic yard; (2) Eight men with wire brooms swept about one-half mile of road per day. (3) The compressed-air machine with its crews covered about one-half mile per day; (4) the binder-B was heated in tank cars at one end of the road, and the trucks were only able to make two trips per day to points beyond a five-mile haul, three trips per day to points beyond a three-mile haul, and four or five trips on the shorter hauls. Each of these trips covered about 1200 ft. of road. (5) Sixteen men were required to shovel the screenings onto the road, and these men were, of course, only engaged in actually shoveling screenings about two hours of the day on the extreme hauls. They were kept busy in fixing up the parapets and gutters and in forestry work, when not actually engaged in spreading the screenings. (6) The steam roller was likewise idle a great part of the time when the trucks were on the long hauls. (7) It was necessary to open the road to traffic each Saturday and Sunday while this work was being done, and this necessitated the resweeping and blowing of one-half mile each Monday. (8) On three occasions, the delivery of the binder-B by the railway was held up, and this necessitated laying off the entire crew for one or more days at a time. (9) Accidents to the motor trucks used to spread the oil caused three delays of one or more days. (10) Rainy weather, when no work was permitted, also caused three delays.



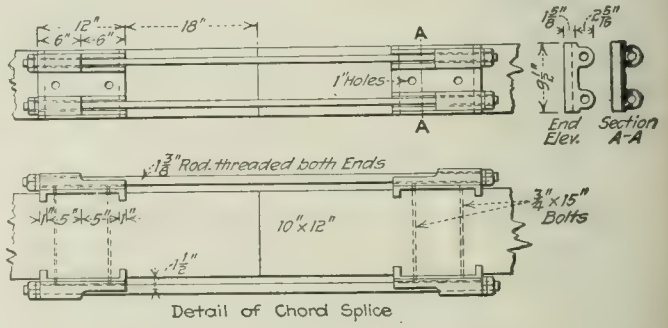
COMPRESSED-AIR MACHINE BLOWING DUST FROM ROAD BEFORE BINDER IS APPLIED

63 cu. yd. of screenings at $1.10 per cu. yd.	$69.30
4700 gal. binder-B at 12.65c. per gal.	594.55
2 air compressors with crews, $20 each	40.00
1 steam roller at $20	20.00
16 shovelers at $3	48.00
16 shovelers at $3	48.00
1 foreman at $5	5.00
Total cost per mile	$824.85

The delays attributed to the above causes brought the cost of this job up to $1106 per mile. Had it been possible to put more oil trucks on the job and another compressor, and so cover the road at the rate of one mile per day, the cost would have been as shown in the accompanying table.

A Splice for Wood Trusses Not Affected by Shrinkage

THE extent to which fir timber, usually more or less green, is used for bridge and roof trusses in the Northwest has led to the design of a type of splice that would avoid the danger of loosening due to shrinkage of the wood and the likelihood of decay between scab and timber, these being the chief defects ascribed to wood or metal-plate scab splices. The new splice



SIMPLE CARPENTRY FEATURES SPLICE

was designed by S. Murray, chief engineer of the Oregon-Washington Railroad & Navigation Co., and is shown in the accompanying illustration. It is intended particularly for use with fir timber, which has a notable amount of shrinkage.

In this splice the rods carry all the tension, the castings being subjected to compression only. The simplicity of the carpenter work required is a feature. The rods are threaded far enough to provide for tightening up the bolts later, should that become necessary.

Upkeep Problems at St. Louis Filtration Plant

Data on Sand Growth — Removal of Mud Balls — Loose Strainer Plates — Chemical Action on Equipment—Care of Hydraulic Valves

SUPERINTENDENTS' daily difficulties with the operation of a filter plant together with much light on how equipment of various kinds stands up under service comprise much of the last annual report of August Nolte, superintendent of the St. Louis filter plant to E. E. Wall, water commissioner. The notes below are from this report.

Increase in the coating of sand grains during the past two years was obtained by treating samples from various depths with hydrochloric acid. The table printed below indicates that the large encrusted grains float to the surface and are found within the first 4 to 6 in. of the top:

Thickness of Sample in Inches		Mean Distance in Inches from Top		Per Cent. Loss in Weight Due to Acid Treatment	
1917	1919	1917	1919	1917	1919
1	1	½	½	9 8	14 0
1	1	1½	1½	8 9	12 6
2	2	3	3	6 9	11 5
2	2	5	5	4 6	7 3
3	3	7½	7½	3 1	4 9
3	3	10½	10½	2 3	4 8
3	3	13½	13½	1 93	4 0
3	3	16½	16½	1 57	3 2
3	3	19½	19½	1 41	3 2
3	5	22½	23½	1 13	3 3
3½		24½		0 86	

In May, 1918, it was noted that fish, mostly carp, were making an unusual number of holes in the filters. These holes varied from 1 in. to mere depressions in depth and were as large as one inch by two inches in plan. The fish varied in size from mere minnows to 6 in. in length, the average being about 3 in. long. On account of the turbidity and of the depth of water (about 4½ ft.) over the sand surface while the filter is in operation, the manner in which these holes are made could not be studied, but it is supposed that the depressions are due to the impact of the fish striking the aluminum hydroxide matting on the surface of the sand, either while swimming downward in the direction of the current or while nibbling for food. There is no doubt that the depressions are due to fish because the holes are always found when fish are found, and vice versa. The depressions do not seem to interfere with the efficiency of the filters as the effluent from them has no turbidity. The situation might become more serious if more voracious fish, such as catfish, were present. These, however, have very seldom if ever been found on the filters.

Mud Balls

The rate of wash during the year was maintained at 15 gal. per square foot per minute. The practice of screening one section in each half of each filter unit once a month with a ¼-in. mesh screen was continued throughout the year. This screen is 4 ft. 2 in. by 3 ft. 2 in., just wide enough and deep enough to cover the volume from gutter to gutter and from gravel to top of floating sand. The screen is pulled through the same section each month so that comparative results are obtained.

In May, 1918, the maximum number of small mud balls caught on the screen from any one filter was about 2000, while the minimum number was 50. In August the maximum number was about 400 and the minimum 10. These mud balls vary in size from about ⅛ to ¼ in. in diameter. This reduction in the number of mud balls from May to August is attributed to the following procedure: During June and July the walls of each filter were raked with an ordinary gardener's rake with extension handle attached. Each filter was raked about eight times. The raking was done while the filter was being washed. At one wash, one-half of the unit was raked, at the next wash the other half, etc. In this way no extra labor was required to do the work.

Loose Strainers

A loose strainer plate in a filter can usually be located by a heaped spot in the gravel bed. Adjacent to the mound of gravel will be found a depression giving the exact location of the loose portion of the plate. In September an examination of the gravel surface was made in each filter. To do this a T was made of ¾-in. pipe, the vertical leg being about 15 ft. long, the horizontal legs about 6½ ft. total. This T, inverted, was moved inch by inch across the filter unit parallel to and between each two lateral gutters while the wash water was being applied. As long as the gravel surface was level the vertical leg of the T would stand perpendicular; any unevenness would tilt the vertical leg. This procedure also revealed the presence of large mud balls in several of the filters; these were broken up with a rake.

Loose strainer plates were found in nine filters. In each of these filters one or more end strainer plates were bare for a distance of from 1 to 3 ft. It was found that the nuts on the U-bolts were not drawn up all the way. In several cases the nut was only held by a few threads. This condition allowed the plate to raise each time the wash water was applied, and the force of the water threw the gravel aside. Repairs were made by regrouting the plates, drawing up the nuts and replacing the gravel.

The concrete sulphate dissolving boxes in the chemical room have been resurfaced with cement mortar and coated with asphalt. The copper screens in the dissolving boxes are rapidly deteriorating and are not worth repairing so they are being replaced with boards drilled full of holes; these answer every purpose of the screens and are easily removed. The surface of the bottom of the solution tanks is becoming more and more raveled so that it will probably be advisable to resurface the bottom of all the tanks during the coming year. The sides are still intact.

The agitator shafts in solution tanks 1 and 2 have been renewed during the year. There is still one tank, No. 4, that has the original shaft in it; this, however, will be replaced shortly.

The vertical agitator motors in the chemical room have been taken apart and the parts bathed in gasoline. These motors are subject to much dust and canvas hoods have been made to protect them.

Bronze gate valves, around the aluminum sulphate solution, operated as frequently as they are, will not hold up for any length of time. Any attempt to keep them leak proof would mean constant repairing. As long as their leaking does not interfere with the proper application of the sulphate solution and does not cause any waste of solution, it is better to tolerate a little leak rather than make constant repairs.

The 4-in. lead solution lines through which the aluminum sulphate solution is conveyed to the point of appli-

cation have been cleaned several times. Instead of pulling a 4-in. leather disc through as was formerly done and which meant disconnecting a line about every 60 ft., a double rubber disc is used, shot through with water pressure. This only necessitated disconnecting an entire line, about 800 ft. in length, at two places. The disc will pass around bends of 3-ft. radius and through the 4-in. open gate valves on the line. The water pressure required to shoot the disc has averaged from 20 to 50 lb. per square inch. No bulging whatever has resulted from this pressure. With this disc the work of cleaning is done much more thoroughly than by hand, in about one-third the time, and is really a protection to the pipe since it eliminates disconnecting and thereby preserving the gaskets.

The 1¼-in. brass cocks on the 1¼-in. lead solution line to the effluent of each filter have been reground several times during the year. When these need replacement globe valves should be substituted.

The bronze orifice castings in the orifice boxes of the automatic chemical meters and the conical plugs that regulate the area of the outlet have had to be repaired on account of the corrosive action of the sulphate on these parts. The bronze orifice casting was turned out about ¾ in. and an orifice bushing made that would screw into the casting, so that hereafter the bushing, when deteriorated, may easily be replaced. The plugs were turned down and polished. Since these repairs were made the automatic control properly regulates the amount of solution to be fed in proportion to the amount of water passing through the 8-ft. meters.

Last July the three 4-in. venturi meters at the north end of the plant used for measuring the amount of aluminum sulphate applied to the settled water were taken apart and cleaned. The meters were so badly clogged with scale from the alum solution that the diameter at the head was reduced from 4 in. to 3 in., and at the throat from 1⅝ in. to 1⅜ in. Before cleaning, the meters recorded and indicated about 30% too fast. After cleaning the variation was only 1%. It is now a practice to leave the meters disconnected when not in service because it is found that solution standing quietly in a meter deposits scale much more rapidly than when in motion.

Tile Chlorine Pipe

The 4-in. tile chlorine pipe laid as an experiment to convey the chlorinated water to the drawing conduit chamber had to be abandoned on account of the excessive leakage from it. Some leakage occurred at the litharge joints, but the greatest leakage was through the body of the pipe itself.

Several times during the year all of the liquid chlorine meter machines had to be taken apart and cleaned. These new machines have given considerably more trouble than the older float type meter machines, one of which is still in service. The greatest source of trouble with the new machine has been the sulphuric acid used in the manometer. Several times the acid has been shot into the parts of the machine on account of a defective meter control valve. After a few weeks of service the diaphragms in these valves lose their elasticity and the valve begins to stick. Whenever a meter is taken apart some part of it is sure to be broken. This is absolutely unavoidable. The arrangement of the piping and fittings on the back of the plate is so close as to be almost inaccessible. On several occasions the scales calibrated for the machines were checked and found to be in error. The error was due to the stopping up of ports with chlorinated oil. After cleaning a new scale had to be calibrated.

A new beam and scale balance machine built in the department is now being tested. The results from it have been very gratifying after two months of service. As it stands it is but experimental, but the results obtained justify the building of a larger one.

Valve Packing and Rust

The wooden baffle in the drawing conduit chamber was replaced by a concrete one in the early part of the year. This baffle insures a more adequate mixture of the chlorine solution with the filtered water. All of the packing glands on the 240 hydraulic valves in the pipe gallery have been drawn up all the way and new packing will be needed. The packing in about 50 of the valves was replaced during the year.

The leathers in all of the valves operating the rate controllers were taken out of the cylinders and worked up, the rust cleaned off the cylinder and piston heads and painted with graphite. This work has improved the running of the filters. The rust that accumulates between the leathers on each side of the piston head has slightly scratched the cylinder walls. This rusting would probably not occur if the piston head were made of bronze instead of iron. The piston head will probably need replacing sooner or later, as that part of the iron exposed to the water is so soft that it can be cut with a knife. The metal has about the consistency of shale. It is possible that an electrolytic action is set up between the brass and iron, thereby causing the deterioration of the iron.

Standard Method of Determining the Dust Content of the Atmosphere

The continued use of the Palmer water-spray apparatus for determining the dust content of air is recommended in the 1919 supplementary report of the American Public Health Association committee on standard methods for the examination of air (Prof. C.-E. A. Winslow, chairman, Yale University, New Haven, Conn.). The advantages and disadvantages of this and two other methods to the same end are thus summarized by the committee:

The Palmer water-spray apparatus is fairly convenient and portable and permits the determination of the total weight of dust as well as the number of particles in a given sample. It yields, however, only about 60% of the total dust present in the air.

The Kotzé konimeter is even more convenient and portable than the Palmer water-spray apparatus, but it is not possible by its use to determine the weight of dust as well as the number of particles present. Exact comparative data as to the proportion of dust obtained by these two methods are not at present available.

The Bill electrostatic method yields more accurate results than those obtained by the Palmer apparatus, and could, of course, be used for determining counts as well as weights of dust. On the other hand, the apparatus is not as yet in a form sufficiently convenient for ordinary field work.

With all the facts in mind we recommend that the Palmer water-spray apparatus be retained for the present as the standard method for the determination of the dust content of air. It seems probable that the failure to collect all the dust actually found to be present by the electrostatic method will not seriously affect the relative values obtained in different environments.

Changes in the Value of the Dollar

With Relation to Wages, Salaries and Prices

IN EVERY movement for increases in wages or salaries, the increase in the cost of living is one of the reasons urged for the advance. Is it not a fact, however, that we are deceiving ourselves by referring to the pronounced change in economic conditions through which we are passing as "the high cost of living?" We shall not be able clearly to understand and act on the situation that confronts us until we frankly recognize that it is *a change in the value of the dollar* that has taken place.

But someone may say that the two are identical. Let us see. Tell the average employer that he should increase all wages and salaries to an amount proportionate to the increase in the cost of living, and he will very likely argue that the cost of living is the employee's affair, not his; or he will say you are attempting to establish the principle of a "living wage," or he will even assert that the trouble is not the high cost of living but "the cost of high living."

On the other hand, if it is once clearly understood that an actual change in the value of the dollar has taken place, these arguments, which do mislead many minds, are seen to have nothing to do with the case. Not only can we then deal fairly and understandingly with the matter of wages and salaries, but other prices as well. There are literally thousands of cases where business is being carried on today at a loss because the prices charged for the product or the service have not changed to correspond to the changed value of the dollar. Professional men of all classes, those who live on fees as well as those who receive salaries, have been hit hard by the change in the standard or value and the fact that the public does not yet comprehend this change.

And yet it is easy to comprehend. Everybody knows that dollars are only useful to buy things with, and that the measure of their usefulness is the amount a dollar will purchase. The workman who has $20 in his pay envelope on Saturday night receives in wages only what that $20 will buy. If that $20 will buy only half as much as $20 bought 10 years ago, then his wages have actually been reduced one-half, even though his pay in dollars is the same.

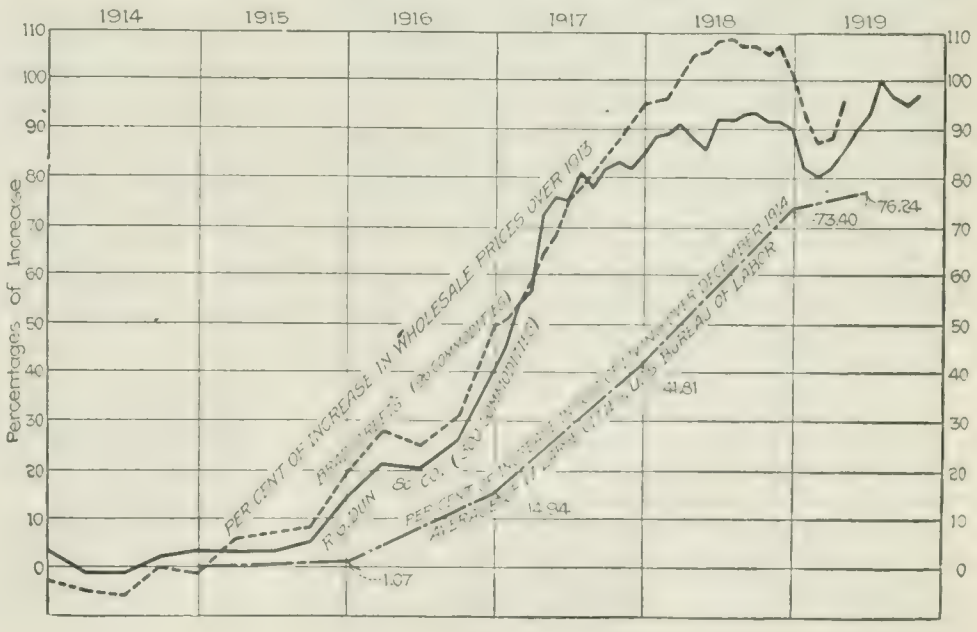
When we talk of increases in wages or salaries, therefore, or of increased prices for goods, we are deceiving ourselves if we measure that increase merely by dollars. The change in value of the dollar must also be considered, before we can determine whether there has actually been an increase or not.

If this is clearly understood it will be apparent how vastly important to every line of business and industry and to every man and woman and child, is the determination of the amount of change that has taken place in the value of the dollar.

Fortunately, there are available statistics which enable the change in the value of the dollar to be determined with reasonable accuracy. The best and most reliable of these statistics are those whi h have been gathered and published for many years by R. G. Dun & Co. These statistics, commonly termed "index numbers," represent the average change in wholesale prices of standard commodities at market centers. In determining the index number, these average prices are weighted in proportion to the per capita consumption of the different commodities or classes of commodities. Thus the index number, when finally determined accurately, indicates, in comparison with the numbers for previous months and years, the change in the average market prices of commodities and therefore the change in the purchasing power of the dollar.

A number of other organizations also collect and publish statistics from which similar index numbers are determined; but those of the Dun organization are believed to be the most reliable, for the following reasons: First, the Dun organization, dealing directly, as it does, with commercial affairs, is in position to obtain and publish the most authoritative statistics of the market prices of commodities; second, these statistics are from an authority with no bias toward either capital or labor; third, Dun's statistics are based on a much larger number of commodities than those used by other statistical bureaus.

The value of this last feature in eliminating irregularities due to excessive changes in price of certain commodities is obvious and is well illustrated on the accompanying diagram, on which has been plotted the percentage of increase that has occurred in wholesale prices over the average for the year 1913, as shown by the index numbers of R. G. Dun & Co., and also by those of Bradstreet. Bradstreet's statistics are based on 96



commodities as against the 300 commodities used by Dun, and the more erratic course of the Bradstreet curve is evident. On the other hand, it will be seen that the *general* course of the Bradstreet curve does correspond substantially with that of the Dun curve. The general accuracy of the latter is therefore substantiated.

What Index Numbers Show

Let us now understand just what these index numbers, from which the Dun curve is plotted, represent with reference to the value of the dollar. These figures show the percentage of *increase* in wholesale market prices which has taken place since 1913. They, therefore, show the proportional *decrease* in the purchasing power of the dollar in the wholesale market during that time. The average man, however, does not use the dollar that he receives in wages or salary to buy in the wholesale market. He must buy at retail. If retail prices were exactly proportional to wholesale prices, then the index numbers for wholesale prices would indicate also the buying power of the dollar as used by the average man.

Speaking broadly and generally, it is true that retail prices do follow the course of wholesale prices. While there is a considerable difference in the retail prices charged in different communities and for different commodities, it will be generally agreed that the increase in retail prices will very seldom be *less proportionally* than the increase in wholesale prices. It is a well known fact that retail merchants during the five years since the beginning of the war have prospered as never before, due not only to a larger volume of trade but larger margins of profit. As far, therefore, as the Dun index numbers for wholesale prices are in error in representing the increase in the market prices of commodities sold at retail, they are in error by understating rather than overstating that increase.

There is another factor which must be taken into account in determining the change in value of the dollar. The whole of the dollar received for wages or salaries is not spent in buying goods; part of it goes to pay rent. Statisticians have determined that the proportion of family income expended for rent by average wage earners is from 15 to 20%. There are some other minor expenses also which enter into the family budget and which are not included under the head of commodities, such as the service of physicians, payments of carfare, amusements, etc.

Of course, if house rents and prices for professional and personal services advanced as rapidly as the prices of commodities, the index numbers above shown in the Dun curve would still be proportionate to the change in the value of the dollar. It is well known, however, that the increase in rents and in prices for professional and personal service has lagged behind the advance in the prices of commodities. To record truly the changes in the value of the dollar, therefore, proper deductions must be made for the slower rates of advance in these other items of expenditure.

It will be evident that when matters like this are taken up, conditions vary materially in different communities. Rents in cities which had a sudden influx of war workers, for example, advanced in some cases even more rapidly than the advance in prices of commodities. In most cities, however, the increase was very slow, and often no material increase in rents occurred until 1917. Nowhere has the average increase in house rent been as great as the increase in prices of commodities.

The United States Department of Labor, in its monthly statistical publication for September, prints tables showing the percent of increase in the cost of living from December, 1914, to June, 1919, in 17 important industrial cities in the United States. The items of expenditure of the average family are classified under the heads of (1) food; (2) clothing; (3) housing; (4) fuel and light; (5) furniture and furnishings, and (6) miscellaneous. These various items are weighted in proportion to the relative importance in the family budget, and this weighted total represents the percentage of increase in living costs. The cities for which statistics are given are Portland, Me.; Boston, New York, Philadelpria, Baltimore, Norfolk, Savannah, Jacksonville, Mobile, Houston, San Francisco and Oakland, Portland, Ore.; Seattle, Chicago, Detroit, Cleveland, and Buffalo. The increase from December, 1914, to June, 1919, shown in these tables, varies from 66% in San Francisco to 87% in Norfolk.

For our present purpose, to obtain figures representing the average increase in cost of living and the corresponding decrease in the purchasing power of the dollar as an average for the entire United States, the figures for the 17 cities above named have been combined and averaged. From the averages thus obtained the lower curve in the accompanying diagram has been plotted. This curve represents the best available information at the present time as to the change in the purchasing power of the dollar that has taken place during the past four years, as an average for the whole United States. Comparison of this curve with the curve representing the index numbers published by R. G. Dun & Co., which includes the principal commodities entering into current consumption, makes it evident that the Bureau of Labor Statistics err by understating, if anything, the decrease which has taken place in the value of the dollar.

What the Statistics Prove

Finally, in order to bring the record up to date, these statistics prove that the cost of living is today higher—the purchasing power of the dollar is *lower*—than it has been at any time. The Dun index numbers for the wholesale prices of commodities reached their highest point during the war on Oct. 1, 1918, when the index number was $233.23, an increase of 93% over 1913. Prices fell slightly during the winter and then rose again and on July 1, 1919, the index number reached $233.70, higher than any recorded during the war. Aug. 1 showed a still higher level, $241.65. A very slight fall occurred in September and October followed by another rise and Dec. eclipsed all records, reaching $244.64, an increase of 100% over the average for the year 1914. Even more important in its bearing on the dollar's value is the fact that on Oct. 1 a large increase in rentals took place all over the country.

And now, having obtained reliable figures, from an unprejudiced authority, showing the change in the value of the dollar that has taken place since 1914, it is obvious that they must be applied as a correcting factor to *all* changes in prices, measured in dollars, to determine whether the price, measured by an unvarying standard, has gone up or down. It must be clearly borne in mind that money—the dollar—is only a medium of exchange. If a man sells wheat or

coal or clothing, the true price which he receives depends just as surely on the amount of other commodities the dollar which he receives will buy as it does if he sells his services as a laborer or a carpenter, or a physician or an engineer.

This fact, that the true price of a commodity depends on the average prices of all other commodities, has been generally overlooked in the current discussion on the high cost of living. Before we condemn a trade union for its demands for an increase in wages, a manufacturer for raising the price of his product, or an engineer for asking a higher price for the service he renders, it is fair to ask two questions: (1) Was the price received five years ago a fair one in proportion to other prices then current? (2) How do the changes in price now in question compare with the decrease in value of the dollar that has taken place?

It may be objected that to carry the above-stated principles into effect would tend to raise prices which are now below the standard and thereby to decrease still further the value of the dollar. But this will only be true if such prices are fixed by law and custom instead of by the law of supply and demand and are now below the average level. The question, how to reduce the present enormous cost of living, is another story. There can be little doubt, however, that the prices and wages which should be reduced to bring down the cost of living are those which are now above the average level, not those which are below it. There can be no dissent, either, that the only certain method to bring down prices is to increase production. When the supply of commodities is increased to exceed the demand, then, if the forces of competition be not held in check, prices will begin to fall, and we shall be on the sure road back to industrial peace and prosperity.

Continuing a series of interviews with contractors:

Construction Labor's Instability

An Analysis---

IV.—In which Harry Blenderman, of the Fred T. Ley Co., Inc., partially blames sensational news writing for industrial unrest, and suggests that conditions could be ameliorated by making the union laborer individually and legally responsible for his labor contract.

AT the door of the "unprincipled newspaper," which with sensational scare heads tells its story of strike, murder and riot, Harry Blenderman, assistant to the manager, Fred T. Ley Co., Inc., New York City, lays the responsibility for the fomentation of a great part of the present industrial disorder. Such papers, he says, so lacking in any moral responsibility, have invested the otherwise sane and industrious laborer with a belligerent spirit.

The industrial upheaval, which Mr. Blenderman believes has not yet reached its crisis, antedated the war. Several years before the war he discovered the presence in the ranks of organized labor of an element disposed toward industrial anarchy. The war, with its diverse means of employment, its greatly increased wages and the scarcity of labor gave the radical element the chance to strike a heavy blow. Abetted by the advertising that strikes and riots receive in the daily press, labor has as a result of a war condition gone the limit in its demands—demands founded upon nothing save the laborer's desire to test the limit of his strength.

One strike, properly advertised, is, in the judgment of Mr. Blenderman, strong enough to damage materially all industry. One gang of laborers, seeing another gang making demands, decides that it will do the same. A succession of strikes and riots is inevitable therefore, when newspapers feature all lurid details. So continuously are his elemental emotions played upon that the laborer has been encouraged to assume a fighting attitude. "Once he has tasted blood he cannot be satisfied except with blood."

Through his taste for power coming to him as a result of the labor shortage created by the war; through the activity of a few conscienceless firebrands who have continually preached the exploitation of labor by capital, and through the conscious or unconscious encouragement offered his excessive demands by a sensational press, the laborer has himself become conscienceless, and is fast losing all desire to share either industrial or social responsibility.

The laborer, then, "intoxicated by his prosperity," observes Mr. Blenderman, is actuated by a single motive—to get all he can out of his employer. The sane, industrious building mechanic of former years, possessed of the proper balance of public, private and industrial responsibility, has been relegated to the background. He has been superseded by the younger and irresponsible mechanic. This newer type shrinks at the suggestion of any scheme which will make him share in the lean as well as the fat construction cycles. His attitude takes into account neither the brains behind business organization nor the administrative ability underlying successful management.

Mr. Blenderman emphasizes the fact, expressed in preceding articles, that there is a decided shortage of construction labor. He heartily endorses the plan permitting restricted immigration. The need for foreign labor, he asserts, is urgent. But he offers corrective measures yet unmentioned. The first of these would be to purge the "yellow" press and to eliminate publications designed to propagate disorder and unrest through misstatement and poisonous insinuation. His second corrective suggestion is that the union laborer be made legally, individually responsible so that he will be forced to live up to contracts he signs for the supply of his labor.

Conditions now exist whereby demands made by labor in excess of the contract price must be borne by the contractor. Mr. Blenderman believes it possible to effect legislation whereby the laborer will be held as legally

responsible when he signs his name to a labor contract as the contractor is legally responsible for agreements he enters into. Why such legislation has so far been avoided Mr. Blenderman explains by the fact that politicians generally, realizing from what sources come the greatest number of votes, are not anxious to do anything that will defeat their political desires.

That there is a shortage of labor, which threatens further to complicate matters should the amount of construction materially increase, contractors generally agree to. One thing to be avoided, states Mr. Blenderman, is contractors bidding against one another for different classes of labor. This state of affairs is liable to exist, he declares, in the event that the construction program materially increases, and in the event that the utmost in coöperation is not sought by the contractors.

Should the construction program increase to such an extent that it will force such a condition, Mr. Blenderman suggests a pro-rating of work over a stated period of time or a slight slowing up of all work. A slacking up in, or a cessation of, the construction program is not at all desired, but is accepted as an alternative in the event that contractors get to bidding against each other, thereby causing another sharp inclination upward in the price of construction labor.

One reason why labor is so hard to handle at present, a reason heretofore unmentioned, Mr. Blenderman says, is the fact that during the war building mechanics learned other trades to which they can turn their hands in the event that employers discharge them. The laborer is now so versatile that he has no fear of unemployment if locked out by his employer, or should he strike while working at his chosen trade. Mr. Blenderman also states that though a close combination of the largest contractors might initiate some action whereby the building mechanic could be brought to a partial realization of his dependence upon organized industry, the percentage of small uncontrolled builders would be so large as seriously to militate against any plan conceived to return the laborer to a reasonable basis.

Mr. Blenderman has the advantage of being able to look at the labor situation from both angles—that of the employee and of the employer—because of his former service as a union stone mason and his present responsibilities as a company executive. He has served his time in setting brick in the wall, and is unusually familiar with labor conditions from within the ranks of labor. He earnestly asserts that he has no quarrel with labor. On the contrary, he has its interest at heart though his patience is worn by the increasingly unreasonable demands that a certain radical element enforces the majority to make. Viewing the situation, then, from the double viewpoint of the employer and former employee, he asserts that in many instances labor is demanding even more than it itself expects to gain.

Agreeing that corrective measures are to be found in welfare work, increase in the use of construction machinery, and restrictive immigration legislation, Mr. Blenderman adds his suggestions: Purge the newspapers; control construction, if necessary even to cessation of building; let contractors' organizations show the greatest coöperation in dealing with the labor situation, and make the individual laborer legally responsible for wage contracts.

Track Creepage Stopped on Heavy Grades of Logging Railroads

METHODS used to overcome creepage or running of rail on heavy grades of logging railroads are outlined in papers by Fred W. Powers, of the Smith-Powers Co., Powers, Ore., and Fred Madigan, of Wilson Bros. & Co., Independence, Ore., presented before the Pacific Logging Congress at Portland, Ore., Oct. 8-11, 1919. The use of large timber dead men to which slotted rails are spiked, and the banking of rails with clay or gravel to maintain a more even temperature, with a view to reduction in expansion and contraction, are the principal methods described.

Mr. Powers stated that the Smith-Powers Co. obtained the best results by spiking the rail to 8 x 16-in. timbers from 10 to 16 ft. long, used as dead men tightly tamped in and secured by bracing from banks or anchored to rock or concrete beds. If on a bridge, the dead man is bolted through the stringers with machine bolts. Slots, about 3 in. apart, are cut in the flange of the rail, on each side, to receive ordinary track spikes, fastening the rail securely to the anchored timber, as a slotted angle bar is spiked to ordinary ties at a joint. It was found that the number of dead men necessary varied according to grade, traffic, weight of rail, and condition of roadbed, but on some of the 6% grades timber placed "every few hundred feet" held the rail.

Creepage on a one-mile 7% grade with a 16° curve at the bottom was successfully overcome by Wilson Bros. & Co., according to Mr. Madigan, by banking the rails with clay and gravel, more readily to carry off the heat imparted to the rail by the rays of the sun and so reduce expansion and contraction which had consistently acted entirely in the direction of least resistance; namely, downward. On this grade it had been necessary to keep a gang of six men continuously at work during the summer months to repair distortion of track from creepage, and it was a common occurrence for the gang to have to realign the curve at the bottom of the hill after a loaded train had passed over it, before the empties could be returned.

It was recognized that the weight of steel itself on a steep grade is sufficient to cause running, but this was thought to be very slight as compared with the effect of a braked load going down the grade and presumably releasing a large portion of the force of expansion due to a rise in the temperature of the rail.

During the summer the rails were first heaped with clay, covering all but the ball of the rail. When the autumn rains started, gravel was substituted. Mr. Madigan reported that creepage troubles ended with the first use of clay, and that no money had been spent for maintenance since the substitution of gravel.

Oxygen in Steel

On account of the importance that frequently attaches to limiting the oxygen content of steel, it is of value to note from a recent study of the Bureau of Standards that "It is probably impossible to determine by the Ledebur method more than 25% of the oxygen present in steels as ferrous oxide." In these experiments, described in "Scientific Paper 350" by J. R. Cain and Leon Adler, mixtures of iron oxide and Acheson graphite were not reduced at 900° C. by the carbon in them when hydrogen was passed over at the rate of two liters per hour or faster.

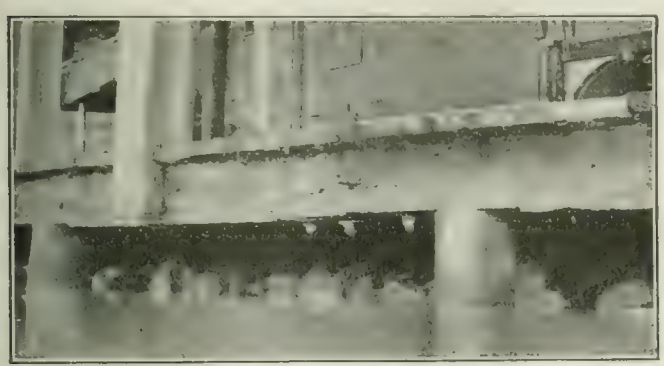
Pumping Station Undermined By Leaks and Shut Down

Stiff Clay Honeycombed by Rush of Water Under Low Head—Simple Repairs With Sheet Piles Enable Early Resumption

EXCESSIVE leakage through the foundation of a low-head centrifugal pumping station lifting water for irrigation over the bar from Utah Lake into the head of the Jordan River caused a shutdown Aug. 13, 1919, at a time when irrigators could least afford to be without water.

For more than 100 days every one of the centrifugal pumps working under a dropping head in the lake with a total lift varying from 0 to 7 ft. had operated continuously, although for some time the leak had been known.

So urgent were the demands for water that it was hoped the leakage would not increase sufficiently



BACKWASH OF 300 SECOND-FOOT CARRIED CLAY THROUGH THIS OPENING

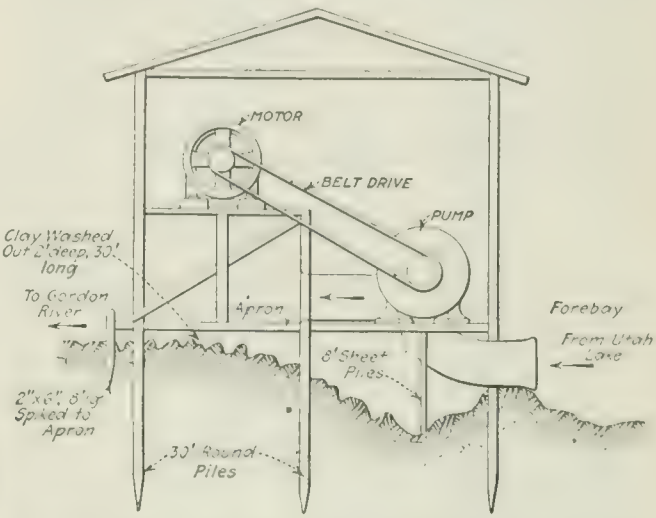
to endanger the structure before the season was over. When records indicated that 300 of the 800 sec.-ft. pumped were flowing back into the suction forebay, the superintendent felt that no further chance should be taken of the collapse of the superstructure of the station. After the pumps were stopped, a dike was thrown across a canal connecting the lake and the suction forebay.

The inlet and outlet pools were pumped out by means of hastily erected motor-driven centrifugal pumps discharging through wooden flumes. This was accomplished in less than 1½ days.

An inspection by a representative of *Engineering News-Record*, Aug. 15, in company with H. K. Burton, superintendent of the Salt Lake water-works, indicated an opening in the stiff blue clay 30 ft. long and 2 ft. deep directly under the wooden apron over which the pumps discharged. It appeared to converge to a deep hole, not unwatered, 15 to 20 ft. wide on the suction side.

By probing, the superintendent found that this hole did not extend much below the lower ends of a row of 8-ft. wooden sheeting under the pumps. A wagon-load of this sheeting was recovered. One of the photographs shows an opening 3 ft. high and about 20 ft. long between two of the suction pipes. These planks, which were spiked to the round piling supporting the structure, were torn off by the water. The round piles are 30 ft. long, and in no case were they undermined, so far as could be determined.

Since the supporting members, the round piles, were intact, and the superstructure showed no distress, a temporary expedient were determined upon. Sheet piles 8 ft. long, of 2 x 6-in. timbers, were driven by hand, directly in front of the plank apron over which the pumps discharge. The upper ends of these short piles were spiked to the apron. A penetration of 5 to 6 ft. was obtained, and it was believed that this barrier would



SKETCH SHOWING WASHOUT UNDER UTAH LAKE PUMPING STATION

hold back the bulk of the water for the six remaining weeks of the maximum pumping demand. The repairs were completed and pumping was resumed on August 18.

It is expected that the oldest portion of the station, which was built 17 years ago, entirely of wood, will have to be revamped. The later additions have concrete foundations and may be retained, although the



HONEYCOMBED CLAY UNDER APRON

question of installing screw pumps to obtain a higher efficiency is under consideration. The oldest units give 45% efficiency or less, and with the screw type it is hoped 70% efficiency over an extended range of the 0 to 7-ft. lift may be obtained.

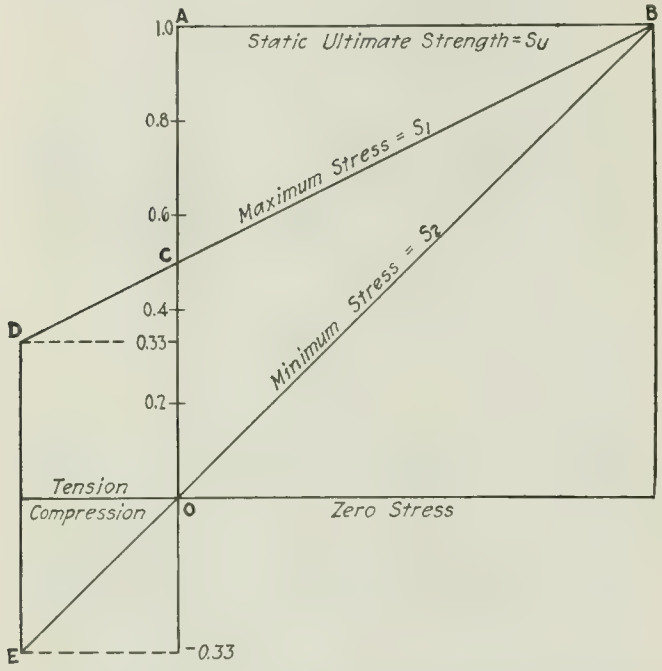
W. A. Knight is superintendent of operation of the pumping station and also acts under direction of the court as water commissioner, handling the distribution of the water to the canal companies. Salt Lake City owns one of the canals and exchanges the turbid warm lake water for potable mountain water. S. Q. Cannon, city engineer, is chairman of the board of canal company presidents employing Mr. Knight.

Broader Use of Johnson's Formula For Repeated Stresses

By J. B. Kommers
Assistant Professor of Mechanics, University of Wisconsin, Madison, Wis.

With the present state of our knowledge regarding the effect of repeated stresses on steel, the diagram suggested by J. B. Johnson, and often called Goodman's diagram, probably represents the facts better than any other diagram or formula which has been suggested.

Goodman's diagram is shown herewith. The values originally plotted by Goodman were for cases in which



GOODMAN'S DIAGRAM FOR REPEATED STRESS

the material had withstood from 4,000,000 to 10,000,000 cycles of repeated stress, in a few cases even more than 10,000,000. The length O A on the diagram represented the ultimate static strength of the material. The minimum stresses to which the material had been subjected were plotted as percentages of the ultimate static strength on a straight line, E O B. The maximum unit stresses to which the material had been subjected were then found to fall along the straight line D C B, so that point C represented 50% of the ultimate strength.

According to the law indicated by this diagram, when a stress is repeated from zero to a maximum value, the maximum value may be made 50% of the ultimate strength. If the maximum stress is greater than 50% of the ultimate, then the minimum stress must be made greater than zero if a large number of repetitions is to be withstood. If the maximum stress is completely reversed, then the stress may be 33% of the ultimate. As the maximum applied stress approaches the ultimate, the range of stress (that is, the algebraic difference between the maximum and minimum stresses) must be decreased.

It has been shown by J. B. Johnson, in "Materials of Construction," 5th edition, pp. 780-784, that according to Goodman's diagram the maximum stress to which the material may be subjected is given by the formula

$$S'_1 = \frac{\frac{1}{2} S_u}{1 - \frac{1}{2} \frac{S'_2}{S'_1}} \qquad (1)$$

in which

S'_1 = maximum unit stress which will cause failure after from 4,000,000 to 10,000,000 cycles of stress.

S'_2 = minimum unit stress applied during the cycle.

S_u = static ultimate strength of the material.

In order to determine to what extent experimental results check the construction of Goodman's diagram, and therefore to what extent formula (1) is justified, Table I (see next page) has been prepared. In this table are given the results of experiments on a great variety of ferrous materials, tested under various conditions. Only those results are given in which rupture took place after at least 3,000,000 cycles of stress had been applied.

The last two columns of the table give the maximum unit stress to which the material was actually subjected in the test, and also the maximum unit stress which the material should have been able to withstand according to formula (1). In those cases in which the material was subjected to a very high number of reversals it is to be expected that the unit stress in the test might be less than that given by the formula. The results show that in general the materials were able to withstand a higher stress than that calculated from the formula, which indicates that when the formula is in error it is in error on the side of safety.

The maximum unit stress as determined from formula (1) is the stress which for the given ratio of minimum to maximum stress would cause failure in from 4,000,000 to 10,000,000 repetitions. Moore and Seely (in *Proc. Amer. Soc. Test. Mat.*, 1916, Vol. 16, p. 470) have found that a decrease of 9% in unit stress doubles the number of repetitions required for failure. On this basis a factor of safety of 1.87 on the stress corresponds to an increase in repetitions of about 100 times, a factor of safety of 2.26 corresponds to an increase of about 500 times, and a factor of safety of 2.56 to an increase of about 1000 times. On this basis if formula (1) gave a maximum unit stress of 30,000 lb. per square inch (for a life of 4,000,000 to 10,000,000 cycles), then a stress of 11,700 should give a life of 4,000,000,000 to 10,000,000,000 cycles.

Formula (1) may be used, therefore, either by applying a factor of safety to the unit stress or by applying a factor of safety to the number of cycles for rupture. Based on the assumption that a decrease of 9% in unit stress doubles the cycles for rupture, a very simple relation exists between the factor of safety f based on the unit stress and the factor of safety f_1 based on the number of cycles: $0.136 \log f_1 = \log f$. This assumes that the unit stress varies with the number of cycles for rupture as a straight line when the results are plotted on logarithmic paper. It has been pointed out by Basquin (*Proc. Amer. Soc. Test. Mat.*, 1910, Vol. 10, p. 625) that when unit stresses are plotted against cycles for rupture on logarithmic paper a straight line will fit the points very well, at least up to about 1,000,000 cycles. Whether this relation holds for large numbers of cycles is in doubt because of lack of experimental evidence. However, one of Wöhler's steels subjected to repeated

TABLE I. REPEATED-STRESS TEST RESULTS COMPARED WITH FORMULA

Experimenter	Kind of Material	Kind of Test	Repetitions of Stress in Test	Ratio of Min. to Max. Stress in Test	Max. Stress in Test	Max. Stress by Formula
Bauschinger	Wrought-iron bars	Repeated tension	16,480,000	0	13 8	13.35
	Wrought-iron bars		9,310,000	0	17 2	13 55
	Steel axle		9,040,000	0	19 7	20 05
	Steel rail		10,190,000	0	16 4	19 5
	Steel rail		7,910,000	0	19 7	19 5
	Steel boiler plate		4,850,000	0	18 4	13 3
	Steel boiler plate		6,340,000	0	16 4	13 3
	Wrought-iron plate		5,170,000	0	7 1	12 6
	Wrought-iron plate		5,190,000	0	9 85	12 6
	Wrought-iron plate		5,180,000	0	16 4	12 6
	Mild-steel plate		6,680,000	0	16 0	14 25
	Mild-steel plate		3,550,000	0	16 0	14.25
	Mild-steel plate		7,350,000	0	16 0	14 25
	Wrought-iron bars		9,110,000	0	13.2	13 3
	Wrought-iron bars		7,400,000	0	16 4	13 3
Wöhler	Wrought-iron axle		10,141,645	0	15 28	10 15
	Wrought-iron axle	Repeated bending	4,035,400	0	17 18	10 15
	Cast steel		5,234,200	0	23 87	22 80
	Wrought-iron axle	Rotating beams	19,186,791	1	8 6	7 1
	Wrought iron		3,930,000	1	11 5	9.4
	Cast-steel axle		3,114,160	1	15.3	15.2
	Cast-steel axle		4,163,375	1	14 3	15.2
	Cast-steel axle		45,050,640	1	14.3	15 2
	Cast-steel axle		20,467,780	1	15 3	14 08
	Cast-steel axle		3,558,700	1	13 4	14 08
	Cast-steel axle		3,275,860	1	11 5	9 25
Baker	Rivet steel		14,876,432	1	11 6	9.23
Haigh	Soft steel	Alternating direct stress	5,900,000	1	13.2	8.93
	Soft steel		3,140,000	0 39	17 06C	11 20C
	Soft steel		4,600,000	0 097	20 7C	12 80C
	Soft steel		8,660,000	0 077	20 25C	12 90C
Stead & Richards	Sorbitic steel, 0.44% carbon	Rotating beams	3,517,200	1	25.0	18 37
	Steel, 0 36% carbon		4,400,000	1	19 0	12 70
Rogers	Steel, 0 27% carbon		4,324,900	1	20 0	34.63
	Steel 0 27% carbon (4 tests)		3,652,452	1	40.0	34.63
	Steel, 0 32% carbon		7,615,035	1	14 0	9.78
Watertown arsenal	0 26C steel	Rotating beams	27,546,930	1	40,000	28,450
	0 26C steel		50,812,370	1	40,000	30,350
	0 26C steel		19,578,810	1	40,000	31,440
	0.26C steel		4,878,310	1	45,000	29,650
	0 29C 5 7 Ni steel		4,368,400	1	40,000	36,000
	0 29C 5 7 Ni steel		3,795,200	1	40,000	41,580
	0 25C 4 5 Ni steel		3,296,700	1	40,000	38,930
	0 66C steel		3,689,000	1	40,000	42,580
	0 66C steel		4,323,600	1	40,000	50,870
	0 25C steel		4,396,480	1	45,000	34,130
	0 73C steel		7,264,010	—1	45,000	46,130
	0 82C steel		62,076,660	—1	35,000	47,600

NOTE.—Unit stresses are given in tons per square inch, except in the case of the Watertown Arsenal results, in which case they are given in pounds per square inch.

The stresses marked C were cases in which the maximum unit stress was compressive, instead of tensile.

bending gave a straight line up to 19,000,000 cycles. There is also some experimental evidence which tends to show that the straight line curve tends to bend to the right for large numbers of repetitions (number of cycles being plotted as abscissas). To assume that this straight-line relation does hold for large numbers of cycles, as will be done in this discussion, is an error on the side of safety.

The use of the formula for factor of safety will be illustrated by the solution of a problem. Suppose an axle subjected to reversed bending is to be designed on the basis of a life of 10 years, running at 300 r.p.m. for 10 hours every day in the year. This would mean about 657,000,000 revolutions. Moore and Seely are of the opinion that a multiplier of 100 is not too large to use on cycles for rupture as a factor of safety. This would make 65,700,000,000 cycles for the present case. Formula (1) is based on stresses which cause failure in from 4,000,000 to 10,000,000 cycles. In order to be conservative it is recommended that a value of 5,000,000 cycles be assumed to cause failure for all stresses taken from Goodman's diagram. This, in the present case, gives a factor of safety of 65,700,000,000 ÷ 5,000,000, or 13,140. The logarithmic formula for factor of safety gives the corresponding factor of safety based on unit stress as 3.63. If a nickel-steel shaft is used having an ultimate strength of 120,000 lb. per square inch, formula (1) gives a unit stress of 40,000 lb. per square inch, the ratio of minimum to maximum stress being —1. Dividing this stress by 3.63 gives an allowable unit stress of 11,020 lb. per square inch.

In order that the amount of computation required for any problem may be reduced to a minimum, Table II has been prepared. From this table the factor of safety to be used on S'_1 may be read off when the number of cycles is known. Taking the value of S'_1 from formula (1) and then dividing by this factor of safety will give the proper allowable unit stress.

TABLE II FACTORS OF SAFETY ON STRESS FOR VARIOUS LENGTHS OF LIFE

Number of Cycles of Stress Causing Failure	Factor of Safety to be Used in Stress from Formula (1)
100,000,000,000	3.85
90,000,000,000	3.78
80,000,000,000	3.72
70,000,000,000	3 67
60,000,000,000	3.59
50,000,000,000	3.49
40,000,000,000	3.39
30,000,000,000	3 26
20,000,000,000	3 08
10,000,000,000	2 81
9,000,000,000	2 77
8,000,000,000	2.72
7,000,000,000	2.68
6,000,000,000	2.62
5,000,000,000	2.56
4,000,000,000	2 48
3,000,000,000	2.39
2,000,000,000	2 26
1,000,000,000	2 06
500,000,000	1 87
100,000,000	1 53
50,000,000	1 37
10,000,000	1 10
5,000,000	1 00

Certain precautions should be kept in mind in using values of S'_1 obtained from formula (1). Bairstow found that when a cycle of stress was applied to a specimen in which the tensile unit stress was numerically greater than the compressive stress, a permanent elongation took place, even when the maximum unit stress was less than the static elastic limit of the material. For this reason no value of S'_1 should ever be

used as an allowable unit stress unless it is well within the elastic limit of the material.

In connection with Goodman's diagram it should be noted that when the stress is partly reversed the stress which is numerically greater is called the maximum unit stress, the other being the minimum.

Moore and Seely (*Proc. Amer. Soc. Test. Mat.*, 1915, p. 438; 1916, p. 471) have proposed certain formulas for determining a safe unit stress to use for materials subjected to fatigue. A comparison of results from their formulas with the methods advocated in this article will be of interest. Table III compares results

TABLE III. ALLOWABLE STRESS FOR LIFE HAZARD

	10,000,000 Repetitions		10,000,000,000 Repetitions	
Ratio of Minimum to Maximum Stress	Moore and Seely	Kommers	Moore and Seely	Kommers
0.8	161,700	45,400	70,250	17,800
0.6	80,800	39,100	35,100	15,300
0.4	53,800	34,100	23,400	13,350
0.2	40,300	30,300	17,580	11,850
0	32,300	27,300	14,050	10,680
—0.2	26,900	24,700	11,700	9,680
—0.4	23,100	22,700	10,030	8,900
—0.6	20,200	21,000	8,780	8,220
—0.8	17,950	19,550	7,810	7,650
—1.0	16,150	18,200	7,025	7,120

(*Proc. Amer. Soc. Test. Mat.*, 1915, p. 438; 1916, p. 471.)

with the formula which they recommend for cases in which failure would endanger life, and Table IV compares results with the formula which they recommend for cases in which failure would not endanger life. The comparison is made for structural steel of ultimate strength 60,000 lb. per square inch.

It will be noted that in both the above tables the results for reversed stresses (negative ratios) agree very well, although the formulas of Moore and Seely were arrived at by a method quite different from that

TABLE IV. ALLOWABLE STRESS FOR ORDINARY HAZARD

	10,000,000 Repetitions		10,000,000,000 Repetitions	
Ratio of Minimum to Maximum Stress	Moore and Seely	Kommers	Moore and Seely	Kommers
0.8	185,000	45,400	88,000	17,800
0.6	91,000	39,100	44,000	15,300
0.4	61,000	34,100	29,500	13,350
0.2	46,000	30,300	22,000	11,850
0	37,000	27,300	17,800	10,680
—0.2	30,000	24,700	14,300	9,680
—0.4	26,000	22,700	12,500	8,900
—0.6	22,500	21,000	11,000	8,220
—0.8	20,000	19,550	9,800	7,650
—1.0	18,300	18,200	9,000	7,120

used by the author of the present article. For unidirectional stress, however, the results do not agree. It is seen that the formulas of Moore and Seely in a number of cases give values which are considerably higher than 60,000 lb. per square inch, the ultimate strength of the material. These results seem to indicate that for the larger plus values of the ratio of minimum to maximum stress the formulas are incorrect.

Soaking in Salt Lake Increases Life of Ties

When the Southern Pacific R.R. has ties that are to be stored anywhere in the vicinity of Salt Lake, Utah, it is the custom to put them into the lake and allow them to soak. It has been found that the high salt content in the water acts as a preservative and materially lengthens the life of the tie when used in an arid climate. This has been done for some years. It was begun when engineers of the company noted that Oregon fir piling lasted indefinitely in these waters. A "pickling pool" was accordingly selected, and ties are left in soak for a year or two whenever it is found convenient to do so.

County in Michigan Saves $10,000 on Own Pebble-Washing Plant

WHAT amounts to 400% gross profit on its investment has been realized by Wayne County, Mich., in the installation and operation of its pebble-washing plant at Northville, Mich. Instead of paying $2.25 per cubic yard for commercial pebbles to use on the Northville concrete paving job, by operating its own plant Wayne County has paid but 53c. per cubic yard, according to figures included in the recent report of the Board of County Commissioners. Approximately 10,000 cu. yd. of material will be taken out of the Northville pit. Cost of the plant was approximately $7,200 and daily operating expense is approximately $76—gravel loaded on industrial cars ready to haul—so the net saving on the Northville job alone is $10,000.

Wayne County entered into its own pebble-washing scheme because of the great possibility of being held up for shipments of pebbles and sand through railroad congestion and on account of the poor yard facilities at Northville. A gravel pit was leased at 15c. per cubic yard in the bank, measurement to be governed by the number of cubic yards of concrete laid on the Northville and Fishery Road jobs—the only two jobs upon which gravel from the Northville pit was to be used. An industrial railway was laid right up to the chutes from the washing-plant bins. A small stream fed by local springs furnishes an abundant supply of water, which is pumped 1,000 ft. through two lines of 3-in. pipe to the washing plant by electric motor. Three-inch pipe was used because it was in stock. The plant is operated by a small electric motor.

The average daily output has been 200 cu. yd., the total daily cost of this production being $76, distributed as follows:

Four teams, $8 each	$32.00
Two scraper holders, $5 each	10.00
One foreman, $6.50	6.50
One operator, $6	6.00
Two carloaders, $5 each	10.00
Motor rental	1.50
Electric current (estimated)	10.00

Adding the 15c. per yard for the cost of the material in the pit, a total cost of loading the gravel on industrial railway is 53c. Additional saving might have been made by the installation of a dragline bucket and hoisting engine, but owing to the short run which the plant will have it was not considered advisable to invest in so expensive equipment.

Commercial pebbles cost $1.25 per ton f.o.b. cars at Northville, plus about 25c. per ton to unload into industrial cars, making a total of $1.50 per ton, or $2.25 per cubic yard.

Wayne County expects next year to operate the plant for a few months to furnish maintenance gravel for the 24 miles of gravel road from Detroit to Plymouth and Northville.

Responsibility for Water-Main Break Damages

Responsibility for damages to breaks in water mains due to the increased pressure caused by the introduction of Catskill water has been placed on New York City by the Appellate Division of the state Supreme Court. The decision, which is subject to appeal, is printed in the September *Journal of the American Water Works Association*

Side Hill Loading Plant for Concrete Road

Batch Boxes Successfully Charged Through Bottom Gates in Horizontal Storage Platform Built Out From Hillside

UNUSUAL details in central proportioning plant operation and in batch-box arrangement have been developed in constructing the 5½-mile concrete road from Martins Creek to Bangor, Penn. Free discharge of stone and sand from flat-bottom bins is insured by using the unloading crane to shift the material in the bins; manual handling of cement bags is greatly lessened by roller conveyors; all measuring is done in the batch boxes; three-compartment batch boxes keep sand, stone and cement separate, and a close cover for the cement compartment insures a dry cement.

Officially, the improvement is Route No. 165, Northampton County; it is a portion of the main route between Philadelphia, the Delaware Water Gap and the Pocono mountain resorts. Its length is 28,791 ft., or a trifle less than 5½ miles. The slab is 18 ft. wide and 6 in. thick at the edges, and is reinforced with a mesh weighing 25 lb. per 100 sq.ft. A 1:2:3 concrete is specified. Premolded expansion joints were spaced every 50 ft. at the beginning of the work, but later this spacing was changed to 500 ft. to tangents and at the beginning and end of vertical and horizontal curves, but not closer than 100 ft. Vertical contraction joints, without expansion, are placed wherever work is stopped for the day. Generally speaking, the construction is side-hill work calling for a considerable volume of excavation, largely in rock.

Advantage was taken of the sidehill in locating the loading plant, as indicated by the view, Fig. 1. Sand and stone delivered by railway are unloaded by a locomotive crane, running on a parallel track and operating a 1-cu.yd. clamshell, into the storage bins. These consist of a platform built out from the crane-track level overhanging the slope and supported by a timber framework; the ends and the outer edge of the platform have plank sides. Holes with 12 x 12-in. iron chutes, controlled by gates, were provided in the bin bottom for charging the batch boxes on cars running underneath the bin. There are five chutes for stone and four for sand, and they are so spaced as to discharge vertically into the proper batch-box compartments. No difficulty is experienced in securing a free flow through the chutes when plenty of material covers them, and when a chute becomes uncovered the crane shifts material from other parts of the pile to cover it again.

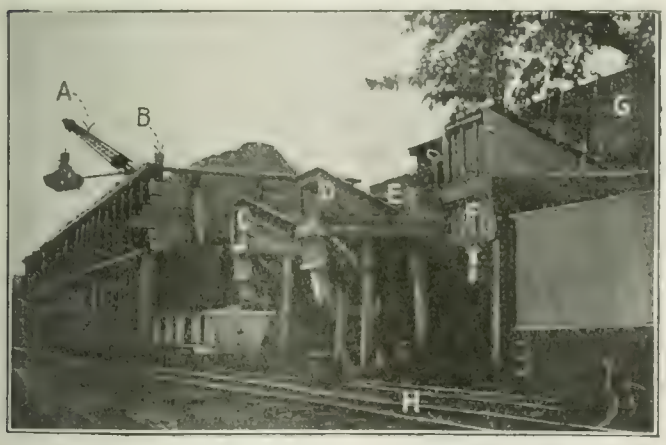


FIG. 1. ARRANGEMENT OF BINS, CHUTES AND TRACK FOR PROPORTIONING BATCHES

A, unloading crane; B, gravel and sand bin; C, cement chute; D, cement chute; E, railway track; F, cement chute; G, cement house; H, industrial railway

Cement is shipped in bags. When cars are in and concreting is in progress the bags are delivered directly from the car to the charging chutes shown by Fig. 1. Delivery is by a roller conveyor which extends from the car through the cement house to the chute. If paving is not in progress, the bags are removed from the conveyor at the cement house and stored. The conveyor has 18-in. rollers. When bags are being delivered to the chutes they are placed on the conveyor with the tie end uphill, so that they may be untied as they move downward and be ready for emptying when the chute is reached.



FIG. 2. INDUSTRIAL TRAIN DUMPING AT MIXER

Transportation of materials to the mixer is by six-car trains hauled by three-ton gasoline locomotives on 24-in.-gage industrial track. Especially heavy cars with 7-in. channel sides, roller bearings, spring journals and spring drawbars are used. Each car carries two batch boxes of three compartments each, holding respectively 12 cu.ft. of stone, 8 cu.ft. of sand and 4 cu.ft. of cement. The cement compartment carries a cover as protection against rain. In this connection the superintendent of the work suggests that the whole box be covered, as when rain water collects in the bottoms of sand and stone boxes it is likely to work through into the cement and damage it. Proportioning is accomplished by filling the respective compartments as the train passes under the aggregate bins, and by the cement chutes.

At the mixer the batch boxes are lifted from the cars by a mixer crane and dumped into the charging skip by tilting. The slab is compacted and finished by machine tamping.

Grade preparations for this road required rather heavy rock excavation, partly in through cuts but in large part in side-hill cuts. The volume of rock excavation was 19,520 cu.yd. of limestone, shale and slate. A wagon compressor supplied the air for drilling. After blasting, the rock was loaded by steam shovel into wagons and hauled to dumps. With two drillers, one helper and a foreman, 145 ft. of hole per day was drilled. The maximum depth of hole was 12 feet.

The contract for this improvement was let to McArthur Brothers Co., New York, for $320,000. Alfred H. Sauerbrun is superintendent for the contractors. The work is under the supervision of the Pennsylvania State Highway Department, W. D. Uhler, chief engineer, and W. R. Wolfinger, district engineer. George D. Evans was chief inspector.

Resistance of Soft Clay to Penetration By Pyramids and Piles

A NEW attack was made on the subject of the mechanical properties of clay and its resistance to penetration—that is, its load-carrying power—by A. S. E. Ackermann in a long series of laboratory experiments reported in a paper read before the Society of Engineers (London) last March and printed in the society's "Journal" No. 2 of 1919. The experiments, made on London clay puddled to a very soft condition, tend to show that the material experimented with was elastic; that at a definite pressure, varying with the temperature and the percentage of water, it flowed like a viscous fluid; that tapered piles in clay will support more load per unit of volume than straight piles; that side friction is the main factor in pile supporting power; and that pointed piles are more efficient than blunt piles.

All the work was done on laboratory scale. In the experiments with square pyramids, two tapers were used; one pyramid measured 6½ in. square at the base and was 9½ in. high (half angle 18° 47′), while the corresponding dimensions of the other were 2⅝ in. and 15½ in (half angle 4° 57′). Rods or "piles," of diameters from $\frac{11}{16}$ in. to 2½ in., were used, sometimes with square end, sometimes fitted with a point; and tapered piles, truncated pyramids and round disks were also tried. In each case the test object was forced down into the clay by a loading and guide rod, passing through a guide some distance up, and loaded at the top by weights placed on a self-centering carrier. The load was increased by small increments, and the downward movement of the rod was measured when it had come to rest.

The clay contained from 27.8 to 39.6% of water in the various experiments. A coal scuttle was used as a container, so that only moderate penetrations could be reached. Its elasticity was shown by a torsion experiment, made on a rolled specimen about ¾ in. by 27 in. suspended by one end and twisted by means of a crossbar at the lower end to an angle of 37½°; this rod recovered to a set of 5½°, and on repeating the twisting and holding it for 5 sec. it recovered the full 32° of twist within 2 sec., indicating an acquired complete elasticity.

With the pyramids, the load varied as the square of the penetration but directly as the area of contact between the test object and the clay. In the pile experiments the plot of load against penetration curved to the right, tending ultimately toward a sloping straight line. This, it was concluded, was due to the combination of base and friction effects; by measuring the former, using a thin horizontal disk in place of a pile, and subtracting the resistance of the disk from that of the pile, nearly straight-line plots were obtained. The computed mean surface friction (on wood) was found to vary greatly with both water content and temperature of the clay, and in addition proved to be greater for a pile of small diameter than for one of large diameter. At a water content of 29% and at 45° to 47° F., a 1-in. pile had a surface friction of 0.72 lb. per square inch, and a 2½-in. pile a friction of 0.45 lb. per square inch. Comparison experiments for straight and tapered piles showed larger friction values for the latter than for the former, even with only 1.6% taper; the advantage of the tapered pile was still greater when expressed as load carried per unit of pile volume. While the results were quite variable, the author gives a figure of 24.7% as expressing the advantage of a tapered pile over a pointed straight pile (35-mm. square pile compared with tapered square pile 36 mm. and 18 mm. at ends.

Flat horizontal disks forced down into the clay gave load-penetration curves tending to become horizontal. "At certain critical loads the disks started, and continued without additional load to sink comparatively rapidly into the clay." Considering that under the critical load the clay directly under the disk acquires the nature of a viscous liquid, the author computed the "pressure of fluidity." At 29% moisture it was about 1200 lb. per square foot, the values for disks 1 to 2½ in. in diameter being in close agreement. These loads were reached when the disks had been forced about 4 in. into the clay, lower pressures sufficing for penetrations of lesser amount. The "pressure of fluidity" decreased rapidly with increasing water content of the clay, falling to 750 lb. per square foot for 31%, 500 lb. for 33%, and 250 lb. for 37% of water content. As even the highest of these values is very far below any footing pressure in clays ordinarily utilized for foundations, it is evident that the material experimented on was an abnormally soft clay.

Service of Motor Truck During British Railway Strike

POSSIBILITIES of the use of heavy motor vehicles, particularly to relieve congestion at docks and railroad terminals in London, were revealed in the recent strike in England. A description of this forced investigation of the economy and utility of heavy haulage by truck is given in *Commerce Reports* by Trade Commissioner Henry F. Grady of London. According to Mr. Grady, Great Britain's conclusion upon the settlement of the strike was that motor vehicles have invaluable possibilities for public service.

The three biggest opportunities for the heavy motor vehicle, according to Mr. Grady's report of the situation, lie in the evacuation of docks and railroad terminals, and in the transport of farm and dairy produce to the marketing centers. During the strike the motor vehicle appeared to have been specially useful in the collection and distribution of food. Much less handling, meaning a great deal less warehousing, of food is necessary when shipped by truck.

No adequate consideration can be made of the running cost of motor transport during the strike because of the abnormal conditions under which the transport service was initiated. The main advantage gained was proof that the community could call upon an alternative service, far more efficient and abundant than it was supposed to be. According to the London *Times*, the more efficient motor vehicles used by the government—which operated a maximum of 25,000 vehicles during the strike—were capable of running from 8 to 9 mi. on a gallon of gasoline. However, the average was 6 mi. per gal. Lubricating oil, labor, and depreciation brought the cost per ton-mile to a fairly heavy figure. The Ministry of Food charged traders for transport service 12c. per ton-mile. The motor correspondent of the *Daily Telegraph* gives the following as the highest figures that the road transport firms of

Great Britain charge today per ton-mile: One-ton vehicle, 35c; two-ton vehicle, 54c.; three-ton vehicle, 72c.; four-ton vehicle, 84c.; five-ton vehicle, 96c. These figures give a profit to haulage firms, provided the mileage run per day averages 60.

In the case of dock congestion the Port and Transit Committee of London consider that the cost of transport will be more than offset by limiting the enormous loss which results from the detention of ships unable to discharge cargoes. A big London drygoods house, says Mr. Grady, estimates the cost of handling its goods by rail at from $5.66 per ton for class 1 merchandise to $11.40 per ton for class No. 5 merchandise. In contrast with these costs, road transport charges would work out at not less than $10 a ton, and if the trucks were not loaded both ways, $20 per ton. The economic aspect of motor transportation cannot be arrived at, it is said, until an analysis is made of statistics and the actual cost per truck-mile is ascertained.

Effect of Deferred Earnings on Capital Value

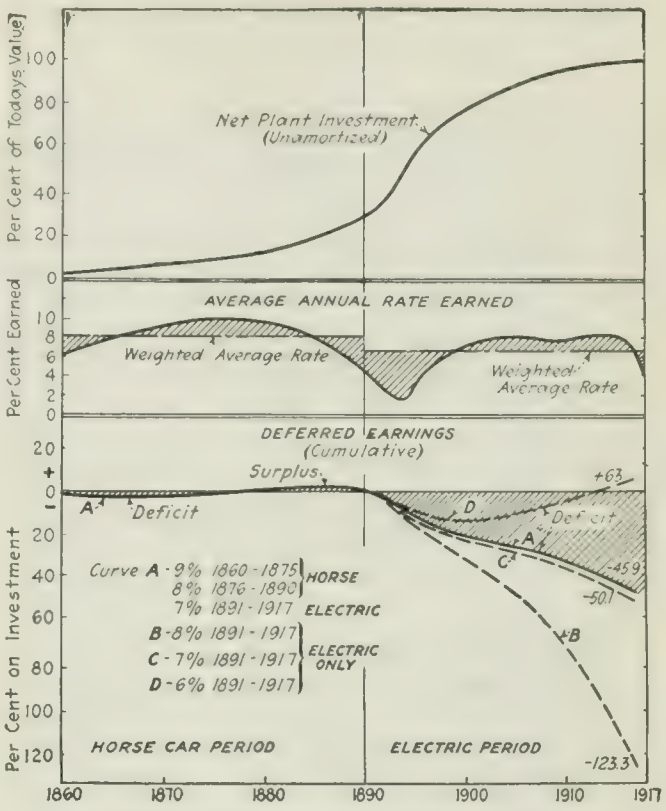
James R. Bibbin, in Paper Before Western Society of Engineers, Shows Cumulative Result of Small Net Returns

THE effect of cumulative deferred earnings on the capital value of a public utility, the effect being brought about by net returns less than current interest rate on unamortized investment, is pointed out in a paper presented before a September meeting of the Western Society of Engineers by James R. Bibbin, of the Arnold Co., consulting engineers, Chicago. An actual example of an electric-railway company is used to illustrate the principle of an aggregate deficit extending over a period of years, showing that a total deficit of nearly half the value of the property has been brought about in less than 30 years, although there have been apparent net returns annually.

The discussion is based on the theory that all periods of a property's history—past, present and future—must be considered in any determination of true status. Corporate deficits must be financed, and it is assumed that such deficits were financed, during the slumps, on money borrowed at current rates of interest. Similarly, surpluses, when they occurred, are assumed to have been put immediately at interest and credited at the same rate. Thus, the zero-line of surplus-deficit, as indicated in the lower portion of the accompanying diagram, indicates what may be termed "par" on the money market with respect to true operation and without reference to stocks and bonds.

The investment history of the company in question begins with the time of the Civil War, when a few horse-car lines were operated, and extends to 1917. The period of electrification began in 1890, when the property investment was but one-third the investment in 1917, the most rapid rate of increase occurring between 1891-1896, when the rate earned dropped rapidly, as shown in the diagram. Thus, a deficit, below the normal current interest rate, occurred, and is represented in the lower portion of the chart as cumulative deferred earnings.

A definite money rate is assumed (for example,



INVESTMENT HISTORY OF A PUBLIC UTILITY

from 1860 to 1875, 9%; from 1876 to 1890, 8%, and from 1891 to 1917, 7%) in accordance with which the property should have made earnings applicable to interest only, carrying forward each year the resulting surplus and deficit, as the case might be, to a cumulative total as of the date under consideration. At these rates, this property actually showed an aggregate deficit, or deferred earnings, amounting to nearly one-half (45.9%) of the existing plant investment in 1917. The horse-car period practically sustained itself at par up to 1890, when electrification on a large scale began, and unamortized investment increased accordingly. Closing with 1917, the curve of cumulative deferred earnings is downward, indicative of future conditions.

Output of Mineral Products in 1918

According to a preliminary report on the mineral production of the United States in 1918, based on figures compiled by the United States Geological Survey, the production of mineral components of building material, such as clay products, building stone, cement, lime and gypsum, showed a great decline from the output for 1917. The total value of all minerals produced was approximately $5,500,000,000, more than $500,000,000 in excess of the value recorded for 1917, but the total quantity produced was less. The output of fuels was greater than in 1917, though somewhat less anthracite coal was marketed. The increase in the quantity of coal marketed was about 5%, but the increase in value, due to higher prices, was more than 17%. It is significant that although the increase in the quantity of petroleum marketed was only a little more than 4%, the increase in value was over 32%. The value of the metals produced was about 3% greater in 1918 than in 1917.

Economic Values in Sewage and Sewage Sludge

The great difficulties incident to the recovery of grease and fertilizer from sewage, and the possibilities of attaining that end by a modification of the Cobwell process of garbage treatment, are reviewed in the following slightly condensed paper read before the American Society of Municipal Improvements, Nov. 12, 1919, by Raymond Wells, chemist and technologist, Homer, N. Y. The chief hope held out by Mr. Wells is that cities may contribute to the conservation of grease and fertilizer base while getting rid of their sewage sludge after it has been produced, rather than that they may expect to get much, if any, revenue from it, at least in the immediate future. Mr. Wells has played an important part in the development of the Cobwell process and writes also from the viewpoint of a purchaser of grease.—EDITOR.

VAST quantities of valuable materials are present in sewage, but so great is the dilution that methods of recovery readily applied in other waste reclamation are not applicable to sewage or sewage sludge.

Partial elimination of moisture by filter-pressing or centrifuging, followed by drying, would seem to be the simplest method of putting sludge into a valuable form. But, unfortunately, the almost colloidal character of the precipitate, and the amount of grease and metallic soaps contained, render pressing and centrifuging below 75-80% of moisture a difficult task. The subsequent evaporation of so great an amount of water in any type of dryer is most expensive, and odors given off are extremely disagreeable. Furthermore, in direct-heat dryers, the volume of gases of combustion, together with the moisture-saturated air, is so great as to preclude any thought of condensing or scrubbing out the odors. For this reason alone, aside from the difficulties encountered in drying such a material, it is difficult to see any hope of solution in this direction. Moreover, the dried residue or tankage obtained by this method, while having considerable manurial value, is in a most undesirable condition for use as fertilizer or fertilizer-base goods.

GREASE LESSENS FERTILIZER VALUE

This is due to the grease contained which, when it exceeds 8% in any tankage, renders its assimilation by the soil extremely difficult. Really, to complete the cycle of operation, the dried sludge should be percolated, the grease removed and the percolated tankage redried. Since, however, a large percentage of the grease present is in combination with alkaline earth and heavy metals in form of metallic soaps, it renders solution by simple percolation impossible. For this reason it is necessary to acidulate the sludge, prior to percolation, with some mineral acid, so that the fatty acids combined with metals as soaps will be liberated and put in such condition that they will be soluble in the usual solvents employed in percolation. This acidulation would have to take place prior to the drying operation, in suitable lead-lined digesting apparatus, and no matter how carefully this operation were carried out, the wear and tear on the drying apparatus and the percolator, due to acid action, would render the operation very expensive and troublesome. Not only would the appartus employed be very short-lived, but the action taking place between the liberated fatty acids and the grease in immediate contact with even a trace of mineral acid at high temperature would crack the fatty materials so badly as to render them valueless. This was very evident in attempts by the writer to handle samples of sludge made by the Miles-acid process, by direct drying. At a certain point where most of the moisture was eliminated, charring took place with copious evolution of sulphur dioxide and acrolein vapors, and the grease obtained by subsequent extraction and distillation gave an extraordinary amount of tar and unsaponifiable matter. Not only does this reaction take place in the drying operation, but the solvent carrying the grease also carries with it small traces of mineral acid, which must be carefully washed and settled out before distillation for recovery of solvent. If this is not done, upon approaching a certain concentration in the still, violent foaming with evolution of sulphur dioxide and fatty decomposition products takes place, and again the grease is damaged. It may be well to note that the mineral acid referred to is of course, sulphuric acid, no other acid being available, on account of price, for use on such low-grade raw material. For these reasons, the operation of drying, percolating, redrying, etc., so readily applied to other materials, seems not to be very successful when used on sewage sludge.

THE DEWATERING PROBLEM

Destructive distillation of the dried or semi-dried sludge has been attempted, with the usual methods of recovery of the ammoniacal liquors and oils. Here again the problem of moisture elimination is intruded, and the recoveries made are not such as warrant the hope of even paying for the operation, much less of showing any profitable return. In both the cases of distillation of dried sludge and of garbage tankage, the experiments of the writer have in all cases failed to show a greater recovery of nitrogen in the ammoniacal liquors than 35-40% of that present in the original samples. As a rule, an additional 30% remains in the retort charcoal, with the residue passing off as nitrogen in the combustible gases. The oils passing over are of little value except as fuel. This seems to the writer a very expensive way of producing fuel oil.

Acidulation of semi-dried sludge from filter-presses or centrifuges, followed by drying in retorts, with subsequent distillation in current of superheated steam, to carry over the fatty acids liberated by acid, has been tried, but found unsatisfactory for many reasons.

Methods have been described and tested out on a large scale, attempting the direct extraction of greases from wet sludge by volatile solvents. In these processes, which are difficult and expensive to carry out, a partial solution of the free grease results, together with a portion of the waxes existent in sewage, and of soaps. The result is the formation of extremely resistant emulsions, which seem to defy any recovery treatment by distillation. After such an emulsified mass has reached a certain concentration in the solvent recovery stills, the whole charge expands into a foamy mass, in which, seemingly, a gallon will fill a large tank.

An endless number of methods and schemes have been tried first and last, but apparently none had sufficient merit to survive the first attempts. Possibly many failed under market conditions which do not exist at the present time, or, what is more likely, at their

beginning they promised so much that mere partial success gave nothing but discouragement.

Leaving the recovery method aside for the moment, has sewage sludge any inherent values, and, if so, what are they? What type and condition of the sludge offers the greatest possibilities?

What Is the Value of Sewage Sludge?

Setting aside for the present the moisture content, the value of the sludge will be governed by its grease and nitrogen content, since, while all sludges contain small percentages of bone phosphate and potash, from a practical standpoint they may be neglected.

Consider the following analyses (dry basis):

	Ammonia, Per Cent.	Grease, Per Cent.
Baltimore sludge, acid process, fresh	3.26	27.23
Boston sludge, acid process, fresh	3.91	29.30
Chicago Sanitary District, activated, fresh	5.10	14.70
Pleasantville, N. Y., settling basins, one month in basin	4.14	27.40
Syracuse, settling basin, fresh	4.92	9.60
Syracuse, activated, fresh	5.06	17.70

All of the analyses are from samples of sludge produced from comparatively fresh sewage and are representative of sludge rapidly deposited and not allowed to rest in the tanks for any great length of time. For that reason little bacterial action had taken place, and the ammonia and grease content were at their maximum for the different types of sludge. Compare with these the analyses of samples of sludge from so-called septic tanks or sludge which has been exposed for a great length of time on drying beds:

	Ammonia, Per Cent.	Grease, Per Cent.
Baltimore sludge from tanks, on bed approximately six months	2.24	1.50
Chicago activated, nine months old	4.40	5.00
Akron, O., three months in tank, six months on bed	1.00	6.00

All other things being equal, the value of a sludge for byproduct recovery purposes depends upon the shortest possible period of tanking and shortest elapsed time between tank and ultimate utilization. In other words, bacterial action and weather erosion must be restricted to a minimum. This is directly contrary to usual sewage practice and is one of the rocks on which the disposal proposition has stumbled. Below a certain minimum of recoverable values, there is no use attempting recovery. This minimum seems to be for low-grade ammoniates, such as garbage tankage and sewage sludge, approximately 3% ammonia. Below this the expense of handling and freight cost put it out of all hope of competition with other and more concentrated materials. From an economic and business standpoint, any goods falling below this rating had better be forgotten and no time wasted on developing methods of handling.

Moisture Content of Sludge Vital

Moisture content of sludge leaving tanks is the next most vital consideration. In order to come within economic range of any method of artificial drying of any material containing 3% to 3.5% ammonia and 10% to 15% grease on a dry basis, moisture must not exceed 75% to 80%. All sludges as they come from tanks or basins are far above this, and activated sludge way beyond. Sludge from ordinary sedimentation basins can be drained and air-dried within several weeks to 77% to 80% moisture, and by centrifuging to about the same amount. It would appear, however, that the simplest and most inexpensive method is that of depositing sludge after removal from tanks on drainage beds, exposed to atmospheric drying conditions. In any case, without the presence of water dumping facilities, the sludge must be partially dewatered before final disposition.

With sludge containing 75% moisture the ultimate disposition with byproduct recovery is not impossible, though difficult and presenting many curious conditions.

To accomplish the disposal with production of a marketable tankage and grease, the elimination of all of the moisture with subsequent extraction of the grease by volatile solvents, a system of drying, extraction and recovery in one operation is suggested. Such a combined and complete operation is carried out at the present time only by the Cobwell process.

This process, as is doubtless well known, is applied to municipal garbage, dead animals, slaughter-house offal and other wet organic waste materials. At the request of several engineers and municipal officials, a number of small-scale and several large-scale experiments have been made on sewage sludge, with results which seem to warrant some hope of solution of the problem.

Simultaneous Dehydration and Degreasing

In this method of dehydration with simultaneous degreasing, the principle employed is that of desiccation in a hot bath of an immiscible solvent, which shall serve not only as a dehydrating medium but shall also during the period of drying continually dissolve the grease contained in the material to be dried. Such a solvent, preferably employed in the handling of sewage sludge, is a high-boiling petroleum naphtha, distilling within the range 360° F.-420° F., which corresponds to the first 60-70% over in the fractionation of "standard waterwhite kerosene." This material serves not only as the most economical heating medium, but, owing to the high temperature maintained in the desiccating mass, serves to remove or dissolve the metallic soaps as well as the free grease. Cold or merely warm solvents of a less oily nature have little solvent action on such soaps, but high-boiling oils, particularly when carrying small quantities of grease, are able to dissolve them without difficulty. Upon cooling they are apt to be deposited as jelly-like masses or to cause the gelatinization of the whole solvent solution, and for that reason the solution must be treated, before entering the recovery stills, in such manner that the soaps are decomposed and a solution of clean, fatty acids results. This treatment will be taken up in order.

The principal apparatus consists essentially of a closed tank, circular in shape and of a diameter three times the height. Jackets are provided on the bottom and well up the sides, so that as much available heating surface is obtained as is possible. Through the bottom, oblong, screened openings are provided for the withdrawal of solvent and grease and for pumping in solvent during the cooking or desiccating operation. Within the tank proper is a central shaft, provided with two sweeps set very close to the bottom, in such manner that they shall slide under the mass to be treated, imparting an undulatory motion, without cutting through the mass itself. For this reason very little power is required. The tanks are of shallow form, in order that the amount of heating surface in proportion to the mass to be treated may be as great as possible. Greater height and capacity could only be obtained at the expense of operating time and greater consumption

of power. The top of the tank is provided with a charging manhole and an outlet pipe for vapors to pass to the condenser.

After the tank is loaded with sludge the charging manhole is securely closed by the swing cover, solvent is admitted through the bottom screens, sufficient to immerse totally the mass of sludge, and steam is turned on the jackets. Combined vapors of solvent and water vapor pass out through the vapor line to surface condensers of suitable capacity, and in these the mixture of solvent and water vapor is condensed to a liquid, which leaves the tail pipe of the condenser and passes to a separating tank where, by virtue of the lighter gravity of the solvent, separation of solvent and water is effected. The solvent flows to storage for re-use. Owing to rapid evaporation, the solvent level is lowered in the tank, and a further quantity is pumped in.

Four to five hours are required for the evaporation of all of the water, and at this time, through the sight glasses, the dried fiber, etc., can be observed floating on the top of the solvent. At this point the agitator is stopped, the steam turned off, the drain valves opened and the grease-laden solvent pumped. Several washes with fresh solvent complete the degreasing of the mass, which is then heated, and agitated and, with the help of live steam, freed from the absorbed solvent.

Treatment of Grease-Laden Solvent

The solvent, carrying with it the extracted grease, soaps, etc., must receive preliminary treatment before passing to the solvent-recovery and grease-finishing stills. This treatment is carried out in a lead-lined tank provided with an agitator. To the solvent is added a sufficient quantity of sulphuric or muriatic acid and water to decompose completely the metallic soaps present. The acid water is well churned up with the solvent, and allowed to settle and drained off; fresh water is added and mixed, allowed to settle, and the clear grease solvent solution is run to the recovery stills. By this treatment, foaming and other difficulties are avoided in the distillation, and the grease recovered does not form the emulsions, separated with difficulty, it is disposed to form. Such grease can be cleaned up and settled free from mechanical impurities and moisture, without undue trouble.

The entire cycle of operations takes place in a closed circuit, and the only vent for noncondensible gases for the whole system of tanks (or reducers), condensers, separating tanks, washers, stills and storage tanks, is on the final solvent storage tank or tanks. This vent exhausts through an oil scrubber to recover traces of naphtha carried over by carburetting. During no period of the operation is the sludge exposed to the air or man-handled in any way, until it is finally discharged from the side door of the tank in a dried, degreased condition. The only places where odors or noxious effluent are exposed to the air and liable to cause an insanitary and nuisance condition, is at the gas vents on the storage tanks and at the effluent overflow on the separating tank. This effluent is, of course, distilled water from the sludge, and carries with it the odor of the sludge, which in the case of fresh sludge (and that is preferably handled) is very offensive. The quantity of this water equals that contained in the sludge prior to desiccation and the condensed steam from the steaming out of the solvent from the drained sludge, prior to dumping from the machine. This approximates a ton of effluent for every ton of sludge handled. The only way found by the writer to effect deodorization of this effluent and to render it harmless is by the addition of chlorinated lime or chlorine water. The greatest amount necessary for deodorizing very foul water is one part of 35% available chlorine bleaching powder to 3000 parts effluent. The noncondensible gases leaving the storage-tank vents must be scrubbed with chlorinated-lime solution before being allowed to pass to the atmosphere.

With these precautions it is safe to say that the entire operation of desiccation and degreasing, or the whole recovery operation, can be carried out with no offense.

In handling sewage sludge by this method, no difficulties have arisen other than those usually met with in handling wet organic materials of other sorts, and since in sludge, the moisture is present in free condition, mechanically combined, the period required for desiccation is much shorter than that met with in the treatment of garbage and animal refuse, in which the larger part of the water is more or less chemically combined. For this reason only four or five hours are required for drying a given amount of sludge, compared with at least twice that for the same amount of garbage.

Trial runs indicate the capacity of each tank as eight tons in 24 hours and that for a plant handling the sludge from a town of 200,000 inhabitants (approximately 40 tons 75% moisture basis daily) the cost for handling, including overhead and fixed charges, will approach $6 to $6.50 per ton on green sludge. This cost would not be greatly changed in handling sludge containing 75% or 50% moisture, but since the gross tonnage to be handled would be greatly reduced, the plant investment would be much less and therefore the byproduct returns per green ton much greater. If by any method of dewatering on beds, or other inexpensive method, the moisture can be reduced below 75%, by just so much will the success of a recovery plant pass from just self-maintenance to a possible profit.

Yield of Grease and Tankage

After carrying out such an operation, what possible yield of byproducts may be expected, and what is their character and what their value? This depends entirely on the nature of the sewage handled. It has been presupposed that any sludge running less than 3% of ammonia on a dry-tankage basis is not worth handling—unless, indeed, the grease content is very high, in which case it is possible that the grease alone might pay for recovery. From an average of a number of analyses, however, it would seem that a sludge low in ammonia is also low in grease, so that a 3% ammonia tankage would indicate a 15-25% grease content on a dry basis. For these reasons, in handling a 75% moisture sludge a yield of 430 lb. of tankage and 75 lb. of grease may be expected.

What is the nature of this grease and tankage; have they any market value? What use to rescue this material if it cannot be sold or used? This is not a matter to be dismissed off-hand. At the present time, if either or both of these products were thrown on the market, emphatically they would not find a purchaser, or certainly the price would be absurdly low. Consider

the nature of these byproducts as indicated by their analyses:

ANALYSES OF GREASES FROM DIFFERENT TYPES OF SLUDGE

	Free Fatty Acid, Per Cent.	Nonsaponifiable, Per Cent.	Neutral, Per Cent	Moisture Per Cent
Baltimore (acidulated)	77 48	11 78	....	10 74
Chicago (activated)	48 80	24 40	19.1	7 70
Syracuse (sedimentation)	51 50	19 30	18.70	10 50
Pleasantville, N. Y. (sed.)	75 70	19 80	4.50	....
Boston Moon Island (sedimentation)				

	Per Cent.	
Free fatty acid (as oleic)	48 40	
Free fatty acid (by weight)	40 19	
Rosin acids (in fatty acid)	14 36	
Fatty acids (by difference)	25.83	
Unsaponifiable	21 09	
Neutral grease (by weight)	20.00	(molecular weight of neutral fatty acids 272)
Metallic soaps and solid impurities	3 30	

The first four analyses are of grease recovered in the process outlined, and it will be noticed that, in the first three, large quantities of solid impurities and moisture are recorded. All grease of sewage-sludge origin on leaving stills contains large amounts of such impurities, since, due to the emulsifying action of the waxes present in the so-called unsaponifiable, it is very difficult to obtain clean greases without subsequent washing with acid and settling. The fourth analysis is of a grease after such treatment.

Saponifiable and Unsaponifiable Matter

These analyses are of several different types of sludge and sewage treatment, yet all present the following general characteristics:

The saponifiable matter in each case consists for the most part of free fatty acids and a very small portion of neutral grease or combined glycerides. This is, of course, anticipated by the fact that the greater part of the grease present in sewage sludge comes from hydrolyzed soap solutions, or through the action of bacteria and ferments neutral grease has been broken down into fatty acids and glycerine. In any event, the neutral grease present gives no hope of glycerine recovery, so at once the so-called grease falls into the grade of poor-class fatty-acid stock. Of the total fatty acids present, varying in a number of analyses, from 1% to 15% of the total consists of rosin acids. These again are from the soap solutions.

The unsaponifiable matter varies between 10% and 30%, but a majority of samples analyzed show an average of 20%. As may be supposed, the lowest percentages are found in strictly domestic sewages, where they are traceable to body waxes and products of physiological action. In mixed sewage from manufacturing towns the unsaponifiable is highest, as it is made up of mineral oils, thrown out from different factories, mills, etc.

Small percentages of metallic soaps of calcium, iron, aluminum and magnesium are present, but upon proper treatment are broken down into fatty acids and mineral salts, washed out as sulphates or chlorides, dependent on the sort of acid used for refining.

From these premises it is necessary to conclude that sewage grease can be regarded only as a very low-grade fatty-acid stock containing 70-75% of fatty acids and 25-30% of unsaponifiable matter. These fatty acids, depending on the sewage from which they are extracted, will vary in color from a dark ruby red to a black tarry-looking mass. In consistency the variation is between a soft, buttery mass and a hard and solid cake. This is quite readily explained; the former is very high in fluid-mineral and industrial-refuse oils, the latter, from domestic sewage in which the high-melting-point fatty acids have been hydrolyzed and precipitated from the soap liquors, whereas the oleic-acid soaps or oleic acid present in mixed soaps remain in solution and pass off with the effluent.

Fatty acids of this type have no legitimate market at this time. Such materials are only valuable as they are refined and made into marketable products. A purchaser of sewage grease would expect by his own efforts to give it all of the value it might ultimately have and, having created something out of nothing, would care to pay little for the raw material. That sewage grease in refined or manufactured form has value is not to be questioned. Such a grease as that indicated in analyses of the Pleasantville sludge grease, upon distillation in the manner usually employed for fatty acids, gave the following percentage yields:

Light colored distillate	85
Still returns	6
Stearine pitch	6
Loss	3

The distillate was orange yellow in color and of high titre, and upon pressing gave 50% of good-colored stearic acid of titre 53.3° C., and 50% of red oil containing 38.25% unsaponifiable matter. Upon pressing, all unsaponifiable matter passes out of seeded or crystalline cake in the red oil, leaving good stearic acid behind. This red oil is marketable for grease compounding and as wool oil. In other words, sewage grease must be manufactured to have value. Once its value is established, a market will be automatically created for the raw grease.

Who Shall Bear the Unavoidable Burden?

Upon whom shall the burden of carrying out these operations fall? Shall each sewage plant carry out the whole work from sewage to finished product? Shall a number of sewage plants pool their sludge, or their raw grease and tankage, and finish at a central plant, or shall a number of plants interest directly a corporation or individual able to carry out the refining operation? At this point sewage sludge ceases to be a problem for the scientist and becomes a purely business proposition.

Returning to the question of disposition of the tankage, it would require considerable propaganda to place upon the fertilizer-goods market a low-grade 3% ammoniate, cursed with the name sewage sludge, though in the old days of poudrette and natural guano it had an enhanced value in the public mind far greater than its chemical value indicated. The great diluent of sewage tankage is insoluble ash or mineral matter, running from 40-70%, with 60% as an average. It is not impossible to concentrate this, though methods are not yet complete for doing so. A number of experiments conducted by the University of California indicate that, for percentage of nitrogen contained, degreased sludge has a higher plant food value than dried blood or high-grade tankage.

Even with reasonable markets for the tankage and grease, it is a question whether it is possible to recover enough materials to defray the cost of the operation In the opinion of the writer, and from experience in the garbage-reduction business, it does not seem impossible, though there would be little margin of profit left. But the sludge would be disposed of, its disposition paid for and a large amount of needed materials returned to active use to assist in helping out the world's supply

of chemicals and greases. The individual city would receive no monetary return, probably, but virtually to create actual, concrete products of economic value, to pay for the creation and at the same time solve a troublesome disposal problem, is something worthy of consideration.

With ordinary sedimentation of suspended solids, it is not at all unreasonable to expect from the sewage of a town of 150,000 persons daily recoveries of five tons of tankage and one ton of grease. There are many towns of this size. Any city of this class which can return to a useful cycle $50,000 worth of needed materials annually should consider well the disposition of its sludge pile.

Solving the problem of sludge disposal is not impossible, but it is difficult. No chemist, engineer, business man or politician can solve it alone. A coöperation which has not heretofore existed must be brought about before there can be any hope of solution.

Present Status of the Ohio River Improvement

IN 1908 the Federal Government, through the United States Engineer Department, began the construction of locks and movable dams on the Ohio River from Pittsburgh to its mouth at Cairo, by means of which a 9-ft. stage of water would be guaranteed. Work has been



GENERAL VIEW DURING CONSTRUCTION OF ONE OF THE OHIO RIVER LOCKS AND DAMS (NO. 33, NEAR MAYSVILLE, KY.)

steadily carried on during the past 11 years, though the total cost will be greatly in excess of the $64,000,000 estimated then for the 54 locks and dams. The accompanying table shows the state of the improvement at the end of the working season of 1919:

STATUS OF WORK ON SLACKWATER IMPROVEMENT OF THE OHIO RIVER, OCT. 1, 1919

Dam No.	Miles Below Pittsburgh	LOCATION With reference to nearest town or other geographical division
		Locks and Dams in Operation
1	4.7	West Bellevue, Penn.
2	9.0	Coraopolis, Penn.
3	10.9	Glenosborne, Penn.
4	18.6	Legionville, Penn.
5	23.9	Freedom, Penn.
6	28.8	Beaver, Penn.
7	36.9	Midland, Penn.
8	46.1	Newell, W. Va.
9	55.6	New Cumberland, W. Va.
10	65.7	Steubenville, Ohio.
11	76.3	2.3 miles below Wellsburgh, W. Va.
12	87.0	2 miles above Wheeling, W. Va.
13	95.6	McMechen, W. Va.
14	113.8	Woodland, W. Va.
15	128.9	New Martinsville, W. Va.
16	146.4	Ben's Run, W. Va.
17	167.4	4 miles above Marietta, Ohio.
18	179.3	4½ miles above Parkersburg, W. Va.
19	191.4	Little Hocking, Ohio.
20	201.7	Belleville, W. Va.
21	213.8	Portland, Ohio.
22	220.1	Ravenswood, W. Va.
24	242.0	Graham, W. Va.
26	278.0	Hogsett, W. Va., 9½ miles below Galliopolis, Ohio.
28	310.9	Huntington, W. Va.
29	319.4	3 miles below Catlettsburg, Ky.
35	449.7	1 mile below New Richmond, Ohio.
37	481.3	Fernbank, Ohio.
41	604.0	Louisville, Ky. (Old lock and canal in operation; canal widened; work in progress on construction of new lock, etc.)
		Locks and Dams Under Construction
23	230.6	Millwood, W. Va.
25	260.0	5 miles above Pt. Pleasant, W. Va.
27	300.3	4 miles above Guyandotte, W. Va.
30	338.9	3 miles below Greenup, Ky.
31	358.4	3 miles below Portsmouth, Ohio.
32	381.7	1 mile above Rome, Ohio.
33	404.0	3 miles above Maysville, Ky.
34	432.8	Chilo, Ohio.
36	458.4	10 miles above Cincinnati, Ohio.
38	501.3	Maxville, Ky.
39	529.6	1 mile above Markland, Ind.
43	630.2	3 miles below West Point, Ky.
44	660.3	Leavenworth, Ind.
45	699.7	Addison, Ky.
48	804.1	6 miles below Henderson, Ky.
		Locks and Dams Upon Which Construction Has Not Yet Been Commenced
40	553.6	2 miles above Madison, Ind.
42	.....	Eliminated.
46	748.5	Between Rockport, Ind. and Owensboro, Ky.
47	771.3	1½ miles above Newburg, Ind.
49	830.5	7½ miles below Mt. Vernon, Ind.
50	859.6	Caseyville, Ky.
51	878.0	1½ miles above Elizabethtown, Ill.
52	913.2	1½ miles below mouth of Cumberland River.
53	946.0	Head of Grand Chain.
54	962.4	Mound City, Ill.

RECAPITULATION

Locks and dams completed and in operation	29
Locks and dams under construction	15
Locks and dams upon which construction has not yet been commenced	9
Locks and dams eliminated	1
Total	54

Concrete Mast 164 Feet High Built in Place

TWO wireless masts of reinforced concrete, each 164 ft. high, are to be built for the American Navy on the city wall at Pekin, China, according to an article in *Ingeniören* of Aug. 2, 1919. One of these masts has already been completed, and the other is under way. The contract was let by the Navy to the firm of Andersen, Meyer & Co., Ltd., Shanghai. For the first mast the original program contemplated precasting in two parts. This was done, but while the two parts were being lifted into vertical position the tackle broke, or some other similar accident occurred, and the mast fell, killing the European engineer in charge and four coolies. It was then decided to build the mast in place from a timber scaffolding. It is stated that this method proved very costly, and difficulties were experienced in constructing a scaffolding sufficiently rigid to support the concrete while setting. The work was carried out, however, to a successful conclusion. The mast is of hollow reinforced concrete, 16¾ in. in outside diameter, with a 4-in. wall at the base, and 12 in. in diameter, with 3½-in. walls at the top. A 1:2:3 concrete was used, with ¾ x ⅝-in. rectangular corrugated bars as reinforcement. The number of rods was not given in the article. The mast is guyed by four guy ropes, three of which go to the wall itself and the fourth to the ground inside the wall. The mast was designed with a factor of safety of 4 when carrying 11 ice-laden wires and exposed to a strong gale.

Engineers Teach Doctrine of Designed Roads

Systematic Instruction Converts Iowa to Active Support of Engineering Direction of Road Construction Work

ONLY road work designed and directed by engineers is done in Iowa. This practice applies to the whole 104,084 miles of state roads. The change to this condition from haphazard, untechnical local direction has been brought about by a campaign of education planned and conducted by engineers. Direct instruction by object lesson and by personal appeal aided by intelligent publicity were the methods.

The population of Iowa is largely rural, and when, in 1904, commission direction was inaugurated it was a population uninstructed in the nature or the cost or the value of modern, improved highways. It was also a population jealous of the right of local initiative in all affairs relating to public roads. Standards of road service were everywhere about the same and were generally low. Nowhere was the necessity felt to be keen for any radical change in road policies and practices. County and township control was intrenched, and centralized state control had only scattered support.

In 1904, therefore when a state highway commission was reluctantly created, it was made a commission without authority. No salaries were paid. No money was given to it to expend for road construction or maintenance. The fund allowed it for expenses was negligible. It had only advisory powers. Communities need not ask its advice and, if they did, were not required to follow the advice. But because the deans of the two state engineering schools were named as commissioners it was in spirit an engineering commission and possessed the outlook of engineers toward a future road construction program.

Earth Roads First Considered

Under the conditions, the first requirement of any plan was guaranteed earth-road service. Agitation for paved roads was certain to fail. No community would have countenanced the expenditure, and the communities held the purse strings and the sole right to plan expenditures. To build up a permanent road system was the object, but, during the operation, continuous and general earth-road service must be maintained. This service being assured, it followed that, so far as practicable, all construction ought to contribute to the accomplishment of the ultimate permanent road system. A working policy was adopted based on the reasoning outlined.

Hard surfacing could not be contemplated. Permanent culverts and bridges could, however, be urged, and the arguments would have a receptive audience, because it was an audience which had been badly cheated in the quality of the structures it had been getting. Standard culvert and bridge plans and specifications were prepared. Engineering advice was gratis to those who asked it, and a planned effort was made to create a public sentiment favoring permanent structures. These activities were extended with time, and as more money was granted to the commission for operation. In a few years, counties were voluntarily building commission-designed or approved bridges and culverts in quantities.

The greater measure of success of the commission bridge and culvert activities was the educated public sentiment, and not the totals of structures built. The road-using public was being trained by object lessons into the habit of permanent road construction and to a knowledge of the value of engineering direction of road work. The growth of this sentiment was capitalized year after year in increased appropriations from the legislature. Finally, in 1913 it was capitalized in a broad way. A basic road law was secured, the effect of which was to place engineering paramount in highway development.

Commission Law Gave Authority to Commission

By the new law no money was given to the commission to spend in building roads. Initiation of road improvements still remained with the community. However, the commission was made responsible for all plans for permanent work, and compliance with these plans by the community was made obligatory. Thus, no permanent road work could be planned except under the technical supervision of the engineers of the commission. The law also required that the county supervisors employ county engineers to have technical direction of road work, and provided that the highway commission could remove these engineers for incompetence. The road mileage was divided into county roads and township roads. The powers of the county supervisors and township trustees were defined. A financial accounting to the commission of all road expenditures was required. Means for raising road funds were provided, and the allotment and disposition of these funds were stipulated. The methods of road maintenance and the organization for directing it were specified.

Centralized engineering direction of road work was definitely established by the basic road law of 1913. By the creation of county engineers, a permanent, state-wide machine for exercising this centralized direction was provided. This development from uncorrelated, untechnical, local administration of road work was the educational accomplishment of the commission engineers in nine years, from 1904 to 1913. It was not the final step. The welding of the commission and the county engineering units into an organization having a common purpose remained necessary, and further enabling legislation was desirable.

Qualifications of County Engineers Raised

County engineers, by the law, are employed and compensated by the counties. They can be removed by the highway commission for incompetence, and they must design to the commission's standards. Where a contract exceeds $2000 they must have the commission's approval. Success of the commission's road policies therefore depended very largely upon the qualifications and the coöperation of the county engineers. Adequate compensation and the surety of continuing in the office were essential, if qualified and reliable men were to be secured. By advice and admonition, and occasionally by exercising its power to discharge, the commission gradually raised the standards in both respects. Salaries now range from $2000 to $3000 a year. About 90% of the men are graduates of engineering colleges. Most of them are continued in office year after year. The result is a body of engineers of high efficiency, imbued with the policies of the commission and familiar with its precedure, and, as citizens, interested in having the community obtain good structures.

Education of the people to higher standards of contracting proceeded hand in hand with their education to higher standards of engineering. The counties generally were being cheated in a large portion of their contract work. To demonstrate this, an object lesson was again employed. The commission engineers went into certain counties and dug up structure after structure and showed where work paid for had never been done. The lesson was sufficient. With the placing of contract construction strictly on an engineering basis, contractors began to play the game squarely, and other contractors who had kept out of county road work because of its undesirable character began to solicit work. This movement was encouraged by the policy of the commission—reflected by the county engineers—of watching out for the contractor's interests. The attitude was that the engineer was just as much concerned in seeing that the contractor made a legitimate profit as that he did good work. Today, as the result, Iowa boasts of having a body of road contractors as reliable as can be found in any branch of construction.

Additional Powers Needed by Commission and Obtained

As the law of 1913 was enforced, the need for additional powers became evident. For example, in many instances road drainage was not possible because the surrounding country was not drained and there were no outlets. A law was urged and obtained which enabled county engineers to establish drainage districts, build the necessary works, and assess the cost on the benefited property. In the same manner, power was obtained to condemn property for roads or for supplies of road materials and to improve dangerous crossings of railroads at grade. Nearly a score of these supplementary laws were obtained. Finally, the primary road law of 1919 was enacted, centralized technical direction of road construction was clinched, and money and methods were provided for building an intercounty, or state, system of paved roads.

The revolution in public sentiment from indifference and incredulity to active belief in complete engineering administration and to hearty support of a plan to hard-surface 6300 miles of main road was accomplished by continuous and persistent educational work. Two methods principally were employed. Publication monthly of a service bulletin; personal instruction assisted by object lessons.

Publish Service Bulletin

Publication of a service bulletin was begun in 1914 and has been continuous to date. It has been mailed regularly to all road officials, newspapers, members of the legislature, and citizens having influence in public-works affairs. This bulletin does not deal in glittering generalities or in word pictures. It tells what the commission and the various counties were doing, and it gives the results in terms of cost and service. It presents examples of bad practice as well as of good practice, and evaluates in dollars and cents the losses resulting from bad practice. It publishes articles, by county and commission engineers, giving methods and costs of work, and explaining the economic reasons for the designs adopted. It keeps close to the facts that are of direct interest to the officials directing road work and to the practical business men and farmers who are paying for road work. With the continuous publication of the service bulletin, other means of publicity have not been neglected. Newspaper articles, pamphlets, broadsides and posters are employed. Demonstrations are staked on occasion, road schools are held and exhibits made.

Personal influence was adopted as the main lever for moving public opinion. The engineers of the commission and of the 99 counties of the state, who had been amalgamated into a body with the same connections and trained in the same methods, provided the teaching staff. Swivel-chair instruction was discouraged; the men were expected to go into the field. As an illustration, in 1917 the commissioners and the men from the main office were in the field an aggregate of 255 days, and the five district engineers were in the field an aggregate of 1169 days. Every county engineer every working day was in touch with some portion of his territory.

Precast Concrete Pump Well Set in 12 Feet of Water

TO HANDLE the condensing water in the generating plant of the Stamford, Conn., Gas & Electric Co., on Long Island Sound, three 20-in. centrifugal pumps are located at the bottom of a 25-ft. well structure in water 12 ft. deep at low water with a range of



LOWERING 150-TON CONCRETE PUMP WELL INTO SOUND AT STAMFORD, CONN.

tide of 13 ft. This well structure is made up of two precast reinforced-concrete boxes, each 30 x 21 ft. in plan and 25 ft. high, which were cast on shore, and lowered into place with a heavy wrecking derrick as shown in the view, onto a foundation leveled and prepared by divers.

Each well has walls 12 in. thick and a bottom 18 in. thick, with an interior 14-in. cross-wall which separates the screen chamber from the pump well proper.

Effect of Size of Lots on Cost of Industrial Housing

A Study of Yard Frontages and Depths in Relation to Outlays for Utilities, Streets and Sidewalks — Possible Economies

By Morris Knowles
Consulting Engineer, Pittsburgh, Penn.

MEASURED in terms of utilities and street improvements, the addition of depth to house lots entails much less cost per foot than the addition of width, according to studies of an assumed example of an industrial town. The data, from which the following has been abstracted, will appear in a forthcoming book.

Those portions of utilities and street improvements which directly relate to size of lots are:

1. Street improvements and utilities located directly in front of the space lying between houses.

2. Street improvements and utilities located on minor streets that lie parallel to space occupied by front yards and by rear yards.

3. Lengths of house service connections which are located in front yards and in rear yards.

Assumed Industrial Town Site

In order to obtain relative costs, it will be necessary to assume an industrial town. Following are the factors: An industrial town with 1000 houses. Houses are 22 ft. wide and 30 ft. deep; lots are 42 ft. front by 80 ft. deep. Houses are located on center line of lots and are placed 15 ft. back from front property line. Main streets are 50 ft. wide, minor streets 40 ft. wide. Main streets have 24-ft. paved roadway, 5½-ft. planting strips, combined concrete gutters and curbs, and 5-ft. sidewalks. Alleys are omitted. There are 24 houses in each block, making length of block 504 ft. and width 160 ft. There are approximately 42 such blocks in the town site.

It will be noted that the house is 64% of total cost, including distribution of overhead; the land, with lot improvements, 12.1%; street improvements, 9.9%; water, electrical, gas and sewer improvements, with house connections, 14%. Engineering, supervision and interest charges, which are distributed in these statements, are 14.24% of the whole.

Table II shows that if the space between houses on main streets is increased 1 ft. the cost of utilities and street improvements per house is increased $14.53. If the front or rear yard is increased 1 ft. in depth, the cost of street improvements and utilities per house is increased $2.48. These computations bring out the interesting fact that in so far as street improvements and utilities are concerned 5.86 ft. can be added to the depth of the front or the rear yard for the same cost as adding 1 ft. to the width of the side yard.

Assuming for sake of comparison a lot 42 ft. front by 80 ft. deep, the combined cost of land and lot improvements is equal to $568.64, or $13.54 per front foot. (See Table I.) If, for this lot, the costs of main and minor street improvements and utilities are combined and quoted as cost per lineal front foot of side yard parallel to yard space, they equal $20.73 per lineal foot.

If the cost of the land and lot improvements be combined with the cost of utilities and street improvements on the main street parallel to the side yard, the cost per lineal front foot of the side yard is $28.07. Assuming rents are based on 10% return, rent for each front foot of side yard is 23c. per month.

TABLE I ESTIMATE FOR ASSUMED TOWN SITE

	Item	Cost per House	Per Cent of Total Cost	Per Cent, Including Overhead
1	House	$3,000 00	54 85%	64 0
2	Land	336 60	6 14	7 2
3	Lot improvements	232 64	4.25	4 9
4	Street improvements	463 29	8 48	9 9
5	Water system	190 15	3 48	4 1
6	Electrical system	26 33	0 48	0 6
7	Gas system	101 18	1 85	2 1
8	Sewers—storm and sanit'y	202 48	3 70	4 3
9	House connections	138 50	2 53	2.9
		$4,690 57		
10	Engineering and supervision at 10%	469 06	8.58	
		$5,159 63		
11	Interest, at 6%	309 58	5.66	
		$5 469 21	[illegible]	[illegible]

While no sweeping conclusions can be made, because we have discussed only one assumed industrial town site, it is interesting to note that the cost per lot for "street improvements and utilities" is $1121.93, compared with $568.64 for "land and lot improvements," the latter being 50% of the former. If, however, we compare the cost per front foot of those elements of street improvements and utilities directly related to the size of lot with the cost per front foot of lot improvements and land, they are respectively $20.73 and $13.54, the latter being 65% of the former.

TABLE II COST OF UTILITIES AND STREET IMPROVEMENTS PARALLEL TO YARD SPACE

	Parts of Items	Cost for Length Parallel to 20-Ft. Side Yard	Cost per Lineal Front Foot of Side Yard	Cost for Length Parallel to 50-Ft. Front and Rear Yard	Cost per Lineal Foot Depth of Front and Rear Yard
4	Street improvements	$178 60	$8 93	$55 00	$1 10
5	Water system	36 40	1 82	13 00	26
6	Electrical system	4 20	21	00	00
7	Gas system	17 40	87	6 50	13
8.	Sewers—storm and sanitary	54 00	2 70	17 00	34
9	House connections	00	00	32 50	65
		$290 60	$14 53	124.00	$2 48

Condensed suggestions on economical design and construction follow: Use of contour streets; grading of lots and streets at same time; design of street widths and pavements to meet demands of traffic; comparison of cost of reducing grade with cost of a pavement suitable for steeper grades; making of sidewalks not unnecessarily wide; use of combined gutter and curb; study of relative merits of alleys and easements; careful study of location of utilities; use of combined trenches where suitable; substitution of direct sewer connections for catchbasins; use of combination manholes; connection of roof leaders to gutters; omission of storm sewers near summits of streets; installation of house connections at one time; carrying of house wire services on brackets attached to rear of house; and so forth.

Mexican Railroads Suffer Heavily by Storms

According to a recent issue of *Commerce Reports*, extensive and immediate appropriations of public funds are necessary to repair damage done to Mexican national railroads by recent storms. More than 50 bridges, large and small, were destroyed in the division from Jimenez to Chihuahua. It is stated that the large Otiz bridge, in the State of Chihuahua, will have to be rebuilt completely. It is planned to construct a new bridge entirely of concrete, in order that it may more successfully resist repeated overflows of the River Concha.

Meters Cut Water Consumption of City In Irrigated District

By C. E. Painter
With Tibbets & Pleasant, Contractors, Okmulgee, Okla.

When the officials of Twin Falls, Idaho, were shown that there was a daily per capita consumption of 450 gal. and that payment was being received for only 20% of the water delivered, metering was speedily adopted. The writer, when employed recently as resident engineer for the construction of a purification plant, by Burns & McDonnell, consulting engineers, Kansas City, Mo., investigated the meter situation and found 1800 taps, 38 meters, 10,000 population and 4,500,000 gal. of water used. Knowledge of conditions and publicity brought about a more equitable relation between the water-works department and the consumers, for within three weeks after the report was presented 500 meters were ordered and a price contract was made for future orders. Twin Falls will shortly be 100% metered.

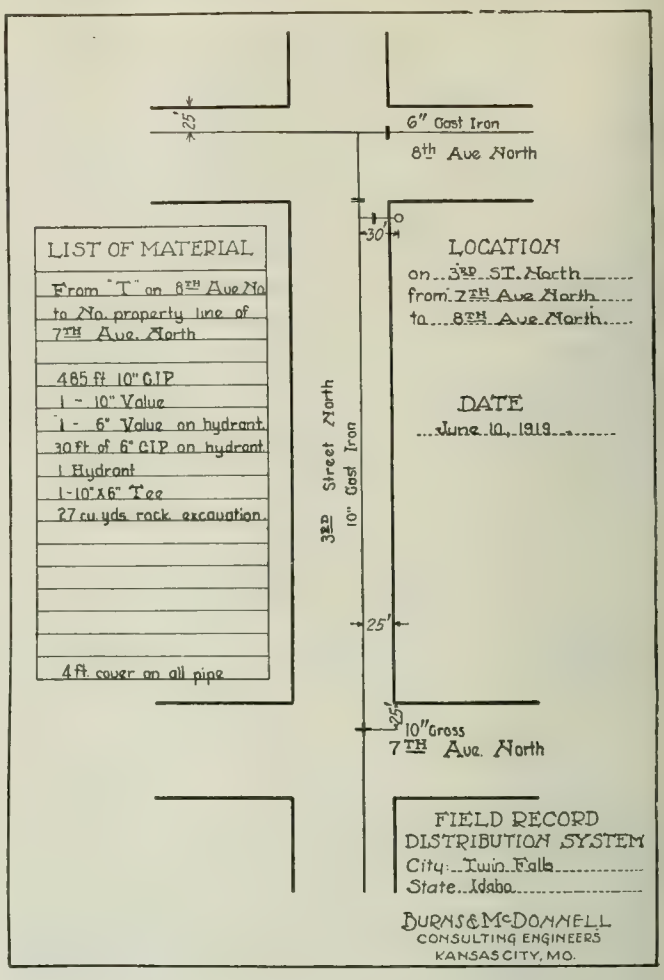
It was rather startling to find that the total income—fire hydrants and sewer flushing included—when estimated according to existing meter rates, indicated that the city received payment for only about 20% of the water that left the plant. In these circumstances the plant could not be expected to take care of itself financially. The estimated operating costs are $52,000 and the receipts last year were $4000 less.

Leaky plumbing was found to be responsible for the largest loss. Definite figures as to the more equitable basis of charge produced by the installation of the first 24 meters are given below:

	Flat Rate	Aver. Yearly meter rate
Twin Falls Steam Laundry	$ 11.50	$ 25.09
Western Auto Co.	5.00	2.74
H. E. Cutting	2.00	1.41
Twin Falls Auto Co.	5.00	6.72
Johnson Auto Co.	5.00	2.61
George Batley	8.00	6.64
Twin Falls Auto Co.	5.00	5.43
Rice Building	2.50	3.54
Young Hardware Co.	2.00	1.13
Gooding Motor Co.	5.00	2.57
Perrine Hotel	40.00	66.20
Seal Auto Co.	5.00	4.93
Lee Woodcock Barn	2.50	2.11
Troy Laundry	20.00	27.10
Twin Falls Livery Barn	2.50	1.06
Idaho Auto & Supply Co.	5.00	3.73
J. F. Blankenship Barn	2.50	2.86
Belleville Bros.	5.00	1.06
Nick Smith	2.50	2.55
C. A. McMaster	2.50	7.42
J. A. Johnson	2.50	3.71
A. M. Sande	5.00	24.15
Lincoln Produce Co.	15.00	68.85
Sterling Creamery	35.00	30.27
	$196.00	$303.88

Of these 24 customers 50% were being overcharged, and to the other half water was being presented free of charge. This was not equitable. The total income was increased incidentally 55%, and much water was saved. A typical individual example of what happened is the Twin Falls livery barn. For the first two months after the meter was installed the use was 2878 and 2001 cu.ft., with charges of $5.30 and $4.00, respectively. Repairs were made, and for the next two months the use was 396 and 402 cu.ft., with minimum charges of $1 each month. The former flat rate was $2.50 per month. In the case of the Perrine Hotel, where the rate increased 65%, the plumbing was not repaired, the owner apparently feeling it was cheaper to pay water bills than plumbing bills, but the city receives pay for water delivered.

Another point made in the report was that the present purification plant would have to be extended within five years if the consumption were not curtailed. Between 11 a.m. and 1 p.m. and from 5 to 7 p.m. water was used at the rate of 7,000,000 gal. daily. By running over capacity for a few hours the plant can care for this rate, but only for a limited period. If restriction is made to legitimate use, the present capacity of the plant should be good for 15 to 20 years. It was recommended that the city buy 500 meters and require the customer to deposit $15 to cover cost of meter and installation, then to finance the next and succeeding purchases from the fund created by the deposits.



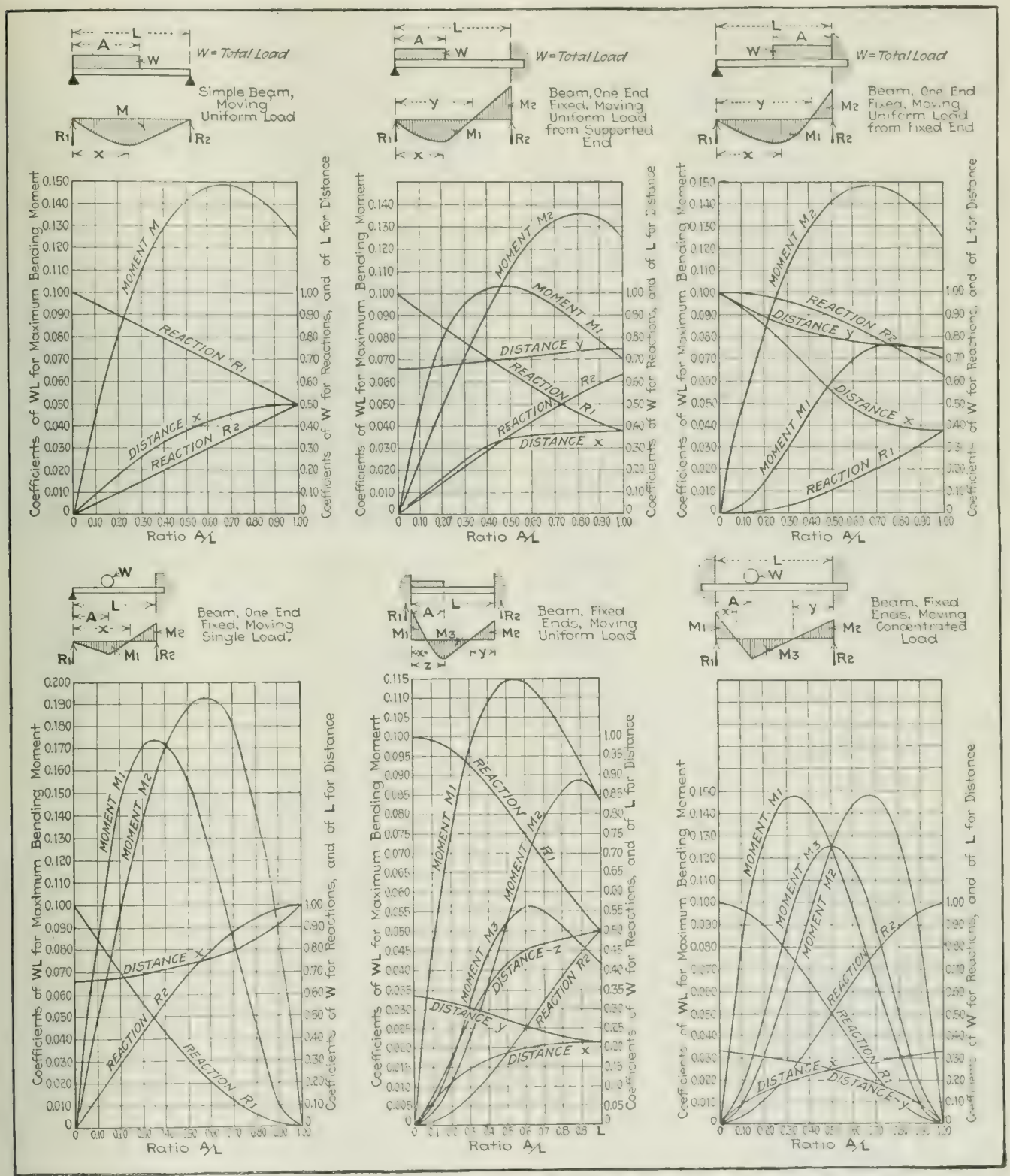
WATER DISTRIBUTION SYSTEM RECORD, TWIN FALLS

Diagrams for Reactions and Bending Moments of Beams

By Raymond Burnham
Consulting and Designing Engineer, Chicago, Ill.

The six diagrams herewith have been of great value in facilitating the calculation of beams under unusual loading, or for moving loads. They can be used to obtain the maximum bending moments, the reactions, the points of contraflexure and the points of maximum bending moment. The diagrams include the simple beam with moving uniform load, beams supported at one end and fixed at the other for moving uniform loads or concentrated loads, and beams fixed at both ends for moving uniform or concentrated loads.

The method of using the diagrams is quite simple. For example, take the case of a beam supported at one end and fixed at the other with a uniform load



REACTIONS AND BENDING MOMENTS FOR MOVING LOADS ON VARIOUS TYPES OF BEAMS

coming on from the supported end. The diagram for this case gives the negative moment equal to the positive moment when the load covers 0.46 of the length of the beam, at which time the reactions are two-thirds and one-third of the load, respectively, and the distance to the point of contraflexure is 0.7 L from the supported end, while the point of maximum moment is 0.33 L from the supported end. This diagram also shows that for a fully loaded beam, the negative bending moment is 0.125 WL, and the positive bending moment is 0.7 WL; the reactions are 0.625 W and 0.375 W. The distance to the point of contraflexure is $\frac{3}{4}$ L and the distance to point of maximum moment is 0.38 L. These results accord with the ordinary formulas for a uniformly loaded beam supported at one end and fixed at the other.

The other diagrams are used in precisely similar manner, all bending moments being given in turns of WL and reactions in terms of W, the total superimposed load.

Heavy Rain Destroys Sewer and Railway at St. Louis

City Delayed Taking Engineer's Advice After Earlier Damage — About 4 Inches of Rain in 2½ Hours

By W. W. Horner
Chief Engineer, Sewers and Paving, St. Louis, Mo.

An unusually heavy rainfall at St. Louis, Mo., on the evening of Sept. 28, destroyed about 250 ft. of the Rocky Branch sewer, and washed out a number of railroad tracks beneath which the wrecked sewer passed. The downpour lasted about 2½ hours, during which time from 3.3 to 4.1 in. of rain was registered on gages at various points in the city.

The rain was quite steady during a large portion of the time, but the maximum rates were not exceptional, the heaviest five minutes being 0.35, the maximum ten minutes being 0.7 and the maximum hour 2.35. The rain caused considerable damage throughout St. Louis, overcharging many of the sewers in the lower part of the city, and creating a flood of the River des Peres, which left its banks throughout almost its entire length.

The greatest actual damage to city structures was at the outlet of the Rocky Branch sewer. This portion of the sewer is of horseshoe section, constructed of brick and stone partly supported on piles. The section is approximately 14 ft. in height by 12 ft. in width and was built prior to 1870.

The original end of the sewer was carried away some time ago by undermining by the water flowing from the sewer itself. Since then large sections have been carried away from time to time, so that the sewer was probably 100 ft. or more short of its original outlet.

This matter was brought to the particular attention of the city officials two years ago, when the plans for the construction of the North Market St. municipal docks were taken up. The new docks were to be built immediately south of the sewer, and the line of the dock face was to be about 300 ft. farther out in the river than the end of the old sewer. A request for an appropriation to extend the sewer was made at that time, with an estimated cost of $30,000. Since then the dock has been constructed and a fill made along the south side of the sewer estuary, and also some additional length of sewer carried away. An appropriation of $50,000 for the extension was made in the summer of 1919, and the work of extending the sewer by the city's forces was started late in September.



SEWER OUTLET BEFORE RAIN OF SEPT. 28

Only a few piles on the site of the new outfall had been driven when the storm of Sept. 28 occurred. The sewer undoubtedly ran full, and under a considerable head. The erosive effect of the stream on the soft ground under the outfall progressively undermined the old piling and permitted the sewer structure to collapse in large units at a time. In all, about 250 ft. of the sewer was carried away, bringing the new outfall back to the edge of the main line Burlington tracks, which were temporarily abandoned, and washing out on the way four tracks of the St. Louis Transfer Railway, a part of the freight terminal systems.

The estimated cost of replacing the sewer destroyed by this rain will be about $40,000, in addition to the $50,000 which had been appropriated for the extension of the outlet. A temporary apron is being built under the outfall to prevent further undermining, but it is probable that another very heavy rain would destroy additional sewer and possibly begin to undermine buildings in the vicinity.



LOOKING TOWARD THE RIVER FROM THE BANK ABOVE THE SEWER OUTLET AS IT STOOD AFTER THE WASHOUT

Society Service

A Section Dealing with the Results of Teamwork by Technical Men

Providence Drive Nets 62 Per Cent Membership Increase

The Providence Engineering Society recently completed a 15-day membership drive which netted 370 new applications—more than 62% of the membership—and which will bring the society's total number of members to 966, a remarkable membership for an engineering society serving a city of less than 300,000 people and an industrial community of about 600,000. Credit for the achievement, according to a communication from Prof. James A. Hall of Brown University, is largely due to Frederick W. Bliss, chairman of the membership committee, who personally laid out the campaign and created a great deal of its enthusiasm.

Fifteen teams of five men each were chosen and each team was assigned five names of prospective members and the names of ten industrial concerns which were not represented in the society. During the first week those names were limited to the teams to which they were assigned, but throughout the remainder of the competition the field was open, and all competitors were urged to go after anyone whom they considered eligible. The result was most gratifying, as a large number of engineers not formerly connected with the society were

brought in, and in addition, many presidents and heads of business concerns have joined the society as associate members. The scoring was based on the size of entrance fees for the various grades of membership—that is, 4 points for senior or associate, 3 points for junior, and 1 point for student. In all cases the entrance fee must necessarily accompany the application. The points scored in securing the 370 new members totaled 1219.

Society Carries on a Publicity Contest

Publicity for engineers and engineering societies, in local newspapers, is being promoted throughout the country through a publicity contest being held by the American Association of Engineers. On Sept. 1 its chapters and clubs entered a contest of indefinite duration, to see which could obtain the greatest number of column inches of space, covering legitimate news, in their local newspapers. Up to the middle of October the Globe-Miami Chapter in Arizona led with 267 column inches. The St. Louis Chapter had 211 and the Portland, Ore., Chapter 176. Some of the other chapters stood as follows: Toledo, 64; Phoenix, 63; Parsons, Kan., 45; Washington, 42; Knoxville, Tenn., 33; Indianapolis, 31; Butte, Mont., 25; Chicago, 25; Dayton, 25; Baltimore, 25.

No attempt has been made to furnish "boiler plate" from national headquarters, all of the copy being furnished by local effort and with the main purpose of advising the public as to what the engineers were doing. Much of the publicity has consisted of society activity, although in St. Louis the copy has dealt largely with the efforts of the municipal section to obtain an increase in compensation.

In counting space, only items containing the word "engineer" are accepted. If it appears in the heading ¼-in. or more in height an extra 5 in. of space is allowed. Several items have been capped by eight-column heads some of which contained the word "engineer."

In the opinion of the society officials, the value of this publicity to the profession cannot be overestimated. Through reading the news items appearing in his local newspaper the average citizen will find out that there are many more engineers in his community than he ever realized; that this body of men is active in civic work; that it is working for legislation to protect the public interest; that it is insisting on the appointment of trained men to public offices supervisory over engineering works; that engineers have a code of ethics and are trying to improve it; and that the notorious high cost of living treats an engineer no less rigorously than the layman. In short, he will learn what engineers are doing and the value of the engineer's service to the community, and in time he may learn that the professional engineer does not drive a locomotive or tend the boilers in an office building.



LOWER OTAY DAM HIGHEST TYPE OF ENGINEERING ART

This Is Statement of Dr. Newell at Banquet Given in His Honor

Know YOUR Chicago

The American Association of Engineers

ENGINEERS WANT PUBLIC WORKS DEPARTMENT

Tidewater Chapter Saturday Night To Discuss Proposal

BOARD NAMED BY ENGINEERS TO AID FOSTER

Association Pledges Support to Anti-Teelic Candidate for Commissioner.

TELLS COUNTY NEEDS

ENGINEERS LEAVE CITY EMPLOY FOR BETTER SALARIES

Failure of Administration to Grant Request for Higher Wages Causes Technical Experts to Resign, Declares Kinsey.

DEPARTMENT TO BE SHORT FOR NEW BOND ISSUE WORK

Amendment to Be Suggested Providing $700 000 Allotment for Payment of Additional Engineers and Administration Expenses.

NOTED ENGINEER APPEALS TO MEN HERE

Says Association Something More Than Labor Union Move

ENGINEERS' CLUB SAID TO BE HOSTILE TO FREE BRIDGE

F. H. Gerhart Declares at Hearing on $22 000 000 Bond Issue That Railroads Control Body

SPEAKER ARGUES FOR EAST SIDE APPROACH

Opposition Voiced to Items for Improvement of Rue des Peres and Elimination of Grade Crossings.

AMERICAN ASSOCIATION OF ENGINEERS BANQUET

SOME RESULTS OF ENGINEERS' PUBLICITY CONTEST

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Engineering Fundamentals for Four-Year Course

Sir—I think perhaps it is worthy of note that the College of Applied Science, which is the Engineering College of the State University of Iowa, has taken what it thinks to be a step in advance toward the devotion of the four-year college course in engineering to the development of the fundamentals of the profession of engineering as distinguished from the development of specialists in one or another branch of engineering.

The College offers five distinct courses, namely, courses in civil engineering, mechanical engineering, electrical engineering, chemical engineering and chemistry. These are all four-year courses except the course in chemical engineering, which is a five-year course.

By action of the faculty last year, which action was put into effect this year for the first time, the first-year work in the four engineering courses is alike, and the civil, electrical, and mechanical courses differentiate only in the senior year, and then only to the extent of twenty of the thirty-four semester hours constituting the year's work.

All students in these courses receive the same instruction in the ordinary fundamentals of mathematics, chemistry, drawing, shop work, surveying, physics, descriptive geometry, mineralogy and geology, mechanics, materials of engineering, hydraulics, machine design, stresses in static structures, steam engine, the generation, transmission and delivery of electric power.

They also receive the same instruction in economics, accounting, business law, English and metallurgy.

In the senior year special work in surveying and railroad surveying, structural engineering, road engineering and sanitary engineering is given to civil-engineering students. Special work in the theory of electricity, electro-chemistry, telephone and telegraph, illumination, dynamo design and power-plant engineering is given to electrical engineering students. Special instruction in shop work, heat engines, engine design, heating and ventilating and power-plant design is given to mechanical engineering students.

We are hoping to take further forward steps later.

WILLIAM G. RAYMOND,
Dean, College of Applied Science, University of Iowa.
Iowa City.

What Will Engineers Pay To Improve Their Status?

Sir—I am in receipt of your favor inclosing copy of an editorial entitled "What Will Engineers Pay To Improve Their Status?"

In reply to the questions asked in this editorial, I can scarcely put the assurance strong enough that engineers will pay, and will pay willingly, to improve their status, when it is known that such expenditure is in capable hands and will be devoted to an achievement of the desired end in an efficient manner. The local association of the American Society of Civil Engineers has had a great deal of discussion among the members as to this question, and I believe it is a fact that many engineers had not taken the time to realize that their status needed improving until this discussion began. Through this section, at least, there has been a great realization of the part which the engineer is capable of playing in public and civic affairs. There is no doubt that with this awakened interest those affected will be willing to pay whatever is necessary in order that their effort toward improvement may be properly directed.

I rather hesitate to state the probable amount which could be raised among the engineers of Nebraska to further this movement, but I am sure that there would be a prompt and generous response to any reasonable request.

HOMER V. KNOUSE.
Omaha, Neb.

Sir—I did not read your editorial in the Sept. 11 issue on "What Will Engineers Pay To Improve Their Status?" for the reason that I did not receive that particular issue. For an ex-engineer like myself, the replies to the above question in the Oct. 16 issue, pp. 720-722, made extremely interesting reading. Through reading these replies I also gleaned the sense of your editorial. Interesting as was the reading of these replies, greater still was the disappointment with their sense and reason.

To be in accord with the idea and purpose of Engineering Council is the least one can do; to support it financially follows as a matter of duty to an accepted cause. However, if engineers—"that great body of junior engineers or noncommissioned officers" (F. H. Newell)—earn so little that they are compelled to ignore an obvious duty, they are more to be pitied than censured, but also more to be censured than admired.

F. H. Newell correctly presented the subject, or, rather, the plight of the engineers; but what does he propose as a remedy? "Greater public recognition of the engineer's worth"? To what end? To improve the engineer's status. How obviously inadequate! What does the public care about the engineer's status, when its elected and appointed officials, who are supposed to know better, are so indifferent to his status. Witness the recent action of the New York Public Service Commission, First District, in laying off hundreds of engineers with a half-hour's notice; the laying off, a few years ago, by the New York State Engineer, of hundreds of engineers for political reasons. The public marvels at the engineer's achievements (and it is the most patent objects only that elicit an admiring phrase) but does not restrain its unqualified condemnation of engineers at large, when an old dam breaks, or other large-scale accidents occur. The public never stops to ask the cause of the inadequacy of those structures that fail, for if it did it would learn how little is the engineer responsible, and how much is the business man behind the project responsible. The public at large is all too ignorant and stands in need of general enlightenment much more than the engineer needs the public's recognition of his worth.

It is disgraceful enough that a body of men so intelligent, upright and necessary to the country's progress should have cause to beg for recognition at all, let alone for the purpose of improving its status, and that from a body so indifferent as the public.

The existence of the ten thousand "senior engineers" estimated by Mr. Newell does not alter the situation, because their technical excellence is beyond the grasp of the public. In fact, their existence as an independent body, who "consider themselves, and doubtless are, the men of the profession" (F. H. Newell), is in a great measure responsible for the pecuniary plight of the estimated 100,000 junior engineers. The "best men" are mostly employers of engineers, and their tactics and ethics are those of the business world. They may wonder wherein this is derogatory to their standing as engineers, but the writer, now successfully prosecuting a very large business, can say, despite any one's contradiction, that business ethics and engineering ethics are as different as the ethics of Tammany Hall compared with those of the American Society of Civil Engineers.

Why not come down to fundamentals and recognize that the engineer's plight is caused by the economics of our industrial order; that to improve his status it is first necessary to change his status? Licensing and unionizing, however odious to some socially backward engineers, are the immediate remedies for his betterment. Necessity is driving engineers together, or apart. If they stick together, no matter how (except through the technical societies) they will eventually learn to seek licensing and unionizing, hence—why not now? If they are thrown apart, then as a rule, they leave the profession and seek improvement in their status through the medium of business. Usually they are successful. This fact has fast spread, with the result that the engineering ranks have been depleted. The loss to the community and country is incalculable. The wasted years of study, training and getting experience cry out in vain, for the public offers a deaf ear, the technical societies a dumb mouth, the "uplift" organization useless endeavor, in the face of a vicious and unjust social and economic order of society. Such

ancient minds as R. B. Shepard, Jr.'s., and Wendell M. Butts', may feel horrified at this frank truth, but A. L. Dabney and F. H. Newell and the many progressive engineers whom necessity has forced to think socially will agree with me that only a fundamental change in the engineer's status will bear fruit.

I am in favor of all technical societies, "mutual-aid" (engineers') societies, etc., but most of all of licensing and unionizing. J. Ross.

New York City.

Theory and Shelf-Angle Support for Girders

Sir—The writer wishes to take exception to some of the statements which were made by Edward Godfrey in his article on "Common Errors in Detailing Steelwork for Buildings," appearing in your issue of Oct. 16. These statements are potential sources of dangerous influences over inexperienced designers, especially so when made by an engineer of wide reputation.

Particular attention should be directed to the author's discussion of the manner of connecting a steel beam to a column shown in sketches (a) and (b) of his Fig. 1. Sketch (a) shows a beam resting upon a shelf angle of ample strength to carry the load, yet the beam is not attached rigidly to the side of column. Very rightly this is termed an eccentric load, the moment resulting being evident and determinate. Mr. Godfrey condemns this detail and favors that shown in sketch (b), where the beam is given a rigid and full-depth connection to the column side, stating that the fixed condition renders the beam and adjacent portion of column, in effect, a single unit capable of acting as beam to carry the load to the column axis. This is true only when the beam is unusually rigid in comparison with the column, a condition sometimes found where heavy beams are supported by relatively slender columns in upper stories. Elsewhere it is dangerously erroneous.

The author's arguments can be attacked by the most elementary and simple line of reasoning and with complete freedom from the least-work ideas of the "ultra-theorists" so emphatically scouted by Mr. Godfrey.

Any beam carrying a load is under stress and subjected to deflection, which results in its center being lower than the ends. The downward inclination from the ends toward the center must be considered. In the connection of sketch (a) there is a slight tipping upon the support, and the moment is as Mr. Godfrey states. In the detail of sketch (b) the rigid connection maintains a right angle between the new direction of beam and that of the column, the column being pulled out of line by a more or less uncertain bending moment. With infinitely rigid columns there is a negative moment at the end equal to $\frac{1}{12}\ wl^2$, while the center positive moment is $\frac{1}{24}\ wl^2$. With flexible columns, the end moment is decreased and that at the center is increased, the sum always being $\frac{1}{8}\ wl^2$. With connections such as sketch (b), the length may be taken as the face-to-face distance between columns, and the bending moment developed in the column is the negative bending at the connection *plus* the product of the reaction by the half width of column. There remains only the question of the exact amount of this negative moment, and this depends upon the position of the point of inflection, which is governed by the relative stiffness of column and beam. Surely Mr. Godfrey and others will agree that only in extreme cases is it nearer to the column than is the center of the support in sketch (a), and that in all other cases sketch (b) will result in there being a considerable length of beam subjected to a negative bending moment. Mr. Godfrey should have limited his statement to the case of very flimsy columns carrying heavy beams.

There would be considerable danger in following the advice to design beams as though of simple span center to center of columns, when the rigid connections are used, since the column bending would be ignored. If the beams actually acted as designed, when this plan is followed, then the column would be thrown out of direction at the connection by an angle equal to that through which the end of the simple beam would change. So long as the change of shape in the column is accompanied by a bending moment, this same moment is deducted from the simple-beam moment at the center of span. This is a condition which we cannot ignore. Our designs are far more consistent throughout when we take into account all moments and stresses that are known to exist. By doing so the beam sections can be materially reduced.

When the point of inflection of a beam is as little as one-tenth the span from the support the positive moment at the center is less than $\frac{1}{12}\ wl^2$, and when the column is perfectly rigid, ideal fixed-end condition, the maximum negative moment is $\frac{1}{12}\ wl^2$. Only when the point of inflection is closer than one-tenth of the span to the support can the moment be greater than $\frac{2}{3}$ as much as in a simple beam. We might as well play fair with the structure and use beams only of sizes sufficient to resist the actual moments, using the saving thus effected to strengthen the columns against the bending inflicted upon them by rigid connections.

The foregoing must not be confused with the case of standard beam connections which make no provision for transmitting bending to columns. In the usual shallow standard details a very slight slipping of the web between the legs of connection angles permits the beam to act as though resting upon independent supports. Rigid connections are preferable to the standard ones in many structures where the stiffness of the building as a whole is important, but when they are used all resulting stresses should be taken into account and provided for.

Mr. Godfrey makes another statement which may be construed, and the writer so takes it, as meaning that like conditions of eccentric loading on each of several floors cause greater bending than does a single one of these loadings, yet he recognizes the fact that the bending carried into the column is divided between the sections above and below the connection. Obviously, the bendings at top and bottom of any story are in opposite directions. Besides, the column is held to position in plan by the framing of each floor, and any bending must be in the form of reversed curves, a complete cycle per story. The column, then, is under no worse bending when there is like eccentricity at each of a dozen successive floors than when at one floor only. Such eccentricity occurring only at alternate floors, or eccentricity of opposite kinds at adjacent floors, tends to combine the separate effects.

Mr. Godfrey is quite correct in condemning the connections of cantilever beams and brackets which he shows to be of improper detail. Also he champions the matter of tension rivets. Since a large part of the resistance of a riveted connection is due to the clamping of parts by the longitudinal shrinking of the rivet, we

might as well recognize the ability of rivets to take tension. In many cases, cited as causing tension on the rivets, probably the initial stress in the rivets is sufficient for the purpose and the external pull of the connected members merely reduces the original pressure between parts caused by the shrinking of rivets. However, the writer will suggest that, so far as possible, such details be made up so that only shop rivets be in tension while field rivets be arranged to take shear only.

In matters of this nature our concern should be to take into account all stresses resulting from the conditions which we impose upon the structure by the details of connections and the relative stiffness of members. Our attitude should be one of investigation of unknown factors and careful consideration of known facts rather than one of argument and the all-too-common unsound respect for precedent and the prestige of established practice. Argument never alters fact.

New Rochelle, N. Y. LEONARD C. JORDAN.

Sir—Mr. Godfrey's criticisms of errors in steel work details, in your issue of Oct. 16, 1919, are, as usual, well placed, and may be studied with much profit. However, in substituting the knee-angle connection for the seat-angle connection he is using a field connection in place of a shop connection, a weaker and costlier detail. The added strength may justify this step, but the point mentioned should be borne in mind.

He takes occasion to criticize the "ultratheorist" in rather caustic fashion. The distinction between the "theoretical" engineer and the "practical" engineer is annoying as well as useless. Whether a theoretical or practical man, you cannot evade natural laws. The theoretical engineer attempts to analyze and interpret them. Too often the practical man merely guesses that stresses do or do not exist. If refinements of analysis bring into play quantities too small for actual consideration, ignore them; the purpose of the investigation is to show whether they may or may not be ignored. It is not so long ago that the great theoretical investigator, St. Venant, pointed out to engineers the dangers involved in ignoring the shear in beams; practical engineers of that time did not use the shear. Take the example shown by Mr. Godfrey's Fig. 1. If the connection is made as he suggests and rigidity is sought and utilized, why not accept the result of the theory which says that the joint is then a fixed one and a bending moment introduced in the column? Any bending of the girder must necessarily affect the column, and can be quantitatively measured by the methods of analysis mentioned in the article. Like a concrete box section, the corners are fixed, and if such rigidity is overlooked the corner moments will crack the concrete.

The engineer should use all the tools in his possession. A practical engineer, with the word used in the right sense, eagerly scans the results of theoretical investigations, knowing them to be fruitful in many important and economical results. He only becomes "disgusted" to use Mr. Godfrey's term, when he discovers that valued truths are applied by the engineering profession about fifty years after their discovery by scientific students.

I speak at length on this point, because remarks by men like Mr. Godfrey have a strong reaction upon the technical schools and tend to hold in disrepute all theoretical investigations. Point out the errors in the theoretical studies and the fallacies in the hypotheses, but encourage at all times the careful, scientific analysis of engineering problems. That way lies the orderly progress of engineering design. GEORGE PAASWELL,

New York City. Consulting Engineer.

Highway Engineer Sees Need for Driller-Crusher-Tractor

Sir—I have received from J. W. McLaren, a road engineer in this state, a communication embodying his views concerning road construction, in which he says:

"Improvement in present types of road machinery is essential to meet successfully conditions in a rocky, mountainous country.

"An economical and efficient tractor is needed. Such a machine should be equipped with an air compressor for drilling rock to be removed from the roadway. (Perhaps a steam line for running Jap drills would be better.)

"It should be arranged to drive a stationary rock crusher at a quay, or to pull and drive a portable crusher for the loose stones along the road.

"In addition, there should be a large dumping wagon or truck, with loading device, for use in grading or graveling the road; this outfit to be operated by the tractor."

Mr. McLaren thinks that manufacturers of road-building machinery should be induced to develop something along the lines suggested. I believe there is considerable merit in his ideas, and should like to have suggestions from other experienced road engineers.

Keyser, W. Va. S. H. LEA,

County Engineer.

An Error in Field Tables

Sir—In the latest (18th) edition of Searles' "Field Engineering," revised by Prof. H. C. Ives, the logarithmic versed sine of 87°33′ is given as 9.881026 instead of 9.981026, which is the right value. This error, which of course is simply a misprint or an oversight and does not detract from the general excellence of the work, occurs in other previous editions, and probably did occur in the first, which was printed about 40 years ago. I found it some three months since, and notified the publishers, who no doubt have corrected the plates. However, it seems just that the many thousands of engineers who are using the book in its present form should be informed of the error, which is comparatively serious. ANTONIO LLANO.

Montclair, N. J.

Asks Aid in Swatting the Woodpecker

Sir—We have creosoted timber water tanks and a number of creosoted pine telegraph poles in northern Mississippi and Tennessee, which have been seriously damaged by woodpeckers, the birds having made holes almost the entire thickness. I am not able to say what becomes of the woodpeckers after they eat the creosote, but some of them continue their operations.

Can you or any of your readers furnish any suggestions as a means of combatting this pest?

Laurel, Miss. L. W. DUFFEE,

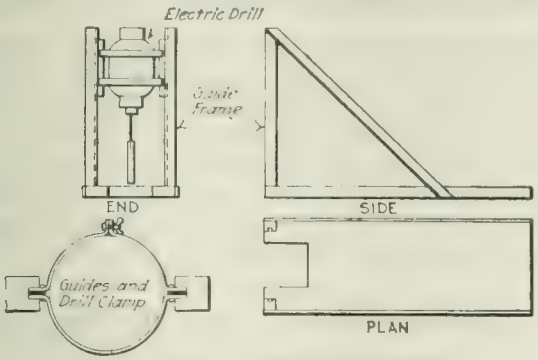
Chief Engineer, Mobile & Northern Railroad.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Boring Machine Improvised From Electric Drill

AN IMPROVISED guide frame and an electric drill hooped with two straps fitted to slide in the guides, as indicated by the drawing, proved to be a labor-saving tool in constructing centers and forms for the six-span arch bridge for the Illinois Central R.R., at Kankakee, Ill. The frame, except the plank base, was built of strap iron, the guides being square bars grooved. It



FIELD-BUILT BORING MACHINE

was an ordinary blacksmith-shop job. The drill was a small rotary electric drill fitted with wood augers. One man operated the outfit, and often bored, in timbers lying on a working platform, as many as 1200 holes a day. Separated from its guide frame and fittings, the drill proved highly useful about the framework during erection. The Gould Construction Co., Davenport, Iowa, was the contractor for the Kankakee bridge, with Alf. Lepard in charge.

Construction Air Line Anchored to Concrete Posts

COMPRESSED air up to 120-lb. maximum pressure is carried along the entire length of the nine-mile Queenston-Chippawa power canal now being built for the Ontario Hydro-electric Power Commission around Niagara Falls. The 10-in. line showed at first some tendency to jump or buckle under the extreme pressure, so the whole line has been carried on concrete anchor blocks spaced from 25 to 50 ft. apart. These blocks are 24x36 in. in plan and about 12 in. above ground and 12 in. below. The upper surface is cast with a semicylindrical groove in which the pipe rests. At each post the pipe is anchored down with a strap over the pipe and bolted into the concrete block.

Light Piledriver Operated by Derrick Without Extra Engine

BY F. W. EPPS

Bridge Engineer, Kansas Highway Commission, Topeka, Kan.

ONE HUNDRED sheet piles per day, driven 4 ft. at a cost of 2c. per foot, is the record of a light and inexpensive piledriver used at Kansas City, Mo. The driver is handled and operated easily by an ordinary boom derrick without the use of an extra engine, but is so constructed that it must be placed, guyed and braced for each pile.

The hammer is operated from the derrick lead line, while the boom is handled by the other line. The back brace, which may be seen in the view, consists of two 2 x 4-in. pieces, latticed so as to form a ladder. This is used when it is necessary to repair the hammer or the leads. Moving from one pile to the next position is accomplished quickly by slacking off the guys, raising the hammer until it engages a stop placed at the top of the leads, and then raising the entire driver by means of the derrick. When the leads are shifted to the new position, they are lowered to contact with the back bracing, and the guys are tightened. No extra engine is required for this driver, and no extra material except the leads and hammer. The outfit was designed by C. C. Clark, contractor, Topeka, Kan.



LIGHT PILEDRIVER IN POSITION FOR DRIVING

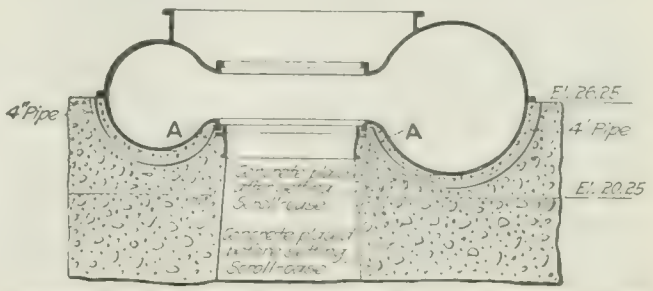
Curved Pipe Used To Prevent Air Pockets in Concreting Scroll Case

BY R. C. HARDMAN

Superintendent, Division of Municipal Engineering, The Panama Canal, Ancon, Canal Zone

IN THE construction of the extension to the Gatun hydro-electric station on the Panama Canal 4-in. black iron pipe was used satisfactorily for eliminating air pockets during the placing of concrete under the lower section of the scroll case for a 4500-kw. turbine unit.

As will be seen by the accompanying illustration, it would be practically an impossibility to place the concrete without having an accumulation of air at the points marked AA in the section unless some special means were taken to prevent it. At least, one could not be certain that such pockets did not exist in the



METHOD OF PLACING CONCRETE UNDER SCROLL CASE

finished work. Air pockets in such locations being especially undesirable, the method shown and described was adopted after consideration of several others.

Six lengths of 4-in. black iron pipe were bent to fit approximately the circumference of the scroll case at the sixth points in the horizontal plane. These were then placed as shown in the illustration and blocked in place with permanent blocking, with their inner ends a few inches below the case and their outer ends slightly below the level of the rough floor of the turbine pin. Concrete of usual consistency was then poured all around the case nearly to the level of its bottom, after which a very wet mixture was placed. This wet mixture was placed between the pipe bends and in but one segment at a time, so that the air would be forced out through the pipes on either side. As the air was forced out and the concrete flowed into position, the excess overflowed into the pipes and appeared at the outer ends at approximately the same level as the inner ends. The outer ends were then filled. The pouring was carried continuously around the scroll-case, so that after the first segment was poured the air and excess concrete must escape through the pipe ahead of the pouring. The upper ends of the pipes were concealed by the tile flooring with which the turbine pits were finished.

No originality is claimed for this method, but it is believed that it is not generally used and is as good a method of securing the desired results as is possible. The work was done by the forces of the Building Division of the Panama Canal, Hartley Rowe, resident engineer. The writer had charge of the work as acting superintendent.

Small Leaks Are Large Losses

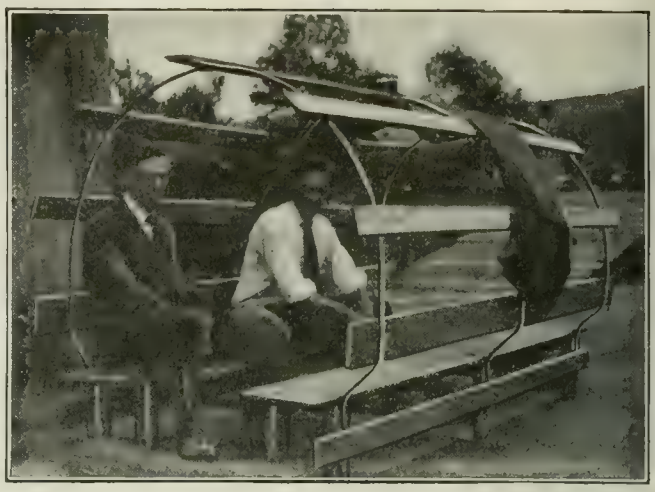
By E. Earl Glass
Los Angeles, Calif.

SMALL but constant losses are often the serious ones, and one cause of these is the common use of hauling equipment which distributes a part of every load along the route. Trucks, wagons and cars will become loose-jointed with continued use and abuse. Until they are overhauled the open joints should be stopped with canvas or burlap strips to prevent loss of sand, screenings or other fine materials. Strips may be nailed to the bottom edges of wooden dump-car doors to stop the spilling. Gondolas and steel dump cars are often received with several tons of stone or sand gone through a loose-fitting door or trap. Purchasers should insist that all openings be effectually stopped before loading so the carload will be delivered intact.

Motor-Truck Frame for Use in Hauling Men to and From Work

A MOTOR-TRUCK frame for use in hauling laborers to and from construction work and in transferring them from one part of the work to another is shown in the illustration. Being provided with a canvas covering, it may also be used as shelter for men upon road work during showers.

The frame is of light construction so it can be easily loaded or unloaded from the trucks by two or three men. This makes it possible to use it with the regular construction trucks which are employed for excavation and other hauling, the frame being removed on arrival



MOTOR-TRUCK FRAME FOR TRANSPORTING LABORERS

at the work. The bow frames are made of ¾-in. iron, and inch lumber is used throughout with the exception of the framing under seats, where 2-in. material is used.

This device has been found very convenient by Guy W. Pinck, assistant engineer in charge of maintenance of the sixth division, New York State Highway Department, who originated the idea.

Submerged Pipelaying Experience in Shallow Water

By Theodore Warren Hacker
Resident Engineer for Norton, Bird & Whitman, Baltimore, Md.

SUBMERGED pipelaying across a series of water channels and intervening islands in the Potomac River is being conducted by novel methods for the new water-supply of Brunswick, Md. The crossing is at Knoxville, Md. The river at this point is 1925 ft. wide at low water, with a depth ranging from 12 in. to 4 ft. The water span is intercepted by five islands varying in width from 30 to 235 ft., making the widest water stretch 635 ft. The river bed is composed of conglomerate, varying from small gravel to stones 3 ft. in size, with frequent outcroppings of bedrock that is especially hard.

Universal cast-iron pipe 8 in. in diameter is being used, and was to have been laid in a 3-ft. trench and secured from movement by concrete anchors spaced at 30-ft. intervals. It was purposed to excavate trench by blasting, for which holes were to be driven to grade 18 in. apart for 100 ft., and loaded and bloated simultaneously. The holes were to be driven through the gravel with sand machines and through the rock with churn drills. After several trials of this method, it was found that the sand machines in penetrating the gravel would literally collapse under successive blows before a depth of 16 in. would be reached. Also, the rock proved to be so hard that progress with churn drills was so slow as to be too costly in time and money. Furthermore, the trench soon filled up with in-washing sand and gravel carried by the current, which runs from three to four miles an hour.

In the shallow water it was at first not deemed necessary to use a dam to check the flow and divert the water, but it was found to be necessary in order to keep the trench free from shifting material. The method worked successfully. To drill the rock it was

decided to use steam drills, and after much difficulty a two-ton boiler was rolled across the river and erected on an island from which steam lines extend both ways across the water.

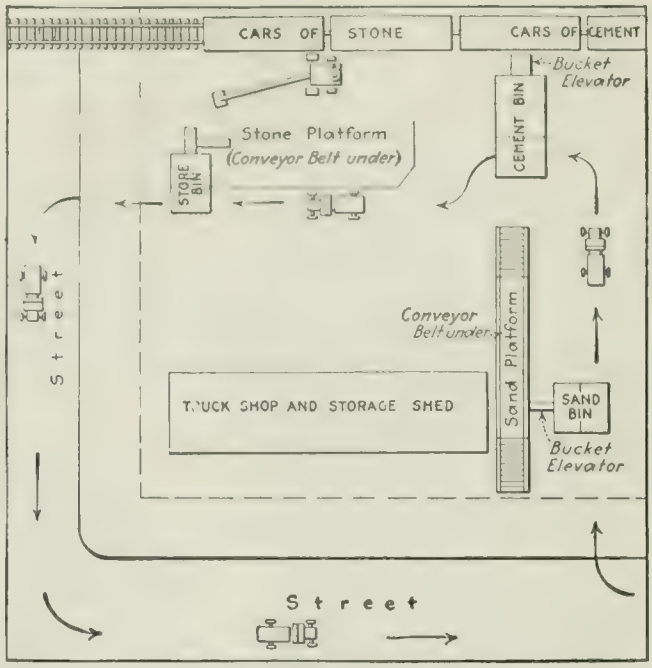
As it was imperative that water be delivered to Brunswick this year, after several attempts at a 3-ft. trench, which, it was estimated, would carry the work into cold weather, it was finally decided to lay the pipe in an 18-in. trench, place bags of concrete side by side across the pipe and refill the trench. In places where the pipe is laid in shallow trench it is raised and the material is raked out from underneath with hooks and rakes. A dam of excavated material on the downstream side of trench will be left 1 ft. above the river bed, which in time will build up to this level, making its own pipe cover.

The firm of Norton, Bird & Whitman, Baltimore, Md., is the engineer and the H. C. Brooks Co., Inc., Martinsburg, W. Va., is the contractor for this operation.

Central Loading Plant for Motor Truck Haulage

A COMPACT loading plant operated with a rather high output by a small force is being used with motor truck haulage of proportioned batches, on paving, at Spencer, Iowa. As described by W. L. Fahey, city engineer, in the *Concrete Highway Magazine*, a crane equipped with a clamshell unloads the crushed stone from gondola cars onto a wood box tunnel a little above ground level. The tunnel has gates operated from below by short-handled levers. These gates discharge onto a conveyor belt that carries the material to a bucket elevator to the top of the loading bin. From the bin the stone runs by gravity into a measuring box which is mechanically emptied into trucks.

Bulk cement is delivered to the cement bin in freight cars, which are unloaded by a power-driven scoop. The cement is carried to the top of the bin by bucket conveyors and is measured in a box before being emptied into the trucks. Sand is handled in much the same manner as the stone. As the source of supply is local, the contractors use their own five-ton motor trucks to haul it from the washing plant to the bin. The loaded trucks



PATH OF MOTOR TRUCK THROUGH LOADING PLANT

run up an incline onto the platform, dump their loads, and the sand is carried by belt conveyor and bucket to the bin, from which it is measured into trucks. Electric motors operate the conveyors and elevators for each bin.

Materials are hauled from the loading plant to the mixer by a fleet of 10 standard Ford trucks with specially designed bodies. These first receive the correct amount of sand at the sand bin. They then pass under the cement bin, receive there the right amount of cement and proceed to the stone bin, where the correct volume of that material is loaded on top of the cement. For an average daily output of 1200 sq.yd. of 6-in. slab the loading plant crew consists of 1 foreman in charge and a mechanic, 2 men at the stone bin, 2 at the sand bin and 3 at the cement bin. Two machine operators handle the clamshell; there is a driver for each truck.

The contractors for this operation are J. S. McLaughlin & Sons, Red Oak, Iowa.



COMPACTLY ARRANGED LOADING PLANT FOR CONCRETE PAVING

NEWS OF THE WEEK

New York, November 27—December 4, 1919

State Departments in Massachusetts Reorganized

Under the provisions of the act providing for reorganization of the executive and administrative functions of the State of Massachusetts, the duties formerly performed by the various agencies are now vested in 16 departments. Of interest to engineers is the creation of the departments of public welfare, public health, public safety, public works, public utilities and the Metropolitan District Commission.

The Department of Public Welfare is under the supervision of a commissioner and an advisory board of six members, two of whom are women, all being appointed by the Governor, with the advice and consent of the Council. This department is charged with the study and investigation of problems relating to public interests, and to this end is organized into divisions of aid and relief, child guardianship and juvenile training.

The Department of Public Health consists of the department as formerly organized. It is under the supervision of a commissioner, who is in charge of the various divisions relating to the supervision of state hospitals, investigations and education.

The Department of Public Safety is charged with the supervision of boiler inspection, elevator regulations, fire prevention and the control of the district police.

The Department of Public Works comprises the former Highway Commission and the Commission on Waterways and Public Lands. It is organized as two divisions—a division of highways and a division of waterways and public lands. The department in general is under the supervision and control of a commissioner called the Commissioner of Public Works (salary, $7500) and four associate commissioners of public works (salaries $6000). The term of the commissioner is three years. Two of the associate commissioners serve for two years, two for one year. The commissioner appoints division heads, the registrar of motor vehicles and the various engineer-assistants and executive officers. He also approves all contracts and supervises all expenditures of the Department of Public Works. All rules and regulations under provisions of the existing law and pertaining to highways, public lands and automobiles shall be drafted by the commission and take effect when approved by the board.

The Department of Public Utilities is under the control of a commissioner and four associates appointed for

(*Concluded on page* 970)

This Week's News

This issue carries news current for the week ending Dec. 13. It is dated Nov. 27—Dec. 4, to preserve the sequence of numbers in the volume.

Conference of Founder Societies and A. A. E.

A joint conference of secretaries and other officials of the four leading national engineering societies and the secretary of the American Association of Engineers was held in New York on Dec. 8, with the object of discussing the possibility of coöperating in a proper apportionment of technical and professional work between the various organizations. It is understood that distinct progress was made toward concentrating technical work in the one group of organizations and professional work in the other.

Constructors Continue Coal Plea

Through its president, Ernest T. Trigg, the National Federation of Construction Industries, Dec. 4, again addressed the Central Coal Committee of the United States Railroad Administration on the subject of permitting certain classes of construction industries priority in coal during the strike situation. Representations had previously been made to the coal committee, but these were without result. Up to the present writing no further priorities had been granted.

M. I. T. Contracts With Industries

In connection with the drive of the Massachusetts Institute of Technology for $4,000,000 to match an equal amount offered by "Mr. Smith," the institute's anonymous benefactor, the executive committee of the institute has approved a plan whereby the industrial organizations of the country may retain the technical services of the institute. Such services include making available for five years its library and files, and conferences with its technical staff on problems pertaining to the business of the company seeking such service. Records of the qualifications, experience and special knowledge of the alumni are to be kept and made available. For the solution of special technical problems, the company will be advised as to where this service can best be obtained. Twenty-two organizations have already signed such contracts, $416,500 being obtained, in sums ranging from $500 to $25,000.

Make Plans To Accomplish Industrial Peace

President's Conference in Washington Formulates System To Obtain the Necessary Facts

(*Washington Correspondence*)

After a week of daily meetings held in executive session, President Wilson's new industrial conference has formulated a plan of procedure to obtain the necessary facts from which a definite program pointing toward industrial peace may be evolved.

Without any preconceived plan of attacking the task assigned them, the 16 members of the conference came to Washington at the invitation of the President. The problem that confronted them was the plan of procedure, and, unlike the members of the first conference, the members chose to deal with machinery and methods of handling and preventing labor disputes rather than deal with industrial principles.

Industrial disputes were divided by the conferees into the following groups: Federal, state and municipal employees; employees of public utilities, and employees of private industries. Whether employees coming under the first groups should be allowed to strike and what methods should be used to prevent such action, was the problem assigned to a special committee of the conference, which reported to the entire membership. It is the plan of the conference to deal similarly with the other groups of employees.

In order to expedite the collection of data upon which the conference will base its future decisions, Henry R. Seager, professor of economics, Columbia University, has been appointed executive secretary of the conference.

Other economic experts, who will assist Professor Seager in the collection and collation of facts, have been added to the conference staff.

"We are trying to arrange a permanent system, not a truce," said one of the members of the conference. "Machinery to prevent the necessity for strikes is as much an object of the conference as the machinery to stop strikes after they have started."

It is the plan of the conference to take a recess from Dec. 19 to Jan. 5. Before the recess, the conferees expect to have a definite outline of how they propose to handle and prevent labor disputes. After the recess, representative employers and employees will be called before the conference to present the facts of their respective sides.

The conference expects to utilize the data accumulated by Congressional

committees which have investigated labor disputes, data collected by Federal commissions, and the conclusions of the British and Canadian industrial conferences.

A tentative report will be published after sufficient data have been collected. Before publishing and presenting the final report to the President, the conference will take into consideration such criticism as will follow the publication of the preliminary report.

The members of the conference are W. B. Wilson, secretary of labor, chairman; Thomas W. Gregory, George W. Wickersham, Oscar S. Straus, F. W. Taussig, Samuel W. McCall, Herbert C. Hoover, Martin H. Glynn, H. C. Stuart, W. O. Thompson, Julius Rosenwald, O. D. Young, H. J. Waters, Stanley King, Henry M. Robinson and Richard Hooker.

Engineering Council Makes Direct Appeal for Funds

On account of the increased cost of services, Engineering Council has issued a direct appeal to engineers of the country for personal contributions to aid in carrying on the activities of the National Service Committee headquarters in Washington.

It is pointed out that for the calendar year 1919 the member societies of Engineering Council have been able to provide $25,000, but that the council will need not less than $50,000 for the calendar year 1920, including the cost of the National Service Committee's headquarters in Washington. The statement is made, that aside from the possible appropriation of the member societies, not less than $30,000 will be needed.

The agreement is binding upon all work performed within the geographical limits of Greater New York and Long Island, and in such additional territory as is included in the provisions of existing trade agreements between the several trade associations of employers and the unions of their trades.

Urging Commerce Bodies To Indorse Jones-Reavis Bill

Engineers in the Chicago Association of Commerce are attempting to get that body to indorse the Jones-Reavis bill providing for a national Department of Public Works. In Denver the Civic and Commercial Association has had the matter presented to the board of directors through its mining bureau. A committee, of which some engineers are members, has the matter in hand.

Mississippi Proposes Road Bonds

In accordance with the highway convention held in Jackson, Miss., Oct. 23, the committees of attorneys and civil engineers met Nov. 13 at the office of the State Highway Commission to frame a bill authorizing the issue of $25,000,000 in road bonds. The bill will be considered by the Mississippi legislative session in January.

Railroads May Not Be Returned at Beginning of the Year

In the past week a decided change in opinion among officials and legislators in Washington has taken place with regard to the likelihood of the railroads being returned to their owners on the first of the year, in accordance with previous statements of Director General Hines, which followed opinions of the President. Due to the apparent impossibility of putting into effect an adequate legislative program by the first of the year, it is now considered by many that it will not be possible to return the roads to their owners at that time.

On Dec. 8 a vote on the Cummins bill in the Senate was halted by a parliamentary tangle, and it is now likely that another vote will not be possible for several days, to permit the bill to go to conference with the House, together with the Esch bill, already passed by the House.

In the meantime Director General Hines has completed his report to President Wilson on his recent conferences with Chairmen Cummins and Esch of the Senate and House Committees, respectively, but up to the present writing no intimation as to the nature of the report had been made public.

A conference of the six Governors of New England States, held in Boston Dec. 10 on invitation of Governor Coolidge of Massachusetts, adopted resolutions urging that financial assistance be given the New England railroads after they are returned to private control, and protesting against such return, under present conditions, as spelling disaster to these lines.

Canadian Waterway Men Favor St. Lawrence Improvement

The first Canadian waterways convention was held at Windsor, Ont., Nov. 18-19, 1919, with the object of effecting an organization to further the project of a great inland waterway from the Atlantic Ocean to Lake Superior. About 100 delegates were in attendance. E. L. Cousins, chief engineer of the Toronto Harbor Commission, said the channels in Toronto harbor have been deepened to 30 ft. to accommodate oceangoing vessels, in anticipation of the deepening of the St. Lawrence. C. P. Craig, Duluth, emphasized the need of greater transportation facilities for the Northwest. He would do all in his power to further the plan for making the Great Lakes the Mediterranean of the American continent. The Hon. Frank Keefer, Port Arthur, said the railways had failed to meet the problem of carrying the increased production of the Northwest, which could only be solved by deepening the St. Lawrence. This would make available more than 1,000,000 hp. for Ontario and New York. The project would involve the expenditure of $100,000,000, less than one-fifth of the cost of the Panama Canal, and would add 1000 miles to the coast line of the United States.

At the second day's session an organization was formed under the name of the Canadian Deep Waterways and Power Association, with the following officers: W. M. German, Welland, honorary president; Sir Adam Beck, London; and Mayor Thomas L. Church, Toronto, honorary vice-presidents; O. E. Fleming, Windsor, president; E. L. Cousins, Toronto, vice-president; F. M. Sclanders, Windsor, secretary-treasurer. Resolutions were adopted favoring the Great Lakes-Welland-St. Lawrence route to the ocean, and declaring that one of the objects of the association will be securing the development and deepening of the St. Lawrence waterways system along the lines on which the Great Lakes-St. Lawrence Tidewater Association is now working.

Standardize Stone Sizes

In order to facilitate the supply of crushed stone for road purposes, representatives of the highway departments of New York, New Jersey, Pennsylvania, Delaware and Maryland and of the crushed-stone producers of those states met in Philadelphia Nov. 18 and agreed on one standard size for stone. It was found that each state had a different standard, and that this situation resulted in slowing up production, due to the necessity of changing screens and stocking different sizes. The standard stone adopted was that passing a 2½-in. screen and retained on a ⅝-in. screen. The sizes between these meshes are to be the crusher run.

The meeting was called at the instance of Lieut. Col. W. D. Uhler, state highway engineer of Pennsylvania. Besides the representatives of the stone interests and Colonel Uhler, there were present W. G. Thompson, state highway engineer of New Jersey; Charles G. Upham, state highway engineer of Delaware; J. N. Mackall, state highway engineer of Maryland, and William Treadwell, representing Frederick Stuart Greene, state highway commissioner of New York.

Michigan Registration Board for Engineers and Architects

Appointments to the Michigan Board of Examiners of Architects, Engineers and Surveyors, created under the statute abstracted in *Engineering News-Record* of May 1, 1919, p. 889, are as follows: Emil Lorch, professor of architecture, University of Michigan, Ann Arbor; George L. Harvey, architect, Port Huron; Edward M. Walker, grade-separation engineer, Michigan Central R.R., Detroit; John A. Broad, Luce County road engineer, Newberry (trained as a mining engineer, but recently in road work); John J. Cox, Washtenaw County road engineer, Ann Arbor; Joseph A. Lardie, heating engineer, Pulte Plumbing & Heating Co., Grand Rapids; and George Jerome, civil engineer and surveyor, Detroit.

Would Make Construction Division Part of Public Works Dept.

A bulletin issued at Washington, Nov. 26, by the Engineers, Architects and Constructors' Conference on National Public Works contends that the Construction Division of the Army should be given an independent status outside the jurisdiction of the War Department, and that it should be eventually transferred to the proposed Department of Public Works. The reasons given for the proposed change are that the division's work is of a strictly noncombatant nature; that Army methods and Army experience are absolutely unnecessary to its proper functioning; and that its personnel consists almost entirely of civilian engineers and constructors.

According to the bulletin, the work of the Construction Division is not yet completed. The cantonments which were constructed during the war were of but temporary nature, and will not provide proper housing facilities for the permanent personnel of the regular Army. There are, the bulletin says, in the United States housing facilities of a permanent and usable nature for something less than 100,000 troops, and to care for the 300,000-odd men, which seems to be the minimum proposed by new Army legislation, it is necessary to provide additional facilities for some 200,000 men and officers. The bulletin states that Brig. Gen. R. C. Marshall, head of the Construction Division, estimates that its annual expenditure for some years to come will be not less than $100,000,000, and as that figure is said to exceed the total amount annually expended by the entire Quartermaster Corps during the period previous to 1917, the Construction Division should not operate as part of the Quartermaster Corps, or any other corps, but should be placed on a parity with them.

Final 27-Mile Stretch Is Paved on "Ridge Route" in Southern California

The "Ridge Route" between Bakersfield and Los Angeles was constructed by the California Highway Commission several years ago to cut 25 miles from the shortest route then existing between the two cities. The rather unusual features of the road were described in *Engineering Record* of Sept. 11, 1915, p. 322, and in the following issue editorial comment appeared on the policy of carrying out expensive construction through nontributary territory in order to get a short through route.

Decision to pave the entire ridge route was made last year, and the work was soon carried out on those sections along which traffic could be carried at one side while paving was under way. The central section, 27 miles in length, was, however, a formidable undertaking and was postponed until this autumn. During this part of the work all traffic had to take a detour that added 25 miles to the distance between terminals. Cement and steel had to be hauled 40 miles from the railroad, sand and gravel were hard to find along the line, and water was piped a total of 17 miles.

The paving has just been completed by highway commission forces for about $100,000 less, it is reported, than the lowest bid on the job and in less time than the limit set in the proposed contract.

The work was advanced from both ends simultaneously. The pavement is 20 ft. wide and has a minimum thickness of four inches.

Wyoming Plans Permanent State Good Roads Association

Considerable extension in the road-building program of Wyoming was indicated in a recent good roads conference held at Cheyenne. The proposal was made that Wyoming's next step in its highway development program be the voting of $25,000,000 worth of bonds, and the 300 delegates attending the conference were asked to give their support to the proposal.

From delegates to the conference, invited by Governor Carey, one man from each county was named to represent his county on a committee to map out a program leading to the establishment of a permanent good roads organization.

Pennsylvania's 1919 Road Contracts Total 649 Miles

Construction contracts awarded by the Pennsylvania State Highway Department from Jan. 1, 1919, to Nov. 30, 1919, inclusive, totaled 648.78 miles, the contract price for this work being $27,020,120.66. This figure includes contracts on state highways, county contracts, and state-aid contracts. The majority of the road contracted for in Pennsylvania during 1919 is of reinforced-concrete type, the remaining mileage being divided among bituminous concrete, brick, sheet asphalt, and plain concrete. The 486.21 miles of reinforced concrete contracted for aggregated $21,558,111.65, or an average cost of $44,358.25 per mile. All but 60 of the 648.78 miles contracted for were on primary and secondary highway systems, and state-aid on highway routes. On the primary system alone contracts were awarded for the construction of 512.61 miles of road, the contract price aggregating $21,514,212.83.

New Shipbuilding Program Proposed

Announcement has just been made by the United States Shipping Board that it is preparing plans for a new shipbuilding program of 1,000,000 deadweight tons carrying capacity of ships, distinct from the emergency war program, and that it will present these plans to Congress.

Col. W. D. Sohier Resigns From Mass. Highway Commission

Col. W. D. Sohier, for 11 years a member of the Massachusetts State Highway Commission, and for the past eight years chairman, recently tendered his resignation, pending the recent reorganization of the state's administrative departments.

In many respects, Colonel Sohier was the pioneer in this country in the framing of highway legislation pertaining to the regulation of traffic. He drafted the laws, now on the statute books of the State of Massachusetts, regulating the speed of automobiles and providing for the revocation of licenses of drivers convicted of certain offenses. He helped to administer the laws, and worked out a uniform automobile law which laid the foundation for the present system in Massachusetts.

Colonel Sohier early became a strong advocate of the good-roads movement and interested himself in methods and means for the development and standardization of state highways. Twenty years ago he began his investigations of the problem of the preservation of road surfaces against the wear and tear of automobile traffic. He experimented with calcium chloride, at that time in use to some extent in England, and later with oil products.

In 1908 Colonel Sohier became a member of the Massachusetts State Highway Commission, and at once started a scheme of providing efficient maintenance which has been followed out and has resulted in placing Massachusetts in the foremost ranks in this respect. Experimental sections were established—sand-oil sections in the soft, sandy district of Cape Cod, macadam sections in other parts of the state, and gravel and stone mixtures in heavily traveled parts. These experimental sections were noticed and studied by engineers from all parts of the country.

Early achievements of Colonel Sohier in this field of engineering were notable. Under his direction the first power spraying machine for distributing asphaltic materials on road surfaces was introduced; a machine to spray the heavier tar and asphalt products also was developed.

Under the supervision of Colonel Sohier a strong, efficient engineering department was developed, which has come to be recognized throughout the country as a leader in the field of highway engineering.

Colonel Sohier for many years past has been a prominent figure at national road conventions.

City Administrator Wanted

Under the new city charter of Akron, Ohio, which goes into effect on Jan. 1, 1920, the new council will appoint a chief administrator or city manager. The tentative salary for the office is $10,000 a year.

Bridge Project for Detroit River Being Studied

Investigations looking toward the construction of a bridge across the Detroit River to connect Detroit and Windsor, Canada, have just been started. Traffic and location studies are included. The work has been placed in the hands of Gustav Lindenthal, engineer of the Hell Gate arch bridge and designer of the proposed 3100-ft. Hudson River suspension bridge, as consulting engineer, and Charles E. Fowler as chief engineer for the joint boards of the American and Canadian companies which will undertake the construction.

While the need for better traffic connection across the river has been felt for years, the increase of traffic with the phenomenal growth of Detroit has made it imperative that modern means of carrying passengers and freight be provided soon. The great development of Windsor industrially is an important factor in this need. It is held that conditions call for a bridge of large capacity. Present views favor a double-deck structure to carry roadway traffic, street cars and steam trains. While the heavy vessel traffic of the Lakes must not be obstructed in any way, all navigation requirements can be met by either a cantilever or a suspension bridge of from 1800 to 2400 ft. span, depending on the final location adopted. These proportions will give the new structure rank among the greatest bridges of the world, though the cost, as estimated, is moderate. Local reports name figures between $20,000,000 and $30,000,000.

Water Works Association Elects Nominating Committee

The American Water Works Association has reported the result of the ballot for the nominating committee for the coming election of officers, as follows:

Charles R. Henderson, chairman; manager of the water company, Davenport, Ia.
District 1—Frank A. Barbour, consulting engineer, 1120 Tremont Temple, Boston.
District 2—Lyman P. Hapgood, superintendent water and light, Jamestown, N. Y.
District 3—James H. Long, City Hall, Camden, N. J.
District 4—Henry B. Morgan, manager Peoria water-works, Peoria, Ill.
District 5—Chester B. McFarland, secretary and manager Tampa water-works, Tampa, Fla.
District 6—F. W. Cappelen, city engineer, Minneapolis.

The officers to be elected are president, vice-president, treasurer, one trustee from district 2 and one trustee from district 5, the former district consisting of the State of New York, and the latter of the Southern states.

December Water Works Meeting

The New York Section of the American Water Works Association will hold a meeting at the Park Avenue Hotel, New York City, Dec. 17. It will be preceded by a luncheon. Francis H. Sherrerd will describe the 30-in. flexible joint line under the Hackensack River for the water-supply of Jersey City, N. J. The method of laying a 36-in. line across the Narrows from Brooklyn to Staten Island will be outlined by a representative of the New York Board of Water Supply. In addition to subaqueous water lines, there will also be discussed the suggested improvements in iron for pipe.

Lieut. Col. Keller, Former Deputy Chief Engineer, A. E. F., To Be Promoted

A communication from Washington, dated Dec. 7, contains the information that Lieut. Col. Charles Keller, until recently brigadier general and deputy chief engineer of the American Expeditionary Forces, has been nominated by the President for promotion to the rank of colonel, Corps of Engineers, U. S. A. The appointment is to be effective from Sept. 19, this year.

Colonel Keller was graduated from the Military Academy in the class of 1890. His experience in the service has been varied and valuable, and has covered most fields open to an engineer officer. From Dec. 27, 1898, to Mar. 15, 1903, he engaged in river and harbor work, first for one year at Portland, Me., under the immediate orders of Maj. S. W. Roessler; then until Apr. 28, 1901, he was secretary of the Missouri River Commission; and, following that assignment, was himself in charge of improvements of rivers and harbors on the east shore of Lake Michigan from Apr. 30, 1901, to Mar. 15, 1903. He served in the Philippine Islands from May 1, 1903, to Aug. 15, 1905, as engineer officer, Department of Mindanao, and as engineer of the Moro Province. Concurrently with his Philippine assignment he served from Apr. 1, 1903, to Sept. 15, 1905, in command of Co. K, First Battalion of Engineers, and from Aug. 13, 1905, to Sept. 15, 1905, commanded the battalion. From Sept. 20, 1905, until the beginning of preparations for the great war, he served as engineer of the 11th Lighthouse District and was in charge of the survey of the Northern and Northwestern lakes, with headquarters at Detroit, Mich.

With rank of brigadier general he joined the staff of Maj. Gen. W. C. Langfitt, chief engineer, A. E. F., as deputy, at the time preparations were being made for the great American offensives. During part of his service in the theater of operations he was assistant to the Chief Engineer at General Headquarters, acting as the latter's liaison and executive officer in relations with the Commander-in-Chief and the General Staff. For his services in France General Keller received among other decorations the French Legion of Honor.

Upon General Keller's return to the United States in the early summer of this year, he reverted to his pre-war rank of lieutenant colonel, and was assigned to duty as a member of the Board of Engineers for Rivers and Harbors.

Bureau of Standards' Current Budget

For the ensuing year the Bureau of Standards has asked Congress for nearly $3,000,000. Among the items of the estimates are: For continuation of the investigation of structural materials, $250,000 (an increase of $125,000 over the present appropriation); for investigation of fire-resisting properties of building materials and conditions under which they may be used most efficiently, and for the stabilization of types of appliances for fire prevention, $65,000 (an increase of $40,000); to study methods of measurements and technical processes used in the manufacture of brick, tile, terra cotta and other clay products, $50,000 (an increase of $30,000); for technical investigations, in coöperation with the industries, of fundamental problems involved in industrial development following the war, with a view to assisting in the permanent establishment of the new American industries developed during the war, $250,000 (an increase of $200,000).

American Contractors Invited to Bid on Colombian Tunnel

The Department of Antioquia, Republic of Colombia, South America, is planning the construction of a tunnel on the Antioquia Ry. through the La Quiebra Mountain. American contracting companies have been invited to submit bids, according to advices received by the Bureau of Foreign and Domestic Commerce. The tunnel will be approximately 12,250 feet long, and engineers of the Department of Antioquia have estimated that it will cost about $2,000,000.

More detailed information regarding the tunnel project may be obtained from the American Consular agent at Medellin. The Bureau of Foreign and Domestic Commerce will furnish the name of the engineer in charge, to inquiries referring to file No. 40802A.

Rapid Transit Engineers Organize

At a meeting of engineers engaged in rapid-transit construction in New York City, Dec. 8, a rapid-transit section of the American Association of Engineers was organized. One of the first undertakings of the section will be to induce the city Board of Estimate to adopt the budget formulated by the Transit Construction Commissioner, which provides increased compensation for the engineering staff.

Elect Officers on Detroit Examining Board

At a meeting of the Board of Examiners for the Registration of Architects, Engineers and Surveyors in the State of Michigan, held Nov. 8, 1919, the following officers were elected: George Jerome, Detroit, president; Prof. Emil Lorch, Ann Arbor, vice-president; John J. Cox, Ann Arbor, secretary.

State Departments in Massachusetts Reorganized

(*Concluded from page* 966)

terms of one, two, three, four and five years, respectively. The chairman of this board is designated by the Governor. This board has jurisdiction over different classes of corporations, and rules on the adoption of rates and policies of gas and electric corporations.

The Metropolitan District Commission controls the functions of the Metropolitan Sewerage and Water Board and the Metropolitan Park Board. It is under the supervision of a commissioner (salary $6000) and four associates (salaries $1000) appointed by the Governor with the advice and consent of the Council.

This act took effect Dec. 1. With the exception of the naming of Col. Richard K. Hale as an associate commissioner of public works, the appointments all went to lawyers and business men.

The following is a roster of the newly appointed officials:

Department of Public Works—Commissioner, John N. Cole, Andover; Division of Highways—Associate Commissioners, F. D. Kemp, Springfield; and J. W. Synan, Pittsfield; Division of Waterways and Public Lands—Associate Commissioners, J. B. Baxter, Milton; and R. K. Hale, Brookline.

Metropolitan District Commission—Commissioner, James A. Bailey, Arlington; associate commissioners, E. F. Whitney, Milton; Charles S. Baxter, Boston; F. G. Hall, Boston; W. H. Squire, Boston.

Work Resumed by American Committee on Electrolysis

Field investigations on the electrolysis of underground pipes and structures have been taken up by the American Committee on Electrolysis, working in coöperation with the United States Bureau of Standards. The work is being resumed where it was interrupted by the war and as it was left by the printed report of October, 1916.

The committee consists of 27 members, there being three each from the following nine organizations: American Institute of Electrical Engineers; American Gas Association; American Electric Railway Association; American Water Works Association; American Telephone & Telegraph Co.; National Electric Light Association; Natural Gas Association; American Railway Engineering Association; national Bureau of Standards. In the coöperative work being done with the United States Bureau of Standards each of the organizations named is represented by an expert chosen by it. The report made by the Bureau of Standards will be submitted to the general committee for approval.

The chairman of the main committee is Bion J. Arnold, consulting engineer, Chicago. The American Water Works Association is represented on the main committee by E. E. Minor, New Haven, Conn., and Nicholas S. Hill, Jr., and Alfred D. Flinn, New York City. This association has as its expert Prof. L. A. Hazeltine of Stevens Institute, Hoboken, N. J.

St. Louis Contractors Join A. G. C.

The several classes of contractors in St. Louis recently voted to amalgamate and become a chapter of the Associated General Contractors of America. The action was taken as a result of the visit to that city of the president and secretary of the Associated General Contractors.

Organize Eastern Ontario Hydro-Electric Municipal Union

The Eastern Ontario Hydro-Electric Municipal Union was recently organized at Brockville, Ont., by about 150 representatives of municipalities in eastern Ontario, from Kingston to the Quebec border, the object being to secure the development of water powers in that section and obtain the advantages of cheap electrical energy similar to those enjoyed in western Ontario. It was stated that the rates for electricity supplied by the Cedar Rapids Co. to municipalities in the East ranged from $45 to $70 per horsepower, while in western Ontario the rate was as low as $9 per horsepower. Resolutions were adopted urging the coöperation of the Federal and provincial Governments with the Hydro-Electric Power Commission to secure power development on the St. Lawrence between Morrisburg and Cornwall, and that one member of the Hydro-Electric Comission should be chosen from eastern Ontario. Mayor W. A. Lewis of Brockville was nominated for the position. The following officers were elected: President, W. B. Reynolds, Brockville; vice-presidents, Mayor Fetterby, Cornwall; R. F. Elliott, Kingston, and R. McEwan, Renfrew; secretary-treasurer, J. A. Johnston, Brockville.

Viaduct Cost Apportioned Among Eight Parties

Under an order issued by the Public Service Commission of Pennsylvania Nov. 20, the cost of the viaduct and bridge to be built across the Lehigh River at Bethlehem, Penn., is to be apportioned among eight parties. The total cost of the structure is estimated at $2,315,000. Of this sum the Counties of Northampton and Lehigh are each to pay $450,000; the Central R.R. of New Jersey and the Philadelphia & Reading R.R., jointly, $500,000; the Lehigh & New England R.R., $15,000; the Lehigh Valley Transit Co., $100,000; the City of Bethlehem, $405,000, and the Bethlehem Bridge Commission, $395,000. The last item has been raised by private contribution. Bids for construction of the viaduct are now being called for.

Civil Service Examinations

Canada.—Assistant in wood preservation, Forest Products Laboratory, Montreal, Department of the Interior, $1320 per year. File application with Civil Service Commission of Canada at Ottawa before Dec. 18.

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Town manager, $2400 per year, Dec. 16. To fill vacancy in Ordnance Department, Nitrate Plant No. 1, Muscle Shoals, Ala. File applications before Dec. 16.

Structural steel inspector, Naval Ordnance Plant, South Charleston, W. Va., $7.04 per diem, Dec. 23. File applications before Dec. 23.

Architectural and structural steel draftsman, Lighthouse Service, Key West, Fla., $1560 per year, Jan. 6. File application before Jan. 6.

Fire-prevention engineer, office of Director of Purchase and Storage, War Department, duty throughout United States, $2500 to $4000 per year, Jan. 13. File application before that date.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

BRIDGE BUILDERS' & STRUCTURAL SOCIETY, 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

ENGINEERING INSTITUTE OF CANADA; General Secretary, Fraser S. Keith, 176 Mansfield St., Montreal; Jan. 27-29, Montreal.

AMERICAN ROAD BUILDERS' ASSOCIATION, 150 Nassau St., New York City; Feb. 9-13, Louisville, Ky.

AMERICAN WOOD-PRESERVERS' ASSOCIATION; Secretary-Treasurer, F. J. Angier, Mt. Royal Station, Baltimore; Feb. 10-12, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle St., Chicago; Feb. 20-21, Chicago.

The Cleveland Engineering Society was addressed Dec. 9 by W. H. Weingar, precision-gage expert, Pratt & Whitney Co., Hartford, Conn., who spoke on the subject of "Manufacturing and Measuring in Millionths of an Inch." At the luncheon Dec. 5 John A Alburn, counsel for petitioners for the creation of a conservency district in Cuyahoga County, Ohio, spoke on "The Cuyahoga Valley Conservancy Plan." At the meeting Dec. 16 W. J.

Beck, director of research, American Rolling Mills Co., Middletown, Ohio, will read a paper on "Manufacture and Magnetic Testing of Electric Sheet."

A Billings, Mont., Chapter of the American Association of Engineers is in process of formation. A meeting in Billings Nov. 25 was attended by 22 engineers. The meeting was the result of a call issued by F. D. Monty, district engineer of the Montana State Highway Commission at Billings. Mr. Monty was elected temporary chairman, A. E. Lamb was elected temporary secretary, and steps were taken for the formation of a local chapter of the association.

The American Association of Engineers recently organized a section at the University of Kentucky, Lexington, with a number of members of the faculty and students in the engineering colleges as charter members. J. M. Angell, a traveling representative of Chicago, and also representing *Engineering and Contracting*, presented the purpose of the society to the students and faculty, and the following were among those enrolled: Prof. D. V. Terrell, head of the department of civil engineering: Prof. William A. Newman, Prof. W. J. Carroll and Prof. M. F. Melton. As soon as the necessary formalities can be complied with, the Lexington chapter will be organized.

The Oklahoma Chapter of the American Association of Engineers has been asked to name one representative to a civic advisory board of nine members which the city council has created to give it expert advice and assistance in administration matters.

The Louisiana Engineering Society held a regular meeting Dec. 8 at which Allen E. Washburn, Government engineer in charge of works at the mouth of the Mississippi River, presented a paper on "An Open Mouth for the Mississippi River."

The Baltimore Chapter, American Association of Engineers, announced that more than 200 applications for membership had been received during the first week of its membership campaign. At a business meeting Dec. 5 the following nominations were made: J. Harry Gross for president; G. A. M. Schaeffer, J. H. Adamson, F. P. J. Patenall and E. L. Gosnell for vice-presidents; Arthur T. Ihlang for secretary, and Milton J. Ruark and B. L. Crozier for treasurer. A city and state rally of the association was held in the City Club quarters in the Munsey Bldg., Baltimore, Dec. 9, when a program of addresses arranged by Frank L. Riley was presented. Dr. John H. Gregory, professor of civil engineering, Johns Hopkins University, delivered a paper on "The Advancement of the Ethics of the Professional Engineer"; Maj. Ezra B. Whitman, consulting engineer, spoke on "Liaison Between Engineers and Contractors"; Otto G. Simonson, architect, defined "The Relationship Between the Architect and the Engineer"; Prof. J. B. Whitehead, dean of the Engineering School at Johns Hopkins University, presented a paper on "The Engineer as a Public Servant."

The Rochester, N. Y. Engineering Society was addressed by Edward G. Miner, president of the Pfaudler Co., at the weekly luncheon Dec. 9. Mr. Miner, who spent considerable time in England and Germany in the past year, spoke on "The European Situation."

The Engineers' Club of Philadelphia will be addressed by Commander William L. Cathcart, U. S. N. R. F., at the weekly luncheon Dec. 23. Commander Cathcart is to speak on "The Navy of the Future."

The Engineering Society of Buffalo held its third general meeting of the season Dec. 9. Ansley Wilcox spoke on the subject, "Buffalo's Opportunity." James H. Herron, Cleveland, addressed the meeting on "The Economic and Social Development of the Engineer."

The Canadian Electric Railways Association held its annual meeting at Montreal Dec. 3-4. The following officers were elected: Honorary president, Col. J. E. Hutchison, Montreal; honorary vice-president, Acton Burrows, Toronto; president, A. Gaboury, Montreal; vice-president, G. Gordon Gale, Hull, Que.; honorary secretary-treasurer, A. Eastman, Windsor.

The Indianapolis Chapter of the American Association of Engineers held a meeting Dec. 3 at which R. E. Tracy, bureau of municipal research, Chamber of Commerce of Indianapolis, spoke on the work of the bureau. A "traffic committee" was proposed for studying the local transit problem.

The Engineers' Society of St. Paul held a meeting Dec. 8, at which H. E. Mitchell, safety engineer, Oliver Iron Mining Co., Eveleth, Minn., spoke on safety engineering.

PERSONAL NOTES

MAX L. CUNNINGHAM has resigned as state highway engineer of Oklahoma.

H. B. BUSHNELL has resigned as maintenance engineer of the Illinois State Highway Department, to join the staff of the Western Wheeled Scraper Company.

J. N. SMITH has been appointed county engineer, Logan County, West Virginia, succeeding J. W. MCLAREN, who has entered the office of the division road engineer at Huntington.

LEWIS H. DELANY has severed his connection with FRANK L. WILCOX, consulting engineers, St. Louis, and has become superintendent of construction for the W. E. Wood Co. of Detroit, on additions to the Dort Motor Car Co. plant in Flint, Mich.

W. F. COCKE has resigned as highway engineer of Florida, to accept the position of deputy highway commissioner of Virginia.

FRED TARRANT, district engineer of the Illinois State Highway Department, has been promoted to the position of maintenance engineer, succeeding H. B. BUSHNELL, resigned, as noted elsewhere.

KENNETH EVANS, assistant construction engineer of the Illinois State Highway Department, has been promoted to the position of district engineer, succeeding FRED TARRANT, whose promotion is noted above.

PROF. J. E. KICKHAM has resigned as professor of structural engineering at the Iowa State College and as consulting bridge engineer for the Iowa State Highway Department, and has become bridge engineer in the South Dakota highway department.

E. W. CANNING, formerly a superintendent of construction, STONE & WEBSTER CO., Boston, has become associated with JOHN B. LEARY, formerly of the staff of FORD, BUCK & SHELDON, INC., in the building contracting business, with headquarters in New London, Conn.

FRANK E. CAVE has left the service of the St. Paul Union Depot Co. to enter the bridge department of the South Dakota State Highway Commission.

C. S. CHENEY, San Francisco, secretary of the City Plan Commission of California and city plan consultant for Portland, Ore., has been appointed city planning engineer for Spokane.

JAMES H. POLHEMUS, general manager, Coos Bay Shipbuilding Co., Marshfield, Ore., has been appointed general manager and engineer of the Port of Portland, Ore., and will take office Jan. 1.

H. FRANK DORR has been elected county engineer, Cambria County, Pennsylvania, with headquarters at Ebensburg. Mr. Dorr was previously engineer of two townships in Cambria County.

J. M. MEADE, who for the past 43 years has been connected with the engineering department of the Atchison, Topeka & Santa Fé Ry., for many years serving as division engineer, has opened an office in Topeka, Kan., to engage in private practice, specializing in railroad work.

IRA TAYLOR, formerly assistant drainage engineer, Kansas State Engineering Department, has been appointed resident engineer on Federal-aid road work in Mitchell County, Kansas, with headquarters at Beloit.

F. H. FREETO, who since his discharge from the Army has been con-

nected with the testing department of the Kansas Agricultural College, has been appointed resident engineer of Federal-aid roads in Labette County, Kansas.

DAVID V. BLAIR, Bilivia, Ky., who was formerly connected with the engineering department of the Consolidation Coal Co. at Jenkins, has become field manager of the Elkhorn Mining Corporation at Fleming.

W. RANSOM HOLBROOK, Mayking, Ky., has entered the engineering department of the Louisville & Nashville R.R., with headquarters at Ravenna.

COL. RICHARD K. HALE, who before the war was a member of the firm of RICHARDSON & HALE, has been appointed a member of the Public Works Commission of Massachusetts. For a number of years he was editor of the *Journal of the New England Water Works Association.*

GEORGE I. HOWARD, who for many years was deputy city engineer of Schenectady, N. Y., under HENRY C. ALLEN and THOMAS W. WOOLEY, has been appointed city engineer.

W. W. PEARSE, architect and superintendent of buildings for the City of Toronto for some years, has been appointed business administrator and secretary-treasurer of the Toronto Board of Education. Mr. Pearse was born and educated in Canada, but was for many years connected with engineering work in New York City, being successively with Levering & Garrigues, the Hinkle Iron Co., the American Bridge Co., and the Radley Steel Construction Co. For the last-named concern he was engineer and later vice president.

PAUL H. NORCROSS will continue the work of the firm of the SOLOMON-NORCROSS Co., consulting engineers, Atlanta, Ga., which was dissolved Jan. 1, 1918, when Col. Gabriel R. Solomon became identified with the Construction Division of the Army. At that time current contracts were carried to completion by Mr. Norcross, under the old firm name, and now that such work has been completed Mr. Norcross will continue his work as consulting engineer, with headquarters in Atlanta.

T. F. BRIGHT has been appointed county engineer, Norton County, Kansas.

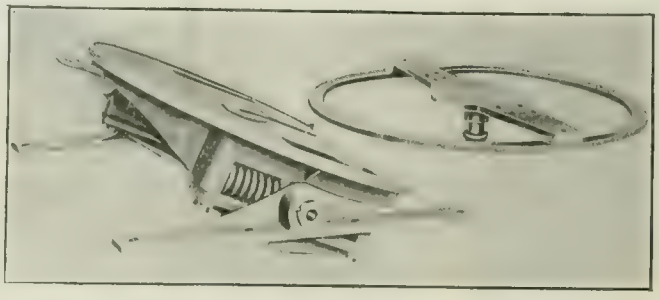
OBITUARY

STEPHEN PEARSON BROWN, who until last May was vice president and general manager of the Ford, Bacon & Davis Corporation, New York City, died in Dover, Me., Dec. 7. He had been associated with the corporation since 1917, and had been in charge of the construction of a carbo-coal plant for the International Coal Products Corporation, built for the United States Government in southwestern Virginia. He was born in Dover, Me., in 1877, and was graduated from the Massachusetts Institute of Technology in 1900. From then until 1903 he was junior partner in the firm of Collier & Brown, consulting engineers, Atlanta, Ga., and later became associated with the United Engineering & Contracting Co., New York City, with which he served as resident engineer and principal assistant engineer in charge of construction. He was finally made general superintendent of all work west of Fifth Ave. on the crosstown section of the Pennsylvania R.R. tunnel. In 1908 and 1909 Mr. Brown was in Europe, where he made an extended investigation of European tunnel practice. For three years following he was chief engineer of the Tidewater Building Co., New York City, and in 1912 became chief engineer of the Mount Royal Tunnel & Terminal Co., Ltd., Montreal, and managing engineer for Mackenzie, Mann & Co., Ltd. He had charge of both the design and construction of the Canadian Northern terminal development in Montreal, including a double-track tunnel over three miles long and freight and passenger terminals involving an expenditure of about $15,000,000. He was a contributor to the technical press and was the author of the description of the Mount Royal tunnel work which appeared in *Engineering Record* of June 28, 1913, p. 708. In 1917 he became associated with the Ford, Bacon & Davis Corporation. He resigned last May to take up private business in Dover, Me.

FRANK H. KIRCHNER, president of the Kirchner Construction Co., Cincinnati, died in that city Dec. 7, at the age of 60.

Device Lifts and Couples Trailer

A new automatic "fifth-wheel" device which renders unnecessary the use of jacks for lifting the front end of a semi-trailer to connect to and disconnect from the truck has been invented by C. H. Martin, Springfield, Mass. The device combines in one unit an automatic coupler and a cam for raising the front end of the semi-trailer. It will soon be placed on the market by the Martin Rocking Fifth Wheel Co., Springfield, Mass.



DEVICE FOR CONNECTING TRAILER TO TRUCK

Compressed Gas Manufacturers Will Meet in January

The Compressed Gas Manufacturers' Association will hold its seventh annual convention at Rumford Hall, Chemists' Club, 52 E. 41st St., New York City, Jan. 12. Otto S. King, Standard Oxygen Co., New York City, is secretary.

BUSINESS NOTES

THE MCCLINTIC-MARSHALL PRODUCTS CO., Pittsburgh, has established a contracting office in Havana, Cuba, Obrapia y San Ignacio, P. O. Box 2429, in charge of Charles A. Pesant, for the sale of steel construction for bridges, buildings and storage tanks for oil and molasses.

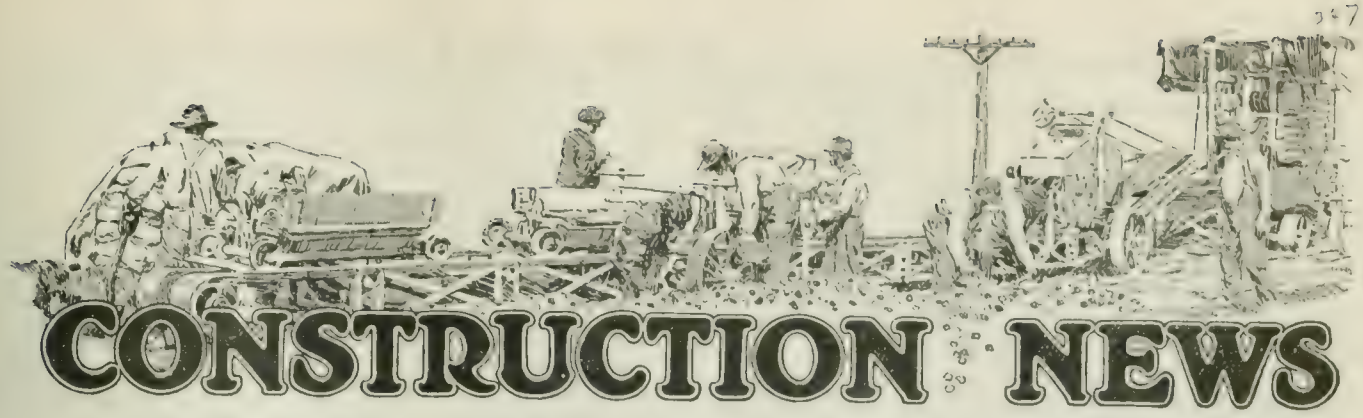
THE LINK-BELT CO., Chicago, is building a 70 x 400-ft. addition to the furnace buildings of the Belmont foundry in Indianapolis, to provide greater facilities for the production of "Malleable Vim Chains."

THE VAN DORN ELECTRIC TOOL CO., Cleveland, has just completed a four-story building with 30,000 additional feet of floor space.

FAIRBANKS, MORSE & CO., Chicago, are to build in Beloit, Wis., a new foundry which will contain approximately 490,000 sq.ft. of floor space.

THE READING IRON CO., Reading, Penn., is being reorganized under the direction of L. E. Thomas, the newly elected president, who was formerly vice president and general manager, Birdsboro Steel Foundry & Machine Co.

W. Woodward Williams, the general manager of the company, was general manager of A. M. Byers Co., Pittsburgh, for several years. Craig Geddis, advertising manager, was formerly connected with the sales and publicity departments of the National Tube Co. Edgar F. Blessing has been appointed metallurgical engineer, and W. E. Dunham production engineer. Mr. Blessing was formerly connected with the Doehler Die Casting Co., Brooklyn, N. Y., and Mr. Dunham was service manager for the A. M. Byers Co. The company has purchased the George B. Lessig Co. plant at Pottstown, Penn. Branch offices for district sales representatives have been established in Philadelphia, New York, Pittsburgh, Chicago, Cincinnati and Dallas.



CONSTRUCTION NEWS

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close		See Eng. News-Record
Jan. 5	Galesburg, Ill. ..... Adv. Dec. 11.	Dec. 11
Jan. 5	Whittier, Cal.	Dec. 16
Jan. 7	Heppner, Ore.	Dec. 16

SEWERS

Dec. 22	Euclid, O.	Dec. 4
Dec. 31	Grasse Pointe, Mich.....	Dec. 11
Jan. 15	Duluth, Minn.	Dec. 11
Feb. 2	Kokomo, Ind.....	Dec.16

BRIDGES

Dec. 20	Astoria, Ore.	Dec. 16
Dec. 27	Madison, Wis.	Dec. 16
Dec. 29	Reading, Pa.	Dec. 16
Dec. 30	Minco, Okla.	Dec. 16
Jan. 6	Owatonna, Minn.	Dec. 11
Feb. 7	Bethlehem, Pa.	Dec. 11

STREETS AND ROADS

Dec. 18	Jersey City, N. J.....	Dec. 16
Dec. 19	Versailles, Mo.	Dec. 11
Dec. 19	St. Louis, Mo.	Dec. 11
Dec. 19	Sylvester, Ga.	Dec. 4
Dec. 20	Waynesburg, Pa.	Dec. 11
Dec. 21	Lewiston, Idaho	Dec. 16
Dec. 22	Eutaw, Ala.	Dec. 11
Dec. 22	Rapid City, S. D.	Dec. 11
Dec. 22	St. Louis, Mo.	Dec. 11
Dec. 22	Wenatchee, Wash.	Dec. 4
Dec. 22	Macon, Miss.	Dec 11
Dec. 22	Wharton, Tex.	Dec. 16
Dec. 22	North Carolina	Dec. 16
Dec. 23,	Montgomery, Ala.....	Dec. 16
Dec. 23	North Carolina	Dec. 16
Dec. 23	Ventura, Cal.	Dec. 11
Dec. 23	Gaylord, Minn.	Dec. 11
Dec. 23	Long Island City, N. Y.	Dec. 16
Dec. 23	Henderson, Minn.	Dec. 4
Dec 26	Wauwatosa, Wis.	Dec. 11
Dec. 27	Lawrenceville, N. J.....	Dec. 16
Dec. 29	Athens, Tex.	Dec. 16
Dec. 30	Denton, Tex.....	Dec. 16
Jan. 2	Waco, Texas	Dec 16
Jan. 5	St. Louis, Mo.	Dec 11
Jan. 6	Hamlin, W. Va.....	Dec 16
Jan. 15	St. Louis, Mo	Dec 11
Jan. 17	St. Louis, Mo.	Dec. 11
Jan. 19	Finch, Ont	Dec. 4
Jan. 28	St. Louis, Mo.	Dec. 11

EXCAVATION AND DREDGING.

Dec. 22	Brooklyn, N. Y....	Dec. 16
Dec. 22	Hinckley, Utah	Dec. 16

INDUSTRIAL WORKS

Dec. 20	Durham, N. C.	Dec. 16
Dec. 21	Philadelphia, Pa.	Dec 16
Dec. 22	Philadelphia Pa	Dec. 16
Dec. 24	Detroit, Mich	Dec. 16
Jan. 7	Freehold, N. J.....	Dec. 16
Jan. 12	Wakefield, Mass.	Dec. 16

BUILDINGS

Dec. 20	Ness City, Kan.	Dec. 4
Dec. 20	Independence, Kan.	Dec. 4
Dec. 20	Indianapolis, Ind.	Dec. 11
Dec. 20	Detroit, Mich	Dec. 16
Dec. 22	Yuma, Ariz	Dec 4
Dec. 22	Lafayette, Minn.	Dec. 11
Dec. 22	Detroit, Mich	Dec. 11
Dec. 23	Fairport, O.	Dec. 4
Dec. 29	Cleveland, O.	Dec. 4
Dec. 22	Santa Monica, Cal.	Dec 11
Dec. 27	Chandler, Ariz.....	Dec. 11
Dec. 30	Mt. Pleasant, Ia.	Dec. 11
Dec. 30	Lynn, Mass	Dec. 16
Jan. 1	Bloomer, Wis.	Dec. 11

Bids Close		See Eng. News-Record
Jan. 1	Vancouver, B. C.	Dec 11
Jan. 2	Duluth, Minn.	Dec 11
Jan. 3	McKeesport, Pa.	Dec. 11
Jan. 3	Woodbine, Ia.	Dec. 11
Jan. 5	Gaza, Ia.	Dec. 11
Jan. 10	Kenosha, Wis.	Dec. 11
Jan. 13	Storm Lake, Ia.	Dec. 4
Jan. 15	Waterloo, Que.	Dec. 18
Jan. 15	Jacksonville, Ill.	Dec. 11
Jan. 19	Lowell, Mass.	Dec. 11
May 15	Syracuse, N. Y.	Dec. 11

FEDERAL GOVERNMENT WORK

Dec. 23	Annual House Extension Washington, D. C.....	Dec. 4
Dec. 23	Cranes — Spec. 4092 — Norfolk, Va.	Dec. 11
Dec. 23	Cranes—Spec. 4092—Philadelphia, Pa.	Dec. 11
Dec. 23	Partitions — Spec. 4098 — Alexandria, Va.	Dec. 16
Dec. 23	Heating — Spec. 4091 — Charleston, S. C.....	Dec. 16
Dec. 23	Heating System—Spec. 4071 —Pensacola, Fla.	Dec. 16
Dec. 23	Building—Spec. 4047—San Diego, Cal.	Dec. 16
Dec. 26	Lock Gates — Wheeling, W. Va. ..... Adv. Dec. 4.	Dec. 4
Dec. 30	Electric Elevators—Stapleton, N. Y.	Dec. 11
Dec. 30	Remodeling Custom and Court House—Toledo, O...	Dec. 11
Dec. 30	Electrical Traveling Cranes — Spec. 4094 — Washington, D. C.	Dec. 16
Dec. 31	Buildings — Washington, D. C.	Dec. 16
Jan. 2	Lock and Esplanade—Florence, Ala.	Dec 16
Jan. 5	Remodeling Post Office — Fitchburg, Mass.	Dec. 16
Jan. 6	Alterations to Post Office— Ashland, Ky.	Dec. 16
Jan. 7	Dirigible Hangar — Spec. 4080—Cape May, N. J....	Dec. 16
Jan. 13	(Additional Buildings)— Dawson Spring Key.....	Dec. 16
Feb. 2	Tower and Dwelling—Rincon, P. R. ..... Adv. Dec. 11.	Dec. 11

MISCELLANEOUS

Dec. 22	Electric Pump—Sault Sainte Marie, Mich.	Dec. 4
Dec. 22	Fire Protection System — Livermore, Cal.	Dec. 16
Dec. 23	Jib Cranes — New York, N. Y. ..... Adv. Dec. 4.	Dec. 4
Jan. 7	Dam — New Westminster, B. C.	Dec. 16
Jan. 22	Pipes, Valves, etc. — St Louis, Mo	Dec 11

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

O., Cincinnati—City plans to build water mains in Montgomery Pike from Kennedy Heights westwardly, also through Millcreek Valley and from Western Hill Station to College Hill, cost $720,000; install new boilers, pipe, etc., in Main River Pumping Sta. and boiler equipment in Western Hills Sta. $380,000. F. Krug, city engr.

O., Euclid—Village rejected bids received Dec. 8, building 13,885 ft. 6 and 8 in. c.i. water mains in Cut Rd., Brewer, Pond and Fuller Aves. Work will be readvertised. F. A. Pease Eng. Co., Marshall Bldg., Cleveland, engrs.

O., Greenville—Town plans to build brick and steel filtration plant. About $135,000. G. A Johnson, 150 Nassau St., New York City, engr.

N. D., Hankinson—City plans to build waterworks system, cost to exceed $20,000. A. Lecocq, Aberdeen, S. D., engr.

Mont., Conrad—City plans to build waterworks system. About $180,000. C. Fergussen, city atty.

Tex., Cisco—City election in January to vote on $100,000 bonds for waterworks system.

Idaho Cambridge—City plans to build waterworks system in spring. About $25,500. S. M. French, Cambridge, engr.

Idaho, Wendell—City election Dec. 22, to vote on $15,000 bonds to replace present wooden pipe with steel pipe F. W. Chapman, clk.

Ariz., Nogales—City plans election to vote on $135,000 bonds to lay 14 in. steel watermains, $37,000 to install pumping units and $15,000 to enlarge and repair reservoir.

Ore., Heppner—City soon receives bids building 15 mi. wood, c.i or steel pipe line from here to Willow Creek. About $100,000.

Ore., North Powder—City receives bids about Jan. 1, laying 2 mi wood, steel or iron pipe, installing and furnishing steel tank and tower for well which will supply town with water. About $30,000. C. J. Forstrom, mayor

Ore., Richland—City soon lets contract building waterworks system to include 4 mi. 8 in. steel or iron supply main, 50 water meters, connections and filtration plant, 125,000 gal. per minute capacity, 10 hydrants and valves, 1 mi. 4-6 in. distributing system. About $35,000. L. C. Kelsey, 410 Selling Bldg., Portland, engr.

Cal., Blythe—City Council soon receives bids building waterworks system, to consist of well, 50,000 gal. tank on 80 ft. tower, 400 gal. per minute pumping plant and 4 mi. 2-10 in. riveted steel mains. Bonds for $36,000 voted for project. Noted May 22.

Cal., Brawley—City voted $125,000 bonds to build water tank and tower, lay larger water mains and install fire hydrants. G. B. Wade, city engr. Noted Sept 18.

Cal., Manhattan Beach (Manhattan P. O.)—City voted $30,000 bonds to extend and repair waterworks system. V. H. Staheli, city engr.

Ont., Brantford—City having plans prepared for reconstructing water works system T. H Jones, city engr.

Alta., Vulcan—City plans to install waterworks system. About $9000.

BIDS DESIRED

Ore., Heppner—Until Jan. 7, by J. P. Williams, city recdr., building waterworks system. Separate proposals on (a) furnishing labor, equipment and materials except pipe and specials and building gravity supply line and accessories, (b) furnishing special c.i. fittings and valves, f.o.b. and furnishing machine banded wood pipe, (c) furnishing and laying concrete pipe on supply line. About $100,000. Burns & McConnell, Interstate Bldg., Kansas City, Mo., engrs.

Cal., Whittier—Until Jan. 5, by C. L. Trueblood, city clk., furnishing and installing 2100 tons 4-24 in. classes B and C c.i. water pipe fittings and equipment for pumping water and generating 200 kw. electric current. Alternate bids for pumping and generating will be taken as follows: (1) one 12 x 36 in. high duty cross compound double acting crank and fly wheel pumping engine, two 150 hp. water tube boilers and one 200 kw. steam turbine generator; (2) same as preceding, excepting generator; (3) two direct connected 2200 gal. per minute centrifugal pumps and motors.

Waterworks (Continued)

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Chicopee**—City will lay 8 and 12 in. c.i. pipe in various streets. About $20,500. Work will be done by day labor.

★**N. Y., New York**—Dept. Water, Gas & Electricity let contract laying watermains in East 167th St., to Beaver Eng. & Contg. Co., 51 Chambers St., $376,406, and in East 161st and 164th Sts., to Masterson Constr. Co., 15 East 40th St., $13,262.

★**Minn., Grand Rapids**—City let contract building water mains in various streets, involving 3622 cu.yd. earth excav. and backfilling, 10 cu.yd. rock excav., 6112 lin. ft. 4-8 in. c.i. pipe, etc., to J. Ame Vey, Grand Rapids, $6967.

★**Mont., Hardin**—City let contract building filtration plant, to Security Bridge Co, 503 North 32nd St., Billings, $89,517. Plans include constructing 30 x 44 ft. filter building, 32 x 56 ft. coagulating basin, etc.

★**Cal., Oakland**—City Council let contract replacing fresh water connection of high pressure fire system from 12th St. to pumping station, involving 1128 ft. 14 in. c.i. pipe and 800 cu.yd. earth excav., to M. Murphy, 1321 Milvia St., Berkeley. About $9300.

Sewers

PROPOSED WORK

Conn., Ansonia—City soon lets contract laying sewers in various streets, involving 370 ft. 36 in. concrete pipe, 48 ft. 36 in. c.i. pipe, 7145 ft. 8-15 in. vitr. pipe, 29 manholes and 550 ft. tar pavement. V. B. Clarke, city engr.

Conn., Derby—Finance Com. soon lets contract laying sewers in various streets, involving 370 ft. 36 in. concrete pipe, 48 ft. c.i. pipe, 7145 ft. 8-10 in. vitr. pipe, 29 brick manholes, 550 sq.yd. tar walk, 28 sq.yd. asphalt pavement, 418 ft. rip.rap, etc. About $35,000. V. B. Clarke, city engr.

Mich., Detroit—Dept. Pub. Wks. receives bids about Dec. 22, building 6475 ft. Bates St. Sewer Sect. 2, in Bates, Congress Randolph. Adams and Brush Sts., 13 ft. 6 in. cylinder, with 16 in. brick or concrete segment block walls. Alternate plan, 2-barrel sewer, 10 ft. 4 in. diameter, 16 in. walls, same material. C. W. Hubbell, city engr.

N. D., Hankinson—City plans to build sewerage system, cost to exceed $20,000. A. Lecocq, Aberdeen, S. D., engr.

Idaho, Cambridge—City having plans prepared for sewerage system. About $22,500. S. M. French, Cambridge, engr.

Ore., Warrentown—See "Streets and Roads."

Ont., Woodstock—City plans election to vote on $100,000 bond to build new intercepting sewerage system and sewage disposal plant.

BIDS DESIRED

Mass., Woburn—Buckman Tanning Co. receiving bids for building rein.-con. sewerage disposal tank and reclamation of tannery sludge. About $20,000. Vaughan & Meyer, Security Bldg., Milwaukee, Wis., engrs.

Ind., Kokomo—Until Feb. 2, by Bd. Pub. Wks. building Washington St. sewer and laterals, involving 16,100 lin.ft. 15-84 in. pipe, etc. About $276,000.

Kan., Topeka—City receiving bids building 1125 ft. 8 in. sewer from McKinley School to River. About $18,000. M. C. Holman, 116 Evelyn St., engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Greendale** (Worcester P. O.)—See "Buildings."

★**Conn. New Canaan**—City let contract to T. F. Foley & Co., 23 Quintard Ave., South Norwalk, building sewers and drains in various streets, involving 1545 ft. 6-15 in. vitr. pipe with appurtenances, 2390 ft. 8-12 in. c.i. pipe and 1128 ft. 10-15 in. vitr. pipe.

★**N. Y., Long Island City**—M. E. Connolly, pres. Queens Boro., let contract building sewer in Linden St., Sec. A, to Booth & Flynn, Montague St., Brooklyn, $925,100; Sect. B, to O'Rourke Contg. Co., 150 Nassau St., New York City, $876,062.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received lowest 3 bids Dec. 8, building sewer in Buckley St. from Queens Blvd. N. to Skillman Ave., etc., (1) Type "A," (2) Type "B," from F. L. Paino, Woodhaven, L. I., (2) $69,232; Green Contg. Co., 734 Vernon Ave., Brooklyn, (1) $74,000, (2) $73,000; A. Paino, Woodhaven, L. I., (1) and (2) $75,000.

★**N. Y., New York**—M. F. Loughman, pres. Manhattan Boro., let contract repairing barrel sewer in Coenties Slip, 5th St. East River, and 21st St. East River, to J. Riches, 23 Willow Pl., Brooklyn, $10,680, $9903 and $8721 respectively; emergency repair to overflow in 129th St., to J. J. Hademan, $1610.

★**N. J., Trenton**—City let contract building 2179 ft. sewers in Gouverneur. Grand, 2nd and Academy Sts., to Boscarelli & Jiangola, 110 2nd St., $12,597.

★**O., Cleveland Heights** (Warrensville P. O.)—Village let contract building Noble Pl. Sewer, involving 7690 ft. 20-66 in. vitr. pipe, 14 catch basins, 8 manholes, to A. Marra, 2276 East 105th St., Cleveland, $14,714; 10,000 ft. 6-in. curb connections in Taylor, Canterbury, Princeton and Kerwood Rds., to Curro Bros., 1977 East 26th St., Cleveland, $12,570.

★**O., Garfield Heights**—Village let contract building sewer in Service Court, involving 1722 ft. 10-12 in. vitr. pipe, 1280 ft. 6 in. c.i. pipe, and 7 brick manholes, to C. Joseph, 1200 Bolivar Rd., Cleveland, $8925.

Mich., Detroit—City received bids building Seven Mile Rd. Sewer, with temporary pumping station and electrically operated pumps, involving 11 ft. 3 in. cylinder sewer with special manhole, from C. A. Handyside, 833 Lothrop Ave., $26,600; Power Plant Supply Co., Chamber of Commerce, $29,980.

★**Neb., Blair**—City let contract building sewers and sewer outlet in Dist. No. 21, to Hansen & Willadsen, Omaha, $87,687.

★**Cal., Los Angeles**—See "Streets and Roads."

Cal., Wilmington—Bd. Pub. Wks. received bids building sewers in Gulf Ave. Sewer Dist., involving 46,937 ft. 6-24 in. concrete, 412 ft. chimney and 24 ft. c.i. pipe, from J. Balch, 696 12th St., San Pedro, $233,000, M. Chutuk, Los Angeles, (not totaled), C. D. Soteras, Black Bldg., Los Angeles, (not totaled).

Bridges

PROPOSED WORK

W. Va., Clarksburg—Harrison Co. soon lets contract building 150 ft. span viaduct at Sta. 187, North Western Turnpike.

N. C., Oxford—State Highway Comn., Raleigh, soon lets contract building 2 bridges and 2 culverts, Granville Co., involving 35,478 lb. reinforcing steel, 202,-35 cu.yd. class A, 240.74 cu.yd. class B and 86.50 cu.yd. class C concrete. W. S. Fallis, Raleigh, engr.

Ga., Augusta—States of South Carolina and Georgia having preliminary sketches made by H. C. Orr, bridge engr., State Highway Dept., Columbia, for 800-ft. steel bridge, concrete piers and abutments, between Aiken Co., S. C. and Richmond Co., Ga., 3½ mi. below here. About $175,000.

Wisconsin—State Highway Comn., Madison, preparing plans for Weinandy Bridge, 12 x 24 ft. rein.-con. span, concrete abutments Belvidere Twp., Buffalo Co.; Lamb Bridge, 24 x 30 ft. rein.-con. deck girder, concrete abutments, La Grange Twp., Monroe Co.; Tucker Bridge, 16 x 20 ft. concrete, concrete abutments, Albion Twp., Jackson Co.; Davenport No. 1 Bridge, 6 x 24 ft. rein.-con. slab, concrete abutments, Clayton Twp.; Davenport No. 2 Bridge, 12 x 24 ft. rein.-con., concrete abutments, Clayton Twp., Wanamaker Bridge, 20 x 24 ft. rein.-con. slab, concrete abutments, Marietta Twp.; Crawford Co.; 2nd South Branch Bridge, 20 x 40 ft. rein.-con. deck girder span, concrete abutments, Armstrong Twp., 1st South Branch Bridge 20 x 30 ft. rein.-con. girder, concrete abutments, Waupee Bridge, 24 x 30 ft. deck girder, concrete abutments, Middle Bridge, 18 x 24 ft. concrete slab, concrete abutments, Suring Village, Bowen Bridge, 12 x 24 ft. concrete slab, concrete abutments, Gillett Twp., Demeny Bridge No. 2, 8 x 22 ft. concrete slab, concrete abutments, Morgan Twp., Johnson Bridge, 6 x 24 ft. concrete slab, concrete abutments, Havelik Bridge, 6 x 20 ft. concrete slab, concrete abutments Blazek Bridge, 8 x 12 ft., concrete slab, concrete abutments. Sprice Twp., Oconto Co.; Witches Gulch Bridge, 10 x 24 ft. rein.-con. span, concrete abutments, Dell Prairie Twp., Adams Co., Birch Creek Bridge, 12 x 24 ft. rein.- con span, concrete abutments, Wautoma Twp., Waushara Co.

Wis., Eau Claire—Comrs. Eau Claire Co. plan to build bridges in Fall Creek Village, Clear Creek and Washington Twps. About $11,000. G. Osborne, comr.

Wis., Viroqua—Comrs. Vernon Co. plan to build bridges, Kickapoo Twp., cost $1400, Franklin Twp., $6000 and Readstown Village, $18,000. A. Ristow, comr.

Utah, Salt Lake City—City and Comrs. Salt Lake Co. having designs and specifications prepared by G. G. Bywater, engr., 518 E St., for Memorial Bridge, 1000 ft. long, over Parleys Canyon. Cost between $200,000 and $250,000.

BIDS DESIRED

Pa., Reading—Until Dec. 29, by Comrs, Berks Co., building 1586 ft. rein.-con. bridge on Bingaman St. over Schuylkill River, Schuylkill canal and Pennsylvania, Philadelphia & Reading R.R., to have 13 arch and 3 flat spans, rein.-con. approaches, 39 ft. roadway and two 10 ft. 6 in. sidewalks. C. J. Shode, compt. Noted May 1.

Wis., Madison—Until Dec. 27, by State Highway Comn., furnishing labor and materials for building 1428 ft. plate girder bridge, to include fifteen 79 ft. plate girder spans, double leaf bascule to give 70 ft. clear opening and two 79 ft. plate girder approach spans carrying bascules, concrete piers and abutments. Work involves 500 tons structural and 55 tons reinforcing steel, 2400 cu.yd. class A concrete, 205 sq.yd. paving, 500 cu.yd. riprap, etc.

Okla., Minco—Until Dec. 30, by State Highway Comn., Oklahoma, building 1242 ft. bridge, 20 ft. wide, here, involving 8431 cu.yd. rein.-con. and 255 tons steel.

Ore., Astoria—Until Dec. 20, by State Highway Comn., Portland, building double leaf trunnion bascule bridge over Youngs Bay here. Bids will be received on 3 propositions, as follows: (1) bascule bridge for combined highway and railroad traffic, including 1580 lin.ft. timber trestle approach for highway, 42,600 lin.ft. foundation piling, 750 cu.yd. class "A," 1500 cu.yd. class "B" and 4950 cu.yd. "D" concrete (Tremie concrete for cofferdam seal and pier base), 425 cu.yd. counterweight concrete, 120,000 lb. reinforcing steel, 6700 lin.ft. protection piling, 1,000,000 lb. structural steel, 125,000 lb. machinery, necessary signal lights, motors, pumps, and electrical equipment; (2) bascule bridge for highway traffic only with 1580 ft. timber trestle approach span, 20,-000 lin.ft. foundation piling, 500 cu.yd. class "A." 700 cu.yd. class "B" and 2500 cu.yd. class "D" concrete (Tremie concrete for cofferdam seal and pier base), 5000 lin.ft. protection piling, 70,000 lb. reinforcing steel, 485,000 lb. structural steel, 65,000 lb. machinery, 225 cu.yd. counterweight concrete, necessary electrical equipment, pumps, signal lights, etc.; (3) bascule bridge for highway traffic only with 309 ft. permanent approach, steel plate girder, concrete floor and foundation, 1220 lin.ft. timber trestle approach, 29,000 lin.ft. foundation piling, 750 cu.yd. class "A," 1000 cu.yd. class "B" and 3000 cu.yd. class "D" concrete, 225 cu.yd. counterweight concrete, 1000 lin.ft. protection piling, 117,000 lb. reinforcing and 695,000 lb. structural steel, 65,000 lb. machinery, 750 lin.ft. concrete handrail, pumps, signal lights, motors and electrical equipment. About $280,000 H. Nunn. Salem, state highway engr. Noted Oct. 23.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Middletown**—Middlefield and Middletown Twps. let contract building bridge, to A. Brazos & Son, Inc., 88 Oak St., Middletown, $15,000. Work involves 35 cu.yd. rein.-con., 250 cu.yd. concrete, 6 tons steel, 3310 cu.yd. earth approach and fill, 1950 ft. macadam surface, etc.

N. Y., Brooklyn—New York Municipal Ry. received bids Dec. 8, building bridge on Beverly Rd., Brighton Beach Line, from Donnell Zane Co., 298 Bway., New York City, $51,441; Jobson-Gifford Co., 30 East 42nd St., New York City, $54,901.

★**W. Va., Moorefield**—See "Streets and Roads."

Ia., Manchester—Delaware Co. received bids Dec. 2, building 168 ft. bridge, 45 ft. wide, to have two 80 ft. rein.-con. span arches, 33 ft. roadway, two 6 ft. walks and 4 retaining walls, from F. E. Marsh & Co., Jefferson, $44,250; Koss Constr. Co., 2818 5th St., Des Moines, $46,146; Widell Constr. Co., Mankato, Minn., $49,179. Work involves 1605 cu.yd. rein.-con., 58 tons steel, 900 cu.yd. earth approach and fill.

★**Que., Quebec**—Dept. Pub. Wks. let contract building approaches and caissons of Batiscan Bridge, to Gosselin Co., Levis. Total cost, $260,000.

Streets and Roads

PROPOSED WORK

Pa., East Brady—Boro. soon lets contract improving 3rd St from Broad to High Sts., High St. from 4th St. to Clarion Rd., Clarion Rd. from High to Grant Sts., High St. extension from Clarion Rd. to Ferry St., Broad St. from Brady to Clarion Sts., Clarion St. from Water to Broad Sts., and Brady St. from Broad St. to rear of bank building, involving 3500 cu.yd. grading, 5600 lin.ft. curbing, 380 lin.ft. backing curb, 8060 sq.yd. paving, 1280 lin.ft. 12-18 in. sewer pipe, etc. Douglass & McKnight, 707 Columbia Bank Bldg., Pittsburgh, boro. engrs.

W. Va., Logan—Logan Co. voted $1,000,000 bonds to improve roads. J. N. Smith, Logan, engr.

W. Va., Wheeling—City voted $1,000,000 bonds to improve various streets. Property owners contributed $2,000,000 toward amount making $3,000,000 available for work. H. A. Conrad, city engr.

N. C., Waxhaw—City plans to grade, pave and build side walks. Cost between $10,000 and $15,000. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, Ga., engrs.

S. C., Charleston—Charleston Co. receives bids about Jan. 15, improving 7 mi. Charleston-Savannah Highway, 18 ft. wide, involving 73,920 sq.yd. 7 in. concrete. J. W. Martin, c/o Sanitary & Drainage Comn., engr. About $250,000. Federal Government will appropriate toward cost.

Fla., Panama City—City voted $132,000 bonds for paving and draining various streets. F. S. Parrigin, Lexington, Ky., engr.

Ky., Warsaw—Gallatin Co. voted $80,000 bonds to improve roads and bridges.

O., Ashtabula—City having plans and estimates prepared grading and paving 1500 ft. Dakota St. from Lake to Ohio Sts., 20 ft. wide, involving 3350 sq.yd. vitr. brick on 6 in. concrete base. L. A. Amsden, Ashtabula, engr.

O., Cincinnati—City plans to grade, pave with bituminous macadam and build concrete curbs and gutters on 1630 ft. Rulison Ave., 30 ft. wide. About $21,231. F. Krug, city engr.

O., Cleveland—F. A. Pease Eng. Co., engrs., Marshall Bldg., receive bids in spring grading and building 5 mi. sidewalk on Blue Stone and Mayfield Rds., for Knight-Norris-Gibbs Co., Leader-News Bldg.

O., Columbus—Comrs. Franklin Co. plan to improve 11 mi. Alkire Rd. south of Briggsdale, 6 mi. Brice Rd. from Natl. to Winchester Pikes, 1 mi. Hess Rd. from Union Cemetery to Kennedy Rd., 1.75 mi. Hess Rd. from Kennedy to Reed Sts., all waterbound macadam; 1.75 mi. 3rd Ave. from bridge to Cambridge Place Ave., 24 ft. wide, 5½ in. bituminous macadam surface on waterbound macadam base, Berea stone curb and 3 ft. brick gutters, 2 mi. Sullivan Ave. from west corporation line to Georgetown Dr., 16 ft. wide, 3½ in. bituminous macadam on rein.-con. base.

O., Jefferson—Comrs Ashtabula Co. having specifications and plans prepared grading and paving 6½ mi. Rock Creek-Orwell Rd. and 6⅝ mi Trumbull-Windsor Rd., 10 ft. wide, monolithic brick or concrete. A. H. Bixler, co. engr.

Mich., Marine City—City Council passed resolution requesting State Highway Dept., Lansing, to prepare plans and estimates for widening, grading, paving and building concrete curbing on Main St. from Bridge St. to city line, 30 ft. wide, involving 7090 sq.yd. concrete. About $20,000.

Mich., Port Huron—St. Clair Co. having plans prepared by State Highway Dept., Lansing, for 30 mi. Victory Highway (State Trunk Line), 16 ft. wide, concrete. A. H. Medbury, Capac, chn., of com.

Wis., Ashland—Comrs. Ashland Co plan to expend $34,543 to improve roads. W. E. Dillon, Highbridge, comr.

Wis., Eau Claire—Comrs. Eau Claire Co. plan to grade and surface Eau Claire-Menomonie Rd., Union Twp., cost $7000; Eau Claire-Fall Creek Rd., Washington Twp., $3457; Augusta-Ludington-Wilson Rd., Ludington Twp., $2500; Augusta-Wilson-Stanley Rd., Wilson Twp., $2500; Eau Claire-Springfield Rd., Seymour Twp., $2500; Eau Claire-Altoona Rd., Altoona Twp., $2500; Augusta-Fairchild Rd., Lincoln Twp., $25,000; grade, drain and surface Eau Claire-Cleghorn-Eleva Rd., Pleasant Valley Twp., $2548. G. Osborne, comr.

Wis., Ellsworth—Comrs. Pierce Co. plan to grade and surface road, River Falls Twp., cost $10,500; Hager Hill Rd., Treton Twp., $3000; Ellsworth Twp., beginning at Cudd's corner thence northeasterly, $5343; Rock Elm Twp., $3337; grade and drain road, El Paso Twp., $3337, Maiden Rock Twp., $3337; Rock Elm Twp., $3337, El Paso Twp., $1000, and Salem Twp., $1300. C. F. Kenall, comr.

Wis., Prairie du Chien—Comrs. Crawford Co. plan to grade overflow road, Marietta Twp., $6300; grade and build bridges, Marieetta Twp., $4500; build 2 culverts Scott Twp., $800; 3 bridges, Clayton Twp., $4250; grade and drain, Freeman Twp., $1200; Utica Twp., $1200; Clayton Twp., $3000; Haney Twp., $2000; Ferryville Village, $2000. J. N. Campbell, Bell Center, comr.

Wis., Viroqua—Comrs. Vernon Co. plan to grade, drain and build culverts, Christiana Twp., $4584; Clinton Twp., $2293; Coon Twp., $4584; Franklin Twp., $2293; Genoa Twp., $4584; Hamburg Twp., $4584; Harmony Twp., $5038; Kickapoo Twp., $2293; Webster Twp., $2293, and Wheatland Twp., $2293. A. Ristow, comr.

Wis., West Bend—Comrs. Washington Co. plan to grade, drain and concrete surface Fond du Lac Rd., Germantown Twp., cost $11,909, grade, surface and build culverts, Hartford Twp., beginning at village limits of Schleisingerville, thence westerly, $3900; Village of Schleisingerville, beginning at Franklin St. thence westerly, $3900; Old Fond du Lac Rd., Polk Twp., beginning at Ackerville, thence southeasterly, $4390; grade, drain, surface and build culverts on Old Fond du Lac Rd., Richfield Twp., beginning at southeast end of Ackerville, thence southeasterly, $2100. C. Johnson, Kewaskum, comr. Noted Sept. 11.

Kan., Independence—Montgomery Co. rejected bids gravel surfacing 9½ mi. Ozark Trail Rd., Federal Aid Project No. 23, A. 16 ft. wide, also building necessary bridges and culverts on same. Work will be readvertised. H. K. Hibbard, Independence, engr.

South Dakota—State Highway Comn., Pierre, plans to grade, gravel and drain 10-9 mi. Redfield Watertown Rd., Federal Aid Project No. 34, Spink Co., involving 43,600 cu.yd. earth excav., 16,350 cu.yd. gravel, 1450 lin.ft. corrugated culverts, 280 cu.yd. concrete for culverts, 18,000 lb. reinforcing steel, etc., cost $74,053; 16 mi. Aberdeen Ipswich Highway, Federal Aid Project No. 32, Edmund Co., involving 72,000 cu.yd. earth excav, 24,000 cu.yd. gravel, 1200 lin.ft. corrugated culverts, 465 cu.yd. concrete for culverts, 30,000 lb reinforcing steel, etc., $131,467.

Montana—State Highway Comn., Helena, receives bids about Jan 1, gravel surfacing 26 mi Yellowstone Trail, Yellowstone Co. and 2.84 mi. Belgrade-Maudlow Rd., Federal Aid Project No. 15, Gallatin Co. Latter includes 50 ft. steel span over East Gallatin River. J. N. Edy, state highway engr.

Mo., Lebanon—Lebanon Special Rd. Dist. voted $100,000 bonds to build roads. Engineer not selected.

Mo., Trenton—Town voted $135,000 bonds to build roads. Engineer not selected.

Tex., Cameron—Milam Co. having plans prepared grading, gravel surfacing and draining 5.724 mi. Cameron-Waco Rd., 14 ft. wide, involving 4600 cu.yd. earth excav., 800 sq.yd. concrete, 10,690 cu.yd. gravel and 21,810 lb. reinforcing steel. About $57,946. A. F. Mitchell, Cameron, engr.

Tex., Hillsboro—Comrs. Hill Co. having plans prepared gravel surfacing and draining 14.9 mi. Highway No. 31, 15 ft. wide, known as Corsicana-Waco Rd., involving 134,000 cu.yd. earth and 2000 cu.yd. rock excav., 1114 sq.yd. class A and 203 cu.yd. class B concrete, 102,000 lb. reinforcing steel and 3000 lin.ft. guard fence. About $224,315. Bryant & Huffman, Littlefield Bldg., Austin, engrs.

Tex., Liberty—Liberty Co. having plans prepared grading, gravel surfacing and building trestle on 8.518 mi. Highway No. 35, Cleveland Montgomery Co. Rd., 16 ft. wide, involving 11,282 cu.yd. earth and 234 cu.yd. structural excav., 6.16 acres clearing and grubbing, 3733 lb. reinforcing steel, 164 sq.yd. concrete and 232,893 ft. B. M. creosoted timber in trestle. About $75,377. W. S. Bonner, New Orleans, La. engr.

Tex., Linden—Comrs. Cass Co. plan to grade, gravel surface and drain 4.949 mi. Bryants Mill Rd., 9 ft. wide, involving 6.5 acres clearing and grubbing, 43,315 cu.yd. unclassified earth excav., 187 cu.yd. class A, 24 cu.yd. class B and 56 cu.yd. class C concrete, etc. About $36,472. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Tex., Wichita Falls—Wichita Co. plans to build 10 mi. highway from here to Iowa Park, 20 ft. wide. About $485,000. J. A. Donald, city engr.

Idaho — State Highway Dept., Boise, plans to gravel and rock surface 9 mi. Idaho-Utah Highway, cost $68,000, rock surface 9 mi. Utah-Idaho Highway, from Pocatello to McCammon, $75,000, Bannock Co.; hard surface 2 mi. Yellowstone Park Highway, $61,000, Bingham Co.; grade, gravel and rock surface 22½ mi. North and South Highways, $255,000, Bonner Co.; hard surface (bitulithic, concrete or asphaltic macadam) 6 mi. Yellowstone Park Highway, $185,000, 10 mi. Roosevelt Highway, $280,000, 3 mi. Idaho Central Highway, $93,000, Bonneville Co.; grade and gravel surface 18 mi. North and South Highways, $185,000, Boundary Co.; grade and gravel surface 12.5 mi. Pacific Highway, $100,000, 28 mi. Pacific Highway, $266,000, grade and rock surface 7.5 mi. Idaho Central Highway, $75,000, Elmore Co.; grade earth road on 7½ mi. Yellowstone Park Highway, $90,000, Jefferson Co.; grade and gravel surface 12.5 mi. North and South Highways, $198,000, Kootenai Co.; grade and rock surface 22½ mi. North and South Highways, $307,000, Latah Co.; grade and gravel surface 17 mi. Idaho Pacific Highway, $205,000, Payette Co.; grade and gravel surface 19 mi. Idaho Pacific Highway, $182,000, Power Co.; hard surface (bitulithic, concrete or asphaltic macadam), 27 mi. Idaho Pacific Highway, $664,000, hard surface 9 mi. Idaho Pacific Highway, $280,000, grade and gravel surface 14.7 mi. Idaho Pacific Highway, $136,000, Twin Falls Co.; grade and gravel surface 40 mi. North and South Highways, $400,000, Washington Co. Federal Government will appropriate toward cost. P. D. Olsen, state highway engr.

Ariz., Tucson—Pima Co. retained L. E. Barker, engr., Tucson, to have charge of construction of roads. Bonds for $1,500,000 voted for project. Bids will soon be received building 22 mi. Ajo-Gunsight Rd.

Ariz, Yuma—Yuma Co. voted $1,200,000 bonds to grade and pave roads. Federal Government will appropriate $150,000 toward project.

Wash., Kelso—City Council plans to grade and build concrete sidewalks and curbs on 2 mi. South 2nd, 3rd, 4th and 5th Sts. Cost to exceed $10,000.

Wash., Tacoma—Pierce Co. plans to pave Mountain Rd. from terminus of pavement to Ohop Hill, 20-24 ft. wide, concrete or asphaltic concrete. About $100,000. State appropriated $50,000 toward project.

Ore., Albany—Rd. Dist. No. 27 voted $10,000 bonds to improve and pave with gravel macadam connecting road links throughout district. L. G. Lewelling, recdr.

Ore., Astoria—City plans to grade, pave, build sidewalks and curbs on various streets. City sold $167,260 bonds for project. E. G. Gearhart, aud.

Ore., Portland—City plans to pave with concrete Nos. 1 and 2, bitulithic or asphaltic concrete, Tacoma Ave. from 15th to 17th Sts., cost $9590; East 21st and Clinton Sts., redress, $1966; East 44th St. from Hawthorne Ave. to Lincoln St., $15,319; East 70th St. from Siskiyou St. to Sandy Blvd., $5791; East 12th St. from Hawthorne Ave. to Market St., redress, $8565; East Kelly St. from 36th to 39th Sts. $7147; East 68th, East 69th and East Morrison Sts., $1074; East 60th St. from Killingsworth Ave. to Alberta St., $10,266; 71st St. S. E. from 45th Ave. to Foster Rd., $6195; East 16th St. from Spokane to Nehalem Aves., $1940. C. Laurgaard, city engr.

Ore., Seaside—City having preliminary plans prepared for building Roosevelt Dr. from Wahanna Sta., via Southern Pacific and Southern Ry. to Bway. Ave., 18 ft. wide, divided in 2 sections with packing between. Work includes grading, surveying and paving with concrete. About $78,000. E. S. Abbot, aud.

Ore., Warrentown—City purchased 100 acres of D. K. Warren Estate and plans to establish site with 2000 ft. frontage on Skipanon River and 1000 ft. on Columbia River. Work involves building streets, sewers, railway tracks and laying watermains. Funds will be obtained from $500,000 bond issue recently voted. J. Evenden, city aud.

Streets and Roads (Continued)

Cal., Elsinore—City Trustees having plans prepared paving all streets, 18 ft. wide, concrete. About $50,000. P. E. Kressly, city engr.

Cal., Fresno—Bd. Supervs. Fresno Co. soon receives bids building 2nd group of roads under $4,800,000 bond issue, comprising 12 mi. Adams Ave. east to Reedley, 7.5 mi. from Fowler to Selma, 2 mi. Adams St. through Del Rey, 1.5 mi. road north from Sanger, 10 mi. Fowler-Layton Rd., 9 mi. White's Bridge Rd. to Kerman, 8 mi. Sanger-Kingsbury Ave. and 2 mi. Clovis Ave., involving excavating, grading, 5 in. concrete paving with 1½ in. concrete asphalt top, corrugated iron and concrete culverts. D. M. Barnwell, co. clk. C. Jensen, Cory Bldg., engr. Noted May 22.

Cal., Imperial—City voted $35,000 bonds to resurface Main St. and Imperial Ave., $25,000 to pave approaches to Main St. and $20,000 for approaches to Imperial Ave.

Cal., Long Beach—City soon lets contract improving 4000 ft. Alaminto and Olive Aves., 51 ft., wide, involving 23,833 sq.yd. 5 in. concrete, 910 lin.ft. cement concrete curbing, 5831 sq.ft. cement concrete sidewalks, 6000 cu.yd. earth excav., 776 lin.ft. 8 in. vitr. clay and 500 lin.ft. brick pipe, etc.

Cal., Riverside—Bd. Supervs. Riverside Co. having plans prepared paving 13 mi. road from Thermal to Mecca, concrete, 16 ft. wide. About $250,000. A. C. Fulmor, co. engr.

Cal., Upland—City trustees soon receive bids paving and resurfacing 4 mi. Euclid Ave., involving 551,190 sq.ft. surfacing with oil and rock screenings. 574,600 sq.ft. 4 in. concrete paving, 37,148 lin.ft. stone curbs and 340 lin.ft. rein.-con. culverts. About $97,000. F. C. Froedhe, city engr.

Ont., Russell—Comrs. Russell Co. soon receive bids paving 3½ mi., bituminous macadam road from eastern limits of Rockland on Provincial Co. Rd., 16 ft. wide. About $11,000. V. E. Belanger, L'Original, engr.

BIDS DESIRED

N. Y., Long Island City—Until Dec. 23, by M. E. Connolly, pres. Queens Boro., regulating and grading from Woodside Ave. to right of way of Long Island R. R. and curbing and laying sidewalks and crosswalks where necessary, from Woodside Ave. to Stryker Ave., 2nd St., 2nd Ward; regulating, grading and laying gutter on 4th St. from Queens Blvd. to Woodside Ave., 2nd Ward; regulating, grading, curbing and laying sidewalks, on 50th St. from Jackson to Burnside Aves., 2nd Ward; 91st Ave. from Brooklyn Boro. line to 84th St., 84th St. from 91st Ave. to 90th Rd., regulating, grading and laying sidewalks, and gutter spaces, on 182nd Pl. from Jamaica to 91st Aves., 4th Ward; regulating, grading, curbing, laying sidewalks and gutters, on Gunther St. from 51st St. to Peartree Ave., Ferguson St. from 51st St. to DePeyster Sts., Roosevelt Ave. from 51st St. to Tieman Ave., 2nd Ward.

N. J., Jersey City—Until Dec. 18, by Bd. Freeholders Hudson Co., paving Newark Turnpike at approaches under Pennsylvania R.R. trestle. Work consists of placing rein.-con., driving piles, excavating and back-filling. About $10,000.

N. J., Lawrenceville—Until Dec. 27, by town, improving Cherry Tree Ave., involving 3257 sq.yd. waterbound macadam. About $10,000. F. W. Kafer, clk.

W. Va., Hamlin—Until Jan. 6, by Lincoln Co. improving 6000 ft. road from Hamlin to West Hamlin, involving 40,000 cu.yd. excav. and 10,000 sq.yd concrete. About $65,000. G. J. Barturg, Hamlin, engr.

North Carolina—Until Dec. 22, by Div. Office State Highway Comn., Asheville, hard surfacing 1.64 mi. Cleveland Co. Rd., Wake Co. About $50,000. W. S. Fallis, Raleigh, engr.

North Carolina—Until Dec. 23, by Div. Office State Highway Comn. Greensboro, hard surfacing 1.35 mi. Cabarrus Co. Rd., Cabarrus Co. About $40,000. W. S. Fallis, Raleigh, engr.

Ala., Montgomery—Until Dec. 23, by J. L. Cobbs, city treas., paving roadway Morgan Ave. from south side Mildred St. to north side of Jefferson Davis Ave., brick, asphalt, bitulithic, mineral rubber, wood block, concrete, vibrolithic concrete or asphaltic concrete.

Tex., Athens—Until Dec. 29, by Judge Henderson Co., grading, surfacing and draining 11.66 mi. Highway No. 19, Canton-Palestine Rd., 16 ft. wide, involving 11.1 acres clearing and grubbing, 15,915 cu.yd. gravel, 64,343 cu.yd. earth excav. and 849 cu.yd. concrete. About $104,319. Wilder & O'Neal, Mt. Pleasant, engr.

Tex., Denton—Until Dec. 30, by Comrs. Denton Co., grading, gravel surfacing and draining 10.055 mi. Highway No. 40, from here to Garza, 18 ft. wide, involving 17 acres clearing and grubbing, 67,762 lb. reinforcing steel, 38,419 cu.yd. unclassified earth and 3000 cu.yd. rock excav., 488 cu.yd. class A and 371 cu.yd. class B concrete. About $164,897. Bryant & Huffman, Littlefield Bldg., Austin, engrs.

Tex., Waco—Until Jan. 2, by Comrs. McLennan Co., concrete surfacing and building .63 mi. Highway No. 3, 15 ft. wide, known as Waco-Axtell Rd., involving 5483 sq.yd. concrete pavement and 99 cu.yd. concrete. About $26,129. M. Hannah, 2620 Washington St., engr.

Tex., Waco—Until Jan. 2, by Comrs. McLennan Co., surfacing .38 mi. Highway No.7, 15 ft. wide, known as Waco-Springfield Rd., involving 3333 sq.yd. course rein.-con., 752 cu.yd. earth excav. and 30 cu.yd. concrete. About $15,767. M. Hannah, 2620 Washington St., engr. Noted Sept. 25.

Tex., Wharton—Until Dec. 22 by W. G. Davis, judge Wharton Co., grading, draining and gravel surfacing with bituminous material, 6.4 mi. Highway No. 3, from Colorado Co. line, west, 16 ft. wide, involving 4.715 mi. road machine work, 18,869 cu.-yd. unclassified earth excav., 60,070 sq.yd. bituminous macadam, 225 cu.yd. class A concrete, 15,015 cu.yd. gravel, 14,014 lb. reinforcing steel and 76 lin. ft. pile trestle. About $91,870. D. B. King, Wharton, engr. Noted July 17.

Tex., Wharton—Until Dec. 22, by W. G. Davis, judge Wharton Co., gravel surfacing with bituminous topping and constructing rein.-con. drainage structures on 5.9 mi. Highway No. 3, from San Barnard River, west, 16 ft. wide, involving 4,395 mi. grader work, 13,210 cu.yd. unclassified earth excav., 281 cu.yd. class A concrete, 61,055 sq.yd. bituminous treatment, 22,975 lb. reinforcing steel and 288 lin.ft. pile trestle. About $97,623. D. B. King, Wharton, engr.

Idaho, Lewiston—Until Dec. 21, by city paving Dist. No. 12, involving 31,210 lin.ft. concrete curbing, 137,160 sq.ft. 4 in. concrete sidewalk, 43,880 cu.yd. dry earth excav. and 3500 sq.ft. 6 in. concrete crossings. T. W. Burns, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Greendale** (Worcester P. O.)—See "Buildings."

★**Connecticut**—State Highway Comn., Hartford, let contract building 2400 ft. Niantic-New London Rd., East Lyme Twp., and 3550 ft. road, Waterford Twp., trap rock macadam, to F. B. Hastings, 1200 Wood Ave., Bridgeport. About $21,000 and $16,000 respectively.

★**N. Y., New York**—Dept. of Parks let contract improving carriage drive in Central Park, asphaltic concrete, to Sicilian Asphalt Paving Co., 41 Park Row. About $106,000.

★**N. Y., New York**—M. F. Loughman, pres. Manhattan Boro., let contract granite paving 34th St., to Asphalt Constr. Co., 2197 Madison Ave., $21,830, regulating and grading same to Cleveland Trinidad Paving Co., Flushing Ave., Brooklyn, $17,762.

N. Y., S. I., St. George—C. D. Van Name, pres. Richmond Boro., received lowest 3 bids Dec. 4, paving Richmond Terrace from Harbor Rd. to Western Ave., granite blocks, from Kraemer & Leedecke, 114 East 65th St., New York City, $18,032; J. Johnson Sons, Port Richmond, $19,890; J. E. Donovan, Port Richmond, $20,059.

★**N. J., Ridgefield Park**—Town Council let contract improving 7th and Orchard Sts., to M. J. O'Connell, Union St., Hackensack, $44,545.

★**N. J., West New York**—City let contract repaving 19th and 20th Sts., bituminous, to G. J. Hornung, 513-16th St. Cost to exceed, $10,000.

★**W. Va., Marlinton**—Comrs. Pocahontas Co. let contract grading and draining 5.5 mi. Campbelltown-Marlinton-Huttonsville Rd., 26 ft. wide, to Duncan Constr. Co., Marlinton. $60,680. Work involves 52,-172 cu.yd. earth and rock excav., vitr. clay pipe and concrete culverts.

★**W. Va., Moorefield**—Comrs. Hardy Co. will improve 7 mi. Fishers P. O., Reynolds Gap Rd., involving 21,400 cu.yd. earth and rock excav., 64,000 sq.yd. gravel surfacing and 40 ft. span concrete bridge. About $43,475. Work will be done by county forces.

★**S. C., Chester**—City let contract paving 70,000 sq.yd. various streets to R. M. Hudson Co., 3rd Natl. Bank Bldg., Atlanta, Ga. About $250,000.

★**Ga., Americus**—Sumter Co. let contract building 3 mi. Andersonville Rd., involving 31,880 sq.ft. concrete, to Prayler, Hawton & Wood Constr. Co., Birmingham, Ala., $95,472.

★**Ga. Madison**—City let contract for 29,-000 sq.yd. pavement, 6000 cu.yd. excav., 18,100 lin.ft. granite curb and 73,000 sq.ft. concrete sidewalk, to Case & Cathran, Chandler Bldg., Atlanta, $141,680.

★**Ga., Rome**—Floyd Co. let contract paving 2.86 mi. road from here to Lindale, involving 30,080 sq.yd. bituminous macadam and 15,050 cu.yd. earth excav. to Meador Constr. Co., Healey Bldg., Atlanta, $91,-916.

★**O., Cleveland**—Comrs. Cuyahoga Co. let contract building Stumph Rd. from Huffman to Brookpark Rds., involving 8000 cu. yd. grading, 16,000 sq. yd. waterbound macadam and 1500 lin. ft. 4 in. vitr. tile sewer pipe, to Cleveland Macadam Co., Leader-News Bldg., $41,557.

Kan., Emporia—Lyon Co. received bids grading and paving 4.489 mi. Sect. B, Santa Fe Trail, Federal Aid Project No. 30, 18 ft. wide, also building necessary bridges and culverts on same, from McCoy & Taylor, Emporia, $253,470; M. R. Amerman, Salina, $270,274; Cook & O'Brien, 315 Ry. Exch. Bldg., Kansas City, Mo., $279,160.

★**Kan., Norton**—City let contract paving 10 blocks East Main and State Sts., Norton and 1st Aves., to E. W. Geiger Constr. Co., 626 Cherokee St., Leavenworth. About $210,000.

★**Neb., Collegeview** — City let contract paving Dist. No. 3, to Burke-Cochrane Constr. Co., 1st Natl. Bank Bldg., Lincoln. About $69,000.

★**Montana**—State Highway Comn., Helena, let contract gravel surfacing 3.6 mi. Yellowstone Trail, west of Forsyth, Federal Aid Project No. 15, to Lindgren, Peterson & Thornton, Forsyth, $18,638.

★**Mo., Liberty**—Clay Co. let contract building 21.83 mi. Liberty-Barry, Smithville-Excelsior Springs and Mosby-Smithville-Excelsior Springs Rds., to W. M. Spencer, Independence, $97,189.

★**Tex., Mt. Vernon**—Franklin Co let contract gravel surfacing and draining 12.37 mi. Highway No. 3 from Hopkins Co. line to Titus Co. line, 14 ft. wide, to Smith Bros., Crockett, $92,764. Work involves 10.6 acres clearing and grubbing, 13,328 cu.yd. unclassified earth excav. and 10,420 sq.yd. concrete pavement. County will furnish gravel.

★**Ariz., Clifton** — Comrs. Greenlee Co. let contract to Webster Constr. Co., Phoenix, building 2 sections of Clifton-Franklin Highway, Federal Aid Project No. 13, 20 ft. wide, as follows: Contr. No. 1, involving 32,000 cu.yd. roadway excav. at $1.30 per cu.yd., 5000 cu.yd. borrow at $.85 per cu.yd., 25,000 cu.yd. unclassified excav. at $.60, 1000 lin. ft. surface ditch at $.20 per lin.ft., 345 cu.yd. class "A" and 40 cu.yd. class "B" concrete at $10 and $8.50 per cu.yd. respectively, 40 cu.yd. rubble concrete at $7.00 per cu.yd., 186 lin.ft. 24 in. and 432 lin.ft. 36 in. C. M. P. culvert at $.30 and $.35 per lin.ft. respectively, 350 cu.yd. dry rubble retaining wall at $6.00 per cu.yd., 5903 lb. reinforcing steel at $.009 per lb., total cost, $71,896; Contr. No. 2, involving 2426 cu.yd. excav. at $.60 per cu.yd. 2390 cu.yd. class "A" and 79 cu.yd. class "B" concrete at $14 and $9.50 per cu.yd., 342 cu.yd. rubble concrete at $8.00 per cu.yd., 100 sq.yd. slope walls at $1.00 per sq.yd., 78,804 lb. reinforcing steel at $.01 per lb., 90 lin.ft. 24 in. C. M. P. culvert at $.30 per lin.ft., total cost $39,317.

Ariz., Tombstone—Bd. Supervs. Cochise Co. received lowest bids Nov. 17, building 8.463 mi. of (1) Sect. A and (2) Sect. B of Bisbee-Douglas Highway, Federal Aid Project No. 11, 18 wide, involving 89,377 sq.yd. 6 in. concrete or 2 in. bitulithic surface on 5 in. concrete base or 2 in. bituminous concrete (Modified Topeka) on 5 in. concrete base and 24,000 bbls. cement, from Eagan & Smith, (1) $146,340, (2) $164,238; G. H. Oswald, (1) $148 230, (2) $153,407.

Ore., Portland—City Council received bids grading and building concrete sidewalks and curbs, on 43rd Ave. S. E., et al, from S. Simonsen, 841 East 10th St., $30,311, Elliott & Scoggins, McKay Bldg., $35,665.

Streets and Roads (Continued)

M. Hansen & Co., Portland, $35,799; paving Harold Ave. from East 24th to Milwaukee Sts., asphaltic concrete, from Municipal Paving Plant, Portland $1.10 per sq.yd., total $12,632, Warren Constr. Co., Journal Bldg., $1,39 per sq.yd., $14,026.

Cal., Fresno—Bd. Supervs. Fresno Co. received lowest bid paving 12 mi. Elm Ave., 16 ft. wide, involving 21,550 cu.yd earth excav. and 15,670 cu.yd. concrete, from Federal Constr. Co., Fresno, $280,446.

★**Cal., Los Angeles**—City let contract to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg. improving Cheney St., involving 58,472 sq.ft. surfacing and paving with protected concrete, $0.26 per sq.ft., 24,086 sq.ft. rough grading, oiling and rolling $0.09 and sanitary sewer, $2400, etc., total cost, $19,859.

★**Cal., Oakland**—City let contract improving 3200 ft. Porter and Suter Sts. from 35th to 38th Aves., Octavia and Abbey Sts. from Suter to Porter Sts. and Loma Vista Ave. from Quigley to Porter Sts., 40 ft. wide, involving 8699 sq.yd. oil macadam, 6188 cu.yd. earth excav., 32 099 sq.ft. cement sidewalk, 13,120 sq.ft. concrete gutter, 6377 lin.ft. concrete curbing, etc., to Hutchinson Co., 444 17th St., $33,016.

★**Cal., San Diego**—City let contract improving Upas St., involving 42,608 sq.ft. 5 in. concrete paving, cement curbs and water pipes, to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $11,854.

★**Cal., Santa Rosa**—Bd. Supervs. Sonoma Co. will build 16.7 mi. Sects. "A" and "B" of Petaluma-Valley Ford Rd., concrete. About $300,000. Work will be done by day labor under supervision of L. Aldrich, co engr.

★**Cal., Taft**—City let contract improving 4th St., to Romanite Paving Co., Bakersfield, work involves grading at $0.03½ per sq.ft., 1½ in. Romanite paving on 3½ in. base, $.21½ per sq.ft. cement curbs, $.75 per lin.ft., concrete gutters $.21 per sq.ft., and cement sidewalks, $.28 per sq.ft. Total cost about $15,000.

★**Cal., Visalia**—City let contract paving, curbing, guttering, etc., various streets, involving 647,000 sq.ft. asphalt, to Federal Constr. Co., Call Bldg., San Francisco. About $157,000.

Excavation and Dredging

PROPOSED WORK

Ind., Princeton—Levee—Comrs. Patoka-Wabash Drainage and Levee Dist. having preliminary plans prepared for 38 mi. levee, with flood gates and pumping station. T. N. Jacob, Boatmens Bank Bldg., St. Louis, Mo., engr.

Cal., Merced—Irrigation—Merced Irrigation Dist. plans to build system comprising 173,000 acres. Project includes construction of reservoir and distributing system. About $6,000,000. F. Wagner, mgr.

Cal., San Diego—Dredging—E. D. Williams, city purch. agt., soon lets contract dredging 20,000 cu. yd. harbor near municipal pier and wharf of San Diego Fish Co.

BIDS DESIRED

N. Y., Brooklyn—Dredging—Until Dec. 22, by E. Riegelmann, boro. pres., dredging Gowanus Canal from its head to Hamilton Ave., involving 18,000 cu.yd., scow measurement. Former bids rejected.

Utah, Hinckley — Drainage — Until Dec. 22, by Millard Co. D. D. No. 1, furnishing labor and materials for building system. Work involves 281,600 lin.ft. drain tile, 281,600 lin.ft. trenching and backfilling and 106,000 cu.yd. open canal. Caldwell & Richard, Vermont Bldg., Salt Lake City, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—Dredging—Dept. Docks, Pier A, North River, Battery Pl., received bids Dec. 4, dredging (a) Sect. 1, North River, (b) Sect. 2, East River, (c) Sect. 3, East River, from F. E. Jones, 17 Battery Pl, (a) $21,600. (b) 9500, (c) $1400; P. S. Ross Inc., (a) $26,176.

Mich., Detroit—Excavating—City received bids making test borings for new Belle Island Bridge (including use of 1 diamond drill) from W Marks Constr. Co. Cleveland, $17,625, Sullivan Mchy. Co., 124 South Michigan Ave., Chicago, cost of all labor, repairs, depreciation, etc., plus $25 per day.

Industrial Works

PROPOSED WORK

Mass., Cambridge—Eco Mfg. Co., 941 Exchange St., Boston, having plans prepared by Densmore & LaClear, arcts., 88 Broad St., Boston, for 1 story, 50 x 110 ft., brick and concrete factory, concrete flooring and foundation, on Charles River Parkway, here. About $40,000.

Mass., Fitchburg—Simonds Mfg Co., 35 North St., soon lets contract building 2 story, rein.-con. storehouse, rein.-con. flooring, concrete foundation. About $75,000. J. O. DeWeolf, 19 Milk St., Boston, engr.

Mass., Gloucester—General Electric Co., Lynn, plans to build large plant, here. D. W. Weed, Lynn, executive secy.

Mass., Lynn—J. F. Hunt, 28 Mulberry St., soon receives bids building 1 story, 40 x 150 ft., brick and concrete garage, rein.-con. flooring, concrete foundation, on Pleasant St. About $25,000 Burk & Bottomley, 34 School St., Boston, archts.

R. I., Lonsdale (Pawtucket P. O.)—C. R. Makepiece & Co., engrs., Butler Exch. Bldg., Providence, soon lets contract building 1 story, 68 x 90 ft., brick and mill construction addition to Mill No. 4, concrete flooring and foundation, for Lonsdale Co.

Conn., Bridgeport—United Illuminating Co., 84 Temple St., New Haven, having plans prepared by W. Thompson, archt., c/o Westcott & Mapes, 207 Orange St., New Haven, for brick, rein.-con. and steel power station, rein.-con. flooring, brick, rock and concrete foundation, on Congress St., here. About $1,500,000.

Conn., Bridgeport—Bassick Co., 38 Austin St., soon lets contract building brick and concrete addition to plant, concrete flooring and foundation. About $65,000. Ford, Buck & Sheldon Co., Inc., 60 Prospect St., engrs.

Conn., New Haven—I. Hershman & Co., Minor St., and J. Weinstein, archt., 6 Church St., soon let contract building 5 story, 50 x 179 ft., brick, concrete and steel factory, rein.-con. flooring, brick and concrete foundation. About $300,000.

N. Y., Churchville—Alderman, Fairchild & Co. 367 Orchard St., Rochester, plans to build electric power plant and transmission line, here. About $75,000.

N. Y., College Point (Flushing P. O.)—Amer. Hard Rubber Co. having plans prepared by W. Kidde, archt. and engr., 140 Cedar St., New York City, for 120 x 130 ft., rein.-con. and steel addition to factory, rein.-con. flooring, concrete foundation.

N. Y., Long Island City—F. Castillo, c/o J. M. Felson, archt. and engr., 1133 Bway., New York City, having plans prepared for 50 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on 9th Ave., here. About $50,000.

N. Y., Malone—Northern New York Grocery Co. plans to build 2 story, brick addition to storage plant, on Clark and Railroad Sts. Cost between $60,000 and $75,000. M. H. McGillic, treas.

N. Y., New Rochelle—H. T. Childs, archt., 29 Bway., New York City, soon lets contract building 3 story, 60 x 150 ft., rein.-con. warehouse, for D. and J. O'Brien.

N. Y., New York—J. Bashein, c/o Moore & Landseidel, archts. and engrs., 3rd Ave. and 148th St., having plans prepared for 1 story, 100 x 175 ft., brick and steel garage, concrete foundation, on Southern Blvd. and Longwood Ave., (Bronx Boro.). About $40,000.

N. Y., New York—J. Kreinick and S. Ladner, 15-17 West 30th St., having plans prepared by C. H. Gillespie, archt. and engr., 1123 Bway., for converting brick and steel loft building into factory, rein.-con. flooring. About $25,000.

N. Y., Ontario—Ontario Storage Corp. plans to build rein.-con. and steel storage plant, and install ice making machinery. About $150,000. J. S. Albright, pres.

N. Y., Rochester—Eastman Kodak Co., 333 State St., plans to build 5 story, 60 x 90 ft., brick factory and storage plant, on Caledonia Ave. About $80,000.

N. Y., Rochester—E. W. Hamilton Mfg. Co. plans to build 2 story, 55 x 195 ft. factory, on Hollenbeck St. About $25,000.

N. Y., Rochester—Levy Bros. Clothing Co., 169 St. Paul St., plans to build 1 story, 142 x 166 ft., brick factory, on Hollenbeck St. About $50,000.

N. C., Rockville Center—E. Holmgren, archt., 373 Fulton St., Brooklyn, soon lets contract building 1-story, 75 x 170 ft., brick and terra cotta garage, for Goodwin Motor Sales Corp., North Park Ave., About $65,000.

N. Y., Syracuse—Mills Oil Co., 263 Walton St., plans to construct four or five buildings on North Clinton St., to include warehouse, cooper shop, boiler house, office stable, garage and storage tanks. About $200,000. Architect or engineer not selected.

N. Y., Syracuse—Smith Wheel Co., 100 North Geddes St., having plans prepared by Gaggin & Gaggin, archts., University Blk., for brick factory. About $35,000.

N. Y., Watertown—Hungerford Holbrook Co., Printing House Pl., plans to build 3 story, brick addition to plant. Cost between $75,000 and $100,000. C. E. Holbrook, treas.

N. J., Hoboken—H. R. Mallinson & Co., Woolsley Ave., Long Island City, having plans prepared by Lockwood & Green, archts., 101 Park Ave., New York City, for rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here. About $200,000.

N. J., Newark—W. J. Fitzsimmons, archt., 207 Market St., soon lets contract building 2-story, 65 x 375 ft., rein.-con. garage and service station, at 997-9 Broad St., for McAllister-Carlton-Stulz Corp., 1003 Broad St. About $200,000.

Pa., Coatesville—B. R. Stevens, archt., 1737 Filbert St., Phila., receives bids about Jan. 1, building 2 story, 80 x 126 ft., rein.-con. and brick factory for Breuinger Bros., 338 East Lincoln St.

Pa., Forty Fort (Kingston P. O.)—Newark Silk Co., Wilkes-Barre, having plans prepared by H. A. Maiers, archt., Coal Exch. Bldg., Wilkes-Barre, for 2 story, 50 x 90 ft. brick and concrete mill, rein.-con. flooring, on Oxford St., here. About $28,000.

Pa., Forty Fort (Kingston P. O.)—Passaic Silk Co. having plans prepared by H. A. Maiers, archt., Coal Exch. Bldg., Wilkes-Barre for 1 story, 137 x 137 ft. mill, brick, rein.-con. floring, rock foundation, on Simpson and Durkee Sts. About $38,000.

Pa., Kingston—Wales Adding Machine Co., Walnut and Hoyt Sts., plans to build 3 story, 100 x 100 ft., concrete, brick and steel factory, rein.-con. flooring, rock foundation, on Hoyt St. About $100,000. Architect not selected.

Pa., Phila.—Phila. Public Ledger, 6th and Chestnut Sts., plans to build 10-story, 200 x 350 ft., publishing house and auditorium, brick. Cost to exceed $4,000,000. C. H. Curtis, pres. F. C. Roberts & Co., Real Estate Trust Bldg., engrs.

Pa., Wilkes-Barre — Karnofsky Bros., Northampton St., plans to construct 3 story, 70 x 90 ft., concrete, steel and brick wholesale building, rein.-con. flooring, rock foundation. About $60,000. Architect not selected.

Pa., Wilkes-Barre—Kitsee Battery Co., 62 North Main St., having plans prepared for 3 story, 80 x 150 ft. factory. About $100,000. Private plans.

Va., Newport News—W. N. Diehl, archt., Law Bldg., preparing plans for 4 story, rein.-con. warehouse. Cost to exceed $50,000. Owner's name withheld.

Va., Petersburg—Southern Bonded Warehouse Corp. having plans prepared by Harrison Constr. Co., engrs., Mellwaine Bldg., for concrete and steel warehouse, covering 80,000 sq.ft. floor space. About $75,000. Address, W. B. Cole, secy.

Va., Richmond—Cheek-Neal Coffee Co., 1011 East Cary St., having plans prepared by Carneal & Johnson, archts., 6th and Main Sts., for 4 story, 70 x 100 ft., rein.-con. warehouse and office, on 2nd and Hull Sts. Cost to exceed $50,000.

N. C., Mebane—Durham Hosiery Mills, Durham, plan to build 2 story, 106 x 300 ft., concrete and mill construction warehouse, steam heating plant and 50 dwelling houses. J. E. Sirrine, Greenville, S. C., archt.

N. C., Mt. Holly—Globe Yarn Mill plans to build 1-story, 100 x 250 ft. brick mill, concrete flooring. R. C. Biberstein, 614 Elizabeth Ave., Charlotte, archt.

Industrial Works (Continued)

N. C., Winston-Salem—P. H. Haynes Knitting Co. increased capitol stock from $2,000,000 to $12,000,000 and will build large plants. Architect not selected.

S. C., Charleston—Cosgrove Auto Co. having plans prepared by J. D. Newcomer, archt., 32 Broad St., for 2 story, 94 x 94 ft., rein.-con. garage and sales room, Ann and Meeting Sts. About $50,000.

O., Cincinnati — Dittoe-Fahnestock-Ferber Co., archts., 17 West 7th St., receives bids about Jan. 1, building 2 story, 86 x 150 ft., rein.-con. garage, on Gilbert Ave., for G. C. Miller Carriage Co., 713 Main St. About $50,000.

O., Cincinnati—Edwards Mfg. Co., Eggleston Ave., negotiating for site and plans to build warehouse. About $1,000,000.

O., Cincinnati—G. C. Burrough, archt., Commercial Tribune Bldg., receives bids about Jan. 1, building 5 story, 60 x 80 ft., concrete factory, for G. Gruen Watch Co., Time Hill. About $50,000.

O., Columbus—Columbus Heating & Ventilating Co., 425 West Town St., soon receives bids building 1 and 2 story, 100 x 120 ft., concrete and brick factory. About $35,000. Private plans.

O., Dayton—P. R. Gruner, 109 South St Clair St., plans to build 3 story, 24 x 125 ft., rein.-con. and brick printing plant, rein.-con. flooring, concrete foundation, on South St. Clair St. About $75,000. Architect not selected.

O., Dayton—Miami Brass Fdry Co., McDonough and Bacon Sts., plans to build 3 story, 75 x 120 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on McDonough St. About $100,000. Private plans.

O., Dayton—Peckham Coal & Ice Co., Daller and Chapel Sts., plans to build 2 story, 100 x 110 ft., rein.-con., steel and brick plant, rein.-con. flooring, concrete foundation, on Linden Ave. About $70,000. Architect not selected.

O., Lancaster—G. R. Bassett, archt., Central Natl. Bank Bldg., Columbus, soon receives bids building 2 story, 90 x 165 ft., rein.-con. garage, for Martin Bros., Main St.

Mich., Bay City—Columbia Sugar Co., 508 Crapo Blk., plans to build 1 to 3 story, rein.-con., steel and brick factory, 800 to 1000 ton capacity.

Mich., Bay City—Union Motor Truck Co., 1112 North Water St., will construct 2 units of factory buildings, 1 and 2 story, 100 x 500 ft., also 100 x 200 ft. foundry and power house, all concrete, brick and steel, rein.-con. flooring, concrete foundation, in suburb off Banks. About $2,000,000. Work will be done by day labor under supervision of J. L. Sparling, supt. construction.

Mich., Detroit—Baxter, O'Dell & Halpin, archts., 1024 Hammond Bldg., soon let contract building 2 story, 30 x 120 ft., rein.-con. service station, rein.-con. flooring, concrete foundation, on Larned St., for Bemb-Robinson Co., 286 East Jefferson St. About $30,000.

Mich., Detroit — Esselstyn, Murphy & Hanford, engrs., Marquette Bldg., soon let contract building 4-story, 82 x 584 ft., rein.-con. and brick plant, rein.-con. flooring, concrete foundation, on East Jefferson Ave., for Hudson Motor Car Co., 2901 East Jefferson Ave.

Mich., Detroit—A. Kahn, archt., Marquette Bldg., soon lets contract building 4-story, 200 x 250 ft., rein.-con., brick and steel addition to factory, rein.-con. flooring, concrete foundation, on Brush and Piquette Aves., for Studebaker Corp. About $300,000

Mich., Kalamazoo—Smith, Hinchman & Grylls, archts., 710 Washington Arcade, Detroit, soon let contract building 4-story, 65 x 75 ft., rein.-con., brick and steel addition to factory, rein.-con. flooring, brick foundation, on Pitcher and Prouty Sts., for Fuller & Sons Mfg. Co. About $75,000.

Mich., Saginaw—Saginaw Table & Cabinet Co., Wheeler St., having plans prepared by Cowles & Mutscheller, archts., Saginaw, for 2 story, 61 x 475 ft., concrete, steel and brick factory, concrete and brick foundation. About $100,000.

Mich., Saginaw—Sutton Sales Co., 821 Genesee Ave., plans to construct 4-story service and sales building, on Genesee Ave. and Water St. About $60,000. A. S. Levisohn, pres.

Mich., Yale—Yale Woolen Mills having plans prepared by H. H. Lane, archt. and engr., 2320 Dime Bank Bldg., Detroit, for 3 story, 60 x 300 ft., steel and brick addition to factory. About $100,000.

Ill., Chicago—Chicago Addressing Co., 720 South Dearborn St., plans to construct 6 story, 95 x 100 ft. printing plant and office building. About $250,000. Architect not selected.

Ill., Chicago—Commander Fireproof Storage Co., 1616 Milwaukee Ave., having plans prepared by Moores & Dunford, engrs., 38 South Dearborn St., for 7 story, 75 x 130 ft., brick and rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Lawrence and North Sawyer Aves. About $250 000

Ill. Chicago—Mutual Tailoring Co., 1028 West Van Buren St., soon receives bids building 7 story, 100 x 120 ft., brick and rein.-con factory, rein.-con. flooring, concrete foundation, on Racine and Van Buren Sts. About $400,000. Will not announce architects or engineers.

Ill., Chicago—C. S. Frost, archt., 105 South La Salle St., receives bids about Jan. 1, building 2 story, 150 x 178 ft. brick and rein.-con. printing plant, rein.-con. flooring, concrete foundation, at 1101 North La Salle St., for Uniform Printing & Supply Co., 351 West Chicago Ave. About $225,000.

Ill., East St. Louis—St. Louis Pressed Steel Co., Merchants Exch., plans to build steel mill on 26th and Bond Sts. About $40,000. F. Key, mgr. Architect not selected.

Ia., Sioux City—Farmers Terminal Elevator Co. plans to build concrete elevator. About $500,000. Engineer to be selected at once.

Kan., Atchison—Blair Elevator Co., 10th and Main Sts., plans to build elevator, 700,000 bu. capacity, brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $300,000. Architect and engineer not selected.

Mo., Joplin—Norton Taxicab Co., 220 West 8th St., soon lets contract building 5 story, 102 x 156 ft., rein.-con. steel and brick garage and salesroom, rein.-con. flooring, concrete foundation. About $100,000. Private plans.

Mo., St. Louis—T. L. Condron Co., engrs., 408 South Dearborn St., Chicago, receives bids about January, building 6 story, 60 x 400 ft. factory with two 60 x 60 ft. wings, rein.-con. and brick, rein.-con. flooring, concrete foundation, for Wagner Electric Co., 6400 Plymouth St., here.

Ore., Eugene—Lang & Co., 1st St., Portland, plans to build 3-story, 100 x 100 ft., warehouse, on 4th Ave. and Charnelton Sts., here. About $60,000. E. L. Keeney, local mgr. Architect not selected.

Ore., North Portland—North Portland Box Co. plans to rebuild 2 story factory, recently destroyed by fire. About $25,000.

Ore., Vale—Idaho Mutual Sugar Co. plans to build 2 or 3 story concrete factory, concrete foundation, on Dead Ox Flat, 500 ton daily capacity. About $1,000,000. Private plans.

Cal., Alhambra—V. Woodbury and R. H. Sanborn, c/o Alhambra Laundry Co., Mission and Stoneman Sts., plan to build ice plant. About $30,000.

Cal., Los Angeles—Bekins Fireproof Storage Co., 1335 South Figueroa St., having plans prepared by E. T. Flaherty, archt., 1065 North Normandie St. for 6 story, 58 x 100 ft., rein.-con. addition to warehouse. About $60 000.

Cal., Los Angeles—Brownstein-Louis Co., 716 South Los Angeles St., having plans prepared by J. Parkinson, archt., 420 Title Insurance Bldg., for 6 story, 200 x 220 ft., rein.-con. factory on 8th and Figueroa Sts. About $500,000.

Cal., Placentia—Placentia Mutual Orange Assn. having plans prepared by Shepherd & Hamm, engrs., Central Bldg., Pasadena, for 1 story, 100 x 237 ft., hollow tile, steel and concrete packing house.

Cal., Visalia—California Prune & Apricot Growers Assn., Market and San Antonio Sts., San Jose, plans to build packing house, here. About $100,000.

BIDS DESIRED

Mass., Wakefield—Until Jan. 12, by Lee & Hewett, archts. and engrs., 1123 Bway., New York City, building 3 story, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, for Heywood Bros. & Wakefield Co., Gardner. About $150,000.

N. J. Freehold—Until Jan. 7, by Bd. Freeholders Monmouth Co., for (1) constructing power house, (2) toilet room changes in court house, (3) plumbing for power house and court house basement toilet, (4) power house equipment, including heating, boilers, boilter setting, smoke breeching, chimney, oil engine and generator, electric work, etc. W. M. Bergen, dir.

Pa., Phila—Until Dec. 22. by F. V. Nickels, Archt., 4400 Manayunk Ave., building 3 story 80 x 225 ft., rein.-con. factory on Boynton and Chelton Sts. About $90,000. Owner's name withheld.

Pa., Phila.—Until Dec. 21, by F. V. Nickels, archt., 4400 Manayunk Ave., building 2 story, 24 x 90 ft., brick and stone garage and dance hall, on Broad and Wharton Sts., for J. Reale, 1609 Wharton St.

N. C., Durham—Until Dec. 20, by J. E. Sirrine, engr., Greenville, S. C., building 4-story, 80 x 125 ft. mill, for Durham Hosiery Mills.

O., Columbus—O. Darst, archt., Brunson Bldg., Columbus, receiving bids constructing 38 x 100 ft. addition to factory and 35 x 60 ft. office building, both 2 story, brick and concrete, for Columbus Dental Co., 634 Wagner St. About $40,000.

Mich., Detroit—Until Dec. 24, by A. E. Harley, archt., Kresge Bldg., constructing 3 story, 76 x 180 ft., rein.-con., steel and brick factory, rein.-con. flooring, concrete foundation, on Russell St., for I. Applebaum, 2023 Dime Bank Bldg. About $100,000.

Ill., Chicago—Gardner & Lindberg, engrs., 38 South Dearborn St., receiving bids building superstructure for 10 story, 250 x 325 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Fulton and Morgan Sts., for Fulton Market Cold Storage Co., c/o J. Byfield, pres., Hotel Sherman. About $4,000,000. Noted Aug. 14.

Ill., Chicago—P. F. Olsen, archt., 127 North Dearborn St., receiving bids building 2 story, 70 x 190 ft., rein.-con. service and sales building, rein.-con. flooring, concrete foundation, at 2439 Wabash Ave., for Gram-Berstein Truck Co., 2438 South Michigan Ave. About $15 000. Noted Aug. 28.

Ill., Chicago—A. S. Alschuler, archt., 28 East Jackson St., receiving bids building 1 story, 135 x 356 ft., brick, concrete and steel factory and foundry, concrete foundation, on Lake and Kildare Sts., for Sloan Valve Co., 617 West Jackson Blvd. About $75,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Carter Rice Co. let contract building 7 story, rein.-con. warehouse, on Summer St., to Kearns Constr., Devonshire St. About $450,000

★**Mass., Clinton**—Lancaster Mills let contract building 8 story, 102 x 120 ft., rein.-con. addition to plant, rein.-con. flooring, concrete foundation, to Geni Bldg. Co. 587 Boylston St., Boston about $300,000.

★**Mass., Dorchester** (Boston P.O.)—Amer. Radiator Co., 820 South Michigan Ave., Chicago, let contract building rein.-con. warehouse and asembly plant, on Mt. Vernon St., here, to Stone & Webster Corp., Milk St., Boston, $1,500,000.

★**Mass., Willimansett** (Holyoke P. O.)—Stevens-Duryea Co., Chicopee Falls, let contract building (2nd unit of plant) 1 story, 300 x 320 ft., brick and steel, concrete flooring and foundation, at Driving Park, here, to P. J. Kennedy & Co., 464 Maple St., Holyoke. About $250,000.

★**Mass., Worcester**—Morgan Constr. Co., 15 Belmont St., let contract building 2 story, 45 x 97 ft., brick and steel extension to shop, concrete foundation, on Lincoln St., to E. J. Gross Co., 252 Foster St., About $30,000.

★**Mass., Worcester**—Walden Worcester Inc., 72 Commercial St., let contract building 1 story, 132 x 173 ft., brick and steel plant, concrete flooring and foundation, on Shrewsbury St., to W. F. Kearns Co., 200 Devonshire St., Boston. About $65,000.

★**R. I. East Providence** (Providence P. O.)—Sayles Finishing Co., Slater Trust Bldg., Pawtucket, let contract building 1 story, 44 x 300 ft. and 42 x 70 ft., brick and mill construction factory, concrete foundation, here, to Central Constr. Co., Slater Bldg., Pawtucket. About $25,000.

Industrial Works (Continued)

★**R. I., Providence**—Dolbey Ice Cream Co., 485 Plainfield St., let contract altering and building 2 story, 35 x 60 ft., brick, concrete and steel addition, rein.-con. flooring, concrete foundation, to C. I. Bigney Constr. Co., 898 Westminister St. About $25,000.

★**R. I., Providence**—D. W. Flint Co., Allens Ave., let contract building 1 story, 100 x 150 ft., brick and mill construction storage plant, concrete flooring and foundation, to Interstate Constr. Co., 29 Weybosset St.

★**Conn., Bridgeport**—Crane Co., 836 South Michigan Ave., Chicago, Ill., let contract building 3 story, rein.-con. and steel factory, concrete foundation, here, to Stone & Webster Corp., Milk St., Boston, Mass.

★**Conn., Bridgeport**—Locomobile Co. of Amer., 2 Main St., let contract building 2 story 50 x 80 ft., brick and steel addition to plant, concrete foundation, to T. P. Pardy Constr. Co., 1484 Seaview Ave. About $30,000.

★**Conn., Bridgeport**—Singer Mfg. Co. Pembroke St. and Washington Ave., let contract building 1 story, 23 x 61 ft. forge building, 1 story, 12 x 25 ft. pump house and two 200,000 gal. fuel oil tanks, brick and steel, concrete foundation, on Waterview Ave., to J. R. Sheehan, 211 State St.

★**Conn., Bristol**—J. H. Sessions & Son, Riverside Ave., let contract building brick and rein.-con. storehouse, rein.-con. flooring, concrete foundation, to Torrington Bldg. Co., 197 Water St., Torrington. About $40,000.

★**Conn., Danbury**—Danbury Felt Mills Co., let contract building 2 story, 60 x 160 ft., factory with 35 x 40 ft. ell, and 1 story, 18 x 36 ft., boiler house, rein.-con., rein.-con. flooring, concrete foundation, to Westcott & Mapes, Inc., 207 Orange St., New Haven. About $80,000.

★**Conn., Hartford**—Johnson-Wester Co., 159 Washington St., will build 3 story, 50 x 150 ft., brick and concrete garage, rein.-con. flooring and foundation, on Washington and Park Sts. About $65,000. Work will be done by day labor.

★**Conn., New Britain**—Fafnir Bearing Co., Booth St., let contract building 1 story, 50 x 140 ft., brick and rein.-con. factory, rein.-con. flooring, concrete foundation, on Orange St., to J. H. Grozier Co., 721 Main St., Hartford.

★**Conn., New Haven**—New Haven Clock Co., 133 Hamilton St., let contract building 4 story, brick and mill construction addition to factory, concrete foundation, to C. E. Augur Co., 549 Elm St. About $35,000.

★**Conn., New London**—A. Bloom Co., Inc., 23 Market St., Paterson, N. J., let contract building 2 story, 45 x 430 ft., brick and steel factory, concrete foundation, on Garfield Ave., here, to P. S. Van Kirk Co., 85 Fulton St., Paterson, N. J. About $175,000. Incorrectly noted in our issue of Nov. 20.

★**Conn., Stamford**—Stollwerck Chocolate Co., Greenwich Ave., will build 1 story, 40 x 285 ft., rein.-con. addition to plant, concrete flooring and foundation, on Sunnyside Ave. About $25,000. Work will be done by day labor.

★**Conn., Wallingford**—Wallingford Industrial Assn. let contract building 2 story, 42 x 150 ft., brick and mill construction plant, concrete foundation, on North Cherry St., to Loucks & Clarke, Ernest St. About $42,000.

★**Conn., Waterbury**—A. C. Campbell & Co., 42 State St., let contract building 4 story, 35 x 100 ft. and 2 story, 35 x 140 ft., with ell 50 x 60 ft., brick and mill construction factories, concrete foundation, to T. J. Pardy Constr. Co., 1484 Seaview Ave., Bridgeport. About $60,000.

★**N. Y., Brooklyn**—Amer. Machine Fdry. Co., 55th and 56th Sts. between 1st and 2nd Aves., let contract building 6 story, 127 x 190 ft., brick and steel factory, rein.-con. flooring, concrete foundation, to H. D. Best, 949 Bway., New York City.

★**N. Y., Brooklyn**—J. L. Link, 833 St. Johns Pl., will build 1 story, 75 x 100 ft., brick and steel garage, brick foundation, on Park and Throop Aves. About $75,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Rigney & Co., 348 Park Ave., let contract building 8 story, 75 x 90 ft., rein.-con. factory, on Park Ave., near Ryerson St., to Turner Constr. Co., 244 Madison Ave., New York City.

★**N. Y., Long Island City**—Dings & Schuster, 510 West 25th St., New York City, let contract building 2 story, 56 x 84 ft., factory, on 14th St. near Van Alst Ave., to Aljon Constr. Co., 51 East 42nd St., New York City. About $40,000.

★**N. Y., New York**—Upjohn Co., c/o H. Upjohn, archt., 456-4th Ave., let contract building 5 story, 60 x 75 ft., brick and terra cotta warehouse, at 59-61 Bedford St., to North Eastern Constr. Co., 101 Park Ave. About $250,000.

★**N. Y., Syracuse**—Greenway Brewing Co. let contract building 3, 5 and 7 story, 80 x 500 ft., garage, steel and glass, rein.-con. flooring, rock foundation, on West Water St., to Syracuse Bridge Co., University Bldg. About $250,000.

★**Va., Norfolk**—Virginia Ice & Freezing Co. let contract building 3 story, 150 x 200 ft., rein.-con. plant, to White Constr. Co., Inc., 95 Madison Ave., New York City. About $500,000.

★**Va., Petersburg**—A. M. Rodgers, mgr. International Filler Corp., Salem, let contract building 1 story, 100 x 100 ft., brick factory, here, to E. L. Bass, 708 Bainbridge St., Richmond. About $26,000.

★**O., Ashland**—Osborn Eng. Co., engrs., 2848 Prospect Ave., let contract to G. B. Hicks, South Charleston, building 2 story, 100 x 240 ft. concrete, steel and stone factory, rein.-con. flooring, concrete foundation, for Ashland Tire & Rubber Co. About $150,000.

★**O., Carey**—Carey Tire & Rubber Co. let contract building 3 story, 80 x 160 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to C. N. Dennis, Tiffin. About $150,000.

★**Mich., Benton Harbor**—Superior Steel Castings Co., Graham St., will build 1 story, 132 x 440 ft., brick and steel factory. Work will be done by labor. Contract furnishing steel let to Indiana Bridge Co., Macedonia Ave. and East 12th St., Muncie, Ind.

★**Mich., Detroit**—Amer. Auto Parts Co. let contract to Thompson-Starrett Co., Lincoln Bldg., constructing plant, consisting of two 1-story, 303 x 361 ft. buildings and 1-story, 105 x 254 ft., foundry and coreroom, rein.-con., brick and steel, concrete flooring and foundation, on French Rd., near Gratiot Ave.

★**Mich., Detroit**—Central Axle Co., c/o Genl. Motors Corp., 435 Woodward Ave., let contract constructing 1 story, 240 x 1080 ft. factory and 2 story, 60 x 275 ft. office building, both brick and steel, rein.-con. flooring, concrete foundation, on Holbrook Ave., to W. E. Wood Co., 1805 Ford Bldg.

★**Mich., Detroit**—Commerce Motor Car Co., 26 Mackie St., let masonry contract constructing 1-story, 120 x 240 ft. plant, also 2-story, 40 x 120 ft. office building, brick and steel, concrete foundation, to L. Zander, 708 14th St.; steel, to Daigle Iron Wks., 549 Lafayette St. and Lewis-Hall Iron Wks., Ferry Ave.

★**Mich., Detroit**—Detroit Creamery Co., Cass St. and Grand River, let contract building 6 story, 70 x 86 x 121 ft., rein.-con., brick, steel and terra cotta factory and office, rein.-con. and tile flooring, concrete foundation, on Case and Adam Sts., to Bryant & Detwiler, 2336 Dime Bank Bldg. About $250,000.

★**Mich., Detroit**—Lincoln Motor Co., Tireman Ave., let contract building 2-story, brick, steel and concrete addition to factory, rein.-con. flooring, concrete foundation, on Livernois and Tireman Aves., to A. A. Albrecht Co., 1130 Penobscot Bldg. About $175,000.

★**Mich., Detroit**—J. C. Wilson Co., 15th and Warren Aves., let contract building 1-story, 60 x 150 ft., brick and steel plant, concrete flooring, brick and concrete foundation, to L. Zander, 708 14th St.

★**Mich., Detroit** — Yoemens Box Co., Wight St., let masonry contract constructing boiler house, garage and dry kiln building, also 1-story, 100 x 240 ft. factory, concrete, brick and steel, concrete foundation, to Martin & Krausman Co., 747 Garland St., steel, to Daigle Iron Wks., 549 Lafayette Blvd.

★**Mich., Jackson**—Jackson Metal Products Co., 601 Liberty St., let contract building 1-story, 113 x 130 ft., concrete, brick and steel addition to plant, concrete flooring and foundation, to J. C. LaDuc, Liberty St. About $50,000.

★**Mich., Lansing**—D. J. Ryan, c/o Allyne-Ryan Fdry. Co., Aetna Rd., Cleveland, O., let contract building grey iron foundry, 1 story, 300 x 400 ft., brick and steel, brick foundation, here, to Christman Constr. Co., 302 Union Trust Bldg., South Bend, Ind. About $300,000.

★**Ill., Chicago**—Armour Fertilizer Wks., Union Stock Yards, let contract building acid plant, rein.-con and steel, rein.-con. flooring, concrete foundation, to Westinghouse, Church-Kerr, 37 Wall St., New York City. About $150,000.

★**Ill., Chicago**—S. J. Schaeffer, c/o Dubin & Eisenberg, archts., 139 North Clark St., let contract building 3 story, 80 x 170 ft., brick and rein.-con. factory, rein.-con. flooring, concrete foundation, at 1725 North Ave., to Waldemar Constr. Co., 155 North Clark St. About $200,000.

★**Ill., Chicago**—South Side Ice & Beverage Co., West 37th St. and Auburn Ave., let contract building 1 story, 75 x 147 ft., mill construction warehouse, cement flooring, concrete foundation, to A. Nelson, 7950 Princeton St. About $80,000.

★**Ill., Rockford**—Tarkington Motor Co., 19th Ave., will build 1 story, 100 x 500 ft. factory, on Harrison Ave. About $50,000. Work will be done by day labor. Part of contract has been sublet, to A. Clubb, 1115 Harlem Blvd. Total cost, $50,000.

★**Wis., Manitowoc** — Aluminum Goods Mfg. Co., 15th and Franklin Sts., let contract building 1-story, 300 x 340 ft. brick and steel mill, rein.-con. flooring, concrete foundation, to W. W. Oeffiein, 86 Michigan St., Milwaukee. About $300,000.

★**Wis., Milwaukee**—Hurley-Davidson Motor Co., 3732 Chestnut St., let contract building 6 story, 122 x 214 ft., rein.-con. and brick addition to factory, concrete foundation, to Raulf Co., Patton Bldg. Total cost, $300,000.

★**Wis., Milwaukee**—Pfister-Vogel Leather Co., 443 Virginia St., let contract building 1-story, 150 x 300 ft. tannery, brick, concrete and steel, rein.-con. flooring, concrete foundation, on 2nd Ave. and Virginia St., to Dahlman Constr. Co., Majestic Bldg About $125,000.

★**Kan., Sterling**—Arnold-Madans Milling Co. let contract building 7-story, 40 x 200 ft. brick, rein.-con. and steel mill, rein.-con. flooring, concrete foundation, to Fenton Constr. Co., 414 Ridge Arcade, Kansas City, Mo. About $250,000; cost plus percentage basis.

★**Mo., St. Joseph**—Western Tablet Co., 11th and Mitchell Sts., let contract building 6 story, 141 x 157 ft., rein.-con. and brick factory, rein.-con. flooring, concrete and brick foundation, to Swenson Constr. Co., Shubert Bldg., Kansas City. About $364,000.

★**Tex., Breckenridge**—Texas Co., 17 Battery Pl., New York City, let contract building rein.-con. and steel compression and absorbtion plants, rein.-con. flooring, concrete foundation, here, to Westinghouse-Church Kerr, 57 Wall St., New York City. About $150,000.

★**Tex., Ft. Worth**—S. C. Cunningham, 209½ West 8th St., will build 2-story, 95 x 100 ft. brick, concrete, steel and stone garage and auto sales room, concrete foundation, on 6th and North Main Sts. About $35,000. Work will be done by day labor.

★**Colo., Denver**—T. Roberts, 1235 Bway., let contract building 1-story, 100 x 125 ft. garage, on 11th and Bannock Sts., to C. S. Lambie, Tramway Bldg. About $75,000; cost plus percentage basis. Noted Aug. 7.

★**Ore., Portland**—Specialty Fdry. Co., 440 Belmont St., will build 2-story, 100 x 100 ft., frame foundry and machine shop, concrete foundation, on East 10th and Belmont Sts. About $25,000. Work will be done by day labor.

★**Ont., Toronto**—F. R. Pember, Jones Ave. and Grand Trunk Ry., let contract building 600-ton circular rein.-con. coal-handling plant, to J. B. Nicholson, Ltd., Hamilton.

Buildings

PROPOSED WORK

N. H., Manchester—High School—City plans to build 3 story, (30 room) brick and steel, on west side. About $300,000. L. A. Thorp, Amoskeag Savings Bank Bldg., chn. Architect will be selected from competitive plans.

N. H., Manchester—High School—City plans to build 3 story (40 room) practical arts high school and assembly hall. About $450,000. L. A. Thorp, Amoskeag Savings Bank Bldg., chn. Architect will be selected from competitive drawings.

N. H., Manchester—School—City plans to build 2 story, (20 room) brick and steel grammar school. About $160,000. L. A. Thorp, Amoskeag Savings Bank Bldg., chn. Architect will soon be selected from competitive plans.

Mass., Amherst — Memorial — Massachusetts Agricultural College soon lets contract building 2 story, 60 x 120 ft., brick and stone, rein.-con. flooring, concrete and stone foundation, on campus. About $150,000. J. H. Ritchie, 8 Beacon St., Boston, archt. Noted Sept. 11.

Mass., Boston—Store—S. S. Kresge Co., Kresge Bldg., Detroit, having plans prepared by Newhall & Blevins, archts., 9 Park St., for 6 story, concrete and steel, on Washington and Temple Sts., here. About $400,000.

Mass., Lowell—Memorial—City having plans prepared by Blackall, Whittemore & Clapp, archts., 20 Beacon St., Boston, for 2 story stone and concrete. About $1,000,000.

Mass., Lynn—Club—Knights of Pythias, 23 Central Ave., having plans prepared by Burk & Bottomley, archts., 34 School St., Boston, for 2 and 4 story, 90 x 184 ft., brick and stone, concrete foundation. About $200,000. W. E. Solomons, chn.

Mass., Malden (Boston P. O.)—School—S. S. Eisenberg, archt., 203 Bway., Chelsea, receives bids about Dec. 30, building 2 story, 65 x 65 ft., brick and frame, concrete foundation, for Hebrew Free School, 19 Boylston St. About $50,000.

Mass., Medford (Boston P. O.)—Church—Methodist Episcopal Church Society having plans prepared by Woodbury & Stuart, archts., 53 State St., Boston, and receives bids in spring, building new stone church. About $50,000. A. B. Thompson, chn. com.

Mass., Peabody—Mercantile—G. H. Fanning, archt., 221 Essex St., Salem, soon receives bids building 2 story, 36 x 196 ft. and 3 story 66 x 75 ft. brick, concrete foundation, on Main St., here, for L. Karelitz, Central St., Lowell. About $75,000.

Mass., Smiths Ferry—School—Holyoke School Bd. plans to build 3 story, 30 x 75 ft., here. Architect not selected.

Mass., Springfield—Hotel—P. H. Faber, c/o The Oaks, 31 Thompson St., plans to build 3 story, (125 room and 65 bathroom) addition, brick, concrete and steel, on State St. About $200,000. Architect not selected.

Mass., Worcester—Hospital—Trustees St. Vincents Hospital, 73 Vernon St., receive bids about Jan. 1, building 4 story, brick addition, concrete foundation. About $200,000. J. W. Donahue, 40 Walker Bldg., Springfield, archt. and engr.

R. I., Pawtucket—Theatre—Pawtucket Amusement Co., Smithfield, plans to build theatre, here. About $100,000. Architect not selected.

Conn., Bristol—High School—Bd. Educ. having plans prepared by W. Potter, archt. and engr., 22 East 17th St., New York City, for 3 story, brick, steel and stone, brick foundation, here. About $600,000.

Conn., Hartford—School—East Hartford Dist. having preliminary plans prepared by Johnson & Burns, archts., Hartford, for 2 story, 62 x 124 ft. with 42 x 57 ft. ell, brick and terra cotta, rein.-con. foundation. About $200,000.

Conn., Lakeville—Dormitories—Hotchkiss School having plans prepared by C. Gilbert, archt., 244 Madison Ave., New York City, for three or four 3 story, brick and steel, on campus.

Conn., Meriden—Office—E. Derecktor, 39 Crown St., plans to build 2 story, 105 x 118 ft. brick and terra cotta, concrete foundation, on West Main St. About $100,000. Architect not selected.

Conn., Meriden—Office and Salesroom—Meriden Electric Light & Gas Co., Colony St., soon lets contract building 2 story, 48 x 190 ft., brick, terra cotta and concrete

THE FOLLOWING IS A LIST OF FEDERAL AID AND SPECIAL STATE HIGHWAY PROJECTS TO BE UNDERTAKEN BY THE STATE HIGHWAY COMMISSION OF COLORADO DURING 1920

Dist. No.	Proj. No.	State Road	Kind	Length, Mi.	County	Between	Total Cost or Estimate
5	8	42	G-D	17.5	Rio Blanco	Meeker-Craig	$10,958.20
1	11	6-S	G-D	15	Yuma	Wray to Idalia	42,000.00
1	15	9	Concrete	½	Logan	Sterling, South ½ mi	11,000.00
3	19	34	G-D	30	Prowers	Lamar, South to Baca Co. line	12,000.00
3	20	34	G-D	15	Baca	Springfield, North to Prowers Co. line	6,000.00
4	23	12	Concrete	½	Delta	Delta, South ½ mi	11,000.00
4	25	12	Concrete	½	Montrose	Montrose, North ½ mi	11,000.00
4	26	..	G	1½	Ouray	Ouray to Red Mountain on new location. (See also Project No. 65)	18,000.00
5	28	..	G-D	3½	Summit	Grading and draining	13,000.00
1	29	35	G-D	15	Jefferson	Morrison to Baileys via Conifer Jct.-Turkey Creek	60,000.00
1	30	27	Concrete	3	Jefferson	Denver-Morrison Rd	75,000.00
1	31	7	Concrete	2	Adams, Arapahoe	Denver to Hospital 21, 2 mi	44,000.00
1	32	49	Concrete	10	Adams	Denver-Brighton Rd	230,000.00
1	33	2	Concrete	3	Larimer	Ft. Collins, South 3 mi	75,000.00
1	34	24	Concrete	3	Weld	Greeley, North 1 mi., East 1 mi., South 1 mi	75,000.00
1	35	49	Concrete	2	Weld	Platteville, South 2 mi	50,000.00
1	36	2	Concrete	2	Boulder	Longmont, South 2 mi. (See Project No. 14)	45,000.00
1	37	..	Concrete	2	Boulder	Boulder, East 2 mi. (See Project No. 13)	45,000.00
1	38	24	Concrete	2	Morgan	Ft. Morgan-Brush Rd. (See Project No. 16)	45,000.00
1	39	19	G-D-S	15	Washington, Morgan	Akron-Brush Rd	48,000.00
1	40	19	G-D	10	Yuma	Wray-Schram Rd	30,000.00
1	41	9	Bridge	Bridge	Logan	Sterling-Merino Rd	70,000.00
2	42	1-S	G-D	48	Douglas 3/7, El Paso 4/7	Cherry Creek to Colorado Springs Junction	35,000.00
2	44	6-S	G-D	10	(Kit Carson	Burlington, North 10 mi.)	10,000.00
2	45	6-S	G-D	10	(Kit Carson	Burlington, North 10 mi)	5,000.00
2	46	30	G-D	10	Lincoln	Limon, East 10 mi	15,000.00
2	47	22	G-D	6	El Paso	Colorado Springs-Cañon City, Dead Man's Cañon Rd	40,000.00
2	48	8	G-D	6	El Paso	Colorado Springs to Palmer Lake.	30,000.00
2	49	18	G-D	1	El Paso	Colorado Springs to Cripple Creek, Cheyenne Cañon Rd	20,000.00
2	50	8	G-D	20	Elbert	Castle Rock to River Bend	50,000.00
2	51	32	G-D	10	Cheyenne	Cheyenne Wells, North or West	25,000.00
2	52	18	G-D	10	Teller	Woodland Park to Cripple Creek.	25,000.00
2	53	17	G-D	26	Chaffee	Buena Vista to Salida	75,000.00
2	54	18	G-D	12	Chaffee	Buena Vista to Divide	40,000.00
2	55	.	G-D	10	El Paso	Peyton to Ramah	17,000.00
2	56	18-S	G-D	5	El Paso ½, Lincoln ½	Farmers Highway, Colorado Spgs. to Boyeno	15,000.00
		34	G-D	2	Baca	On State Road 34	6,000.00
3	59	5	G-D-S	10	Bent	Las Animas, East	35,000.00
4	64	19	G-D	9	Costilla	Fort Garland to San Luis, Extension of Project No. 24	30,000.00
4	65	13	G-D	1½	Ouray	Silverton-Ouray Rd. (Addl. to Project No. 26)	30,000.00
4	66	44	G-D	10	Montrose, San Miguel	Top of Norwood Hill to connection with No. 7 Federal Aid Project	50,000.00
4	67	45	G-D	4	Dolores	Rico, North	20,000.00
4	68	36	G-D	12	Rio Grande, Saguache	Monte Vista-Saguache Rd	25,000.00
							60,000.00
4	69	12 and 13	G-D	7	Delta	Delta to Montrose	21,000.00
				10	Montrose	To Ouray County Line	19,000.00
4	70	46	G-D	10	Delta	Delta-Hotchkiss Rd	30,000.00
4	71	14	G-D	6	La Plata	Durango-Mancos Rd	40,000.00
4	72	15	G-D	6	La Plata	Bayfield-Dyke Rd	27,000.00
5	73	43	G-D	6	Archuleta	Walden to Rand Rd	30,000.00
5	74	41	G-D	10	Jackson	Craig, West to Maybell	75,000.00
5	75	57	G-D	30	Moffat	Kremmling, North	30,000.00
5	76	42	G-D-S	10	Grand	Meeker-Rifle Road (included in Project No. 4)	
5	77	11	Concrete	1¾	Mesa	Grand Junction-Palisade Rd	50,000.00
5	78	10	G-D	6	Eagle	Battle Mountain Road between Redcliff and Minturn	60,000.00
5	80	52	G-D	15	Routt	Steamboat Springs, North	59,400.00
1	81	..	G-D	4	Jefferson	Vernon Cañon Rd	35,000.00
1	82		Paved	3½	Jefferson	Denver-Morrison	87,000.00
1	83		Paved	4	Arapahoe	Denver-Colorado Springs, Littleton South	110,000.00
1	84		Paved	2	Morgan	Morgan-Brush	58,000.00
1	85		Paved	2	Morgan	Ft. Collins-Loveland	58,000.00
1	86		Paved	2	Larimer	Loveland-Berthoud	58,000.00
1	87		Paved	2	Larimer	Boulder, East	58,000.00
1	88		Paved	2	Boulder	Longmont, South	58,000.00
1	89		Paved	6½	Adams ⅛ Weld ⅞	Brighton Road	30,000.00
1	90		G-D	6	Clear Creek ½, Gilpin ½	Brighton to Ft. Lupton	146,000.00
3	91		G-D	11	Las Animas	Idaho Springs to Central City	40,000.00
3	92		Bridge	Huerfano	Pueblo	Trinidad to Hoehne	20,000.00
3	93		G-D	16	Crowley	Pueblo, East Huerfano Bridge	70,000.00
3	94		G-D	7	Fremont	Ordway, East and West, 16 mi	40,000.00
3	95		G-D	10	Kiowa	Canon City, East	40,000.00
3	96		Paved	3	Otero	Eads, North	25,000.00
3	97		G-D	18	Prowers	La Junta, West	80,000.00
3	98		G-D	6	Baca	Lamar, East	90,000.00
3	99		G-D	15	Bent	Springfield, North	20,000.00
4	100		G-D	6	Rio Grande ½, Saguache ½	Las Animas, East to County Line No. 5	60,000.00
4	101		G-D	10	La Plata	Del Norte-Saguache Rd	30,000.00
4	102		G-D	1½	Ouray	Durango	80,000.00
4	103		G-D	6	Montrose	Silverton-Ouray	50,000.00
4	104		G-D	8	Montrose ⅔, Delta ⅓	Placerville-Dry Creek	30,000.00
4	105		G-D	5	Dolores	Montrose-Delta	50,000.00
5	106		G-D	6	Routt	Rico-Lizzard Head	40,000.00
5	107		G-D	12	Moffat	Steamboat, East	30,000.00
5	108		Paved	1.8	Mesa	Maybell to State Line	60,000.00
						Grand Junction-Palisade	50,000.00

Dist. No.	Proj. No.	Kind	Length Mi.	County	Between	Total Cost or Estimate
5	109	Paved	1 8	Mesa	Grand Junction-Fruita	50,000 00
2	110	G-D	2	Kit Carson	Burlington, South	10,000.00
2	111	G-D	6	Lincoln	Limon, East	30,000.00
2	112	G-D	5	Park	Divide, towards Lake George	30,000 00
2	113	G-D	6	Chaffee	Salida, North and South	40,000.00
2	114	G-D	4	Elbert	Kiowa, West	20,000.00
2	115	G-D	6	Cheyenne	Cheyenne Wells, West	30,000.00
2	116	Paved	4	El Paso	Colorado Springs, North	100,000.00
2	117	Paved	1½		Colorado Springs-Manitou	35,000 00
	Extended totals					$4,074,358.20

SPECIAL STATE PROJECTS
STATE FUNDS

State Road No.	Kind	Length	County	Between	Total Cost or Estimate
		6 mi.	Lake		
25	G-D-S	4 mi.	Pitkin	Independence Pass Rd	$25,027.02
27	Bridges	Bridges	Jefferson	Bear Creek Bridges, 42,000 Denver; 21,000 State	4,807.46
7 and 31	G-D-S		Adams, Arapahoe, Elbert, Lincoln	Denver-Limon Rd	13,554 01
21	G-D-S	1 mi.	Jefferson	Golden Approach to Lookout	1,600 00
	Extended totals				$44,988.49

Buildings (Continued)

wood flooring, concrete foundation. About $100,000. C. Palmer, 191 Church St., New Haven, archt.

Conn., Meriden—Stores and Offices—Griswood, Richmond & Glock, 2 West Main St., having preliminary plans prepared by D. Bloomfield, archt., 129 State St., for 2 story, 100 x 106 ft., brick and rein.-con., concrete foundation. About $75,000. Engineer not selected.

Conn., Meriden—Y. M. C. A., 21-23 Colony St., soon lets contract constructing 4 story, 138 x 138 ft., brick and rein.-con. building, rein.-con. flooring, concrete foundation, on West Main St. About $360,000. C. E. Schunack, chn., bldg. com. Jallade, Lindsay & Warren, 37 Liberty St., New York City, archts.

Conn., Naugatuck—Hotel—P. J. Hall, 1 Oak St., had plans prepared by C. J. Bailey, archt., 95 Bank St., Waterbury, for 3 story, 42 x 100 ft., brick and steel, concrete foundation, on Oak St. About $50,000.

Conn., New Britain—School—Bd. Educ. soon lets contract building 2 story, 115 x 272 ft., brick, concrete and steel, concrete foundation, on Bassett and Ellis Sts. About $200,000. C. C. Palmer, 272 Main St., archt. Noted July 24.

Conn., New Haven—Business—R. W. Foote, archt., 185 Church St., receives bids about Apr. 1, building 12 story, 40 x 90 ft., brick and concrete, on Church and Court Sts., for A. H. Powell, 177 Church St. About $300,000.

Conn., New Haven—Church—St Brendan's Roman Catholic Congregation, 380 Sherman Ave., plans to build large stone church on Whalley and Ellsworth Aves. Architect not selected.

Conn., New Haven—Laboratory, etc.—State Comn., Hartford, having preliminary plans prepared by F. Slater, archt., 308 Church St., Hartford, for 3 story, 50 x 110 ft., laboratory and agricultural experiment station, and 2 story, 18 x 20 ft. power sta- for 120 x 600 ft., brick and hollow tile. con. flooring and foundation, on Hillside Ave., here.

Conn., Seymour—High School—Bd Educ. plans to build 2 story, brick and steel. About $125,000.

Conn., Willimantic — Bank — Windham Natl. Bank, 779 Main St., and T. M. James, archt., 3 Park St., Boston, Mass., soon let contract altering brick and steel bank building, on Main St. About $50,000.

N. Y., Brooklyn (Bensonhurst)—Bank—Holmes & Winslow, archts., 110 West 40th St., New York City, soon let contract building 2 story, 30 x 90 ft., brick, steel, stone and marble, brick foundation, on 20th Ave. and 86th St., for West End Bank, c/o architects.

N. Y., Brooklyn—Bank—East Brooklyn Savings Bank, 643 Myrtle Ave., having plans prepared by Koch & Wagner, archts., 32 Court St., for 1 story, 50 x 100 ft., brick, steel and stone, brick foundation, on Bedford and DeKalb Aves.

N. Y., Brooklyn—Hospital—L. A. Abramson, archt., 46 West 46th St., New York City, soon lets contract building 3 story, 115 x 180 ft., at 4801-4824 10th Ave., for Israel Hospital, Inc., 1246-42nd St. About $410,000.

N. Y., Fulton—High School—Bd. Educ. plans to build 2 story, brick, steel and stone, brick foundation. About $225,000. W. Potter, 22 East 17th St., New York City, archt. and engr.

N. Y., Lake Placid—Hotel—Stevens Hotel Co. plans to build addition to hotel. About $200,000.

N. Y., New York—Club—International Sporting Club, c/o W. H. Gompert, archt. and engr., 171 Madison Ave., having plans prepared for 9 story, brick, steel and stone, brick foundation, on 49th St. and Lexington Ave. About $600,000.

N. Y., New York—Loft—Euvrard, Sambach & Euvrard, archts. and engrs., 29 Cleveland Pl., preparing plans for 7 story, brick, steel and stone, brick foundation, at 48-50 West 36th St. About $400,000. Owner's name withheld.

N. Y., New York—Office—R. H. and C. N. Whinston, archts., 2 Columbus Circle, soon let contract building 3 story, 50 x 66 ft., brick, limestone and terra cotta, at 723 7th Ave. and 169 West 48th St. About $75,000. Owner's name withheld.

N. Y., New York—Office—C. H. Gillespie, archt., 1123 Bway., soon lets contract building 6 story, 32 x 100 ft., at 47-49 Beaver St., for Importers & Exporters Insurance Co., 17 South William St. About $100,000. Noted Aug. 14.

N. Y., New York—Offices and Lofts—A. E. Lefcourt & Co., 140 Madison Ave., having plans prepared by G. and E. Blum, archts. and engrs., 505-5th Ave., for 12 story, 100 x 200 ft., brick and steel, brick foundation, at 223 West 38th St.

N. Y., Rochester—Library, etc.—City plans to build library and art gallery. About $440,000 available from will of late M. W. Rundel. C. A. Parke, city engr.

N. Y., Saranac Lake—Hotel—Village plans to build hotel. About $400,000. Address T. E. Krumbholz, Saranac Lake.

N. Y., Schenectady—School—City plans to build 2 story, 60 x 200 ft., brick, concrete foundation, at Woodlawn. About $60,000. A. Atkinson, State St., archt. and engr.

N. Y., Syracuse—Fire Station—Bd. Contr. & Supply, receives bids about Jan. 1, building 3 story, brick, concrete and steel, concrete foundation, on West Genesee St. About $50,000. H. C. Allen, City Hall, engr. J. A. Randall, S. A. and K. Bldg., archt.

N. Y., Syracuse—School—Bd. Contr. & Supply receives bids about Jan. 1, building 3 story, brick, concrete and steel, rein.-con. flooring, concrete foundation, on South Alvord St. About $300,000. H. C. Allen, City Hall, engr. M. L. King, Snow Bldg., archt.

N. J., Trenton—Church—Trustees 2nd Presbyterian Church plan to build church on Mercer St., to replace one destroyed by fire. About $50,000. H. J. Baumgartel, 142 Mercer St., pastor. Architect not selected.

N. J., Trenton—Club House—Blue & Gray Post, Amer. Legion, 2nd Regiment Armory, plans to build club house. About $150,000. J. P. Gill, 42 Murray St., chn. Architect not selected.

N. J., Trenton—School—Bd. Educ. Hamilton Twp. rejected bids received Dec. 3 building 2 story, 36 x 105 ft., brick, on South Broad St. About $60,000. Work will be readvertised. W. A. Klemann, 1st Natl. Bank Bldg., archt.

Pa., Chester—Lodge—Tall Cedars Lodge having plans prepared by V. T. Ritter, archt., North Amer. Bldg., for 6 story, 150 x 180 ft., brick and stone, on 9th and Sproul Sts. About $65,000.

Pa., Phila.—Auditorium—See "Industrial Works."

Pa., Phila.—Sales and Service—C. E. Oelschlager, archt., 1615 Walnut St., receives bids about Jan. 1, building 6 story, 210 x 440 ft., concrete and brick, on 24th and Market Sts., for Gomery-Schwartz, 128 North Broad St. About $700,000.

Del., Middletown—School—W. E. Hance archt., 1619 Chestnut St., Phila., receives bids about Feb. 1, building 2 story, 100 x 140 ft., for Bd. Educ. About $100,000.

Va., Richmond—Bank—Bank of Commerce & Trusts, 901 East Main St., having plans prepared by M. E. Ruehrmund, archt., Allison Bldg., for 2 story, brick, concrete foundation, on Hull St. About $75,000.

Va., Richmond — Studio — Collegiate School for Girls, 1619 Franklin St., having plans prepared by C. Messerschmidt, archt., Mutual Bldg., for 3 story, on Franklin St. About $75,000

N. C., Concord—Hospital—Cabarrus Sanitarium plans to build 3-story, 40 x 80 ft. About $100,000. Heard & Chesterman, Danville, Va., archts.

N. C. Raleigh—Hotel—B. H. Griffin Hotel Co., plans to build 7 story, 105 x 210 ft. on Fayetteville St. About $1,000,000. Architect not selected.

N. C., Reynolds—School—Reynolds Memorial School having sketches drawn by C. B. Keen, archt., 1218 Chestnut St., Phila., for 120 x 600 ft. brick and hollow tile.

N. C., Winston-Salem—Schools—Bd. Educ. plans to construct academy, auditorium and gymnasium, brick. About $1,000,000. C. B. Keen, 1218 Chestnut St., Phila., archt.

O., Caldwell—High School—Bd. Educ. having plans prepared by F. S. Rusk, archt., 16 South 3rd St., Columbus, for high school, here. About $60,000.

O., Cincinnati—Synagogue—L. Feinberg, 3252 Burnet Ave., Avondale, plans to build synagogue, on Rockdale Ave. and Redding Rd., here. About $100,000.

O., Cleveland—Church—Our Lady of Peace Church, 2544 East 110th St., having plans prepared by E. T. P. Graham, archt., 8 Beacon St., Boston, for 1 story, brick, steel and stone, concrete foundation. About $100,000.

O., Cleveland—Library—Cleveland Public Library Bd., 1375 Euclid Ave., plans to build 4 story, 140 x 204 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on old city hall site. About $3,500,000. Walker & Weeks, 1900 Euclid Bdg., archts.

O., Cleveland—Store and Theatre—D. Schuman, West 25th St. and Denison Ave., having sketches prepared for 2 story, 90 x 165 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Pearl Rd. About $100,000. Architect's name withheld.

O., Cleveland—Store and Theatre—D. Schuman, West 25th St and Denison Ave., having sketches prepared for 3 story, 100 x 280 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on East 146th St. and Euclid Ave. About $250,000. Architect's name withheld.

O., Columbus—Store and Office—M. H. Rieser, 66-80 East Main St., had plans prepared by Stribling & Lum, archts., 85 North High St., and soon receives bids building 3 story, 80 x 100 ft., brick and terra cotta, on Main and 3rd Sts. About $100,000.

O., Dayton—Market—Jefferson-Main St Market Co., plans to build 4 story, 50 x 400 ft., rein.-con., rein.-con. flooring, concrete foundation, on South Main St. About $500,000 J. Lowes, Schwind Bldg., archt.

O., Kent—Corridor—Kent Normal School receives bids about Feb. 15, building 2 story, 40 x 140 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $50,000. H. E. Briggs, Rose Bldg., Cleveland, archt.

O., Lakewood (Cleveland P. O.)—Theatre—Lakewood Theatre Co. plans to build 2 story, concrete, steel and brick, concrete foundation, on Detroit and Lakeland Aves. About $75,000. E. M. Baum, Sloan Bldg., Cleveland, pres. Architect not selected.

O., Lorain—Theatre—Rayn-Willis Theatre Co. plans to build 2 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, on Bway. and 6th St. About $250,000. G. B. Post & Sons, 1109 Schofield Bldg., Cleveland, archts.

O., Sidney—School—Bd. Educ. Perry Twp., plans to build 2 or 3 story, 80 x 120 ft., rein.-con. and brick concrete foundation, in Dist. No. 2. Bonds for $50,000 voted for project. Architect not selected.

Buildings (Continued)

Mich., Detroit—Bank—L. Kamper, archt., Book Bldg., preparing plans for 2 story, 58 x 72 ft., rein.-con., steel and stone, rein.-con. flooring, concrete foundation, on Gratiot Ave. near Jos. Campau Ave. About $100,000. Owner's name withheld.

Mich., Detroit—Church—Nativity Church McClellan Ave., having plans prepared by Van Leyen, Schilling & Keough, archts. and engrs., Union Trust Bldg., for 2 story, rein.-con., steel and brick, rein.-con flooring, concrete foundation, on McClellan Ave., near Lamb Ave. About $175,000. F. Heidenrich, pastor.

Mich., Detroit—Commercial—C. Singer, 271 East Kirby Ave., had plans prepared by I. M. Lewis, archt., Congress Bldg., for 2-story, 75 x 120 ft., brick, steel and frame, concrete flooring, brick foundation, on Oakland and Woodland Aves. About $60,000.

Mich., Detroit—Mercantile—J. Turnbull, c/o Mildner & Eisen, archts., Hammond Bldg., soon lets contract building 2-story, 45 x 100 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Adelaide St. About $50,000.

Mich., Detroit — Mercantile — Grennan's Bakery Co., 17th and Porter Sts., soon lets contract building 2 story, 50 x 103 ft., brick and steel, on 17th St. About $50,000. Walsh & O'Dell, Chamber of Commerce, archts.

Mich., Detroit—High School—Bd. Educ., 50 Bway., receives bids about Dec. 23, building 4 story, 100 x 200 ft., rein.-con., brick and steel addition, rein.-con. flooring, concrete foundation, also 4 story addition to portion of present building, on High St. and 2nd Ave. About $1,900,000. Malcomson & Higginbotham, 404 Moffat Bldg., archts.

Mich., Detroit—Office—Sinclair Refining Co., 711 Washington St., Chicago, preparing plans for 2 story, 40 x 100 ft., rein.-con., here. About $50,000.

Mich., Detroit—Pavilion—Kling Products Co., 1424 East Jefferson Ave., having plans prepared by L. Kamper, archt., Book Bldg., for 1 story, 110 x 110 ft., rein.-con., steel and wood, rein.-con. and wood flooring, concrete foundation, on East Jefferson Ave. and Blvd. About $70,000.

Mich., Detroit—School—Bd. Educ., 50 Bwy. Ave., having plans prepared by Malcomson, Higginbotham & Palmer, archts., 405 Moffat Bldg., for 3-story, 100 x 250 ft., rein.-con., brick, steel and terra cotta, rein.-con. flooring, concrete foundation, on Goldberg Athletic Field. About $400,000.

Mich., Grand Rapids—Church and School—Our Lady of Sorrows Church having plans prepared by H. L. Mead, archt., Houseman Bldg., for 2 story, rein.-con. steel, brick and terra cotta, rein.-con. flooring, concrete foundation. About $175,000. S. Clanci, pastor.

Mich., Jackson — Community House — First Methodist Episcopal Church, c/o W. E. N. Hunter, archt., 1306 Chamber of Commerce Bldg., Detroit, having plans prepared for 2-story, rein.-con., brick and steel, concrete foundation. About $200,000.

Mich., Redford—School—Michigan State Auto School, Woodward Ave., Detroit, having plans prepared by C. W. Brandt, archt., Kresge Bldg., Detroit, for technical school, here, to consist of 130 x 160 ft. administration building, two 100 x 400 ft. dormitories, 70 x 200 ft. commercial building, 100 x 150 ft. dining hall, 90 x 300 ft. garage, all 2 story, 100 x 200 ft tractor building, 80 x 150 ft. pumping station and power plant and 40 x 300 ft. motor building, all 1 story, rein.-con., brick and steel, rein.-con flooring, concrete foundation. About $2,000,000.

Mich., Saginaw—Sales—See "Industrial Works."

Ill., Chicago—Hotel—Holabird & Roche, archts., 104 South Michigan Ave., receive bids in January building 3 story, 160 x 180 ft., brick, rein.-con. and steel addition, on Clark and Randolph Sts., for Hotel Sherman Co. About $500,000.

Ill., Chicago—Offices—See "Industrial Works."

Ill., Rockford—Business—G. Anderson, c/o Commercial Bldg. Corp., 719 Seminary St., plans to build 1 story, 110 x 150 ft., on 7th St. About $100,000.

Ill., West Frankfort—School—Bd. Educ. receives bids about Feb. 10, building 2 story, 94 x 215 ft., brick and terra cotta. About $200,000. Architect not selected.

Wis., Milwaukee—Commerce — Chamber of Commerce, 96 Michigan St., plans to build brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. Cost between $600,000 and $1,000,000. H. M. Stratton, pres. Architect and engineer not selected.

Ia., Ames—Church—Methodist Episcopal Church having plans prepared by Proudfoot, Bird & Rawson, archts., Hubbell Bldg., Des Moines, for 2-story, 60 x 112 ft. brick, concrete and steel, brick foundation. About $80,000.

Ia., George—School—Bd. Educ. plans to build 2-story, 108 x 120 ft. brick, concrete and steel, concrete foundation. About $60,000. Perkins & McWayne, Sioux Falls, archts.

Minn., St. Paul—Hotel—Minor Hotel Co., c/o Hotel McGee, Robert and 4th Sts., soon lets contract razing present building and constructing 12 story, 100 x 100 ft., rein.-con., brick and stone. About $1,500,000. M. Fitzpatrick, 17 West 19th St., archt.

Kan., Caney — Store — Atwood-Carinda Hardware & Furniture Co. having plans prepared by T. W. Williamson, archt., 418 Central Natl. Bank Bldg., Topeka, for 2-story, 80 x 150 ft., semi fireproof, rein.-con. flooring, rock foundation. About $50,000.

Kan., Emporia — Hospital — Lyon Co. plans to build brick, rein.-con. and steel, rein.-con. flooring, brick foundation. About $150,000. J. H. Felt & Co., 802 Grand Ave. Temple, Kansas City, Mo., archts.

Kan., Fredonia—School—Bd. Educ. having plans prepared and soon receives bids building 74 x 160 ft. brick and stone, rein.-con. flooring, brick and concrete foundation. About $65,000. T. W. Williamson, 418 Central Natl. Bank Bldg., Topeka, archt.

Kan., Topeka—High School—Bd. Educ., Consolidated Dist. No. 5, soon receives bids building 2- story, 66 x 84 ft. brick, stone, rein.-con. and steel, rein.-con. flooring. About $50,000. T. W. Williamson, 418 Central Natl. Bank Bldg., archt.

Kan., Wichita—Business—G. H. Siedhoff, 121 North Market St., and others plan to build 6-story, 100 x 140 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $300,000. Architect to be selected at once.

Kan., Wichita—Temple—Wichita Labor Unions plan to build brick, concrete and steel, concrete foundation. About $100,000. Architect to be selected at once.

Neb., Lincoln — Club House — Country Club having plans prepared by Fiske & Meginnis, archts., 533 Bankers Life Bldg., for brick, steel and concrete, brick foundation. About $150,000.

N. D., Bismarck—School—City plans election soon to vote on $75,000 bonds to build school. T. R. Atkinson, city engr.

Mo., Jackson—School—Bd. Educ. having plans prepared by J. H. Felt & Co., archts., Grand Ave., Kansas City, for 2 story, concrete, steel and brick, concrete and brick foundation. About $60,000.

Tex., Dallas—Office—Magnolia Petroleum Co., Great Southwestern Life Bldg., having plans prepared by A. C. Bosson, archt. and engr., 366 5th Ave., New York City, for 10-story, brick and steel, brick foundation. About $1,000,000.

Tex., Ft. Worth—Hospital—Oil men of city are raising funds to build 2 story children's hospital, on 3-acre site. About $100,000. Address, C. E. Gillham, assist. cashier Natl. Bank of Commerce. Hawk & Parr, 501 Security Bldg., Oklahoma, Okla., archts.

Tex., Ft. Worth—Office—N. P. Anderson & Co., Grand and Cotton Exch. Bldg., had plans prepared by Sanguinett & Staats, archts. and engrs., 1st Natl. Bank Bldg., for 11-story, 60 x 200 ft. rein.-con., brick and terra cotta, rein.-con. flooring, concrete foundation, on 7th and Lamar Sts. About $500,000.

Okla., Ardmore—High School—Bd. Educ. plans to build Junior High School. Bonds for $350,000 voted for project. Architect and engineer not selected.

Okla., Hitchita—School—Bd. Educ., Consolidated Dist., soon lets contract building 1-story, 100 x 114 ft. brick, concrete and steel, concrete foundation. About $55,000. H. O. Valeur & Co., 705 Phoenix Bldg., Muskogee, archts.

Okla., Okmulgee — Hotel—Creek Hotel Co. plans to build brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $500,000. Smith, Rea & Lovett, 601 Finance Bldg., Kansas City, Mo., archts.

Ariz., Jerome—Hospital—Lescher & Kibbey, archts., Bank of Arizona Bldg., Phoenix, soon receive bids building 2 story, 40 x 130 ft. rein.-con., for United Verde Extension Mining Co.

Ariz., Warren—High School—Trustees Bisbee School Dist. having preliminary plans prepared by Lescher & Kibbey, engrs., Bank of Arizona Bldg., Phoenix, for 129 x 159 ft. brick.

Wash., Seattle—High School—Bd. Educ. having plans prepared by F. A. Narramore, school archt., for high school in University Dist., cost $500,000; also junior high school on 24th and Alder Sts., $300,000.

Ore., Bend—Lodge—B. P. O. E. plans to build 2 or 3 story, 85 x 135 ft., brick or concrete, brick or concrete foundation, along Des Chutes River. About $50,000. Architect not selected.

Cal., Hanford — Schools — City voted $350,000 bonds to purchase site and build high school, and $115,000 to build grammar school.

Cal., Independence—Court House—Bd. Supervs. Inyo Co. soon receive bids building rein.-con. and terra cotta. About $150,000. W. H. Weeks, 75 Post St., San Francisco, archt.

Cal., Long Beach—Schools—City voted $150,000 bonds to build auditorium to high school and $290,000 for 8 grammar schools. Architect not selected. Noted Sept. 11.

Cal., Los Angeles—Schools—Bd. Educ. plans election to vote on $7,000,000 bonds to build schools. W. D. Sheldon, sec.

Cal., Los Angeles—Theatre—A. Ramish, et al, San Francisco, purchased site here, on Bway near 6th St., and plan to build 120 x 130 ft. theatre. Reid Bros., California Pacific Bldg., San Francisco, archts.

Cal., Los Banos—Hotel—S. P. Galvin having plans prepared by A. W. Cornelius, archt., Merchants Natl. Bank Bldg., San Francisco, for 3 story, 100 x 150 ft., brick. About $130,000.

Cal., San Bernardino—Detention Home and Court House—Bd. Supervs. San Bernardino Co. having plans prepared by H. E. Jones, archts., 404 Katz Bldg., for rein.-con. detention home and 2 story, 100 x 104 ft. addition to Hall of Records. About $30,000 and $200,000, respectively.

Cal., San Bernardino—School—Bd. Educ. having plans prepared by H. E. Jones, archt., Katz Bldg., for 1-story, 143 x 178 ft. rein.-con., on Base Line Site. About $90,000.

Cal., San Francisco—Bank and Office—Crocker Estate, c/o W. H. Crocker, Crocker Bank, having plans prepared by W. Polk & Co., archts., Hobart Bldg., for 25 story, on Montgomery and Market Sts. About $5,600,000.

Cal., Strathmore—High School—Trustees Strathmore Union High School Dist. plan to build high school. Bonds for $85,000 voted for project. E. J. Kump, Rowell Bldg., Fresno, engr.

Cal., Ventura—City Hall and Library—City Trustees having plans prepared by A. F. Priest, archt., Fay Bldg., Los Angeles, for 2 story, brick. About $50,000.

BIDS DESIRED

Mass., Lynn—School—Until Dec. 30, by Pub. Bldg. Dept., constructing 1 story, 60 x 110 ft., brick and concrete, concrete foundation, on Ontario St., Pine Hill. About $50,000. W. H. McLean, 110 Tremont St., Boston, archt.

O., Cleveland—Commercial—M. Teplitz and M. Heldman, 4901 Woodland Ave., receiving bids building 2 story, 80 x 100 ft., brick and timber, brick foundation, on East 55th St. and Cobleigh Ave. About $50,000. M. Weis, 618 Union Bldg., archt.

Mich., Detroit—Mercantile—Until Dec. 20, by Williams Bros., archts., Kresge Bldg., constructing 2 story, 72 x 100 ft., brick, steel and terra cotta, brick foundation, for A. Selewsky, Michigan Ave. About $50,000.

Ill., Chicago—Hotel—P. Johnson, archt., 1254 Pratt Blvd., receiving bids building 8 story, 60 x 145 ft., brick and rein.-con. rein.-con. flooring, concrete foundation, at 4910 Sheridan Rd., for Shore View Hotel Co., c/o architects. About $800,000.

Kan., Haven—School—Bd. Educ. receiving bids building 2-story, brick, concrete

Buildings (Continued)

and steel, rein.-con. flooring, concrete foundation. About $60,000. Mann & Gerow, Hutchinson, archts. H. A. Noble, Kansas City, Mo., engr. Noted Sept. 11.

Okla., Tulsa—Hospital—Sisters of Sorrowful Mother, Wichita, Kan., receiving bids building St. John's Hospital, here, 5-story, brick, rein.-con. and steel rein.-con. flooring, concrete foundation Wight & Wight, 1st Natl. Bank Bldg., archts., W. E. Gillham, engr., both of Kansas City, Mo.

Que., Waterloo—College—Until Jan 15, by Catholic School Comrs., building 3 story 66 x 75 ft., brick and steel, concrete foundation, at St. Barnavdin College, Couvant St. About $150,000. V. Carow, St. Catharine St., E. Montreal, archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Brookline** (Boston P. O.)—Sales—D. Cerussi, 1371 Commonwealth Ave., let contract building 2 story, 110 x 135 ft., rein.-con., concrete flooring and foundation, on Winslow Rd., to F. J. Van Etten Co., 153 Milk St., Boston. About $125,000.

★**Mass., Framingham** — School — School Comn. let contract building 2 story, 157 x 201 ft., brick and stone, concrete foundation, on Lincoln St., to J. P. Keating, Westboro. About $160,000. Incorrectly noted in our issue of Oct. 30-Nov. 6.

★**Mass., Greendale** (Worcester P. O.)—Housing—Norton Co., Barbers Crossing, Worcester, let contract building 100 houses, streets, sidewalks and sewer connections, here, to F. T. Ley Co., Devonshire St., Boston. About $500,000.

★**Mass., Holyoke**—Store—McAuslan & Wakelin Co., Inc., 239 High St., let contract converting present office building into extension of present department store, on High and Dwight Sts., to M. J. O'Connor, 89 Main St., Northampton. About $50,000.

★**Mass., Waban** (Boston P. O.)—School—Pub. Bldg. Comn., Newton, let contract building 2 story, 110 x 150 ft., brick, concrete and steel, concrete flooring and foundation, here, to C. S. Cunningham & Sons Constr. Co., 7 Water St., Boston, $234,140.

★**Mass., Worcester**—Sales, etc.—Livingstone Motor Co., 109 Grafton St., let contract building 3 story, 80 x 250 ft., brick and concrete, sales, service and assembly plant, concrete flooring and foundation, 51 Shrewsbury St., to E. J. Cross Co., 82 Foster St. About $150,000.

R. I., Westerly—Bank and Office—Washington Trust Co., Main St., received lowest bid building 4 story, 88 x 90 ft., brick, concrete and steel, concrete flooring and foundation, on Main and Broad Sts., from W. L. Crow Constr. Co., 103 Park Ave., New York City.

Conn., Glenville—School—G. E. Bearn, secy. Greenwich Corp., 335 Greenwich Ave., Greenwich, received only bid building 2 story, 148 x 155 ft., brick and steel, concrete foundation, here, from Rangeley Constr. Co., 56 West 39th St., New York City, $233,500.

★**Conn., New Britain**—Club—New Britain Boys Club, 85 East Main St., let contract building 2 story, 50 x 78 ft., brick and steel addition, concrete foundation, on Center and East Main Sts to B. H. Hibbard Co., 153 Arch St. About $50,000. Noted Aug. 14.

★**Conn., New Britain**—School—State Bd. Educ., Hartford, let contract building 2 story, 64 x 110 ft., brick, concrete and steel addition to Normal Training School, concrete foundation, on Camp St., here, to J. H. Grozier Co., 721 Main St., Hartford. About $150,000. Noted July 24.

★**Conn., New Haven**—Murphy & Dana, archts., 311 Madison Ave., New York City, let contract to Larkin-Carey Co., 166 Brewery St., constructing brick, concrete and steel addition to building, rein.-con. flooring, concrete foundation, on Howe and Chapel Sts., for Y. M. C. A., 470 Ellsworth Ave. About $150,000. Noted Sept. 11.

★**N. Y., New York**—Club—Amalgamated Centre, Inc., c/o G. A. and H. Boehm, archts. and engrs., 9 West 42nd St., will build 7 story, 60 x 130 ft., brick, steel and stone, brick foundation, on 2nd Ave. and 11th St. About $500,000. Work will be done by day labor.

★**N. Y., New York**—Office—Castillo Bldg. Corp., 24 State St., will alter 5 story, brick and steel, at 16 Beaver St. About $70,000. Work will be done by day labor.

★**N. Y., New York**—Office—Peck & Peck, 586-5th Ave., will build 10 story, brick and steel, brick foundation, at 587 5th Ave. About $200,000. Work will be done by day labor under supervision of architects.

★**N. Y., New York**—Parish—Ludlow & Peabody, archts. and engrs., 101 Park Ave., let contract to J. E. Wallace, 442 West 46th St., building 5 story, 25 x 100 ft., brick and steel addition, brick foundation, at 19 West 99th St., for St. Judes Chapel. Noted Aug. 14.

★**N. Y., New York**—Stores and Lofts—J. Tishman & Sons, 18 East 41st St., will build 16 story, 93 x 98 ft., brick, steel and stone, brick foundation at 19 West 37th St. About $850,000. Work will be done by day labor.

★**N. Y., Riverdale** — Dormitory — Riverdale Country School, c/o McKim, Meade & White, archts., 101 Park Ave., New York City let contract building 3 story, to F. T. Ley Co., Inc., 19 West 44th St., New York City. About $350,000.

★**N. J., Atlantic City**—Store—Braustein & Blatt, 1420 Atlantic Ave., let contract building 8 story, 110 x 150 ft., concrete and brick, on Atlantic and South Carolina Aves., to Warren Moore & Co., 13th and Market Sts., Phila. About $500,000.

N. J., Trenton—Hotel—Stacy-Trent Hotel Co., Broad St. Bank Bldg., received bids building 10 story, on West State St., from Amsterdam Bldg. Co., 140 West 42nd St., New York City, $1,500,000 (general contract), Standard Arch Co., 217 West 14th St., New York City, $100,000, (rein.-con. contract), J. Davis Co., Ellicott Sq., Buffalo, $85,000, (plastering). Noted Sept. 18.

★**Va., Richmond**—Bank—Planters Natl. Bank, 12th St., let contract building 1 story, brick and stone, rein.-con. flooring, concrete foundation, on 12th and Main Sts., to J. F. Wilson, Mutual Bldg. About $200,000. Noted July 10.

★**N. C., Wilmington**—School—Bd. Educ. let contract building 3 story, brick and hollow tile, rein.-con. flooring, to Liberty Eng. & Constr. Co., Wilmington. About $312,000.

★**O., Chillicothe**—Office—L. T. Franklin let contract for concrete and cement work building 3 story, 45 x 62 ft., fireproof, to P. Mover, plumbing and steam heating, to Jardiner Plumbing Co., plastering to J. E. Maxwell, electrical work to Wissler Hardware Co., tile work to W. A. McNeiles, carpenter work to F. C. Simon, all of Chillicothe; roofing to F. O. Schoedinger, and cut stone to J. Keintz, both of Columbus. About $50,000. Noted Sept. 11.

★**O., Cleveland**—Store—May Co., East 1st St. and Euclid Ave., let contract building 2 story, 240 x 400 ft., concrete, steel, brick and terra cotta addition, rein.-con. flooring, to J. Black Masonry & Contg. Co., 212 West Washington Blvd., Chicago. About $500,000.

★**O., Lorain**—Store, Pavilion, etc.—F. Andorka, Vine St., let contract building 2 story, 50 x 110 ft., brick, brick foundation, on East 30th St., to Van Blarom Constr. Co., 22nd St. and Prospect Ave., Cleveland. About $60,000.

★**O., New Concord**—Administration—J. K. Montgomery, pres. Muskingum College, let contract building 3 story, 60 x 150 ft., brick, on campus, to Detweiler Constr. Co., Zanesville. About $186,000.

★**Mich., Detroit**—Church—Ninde Methodist Episcopal congregation, c/o W. E. N. Hunter, archt., 1306 Chamber of Commerce, let contract building 1-story, concrete, steel and brick, concrete foundation, on Beverly Ct. and Grand River Ave., to Bryant & Detwiler, 2336 Dime Bank Bldg.

★**Mich., Detroit**—Hotel—Freud Hotel Co., Hotel Addison, let contract building 17 story, 100 x 100 ft., steel, brick and terra cotta, rein.-con. flooring, concrete foundation, on Witherall and Elizabeth Sts., to G. A. Fuller Co., 540 Penobscot Bldg. About $2,000,000.

Mich., Detroit—Office—See "Industrial Works."

★**Mich., Detroit**—Office—See "Industrial Works."

Mich., Detroit—School—Bd. Educ. received masonry bids building 2-story, 150 x 211 ft., rein.-con., brick, steel and terra cotta, on Maplewood and Spokane Aves., from F. H. Goddard, Inc., 516 Franklin St., $187,373, M. Bartholomei & Son, 466 Warren Ave., $190,842, F. N. Cooper, 400 Penobscot Bldg., $192,000; carpentry, Harcus & Co., 774 Russell St., $47,257, E. Thiede, 287 Berlin St., $47,500; heating, ventilating and plumbing, Irvine & Meier, 2289 Woodward Ave., $81,682, J. W. Partlan, 51 Park Pl., $90,346, W. J. Rewoldt, 506 Owen Bldg., $90,860; electric wiring, etc., J. Miller Co., Penobscot Bldg., $12,545, Howell & Sewell, Penobscot Bldg., $12,615. Iron City Eng. Co., 1332 Dime Bank Bldg., $12,785.

★**Ia., Ainsworth** — School — Bd. Educ., Consolidated Dist., let contract building 3-story, 60 x 85 ft. brick, concrete and steel, concrete foundation, to J. Thye Co., 1820 Sunnyside Ave., Burlington, $56,540.

★**Ia., Ankeny**—Junior High School—Bd. Educ. let contract building 1-story, 75 x 118 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Western Constr. Co., Earlham. About $104,800. Noted Sept. 18.

★**Minn., Duluth**—Exchange—Duluth Telephone Co., East 1st St., let contract building 4 story, 50 x 140 ft., rein.-con. and brick addition, to G. H. Lounsberry, 322 East Superior St. About $250,000.

★**Kan., Girard**—Court House and Jail—Comrs. Crawford Co. let contract building 3-story, 9 x 123 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to Midwest Constr. Co., Oklahoma, Okla., $289,200. Noted June 26.

★**Kan., Hutchinson**—School—Bd. Educ. let contract building Winans School, 3-story, 62 x 82 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to W. C. Barnes, Hutchinson. About $70,000; cost plus percentage basis.

★**Kan., Hutchinson**—School—Bd. Educ. let contract building Roosevelt School, 3-story, 62 x 82 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to M. C. Foy, Hutchinson. About $70,000; cost plus percentage basis.

★**Kan., Hutchinson**—Theatre — Columbia Realty & Amusement Co. let contract building 2-story, 50 x 150 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to L. R. Pinaire, 947 North Hillside Ave., Wichita. About $100,000; cost plus percentage basis.

Neb., Omaha—City Jail—W. J. Hunter, city clk., received lowest 3 bids building 4 story, 86 x 132 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on 11th and Dodge Sts., from R. Butke, 528 Paxton Blk., $133,800; T. Herd & Son, 814 South 33rd St., $152,800; W. P. Deverell, 435 Railway Exch. Bldg., $158,900.

★**Neb., Omaha**—Office—Medical Society Bldg. Co., 826 Brandeis Theatre Bldg., let contract building 16 story, 88 x 132 ft., brick, rein.-con., steel and terra cotta, rein.-con. flooring, concrete foundation, on 17th and Dodge Sts., to Selden Breck Constr. Co., 537 Keeline Bldg. About $2,000,000; cost plus percentage basis. Noted June 13.

★**Neb., Winnebago**—School—Bd. Educ. let contract building 1 and 2-story, 65 x 130 ft. brick and timber, concrete foundation, to B. E. Short, Sioux City, Ia. About $100,000. Noted July 31.

★**Okla., Sulphur**—School—State Bd. Pub. Affairs, Oklamoma, let contract building 2 story, 52 x 96 ft. school for boys, here, brick, rein.-con. and steel, concrete foundation, to V. O. Mathews, Chandler. About $52,500.

★**Ore., Portland**—Sales—Francis Motor Car Co., East 13th St. and Hawthorne Ave., let contract building 3 story, 90 x 95 ft., brick and rein.-con., concrete foundation, on Grand and Hawthorne Aves., to A. Guthrie & Co., Inc., Sherlock Bldg. About $60,000.

★**Cal., Los Angeles**—Offices—T. B. Story, Story Bldg., let contract building 13 story, 119 x 153 ft., rein.-con., on Spring St., to Weymouth Crowell, 2026 West 9th St. About $750,000.

★**Ont., Chapleau**—School—Dominion Government, Ottawa, let contract building 3 story, 80 x 100 ft., school, here, (for native Indian population) to Gustiana & Zettler, Copper Cliff. About $89,000. Noted Apr. 24

Federal Government Work

PROPOSED WORK

Mass., Atlantic—Removal of Buildings and Machinery—Spec. 4106—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to remove buildings and machinery from Fall River to here. About $50,000.

N. Y., Buffalo—Radio Building—Spec. 4108—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct here. About $9000.

Pa., Lewiston—Post Office—Treas. Dept., Wash., D. C., rejected bids received Nov. 20, for labor and material for building, here.

Federal Government Work (Continued)

S. C., Paris Island—Seawall, Roads, Curbs and Gutters—Spec. 4104—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build here. About $86,000.

Miss., Meridian—Remodeling Post Office—Treas. Dept., Wash., D. C., rejected bids received Nov. 24, remodeling post office and court house, here. J. A. Wetmore, superv. archt.

Wis., Milwaukee—Radio Building—Spec. 4107—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to construct radio building on U. S. Naval Grounds, McKinley Park. About $9000.

Wash., Puget Sound—Fan and Air Compressor—Puget Sound Navy Yard, plans to install 1 exhaust fan, 11,000 cu.ft. of air per minute against static head of 6 in. of water when operating 12000 r.p.m. and one air compressor set, motor driven. S. E. Barber, supply officer.

Cal., San Diego—Coal Hopper—Spec. 4105—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build here.

BIDS DESIRED

Mass., Fitchburg—Remodeling Post Office—Until Jan. 5, by Treas. Dept., Wash., D. C., remodeling, here. J. A. Wetmore, superv. archt.

N. J., Cape May—Dirigible Hangar—Spec. 4080—Until Jan. 7, by Bureau Yards & Docks, Navy Dept., Wash. D. C., altering and building addition to dirigible hangar, 708 ft. long, 155 ft. wide and 113 ft. high from floor to center pin of arch at Naval Air Sta. and dismantling 100,000 cu.ft. capacity gas holders, at Montauk, L. I., and transferring and storing here.

D. C., Wash.—Buildings—Until Dec. 31, at office of Constr. Quartermaster, constructing A and B Bldg., 33 x 42 ft. brick and steel, fireproof floors and roof, incinerator and can washer, 265 gal. steel tank, one 45 ft. brick stack, with fireproof lining.

D. C., Wash.—Electric Traveling Cranes—Spec. 4094—Until Dec. 30, by Bureau Yards & Docks, Navy Dept., furnishing and installing two 15-ton electric traveling bridge cranes, with 5-ton auxiliary in proof shop at Navy Yard. About $22,000.

Va., Alexandria—Partitions—Spec. 4098—Until Dec. 23, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building in Torpedo Assembly Plant, here. About $25,000; $10 deposit required for plans and spec.

S. C., Charleston—Heating—Spec. 4091—Until Dec. 23, (change of date), by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing heating system for torpedo storehouse building No. 101 and building boiler house addition to same building, at Naval Ammunition Depot, here; $10 deposit required for plans and spec.

Fla., Pensacola—Heating System—Spec. 4071—Until Dec. 23, by Bureau Yards & Docks, Navy Dept., Wash., D. C., installing heating system at Torpedo Storehouse and constructing additional building with brick chimney at Naval Ammunition Depot, here. About $15,000. $10 deposit for plans and spec.

Ala., Florence—Lock and Esplanade—Until Jan. 2, by U. S. Eng. Office, Florence, building lock and esplanade for dam at Widows Bar, Tennessee River, near Bridgeport.

Ky., Ashland—Alterations to Post Office—Until Jan. 6, by Treas. Dept., Wash., D. C., altering Post Office, here. J. A. Wetmore, superv. archt.

Ky., Dawson Springs—Additional Buildings—Until Jan. 13, by Treas. Dept. Wash., D. C., constructing 19 additional buildings (exclusive of mechanical equipment) at U. S. Pub. Health Sanitarium, here. J. A. Wetmore, superv. archt.

Cal., San Diego—Building—Spec. 4047—Until Dec. 23, by Bureau Yards & Docks, Navy Dept., Wash., D. C., constructing 1 story, central buildings, covering 30,000 sq ft floor space, consisting of power house at center with ell-shaped east and west wings for housing utilities, at Marine Corps Base, here. About $200,000. Former bids rejected.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Officers' Quarters, Pavilion, etc.—Treas. Dept., Wash., D. C., let contract building senior and junior officers' quarters, nurses, pharmacists and attendants quarters and tuberculosis pavilion, here, to Connors Bros., 15 West 91st St., New York City. Cost $40,000 (4 months). Noted Sept. 11.

Va., Harrisonburg—Extension of Post Office—Treas. Dept., Wash., D. C., received bids Dec. 10, extending Post Office and Court House building, here, from W. P.

TENTATIVE LIST OF NEW YORK STATE HIGHWAYS TO BE CONSTRUCTED IN THE FOLLOWING COUNTIES DURING 1920

Road	Type	Miles	County
Greene County Line-Ravena	Concrete	1.00	Albany
Altamont-Voorheesville	Concrete	7.20	Albany
Callanan Corners-Becker Corners	Concrete	4.30	Albany
Selkirk-Coeymans	Concrete	0.29	Albany
Bolivar-Wellsville, Part 3	Concrete	2.80	Allegany
Hallsport-Whitesville	Concrete	2.05	Allegany
Lisle-Cortland County Line	Concrete	4.75	Broome
Riverside Drive: Binghamton (elimination)	Concrete	0.25	Broome
Vestal Center-Binghamton	Bit. mac	6.00	Broome
Maine-Glen Aubrey	Concrete	5.35	Broome
Castle Creek-Whitney Point	Concrete	6.93	Broome
Arcade-Farmersville, Part 2	Concrete	4.15	Cattaraugus
Salamanca-Ellicottville, Part 2	Concrete	5.68	Cattaraugus
Portville-Carroll	Concrete	1.91	Cattaraugus
Cattaraugus-Dayton, Part 1	Concrete	5.20	Cattaraugus
Cattaraugus-Dayton, Part 2	Concrete	4.10	Cattaraugus
Weedsport-Jordan, Part 1	Concrete	3.30	Cayuga
Victory-Red Creek	Concrete	5.00	Cayuga
Pennsylvania State Line-Ripley	Concrete	7.04	Chautauqua
Westfield-Brocton	Concrete	6.25	Chautauqua
Village of Westfield	Concrete	2.35	Chautauqua
Village of Fredonia	Concrete	1.30	Chautauqua
Village of Silver Creek	Concrete	1.30	Chautauqua
Pratts Corners-Sinclairville	Concrete	3.00	Chautauqua
Southport-Fassett	Concrete	4.55	Chemung
Afton-Coventry, Part 2	Bit. mac	2.92	Chenango
Sherburne-Columbus	Bit. mac	7.00	Chenango
Ingraham-Chazy	Concrete	5.50	Clinton
Schuyler Falls-Morrisonville	Bit. mac	5.20	Clinton
Forestdale-Black Brook, Part 2	Bit. mac	4.00	Clinton
Copake Iron Works-Copake	Concrete	1.72	Columbia
Hillsdale-Austerlitz, Part 1	Concrete	2.75	Columbia
Chatham-Chatham Center	Concrete	3.25	Columbia
Stuyvesant-Sunnyside	Concrete	3.90	Columbia
Marathon-Cortland, Parts 1, 2 and 3	Concrete	6.54	Cortland
Solon-Gee Brook, Part 2	Bit. mac	2.50	Cortland
Andes-Margaretville, Parts 1 and 2	Concrete	10.50	Delaware
Hancock-Long Eddy	Bit. mac	6.00	Delaware
Bloomville-Hobart	Concrete	3.00	Delaware
Fishkill Plains-Poughkeepsie, Part 2	Concrete	4.95	Dutchess
Rhinebeck-Rhinecliff	Concrete	2.28	Dutchess
Holland-Yorkshire, Part 2	Concrete	2.50	Erie
Akron-Crittenden	Concrete	1.00	Erie
Cowlesville-Alden, Part 2	Concrete	3.77	Erie
Evans-Eden, Part 1	Concrete	3.20	Erie
Buffalo-Cheektowaga	Concrete	2.30	Erie
Athol Springs-Orchard Park	Concrete	3.79	Erie
Gardenville-Williamsville	Concrete	7.30	Erie
Whallonsburg-Essex	Concrete	2.00	Essex
Ticonderoga-Washington County Line	Concrete	4.00	Essex
Paul Smiths-Mountain Pond	Concrete or bit. mac	2.83	Franklin
Saranac Junction-Lake Clear	Concrete or bit. mac	2.00	Franklin
Bangor-West Bangor	Bit. mac	2.50	Franklin
Tupper Lake-Saranac Lake, Part 1	Bit. mac	3.53	Franklin
Stone Arabia-Ephratah, Part 2	Concrete	1.10	Fulton
Broadalbin-East Galway (Fulton-Saratoga Conties)	Concrete	3.50	Genesee
Darien Center-Alexander	Bit. mac	4.56	Greene
Jewett Center-East Ashland	Bit. mac	1.50	Greene
Cairo-Purling	Bit. mac	3.00	Hamilton
Morehouseville-Piseco, Part 2	Concrete	3.36	Herkimer
West Winfield-County Line	Concrete	2.00	Herkimer
West Winfield-Exeter	Concrete	3.50	Herkimer
Cedarville-East Winfield	Concrete	8.37	Jefferson
Carthage-Antwerp, Part 1	Concrete	2.61	Jefferson
Ellisburg-Woodville	Concrete	4.78	Jefferson
Watertown-Philadelphia, Part 1	Bit. mac	4.74	Lewis
Barnes Corners-Copenhagen, Part 2	Concrete	2.00	Livingston
Dansville-Conesus	Concrete	8.34	Livingston
Conesus-Wayland	Concrete	1.60	Madison
Cazenovia Village: Albany Street	Concrete	5.25	Madison
Oneida-Clockville-Canastota	Concrete	4.00	Monroe
Fairport-County Line	Concrete	3.69	Monroe
Rush-Mendon, Part 1	Concrete	4.50	Montgomery
Fultonville-Amsterdam, Part 1	Concrete	3.63	Montgomery
Manny Corners-Blue Corners	Bit. mac	0.40	Nassau
Front Street: Hempstead	Concrete	9.00	Nassau
Valley Stream-Wantagh	Concrete	5.00	Nassau
Wantagh-Amityville	Concrete	0.50	Nassau
Westbury (Post Ave.) to C. H. No. 1343	Concrete	1.15	Nassau
Middle Neck-Brady Estate Road	Concrete	3.00	Niagara
Lockport-Pendleton	As designed	2.38	Niagara
Wendellville-Lockport, Part 2	Concrete	2.00	Oneida
Utica-Poland, Part 2	Concrete	10.40	Oneida
Frenchville-Holland Patent, Parts 1 and 2	Dual type	7.20	Oneida
Bridgewater-Sangerfield	Concrete	4.05	Onondaga
Scott-Borodino, Part 2	Bit. mac	0.22	Onondaga
East Onondaga: Seneca Street	Concrete	2.50	Onondaga
Syracuse-Otisco, Part 2	Bit. mac	1.00	Ontario
Bloomfield-Bristol Center	Concrete	4.60	Ontario
Chapin-Palmyra, Part 2	Concrete	2.20	Ontario
Phelps-Geneva	Concrete	2.59	Orange
Fort Montgomery-Highland Falls	Concrete	1.51	Orange
Unionville-New Jersey State Line	Concrete	6.80	Orange
New Hampton-Denton	Concrete	8.50	Orange
Montgomery-Bullville	Bit. mac. or concrete	3.70	Orange
Harriman Village	Concrete	7.50	Orange
Cronomer Valley-Plattekill	Concrete	1.14	Orange
Rockland County Line-Woodbury T'n Line	Concrete	1.25	Orange
Balmville-Newburgh	Concrete	2.10	Orlens
Walden Village	Concrete	4.82	Orleans
Kendall-Morton	Concrete	9.50	Oswego
Barre Center-Elba, Part 1	Concrete	4.65	Oswego
Williamstown-Redfield	Bit. mac	0.66	Oswego
Palermo-Mexico, Part 1	Concrete	3.00	Oswego
Minetto-Fulton	Conc. or bit. mac	5.80	Oswego
Central Square-Constantia, Part 2	Conc. or bit. mac	6.36	Oswego
Constantia-Cleveland	Bit. mac	....	Otsego
Sandy Creek-Smartville	Concrete or bit. mac	7.83	Otsego
Sidney Gap: Grade Crossing Elimination	Concrete	4.00	Rensselaer
Cherry Valley-Sharon Springs (Otsego-Schoharie Counties)	Concrete	5.10	Rensselaer
Defreestville-West Sand Lake			
Johnsonville-Buskirk			

Road	Type	Miles	County
West Haverstraw-Tompkins Cove	Concrete	3 92	Rockland
Rockland Lake-Congers	Concrete	2 50	Rockland
New Jersey State Line-Nyack	Concrete	5 57	Rockland
Nyack: Midland Avenue	Concrete	0 50	Rockland
Massena-Winthrop, Part 1	Concrete	3 64	St Lawrence
Canton-Madrid, Part 2	Bit mac or concrete	5.85	St. Lawrence
Potsdam-Winthrop, Parts 1 and 2	Bit. mac. or concrete	14.05	St. Lawrence
DePeyster-Ogdensburg	Bit. mac	11 16	St Lawrence
Gouverneur-Edwards, Part 2	Concrete	4 60	St Lawrence
Malta-Bemis Heights, Part 1	Concrete	4 17	Saratoga
Ballston Lake-Crescent, Part 2	Concrete	3 50	Saratoga
Rexford Flats-Wait Corners-Groom Cors	Bit mac	6 10	Saratoga
Broadalbin-E. Galway (Sara.-Fulton Cos.)	Concrete	10 50	Saratoga
Pattersonville-Scotch Church	Dual type	3 42	Schenectady
Scotia-Saratoga County Line, Part 2	Concrete	3 90	Schenectady
Sharon-Sloansville	Concrete	10 50	Schoharie
Franklinton-Middleburg	Bit mac	5 60	Schoharie
Cobleskill-Sharon Springs, Part 2	Bit. mac.	5 22	Schoharie
Cherry Valley-Sharon Springs (Schoharie-Otsego Counties).			
Watkins-Hector, Part 1	Concrete	2 95	Schuyler
Hector-Lodi	Concrete	10 00	Seneca
MacDougall east to C H No 326	Concrete	1 70	Seneca
Seneca Falls-Nichols Corners	Concrete	1 80	Seneca
Canisteo-Whitesville, Part 3	Bit mac	2 00	Steuben
Seely Creek-Caton, Part 2	As designed	4 00	Steuben
Corning-Hornby	As designed	6 00	Steuben
Hartsville-Canisteo	Bit. mac	5 57	Steuben
Kanona-Prattsburg, Part 1	Concrete	6 40	Steuben
Center Moriches-East	Concrete	3.00	Suffolk
Mongaup-Pond Eddy	Concrete	5.69	Sullivan
Wurtsboro-Ellenville (Sullivan-Ulster Co.).			
Candor-Tompkins County Line	Concrete	7.75	Tioga
Spencer-Van Etten	Concrete	1.50	Tioga
Smithboro-Nichols	Concrete	4 10	Tioga
Richford-Harford Mills	As designed	5 50	Tioga
South Lansing-Myers	Concrete	2 00	Tompkins
Mecklenburg-Enfield, Part 2	Concrete	3 10	Tompkins
Highland-New Paltz	Concrete	7 19	Ulster
Bearsville-Beechford-Mt. Pleasant	Bit. mac.	6.83	Ulster
Saugerties-Palenville, Part 1	Bit. mac	7.50	Ulster
Saugerties Village	Concrete	0.85	Ulster
Rosendale Village	Concrete	3 17	Ulster
Wurtsboro-Ellenville (Ulster-Sullivan Co.)	Concrete	11.04	Ulster
North Creek-North River	Concrete	4.85	Warren
Chestertown-Hague, Part 3	Bit. mac	5 13	Warren
Whitehall-Fair Haven	Concrete	7 90	Washington
Adamsville-Hartford	Concrete	5 30	Washington
Greenwich-Cambridge	As designed	6.98	Washington
Newark-Lyons	Concrete	5.45	Wayne
Clyde-Lyons	Concrete	5.58	Wayne
Lyons Village	Concrete	0.27	Wayne
Pittsford-Palmyra, Part 3	Concrete	3.00	Wayne
Rye Village: Boston Post Road	Asphalt blocl	0 51	Westchester
Port Chester Village: Boston Post Road	Asphalt blocl	0 72	Westchester
Mt. Vernon City: Columbus Avenue	Concrete	3.05	Westchester
Mt. Kisco-Katonah	Concrete	4 10	Westchester
Valhalla-Hawthorne	Concrete	2.70	Westchester
Williams' Corners-Scott Corners	Bit mac	5 72	Westchester
Varysburg-Warsaw, Part 1	Concrete	3 54	Wyoming
Warsaw Village Connection	Concrete	0.75	Wyoming
Perry Center-West	Concrete	3.00	Wyoming
Bennington-Attica-Attica Center	As designed	6.99	Wyoming
Hammondsport-Dundee, Part 4	Bit. mac	4.62	Yates
Penn Yan-Potter	Bit. mac	2.24	Yates
Rushville-Potter-Middlesex-Overacker C'rs	As designed	9.63	Yates

Federal Government Work (Continued)

Thurston, Merchants Natl. Bank Bldg., Richmond, $12,900; J. Nielson & Co., Harrisonburg, $16,430; King Lumber Co., Charlottesville, $23,968.

S. C., Charleston—Quay Wall—Spec. 4078—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Dec 10 building 830 ft. quay wall, here, (1) work complete, from Snare & Triest Co., 8 West 40th St., New York City, (1) $287,400 (200 days), (2) $370, (3) $1.50, (4) $15,000, (5) add $28 deduct $24, (6) add $.50 deduct $.20, (7) add $.80 deduct $.30; McHard Barton Co., 171 Madison Ave., New York City, (1) $314,000 (210 days), (2) $320, (3) $.80, (4) $9600, (5) add $30 deduct $15, (6) add $.75 deduct $.20, (7) add $1 deduct $.30; McLean Contg. Co. 1415 Fidelity Bldg., Baltimore, Md., (1) $323,000 (325 days), (2) $300, (3) $.80, (4) $9500, (5) add $30 deduct $15, (6) add $.95 deduct $.10, (7) add $1.35 deduct $.20.

Fla., Tampa—Radio Towers—Spec. 4088—Bureau Yards & Docks, Navy Dept., Wash. D. C., received only bid Dec. 10, removing and rebuilding two 200 ft. towers, here, from Donnell-Zane Co., 298 Bway., New York City, $4262 (95 days).

★Tenn., Memphis — Hoisting Engines, Boilers and Locomotive Crane—Mississippi River Comn., Custom House, let contract furnishing hoisting engines, boilers and locomotive crane, to Lenher Eng. Co., 95 Liberty St., New York City, $18,125.

★Mich., Detroit—Dike Reconstruction—U. S. Eng. Office, 337 Federal Bldg., let contract improving channel at St. Clair Flats Ship Canal by removing 7220 lin ft. old revetment and old crib, dredging 165,000 cu.yd. sandy material, furnishing and placing 20,000 tons riprap, to Dunbar & Sullivan, 2211 Dime Bank Bldg., $84,240.

★Mich., Detroit—Dredging—U. S. Eng. Office, Federal Bldg., let contract dredging and rock excavation in Livingstone Channel, Detroit River, involving 98,000 cu.yd. limestone rock and 345,000 cu.yd. place measurement of earth, to Empire Eng. Co., Inc., 6 Church St., New York City, $486,910.

★Wash., Keyport—Radio Towers—Spec. 4077—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building 400 ft self-supporting radio tower with concrete foundations on wood, and for modifications of out riggers on existing towers at Naval Radio Sta., here, to Foundation Co., L. C. Smith Bldg., Seattle, $42,468 (180 days)

★Wash., Puget Sound—Officers' Quarters, Storehouse and Railroad Extension—Spec. 3983—Bureau Yards & Docks, Navy Dept., Wash., D. C., let contract building 1 officers' quarters, 2 storehouses, concrete footings, foundations, platform and floors, built up and sheet metal roofing, copper and tin sheet metal work, etc., also railroad extension, to Puget Sound Bridge & Drdging Co., 811 Central Bldg., Seattle, $51,350 (180 days)

★Wash., Tacoma—Painting and Repairing—Treas. Dept., Wash., D. C., let contract painting and repairing Post Office, here, to J. P. Sullivan, 4515 Indiana Ave., Chicago, $3449.

★Cal., San Diego—Power House—Spec. 4070—Bureau Yards & Docks, Navy Dept., Wash., D. C let contract extending existing power house at Naval Radio Sta., Cholles Heights, to W. Slater Co., 2314 Santa Fe Ave., Los Angles, Cost $7500 (90 days)

★H. T., Honolulu—Post Office and Court House—Treas. Dept., Wash., D. C., let contract building, here, to Hawaiian Contg. Co., 139 Merchant St., $987,708 (30 months). Noted Aug. 21.

Miscellaneous

PROPOSED WORK

Transmission Line—Benson Mines, N. Y.—Northwestern Telephone Co. plans to build connecting link, 38 mi. from here to Tupper Lake. Cost between $20,000 and $25,000. L. W. Jenks, Carthage, supt.

Transmission Line—Churchville, N. Y.—See "Industrial Works."

Cement—Detroit, Mich.—E. N. Hines, chn. Wayne Co. Rd. Comn., soon lets contract furnishing 125,000 bbls. Portland Cement.

Stadium—Grant Park, Ill.—South Park Comn., East 57th St. and Cottage Grove Ave., Chicago, having plans prepared by Holabird & Roche, archts., 104 South Michigan Ave., Chicago, for 600 x 800 ft., rein.-con. stadium, here. About $3,000,000.

BIDS DESIRED

Fire Protection System—Livermore, Cal.—Until Dec 22, by Supervs. Alameda Co., Oakland, replacing pipes and installing electric system at Arroya Sanitorium, involving 5 in. centrifugal pumps and motor, switchboard, wiring and 14 hydrants. County will furnish 3000 ft. 4 in. c.i. pipe. Alternate bid replacing hydrants. About $14,000. P. H. Haviland, co. surv.

Dam., etc.—New Westminster, B. C.—Until Jan. 7, by Dept. Pub. Wks., Ottawa, building dam, embankment and 3 groynes at Nicomen Island, Fraser River, near here. Noted June 19.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Tanks—Bridgeport, Conn.—Singer Mfg. Co., Pembroke St. and Washington Ave. let contract building two 200,000 gal. fuel oil tanks, each 41 ft. diameter and 18 ft. high, on Yellow Mill Pond, to Lancaster Iron Wks., 126 North Water St., Lancaster, Pa.

Cast Iron Pipe—New York, N. Y.—Dept. Water, Gas & Electricity received bids Dec. 4, furnishing, delivering, loading, storing and stacking c.i pipe, (a) Manhattan Boro., (b) Brooklyn Boro., from U. S. Cast Iron Pipe & Fdry Co., 71 Bway., (a) $6102, (b) $3253; J. Fox & Co., 253 Bway., (a) $6199, (b) $3306; R. D. Wood Co., (a) $6278, (b) $3360

★Heating and Ventilating, etc. — New York, N. Y.—H. Bruckner, pres. Bronx Boro., let contract installing heating and ventilating apparatus in P. S. No. 6, Tremont Ave., to D. J. Rice, 405 Lexington Ave., $61,393; installing temperature apparatus, to Fisher & Babcock, $3300.

N. Y. New York—Dept. Water, Gas & Electricity received lowest 3 bids Dec. 4, for c.i. special castings, valves, box casting valves, double nozzles, (a) Sect. 1, (b) Sect. 2, (c) Sect. 3, (d) Sect. 4, from J. Fox, 253 Bway., (a) $116,515, (b) $9603, (d) $21,235; Flockhardt Fdry. Co., (b) $8266; A. B. Smith Mfg. Co., (c) $7421, (d) $17,527.

★Caissons—Chicago, Ill.—Gardner & Lindberg, engrs., 38 South Dearborn St., let contract to Blome Sinek Co., 139 North Clark St., for caissons for 10 story, 250 x 350 ft., rein.-con. warehouse, rein.-con. flooring, concrete foundation, on Fulton and Morgan Sts., for Fulton Market Cold Storage Co., c/o J. Byfield, pres., Hotel Sherman. Total cost, $4,000,000.

Sewers

★Park—Salina, Kan.—C. R. Cravens and B. Neil, Kansas City, Mo., will build amusement park, to include dancing pavilion, steel, rein.-con. flooring, brick and concrete foundation, wading pool, ferris wheel, chute the chutes, etc. About $100,000. Work will be done by day labor under supervision of B. Neil

★Air Mail Hanger—Omaha, Neb.—Chamber of Commerce, Woodmen of the World Bldg., let contract for 1 story, 115 x 127 ft., steel and wood hanger, concrete foundation, on Chamber of Commerce Field, to J. E. Wakefield Co., 750 Brandeis Theatre Bldg., Omaha. About $20,000 to $30,000; cost plus percentage basis.

★Pipe Line—Breckenridge, Tex.—Texas Co., 17 Battery Pl., New York City, let contract furnishing labor and materials for building pipe line and gathering system, here, to Westinghouse, Church, Kerr, Inc., 37 Wall St., New York City. About $75,000

Cement—Phoenix, Ariz.—City received bids furnishing 500,000 lb. cement, (for roads to be paved under $4,000,000 bond issue) from E. D. Skinner, Tempe, $2.64 f.o.b. Tempe, Diamond Portland Cement Co., Phoenix, $2.69 f.o.b. Tempe, Southwestern Portlandt Cement Co., 356 South Spring St., Los Angeles, $1.90 f.o.b. El Paso, Tex. or Victorville, Cal., Riverside Portland Cement Co., Title Insurance Bldg., Los Angeles, $1.77 f.o.b. Crestmore, Cal.

Gas Distributing System — Huntington Beach, Cal.—City Trustees received bids furnishing and laying pipe, valves and fittings, for gas distributing system, from R. F. Warren, Union Oil Bldg., Los Angeles, $15,750, T. Haverty Co., 8th and Maple Aves., Los Angeles, $34,987.

★Towers—Winnipeg, Man.—City let contract for steel towers for second power transmission line to Point du Bois, to Canadian Bridge Co., New Birks Bldg., Montreal, $136,163.

OFFICIAL PROPOSALS

Bids: Dec. 23.

Barge Canal

STATE OF NEW YORK
OFFICE OF SUPERINTENDENT OF PUBLIC WORKS
Albany, N. Y.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Tuesday, December 23rd, 1919, at which place and hour they will be publicly opened and read, for the construction of barge terminals pursuant to the provisions of Chapter 746 of the Laws of 1911, and of the acts amendatory thereof, as follows:

TERMINAL CONTRACT NO. 116
(Revised)

For furnishing and installing four three-ton electric semi-portal revolving jib cranes on Barge canal terminals, two each at Greenpoint and West 53rd Street, New York City.

Contract plans, sheets 1 and 2.

Plans may be seen and detailed specifications, engineer's estimates of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y., at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., at the canal office, Spaulding's Exchange, Buffalo, N. Y., and at the office of the State Engineer and Surveyor, Hall of Records, New York City.

Copies of detailed plans or drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or state bank or trust company in good credit within the state and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work, according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the state for doing the work, and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the state will be enhanced thereby.

EDWARD S. WALSH,
Superinendent of Public Works.

Bids: Dec. 29.

Reinforced Concrete Bridge

OFFICE OF THE COUNTY CONTROLLER OF BERKS COUNTY, PENNSYLVANIA
Reading, Pa.

Proposal for the construction of a Reinforced Concrete Bridge consisting of 13 arches and three flat spans with reinforced slab approaches on Bingaman Street, Reading, Pennsylvania.

Sealed proposals will be received at this office up to 10 o'clock A.M., Friday, December 29, 1919, for the construction of a reinforced concrete bridge consisting of 13 arch spans and three flat spans with reinforced slab approaches on Bingaman Street.

The structure will span the Schuylkill River, Schuylkill canal and the Pennsylvania, and Philadelphia and Reading R.R. tracks.

The total length of the structure will be 1586 feet with a 39 foot roadway and two 10 foot 6 inches wide sidewalks.

Bids will be opened in the office of the County Commissioners in the Court House at 11 o'clock A.M., December 29, 1919.

All bids must be accompanied with a certified check equal to 10 per cent. of the aggregate amount of the bid and made payable to C. J. Rhode, County Controller.

Copies of proposal blanks, plans and specifications may be obtained at the office of the County Commissioners, Reading, Pa., or upon application to Charles F. Sanders, C. E. Reading, Pa. A deposit of $200.00 will be required which will be refunded upon the return of the plans and specifications on or before December 29, 1919.

The right is reserved to reject any or all bids.

J. CALVIN HERBINE,
DANIEL G. GABEL,
HARRY D. MATTHEWS,
County Controler.

Dec. 8, 1919.

Bids: Jan. 5.

Bridge Construction

Tallahassee, Fla.

Sealed proposals will be received by the State Road Department, at Tallahasse, Florida, up to ten o'clock P.M., on the 5th day of January, 1920.

For the construction of a bridge over the Blackwater river, at Milton, Florida, consisting of four steel Girder Approach spans, and a steel Bascule lift span.

The length of the structure to be constructed is approximately 338 feet long, of four 60' deck girder spans, and a Strauss Bascule lift span with an 80' clear channel, having an 18' clear roadway and one 6' sidewalk, all on a substructure of concrete piers.

The proposed improvement will consist of approximately the following:

Wood foundation piling, 8250 lin. ft.
Concrete, 1348 cubic yards.
Steel Reinforcement, 168,000 pounds.
Structural Steel, Approach spans, 220,000 pounds.
Structural Steel, Bascule span, 200,000 pounds.
Castings, machinery, etc., 22,500 pounds.
Flooring, 26,500 ft. B.M.
Hand Rail, 716 lin. ft.

Plans and specifications are on file at the State Road Department, Tallahassee, Florida, for examination, or may be obtained on application to the State Road Department, for the sum of Twenty Dollars ($20.00), when returned with a bona-fide bid. Fifteen Dollars will be returned to the bidder.

The right is reserved to reject any or all bids.

A certified check in the sum of Three Thousand Dollars ($3000.00) amde payable to M. M. Smith, Chairman of the State Road Department, must accompany each bid as an evidence of good faith and the acceptance and entering into contract by the party to whom the work may be awarded.

Any bidder who shall, after fifteen (15) calendar days, notice being given, of the acceptance of his or their proposal, fail to execute the contract and furnish the required bond shall forfeit his or their claim to the work and his or their certified check shall be retained and used by the State of Florida as liquidated damages.

STATE ROAD DEPARTMENT
M. M. SMITH,
Chairman.

CHAS. A. BROWNE,
State Highway Engineer.
Dec. 6th, 1919.

U. S. GOVERNMENT

Bids: Jan. 2.

U. S. ENGINEER OFFICE, Florence, Ala.—Sealed proposals will be received here until 2 P.M. (central time), January 2, 1920, and then opened for constructing Lock and Esplanade for Dam at Widows Bar, Tennessee River, near Bridgeport, Ala. Further information on application.

Bids: Feb. 2.

SEALED PROPOSALS will be opened by the Supt. of Lighthouses, San Juan, P. R., 2 o'clock p.m., February 2, 1920, for construction of tower and dwelling for Point Jiguero Light Station, Rincon, P. R. Plans, specifications and other information upon application.

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ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, *Editor* — Charles Whiting Baker, *Consulting Editor*

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The Coal Strike and Water Power

DURING the past weeks the prospects of water-power development have measurably brightened. It has been borne in upon many who have held that steam power can be produced more cheaply than water power, even where the latter is available, that steam means coal and that coal is one of the many commodities which promise to show an increasing cost with the growing demands of labor. The first cost and the operation of the hydro-electric plant involve labor, and therefore are responsive to any increases that labor will get, but the fuel that feeds the water-wheels is not so affected. It looks as though the time is approaching when with far greater frequency than ever before the cost of transmitting the energy from the place where water power exists is going to be less than the cost of getting the coal to the place where the energy is needed.

Utilizing All the Head

WHEN the economic advantage noted in the last paragraph begins to assert itself, no small part of the hydro-electric development work undertaken will be in the way of improving existing plants. By the installation of more modern machinery and by the more efficient utilization of head, more energy can be delivered from the same amount of water. This is just what is being done at Niagara Falls in the Queenston development by the Hydro-electric Power Commission of Ontario, the progress of which is described on another page. Instead of the 12 hp. per second-foot of the early Niagara plants and the 20 of the latest American plant which uses only a part of the full head of the river, the new Canadian development will deliver 30 hp. per second-foot and utilize all but 25 ft. of the 330-ft. difference in the level of the two lakes. Of course, these figures do not mean anything in ultimate economy unless first costs are given, and until the Queenston work is completed these will not be known. Unit construction costs are rising almost daily, and estimates on such work as the long canal from Chippawa are apt to fall far below the final bill, but the principle there will undoubtedly have growing application. If it were not for the engineer's ability each year to approach more nearly the full utilization of the resources of nature, the prospects for the remote future would indeed be bad.

Progress in Sludge Dewatering Tests

DEWATERING sewage sludge to the satisfaction of the fertilizer trade is no easy task. It means reducing the moisture content of a hugh volume of sludge by some 90%. If this can be done it may revolutionize sewage treatment, or at least it may assure the success of the activated-sludge process, which produces a sludge of high nitrogent content. So much hinges upon this possibility, both as to sewage treatment in general and activation in particular, as to invest with unusual interest the large dewatering plant at Houston, Tex. (p. 1003). The changes in mechanical details that have been found necessary while this dewatering plant was still in the hands of the contractor, combined with the fact that operating charges and a fair allowance for depreciation have yet to be determined by service results, force the conclusion that sludge dewatering is still in an experimental stage. Perhaps it would be fairer to say that it is about to have its first full-sized working-duty test. It is particularly satisfying to note that the entire range of operations, financial as well as physical, at the Houston activated-sludge plants are being recorded, so that when the dewatering plant has been in use a year or two, clear and abundant light on its success from all viewpoints may be expected.

A Meaty and Readable Annual Report

FROM the keynote lines by Browning beginning, "The common problem, yours, mine, everyone's," to the summary of statistics according to the New England Water Works Association schedule, the latest annual report of the water commissioner of St. Louis is so interesting and useful that it might well serve as a model. After the report is read it is easy to see why Mr. Wall has been connected with the St. Louis water-works for so many years. Besides being an efficient public servant, he has the rare faculty of giving an interesting and instructive account of his stewardship.

Lessons from Filter-Plant Operation

OF SPECIAL interest and value is the information on filter-plant operation given in the St. Louis report. Here are described the everyday difficulties of the operator and how they were met—difficulties which must be overcome if a filter plant is to run with efficiency and economy. Troubles are analyzed, and all the loose points in operation, as well as in original design of equipment, are covered. Thus, to emphasize only a few of the points brought out in the abstract of the report printed on page 935 of our issue of Nov. 27-Dec. 4, 1919: The old idea that holes in a board for the bottom of a solution-dissolving box may be replaced with anything better is practically exploded. Strainer plates are not yet made simple enough to be foolproof in construction. Bronze orifices ought to be made in the form of bushings, and no one hereafter will use tile pipe for the passage of chlorine solution. Throughout the whole discussion, in giving reasons for and against certain practices —reasons based on experience—the designer is served in a measurable way. The same is true as regards hints

for operators. Doubtless similar lessons are being drawn from other filter plants, but too few of them are made available through such illuminating reports as are prepared by Mr. Wall and his able staff.

Drainage and Again Drainage

ELSEWHERE in these columns will be found comment upon the success achieved with penetration-bituminous roads in Rhode Island. Five reasons are there given why the work has been so successful. Mr. Patterson, questioned on the subject, has emphasized that drainage is the most important of these. Experienced roadbuilders will thoroughly agree with him. But Mr. Patterson's emphasis is not one of mere theory. His article testifies that he takes scrupulous care of the drainage, while the evidence afforded by the roads themselves gives the full and final proof. How often do we hear engineers protest that they give careful attention to drainage and subgrades, and then find that they have let contracts for a two or three or five-mile stretch in which there is no variation in foundation design! In theory they worship at the shrine of drainage; in practice they seem to regard it as a false god. In the section on drainage Mr. Patterson has written one of the best treatments in American technical literature on highway foundations and drainage. It may well form a text for and an inspiration to highway engineers everywhere, even though they are not convinced of the value of penetration-bituminous surfaces or have conditions that forbid the use of that type.

Let the Facts Speak

SUCH excellent work has been accomplished by the Joint Employment Bureau of the national engineering societies that the simple facts of the work as reported at the recent annual meeting of the American Society of Mechanical Engineers by Secretary C. W. Rice are enough to give the bureau a brilliant record. No comparison with the work of other organizations was needed to make the record more distinguished. Regard for proper comity between engineering societies might well have kept Mr. Rice from contrasting the efficiency of the bureau which he conducted with that of another society's employment service. He thought fit to present such a contrast, however. This would not call for comment here except for the fact that the figures he quoted were grossly and unexplainably in error, to the disadvantage of the other organization. Said Mr. Rice:

"In a recent publication of the American Association of Engineers they stated that during the last three months they had been notified of 1000 positions which were vacant, that they had recommended to these positions about 3000, and had placed in positions 271. So that you may know that we are not failing to do our duty, I will report that we have received about the same number, namely, 1000 notices of vacancies to be filled; we have nominated 6000 men for these places, and have placed 374. The expense of the American Association of Engineers in their activities, which, according to their own statement, is primarily if not exclusively that of welfare work and of getting positions, was, according to their published statements, upward of $40,000 during the last three months. They have placed, with an expenditure of $40,000, 271 men in positions. Your Joint Bureau was maintained at an expense of $3750 during the last there months, and has placed 371 men in positions. In other words, it took $40,000 by the American Association of Engineers to canvass and place 271, and it took $3750 under our auspices to canvass and place 374 men."

Long before this, the association had publishedd the fact that its employment work cost $1 per member per year, which on the basis of 8000 members means about $2000 for three months. On inquiry we learn that the exact figure is $1900. If Mr. Rice did not have these figures he could easily have obtained them; but he was content to make a haphazard statement that is gravely unfair to a sister society. He succeeded in being just 1900 per cent. away from the truth. Possibly the absurd error did not deceive the engineers who heard him, for they know that two similar services are not likely to show relative costs of 10 and 1. Nevertheless, harm was done, we believe, by placing the untrue comparison before a formal public session of technical men assembled from all over the country, and the harm should be made good by equally wide circulation of the facts. Surely, such irresponsible citation of inter-society "statistics" does not promote the spirit of coöperative service to the world that today pervades the engineering societies. We repeat, therefore, that it is regrettable that the statement on the Joint Bureau was not confined to the simple facts. The bureau's achievements are able to speak for themselves, and have no need for tricks of publicity. Good wine needs no bush.

Penetration Surfaces on Heavily Traveled Roads

IN MANY sections there is an opinion that for trunk highways there are only two types of bituminous road that will give satisfactory service—sheet-asphalt and mixed-bituminous surfaces, both laid on a concrete base. In this issue is an article by I. W. Patterson which refutes that view. We say this not merely on account of the evidence in the article itself, but from a personal inspection of the roads.

The bituminous road has suffered not merely from the fact that it did the first pioneering in the fight against destruction by automobile tires, but because the higher forms resemble in surface appearance the cheaper types.

Ten years ago, when we were in panic because, with the advent of the automobile, tires began to suck the binder out of our waterbound macadam and gravel roads, flinging the metal into the gutters, bituminous materials were the first to step into the breach. Everybody experimented. There were failures—failures that were to be expected. These were sometimes in the higher types of surfacing, but the greater number were in surface-treated roads.

The failures of those days became, in many minds, generalizations. A bituminous road was a bituminous road, whether it was a surface-treated macadam or a high-grade penetration or mixed job. Such was not the case with other types. Concrete, brick, granite block are distinct types. They will not be condemned if a surface-treated macadam or gravel breaks down under traffic or rolls up a $700 annual surface-maintenance charge. But sheet asphalt on a concrete base, because it looks like the cheaper road, is included by the unthinking in a general, and unwarranted, condemnation.

What stands out clearly in the work done in Rhode Island (and in Massachusetts also) is that penetration roads on heavy rock and gravel foundations have stood up under trunk-line traffic. There may have been failures elsewhere, but any number of failures cannot negative the fact that on main routes in Rhode Island and Massachusetts penetration roads without concrete bases have given satisfactory service. It is true that this traffic is not as heavy as that which follows the main routes around such cities as Cleveland and Detroit, but the traffic is reasonably heavy. The data in this issue deserve a careful study by highway engineers. Fully digested—studied as an engineer should study them—they should cause a revision of many quite widely held views.

Naturally, the first query will be as to the details of construction. Why have the roads been so successful? The question is answered in Mr. Patterson's article. Briefly, he accounts for the success under five heads: (1) Very thorough drainage; (2) the use of hard stone; (3) the use of stone of large size in the penetration top; (4) the use of asphalt of low penetration; (5) very thorough rolling, before, during and after the penetration process.

Each of these is an important factor in the success of the finished surface, and no one of them can be neglected without endangering the results. In other words, it requires quite as much, if not more, attention to detail to get a successful penetration top as it does to lay a concrete pavement. Mr. Patterson's article bears out again what we all really know but must emphasize constantly—that successful highway work requires scrupulous attention to detail. This scrupulous attention carries its own reward, as is evidenced by the excellent results which Rhode Island has achieved.

Revolutionary Changes in the Steam Locomotive

FOR half a century there has been no fundamental development in steam-locomotive design. Except as to size and tractive power and the addition of the superheater to the steam generating unit the elements of the moving power plant have remained relatively unchanged. Progress up to the present time has been gradual and has never involved sudden changes in operating limits and general arrangement. Now it is proposed to develop a locomotive that will at once involve such radical departure from present practice as suddenly to revolutionize the whole design.

It is generally agreed that we are approaching, if we have not already reached, limits of clearance and weight. The need for greater efficiency in railroad operation and in the conservation of fuel have become so apparent that we must look to essential, if not radical, changes in the elements of design, if much greater progress is to be made. The able presentation of the subject by John E. Muhlfeld, formerly general superintendent of motive power of the Baltimore and Ohio R. R., before the annual meeting of the American Society of Mechanical Engineers in New York City, Dec. 5, in his paper, "The Scientific Development of the Steam Locomotive," is notable because it embodies proposals for such definite changes in practice as may bring about a revolution in the art of locomotive design. With the increase in boiler pressure and degree of superheat, the reduction of reciprocating effects and the general refinement of mechanism that Mr. Muhlfeld proposes, it is reasonable to assume that the outcome will be—in operating results and in appearance—an almost entirely new machine.

Briefly, it is proposed to raise the boiler pressure from the present standard of 200 lb. per square inch to 350 lb., in combination with 300° F. of superheat, giving a cylinder temperature approaching 750° F., the maximum considered practicable in the present development of valve practice and lubrication. Cylinders would be compounded and back pressure reduced to utilize the greatly increased temperature range. Present outside valve gears would be replaced with a different arrangement to insure a better maintained steam distribution. Reciprocating parts would be lightened and the distance between cylinders considerably reduced to cut down nosing effects to a point permitting the elimination of guiding trucks and affording greater weight for traction. The factor of adhesion would be somewhat decreased, presupposing a better sustained flow of power delivered at the rail. Combustion would be so regulated as to permit the use of low-grade as well as high-grade fuels. An almost complete change in boiler design, involving the use of an economizer for preheating feed water, would take place. With respect to the locomotive as a whole, there would be a degree of mechanical refinement more like that obtaining in marine and stationary engines.

There is, then, under consideration a machine that represents a revolution in locomotive practice; one that will develop a considerably greater thermal efficiency and somewhat greater tractive effort—certainly a much greater tractive effort at the higher speeds. In consideration of European results in the use of high pressure and superheat in steam engines of the "Unaflow" type (which have developed "absolute" thermal efficiencies of more than 15%—comparable to the Diesel engine), proposals for high-temperature range in locomotive practice should not be lightly dismissed. Evidently, an entirely different valve and cylinder arrangement, with corresponding changes in power transmission, is contemplated. In light of the emphasis laid upon mechanical refinement, it is likely that there will be needed a frame and journal box arrangement similar to European practice, to replace the existing American practice of providing a system of equalizers to compensate for track irregularities.

So far, greater emphasis is placed upon the development of higher thermal or fuel efficiency than upon a material increase in tractive power—and, therefore, a material increase in weight—to bring about operation in still larger units without exceeding present clearances. But when an increase of 75% in boiler pressure is so forcefully proposed, the likelihood of considerably increased wheel loads, as a result of a heavier boiler, will immediately suggest problems to the civil engineer that may, at first, appear impracticable of solution. It is likely that the expense involved in a general increase of clearances, necessary for much larger cylinder dimensions, with present principles of design, would considerably exceed the expense of providing for the greater weight of a locomotive within present clearance limits but with a heavier boiler and greater tractive effort. Certainly, should it appear that the saving in general operating expenses could be capitalized to provide for materially increased wheel loads, civil engineers will be called upon for solution of the problem.

Why Bituminous Macadam Is Successful in Rhode Island

Painstaking Attention Paid to Design of Foundation and Drainage Facilities—Materials Carefully Selected—Cost Reasonable—Traffic Heavy

By Irving W. Patterson
Chief Engineer, State Board of Public Roads, Rhode Island



GREAT CARE IS EXERCISED IN LAYING STONE FOUNDATION

THE first instance of the use of bituminous macadam built by the penetration method upon the state highway system of Rhode Island was in 1913. During the period between 1906 and 1912 inclusive a rather extensive use of bitumens was made, but during this earlier period the use of bitumens was confined almost without exception to the cold-mixing method. The aggregate employed for the cold-mixing work was crusher-run stone from ½ in. to 1½ in. in size. This type of construction according to present definition should be termed bituminous concrete, although the character of the aggregate would seem to warrant its designation as bituminous macadam by the cold-mixing method. The roads built by the cold-mixing method were described in many publications a number of years ago by Arthur H. Blanchard, and for this reason and also because of the fact that this type of construction no longer is employed in Rhode Island, the writer will confine his remarks to penetration work.

In 1913 the conditions surrounding the state road situation in Rhode Island were rather discouraging because of the fact that funds for reconstruction and maintenance had been so meagre that little had been accomplished toward rebuilding or resurfacing the wornout waterbound macadam roads built in the period from 1896 to that time. The funds available in 1913 also were so limited that it was deemed out of the question to lay pavements of the so-called durable type. The engineering force, which had recently undergone considerable change in personnel, was called upon therefore to select types of construction which were relatively inexpensive. An examination into the results secured in Rhode Island in previous years by the use of the cold-mixing method disclosed the fact that the results were erratic. Some of the roads built by this method were in almost perfect condition and had required little maintenance, while other roads built under the same specification had given very poor service. It appeared that very slight variations in the quality of crushed stone employed in this type of construction were responsible for widely varying results secured.

This examination brought to light the surprising paradox that the best quality of stone according to usual standards gave the poorest results. The fact that a soft stone broke up under the roller sufficiently to bring about a more perfect grading of sizes than was involved in screening very likely accounted for this peculiarity. Although good results were secured by the use of soft stone in our cold-mixing work, we have found that only a hard, tough stone gives good results in our penetration work. A continuation of the use of the cold-mixing method was not deemed advisable. An investigation into the penetration method led us to believe that very good results could be secured by that method in certain localities. It appeared that bituminous macadam had failed in many sections by reason of foundation defects, by reason of waving or corrugation of the surface and by reason of ravelling of the wearing surface. An attempt was made therefore to adopt a practice in regard to the design of foundations and drainage facilities, in regard to selection of materials and in regard to construction details, which would

remedy to some extent these defects. The specification first employed for the work done in 1913 has been modified somewhat in minor detail but no radical changes have deem deemed necessary. The results secured upon our penetration roads have exceeded our expectations somewhat. Resealing of none of our penetration roads has as yet been necessary and the repairs have been comparatively inexpensive.

Our construction has not been confined to bituminous macadam. For several years past we have selected frequently other types of construction such as bituminous concrete both upon a macadam base and upon a concrete base and cement concrete. We still believe, however, that there is a field in Rhode Island for bituminous macadam upon our main trunk lines.

In our early investigation into bituminous macadam by the penetration method it appeared to us that waving or corrugation of the wearing surface of penetration roads was due to five causes, viz.: the use of asphalt of too high penetration, the use of excessive amounts of binder, the use of crushed stone of too small sizes in the wearing course, the use of soft stone in the wearing surface and inferior construction methods. Waving of the surface of penetration roads is one of the most serious defects of this type of construction as frequently built and is, if it develops, very nearly irrevocable. Attributing the cause of waving to the conditions mentioned previously, we adopted the use of an asphalt of comparatively low penetration, we employed a hard crushed stone screened to large sizes for the wearing surface and we exercised care in the construction.

Detailed Construction Data Are Furnished Each Inspector

RHODE ISLAND STATE BOARD OF PUBLIC ROADS

Contract No. 1903 1919 Reconstruction

Town of Smithfield-Gloucester (Putnam Pike)

Information for Inspector—Special

Made by G.H.H. Chk'd by F.H.W.

Date. 3-31-19 Date 3-31-19

Traffic: The road will be kept open to traffic at the driver's own risk until crushed stone is spread; after which the road will be closed to traffic. The contractor will place all necessary signs where needed before construction begins.

Stationing: Sec. I. extends from Station 3950 to 5280
" II. extends from Station 0 to 5280
" III. extends from Station 0 to 5280
" IV. extends from Station 0 to 850

Center Line: From Sta. 3950 to 4350 Sec. I., the center line is to be 10½ feet from the rail.
From Sta. 4350 Sec. I. to Sta. 250 Sec. II., the center line is to be located from the grade stakes.
From Sta. 250 Sec. II. to 850 Sec. IV. the center line is to be 10½ feet from the rail.

Grade: The grade marked upon the grade stakes is the finished grade for the center line.

Transverse Slopes: In general the surface of the metal is to slope from the center to the sides at the rate of ½ inch per foot.

Banked Curves: The surface of the metal on banked curves slopes as follows:

Sec. III. Sta. 400 left down ½ inch per ft. for 9 ft.; Right level for 9 ft.
150–650 left down ½ inch per ft. for 9 ft.; Right up ½ inch per ft. for 9 ft.
700 left down ½ inch per ft. for 9 ft.; Right level for 9 ft.
Sec. IV. Sta. 450 left down ½ inch per ft. for 9 ft.; Right level for 9 ft.
500 left down ½ inch per ft. for 9 ft.; Right up ½ inch per ft. for 9.5 ft.
550 left down ½ inch per ft. for 9 ft.; Right up ½ inch per ft. for 11.5 ft.
600 left down ½ inch per ft. for 9 ft.; Right up ½ inch per ft. for 13.0 ft.
650 left down ½ inch per ft. for 9 ft.; Right up ½ inch per ft. for 14.0 ft.
700 left down ½ inch per ft. for 9 ft.; Right up ½ inch per ft. for 13.5 ft.
750 left down ½ inch per ft. for 9 ft. Right up ½ inch per ft. for 11.0 ft.
800 left down ½ inch per ft. for 9 ft.; Right level for 9 ft.

Width: The surface of the new metal is to be 18 ft. wide except on the banked curve (Sec. IV), where it is to be approximately as noted above.

Note: The inspector is to measure and report all varying widths by stations in order that the office can compute the area of new metalled surface. Also all varying shoulders and side ditches from the sample section, and the exact stations where side ditches begin and end. This is necessary in order that the office can compute the actual excavation to be paid for.

Shoulders and Side Ditches or Gutters. See Sample Sections.

Side ditches or gutters formed as per sample sections are to be constructed where practicable, the entire length of the contract.

The inspector will measure and report the exact dimensions of the gutter or ditch employed by stations giving the distance out from the center line and depth below finished grade.

Note: Sec. II. Right side, ditch from Sta. 1800 back to the culvert at Sta. 1700 approx.
Sec. IV. Right side, grade ditch to meet culvert at Sta. 190 approx.

Grading: The depths to excavate for metal and foundations are shown on Grading Diagram. All variance from same should be reported. In any case strip all loam within 24 inches of finished grade.

Culverts:

Sec. I. Sta. 4159–4120 approx. Replace present culvert with 72 ft. 18 in. corrugated metal pipe.
4775 approx. Place new standard concrete box culvert 3 ft. high x 2 ft. wide at low point under new fill (see sketch). Estimated length 100 ft.
5245 approx. New culvert to drain from right to left. 56 ft. of 12 in. corrugated metal pipe.

Sec. II. Sta. 1625 approx. Rhode Island Co. reports a 24-in. cast iron pipe in this location. Investigate and extend if necessary (consult engineer).
2065 As above (consult engineer).
3287–3318 approx. culvert. Replace with a standard reinforced concrete box culvert 5 ft. high x 5 ft. wide at Sta. 3325 approx. right to Station 3315 approx. left (see sketch). Use present culvert until new is built, then tear down and fill in. Esti. length new culvert 40 ft.
4700 approx. culvert. Replace with 44-ft. 18-in. corrugated metal pipe.
Drop flow line to get 12-in. approx. fill between top of pipe and track ties.
Ditch from outlet on left.
Trench on right from 4800 approx. to meet flow line of culvert.

Sec. III. Sta. 880 approx. culvert. Replace with standard reinforced concrete box culvert, 3 ft. high x 4 ft. wide. Est. length 40 ft.
1467–1512 approx. longitudinal culvert. Replace with 50 ft. 18-in. corrugated metal pipe.
1997 approx. Catch basin and culvert. Build catch basin (26-in. ring and cover) 28 ft. from rail, taking flow from old stone box culvert. Lay 60 ft. 12-in. cast iron pipe from new catch basin out under the tracks in a line just east of the shed at Sta. 1945 approx.
2320 approx. Catch basin and culvert. Build catch basin with curb inlet at 2300 approx. right. Lay 110 ft. approx. of 18 in corrugated metal pipe from catch basin under side walk along the south side of road to N. Scituate to present drop inlet.
2475–2410 approx. culvert. Replace present culvert across the road as far as the building on the left with a standard concrete box culvert of equal capacity as the present culvert at its left end where it enters the building. Estimated dimensions are 2 ft. x 3 ft. x 58 ft.
2500 approx. Build curb opening drop inlet on right with 24 ft. of 18-in. corrugated metal pipe leading out of same under sidewalk into the lot near the new concrete culvert. The above is to intercept the water coming down the hill and throw same into lot on right where it will flow through large culvert.
3875 approx. culvert. Replace with 44 ft. 18-in corrugated metal pipe.
5020 approx. culvert. Replace with 42 ft. 18 in corrugated metal pipe.

Sec. IV. Sta. 14–33 approx. longitudinal culvert. Replace with 18 ft. 18-in. corrugated metal pipe.
190 approx culvert. Replace with two 44 ft. lengths of 12-in. corrugated pipe.
560–630 approx longitudinal culvert. Replace with 72 ft. 18-in. corrugated pipe.
740 approx. culvert. Extend present concrete arch culvert under the track across under the road. Estimated length 33 ft.

Cobble Gutter with Header:

Sec. II. Sta. 3450 to 3950 approx. Standard Section 5 ft. gutter with header (see sketch).
Sec. III. Sta. 275 to 725 approx. Standard Section 5 ft. gutter with header (see sketch).
1150 to 1450 approx Standard Section 5 ft. gutter header (see sketch).
NOTE: Meet outlets to the culverts at 1150 approx.
2500 to 3150 approx. Standard Section 5 ft. gutter with header (see sketch).
NOTE: Construct header at Sta. 2500 to throw water into new curb opening.

Rip-Rap:

Sec. II. Sta. 1200 to 1400 approx. on left.
Report widths by stations in order that office can figure square yardage.

Guard Rails: Locations to be determined during construction.

The depth of crushed stone composing the wearing surface is made as nearly uniform as is possible. In resurfacing of old macadams especially it frequently happens that the depth of crushed stone constituting the wearing surface varies considerably because of the very common practice of laying the crushed stone in one course only over an irregular base. In all of our penetration work we make a practice of laying the crushed stone in two courses so that the top course or wearing course may be made very uniform in depth.

The sizes of crushed stone employed in both the base course and in the wearing course are the same, being of sizes passing a 2½ in. screen and retained upon a 1½ in. screen. The depth of the wearing surface is made 2½ in. thick after compression.

The bottom course of crushed stone always is filled with sand or with crusher-run screenings. The depth of the base course does not vary greatly over various types of foundations and sub-soils. We very seldom increase the depth of the base course of crushed stone in order to strengthen the pavement where sub-soil conditions appear to make a stronger construction desirable. It has been our experience that crushed stone does not make a satisfactory foundation over unstable sub-soil. Some type of foundation other than crushed stone therefore always is employed where the sub-soil conditions are unfavorable.

As a rule the base course is made 3½ in. thick after compression so that the total depth of the pavement is 6 in. Over heavy rock foundations, however, we make a practice of laying the base course of crushed stone 2½ in. thick. We are not in favor of laying the crushed stone in one course even over heavy rock foundations. In order to secure a smooth uniform surface it is very essential to have the crushed stone constituting the wearing surface free from irregularities which would be objectionable in the finished surface previous to the application of the bitumen. We have discovered no method of repairing irregularities due to faulty spreading of the crushed stone constituting the wearing surface after the bitumen has been applied.

Rolled to Get Maximum Mechanical Bond

Previous to the application of the bitumen the crushed stone constituting the wearing surface is thoroughly rolled. We make a practice of rolling until there is no sinking or creeping ahead of the roller and until a loaded cart or truck leaves no appreciable mark. It frequently is claimed that over-rolling of the stone constituting the wearing course is a condition prejudicial to the securing of good results. The theory which we work upon is to secure the maximum mechanical bond which is possible and to augment this bond with the bitumen. One of the reasons frequently given for not rolling the wearing course of stone heavily is that the individual pieces of stone fracture to such an extent that proper penetration of the bitumen is not secured. The writer is of the opinion that no crushed stone should be used for the wearing course in penetration work which is soft enough to break up seriously under rolling as heavy as is described.

Our best results have been secured with trap rock (basalt). Our observation leads us to believe that the ability to secure trap rock for the wearing surface or the ability to secure a stone approximately as good should be a condition precedent to the selection of bituminous macadam. Although a hard granite, a good quality of quartzite, a hard indurated sand stone and a number of other types of rock usually considered rather inferior may give very satisfactory service for a few years, our experience indicates that the use of anything but the best quality of crushed stone for the wearing surface involves high maintenance costs unless very light traffic is to be provided for. It is a fact, however, that the initial "surfacing-up" process is much more rapid where a rather soft stone is employed. We have noted that as a rule a penetration road built of fairly soft stone presents a tighter surface for approximately two years after its construction than does a road built of trap rock. In the selection of stone to be employed for the wearing surface it is also essential to avoid rock which is characterized by adhesion of fine rock powder to the large sizes of crushed stone. Some of the quartzites have this peculiarity in marked degree.

The greater part of our bituminous macadam work has been constructed of asphalt of penetration between 90° to 100°. There has been a general tendency within the last few years toward the use of harder asphalt for penetration work, but when our first penetration work was done in 1913 the use of an asphalt of such low penetration was unusual. We have secured excellent results from the use of an asphalt of penetration of approximately 55°. We never have employed an asphalt of penetration higher than 130°. At present our specifications invariably call for an asphalt of penetration between 90° and 100°.

The first or binding application of asphalt is made at the rate of 1¾ gal. per square yard of surface, volume measured at air temperature. We have employed both the hand pouring method and machine distribution. Our results indicate that hand pouring is fully as efficient as machine distribution, but we do not feel justified in stating that results secured by the hand pouring method are superior to the results secured by machine distribution.

Immediately after the application of binder the key stone or the crushed stone employed to fill the surface voids in the wearing course is spread. As the key stone is spread, so does the finished surface appear. We attempt only to fill the surface voids but we are careful to see that practically all of the surface voids are filled. Workmen may become so proficient at spreading the key stone that little sweeping is necessary, but ordinarily sweeping of the key stone into the voids is required. We employ for the key stone crushed stone of sizes passing a 1 in. screen and retained upon a ⅜ in. screen. We urge the necessity for having this stone free from stone dust. After the key stone has been spread satisfactorily the surface is well rolled. It usually is necessary to touch up spots which show a deficiency of key stone during the rolling operation.

Conditions Governing Seal-Coat Application

Conditions affecting accumulation of dust upon the surface of the road influence the length of time intervening between the spreading of the binder application of asphalt and of the spreading of the second application of asphalt, or the seal-coat. In general we do not favor applying the seal-coat upon the same day that the first application is spread. If, however, there is a car track in the highway or if traffic is carried upon a portion of the highway, there is a possibility that dust will be blown upon the surface to such an extent that the application of the seal-coat should be made as soon

as possible. Care of course always is taken to avoid applying asphalt upon wet stone.

We apply the seal-coat at the rate of between ¾ gal. and one gal. per square yard of surface. The fact that the key stone is fairly large in size permits the use of a heavier seal-coat than would be possible if a smaller stone were employed. The use of key stone of comparatively large sizes does not permit the seal-coat to lay upon the surface in blanket form. Puddling of the seal-coat is very rare in our work in spite of the fact that the amount employed for it is more liberal than is customary.

Immediately after the application of the seal-coat a cover of crushed stone of sizes passing a ⅝ in. screen and retained upon a ⅜ in. screen is applied. The cover is applied in amount only sufficient to cover the surface. Care is essential to avoid bunches in the material employed as a cover, because while the road is plastic irregularities in the finished surface may result from these bunches during final rolling. We consider it a disadvantage to have the cover applied in amount materially greater than will bond to the seal-coat. For work finished late in the season we consider a large excess of covering material very detrimental in view of the fact that the "surfacing-up" process is retarded and the pavement is called upon to go through the winter covered by a layer of mud produced by the grinding up under traffic of the covering material. A penetration road which does not have an opportunity to complete its initial "surfacing-up" process before winter sets in is, in the opinion of the writer, greatly handicapped. Anything which retards the surfacing process should be avoided, and anything which will hasten it is desirable.

Rolling Completed Surface

Rolling of the pavement after it is completed is a matter which appears to be slighted frequently. The rolling of a penetration road is a vastly different proposition from the rolling of sheet asphalt or of bituminous concrete having a well graded mineral aggregate. The extent of rolling means little, however, unless care is used to roll at the right time. It is desirable to have the temperature high enough so that the road is somewhat plastic in order to secure the best results in final or back rolling. We endeavor to have the rolling of the finished pavement carried out for a period of two weeks. The time of rolling of course is dependent upon the season of the year during which the work is done. Rolling of the finished pavement should be avoided when it is raining or when the pavement is wet from previous rains. In the fall rolling of the finished surface is not efficacious when done in the early morning or late afternoon. When the weather becomes cold it is essential to do the back rolling at the time of day that the temperature is the highest. The "surfacing-up" process is greatly hastened by heavy rolling after the pavement is completed. We deem it also desirable to roll the finished pavement after traffic is allowed upon the road. The combination of vehicular traffic and rolling seems to be more effective than mere rolling without traffic. It is of course possible to roll too much at one time. During very warm weather especially the effect of rolling must be observed carefully in order that too much rolling may be avoided. During the summer months the final rolling frequently is more effective when done in the early morning or late afternoon. Although the writer was of the opinion that extensive rolling after the completion of the pavement is policy, he did not appreciate the value of this feature until he had an opportunity to observe the effect of very heavy rolling upon a section of newly finished road caused by the hauling of a large quantity of crushed stone over the road by means of a steam roller employed as a tractor. The hauling of the crushed stone over the section of newly finished road referred to was occasioned by extension of a contract upon the end farther from the source of supply of stone. The crushed stone was hauled over the newly completed section, much against the desires of those in charge of the work, immediately after the road was open to traffic. The section of road involved in the extension of the contract never presented such a perfect surface as did the section over which the hauling by means of the steam roller was carried out. The section done last, however, was finished about midsummer so that the difference in the surfaces of the two sections well could not be attributed to the fact that the section done later was finished late in the season. The difference in the surfaces of the two sections is not microscopic in any sense of the word, but is evident even to the casual observer. We feel that the matter of rolling penetration roads has not received generally the attention that it deserves.

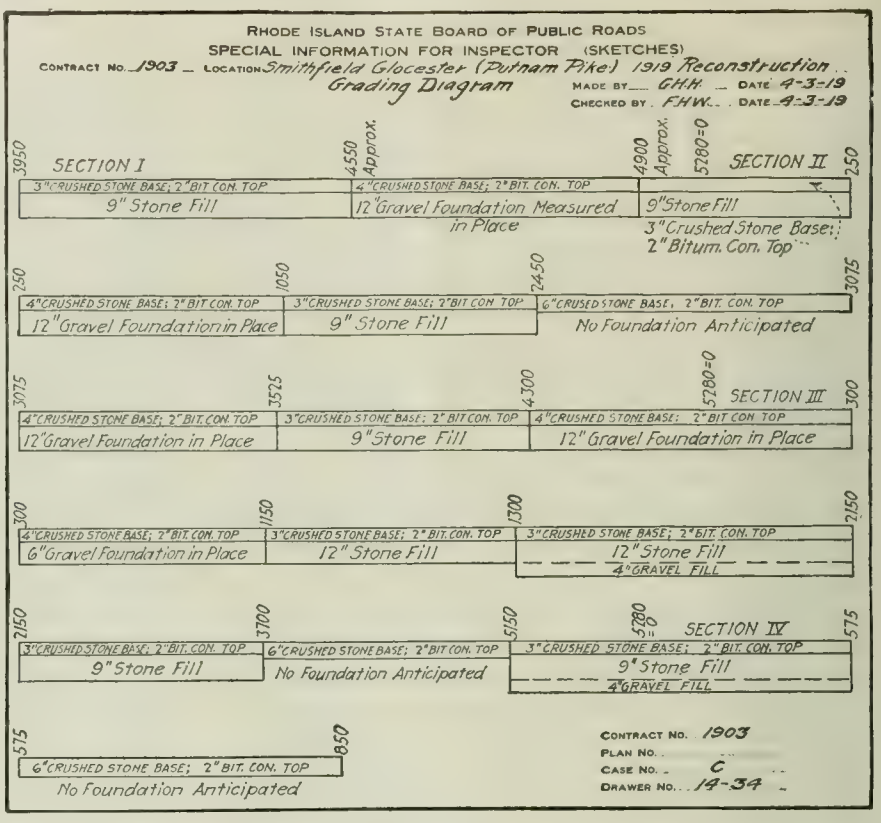
Foundations—Drainage

The design of foundations and of drainage facilities is of course of the utmost importance, regardless of the type of surface construction involved. The most careful attention to technical and practical details in the surface construction of a penetration road are of no avail unless adequate foundations and adequate drainage facilities are provided.

The sub-soil conditions in Rhode Island are extremely varied in spite of the fact that our state is so small. There are certain well defined areas, as for instance the Island of Rhode Island, where the sub-soil is uniformly heavy and clayey and subject to a great deal of heaving during thaws. There are also well defined areas where the sub-soil encountered is uniformly coarse, sandy gravel affording admirable sub-drainage. There are also sections where alternate streaks of heavy impermeable soil and of sandy or gravelly soil occur at fairly short intervals. The greatest attention is given to design of foundations. *The planning of steps to be taken to meet adverse sub-soil conditions is done only by engineers connected with the main office and nothing is left to be decided upon by those supervising the construction.* The greater part of our penetration work to date has been employed to replace wornout water-bound macadam. The problem of designing foundations is a great deal easier where a macadam road has existed for a number of years, because the inadequacies of foundations are very apparent in macadam surfaces. We believe that sub-soil conditions which cause a macadam road to rut or heave warrant the placing of foundations under a penetration road. The fact that the penetration surface ultimately is very nearly waterproof and has a tendency therefore to keep the sub-soil dry should not, we believe, be considered as a condition favorable to the omission of foundations, because certain sub-soils have such a marked capillarity that the waterproofing of the surface is of little avail. The problem of planning foundations for a road built in a new location or even upon the site of a dirt road,

especially where radical changes in grade are planned, is much more difficult than is the planning of foundations for a road surface replacing a macadam. In general, however, the proposition is very similar.

Observation of conditions existing during thaws in the winter we consider of the utmost importance in designing foundations, because it is at that time that the hydroscopic properties of the subsoil are very apparent. *The engineers responsible for the planning of foundations therefore make very careful inspection of conditions existing during a winter thaw.* The plans are taken along and rather copious notes describing the conditions then existing are made. In this preliminary inspection of conditions affecting the design of foundations the notes merely describe the conditions existing. The notes go into detail and the various conditions found are very carefully described and reference given to station numbers upon the plan so that the same points may be picked up later.



GRADING DIAGRAM SHOWS FOUNDATION TYPE FOR EVERY FOOT OF ROAD

A subsequent examination is made in the early spring when the sub-soil is well saturated with water and when the frost is completely out of the ground. The idea of the second inspection of conditions is to determine the steps necessary to take care of sub-soil drainage. Springs always are in evidence in the early spring, but during the winter and during the summer they frequently are not in evidence. At the time of the second inspection foundations and drainage facilities are designed in detail. We have made a very careful survey of the location of materials suitable for foundations and the engineers making the design of foundations usually take with them notes concerning the availability of these materials in the section that they are working.

The types of foundations which we employ under penetration roads are heavy rock foundations, or stone fill, and gravel foundations. We never employ telford foundations, and we never employ crushed stone as a foundation proper. A telford is much more expensive to lay than is a stone fill, and over certain types of sub-soil the fact that there is direct drainage from the top to the bottom of the telford makes possible the working up of the sub-soil beneath when it is softened during thaws. The features influencing the selection of gravel and of stone fill, respectively, are the relative costs and the particular conditions to be met. A combination of both stone fill and gravel frequently is employed. Over clay, which is usually very unstable in this section, we prefer a gravel foundation to a stone fill foundation. We consider that the sand in the gravel is the active agent in overcoming the defects of the clay. We have secured perfect results by the use of fine sand over clay, but since sand is rather difficult to bind and causes therefore more or less difficulty in rolling, we prefer a gravel containing at least 40% by weight of stones retained upon a one in. screen. Since permeability is to be desired in gravel employed as a foundation, we specify that not over 25% of the particles passing a ½ in. screen shall pass a 40-mesh screen.

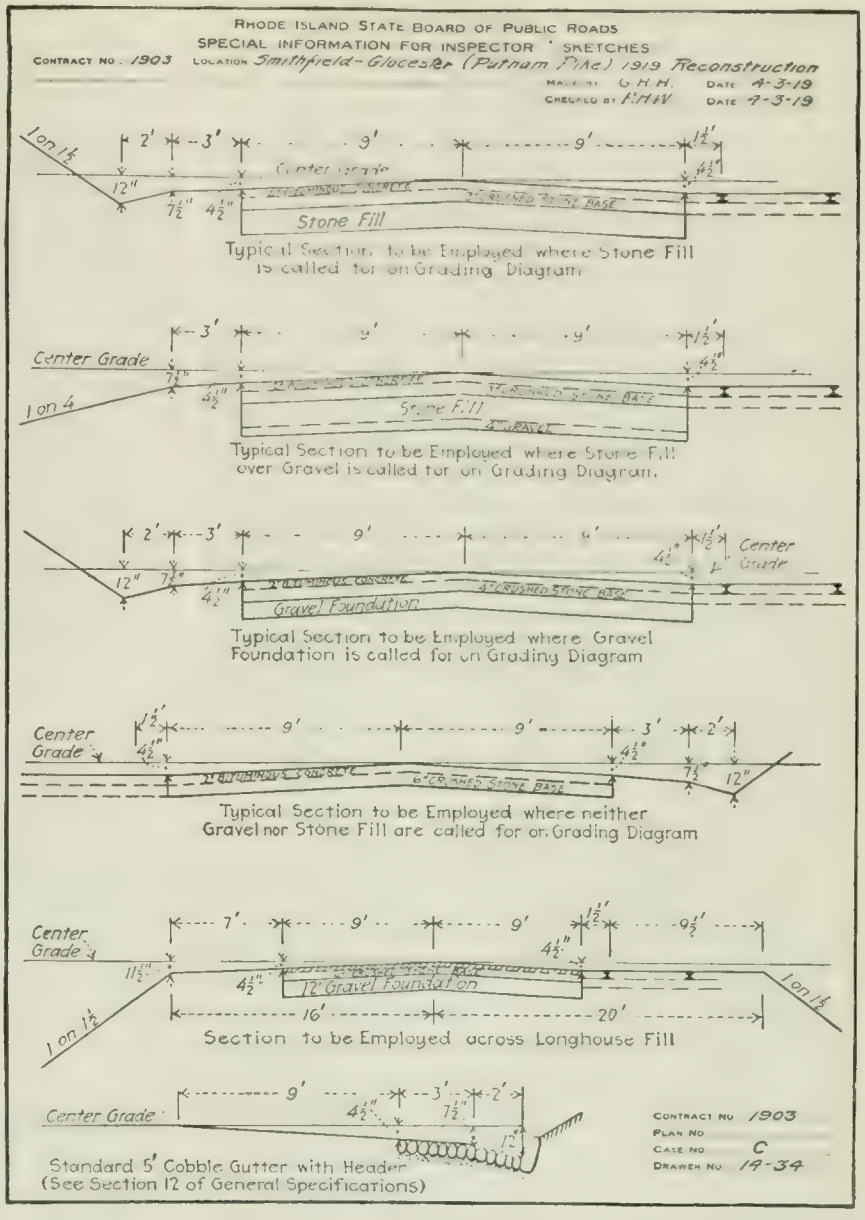
Stone fill is preferred where it is possible that more or less water will be present in the foundation. Over extremely unstable sub-soil a layer of gravel is placed below the stone fill in order to prevent the unstable sub-soil from working up into the stone fill and preventing thereby the seepage of water through the foundation. Gravel always is employed to fill the voids in the stone foundation. The stone foundation is brought to grade and the gravel is then spread over the surface. The gravel aids materially in consolidating the foundation and does not prevent the seepage through the foundation of small amounts of water. We do not believe in allowing large amounts of water in the rock foundation if it can be avoided. When there are decided springs, sub-drains at the side are provided to intercept the water before it reaches the foundation.

Stone fill always is employed where there is ledge. In New England much trouble is experienced by the breaking up of roads built upon ledge. Our ledges are very apt to be springy. In blasting ledge it is of course impossible to meet exact lines, and it is therefore fairly common to find undrained pockets in ledge which may become filled with water. The leaving of undrained pockets in ledge is to be avoided if possible, although it is not to be expected that a smooth contour in ledge excavation will be secured. Care in avoiding undrained pockets and a stone foundation we find very effective in ledge.

An improperly laid or improperly compacted stone foundation is very apt to result in an irregular wearing surface because of local settlement under traffic. We consider it a good plan to do all of the hauling over the stone foundations that is possible before any crushed stone is put on. The use of gravel to fill the

voids in the rock foundation makes it possible to haul over the foundation very readily.

Our stone foundations are constructed ordinarily of field, wall or ledge stone of sizes varying from 3 in. to 15 in. in longest dimension. The largest sizes permissible depend upon the depth of the foundation. We do not approve of the use of stones large enough to reach from top to bottom of the foundation unless the foundations are very shallow. The stones are all packed by hand, the loads being dumped so that there is a small clearance between the laid foundation and the piles dumped. There is a knack in laying the stone so that the surface will roll uniformly. If there are areas where the stone is loosely packed and other areas where the stone is compactly laid, the differences in laying are apparent after rolling because of the greater compression resulting where the stone is loosely packed. In general the sizes of stones used are graded from the largest sizes upon the bottom to the smallest sizes upon the top. It is important to have larger stones laid in such a manner that they do not tilt or rock under the roller. Considerable breaking of stones upon the surface with hammers during the rolling process generally is necessary. It is desirable to secure a fair percentage of broken stones in the foundation because of the difficulty experienced in rolling a foundation constructed wholly of round cobbles. It is difficult to predict the percentage of compression secured by rolling because there is a great variation in this feature produced by variations in the grading of sizes of stones, character of the rock employed and details of laying.



TYPICAL ROAD SECTIONS, DEPTH OF BASE DEPENDENT UPON FOUNDATION

We find that the most satisfactory method of determining the compression is to lay a short section and roll it. We believe in securing an even surface upon our stone foundations. The taking care of pronounced irregularities in the surface of the stone foundation by varying considerably the depth of the bottom course of crushed stone is not considered either good construction or economy. It is a good plan to accumulate a considerable supply of the smaller sizes of stone to fill depressions which develop in rolling, and to fill the depressions with this material before the surface is packed too hard. Rolling of the stone foundation is continued until there is no noticeable movement under the roller. Fracture of the stones in the surface always results from rolling to the extent which we deem necessary. After our stone foundations are rolled and the voids are filled with gravel the surfaces are usually sufficiently smooth to ride over in a mtor vehicle in comfort at moderate speeds.

There should be a close relationship between the establishing of grades and the design of foundations. If it is possible in places to avoid excavation for foundations in the establishment of grades, the resulting economy makes this course practicable. It sometimes happens also that a thin stratum of unstable sub-soil underlaid by good material may be taken care of without the necessity for foundations by establishing a grade which involves excavating the poor material. It is not desirable furthermore to establish grades finally until the foundations are designed because excavation for foundations affects the quantities considerably and influences the balancing of quantities.

The design of foundations does not appear to us to be a definite science. It is a matter of judgment to determine the proper depth required. Our foundations vary in thickness from 6 in. to 18 in., depending upon conditions.

It is not to be presumed that foundations are placed under all of our penetration roads. If the sub-soil consists of sand or gravel offering perfect sub-drainage, we never plan foundations.

There never has been an instance where uniform

foundations were planned for the entire length of one of our sections of road,' even though we have built many sections only one mile in length.

All information regarding foundations is furnished the resident engineer. There are cases occasionally, in new construction work particularly, where the matter of foundations at certain points is not definitely settled until rough grading has been finished, but the resident engineer's information sheet calls upon him to notify the office when the rough grading is done so that the engineer designing the foundations may determine the best course to follow in regard to foundations. We find that a foundation diagram is a very simple way of providing information for the resident engineer. This diagram consists merely of a straight line indicating the center grade, below which are shown in diagrammatic form the details of the foundations upon the entire contract. Station numbers indicating the limits of the various types and depths of foundations are placed over the line representing the center grade. This grading diagram we consider a more ready reference than notes stating what the foundations are to be from station to station. Typical cross-sections also are included in the information provided the resident engineer. We attempt to include upon the resident's engineer information sheets every detail concerning drainage and foundations. The grades and directions of special drainage ditches, for instance, always are provided.

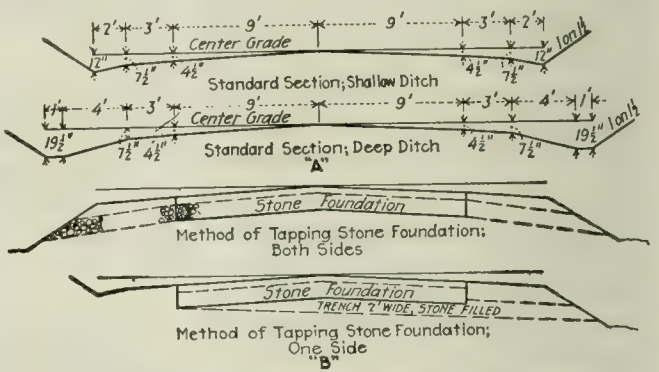
Advantage in Planning Foundation

One of the chief advantages of planning foundations in advance of letting the contract is that the contractor knows definitely where all of the foundations are to be placed and can, previous to the making out of his bid, make definite arrangements for the securing of the required amounts of material. There is very little variation always in the foundation quantities contained in our proposals and the final computed quantities. We consider also that the design of foundations and of drainage facilities is of sufficient importance to warrant attention by engineers of long experience in this class of work. We do not deem it advisable to allow our resident engineers to determine anything in regard to the locations, character and depth of foundations.

Our plan of careful design of foundations has proved to be very effective, since we have not as yet noted a single instance of foundation defects developing after the completion of a road. We deem a standard foundation for a given road very poor judgment, in view of the conditions which have to be met in Rhode Island. Each individual fault in the sub-soil should, we believe, be considered as a separate problem to be solved separately. A standard foundation furthermore would have to meet the worst condition and would be far heavier than would be necessary for the remainder of the road.

Our ditch or gutter sections vary considerably in order to meet varying conditions. We employ two standard typical ditch sections, but special ditches are common. The shallower standard ditch section is employed as a rule where the sub-soil conditions are favorable, so that deep foundations are not needed, or where drainage of the foundations may be accomplished at frequent intervals in fill sections. This section involves a gutter 5 ft. wide and 7 in. below the edge of the pavement at the outer extremity. The gutter slopes for the first three feet at the rate of 1 in. per ft. and slopes for the remaining two ft. at the rate of 2 in. per ft. The deeper ditch section is 8 ft. wide and has a maximum depth below the edge of the pavement of 15 in. at the outer extremity. The latter section is employed where particularly adverse sub-soil conditions prevail.

We do not deem it necessarily essential to employ a ditch section which involves an elevation of the bottom of the ditch below the bottom of the foundations. We never drain our foundations at intervals less than 300 ft. and frequently no drains are provided for intervals of 1000 ft. or more. Our plan of intercepting water before it gets into the foundations where decided flow of water exists makes very frequent taps into the side ditches unnecessary. A most careful observation has



A, STANDARD DITCH SECTIONS; B, METHODS OF TAPPING STONE FOUNDATIONS

yet to disclose a single instance of perceptible flow of water from the taps leading into our foundations. We always place taps, however, at low points in grades and in fill sections upon long grades.

The same attention to foundations and drainage is given to projects involving types of construction other than bituminous macadam.

Construction Costs

Total costs of road projects vary greatly even though there be little difference in the costs of the paving surfaces. The costs of grading, of foundations and of property damages are subject to great variation. It is deemed therefore advisable to separate here the costs of the pavement proper from the total costs.

The costs of the pavement proper as given below include no engineering cost, no costs of grading and no costs of foundations and drainage, but include only the cost of the items entering into the construction of the pavement proper, including the cost of the base course of crushed stone.

In 1913 the costs of the pavement proper varied from $0.76 to $1.11 per square yard and averaged $0.90 per square yard. The total costs of work done in that year varied from $0.83 to $1.38 per square yard and averaged $1.09 per square yard. The bituminous macadam roads built in 1913 are not characteristic of our bituminous macadams in general, because they were in large part laid under conditions requiring little foundation cost and because rather inferior crushed stone was used in some cases. These roads also were built with one exception to a uniform width of 14 ft., while our bituminous macadams built since that time are in general 18 ft. in width except upon curves, where the surface is widened.

No bituminous macadams were built in 1914, because our funds in that year allowed of general maintenance only.

In 1915 only two sections of bituminous macadam were built, since our funds in that year also were very meager. One of these roads was built at a cost of pavement proper of $0.62 per square yard and at a total cost of $0.78 per square yard. The costs of the other road built in 1915 were $0.86 per square yard and $1.10 per square yard, cost of pavement proper and total cost respectively. Trap rock was employed upon this work exclusively. As the figures indicate, however, the costs of grading, foundations and drainage were relatively low. The sub-soil conditions encountered in building these roads were very satisfactory.

In 1916 a total of 20.35 miles of bituminous macadam were built. The conditions encountered in this work varied greatly, as the costs indicate. The costs of pavement proper in that year varied from $0.82 per square yard to $1.42 per square yard and averaged $1.16 per square yard. The total costs of this work varied from $1.02 per square yard to $2.11 per square yard and averaged $1.58 per square yard. Common labor costs averaged 20c. per hour in 1913 and 1915 and 25c. per hour in 1916.

All of the bituminous macadam built from 1913 to 1916 inclusive was done by contract. The costs given therefore are not actual costs, but are the costs to the state.

A considerable amount of bituminous macadam has been built since 1916 both by contract and by convict labor. Costs of this work since 1916 have of course increased, as have the costs of all types of pavements. Since costs of construction are of little interest without costs of maintenance, for a few years at least, and since the roads built since 1916 are so recent that maintenance costs are of little interest, no costs of later work are given.

Maintenance Heaviest First Year

The maintenance of our bituminous macadam roads has to date been slight. As a rule our maintenance costs the year following construction are greater than they are each year for several years following. The most careful supervision will not avoid absolutely minor faults in the distribution of the bitumen. These faults are apparent the year following construction, and that is the time to take care of them. Upon roads finished late in the fall the maintenance the year following construction always is greater than is the case of a road finished earlier in the season.

In our maintenance of bituminous macadam roads we believe that the same type, quality and consistency of bitumen should be used as was used in construction. We do not favor the use of light patching compounds except in case of emergency during the winter months. All of our maintenance of bituminous macadams is carried out by the section gang scheme. Each section gang is equipped with heating facilities and with a small tandem roller so that repairs may be made under conditions substantially the same as the road was built under. Aside from cuts in the surface by public utility companies we have very few holes to repair and it is therefore very often possible to omit the tandem roller from the equipment. Most of our maintenance of our bituminous macadam consists merely of painting over spots which look porous and covering with clean ½-in. screenings. A considerable portion of our total cost of maintaining bitminous macadams is occasioned by inadequate drainage of surface water upon car tracks adjacent to the metalled surface. Our law does not permit us to exercise compulsion over street railway companies in the matter of drainage of surface water and we are not allowed under our law to drain the tracks at our expense. It is necessary for us to ask the aid of township and city authorities in order to have the traction companies do the work necessary from our standpoint, and this plan is not efficacious in bringing about results. As an example of this sort may be cited an instance of a road 2.2 mi. in length and containing 22,862 sq.yd. built in 1915 which has cost to date a total of $194 to maintain, of which approximately 75% has been occasioned at one point where the drainage from the street railway tracks was so inadequate that the pavement was covered with water and ice during the greater part of each winter.

As has been stated previously none of our bituminous macadams has as yet required re-sealing. It is unfortunate that accurate costs of maintenance of the bituminous macadams built in 1913 are not available. These sections were in every case very short, and under our old cost-keeping system the cost of maintaining these sections was included in the cost of maintaining longer sections of which these particular sections were a part. One of the sections built in 1913 has required absolutely no maintenance of metalled surface to date. In no case has the maintenance cost been over $100 per mile per year and the average cost of maintenance we estimate to be less than $50 per mile per year.

Maintenance Cost Data

The total average cost to date of maintaining the bituminous macadam roads built in 1915 is $0.017 per square yard, or $179 per mile. The average total cost to date of maintaining the roads built in 1916 is $0.019 per square yard, or $201 per mile. The total annual costs of maintenance of the roads built in 1916 is of interest in showing that the maintenance the first year is larger than for a few years following. No maintenance of the roads built in 1916 was carried out during that year. In 1917 the total cost of maintenance of these roads was $2300.11, in 1918 the total cost was $1049.99 and in 1919 the total cost was $750.61. Of the total of $2300.11 spent in 1917 for maintenance of the roads built in 1916, the amount of $1148.48 was spent upon one section two miles in length and containing 20,209 square yards. This road was finished very late in the season of 1916 and for that reason the results were rather inferior. It is, however, gratifying to note that the maintenance costs of this road in 1918 and 1919 were $55.03 and $37.33 respectively. Increases in the cost of labor and of materials during the period in which the total costs of maintenance of our 1916 work are given cause the relative costs in the separate years to be less than they would have been otherwise.

Since our experience with bituminous macadam dates from 1913 only and is therefore recent, the above costs are not perhaps of special interest, because the roads have not been down long enough yet to require re-sealing. What the annual cost for re-sealing will be remains to be seen. The surfaces at present appear to indicate that re-sealing of none of our bituminous macadams will be required for several years to come, but time only will prove it. Observation of our older cold mixed roads indicates that a road of that type which gives good service at slight expense for three years

can be maintained at slight expense for at least ten years. Whether or not the same condition applies to our bituminous macadams is a question we cannot yet answer.

None of our bituminous macadam roads has waved perceptibly so that it does not appear that there is danger from that cause.

Traffic

Our bituminous macadams have been laid upon some of our heaviest main trunk lines. Some of the roads upon which we have laid bituminous macadam successfully are as follows: Post road from Providence to Westerly via Narragansett Pier, the road between Fall River and Newport, the road between Providence and Fall River, the road between Providence and Woonsocket, the Putnam Pike, the Hartford Pike and the New London Turnpike. The section of bituminous macadam carrying the heaviest traffic in point of number of vehicles is upon the post road between Providence and East Greenwich. This road carries an average daily traffic of approximately 3500 vehicles of which 97% are motor driven. The motor-truck traffic over this road is approximately 300 trucks per day. The Mendon Road between Providence and Woonsocket, upon which we have laid bituminous macadam, carries an average daily traffic of approximately 1800 vehicles, of which 600 are motor trucks.

Summary

The writer is of the opinion that bituminous macadam properly laid is an economical pavement under certain conditions. There are of course a great many points to consider in the selection of type of pavement for a given highway. It is not deemed within the province of this article to enumerate or to discuss these points. It is of course not sufficient to compare alone first costs. A comparison between ultimate annual costs should be attempted.

In Rhode Island we frequently are called upon to select pavements for use in sections far removed from railroad facilities and in which the local rock is of poor quality. The use of the inferior local rock in bituminous macadam construction is not considered, but a bituminous concrete of mineral aggregate consisting of local sand or gravel laid over a base of the local rock crushed to large sizes, or cement concrete, is selected.

It is beyond question that a great deal of bituminous macadam has given poor service. It is also doubtless a fact that much bituminous macadam has been laid without due regard to selection of materials, to design of foundations and drainage facilities and to construction details. It appears that many of the common faults of bituminous macadam, however, may be avoided.

Geological Survey's Work

The United States Geological Survey during the year which ended June 30, 1919, according to the annual report of the Secretary of the Interior, mapped more than 10,000 square miles of territory in the United States, laid more than 4000 linear miles of primary traverse and more than 4000 linear miles of levels, and established more than 2000 permanent bench marks, occupying 61 triangulation stations and permanently marking 50 stations.

Drainage for Irrigated Land in Yakima County, Washington

Saturated Soil Like Quicksand—Construction and Maintenance Under County Engineer—Pay by Warrants and Bonds

BOTH drainage and flood protection are required for land reclamation in Yakima County, Washington, the former being entirely for the improvement of land that has become waterlogged and covered with alkali owing to lack of outlets for irrigation waste water. Levees or dikes are needed as protection from high water in the Yakima River and to prevent changes in the river channel during high water. As Yakima County has the largest irrigated area in the state, its drainage problem is important, and it was largely instrumental in securing the passage of the present state law, in 1913, under which it has established the office of drainage engineer for the county. Since then it has built 74 miles of open ditch and 78 miles of pipe drain laid with open joints. The total cost of drainage work for about 85,000 acres is about $1,030,740.

Under the Washington law, property holders desiring drainage file a petition and bond with the county commissioners, who order an investigation by the county drainage engineer. If this is favorable, a location survey and report are ordered, the report being then discussed with the property owners at a public hearing. If the project is approved, the works can be carried out by contract under the county commissioners or by force account under the board of supervisors elected by the people within the district. In either case the administration is left to the county engineer.

Payment is made by temporary warrants until the improvement is completed, after which bonds are issued and the warrants are called in. This has proved a successful method of financing, as the local banks or the bank with which the contractor does business are usually willing to carry the warrants, which bear 8% interest. All work was done by contract until the summer of 1917, when changes in the labor and material markets made this undesirable. A cost-plus system was then established, with satisfactory results.

Soil conditions make the work difficult, as most of the excavation is in volcanic ash, which when saturated is very similar to quicksand. In trenches a foundation for the pipe is often necessary, gravel being generally used for this purpose, in amount varying with the degree of saturation. With open ditches the main difficulty has been the caving of the sides, but this has been reduced largely by excavating with dragline machines to give the cross-section required by the specifications. Material which slipped after the first excavation was moved by sluicing with irrigation water, as the cost of bank-protection work was prohibitive.

In the drainage law the county engineer is defined as an engineer specially employed for this purpose by the county commissioners, but Yakima County is believed to be the only one that has appointed a drainage engineer to look after this work exclusively. This office is practically a permanent institution, since the law makes the drainage engineer a member of the board of supervisors of each drainage district and each diking or levee district, while he also acts in an advisory capacity in the maintenance of all works constructed. J. O. Greenway has been county drainage engineer for some years, with office at Yakima.

Classification and Uses of Highways and the Influence of Federal-Aid Acts

An Address Before the Louisville Convention of the American Association of State Highway Officials, December 10, 1919

By Thomas H. MacDonald
Chief of the Bureau of Public Roads

A CAREFUL definition of the problem set up by this topic is essential to its discussion, and such a definition rests entirely upon a careful scrutiny and analysis of the uses which we are now making and which we will make in the future, of our highways.

These uses may be defined roughly in four general classes: (1) those uses chiefly related to agriculture; (2) those which are recreational in character; (3) those which are commercial, and (4) those which are military. It is believed that these uses are placed in the order of their importance as determined by their respective volumes, considering traffic in the aggregate for all of the 48 states. Admittedly, there are sections, perhaps of some considerable area, in which the ranking order of these classes would be changed, but conceding this, it does not modify the principle that the roads which we are building must serve these four classes of traffic, and that a failure to provide adequately for any one of these classes means a shortcoming, at least, in the methods adopted by both the states and the nation; so those laws which we now have must be judged in the light of the degree to which they are now providing, or, if given sufficient time, will provide, for these classes of traffic; and certainly provision for these classes is the whole object of the enactment of either state or national highway laws, or the establishment of state or federal highway departments. This statement should be reiterated until the attention of road builders is focused upon the proper objective. It sometimes would seem that we are likely to lose sight of the object we are attempting to obtain in discussing the manner or the means through which we shall operate, and at such times it seems highly desirable to analyze in some detail the uses of the roads for which we are attempting to provide.

Agricultural and Recreational Uses

The first class—those uses related to agriculture—includes the town to farm and farm to town traffic characteristic of the more purely agricultural districts; the country to city and city to country traffic, which is fast growing and highly important where adequate roads have been built radiating into the country districts from the large centers of population; and the traffic carrying crops or foodstuffs from productive areas which are isolated from rail transportation. Under this class should also be included the social, educational and religious activities which produce traffic from the farms to the schools, to the churches, and to the community centers.

The second—the recreational class—includes two distinct types of traffic, local and tourist. Local recreational traffic is continuous, and is not definite in its character. The automobile has been the means of combining a great deal of business and pleasure traffic, and of the two kinds of recreational traffic the first is far more important, because it affects so large a percentage of our population. The recreational value of the continuous outdoor driving and the increased social intercourse which has resulted can scarcely be estimated in their effect upon a large percentage of the population, whose social and recreational activities up to the advent of the moderate-priced motor car were very limited.

The tourist traffic is a growing and highly important one, and this growth should be enlarged by providing adequate roads, so that inter-state and transcontinental traffic will be encouraged. There is not a single state in the union that does not possess localities of interest to the population both within and without the state. There is perhaps no better way to promote a broad Americanism than to make it possible through the building of roads, for the people of one state to know in a more or less intimate way something of the worth and beauties of the neighboring states, and this interest and knowledge should be sufficiently extensive to take in the national parks, forest areas, former battle-fields, and the many points which, through historical association and tradition, or because of their natural characteristics and environments, hold much of value to every man who places his country above all others. While traffic that may be included under the term "tourist" is fast growing, it is very small in comparison to the other recreational uses that are being made of the roads, and it is impossible now to foresee that this class can ever be more than a minor percentage of the local recreational use of the highways. During the season of 1918, 54,596 private automobiles entered the 11 national parks, while during the same season approximately 450,000 people visited these same parks. These figures may be taken as indicating something of the tourist travel by highways when it is considered that a large amount of our western automobile travel makes the national parks its objective; but considering that this traffic is spread over a period of several months, it will be seen that if all of the automobile travel were confined to a single road, it would then only equal a daily traffic equal to that on many country highways outside of the influence of any large city, and would not begin to compare with the traffic on our heavy traveled thoroughfares in populous districts; but considering that the total number is spread over many western roads, it will be seen that this traffic is only incidental to the local uses which are made of the main thoroughfares.

Commercial and Military Uses

The third class—the commercial use—is not strictly defined by this term, but as used in this discussion refers to the traffic on the highways resulting from the transportation of commodities between centers of population as differentiated from the collection of crops and distribution of commodities in the rural districts. This class of traffic would cover the carriage

of commodities, much of it in package form, which now makes up the bulk of the short-haul freight and express. No doubt there will be a very large increase in this class of traffic on the highways, but the traffic which developed during the war is not normal and will not continue as the normal conditions reassert themselves. Just what will be the length of haul which, because of its economy, will go to the highways, has not yet been determined, but the only studies made by the Bureau and these during the period of the war, indicate that 100 mi. seemed to have marked the limit of such hauls. Even conceding that this class of traffic will develop very largely, it must of necessity be confined to those areas where the terminal points consisting of comparatively large centers of population are close enough together to allow at least daily one-way trips to the unit of transportation used.

The fourth—the military uses of the highways—is given fourth place not because of its lack of importance, but because the probable strictly military significance of the highways has been very considerably misunderstood. Any system of highways which will serve the first three classes of traffic will adequately serve the military requirements, except in certain particular areas. In such areas, the highways must be provided which are demanded by the military authorities as a part of their plans for their military operations, but it must be accented that military highways as such are confined to restricted areas, and outside of these so-called vital areas, any system of highways that adequately serves the agricultural and commercial traffic will serve also the military purposes in either war or peace times. If, therefore, it is conceded that practically all of the traffic which we are now carrying on the highways has been defined in the foregoing classes, it is at once evident that, with the single exception of tourist traffic, the uses of the roads are largely local. There are no traffic counts which have been made sufficiently extensive to indicate that a general statement may be arrived at correctly representing by percentages the use of the roads that are local. Those traffic counts which have been made would place this use as high as 90% to 95%, and it is very questionable if this percentage will increase very materially even as the roads are improved, for, although the total traffic on improved roads increases rapidly, it is doubtful if the average daily local traffic will fall below 90%, except on those roads which, because of their particular location, are built primarily for tourist travel.

These statements, it must be remembered, are intended to be very general in their character, and to cover the country as a whole, but it must be conceded that more than 90% and possibly more than 95% of the demand for better highways, arises from the local need for such improvements. The development of a national highway system must, therefore, take this fact into consideration, as opposed to the development of a system of national highways. There would be no advantage gained by considering the local uses of the roads as secondary. No plan of administration predicated on such an assumption can prevail, because it is an economic fallacy. That there is a demand for better facilities for tourist travel there can be no doubt, and that there is an increasing demand in localities for better facilities for through transportation of commodities is equally apparent, but that these needs now justify national intervention solely in their behalf, or that they are of such a nature that they cannot be met by a properly planned national system of highways, is open to serious question.

There is no evidence of fact shown by traffic counts or any highway use of importance, that justifies a presumption that a need of national consequence is being overlooked. We must meet, in the development of our highway systems, the economic needs of the nation for highways in the order of their importance. That these highway systems must be laid out along sane and sound economical lines is all the more important when it is evident that such a procedure will eventually produce systems of highways suited to the special needs of each locality, and yet be entirely adequate to meet all the requirements which those who are particularly interested in a system of national highways specify.

Rural Life and Roads

At the present time there is no more important problem confronting the American people than that of increasing the comfort and desirability of rural life, thereby stimulating the production of food products. Of equal importance to this is the necessity for providing better methods of distributing food products—and especially the perishable food products—to the consumer without loss of time and without these products passing through so many hands between the producer and the consumer.

Federal intervention through federal aid, if of assistance to these ends, is reasonable and proper from such standpoints alone; indeed, such intervention may be said to have become imperative. The city population of this country has for years been growing rapidly, while the growth of the rural regions in many places has been negligible and too often has actually been negative. The towns have held too many attractions in the way of social, recreational and educational advantages, but through the use of the motor car in conjunction with improved roads, these advantages in favor of town life can be largely overcome.

Beyond any doubt the war accented the need for more and better highways during the period of rail congestion, but if there is one need that the after-war conditions have brought close to every individual in the nation, it is a need for an adjustment of conditions that will allow people to be properly fed and clothed within the limits of their incomes. So far as improved highways will help to accomplish this they certainly will be held to fill a great national need. The population of the country has more than doubled since 1880. At that time only a little over 30% of the population was recorded by the Census Bureau as urban, or some 16,000,000 out of a total population of 50,000,000. Today out of a total population of approximately 105,000,000, about half, well over 50,000,000, are urban dwellers. The effect of this condition is reflected in production figures. In 1880 the production of wheat was about 450,000,000 bu. per year, while during the period prior to the war it was only slightly over 700,000,000 bu. Similarly, in the case of corn, the production in 1880 was about 1,700,000,000 bu., while prior to the war it was about 2,500,000,000 bu. War conditions as to production were abnormal, so pre-war figures have been used instead of the later figures. From these figures it appears that the produc-

tion of food has increased about as the rural population has increased. It is true that there has been some gain in the production of the individual on the farm, but the fact still remains that the total population has been increasing much faster than the rural population, and any effort that the Federal Government can make to improve rural conditions that will insure a sufficient rural population, and to provide means for bringing the producer and the consumer closer together, is justifiable. From this standpoint alone Federal aid for roads certainly can be considered to be at this time a great national assistance in solving one of the greatest of our national problems.

Results of Federal Aid Law.

The results accruing from the Federal aid road law up to the present time cannot fairly or honestly be reckoned in the number of miles of finished road because of conditions prevalent during the period from which we are just emerging. The big result, so outstanding as to overshadow every other consideration, which can be primarily credited to the Federal Aid Road Act, is the amount and character of advanced road legislation which has been written into the laws of every one of the 48 states. These laws, in connection with the Federal Aid Road Act, have established on a firm basis, with adequate support funds, highway departments in all of the states which did not have highway departments prior to 1916. In the states which had highway departments prior to that time the legislatures have enlarged and strengthened the authority and increased the support funds of those departments. This legislation has in general provided for more than the building of Federal aid roads, and in some of the states has included provisions for the building of the roads from the greatest to the least important. In addition to the legislation great sums of money have been made available through the levying of special or general taxes and through the authorization of bond issues. The Federal aid law should not be credited entirely with this changed viewpoint on the part of the public, indicated by the availability of such large sums, but it can be credited with appealing in a most forceful way to that characteristic of the human race—willingness to exert itself to secure some award. Probably without Federal aid the conditions after the war and the changed attitude of the public generally toward public spending on a large scale would have made themselves manifest, but certainly the Federal Aid Road Act can be credited with having turned the attention of the public toward the expenditure of public funds for highway purposes. It was not possible to go ahead with the actual production of roads on any considerable scale during 1917 and 1918. During the present year a large mileage of roads has been placed under contract. The production has still been disappointing due to conditions which are now well understood. However, during this period there has been a remarkable development in the fixing of systems through the classifications of roads, so that now we have in each state a system of main or state roads more or less definitely fixed, and in many of the states other systems of lesser degrees of importance. Many of these systems have been worked out very carefully and painstakingly. In fact it is doubtful if the highest administrative and executive officers of the State highway departments have devoted as much of their personal attention to any other single phase of the highway work as they have to the actual classification of roads. For the last three years this has been perhaps the chief and most important work that these men have accomplished, and its importance should not be understood.

Classification of Roads.

The proper classification of roads is basic and fundamental. It has been demonstrated in those states which have carried out this classification in a careful, thorough maner, that people acting through their state legislatures have provided the ways and means for carrying out the program of improvement in accordance with the importance of these roads. Let it here be clearly understood that the people of this country will support a policy of road building which is based on their economic needs. It has been pretty well demonstrated in individual states that the mileage of the primary state roads cannot be restricted to too small a percentage of the total. Most of the states have found it necessary to add a considerable mileage to their original conceptions of an adequate system, and where this action has not been initiated by the State Highway Department itself, it has resulted through legislative action. It has been pretty definitely established that a system of primary roads must be sufficiently extensive to give service to all parts of the state. It is thereby safe to fix the percentage without further inquiry, but it seems evident from the result in states which have made a careful study of their economic needs, that in the neighborhood of 5% to 7% of their total mileage will be included in their primary systems. This percentage may change slightly for the nation as a whole. Unquestionably at the present time Federal aid should be restricted to the State systems, and since it is true that the State primary systems can in general be divided into roads of first and second importance, it might serve the economic needs of the states to confine Federal aid expenditures to the roads of the first class in the primary system. It is likely that this will be more possible in the older states than in the newer states where it is absolutely necessary to develop a considerable mileage of roads in order to give the people access to all of the different sections of the state. That is, there are some sections in which a smaller mileage of high class roads is necessary to meet the traffic demands, and there are other sections in which a longer mileage of cheaper roads will as adequately serve the traffic needs, and which is the only policy that the public will support at the present time.

Connecting the Primary Systems.

The step which seems necessary now is a definite plan of co-operation between the states and the federal government, which will insure that the primary system of each state be connected up with the primary systems of the adjoining states, and that these systems, by agreement between the state and federal authorities, be held to until they are properly improved.

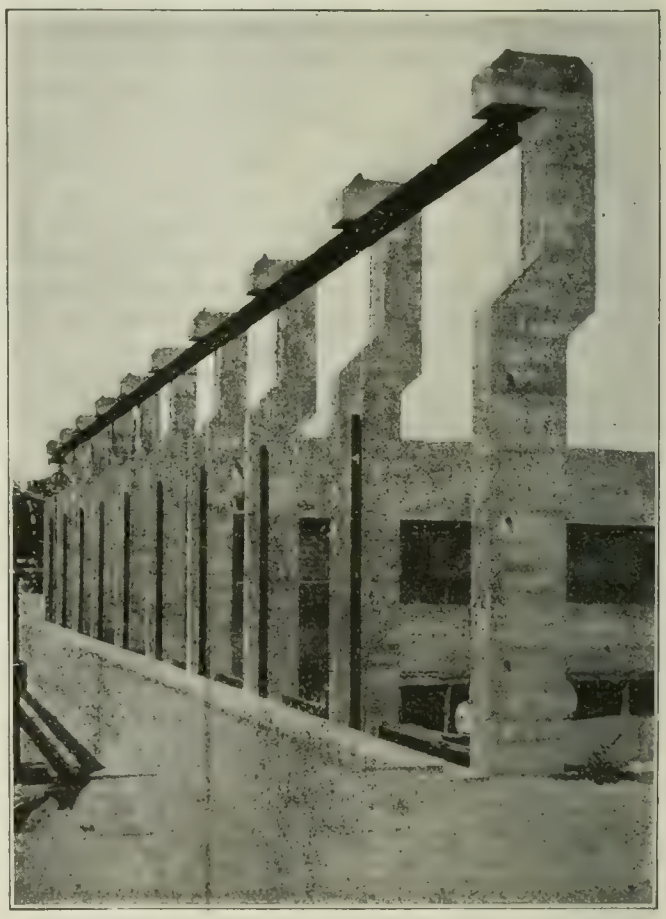
Up to the present time the Bureau of Public Roads has made its objective the perfecting of the administrative relations with the states. These relations have in general been placed on such a basis that better engineering standards can be developed and enforced, and it is undoubtedly a duty of the Federal

Bureau to stand behind the states in their efforts to provide roads that will be adequate not only for present traffic, but for future traffic. This point is of great significance, particularly in those states where roads are being built from bond issues and where it is doubtful if adequate maintenance funds will be provided for those types of roads which will require high maintenance costs. It is true that the Federal aid act requires the greatest co-operation between state and federal authorities in order to make the plan outlined by the law an efficient method of operation, and yet it has as its fundamental basis a plan of action that will have to be used more and more in carrying out large public or private enterprises that are undertaken in this country, and the sooner this fact is recognized and put into operation the better it will be for the industrial life of the nation.

There is now comprised in the 48 state highway departments and the federal department a very large proportion of the engineers of this country who have had actual highway experience, and these agencies can, through co-operation, provide the most effective administrative organization that it is possible to devise. The fact that a considerable portion of these administrative officials are in close contact with the public in all the different localities of the nation, insures the development of the roads which will answer the greatest economic needs. In the law itself there are certain modifications which undoubtedly should be provided for in the extensions of appropriations for carrying out this act. One of these is the $20,000 per mile limitation, which is not now so much of a handicap but may later become so. There are roads being built where the grades themselves, because of the topography, will cost without surfacing nearly up to the limitation now imposed by the law. After these road grades are properly settled they should be surfaced where the traffic justifies. In many of the sparsely settled western states there are large areas of federally owned lands through which the state systems must be projected, and in many cases the roads through areas of this character are necessary links in trans-state or trans-continental lines. To prevent an undue burden falling upon the states which can ill afford to build such roads, consideration should be given to the extension of the appropriations which are now made for the building of roads in the forest areas. These roads in general are of two classes—those which are necessary for the administration of the forest areas themselves, and those which form important links in the state systems. Again, there are roads notably in the western states but found also in some other localities, which are of greater importance as links in trans-state or trans-continental lines of travel than they are to the immediate locality. If the states in which such roads occur follow a program of providing first those roads which meet the greatest economic needs of their people, some of the through roads will necessarily be delayed for some time, and the advantage of a long line of improved roads on either side may be largely lost because of stretches. To take care of cases of this kind consideration should be given to a provision which will allow the bearing of a greater part of the cost from the Federal aid funds than the 50% now specified. Such a procedure would undoubtedly be fair and reasonable, but if adopted it should be carefully restricted and guarded so that the roads which ought to be improved as links in long lines of travel will receive first attention. These points summarize the most important modifications which it seems now necessary to make in order that the present Federal aid law through co-operation between the state highway department and the Federal Bureau of Roads may meet satisfactorily the national need for improved roads, and insure the completion of roads in the order in which they meet the economic needs of the individual communities and thus of the whole nation.

Offset Cantilever Gate Hoist Support

Concrete columns with an offset at the top support a rail on which a trolley gate-raising hoist runs directly over the centers of the headgates of the outlet of Utah Lake into the Jordan River. The offset, as shown in the photograph, is long enough to give clearance for



CANTILEVER EXTENSIONS SUPPORT GATE HOIST

the trolley to pass from one gate to another. Bolts through the cantilever support the I-beam track. This structure was built during the winter, and the concrete was protected by tar paper wrapped around the forms, steam being let into the 4-in. air space between the form boards and paper. The work was carried out by W. A. Knight, superintendent of the nearby pumping station which pumps water over the bar into the river when the water from the lake is drawn down below its natural outlet.

Earth Slips Prove Disastrous to Open-Cut Sewers

Bank Slides and Bottom Upheavals Interrupt Work on Two Detroit Sewers—Revised Methods Correct Trouble

EARTH movements of significant character have occurred in recent large sewer-construction operations in Detroit, Mich. In three instances the consequences have been disastrous. Two of the movements were plain bank slides. The third was a true bottom upheaval resulting from a subsurface flow of plastic material with very slight disturbance of the original banks. Control of open-trench excavation and backfilling has been tightened up as the result of the accidents, and the already prevailing tendency of local contractors and public-works officials toward tunneling methods for sewer construction has been strengthened.

Topographically, the site of Detroit, Mich, is a comparatively smooth plain, rising gently from and not to a great height above the river level. Geologically, this plain is an old lake bed. At a depth of 90 to 150 ft. there is glacially scored limestone ledge. Above this comes a "blue clay" to within 11 to 13 ft. of the surface, and finally a stiff yellow clay with a topsoil of vegetable mold.

The yellow clay covering is hard and firm and forms a strong crust over the more plastic "blue clay." In some parts of the city it has been used largely for making brick. The "blue clay" has physically all the characteristics of a true-blue clay, but chemically it is not clay. Just under the yellow clay crust, for a depth of 17 to 20 ft., it is quite stiff, and then it becomes softer and more plastic. In parts of the plain, sand pockets and lanses are interspersed with the clay. When the clay runs uniform it contains some water, but it is remarkably impervious to the passage of water. It is at various depths in this "blue clay" that the greater part of Detroit's sewers have to be constructed.

Two of these sewers now in progress, the Lonyo Road sewer and the Weatherby Ave. sewer, are the operations on which the earthslides mentioned have occurred. The Lonyo Road sewer is a twin box sewer, with dished inverts and outside dimensions of 32 x 17¾ ft. The Weatherby Ave. sewer is a five-center arch, 24⅝ x 15¼ ft. over all. Both structures are of reinforced concrete, and were located in the "blue clay" below the yellow clay crust.

Lonyo Road Earthslides

Construction of the Lonyo Road sewer was begun at the lower end. The contractor's plan was: (1) To excavate trench by dragline excavator well in advance of the concrete work; (2) to build the invert well ahead of the box walls and roof; (3) to concrete walls and roof with movable steel forms, and (4) to backfill with a second dragline excavator.

A trapezoidal trench, without sheeting or bracing, was opened as indicated by the diagram Fig. 1. The first slide occurred when about 130 ft. of trench had been excavated. It was a plain bank slide which raised the bottom of the trench about 8 ft. for a distance of 50 or 60 ft., as indicated by Fig. 2. The slipping bank crowded up the trench bottom, but there apparently was no true soil upheaval from below. At the time of the slide, July 9, 1919, the trench had stood open about two

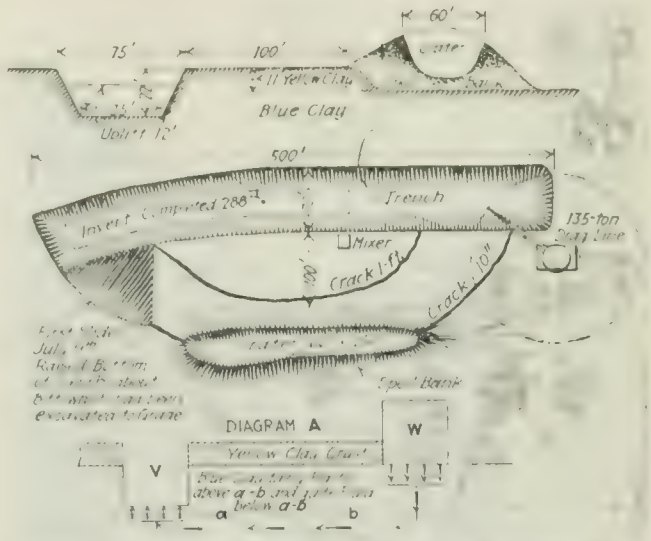


FIG. 1. PLAN OF BOTTOM UPHEAVAL IN OPEN-CUT SEWER

weeks, with the spoil bank close to the edge. No concrete had been placed, and the trench was cleaned out and excavation was continued.

As a precaution, after the first slide, the spoil bank was moved back about 100 ft. from the trench edge. It was placed, as indicated by Fig. 1, in the dry put of an old brickyard, where the top crust of yellow clay had been removed for brick manufacture. Except that the spoil bank was shifted away from the trench edge, construction proceeded as before. The dragline excavator,



FIG. 2. CHARACTER OF BANK SLIP IN OPEN TRENCH

a 3½-cu.yd. bucket machine weighing 135 tons, worked along the side of the trench. On Aug. 27, 1919, about 500 ft. of trench had been opened. From the south end, 288 ft. of invert had been concreted and another 11-ft. section was being poured. On the completed inverts at the south end a set of superstructure forms had been erected. While work was in progress at 10:30 p.m., the second slide began, and was over in a few minutes.

Examination of the wrecked work showed the results indicated by Fig. 1. The bottom of the trench, with the completed invert, had risen from 3 to 4 in. at the south end to 10 to 12 ft. at the north end. The curve of the elevated invert is indicated by Fig. 3. The slab had been shifted very little out of line, and as shown



FIG. 3. BOTTOM UPHEAVAL LIFTS INVERT 12 FEET

by the view, the bank had not settled down against the edge and brought lateral thrust against it. On the far side the clay from the bottom had boiled up between the invert and the bank, as indicated by Fig. 4. Neither bank edge had changed position appreciably. On the surface of the east bank there appeared two cracks, as indicated by Fig. 1. In the spoil bank a crater had been formed by the sinking of the spoil into the plastic underlying clay. The berm between the spoil bank and the trench had not changed elevation.

Apparently what had happened is indicated conventionally by Diagram A of Fig. 1. The weight W of the spoil bank was transmitted by the plastic clay above a-b to the more fluid clay below a-b. Since clay from the cut weighs 120 lb. per cubic foot and the spoil bank was 22 or 23 ft. high at the peak, the maximum pressure was perhaps one ton per square foot. Under the weight W the fluid clay sought relief in all directions, and relief was resisted in all directions except where the trench V made a gash almost to the fluid clay. Here was a void, and into it the fluid clay rose until equilibrium was restored. Possibly a contributing cause, besides the static loads to mobility of the fluid clay may have been the rocking load brought onto the crust by the swinging loaded boom of the dragline.

Reconstruction of the wrecked work will be undertaken. Meanwhile, the contractor, continuing on from the end of the wrecked work, is building the sewer under a modified plan. Only a very short length of trench is being opened. The invert is then concreted immediately. As soon as the invert has set up, the wall and roof forms are placed and concreted; then as soon as the outside wall forms can be removed earth is backfilled onto the concrete. By thus tightening up the control of excavation and backfilling, the work is proceeding successfully.

Damage to the five-center arch sewer on Weatherby Ave. was much less extensive than to the Lonyo Road structure. Like the larger box structure, it is being

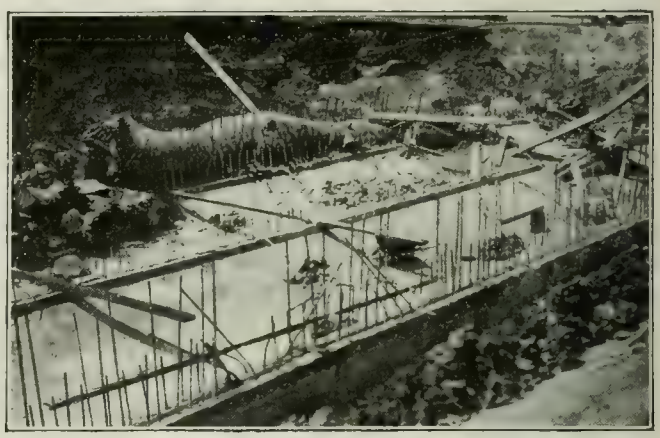


FIG. 4. BOIL-UP OF PLASTIC CLAY AT SIDE OF INVERT

built in open cut excavated by steam shovel and dragline excavator, and a dragline excavator is used for backfilling. The steam shovel makes a cut of 9 to 10 ft., and the dragline, working from the bottom of the shovel cut, completes the trench, which is about 22 ft. deep and 50 ft. wide at the top.

The slide occurred on the night of Aug. 28. It was a plain bank slip, which heaved up the trench bottom



FIG. 5. BANK SLIDE DESTROYS INVERT AND SHIFTS SEWER ARCH

and the inverts completed ahead of the arch, and also shifted sidewise and upward the adjacent completed arches.

The view, Fig. 5, of the cut made nearly 10 days after the accident, indicates the character of the slide, and of the wreck caused by it. The damage has been repaired, and construction is proceeding. Here, as at Lonyo Road, the contractor has constructed his operations and is keeping excavating, concreting and backfilling in close sequence.

Conclusions

In the subsurface soils prevailing in Detroit, the accidents briefly outlined indicate a clear hazard in deep and wide-open sewer construction. If open-cut construction is undertaken, wisdom counsels: (1) That the least practicable length of trench should be opened; (2) that the sewer structure should be constructed in the open trench as quickly as practicable; (3) that a safe weight of backfilling should be placed on the sewer as soon as the outside forms can be removed, and (4) that spoil banks in the vicinity of open cuts should be avoided.

Under other conditions which permit proper cover and an economical section for tunnelling, it is a fair conclusion, also, that tunneling methods promise greater safety than does the employment of open-cut methods.

The work on which the accidents described have occurred is a part of the new public sewer system for Detroit which is being built under the direction of C. W. Hubbell, city engineer.

Reasons Given for High Ocean Freights

Business men engaged in international trade will be interested in an article appearing recently in *Commerce Reports*, by Trade Commissioner Gary, in which he assigned reasons for the very high ocean freights British newspapers, in commenting upon the situation, assert that one of the reasons is that a ton of shipping today performs, according to well informed British ship owners, approximately half the service it did five years ago—a state of affairs largely attributable to the congestion at various ports in Great Britain. At Cardiff recently 50 vessels were lying idle and others were waiting outside the roadstead. Swansea was overcrowded with 200 vessels, and half as many were at Newport.

Much the same conditions prevailed on the east coast. Other reasons for high ocean rates are labor troubles, increased cost of ships, higher insurance values, higher cost of repairs and maintenance, increases in officers' and seamen's wages, heavier bills for food and ship stores, higher dock dues, and higher prices for bunker coal. Five years ago bunker coal could be obtained in Great Britain for $3.65 to $4.87 per ton. Today bunker coal costs $17.08 to $26.77 per ton, an average price for five British ports being $22 per ton.

Wages have increased more than 100%, and the cost of food and of accommodations has also advanced largely. Furthermore, five years ago it cost between $24 and $29 per ton to construct a vessel in Great Britain, while today the same vessel costs $146 per ton.

Mechanical Engineers Recommend New By-Laws for Student Branches

THE closest sort of coöperation between student branches and the parent body of the American Society of Mechanical Engineers is indicated in proposed additions to the by-laws published in the October number of *Mechanical Engineering*. The changes in the by-laws have been proposed by a special committee appointed to investigate student-branch requirements and to recommend a policy for the conduct of student-branch work.

The committee was headed by Ira N. Hollis. Its report was recently made to the Council of the American Society of Mechanical Engineers.

It was pointed out that the ineffectiveness of the relations existing between colleges and the parent organization seemed due to a lack of definite program, failure to coördinate with student organizations, and a reliance upon the initiative of a few individuals. No material change is made in the autonomy of the student organizations through the proposed additions to the by-laws, the most important of which additions are the following:

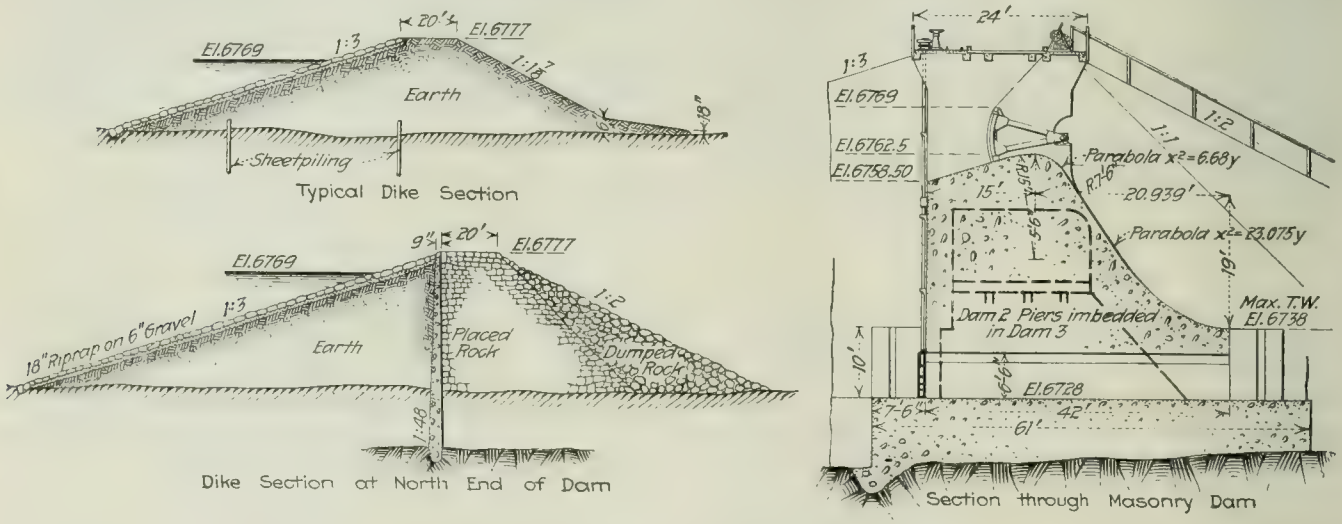
1. Each student branch shall annually elect one of its members to serve as corresponding secretary. He may receive a nominal remuneration and expense account from the society. His duties shall be those ordinarily attached to such a position, and in addition thereto he shall be responsible for the maintenance of records and serve as a channel of communication with the parent society.
2. The society shall issue every spring a syllabus or suggestion of some one subject or subjects for consideration for the following year.
3. The authorization of ten scholarships, not to exceed $200 each, to be awarded under rules prepared and administered by the Committee on Relations With Colleges.
4. The setting aside of a fund to be invested in loans for deserving students, to be administered by the committee.
5. The authorization of the necessary expense for sending a representative of the society to visit student branches, preferably selecting one or more members of the Committee on Relations With Colleges for this service.
6. That the Committee on Relations With Colleges be instructed to encourage coöperation among the different branches of engineering in college as well as among the different student branches in the different colleges.
7. That the Committee on Relations With Colleges be instructed to encourage the students to conduct the affairs of the branch themselves rather than to depend solely upon faculty direction or supervision.
8. That the president of the society, either personally or through the committee, be requested to confer with the engineering socieies, looking to coöperative effort in connection with education.
9. That the local sections of the society be requested to interest themselves in the student branches within their localities.
10. That the organization of student branches be left with the Committee on Relations With Colleges, subject to the approval of the council.
11. That, so far as it seems advisable and possible, the society, through its committee, assist the student branches in obtaining from time to time a few good lecturers from the outside.
12. That a student who has done the most effective work in a student branch in his senior year may be elected to junior membership in the society, upon graduation, by the student branch, and that the society remit the initiation fee and dues for the first year.
13. That the present system of student prizes be continued and, if found possible and advisable, extended.

Jackson Lake Dam the Savior of the Snake River Valley

Third Dam in Ten Years Envelops Second — Flush Method of Delivery Discarded for Regulated Continuous-Flow Method

BY REASON of the bountiful supply of stored water Jackson Lake, in Jackson Hole, Wyoming, has been able to deliver to the farming district of southern Idaho, the lake is directly responsible for crops, equalling many times its original cost, in the Idaho Falls, Minidoka and Twin Falls districts. It is not a pretentious structure nor was its cost excessive, the developed 789,000 acre-feet storage water costing about $1.50 per acre-foot.

The construction of three dams of different types in 10 years, the envelopment of the second reinforced-concrete structure in the third massive gravity dam, a shift transversely of the last dam to a foundation on rising bedrock, and the operation incident to the delivery of stored water, are features noted below, because the working to the substantial final construction and the operation are typical experiences of many other irrigation storage properties. The following information and the photographs were obtained during an inspection of the whole Snake River Valley by a representative of *Engineering News-Record*, and also from a paper presented to the Idaho Irrigation Congress by F. A. Banks, engineer, United States Reclamation Service, with whom the inspection of the dam was made.



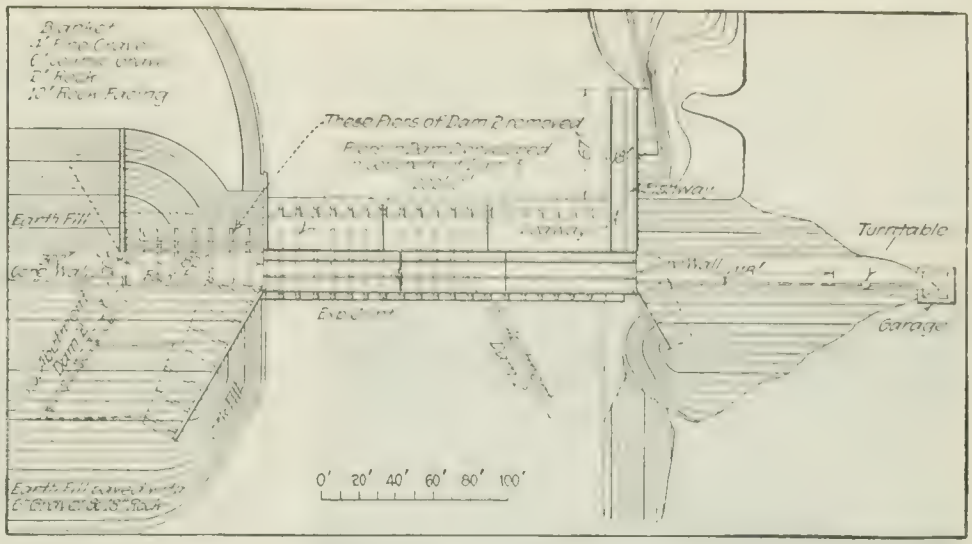
THIRD JACKSON LAKE DAM ENVELOPS DAM 2

Of the three dams constructed across the outlet of Jackson Lake, through which the south branch of the Snake River runs, all were for the purpose of storing additional water for irrigation over and above the natural run-off, the latter being appropriated thirty to forty years ago by early settlers.

The first storage development was a temporary timber crib dam built by the United States Reclamation Service in 1906-7, the first water being stored in 1908. It was the intention to utilize it later as a cofferdam for a permanent dam. The water was raised 14 ft., providing for 250,000 acre-feet storage on top of the original surface, which covered 17,500 acres. On July 5, 1910, nine of the 30 cribs were washed out, and immediately work was started on dam 2, a 206-ft. reinforced-concrete gate section composed of piers 2 ft. thick on 10-ft. centers separated by decks and a curtain wall. For 50 ft. at the north end the dam was founded on piles driven to rock. The remainder rested on rock. A rock-filled crib took the place of a concrete floor in the north half of the dam. Twenty 5 x 8-ft. radial gates controlled the discharge openings at the bottom of the curtain wall between the piers. Flashboards above a platform or deck at an elevation 17 ft. above the gate sills raised the leak level another 7 ft. A concrete core wall founded on rock was constructed for the entire 200 ft. length of the south dike, and another, founded on sheetpiles, was run 300 ft. into the 2600-ft. north dike. Shortly after the completion of the dam in 1911, an agreement was entered into between the Reclamation Service and the Twin Falls Canal Co. and the Kuhn Irrigation & Canal Co., representing respectively the Twin Falls south and north side projects, to raise the height of the dam an additional 17 ft., thereby increasing the storage from 380,000 acre-feet to 789,000 acre-feet. Costs were borne by the companies, and the work was completed by force account by the Reclamation Service in 1916.

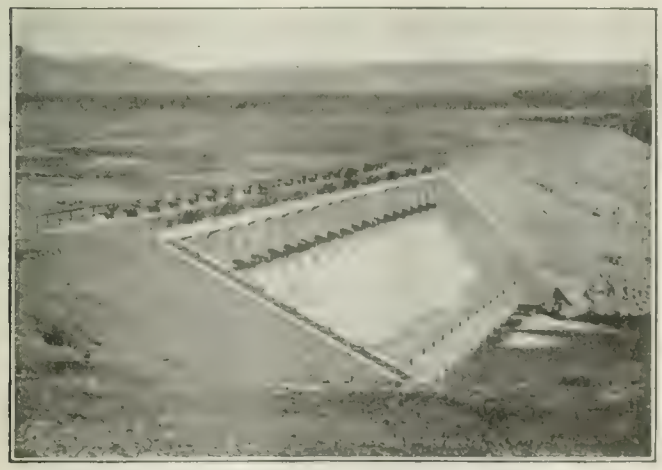
Dam 3, enveloping No. 2, has a concrete gravity section 222 ft. long containing twenty 6 x 8-ft. outlet tunnels controlled by sliding sluice gates, 19 radial spillway gates 6½ ft. high and 8 ft. long, one logway equipped with a radial spillway gate and a fish ladder. The radial gates were salvaged from dam 2. The sluice gates are operated by Ford automobile engines installed on homemade trucks running the length of the dam over an industrial track. The structure was moved transversely to the south 82 ft., since bedrock under the north end of the dam dipped rapidly below the river bed and it was desired to found all of this third dam on rock. Concrete core walls were sunk to bedrock and extended into the north dike to join the core walls already built extending 300 ft. beyond the end of dam 2. The 4000-ft. north dike is riprapped with stone 18 in. thick laid on 6 in. of gravel. The earth embankment was placed by a hydraulic dredge located in the reservoir site, leaving a 200-ft. berm between the borrow pit

and the dike. About 2½-sec.ft. leakage develops when the reservoir is filled, but the seepage water is always clear and shows no tendency to increase in volume; therefore no apprehension of damage is felt. When the reservoir was filled, some seepage developed at the lower toe. To reduce seepage through the dike, a layer of borrow-pit run of gravel-bearing clay was placed on the upstream face, and to suppress the springs formed by seepage under the dike the downstream slope was changed from 2 : 1 to 1⅞ : 1, and the material obtained was used to form a blanket. To prevent logs which are uprooted by the heavy ice on the flooded wooded area from interfering with the spillway and clogging the gates, a log boom has been thrown in front of the dam. Logs are towed by a small launch to the dike, and in the summer when the lake is emptied they are piled and burned. The normal area of the water surface was increased from 17,000 to 25,000 acres. Much of the flooded area has now been cleared by the ice action, the logs floating to the nearby shores, where many of them indicate that rapid decay has already started.



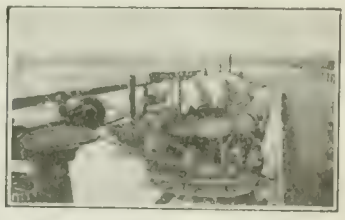
SECTION OF JACKSON LAKE DAM

The Jackson Lake watershed is 820 square miles of mountainous country ranging from 6700 to 14,000 ft. above sea level, from which the main run-off, particularly that which can be stored—as distinguished from natural flow which is needed for immediate irrigation—is melted snow. The mean annual run-off is 1,000,000 acre-ft., and the storage has been developed to a point where, with the present heavy irrigation demands, even with holdover added, the reservoir will fill on an average of but seven out of eight years. During 1918-1919 only 558,000 acre-ft. were stored, hence scientific operation to conserve all of the stored water becomes extremely necessary. The water thus stored supplements the water rights of 750,000 acres of land bearing crops which are worth much in excess of $30,000,000 annually. Specifically, water may be stored when any water is wasted over the Milner dam, which is the last large diversion point on the river. Also, when the flow falls below 10,000 sec.-ft. at the Heise gaging station, located above all of the diversions, the gates must be opened and the natural flow released to supply prior interests.



MASSIVE MASONRY SECTION HAS RADIAL SPILLWAY GATES—LONG DIKE IS RIPRAPPED BOTH SIDES

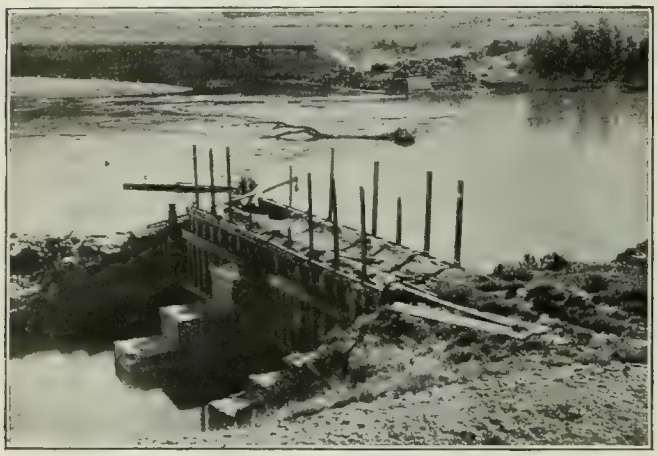
The two systems employed in the delivery of stored water are, first, the release of large heads in separate flushes, and, second, the maintenance of a uniform flow to meet the demands. With the first method, which was used from 1908 to 1911, the natural flow was established, and then an attempt was made to limit these diversions to the natural flow while the stored water was flushed by the Upper Valley headgates to the Lower Valley. Computing the time when Lake Walcott, the Reclamation Service distributing reservoir for the Minidoka project, would be empty, a head large enough to fill it would be released from Jackson Lake in time to cover any shortage. The lake gates were shut off before wasting at Walcott occurred. Previous to the flush, all of the Upper Valley gates were staked, and after the water had passed they were restaked, based on resumed natural flows. The arrangement was unsatisfactory to all interests. When the canals were staked under a falling river the stored water interests lost much water. The heavy flushes washed out the temporary wing dams which the Upper Valley water users had to reconstruct as the natural flow decreased. The expense of reconstruction and the interruption incident to their repair or replacement led to the second method, which has been in operation since 1911.



CHAIN CONNECTS FORD MOTOR ON INDUSTRIAL CAR WITH GATE STAND

Assumptions are made as to the loss of stored water between various gaging points in the upper stretches; these assumptions are based on past experience. The return flows are also accounted for, and by a process of additions and subtractions the stored-water and natural-water proportions are determined at every gaging and large diversion point in the river. A deputy state engineer handles the stored water, and a water

master the natural flow. This season all of the numerous interests combined to obtain a well paid engineering organization which would collect data to regulate the flow to meet the demands and priorities daily. To the deputy are reported daily, by telephone, gagings by hydrographers from the various stations on the river, together with information concerning all diversions, by ditch riders, and of the stages of Jackson Lake and of various smaller storage reservoirs. These men are all



ANDERSON DIVERSION DAM BELOW HEISE GAGING STATION WASHED OUT

under one general supervision, the water master working in close harmony with the deputy. Reports and calculations are completed daily, and one day's orders for operations are based on those of the day previous.

The Jackson Lake dam was designed by F. A. Banks, engineer, and constructed under the direct supervision of Mr. Banks and F. T. Crowe, superintendent of construction, reporting to F. E. Weymouth, then supervising engineer, Jackson Lake Enlargment Project. Its operation is now under the general direction of Barry Dibble, project manager, Minidoka project. G. Clyde Baldwin is the special deputy for the state engineer controlling the transit of the stored water past 50 headgates, 315 miles from Moran to the last diversion at Lake Walcott and Milner. John Empey is water master in charge of the natural flow. The office of water master is elective.

Durability of Green and Seasoned Timber

Durability of untreated timber exposed to the weather and in contact with the ground is about the same for green and seasoned timber, according to experiments made by the United States Forest Products Laboratory. Ties of green larch on the Northern Pacific R.R. had an average life of 7.3 years, while Douglas fir had an average of 7.6 years in Montana and 7.7 years in Washington. For seasoned ties the averages were 7.4, 7.7 and 7.8 years, respectively, the difference being so slight as to be negligible. Observations on telegraph and telephone poles showed a slightly lower rate of decay for green than for seasoned timber. This condition is due to the fact that the moisture content is the principal factor in determining the rate of decay, and that both green and seasoned timbers, when exposed, soon reach the same moisture content. Wood for interior construction in buildings, however, usually does not dry out rapidly and must be seasoned before use; otherwise it is likely to shrink and decay.

Through Concrete Arch Bridge to Give Large Waterway

Roadway Suspended by Light Hangers and Each Floor-Beam Hinged to Allow Bending Under Arch Expansion

By F. W. Epps
Bridge Engineer, Kansas Highway Commission, Topeka, Kansas

In replacing a through steel truss bridge across Soldier Creek, at Kansas City, Mo., a somewhat uncommon through concrete arch bridge was recently built, with a resulting economy, pleasing appearance and large waterway, all necessities of the design.

The old bridge, a 130 ft. span of light construction, carried a heavy traffic into the city and was found to be unsafe. The clear waterway of this span was 2300 sq.ft., but this was found to be too small in time of flood so the drainage board established the enlarged area at 3000 sq.ft. The conditions to be met in designing the

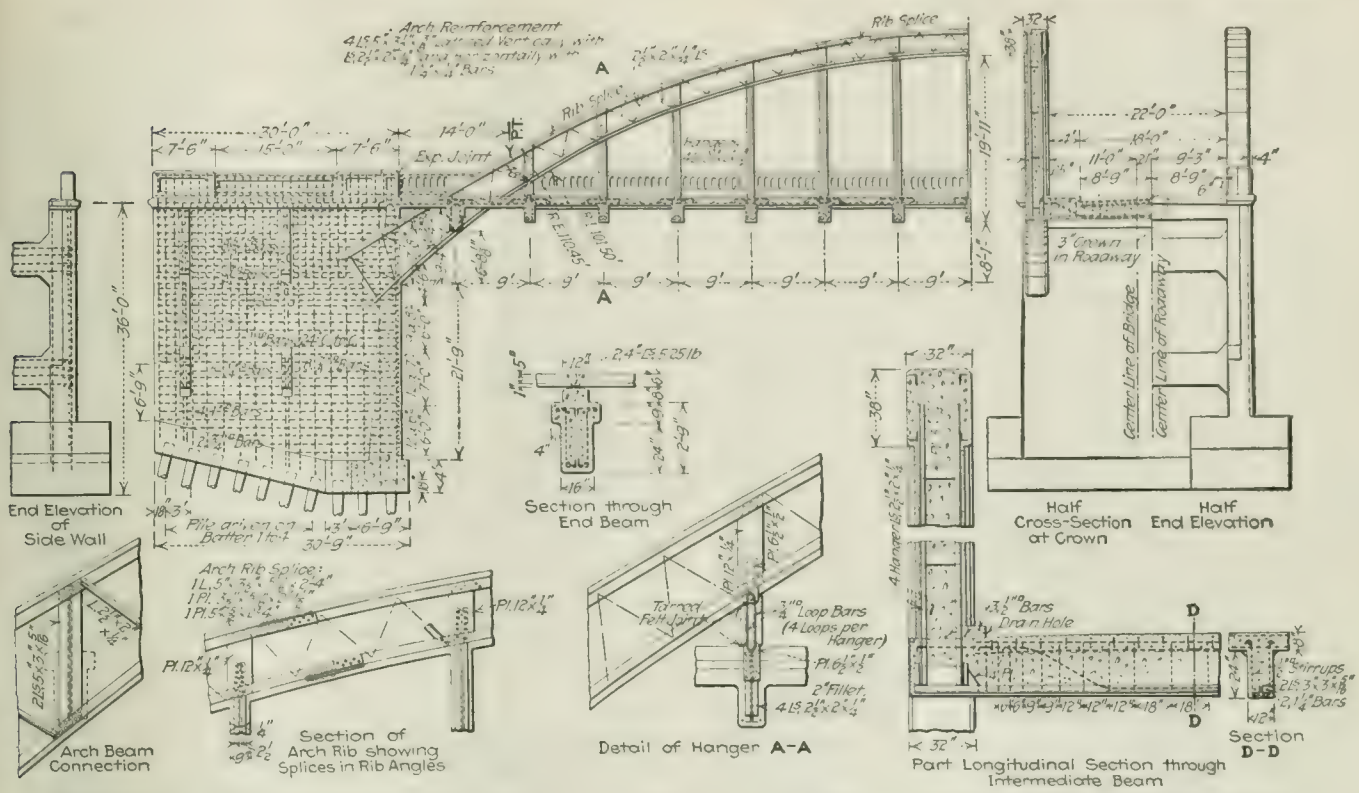


COMPLETED SUSPENDED ROADWAY ARCH BRIDGE

new structure were four in number: First, there had to be an enlarged waterway; second, grades on both sides of the bridge were fixed by adjacent property; third, it was desirable to have a beautiful structure on account of its location at the edge of the city with a park on one bank of the stream; and, fourth, economy was demanded. A through steel truss bridge would have met the first and second conditions, but would have been of prohibitive cost because of the war price of steel. A spandrel arch, in order to meet the waterway requirements, would have made necessary a change in grade



ARCH RIBS SUPPORTED ON FALSEWORK



DETAILS OF REINFORCED-CONCRETE BRIDGE, SUSPENDED ROADWAY, SOLDIER CREEK, TOPEKA, KANSAS

or a longer span, thereby increasing the cost. The length of span used, 140 ft. was determined by the required waterway and the existing banks of the stream. The reinforced-concrete twin arches with suspended roadway answered all requirements of clearance, cost and strength.

The two arch ribs were designed as simple arches, reinforced with four 5 x 3½ x ⅝ in. angles laced together with plates and angles, and carrying the angles of the hangers by a riveted connection. This reinforcing steel was not intended to carry the erection loads. The hangers at each floor-beam were made slender to allow bending under the deflection and expansion of the arch. As the hangers became shorter near the haunches of the arch, the stress due to this bending increased, so at the second panel from the end a pin connection was used at the arch and at the floor-beam.

As shown in the special detail, at the first floor-beam there is no hanger, the beam framing into the arch, and an expansion joint is provided between the floor-beam, which acts with the arch, and the floor slab which moves between the abutment and the pin at the first hanger.

The floor-beams were designed as T-beams, monolithic with the floor slabs. The bottom steel is of two angles framing into the hanger angles, but the stirrups and upper steel are rods. The first floor-beam, as previously stated, was made larger and separate from the floor, to act as a simple beam, and is reinforced with latticed angles. Additional stiffeners in the way of angles are placed in the arch rib at the connection of the floor-beam.

The abutments, as shown, are hollow with reinforced walls and solid extensions carrying the arches down to the footings which on the north side rest on a rock ledge, and on the south side on eighty-eight 25 ft. piles.

The entire structure was supported on falsework, the pile bents being placed 18 ft. centers under alternate panel points with a wood truss to support the intermediate panel point. During a heavy storm, high water took out one span of the falsework and threatened the entire bridge. One arch had been completed but pouring on the other arch had been finished only three days previously. There was no apparent deflection of the arch, indicating that the bridge would have stood had the falsework been entirely carried away.

In pouring concrete the abutments were carried up to the haunches of the arches, then the floor-beams were



STEEL FRAME BEFORE CONCRETE WAS POURED

poured. Next each arch was carried up from both sides at the same time, the hangers being poured as they were reached. The floor slabs were then run in, and the side walls of the abutments poured, completing the structure.

The work was under the direct supervision of J. E. Williams, County Engineer of Shawnee County. The design and plans were made by the Marsh Engineering Co., of Des Moines, Iowa, and approved by W. S. Gearhart, former State Highway Engineer. The contract was held by the Leavenworth Bridge Co., of Leavenworth, Kansas.

Electric Mucking Machine Used on Hetch Hetchy Tunnels

San Francisco Finds Equipment Developed for Mining Operations Economical for Day-Labor Tunnel Job

ON THE Hetch Hetchy water-supply project being built by San Francisco, the city is now working six headings on an 18-mile tunnel which will be entirely through solid rock. Progress on the tunnel is the limiting factor in completing the first unit of the project, and within the limits of funds available every effort is being made to advance the headings as rapidly as possible.

The contractors' bids on this tunnel work, submitted Aug. 22, 1917, were so much higher than the city engineer's estimate that all bids were rejected, and the city has been doing the work on a day-labor basis.

The longest stretch between headings is the 4.5 miles between South Fork and Early intake. On this part of the work an advance of 2500 ft. had been made on the South Fork end and 2600 ft. on the Early intake end by Nov. 1, 1919, leaving 18,600 ft. remaining to be driven. In addition to a 600-ft. shaft sunk to tunnel grade at Big Creek, a total of about 8700 ft. of driving had been made on all six headings up to Nov. 1. Progress has been slow because of delay in selling bonds. The city engineer has repeatedly pointed out that the work could be done more economically if three shifts, instead of one, could be employed.

A few months ago, in an effort to get out the muck more speedily as well as to do away with the need for employing muckers, it was decided to try an electric mucking machine, made by the Myers-Whaley Co. for handling ore in mines. The machine has been working at Priest portal, and during August the labor cost at this heading was $15, as against $23.71 and $21.42, per foot at South Fork and Early intake headings, respectively, where harder rock was encountered and hand mucking methods were used.

The machine has not been operated without interruptions. Delays have been caused by the wearing and breaking of the conveyor belt which carries the muck and by similar trouble in the chain carrying this belt. The exposure to abrasion and the rough usage incidental to continuously handling heavy broken rock is such that delay for repairs was expected at more or less frequent intervals. However, on the whole the machine has shown a material saving, the city engineer says, and additional machines for handling muck are to be put in at other headings.

In using this machine, one operator is required for manipulating the controls and another for changing cars under the delivery and of the belt conveyor. The muck is picked up from steel plates, placed before the blast, by a scoop or shovel which dumps by tilting backward. A belt conveyor takes the muck up over the top of the machine and to the rear end, where it drops into the cars placed to receive it. The shovel consists of two parts, the forward section or lip resembling the teeth of a steam-shovel bucket, and another part immediately back of the lip which serves as a scoop to receive the muck and deliver it, by tilting backward, onto the belt conveyor. In the type in use on the Hetch Hetchy the bucket will load one ton per minute under favorable conditions.

The shoveling and dumping cycle is repeated normally 10 to 15 times per minute. It has been found unnecessary to break up rock under 2 ft. in size, although with pieces of this maximum size the wear and tear on the machine is much greater. The belt conveyors, made of very heavy canvas, are armored with steel bars riveted through the fabric. Manganese-steel teeth are used in the shovel lip.

The entire machine can be moved forward to follow up the pile independently of the operation of shovel and belt conveyors, and the entire forward end of the machine is pivoted to be swung horizontally through an angle of 45°. Similarly, the rear conveyor has a swing of 40°, so that cars may be loaded on either track if the tunnel is served by a double-track line.

A single electric motor is used for moving the machine and operating its mechanism. Between the motor and the bucket a friction clutch is provided, set for the maximum safe motor torque, so that in case too great a load is put on the mechanism the clutch will slip and protect the motor. Motive power is provided by chain drive from the motor to all four wheels.

The work on the Hetch Hetchy project is under the supervision of M. M. O'Shaughnessy, city engineer of San Francisco.

Impressions Here and There

Public-Works Engineering in Cleveland

VARIOUS big engineering projects are afoot in Cleveland, involving questions which as yet are largely unsettled but whose final adjustment ought to come soon. In any case, a decision on these matters is bound to exert very direct influence on the city's future development. The existing situation would be of interest at any time, but seemed specially interesting during the recent pre-election doings. The campaign brought out strikingly what doubtless every engineer knows but at ordinary times does not always consciously realize: that there is only the loosest and most inefficient sort of connection between the political mechanism of city government and planning for the improvement and growth of the city.

Four mayoralty candidates have been contending for votes. One might expect that such a campaign would be very educational, that the larger matters affecting the city's future would be fully discussed, and that in this way the election would be a step in municipal progress. Nothing of the kind developed. The actual issues were the usual commonplaces. There was nothing that would lift the election above the plane of ordinary political contention, nothing that would warrant a hope that the public will take its future into its own hands by insisting that the planning for all controlling features of city development be done by the municipal engineers.

The background behind the persons and parties of the campaign is made up of half a dozen public-works projects of great magnitude, of determining effect on the city's future but themselves quite out of the city's control, apparently. The latter fact may explain in

part why the recent campaign did not concern itself with them. In so far as such enterprises require a city franchise or city money, they are (under the Cleveland system) voted on in special referendum elections, which, however, naturally take on a political aspect themselves and do not necessarily produce technically sound decisions.

Of the present projects some are in the hands of the county (city and county government being still separate in Cleveland), some in the hands of a newly created political body, and some in charge of private interests. Broadly speaking, the city, though possessing a good, if uncentralized, engineering organization with a number of strong men in it, stands by as a passive onlooker while various outside bodies plan out its future development. The newly formed conservancy district for river straightening is organized under a state flood protection law passed five years ago, and will work out its plans and raise money without reference to people or city council. The costly Lorain-Huron bridge is to be built by the county, though it will be in every sense a city thoroughfare. The Union Station enterprise, approved in general terms last winter by popular vote in favor of a franchise ordinance, is now wholly a matter of negotiation between private corporations, and its details will be worked out by them. In each instance, the city's engineers will have to govern their own work by that of the outside bodies, and must adjust public services and reshape traffic currents not according to the city's needs but according to the preferences of men devoted to other interests. Would it not appear possible to get more consistent and more efficient results through some centralization of function and responsibility where it really belongs, in the city's engineering department?

Some delay in public-works planning resulted from the election in at least one case. The effect is the more unfortunate because the past season has not been active either in public improvement or in maintenance work. The street-car-subway scheme proposed last summer has been allowed to sleep for several months, so that it would not be dragged into the campaign, it is said. With the election over it is certain to be put to popular vote soon. Even now, however, final action on may be premature, as it does not appear that the value of the scheme to the city's welfare and future development has been studied from the standpoint of the city's own engineers, who, of course, are primarily concerned with planning along these lines.

River Straightening

Newest among the large-scale improvement projects the Conservancy District has not yet passed through the teething stage. Recently the county court approved the formation of the district, limiting it to that part of the Cuyahoga River valley lying in Cuyahoga County (thus not even including all of the city), and subsequently appointing three directors—business men and lawyers, not a single engineer. But the court's action has been appealed, and the case is likely to be interesting. Though the district was formed under the flood-protection law, the case might be described as a project for straightening the Cuyahoga with flood protection as its most convenient justification, rather than a project for flood protection with river straightening as its most convenient method. It is admitted that the straightening will be greatly beneficial to navigation in the river, and many people suspect that the flood-reducing effect is likely to be exceedingly small. This curious phase of the matter, however, leads to another difficulty.

As the lower Cuyahoga valley is filled brimful of factories, railroad yards and docks, any sort of channel rectification is going to mean a pretty thorough tearing up. Just at present no one knows what can be done, what needs to be done, and what it would be profitable to do, in the way of river improvement through the bottoms. In any event the cost and damages will be very great, and under the law they must be assessed where the benefits will lie. Taking account of the increased harbor values created along the straightened river, the principal gains, it is generally conceded, will go to industrial plants up the valley, which will be able to bring lake ore to their docks more cheaply. To what extent these various interests will submit to navigation-benefit assessments, and to what extent flood-protection benefits will cover the cost of the work, cannot be foretold. It is going to be hard enough to work out any sort of river improvement that will be defensible in court as a sound engineering project; but benefit assessment is going to be a still harder task. Builders of river-straightening machinery need not look for inquiries from the Cuyahoga Conservancy District within the next year or so.

It is also an interesting fact to note that the restoration of the river as a harbor is in conflict with the half-evolved lakefront harbor project, which, however, seems to have been dormant of late.

Rapid Transit and the Public Square Problem.

Three other projects closely interdependent form a problem many times larger than this and one in which it would seem that by all means the municipal engineers should have a controlling voice. These are the new union station in the Public Square, the plan for suburban or semi-rapid-transit service on the C. & Y. (Cleveland & Youngstown R. R.,) and the downtown terminal loop subway for street cars. The C. & Y., by the way, is expected to start suburban service in a small way very soon, operated by the Cleveland Railways Co.; a dozen or so cars are now being refitted for the proposed service.

So far as rapid transit is concerned, it is rumored that those on the inside have held that the city does not need and should not build rapid transit lines of its own, but that private enterprise either by means of a subway system through the streets or preferably by utilizing the C. & Y. right-of-way should furnish the service. This sort of planning, however, was largely that of private parties, and to some extent of public political officials, but not of the city engineers; the latter apparently have not been asked or had opportunity to study rapid transit.

As to the C. & Y. project, which was originally a suburban railway scheme to develop a section of outlying real estate, it grew larger when the Nickel Plate, a New York Central line, became identified with it, and soon developed into a plan for a union station to accommodate the four minor railways entering the city. This would have left the Big Four, the Penn-

sylvania, and the New York Central (the old Lake Shore) in a separate union station at the lake front. Even this arrangement would have made the crowded public square the focal point for street car and interurban traffic plus the traffic of four railways—an ideal arrangement for a city of 100,000, but hardly suited to the self-conscious 1,000,000 city. Last summer, however, the promoters brought the three big railways into the same public square plan and the scheme swelled to such an inflated cost figure as to be really startling. At that time also the Board of Rapid Transit Commissioners had under consideration a plan for "rapid transit" which was opposed to real rapid transit as being too costly but contemplated the construction of terminal-loop subways for the street cars under the square, a proposal dovetailing neatly into the C. & Y. union station scheme.

Two new cross currents in this whirlpool of projects are of some interest. Experts have recently testified that within a very few years the city will need extensive rapid-transit service and will need to spend great sums of money in providing it. On the other hand, opinion among city officials seems to be shifting away from the plan to build short terminal-loop subways (which would cost $15,000,000 but would not earn a cent) and to favor building instead a couple of miles of subway capable of giving real rapid transit service. This may develop further within a short time.

The thing that stands out is that the whole case or group of cases is far more important to the city than to any one of the private interests involved and that yet the principal decisions are reached by the bankers and representatives of private interests, and not by those men who, through technical knowledge and through conscientious disinterested responsibility are specially fitted to plan for the city's development.

Miscellaneous Matters

It is obvious that much repaving needs to be done in Cleveland. But the city's financial condition may interfere here, or at least make progress slow. Another opportunity for a careful engineering look ahead.

Salary scheduling for engineers in the municipal employ is an active subject at the moment. A committee has worked out a classification and submitted it to the Board of Control for approval. Its strongest feature is said to be this: That a definite starting point of the schedule was established by equating the lower grades (engineering aid and apprentice, such as levelman, rodman and plain draftsman) to the grade of mechanic and mechanic's helper. This fixes for the lower engineering grades a far juster compensation than is now generally paid and allows of stepping up in consistent relation to the grades of higher experience and responsibility.

These same engineering employees who have been trying to deal systematically with the pay question did the unusual by holding a political meeting during the campaign now over. It was a very live meeting at that. Their organizaion, the local chapter of the A. A. E., invited all four mayoralty candidates to address them at a special meeting—and the best part of it is that all four were present, either in person or by representative. Says one of the organizers, "We wanted to get the boys interested in city government. And, in the second place, we wanted to show those politicians that engineers are a factor to be reckoned with in future political calculations."

If the Cleveland engineers keep this up they may yet get to the point of securing representation on boards and commissions appointed to handle technical subjects.

Nov. 8, 1919. Cleveland.

Sand Removed From Canal by Sluicing

REMOVAL of sand blown into the west extension main canal of the Umatilla irrigation project, United States Reclamation Service, has been a source of trouble since the canal was put in operation in 1916. This canal is 26¾ miles in length, is lined with concrete and has a designed capacity of 365 sec.-ft. at the head to 77.5 sec.-ft. at the lower end. It passes through sandy areas subject to high winds, and in 1916 and 1917 it was nearly filled at some places by the drifting sand. Channels in this were cut by teams and scrapers. In 1918 a 12-mile stretch contained some 50,000 to 75,000 cu.yd., but the canal could not be cleaned by teams unless the water were turned out. To avoid this, sluiceways were proposed, and four such structures were built, but with the 30-sec.-ft. available the sand was moved for only about ¼ mile. Loosening by teams, and other methods, were not successful, as the sand was too heavy to remain in suspension and would soon settle again.

The problem of transporting the blown sand with a comparatively small head of water was solved by the use of a gate or templet to check the water and concentrate its flow around the bottom and sides. Experiments lead to the development of a wooden diaphragm about 6 in. smaller than the section of the canal, supported by a 4 x 6-in. timber laid across the canal. At the middle is a 2-ft. opening from top to bottom which permits the escaping water to act on the middle of the sand bed as well as at the sides and bottom. As the water washed the sand away the templet was shifted a few feet downstream. The water pressure assisted this movement materially, so that one man could operate the device easily by crossing back and forth on the timber.

With a cost of 15.8c. per cubic yard for the field work, 5.9c. for engineering superintendence and overhead charges, and 4c. as a plant charge for building sluiceways, the total cost was 25.7c. per cubic yard. With teams and scraper the cost was 27c. to 40c. in removing the top portion of the sand, and it would have been much higher for a greater depth of excavation.

To prevent the wind from blowing the sand, the spoil banks have been covered with brush and sand fences of brush built at right angles to the canal where some of the worst blows occurred. Rye was sown on the banks, but there was not sufficient moisture for its growth, while the loose sand is not conducive to the growth of weeds or grass. It is thought that the canal can be kept clean by the protection work on the banks and by running water to the limit of the capacity of the canal.

The above information is from an article by H. M. Schilling, project manager, in the September issue of the *Reclamation Record*, published by the United States Reclamation Service.

Small River Terminal For Widely Varying Water Stages

Municipal Pier and Warehouse on Cape Fear River at Fayetteville, N. C., Solves Problem of Local Freight Handling

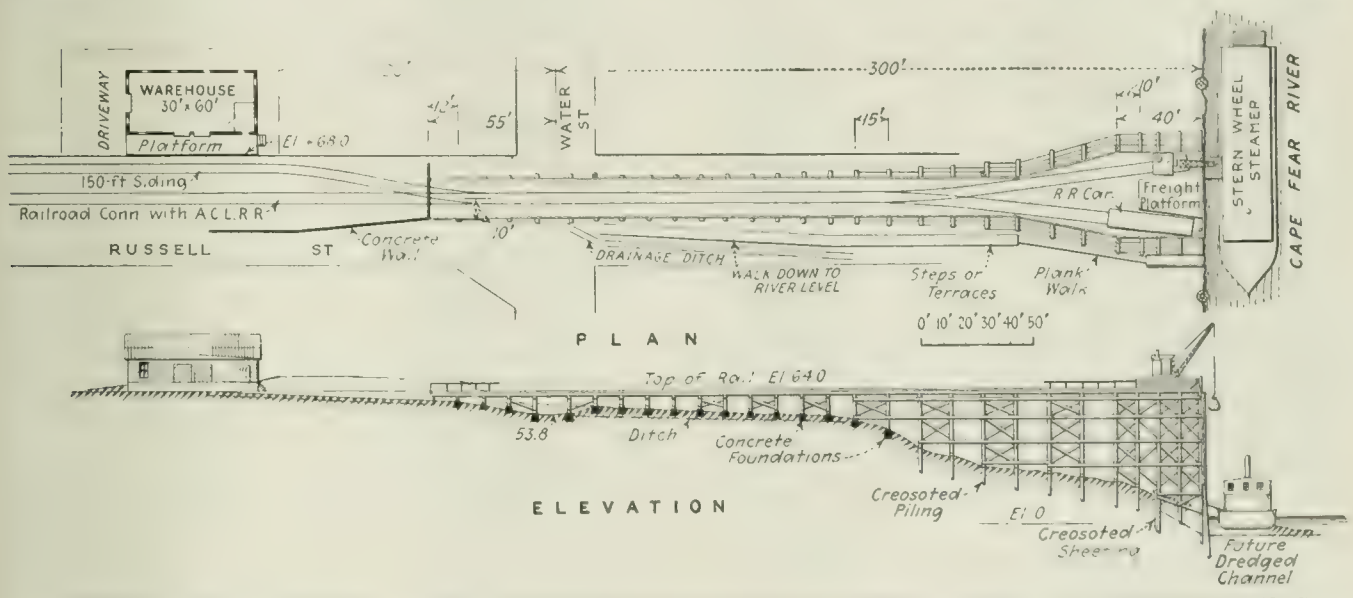
By Hunley Abbott

General Manager, Alsop & Peirce, Contracting Engineers, Newport News, Va.

FREIGHT handling from ship to shore on rivers of widely varying stages is always a difficult matter. How the pier was designed for one small river terminal is shown in the accompanying drawing of the municipal pier and warehouse to be built for the City of Fayetteville, N. C., on the Cape Fear River. The floor at El. 68, and running a timber trestle from that point out to the river bank, as shown on accompanying drawing.

A connection with the main line of the Atlantic Coast Line R.R. is brought down Russell St. and carried out to the end of the pier, with a siding in front of the warehouse. The top of the rail and the deck of pier are kept 4 ft. below the elevation of the warehouse floor, to facilitate loading to and from warehouse by team or railroad car.

The pier is widened out at the river end, and the railroad track is split into a Y, with a raised freight platform in between. Railroad cars and teams are brought out on the pier, and unload onto the pier-head platform. A locomotive crane standing on one of the branches of the Y transfers freight to and from river steamers lying at the head of the pier. Net slings



GENERAL PLAN OF MUNICIPAL PIER AND WAREHOUSE ON THE CAPE FEAR RIVER AT FAYETTEVILLE, N. C.

United States Government is spending more than $1,000,000 to dredge an 8-ft. channel in the Cape Fear River from Fayetteville to Wilmington, a distance of about 110 miles, and the city intends to provide easy access to the river boats for both railway and team deliveries.

The banks of the river at Fayetteville are very steep and high, and great variations often occur in the water stages. The river has been known to rise 68 ft. above low-water level, and a rise of 30 to 40 ft. is to be expected several times each year.

The chief problems to solve in the design of this warehouse and pier were: (1) The warehouse was to be located well above the highest water stages of the river; (2) the pier was to be so designed that traffic could be handled over it at practically all stages of water; (3) it was to be located at the most convenient and economic point and was to have a railroad connection as well as team facilities; (4) it was to be designed to handle practically any and all kinds of goods, package goods, cotton, lumber, piling and material in bulk, such as coal, sand, gravel, acid phosphate and the like; (5) economic freight-handling equipment was to be installed; (6) the total cost of these improvements was not to exceed $75,000.

These conditions were met by locating the warehouse on high ground near the foot of Russell St., with will be used for package goods, and a clamshell bucket may be used for material in bulk.

After careful study, the locomotive crane was chosen as the most desirable piece of equipment, because it could not only handle freight to and from boats but could be used to switch cars on and off the pier. A freight elevator was considered for this work, but was abandoned because it was not adapted to the economic handling of bulk material, such as coal, sand, etc., nor very long pieces, such as piling and lumber; also because additional equipment would have had to be provided for shifting railroad cars on and off the pier.

Another feature of interest is the foundation construction for the outshore bents. Creosoted piles are used to prevent decay, and the bents are secured to the piles by steel strops to prevent flotation and overturning during flood stages.

A small hand-operated flat-car running on the railroad track is provided for transferring goods from warehouse to pier head, or vice versa, but it is expected that only a small percentage of the freight will be handled in this way.

It is expected that about 50,000 tons of freight per annum will be handled over this pier.

This work was designed by Alsop & Peirce of Newport News, Va., the writer being in charge and assisted by E. G. Carey.

Britain Suggests "Team Spirit" Plan for Building Trades

Fair Wage for Worker; Salary for Owner-Manager, and Fixed Income for Hire of Capital, Main Remedial Principles

DEVELOPMENT of the "team spirit" in industry, considered the key to the problem of production, is urged in the interim report of the Committee on Scientific Management and Reduction of Costs, appointed by the Industrial Council of the Building Trades Parliament of Great Britain. The report, after submission to the chairman of the Industrial Council for the building industry, has been referred back to the committee submitting it, for further consideration and elaboration.

This committee, equally divided between employers and employees in the building trades, came to the early conclusion that the great task lying before the Industrial Council was the development of an entirely new system of industrial control by members of the industry itself—actual producers, whether hand or brain—and to bring such members of the industry into coöperation with the state as the central representative of the community which they are organized to serve.

Further investigation by the committee led it to see the possibility of the whole building industry of Great Britain being welded into one great self-governing democracy of organized public service—uniting a full measure of free initiative and enterprise with all the best that applied science and research can render.

The committee found that the whole conception of organized public service demanded the acceptance of three main principles as an essential to that increase of efficiency without which the cost to the community could not be reduced:

1. Regular rates of pay to the operators that insure a real and satisfactory standard of comfort.
2. Salaries to owner-managers commensurate with their ability.
3. A regular rate of interest for the hire of capital.

Upon the acceptance of these three principles, the report states, depends the rapidity with which the "team spirit" in industry develops.

The committee found at the outset that four main factors militated against efficient production. These were fear of unemployment; the disinclination of the operatives to make unrestricted profits for private employers; lack of interest on the part of the workers in the industry owing to lack of participation in control; and inefficiency, both managerial and operative.

In order to remove the fear of unemployment it was suggested that the whole productive capacity of the industry should be continuously engaged and absorbed, and that a regular flow of contracts should replace the old haphazard order of congestion and stagnation. To engage industry continuously it was recommended that the Industrial Council set up a permanent committee called the Building Trades Central Employment Committee with regional councils and local or area councils, each committee to consist of an equal number of employers and operatives supplemented by one architect. The prime function of these committees would be to accelerate new building enterprises, both public and private,, through the coöperation of architects and local authorities, and conversely during periods of congestion to advise building owners to postpone construction of such works as were not of urgent character.

The second main function of the local employment committee would be the decasualization of labor through seasonal interchange of it. Afforestation, roadmaking, the preparation of sites for housing schemes, and the demolition of unsanitary or condemned areas in preparation for improvements, were cited as work upon which the laborer could be employed when the industry itself could not support him. Cases of unavoidable unemployment would be maintained through a tax upon wages.

One of the salient features of the entire committee report was the fact that trade unions in general repudiated any scheme admitting operatives to copartnership, or any plan favoring profit sharing. All such methods of payment are strictly forbidden in the rules of most trade unions in the industry. The fear of disintegrating influences being introduced among the workers through the operation of any such system, and the difficulty of applying most methods of payment by results to the peculiar conditions of the building industry, were prime reasons why any scheme of profit sharing is generally condemned by British trade unions. It was found, however, that unions involved were ready to reconsider their attitude if the surplus earnings of the industry went not to individuals but to some common service controlled by the industry as a whole. This aspect of the situation brought the committee to a consideration of the wages of management.

In the case of owner-managers it was deemed rather difficult to put upon management a proper financial appraisal. A final suggestion was made that each employer-manager declare what salary he receives or what he regards as his due, and a review be made of these declarations by the employment committees in order that a recognized standard of remuneration might be developed.

Realizing that one of the many unsatisfactory features of the building industry heretofore had been the precarious nature of the employer's position and investment, it was recognized that confidence on the part of employers and operatives alike was a positive essential for efficiency. To secure that confidence and consequently the proper efficiency, the committee advised that the earnings of employers should be clearly and definitely separated under two headings—namely, the wages of management or remuneration paid by the business for personal service, and the interest or charges paid by the business for the hire of the capital. Wages of management should depend upon ability, and interest on capital upon the security and market price of money.

To secure public interest in building industries thus managed, recommendations were made that the amount of surplus earnings of the industry be publicly declared each year and that such public declarations be accompanied by a schedule of the services to which the money had been voted. It was also recommended that such surplus be held in trust by a national joint committee of the Building Trades Industrial Council and be applied to the following services which could be developed under the control of the industry as a whole: (1) Guarantee of interest on approved capital; (2) loans to firms in the industry for purposes of development; (3) education and research in various directions for improvement of the industry, both independently and in coöperation with other industries; (4) superannua-

tion schemes for the whole registered personnel of the industry; (5) replacement of approved capital lost through no fault of the management, and (6) such other purposes as may be thought desirable.

The committee also made rather lengthy recommendations as to what systems of cost and accountancy should be developed and adopted by the Building Trades Parliament. It was agreed that an accurate system of "costing" was the only foundation upon which the whole structure of scientific management could be safely erected.

Floods on the Lower Rio Grande in New Mexico and Texas

Review of Available Records and Estimates Made by Weather Bureau and Local Observers—High River Stages, 1872 to 1919

By Alfred J. Henry
Meteorologist, Washington, D. C.

From advance pages, United States "Monthly Weather Review" for October, 1919

THE great extension of irrigation works throughout the lower Rio Grande valley has made intensive agriculture possible in large portions of Starr, Hidalgo and Cameron Counties, Texas. The recent overflow of the river and the destruction of crops with very considerable damage to irrigation works has again drawn attention to the frequency of destructive floods in that part of the river basin.

The Rio Grande rises in the mountains of southwestern Colorado at an altitude of more than 10,000 ft. above sea level, flows in a general southeasterly direction for 1800 miles and empties into the Gulf of Mexico at Brownsville, Tex. From its source to El Paso, Tex., a distance of 740 miles, the fall is 8300 ft. and from El Paso to the mouth—1030 miles—the fall is 3700 ft. In that section of the river below Laredo, Tex., the fall is much smaller, and in the last 100 miles of its course is probably less than 1 ft. per mile. The banks of the river at Laredo and thence upstream to El Paso are generally high, 35-40 ft., and the river flows through a very sparsely settled region, hence the opportunity for damage by flood is very small. In the lower reaches of the stream the banks are only about half as high as at Laredo and while the normal flow is always well within its banks yet, at times, the fluctuations of flow are very great.

The only tributary of consequence on the left bank is the Pecos River of Texas. On the right bank, however, the following named streams join the main river below Presidio, Tex.: San Juan, Alamo, Salado and Conchos.

It so happens that tropical storms which strike the Gulf Coast in the vicinity of the mouth of the Rio Grande generally dissipate in torrential rains over northern Mexico. Owing to the highly diversified topography and the sparseness of the vegetal cover on most of this region the run-off is very great and practically all of it comes from the right bank. There are two flood seasons on the Rio Grande, namely, the late spring and early autumn. The first comes generally in May, when the run-off from melting snow reaches its maximum. Heavy rainfall over the watershed in southern Colorado and New Mexico is quite apt to cause floods in the river in those states notwithstanding the fact that considerable flow is diverted for irrigation. A serious flood in the lower river is rarely caused by an upstream flood unless heavy rain should fall in the lower watershed concurrently with rains in west Texas and New Mexico. The autumn flood is confined almost wholly to the lower river and may be considered as the major flood of the year. It is an aftermath of the tropical storms or West Indian hurricanes which occasionally strike the coast in the vicinity of the mouth of the Rio Grande, as above stated.

There are no bridges across the Rio Grande below Laredo and no permanent object upon which to install a river gage, hence it has been with the greatest difficulty that a river gage has been maintained for any length of time at the points where overflow takes place. Continuous gagings have been made at Rio Grande City for a period of but six years. Unofficial information gleaned mainly from press dispatches and unpublished manuscript reports from the flooded regions enables us to list the destructive floods in the lower Rio Grande (grouped as spring and autumn) in the following paragraphs:

June, 1903 Flood: A level of 19.5 ft. is said to have been reached at Roma, Tex., and a rise of 15 ft. occurred at Fort Ringgold (Rio Grande City).

May, 1905, Flood: This flood was confined to the upper reaches of the stream in New Mexico and extreme west Texas.

September-October, 1904, Flood: This flood was due to heavy rains over the watershed in New Mexico and also over the greater portion of the Rio Grande valley in Texas, especially in September. At Rio Grande City, Tex., the river overflowed its banks from September 16 to 22, resulting in the complete destruction of all crops planted along the river valley and a number of small shacks or huts.

August, 1909, Flood: This storm caused high tides on the coast of Texas and considerable damage by wind and water in the lower coast country. At Corpus Christi a wind velocity of 56 miles per hour was recorded on Aug. 27. The attending precipitation was exceptionally heavy, especially in northern Mexico, where it inundated the country, causing much loss of life and property, and much suffering. The lower Rio Grande rose higher than known for years and flooded the lowlands for miles, resulting in an interruption of traffic and communication and doing other damage. At the close of the month the river had begun to recede at Sam Fordyce, but continued at high-water mark below that place.

September, 1910, Flood: At Mission, Tex.; on Sept. 14, 5.65 in. of rain fell at Mission in 24 consecutive hours, and between Mission and Brownsville the rainfall for the corresponding period was much heavier. The river reached flood stage on the morning of Sept. 19, when it was 26 ft. 10 in. above the lowest known water that year. There being no river gage it was difficult to ascertain how this year's flood compares with that of last year, but from those who have been close observers of the river for many years, it is learned that the high-water mark of 1909 exceeded that of this year by about 4 feet.

September, 1919, Flood: This flood was due to heavy rains that fell in connection with the tropical storms of Sept. 14-16. The rise at Eagle Pass, Tex., amounted to 27.2 ft. in 24 hours, on Sept. 16. This rise was followed by a second period of rains and a second flood wave on the 22d though not so severe as the first. Below Eagle

Pass there was but a single crest, of 26.2 ft., on the Rio Grande City gage on Sept. 26. (For additional information respecting this flood see *Monthly Weather Review*, vol. 47, p. 674).

The highest stage of record at Rio Grande City, Tex., is 31.5 ft. in 1872. Details of this flood are lacking.

Following is a statement of the highest stages each year compiled from various sources for the earlier years and from the regular observations since 1914:

Year	Month	Highest Stage	Authority
1872	. . . . .	31.5	Local reports
1892	August	20.2	U. S. Weather Bureau
1893	. . . . .	. . .	No flood
1903	June	21.0	Estimated on rise at Roma just above Rio Grande
1904	October	30.0	Estimated on rise at Ft. Ringgold
1909	August	30.0	Estimated
1910	September	26.0	Estimated
1913	October	28.0	U. S. Weather Bureau
1914	October	25.5	U. S. Weather Bureau
1915	September	16.8	U. S. Weather Bureau
1916	September	20.8	U. S. Weather Bureau
1917	October	21.7	U. S. Weather Bureau
1918	May	23.5	U. S. Weather Bureau
1919	September	26.2	U. S. Weather Bureau

Essential Functions of a State Department of Health

Legislation, Surveys of Local Work, Demonstration, Research, Standards for Records, Expert Service, Conferences, Educational Work, State Aid

THAT there is too much centralization of public-health work, and that such work should for the most part be administered by local authorities, was the thesis of a paper on "Relative Functions of State and Local Health Departments," presented before the American Public Health Association late in October, 1919, by Dr. Carl E. McCombs, of the New York Bureau of Municipal Research. At the end of his paper the author summarized what he considered to be the essential functions of a state health department, substantially as follows:

The first responsibility of a state department of health is legislation, the provision of a basic law, applicable to all local units of government. The state health authority should have the power, and it should be its duty, to promote the enactment of public-health laws covering broadly all local health work, but it should not so define and detail local procedure that the local health officer does not have to think for himself. He will be a better health officer if he does think for himself, and the community will be a better community if its powers of initiative are not too greatly curtailed.

The second responsibility of the state health department in relation to the local health department is to make surveys of local health administration. Just as the United States Public Health Service sends its officers on request into local health departments to survey their activities and make constructive recommendations, so the state health department should be prepared to make expert surveys of the local health services of the state. The state should be even better able to do this than the United States Public Health Service, because it is familiar, or ought to be familiar, with local conditions, and it is familiar also with the general and special laws of the state which govern the activities of the local health departments. The survey method should be applied also by the state health authority in rural districts where no organized health service exists. The facts obtained through the survey if made known to such rural communities would go far toward providing the needed service.

The third important duty of the state is health demonstration work carried on along the same lines as the demonstration work of the United States Public Health Service and as Dr. Dowling has so effectively done in Louisiana. The importance of this work in developing that community spirit and enterprise which I have spoken of cannot be overestimated.

Research Important

Research is the next important function of the state health service and one which has been neglected in many states. By research I mean not only laboratory research, which is of prime importance, but research in child hygiene, tuberculosis, contagious diseases and all other lines of health work, for the purpose of developing facts which local health boards cannot develop except in a very limited way. The results of such research work should of course be made available to all local health departments.

The establishment of standards of record keeping and procedure is another responsibility which the state may well assume. If the standards are well devised and helpful to the local health officers, they will be quite likely to adopt them. They will be even more likely to adopt them if standard record forms are furnished them by the state. Uniformity of record keeping is a long step toward uniformity of procedure and increased efficiency of service.

The state should also be prepared to furnish special service when called upon to do so. It should be prepared to send an expert diagnostician to the local health department when one is needed. It should be prepared to furnish a sanitary engineer to advise the local health authority with respect to water-supply, sewage disposal, disposal of garbage and refuse, and other matters requiring technical engineering knowledge. It should be prepared to send an epidemiologist to investigate outbreaks of disease in local communities and assist the local authorities in controlling them.

The state should conduct an efficient laboratory service which may be freely available to local health units for diagnostic work. It should encourage the establishment of local laboratories wherever possible; furnish free or at cost sera and vaccine, which it should make in its own laboratory; devise standards of laboratory technique and procedure which may be available to local health laboratories, and finally, as already suggested, conduct special laboratory research and make the results of its work known to local health authorities.

The state health department should also be responsible for conducting periodical conferences of local health officers, at which the local health officer may be given an opportunity to hear his own voice.

Another important service which the state health department should render is that of conducting special courses for local health officers. This work has recently been undertaken by the state health department in New York and the first course conducted last spring was a success from every point of view.

Public Needs To Be Educated

Education of the public along general health lines is an essential function of the state health department. Bulletins, pamphlets, "boiler-plate" material for the press, and particularly the rural press, traveling exhibits, special lecture service where desired—all of

these activities can be carried on most successfully under state auspices.

The state health authority should be the scorekeeper for local health departments. Having established standards of service and encouraged in all possible ways the adoption of such standards, the state authority could stimulate competition between local units by presenting comparative scores. The community which found itself a tail-ender in the health race would be likely to inquire why, and, having found out why, would in all likelihood take the necessary steps to get out of its unenviable position.

Finally, the state should be able to aid local health services through supplementing local appropriations for health work, in the same way as the Federal Government makes grants to states for certain agricultural projects, and as the United States Public Health Service has recently aided the states in the venereal diseases compaign. The Ohio law also provides for subsidy of local health services by the state. Could this be done in all states the problem of raising the efficiency of local health services would be largely solved, for the state could then set the conditions upon which the allotment of funds would be made. It was this system of conditional grants of money which resulted in the establishment of Carnegie libraries from one end of the country to the other. Communities found themselves able to raise unheard-of sums of money when they found they could get an equal amount as soon as they had raised their own share. It is too much to hope that this system can be universally effective for the improvement of local health administration except by the Federal Government, and provision should be made in any bill for a national health department for conditional grants to states which the states in their turn can apportion conditionally among the local health units.

Notes on the Activated-Sludge Plants at Houston, Texas

Remarkably Clear Effluent—Cleaning Rust From Filtros Plates—Dewatering Plant—Some Operating and First-Cost Figures

HOUSTON, Tex., has the two largest activated-sludge sewage-works yet installed. The north-side plant, put in operation in May, 1917, is rated at 10,000,000 gal. a day, and the south-side plant, in operation since Aug. 10, 1918, is rated at 5,000,000 gal. There has been considerable delay in overcoming sludge-handling difficulties at the dewatering plant built for the larger plant. Iron rust from the plateholders has clogged the filtros plates at the larger plant, necessitating removal of the plates for cleaning. The following notes on these and other phases of the two plants were obtained by a member of the editorial staff of *Engineering News-Record* early in November, 1919, through the courtesy of J. C. McVea, city engineer, and G. L. Fugate, principal assistant engineer, and in charge of sewage disposal. The plants were designed by E. E. Sands, formerly city engineer of Houston, now consulting engineer, New York City. The larger installation was described in *Engineering News* of Feb. 8, 1917, p. 236.

By way of general observation it may be said that at the time these plants were visited a remarkably clear effluent was being produced. The smaller plant, however, was treating sewage at a rate of only 1,500,000 gal. a day, but only one-half of the tank capacity, and about one-fourth of the air capacity, were being used, while at the larger plant about 4,000,000 gal. of the then daily flow of 5,500,000 gal. was being treated, some of the sewage being temporarily bypassed on account of the plate-cleaning operations described further on. One-half of the tank capacity, and one-half of the air capacity were being used; the distribution of the air was bad, due to the iron rust in the filtros plates. Not the slightest odor was observed anywhere about either plant.

Removing Iron Rust From Filtros Plates

Iron rust from the cast-iron holders, carried up by the air, has so clogged the filtros plates at the north-side plant (put in operation in May, 1917), that the plates are being reset in concrete. The rust was first noticed months after the plant was put in use. Some of the plates were so badly clogged that they would pass no air. The plate clogging was supposed to be from above until early in 1919, when, on closing down a unit, some plates were taken out and broken.

The filtros plates at this plant were cemented in with sulphur. When it was decided to replace the cast-iron holders an attempt was made to burn out the sulphur with acetylene, but this caused the filtros to crumble. It was then decided to release the plates by smashing the cast-iron holders. About 10% of the plates are broken in the process but it is thought that these can be used by sealing the cracks with portland cement.

The iron rust is being removed from the plates by immersing them in hydrochloric acid, applied at a temperature of about 98° C., of which about 2 lb., costing some 3c. a pound, is required for each plate. Tests indicate that the acid will restore the air capacity of the plates from the 0.7 cu.ft. per minute, to which it had been reduced, to 6.2 cu.ft., as compared with the original rating of 7.1—all with air under 2 in. of water pressure.

In resetting the plates, the spaces in the troughs corresponding to the cast-iron holders are being filled with 1 : 1½ cement mortar, using a galvanized-iron mold for this purpose. It was estimated that the change in setting the plates would cost some $2,500, or 65c. each, all told, for removing, cleaning, pouring mortar holders and resetting the plates. The salvage on the broken cast-iron will amount to some $2,500.

New filtros plates (12 x 12 x 1½ in.) now cost about $1.75 each, against $1.25 in 1916.

It is the opinion of Mr. Fugate that there is no advantage in using a plateholder (or in other words, in having the plates removable) provided the plant is in units. Thus far, no plates have been found broken while in service.

At the south-side plant (put in operation Aug. 10, 1918) the plates were set in cast-iron holders with a 1 : 1½ cement mortar. So far as is known, there have been no joint leaks. Some rust clogging was noticed here after 8 to 10 months, but it has not yet been serious. Most of the sulphur joints at the other plants are known to have cracked after a period of use, causing leaks.

Thus far the sludge at each plant has been pumped to lagoons 11 ft. deep, from which the top water flows back to the activation tanks. No sludge has yet been removed from these lagoons.

At the larger works a sludge-dewatering plant consisting of settling tanks, sludge rams, presses, conveying and elevating machinery and a dryer is nearly ready for use. A smaller plant may be provided at the other plant, or the settled sludge may possibly be pressed, later on, and the cake taken to the dryer at the larger plant—depending upon comparative cost, to be determined after the large dewatering plant has been operated for a time.

The sludge at the larger plant will be pumped against a maximum head of 50 ft. to three 50,000-gal. elevated wood settling tanks, supported on a reinforced-concrete platform of flat-slab construction and columns about 12 ft. in length. After 3 hours of sedimentation the top liquor goes back to the activation tanks and the sludge flows by gravity to two 500-gal. ejectors. These deliver the sludge into two presses of 120 plates each built by the Simplex Ejector Co., of Chicago. The sludge cake is dropped onto a concrete incline leading to a horizontal concrete storage tank. From this tank a horizontal screw conveyor removes the cake and discharges it onto a drag conveyor having 4 x 12-in. flights. This, in turn, delivers the sludge to a second screw conveyor, at a higher elevation, which discharges the sludge into the dryer. Delays in getting the dewatering plant into use have been caused by difficulties in finding elevating machinery that would lift the cake without clogging.

The dryer is a revolving cylinder, 5 ft. in diameter and 40 ft. long, fitted with four spiral blades for propelling the cake forward and an inner tube connected so that the highest temperature comes into contact with the wet and cold material; the heat is then graduated to lower temperatures as the cake becomes drier. The dryer is being installed by the Buckeye Dryer Co., Columbus, Ohio. The dried sludge is taken by a conveyor to an 8-mesh screen, and a pulverizer to grind all material retained by the screen. The dust from the dryer is passed through a large baffled dust chamber, where it is deposited with the aid of a water spray.

Pressing Results

Indications are that 18,000 lb. of sludge of 98.25% moisture can be reduced to 80% moisture by the presses in 8 hours, including cleaning of the press. The press will reduce the moisture to an average of about 77%. The freshness of the sludge largely governs the ease of pressing. Some details of the pressing plant remain to be perfected, including the radial ribs fitted to the filter plates which have caused the filter cloths to break. It is possible that this may be overcome by using a different class of cloth from the 11-oz. duck that was used in the tests.

After 3 hours of sedimentation the sludge moisture is reduced from 99.25 to 98%. The intention is to add about 0.65 gal. of 66° Baume sulphuric acid to each 1000 gal. of the 98% sludge before pressing. This will not only make the sludge press better but will also increase the nitrogen content from 5.47% without to 6.93% with the acid.

It is now expected that the sludge from the dewatering plant will pay the cost of operation, as well as interest and depreciation on the $85,000 of construction cost. It is estimated that pressing and drying will cost $15 a ton, which should give a profit of $4 to $10 a ton, according to the market price of the sludge. This is based on ½ ton of sludge of 10% moisture per 1,000,000 gal. of sewage. If run in three shifts it is thought that the dewatering plant would handle the sludge from 10,000,000 gal. of sewage daily, but it will be some years before three shifts will be needed. It is thought at Houston that a city having 5,000,000 gal. of sewage to treat daily need not fear to put in a dewatering plant in connection with the activated-sludge process unless the local conditions are unfavorable.

COST OF ACTIVATED-SLUDGE PLANTS OF 10,000,000 AND 5,000,000 DAILY CAPACITY AT HOUSTON, TEXAS

	North Side	South Side
Excavation	$25,822	$5,488
General contract	194,405	87,789
Crane	1,125	1,125
Motor and blowers	7,245	6,000
150-hp. engine	7,646	.....
Sludge pump and motor	525	525
Wayne oil tanks	85	85
Fuel oil tanks	1,200	.....
Filter plates	6,440	2,800
Water tank	.....	1,900
Water pump	.....	370
Well	.....	1,350
Miscellaneous	83	.....
Engineering and incidentals	10,095	7,656
Total	$254,671	$115,085*

*Not including 15 acres of land purchased at the north-side works and 50 acres at the south-side works (the plants occupy less than 3 acres each); nor some $85,000 for the dewatering plant at the north side works (not yet in operation; no dewatering plant as yet at south side)

Operating Results

On Jan. 1, 1919, a detailed accounting plan for operating costs was installed. Indications thus far are that for the large plant, operating at an average rate of 5,500,000 gal. a day, the cost of operation per 1,000,000 gal. will be $3.80 for labor and $8.20 for power or $12 for the two. A liberal allowance for depreciation, it is thought, would be $2. These figures do not include the cost of pumping the sewage to the works.

The free air cost per 1,000,000 cu.ft. is about $5.95 for the electric-driven machine and $3.50 for the crude oil engine, but the depreciation on the latter is higher than on the former; taking current at 1c. per kw. hr. and oil at $1.50 per barrel. Including depreciation, the air cost for the two kinds of power is not very different.

There has been no expense yet for sludge disposal, except for pumping the sludge to the lagoons.

So long as there is above 1 part per 1,000,000 of nitrate in the effluent a stability of 99 is secured. The nitrates have run as high as 16 p.p.m. but that is unusual, the average being about 5 parts.

In judging the operating results the free ammonia content is very important, Mr. Fugate says. The free ammonia in the raw sewage averages about 22 p.p.m. and in the effluent 2 to 4 p.p.m., with none at all very often. With 8 p.p.m. of free ammonia the effluent would be considered below the standard. There are sharp changes in the ammonia content which have never yet been explained. The ammonia may run at 6 p.p.m. for two days, then drop to 2 or 3 parts for no apparent reason.

The removal of total suspended solids is about 95%.

The weirs in the settling tanks at the north-side plant proved to be of insufficient length to pass the clarified effluent without carrying over light matter. To remedy this condition a number of 2-in. pipe siphons have been installed. As many of these are kept in use as may be needed at any time.

For compressing the air at each plant Sturtevant No. 10 blowers are used. These are designed to work under a pressure of 5¼ lb. total, 4¼ lb. of this being hydrostatic pressure on the filtros plates.

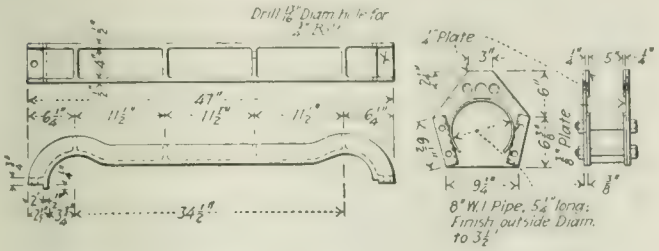
Tests of Concrete in Tension

Briquettes in Rich Mix 5 Inches Square at Breaking Section Broken at Periods Up to Twenty Months

By T. H. Carver and J. H. Quense
Water-Supply Engineer and Assistant Water-Supply Engineer, City Engineer's Department, Seattle, Wash.

LARGE-SIZE tension tests of concrete briquettes have been made in connection with a reinforced-concrete pipe line for the City of Seattle. Though they have not been extensive enough to establish general rules, the results are presented here for such value as they may have in the design of reinforced-concrete structures of rich, high-grade concrete when it is desirable that sufficient steel be used to prevent tensile cracking of the concrete at mixing loads.

The specifications for the concrete pipe called for concrete mixed in the proportion of one part cement to 1½ parts sand and 2½ parts gravel, but the contractor



DETAILS OF BRIQUETTE MOLD AND GRIP

elected to add 21 lb. of cement to each batch, making a mixture of 1 : 1.42 : 2.36, a barrel of cement being considered to be 3.5 cu.ft.

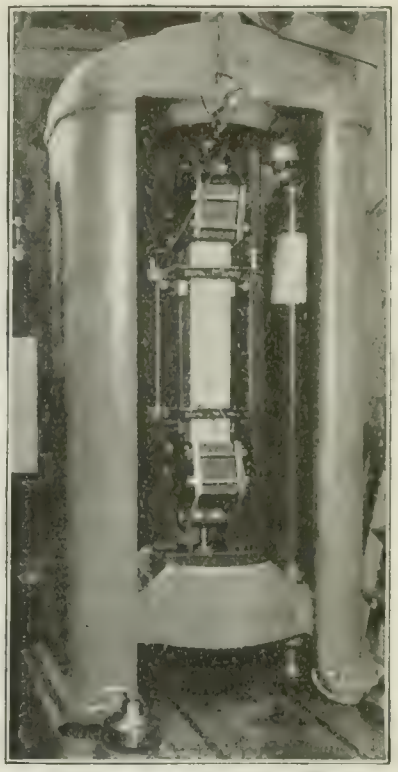
Test briquettes were made in the yard where these pipes were cast, the concrete being taken from the regular mix. In all ten briquettes were made and tested at ages from 57 to 609 days. Two brands of cement were used, both produced by plants near Seattle. It was subjected to the usual laboratory tests and showed from 89% to 95% passing a No. 200 sieve. Briquettes of one part cement and three parts standard Ottawa sand developed an average strength of about 330 lb. in seven days and 490 lb. in 28 days. Sand and gravel were of first-class quality, clean and carefully graded. An average analysis of the combined aggregate was as follows:

Passing	Percentage	Passing	Percentage
1-in.	100	No. 6	53
¾-in.	96	No. 10	51
½-in.	88	No. 20	47
¼-in.	66	No. 50	42
No. 4	59	No. 100	41

While the curve of the total mixture as used resembles Fuller's curve in general form, it was found necessary to use a larger percentage of small gravel. The amount of water used was carefully controlled and averaged about 19.5% by weight. Concrete was machine mixed in four sack batches, each batch remained in the mixer three minutes, the machine running at the rate of 16 turns per minute.

The specimens were carefully made and were kept moist by covering with wet burlap for about sixty days when they were stored in the laboratory. They were dry when tested.

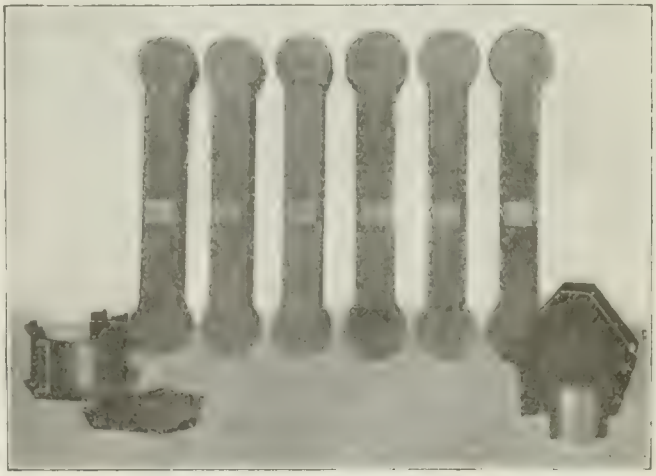
The briquettes were 5 in. square in section, 42 in. long, and weighed about 100 lb. They were formed in cast-iron molds, having machined surfaces against which the concrete was placed. The shape of the briquettes is shown in the drawing, which also shows the heads, or clamps for securing them in the testing machine. In placing the specimens in the clamps, a steel ring formed of a short piece of wrought steel pipe, 8 in. in diameter, machined to a true cylindrical surface on the outside, and having one side cut away, was slipped loosely over each end, the intervening annular space of about ½ in. being filled with molten sulphur. The bearing surfaces of the clamps were machined to parallel planes where contact was made with the steel rings and were oiled to prevent twist due to binding after the specimens were placed in the testing machine. In spite of these precautions there seemed to be a tendancy for the specimens to break near the upper clamp.



CONCRETE TENSILE SPECIMEN IN MACHINE

Specimens A2, B3, C2 and C3 were broken on a machine in the testing laboratory of the University of Washington. This machine was not large enough to take the specimens and it was necessary to extend its capacity by raising the head and supporting it on temporary wooden struts. This arrangement, of course was far from ideal, but it is believed the results secured were good. All other specimens were broken on a 350,000-lb. Riehle machine recently installed in the laboratory of the City Engineer's Department. This machine, with a specimen in place, is shown in a view herewith.

The electric contact extensometer, reading to 0.0001



CONCRETE BRIQUETTES BROKEN IN TENSION

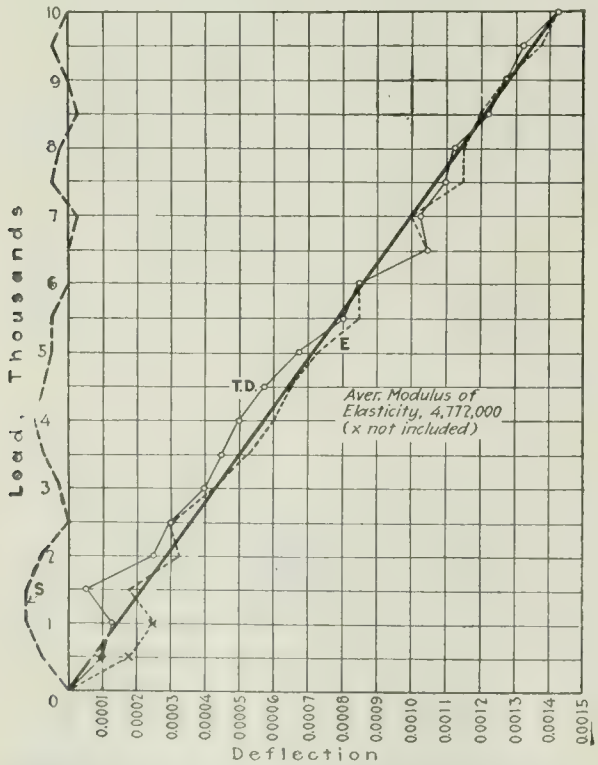
in. which was especially designed and constructed for this work is also shown. The gage length is 18 in.

In running a test, a load increment, usually 250 or 500 lb., was applied. The machine was then stopped and simultaneous readings taken, by two observers, of the right and left micrometers respectively, and recorded to show the increment of deformation. The load was then released and a period of one minute allowed for the specimen to attain its set deformation when readings were again taken, careful observations established that this was time enough for final set to take place. The machine was then started, another load increment applied, read, recorded, etc. All specimens were tested to failure but the extensometer was always removed before this occurred.

A general summary of ten of the tests is given in the following table:

Specimen	Age at Test Days	Breaking Load Lb. per Sq. In.	Average Modulus of Elasticity	Extensometer Removed at Lb. per Sq. In.
A2	58	268	5,030,000	97
B3	57	333	5,830,000	107
C2	60	278	5,996,000	189
C3	234	378	5,870,000	269
F1	585	445	4,904,000	207
F3	609	492	5,785,000	342
G1	562	473	4,952,000	187
G2	565	480	4,918,000	337
G3	566	431	4,772,000	380
G4	567	430	5,140,000	380

A typical test curve is shown in the accompanying diagram. The curve of total deformation is shown in a solid line, marked T. D., the set by a dashed line marked S, and the elastic curve by a dotted line marked T.D., the set by a dashed line marked S, and the elastic curve by a dotted line marked E. The elastic curve is determined by subtracting the amount of set from the



DEFLECTION-LOAD DIAGRAM FOR SPECIMEN G-3

total deformation at each point of observation. It is from the values of the elastic curve, that is, total deformation less set, that the modulus of elasticity is computed.

The heavy straight line that is drawn from the origin of coördinates is an ideal curve determined by dividing the load by the average modulus of elasticity. This ideal line follows the true elastic deformation curve fairly well in most of the tests.

Perhaps the most interesting thing developed by the tests is the fact of the permanent set becoming negative in some cases, one of which is shown on the diagram presented.

Just why this is so is not clear to the writers and no explanation is offered. The same characteristic has been observed by other experimenters, notably by Ira H. Woolson, as reported by him in *Engineering News*, June 1, 1905, p. 561.

Problems of a British City Engineer

SPEAKING before the (British) Institution of Municipal and County Engineers, F. W. Bricknell, city engineer of Hull, commented on several of the after-war problems of the British municipal engineer. He said in part:

"The third problem is that of bringing the cost of routine work and also that of street and sewer construction to such a figure as can be covered by a not intolerable increase of the rates. With average weekly wages doubled, cost of materials more than doubled, and assessments stationary, it is difficult to see how the doubling of rates can be avoided.

"The first cost to be attacked is that of labor. The old class of navvy and horseman, who was recruited from the country, has almost disappeared from the towns, and most of those who are in the towns can find easier and better-paid employment than that offered by a municipal body. The townsman has an inferior capacity for heavy work and a very strong prejudice against it. The obvious policy, therefore, is by some means to cut out the heavy work and endeavor to staff public works with men who will use their heads. A simple example is the use of scarifiers to break up macadam roads. Formerly these were not used in Hull because they would displace labor. Now they have to be used because pick work is unpopular.

"The loading of vehicles is work which cries out loudly for mechanical assistance. Costly vehicles are kept standing when they might be running, and good horsemen and motormen are lost because, being good, they can obtain work in connection with mills, etc., where they do not have to handle their loads. The writer has been able to obtain the use of high-level coal cells, and to obtain delivery of a certain amount of road metal and fuel in hopper wagons, which is an admirable solution so far as it goes. Some material landed at wharves by crane can be taken direct to its destination, but there remains a great deal which has to be picked up in the yard and elsewhere. There are some inexpensive mechanical loaders which deal well with dry macadam, gravel, etc., but tarred material is a problem, and destructor clinker is even more unpopular with the man, and there is more of it. The average cost per ton is probably four times what it was ten years ago.

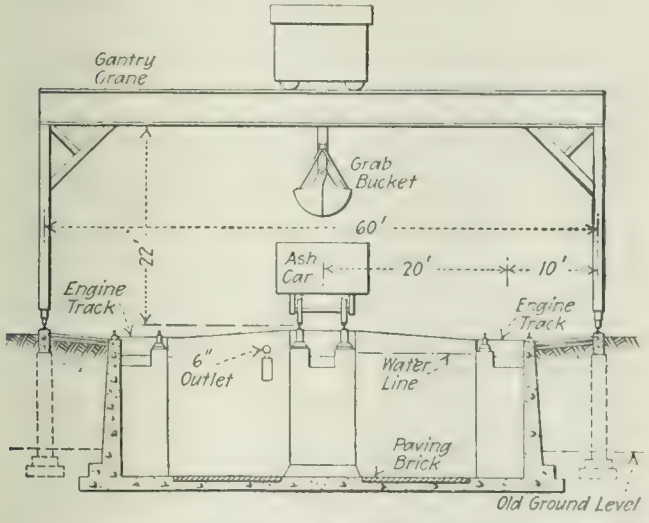
"The cost of refuse destruction has for long been somewhat of a bugbear. During the war not only has the cost of wages more than doubled, but the character of the refuse has changed, its calorific value having become almost nil, and the so-called clinker increased to about 50% of the original weight."

Railway Ashpits of New Design

Sides Are Vertical Instead of Sloping and Ash-Car Track Is on Center Line Instead of Being Outside the Pit

A WATER-FILLED ashpit having vertical walls and a central ash-car track on a concrete trestle is one of the features of two engine terminals at East St. Louis, Ill., and at Bremen Ave., St. Louis, Mo., for the Terminal Railroad Association of St. Louis. In most ashpits of the water-filled type a Y or V section is adopted, the engine tracks being placed over sloping sides which divert the ashes to the central part of the pit, while the ash-car track is at one side. This construction is employed at an engine terminal described in *Engineering News-Record* of July 3, 1919, p. 24. In the St. Louis design the ashes accumulate along the sides and extend over the space between the engine tracks and the ash-car track, whence they are removed by a grab-bucket. This same design has been used at other points on the Terminal Railroad.

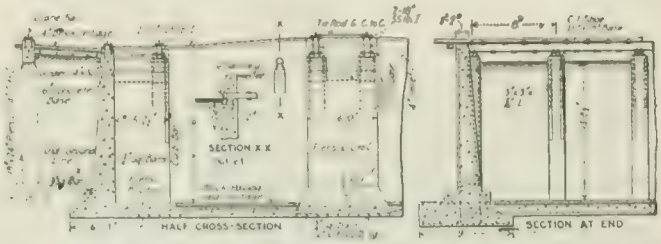
A rectangular section was adopted for the reason that such an ashpit would cost less than one with sloping walls, less concrete being required. It is not considered that this affects materially the capacity or



WATER-FILLED ASHPIT HAS VERTICAL SIDES AND CENTRAL TRACK FOR ASH CARS SERVED BY GANTRY CRANE

utility of the pit, because the ashes will slide as freely on themselves, if lateral support is removed, as on a concrete surface. It is stated that actual operation has proved that this form of construction is not objectionable in any way. The central track for ash cars has the advantage that ashes can be taken out of the pit without interference with its use by locomotives. There is also a large amount of water that drips from the grab-bucket and the ash-car which is a source of annoyance and is scattered over a large area if the ash-car track is on one side of the pit. This may be particularly troublesome in winter. With the central track, the water runs back into the pit, causing no trouble in mild weather and a minimum of trouble even in extreme cold.

Each pit is about 44 ft. wide and 16 ft. deep, with 13½ ft. of water. Its length is 112 ft., or sufficient for two locomotives on each track. Along each side are piers spaced 8 ft. on centers, these piers carrying

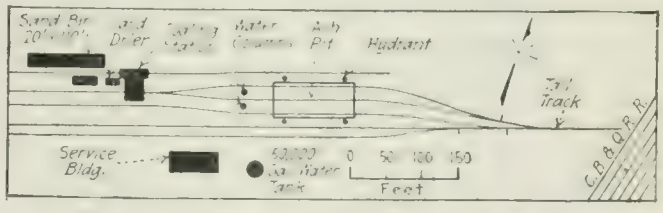


DETAILS OF ASHPIT AND CONCRETE CRANE GIRDERS

girders for the inner rails of the engine tracks, while the outer rails are carried by the side walls. Along the center of the pit is another row of piers, spaced 16 ft. on centers, to carry the girders for the ash-car track. Each girder is composed of a pair of I-beams with concrete filling, 10-in. beams being used for the 8-ft. spans and 18-in. beams for the 16-ft. spans. They rest on cast-iron shoes anchored to the concrete, and similar shoes on the side walls support the outer rails. Steel clips to hold the rails are secured by bolts through the flanges of the I-beams. Tie-bars between the webs of the rails maintain the gage of the central or ash-car track, but are not used on the side or engine tracks. All track and crane rails are 80 lb. per yard.

Water is supplied through a 4-in. inlet pipe at one end. At the same end is a 6-in. overflow or outlet pipe with sewer connection. The end of this latter pipe is capped and has a T-branch opening downward into a recess in the concrete wall, so that surface scum and dirt do not foul the inlet. The concrete floor is flat, and in the spaces between the rows of piers, where the grab-bucket operates, it is paved with vitrified brick on edge, this paving being grouted with cement. The bottom has no outlet drain or sewer connection, as it was considered that the ashes would soon clog both the outlet and the sewer. Should it be necessary to drain the pit, pumps must be used, but such a necessity is not anticipated. Reinforced concrete of 1:2:4 mix is used throughout, and for the walls and floor it is made waterproof by the addition of hydrated lime in the proportion of about 10% of the cement.

A gantry crane handles the ashes at the East St. Louis terminal, as shown on one of the drawings. This spans the pit, traveling on rails 60 ft. apart, and upon it is a traversing trolley which operates the 2-yd. grab bucket. As the site is filled ground, the rails for the gantry are carried on heavy concrete girders, 14 x 30 in. in section, which have a span of 22 ft. 4 in. and are supported by columns with footings in the



ENGINE TERMINAL WITH STUB TRACKS AT BREMEN AVENUE, ST. LOUIS, MO.

solid ground beneath the fill. The rails rest on ¾-in. plates and are secured by clips on anchor bolts embedded in the girders. The crane travels on four wheels and one wheel on each side is driven by gearing. Current is taken from an overhead wire for a 15-hp. motor on the hoisting trolley and a 15-hp. motor for

the propelling gear. At the Bremen Ave. yard a locomotive crane with grab-bucket is used to remove the ashes.

The ashpit at the Bremen Ave. terminal is used mainly by the switching engines employed in the terminal service, and about 30 engines have their fires cleaned in 24 hours. During the busiest times four engines can have their fires cleaned in 20 minutes. Two hydrants are arranged on each side of the pit, while a 300-ton coaling station and two 10-in. water columns are located near one end. This is a stub and terminal, with the three pit tracks and two outside tracks all converging on one tail track beyond the ashpit. The ashpit design and the terminal layouts were prepared under the direction of H. J. Pfeifer, chief engineer of the Terminal R.R. and now chief engineer of the St. Louis and East St. Louis Terminal District, United States Railroad Administration.

Paved Roads Built in Installments From Dirt Roads

Iowa Lays Base for Paved Roads by Progressively Building Up Earth Road—Engineers Direct All Work

STARTING with the axiom that the foundation structure of every paved road is a dirt road, Iowa has progressively built up its prairie-soil roads, so that on nearly 3000 miles a permanent paved road structure exists except the hard surfacing proper. Specifically, with 104,084 miles of earth road and with an annual expenditure of less than $140 per mile, Iowa has in barely five years completed 2900 miles of grade and structures ready for hard surfacing; has brought 13,000 miles additional partially to section and grade; has constructed nearly 40,000 concrete and steel bridges and culverts, and has kept its entire mileage in condition to accommodate traffic. All construction, wherever it has been performed, is uniform in design and materials. The maintenance has been the same in character and methods in every township. In terms of money, one-half of every dollar spent on earth roads has been for work which contributes to an ultimate system of paved roads. The other half of the dollar has kept the earth roads in condition to accommodate traffic.

General Program of Operations

With limited income; a prairie soil with no stone and very little gravel; a uniform use of roads and the consequent necessity for keeping the entire 104,084 miles in service, the development program was based on a few fundamental conclusions. One conclusion was that if all earth roads were built up, as they could be, to furnish fine traffic facilities during the nine dry months of the year, better highway service would be provided than if a few expensive all-the-year roads were constructed and the remaining mileage was left unkept. Another was that by working with machine graders systematically to plan, a large amount of widening and ditching and a material amount of longitudinal grading could be done in the regular course of building up the earth roads, thus creating the underlying element of future permanent roads. The third conclusion was that since bridges and culverts had the same service to perform whether the roads remained earth roads or became paved roads, these structures should, so far as possible, be designed and constructed as permanent work.

Under the general policies enumerated, plans were prepared having in view (1) construction to permanent grade and (2) construction to temporary grade. Construction to permanent grade meant completion to transverse and longitudinal profile, with ditches and permanent bridges and culverts. Where funds were not available for construction to permanent grade, provision was made for partial improvement. A cut through a hill or a fill across a valley was permitted, to be brought partly to depth or height in such manner that the work accomplished would contribute to the final construction to permanent grade. Where even longitudinal grading was beyond the means available, the road was widened to transverse profile at the natural grade. In general, the broad plan was to provide for road improvement to any degree desired, but always to perform the work so that it was a step toward final, permanent construction.

In detail, the plans provided standard requirements for all classes of construction and standard designs for all types and sizes of structures ordinarily required. Earth-road sections were prepared which could be widened and shaped from the existing prairie roads almost entirely by scraper graders, and could be kept to surface largely by dragging. Sections were also provided for gravel and other surfacing, but the main purpose was to develop standards for building up earth roads to width and with adequate ditches. In respect to bridges and culverts the plans were more elaborate. The assumption, as stated, was that these were, ordinarily, to be permanent structures. The plans, therefore, presumed construction of concrete and of steel, and designs were prepared for a large variety of conditions and for many dimensions of waterway, and general requirements were laid down for materials, loadings and stresses.

Standards were set, but adherence to these standards was conditioned on common sense. A tendency to fit standard designs, without change, into local conditions was discouraged. Instead, the policy urged was to prepare, in conformity with the standard, a plan fitted to each locality. For large or unusual structures special designs were permitted if the designs conformed to the requirements laid down by the adopted standards. In brief, the purpose of setting standards was to secure uniformity in type, character and quality, and not to provide custom-made bridge and culvert plans.

General Plan for Administration

In Iowa the units of state, county and township have distinct functions of administration and control in road affairs. The state is represented by the State Highway Commission and a corps of engineers and assistants appointed by the commission: The county is represented by the county Board of Supervisors, consisting of three to seven men elected to the position, and the county engineer appointed by the supervisors. The township is represented by the Board of Trustees elected to the position and the township superintendent appointed by the trustees.

The function of the State Highway Commission is to establish standards, both plans and specifications; to enforce these standards, and to devise and enforce general rules providing for uniformity of action for

the county and township road officials in the administration of road and bridge work.

The function of both county and township is to initiate and plan road improvements and to appropriate and expend the money for these improvements and for maintenance.

This general plan of administration was laid down by the basic road law of 1913. The law also established a number of details which bear directly on procedures. It placed the county engineers partially under the control of the commission, by empowering the commission to remove them for incompetency. It delegated all permanent bridge and culvert construction on all roads to the county supervisors, and thus insured engineering design and direction. It concentrated major improvements on main roads by dividing the state road mileage into county roads (16,000 miles) and township roads (88,000 miles). It placed a check on expenditures by requiring counties and townships to make financial reports to the commission and by requiring all contracts exceeding $1000 to be awarded after competitive bidding and all contracts over $2000 to be approved by the commission.

Commission Controls County Engineers

The engineering organization for road work consists of the Highway Commission engineers and the county engineers, over whom the commission has control in three ways: (1) The county engineers must plan in conformity with the commission standards; (2) they must render an accounting of all work to the commission, and (3) they can be removed by the commission for incompetency. As organized at present the commission has a chief engineer, four department engineers and nine district engineers, each with such assistants as are called for by the work being done. There are 99 county engineers. A district engineer has direction over 11 counties and has headquarters in each district. The county engineers have headquarters at the county seats. Every section of the state thus has equal engineering representation before the commission, and, conversely, the commission has equal engineering direction over every portion of the state.

Engineering direction of all permanent construction is obligatory under the law. Permanent work comprises concrete and steel bridges and culverts; grading and widening roads to or toward permanent grade; tile drainage, and surfacing with gravel, macadam, sand-clay or some form of paving. The procedure is alike in all cases whether the project is to complete a dozen miles of road to permanent grade or to construct a single culvert. The project is initiated by the county supervisors and the county engineer prepares plans, conforming (the law makes this obligatory) to the commission standards. Contracts are awarded by the supervisors, and the county engineer supervises the execution of the work. If the contract exceeds $1000 a public letting is required by law; if it exceeds $2000 it must, including plans and specifications, be approved by the commission. Annually the county engineer renders to the commission an accounting, on forms provided by the commission, of all work done.

Though the county initiates, plans and executes all permanent improvements, commission engineering control is complete unless the law is evaded. Opportunity for evasion is restricted by constant oversight. Contract lettings are widely attended by the district engineers, who are also constantly over all work under construction in their districts.

Local practices capable of general use were investigated and reported in the monthly service bulletin published by the commission. County manufacture of concrete pipe, county operation of gravel pits, winter concreting methods, motor-truck haulage of gravel, cost of bridge painting, and road-oiling experiences were some of the subjects of these reports. Materials prices were published. Recently instruction pamphlets for making surveys have been published, and others are being prepared. Laboratory and field tests of materials and methods of construction were conducted. These tests included paints, road oils, wood preservatives, concrete materials and culvert pipe. The data obtained were incorporated in new or revised standards or made available by publication.

Investigations of wide scope included a stream and waterway survey to determine the proper sizes of bridge and culvert openings; a census of available sources of road materials, and a main-road traffic census made at 47 stations in 17 counties. Almost two-thirds of all rural-road traffic was found to originate in towns and to return to towns. Nearly 86% of the traffic was motor-driven. Purely freight vehicles were a small percentage of the total. Weight records kept at four stations for 42 days gave an average weight of 2636 lb. per vehicle. The daily average weight of traffic was nearly 1,000,000 lb. These data were utilized in driving home the lessons that town residents should pay their share of the taxes for rural roads, and that roads must generally be built to carry motor-driven traffic.

Construction Accomplished

In five years, from 1914 to 1918, by the methods outlined there have been completed 2900 miles of permanent grade and 37,700 permanent bridges and culverts. The completed grade is ready for hard surfacing with any kind of pavement desired; the bridges and culverts are of concrete and steel. These figures do not present the total permanent work accomplished. About 1100 miles of road have been brought to temporary grade—that is, widened to transverse profile and with hills cut down and valleys filled part way to longitudinal profile. In addition, 12,000 miles of road have been widened to transverse proqle without change in the natural grade. Besides this permanent work, an average of 15,000 miles of road have been dragged an average of 29 times a year, ordinary repairs have been made, and a total of 85,700 temporary bridges and culverts have been built.

The average expenditure per mile for all purposes, as tabulated by the Highway Commission for four years, has been as follows:

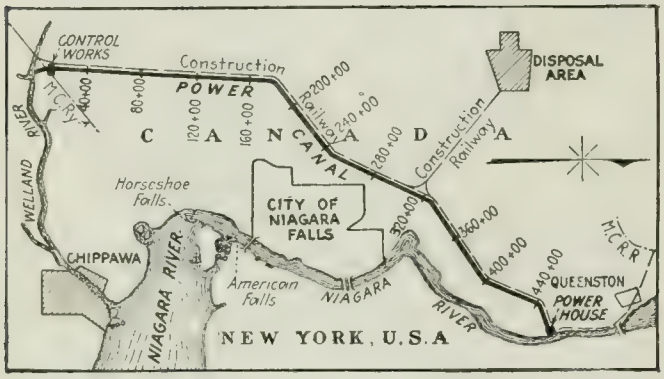
Item	1915	1916	1917	191[illegible]
County roads	$191	$204	$223	$23[illegible]
Township roads	10	11	16	1[illegible]
Bridges, all roads	66	69	71	6[illegible]
Average for all roads	130	128	146	13[illegible]

The records show that about 40% of the expenditure on county roads has been in permanent work, and that about 60% of the expenditure for bridges has been for concrete and steel structures. In addition, at least 10% of the township road expenditure has been for construction of permanent character. The total engineering cost has been less than 4%, of which about 0.75% is chargeable to the highway commission.

Construction Progress on Canadian Niagara Power Project

Excavation Well Under Way on Queenston-Chippawa Canal Which Will Develop Most of Head Between Two Great Lakes

WORK on the new hydro-electric development at Niagara Falls, which the Hydro-electric Power Commission of Ontario started in 1918, is progressing at an expected rate of speed. Some little difficulty has been met in holding the slope in the deep cuts in the earth overburden, but this has not caused serious retardation, and the prospect now is that power will be available in 1921. Work is being carried on under



PLAN OF QUEENSTON-CHIPPAWA POWER DEVELOPMENT

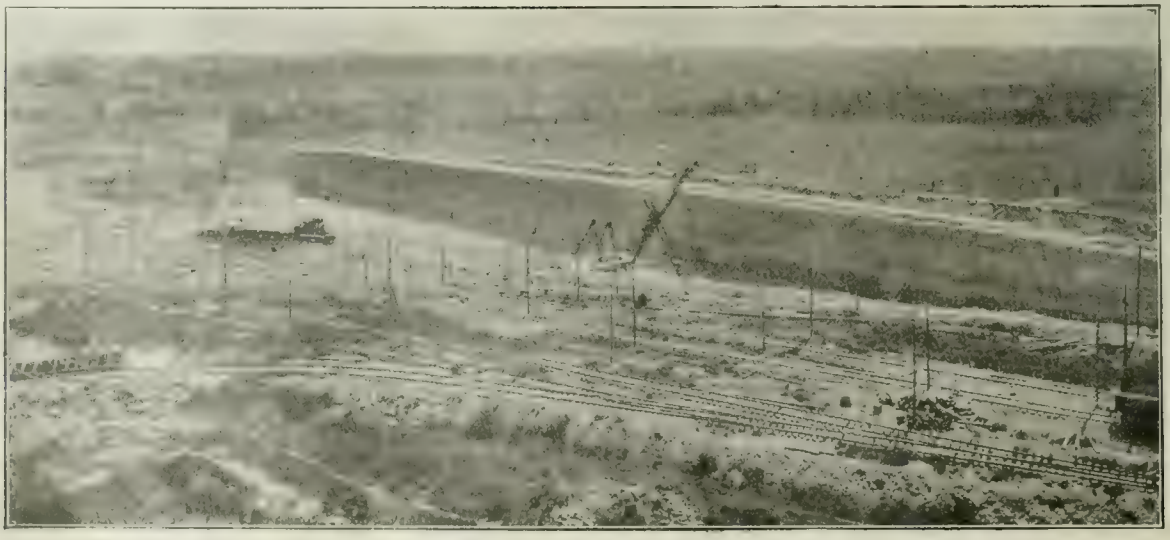
force account by the engineers of the Commission, and will be continued throughout the winter, as it was last winter.

The general features of the Queenston-Chippawa development, with the progress up to that time, were described in *Engineering News-Record*, Oct. 31, 1918, p. 801. It is, in brief, a scheme for developing nearly the full head of the Niagara River between Lakes Erie and Ontario by a canal running from Chippawa, about two miles above Niagara Falls at the mouth of the Welland River, to Queenston, about a mile above the Lake Ontario end of the Niagara River. The difference in elevation of the two lakes is 330 ft. The new plant will operate under a head of 305 ft., 12 ft. of the loss being due to the drop in level to the intake of the Niagara River from Lake Erie to the Welland River, 8 ft. to the gradient of the canal, 2 ft. to the drop in Niagara River level from power-house discharge to Lake Ontario, 6 in. due to friction in the canal and 2½ ft. loss in friction in the penstocks. As at present designed, the plant will develop 300,000 hp. with a flow of 10,000 cu.ft. per second or a development of 30 hp. for each cu.ft. per sec. The old Niagara River power plants developed from 12 to 15 hp. per sec.-ft., the new Ontario Power Co.'s development on the Canadian side about 17, and the new Hydraulic Power Co.'s development on the American side about 20.

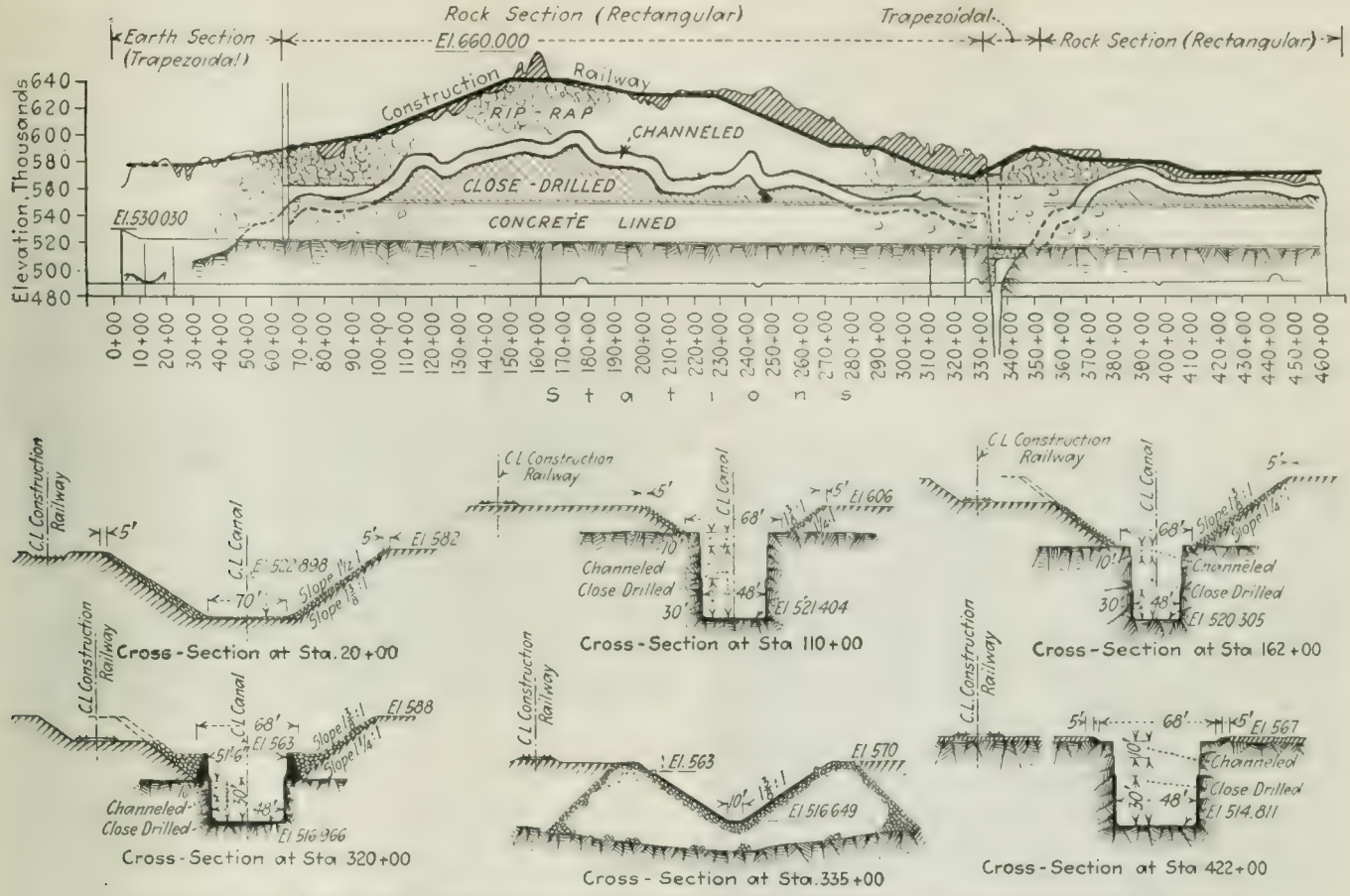
Under the international agreement, of the 220,000 cu.ft. per second flow of the Niagara River 56,000 sec.-ft. can be diverted for power purposes. Of this total, 36,000 has been assigned to Canada and 20,000 to the United States. At present the Ontario Hydro-electric Power Commission has control of 17,790 sec.-ft. of the 36,000 permitted to Canada, of which 11,180 is developed through the Ontario Power Co., a private plant which was bought by the Commission two years ago. It is evident, therefore, that the Commission will have to shut down some of the power in its older system as soon as it commences to operate the Chippawa development at its 10,000-cu.ft.-per-sec. capacity.

The project comprises 4½ miles of river canalization and 9 miles of power canal dug in the dry. The river canalization is in the Welland River whose direction will be reversed from its present mouth up to the canal intake where the control works will be built. The canal extends across high land beyond the Niagara Gorge to the power house which will be built at the foot of the gorge at the river elevation. Water will be delivered to the power house by penstocks laid on the slope of the bluff.

The mean velocity will be 2 ft. per sec. in the Welland River channel with a gradient of 0.63 ft. per mile and 6 to 7 ft. per sec. in the canal where the gradient is to be 1.1 ft. per mile. The river channel section is being excavated by dredge and cableway, to provide sufficient waterway. Canal excavation is largely through rock with a heavy earth overburden. The first 1¼ miles of the canal just beyond the river is in earth section; the remainder is in rock with the exception of a short earth section opposite the Whirlpool, where an old gorge, probably a former bed of the Niagara



LOOKING OVER FOREBAY EXCAVATION TOWARD INTAKE. (BACKGROUND IS ON OTHER SIDE OF NIAGARA RIVER)



PROFILE AND SECTIONS OF QUEENSTON-CHIPPAWA POWER CANAL AROUND NIAGARA FALLS

River, drops the rock bottom so deep as to make it impossible to found the canal on rock.

The earth section at the river end of the canal is trapezoidal in shape, 70 ft. in base width with an earth slope of $1\frac{3}{8}$: 1, and a riprap facing 5 ft. thick at the top and sloping $1\frac{1}{2}$: 1. The section in rock is trapezoidal, 48 ft. wide and varying in depth up to 60 ft. The earth overburden slopes back $1\frac{1}{4}$: 1 with a riprap face 5 ft. thick at the top and on a slope of $1\frac{3}{8}$: 1, according to the details shown in the accompanying drawing. Back of the Whirlpool the section is triangular on a heavy fill, with a lining of concrete. The rectangular rock cut is channelled for the first depth of 10 ft. and close drilled for the remaining depth. It will be lined with concrete for a height of 30 ft. from the bottom.

At a distance of about 2400 ft. from the river the canal widens out into a forebay 1000 ft. long and 300 ft. wide at the intake gate. The penstocks are of riveted steel plates 14 ft. in diameter and about 450 ft. in length and extend down the steep bank of the gorge and the river from the forebay to the power house. No surge tanks or standpipes will be required. At present four main penstocks are to be built and one exciter penstock 5 ft. in diameter.

The initial power installation consists of two 55,000-hp. turbines driving the generators. Full details of the generating machinery are not yet available. However, two of the turbines have been let to the Wellman-Seaver-Morgan Co. and their generators to the Canadian Westinghouse Co. It is expected that four units will be installed at the present time.

The work at present may be divided into that on the river, that on the canal proper, and that on the power house. In the Welland River a dredge is working up from the mouth of the Niagara River and has reached the Michigan Central Ry. bridge, about a half-mile from the mouth. This dipper dredge is spoiling into scows which are being taken out into the Niagara River and dumped. A cableway excavator farther up the river has done a certain amount of work but is now operating at full capacity. Between 3,000,000 and 4,000,000 cu.yd. of earth is the total excavation in the river. About one-quarter of this has been removed.

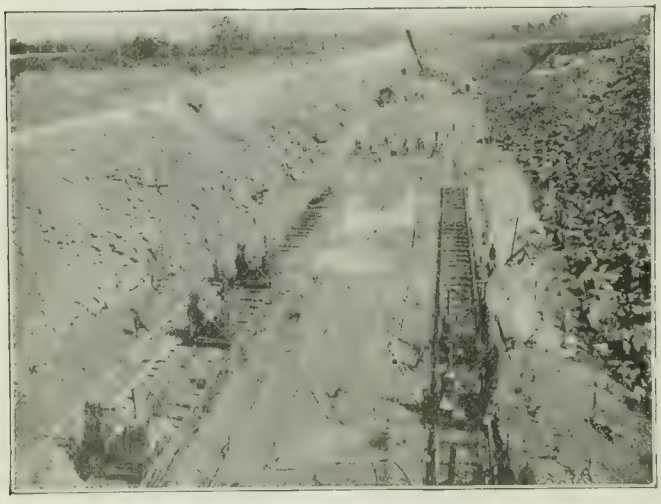
The larger part of the work in the canal has been done, beginning at the forebay end. From that forebay, which is about Sta. 470 to Sta. 200, practically all



STEAM SHOVEL WORKING DOWN NIAGARA RIVER BANK AT POWER HOUSE SITE

of the earth overburden has been removed by the heavy longboom electric steam shovels described in previous articles in this journal. From Sta. 200 to Sta. 0 at the Welland River only some pilot cuts have been started but the beginning of the earth excavation has been made. Between Sta. 200 and Sta. 273 the steam shovels are now working removing the overburden. The forebay itself is practically completed and channelers and drills are working in the rock cut between the forebay and the end of the earth overburden excavation. The construction railway is completed, all except a short section at the upper end and is in operation carrying trains of earth and rock cars to the spoil dump, which is on a spur two miles to the west of the canal line.

Two of the big concrete bridges, those carrying the



GANG OF CHANNELERS MAKING FIRST ROCK CUT

St. Catharine's & Thorold Electric Ry. and that carrying the Wabash Ry., are completed. The twin bridges carrying the Grand Trunk and the Michigan Central are under way, the foundations being all done at this time. At the power house site the whole face of the cliff has been stripped and a construction railway is being built down to the river edge from a connection to the main line road, about a mile below the power house site. A steam shovel has been worked along about 50 ft. above the river level and is engaged in excavating the power house site. The heavy rock-filled section across the Whirlpool gully is well along, about 60% of the rock fill being in place and 80% of the

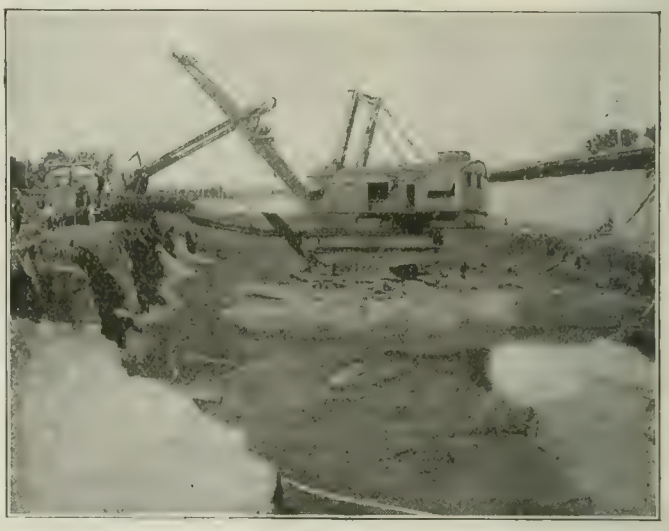


STEAM SHOVEL TAKING OUT FIRST ROCK LIFT

gullies which run back from the main line being filled.

A number of the special methods used in the construction of the canal have been described in short articles which are appearing in the "Hints to the Contractor" section of this journal.

The Queenston-Chippawa Canal is being built under force account by the Hydro-electric Power Commission



EIGHT-YARD SHOVEL REMOVING OVERBURDEN IN WET GROUND

of Ontario, of which F. A. Gaby is chief engineer, and the work itself is in charge of H. G. Acres, hydraulic engineer, with J. B. Goodwin, works engineer; George Angell, general superintendent of construction; A. C. D. Blanchard, chief field engineer, on the ground.

Renewal of Ladder Tracks in Yards

In maintenance work at large classification yards the rebuilding of ladder tracks is the most difficult operation, according to a report presented at the recent annual meeting of the Roadmasters' and Maintenance-of-Way Association in Chicago. Everything possible should be done in advance of cutting the track. Material must be checked, rails cut and drilled for lead rails, and switch ties marked as to their length so that they can be identified at once. Where conditions permit, all material should be distributed along the ground, opposite the ladder, but if this is not possible the material should be assembled on cars so that it can be unloaded in proper order. Arrangements should be made to have traffic suspended over the ladder for four hours, during which time, says the report, a gang of 40 experienced men can renew three switches. Where the track cannot be given up for any definite time, the new rails must be laid on the old ties, one switch at a time, the ties being then renewed singly. This method is expensive and is not conducive to good work. All old material should be removed to a safe place on the day when the work is done, so that no obstruction to the yard men is formed. For track repairs in such yards, a designated track is usually put out of service for a day's work, and a car with supplies is set out on this track. The old material is placed on the car, and the track is left in good condition for the night work of the yard. If sufficient force is available, the track can be worked from both ends.

Experiences in Garbage Collection and Disposal at Akron, Ohio

Change to Hog Feeding After Two Years' Trial of Reduction—City Will Receive 85 Cents a Ton—Former Reduction Costs

By F. C. Tolles
General Superintendent, Bureau of Sanitation, Akron, Ohio

AFTER experience with garbage reduction in a municipally owned plant operated first by the city, then by a company under lease, and then again by the city, during which latter period the plant was crippled by fire, Akron, Ohio, has let a five-year contract for disposal to the American Stock & Food Co., Alvah Brown, president. The city will receive 85c. a ton for garbage delivered within 4 miles of an existing reloading station. For distances over four and under five miles an additional allowance is made of 15c. per ton-mile. Akron's experience with both the collection and disposal of garbage seems worthy of brief record.

In January, 1916, the city, then having a population of about 110,000, put into operation, under city ownership and management, a reduction plant of 25-ton capacity. The process was the usual one of digestion with steam followed by percolation of the dried tankage with gasoline to recover the grease. Collections at this time were made under contract. In May, 1916, the collection contract was awarded to the Akron Garbage Collection Co., formed for that purpose, and in August, 1917, the operation of the plant was also turned over to this company under the name of the Akron Garbage Disposal Co. The contract then underwritten was for a period of five years, with privilege of a five-year renewal. The dual company was paid $3.12 per ton for the collection service and in turn paid to the city a yearly plant rental of $8200 (plant valuation $116,000). During its operation of the plant the Reduction Co. increased the capacity to 45 tons to meet the rapid growth of the city.

Collection service under this contract was very unsatisfactory, as was indeed the nuisance caused by the operation of the plant, though the latter was in no wise the fault of the operating company.

The 1918 report of the two companies furnished the following data:

GARBAGE COLLECTED—10,142 TONS

	Receipts	Operation Cost
Collection Co.—Collection	$30,856 06	$35,842 65
Disposal Co.—Products	63,134 89	61,886 75
Total	$93,990 95	$97,729 40

A slight profit on reduction will be noted, but it is very small considering the prices current for grease in 1918. The operation totals listed above include no items properly charged to capital account save the rental of $8200. Insurance and maintenance were included. Insurance is simply the fire insurance on the buildings; it, together with the cost of small repairs, is included under the head of "General Expense" and shows above as "operation cost," or cost to the company for both collection and disposal.

In January, 1919, the collection company, claiming a breach of contract on the ground that the city had failed to pave the approach to the reduction plant, formally stated its intention to cease operations Mar. 1, 1919. The paving referred to had been held up by the National Capital Issues Committee, but the city elected to assume operation of both collection and reduction systems. The contractor's organization was also taken over. Equipment and plant installed by the contractor were appraised and purchased by the city for $96,174, of which $48,245 represented teams, trucks, barns, bins, etc., of the collection service. At the same time, funds to the extent of $54,000 were provided to add to the plant in an effort to recover greater value from the treated garbage and to lessen the odors of which complaint was common.

On April 16, 1919, a severe explosion wrecked the percolator room of the reduction plant. An investigating board of industrial chemists and engineers from the local rubber factories reported findings to the effect that gasoline vapors residual from the degreasing process had traveled until they came into contact with direct heat dryers two rooms distant, had there ignited and had flashed back to cause the major explosion in the percolator room. The accident resulted in the death of two men and the injury of four others. The loss to plant was estimated at $30,000. The digestors were put into operation within two days, since which time the plant has been so run, sterilizing the garbage and spreading it on the grounds.

With conditions as indicated, renewed study was given to the matter of garbage disposal in Akron, the technical studies being conducted by I. S. Osborn, Cleveland, as consulting engineer to the city.

Where originally located in 1914-15, the garbage plant site was situated in the Cuyahoga valley, well on the outskirts of town. With the rapid growth of the city, boundaries have been extended. Moreover, the operation of the plant drew considerable complaint from two of the principal residential areas and served to justify the presence of one or two odorous neighbors, newcomers to this section. City planning now contemplates the development of a boulevard and playground system in the valley. The aggregation of these facts made the city reluctant to increase its investment in a plant at that location. An estimate for an entirely new (Cobwell) plant of 100 tons capacity at some point remote from the city called for an expenditure of $472,000, with a net annual charge of $34,700. As counter to these, the project of feeding hogs was considered, and as the city was unwilling to undertake municipal operation bids were asked from private contractors. The first opening resulted in but one bid of unsatisfactory price. Readvertisement produced two bids.

Reviewing all the data in its possession, the city council, under recommendation of the public-service department, declared in favor of feeding to hogs, taking the stand that the financial conditions of the city and the uncertainties of its development rendered desirable a deferment of the final decision. In other words, the determination was not a final pronouncement, but a convenient and economical solution of the present-day situation, permitting the city to reopen the question later. Accordingly, a contract for disposal was awarded, as stated in the opening paragraph.

Under the terms of its contract the city is obligated to provide collection twice a week, May to November, inclusive, and once a week the rest of the year.

Collection at present is accomplished with 15 teams using Studebaker garbage wagons and centering the loads, to bins from which the material is relayed by a truck using a 10-cu.-yd. Lee body. The average wagon haul is 2½ miles. Plans for extension and improvement of service contemplate a gradual increase of the number

of teams and the immediate purchase of two or three delivery trucks. It is also proposed to experiment with convertible wagon-trailers and eventually to establish a second relay station. The need for improvement is decided, but financial restrictions are severe.

As furnishing information upon the finances of municipal operation of collection and disposal services, the following is pertinent: From Mar. 1 to Oct. 1, 1919, the city handled 7,588.3 tons of garbage at a cost of $8.94 per ton for both collection and disposal, exclusive of $1.45 per ton attributed to plant and equipment extensions, and also exclusive of interest and depreciation charges, which amount to about $2.05 per ton. The receipts from grease and tankage from March to June, 1919, amount to $7325. As noted before, the recovery of grease practically ceased June 16.

H. S. Morse is director of public service, and D. R. Thomas is superintendent of both collection and reduction.

Turntable Reinforced by Trussing To Carry Heavy Engines

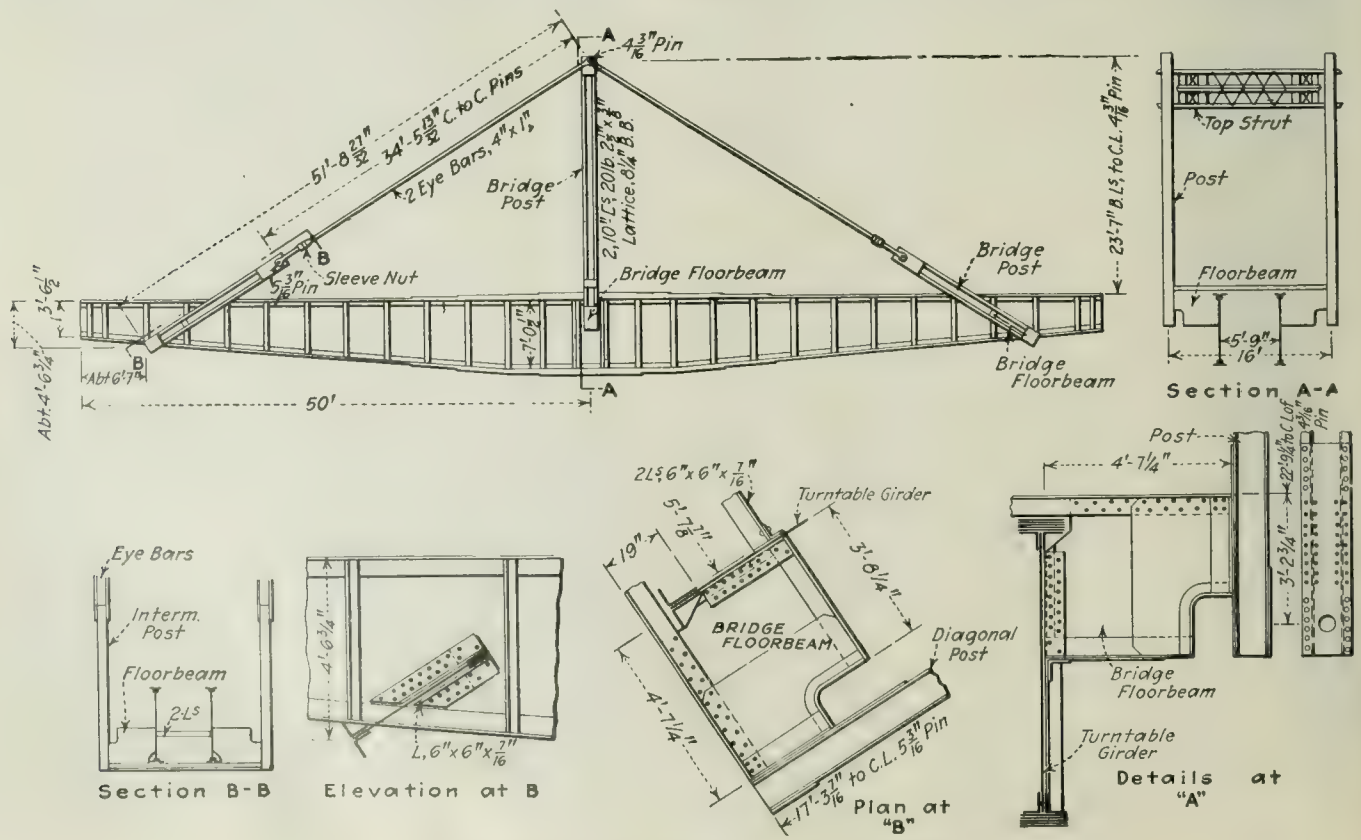
Girder Structure Fitted With High Center Frame And Tension Bars to Ends—Old Bridge Material Utilized

INCREASED strength and rigidity of a 100-ft. plate girder turntable on the Chesapeake & Ohio R.R., at Russell, Ky., has been obtained by trussing it with members salvaged from an old bridge span. The turntable was built in 1913, but new engines assigned to this railroad by the United States Railroad Administration were so heavy and so long that they caused excessive deflection at the ends. Reinforcement consisted in converting it into the bottom chord of a king-post truss, as shown in the accompanying drawing.

Material was utilized from a 150-ft. single-track through pin-connected truss bridge which had been taken down as inadequate for service. The two center posts with the floor-beam between them were used as a center frame, the web and bottom flange of the floor-beam being cut away at the middle so as to enable it to straddle the top of the turntable. The bottom flange compression in the floor-beam is taken by the loading girders between the webs of the turntable girders. Connection angles were riveted to the web of the floor-beam and the outside of the webs of the turntable girders. A strut formed of two old top struts riveted together was fitted between the heads of the posts.

Diagonals consisting of the original eyebars of the center panels are attached to the top chord pins in these posts and extend to attachments to the girders near the outer ends of the turntable. The bars connect to bottom sections consisting of the lower portions of the adjacent posts of the bridge. These latter posts in turn are riveted to two of the old floor-beams, which have their webs and top flanges cut away at the middle so as to straddle the bottom of the turntable. The posts and end floor-beams are inclined, lying in the same plane as the diagonals, with the floor-beam webs connected to the turntable girders in the same way as at the center frame. Sleeve-nuts in the eyebars enabled the truss to be brought into action. As many as possible of the old bridge connections were maintained in the new work.

This reinforcement material was fitted up in the railway shops at Huntington, W. Va., and was erected by the maintenance forces. The method was suggested by J. M. Staten, general inspector of bridges. The work was planned and executed under the direction of Crosby Miller, bridge engineer, Chesapeake & Ohio Railroad.



TURNTABLE TRUSSED BY OLD BRIDGE MEMBER

Bond-Issue Highway Program in Salt Lake County

Both Scenic and Utilitarian Roads Built—Concrete and Bitulithic Only Hard Types Used, Latter Near Beet-Sugar Factories

SCENIC as well as strictly utilitarian roads are included in the $1,500,000 highway program on which Salt Lake County, Utah, to Aug. 1, let contracts totaling $625,000. Funds available for highways are estimated at $27 per capita, or nearly twice as much as the next highest per capita in the country. Naturally, the most intensive development centers in Salt Lake County, where reside approximately 50% of the 400,000 people of the state.

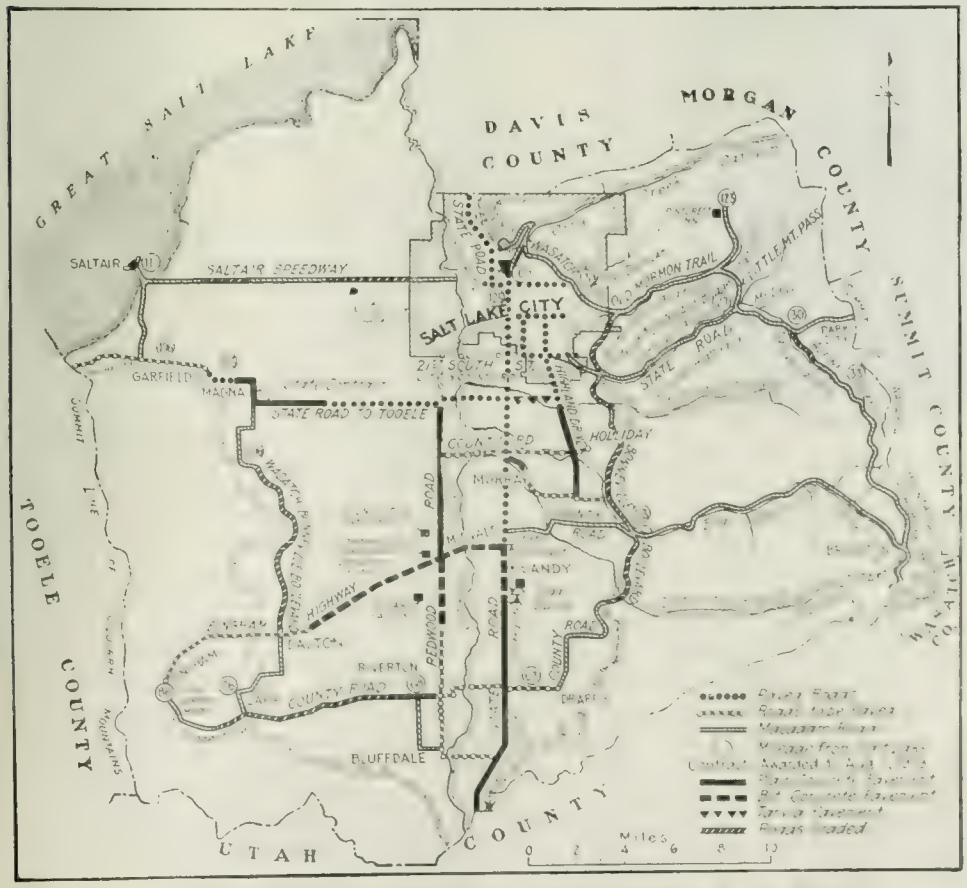
In general plan, the economic roads grid the U-shaped valley to serve the intensively cultivated irrigated areas and to connect with important points on the west where mines or mining operations are located, as at Bingham, Magna and Garfield. On the east, transcontinental routes and scenic cañons are the objectives. The basis of the scenic part of the plan is a 125-mile drive skirting the whole valley on the shores of the ancient prehistoric Lake Bonneville, visible as a bench entirely around the valley. Added to this, as a rival of the Mountain Parks drive out of Denver, is a proposed Alpine Highland drive out of Lamb's Cañon to the summit of the Wasatch range, 10,000 ft. above sea level, with Brighton as the objective. The city was full of tourists all summer, but a bid for more and more of them is to be made by means of good roads.

The general scheme of construction, which was entered upon as quickly as possible after the armistice was signed, was to put men to work early in the spring on force account on grading operations in the foothills for the Bonneville Boulevard. The sand and gravel nature of the bench made work here feasible long before the more utilitarian valley roads could be worked, thus giving the engineers time to make surveys, estimates and plans for the hard-surfaced roads. Few of the scenic roads have had anything done on them except grading. Laborers suddenly became scarce about June, and the crews found work elsewhere or with the valley contractors. Much of the mountain mileage will need only shaping with a grader, as the material on the site is good road metal. Some oiling may be done, but there will be little real macadam.

On account of the uncertainties as to price, the contractors were not asked for bids on the materials. In consequence, a fairly large staff of engineers, inspectors and foremen has been necessary to keep track of the pits, quarries and loading stations, in addition to the regular engineering work. These men, 36 in number, are all under the supervision of the county highway engineer, who has a chief field engineer with four parties under him. More than 175 miles of new location had been made up to Aug. 1. A location party consists of three men on preliminary location, four on trial location, and four in a level party. The other three parties handling construction consist of a chief, a transitman and two rodmen. The inside work is under an office engineer who has a bridge engineer, a chief assistant and road designer, five draftsmen and a clerk.

The types chosen for the work were not influenced entirely by costs. Concrete and bitulithic on slag base and on so-called "black" base were about of equal cost. Bitulithic has been specified, however, on those roads in the vicinity of beet-sugar factories because the experience at Layton, in the northern part of the state, where it is said, disintegration of concrete has taken place rapidly due to the organic acid in the pulp hauled away from the factories for cattle food. This road was covered with Tarvia which peeled off later, bringing a portion of the concrete with it, indicating that the acids continued to work under the coating. From correspondence with the factories and with surrounding states, the engineers learned of similar experiences.

The concrete is an 18-ft. slab, 6 in. thick on the sides and 8 in. in the center, made with a 1:1.37:1.42 mix, so proportioned that there will not be an excess of mortar. The six-mile stretch on Redwood Road under contract by Ryberg Bros. is typical. The old gravel-macadam road is scarified to the new grade, following the old as closely as possible. Some of the gravel had been down 10 years,



ROAD PROGRAM ON WHICH SALT LAKE COUNTY IS AT WORK

but in most places sufficient material is left for shoulders. For 2½ miles a longitudinal drain will be necessary on the uphill side of the road, but the remainder has been well built up above the surrounding country. Sand and gravel from a county pit near the center of the section are washed over rotary screens with 400 gal. per minute, the output being 350 cu.yd. per day. Less than this amount of water leaves a filament of clay adhering to the stones, effectively preventing a bond.

Concealed expansion joints are inserted at the end of a day's work. Finishing is done by rolling four times and belting twice. Ponding for 10 days is practised, and the engineers are attempting to increase this period to 20 days. The road is opened to traffic in 28 days. Water problems are easily solved, because irrigation ditches parallel and cross the road at frequent intervals. A pump with pipe line, however, is installed to make the ponding operation sure. On this job a Koehring mechanical loader of the belt type is operated by 11 men, who easily keep the boom and bucket mixer turning out a batch every 1½ min. Once during the inspection by a representative of *Engineering News-Record* two of the four hoppers were discharged at once, apparently by accident, overloading and stopping the belt for a few minutes.

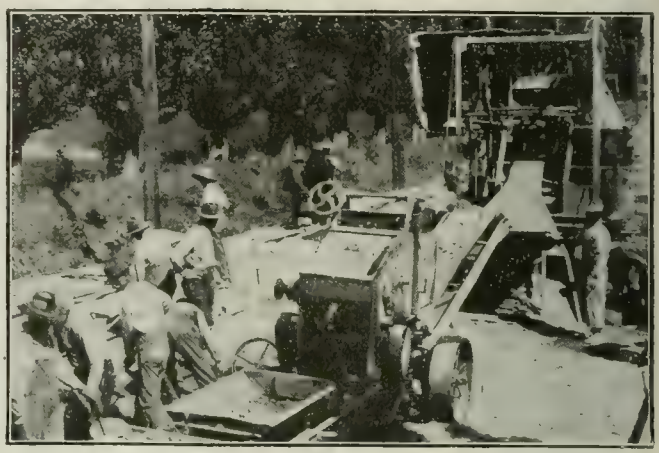
Of the bitulithic on black base, a stretch of 9.3 miles on Bingham Highway, just north of a sugar factory and on Redwood Road east of the factory, is typical. Practically all of this road is old gravel macadam, so there is good foundation for the 3-in. base, which consists of an asphaltic concrete with the aggregates graded down from a 2-in. gravel. It is rolled with a 10-ton roller, and a 2-in. bitulithic layer is put on top, dependence being placed on the original foundation to carry most of the load directly. The old material varies from 6 to 24 in. in depth. The contractor, the Cliffton, Applegate & Toole Co., has built a portable plant near the junction of the Bingham and Redwood roads at the Salt Lake & Utah R.R. crossing, thereby giving easy shipping accommodations. The county has a pit of fine sand about a mile north, and has erected a trestle for loading by slip scrapers directly into gondola cars. It furnishes this at a cost of 60c. per yard.



FOUR HOPPERS LIKE THE ONE IN FOREGROUND FEED ONTO BELT CONVEYOR

For the 4-in. slag base which is being used by the state on State St., material 4 in. and under is placed and rolled, then covered with a crushed filler of slag 1 in. and under, rolled into the interstices before the 2-in. top coat of regular bitulithic is applied. A slag dump at Sandy is available, a crusher having been installed by the contractor to furnish road material.

Practically all of the mountain work so far has been excavation only. The state forces are now at work in Parley's Cañon widening an existing road to 24 ft., as this is the Lincoln Highway entrance from the east and carries a heavy traffic in addition to that of Park City, a mining town. A steam shovel and a five-ton truck hauling a grader are the large tools used. Work on the surveys of the Alpine Highway up Lamb's Cañon have been completed—that is, beyond the end of the present narrow one-track steep-grade existing mountain road. In the first four-mile section which is about to be let a long "hairpin" curve with 40-ft. radius on the loop is the first feature. There are also one 80-ft. and three 100-ft. radius curves necessary to gain the crest, but there is only 500 ft. of solid-rock excavation in this distance. The maximum grade will be 5%. To check cars coming up to sharp curves on grades, the lower end is made the maximum and the upper end leads off on a flattened grade. The latter permits cars to slacken speed coming down. Beyond the head of Mill Creek, where the steepest portion will be located, the road will wind in and out around the peaks, hitting all of the saddles on the top of the range until it reaches Mount Majestic at a point much nearer the peak than indicated on the map.



TRIPPING END HOPPER ONTO BELT

Structures of importance on the county roads are not numerous. A $200,000 concrete arch bridge on the Bonneville Boulevard over the mouth of Parley's Cañon, for which tentative designs have been made, is the most ambitious structure of its type in the valley. It will have a main arch of 280 ft. and two 90-ft. arches at the ends. The bed of the creek will be 200 ft. below the roadway. A suspension bridge estimated at $140,000 has also been proposed. All other bridges are of slab-and-girder type. One over the mouth of Big Cottonwood Cañon with three beams and slab spans of 28 ft. will be on a radius of 82 ft., the road circling upstream to gain a view of the water-works dam spillway. The roadway is 20 ft. wide and has a superelevation of 8 in. for an assumed speed of 20 miles per hour by the heaviest touring car. The outer girders are deepened to allow for the impact. For two 30-ft. spans

of beam-and-slab construction to be built over the Jordan River in Midvale, shallow beams were necessary on account of 1½-ft. head room only above high water. This structure will be 24 ft. wide on five girders and will have cantilever sidewalks.

Of the 73 miles of hard-surface road planned for the county, the county will build 43, and 20¾ miles are under contract. C. F. Hillman, chairman of the county commissioners and commissioner of roads, is the originator of the extensive county system and of the bond-issue method of getting them. George G. Bywater, county surveyor, is also highway engineer in charge of the engineering and the force-account work. The state work is under Ira R. Browning, state highway engineer.

Passenger Train Resistance Tests

EXPERIMENTS on the tractive resistance of passenger trains show that in these, as in freight trains, the resistance measured in pounds per ton decreases as the weight of car increases, so that this unit is lower for trains composed of heavy cars than for those composed of light cars. Regular main-line trains on the Illinois Central R. R. were utilized for the experiments. These trains had from four to 12 cars each, the weight per car ranging from 33½ to 71 tons and the total weight behind the tender ranging from 138 to 727 tons. A report on the observations and results, by Professors Edward C. Schmidt and Harold H. Dunn, is given in Bulletin No. 110 of the Engineering Experiment Station of the University of Illinois.

PASSENGER TRAIN RESISTANCE

Weight of Car or Train	Car Train Resistance: Lb. per Ton Cars 20 Miles per Hour	40 Miles per Hour	60 Miles per Hour
30-ton car	9	11½	14¾
40-ton car	6½	8⅝	11¼
50-ton car	5⅛	7	9¼
60-ton car	5¼	6½	8⅝
70-ton car	4⅝	6	8
Eight 40-ton cars	5¼	8⅛	11
Ten 60-ton cars	4¼	6⅛	8

The influence of car weight upon train resistance has been understood for several years and is recognized generally in the preparation of tonnage ratings for trains. Although a similar influence upon passenger trains has appeared highly probable, this factor has not received much recognition in regard to the latter. The authors of the report consider that this is due partly to lack of experimental data and partly to the fact that the range of weight is much less for passenger cars than for freight cars, so that this factor is of less economic importance for passenger service than for freight service. Thus, the weight of freight cars may range from about 18 to 100 tons while that of passenger cars ordinarily is only from about 35 to 65 tons.

Passenger train resistances for both cars and trains at different speeds are summarized in the accompanying table, which is prepared from diagrams in the report. The observations were made with trains running on stone-ballasted track laid with 85-lb. and 100-lb. rails. Weather conditions were favorable in most cases and wind resistance is included in the final results. It will be seen that as the car weight increases there is a regular reduction in the unit resistance.

Treatment of Canning-Plant Wastes in Wisconsin

State Board of Health Has Prepared General Plans for Treating Plain Washings, Silage Juice and Combined Wastes

By E. J. Tully

State Sanitary Engineer, State Board of Health, Madison, Wis.

TREATMENT of canning plant wastes is a phase of the industrial waste problem which is of concern not only to state boards of health but to conservation commissions also. The discharge of raw liquors of this type, particularly into relatively small streams, is decidedly toxic to fish life, as we have experienced in a considerable number of instances in Wisconsin.

Three types of water-course pollution or nuisance may result, and usually ensue, from the direct discharge of canning wastes into water; namely, physical, chemical, and bacterial. The latter type is augmented when sewage disposal complicates the industrial waste-problem, as is the case where a public sewer system is not available for the disposal of waste of this character. The wastes discharged include cooling waters, pea washings, floor washings, silage juice, and sewage.

In preparing canning-plant products for "processing," large volumes of water are used to wash the peas, corn, etc., and as a result of such washings a relatively large amount of suspended matters is discharged, part of which is of a gross and part of a fine character. In addition to the washings, large volumes of water are used for cooling purposes, but such water is practically free from foreign substances and may be discharged into the line carrying the treated effluent to the watercourse, thus effectively using it for the dilution of the effluent. Silage juice results from fermentation of the vines, which are usually stacked adjacent to the plant, and during the period of active fermentation the volume of such waste is substantial. This liquor, the product of fermentation, is a relatively concentrated, brown, turbid waste, and decidedly acid in character.

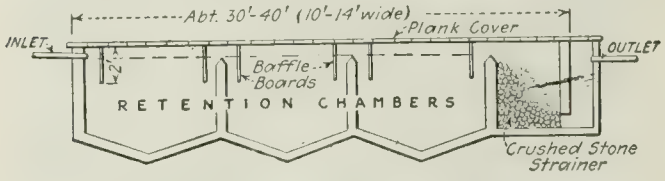
Domestic sewage should always be disposed of by discharge into the public sewer system, where available.

Wash water ranges from ½ to ¾ gal. per can of product. The silage juice discharged per day varies with the amount of vines and the fermentation activity.

When the vines are stacked, rather than placed in a silo, the daily volume may be greatly augmented during periods of rain, a diluted juice resulting under such conditions. The volume of water used for cooling purposes is a factor which is not involved in the treatment problem, as all water used for this purpose should be diverted around the treatment system and used to dilute the effluent.

The wastes to be considered, therefore, include products of washings, silage juice and, under certain conditions, sewage. Briefly stated, treatment of these wastes involves reduction of the concentration of the organic matter, in suspension and in solution, to conform to local sanitary requirements; and the plan indicated to accomplish this end includes diversion of all cooling water around the treatment system to be used to dilute the effluent; coarse screening of the waste products prior to discharge into the system, if it is desired to recover peas, etc., to be used for cattle-feeding purposes; discharge of domestic sewage into public sewer

systems, when such facilities are afforded; conveying pea, corn and plant washing and silage juice effluent, and sewage if necessary, to a common point, and subjecting wastes to treatment in a combination unit comprising a sedimentation or retention unit of three sections and a crushed stone gravity or contact filter, depending on topographical conditions; and preliminary treatment of silage juice, using lime or soda-ash to neutralize partly the acidity and reduce the organic concentration, and subjection of the chemically treated liquor to sedimentation, coke contact or gravity straining and gravel-sand filtration, depending on the degree



RETENTION CHAMBER AND STONE STRAINER FOR TREATMENT OF CANNERY WASHINGS

Sizes of stone for strainer: Bottom, egg; middle, 1-inch; top, ½ to ¾ inch.

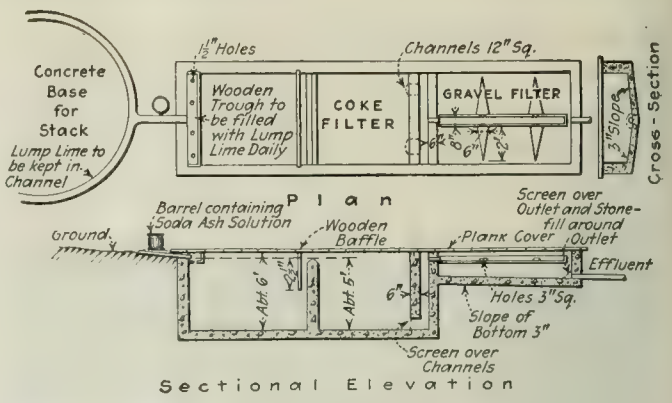
of treatment required prior to the discharge of the effluent into the unit used to treat the washings. When the available stream dilution is small and conditions point to the use of an upper layer of gravel- coarse-sand mixture in the washings' treatment unit, a stone contact strainer is indicated between the retention chambers and the filter. When a watercourse is not available or is relatively distant and a gravel-sand formation is at hand, disposal of the final effluent by natural filtration in a series of excavations is an indicated procedure.

In every instance, local sanitary requirements are the main factors to be considered in deciding on the degree of treatment. The purpose is to effect satisfactory reduction in the concentration of the wastes, and thereby produce an effluent of such character that disposal may be satisfactorily effected either by dilution or ground filtration.

General outlines of plans which have been developed for treatment of canning plant wastes are illustrated in the accompanying illustrations. These plans of treatment afford satisfactory methods of purifying such wastes, provided intelligent operation and care are given the system, including such chemical treatment as is directed, removal of scum and sludge or deposit as often as the conditions indicate the necessity of cleaning, renewal of coke each season, and frequent raking of the surface of the filters.

Fig. 1 illustrates a type of treatment indicated for washings not complicated with silage juice. The crushed stone strainer at the end of the unit may be either of the contact or gravity type, depending on available elevation.

Fig. 2 shows a unit for treating silage juice. The lime or soda ash is applied from a



GENERAL-SCHEME FOR TREATING SILAGE JUICES AT CANNING PLANTS

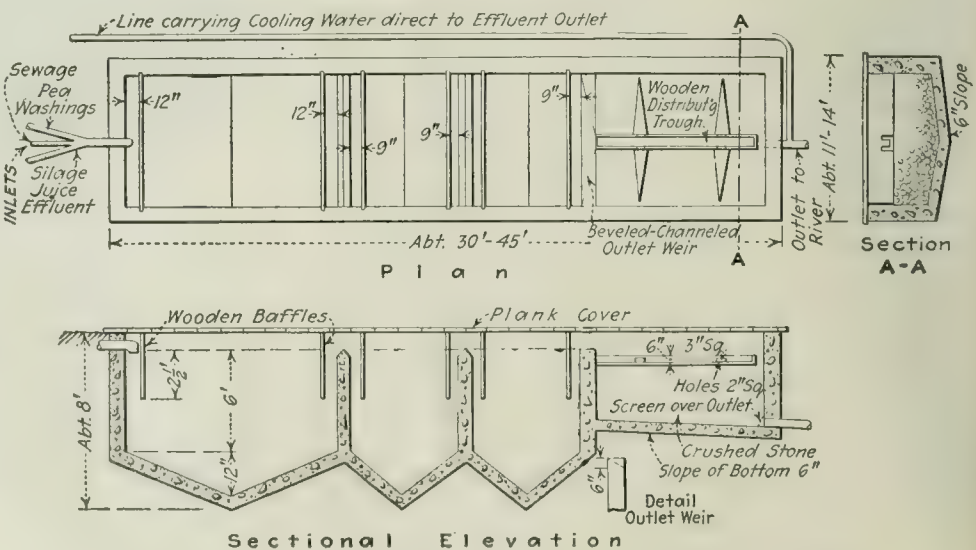
Sizes of coke: Bottom layer, 1-inch; top, ½ to ¾-inch. Sizes of gravel: Bottom, 1-inch; middle, ½ to ¾-inch; top, mixture of gravel and coarse sand

barrel or solution box prior to entrance to the sedimentation chamber. The trough below the inlet acts as a mixing unit and may be also used for liming purposes. The coke strainer may be either of the contact or gravity type, depending on the local conditions prevailing in each case.

Fig. 3 indicates a system for treating combined wastes, washings, silage juice and sewage.

Modifications of these schemes may be employed to accomplish such results as may be required for a particular case. It is pertinent to call attention to the advisability of definitely indicating to the officials of concerns installing works for the treatment of cannery wastes the necessity for proper supervision and operation of such works.

General sanitation with reference to canning plants is a most important matter. To insure clean conditions in and about such plants sanitary regulations have been formulated by the State Board of Health and copies of such regulations have been sent to officials of the canners' association of our state. The association has recently appointed a full-time sanitary inspector who is now coöperating with the state departments in the program which has for its purpose the maintenance of sanitary conditions in and about such canning plants.



SEDIMENTATION AND FILTRATION PLANT FOR COMBINED WASTES FROM CANNING FACTORIES

Sizes of stone for filter: Bottom, 1-inch; middle, 1-inch; top ½ to ¾ inch

Water-Works Operating Problems at Quincy, Illinois

Changed Pumping Conditions Increase Head—Main Cleaned and Gate Repaired—Pressure and Pumping Cost Reduced

By W. R. Gelston
Superintendent of Water-Works, Quincy, Ill.

CLEANING a force main has materially reduced the cost of pumping the water-supply of Quincy, Ill., through a decrease in pressure head and more favorable operating conditions. Incidentally, the cleaning operation discovered a broken gate valve.

Until May 19, 1919, the entire City of Quincy was supplied with water by dumping from the filtration plant, on the Mississippi River, through the distribution system to a storage reservoir 2½ miles distant on the highest hill in the corporate limits. The static head at the pumping station, with the reservoir full, is 90 lb. per square inch. With the pump discharging 4200 gal. per minute it operated against a head of 103 to 110 lb. per square inch, depending upon the rate of consumption.

The capacity of the filtration plant is 6,000,000 gal. per 24 hours, and the pumping station is always operated at the full capacity of the filters. The average daily consumption of water is less than 2,000,000 gal., so eight hours per day is about the average time of pumping. Therefore the static reservoir head prevails throughout the city about two-thirds of the time.

Booster Station and Tank Put In

In recent years the high ground surrounding the reservoir has been built up, and the reservoir pressure there has not been satisfactory. To make the pressure adequate, a booster pumping station and an elevated tank were built on ground adjacent to the reservoir, and about 18 miles, or 23%, of the distribution system was cut off from the reservoir service and placed under the tank pressure. While some increase in the operating head at the river pumping station was expected as a result of this change, the increase was greater than expected and more than some of the mains were designed to withstand. There was only one break in cast-iron mains, however, as a result of the increase in pressure.

A three-stage centrifugal pump is used most of the time, at the river station, for pumping water to the reservoir. Previous to the change in the distribution system, this pump operated under a head of about 106 lb. per square inch when discharging 6,200,000 gal. per day. Since the pump operates at a constant speed, any decrease in the discharge head results in an increase in the amount of water discharged, and vice versa. After the change in the limits of the distribution system, the pressure increased to such an extent that the pump would only discharge from 3,200,000 to 4,800,000 gal. per day, depending upon the amount of water being drawn from the distribution system. At the highest rate of discharge it developed the lowest pressure, about 117 lb. At the lowest rate of discharge the pressure ran as high as 126 lb. per square inch. Since the static pressure at the pumping station is 90 lb., the frictional resistance to be overcome in pumping at a rate equivalent to 55% of the capacity of the plant was 36 lb. or 83 ft.

The force main from the pumping station to the reservoir consists of the following sizes and lengths of pipe: 1320 ft. of 18-in., laid in 1881; 3300, 16, in 1877; 1900, 15½, in 1875; 810, 16, in 1882; 1750, 18, in 1882; and 4720 ft. of 20-in., laid in 1882; total, 13800 ft. There are four depressions in the grade line.

Contract Let For Cleaning the Force Main

Untreated Mississippi River water was pumped through the force main until 1891, when the first filtration plant was built. There was considerable tuberculation in the Quincy distribution system, but it had not been considered serious. It did not seem possible that the tuberculation could be the cause of so much frictional resistance as existed. However, all of the valves on this line and all of those on connecting pipe were tested, and seemed to open and close properly. No accumulation of air could be found at any of the high points, so it was decided that tuberculation and deposits of silt in the depressions were causing the excessive frictional resistance. A contract was then made with the National Water Main Cleaning Co. for cleaning the pipe listed above.

The work was started July 15, 1919, at the pumping station end, and progressed toward the reservoir. Although considerable tuberculation was removed and there was some improvement in operating conditions from the successive machine runs, the results, as a whole, did not promise to give the desired relief, until an opening was made close to a 20-in. valve which was located 2700 ft. from the reservoir end of the line. This valve was a bevel-gear horizontal type of taper-seat double-gate valve. One of the trunnions on the bell of the valve was broken, allowing its gate to remain in the closed position while the other gate was moved back and forth in the normal manner by turning the stem. The broken surface of the trunnion was covered with a thick coat of rust and tuberculation, indicating that the valve was broken many years ago.

Power Consumption Reduced

The removal of this obstruction gave the desired relief. There was still, however, about 2700 ft. of 20-in. pipe to be cleaned, and the results obtained from cleaning it give, approximately, the value of the cleaning operation.

The pump operated one day with the broken gate removed and 2700 ft. of uncleaned pipe. The power consumption, on this run, was 1165 kw.-hr. per 1,000,000 gal. pumped. The average power consumption for 14 similar runs, succeeding the cleaning of the last section, was 1135 kw.-hr. per 1,000,000 gal. This saving of 30 kw.-hr. per 1,000,000 gal. will result in an annual total of $141.75 in power cost alone for the pump on this service. A proportional saving cannot be claimed for the entire line of pipe which was cleaned, because the first 9300 ft. at the pumping station end is a part of the reservoir distribution system and has branches leading from it at nearly every street intersection. The last 4500 ft. of 20-in. main, however, is purely a force main passing through the tank district, and all of the intersection branches were disconnected from it when the tank distribution system was put in service. It can, therefore, safely be assumed that a proportional saving resulted from cleaning 4500 ft. of 20-in. pipe or 2700 ft. : $141.75 : : 4500 ft. : x, or x = $236.25, which is the annual saving of power cost from cleaning 4500 ft. of 20-in. pipe. This sum capitalized at 5%

gives $4725 as the sum which might be reasonably expended in cleaning the 4500 ft. of pipe. As a matter of fact, the cost of cleaning the entire line was considerably less than this amount.

A comparison of the operating conditions since cleaning the mains and removing the broken gate with the conditions during June, previous to beginning the cleaning, shows the following results:

In June the pump discharged from 3,200,000 to 4,800,000 gal. per day with the discharge valve wide open, against pressures ranging from 117 to 126 lb. per square inch, and it was necessary to pump about 13 hours per day to maintain the supply. Since the cleaning was completed, the pump discharges against a partly closed discharge valve all of the time. Controlled in this manner, it discharges from 6,000,000 to 6,750,000 gal. per day against heads ranging from 100 to 104 lb. per square inch on the reservoir side of the partly closed gate. With the rate of discharge reduced to 4,800,000 gal., the maximum under the conditions before cleaning, the pressure drops to 95 lb. per square inch as compared with 117 lb. before cleaning. The plant is now operated only eight hours per day and six days per week.

The power used by the pump on the reservoir service now averages 289 kw.-hr. per 1,000,000 gal. less than the average for June, and there is an additional average saving of 49 kw.-hr. per 1,000,000 gal. from the operation of the pump which lifts the water from the river to the filtration plant, due to the increased rate of discharge. This makes a total saving of 338 kw.-hr. per 1,000,000 gal. pumped. The power is purchased from the local power company at 0.75c. per kilowatt-hour. The saving is therefore $2.54 per 1,000,000 gal. or $1600 per year at the present rate of consumption.

A comparison of the present operating conditions with the condition previous to cutting off the tank distribution system shows that the centrifugal pump has about 10% greater discharge capacity, due to a decrease of about 3 lb. per square inch in the discharge head. In other words, the cleaning of the mains and the removal of the broken gate offset the frictional resistance caused by cutting off the 18 miles of mains and putting in the booster and tank, and made an additional gain of about 3 lb. per square inch in head.

Questions Relating to Effect of Broken Gate

Two questions are suggested by finding the broken gate: (1) How serious has the obstruction caused by the broken gate been in the years which have passed since it was broken? and (2) Why was it not discovered sooner? Both questions are answered by the same explanation.

The effect of the broken gate, previous to cutting off the new distribution system, was practically *nil*. This was due to the fact that (1) practically all of the pumping operations were carried on during the hours of maximum consumption, and at least 50% of the water pumped went direct to the consumers without going to the reservoir at all; (2) there were four 6-in., two 8-in. and one 12-in. connections, with a total area of 326.7 sq.in., carrying water around the broken valve and into the 20-in. main between the valve and the reservoir; (3) the Quincy water-works plant was not equipped with pressure-recording gages until 1911, and the valve was undoubtedly broken before that date; (4) there was a considerable amount of water passing through the broken valve, around the loose gate and through the hood. This last assertion was conclusively proved during the cleaning operations.

After the new distribution system was cut off there remained only two mains carrying water to the reservoir—the 20-in. main which was cleaned and a 21-in. main which also ran through the new district and connected into the 20-in. main just outside of the reservoir. When the pumping station was not in operation all of the water used in the reservoir district had to pass through this 12-in. pipe and the 20-in. pipe, obstructed as it was with the broken gate. In spite of this obstruction, there was no serious drop in pressure at any time when the pump was not running. While the cleaning operations were under way it became necessary to shut off the 20-in. main in which the broken valve was located. While the main was shut off, the engineer at the pumping station, through a misunderstanding, shut down the plant, and all of the reservoir distribution had to be supplied temporarily through the 12-in. main. In a few minutes the office was besieged with inquiries from consumers who could not get water. The pressure in the office, which is normally about 42 lb. per square inch, dropped to 22 lb. This sudden drop in pressure proves conclusively that a considerable amount of water must have passed through the broken valve and that it was not so serious an obstruction as might be supposed. It was serious, at any rate, only during the period between May 19, 1919, when the tank district was cut off, and the date of its removal, Aug. 5, 1919.

Brittleness in Nickel-Chrome Steel

According to elaborate experiments carried on in England during the war, and reported last month by R. H. Greaves before the Iron and Steel Institute (London), nickel-chrome steel is likely to be made brittle by final slow cooling from a temperature of 600° C. or above, while every tempering treatment that was tried involving a final rapid cooling from above 600° gave good impact figures. Furthermore, steel of satisfactory toughness was always made brittle by reheating to a temperature of about 520° C., or by higher heating when followed by slow cooling. Brittle steel could be restored to toughness by reheating to a temperature between 600° and 670° and cooling rapidly. All these effects are practically without influence on the tensile strength of the material. Other experiments reported by F. Rogers at the same meeting, indicated that the amount of working of nickel-chrome steel affects its susceptibility to "tempering brittleness." The more a steel is worked, the greater is its susceptibility to this effect.

In a separate study of nickel-chrome forgings, carried out by J. H. Andrew, J. M. Greenwood and G. W. Green, the importance of keeping the metal clean and of casting under the right conditions was brought to the fore. One suggestion made for keeping the metal clean is to pour it through a funnel lined with basic material, which would catch much of the included slag in the metal and allow only the pure steel to go through the hole in the bottom of the dish. Ingots should be cast wide end up, and casting should be done at as low a temperature as possible. A high ladle temperature, holding the metal in the ladle, and casting cool, are advantageous features, by giving cleaner metal, keeping the crystals small and preventing ghost lines. Thorough soaking immediately after casting is said to help in promoting soundness and preventing the liability to cracking.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Water as a Natural Resource

HYDROLOGY: The Fundamental Basis of Hydraulic Engineering—By Daniel W. Mead, M.Am. Soc. C.E., Consulting Engineer, Professor Hydraulic and Sanitary Engineering, University of Wisconsin. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 647; illustrated.

REVIEWED BY F. H. NEWELL

Professor of Civil Engineering University of Illinois, Urbana

Professor Mead's "Hydrology" has interest and value to students of the natural resources of the country, particularly those who are concerned with the better conservation and use of water in the production of power and in irrigation, drainage and flood protection.

The material brought together, largely from the results of his own work, covers the occurrence of water, its distribution and fluctuations in quantity—especial attention being given to rainfall phenomena and to the observations of atmospheric conditions which control precipitation. Following this is a discussion of the influence of geology and of topography upon the occurrence of water in the ground and flowing off its surface, with a consideration of the causes and effects of floods, the practicability of water storage and other applications of engineering data. The book, in its wealth of detail, is almost encyclopedic in character. The data are visualized by diagrams and supplemented by copious references to related literature. It forms a valuable and needed introduction to the work of the same author on "Water Power Engineering." It has been preceded by the author's "Notes on Hydrology" issued over a decade ago for the use of his students, but these notes have been so amplified and revised that the present may be considered as a new book.

The ramifications of hydrology, as treated by Professor Mead, illustrate the fact that the successful engineer must be a keen student and observer of natural phenomena, many of which are often considered to lie outside of engineering, such as meteorology, geology, soil physics, forestry and various phases of economics. His discussion of these matters is not only of value to the practicing engineer but the clear way in which the subjects are handled make the facts accessible and really interesting to the general reader.

Forest Products Other Than Lumber

FOREST PRODUCTS, THEIR MANUFACTURE AND USE: Embracing the Principal Commerical Features in the Production, Manufacture, and Utilization of the Most Important Forest Products Other Than Lumber in the United States—By Nelson Courtlandt Brown, B.A., M.F., Professor of Forest Utilization, The New York State College of Forestry, Syracuse, N. Y., etc. New York and London: John Wiley & Sons, Inc. Cloth; 6 x 9 in.; pp. 471; illustrated.

The magnitude of the forest-product industries is well emphasized by the fact that the author speaks of the necessarily brief treatment he has been able to give to each product in a book so large as the present one, from which all consideration of lumber is omitted, as well as such woodworking industries as furniture, shipbuilding and car construction.

After a general introduction, wood pulp and paper, tanning materials, veneers, slack cooperage, naval stores, hardwood distillation, and a variety of other topics are taken up. Chapters of most appeal to readers of *Engineering News-Record* are those on cross-ties, poles and piling, posts, and mine timbers.

The chapter on ties gives the species used and requirements for a good tie, discusses sawed versus hewn ties, deals with specifications and prices, goes into the shaping and delivery of ties to the market, and takes up seasoning, preservation and protection against mechanical wear. The chapter on poles follows somewhat the same general lines and contains a few paragraphs on substitutes for poles and piling. There is a bibliography at the end of each chapter.

Government Work for Irrigation

THE UNITED STATES RECLAMATION SERVICE: Its History, Activities and Organization. Institute for Government Research. New York and London: D. Appleton and Co. Cloth; 6 x 9 in.; pp. 177.

Among its other undertakings, the Institute for Government Research, which describes itself as "an association of citizens for coöperating with public officials in the scientific study of government with a view to promoting efficiency and economy in its operations and advancing the science of administration," has set for itself the task of preparing monographic descriptive studies of each of the fifty or more distinct services attempted by the Government of the United States. These studies follow a uniform plan which is outlined in the volume before us as follows:

"1. The history of the establishment and development of the service; (2) its functions described not in general terms but by detailing specific activities; (3) its organization for the handling of these activities; (4) the character of its plant; (5) the compilation of or reference to the laws and regulations governing its operation; (6) financial statements showing its appropriations, expenditures and other data for a period of years; (7) finally, a full bibliography of the sources of information, official and private, bearing on the service and its operation."

These monographs are descriptive rather than critical. They are designed to be of service to both officials and to those laymen who are interested in the branch of the Government dealt with. The volume on the Reclamation Service does not need specific description, since it conforms with the general plan, already given, for the series. It is written in a direct, attractive style and presents a large amount of information in small compass. The bibliography is quite extensive.

A Keenly Observant World-Roving Engineer

INCIDENTS IN THE LIFE OF A MINING ENGINEER—By E. T. McCarthy A.R.S.M., M.I.M. & M., M.I.M.E., M.Am. I.M.E., F. R. G. S. London: George Routledge and Sons, Ltd.; New York: E. P. Dutton & Co. Cloth; 6 x 9 in.; pp. 384.

Accounts of adventures with and observations on men and nature in what were at the time and in some cases still are out-of-the-way places of the world, make up this entertaining volume. Except as backgrounds, the author's extensive and varied experiences as a mining engineer are not given. The author shows still further restraint by confining his story to the first 18

of his 44 years of life as a mining engineer, stating that he thinks "impressions are much more vivid in early life than in later life."

After some preparatory experience in an English coal mine, and a course at the Royal School of Mines, the author was surprised by an offer to go to a gold mine in North Carolina After two years spent there he resolved to carry out a long-felt desire to go to West Africa, but before leaving America he decided to go west to "collect information, especially with regard to Leadville, the new silver mining camp in Colorado." Some fifty pages are devoted to these early American experiences. These pages contain many interesting observations on both negroes and Indians.

Returning to England, Mr. McCarthy was soon on the West African coast, and later in Morocco. He then went to western Canada, stopping at Calgary when that place was in its veriest infancy, and while it was still uncertain whether the Canadian Pacific Ry. would pass through it. Proceeding by horse he went to Montana, then to Vancouver. In these chapters we have still more about the American Indians and Western pioneer days.

Subsequently the author was for some time in Nicaragua, visiting en route the Panama Canal in the French days. The grossly unsanitary conditions then prevailing and the hopelessness of the project as then conducted are set forth. Still later the author was located in the Malay peninsula and then went to China, Australia and New Zealand. Four chapters are devoted to life in Uruguay and one to the low country of South Africa; with this chapter the book closes.

It is to be hoped that the welcome which is being accorded to this book here and abroad will induce the author to give the world the benefit of his keen observations of men and things during the later years of his professional life.

Our National Parks and Monuments

THE BOOK OF THE NATIONAL PARKS—By Robert Sterling Yard, Chief of the Educational Division, National Park Service, Department of the Interior; Author of "The National Parks Portfolio," "The Top of the Continent," etc. New York: Charles Scribner's Sons. Cloth; 6 x 9 in.; pp. 420; illustrated.

Written with fullness of knowledge and with a large measure of intimate personal acquaintance, this volume promises to fulfil the two principal objects of the author: "The one is to describe and differentiate the national parks in a manner which will enable the reader to appreciate their importance, scope, meaning, beauty, manifold uses and enormous value to individual and nation. The other is to use these parks, in which Nature is writing in large, plain lines the story of America's making, as examples illustrating the several kinds of scenery, and what each kind means in terms of world building."

To carry out this twofold object the descriptions are ordered in four groups: Parks whose geological formation is (1) granitic; (2) volcanic; (3) sedimentary, and (4) the Grand Cañon and national monuments. The book is prefaced by 14 pages "On the Appreciation of Scenery," and each of the main sections has from three to seven introductory pages dealing with the scenery of its type, the fourth and longest section being entitled "On the Scenery of the Southwest."

From a very handy table it appears that our 18 national parks have a total area of 10,739 square miles, ranging from 1½ miles of Hot Springs, in middle Arkansas, to the 3,348 miles of the Yellowstone, in northwestern Wyoming. These are the two earliest parks, created in 1832 and 1872. The latest, established in 1919, is Lafayette Park, on the Maine coast, eight square miles in area. Included in the 18 parks described are Hawaii (1916) and Mount McKinley, Alaska (1917). Among the national monuments described is the Rainbow Bridge, in Utah, discovered in 1909, a natural arch of 209 ft. span and a clear opening 309 ft. high.

Interwoven in each description is a brief account of the efforts, often long and arduous, made to set apart for national use each park or monument. The volume should serve to stimulate interest in the great system of national parks and monuments being established and made accessible to all by our national Government.

Orifices in Pipe

THE ORIFICE AS A MEANS OF MEASURING FLOW OF Water Through a Pipe—By Raymond E. Davis, Associate in Civil Engineering, and Harvey H. Jordan, Assistant Professor in General Engineering Drawing, University of Illinois, Urbana: Engineering Experiment Station. Paper; 6 x 9 in.; pp. 56; illustrated.

Definite coefficients have been obtained by experiment by the authors on the measurement of the flow of water through 4- to 20-in. pipes by means of a thin-plate circular orifice. The device is applicable, in the author's opinion, to testing pump efficiency; individual wells in a water-works system; water consumption for individual purposes in mills and factories; discharge in city mains, and measuring irrigation water.

Tests were made to determine: (1) The position of two cross-sections of the pipe, one section upstream from the orifice, the other downstream from the orifice, at which pressure head may be measured and the drop in pressure from one section to the other may be most favorably determined; (2) the relation between this drop in pressure head and the rate of discharge through the pipe; (3) the lost head occasioned by the orifice; (4) the effect of small deviations from what may be termed standard conditions, and (5) the proper size of orifice for given conditions.

Chemical Reference Book for General Use

THE CONDENSED CHEMICAL DICTIONARY: A Reference Volume for All Requiring Quick Access to a Large Amount of Essential Data Regarding Chemicals, and Other Substance Used in Manufacturing and Laboratory Work—Compiled and Edited by the Editorial Staff of the Chemical Engineering Catalog, F. M. Turner, Jr., Technical Editor; Assistant Editors, D. D. Berolzheimer, W. P. Cutter, John Holfrich, New York: The Chemical Catalog Co., Inc. Cloth; 6 x 9 in.; pp. 525.

Designed primarily for the increasing number of persons without chemical training who have frequent need for a handy dictionary of chemical and allied substances, the editors express what appears to be a well founded hope that this volume will be a time-saver for chemists also. Besides the dictionary proper, the book contains a number of pages devoted to combining (atomic) weights, domestic weights and measures, metrical equivalents, conversion tables, definitions of units, and extracts from regulations governing the transportation of explosives and other dangerous articles by freight and express. The dictionary gives for each substance listed its chemical symbol, color and properties, chief constituents, constants, solvents, derivation, method of purification, container, uses, fire hazard and shipping regulations. Space is left between the entries, and also by means of liberal margins, for supplementary notes. The dictionary promises to be widely useful.

For the Average Health Officer

THE HEALTH OFFICER—By Frank Overton, A.M., M.D., D.P.H., Sanitary Supervisor, New York State Department of Health, and Willard J. Denno, A. B., M. D., D. P. H., Medical Director of the Standard Oil Company, Formerly Secretary of New York State Department of Health. Philadelphia and London: W. B. Saunders Co. Cloth; 6 x 9 in.; pp. 512; illustrated.

Except for having a horizon restricted to New York State in matters of statutory powers and Governmental administrative details, the authors have produced a volume that bids fair to meet their aim to tell the "average" health officer "what to do, how to do it and why he should do it." Particularly commendable is their recognition of the fact that the province of the health officer is to deal with man in his relation to public health, leaving to the sanitary engineer the satisfaction and safeguarding of most of his physical wants and comforts affecting health more or less directly, such as nuisances, plumbing, garbage disposal, water-supply, sewerage, water purification and sewage treatment. The authors might well have gone somewhat further in this respect and either have attempted less or used more care in their treatment of some sanitary-engineering subjects. This is particularly true of sewage disposal, which is the stumbling block over which nearly every medically trained writer on health and sanitation falls.

PUBLICATIONS RECEIVED

Under a Postoffice Department ruling made applicable to *Engineering News-Record* in July, 1919, it is no longer possible to give the prices of new publications announced under this head or of books reviewed in the preceding columns. Readers will therefore have to obtain this information as best they can. Most of the public documents and of the pamphlets announced may be obtained free on application, or at least by paying postage. So far as possible, the name and address of the publisher of each book and pamphlet are given in each entry.

THE AGRICULTURAL AND INDUSTRIAL COMMUNITY FOR Arrested Cases of Tuberculosis and Their Families: A Study, 1919. Washington, D. C.: Federal Board for Vocational Education. Paper; 6 x 9 in.; pp. 45.

Combined agricultural and industrial communities resembling English garden cities are proposed. Private funds would be put in the hands of trustees who would provide land, buildings and industrial plants and organize an executive staff with departments similar to those under the commission plan of city government. The pamphlet was proposed by H. A. Pattison, field secretary of the National Tuberculosis Association.

BLUEPRINTING—By John F. Friese, Editorial Assistant and Draftsman, Manual Training Magazine. Peoria, Ill.: The Author. Cloth; 5 x 7 in.; pp. 56; illustrated.

BUILDING ORDINANCE—Chicago, Ill.: National Lumber Manufacturers Association. Cloth; 5 x 8 in.; pp. 60; illustrated.

CHIEF OF ENGINEERS: Report of United States Army, Three Parts, 1919. Washington, D. C.: War Department. Paper; 6 x 9 in.; illustrated. Part I, Annual Report of the Chief of Engineers, pp. 2107. Part II, Report of the Board of Engineers for Rivers and Harbors and Reports of District Engineers, pp. 1262. Part III, Report of District Engineers, pp. 1118.

CLAYS AND SHALES OF MINNESOTA—By Frank F. Grout; with Contributions by E. K. Soper. Work done in Coöperation with the Minesota Geological Survey. Washington, D. C.: U. S. Geological Survey. Paper; 6 x 9 in.; pp. 259; illustrated. 25c. from Superintendent of Documents.

A COMPARISON OF THE HEAT INSULATING PROPERTIES of Some of the Materials Used in Fire-Resistive Construction—By Walter A. Hull, Associate Physicist, Bureau of Standards. Washington, D. C.: The Bureau. Paper; 7 x 10 in.; pp. 40; illustrated. 10c. from Superintendent of Documents.

ELECTROLYSIS IN CONCRETE—By E. B. Rosa, Chief Physicist, Burton McCollum, Associate Physicist, and O. S. Peters, Assistant Physicist, Bureau of Standards. Washington, D. C.: The Bureau. Paper; 7 x 10 in.; pp. 142; illustrated. 35c. from Superintendent of Documents.

A second edition of a bulletin published in 1913 containing some additional long-time tests at low voltages, but few new conclusions as to the general problem.

ENGINEERING SOCIETY OF WISCONSIN (INCORPORATED): Report, 1919. Madison, Wis.: The Society. Paper; 6 x 9 in.; pp. 104.

FAR EASTERN MARKETS FOR RAILWAY MATERIALS, Equipment, and Supplies—By Frank Rhea Trade Commissioner. Special Agent Series—No. 180. Washington, D. C.: Bureau of Foreign and Domestic Commerce. Paper; 6 x 9 in.; pp. 339; illustrated. 35c. from Superintendent of Documents.

FIRE DEPARTMENT MOTOR APPARATUS INSTRUCTION: A Complete Technical Description in Firemanic Language, as Officially Taught in the New York Fire Department Automobile School—By Captain Daniel A. Sullivan, Recently, and for Six Years, Instructor of the New York Fire Department Automobile School. New York: Civil Service Chronicle. Paper; 7 x 10 in.; pp. 93; illustrated.

FOREIGN COMMERCE AND NAVIGATION OF THE UNITED States: Report, July-Dec., 1918. Washington, D. C.: Bureau of Foreign and Domestic Commerce. Cloth; 9 x 12 in.; pp. 635. $1.25 from Superintendent of Documents.

INDUCTIVE INTERFERENCE BETWEEN ELECTRIC POWER and Communication Circuits: Selected Technical Reports with Preliminary and Final Reports of the Joint Committee on Inductive Interference and Commission's General Order for Prevention or Mitigation of Such Interference. San Francisco, Calif.: Railroad Commission of the State of California. Leather; 9¼ x 6½ in. Printed on bible paper; pp. 1160; illustrated.

Gives the results of five years' field and laboratory investigations of power circuit interference with telephone and telegraph lines. The studies were made jointly by engineers representing railway, electrical, telephone and telegraph companies and the California Railroad Commission, at a cost of $100,000. Of the 1200 copies printed subscriptions for 800 have been received. The price has been fixed at cost.

THE INDUSTRIAL BUILDING BOOK—Compiled by Charles F. Dingman, Assoc. M. Am. Soc. C. E. New York: Flynt Building and Construction Co. Cloth; 7 x 9 in.; pp. 69; illustrated.

IOWA ENGINEERING SOCIETY: Proceedings of the Thirty-First Annual Meeting, Feb. 19-20, 1919. Iowa City, Iowa: The Society. Paper; 6 x 9 in.; pp. 212; illustrated.

IRON BACTERIA—By David Ellis, D.Sc., Ph.D., F.R.S.E., Royal Technical College, Glasgow. London, Eng.: Methuen & Co., Ltd. Cloth; 6 x 9 in.; pp. 176; illustrated.

LA LUTTE CONTRE LA ROUILLE ET LES CORROSIONS Dans Les Chaudières à Vapeur—By E. Hoehn, Ingenieur en Chef de L'Association Suisse de Proprietaires de Chaudières à Vapeur. Zurich, Switzerland: The Association. Paper; 6 x 9 in.; pp. 68; illustrated.

MASSACHUSETTS HIGHWAY COMMISSION: Report, 1918. Boston, Mass.: The Commission. Cloth; 6 x 9 in.; pp. 186; illustrated.

MOUNTAIN HIGHWAYS OF HAMILTON, ONTARIO, CANADA: Report, 1919—By N. Cauchon, Consulting Engineer and Town Planner, Ottawa, Can.: The Author. Paper; 11 x 9 in.; pp. 12; illustrated.

NEW YORK PUBLIC SERVICE COMMISSION: Report, 1917—Abstracts of Reports of Corporations, Electrical, Gas, Steam, Telegraph, Telephone. Albany, N. Y.: The Commission. Cloth; 9 x 12 in.; pp. 338.

THE PANAMA CANAL: Report of the Governor, for the Fiscal Year Ended June, 1919. Washington, D. C.: War Department. Paper; 6 x 9 in.; pp. 366; illustrated.

PROGRESS REPORT OF RUN-OFF INVESTIGATION ON Third Creek, Iredell County, North Carolina—By H. M. Lynde, Senior Drainage Engineer, U. S. Dept. of Agriculture. Washington, D. C.: The Department. Paper; 6 x 9 in.; pp. 16; illustrated.

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LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

In Union—Not Confederacy—Lies Future Strength of Engineering Profession

Sir—I have just reviewed the report on development, of the Joint Conference Committee of the four founder societies, and whereas I fully recognize the delicacy of discussing a society action outside of its proceedings, yet in view of the tremendous importance of the subject and the further consideration that the proposed organization affects all engineers irrespective of their membership in the founder societies, I feel more than justified in asking you to bring this matter to the attention of your readers.

The committee is to be congratulated for its recognition of the need for an effective, all-inclusive organization of professional engineers, irrespective of their technical classification, to handle matters of common interest to the entire profession. But against the proposed system of organization I must enter a vigorous protest.

The type of the proposed organization, which the committee did not see fit to name, may be styled "The Engineering Confederacy." The very proposal to form a confede acy is an admission of inability to form a real union. In union—organic union—there is strength, but a confederacy is a makeshift, it is but a delusory substitute for a real union, it can be held together only by exceptional circumstances, it cannot live a normal life, it thrives on excitement and confusion, it can be easily created, because its constituents are not called upon to give up anything, and still more easily dissolved when the time for sacrifice and action arises. We have only to review the political history of the world to see the weak character of the confederation as a type of political organization. There is not an example of a single powerful one that has endured, though many have been formed. We have had two experiments of this character in America.

Now, why do confederations as a means of organization always fail?

1. They are usually brought into existence as the dying struggle of the elements of reaction, to protect vested interests or class prestige that feels itself slipping, losing ground against the overwhelming tide of progress. For there is no need of the confederation where justice rules or common interests prevail; in these premises an organic union is always possible.

2. The constituent members of the confederacy are large and possess a more coherent organic structure, rendering their withdrawal easy on the slightest pretext, thereby disrupting the organization. Moreover, the jealousies of these groups for power and control over the confederacy lead to the formation of wheels within wheels and thus to its ultimate destruction.

3. There is no organic structure to them, they have not the functions of life in them, they have the form but no life, they are a number of lives compressed into a close space without the necessary articulation for developing a single new life apart from the constituent members, there is no *corpus* and their contact is too close to permit individual development. Thus they hinder the individual growth of the constituents and are incapable of life and growth themselves.

4. But the ultimate reason of all the reasons is that they are inefficient, they do not fill the common interests they are designed to serve, they do not survive because only the fittest, the most efficient, forms survive.

We have even tried the confederacy as a type of engineering organization, and it has signally failed to enlist the support and coöperation of engineers. Why rehabilitate a device that always fails? To quote the language of Dr. F. H. Newell in his recent address on coöperation:

We have worked through and beyond this idea of forming small societies of civil engineers and of mechanical engineers and so on with the idea of then getting them to work together, and somehow out of that same combination produce a powerful organization. This idea does not work under present economic conditions. For efficiency we must have an organization in which every man is a member just as much as he is a citizen of the United States. That does not prevent his being an active citizen or member of his technical society, any more than your citizenship in the United States prevents you from being a good citizen of Ohio or of Columbus. In fact, it strengthens it; but the two citizenships are independent and function without any interference with each other.

This not only disposes of the confederacy type of organization as an effective instrument, but points the way to constructive criticism in outlining a type of organization that will meet our necessities. First let us state the objects to be attained. These are well expressed in the following language from the committee's report:

It was the unanimous opinion of those present at all conferences that one of the most important matters on which joint action can be taken is the formation of a single comprehensive organization to secure united action of the engineering and allied technical professions in matters of common interest to them. . . .

The great object is to provide an effective body, widely and truly representative, modestly yet adequately financed, which will be neither autocratic nor aristocratic, which will at all times stand as the representative and defender of the profession in matters affecting its honor, welfare and common interest. . . .

In submitting the proposed fundamentals to govern a single comprehensive organization by which the engineering and allied technical professions may become more active in their service to the public and themselves, the Joint Conference Committee would point out the following as among some of the objects to be attained by such an organization:

1. To render the maximum of service to the nation through unity of action.
2. To give the engineers of the country a more potent voice in public affairs.
3. To secure greater recognition of the services of the engineer, and to provide for his advancement.
4. To promote *esprit de corps* among the members of the profession.
5. To provide the machinery for prompt and united action on matters affecting the profession, among which are:

Licensing and registration of engineers;
National Service Committee;
National Department of Public Works;
Conservation of national resources;
Publicity;
Classification and compensation of engineers;
General employment bureau;
Engineering education;
International affiliation of engineers;
Industrial relations.

Now, in spite of the fact that the committee has made an excellent summary of the objects to be attained, it is the apparent sense of the committee—in fact, it is the general tenor of that whole portion of

the report on organization—that the maintenance of the prestige of the founder societies is the principal object sought, rather than the creation of an effective organization to consummate the declared objects. The following extract from the report shows specifically that the matter of preserving the prestige of the founder societies was a paramount consideration:

The committee submits the plan with the confident belief that it will be accepted by the four societies, that they will make the sacrifices necessary and assume the responsibility of leadership, supporting the movement by virtue of their position in the engineering profession. A national movement by local societies is sure to come. The four national societies can take the initiative and continue their leadership in American engineering by prompt action, or by inaction lose the prestige they now hold.

Let us not think of preserving the prestige of existing technical organizations, let us not mar the birth of a new spirit in engineering by the dominating shadow of existing institutions, for prestige always goes where it belongs—to those who earn it—and all the mad delirium of precipitate action, after years of inaction, cannot change it. Let us rather think of the form or organization suited to our needs and create it out of men, not out of organizations. Let us build up an organic union of professional engineers and secure their unswerving allegiance.

With this type of organization, group control will be at a minimum. Moreover, it will enlist the support of that great body of engineers who have never been attracted to the existing technical organizations and will thus build up a representative body of engineers who can direct all of their efforts toward the common welfare of the engineering profession and of the public.

To avoid any possibility of misunderstanding the sense in which the word "union" is used in this letter, I desire to state that it is used in the same sense that we speak of the union of the American people or of the union of marriage—that which blends the life of several persons into one for coöperative effort and still preserves the individuality of the constituent persons. It has no reference whatever to the type of organization known as a labor union or trade union.

Chattanooga, Tenn. HENRY B. SMITH,
Civil Engineer.

Cost of Employment Service

SIR—At the annual meeting of the American Society of Mechanical Engineers the secretary of the society, C. W. Rice, is reported to have said in an official statement to the meeting that in three months the employment service of the American Association of Engineers cost $40,000 to operate, and placed about 270 men, while the engineering societies' employment bureau placed about 375 men at a cost of $3750. This statement is ridiculously incorrect. Since the American Association of Engineers was organized there has never been available $40,000 for all its work in any three-month period. The total expense of its service department during the three months of September, October, and November, 1919, was less than $2000.

In our present system for promptly placing employers in touch with qualified men, installed July 1, 1919, difficulty was experienced at first due to failure of engineers to report to us when they accepted positions. At first we received this information from only about 50% of the men. As our members are now more familiar with the new system we are receiving reports on positions introduced from about 80% of the men. In an advertisement in *Engineering News-Record* of Oct. 16, 1919, we made the following statement as a report for the three months immediately after the new system was in operation, namely, July, August and September, 1919:

Positions received 1085
Positions filled by members 264

As the figure given for number of positions filled was based entirely upon the actual number of reports received, which was only about 50% of the number introduced, the actual number of men placed in positions is much greater.

A healthy growth is manifested by the actual number of reports received during the past three months which shows: Positions filled by members for

September 120
October 124
November 145

Total for three months 389

This covers the actual number of reports received of positions filled, and should be increased by about 20% to obtain the actual number of men placed.

The average monthly expenses incurred in maintaining the service department under the present plan of operation, including salaries, advertising in the technical press and the *Professional Engineer* (formerly *The Monad*), postage, stock and printing, rent, telephone, light, and current depreciation of equipment, amount to $575. In three months this totals $1725. Adding $175 as a wide margin for miscellaneous expenses makes the amount $1900, which averages less than $5 for every man placed.

These are the records of accomplishment at national headquarters only. They do not include the number of men placed by the five district offices or through our ninety branches. By adding the reports of the employment committees of the many chapters to the above statement the number of men placed and the benefits received by individual members would be shown to be far greater.

Chicago, Ill. E. B. MILLER,
Assistant Secretary in Charge of Service Department, American Association of Engineers.

[Because of the direct question of fact raised by the above letter we reproduce below, verbatim, Mr. Rice's statement at the annual meeting of the American Society of Mechanical Engineers.—EDITOR.]

THE SECRETARY: Inasmuch as the secretary of your society is the chairman of the joint committee of all the societies operating the employment bureau, I should advise you for your information of the extraordinary work which your society in splendid coöperation with all the societies is doing. In a recent publication of the American Association of Engineers they stated that during the last three months they had been notified of 1000 positions which were vacant, that they had recommended to these positions about 3000, and had placed in positions 271. So that you may know that we are not failing to do our duty, I will report that we have received about the same number, namely 1000 notices of vacancies to be filled; we have nominated 6000 men for these places, and have placed 374.

The expense of the American Association of Engineers in their activities, which, according to their own statement, is primarily if not exclusively that of welfare work and of getting positions, was, according to their published state-

ment, upward of $40,000 during the last three months. They have placed, with an expenditure of $40,000, 271 men in positions. Your Joint Bureau was maintained at an expense of $3750 during the last three months, and has placed 371 men in positions. In other words, it took $40,000 by the American Association of Engineers to canvass and place 271 men, and it took $3750 under our auspices to canvass and place 374 men.

Further Data on the Direct-Oxidation Process of Sewage Treatment

Sir—The tests of the Landreth electrolytic or "direct-oxidation" process for treating sewage made by the State Department of Health of Pennsylvania at Easton and described in *Engineering News-Record* of Sept., 18, 1919, p. 569, appear to confirm in a general way the results of tests made by the Bureau of Sewer Plan of New York City at Elmhurst, Borough of Queens, (*Engineering News* of July 13, 1916, p. 91.)

A summary of the results just mentioned, which have not been published heretofore, is given in the Table I. They were submitted to Prof. E. B. Phelps of the United States Public Health Service for review, and in a letter to the chief engineer of the Board of Estimate and Apportionment he summarizes his conclusions as follows:

TABLE I. SUMMARY OF ELMHURST LIME-ELECTROLYTIC SEWAGE TREATMENT TESTS

(Parts per million except as otherwise noted)

Tests made on sewage received in three hours at the rate of about 0.75 m.g.d. with 4½ hours' retention

Test No.	1	2	3	4
Date, 1915	Dec. 10	Dec. 15	Dec. 21	Dec. 23
Conditions of test	Normal Operation	Normal Operation but Without Electricity		No Electricity Excess Lime
Suspended solids:				
Raw sewage	60	60	88	60
Tank influent	352	216	296	312
Tank effluent	56	52	84	56
Permanganate consumed:				
Raw sewage	42	30	56	32
Tank influent	24	24	62	32
Tank effluent	18	26	44	28
Nitrites:				
Raw sewage	0 900	2.000	0.700	0.260
Tank influent	0 180	2 000	0 900	0.260
Tank effluent	0.180	2.000	0.300	0.260
Nitrates:				
Raw sewage	0.006	1.80	1.20	1.60
Tank influent	1.00	1 80	1.20	1.60
Tank effluent	1.00	1.80	1.20	1.60
Iron:				
Raw Sewage	1.00	1 20	1.20	1.80
Tank influent	4 00	1 00	1.20	1.80
Tank effluent	0.40	1.40	0.60	0.60
Alkalinity:				
Tank influent	306	276	324	344
Tank effluent	260	228	266	274
Causticity:				
Tank influent	190	124	288	176
Tank effluent	132	60	78	46
*Oxygen Demand 0.37° C. 5 days				
Raw sewage	36	32	58	43
Tank influent	36	36	42	40
Tank effluent	16*	15**	24†	12††
Bacteria per c.c.:				
Raw sewage	1,100,000	1,300,000	1,000,000	1,000,000
Tank effluent	4,000	32,000	15,000	15,000
Tank effluent, 4 da.	4 da. 20,000	5 da 90,000	9 da. 12,000	5 da. 14,000
Tank effluent, 10 da	10 da. 20,000	8 da. 40,000	.....	12 da. 7,000
Lime (CaO) used, pound per million gallons	670	730	650	1,160

NOTE—With current averaging 28.3 amp., the iron electrodes were estimated to be consumed at a rate of 1.2 oz. per hour.

* Sludge and tank effluent stable, but with alkalinity neutralized this putresced in two days at 37° C.

** Sludge stable. Effluent putresced in five days.

† Sludge stable. Effluent putresced in two days.

†† Sludge stable. Effluent putresced in four days.

1. The character of the final effluent of the Landreth electrolytic process, as demonstrated at Elmhurst, is highly satisfactory.

2. The method of sludge disposal, as employed at Elmhurst, is not satisfactory and could not be employed in any situation where there was real necessity for sewage purification.

3. There is at least a basis for an honest difference of opinion as to whether or not the electrolytic feature contributes materially to the result, opinion upon this matter being about equally divided among those who have properly investigated it.

4. The cost of treatment by this process is so large that it cannot compete under usual conditions with better known treatment processes capable of producing an equivalent result.

To my mind, the high cost of the process is the dominating consideration and in my opinion, founded on the appearance of the effluent and on the condition of the ditch into which both sludge and effluent were discharged, the electrolytic feature is to a certain extent really beneficial in producing a clearer and more nearly sterile effluent. According to Professor Phelps it is analytically "between the effluent of a first-class trickling filter with post-sedimentation and the effluent of a slow sand filter." But a point likely to be overlooked is the fact that the organic matter remains subject to subsequent decomposition and is therefore potential as a future source of nuisance. "All that can be justly said of the treatment is that it is a reasonably effective method, disregarding cost, of separating a large part of the putrescible organic matter from the liquid, and of reducing the bacterial content of both sludge and liquid. . . . If the process is to be of any value in sewage treatment, provision must be made for the disposal of the recovered sludge."

TABLE II. COST OF LIME-ELECTROLYTIC SEWAGE TREATMENT COMPARED WITH OTHER METHODS

Capital Cost Based on 1.5 m.g.d.	
Two electro-chemico units, 0.75 m.g.d. each	$32,000
Sludge press to handle 26 cu.yd. daily	13,050
Total	$45,050
Annual Charges Based on 1 m.g.d.	
Electric current 78,475 kw.-hr. at 4c	$3,139
Lime—237½ tons at $7 90	1,874
Sludge pressing and disposal, 365 days at $5.11	1,865
Pumping	1,925
Supplies	500
Labor, superintendent, two assistants, one laborer and chemist (part time)	5,700
	$15,003
Fixed charges at 5%	2.252
Total per annum	$17,255
Total per million gallons	$47.30

Comparative estimates of different processes were then made for the Elmhurst situation, resulting as follows:

	Capital Cost	Annual Charges	Per Million Gallons
Electro-chemico process	$45,050	$17,255	$47.30
Chemical precipitation	13,550	11,635	32.40
Tanks and trickling filters	34,500	8,650	23.70
Tanks and contact beds	73,600	11,380	31.20
Activated sludge	15,500	12,825	35.10
Acidulation	7,000	11,565	30.00

Based upon the above tests, the cost of a plant having a capacity of 1,500,000 gal. per day and the cost of treating a mean flow of 1,000,000 gal. per day was as shown by Table II.

These estimates, it should be recalled, are for a weak sewage and are based on much lower prices than obtain today.

Plans adopted since then call for the ultimate abandonment of the Elmhurst disposal plant, pumping the sewage to a temporary outlet south of Riker's Island.

KENNETH ALLEN,
Sanitary Engineer, Board of Estimate and Apportionment, New York City.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Safety Suggestions for the Builder

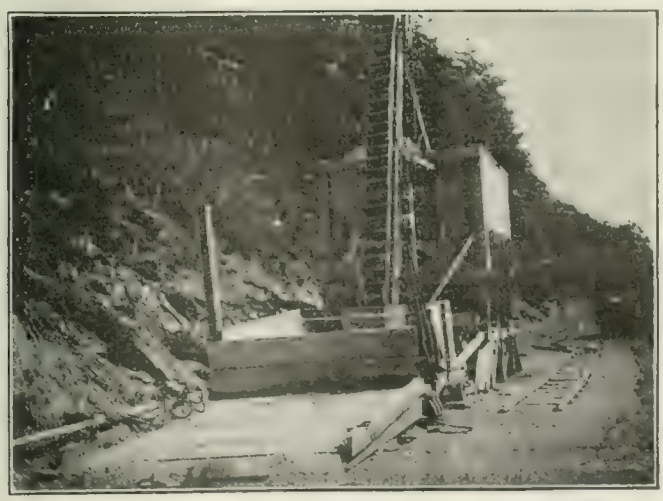
INCLUDED in a recent paper read before the National Safety Congress in its Cleveland sessions by George A. Rutherford, of the George A. Rutherford Company, Cleveland, were several suggestions concerning accident prevention in building work. As insurance measures against accidents, Mr. Rutherford recommended the following:

1. Personal education among employees in safety rules.
2. Periodical inspection of appliances used daily.
3. Insistence on the part of the contractor or superintendent that all jobs be kept free of débris.
4. Making compulsory the fencing in of all floor openings, and the toe boarding of scaffolding where bricklayers and masons are working.
5. Advertisement by safety-first signs, and the inclusion of safety-first propaganda in pay envelopes.

Mr. Rutherford also suggested that a group of employers whose work does not permit the establishment of well organized safety departments, such as are possible in stabilized industries, employ a safety engineer to make periodical inspections insisting upon well known methods of insuring maximum safety.

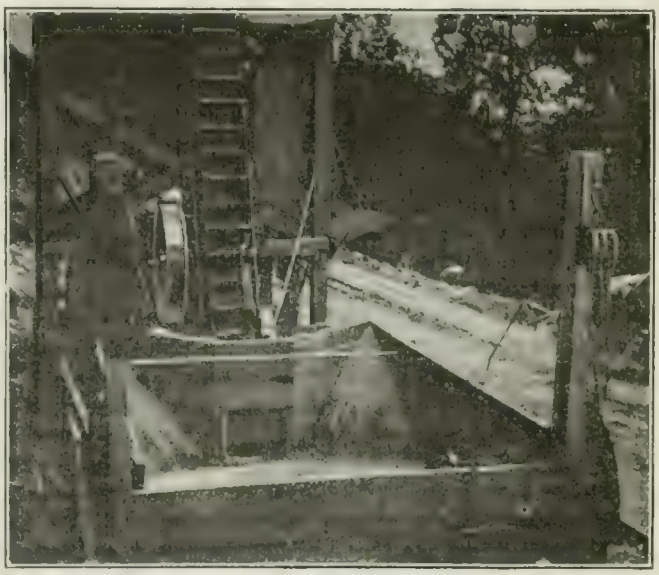
Motor-Truck Skip and Small Bin Protect Subgrade

PROTECTING the finished subgrade by the use of a short stretch of industrial railway, in connection with a motor-truck skip and elevator bin, has been tried out on work done under the Pennsylvania Highway Department. While the plant accomplishes the intended purpose in fairly level country, it is unworkable where the grades are steep, as the cars on so short a line are necessarily horse-drawn. The bin and skip are arranged to be easily moved, and by their use all labor of shoveling and wheeling from the subgrade to the mixer is eliminated.



ARRANGEMENT OF MOTOR-TRUCK SKIP, MATERIAL BIN AND INDUSTRIAL CARS

An ordinary commerial elevator bin is used. It is divided into two compartments, one for sand and one for stone. The capacity of the bin is two truckloads of sand and one truckload of stone. The bin is on wheels and is jacked up while in use. The construction of the skip may be seen in the views. It is also on wheels and has an incline on one end, up which the trucks are backed. This incline is raised by means of the block and tackle on the posts at either side, when it is desired to move.



VIEW SHOWING DETAILS OF MOTOR-TRUCK SKIP

The operation of the plant requires three men in addition to those on the industrial cars and trucks. The trucks dump into the skip, and one man attends to its free flow into the elevator, a second runs the engine and operates the chute into the bin so that it dumps into the sand or stone compartment as desired, while a third fills the compartment batch-measuring boxes on the industrial cars. Enough industrial track is used to allow for from three to four days' run, and the moving of the outfit requires from six to eight hours.

The method is being used by the Quinlan-Robertson Company, Montreal, on route No. 141 in Berks and Schuylkill Counties. The company has found it impracticable on grades of over 6%. The work is being done under the general supervision of W. D. Uhler, chief engineer of the State Highway Department. W. R. Wolfinger, district engineer, is in charge.

Building Association Stock Provides Plant-Replacement Fund

By O. H. YEAGER
Yeager & Sons Builders, Danville, Ill.

PLANT-rental or equipment charges on construction have for a number of years been so managed by the writer's firm as to eliminate largely the necessity for charging off depreciation.

By a careful system of cost accounting, the firm has

determined the life of standard construction equipment under ordinary use, and the amount spent for maintenance and repairs. For example, take a hoisting engine for which $1200 was paid. It has been found that, with good care, this machine can be used for five years before being salvaged either because of wearing out or replacement with more modern equipment; also, that during that time there has been spent approximately 33⅓ per cent for maintenance and repair. At the end of the five years, therefore, there would have been spent $1600 for the engine. To this add interest at the rate of 7%, and the total is $1712.

During this period of five years it has been found that this machine will work approximately two-thirds of the time, or 1000 working days. This would make an approximate charge of $1.75 per day on the actual investment. This machine must also take care of its proportion of the charge for the maintaining of an equipment repair lot and sheds, insurance and taxes, and pay for the oil, waste and packing which are used, so the charge is increased to $3 a day. All freight hauling, engineer's time and fuel will be charged in addition to this amount.

All money received for equipment rental is carried in a separate account, from which the cost of all of the above items is paid. When a piece of equipment is purchased, an equivalent amount of stock is taken out of a building and loan association, and the dues are paid monthly. This stock generally pays 7%, and a certain amount of it is maturing each year. When a piece of machinery is salvaged, it is found that enough has been paid to the building association, for this particular piece of equipment, to replace it. This method is used instead of a sinking fund, or charging off a certain amount to depreciation.

Small hand tools such as shovels and picks are charged in full direct to the job on which they are being used. The prices of wire cable and of rope have been worked out on a lineal-foot basis. By this system, the rental can be applied on the purchase price.

A card system with a complete description of each piece of equipment is kept from the time it is purchased until it is disposed of. Small tools are lumped. For example, one card is kept for shovels, another one for picks, and so on.

Construction Railway Fill Made by Caterpillar Steam Shovel

ADJOINING the whole length of the new Queenston-Chippawa power canal being built around Niagara Falls for the Ontario Hydro-electric Power Commission is a double-track standard-gage railway built to the highest standards of main-line railway construction. Necessarily, there was a considerable amount of filling to be done in laying out the road, and it was not expedient to attempt a balancing of cut and fill. In all of the low fills—that is, those up to about 8 ft.—it was found cheaper to make the fill by a caterpillar steam shovel excavating alongside the line than by using trestles from which dumps could be made or by building on grade and raising the tracks as fill was made.

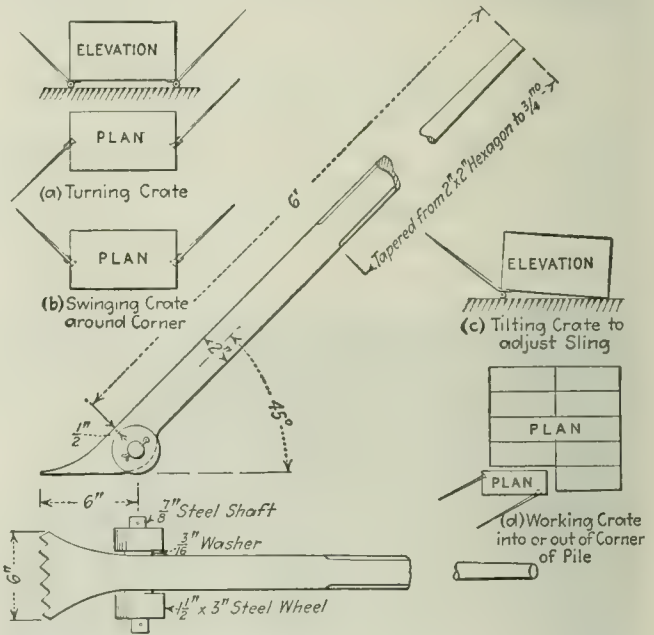
The accompanying view shows one of the caterpillar tread steam shovels working alongside of the fill which it is making. Excavation is made to a few feet in depth over the area of control of the shovel, and a fill thrown up for the single-track line which is used for the fill, subsequently to be widened out to a double-track line.



CATERPILLAR STEAM SHOVEL MAKING RAILWAY FILL FROM PARALLEL CUTS

Casters Increase Utility of Pinch Bar

FOR shifting machinery, large stone blocks or other compact, heavy objects, in construction work, the pinch bar on wheels shown by the drawing will be found convenient. This has been demonstrated by its use on the Seattle, Wash., wharves of the Oregon-Washington Railway & Navigation Co. Construction of the bar is shown clearly by Fig. 1, and Figs. 1a to d indicate various methods of using it in the shifting of heavy objects.



PINCH BAR ON WHEELS FOR SHIFTING HEAVY OBJECTS

The wheels or casters serve two purposes. Besides making a vehicle of the bar, they so reduce friction between the heel of the bar and the floor that much heavier loads can be lifted than with a plain bar. The special design illustrated was worked out by S. Murray, chief engineer, Oregon-Washington Railway & Navigation Co., Portland, Ore.

NEWS OF THE WEEK

New York, December 11–December 18, 1919

A. A. E. States That It Is Not a Technical Organization

Under date of Dec. 12 the American Association of Engineers, through its national headquarters in Chicago, issued a statement containing the announcement of policy that "the association is not a technical organization but one which promotes the social and economic welfare of professional engineers."

Expect Senate To Pass Cummins Bill This Week

Leaders in the Senate early this week insisted that the Cummins railroad bill would be passed by a narrow margin before the end of the week, when the holiday recess begins, in spite of the continued debate and the failure to bring about closure up to the present writing. Late last week Senators supporting the bill began to feel considerable concern over the opposition to the measure which was developing and which was shown, by an informal poll, to be much greater than had been supposed.

Although the Railroad Administration is proceeding with its plans for returning the lines, it is now generally believed that the roads will certainly not be returned on the first of the year, in accordance with the previous announcement of policy by the President. The report of Director General Hines, which may be the basis for the President's promised message to Congress on the railroad situation, has not been made public and is still under the consideration of the President. Even should the Cummins bill be passed this week, it will not be possible to report it from conference until late in January, according to present belief in the capital. It will very probably be February or March before a final measure is passed by both houses. There is now a belief that the roads will not be returned until as late a time as June, 1920.

General Wood Joins A. A. E.

Maj. Gen. Leonard Wood, commander of the Central Department, U. S. A., has joined the American Association of Engineers. His affiliation with the organization is one result of its campaign for 10,000 new members during the first two weeks in December. His application was passed by the qualifications committee of the association on the basis of his experience, while military Governor of Mindanao, in important sanitary engineering work. He was in charge of the construction of highways, harbor improvements, railroads, schools, water-purification works and sewerage systems.

Annual Meeting of State Highway Officials

Building of Adequate Organizations and Securing of Materials Given Chief Consideration

The fifth annual meeting of the American Association of State Highway Officials was held in Louisville, Ky., Dec. 8-11, 1919, with all but six of the states represented. Chief interest centered in the problems of developing adequate organizations and of securing materials sufficient for the tremendous highway program now in hand. To maintain competent organizations, it was recognized, salaries adequate to responsibility must be paid. With reference to the supply of materials, it was recognized that there would be serious limitations of the highway program unless local supples right at the roadside, or within trucking distance, could be developed.

> ***This Week's News***
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> *This issue carries news current for the week ending Dec. 17. It is dated Dec. 11-18, to preserve the sequence of numbers in the volume.*

The keynote of the meeting—the heavy responsibility placed upon the state highway organizations — was sounded in the presidential address of A. R. Hirst, chief engineer of the Wisconsin Highway Commission. He stressed particularly (see issue of *Engineering News-Record* of Nov. 27-Dec. 4, for address in full) the need for paying adequate salaries to both the leaders and the subordinates in highway work. The concurrence of the association in his views on compensation was indicated by the passage of a resolution recommending to the several states the consideration of a salary schedule drawn up in conference with highway officials by a committee headed by A. N. Johnson, chairman of the committee on salaries of engineers in public service, of the American Association of Engineers. This schedule was laid before the association by Mr. Johnson.

Materials

State participation in the development of supplies of road materials, even to the point of state production and state ownership of open-top cars, was discussed by A. B. Fletcher, state highway engineer of California. Unless every resource was developed, he pointed out, lack of materials would prevent the programs now planned from being completed in the periods contemplated. In discussing the subject, Watson G. Clark, highway commissioner of New Jersey, urged that the situation be squarely faced, that the conditions of materials supply in 1920 would not be materialy different from those in 1919, and that road construction programs should be planned accordingly and the public be frankly made aware of the fact. The advantage of state road-materials surveys was urged by F. E. Everett, who stated that such a survey for New Hampshire had accomplished much in solving materials-shortage problems which had previously existed. Similar surveys, it was pointed out, have been made in New York and are under way in Pennsylvania, Minnesota and several other states.

Coöperation Between States

Arthur H. Blanchard, professor of highway engineering, University of Michigan, discussed the necessity for coöperation between adjoining states for the purpose of keeping the cost of materials and construction within fair limits. Taking a group of Middle Western states, he pointed out great variations in requirements for crushed stone, paving brick, and bituminous materials. He urged that states geographically related and drawing supplies from the same sources get together and attempt to fix standards for the chief materials.

In discussion, Clifford Older, state highway engineer of Illinois, pointed out that some years ago 11 states in the northern part of the Mississippi Valley had adopted standard stone and gravel sizes. An inquiry this year regarding gravel sizes showed that 16 plants, producing 2,000,000 tons of gravel annually, were working almost entirely upon the standard aggregate agreed upon some years ago. The result of this standardization had been a cheapening of the product. Mr. Hirst, commenting further upon the coöperation of the northern Mississippi valley states, declared their efforts successful and commended to other states the consideration of Professor Blanchard's recommendations. W. G. Thompson, state highway engineer of New Jersey, called attention to a meeting held in November of this year by representatives of the highway departments of New York, New Jersey, Pennsylvania, Maryland and Delaware for the purpose of standardizing crushed stone. A standard calling for a stone that would pass a 2¾-in. mesh screen and be retained on a ⅝-in. screen had been

(*Continued on page* 1032)

Engineer Work "Among Most Notable Achievements of the A. E. F.," Says General Pershing

Characterizing the large program of construction carried out by Engineer troops in the Services of Supply and elsewhere in France as "among the most notable achievements of the American Expeditionary Forces," General Pershing, in his final report, made public this week, outlines briefly some of the more important overseas projects for which the Engineers were responsible. The report is in very condensed form, considering the wide scope of the operations of the A. E. F. In so far as combatant troops are concerned, the Commander-in-Chief apparently adopted the general policy of not discussing the work of units smaller than divisions; there is, therefore, no detail regarding the performance of the divisional sapper regiments, or the corps and army engineer troops, these being included in the descriptive matter concerning the larger units of which they formed a part.

Of the construction work in the Services of Supply, however, General Pershing says:

"Among the most notable achievements of the American Expeditionary Forces was the large program of construction carried out by our Engineer troops in the Services of Supply and elsewhere. The chief projects were port facilities, including docks, railroads, warehouses, hospitals, barracks and stables. These were planned to provide ultimately for an army of 4,000,000, the construction being carried on coincident with the growth of the American Expeditionary Forces.

"The port plans contemplated 160 new berths, including the necessary facilities for discharge of cargo, approximately one-half of which were completed at the time of the armistice. Construction of new standard-gage railroad track amounted to 1002 miles, consisting mainly of cut-offs, double tracking at congested points, and yards at ports and depots. Road construction and repair continued until our troops were withdrawn from the several areas, employing at times upward of 100,000 men, and often using 90,000 tons of stone per week.

"Storage requirements necessitated large supply depots at the ports and in the intermediate and advance sections. Over 2,000,000 sq.ft. of covered storage was secured from the French, but it was necessary to construct approximately 20,000,000 sq.ft. additional. The base hospital centers at Mars and Mesves, each with 4000-bed convalescent camps, are typical of the large scale upon which hospital accommodations were provided. The hospital city at Mars, of 700 buildings, covered a ground space of 33 acres and included the usual road, water, sewerage and lighting facilities of a municipality.

"Advantages of economy and increased mobility caused the adoption of the system of billeting troops. Billeting areas were chosen near the base ports, along the line of communications, and in the advanced zone, as strategical requirements dictated. The system was not altogether satisfactory, but with the number of troops to be accommodated no other plan was practicable. Demountable barracks were used for shelter to supplement lack of billets, 16,000 barracks of this type being erected, particularly at base ports where large camps were necessary. Stables at remount stations were built for 43,000 animals. Other construction included refrigerating plants, such as the one at Gievres with a capacity of 6500 tons of meat and 500 tons of ice per day; and mechanical bakeries like that at Is-sur-Tille with a capacity of 800,000 lb. of bread per day. If the buildings constructed were consolidated, with the width of a standard barrack, they would reach from St. Nazaire across France to the Elbe River in Germany, a distance of 730 miles.

"In connection with construction work, the Engineer Corps engaged in extensive forestry operations, producing 200,000,000 ft. of lumber, 4,000,000 railroad ties, 300,000 cords of fuel wood, 35,000 pieces of piling, and large quantities of miscellaneous products."

Public Works Conference Widens Scope and Changes Name

At an executive committee meeting in New York City Dec. 5 it was decided to broaden the scope of the Engineers, Architects and Constructors' Conference on National Public Works, and to make it a general body for all business and professional men, instead of limiting it to the engineering and allied professions. The name of the conference has, therefore, been changed to the National Public Works Department Association.

Recent investigations of the association indicate that the measure for a national Department of Public Works has a much greater standing and prestige than was previously thought to exist, but it is the opinion of the association that it will take a good part of the year 1920 to put the measure through.

The expenses of the conference have been underwritten until Jan. 1, 1920, by interested persons, but from now on it will be necessary that the organization stand on its own feet. To this end a financial campaign has been initiated to raise the necessary funds, and the intention is announced of raising $100,000 to cover expenses for the ensuing year.

Stockholders of New Haven Seek Limited Receivership

Arguments on the application of a group of minority stockholders of the New York, New Haven & Hartford R.R. Co. for the appointment of a limited receiver, to press the $150,000,000 restitution suit against former directors of the company, began before Federal Judge Mack in New York City Dec. 11.

Land Valuation Case Before Supreme Court

Kansas City Southern Makes Argument for Admitting Further Evidence Before Commerce Commission

Exhaustive arguments were heard Dec. 10, before the Supreme Court of the United States, in the mandamus proceedings of the Kansas City Southern R.R., to compel the Interstate Commerce Commission to receive additional evidence in the fixing of land values and to enable the commission to ascertain and report separately the "present cost of condemnation and damages or of the purchase in excess of original cost or present value." Counsel for the railroad company contended that the commission had refused to admit evidence necessary to arrive at a true cost of reproduction, provided for in the valuation act, and attorneys for the commission asked whether that body could be required by mandamus to investigate and report the "present cost of condemnation and damages or of purchase of property used by common carrier."

Following the valuation report on the Texas Midland Ry., in which no actual values were indicated at the time, the Interstate Commerce Commission served a tentative valuation on the Kansas City Southern R.R. in November, 1916, in which it was stated that the "present value" of land was ascertained from the market value of similar adjacent lands, with allowance for peculiar adaptability for railroad use, but with nothing added for "expense of acquisition for severance damages, for engineering and for interest during construction." The carrier introduced evidence similar to that in the Texas Midland case, with respect to a portion of its land, but the commission refused to permit the introduction of evidence of the same kind covering all other land owned by the Kansas City Southern R.R. Subsequently a mandamus proceeding was brought in the Supreme Court of the District of Columbia to compel the commission to receive this additional evidence.

During the hearing Dec. 10 attorneys for the railroad pointed out that neither in the tentative valuation nor in the investigation which preceded it did the commission make any investigation or report whatever as to the "present cost of condemnation and damages or of purchase" of the railroad's land. The commission has not found, they contend, nor has it undertaken to find, the cost of reproduction of the plaintiff's right-of-way and other lands as required by the valuation act and has not complied with the explicit command of the act. Counsel for the railroad also insisted that the method used by the commission in arriving at the present value of the plaintiff's land was nothing more than the average acreage value of adjoining lands, and that this is not a fair unit to be used for purposes of valuation, since it excludes essential elements of value.

Attention also was called to the fact that the commission did not deny, in its answer to the railroad's amended petition, that the cost of acquisition of these lands by purchase or condemnation as of the valuation date, June 30, 1914, would exceed the so-called present value by the sum of $5,000,000, with a resulting aggregate cost of reproduction of approximately $10,000,000. The contention of the railroad company was that the valuation act requires the commission to ascertain and report reproduction costs, to the end that values may be before the commission for its consideration when it later proceeds to place a final value upon any railroad property.

Counsel for the Interstate Commerce Commission declared that the commission has permitted the Kansas City Southern and other carriers, including the Texas Midland, to introduce evidence in proceedings before it, the effect of which was to prove that it is impossible to comply with the requirement of the valuation act for the reason that no lawful or reasonable method upon which to rest an estimate of such a cost has been discovered, and that this had previously been demonstrated by the Supreme Court in its decision in the Minnesota rate cases.

P. J. Farrell, counsel for the Interstate Commerce Commission, presented the case for the defendant, while Samuel W. Moore concluded the argument for the plaintiff.

Chamber of Commerce Committee on Department of Public Works

The Chamber of Commerce of the United States has named a committee to consider the referendum of the National Public Works Department Association (formerly the Engineers, Architects and Constructors' Conference on National Public Works). The committee consists of Charles Nagle, William C. Redfield, R. G. Rhett, Dr. Ira N. Hollis, J. Parke Channing, L. S. Gillette, Morton C. Tuttle, Walter S. Dickey and F. A. Seiberling.

St. Lawrence Report To Appear Soon

W. J. Stewart, Dominion hydrographer, Dominion of Canada, and Col. Charles Keller, Corps of Engineers, U. S. A., who were appointed by their respective Governments to prepare a statement regarding the development of navigation resources of the St. Lawrence River, have completed their work. They have prepared, for reference to the International Joint Commission, questions covering several schemes for removing obstacles to deep-water navigation of the St. Lawrence and the development of water power which are now before the United States and Canadian Governments for consideration. Meetings will be held by the commission at various points for hearing the evidence of interested parties.

With Equipment and Men Kansas Highway Commission Aids in Coal Emergency

(From "Engineering News-Record's" Correspondent)

As an emergency method of maintaining the output of coal in Kansas, after Governor Henry J. Allen took over the mines in that state Nov. 28, road-building and excavating equipment, including steam shovels, motor trucks and tractors, were quickly mobilized and placed in service, and, through the efforts of the State Highway Commission, under M. W. Watson, chief engineer, steam-shovel operators, truck drivers and mechanics were recruited. The Governor appointed C. D. Sample and B. S. Gaitskill receivers for the operators. Headquarters were established at Pittsburg, in the heart of the main coal fields, and the Governor and the receivers operated from this point.

Steps were immediately taken to operate the mines. The first mines to be opened were the strip pits. In these the coal is close to the surface and is mined with steam shovels. All available steam shovels were borrowed from contractors and railroads and sent to the strip pits to augment the equipment already there. Counties all over the state that had trucks and tractors working on Federal-aid road construction were ordered to send them to the coal fields, with drivers if possible.

Common labor was recruited by the State Labor Commission under J. H. Crawford, commissioner of labor, from several of the larger cities, by advertising in all the Kansas papers. The various colleges in the state furnished volunteers from their student bodies, many of them sending the football teams that had just finished the season's play.

The Kansas National Guard furnished all the guards as well as the camp equipment for guards and volunteers. Mining was carried on under great difficulties, owing to the extreme cold weather, snow and sleet, but all the volunteers did good work, and the situation in Kansas was greatly relieved by this action.

A special session of the legislature of Kansas has been called to consider a special appropriation to cover the cost of this emergency. In several counties the road trucks which have not been sent to the coal fields are being used to haul wood from the timber lands to the cities. The county forces are also being pressed into service as axmen in their timber lands.

Fire Damages Upper Floors of New York Engineers' Club

Fire which broke out about 5 a.m. Dec. 12 damaged the New York Engineers' Club, at 32 W. 40th St., to the extent of about $100,000, according to the best available estimate. The fire originated on the 12th floor, where the dining rooms and kitchen are located, but was confined to the two upper floors. For a time it threatened to spread through the rear of the building to the Engineering Societies' Building, 29 W. 39th St., but was kept under control, doing only slight damage to the 13th floor of the societies building, where the engineering library is located. No damage was done to the contents of the library.

After 300 members and guests of the club were driven from their rooms to the corridors of the building, it was found that six employees who slept on the 13th floor had been unable to get down. They were brought down by two policemen who went up in an elevator through the smoke.

Future of Army's Construction Division Still Undecided

(Washington Correspondence)

The fate of the Construction Division of the Army still hangs in the balance. There is a chance that the Military Affairs Committees of Congress will recognize it as a separate corps. This is the desire of the officials of the Construction Division as well as that of a great majority of civil engineers throughout the country. It is believed that the efficiency of the Construction Division will be impaired if it is made a part of the Corps of Engineers or if it is returned to the Quartermaster Department.

The General Staff bill, which is dead as far as its general provisions are concerned, provided for the incorporation of the Construction Division in the Corps of Engineers. Nevertheless, many of the suggestions of the General Staff bill as a whole are being incorporated in the bill which will be brought out in the near future. The Dent bill, another of the rejected drafts, sends the Construction Division back to the Quartermaster General. Some of the Dent provisions are being embodied in the composite measure which is now being prepared.

In brief, the arguments against making the Construction Division a part of the Engineer Corps or a subsidiary of the Quartermaster Department are that the Engineers, with the coming of an emergency, are among the first troops to be hurried to the fighting line. Most of the duties of the Construction Division would be at training camps and other points at a distance from the scene of actual combat. Thus, it would be so far removed from its administrative organization as to make for inefficiency in time of emergency, to say nothing of the difficulties of technical developments when under the direct orders of men not schooled in its problems. To return the division to the Quartermaster Department would be a case of the tail wagging the dog, as the Construction Division is, and is certain to continue to be, a very much larger organization than the Quartermaster Corps. Even if the Army is held at 300,000 men, the amount of ad-

(Concluded on page 1034)

Annual Meeting of State Highway Officials

(*Continued from page* 1029)

adopted. Representatives of stone interests from the Buffalo district had declared that the adoption of this standard would increase their output 20 per cent.

Relations With Contractors

Relations with contractors formed the subject of three discussions. The chief one followed a paper presented by a representative of the Associated General Contractors of America on "A Better Understanding Between Contractors and Highway Officials." His recommendations were the result of a conference between members of the highway division of the Associated General Contractors. He recommended, among other things: (1) The early letting of contracts so that available car supply could be used during the winter; (2) allowing estimates for material placed on the ground before the construction season, including allowance for the cost of rehandling; (3) use of local aggregates where possible; (4) inspection of materials at the source; (5) the securing for highways of preferential treatment with reference to the use of cars; (6) the letting of jobs in long contracts, extending over more than one season, and including all the work, the surfacing, culverts, drainage, etc.; (7) consideration, in letting contracts, of the contractor's responsibility, taking cognizance of his organization, equipment, financial ability and past record; (8) safeguarding the contractor from the unnecessary risks due to calling for needless refinements, the giving out of inadequate plans, retaining a high percentage of estimates, etc. On the subject of labor his recommendation was a very simple one: Hire big, responsible contractors and let them take care of the labor problem.

He closed with the recommendation that there be appointed a joint committee of representatives of the American Association of State Highway Officials and of the Associated General Contractors of America. Such a committee was authorized by resolution of the association.

H. S. Mattimore, testing engineer of the Pennsylvania Highway Department, urged, in a paper on "Fair Relations With Contractors," care in drawing up specifications so that they will indicate exactly what is wanted; avoidance as far as possible of the clause "to the satisfaction of the engineer"; elimination of demand in the specifications for greater refinement than is actually expected; and better training of inspectors, imbuing them with a spirit of helpfulness rather than of carping criticism of the contractor. In view of the materials shortage he urged that full data be given the contractor on local materials, and, for such surveys, advised the use of engineers rather than geologists. The engineer is apt to look at the cost of getting out the materials and not merely of locating deposits.

Discussing Mr. Mattimore's paper, Paul D. Sargent, chief engineer of the Maine Highway Commission, declared that if both engineer and contractor were honest there would be no trouble. Specifications must be written rigidly in order to get from poor contractors a satisfactory quality of work. On the other hand, these rigid specifications cause the good contractor to bid on the theory that he will run into the very worst conditions. The writing of rigid specifications therefore makes the work more costly than it should be. Nevertheless, it is difficult to see how under the present circumstances the specifications can be made less rigid. He believed it more important to get fair contractors and good inspectors than to over-refine the specifications.

Contract bonds and methods of bonding companies received rather severe handling in a discussion opened by Mr. Thompson, of New Jersey, and continued by Frank F. Rogers, H. J. Kuehling, John H. Mullen, Mr. Hirst, Mr. Sargent, and others. Most of the speakers considered some form of bond desirable, but others contended that the withholding of a fair percentage of the monthly payment was sufficient protection. At present rates and with the volume of work in prospect, bond expenses will aggregate a large sum, and every effort should be made to reduce it.

State insurance, personal bonds and reduction of bond premiums were presented as means of bringing about this reduction, and their adoption was urged wherever it was possible to do so.

Relations to Federal Goverpment

A group of papers was presented on the relationship of the state highway departments with the Bureau of Public Roads. Chief of these was a paper by George P. Coleman, state highway commissioner of Virginia, in which he reported that as a result of an inquiry addressed to the states, and responded to by 33 highway departments, the conclusion was evident that the relations in general are very satisfactory. The criticisms of a few years ago have almost entirely disappeared. Improvement has been especially marked during the past year. Ninety per cent. of the projects proposed by the states have been accepted, and the delays on the other 10% are realized by the states themselves to have been entirely justified. The law itself was generally considered satisfactory. Amendment was urged so that the Federal Government would be allowed to pay more than 50% of the cost of roads built in the public-land states of the arid West. It was urged also that somewhat lower standards be permitted in the Western states, and that a competent engineer be assigned to every state highway department and receive authority to approve minor changes in plans.

In the resulting discussion, E. W. James, assistant chief engineer of the Bureau of Public Roads, gave it as the view of the bureau that it had gone as far as the law would permit in approving cheaper forms of construction. The bureau had already placed resident engineers in a number of the states and had given them the authority which Mr. Coleman suggested. Mr. James placed great stress upon the necessity, in order that payments be promptly made, of adhering strictly to the vouchering rules that had been prescribed. This system was not of the bureau's making, but had been imposed upon it by the auditors of the Department of Agriculture, through whose hands all vouchers for Federal road funds must pass. He advised that state depositories be designated for the deposit of funds in those states where county depositories are now employed. Bearing out views expressed a number of times during the meeting, Mr. James also called attention to the fact that in many states the engineering and inspection were inadequate, and that the forces were deficient both in numbers and ability.

Thomas H. MacDonald, chief of the Bureau of Public Roads, discussed the classification of highways and the proper policy of the Government with relation to the state systems. (The paper will be found in full in this issue.)

Discussing the paper, L. A. Gillette, state highway engineer of New Mexico, pointed out that even with a 4.5 mill tax levy, New Mexico could not raise enough money to meet its Federal-aid allotment. Colonel William D. Sohier, formerly of the Massachusetts State Highway Commission, pointed out, on the other hand, that a tax levy of ¾ mill was sufficient in Massachusetts to meet the Federal-aid allotment. The association later adopted a resolution favoring a change in the law which will permit the Government to pay a higher proportion than 50% on the Federal-aid work in the public-land states.

Lieut. Col. H. L. Bowlby, chief of the war-materials division of the Bureau of Public Roads, explained in detail the reason for delay in delivering surplus war materials to the states, these materials being principally motor trucks. In all, 27,983 vehicles have been allotted, and of these over 9195 have already been delivered. Colonel Bowlby assured the state highway officials that each state would get its full allotment of trucks and of Ford cars, but stated that there was some uncertainty whether they would get the full allotment of touring cars. He also said that there was likelihood of each state obtaining 100% additional in Ford cars, probably with ambulance bodies.

He explained in detail the Kahn bill now in Congress (passed by the Senate but pending in the House), which would make it mandatory upon the Secretary of War to turn over to the states surplus material that could be used for highway building, including not merely trucks, but mixers, rollers, pumps, hoisting engines, etc. He pointed out that the bureau had recommended an amendment to the bill which would transfer to the states, in addition, gaso-

line engines, movable mess equipments, mobile machine shops and equipment for motor-truck repair shops. At the close of the meeting the convention passed a resolution urging upon Congress the passage of the Kahn bill with the amendment suggested by the bureau.

Rollen J. Windrow, state highway engineer of Texas, presented a paper on the use of the Federal equipment by the state after its receipt. In some states the equipment is rented to the contractors and in other cases used on force-account work.

MISCELLANEOUS SUBJECTS

Discussing design of pavement, Charles M. Upham, state highway engineer of Delaware, said that in the laying out of commercial routes the straightest practicable line should be chosen between the points served. Grades should be reduced as far as possible. Widths are dependent on density of traffic. The tendency in determining widths should be liberal rather than sparing. There is a point beyond which the width of a single slab is objectionable, and at this point it would be wise to consider whether a separate track should not be prepared for heavy, slow traffic and for light, high-speed traffic. In the matter of thickness of surface the thought of designers should be toward reduction of slab depth, and to make this possible sub-base construction should be improved and increased stability secured by better drainage.

On the matter of surveys, Capt. P. St. J. Wilson, chief engineer, Bureau of Public Roads, stated that the majority of the states seemed to be satisfied with the methods laid down by the bureau. In the discussion there was unanimity in the view that plans could not be made too complete. Completeness of plans always brought returns in lower bids. Quantities should be double-checked, and whatever sums spent that were necessary to make the plans complete.

On the subject of taxation, S. E. Bradt, superintendent of highways of Illinois, maintained that the direct benefits of improved roads to the road users, in reduced cost of fuel, tires, upkeep, etc., were far in excess of the present license fees. In Illinois the average fee for 1917 was $5 a car; for 1918, $7, and in 1920 would be about $10. The fees for 1920 should produce about $5,000,000, of which $2,000,000 will be used for maintenance and the rest will go into the general highway fund. Whereas the automobile license fees will yield about $5,000,000 in 1920, $15,000,000 will be contributed out of the tax levy. For this $15,000,000 the public receives the indirect benefits due to reduction in the cost of food, better rural schools, increase in property values, etc. The ratio of 1 to 3, in Mr. Bradt's opinion, is not correct, as the automobile and motor-truck users receive, in proportion, a larger benefit. Therefore the license fees should be raised. The motorists, he maintains, will agree to this, as was shown by the fact that they voted the Illinois $60,000,000 bond issue, which is to be entirely carried and amortized from automobile and motor-truck license fees. He said that at present there was one car to every 12 persons in the State of Illinois and that by 1923, it was expected, there would be one car for every eight persons.

He maintained that the horsepower rating was not equitable, since one man might use his car to a much greater extent than another. He suggested the possibility of a gasoline tax, which would be in proportion to the use of the vehicle.

Discussion of Mr. Bradt's paper brought out the fact that in three states, Colorado, New Mexico, and Oregon, there are gasoline taxes; 1c. a gallon in Colorado and Oregon and 2c. a gallon in New Mexico. The New Mexico law has been attacked on the basis of its constitutionality (as class legislation) and the case is now before the United States Supreme Court.

George H. Biles, assistant highway commissioner of Pennsylvania, read an exhaustive paper on the organization of a highway department, going into the executive, construction, maintenance, township, auto registration and accounting divisions.

In addition to the resolutions heretofore noted, resolutions were adopted urging that the United States Government become a member of the permanent International Road Congresses and that the association support the movement to have the International Congress brought here in May, 1920. Honorary membership was abolished. The support of the national Government and the states for the completion of the topographic mapping of the United States by the year 1932 was strongly urged. Indorsement was given to the present laws governing expenditure of Federal aid through the existing agencies. Coupled with the last resolution was the recommendation that sums of $100,000,000 a year be made available for each of the fiscal years ending June 30, from 1921 to 1924, inclusive. It was urged in the resolution relating to Federal aid that a national highway system be developed, but under the Federal-aid plan.

Officers for the ensuing year were elected as follows: President, Paul D. Sargent; vice-president, W. S. Keller; secretary, Col. Joseph Hyde Pratt; treasurer, John H. Mullen; new members of executive committee: Thomas H. MacDonald (reëlected), George E. Johnson (reëlected), A. B. Fletcher, S. E. Bradt and W. R. Neel. The holdover members of the executive committee are George P. Coleman, W. G. Thompson, Lieut. Col. W. D. Uhler, Ira H. Browning and Charles J. Bennett.

Iowa Engineers Must Register

Unless engineers desiring to practice in Iowa register before July 4, 1920, they will be guilty of a punishable offense should they continue to practice. All professional engineers and land surveyors are included in the provisions of the law which requires registration upon their professional requirements without examination up to Jan. 4, 1920. Thereafter, until July 4, 1920, technical examination before the Board of Examiners is required. After the latter date the law is in full force. The penalty is a fine of not less than $100 or more than $500. K. C. Kastberg, Des Moines, is secretary of the Board of Examining Engineers. Other members are Seth Dean, L. M. Martin, F. W. Stubbs and Alvin Le Van.

Ask Appropriation for Delaware River Bridge

An initial appropriation of $1,000,000 for beginning the construction of a bridge across the Delaware River to connect Philadelphia and Camden is asked of the New Jersey legislature by the state's members of the Interstate Bridge and Tunnel Commission. The same body requests a further appropriation of the same amount for the Hudson River highway tunnel between New York and Jersey City, to which project the state, in conjunction with New York State, is already committed by an appropriation made early in 1919.

St. Louis Municipal Engineers Receive Pay Increase

An ordinance providing for increased compensation for professional engineers employed by the City of St. Louis has been passed by the Board of Aldermen of that city. The ordinance was prepared last spring by the municipal section of the St. Louis Chapter of the American Association of Engineers.

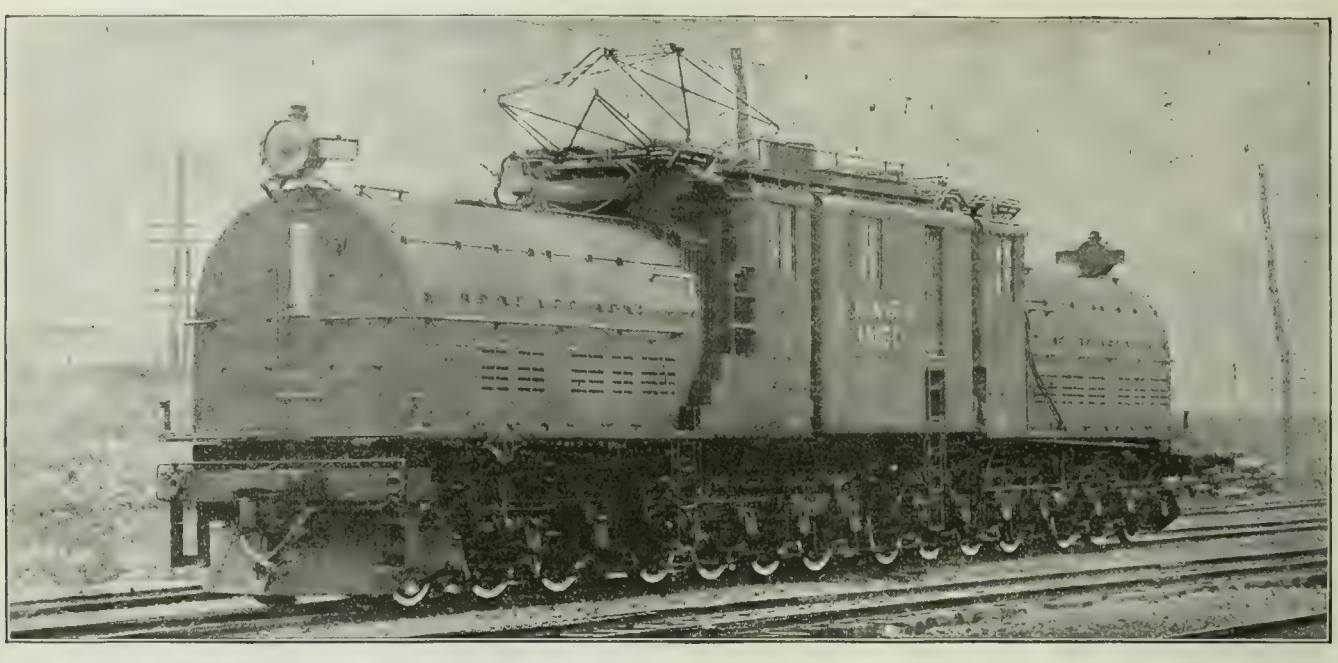
Newark Zoning Ordinance

A zoning ordinance, providing for the regulation of building in Newark, N. J., specifying building heights and uses, and localizing types of construction, passed its second reading before the Newark City Council Dec. 4. Because of certain minor changes proposed, the ordinance was returned to the second reading Dec. 11. Hearings are now being held and final action will be taken when the council meets Dec. 24. Applications for permits to build under the provisions of the new ordinance, aggregating $9,000,000, have been received.

San Diego & Arizona Ry. Open

The new San Diego & Arizona Ry., from San Diego, Calif., to El Centro, in the Imperial Valley, was formally opened to local and transcontinental passenger traffic Dec. 1, with ceremonies under the auspices of the railroad company and the San Diego Chamber of Commerce. On Dec. 10 through pullman service was established on the Golden State Limited, between San Diego & Chicago. A description of the route covered by the railroad appeared in *Engineering News-Record* of Aug. 22, 1918, p. 365.

Gearless Electric Locomotive Develops 115,000-Pound Tractive Effort



New electric locomotives weighing 265 tons, capable of a maximum starting tractive effort of 115,000 lb., are being placed in service on the Othello-Seattle-Tacoma Cascade electric zone of the Chicago, Milwaukee & St. Paul Ry. They are built for passenger service and are of the bipolar gearless type, with motor armatures mounted directly on the driving axles with 12 motors. The locomotives are designed for handling, in normal service, a 12-car train weighing 950 tons against a grade of 2% at 25 miles per hour, which requires 56,500-lb. tractive effort. They were built by the General Electric Company.

Future of Army's Construction Division Still Undecided

(*Concluded from page* 1031)

ditional construction for its housing is a tremendous proposition. Under peace-time conditions, it is admitted, the Army will not be content to be housed in temporary shacks. The new Army program, even if held below the desires of the General Staff, is certain to call for very much construction.

At present, while the matter is being thrashed out, most of the Construction Division projects are being held up. A large amount of work, however, is being required to maintain the temporary housing of the Army. Three ammunition-storage warehouses are in course of erection. These plants call for an expenditure of $15,000,000. They are located at Salt Lake City, Savannah, Ill., and Sparta, Wis.

Philadelphia Proposes New Loan Bill

A bill providing for the floating of a loan to raise funds with which to construct civic improvements in Philadelphia has been declared unconstitutional, owing to a provision in the new charter which makes it unlawful to pay for repair work with funds raised otherwise than by direct taxation. Capital outlay, or new construction work, alone, may be paid for with money raised by a loan bill.

A new bill has, therefore, been framed for the floating of a $62,100,000 loan providing for new work that must be done, and not including repairs and maintenance which must come out of the financial budget.

Some road work had already been done by the city before the former bill was declared unconstitutional, and it has become necessary for the city to raise $78,000 for the Barber Asphalt Paving Co. and $87,000 for the Union Paving Co., to pay for completed work. The question still arises whether the contracts awarded under the old bill will be held valid, or whether new bids will have to be advertised and new contracts awarded on over $2,000,000 worth of work on bridges, sewers and general road repairs.

City Planning at Philadelphia

Through the coöperation of the engineers and architects of Philadelphia, led by the Engineers' Club, the Philadelphia Planning Conference has been organized to unite the art, technical and civic organizations of Philadelphia in the promotion of city planning and zoning. An exective committee of a dozen men from various organizations has been created, with D. Knickerbocker Boyd, Philadelphia Chapter, American Institute of Architects, as chairman, A. W. Crawford, of the Art Society and City Park Association, as secretary, and J. A. Steinmetz, president of the Engineers' Club, as the ex officio member. The conference will urge a budget providing for a zoning and planning commission.

Work Commenced on Port of Birmingham

Contracts aggregating $100,000 have been let for the construction of terminals on the Warrior River, 18 miles from Birmingham, Ala. These terminals will form the basis of a port for that city. The work at present is under the direction of a private company known as the Port of Birmingham Co., which has made public sale of stock to the amount of about $200,000, and hopes eventually to have the port taken over by the municipal or state Government.

The port is located on the Warrior River, just below the Ensley Southern Ry. crossing. It is connected to the City of Birmingham by that railroad. The plans at present comprise a grading of the steep bank of the river, the continuation of the track from sidings to benches about 40 ft. above high water in the river, and the provision of trains running on these tracks to unload the barges which can be moored to the foot of the bluff. It is also intended to install unloading trestles for downstream-bound coal or slag, etc., from Birmingham. In the first construction will be included labor quarters. The Warrior River has been improved by the Government, contains locks and dams, and provides 8-ft. minimum depth to Mobile, 419 miles below the terminal. The river is now being operated by the inland waterway section of the United States Railroad Administration. C. F. Wood, Birmingham, Ala., is chief engineer of the Port of Birmingham Company.

Civil Service Examinations

Canada. Instructor in mathematics, Royal Military College, Kingston, Ont., $1800 per year. File application with Civil Service Commission of Canada at Ottawa, Ont., before Dec. 26.

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Town manager, $2400 per year, Dec. 16. To fill vacancy in Ordnance Department, Nitrate Plant No. 1, Muscle Shoals, Ala. File applications before Dec. 16.

Structural steel inspector, Naval Ordnance Plant, South Charleston, W. Va., $7.04 per diem, Dec. 23. File applications before Dec. 23.

Architectural and structural steel draftsman, Lighthouse Service, Key West, Fla., $1560 per year, Jan. 6. File application before Jan. 6.

Fire-prevention engineer, office of Director of Purchase and Storage, War Department, duty throughout United States, $2500 to $4000 per year, Jan. 13. Application should be filed before that date.

Engineering Societies

Calendar

Annual Meetings

BRIDGE BUILDERS' & STRUCTURAL SOCIETY, 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

ENGINEERING INSTITUTE OF CANADA; General Secretary, Fraser S. Keith, 176 Mansfield St., Montreal; Jan. 27-29, Montreal.

AMERICAN ROAD BUILDERS' ASSOCIATION, 150 Nassau St., New York City; Feb. 9-13, Louisville, Ky.

AMERICAN WOOD-PRESERVERS' ASSOCIATION; Secretary-Treasurer, F. J. Angier, Mt. Royal Station, Baltimore; Feb. 10-12, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle St., Chicago; Feb. 20-21, Chicago

The Arkansas Association of Surveyors, Civil Engineers and Architects will hold its 11th annual meeting at the Hotel Marion, Little Rock, Dec. 30-31, 1919. One of the principal subjects to be dealt with will be "After-War Problems With Which the Profession Is Now Confronted."

The Montreal Branch of The Engineering Institute of Canada, Dec. 11, was addressed by John Grieve on "Paint for Protection of Steel Work," and by John T. Farmer on "Mechanical Stokers." Mr. Farmer spoke in behalf of the Combustion Engineering Corporation.

The San Francisco Chapter of the American Association of Engineers at the annual meeting Dec. 4 elected the following officers: President, William S. Wollner; vice-president, J. F. Johnston; treasurer, L. R. Kessing; secretary, A. G. Mott.

The Los Angeles Chapter of the American Association of Engineers held a get-together meeting Dec. 9 for the purpose of formally amalgamating the Engineers and Architects' Association of Southern California and the Los Angeles Chapter of the American Association of Engineers. The program included a declaration of the amalgamation by President H. Z. Osborne, Jr., and talks on "The Engineer and His Relations to the Public" by F. H. Olmsted, and "The American Association of Engineers," by Samuel Starrow. The joint organization has opened headquarters at 625 Metropolitan Bldg., Los Angeles, and during the week of Dec. 8-13 meetings were scheduled for every evening, to forward a membership drive for raising the membership from 450 to 1000.

The Illinois Section of the American Water Works Association met Dec. 10 in Chicago and heard papers by Dr. Edward Bartow, formerly lieutenant colonel in charge of water laboratories in France, on "Water-Supply Service of the A. E. F.," and L. A. Fritze, formerly captain, on "Water Service of the Forty-Second Division," for which he was water-supply officer. It is Captain Fritze's observation that chaos exists for the first three days of any battle, and that the size of the present canteen should be enlarged to hold a two-day supply. He recommended that a place in the army organization be provided for water-supply men, including sanitary engineers, chemists and bacteriologists. The section indorsed the idea, by resolution.

The San Francisco Engineers' Club Dec. 4 was addressed by M. M. O'Shaughnessy, city engineer of San Francisco, on the Hetch Hetchy power project. Motion pictures were used to illustrate the address.

Personal Notes

GEORGE F. SPROULE has been appointed director of the Department of Wharves, Docks and Ferries of the City of Philadelphia by Mayor-elect Moore. Mr. Sproule entered the Board of Port Wardens in 1884, and four years later was elected secretary of the board and held this position continuously until the abolishment of that body in 1907, when he was appointed to the position of secretary of the Commissioners of Navigation.

D. Q. MCCOMB, previously major, Engineers, U. S. A., has been appointed engineer in the United States Public Roads Bureau and assigned to duty at Birmingham, Ala., where he will have charge of Federal-aid road projects now under construction in Jefferson County, as well as some Federal-aid road work in the State of Tennessee. Before entering the Army Mr. McComb was connected with the Pittsburgh Testing Laboratories.

H. W. HOLMES, previously associated with the Oregon State Highway Commission, and more recently with the engineering department of the City of Portland, Ore., has been appointed bridge engineer, Montana State Highway Commission, with headquarters at Helena, succeeding F. E. PHILLIPS, resigned.

COL. C. LINCOLN FURBUSH has been appointed director of public health, City of Philadelphia, by Mayor-elect Moore.

H. J. DOOLITTLE, highway engineer in charge of state and Federal highway construction in eastern Washington, has been chosen by the Board of Commissioners of Spokane County, Washington, as special construction engineer on permanent highways to be constructed under the $3,250,000 county bond issue.

CAPT. M. J. MCMAHON, Air Service, U. S. A., recently discharged from the service, is now general superintendent for Aronburg & McDonald, general contractors, Newcastle, Penn.

L. L. PIERSALL, of the Kentucky State Road Department, has been appointed chief engineer in charge of the construction of the Ohio River Federal-aid road from Louisville to Paducah. Prior to becoming a state employee, Mr. Piersall was a road engineer with the Louisville & Nashville Railroad Company.

CAPT. ALBERT SPENGLER, Quartermaster Corps, U. S. A., who served a year in the construction division as assistant to the constructing quartermaster, Brooklyn Army Supply Base, and as constructing quartermaster of the Baltimore depot, was recently discharged from the service, and has returned to the Pauly Jail Building Co. as engineer and superintendent of construction.

COL. T. H. DILLON, Corps of Engineers, U. S. A., has resigned from the Army to accept appointment as professor of electrical engineering at the Massachusetts Institute of Technology. In his new position Colonel Dillon will be concerned chiefly with electric-railway problems, including tramways, the electrification of steam railroads, and problems of power transmission. His service included a period on the Panama Canal as superintendent of the Gatun locks. He was also in charge of engineering in the locks division and the hydrographic division. In 1918 he went to France as colonel

in command of the 37th Engineers, a special electrical-mechanical regiment, later becoming deputy chief engineer of the First Army, A. E. F., during the St. Mihiel, the Aisne-Marne and the Argonne-Meuse campaigns. After the armistice Colonel Dillon was attached to a board for the valuation of damages in allied countries, of which board Brig. Gen. C. H. McKinstry was chief.

F. L. METZGER, formerly vice-president, Electric Welding Co., Pittsburgh, and JOSEPH G. RICHARDSON, captain, Chemical War Service, in charge of designing at Edgewood Arsenal, have organized the METZGER-RICHARDSON Co., with offices at 331 Fourth Avenue, Pittsburgh, to engage in consulting engineering, specializing in reinforced-concrete designing and furnishing and fabricating steel for concrete and other building specialties.

ROBERT C. WALKER, architectural engineer, Washington, D. C., has opened a branch office at Salisbury, Md.

HAROLD L. HOCK, formerly a lieutenant of Engineers, has returned to the New York State Highway Department, with headquarters in Buffalo. While overseas Lieutenant Hock was decorated with the Croix de Guerre.

C. A. FERGUSON, formerly of Richester, N. Y., who, as captain in the Corps of Engineers, was supervising engineer of the Raritan, N. J., arsenal, has established himself in business in Seattle, Wash., under the firm designation of the FERGUSON CONSTRUCTION COMPANY.

JOHN W. FOTHERGILL, recently returned from overseas with the 309th Engineers, has become connected with the MORGAN ENGINEERING Co., Memphis, Tenn.

JULIUS ADLER, for the past seven years with the Pennsylvania State Highway Department, the last three of which have been spent as engineer of tests, has resigned and has accepted the position of technical engineer in the asphalt department of the Atlantic Refining Co., Philadelphia.

LOGAN MCDONALD, Lothair, Mont., has been elected county surveyor of Liberty County, Montana, with headquarters at Chester.

E. L. GRANT, assistant district engineer, United States Geological Survey, has resigned to become a member of the faculty of Montana College of Agriculture and Mechanic Arts at Bozeman. Mr. Grant has been located at Topeka, Kan., since last April.

OBITUARY

SIR JOHN JACKSON, civil engineer and contractor for public works in various parts of the world, died in London, Dec. 15, at the age of 68. He was educated in the University of Edinburgh, receiving the training of a civil engineer. He was the contractor for the last section of the Manchester Ship Canal, and for the foundations for the Tower Bridge and Dover harbor work. In recent years he completed the Admiralty dock at Keyham, Devonport, as well as Admiralty harbor work in South Africa and India. He carried out the contract for the construction of the railway across the Andes Mountains from Arica, on the Pacific Coast, to La Paz, the capital of Bolivia. More recently he was engaged in irrigation works in Mesopotamia and harbor works in Canada. He was knighted in 1895.

CHARLES E. LOGUE, of the Logue Building Co., Boston, was killed recently, when he fell from a ladder upon which he was descending after the general inspection of a church building in Bridgeport, Conn. Mr. Logue had erected several important buildings in Bridgeport, and was the contractor for the Fenway Park baseball grounds of the Boston American League team.

CORNELIUS KENNEDY, street-paving contractor, Parkersburg, W. Va., died in that city Dec. 7. Mr. Kennedy entered the paving business in the early 80's and took an active part in construction work until a few months ago, as senior member of the firm of C. Kennedy & Son, street and road builders, Parkersburg, which has been succeeded by the Kennedy Construction Co., of which his son, John R. Kennedy, is president and general manager.

Tractor Engine Operates Plant During Coal Crisis

Before the coal strike was settled, the fuel situation in Peoria, Ill., became so serious that power was denied all manufacturing plants, which meant a complete shutdown for most of the institutions. As soon as notice was received that power would be cut off, engineers of the Holt Manufacturing Co., makers of caterpillar tractors, arranged to run the busiest parts of the plant by connecting block test dynamos with two 55-hp. tractor engines to supply direct current for the large traveling cranes and hoists. In addition, several 55-hp. engines were placed on stands throughout the shop and belted up directly to line-shaft pulleys, and two 5-ton tractors were brought in, and their power pulleys connected with line shafting serving two more divisions of the plant.

A considerable portion of the plant operated in this manner up to the time of the raising of fuel restrictions, while a 120-hp. motor was connected with a power house generator to furnish lighting current.



TRACTION ENGINE SUPPLIES EMERGENCY POWER TO MANUFACTURING PLANT

BUSINESS NOTES

JENKINS BROS., manufacturers of valves, New York City, will in the near future increase their manufacturing facilities by acquiring a new plant in Bridgeport, Conn.

CHARLES R. POLLARD has resigned as sales manager, Alexander Milburn Co., Baltimore, Md., and has joined the sales organization of the Dravo Doyle Co., merchant engineers, Pittsburgh.

The CLINTON WATER & WATER SUPPLY CO., Clinton, N. J., has under advisement an extension of about four miles of pipe line during the year 1920. Since the death of W. B. Meetch, president of the company, all of the interests have been purchased by E. E. Tomson and Chester Tomson, the latter continuing as secretary under the new management.

JOHN J. MOORE, JR., has joined the sales force of the Beaver Board Co., with offices at 225 Fifth Ave., New York City.

TRADE PUBLICATIONS

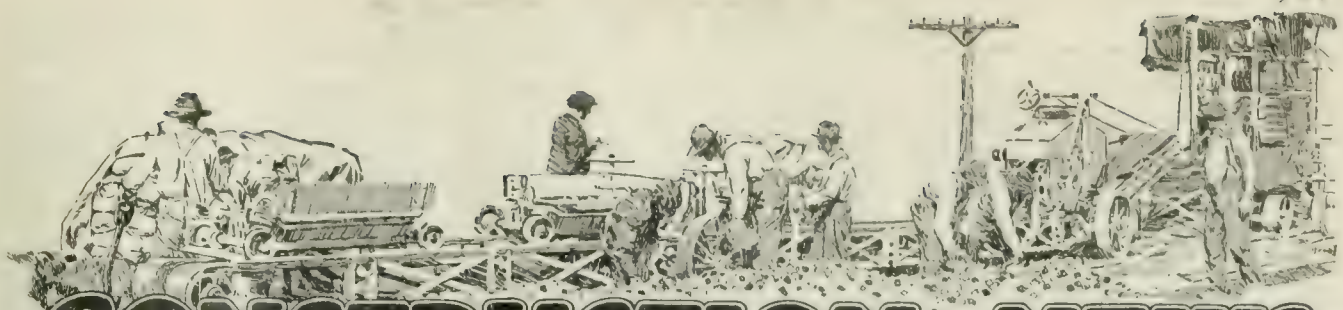
The following companies have issued trade publications:

JULIEN P. FRIEZ & SONS, Belfort Meteorological Observatory, Baltimore; catalog B, 6 x 9 in., 58 pages, illustrated, including information on standard meteorological instruments and apparatus, and Circular W (third edition) 6 x 9 in., 24 pages, illustrated, describing improved automatic water-stage registers.

THE OWEN BUCKET CO, Cleveland; folder, 6 x 9 in., illustrated, describing "Owen Type L" buckets.

WALLACE & TIERNAN CO., INC., New York City; folders, 7½ x 8 in., illustrated, on "Safe Transport" of tubed media for bacterial analysis of water and sewage; and "An Automatic Discharge Counter" developed to record the application of sewage from dosing chambers to sprinkling filters or contact beds.

STERLING ENGINE CO., Buffalo; catalog, 8½ x 11 in., 24 pages, illustrated, describing various types and uses of "Sterling" internal combustion engines particularly designed for adaptability to use in auxiliary power plants.



CONSTRUCTION NEWS

PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close			See Eng. News-Record
Jan.	5	Galesburg, Ill. ..... Adv. Dec. 11.	Dec. 11
Jan.	5	Whittier, Cal.	Dec. 16
Jan.	7	Heppner, Ore.	Dec. 16

SEWERS

Dec.	31	Grasse Pointe, Mich.	Dec. 11
Jan.	14	Little Falls, Minn.	Dec. 20
Jan.	15	Duluth, Minn.	Dec. 11
Feb.	2	Kokomo, Ind.	Dec. 16

BRIDGES

Dec.	24	Michigan	Dec. 20
Dec.	27	Madison, Wis.	Dec. 16
Dec.	27	Prairie du Sac, Wis.	Dec. 20
Dec.	29	Reading, Pa.	Dec. 16
Dec.	30	Quitman, Ga.	Dec. 20
Dec.	30	Minco, Okla.	Dec. 16
Jan.	6	Owatonna, Minn.	Dec. 11
Jan.	6	Duluth, Minn.	Dec 20
Feb.	7	Bethlehem, Pa	Dec. 11

STREETS AND ROADS

Dec.	23,	Montgomery, Ala.	Dec. 16
Dec.	23	North Carolina	Dec. 16
Dec.	23	Ventura, Cal.	Dec. 11
Dec.	23	Gaylord, Minn.	Dec. 11
Dec.	23	Long Island City, N. Y.	Dec. 16
Dec.	23	Henderson, Minn.	Dec. 4
Dec.	24.	Brooklyn, N. Y.	Dec. 20
Dec.	24	Rhode Island	Dec. 20
Dec	26	Wauwatosa, Wis.	Dec. 11
Dec.	27	Lawrenceville, N. J.	Dec. 16
Dec.	29	Athens, Tex.	Dec. 16
Dec.	29	Franklin, W. Va.	Dec. 20
Dec.	29	Minneapolis, Minn.	Dec. 20
Dec.	29	Texas	Dec. 20
Dec.	30	Michigan	Dec. 20
Dec.	30	Texas	Dec. 20
Dec.	30	Denton, Tex.	Dec. 16
Jan.	2	Waco, Texas	Dec. 16
Jan.	2	Texas	Dec. 20
Jan.	3	Limestone, Ariz.	Dec. 20
Jan.	5	St. Louis Mo.	Dec. 11
Jan.	5	Fayetteville, W. Va.	Dec. 20
Jan.	6	Hamlin, W. Va.	Dec. 15
Jan.	7	Palestine, Ill.	Dec. 20
Jan.	9	Fresno, Cal.	Dec. 20
Jan.	12	Texas	Dec 20
Jan.	14	Charleston, W. Va.	Dec. 20
Jan.	15	St. Louis, Mo	Dec. 11
Jan.	16	La Grange, Tex.	Dec. 20
Jan.	16	Liberty, Tex.	Dec. 20
Jan.	17	St. Louis, Mo.	Dec. 11
Jan.	19	Finch, Ont.	Dec. 4
Jan.	28	St. Louis, Mo.	Dec. 11

EXCAVATION AND DREDGING.

Dec.	22	Brooklyn, N. Y.	Dec. 16
Jan.	7	Elbow Lake, Minn.	Dec. 20

INDUSTRIAL WORKS

Dec.	22	Philadelphia, Pa.	Dec. 16
Dec.	24	Detroit, Mich.	Dec. 16
Dec.	27	Montreal, Que	Dec. 20
Jan.	1	Hamilton, Ont	Dec 20
Jan.	4	Iowa Falls, Ia	Dec. 20
Jan.	7	Freehold, N. J.	Dec. 16
Jan.	12	Wakefield, Mass.	Dec 16
Jan.	15	Montreal, Que.	Dec. 20

BUILDINGS

Dec.	26	Cleveland, Okla.	Dec. 20
Dec.	26	Coquille, Ore.	Dec. 20
Dec.	27	Chandler, Ariz.	Dec. 11
Dec.	29	Cleveland, O.	Dec. 4
Dec.	29	Cleveland, O.	Dec. 20
Dec.	29	Kenmore, O.	Dec. 20
Dec.	30	Mt. Pleasant, Ia.	Dec. 11
Dec.	30	Lynn, Mass.	Dec. 16
Dec.	31	Detroit, Mich.	Dec. 20
Dec.	31	Grand Rapids, Mich.	Dec. 20
Jan.	1	Waterloo, Iowa	Dec 20
Jan.	1	Bloomer, Wis.	Dec. 11
Jan.	1.	Windsor, Ont.	Dec. 20
Jan.	1	Vancouver, B. C.	Dec. 11
Jan.	2	Duluth, Minn	Dec. 11
Jan.	3	McKeesport, Pa.	Dec. 11
Jan.	3	Woodbine, Ia.	Dec 11
Jan.	5	Gaza, Ia.	Dec 11
Jan.	5	Hartford, Conn.	Dec. 20
Jan.	8	Fresno, Cal.	Dec 20
Jan.	8	Laurel, Iowa	Dec 20
Jan.	10	Kenosha, Wis.	Dec. 11
Jan.	13	Ord, Neb.	Dec. 20
Jan.	13	Storm Lake, Ia.	Dec 4
Jan.	15	Waterloo, Que.	Dec. 16
Jan.	15	Jacksonville, Ill.	Dec. 11
Jan.	19	Lowell, Mass.	Dec. 11
Feb.	1	Mitchell, S. D. ..... Adv. Dec. 28.	Dec. 20
May	15	Syracuse, N. Y.	Dec. 11

FEDERAL GOVERNMENT WORK

Dec.	23	Animal House Extension — Washington, D. C.	Dec. 4
Dec.	23	Cranes — Spec. 4092 — Norfolk, Va.	Dec. 11
Dec.	23	Cranes Spec. 4092—Philadelphia, Pa.	Dec. 11
Dec.	23	Partitions — Spec. 4098 — Alexandria, Va	Dec. 16
Dec.	23	Heating — Spec. 4091 — Charleston, S. C.	Dec. 16
Dec.	26	Lock Gates — Wheeling, W. Va. ..... Adv. Dec. 4.	Dec. 4
Dec.	30	Electric Elevators—Stapleton, N. Y.	Dec. 11
Dec.	30	Remodeling Custom and Court House—Toledo, O. ..	Dec. 11
Dec.	30	Electric Traveling Cranes — Spec. 4094 — Washington, D. C.	Dec. 16
Dec.	30	Buoys—Spec. 4068 -Yorktown, Va.	Dec. 20
Dec.	31	Buildings — Washington, D. C.	Dec. 16
Jan.	2	Lock and Esplanade—Florence, Ala.	Dec. 16
Jan.	5	Remodeling Post Office — Fitchburg, Mass.	Dec. 16
Jan.	5	Sewers—Washington, D. C.	Dec. 20
Jan.	6	Alterations to Post Office—Ashland, Ky.	Dec. 16
Jan.	7	Dirigible Hangar — Spec. 4080—Cape May, N. J.	Dec. 16
Jan.	7	Dredging — Los Angeles, Cal.	Dec. 20
Jan.	7	Water Tanks and Towers — Spec 4103—Annapolis, Md	Dec. 20
Jan.	8	Bridge—Santa Clara, Utah.	Dec. 20
Jan.	8	Remodeling Post Office — Springfield, O.	Dec. 20
Jan.	13	Additional Buildings — Dawson Spring, Ky.	Dec. 16
Feb.	2	Tower and Dwelling—Rincon, P. R. ..... Adv. Dec. 11	Dec. 11

MISCELLANEOUS

Dec.	22	Bulkhead and Side Walls—Philadelphia, Pa.	Dec. 20
Dec.	23	Jib Cranes — New York, N. Y. ..... Adv. Dec. 4.	Dec. 4
Dec.	24	Steam Road Roller—Manitowoc, Wis.	Dec. 20
Jan.	6	Sewer Pipe — Brownstown, Ind	Dec 20
Jan.	7	Dam — New Westminster, B. C.	Dec 16
Jan.	12	Gravel Screening and Loading Plant — Minneapolis, Minn.	Dec. 20
Jan.	22	Pipes, Valves, etc. — St. Louis, Mo.	Dec 11

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Watertown—Bd. Water, Light & Power having plans prepared by Hazen, Whipple & Fuller, engrs., 30 East 42nd St., New York City, for additional settling basin to be added to present water filtration system. Cost between $60,000 and $80,000.

N. J., New Brunswick—City voted $20,000 bonds to install watermains at Lincoln Gardens, $13,000 for additional units at filtration plant, $5000 for radial stack at Weston Mills Station, $10,000 for water tube boiler at pumping station, $30,000 for completion of dam, $8000 for water wheel, rotary pump, etc., $75,000 for 4000 meters and installation thereof.

Mich., Ironwood—City election in January to vote on bonds to build new waterworks system with pumping plant at Spring Creek, 6 mi. north of here and replace present plant at Montreal River. Plans include 3 electrically and 2 auxillary gasoline driven centrifugal pumps. Estimated cost of pumping and filtration plant, $435,000. pumping plant only, $290,000. Undecided as to whether filtration plant is necesary.

Mich., Pontiac—City plans election in April to vote on bonds to build filter plant, 10,000 000 gal. daily capacity, 6000 ft. 48-in reim.-con. pressure pipe to withstand head of 10 in., concrete head house at intake and gravity system. About $506,000. C. W. Hubbell, 2348 Penobscot Bldg., Detroit, engr.

Ill., Decatur—City receives bids about January, building concrete and earth impounding dam, 1900 ft. long, 28½ ft. high at spillway. About $500,000. S. A. Greeley, 39 West Adams St., Chicago, engr. Noted May 1

Ill., Jacksonville—City Clerk receives bids about January, building filtration plant, 1,500,000 gal. capacity. About $50,000. S. A. Greeley, 39 West Adams St., Chicago, engr.

Wis., Kohler—City having preliminary surveys made for waterworks system. About $50,000. J. Donohue, York Bldg., Sheboygan, engr.

Okla., Foraker—City voted $10,000 bonds to improve waterworks system. Engineer not selected.

Ore., Bend—Bend Water, Light & Power Co. applied to state engineer for 50 second ft. of water from Tumalo Creek, for development of 4225 hp. and also plans to build 2 concrete dams and canal. About $229,000.

Cal., Brea—City having plans prepared by Olmsted & Gillelen, engrs., 1112 Hollingsworth Bldg., Los Angeles, for improving waterworks system. Bonds will be voted for project.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Cal., Inglewood—City received bids furnishing and laying 13,000 ft. 4 in. 9825 ft. 6 in. and 4150 ft. 8 in. class A c.i. pipe, from T. Haverty Co., 8th and Maple Sts., $55,369, laid with cement joints; M. Murphy, San Francisco, $56,631, lead joints. Noted June 5.

★Ont., Welland—Crowland Twp. let contract laving 8000 ft. 6 in. c.i watermains, to Somerville & Delworth, Welland, $.58 per lin.ft. Town will supply pipe.

Sewers

PROPOSED WORK

N. J., New Brunswick—City voted $25,000 bonds to build surface draining sewers in various streets.

O., Lakewood (Cleveland P. O.)—City plans to build 9000 ft. vitr. and segmental block sewers in Edgewater Dr. from Webb Rd. to Sullivan Park and Franklin Ave. from Contant to Highland Aves. About $35,000. E. A. Fischer, Lakewood, engr.

Ill., Decatur—City plans election in January to vote on $500,000 bonds to build 14,000 ft. intercepting sewers various sizes. S. A. Greeley, 39 West Adams St., Chicago, engr.

Sewers (Continued)

Ill., East Moline—City plans to build 10,000 ft. 36-84 in. sewers in various streets. About $230,000. W. L. Warnes, city engr.

Wis., Kohler—City having preliminary surveys made for sanitary sewerage system. About $75,000. J. Donohue, York Bldg., Sheboygan, engr.

Ia., Des Moines—City had preliminary surveys made building Northeast Sanitary Sewerage System, involving 20 mi. 10-22 in. vitr. pipe. Cost to exceed $200,000. K. C. Kastberg, city engr.

Ore., Portland—City plans to build vitr. or cement sewers, manholes, lampholes, catchbasins, service branches and trunk lines, in East 57th St. from Sandy Blvd. to Halsey St., cost $12,928, East 54th St. from Halsey to Tillamook Sts., $6968, Ravensview Dr. from Bway Dr. to Tract 8, $2246; Williamette Blvd. and Rens St., $1933; Albina Ave., $75,294; East 72nd and Taylor Sts., $8991; East 58th St. from Davis to Burnside Sts., $1357; East 61st and Sacramento Sts., $7097; East 58th St. from Klickitat St. to Sandy Blvd., $6607; North line Sandy Blvd. to Klickitat St., $5624; East 53rd St. from Halsey to Tillamook Sts., $6048; Nevada St. from Corbett to 1st Sts., $945. O. Laurgaard, city engr.

Ore., Portland—City plans to build sewerage system in East 38th and Knight Sts., vitr. or cement pipe, cost $13,115; improve East 10th St. from Killingsworth Ave. to south line of Durham Ave., to include grading, curbing, draining and building concrete sidewalks, $6737. O. Laurgaard, city engr.

Ont., Belleville.—City having plans prepared and soon receives bids building 5000 ft. 10-15 in. vitr. sewers in Dufferin Ave. and Victoria St. About $125,000. J. G. McGill, city engr. Noted Sept. 25.

Ont., Guelph—City plans to build 2500 ft. 18-24 in. vitr. sewer in Preston St. from Fergus to Yorkshire Sts. F. McArthur, city engr. About $12,000.

BIDS DESIRED

Minn., Little Falls—Until Jan. 14, by A. Johnson, city clk., building sewers in various streets, involving 3152 ft. 10-20 in. pipe, 6 manholes 8-13 ft. deep, etc. About $13,000. C. L. Pillsbury Co., 805 Metropolitan Life Bldg., Minneapolis, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★O., Cleveland—E. W. White, 906 Williamson Bldg., will build sewer in Edgewood Ave., involving 1770 ft. 20-30 in. vitr. pipe, 10 manholes, etc. About $14,600. Work will be done by day labor. Former bids rejected.

★Wis., Kewaunee—City let contract excavating and laying 3.1 mi. 10 in. vitr. pipe sewers in various streets, to Gray-Robinson, 8th St., Manitowoc, $34,890.

★Ia., Osage—City let contract building sewers in various streets, involving 76,020 lin.ft. 8-15 in. pipe and 11,879 cu.yd. rock excav., to O'Neill & Preston, 60 East 6th St., St. Paut, Minn. About $253,000.

Ore., Portland—City received bids building sewerage system in (a) East 65th and Stanton Sts., (b) Bradford and Alta Sts., (c) East 84th St. from East Burnside to East Stark Sts., (d) East 2nd St. from East Madison to East Salmon Sts., (e) 5th Ave. from point 80 ft. south of Nevada St. to sewer extension "b" in Fulton Park, (1) concrete, (2) cement, from Warren Constr. Co., Journal Bldg., (a1) $53,817; Azar & Co., Portland, (b2) $7857; Elliott & Scoggin, McKay Bldg., (b2) $7865, (c2) $3454; J. Keating, Portland, (b) $8156, (d2) 4152; E. Sandberg, (c2) $3073; Mehemarie & Co., (c2) $3382; Dyoub & Joseph, (e2) $938.

Bridges

PROPOSED WORK

Mass., Chelsea—Dept. Pub. Wks. plans to build concrete and steel bridge. About $500,000.

Conn., Bridgeport—City plans to expend $100,000 to repair present Steeplechase Island Bridge, over Johnson Creek.

N. J., New Brunswick—City voted $11,000 bonds to build steel foot bridge over Pennsylvania R.R. tracks on Sandford St.

Florida—State Road Dept., Tallahassee, soon lets contract building 388 ft. bridge, 18 ft. roadway, 6 ft. walk, over Blackwater River at Milton, to have 4 steel girder approach spans and steel bascule left span. Work involves 1348 cu.yd. concrete, 168,000 lb. steel reinforcement, 220,000 lb. steel for approach span, 200,000 lb. steel for bascule span, 8250 lin.ft. wooden piling, 22,500 lb. castings and machinery, 26,500 ft. flooring and 716 lin.ft. handrail. C. A Browne, Tallahassee, engr.

Mich., Ironwood—Chicago & Northwestern Ry., Jackson Blvd. and Franklin St., Chicago & Minneapolis, St. Paul & Sault Sainte Marie Ry., 204 Clark St., Chicago, and city plan to build viaduct over tracks on Marquette or Curry Sts., here. Estimated cost, on Marquette St., $145,700, Curry St., $235,975. Railways will pay 75 per cent of cost and city 25 per cent. W. H. Finley, ch. engr. of former and E. A. Whitman, ch. engr. of latter.

Cal., San Bernardino—City defeated $60,000 bonds to build 2 bridges. Noted Aug. 14.

Ont., Toronto—Comrs. York Co., 57 Adelaide St. E., having plans prepared by E. Barber, engr., 40 Jarvis St., for 100 ft. rein.-con. bridge, 20 ft wide, over Black River. About $22,500.

BIDS DESIRED

Ga., Quitman—Until Dec. 30 by Comrs. Brooks Co. building 10 concrete bridges between here and Moultrie. Work involves 1066 cu.yd. excav., 1340 lin.ft. wooden piling, 2304 lin.ft. concrete piling, 1349.9 cu.yd. class "B" concrete and 100 341 lb. reinforcing steel, Garret & Slack, Bell Bldg., Montgomery, Ala., engrs. About $50,000.

Michigan—Until Dec. 24, by F. F. Rogers, state highway engr., Lansing, building State Trunk Line Bridge No. 318, over north branch of Pine River, ½ mi. north of Rudyard, Chippewa Co., 140 ft. long, 18 ft. wide, to have two 24 ft. concrete abutments, two 9 ft. piers, 60 ft. deck plate girder on steel bents with two 40 ft. I-beam approach spans containing 100,000 lb. steel, also State Trunk Line No. 319, over west branch of Pine River, ½ mi. west of Rudyard. Work involves 221 cu.yd. rein.-con. and 50 tons steel.

Wis., Prairie du Sac—Until Dec. 27, by State Highway Comn., Milwaukee, building 1428 ft. plate girder bridge, over Wisconsin River, here, to have 15 through plate girder spans, 79 ft. total length, double leaf bascule 70 ft. clear span, 2 plate girder approach spans, 79 ft., and concrete piers and abutments. Work involves 2400 cu.yd. rein.-con., 500 ton structural and 55 ton reinforcing steel, 330 lin.ft. piles, 205 sq.yd. paving, etc. Noted June 19.

Minn., Duluth—Until Jan. 6, by W. H. Borgen, aud. St. Louis Co., building 110 ft., steel span bridge, 18 ft. wide, over Little Forks River. About $18,000. O. A. Rold, co. engr.

Minn., Duluth—Until Jan. 6, by Comrs. St. Louis Co., building 140 ft. span bridge, 20 ft. wide, State Job No. 1903, Div. No. 2. About $22,000. O. A. Rold, co. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Charlestown (Boston P. O.)—Boston & Maine R. R., North Sta., Boston, let contract building timber railroad bridge, here, to W. L. Miller Co., 171 Alford St. About $50,000.

★N. J., Trenton—Bd. Freeholders Mercer Co. let contract building bridge No. 421.1, 15 ft. rein.-con. span, 30 ft. roadway, to H. Morgan, 12 North Willow St., $9346; No. 423.1, to L. J. Seiling, 211 Broad St., Red Bank, $3572.

★N. C., Pittsboro—Comrs. Pitt Co. (Greenville) let contract building 273 ft., 5 span bridge, 12 ft. wide, over Tar River, to A. P. Gilbert, Durham, $15,074. Work involves 220 cu.yd. concrete.

★O., Cleveland—City let contract for 1310 cu.yd. rein.-con., 50,000 lb. steel and 1200 cu.yd. excav. in connection with building concrete bridge on West 117th St., 40 ft. long, 80 ft. wide, to C. R White, 643 Lincoln Ave., Lakewood. About $25,000.

Wis., Milwaukee—P. Braman, comr. pub. wks., received bids Dec. 10, furnishing labor and materials for building North Ave. viaduct and side approach over Chicago, Milwaukee & St. Paul R.R. tracks and Milwaukee River, here, (a) work in case level of Milwaukee River is left at normal elevation, about 14-16 ft. above city datum, (b) in case gates of dam are opened and level of Milwaukee River is lowered about 10 ft., from Klug & Smith Co., 40 Mack Bldg., (a) $643,000, (b) $628,000; Standish & Allan, 220 South State St., Chicago, (a) $894,931, (b) $844,931. Work includes building concrete viaduct extending from intersection of North and Humboldt Aves. on west, to east bank of Milwaukee River to east. From westerly end, work consists of 183 ft. retaining wall with earth fill, 142 ft. concrete beam-and-slab construction, 141 ft. steel girders, concrete encased, over Chicago, Milwaukee & St. Paul R.R. tracks; 348 ft. concrete beam-and-slab construction and 571 ft. concrete arch construction, 3 arch spans, over Milwaukee River. Total width of viaduct, 61½ ft. with 40 ft. clear roadway. At west side of Milwaukee River will be side approach 600 ft. long, 28 ft. wide, with stairway.

Streets and Roads

PROPOSED WORK

Connecticut — State Highway Comm., Hartford, plans to build 14 mi. trunk line between Waterbury and Bristol, 16 ft. wide. About $300,000. C. J. Bennett, state highway comr.

N. J., New Brunswick—City voted $3000 bonds to grade Codwise Ave., $59,000 to pave Rutgers St., Livingston, Commercial and Codwise Aves., sheet asphalt, $63,000 to pave Remsen Ave., Townsend, Comstock, Condict, Brown, Hamilton, French, Alexander and other streets, Warrenite bituminous concrete, and $8,000 to repave Fitzpatrick and Paterson Sts., Warrenite bituminous concrete.

W. Va., Spencer—Comrs. Roane Co. having plans prepared for concrete paving, grading and draining 3 mi. road from here to Walton, 16 ft. wide. About $67,000. H. R. Muldoon, Spencer, engr.

O., Cleveland—J. Laronge Co., Williamson Bldg., receives bids about spring, grading, building stone sidewalks and water mains in 120 acre allotment, 4300 ft. long, 2400 ft. wide, on east side of Lindsay Rd. north of Lake Shore Blvd., Euclid Village. About $75,000. F. A. Pease Eng. Co., Marshall Bldg., engrs.

O, Lakewood (Cleveland P. O.)—City plans to grade, drain, curb and pave 11,250 ft. Hazelwood, Wyandotte, Richland and Lakeland Aves., asphalt, concrete, bituminous, brick block or macadam. About $50,000. E. A. Fischer, Lakewood, engr.

Wis., Chilton—City plans to grade and pave 5.2 mi. Chilton-Hilbert Jct. Rd., 18 ft. wide, 2 course rein.-con., also building bridges and culverts on same. Work involves 300,000 sq.yd. concrete. About $162,000. W. Hoenig, co. engr.

Wis., Chilton—Calumet Co. plans to grade, drain and surface Forest Junction-Hilbert Rd., Brillion Twp., $3600; New Holstein St. Anna Rd., New Holstein Twp., $3600; Hook Hill Rd., Stockbridge Twp., $3600; also building concrete culverts on roads on State Trunk Highway System, $9000. W. Hoenig, co. engr.

Wis., Ft. Atkinson—City plans to grade, drain and surface 2.8 mi. Watertown Plank Rd., 18 ft. wide, concrete. About $95,000. R. D. Rogers, co. engr.

Wis., Kewaunee—Kewaunee Co. plans to grade, drain and surface Montpelier Rd., West Kewaunee Twp., $6082; Casto-Ryan Rd., Casco Twp., $1521; Lakeshore Rd., Ahnapee Twp., $1521: Black Ash Rd., Lincoln Twp., $1521; Bauer Rd., Franklin Twp., $1521; also build Bain Bridge, concrete, Casco Twp., $758 and Brandle Bridge, concrete, Luxemburg Twp., $9380. M Shaw, Algoma, comr.

Wis., Port Washington—City plans to grade, pave and drain 2.8 mi. Lake Shore Rd., 18 ft. wide, rein.-con. About $90,000. J. H. Mueller, Thiensville, engr.

Wis., Wausau—Marathon Co. plans to grade and gravel surface Colby-Marshfield Rd., Brighton Twp., $3000; Wausau-Birnamwood Rd., Ringle and Easton Twps., $6000; Grand Rapids-Wausau Rd., Bergen Twp., $6000; Colby-Wausau Rd., Hull Twp., $5133; also expend $20,865 for improving roads in other towns. J. H. Vogt, comr.

Minn., Blooming Prairie—City having plans prepared for 1500 sq.yd. paving. Bids will be received on all types of pavement. About $100,000. J. W. Shaffer & Co., New York Life Bldg., Minneapolis, engrs.

Minn., Duluth—City soon lets contract improving 5000 ft. 63rd Ave. west from Front to Roosevelt Sts., 24-32 ft. wide, involving 4930 ft. earth excav., 12.365 sq.yd. concrete paving, 7808 lin.ft. concrete curbing, 1028 ft. concrete heading, 200 ft. 3 in. drain tile and 1700 ft. 12 and 18 in. sewer pipe. About $55,531. E. K. Coe, city engr.

Minn., Lake Crystal—City having surveys made for paving 20 blocks, 18 ft. wide. Bids will be received on all types of pavement. About $200,000. J. W. Shaffer & Co., New York Life Bldg., Minneapolis, engrs.

Minn., Madison—City having surveys made for 40,000 sq.yd. paving. Bids will be received on all types of pavement. About $200,000. J. W. Shaffer & Co., New York Life Bldg., Minneapolis, engrs.

Streets and Roads (Continued)

Montana—State Highway Comn., Helena, plans to gravel surface Missoula-Carlton Rd., cost $20,000, Missoula-Lathrop Rd., $20,000; road from O'Keefe Ranch to Ravalli, $20,000, Missoula Co. Federal Government asked to appropriate toward cost. J. N. Edy, state highway engr.

Mont., Great Falls—City plans to pave 30,581 sq.yd. 2nd Ave. N. from 19th to 36th Sts. L. B. Evenson, city engr.

Mont., Livingston—City receives bids about Feb. 1, paving 140 blocks in eastern and western districts. About $400,000. C. T. Sakett, city engr.

Tex., Linden—Cass Co. having plans prepared grading, gravel surfacing and draining 7.689 mi. Douglasville Rd., 9 ft. wide, involving 8.3 acres clearing and grubbing, 66,391 cu.yd. unclassified earth excav., 167 cu.yd. class A and 41 cu.yd. class B concrete, 17,882 lb. reinforcing steel and 476 ft. 24-36 in. c.i. pipe. About $68,342. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Okla., Tecumseh—Pottawatomie Co. voted $500,000 bonds to build roads in Earlsboro, Davis, Brinton, Forest and Rock Creek Twps. L. L. Winans, Tecumseh, engr.

New Mexico—State Highway Dept., Santa Fe, plans to pave 8 mi. road between Lordsburg and Steins, 20 ft. wide, Federal Aid Project No. 44. L. A. Gillett, state highway engr. About $50,000.

Ore., Astoria—City plans to pave 17,000 ft. Taylors Addition, 16 ft wide, concrete; also grade streets, 24 ft. wide. About $10,000. E. G. Gearhart, city aud.

Ore., Milton—City plans to issue $25,000 bonds to pave streets with concrete or bitulithic in conjunction with work planned by State Highway Comn.

Ore., Silverton—City Council passed resolution to expend $20,919 to grade and pave with concrete or asphaltic concrete, unpaved sections of main streets and drain overflow section of lower 3rd St.

Cal., Los Angeles—Bd. Pub. Wks. receives bids about Jan. 14 paving Melrose Hill Impvt. Dist., concrete with Warrenite surface, cement curbs and gutters. About $25,000. H. B. Ferris, secy. A. C. Hansen, city engr.

Cal., Los Angeles—Bd. Pub. Wks. receives bids about Jan. 15, improving Clementina Ave. et al, in Clementina Ave. Impvt. Dist., involving concrete base, asphalt surface, cement curbs, concrete and granite block gutters, vitr. pipe storm drains, grading and oiling. About $75,000. H. B. Ferris, secy. A. C. Hansen, city engr.

Cal., Los Angeles—City having plans prepared paving 5 mi. Western Ave between Adams St. and Manchester Ave., 50 and 60 ft. wide, 5 in. concrete base, 1 in. binder and 2 in. asphalt surface. Also 13 other smaller paving jobs, some concrete, others Warrenite. A. C. Hansen, city engr.

Cal., Santa Ana—Bd. Supervs. Orange Co. plans election to vote on $2,500,000 bonds to pave 100 mi. highways. J. M. Backs, co. clk.

Cal., Visalia—Tulare Co. having plans and specifications prepared for concrete paving on 5 mi. Woodville-Poplar Rd., 4 mi. Klink-Woodville Rd., 9 mi. Yettem-Mud Springs Rd., 6 mi. road from Dinuba, south, 4 mi. Naranjo-Lemon Cove Rd. 4 mi. from Sultana, south and 8 mi. Orosi-Orange Cove Rd. L. Moye, co. engr. G. R. Prestidge, co. clk.

Ont., Belleville—City having plans prepared and soon receives bids paving William, Charles, Ann, John, Bridge and Pinnacle Sts. Work involves 38,000 sq.yd. 28-33 ft. wide, asphaltic concrete on concrete base. About $110,000. J. G. Mill, city engr.

Ont., Hamilton—City Council plans to grade McKittrick Blvd., King, Dundas, and Cannon Sts., Balsam, Connaught and Beechwood Aves.; build cement sidewalks on Homewood Ave., and King St. and concrete curb on Tisdale St. About $60,000. E. R. Gray, city engr.

BIDS DESIRED

Rhode Island—Until Dec. 24, by State Bd. Pub. Rds., State House, Providence, improving 1975 ft. and 8180 ft. state road, penetration method, Lincoln Twp. About $60,000. I. W. Patterson, engr.

N. Y., Brooklyn—Until Dec. 24, by Dept. Parks, Municipal Bldg., New York City, furnishing all labor and material for improving East Drive, Prospect Park between main entrance of park and Ocean Ave. entrance. Work includes regulating, grading, building sheet asphalt pavement on concrete foundation and laying brick gutters.

W. Va., Charleston—Until Jan. 14, by L. C. Massey, clk. Kanawha Co., grading, draining and paving 2.16 mi. Elk River Rd. Work involves 54,253 cu.yd. excav. and 25,761 sq.yd. concrete paving. About $138,586. F. G. Burdette, co. engr.

W. Va., Fayetteville—Until Jan. 5, by Comrs. Fayette Co., paving 8 mi. James River and Kanawha Turnpike, 9 ft. wide, concrete or penetration macadam. About $100,000. J. K. McGrath, co. engr.

Michigan—Until Dec. 30, by F. F. Rogers, state highway engr., Lansing, grading and surfacing 3.068 mi. Assessment Dist. Rd. No. 150, from Huron Shore Pike northwest, 9 ft wide, involving 16,200 sq.yd. class B gravel. About $30,000.

Ill., Palestine—Until Jan. 7, by Village Clerk, improving sections of Walnut and Main Sts., involving 5820 cu.yd. excav., grading and preparing subgrade, 14,160 sq.yd. Portland cement concrete pavement, 10 and 11 in. thick in center, 6 and 7 in. thick on sides, 6535 lin.ft. Portland cement concrete curb, 532 lin.ft. soft steel protection plates, 3458 lin.ft. 8-12 in. vitr. clay sewer pipe, 19 concrete combination inlets and catch basins, etc. E. F. Mail, Robinson, engr.

Minn., Luverne—W. Bauer, city recdr., receiving bids paving 100 blocks, 18 ft. wide, concrete, asphalt, asphaltic concrete, bitulithic or vitr. brick. About $300,000. T. H. Johnson, 32nd and Myrtle Sts., Sioux City, Ia., engr.

Minn., Minneapolis—Until Dec. 29, by A. P. Erickson, aud. Hennepin Co., grading and graveling 38,000 sq.yd. Rd. No. 55A, on Dan Patch Line, near Bloomington. About $25,000. E. E. Terrell, co. surv.

Texas—Until Dec. 29, by State Highway Dept., Austin, gravel surfacing 11.5 mi. Highway No. 19, Federal Aid Project No. 102, Henderson Co.

Texas—Until Dec. 30, by State Highway Dept., Austin, surfacing with bituminous gravel, 10.1 mi. Highway No. 40, Federal Aid Project No. 117, Denton Co.

Texas—Until Jan. 2, by State Highway Dept., Austin, concrete surfacing 1.01 mi. Highway Nos. 7 and 31, Federal Aid Project No. 110, McLennan Co.

Texas—Until Jan. 12, by State Highway Dept., Austin, gravel surfacing 11.3 mi. Highway No. 3, Federal Aid Project No. 37, Fayette Co. and 8.5 mi. Highway No. 35, Federal Aid Project No. 125, Liberty Co.

Tex., La Grange—Until Jan 16, by J. F. Ehlenger, judge Fayette Co., grading, gravel surfacing and draining 11.27 mi. Highway No. 3, from Gonzales Co. to Flatonia, Schulenberg and beyond, 15 ft. wide, involving 35,837 cu.yd. unclassified earth excav., 1762 cu.yd. concrete and 181,224 lb. reinforcing steel. About $144,827. A. Schlafli, Schulenburg, engr.

Tex., Liberty—Until Jan. 16, by C. N. Smith, judge Liberty Co., draining, gravel surfacing and building trestle on 8.518 mi. Highway No. 35, from Cleveland to Montgomery Co. line, 16 ft. wide, involving 6.16 acres clearing and grubbing, 11,282 cu.yd. earth and 234 cu.yd. structural excav., 164 cu.yd. concrete, 1260 lin.ft. piling in trestle and 232,892 ft. B. M. creosoted timber in trestle. About $120,252. H. O. Compton, Liberty, engr.

Ariz., Tombstone—Until Jan. 3, Bd. Supervs. Cochise Co., building Sects. 2-A and 2-B Bisbee-Douglas Highway, Federal Aid Project No. 11, involving 47,137 sq.yd. 6 in. concrete paving on Sect. 2-A and 42,240 sq.yd. on Sect. 2-B. State furnishes cement. Former bids rejected.

Cal., Fresno—Until Jan. 9, by Bd. Supervs. Fresno Co. improving 12 mi. Elm Ave., involving 21,550 cu.yd. earth excav., 15,670 cu.yd. concrete paving, 1,014,014 sq.ft. wearing top and 14 concrete and corrugated iron culverts, 280,000; 5.35 mi. Blackstone Ave., 8260 cu.yd. earth excav., 7005 cu.yd. concrete paving, 453,782 sq.ft. wearing top, and 4 concrete and corrugated iron culverts, cost $125,000. Bids will be taken under 4 specifications, concrete base with Warrenite or Jensenite surface and asphaltic concrete base with Warrenite or Topeka surface.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**New York**—State Highway Comm., 53 Lancaster St., Albany, let contract improving 1.27 mi. Oakwood Ave., Rd. No. 1527, Rensselaer Co., to Belmar Contg. Co., Inc., Troy, $41,907; 4.17 mi. Malta-Bemis Heights, Part 1, Rd. No. 1528, Saratoga Co., to J. B. Dower, Ballston Spa., $167,257; 6.1 mi. Rexford Flats-Wait Corners-Groom Corners, Rd. No. 1117, Saratoga Co., to W. G. Fox, Saratoga, $94,109; 6.93 mi. Castle Creek-Whitney Point Rd. No. 1450-A Broome Co., to Rosoff Eng. Co., 15 Park Row, New York City, $304,874; 6.36 mi. Sandy Creek-Smartville Rd. No. 1428, Oswego Co., to J. D. Rust, Buffalo, $95,405; completing 6.99 mi. Bennington-Attica-Attica Center, Parts 2 and 3, Rd. No. 1267, Wyoming Co., to F. W. Knickenberg, 702 Michigan Ave., Buffalo, $130,389; 2 mi. Canisteo-Whitesville, Part 3, Rd. No. 5650, Steuben Co., to Sweeney & Boland, Wolcott Rd., Rochester, $56,370.

New York—State Highway Comm., Capitol, Albany, received bids Dec. 9, improving 1.44 mi. Riders Mills-Brainard Rd. No. 1521, Rensselaer Co., from Belmar Contg. Co., Troy, $43,508; J. J. Rigney, Rensselaer, $43,715; L. Mayersohn, Albany, $46,271; 4.78 mi. Watertown-Philadelphia, Part 1, Rd. No. 5651, Jefferson Co., from J. L. Smith & Son, Lyons Falls, $144,128.

★**N. Y., Brooklyn**—E. Riegelmann, boro. pres. let contract laying asphalt pavement on West 35th St from Neptune to Mermaid Aves., to Brooklyn Alcatraz Co., 407 Hamilton Ave., $12,502; regulating and grading 90th St. from 5th to Gelston Aves., to C. Gallagher, 745 Dean St., $1467.

★**N. Y., Rochester**—Bd. Contr. & Supply let contract paving Averill Ave., asphalt, to Rochester Vulcanite Paving Co., Exchange Pl. Bldg., $20,569.

★**N. Y., Syracuse**—Bd. Contr. & Supply let contract resurfacing .562 mi. East Fayette St. from South State to South Crouse Aves., 35-40 ft. wide, sandstone block, to F. J. Baker, Union Bldg., $65,190; .274 mi. North Saline St. between Oswego Canal and Butternut St., to G. B. Slickson, Union Bldg., $17,621; .248 mi. East Water St. from Salina to Warren Sts., to J. H. Gallup, Union Bldg., $15,878.

★**W. Va., Charleston**—City let contract rebuilding 14 streets, involving 58,000 sq.yd. Trinidad sheet asphalt on 7 in. concrete base, brick gutters to G. T. Fogle & Co., Charleston. About $242,000.

★**Miss., Greenwood**—City let contract paving various streets, to Hornaday Constr. Co., Greenwood. Work involves 9000 cu.yd. excav., 22,600 lin.ft. curb and gutter and 29,000 sq.yd. asphalt macadam pavement. About $97,000.

Kan., Abilene—Comrs. Dickinson Co. received bids Dec. 1, (1) hard surfacing and grading, 4.53 mi. Golden Belt Rd., Sect. A, Federal Aid Project No. 32, 18 ft. wide, also building bridges and culverts on same, (2) 3.96 mi. Bee Line Rd., Sect. D, Federal Aid Project No. 29, 18 ft. wide, (a) concrete, (b) monolithic brick, (c) bituminous filled brick, from Ziegler & Dalton, Junction City, (1a) $238,848, (2a) $215,184, (1b) $272,430, (2b) $242,633, (1c) $278,855, (2c) $246,850; Cook & O'Brien, Ry. Exch. Bldg., Kansas City, Mo., (1a) $246,938, (2a) $214,794, (1b) $286,266, (2b) $239,398, (1c) $292,105, (2c) $244,318.

★**Cal., Fresno**—City let contract improving 6 mi. Shaw Ave., involving 6400 cu.yd. excav., 421,000 sq.ft. asphalt concrete pavement, corrugated iron and concrete culverts, to Worswick Paving Co., 1st and San Diego Sts., $89,339. Latter assigned contract to Federal Constr. Co., Call-Post Bldg., San Francisco.

★**Cal., Fresno**—Fresno Co. let contract paving 24.2 mi highway, 1½-in. Warrenite on 5-in. concrete base, to Blanchard, Crocker & Howell, 58 2nd St. About $687,000.

Cal., Los Angeles—Bd. Supervs. Los Angeles Co. received bids improving 5.62 mi. Saugus-Ventura Rd., Rd. Impvt. Dist. No. 5, 18 ft. wide, involving 53,500 cu.yd. earth excav., 59,440 sq.yd. 5 in. concrete base, 29,270 lin.ft. shaping roadbed, 43 cu.yd. concrete in culverts, 1800 lb. reinforcing steel, 357 ft. 18-36 in. corrugated iron pipe, 2 small tile bridges, etc., from Rogers Bros. Co., 350 Merrick St., $100,908; G. S. Benson & Sons, Stimson Bldg., $107,817; C. H. Hudson, Marsh-Strong Bldg., $116,858; 2.4 mi. Harbor Truck Blvd. near Compton, 24 ft. wide with disintegrated granite shoulders, involving 500 cu.yd. earth excav., 12,802 lin.ft. shaping roadbed, 34,136 cu.yd. 8 in. concrete base, 4610 lb. reinforcing steel, 22 cu.yd. concrete culverts, from Rogers Bros. Co., $87,898; D. L. Gaskill, 326 Hermosa St., Long Beach, $86,871; Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., $72,139. County furnishes 11,481 bbl. cement, 316,266 sq.ft. welded wire mesh and 7820 tons disintegrated granite.

Railways

PROPOSED WORK

Oklahoma—J. F. Crow, pres. Oklahoma Union Ry. Co., C. Page Sand Springs, Bigheart Producing & Refining Co., Mayo Bldg., Tulsa and Exch. Natl. Bank, Tulsa, formed new company, to build interurban

Streets and Roads (Continued)

line to Pawhuska, Bigheart, Avant and Nelagony. About $1,000,000.

Ont., Elk City—I. W. Solloway, Toronto, forming company and plans to build 26-28 mi. light railway of 30 lb. rails from here to Gawganda, operated by gasoline locomotives, similar to those used in France. About $520,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ohio.**—Cleveland Ry., Leader News Bldg., will build 2¼ mi. double track from West 3rd St. and Scranton Bridge to Bway. and East 34th St. About $250,000. Work will be done by day labor.

Excavation and Dredging

PROPOSED WORK

Pa., Wilkes-Barre—Dredging—City and Hanover-Twp. had plans prepared dredging Solomon Creek; work includes 13,432 ft. ditch work, 20 ft. wide, 2000 ft. concrete tunnel and changing creek's course. About $1,000,000. B. K. Finch, Wilkes-Barre, engr.

O., Cleveland—Excavation—Comrs. Cuyahoga Co. having preliminary surveys made for straightening Cuyahoga River. About $3,000,000. Federal Government will appropriate toward cost of project. W. A. Stinchcomb, co. engr.

Mont., Ulm—Irrigation—Ulm Irrigation Dist., Cascade Co., plans to build 20 mi. canal to irrigate about 10,000 acres. J. E. James, Cascade, engr.

BIDS DESIRED

Minn., Elbow Lake—Ditch—Until Jan. 7, by Comrs. Grant Co., clearing and grubbing County Ditch No. 8, involving 14,500 cu.yd. excav., also repairing bridge foundation. About $11,000. W. E. Burgess, Elbow Lake, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Miss., Lake Cormorant**—Drainage—Bd. Comrs. Lake Cormorant D. D. let contract building 90 mi. open drainage channels in Tunica and DeSoto Counties, involving 3,342,000 cu.yd. floating dredgework, to Canal Constr. Co., Exch. Bldg., Memphis., Tenn. About $650,000.

★**Cal., Los Angeles**—Irrigation—Bd. Serv. 645 South Olive St., will build earth dam with hydraulic fill involving 500,000 cu.yd. excav., in Stone Canyon, (same being part of water and irrigation system for Westgate Annex, for which $700,000 bonds were voted.) Work will be done by day labor.

Industrial Works

PROPOSED WORK

N. H., Nashua—H. C. Lintott, 25 Main St., having plans prepared by W. H. Taylor & Son, archts., 50 Bromfield St., Boston, for 2 story, 75 x 150 ft., brick and steel garage, concrete flooring and foundation, on Main St. About $60,000.

Mass., Cambridge—Densmore & LeClear, archts., 88 Broad St., Boston, soon receive bids building 2 story, 50 x 170 ft., brick, concrete and steel factory, concrete flooring and foundation, on Charles River Parkway, for Eco Mfg. Co., 941 Exch. Bldg., Boston. About $65,000.

Mass., Haverhill—Whittier Bldgs., Inc., 1st Natl. Bank Bldg., plans to build 2 rein.-con. factories, on Washington St. About $700,000. Private plans.

Mass., Quincy (Boston P. O.)—C. W. Hodgkinson, Alden St., having plans prepared by W. H. Taylor & Son, archts., 50 Bromfield St., Boston, for 1 story, 85 x 100 ft., brick and concrete garage, concrete flooring and foundation, on Washington St. About $25,000.

Mass., Somerville (Boston P. O.)—Prospect Hill Bottling Co., 153 Cross St., soon lets contract building 2 story, 60 x 100 ft. and 60 x 120 ft., brick and concrete factory, concrete flooring and foundation, on Allston St. About $60,000. J. W. Hyson, 62 Beach Ave., Melrose, archt.

Mass., Westfield—Vitrified Wheel Co., Emery St., soon lets contract building 2 story, 42 x 85 ft., brick and mill construction addition to manufacturing plant, concrete foundation. About $25,000. Private plans.

Mass., Willimansett (Holyoke P. O.)—Stevens-Duryea Co., Chicopee Falls, having plans prepared for 3rd unit of plant, 1 story, 320 x 760 ft., brick and steel, concrete flooring and foundation, at Driving Park, Ave. Private plans.

Conn., Bridgeport—City having revised plans prepared by Davis & Dane, archts., 1024 Main St., and soon receives bids building 2 story, 146 x 200 ft., brick and rein.-con. garage, on Madison Ave. About $150,000.

Conn., Hartford—Cohen & Blum, c/o Berenson & Moses, archts., 1026 Main St., plan to build 2 story, 75 x 80 ft., brick and mill construction factory, on Windsor Ave. About $30,000.

Conn., South Norwalk—J. C. Schaeffler, archt. and engr., 40 West 32nd St., New York City, receives bids about Jan. 5, building brick, steel and concrete factory, rein.-con. flooring, concrete foundation, for Danor Realty Co., c/o architect. About $150,000.

Conn., Waterbury—City plans to build 1 story garage and rein.-con. retaining wall. About $30,000. R. H. Cairns, city engr.

Conn., Wilton—Ozo Co. plans to build rein.-con. factory, to contain 67,500 sq.ft. rein.-con. floor space, concrete foundation. About $175,000. Architect not selected.

N. Y., Binghamton—W. R. Hollingshead Co., 148 Oak St., plans to build 4 story, brick factory. About $150,000.

N. Y., Brooklyn—B. W. Dorfman, archt., 26 Court St., preparing plans for 5 story, brick and steel factory, rein.-con. flooring, brick foundation, on Grand Ave. and Dean St. About $200,000. Owner's name withheld.

N. Y., College Point (Flushing P. O.)—J. B. Kleinert Rubber Co., 725 Bway., New York City, having plans prepared by R. G. Cory, archt. and engr., 39 Cortland St., New York City, for 4 story, brick and steel factory, rein.-con. flooring, concrete foundation, here. About $150,000.

N. Y., Long Island City—A. Leveen, c/o R. Swartburg, archt. and engr., 103 Park Ave., New York City, having plans prepared and soon receives bids building 4 story, 60 x 125 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Wilbur Ave., here. About $85,000.

N. Y., New York—Natl. Gum & Mica Co., 2-10 West End Ave., having plans prepared by J. M. Felson, archt. and engr., 1133 Bway., for 25 x 100 ft., brick and steel addition to factory, rein.-con. flooring, concrete foundation, at 12 West End Ave.

N. Y., New York—Park & Tilford, 529 West 42nd St., having plans prepared by N. Weinberger, archt. and engr., 154 Nassau St., and soon receives bids building three 2 story, 75 x 100 ft., brick and steel garages, rein.-con. flooring, concrete foundation, at 537 West 43rd St. About $60,000.

N. Y., Rochester—Josiah Anstice Co., Inc., plans to build 1 story, 145 x 216 ft., brick foundry, on Humboldt St. About $85,000.

N. Y., Rochester—S. Henmann plans to build 2 story, 45 x 161 ft., brick addition to factory at 65 Sullivan St., cost $35,000; also install electric power plant and transmission line. About $12,000 to $15,000.

N. Y., Rochester—Rochester Motors Co., 609 Driving Park Ave., plans to build 1 story, brick and steel, irregular addition to factory to cover 30,000 sq.ft. floor space, on Wren St. and Driving Park Ave. About $60,000.

N. Y., Utica—Eureka Mower Co., 1005 Hickory St., plans to build 2 story, brick factory, at 1105 Hickory St. About $27,000.

N. Y., Utica—P. E. Hoffman, 2234 Whitesboro St., plans to build 1 story, 50 x 500 ft., concrete factory, on Sunset Ave. Cost between $40,000 and $45,000.

N. J., Hilton—G. C. Higby, archt., 207 Market St., Newark, soon lets contract constructing plant on Burnett Ave., to include 3 story, 135 x 135 ft. main building, 1 story, 75 x 135 ft. shop and 1 story, 50 x 80 ft. power house, rein.-con., for H. Boker & Co., Inc., 101 Duane St., New York City.

N. J., Jersey City—Colgate & Co., 105 Hudson St., plan to construct 4 story addition to building now being constructed. About $26,000.

N. J., Trenton—International Gasofoam Co., 564 East State St., plans to build plant here. About $50,000.

N. J., Trenton—H. D. Lee Mercantile Co., 13 East State St., plans to build plant here. About $1,000,000. Architect not selected.

N. J., Trenton—Mercer Motors Co., Whitehead Rd., plans to enlarge and improve plant, here. Cost including machinery, $650,000. E. S. Hare, 245 West 55th St., New York City, pres.

Pa., Phila.—Greisler & Abramson, archts., Lafayette Bldg., preparing plans for 1 story, 60 x 100 ft., brick garage, on 3rd and Cambridge Sts. About $25,000. Owner's name withheld.

Pa., Wilkes-Barre—J. L. Johnson, Ross St., plans to build 2 story, 50 x 150 ft., brick and steel shop, rein.-con. flooring, on Ross and Gildersleeve Sts. About $45,000. Architect not selected.

Md., Sparrows Point—Bethlehem Steel Co. soon lets contract building 1 story, 50 x 262 ft., steel and brick box factory, concrete foundation. About $70,000.

Md., Westport—McNamara Bros., Kloman St., having plans prepared by H. F. Doelman, archt., 507 North Charles St., Baltimore, for 1 story, 80 x 200 ft., steel addition to tank and boiler factory, concrete foundation. About $50,000.

O., Bedford—Lake Erie Steel & Wire Co. plans to build 1 story, 50 x 180 ft., rein.-con., steel and brick mill, rein.-con. flooring, concrete foundation. About $50,000. Private plans.

O., Cincinnati—Stacey Bros., 5535 Carthage Pike, plans to build factory, on Carthage Pike. About $200,000. Architect not selected.

O., Columbus—H. C. Godman Co., 31 North 4th St., acquired site 187½ ft. square on Town and Front Sts., and plans to build factory. About $350,000.

O., East Liverpool—Ohio River Power Co. having plans prepared constructing transformer-station with connecting buildings. About $600,000.

O., Springfield—Robbin-Myers Co., Lagonda Ave., receives bids about January, building 4 story, 80 x 300 ft., rein.-con. factory. About $100,000. W. E. Russ, 313 North Pennsylvania Ave., Indianapolis, Ind., archt.

Ind., Indianapolis—William Small Co., 31 West 11th St., having plans prepared for 1 story, 70 x 480 ft., brick factory on West Washington St. About $750,000. Private plans.

Mich., Detroit—L. Scisorek, archt., 225 Farwell Bldg., soon lets contract building 1 story, 40 x 80 ft., brick and steel plant, rein.-con. flooring, brick foundation, on Scotten Ave., for Western Gear Mfg. Co., 1040 Scotten Ave. About $30,000.

Wis., Jefferson—Jefferson Creamery Co. plans to build 2 story, 60 x 120 ft. creamery and factory, brick, tile and steel, rein.-con. flooring, brick foundation, on Main St. About $50,000. Architect not selected.

Wis., Milwaukee—Federal Textile Co., 1306 1st Wisconsin Natl. Bank, plans to build 1 and 2 story, rein.-con. and brick plant, rein.-con. flooring, concrete foundation, on Burleigh St. Architect and engineer not selected.

Wis., Milwaukee—Ogren Motor Car Co., 692 Natl. Ave., plans to build 1 story, 100 x 200 ft. brick and steel addition to factory. About $60,000. Architect and engineer not selected.

Wis., Shawano—Shawano Creamery Co. plans to build 3 story, 58 x 112 ft. brick and steel factory, rein.-con. flooring, brick and timber foundation, on Main St. About $48,000. Private plans.

Neb., Scribner—Scribner Artificial Ice Co. plans to build ice and electric plants. About $25,000 and $40,000 respectively.

Ore., Portland—Montgomery Ward & Co., 581 Upshur St., plans to build 3 or 4 story, brick or masonry construction, mail order house, in Guilds Lake Dist. About $1,500,000. C. C. Hindman, Gasco Bldg., atty. Architect not selected.

Cal., Los Angeles—Los Angeles Soap Co., 633 East 1st St., having plans prepared by Morgan, Walls & Morgan, archt., 1124 Van Nuys Bldg., for 1 story, 40 x 80 ft. boiler house, 30 x 40 ft. distillery, 80 ft. high, and 30 x 40 ft. machine shop, on 1st and Alameda Sts.

Cal., San Pedro—Van Camp Sea Food Co., 14th St. and Waterfront, plans to build ice and cold storage plant and 250 ft. wharf. About $300,000.

Cal., Ventura—Sespe Light & Power Co., Merchants Trust Bldg., Los Angeles, plans to build hydro-electric plants and irrigation projects on Sespe and Pivu Rivers; 1st unit to include 2 reservoirs of 51,000 acre ft., 46,000 ft. power conduit, 3000 ft. pressure pipe line, 1000 ft. head and 10,000 kw. hydroelectric plant, to be increased to 18,000 kw. when 2nd unit is built; 2nd unit, 100,000 acre ft. storage reservoirs, 90,000 ft. conduit, 4000 ft. pressure pipe line, 2300 ft. head and 8000 kw. plant; 3rd unit additional storage to deliver 100,000 acre ft. per annum for irrigation. About $100,000 for preliminary surveys. R. R. Comm. has granted certificate of convenience and necessity on condition that company furnishes satisfactory financing plan and sufficient data to enable commission to de-

Industrial Works (Continued)
ermine feasibility of project by Mar. 1, 1920. F. Buren, pres.

Que., Montreal—Deserres Co., 204 St. Dennis, soon lets contract building 4 story, 50 x 50 ft. steel and brick, auto and hardware factory, concrete foundation, on Sanguinet St. About $35,000.

BIDS DESIRED

O., Cleveland—A. A. Chilcote, 733 Superior Ave., receiving bids building 1 story, 100 x 140 ft., steel and brick factory, rein.-con. flooring, concrete foundation. About $30,000. Private plans.

Ia., Iowa Falls—Until Jan. 4, by Swift & Co., 76 West Monroe St., Chicago, Ill., building 3 story, 100 x 140 ft. brick, rein.-con. and steel, produce house, rein.-con. flooring, concrete foundation, here. About $150,000. Private plans.

Tex., Ft. Worth—Hub Furniture Co., 1529 Willie St., receiving bids constructing 4 story, 80 x 100 ft. storage and office building, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $100,000. W. E. Austin, mgr. J. Pollard, Ft. Worth Natl. Bank Bldg., archt.

Que., Montreal—Until Jan. 15, by H. Birks & Co., Ltd., Phillips Sq., building 10 story, 50 x 100 ft., brick, steel and concrete factory, concrete foundation on St. Monique and Cathcart Sts. About $350,000.

Que., Montreal—Until Dec. 27 by McClary Mfg. Co., 20 Wellington St., building 4 story, 50 x 75 ft. steel, brick and concrete factory, rein.-con. flooring, concrete foundation, on Wellington and Grey Nun Sts. About $100,000. Private plans.

Ont., Hamilton—Until Jan. 1, by B. H. Prack, archt., 50 Bay St., Toronto, building 5 story, 100 x 250 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Barton St., here, for Firestone Tire & Rubber Co., South Main St., Akron, O. About $350,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Cambridge**—C. T. Main, engr., 201 Devonshire St., Boston, let contract to Stone & Webster Eng. Corp., 147 Milk St., Boston, building 2 story, 86 x 134 ft., brick, steel and concrete boiler house, rein.-con. flooring, concrete foundation, for Lever Bros. Co., 176 Bway.

★**Mass., Haverhill**—Whittier Bldgs., Inc., 1st Natl. Bank Bldg., let contract building 8 story, 65 x 160 ft., rein.-con. factory, concrete flooring and foundation, on Washington St., to W. A. and H. A. Root, Inc., 1 Beacon St., Boston. About $300,000.

★**Mass., Holyoke**—Farr Alpaca Co., Jackson St., let contract building 3 story, 147 x 200 ft. and 4 story, 75 x 147 ft., brick and rein.-con. factories, rein.-con. flooring, concrete foundation, on Jackson St., to S. M. Green Co., 293 Bridge St., Springfield. About $350,000.

★**Mass., Newton** (Boston P. O.)—H. W. Orr Co., 869 Washington St., Newtonville, let contract building 1 story, 80 x 82 ft., brick and rein.-con. addition to garage, concrete flooring and foundation, to J. W. Duff, Inc., 146 Sumner St., Boston. About $25,000.

★**R. I., Bellefont** (Providence P. O.)—Imperial Printing & Finishing Co. let contract building 1 story, 70 x 200 and 50 x 100 ft., brick and mill construction addition to mill, to C. I. Bigney Constr. Co., Inc., 898 Westminster St., Providence. About $65,000.

★**R. I., Central Falls** (Pawtucket P. O.)—Central Constr. Co., Slater Trust Bldg., Pawtucket, will build 1 story, 50 x 200 ft., brick and mill construction plant, here. About $40,000. Owner's name withheld.

★**R. I., Central Falls** (Pawtucket P. O.)—United Mets Corp., c/o Clark, MacMillan & Riley, archts. and engrs., 101 Park Ave., New York City, let contract building 1 story, 100 x 150 ft., brick and steel mill, rein.-con. flooring, concrete foundation, to Central Constr. Co., Slater Trust Bldg., Pawtucket.

★**R. I., Esmond**—Esmond Mills let contract building 2 story, 108 x 110 ft. and 100 x 125 ft., brick and mill construction addition to mill, to Bowerman Bros., Industrial Trust Bldg., Providence. About $125,0000.

★**R. I., Peacedale**—Peacedale Mfg. Co. will build 2 story, 54 x 80 ft., brick and mill construction addition to mill. About $35,000. Work will be done by day labor.

★**R. I., Riverpoint**—B. B. and R. Knight Corp., 21 South Main St., Providence, will build 3 story, 154 x 420 ft., brick and mill construction weave shed, concrete foundation, here. About $400,000. Work will be done by day labor. Noted Sept. 18.

★**Conn., Bridgeport**—Bassick Co., 38 Austin St., let contract building 6 story, 67 x 178 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, on Myrtle Ave., to T. J. Pardy Constr. Co., 1484 Seaview Ave. About $200,000.

★**Conn., Hartford**—Colonial Auto Co., 1279 Main St., let contract building 1 story, 60 x 150 ft., brick and concrete garage, sales and service station, concrete flooring and foundation, on Washington St., to Porteus-Walker Co., 13 Forest St. About $30,000. Noted June 12.

★**Conn., New Haven**—W. Schollhorn & Co., Hamilton St., let contract building 4 story, 40 x 140 ft., brick and mill construction factory and office, to Sullivan & McKeon, 843 Dixwell Ave. About $84,000.

★**Conn., New Haven**—Smedley Co., 266 State St., let contract building 1 story, brick and concrete garage, concrete flooring and foundation, on Brewery St., to Larkin-Carey Co., 166 Brewery St. About $25,000.

★**Conn., Thomaston**—Waterbury Jewel Co., Inc., 31 Canal St., Waterbury, let contract building 3 story, 95 x 100 ft., brick and mill construction factory, concrete foundation, on River St., here, to Thomaston Land & Impvt. Co., Main St. About $55,000.

★**Conn., Waterbury**—Noera Mfg. Co., Griggs St., will build 1 story, 35 x 160 ft., brick and mill construction addition to factory, concrete foundation. About $25,000. Work will be done by day labor.

★**Conn., Waterbury**—Scovill Mfg. Co., 99 Mill St., will build 1 story, 30 x 100 ft. paint shop and 12 x 22 ft. sub-station addition, brick, concrete flooring and foundation, on Silver St. About $28,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Ascutney Realty Co., 1721 Ave. J, will build 1 story, 100 x 125 ft., brick and steel machine shop, rein.-con. flooring, concrete foundation, on East 7th St. and Foster Ave. About $50,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Couch-Haas Motors Corp., 1537 Bedford Ave., let contract building 2 story, 80 x 185 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, on Henry, Ely and William Sts., to L. Gold, 44 Court St.

★**N. Y., Brooklyn**—Federal Composition Paint Co., 17 Battery Pl., New York City, let contract altering 3 story, brick, rein.-con. and steel factory rein.-con. flooring, at 258 41st St., here, to W. Kennedy Constr. Co., 215 Montague St. About $60,000.

★**N. Y., Brooklyn**—Norman Holding Co., 690 Bway., will build 1 story, 45 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Hancock St. and Wykoff Ave. About $25,000. Work will be done by day labor.

★**N. Y., Great Neck**—R. Levanding, 120 Bway., New York City, will build brick and steel garage, rein.-con. flooring, concrete foundation, here. About $25,000. Work will be done by day labor.

★**N. Y., Long Island City**—G. M. Film Printing Co., Times Sq., New York City, let contract building 2 story, 35 x 155 ft., rein.-con. and steel laboratory, rein.-con. flooring, concrete foundaion, on Pierce and 8th Sts., here, to Fleischman Constr. Co., 531 7th Ave., New York City.

★**N. Y., Long Island City**—Queens Electric Light & Power Co., 347 Central Ave., Far Rockaway, let contract building 1 story, 40 x 200 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Reade and Jane Sts., here, to R. Deeves & Son, 309 Bway., New York City. About $150,000.

★**N. Y., New York**—Flush-Becker Impvt. Co., 391 Christopher St., will build 1 story, 100 x 125 ft., brick and steel garage, concrete foundation, on 19th St. and 10th Ave. About $50,000. Work will be done by day labor.

★**Pa., Phila.**—G. C. Williams, 613 North 34th St., let contract building 1 story, 67 x 185 ft., brick addition to garage, on Pentridge and 57th Sts., to L. K. Smith, 41st St. and Chester Ave. About $25,000.

Pa., Wissinoming (Phila. P. O.)—Tabor Mfg. Co. let contract altering office and building 1 story, 100 x 107 ft., concrete and steel factory, on State Rd., to J. N. Gill, Otis Bldg., Phila. About $50,000.

★**Md., Baltimore**—R. C. Kolb, 10th and Reed Sts., Phila., Pa., let contract building 1 and 2 story, 60 x 200 ft., bakery, brick and stone, concrete foundation, on Pennsylvania and North Aves., here, to Singer-Pentz Co., 600 Equitable Bldg. About $200,000.

★**Md., Baltimore**—A. G. Zimmerman, archt., 85 9th Ave., let contract to F. W. Mark, Commercial Trust Bldg., Phila., altering and building 4 story, brick addition to warehouse and factory, concrete foundation, for Natl. Biscuit Co., 406 South St. About $50,000.

★**Md., Baltimore**—Standard Overall Co., 701 West Pratt St., let contract building 5 story, 40 x 115 ft., brick warehouse and factory, concrete and brick foundation, at 705-7 West Pratt St., to R. B. Mason, 308 West Madison St. About $70,000.

★**O., Cincinnati**—King Machine Co., Winton Pl., let contract building concrete, steel and brick addition to factory, to H. C. Hazen, Reading Rd. About $50,000.

★**O., Cleveland**—Edgewater Lumber & Supply Co., 330 West Prospect Ave., let contract constructing 1 story, 60 x 130 ft. storage building and 2 story, 40 x 60 ft., office, concrete and brick, brick foundations, on West 117th St., to W. Serne, 1595 Chesterland Ave., Lakewood. About $50,000.

★**O., Cleveland**—Parish — Pool Copper Co., c/o P. E. Cleveland, Guardian Bldg., let contract constructing 1 story, 150 x 500 ft., brick and steel, smelting and refining building, on Clinton Rd., to A. W. Kilbourne Co., 6532 Euclid Ave. About $300,000.

★**O., Columbus**—Fireproof Storage & Warehouse Co., 1025 North High St., let contract building 5 story, 70 x 80 ft., rein.-con. warehouse, at 1022 North High St., to E. H. Latham Co., Columbus Savings & Trust Bldg. About $50,000.

★**O., Mount Vernon**—Knox Tire & Rubber Co., let contract building 3 story, 100 x 225 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to E. E. Elford Co., 104 North 3rd St., Columbus. About $150,000. Noted Sept. 18.

★**O., Newark**—Parish Rubber Co. let contract building 2 story, 110 x 180 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to Bellefontaine Steel Co., Bellefontaine. About $100,000.

★**Mich., Detroit**—Cable Draper Baking Co., Marquette St., let masonry contract building 2 story, 68 x 131 ft., brick, steel and concrete addition to bakery, brick and concrete foundation, on Wabash and Marquette Sts., to G. D. Nutt, Farwell Bldg., steel, to Whitehead & Kales, Beecher & Michigan Central R.R. Total cost, $30,000.

★**Mich., Detroit**—Detroit Motor Casting Co., Beaufait St., let steel contract building 1 story, 60 x 155 ft., rein.-con., brick and steel foundry, rein.-con. flooring, concrete foundation, on Beaufait St., to Whitehead & Kales, Beecher Ave. and Michigan Central R.R.; masonry, to J. L. Hopkins, Sun Bldg. About $35,000.

★**Mich., Detroit**—Grennan's Cake Bakery Co., 17th St., let masonry contract building 2 story, 50 x 104 ft., brick, steel and mill construction bakery, brick foundation, to D. Spicer, Sun Bldg.; steel, to Whitehead & Kales, Beecher Ave. & Michigan Central R.R. Total cost, $30,000.

★**Mich., Jackson**—Hup Motor Car Co. let contract building 1 story, 60 x 90 ft., brick, rein.-con. and steel power house, rein.-con. flooring, concrete foundation, to E. Winter, Chamber of Commerce, Detroit.

★**Wis., Milwaukee**—Ludwig-Wolf Ice Cream Co., 608 Caswell Blk., let contract building 2 story, 40 x 52 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on 12th and Clarke Sts., to C. F. Behnke, 827 34th St. About $25,000.

★**Wis., Tomah**—Tomah Rubber Wks., 176 17th St., Milwaukee, let contract building 2 story, 100 x 100 ft. rein.-con. and brick factory, rein.-con. flooring, concrete foundation, here, to C. Larson, Tomah. About $45,000.

★**Ia., New London**—A. D. Haynes & Co. let contract building rein.-con. grain elevator, 25,000 bu. capacity, to Burrell Eng. & Constr. Co., 327 South La Salle St., Chicago, Ill. About $50,000.

★**Ia., Sioux City**—Grain Belt Cereal Co. let contract building 80 x 125 cereal factory and grain storage tank, 25,000 bu. capacity, both rein.-con., to Burrell Eng. & Constr. Co., 327 South La Salle St., Chicago, Ill. About $150,000.

★**Minn., Duluth**—F. A. Patrick & Co., 5th Ave., let contract building 3 story, 140 x 140 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, on West Superior St., to G. H. Lounsberry, Superior St., E. About $100,000; cost plus percentage basis.

★**Mont., Billings**—Marshall Wells Hardware Co. let contract building 4 story, 75 x 140 ft. warehouse, to B. J. Martin, 243 Wyoming Ave. About $80,000.

★**Que., Montreal**—Barrett Mfg. Co., Ltd., 2021 St. Hubert St., let contract building 1 story, 100 x 200 ft., concrete, steel and brick

Industrial Works (Continued)

factory, concrete foundation, on Des Carrieres St., to J. Sheaver & Co., 225 St. Patrick St. About $30,000.

Buildings

PROPOSED WORK

Me., Chisholm—School—T. G. O'Connell, archt., 18 Boylston St., Boston, Mass., soon receives bids building 3 story, 52 x 75 ft., brick and steel parochial school, concrete foundation, for St. Rose's Roman Catholic Church. About $50,000. G. LeGuenice, pastor.

Vt., Brattleboro — Bank — Hutchins & French, archts., 6 Beacon St., Boston, Mass., soon receive bids altering present bank building, for Brattleboro Natl. Bank. About $50,000.

Conn., Trumbull—School—Bd. of Selectmen soon lets contract building 1 story, 60 x 125 ft., brick and concrete, concrete foundation, in Nichols Dist., and 1 story, 60 x 125 ft., brick and concrete, concrete foundation, in Long Hill Dist. About $50,000 each. A. H. Christie, chn. Noted Sept. 18.

N. Y., Brooklyn—Chapel—Polytechnic Preparatory County Day School, 7th Ave. and 92nd St., soon lets contract building 2 story, brick and steel, brick foundation. About $80,000. Lord & Hewett, 345 5th Ave., New York City, archts. and engrs.

N. Y., New York—Loft—L. K. Schwartz, 110 West 40th St., soon receives bids building 6 story, 41 x 98 ft., brick and steel, brick foundation, at 41-43 East 28th St. About $80,000.

N. Y., New York—Loft—J. C. Schaeffler, archt. and engr., 40 West 32nd St., receives bids about Jan. 5, building brick and steel, brick foundation, at 539-549 Broome St., for W. H. Warren, c/o architect. About $150,000.

N. J., Newark—Fire House—City receives bids about January building 2 story fire house. About $75,000. J. V. King, 185 Market St., archt.

Pa., Phila.—Sales and Service—Neel Cadillac Co., 144 North Broad St., receives bids about Jan. 1, building concrete and brick, on 25th St. and Parkway. About $800,000. C. E. Oelschlager, 1615 Walnut St., archt.

O., Canton—Hotel and Lodge—Pythian Castle Bldg. Co. soon lets contract building 7 story, 84 x 159 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $300,000. C. Firestone, Renkert Bldg., archt.

Ind., Indianapolis—Arsenal Technical School—Bd. Educ. soon lets contract building 3 story, 68 x 440 ft., brick, steel and concrete, rein.-con. flooring, concrete foundation. About $400,000. Vonnegut & Bohn, 610 Indiana Trust Bldg., archt.

Minn., St. Paul—School—H. W. Austin, city purch. agt., rejected bids received Nov. 24, building Homecroft School, 2 story, 84 x 140 ft., rein.-con. and brick, on Field Ave. About $80,000. C. A. Hausler, City Hall, archt.

Mont., Eureka—School—School Dist. No. 13 election Dec. 27, to vote on $50,000 bonds to build grade school. H. S. Pomeroy, Eureka, interested.

Mont., Forsyth—Hospital—Rosebud Co. receives bids about Jan. 1, building 3 story, 42 x 100 ft. hospital. About $75,000. McIver, Cohagen & Marshall, 407 Electric Bldg., Billings, archts. Noted July 10.

Wash., Seattle—Hospital—C. H. Bebb, archt., c/o Bebb & Gould, Securities Bldg., soon lets contract building 3 story, 120 x 120 ft., masonry. About $130,000. Owner's name withheld.

Wash., Seattle—Hospital — Orthopedic Hospital Bd., Queen Hill, receives bids about Jan. 1, building 2 story addition. About $60,000. H. Albertson, Henry Bldg., archt.

BIDS DESIRED

Mass., Braintree (Boston P. O.)—Bank—Braintree Natl. Bank, Elm St., receiving bids building 1 story, 26 x 70 ft., brick and granite, concrete foundation, on Main St. About $50,000. E. T. Nolte, 120 Monatiquot Ave., archt.

Conn., Hartford—School—Until Jan. 5, by High School Bldg. Comn., building 3 story high school, on Maple Ave. Architect not selected.

Md., Jarrettsville—Harford Co. School Comn., Belair, receiving bids building 2 story, 60 x 70 ft., brick and stone, rock foundation, here. About $50,000. J. B. Hamme, City Bank Bldg., engr.

O., Cleveland—School—Until Dec. 29, by Bd. Educ., building 2 story, 92 x 166 ft., concrete, steel, brick and stone, rein.-con. flooring, concrete foundation, on Warner Rd. About $300,000. W. R. McCormack, 6th St. and Rockwell Ave., archt.

O. Kenmore—School—Until Dec. 29, by Bd. Educ., building 2 story, 60 x 123 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $150,000. M. P. Lauer, Peoples Bank Bldg., Akron, archt.

O., Massillon—Commercial—F. Hess, c/o Hess Snyder Co., receiving bids building 3 story, 100 x 250 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $75,000. Albrecht, Wilhelm & Kelly, 1836 Euclid Ave., Cleveland, archts.

Mich., Detroit—Pavilion—Until Dec. 31, by L. Kamper, archt., Book Bldg., building 1 story, 110 x 110 ft., rein.-con., steel and wood, rein.-con. flooring, concrete foundation, on East Jefferson Ave. and Grand Blvd., for Kling Products Co., 1424 East Jefferson Ave.

Mich., Grand Rapids—Theatre—Until Dec. 31, by G. M. Lindsey, archt. and engr., 2321 Dime Bank Bldg., building 2 story, 100 x 100 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Crescent and Bond Sts., for Regent Theatre Co., Bond St.

Ia., Waterloo—Theatre—Until Jan. 1, by Palace Theatre Co., 508 Sycamore St., building 1 story, 68 x 128 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $150,000. M. B. Cleveland, 601-605 1st Natl. Bank Bldg., archt.

Minn., Minneapolis—Bank, Office and Lodge—E. C. Haley, archt., 605 Willmar Bldg., receiving bids building 3 story, brick, steel and stone. About $50,000. Owner's name withheld.

Minn., St. Paul—Store—Emporium Mercantile Co., 7th and Robert Sts., receiving bids building 6 story, 145 x 160 ft., rein.-con. and steel addition. About $650,000 Buechner & Orth, 500 Shubert Bldg., archt C. L. Pillsbury, 716 Capital Bank Bldg., engrs.

Neb., Ord—Court House—Until Jan. 13, by Valley Co., building 3 story, 78 x 101 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $140,000. W. F. Gernandt, 634 Keeline Bldg., Omaha, archt.

S. D., Mitchell—Auditorium—Until Feb. 1, by T. Eastcott, city aud., for drawings for auditorium. About $150,000; advertised in this issue.

Mo., Desloge—Bd. Educ. receiving bids building 3 story, 83 x 114 ft., concrete and steel, concrete foundation. About $90,000. R. H. Sanneman, 519 Reserve Bank Bldg., Kansas City, archt.

Okla., Cleveland—High School—Until Dec. 26, by Bd. Educ., building 2 story, 68 x 126 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $75,000. Hawk & Parr, 501 Security Bldg., Oklahoma, archts.

Ore., Coquille—School—Until Dec. 26, Bd. Educ., building 2 story, 77 x 142 ft. mason construction, concrete foundation. About $50,000. Tourtellotte & Hummel, McKay, Bldg., Portland, archts.

Cal., Fresno—School—Until Jan. 8, by Bd. Educ., for excavating, brick and terra cotta work, steel and onamental iron work, plumbing and heating for new John Muir, Arlington Heights, Webster, Longfellow and Kirk Schools. J. R. Fontaine, secy. Noted Aug. 21.

Ont., Windsor—Theatre—Until Jan. 1, by J. and J. J. Allen, Richmond St., Toronto, building 7 story, 60 x 120 ft., brick and rein.-con., rein.-con. flooring, concrete foundation. About $200,000. C. H. Crane, 2325 Dime Bank Bldg., Detroit, Mich., archt. Noted Sept. 25.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Northampton** — Housing — McCallum Hosiery Co., 136 West St., will build twenty-one 2 story, brick, wood and stucco construction houses for workmen, on Woodlawn Ave. Cost between $125,000 and $150,000. Work will be done by day labor.

Mass., Swampscott—School—School Bd. received lowest bids Dec. 11, building 1 story, 78 x 164 ft., brick and timber, concrete foundation, at Machon, masonry work, from A. French, Swampscott, $17,700; carpentry, from Perkins & Wells, Concord, $28,465; heating, from Laskey & McMurrer, 135 Pearl St., Boston, $7292; plumbing, from W. H. Greenleaf, 73 Chestnut St., Boston, $4497; electric work, from E. C. Lewis & Co., Inc., 121 Federal St., Boston, $2227.

★**Conn., Glenville**—School—G. E. Bearn, secy., 335 Greenwich Ave., Greenwich, let contract building 2½ story, 148 x 155 ft., brick and steel, concrete foundation, here, to Rangeley Constr. Co., 56 West 39th St., New York City, $233,500.

★**Conn., Hartford**—School—Bd. Educ. let contract building 3 story, 87 x 87 ft., brick and concrete addition, wood flooring, concrete foundation, to Republic Fireproofing Co., 26 Cortland St., New York City. About $125,000.

★**Conn., New Haven**—Business—Kusterer & Smith, 376 Yale Ave., let contract building 6 story, rein.-con. and steel, rein.-con. flooring, concrete foundation, 1st story, 80 x 116 ft., and upper ones 60 x 80 ft., on Court St., to deBussey-Kusterer Co., 116 Church St. About $100,000.

★**Conn., New London**—Theatre—H. R. Brewster, archt., 295 East 17th St., Brooklyn, N. Y., let contract to A. E. Badgeley Co., Stone Opposite House Bldg., Binghamton, N. Y., building 3 story, 60 x 175 ft., brick, concrete and steel, rein.-con. flooring and foundation, on Bank St., for W. T. Murphy, 143 Bank St. About $225,000. Noted June 12.

★**N. Y., Brooklyn** (Ridgewood)—Community—Ridgewood Heights Church of Christ, Forest Ave. and Linden St., let contract building 2 story, brick, steel and stone, brick foundation, to R. H. Brown, 350 Fulton St. About $80,000.

★**N. Y., New York**—Office—Women's Exch., 539-541 Madison Ave., let contract altering 4 story, brick and steel, to E. E. Paul Co., 101 Park Ave. About $55,000.

★**N. Y., New York**—Stores—Simrud Holding Corp, 135 Bway., will build several brick and steel stores, brick foundation, on 74 x 94 ft. plot on Fordham Rd. and Walton Ave. About $125,000. Work will be done by day labor.

★**N. J., Camden**—Office—Smith-Austermuhl, 529 Market St., let contract building 2 story, 57 x 110 ft., concrete, brick and terra cotta, on 5th and Market Sts., to Standard Constr. Co., 1713 Sansom St., Phila., Pa. About $87,100.

★**Pa., Phila.**—Bank—United Bank & Trust Co., c/o A. L. Levy, archt., 3960 Pennsgrove St., let contract building 1 story, 40 x 95 ft., brick, marble and terra cotta, at 4022 Girard St., to S. Levin, 1631 South 5th St. About $50,000.

★**Pa., Wilkes-Barre** — Theatre — Nesbitt Theatre let contract building 3 story, 50 x 150 ft., concrete, brick, steel and marble addition, rock foundation, on South Main St., to O. J. Behrens, Blackman St. About $139,000.

★**Pa., Wyoming**—School—St. Cecelia's Church let contract building 2 story, 60 x 60 ft., concrete and brick, rock foundation, on 1st St., to Alaimo Bros., Main St. About $50,000.

Del., Laurel—Bank—People's Natl. Bank, Market St., received lowest bid building 1 story, 32 x 62 ft., concrete and brick, cement flooring, concrete and brick foundation, from T. H. Mitchell, 207 Lake St., Salisbury, $68,846.

★**Del., Wilmington**—Bank and Office—Delaware Trust Co., 9th and Market Sts., let masonry contract for 15 story, 80 x 200 ft., steel, brick and stone, concrete foundation, to Stewart Willey Co., 1123 Bway., New York City. About $150,000.

★**Md., Cumberland**—Hotel—Geo. Washington Hotel Co. let contract building 8 story, granite, brick and terra cotta, rock foundation, to Wise Granite & Constr. Co., Amer. Natl. Bank, Richmond, Va. About $350,000.

★**N. C., Monroe**—School—City let contract building 2 story, rein.-con. and steel to Tucker & Ingram, Monroe. About $90,000.

★**O., Cleveland**—Commercial — S. D. Wise, c/o Arco Co., 1812 East 93rd St., let contract building 1 story, 50 x 98 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Euclid Ave., to J. A. Moffet, Union Bldg. About $50,000.

★**O., Cleveland**—Office—Association Bldg. Co., c/o W. E. Lower, Osborn Bldg., let contract building 4 story, 86 x 240 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation on Euclid Ave and East 93rd St., to Crowell-Lundoff-Little Co., 5716 Euclid Ave. About $300,000.

★**O., Kent**—Office—Mason Tire & Rubber Co. let contract building 2 story, 40 x 100

Buildings (Continued)

ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, to Van Blarcom Constr. Co., 22nd St. and Prospect Ave., Cleveland. About $50,000.

★**O., Norwalk**—Bank and Office—Citizens Natl. Bank let contract building 5 story, 50 x 115 ft., rein.-con., brick and stone, concrete foundation, to Mills & Millspaugh, 67 East Long St., Columbus. About $200,000. Noted Sept. 18.

★**O., Troy**—School—H. Sheaver, clk. Bd. Educ., Concord Twp., Miami Co., let contract building 2 story, 72 x 90 ft., brick and concrete, concrete flooring and foundation, to C. P. Kricher, Athens, $80,200.

★**Mich., Detroit**—Sales and Service—M. A. Young, 754 Woodward Ave., let contract building 3 story, 60 x 186 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Woodward Ave., to O. Misch Co., Chamber of Commerce. About $125,000.

★**Wis., St. Francis** — Church — Sacred Heart Church let contract building 2 story, 42 x 129 ft. brick, rein.-con. and tile, brick foundation, to V. Pacholski, 962 Warren St. About $50,000.

★**Ia., Ames**—Armory—State Bd. Educ. let steel contract for 3 story, 96 x 112 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to McClintic-Marshall Constr. Co., Oliver Bldg., Pittsburgh, Pa. Total cost, $300,000. Noted Aug. 14.

★**Ia., Des Moines**—School—Bd. Educ. let contract building 1 story, 62 x 122 ft. rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on 30th and Park Sts., to J. E. Tusant & Sons Co., 583 7th St., $52,855.

★**Ia., Iowa City**—Armory—State Bd. Educ. let steel contract for 3 story, 90 x 180 ft brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, to McClintic-Marshall Constr. Co., Oliver Bldg., Pittsburgh, Pa. Total cost, $200,000.

★**Minn., Hibbing** — Store — Oliver Iron Mining Co., Wolvin Bldg., Duluth, let contract building 2 story, 118 x 129 ft. addition, here, to W. J. Hoy Constr. Co., 700 Metropolitan Bldg., St. Paul. Cost plus percentage basis.

★**Minn., Willmar**—Service—State Bd. Control, Capitol, St. Paul, let general contract building 3 story, 50 x 120 ft., rein.-con., brick and stone, at State Hospital for Insane, here, to J. H. Olson & Co., Willmare, $77,756; heating and plumbing, to W. S. Mathieson, Ottawa Ave., St. Paul, $12,041.

★**Kan., Wichita**—Office—J. B. Hupp, 320 East Central Ave., and J. S. Barnes, Wichita, will build 6 story, 100 x 140 ft. fireproof office. About $350,000. Bd. Trade, lessee.

★**Tex., Austin** — Exchange — Southwestern Telephone & Telegraph Co., 410 Congress Ave., let contract building 2 story, 85 x 97 ft. rein.-con., brick and steel, rein.-con. flooring, on 9th and Colorado Sts., to F. A. Jones, 4627 San Jacinto St., Dallas. About $150,000; cost plus percentage basis.

★**Wash., Seattle**—Sales—Great Western Motors Co., Pine and Bellevue Sts., let contract building 1 story, 100 x 165 ft., concrete and brick, rein.-con. flooring, on Bway. and Union Sts., to Hurley-Mason Co., Hoge Bldg. About $75,000.

★**Cal., Los Angeles**—Nurses' Home—Bd. Supervs. let contract building six 2 story, 30 x 98 ft., frame, concrete foundation, at County Hospital, to F. R. Johnson, H. W. Hellman Bldg., $91,865.

Federal Government Work

PROPOSED WORK

Mass., Boston—Remodeling Hospital—Treas. Dept., Wash., D. C., rejected bids received Sept. 30, remodeling main building of U. S. Marine Hospital, here. J. A. Wetmore, superv. archt. Noted Aug. 28.

BIDS DESIRED

Md., Annapolis—Water Tanks and Towers—Spec. 4103—Until Jan. 7, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building one 2000- and one 12,000-gal. steel water tanks, with 67 ft. steel towers and appurtenances, at Naval High Power Radio Sta., Greenbury Point, here. About $5500; $10 deposit required for plans and spec.

D. C., Wash.—Sewers—Until Jan. 5, by Dist. Comrs., Dist. Bldg., constructing service sewers involving 3800 lin.ft. 10-15 in. pipe sewers. C. W. Kutz, comr.

Va., Yorktown — Buoys — Spec. 4068 — Until Dec. 30, by Bureau Yards & Docks, Navy Dept., Wash., D. C., for furnishing four moving buoys, here. Cost $7000; $10 deposit required for plans and spec.

O., Springfield—Remodeling Post Office—Until Jan. 8, by Treas. Dept., Wash., D. C., remodeling, here. J. A. Wetmore, superv. archt.

Utah, Santa Clara—Bridge—Until Jan 8, by Dept of Interior, Office of Indian Affairs, Wash., D. C., building bridge over Santa Clara River, Shivwitz, Indian Reservation, here. C. Sells, Shivwitz School, comr.

Cal., Los Angeles—Dredging—Until Jan 7, at U. S. Eng. Office, 725 Central Bldg., dredging areas A and C and middle ground, San Diego Harbor, involving 307,000, 1,077,000 and 200,000 cu.yd. About $374,000 available.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Chester**—Remodeling Post Office—Treas. Dept., Wash. D. C., let contract remodeling post office, here, to F. W. Van Loon, Denckla Bldg., Phila., $5453.

Ore., Eugene—Roads—U. S. Dept. Agriculture, Bureau Pub. Rds., 204 Post Office Bldg., Portland, received bids Nov. 29, building 14.2 mi. Blue River Sect. of McKenzie River Natl. Forest Rd., Lane Co., involving 47 acres clearing, 25 acres grubbing, 7000 cu.yd. rock and 43,273 cu.yd. common excav., culverts, abutments, etc., from Montague & O'Reilly, Blake-McFall Bldg., Portland, $157,774; Siems & Carlson, Spokane, Wash., $100,287.

Cal., Mare Island—Electric Lighting and Power System—Spec. 3982 Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Dec. 3, installing, here, from Carleton-Mace Eng. Co., 38 Chardon St., Boston, Mass., $48,000 (120 days); Globe Electric Wks., 1959 Mission St., San Francisco, $49,995 (120 days); H. S. Little, 966 Folsom St., San Francisco, $50,670 (136 days).

Miscellaneous

PROPOSED WORK

Coal Dock and Pockets—Grand Rapids, Mich.—Kent Fuel Co., 1230 Taylor Ave., having plans prepared by F. P. Allen & Son, archts., 463 Houseman Bldg., for 1-story, 75 x 320 ft., rein.-con., coal dock and pockets, rein.-con. flooring, concrete foundation, on Taylor Ave.

Machinery—Antigo, Wis.—Langlade Co. appropriated $8500 to purchase machinery, to include tractors, wheelers and slushers. C. Olsen, comr.

Screening Plant, Grader, etc.—Barron, Wis.—Barron Co. appropriated $50,000 to purchase 1 screening plant, 1 or 2 trucks, 1 tractor, 1 grader, construction outfit and 11 patrolmen's equipment. E. Gleason, Cumberland, comr.

Graders, Plows, etc.—Black River Falls, Wis.—Jackson Co. voted $5500 bonds to purchase 15 graders, 15 plows, 15 slushers, 15 drags or planes. W. Tibbitts, comr.

Graders and Tools—Chilton, Wis.—Calumet Co. appropriated $4000 to purchase small graders and small tools. W. Hoenig, comr.

Gravel Elevator, Graders, etc.—Chippewa Falls, Wis.—Chippewa Co. appropriated $6000 to purchase gravel elevator attachment for crusher, 8 patrol graders, 1 tractor and 1 gravel screening plant. P. O. Lokrantz, comr.

Gravel Crusher and Screening Plant—Crandon, Wis.—Forest Co. appropriated $8000 to purchase gravel crusher and screening plant. F. J. Rogers, comr.

Graders—Eau Claire, Wis.—Eau Claire Co. voted $2000 bonds to purchase graders and other patrolmen's equipment. G. Osborne, comr.

Machinery—Friendship, Wis.—Adams Co. appropriated $2000 to purchase machinery, including 1 patrolman's outfit and 1 truck. J. A. McGregor, comr.

Machinery—Grand Rapids, Wis.—Wood Co. appropriated $20,000 to purchase road machinery. E. Morris, comr.

Crushing Outfit—Green Bay, Wis.—Brown Co. plans to purchase complete crushing outfit. G. J. Cormier, comr.

Machinery—Green Lake, Wis.—Green Lake Co. appropriated $5000 to purchase machinery, to include 2 trucks. D. C. Williams, comr.

Machinery—Jefferson, Wis.—Jefferson Co. appropriated $7900 to purchase machinery, to include patrolmen's outfits. R. D. Royce, Ft. Atkinson, comr.

Machinery—Juneau, Wis.—Dodge Co. appropriated $7000 to purchase road machinery. E. T. Klug, comr.

Machinery—Lancaster, Wis.—Grant Co. appropriated $16,000 to purchase machinery, including graders, 31 plows, 31 road drags, 31 drag scarifiers and small tools to equip 31 patrolmen. H. Mink, comr.

Machinery—Mauston, Wis.—Juneau Co. appropriated $10,000 to purchase road machinery, to include small tools.

Machinery—Medford, Wis.—Taylor Co. appropriated $15,000 to purchase road machinery. F. H. Grahl, comr.

Graders, Wheelers, etc.—Merrill, Wis.—Lincoln Co. voted $19,000 bonds to purchase 16 patrol graders, 12 wheelers, 1 large grading outfit, consisting of tractor, grader and 2 or 3 trucks. H. H. Kuehling, Tomahawk, comr.

Machinery—Neillsville, Wis.—Clark Co. appropriated $12,000 to purchase machinery, including crusher, belts, mail graders and tools. W. C. Thoma, comr.

Paver, Graders, Etc.—Oshkosh, Wis.—Winnebago Co. voted $15,000 bonds to purchase 1 paver and pipe line and 3 patrol graders. J. Binning, comr.

Wheel scrapers, road planes, etc.—Phillips, Wis.—Price Co. voted $5800 bonds to purchase 8 wheel scrapers, 25 road planes and gravel loader. B. M. Griffin, comr.

Machinery—Viroqua, Wis.—Vernon Co. appropriated $10,000 to purchase machinery, to include scarifier, compressor, oiler, tractors and small equipment. A. Ristow, comr.

Graders—Whitehall, Wis.—Trempealeau Co. voted $19,000 bonds to purchase 2 large graders and gravel pit equipment. E. F. Rotering, Arcadia, comr.

BIDS DESIRED

Bulkhead and Side Walls—Phila., Pa.—Until Dec. 22, by G. S. Webster, dir. Dept. Wharves, Docks & Ferries, 550 Bourse Bldg., repairing (a) Columbia Ave. bulkhead, Delaware River, (b) side walls of superstructure of Vine St. pier, No. 19, North Wharves.

Sewer Pipe — Brownstown, Ind. — Until Jan. 6, by Comrs. Jackson Co., furnishing county with sewer pipe for year 1920. A. Luedtke, co. aud.

Motor Fire Truck—Crosby, Minn.—City receiving bids furnishing White motor fire truck, triple compound composed of chemical, hose and pump. H. L. Nicholson, clk.

Gravel Loader and Screener—Hibbing, Minn.—City receiving bids furnishing gravel loader and screener. J. P. Murphy, city recdr.

Gravel Screening and Loading Plant—Minneapolis, Minn.—Until Jan. 12, by A. P. Erickson, aud. Hennepin Co., furnishing gravel screening and loading plant, 30 ton bin.

Steam Road Roller—Manitowoc, Wis.—Until Dec. 24, by A. H. Zander, city clk., furnishing steam road roller and grader. Cost between $20,000 and $30,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Coal Pocket—New Bedford, Mass.**—D. Duff & Son, Pleasant St., let contract building 2 story, 50 x 200 ft., rein.-con. coal pocket, to J. H. Proctor, 840 Old South Bldg., Boston. About $25,000.

★**Trestle — Watertown, N. Y.** — North Counties Coal & Supplies Co., 204 Franklin St., will build 20,000 ton coal storage trestle and reloading tracks, also install hoppers with electric crane. Cost between $40,000 and $60,000. Work will be done by day labor under supervision of C. E. Dewey, archt., Light & Power Bldg.

★**Elevator — Pittsburgh, Pa.** — Central Elevator Co., 11th and Etna Sts., let contract building 300,000 bu. rein.con. grain elevator, to Burrell Eng. & Constr. Co., 327 South LaSalle St., Chicago. About $500,000.

★**Tanks—Grimes, Ia.**—Armour Grain Co. let contract building rein.-con. storage tanks, 25,000 bu. capacity, to Burrell Eng. & Constr. Co., 327 South La Salle St., Chicago. About $45,000.

★**Retaining Wall—Missoula, Mont.**—City let contract building concrete retaining wall 18 ft. high, along block of river front, to include filling and constructing alley south of West Front St., to Smead & Simons, Higgins Blk. About $13,900.

★**Transit Shed—Seattle, Wash.**—Port of Seattle Comm., Bell St. Dock let contract building 2 story heavy timber transit shed, 500 ft. long, 150 ft. wide, on Pier B, Smith's Cove, to Harrington & Peters, Mutual Bldg., Design "B", $124,000.

★**Cast-Iron Pipe and Valves—Inglewood, Cal.**—City Trustees let contract to M. Murphy, 1321 Milvia St., Berkeley, furnishing 12,000 ft. 6 in. class A cast pipe at $1.33 per ft., 9825 ft. 6 in., $1.80, 4150 ft. 8 in., $2.60, 4 in. valves, $24., 6 in., $40., 8 in., $70., 2 in., $22., 3 in., $26., total cost, $56,631.

OFFICIAL PROPOSALS

Bids: Dec. 29.

Reinforced Concrete Bridge

OFFICE OF THE COUNTY CONTROLLER OF BERKS COUNTY, PENNSYLVANIA

Reading, Pa.

Proposal for the construction of a Reinforced Concrete Bridge consisting of 13 arches and three flat spans with reinforced slab approaches on Bingaman Street, Reading, Pennsylvania.

Sealed proposals will be received at this office up to 10 o'clock A.M., Friday, December 29, 1919, for the construction of a reinforced concrete bridge consisting of 13 arch spans and three flat spans with reinforced slab approaches on Bingaman Street.

The structure will span the Schuylkill River, Schuylkill canal and the Pennsylvania, and Philadelphia and Reading R.R. tracks.

The total length of the structure will be 1586 feet with a 39 foot roadway and two 10 foot 6 inches wide sidewalks.

Bids will be opened in the office of the County Commissioners in the Court House at 11 o'clock A.M., December 29, 1919.

All bids must be accompanied with a certified check for $20,000 made payable to C. J. Rhode, County Controller.

Copies of proposal blanks, plans and specifications may be obtained at the office of the County Commissioners, Reading, Pa., or upon application to Charles F. Sanders, C. E. Reading, Pa. A deposit of $200.00 will be required which will be refunded upon the return of the plans and specifications on or before December 29, 1919.

The right is reserved to reject any or all bids.

J. CALVIN HERBINE,
DANIEL G. GABEL,
HARRY D. MATTHEWS,
Dec. 8, 1919. Commissioners.

Bids: Jan. 5.

Beach and Bay Front Improvement

Seaside Park, N. J.

Sealed proposals, addressed to Aaron Wilbert, Borough Clerk, for the construction of a casino, bath houses, swimming pool and pavilion, complete with all their appurtenances, will be received by the Borough Council of the Borough of Seaside Park, at the Council Chamber, on Monday, the fifth day of January, 1920, at 8:00 o'clock P.M., and opened immediately thereafter.

Each proposal is to be labeled "Proposal for Beach and Bay front improvement." Each bid is to be accompanied by a certified check for Ten per cent (10%) of the contract price bid, and made payable to Holmes Van Note, Borough Treasurer, without condition or endorsement.

Plans and specifications may be obtained from the office of the Borough Clerk, from Arnold H. Moses, Architect, 136 South Fourth Street, Philadelphia, Pa., or from Remington & Vosbury, Consulting Engineers, 601 Market Street, Camden, upon the deposit of $10.00, of which sum $5.00 will be remitted upon the return of the plans and specifications in good condition.

The Borough reserves the right to reject any or all bids and to decide as to the desirability of the bidders.

AARON WILBERT, Borough Clerk.

Bids: Feb. 1.

Drawings for City Auditorium

City of Mitchell, S. D.

The City Council of the City of Mitchell are desirous of receiving Drawings for a City Auditorium, to cost approximately $150,000. Three prizes are offered for the best designs submitted, ($450, $300, and $150).

The program governing competition, together with Plat of site and full instructions, will be sent on request by the undersigned.

All drawings, to receive judgment and consideration, must be at the Office of the undersigned by February 1st, 1920.

City Auditor, THOMAS EASTCOTT,
Dec. 11th, 1919. Mitchell, S. D.

Bids: Jan. 5.

Paving

Fayetteville, W. Va.

Sealed proposals will be received at the office of the Clerk of the County Court, Fayetteville, W. Va., until January 5th, 1920, for paving one section of the Midland Trail, through Nuttall District, of approximately 8.0 miles. Grading and drainage complete. Bids will be received on Port-and Cement Concrete, Bituminous Macadam (Penetration) and other improved types of paving.

Bids must be submitted on the blank form contained in the book of specifications, which with other information may be obtained upon application to J. K. McGrath, Road Engineer, Fayetteville, West Virginia.

A certified check for five per cent. of the proposal, made payable to the Sheriff of Fayette County, shall be filed with the bid. The County Court reserves the right to reject any and all bids.

J. K. McGRATH, Road Engineer.

By order of the County Court of Fayette County, West Virginia.

H. O. BOLEY President.
Dec. 10, 1919. C. E. MAHAN, Clerk.

Bids: Jan. 14.

Verde River Gravity Water Supply

Phoenix, Ariz.

Sealed bids will be received until January 14, 1920, ten A.M., by V. A. Thompson, city manager, Phoenix, Arizona, for the furnishing of materials, tools and labor to construct a gravity water supply for the City of Phoenix. The work consists of about 32 miles of 36-inch to 38-inch wood, concrete or steel pipe line and a 25,000,000 gallon reinforced concrete covered circular reservoir. 5% deposit required with bids.

Plans, profiles and specifications can be seen in the city engineer's office at Phoenix Arizona, or the office of Hiram Phillips consulting engineer, 801 International Life Building, St. Louis, or copies can be had for a deposit of $10.00 which will be refunded upon return in good condition of plans within ten days after the award of contract.

The right is reserved to reject any and all bids or parts thereof.

V. A. THOMPSON, City Manager

Bids: Jan. 5.

Bridge Construction

Tallahassee, Fla.

Sealed proposals will be received by the State Road Department, at Tallahassee, Florida, up to ten o'clock P.M., on the 5th day of January, 1920.

For the construction of a bridge over the Blackwater river, at Milton, Florida, consisting of four steel Girder Approach spans, and a steel Bascule lift span.

The length of the structure to be constructed is approximately 338 feet long, of four 60′ deck girder spans, and a Strauss Bascule lift span with an 80′ clear channel, having an 18′ clear roadway and one 6′ sidewalk, all on a substructure of concrete piers.

The proposed improvement will consist of approximately the following:

Wood foundation piling, 8250 lin. ft.
Concrete, 1348 cubic yards.
Steel Reinforcement, 168,000 pounds.
Structural Steel, Approach spans, 220,000 pounds.
Structural Steel, Bascule span, 200,000 pounds.
Castings, machinery, etc., 22,500 pounds.
Flooring, 26,500 ft. B.M.
Hand Rail, 716 lin. ft.

Plans and specifications are on file at the State Road Department, Tallahassee, Florida, for examination, or may be obtained on application to the State Road Department, for the sum of Twenty Dollars ($20.00), when returned with a bona-fide bid. Fifteen Dollars will be returned to the bidder.

The right is reserved to reject any or all bids.

A certified check in the sum of Three Thousand Dollars ($3000.00) amde payable to M. M. Smith, Chairman of the State Road Department, must accompany each bid as an evidence of good faith and the acceptance and entering into contract by the party to whom the work may be awarded.

Any bidder who shall, after fifteen (15) calendar days, notice being given, of the acceptance of his or their proposal, fail to execute the contract and furnish the required bond shall forfeit his or their claim to the work and his or their certified check shall be retained and used by the State of Florida as liquidated damages.

STATE ROAD DEPARTMENT
M. M. SMITH Chairman.
CHAS. A. BROWNE,
State Highway Engineer.
Dec. 6th, 1919.

U. S. GOVERNMENT

Bids: Jan. 2.

U. S. ENGINEER OFFICE, Florence, Ala.—Sealed proposals will be received here until 2 P.M. (central time), January 2, 1920, and then opened for constructing Lock and Esplanade for Dam at Widows Bar, Tennessee River, near Bridgeport, Ala. Further information on application.

Bids: Feb. 2.

SEALED PROPOSALS will be opened by the Supt. of Lighthouses, San Juan, P. R., 2 o'clock p.m., February 2, 1920, for construction of tower and dwelling for Point Jiguero Light Station, Rincon, P. R. Plans, specifications and other information upon application.

Nothing Deducted for Depreciation

¶A friend of mine who drives one of the better, high-priced cars told me a day or two ago that he can sell his car today for $300.00 more than he paid for it when new just three years ago. ¶Nothing deducted for depreciation. ¶I told him he had nothing on me—contractors whom I have served with Contract Bonds for eight years tell me that my service is worth more to them today than it was when first I began serving them. ¶—and I admit they are right.

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ENGINEERING NEWS-RECORD

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

E. J. Mehren, Editor — Charles Whiting Baker, Consulting Editor

Volume 83 — NEW YORK, THURSDAY, DECEMBER 25, 1919 — Number 22

Faith and Good Works

WE HAVE discussed in another editorial the manifesto by 119 union heads, but have made no reference to their other action, condemning Bolshevism and the I. W. W. We are glad they made that declaration; it certainly expresses the views of the majority of unionists. But we shall await action in future difficulties to be sure that un-Americanism has been purged from the American Federation's leadership. We cannot at once forget the Boston policeman's strike and Fosters and Fitzpatricks who essayed to lead a strike in the steel trade. Professions of faith to be of any value must be backed by good works.

What Makes a Record

DOLLARS are a poor gage of value today; they are a much worse measure of amount of material. Yet professional statisticians persist in using them to indicate the trend of conditions. Only a few weeks ago the Geological Survey issued a bulletin stating that this country is exporting more cement than ever before. The headlines have been copied in many newspapers, where they are read by hundreds who never read farther and see that in amount the cement exports are lower than in any year since the war began and that the record is broken only in the dollars the cement costs. Similar misinformation is in a bulletin from a statistical firm which states that all building records in the East have been broken so far in 1919 because the contracts awarded— over $2,000,000,000—totaled some $700,000,000 more than ever before. Obviously, the actual construction—at the present high unit costs—must be much lower than the previous record. Statistics are misleading things at best. They are worse than useless if not handled judiciously.

What We Have Forgotten

AT THE annual meeting of the American Association of State Highway Officials in Louisville two weeks ago Col. William D. Sohier, for 11 years a member of the Massachusetts State Highway Commission, broke up the calm tenor of one of the discussions, in which a number of those present had outlined fields for research, by saying that many of the problems touched upon had been studied, and some of them completely solved, in the past. He was emphatic that the older litreature of highway building would shed much light on questions being, apparently, newly raised. With Colonel Sohier's point of view we have a very great deal of sympathy. There is a tendency in the states where highway work is new to turn up noses at the conservatism of Eastern commonwealths which doggedly hold to types of construction that the new men regard as obsolete. Yet we never associate with the men in the older states without being impressed with their thorough grasp of their problems. They speak with a certainty, and adduce supporting data, which one finds lacking in many parts of the country. There could be no greater service to the highway field at the present time than an openminded study of older practice. Certainly, we would find laid down there fundamentals, thoroughly proved by experience, with which many engineers are trifling—trifling, we believe, with certainty of waste of the public's money. In particular, a study of the older practice would have a salutary influence upon those who now give only superficial attention to the matters of drainage and sub-base.

Experience and Highways

WE HAVE had the good fortune for some years of being given the privilege of attending the normally closed meetings of the American Association of State Highway Officials. Year after year we have lamented the number of new faces which appeared, indicating the retirement, generally through political causes, of some experienced highway engineer. The successor might have been just as able, but the experience which the state had developed in his predecessor was largely lost. That thought came back to us more forcibly at Louisville this year than ever before. The number of new faces was, we are inclined to believe, somewhat less than at some of the previous conventions, but in the present situation far more alarming than such changes have been in the past. The highway engineers and officials of this country are facing the biggest responsibility that has ever been put upon a group of public officials in the expenditure of public funds. As Mr. Hirst pointed out in his presidential address, the expenditure on good roads during the next five years will probably be three or four times as much as was spent on our railway systems in their five palmiest years. For the proper discharge of this great responsibility we shall need not only ability but matured experience. It is a public responsibility of every engineer to see to it that "peanut" politics do not result in the discharge of able roads officials. It is equally a responsibility to see that the organizations are adequate in size and that the compensation is sufficient to hold in our highway organizations men able to assume responsibility for the tremendous highway expenditures that are ahead.

Promising Work on a Soil Problem

EARTH. the commonest material of engineering construction, is full of mysteries for the engineer. Each of its infinitely numerous varieties has many different physical properties, and the subject thus is remarkably complex. Of these properties, only a very few indeed have been explored or even made amenable to measurement. Under such circumstances, it is hardly necessary to point out that every added bit of quantitative information on soil properties is a distinct gain.

The dam-core studies which we have the privilege of describing in this issue promise to add much to our scant stock of knowledge on clays, and will for this reason be of high value to the development of engineering science. In their specific field they constitute a new departure, since they apply measurement in place of mere qualitative operation. They are likely to indicate laws of the action of supersaturated clay and supply numerical data directly serviceable in future construction. But at all events they will contribute toward creating a foundation of tangible fact on which a science of this particular material may ultimately be erected. There is the possibility, too, that the results will show that more is to be learned through studies of soils in their critical states than through investigation made under normal conditions; and if so, a new perspective will be opened in the investigation of soil problems.

Dam Cores and Experience

TEN years ago half a million cubic yards of the Necaxa dam, in Mexico, burst out of the confining slopes of the embankment in a flood wave. It cost a million or two of dollars to make good the loss entailed by this acident. Able engineers were in charge. And again at the Calaveras dam, in California, there were able engineers; yet here a still larger eruption of core clay took place, less than two years ago. Both accidents must be blamed essentially on the profession's utter ignorance with respect to the behavior of fine-grained clay soils of abnormal water content. When the dam-core measurements now begun are completed, though we will still lack knowledge of many phases of the subject, we are likely to have data that will enable us to avoid the recurrence of core slumping in hydraulic-fill dams. The history of the subject proves that this knowledge will represent a great many dollars saved in possible accidents. Not only shall we possess data on pressures in clay cores, and on rates of consolidation, but we may have the advantage of a practical showing that it pays to limit the fineness of the core material. Up to now the principle followed in the Miami dam construction of holding down the percentage of the extreme fines is purely an empirical judgment; the results of the pressure studies should give this principle a more definite grounding. They may also throw some light on the yet obscure question as to what extent, if any, a wet, semi-fluid clay mass of extremely fine grain is stiffened by having "plums" of coarse materials mixed with it, a question of some important practical possibilities.

Land Drainage and Federal Aid

FEDERAL aid has been so successful in irrigation that the vigorous advocacy of its application to land drainage is not surprising. The voices raised for Federal aid at the recent Drainage Congress were many and strong. Another viewpoint was shown by one who speaks with full knowledge of irrigation experience, Prof. F. H. Newell, former director of the Reclamation Service. He pointed out the small likelihood of any large drainage appropriations by Congress for some time to come, and warned against letting the hope of Federal aid deaden private initiative. The warning should be heeded. While Federal assistance may be needed for some large and difficult projects, there yet remains much work that can be done by private capital alone, or by it with state or county aid. To insure these smaller drainage works fitting into possible larger operations of later date, the Federal Government may well continue its comprehensive investigations. In these, the states, and in some cases the counties, may also join. The relatively small appropriations needed for such studies cannot reasonably be withheld by the most ardently tax-reducing Congress or legislature imaginable.

Engineers and Investment Securities

THE important relation of engineering to safe investments and the advisability of engaging consulting engineers to review plans for large projects were two points made in an address to the National Drainage Congress by Edward Bower, representing a firm which handles investment securities. He stated that when such a firm is considering the handling of the bonds of a drainage district the engineer's opinion is of equal importance with the lawyer's opinion and that unless the firm can rely upon the reports of the engineers it cannot afford to handle the securities. The engineering work must not only provide for adequate drainage of the district itself but must include consideration of adjacent territory in order that the specific drainage system may not become inadequate at some future time due to water delivered to it from adjoining districts.

In this connection he outlined the proper function of the consulting engineer, as distinguished from what may be called the practicing engineer. To quote Mr. Bower: "It is essential not only that the officers of the district shall employ reputable and competent engineers to create the drainage system itself, but that they shall employ also consulting engineers to act as an effectual check upon those actually doing the work. In any undertaking there is the possibility that those close up, because of their very nearness to the thing, may overlook some very essential factors which will be apparent to those who are more remote and for this reason may have a more general view of the situation. Further, this practice has a strong tendency to instill confidence in the minds of purchasers of drainage securities."

One would hesitate to endorse without qualification Mr. Bower's point of view of the need always of employing consulting engineers. It is conceivable that those called in on large projects will have the ability to survey the situation broadly as well as to work out the details. But as to the majority of projects Mr. Bowers is right. Those employed are likely to have relatively limited experience, and in such cases broader surveys by a consultant, both before and after the details are worked out should be sound investments.

The Unions' "Bill of Rights"

ON DEC. 13 the American Federation of Labor issued a statement on the rights of labor, which, because it is signed by the heads of 119 national and international unions, can be taken to express the views of the unionists of this country. One would expect such a manifesto to be a carefully considered document, laying down in studied form the basic doctrines of unionism and elaborating each to the extent needed to show their soundness. That, however, is not done, and one who approaches the declaration in the expectation of reading a searching analysis of industrial conditions and a dis-

cussion of the unions' industrial function will be disappointed. The statement is referred to as a "bill of rights." That, in a measure, describes it, for it is devoted very much to rights but very little to the responsibility which goes with those rights.

The manifesto is essentially a fighting document, concerned mainly with the issues of the moment. In its fervor it attacks whatever is in labor's way, without a weighing of what is sound and good and what is wrong. We read with sympathy their exposition of the function of the strike, but cannot accept their view that the right to strike shall under no conditions be abridged. We sympathize with their protest against "government by injunction," but object to their condemnation of the accepted function of the judiciary to pass on constitutionality—that salutary check against precipitate action. We agree that the unions have been "agencies of human progress," but cannot agree that they must be above conspiracy and anti-combination laws.

In some respects, though, the document bears evidence of a groping after a broader conception of industrial economies. There is a call for coöperation between the "scientists of industry" and organized workers, there is a demand for public control of credit, there is a recognition that the creative powers of the workers must be released. It must be coming home to some of the Federation's leaders that they are tyros compared with the leaders of British unions. Possibly they see that only by getting a sound conception of industry can they develop further. At any event, here is new thinking in American unionism.

Part of this new thinking is well expressed. We find, for example, these words:

"Creative power lies dormant when autocratic management prevails. No employer has a vested right to the good-will of his employees. That must be earned as between men. It can be earned only when management deals with workers as human beings, and not as machines. There cannot be a full release of productive energy under an autocratic control of industry. There must be a spirit of coöperation and mutuality between employers and workers."

Sound doctrine that. But before we have had time to allow it to sink in we find, closing the very same paragraph, these words, "we submit that production can be enhanced through the coöperation of management with the trade-union agencies, which make for order, discipline and productivity."

The facts do not warrant that statement. We have never failed to admit the need for the union movement, but we have not blinded ourselves to the fact that in stimulating production it has consistently failed. Rather, its influence has been to restrict production.

Right here, too, is where the federation must make a strong attack. Right here—on the matter of production—it wants to stop and write a strong "bill of responsibilities" to go with its "bill of rights." Such a "bill of responsibilities" on production would do more for union standing than anything we know.

The much-heralded manifesto, then, has been a disappointment. It contains glimmerings of broadened thinking, but by and large it is a mixture of strong truths and woeful errors. It is a "bill of rights" that ignores responsibilities. In some respects it is hopeful; in most, too much reminiscent of the unreasonable and unreasoning fighting spirit of the immediate past.

An Object of Suspicion

IT HAS become the custom when a controversy is brought to judicial notice to close all avenues of information lest there result public discussion which would prejudice the issue. Probably one of the parties to a suit may benefit from such an embargo, but in matters of a public nature other interests than the litigants' must be served. Such is the case with the Chicopee standpipe, discussed on another page. The questions of public welfare and policy involved rise superior to the petty claims of the officials of Chicopee, or of the builders of the standpipe, neither of whom will give out necessary information on which to base a fair judgment.

There is nothing novel in the method by which the Chicopee standpipe was contracted for. Probably most of the tanks and standpipes in the country have been let by nontechnical city officials to builders who also design the structure and who build it without the advice or supervision of any engineer outside of their own employ. Nevertheless, the custom is vicious. Public safety demands some surer protection than a manufacturer's reputation, when that manufacturer must produce a design of minimum price and amount of material. His idea of the chances he can take and the ideas of those who do not profit by the contract may be far apart.

The issue at Chicopee is not so much the design of this standpipe or its immediate danger to the community, but that obstacles have been put in the way of finding out whether it is weak or not, and that no official seems to think the situation calls for expert, unprejudiced advice. On the one hand we have a commercial design backed by an established company of good reputation, but a design made in price competition, and on the other hand the voluntary criticism of an outside engineer based on casual inspection of some elementary drawings and on conclusions reported to him by other engineers who made a more careful study of the design and specifications on which the contract was let. Between the two is a city government quite incapable of judging the technical merits of the case. With this doubt thrown on the design, the city should have been quick to make a public investigation. If the standpipe was safe, the critic would have been silenced and discredited; if his criticisms proved valid, the city and the citizens would have been safeguarded. Instead, however, the city proceeded with the contract, though there is every reason to believe that it was warned regarding the original design by some insurance interests which it consulted privately. Worse than that, it continues tacitly to defend the design by refusing to aid any independent investigation of its nature.

We make no definite criticism of the Chicopee standpipe as built, because we have not been able to learn the exact details of the structure. In the tank as designed, and apparently as built, the base shell tension is nearly 21,000 lb. per square inch, assuming a 70% rivet efficiency which, from a view of the structure, could hardly be surpassed. The rivet design will bear looking into, and the reported designs of the foundations are radical enough to attract the attention of a specialist. If the structure had been designed and contracted for in an open fashion, and if the details were now open for inspection, the standpipe would still be an object of interest to engineers because it is one of the record structures of its type. Enveloped as it is in a cloud of secrecy, it is an object of suspicion.

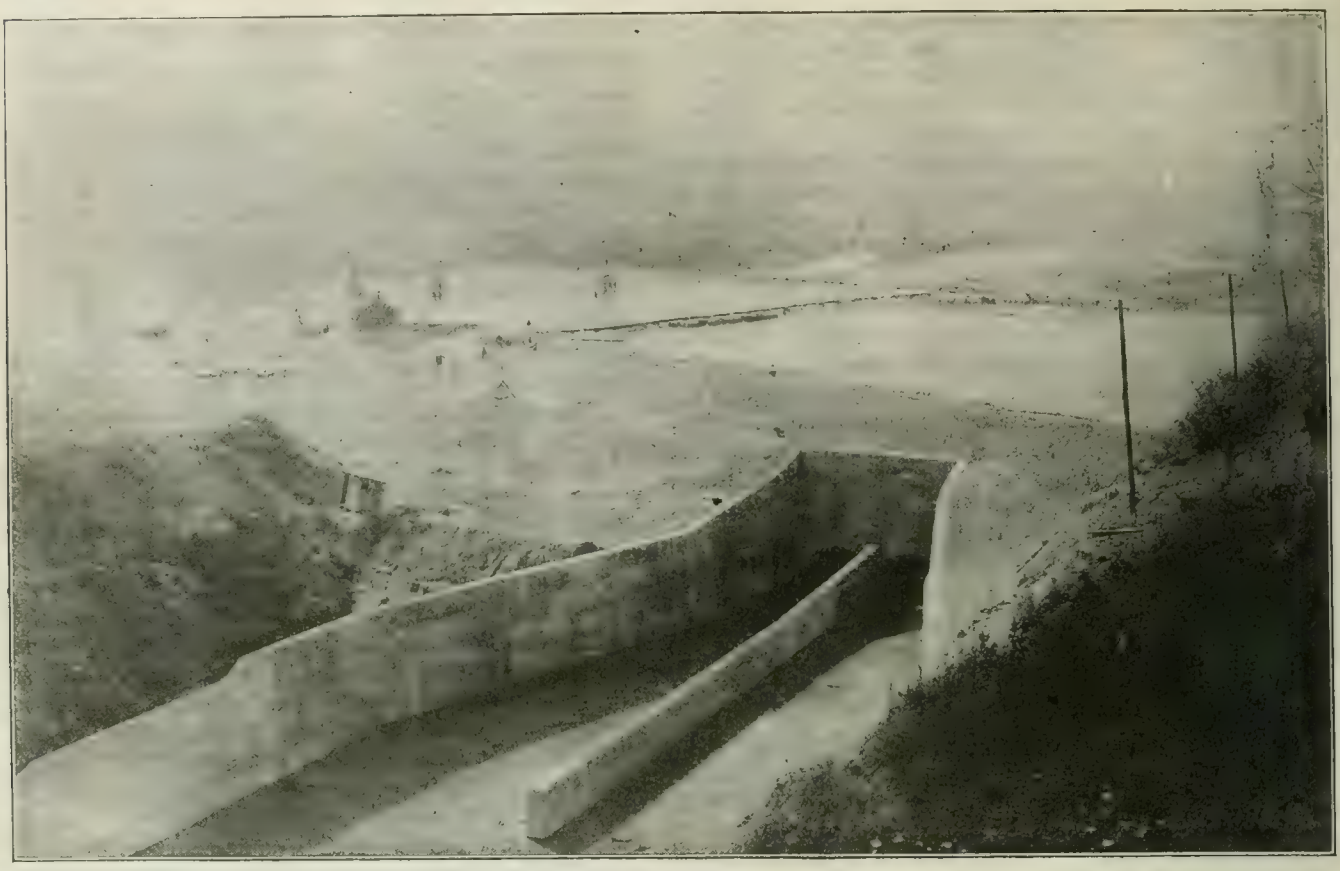


FIG. 1. GERMANTOWN DAM AT THE BEGINNING OF NOVEMBER: VALLEY CLOSED AND ENTIRE EMBANKMENT UP TO 1898 FLOOD-CAPACITY LEVEL. TOWERS FOR CORE STUDY NEAR FAR END, OVER BED OF TWIN CREEK

Study of Pressures in Hydraulic Dam Cores

Methods of Miami Conservancy Engineers To Obtain Data on Core Consistency and Action—Ball Soundings—Measurements of Lateral and Vertical Pressures—Results to Date on Germantown Dam

TO OBTAIN definite information on the solidifying action in their hydraulic dam cores, a subject surrounded with much uncertainty, the engineers of the Miami Conservancy District have initiated a system of tests that should not only serve as a safety control in the construction of the five flood protection dams now being built by the district, but also yield useful data for guiding future work. The large-scale slumping of the Necaxa and Calaveras earth dams within the past ten years emphasized forcibly the risks residing in persistent fluidity of a water-deposited clay mass.[1] Little or nothing is known as to best composition of core material (in grain size), rate of solidification for variously graded cores, and suitable method of testing solidification. The most directly valuable results of the present studies at the Miami Conservancy dams are likely to be those bearing on the last-named question, since pressure-cell observations are being made for the first time. Further, a close check will be secured on the merits of the grading limits selected for the Miami dam cores, which are made of distinctly coarser material and include a larger range of sizes than that of the Calaveras dam, for example.

The work is the sequel of pressure-cell experiments which the district had made for it by A. T. Goldbeck, of the Office of Public Roads at Washington; preliminary results of these experiments were reported in *Engineering News-Record* of April 18, 1918, p. 758. Pressure cells of the type developed by Mr. Goldbeck are being built into the core of each of the five dams, at various depths, and monthly readings of lateral and vertical pressures will be made. The farthest advance has been reached at the Germantown dam, where eleven cells are in place and results are being accumulated.

In addition to the cell gagings, ball soundings of the core are carried on, and frequent analyses of core material are made, thus rounding out a valuable set of checks. Finally, at three of the dams, where vertical shafts have been built into the backs of the outlet-structure retaining walls to take care of the overflow from the hydraulic pool, it is planned to use these shafts for examining the interior of the core.

Limiting The Core Width

To explain the engineering views involved in the Miami core construction, two important matters must be noted. Study of slumping in earth dams, especially the Necaxa dam, led the engineers of the Conservancy District to the conclusion that safety requires the width (and hence side slopes) of the core to be limited rather closely. This opinion was strengthened by later studies of the Calaveras slip. Their conception of the wide core, shown in the upper sketch of Fig. 2, is that

[1] On the Necaxa dam slip, see J. D. Schuyler in *Engineering News*, July 15, 1909, p. 72. On the Calaveras slip, see Allen Hazen and Leonard Metcalf in *Engineering News-Record* of April 4, April 11 and Dec. 26, 1918, pp. 657, 701 and 1158.

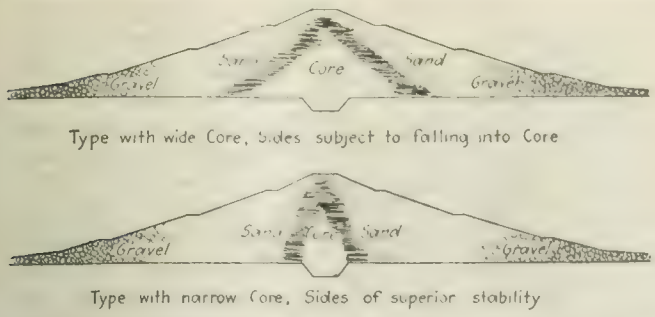


FIG. 2. DIAGRAMS ILLUSTRATING RELATION OF WIDE AND NARROW CORE TO STRENGTH OF DAM

the overhang of the outer banks is likely to be supported in rather unstable fashion on the semiliquid upper portions of the hydraulic core, and that this may lead to (1) caving of the banks inward; (2) extension of the soft core by the production of lubricated and hence mobile material in the banks, and (3) ultimately a

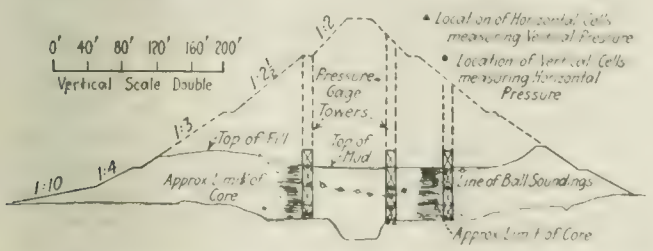


FIG. 3. POSITION OF TOWERS AND PRESSURE-CELLS, GERMANTOWN DAM (SKETCH SHOWS CONDITIONS OF NOV. 14, 1919)

bursting out of the core either causing or caused by a slip of the weakened bank.

With this in mind, they fixed the rule that the cores should nowhere be wider than the final dam height above the point in question (see right hand sketch in Fig. 2). This requires the hydraulicking to be conducted with a narrow pool and gives an ample section of stable, coarse material (grading out to coarse gravel) on either side, but it proves entirely workable if the fines in the material are kept down to a suitably low percentage (Germantown) or if the surface drain from the pool is so handled as to carry out the excess of fines (Taylorsville). The resulting core, with side slopes of approximately $\frac{1}{2}$: 1, is believed to be amply wide for tightness and not likely to induce caving of the bank along the contact.

Under this rule the base width of the core is only slightly over 100 ft. in any of the dams. This is usually less than one-fifth of the dam base. The great width of outside bank so obtained is an added element of strength. Further, consistent effort is being made to obtain a good gradation of sizes in these outside banks, from cobbles and coarse gravel at the outer slopes to fine gravel and sand next to the core.

During the preliminary examinations of material suitable for dam construction, the District conducted soil investigations by borings and test pits in the vicinity of each dam site. These investigations gave the necessary information as to percentages of gravel, sand, and clay present in the available material, and enabled the engineers to determine which of the available borrow-pits would come nearest to giving the desired proportions of coarse and fine materials in the dam. As to the grading of the fine, or core, materials, this required apparatus not available at the District laboratory, but the Bureau of Soils at Washington, D. C., made several analyses of these core materials for the District. So that before the work started, the Conservancy engineers had obtained considerable information as to the probable behavior of the available materials in a hydraulic-fill dam.

In order to avoid excess of fine material in the core, the mechanical analysis of the pumped material was so defined as to limit both the percentage of core material in the total and, to a certain extent, the percentage of "silt" and "clay" in this fraction. The core percentage is fixed by the cross-section of the dam.

The limitation of fines in the core material was largely a matter of judgment, based on analyses obtained of core materials available, and samples of core secured from other hydraulic-fill dams. This question was also influenced by the results of the pressure measurements made for the District by the Office of Public Roads. A standpipe 30 in. in diameter by 41 ft. high, was filled with a pumped sand-clay mixture, pressure cells being placed in it at various elevations. Leakage of water being prevented, consolidation of the material depended on settlement alone, as is thought to be very much the case in a hydraulic dam core. While friction along the sides of the tank undoubtedly influenced the readings, these experiments showed conclusively, first, that the Goldbeck apparatus is suitable for use in hydraulic-dam cores under conditions encountered during construction, and second, that the core material in a dam acts as a perfect fluid during the earlier stages of settlement, but gradually loses its fluid properties as consolidation proceeds.

Another very important fact was suggested by the results of these experiments, namely, that consolidation in the hydraulic dam core may be considerably accelerated by wasting the very finest of the material, which otherwise is held in suspension for a long period.



FIG. 4. GAGE TOWERS IN GERMANTOWN CORE POOL

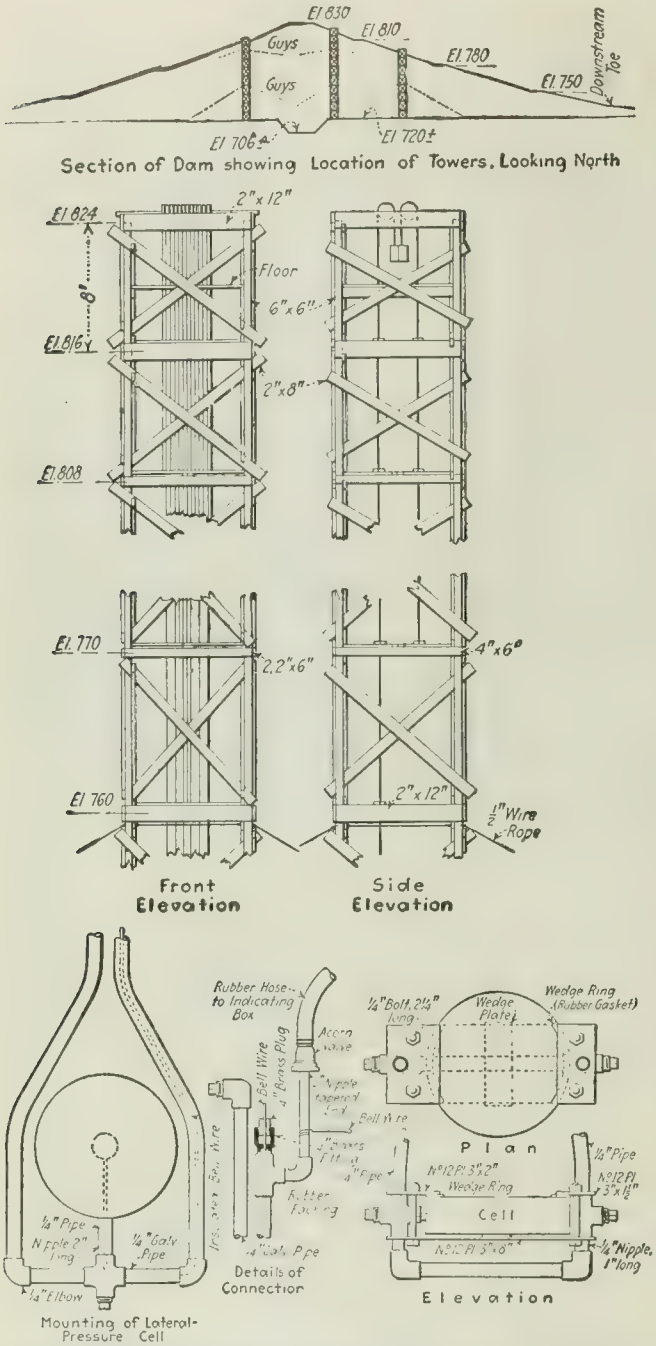
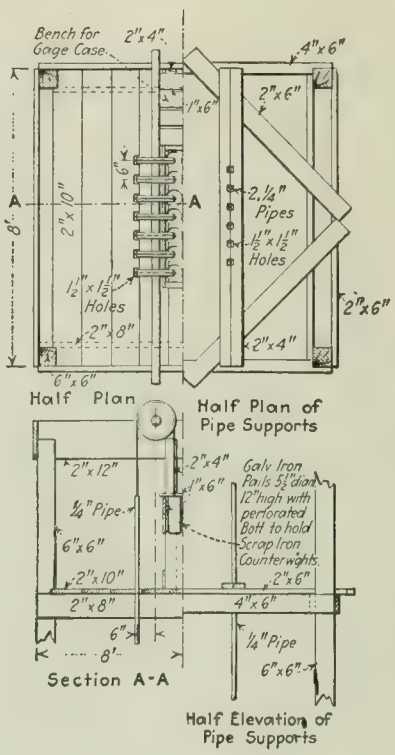


FIG. 5. GAGE SUPPORT AND TOWER-TOP RIGGING

This could not very well be accomplished with the experimental tank, but is very readily accomplished in ordinary hydraulic dam construction. The experiments indicated further that although consolidation of core material is very slow, it does proceed rapidly enough (judged by decrease of lateral pressure ratio) for safety in construction.

While very little can be done on any job toward varying the percentages of the different sizes of the exceedingly fine materials which constitute the core, this can be accomplished to some extent by wasting the fines. And by comparison with various clays and core materials from other dams, some judgment may be formed as to the results being attained with the materials available.

The following analysis of a dipped core sample from the pool of the Taylorsville dam illustrates what the Conservancy engineers are securing there; this analysis



(see table below) is not very different from similar analyses made at the other four dams now under construction.

A consistent effort is made to hold down all core material to *not finer* than the analysis given. At Taylorsville the material available at present is higher in silt and clay than desired, and control is obtained by wasting fines through the pool drain pipe, its level being lowered so as to give the necessary velocity. It is worth noting that the analysis shown is finer than cement as made under present-day specifications. At the same time three-fourths of the fines consist of the coarser particles within the size range, whereas in some prior hydraulic-dam work the clay percentage greatly overbalanced the silt percentage,

SAMPLE ANALYSIS OF TAYLORSVILLE CORE SAMPLE

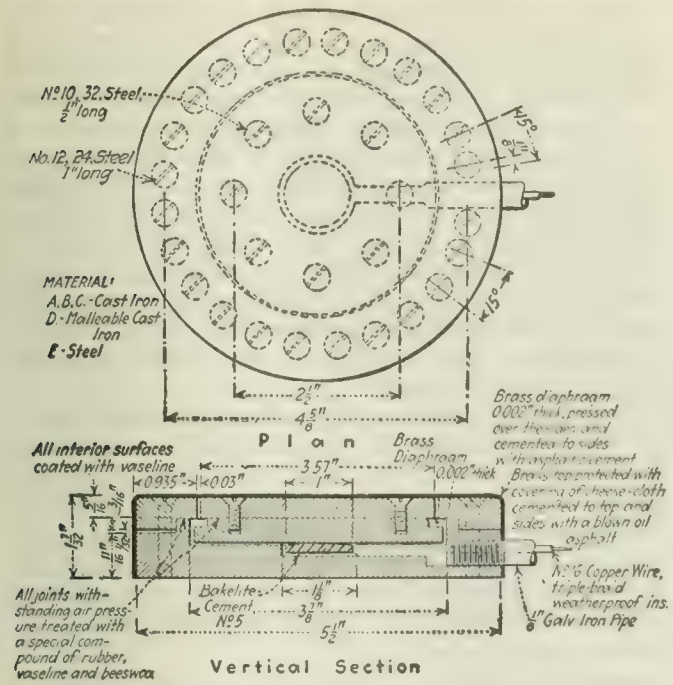
Bureau of Soils Standard		*Taylorsville Sample*	
Grade Name	Size of Particles	Per cent by Weight	
Fine gravel	2-1 mm.	0.0	
Coarse sand	1-0.5 mm.	0.0	
Medium sand	0.5-0.25 mm.	0.1	
Fine sand	0.25-0.1 mm.	1.9	
Very fine sand	0.1-0.05 mm.	18.1	
Silt	0.05-0.005 mm.	59.7	Fines 80%
Clay	0.005-0	20.2	

producing, it is thought, a much more mobile material. While conceding that no definite data are yet available to determine the ideal mechanical analysis of core material, the Miami Conservancy engineers believe that at present they are working on the safe side, and believe that their tests will promptly reveal any undue softness of core or failure to solidify (in terms of drop of lateral-pressure ratio).

Penetration Tests

Resistance to penetration, or supporting power, of dam cores is being gaged by lowering a 6-in. cast-iron ball into the pool by a rope, its penetration under its weight being recorded. This method of gaging was introduced at Calaveras and supplies a comparison standard between various dams on which it has been used. The precise meaning of the penetration obtained by this means is not known at present, but it is hoped that by tying it up with pressure-cell readings at various depths, and by results obtained at other dams by the same method, the work involved in carrying on these penetration tests may prove to be worth while.

Penetration tests with iron and wooden rods have also been made, but no particular value is attached to the results obtained by those methods, as the personal element has such a marked effect on the results. The



each cell to the tower top where the observing is done.

In making a reading (see section of Goldbeck cell, the cell support and the gage-box used for reading pressures, in Figs. 5 and 6) compressed air is slowly admitted to the pipe leading to a cell, until the contact buttons in the cell separate, as indicated by the dimming of a miniature lamp whose circuit goes through the buttons. The pressure at this moment, read by gage, indicates the earth pressure. The portable gage-box contains a small air tank, three dry cells, a 3-volt lamp, and wire and hose connections. In using it, the lamp can be lighted and extinguished repeatedly with identical results, which tends to show that the movements of the pressure-cell diaphragm do not disturb the soil conditions.

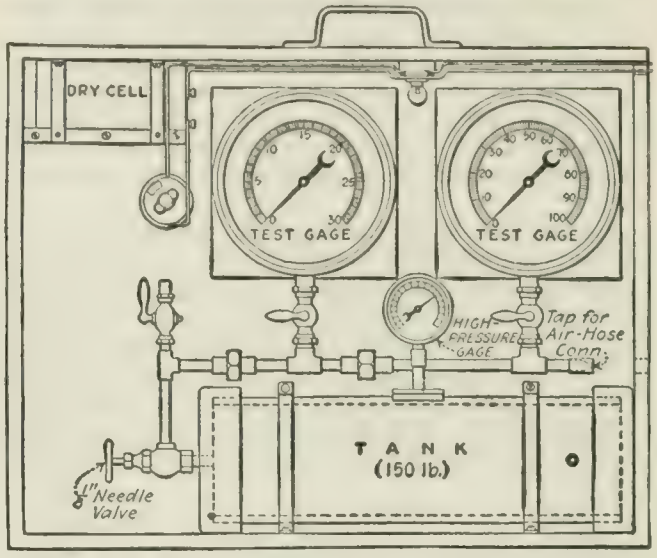


FIG. 6. GOLDBECK PRESSURE-CELL AND INDICATING-GAGE BOX

ball tests are much more definite, and, it is believed, will yield data of some value.

Pressure-Cell Tests

From the Washington tests already mentioned, the inference was drawn that the Goldbeck cells would give reliable information as to the lateral pressure existing in hydraulic-dam cores, and that the relation of vertical to horizontal pressures, recorded by these cells, would portray truly the increasing angle of repose or growing solidity of the core material. Basing on this, the decision was reached to bury similar pressure cells in the dam cores at 10-ft. vertical intervals in order to obtain a full record of the progressive change of nature of the material. The Germantown arrangement represents the test system, as sketched in Fig. 3.

There are three light wooden towers (Fig. 4) erected at three points across the width of the core near the place of lowest foundation. Pressure cells are hung within these towers by wires counterweighted over sheaves at the top (Fig. 5), permitting any cell to move down with the surrounding soil as this settles; the cells are not held laterally. In the middle tower lateral-pressure cells will be set at 10-ft. intervals, and vertical-pressure cells at 30-ft. intervals; in the other towers the corresponding intervals will be 20 and 40 ft. An air-pipe, containing also an electric indicator wire, rises from

During the past two months four sets of readings

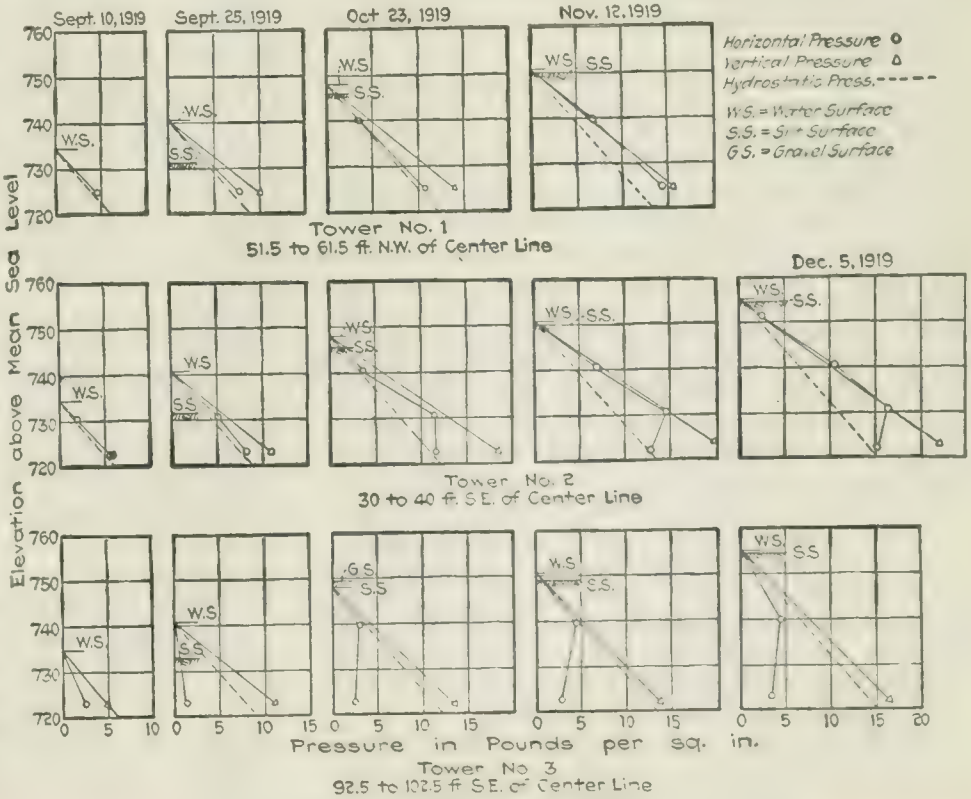


FIG. 7. PRESSURE CURVES OF GERMANTOWN CORE

have been taken at Germantown. The curve-sheet Fig. 7 gives the results. It will be seen that the downstream tower is showing a sharp drop in lateral pressure, not consistent with the readings at the other towers. There is reason for believing that the lowest cell of this downstream tower has become surrounded by gravel and sand from the toe of the embankment confining the pool. On the other hand, the upstream tower may be affected by gravel interference as the work proceeds. These two towers are located purposely in the zones (between core and banks) where such action might occur.

The middle tower, however, is without doubt in true core material, and the distinct drop in lateral pressure at the lower gage is held to show decided solidification at depths of 20 to 30 ft.; the pressure ratio for this reading is 0.6, and the lateral pressure is down to the hydrostatic head. It is interesting to note that the readings of Nov. 12 show no increase of pressure on the lower cells, although both water surface and top of core were higher on that date than on Oct. 23.

In the progress of hydraulic filling, the edges of the pool shift more or less constantly, as pumping usually is carried on along only one side at a time. This results in variations in core width, as represented by the irregular outline in Fig. 2. Through this variation, a certain amount of interleaving of core and banks is produced, which may easily affect records of individual cells placed near the edges of the core. When many cells are in place, however, this effect can be detected by comparison and such readings interpreted by themselves. The curves of Fig. 7 are given here not as especially significant in themselves but as suggesting the possibilities of the extensive observation series of which they are the beginning.

A satisfactory phase of the hydraulic-fill work is that immediately adjacent to the core pool a sand beach forms which is very firm to the foot, even in a hard rain. It is probable therefore that the dam structure has material of marked structural strength close alongside the soft core material, and that only a narrow zone just inside the water's edge, composed of sand combined with fines, is likely to be in lubricated condition.

Congressional Persecution of Contractors and Manufacturers

By William B. King
Of King & King, Attorneys and Counsellors at Law, Washington, D. C.

THE work done by the engineering contractors and manufacturers of the United States during the world war will be recorded as one of the greatest industrial accomplishments in history. Cantonments sprang from nothing in an incredibly short time. Factories were swiftly transformed from purposes of peace to those of war and functioned efficiently without delay. European records of quantity production were promptly exceeded. Engineers and administrative officers adapted themselves to new tasks with a characteristic American readiness.

Some waste and some inefficiency were necessary accompaniments of this speed. Before the event it would have been said that it could not have been accomplished without a considerable amount of dishonesty and fraud. There was some waste, some inefficiency, a good amount of lost motion between contractors and Government officers, but so little dishonesty or fraud as to be practically negligible in the great mass of work done. Throughout the war, the Division of Military Intelligence and the Department of Justice were extremely active. They often had secret representatives employed in the factories. Their failure to unearth fraud was because the work was honestly done. In the conspicuous instance of general prosecution for fraud in connection with the manufacture of raincoats, the wholesale charges fell through and the verdicts of the juries showed the fraud confined to very narrow quarters.

After the armistice, the House of Representatives enlarged its Committee on Expenditures in the War Department, divided it into subcommittees and sent these forth on roving commissions to investigate contracts without limit of expenditure. Contractors have nothing to fear from impartial investigation and do not object to it within reasonable limits. These subcommittees employed investigating agents and counsel with instructions to find out, if possible, irregularities in contracts. They have now been engaged for months at work. Doubtless their efficiency is measured by their employers by the number of irregularities they can report. Suspicion of political partisanship at the beginning of this movement has been confirmed by the events. These subcommittees have been discredited by a series of publications and their political objects in the investigations fully revealed.

The subcommittee that went to the Pacific Coast and investigated the spruce conditions there was openly charged in a vigorous telegram from the Secretary of War with flagrant injustice, saying:

"When I asked your committee for any additional information it might secure, I assumed the committee was investigating. It now is quite clear that the committee is merely restating various assumptions made by it prior to the receipt of any evidence. In both your telegrams statements are made with regard to matters which I have investigated, and which are wholly unsupported by the facts. In addition to this, grave accusations and intimations are made against persons of the highest reputation, whose services to the country have been patriotic and upright.

"I cannot by telegram cover in detail the manifold errors in your messages. I can only express the hope that your committee will afford complete and adequate opportunity for presentation of all facts before it undertakes to make the report.

"Frankness leads me to express deep regret that the committee, not having heard all the evidence, is making its suspicions the basis of widespread and unjust publicity."

Upon their return to the East, they were met by a former Assistant Secretary of War, who had done splendid service to the Government during the war and whose record was sought to be besmirched, with open denunciation of their conduct, as well as candid explanation of the facts.

The subcommittee on ordnance delved into the contracts made by the Democratic candidate for Governor of Massachusetts and called him to Washington during actual progress of his campaign to answer charges founded upon the investigations of their special agents. He vigorously denounced their action as inspired by partisanship. The people of Massachusetts expressed their disapproval of his candidacy on public grounds of high importance, but that does not excuse the impro-

priety of the committee in endeavoring to discredit him in the midst of his campaign by bringing these charges. If the committee's real desire was to find whether the work was efficiently and honestly done, it would have scrupulously avoided a course so redolent of political partisanship.

The chairman of the same subcommittee, after investigating the largest ordnance contract made during the war by a corporation of the highest business standing, is reported in the newspapers as denouncing this company's conduct and declaring that a dozen or more officers of the Government and of the company will be prosecuted. The company felt obliged to defend itself in a page advertisement in six or seven of the most prominent newspapers of the country giving a full statement of the transaction and roundly criticizing the conduct of the investigation.

The committee has made a report to the House in which eight ordnance contracts are mentioned. It is recommended that the Secretary of War be asked to revise settlements already made in all cases where Government property was sold to the contractor, but the committee's report speaks far more mildly than the newspaper interviews ascribed to the chairman and finally concludes by saying that in some of the cases "constructive, if not actual, fraud occurred"—a phrase of little or no meaning. The minority of the committee vigorously dissents even from this finding, saying very pertinently of the settlements of cancelled contracts:

"The matter has been dealt with as a business matter, not as a political matter. It will be most unfortunate if politics be now thrust into what is a strictly business proposition."

The subcommittee on cantonments has started on a tour of investigation and is following the same methods as the other subcommittees. They investigated Camp Sherman and filled the local newspapers with charges. Study of the testimony taken shows the methods followed. Every driver of a team or workman who would declare that he loafed himself or saw loafing was brought before the committee. Responsible officers of the Government, when called, testified that the work was honestly done. Many others who could have testified to the same effect were not called. The contractor's representatives were not called.

The committee then went to Camp Grant, where the contractors built about $4,000,000 of work in two months absolutely on time and then were given an equal quantity more, without addition to their contract fee. The same methods were here followed and nothing more resulted than to show that among the many thousands on the work, some were shirkers. The record of the testimony shows leading questions asked of ignorant witnesses, in order to produce testimony unfavorable to the administration and the contractors. Witnesses without any qualification for doing more than driving a team or shoveling dirt or pushing a plane were asked questions which only the highest experts could answer and their replies were taken as substantial evidence against the contractors and their methods. No opportunity was given for cross-examination by Government officers or contractors.

It is very unfortunate that contractors and manufacturers who devoted their best energies to work during the war and officers of the Government who unstintingly gave their labors to the Government service should now be persecuted. What dampening effect will it have upon future patriotic impulses!

It would be fortunate if Congressmen could be made to realize not only the injustice of these proceedings but the reaction of the country against such partisanship.

Newark's Proposed Zoning Ordinance

FINAL action on the proposed zoning ordinance for Newark, N. J., the second reading of which, as announced in *Engineering News-Record* of Dec. 11-18, 1919, p. 1033, was reached Dec. 3, will probably be taken within a few days.

The ordinance proposes the division of the city into four classes of districts: (1) Residence; (2) business; (3) industrial, and (4) heavy industrial. Residence districts may contain, besides dwellings or tenements, lodging or boarding houses, hotels, churches, schools, libraries or public museums, hospitals or sanitariums, clubs—excepting those whose chief activities are services customarily carried on as business — philanthropic institutions other than correctional ones, railroad passenger stations, buildings incident to farming or truck gardening, nurseries or greenhouses, and accessories customarily incident to these.

In the business district the following buildings are not allowed: Blacksmiths' shops or horseshoeing establishments, milk bottling or distributing stations, carpet-cleaning or dry-cleaning establishments, coal yards or lumber yards, car barns, places for the storage or baling of scrap paper, rags or junk, any kind of manufacturing other than the manufacture of products sold at retail in the premises to the ultimate consumers, and any trade, industry or use prohibited in an industrial district.

There are 36 classes of industry which are prohibited within the industrial district because they are noxious or offensive by reason of the emission of odor, dust, smoke, gas or noise. Classes of construction coming under sections 2 and 3—that is, residence and building uses—are not excluded from the industrial district.

The heavy industrial district includes not only classes of construction restricted from the other three districts but may include any of the class of construction restricted to the other three districts. However, there is one variation; that is, that in the heavy industrial district no building will be allowed which is designed to be used in whole or in part as a dwelling or tenement for one or more families.

The city is also districted with reference to the height of buildings, there being five classes of such districts: (1) 35-ft. district, (2) 50-ft. district, (3) 85-ft. district, (4) 125-ft. district, and (5) 150-ft. district. Only in the 150-ft. district class is there any other restriction laid upon building heights, but here street widths are controlling factors. No limitation is placed upon heights of spires, steeples, grain elevators, etc. Towers and tanks on industrial buildings are also allowed.

A subdivision is also made into five classes of area districts—that is, A, B, C, D and E—this classification being made for the purpose of naming the limits of size of rear yards, side yards, inner courts, outer courts and building areas, and specifying the number of families to be housed within certain areas.

The ordinance provides for the establishment of a

board of appeals consisting of the superintendent of buildings, the chief engineer of the Department of Streets and Public Improvements, the health officer, the inspector of combustibles and fire risk, and the president of the Board of Assessment and Revision of Taxes. The superintendent of buildings is to act as chairman of the board. The administration of the ordinance is placed in the hands of the superintendent of buildings and the inspector of combustibles and fire risks.

All nonconforming uses existing at the time of the passage of the ordinance may be continued, and the reconstruction of nonconforming buildings is subject to certain regulations.

Proposed Engineer Salary Scale in Highway Service

Recommendation for Compensation Schedule of State Road Department Is Presented for Discussion and Approval

DESIRING the opinions of engineers concerned, the American Association of Engineers' committee on salaries of engineers in public service has published a proposed recommendation for salaries of engineers in the state highway services. The committee announces that the schedule which is printed below is not an outline of organizations, as it is not that body's duty to standardize or classify engineering service, but to price such service. In order that each individual in a state organization may be readily placed within the schedule, the various positions are described in considerable detail. The grouping of the positions is clear from the captions.

The schedule is given below. These figures were approved by the American Association of State Highway Officials at its recent annual meeting in Louisville.

Administrative and Executive Positions

Chief Engineer In charge of all construction and maintenance work of the department, acting as chief executive officer	$8,000	$15,000
Engineer of Construction In immediate charge of all construction work from time contracts are let. Assigned to state headquarters	6,000	10,000
Engineer of Maintenance In charge of all maintenance work. Assigned to state headquarters	6,000	10,000
Engineer of Bridges In charge of preparation of specifications and designs for bridges, and in charge of construction of special bridges. Assigned to state headquarters	5,000	8,000
Office Engineer In general charge of preparation of plans and specifications for all construction work up to point of letting contracts. Assigned to state headquarters	5,000	8,000
Engineer of Tests In general charge of laboratory routine tests, investigations, material surveys and field inspection of materials	4,000	7,000
District Engineer In charge of all construction and maintenance work in a division or district of the state, generally including a number of counties. Assigned to division headquarters	5,000	8,000

Senior Engineering Positions Involving Some Administrative Duties in the Higher Grades

Advisory and Consulting Engineer to the Chief Engineer	5,000	10,000
First Assistant Engineer Assigned to Construction Engineer. In general charge of office work in connection with execution of contracts	3,600	5,000
First Assistant Engineer Assigned to Maintenance Engineer. In general charge of office work in connection with maintenance	3,600	5,000
First Assistant Bridge Engineer Assigned to Engineer of Bridges. In charge of bridge drafting room and responsible for bridge specifications and bridge designs	3,600	5,000
First Assistant Engineer Assigned to division headquarters. In general charge of office	3,600	5,000
Assistant Engineers Assigned to Construction Engineer at state headquarters	2,400	4,000
Assistant Engineers Assigned to Maintenance Engineer at state headquarters	2,400	4,000
Assistant Engineers Assigned to Bridge Engineer at state headquarters. Acting as especially skilled draftsmen, designers and computers	2,400	4,000
Assistant Engineers Assigned to Office Engineer. Preparing and checking specifications and plans from division offices	2,400	4,000
Chief Chemist Assigned to Engineer of Tests. In charge of the chemical work of the laboratory	3,500	5,000
Assistant Engineers Assigned to division headquarters. Some in charge of construction, others in charge of maintenance, both field and office	2,400	4,000
Assistant Engineers Assigned to laboratory work. Tests and investigations in laboratory, field examinations and reports on sources of materials as assigned	2,400	4,000
Assistant Chemists Assigned to laboratory	2,000	4,000
Chief Draftsmen Assigned to division headquarters. In charge of drafting room and the preparation of plans	2,400	4,000
Chiefs of Survey Parties In charge of surveys and relocations; during time spent in office, work on plans and computations as assigned	2,400	4,000

Inspection Service

Confidential Inspectors Assigned to Chief Engineer personally. Positions of peculiar responsibilities; represent the chief engineer	4,000	5,000
General Inspectors of Maintenance Assigned to state headquarters	2,400	4,000
Inspectors of Bridge Construction Inspecting construction of the larger bridges only. Work inside on bridge plans and design as assigned	2,400	4,000
Field Inspector of Materials Assigned to Engineer of Tests at state headquarters. Inspection of materials in the field and at point of manufacture	2,400	4,000
Inspectors of Construction Assigned to Division Engineers. Inspect construction, reporting to division engineers, or a number of inspectors may be under immediate charge of some assistant engineer to whom they make immediate reports.	2,400	3,000
If inspectors are employed during working season only, to receive per month	250	300

Junior Engineering Positions Concerned With Routine Work Only

Engineering, Draftsmen, Computers, Checkers Assigned to state headquarters	1,800	2,400
Computers and Checkers Assigned to Bridge Engineer	1,800	2,400
Engineer Draftsmen Assigned to division headquarters. Preparation of plans, computations, estimates, checking	1,800	2,400
Instrument Men Transitmen and levelers. Those employed the year around work inside division offices part of time on plans, computations and estimates	1,800	2,400
If employed by month during construction season only, they should receive, per month	200	250
Rodmen, Chainmen and Tracers	1,200	1,500
Laboratory Assistants Routine testing, laboratory records	1,800	2,400

All engineers working away from state or division headquarters to which they may be assigned are to receive traveling and subsistence expenses.

This schedule not to operate to reduce any salaries now existing.

Largest Barge Canal Terminal Opened in New York City

Old Timber Pile Pier Remodeled and Provided With Modern Freight Shed and Extensive Freight-Handling Machinery Both Outside and In

By Frank M. Williams
New York State Engineer and Surveyor, Albany, N. Y.



GENERAL VIEW OF PIER 6, EAST RIVER, NEW YORK CITY TERMINAL FOR NEW YORK STATE BARGE CANAL

TERMINALS for the New York State Barge Canal have been completed for some time at various places along the line of the canal, but it was not until this autumn that the largest and most elaborate, on the East River in New York City, was opened for use. This structure embodies the latest ideas on the design and equipment of a freight-handling pier available to this department. In its mechanical handling equipment, particularly, it is considerably in advance of any of the piers in New York harbor.

The terminal is located at Piers 5 and 6 on the East River on property acquired by the state from the City of New York for $191,900. With the acquisition of the site, which is shown on one of the accompanying drawings, the state came into possession of a gravity section granite bulkhead wall of a permanent character and two open piers of a semi-permanent type of construction. These piers had the following dimensions: Pier 5, width 70 ft., length 570 ft.; Pier 6, width 50 ft., length 572 ft. Both piers were of timber construction with reinforced-concrete decks. Adjacent slips had from 5 ft. of water at the bulkheads to 20 ft. at the outer ends.

In making studies for the development of this site, as well as others, it was planned to work along lines that would secure the most efficient operating conditions and the most intensive use of the structures at hand. Also, in view of the fact that it was probable that several years at least would elapse before the traffic on the canal would reach large proportions, it was decided to use types of construction having a fairly long life rather than to erect structures of a cheaper type that could be quickly erected but which would have to be scrapped at a later date or require large annual maintenance charges.

The ultimate development adopted for this site provides for the shedding and equipping of both Piers 5 and 6. As an initial development, however, Pier 5 was improved only to the extent of making necessary repairs to the timber work, including a new fender system, and by the installation of two steam-operated tractor cranes of two-ton capacity which have been used to a limited extent during the past season in handling cargo between barges and the open pier. An electrically operated stiff-leg derrick of heavy capacity has been installed at the outer end of Pier 5 by the General Electric Co. under a permit from the Superintendent of Public Works in connection with its lighterage service between its plant in Schenectady and New York City.

The design adopted for the reconstruction of Pier 6 provided for an ultimate or permanent and complete development of the pier. In arriving at the scheme for reconstruction, it was found that the width of the reconstructed pier would be limited by physical conditions existing. In this connection, it is to be noted that many



SITE OF NEW YORK CITY BARGE CANAL TERMINAL

piers in the older part of the city were laid out in the days of sailing vessels of low cost carrying comparatively small cargoes and at a time when a quick turnaround of a vessel was not considered with the importance it holds to-day. As a result of conditions in those days, the piers were used more as runways for moving cargo to and from the shore than for transit storage as in these days. With the gradual development of the function of the transit storage shed as a temporary warehouse and the increase in size and cost of vessels, it has been found that the older piers and slips are totally inadequate to handle modern cargoes. In connection with barge traffic, the same conditions control to a large extent. The site at Piers 5 and 6 had been set aside for canal barges since the early days of the Erie Canal and their use for that purpose was retained when the present city charter was granted by the state. In the days of the old Erie Canal barges, the existing piers were adequate, but under new conditions the old Pier 6, for instance, before being improved and equipped, could not handle a single modern barge with a 1000-ton cargo without costly delay and confusion. Pier 6, as acquired by the state, was only 50 ft. wide and our studies showed that the pier could be widened, but not to more than 85 ft., without seriously encroaching on the widths of the existing slips. With the width of the pier determined by compromising cargo requirements with physical conditions, the problem was to get the best layout possible under the circumstances.

The question of freight-handling equipment had to be considered in connection with the size of pier available. In accordance with our general studies, the preference was given to jib cranes for transferring between barge and pier and vice versa. This type of equipment was preferred because of its speed and its special adaptability to the barges such as operate on the state canals, as these barges are without high superstructures or masts and are also without any form of cargo winch or unloading machinery.

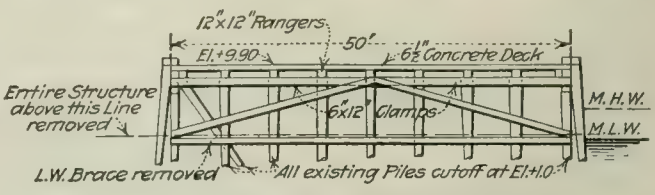
In adopting the jib cranes, it was decided to use the semi-portal type and provide an uncovered roadway on the outside of the freight house in order to keep trucking in general outside of the freight house proper and to provide areas of deposit for miscellaneous cargo as deposited by cranes on the pier deck from the hold of the barge.

Special Boom Cranes Devised

In spite of the preference for the above type of crane, it was quickly evident that with a pier of 85-ft. width, it would not be possible to use cranes of that type on both sides of the pier and still have a freight house of any considerable capacity. A decision was reached to use the jib crane and roadway on the west side of the pier and to build a freight house 50 ft. wide, bringing the east side of the building fairly close to the east side of the pier. In conjunction with a well known firm manufacturing special freight-handling machinery, a type of crane was designed to meet the conditions on the east side of the pier. This special crane consists of a boom projecting over the barge and through the doors into the freight house a short distance. The general specifications of this crane will be given later.

A decision was also reached in favor of using either industrial electric tractors and trailers or load-carrying electric trucks for distributing and assembling cargo in the freight house rather than to install an interior telpherage system.

In rebuilding the substructure of the pier, the old structure was substantially removed down to a point 1 ft. above mean low water, at which point the old foundation piles were capped and replaced with vertical posts. The old piles were entirely sound below the above point of cut-off, making it possible to utilize them



SECTION THROUGH OLD PIER 6 BEFORE RECONSTRUCTION

for the foundation of the new structure. To get the required new width of pier, the existing pile bents were extended 11 ft. on the east side and 24 ft. on the west side. Footings of concrete for shed columns were constructed in alternate pile bents in conformity with the requirements of the pier superstructure. The general pile bent spacing is 10 ft. The deck load is carried to these pile bents by 12 x 12 in. rangers or stringers spaced 6 ft. c. to c. The deck of the pier is a reinforced-concrete slab 6½ in. thick laid directly over the rangers. It is designed to carry a live-load of 500 lb. per sq. ft. A substantial timber fender system surrounds the pier.

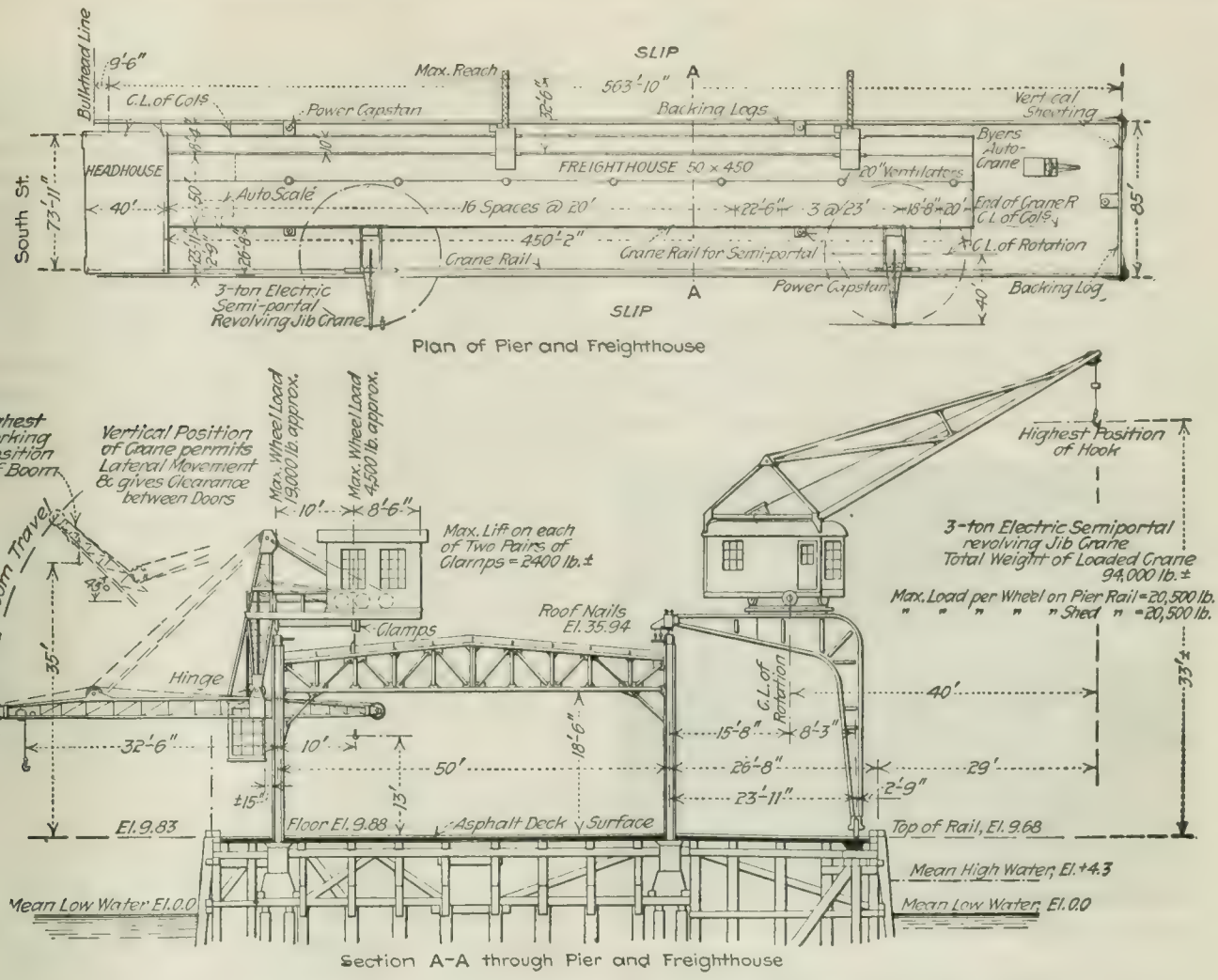
Treated Timber in Wet and Dry Section

Timber used in those parts of the pier subjected to a condition of alternate wetting and drying was treated with wood preservative. The treatment prescribed required that the dressed timber be immersed for twenty minutes in a hot tank followed by a twenty-minute immersion in a cold tank.

The concrete footings were precast units which were seasoned for 30 days before they were deposited on their grillage foundations in the sea water. It has been found that concrete precast and seasoned sufficiently may be relied on not to deteriorate when placed in contact with sea water. A crane rail girder for carrying the outboard wheel loads of the semi-portal cranes was cast into the deck near the west side. This girder is a built-up steel section having a depth of 15 in. and is supported at 10 ft. intervals on special 3-pile footings built into the regular pile bents.

The work of rebuilding and extending Pier 6 was delayed on account of war conditions prevailing. Although the work was started in October, 1916, it was not completed until the spring of 1918. The contractors were Kaufman Garcey of New York City. The contract price was $102,553.75, but under the provisions of Chapter 585, Laws of 1918, the contractor was allowed payment on a basis of the actual and necessary cost for work done after April 6, 1917, the date of the declaration of war with Germany. Under the provisions of this law, the total cost to the state of this work amounted to approximately $130,000.

The freight house proper is 50 ft. wide. In general, the columns and roof trusses are spaced 20 ft. centers with the under side of the trusses providing for a clearance of 18 ft. 6 in. except at kneebraces. On the west side of the building, the crane rail for the inshore end of the half gantry is carried on top of the building columns extended. On the east side, there is a similar



DETAILS OF STRUCTURE AND FREIGHT-HANDLING EQUIPMENT OF NEW YORK STATE BARGE CANAL TERMINAL IN NEW YORK CITY

crane rail on the columns with a parallel one 10 ft. inward and supported on the roof trusses. The latter two girders carry the special conveyor crane previously mentioned. Warehouse doors have been placed in alternate bents between columns on either side. On the west side, the clear openings are 18 ft. wide and 16 ft. high, and on the east side 18 ft. wide and 18 ft. high. The latter are higher than those on the other side to get more clearance for the conveyor cranes. The doors are two-section lift doors of the link suspension type that travel so as to allow the use of the maximum storage space within the freight house. The freight-house roof is a built-up five-ply pitch, felt and slag covering on wood. The roof is drained into substantial outstanding gutters, thence through vertical leaders to a discharge under the pier. The freight house is lighted through continuous wire-glass windows on either side adjacent to the longitudinal bracing trusses between bents.

The headhouse or office section of the freight house was built over the four inshore pile bents and the bulkhead wall, giving a depth of about 40 ft. with a width of 74 ft., leaving two narrow passageways on either side along the fender systems. The headhouse was laid out with offices for the operating force on the first floor and administrative offices on the second floor. In arriving at the proper area of office space for a pier shed of the size to be built, this department had no original data on which to base the design. An investigation showed that on six railroad piers selected, there was an average office area equal to 8% of the pier-shed area, while on 12 steamship piers there was an average area of 7%. It was found that, in general, insufficient office space had been provided. Giving due consideration to the above, and also to the anticipated special requirements of a barge terminal, it was decided to provide office space equal to about 10% of the total freight-house area. The architectural appearance of the headhouse, on which considerable care was taken, is indicated in the views herewith.

The interior of freight house, driveways, etc., has been paved with sheet asphalt.

The water-supply system provides for fire service on the pier through a 6-in. wrought-iron pipe main running from the street main to the outshore end. In the freight house proper the pipe is carried in a truss panel on the easterly side. At four different points, 3-in. branches are run down for hose connections. In accordance with local regulations, provision is made at the outshore end for connection with fire tugs and at the inshore end along the street, provision is made for fire-hose connection. The latter provisions provide an auxiliary salt-water supply not only for the pier but for nearby buildings as well.

The plumbing system as installed provides complete equipment for a building of this character. Washrooms with necessary equipment have been built on the second

floor. Similar provision for stevedores is made at the outshore end of the freight house proper.

The water-supply system for fire protection is measured by a 6-in. detector meter while that for the plumbing service is measured by a 1½-in. disk meter.

Provision has been made for heating all offices, checker's rooms, halls, washrooms and battery room. A system for steam heating was installed. The radiators on the first floor are hung from the ceiling, while those on the second floor are of the standard type resting directly on the floor.

The electrical installation includes a lighting system, a power distribution system and a battery-charging system. The lighting system provides for the illumination of the offices, freight house and pier; the power-distributing system provides for the operation of freight-



INTERIOR OF PIER 6, EAST RIVER, NEW YORK CITY

handling equipment; the battery-charging system provides for the charging of storage batteries for electric tractors and load-carrying trucks.

Power for the above system is obtained from a local power company. It is a direct-current, three-wire system, 120-240 volts. In the battery room previously mentioned, the necessary switchboard is located. This room in addition contains two balancer sets for battery-charging work, a one-ton electric overhead trolley hoist for handling batteries, and a set of battery-charging outlets. The switchboard has seven panels, one for the incoming line and meters, one for the power circuits, two panels for control of the balancer sets and two panels for battery charging and one panel for battery overcharging.

The illumination of offices is by semi-indirect fixtures. There are numerous plug outlets for desk lights and fans. In the freight house are two rows of lights on 20-ft. centers, and outside the building there are lights over each warehouse door. The interior lights are 200-watt Mazda lamps in enameled steel deep-bowl hoods, while the outside ones are of a similar type but with elliptical angle reflectors and 150-watt lamps.

From the power switchboard panel, mains are carried to the roof on each side of the freight house where they are connected to trolley wires running on both sides along the entire length of the building to serve the semi-portal and conveyor cranes. Other mains carry power to five capstans, to 21 safety type cut-outs and power plug receptacles for use in operating portable conveyors and tiering machines. The principal remaining power line runs to Pier 5 for use there for electric hoists, etc.

The battery-charging installation includes the two balancer sets provided, in order that whatever number of batteries are being charged, the system will not be out of balance to exceed the charging current of one battery. From each section of the battery-charging panel, cables are run to plug outlets, both in the battery room and in the freight house, so that batteries may be charged at either place. In the battery room, a heavy battery bench and a ½-ton-capacity overhead electric trolley hoist are provided so that batteries may be readily removed from tractors for repairs.

As previously mentioned, the principal equipment provided are cranes for loading and unloading the barges. As an initial installation, contracts have been awarded for two semi-portal revolving jib cranes to be erected on the east side of the pier and for two special conveyor cranes for the west side.

The semi-portal cranes have a 6000-lb. capacity, a hoisting speed of 120 ft. per min., a slewing speed of one and a half revolutions per minute and a traveling speed of 150 ft. per min. The crane operator will have a clear and unobstructed view of the load during all movements and his control is such that he can secure any particular movement or combination of movements at will. The crane has an effective outboard reach of 28 ft. The special conveyor cranes have a 3000-lb. capacity. These cranes have a main truck traveling on two rails with 10-ft. centers on the roof of the freight house. From the truck an overhanging member supports a boom with a conveyor. The boom extends over the barge and inside the freight house through the doorways. It has a clear outboard reach of 23 ft. and it is pivoted so that it may be raised to a nearly vertical position to clear the doorways and also to clear a ship's rigging. This crane is operated by four electric motors. With a load of 3000 lb. on the hook, hoisting is accomplished at a speed of 125 ft. per min., trolley travel at 125 ft. per min., boom hoist in a complete movement in one minute and traveling at a rate of 200 ft. per min. Additional cranes will be installed as business demands.

It is proposed to use tractors and trailers, and possibly load-carrying trucks also, in moving freight unloaded by the cranes from the barges to the freight house for storage and vice versa. A number of trailers have been secured. They are of a well-known make, have strong frames, with casters having roller bearings, and have semi-automatic couplers. Tractors or load-carrying trucks have not been secured as yet.

In addition to the above, one tiering machine and one portable conveyor for unloading between pier and barge have been secured. These two machines are of the endless chain and wooden slat type, driven by electric motors. There have also been installed five electric capstans, each having a capacity of 8000 lb. on a single line, at a speed of 40 ft. per minute. These capstans are intended for moving boats and other work for which they are adapted.

A 20-ton auto truck scale has been installed in the freight house proper near the street entrance.

The site as obtained from the city had slips with depths of water varying from 5 to 20 ft. Under a dredging contract, the slips have been deepened to give a minimum depth of 14 ft. at mean low water.

The freight house proper was erected by I. J. Stander & Co., Inc., of New York City, at a contract price of $128,250. The asphalt pavement was placed by the Sicilian Asphalt Co. at a contract price of $11,225. The water-supply system and plumbing were installed by Jarcho Bros., Inc., of New York City, at a contract price of $6650. The heating system was installed by Miller & Brady, Inc., of New York City, at a contract price of $2352. The electrical installation and the auto-truck scale were put in by the Lord Electric Co., of New York City, at a contract price of $16,000. A contract for the delivery of two semi-portal cranes has been let to the Edward F. Terry Mfg. Co., of New York City, at a contract price of $41,081. Delivery is pending on these cranes. Two special conveyor cranes have been purchased from Manning, Maxwell & Moore, of New York City, for approximately $24,000. These special cranes are under erection. Under a contract with the Lansing Co., of New York City, 50 industrial trailers and 50 industrial hand trucks are to be delivered. The cost of the trailers and trucks will be $4400. The portable barge unloader and stacking machine were furnished by the Brown Portable Conveying Machinery Co., of Chicago, at a cost of $5626. The five electric capstans and trolley hoist were furnished under a contract with the General Electric Co., of New York City, at a cost of $7805. The dredging of the slips was done by the New Jersey Shipbuilding & Dredging Co., of Bayonne, N. J., at a contract price of $13,035.

The cost of the freight house and all equipment so far provided for Pier 6 amounts to approximately $250,000. Adding to the above the cost of reconstructing the pier substructure, the total amounts to $380,000.

The total cost to the state for the entire terminal, including the cost of the acquisition of the site, improvements and equipments at Piers 5 and 6, and dredging, amounts to $625,000.

The design and supervision of construction of this work has been under the State Engineer. Senior Assistant Engineer Anderberg being in general charge of terminal construction in New York City, and Assistant Engineer Ely Gamse in direct personal charge of the work on Pier 6. After the construction had been completed and the equipment placed, the piers were turned over to the State Department of Public Works for operation.

Concluding a series of interviews with contractors:

Construction Labor's Instability

An Analysis—

V—In which F. J. MacIsaac, of Smith, Hauser & MacIsaac, New York City, and past-president of the General Contractors' Association, blames the administration for an infirm labor policy, reviews preceding recommendations for stabilizing labor, and insists that Americanization education be a fundamental of restrictive immigration legislation.

AN ADMINISTRATION supported in its treatment of industrial questions by academic theorists and predisposed, if not foresworn, to champion the various demands of organized labor, early in its incumbency planted the mustard seed of the present industrial and social turmoil, believes F. J. MacIsaac, member of the firm of Smith, Hauser & MacIsaac, New York City and past-president of the General Contractors' Association. And not until a firmer hand is laid upon the throttle controlling social and industrial life can the country expect anything but abnormality in these matters.

A survey of the administration's acts, Mr. MacIsaac believes, will bear out his judgment that the administration possesses this inclination, and reasons for such a belief he holds to be too self-evident to need either explanation or elaboration.

Since such industrial disorder does exist and since the question is one not for prophylactic treatment, but for therapeutic attention, he makes his diagnosis and finds industrial and social America suffering from a peculiar complication of ailments.

The first point is that industrial America is underfed; that is, the workmen to man its industrial plants and to do its construction work are inadequate in number to the needs of a healthy, growing nation.

As a partial relief for this disorder, immigration is proposed. However, Mr. MacIsaac is not certain that such a remedy should at this time be applied, because of the danger involved in further affecting the health of the patient with the poison of radicalism. Admitting that the shortage of labor is America's present constitutional difficulty, he turns to a consideration of other remedies. He finds that America's blood pressure is abnormal because of the universality of strikes, riots and general social discontent. This ailment is traceable to the first failure of the administration to cope with the labor situation, and has been aggravated by the shortage of labor. Until different administrative methods are applied, then, and until something be done to overcome the constitutional disorder, there is little help offered the patient in correction of this trouble.

Some good has been done, Mr. MacIsaac believes, in the making of wage contracts between employers' associations and those representing the several building trades, such as the contracts entered into recently in Chicago and New York. However, he does not believe that such contracts will be binding under certain circumstances. He maintains that the law of supply and demand is the supreme power affecting construction and labor, and will operate as truly in construction work as in the regulation of the price of any household commodity. For instance, should legislation be passed whereby railroads, upon their return to private management, would be able to expend considerable amounts on road betterment, all common labor would easily be absorbed by them, paralyzing general construction work.

Then, again, if architects, builders and investors as-

sume that the signing of contracts between the Building Trades Employers' Association and the Building Trades Council of New York City guarantees stability in wages and hours of employment, Mr. MacIsaac predicts the greatest building boom that New York City has ever seen. Inasmuch as the general building program is several years behind schedule, the sudden stability given wages, hours of employment, and the general labor situation, would result in the almost immediate release of extensive capital, particularly that for housing propositions.

In either case—if the railroads suddenly began extensive betterment programs, or if the general building industry were suddenly stabilized—contractors would immediately begin bidding against one another for the available supply of labor. In this competitive bidding contractors most capable of offering attractive wages, wages in excess of those named in existing contracts, would secure the services of such labor. It is Mr. MacIsaac's statement that in Chicago now, only a few months after the signing by building trades employers and unions representing them of a three-year contract naming fixed wages and hours of employment, contractors have paid, for some classes of labor, from 10 to 25c an hour more than the scale specified in that contract. He also asserts that this bidding among contractors for labor exists in New York even now, though the condition is not so serious at the present time as it threatens to be.

Mr. MacIsaac ventures the opinion that it might be well to wait a time for the enactment of even restrictive immigration legislation. He admits the crying necessity for immigration sooner or later, but whether it be the most expedient course to foster immediate restrictive legislation he is not ready to say. When that legislation becomes absolutely necessary, through a revival of railroad construction or through reconstruction, an intense impetus being given to all general and special construction, or through the absorption of available common labor by growing industry, he insists upon one thing—that education in American laws, customs, ideals and principles be a compulsory precedent to immigrants being accepted as prospective American citizens. He believes it would also be well to secure from each immigrant, upon his being landed at an American port, his declaration that he intended becoming a citizen of this country. Five years would be allowed for the immigrant to carry out his contract and if bad faith were then discovered or suspected Mr. MacIsaac would ship the immigrant back to his former home.

In the matter of restrictive immigration legislation, Mr. MacIsaac says: "Let history be our guide in choosing the class of immigrants. Scandinavia has furnished us with the most reliable class of immigrants outside of the English-speaking populations."

A certain amount of the present labor unrest, Mr. MacIsaac believes, is due to the fact that immigrants, landed upon American soil, their passports examined and themselves passed by immigration officers, are then entirely lost sight of by the Federal Government. Many of these immigrants come from socially and politically oppressed countries and mistrust all physical evidences of law and government. He firmly believes that a large percentage of immigrants are potentially excellent citizens, but their education and training are neglected, and the Government they have heard of as the benign protector cares little where they go or what they do after passports have been surrendered. Should the American Government undertake to educate the foreigner, upon arrival here, in the principles and ideals underlying the American governmental system, Mr. MacIsaac promises immediate results.

Recognizing, then, that the constitutional disorder from which America is suffering—viewed from the perspective of the contractor—is improper nourishment, there appears but one sensible cure: Wholesome food and plenty of it. But Mr. MacIsaac advises against America being allowed to gorge with no regard to the quality of the food. Rather he advises the establishment of a dietetic bureau for the careful examination of the nutritive values of all food proposed to return labor-hungry America to a healthy, normal being.

"And whatever bureaus for the control of immigration be established," said Mr. MacIsaac, in conclusion, "let them be properly officered, not by schoolmasters and theorists, but by practical employers and hard-headed business men."

Report on 1918 Rail Failures

Continued improvement in rail performance is made evident by the rail-failure statistics for 1918 collected by the rail committee of the American Railway Engineering Association and published in a recently issued bulletin of the association. M. H. Wickhorst, engineer of tests for the committee, summarizes the five-year performance of successive yearly rollings of rails, from service records compiled down to November, 1918, as follows:

Rail rolled in 1908 (service, from 1908 to 1913), 398.1 failures per 100 track-miles; rail rolled in 1909, 277.8; rail rolled in 1910, 198.5; rail rolled in 1911, 176.3; rail rolled in 1912, 107.1; rail rolled in 1913 (five years' service ending with Nov. 1, 1918), 91.9. The improvement shown by these figures is very closely in accord with a projected curve of hoped-for rail improvement, drawn up by Mr. Wickhorst several years ago, according to which rail failures per unit of service and per unit of track length would decrease continuously, though less rapidly as time goes on.

Bessemer rails continue to show a larger number of failures per unit of track than open-hearth rails, the ratio (for five years' service of 1913 rail) being 1.19 to 1.0. Since Bessemer rails in general were in less severe service than open-hearth, the actual difference in quality is considered to be even greater than this ratio indicates.

One important conclusion drawn by Mr. Wickhorst from the statistics is that the rollings of rails subsequent to 1914 are lower in quality than earlier rollings. As an example of the records, 1916 rails in two years' service totaled about 50% more failures than did 1914 rails during their first two years (29.2 failures per 100 track-miles, as against 19.8). The most pronounced irregularities are shown by the short-time service records of 1916 and 1917 rails; thus, 1917 rails in approximately one year of service averaged 21.6 failures per 100 track-miles, whereas 1914 rails during their first year of service showed only 8.2 failures.

Chicopee, Mass., Steel Standpipe Subject of Suit

Engineer Who Criticized Design Sued by Builder. As a Result All Information Withheld on Record Structure

IN CHICOPEE, Mass., a city of about 30,000 adjoining Springfield, there is now being built a steel standpipe 50 ft. in diameter and 130 ft. high, one of the largest structures of its type in the world. With the exception of a number of gas-holder tanks, in which special design problems enter, and of the recently completed Los Angeles standpipe with its 150 ft. diameter and 51 ft. height, the Chicopee structure has the highest shell tension at the base of any water-holding tank or standpipe on record. This fact alone would make it worthy of record, but it has attained some notoriety because of a lawsuit, unique in the history of engineering, in which the builder is suing an outside engineer for "malicious injury of business" on account of his making an adverse report on the design. Overawed by the possibilities of this suit, the city authorities profess to know little about the design, and the builder refuses absolutely to give any information on either design or construction. The structure itself is so far along toward completion that it would be difficult to make measurements of its integral parts, even were the builder not decidedly opposed to anyone attempting to make a personal examination.

In consequence, there is being built in Chicopee alongside the existing standpipe and on a watershed which includes several homes nearby, a 2,000,000-gal. tank, which, on the face of such information as can be obtained, is bolder than conservative practice permits, and one in the design of which it does not appear that any competent engineer outside the builder's employ has ever been concerned. Furthermore, the original design has been severely criticized by several outside engineers. Possibly the structure as built has been improved over that original design, but if it has no one outside of those immediately concerned knows of it. In other words, a public structure involving public safety and public money is being built practically in secret, and under conditions that make its adequacy doubtful.

Standpipe Perhaps Largest on Record

Some time ago the water department of Chicopee decided that it should have additional supply in a standpipe alongside of the existing standpipe on Keating Hill at Chicopee Falls. It accordingly established the size as 50 ft. in diameter by 130 ft. in height, and asked for bids on a steel standpipe of these dimensions. The lowest bid, accompanied by elementary drawings of a standpipe of this size, was submitted by Walsh's Holyoke Steam Boiler Works of Holyoke, Mass. About this time a Springfield engineer, H. B. Andrews of the firm of Andrews, Tower and LaValle, came into the case. Mr. Andrews has specialized in reinforced-concrete standpipes, and called on the superintendent of water-works of Chicopee with the intention of discussing the possibility of a concrete standpipe for the city. As soon as he learned the dimensions, however, he told the superintendent that he could not guarantee the water-tightness of a concrete standpipe of this size. At the same time, he asked to see the design of the steel tank submitted by the low bidder. The superintendent then showed him "a plan, not complete in detail, showing a perspective view, thickness of plates and detail of foundation without details of riveting."

According to his statement, he was sufficiently interested to calculate the working stresses in the lower circular plates of the design, and "found that there was a considerable deficiency in strength in accepted engineering practice." He later took the matter of the design up with the mayor, and he states that the mayor was sufficiently concerned about the matter to ask Andrews to submit a report. This report was accordingly transmitted to the mayor under date of June 30, 1919, and contains a number of criticisms of the design which will be discussed hereinafter. Mr. Andrews did not hear from the mayor, but later found that there were political controversies in the city which seemed to preclude the possibility of getting very far in the matter, and that the board of aldermen apparently were prepared to award the contract to the lowest bidder. Later Mr. Andrews discussed the situation with some of the local manufacturers who, according to Mr. Andrews, verified the main contentions of his criticism.

Criticisms Repeated in Letter

Nothing further was done in the matter by Mr. Andrews until Sept. 5, when he sent another letter to the mayor reiterating his previous criticisms of the standpipe. Meanwhile, some time between June 30 and Sept. 5, the contract for the standpipe was awarded to Walsh's Holyoke Steam Boiler Works for $66,000, and they thereupon guaranteed to the city its safety for a year after completion. They also furnished a general riveting diagram and specifications, which among other things supplemented the riveting diagram. These specifications are now not available. The Walsh company refuses to permit them to be seen; the City of Chicopee is apparently unable to locate them or at least is unwilling to show them.

Meanwhile, in the Springfield *Union* of Sept. 6 there appeared the text of both Andrews' report and letter, together with some additional statements by him. Soon after the publication of this article the Walsh company sued Andrews and his firm for malicious injury of their business, libel and slander.

What was the nature of the report on which this unique suit was brought? It outlines the theory of standpipe design. It shows that for standpipe of the dimensions at Chicopee the maximum bottom-shell tension is 203,125 lb. per ft. of height. It computes the wind pressure on the pipe but not the unit effect on the structure, but suggests that stability against collapse or overturning should be looked into. It refers to a paper by C. W. Birch-Nord, in the *Transactions* of the American Society of Civil Engineers, Vol. 54, 1909, in which "a working stress of 12,000 lb. per sq.in. is recommended, with an efficiency of about 70%, due to riveted joints." It states that this is a working stress "generally adopted," although it quotes from the paper to the effect that the highest shell tension advocated by any engineer of note is 15,000 lb. per sq.in. It states that the bottom shell tension on the $1\frac{3}{16}$-in. plate shown in the elementary drawing shown Andrews by the superintendent of the water-works gives a unit tensile strength of 20,634 lb. per sq.in., according to the standard methods of design, as against 12,000 lb. of "standard practice." It states that according to established theory the thickness of the shell should be slightly

over 2 in. instead of the $1\frac{3}{16}$ in. of the design. It says that the load imposed on the soil is about $4\frac{1}{2}$ tons per sq.ft., whereas the soil at Keating Hill, which is a soft fine sand, would be assumed to support a load of 3 to 4 tons. Therefore "a careful study should be made of the foundation." It suggests the substitution of twin standpipes 35 ft. in diameter and 130 ft. high.

In this same published report Mr. Andrews states that the Fisk Rubber Co. practically verified his report, and that the Boston Manufacturers' Mutual Fire Insurance Co. had its engineers at work examining plans of the standpipe for several days and wrote a letter of condemnation of the design to the superintendent of the Chicopee water-works, in which they went into the details of construction, and showed that in parts of the structure there is a factor of safety of less than 2 as compared with the established practice of using 5 for the factor of safety for this class of work. Further, Mr. Andrews reports that he called the structure to the attention of the chief of state police of Massachusetts, and that the chief, while not giving expert opinion, suggested that the structure was insufficient and that the mayor of Chicopee would be responsible if any damage resulted from the construction.

Text of Letter

The later report to the mayor, dated Sept. 5, read in part as follows:

I understand that work is still being carried on on the standpipe for the City of Chicopee, in spite of the fact that it is of dangerously weak design. (1) In a well-designed standpipe the ordinary factor of safety is 5. (2) In a standpipe of these dimensions larger than ever before built, the factor of safety should be increased rather than decreased. (3) Parts of the standpipe as designed have a factor of safety of less than 2. (4) The molasses tank in Boston failed with a calculated factor of safety when investigated of practically the same. (5) The engineering department of the Boston Manufacturers' Mutual Fire Insurance Co. has worked several days on investigating this design and written a letter to your superintendent of water-works, corroborating my statement. (6) The chief of the Massachusetts District Police has also investigated the strength of the structure. He says that he had no jurisdiction over it, but in his opinion the City of Chicopee, through its mayor, is criminally negligent in allowing work to proceed and would be criminally responsible in case of serious accident in the face of expert engineering advice warning against such probability.

This ended Andrews' connection with the case. Obviously, the situation was one in which the engineering profession would be profoundly interested. An effort was therefore made by *Engineering News-Record* to confirm the various issues, not with the idea of criticizing or condemning anyone connected with the affair but in order to ascertain the truth of the various allegations. This investigation has proved most difficult. Walsh's Holyoke Steam Boiler Co., acting, no doubt, under advice of counsel, has refused to make any statement whatsoever regarding its connection with the structure though it promises full information "when the suit is settled." An officer of the company even went so far as to attempt to prevent a representative of this journal from looking over the structure. The same officer intimated that the suit against Andrews was brought because he was meddling in the case in order to get the design of a concrete standpipe to be substituted for the steel pipe submitted by the Walsh company and further that Andrews had never seen the real drawings of the standpipe.

The present administration of the City of Chicopee was defeated for reëlection early in December and is to be supplanted by a new administration the first of January. The Board of Water Commissioners takes the stand that the case is in litigation and refuses to give any information, but a representative of the paper was allowed to see what drawings were said to be in the city hall. These "drawings" consisted of one small blueprint showing an elevation of the tank with an outlined indication of a stepped foundation. This drawing gave the plate dimensions with a maximum of $1\frac{3}{16}$-in. thickness at the base. It is reported that there was a typical riveting diagram submitted at the same time, but this diagram was not available, nor was it possible to see the specifications which further explained the riveting layout and the kind of metal to be used. It is also reported that there was originally a drawing showing the foundation in some detail, but this drawing could not be found in the offices of the superintendent of water-works.

Inspection of the standpipe itself is not very informing. Visitors are not permitted to go very close and exact measurement of the plates is, of course, impossible. The pipe is fast approaching completion, as the foundation has all been put in and its detail is not, therefore, observable on the ground. An examination of the tank showed, however, that the lower plates are no thicker than the $1\frac{3}{16}$ in. specified in the original drawing, that the lower rings, about 7 ft. high, have butt joints with a double strap, the outside cover plate being about 12 in. wide, with four vertical rows of staggered rivets about $4\frac{1}{2}$ in. outside pitch, the inside cover plate about 20 in., with two extra rows of staggered rivets on each side at the same pitch through cover plate and main plate. The lowest plate is double riveted to the ring angle at the base, and fastened with a single riveted lap joint to the next ring. Nowhere is there available the size or even evidence of the existance of a bottom plate. Field rivets were being placed with compressed-air rivet hammers. These rivets at the bottom ring were $1\frac{1}{4}$ in. in diameter.

Foundations of Special Type

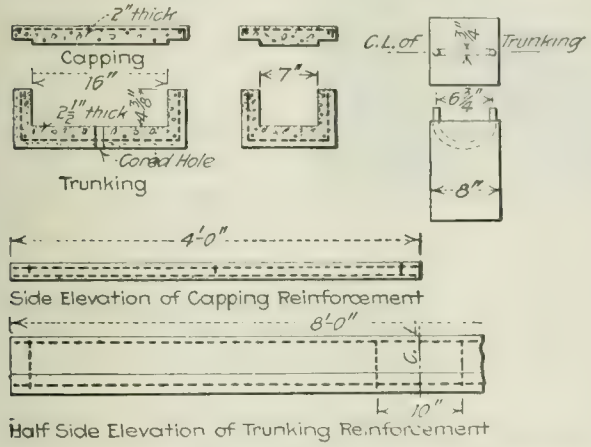
The foundations are reported variously. The original design, it is stated, consisted of a circumferential concrete wall carrying the shell, with a center pedestal and a 15-in. concrete floor spanning the circumferential wall and resting on the center pedestal. In construction it is reported that the whole standpipe is supported on a 2-ft. concrete floor heavily reinforced with rods, and supported, with interposed bracket, on pedestals spaced every 10 or 15 ft. around the circumference (instead of a circumferential wall as designed), and on a center pedestal with a heavy bracket connection. The concrete floor is laid, it is stated, on a heavy puddle fill washed in over the good sand top of the hill, and it is further intended to protect the outside of the foundation as well as that of the existing standpipe, with a concrete paving so as to prevent underwash in case of any overflow of the tank, which is not roofed.

Construction on the standpipe is proceeding normally and it should be soon turned over to the city for acceptance. For a year thereafter the builder is responsible for its safety. After that the city automatically assumes responsibility. Meanwhile Andrews has replied to the Walsh company suit denying all the allegations and the trial is set for some time toward the end of December.

Concrete Conduit for Track Wires: New York Central Railroad

CONCRETE trunking or conduit for electric wires laid above ground along railway tracks has been introduced extensively on the New York Central R. R. during the past few years, owing to the scarcity and high price of the cypress lumber which is used ordinarily. As compared with untreated cypress, the first cost of concrete trunking in place is about three times as great in the smallest sizes, twice as great in medium sizes and equal to that of wood in the larger sizes, according to a statement in a paper presented to the Railway Signal Association by B. A. Lundy, assistant signal engineer of the road. Maintenance expense is eliminated, no painting is required, and there is no periodical renewal in patches, as with wood, while the material can be taken up and relaid with little trouble or damage. Where wires are led across the tracks, concrete trunking has the advantage of eliminating trouble from fire and damage to the wires caused by cinders dropping from the engine.

This trunking consists of shallow rectangular troughs, having flat covers which fit within the sides so as to be adjusted and secured automatically. It is



REINFORCED-CONCRETE CONDUITS FOR ELECTRIC WIRES LAID ALONG RAILWAY TRACKS

made in widths of 2 to 16 in., all sizes above 4 in. being 4⅜ in. deep to allow for a wooden rack which is laid in the bottom to carry the wires. In the smallest sizes this rack is omitted and the depth is only 2½ in. Along the center line of the bottom are cored ½-in. drain holes 4 ft. apart and also pairs of ⅜-in. holes to fit studs which project from the supporting piers. No grouting is used, the trunking being held in place simply by its weight. These piers are spaced 4 ft. on centers except that where trunking is laid in the ballast the piers are placed only at the joints. Horizontal iron handles are fitted along one side of the cover for the larger sizes. The trunks or troughs are made in lengths of 4 ft., 6 ft. and 8 ft., while the capping is in lengths of 2 ft. and 4 ft. to facilitate removal for inspection and repair of the wires.

A concrete mix of 1 : 2 : 2 is used, the coarse aggregate being stone that passes a sieve of ⅜-in. mesh. Reinforcement consisted formerly of wire netting or metal lath, but the plans as revised in September, 1919, provide for ¼-in. twisted rods wired together at all intersections. For convenience the troughs are poured in inverted position, the forms being removed in 48 to 96 hours, according to the temperature. Outlet holes for branch leads are made by wood blocks or cores placed in the side forms. Junctions with lateral lines of wiring are made by cutting away the side of the trough or by cutting out the bottom if the lateral wires pass below the main lead.

Most of the material is made in the field, near the work on which it is to be used, but some has been purchased from manufacturers and shipped as required. For the field work, a gang of seven men with a power mixer produces about 200 ft. of 7-in. trunking per day, the output being limited by the small number of forms used. In present practice no built-up wood forms are required, the trunking being cast on a level floor on which are placed separating strips of 2-in. plank of the proper height and spacing. These are wedged in place, being removed after the concrete has set. This plan has been found to give better results than building forms for the separate pieces.

In weight per foot the trunking ranges from 25½ lb. for the 2-in. size to 63½ lb. for the 16-in., while the capping ranges from 12½ lb. to 41½ lb. respectively. Four men can handle the heavier sections without much difficulty, so that no power appliances are used. It is stated that after a little experience the men can lay the concrete conduit as fast as they can build a timber conduit of the same size. The designs for this concrete trunking were worked out under direction of W. H. Elliott, signal engineer of the road.

Reinforcing in Concrete Pavement

IN DISCUSSING results with reinforcing in concrete pavements, one of those present at a recent meeting of Western engineers made the following comments:

"Reinforcement has been used in many places and has always been a good investment. There is often a clear line of demarcation between that portion which was reinforced and the one which was not so treated. The reinforced section is generally without a longitudinal crack, while the reinforced section adjoining would be shattered in every direction. I am not prepared to state that expansion of adobe has anything to do with it. Rather I should say that it is due to settlement laterally. If water be kept out of adobe by oiling and so making waterproof the shoulders and subgrade and good and deep side drainage is provided, probably much of the trouble may be obviated. A layer of sand on top of the adobe, while often advocated as a cushion, has in some cases permitted water to percolate beneath the pavement and water has so softened and settled the subgrade that the pavement has been quite thoroughly shattered. The proper way is to make the subgrade impervious to moisture.

"Both triangular mesh and bar reinforcing have been used and both have proven satisfactory. The bar placing is undoubtedly the simpler and cheaper method. Since the lateral cracks always appear to be wider at the top surface, undoubtedly the reinforcing should be placed in the upper part of the pavement. Weight for weight, the mesh reinforcing costs not only more per pound but also is more difficult and consequently more costly to place. . . . Rim reinforcing should always be used with artificial expansion joints, or where there is a doubtful subgrade or shoulder material."

Longest Single-Leaf Bascule Bridge: Chicago River

Double-Track, 260-Foot Span Has Unusually Large Trunnions, Cantilever Tower, Pneumatic Buffers and Emergency Brake — Plan to Move Bridge to New Site

A NEW double-track through bridge, 260 ft. between trunnions and end bearings, which carries the St. Charles Air Line across the Chicago River near 16th St. is the longest single-leaf bascule yet built. Three single-leaf double-track bascules rank next to this new structure: The 235-ft. span of the Baltimore & Ohio R. R. over the Calumet River at South Chicago, Ill., the 200-ft. span of the same railroad over the Cuyahoga River at Cleveland, Ohio, and the 200-ft. skew span (with one 206½-ft. truss) of the Great Northern R. R. over the Salmon Bay waterway at Seattle, Wash. Particulars of these and other large drawbridges were noted in *Engineering News-Record* of May 2, 1918, p. 860.



LONGEST SINGLE-LEAF BASCULE BRIDGE SPANS CHICAGO RIVER, SUPERSEDING OLD SWING BRIDGE

The new 260-ft. span at Chicago crosses the river at an angle of 63½° and provides a navigation width of 200 ft. measured at right angles to the channel, while the former 297½-ft. swing bridge was on a skew of about 42° and gave two channels 59 ft. and 55 ft. wide. By changing the railway alignment slightly it was possible to place the new bridge far enough to the north of the old one to avoid interference with the latter during construction and at the same time to obtain a minimum length of span, but the location was governed largely by the track layout on the east side of the river.

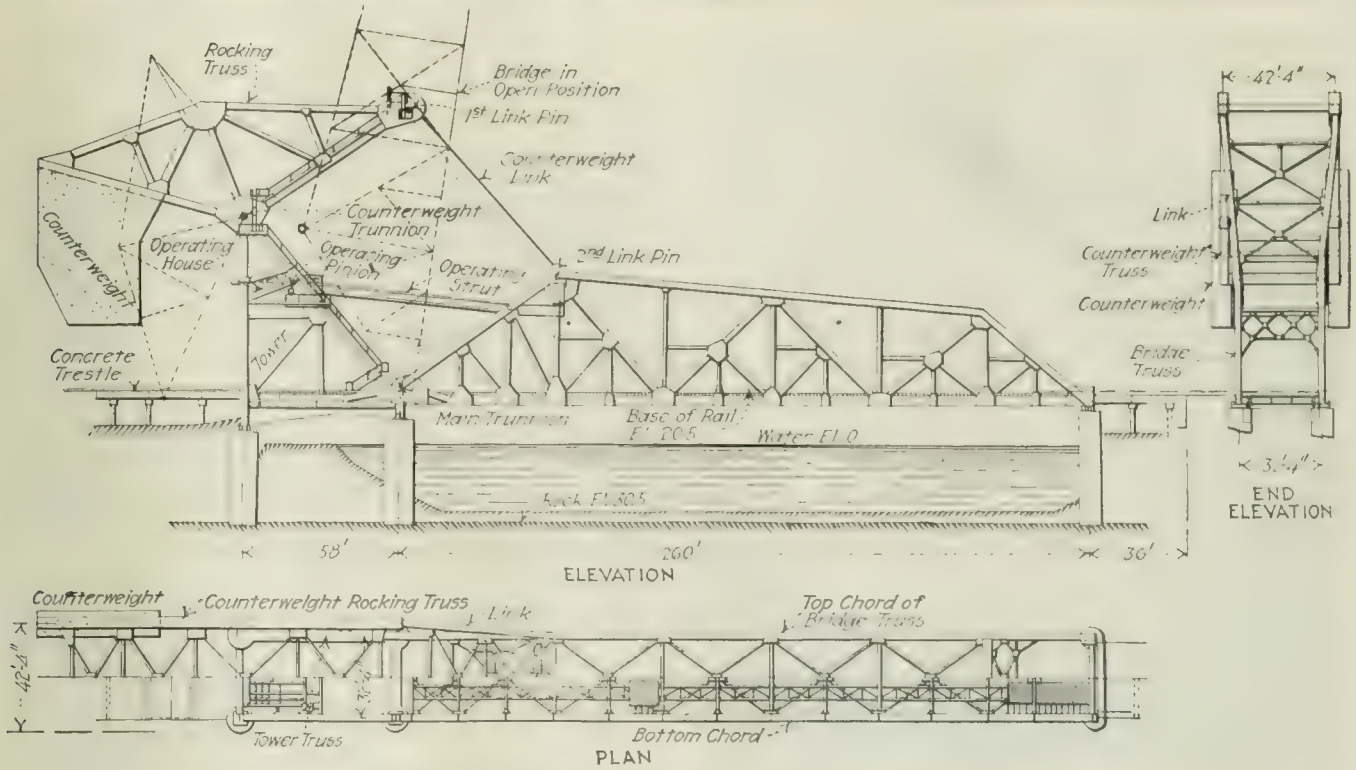
This bascule bridge is of the Strauss type. Its general design is shown in the accompanying drawing. Two Warren trusses having subdivided panels and inclined top chords constitute the main part of the moving leaf, which was designed for Cooper's E60 loading. This leaf revolves upon trunnions at the bottom-chord level. Its counterbalance system consists of a pair of rocking trusses mounted on a tower and carrying concrete counterweights on their rear ends, while to their forward ends are attached links connected to pins at the hip joints of the top chords. The weight of the structural steel is about 1544 tons and that of the machinery is about 166 tons.

Operating struts to raise and lower the bridge are connected to the end posts of the span, the connection being made at an intermediate point on the post instead of at the hip joint, which is the more usual arrangement in bridges of this type. The new plan was adopted in order to permit the use of shorter struts. Racks upon these struts gear with the main operating pinions, which are driven through an equalizer and reduction gears by two 150-hp. alternating-current motors on a 440-volt, 3-phase, 60-cycle circuit. A concrete cabin built into the tower contains the operating machinery and controlling equipment, together with a 60-hp. gasoline engine for emergency drive and an air compressor for the brakes. The bridge can be raised or lowered in 1¾ minutes.

While the structural design of the leaf presents no new features in general arrangement, attention may be drawn to the exceptional size of the members, required by the length of the span and the heavy loading. This may be judged from the fact that the main trunnion pins are 25 in. in diameter and 27 in. long on the bearing area; the counterweight trunnion pins are 46 x 44 in., and the first and second pins of the counterweight links are 20½ x 53 in. and 31 x 27 in. respectively. Phosphor-bronze bushings are provided for both sets of these enormous trunnion pins and the bushings are free to turn in the cast-steel bearings. Double lubrication is thus permitted, lubricating grooves being provided between the bearing and the bushing as well as on the inner surfaces of the bushing which carries the trunnion pin.

An unusual feature in the design of the tower is that the upper part of each side frame is cantilevered outside of the lower part, with a distance of 5 ft. between the vertical planes of the two parts. On these overhanging portions are mounted the bearings for the counterweight trunnions. The object of this arrangement is to place the counterweight truss in the middle of its concrete counterweight block and thus avoid any eccentric loading of these trusses. Deep portal girders in the planes of the vertical and inclined posts of the tower provide for the eccentric load due to the overhung position of the bearings.

Outside or wing counterweights carried on the ends of the rocking trusses are used, being more economical for such a large bridge in that they give a greater leverage than the earlier arrangement of a single counterweight block extending between the ends of the rocking trusses and across the tracks. Each wing counterweight is about 37 x 60 ft. in size, 5 ft. to 5 ft. 7 in. thick, and is made of concrete estimated to weigh 148 lb. per cubic foot, which gives a total of 1770 tons for the two counterweights. Rectangular openings in the outer faces provide for the insertion of blocks to



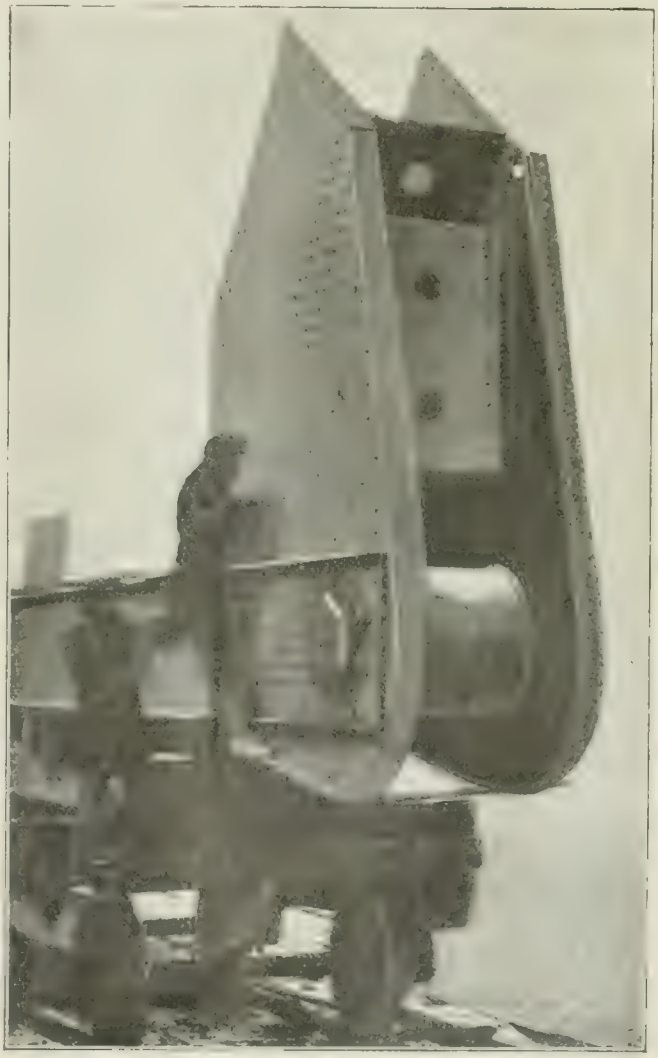
ELEVATION AND PLAN OF 260-FOOT BASCULE BRIDGE

adjust the weight. With the bridge open, the lowest point of each counterweight is about 8 ft. below rail level.

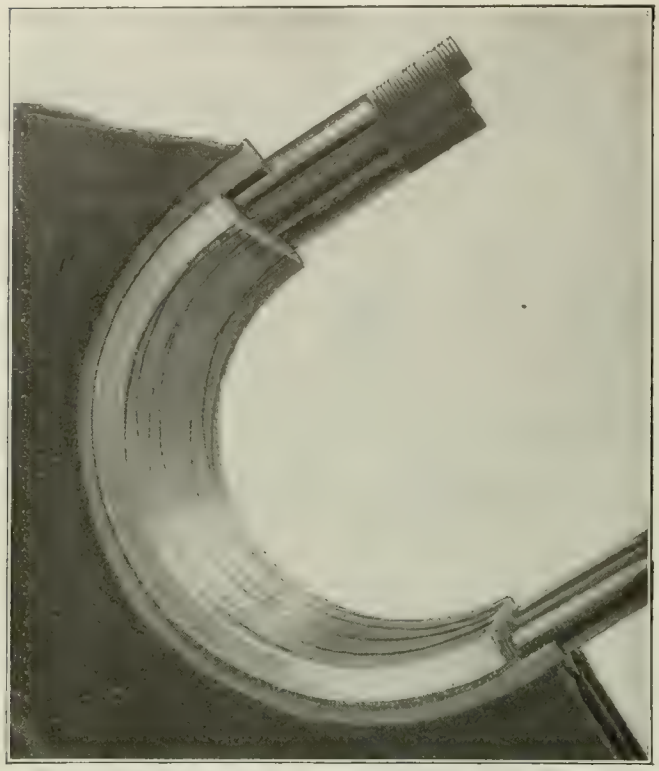
The reasons for using the wing counterweights, which have been used also in some previous bridges of the same type, are as follows: They permit of an increased moment arm, as the size and movement are not limited by railway clearances; they do not obstruct the view of the railway from the operating cabin; they give lower stresses in the counterweight trusses and lower reactions in the counterweight trunnions. Furthermore, when used on bridges erected over existing tracks and on the same center line as the old bridge they avoid interference with traffic which may be involved when the single transverse counterweight block is used.

As the rocking counterweight trusses are 5 ft. outside of the line of the tower frames and main trusses of the bridge, the connecting links are not parallel with either the counterweight trusses, or the bridge trusses, but are spread 32 ft. 4 in. between centers at the bridge end and 42 ft. 4 in. at the counterweight end. These links, 85 ft. 8 in. long, are in direct tension and are braced together by struts and diagonal bracing to take the horizontal or transverse component of the link stress due to the 10-ft. difference in spacing at the opposite ends. Thus there is no eccentric loading on the counterweight trunnions, all eccentricity being taken up in the link connections.

Air buffers are used on the operating struts, on account of the great size of the bridge, these being in addition to the oak bumping blocks ordinarily used and coming into play when the span is raised to an angle of 82½° (the full opening being 83°). Near the bridge end of the top of each strut is a 15 x 23½-in. cylinder, having a piston with rod 6 ft. 3 in. long moving in a guide casting. This rod is held normally at the outer end of its stroke by a group of coiled springs having one end attached to the piston and

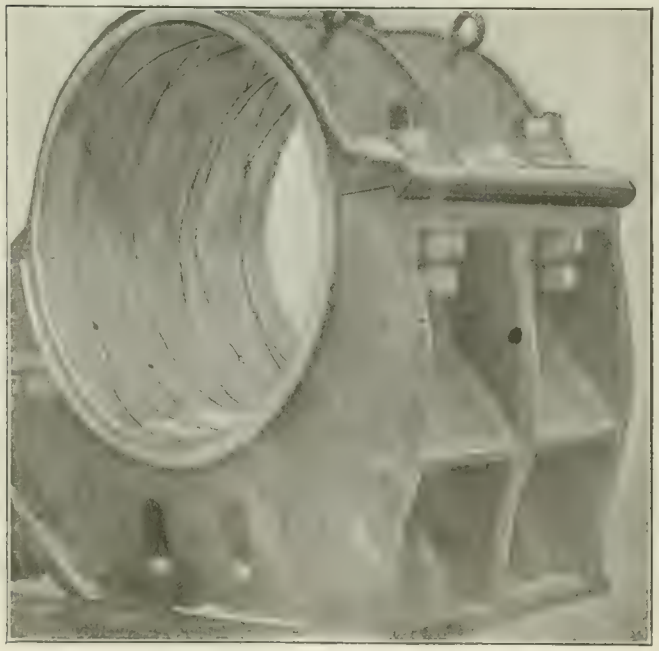


MAIN TRUNNION IN BOTTOM CHORD

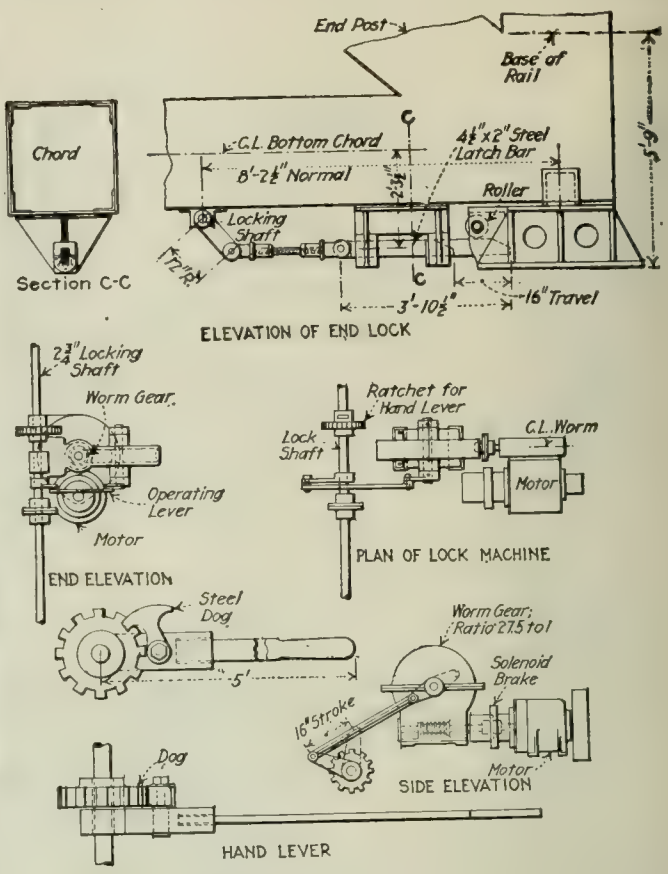


MAIN TRUNNION BEARING

the other end to the casting. When the bridge nears the limit of its opening the ends of the rods engage a short I-beam bumping girder secured to the inclined post of the counterweight tower. Further movement of the bridge then drives back the piston, compressing the air, which escapes through adjustable valves, thus gradually arresting movement after the power has been cut off and motor brakes applied. A similar air buffer under the front end of the leaf comes into play when the bridge closes, the piston rod engaging the bridge seats on the rest pier. The application of the air buffers to check the opening movement is new, but



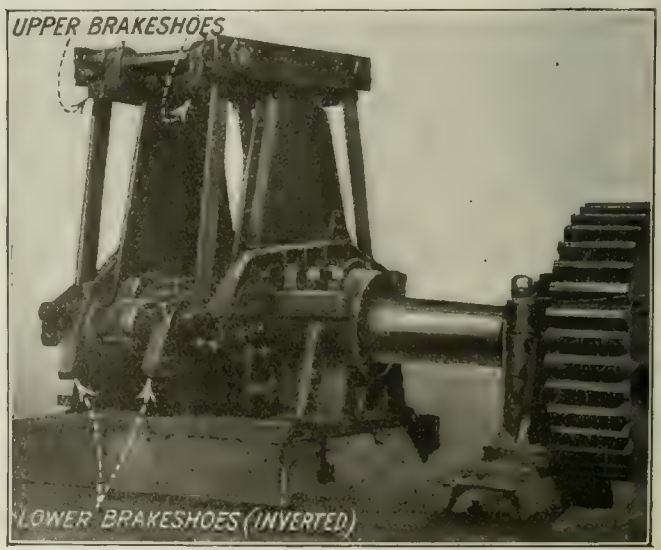
COUNTERWEIGHT TRUNNION BEARING



END LOCK WITH MOTOR DRIVE AND EMERGENCY RATCHET

several bridges of this type have air buffers to check the closing movement.

Latch bars moving in guides beneath the bottom chords of the trusses form the end locks, these bars engaging sockets in the shoes on the rest pier. The rear end of each bar is attached to a lever arm on a transverse locking shaft, which shaft is operated by a motor-driven worm gear with a connecting rod extending from the worm-wheel shaft to an arm on the locking shaft. For emergency operation the shaft has a ratchet wheel and arm, the latter carrying a pawl or dog and having a socket for a hand lever. No rail locks and rail lifts are used, but the rails have square joints



PNEUMATIC BRAKE FOR OPERATING STRUT

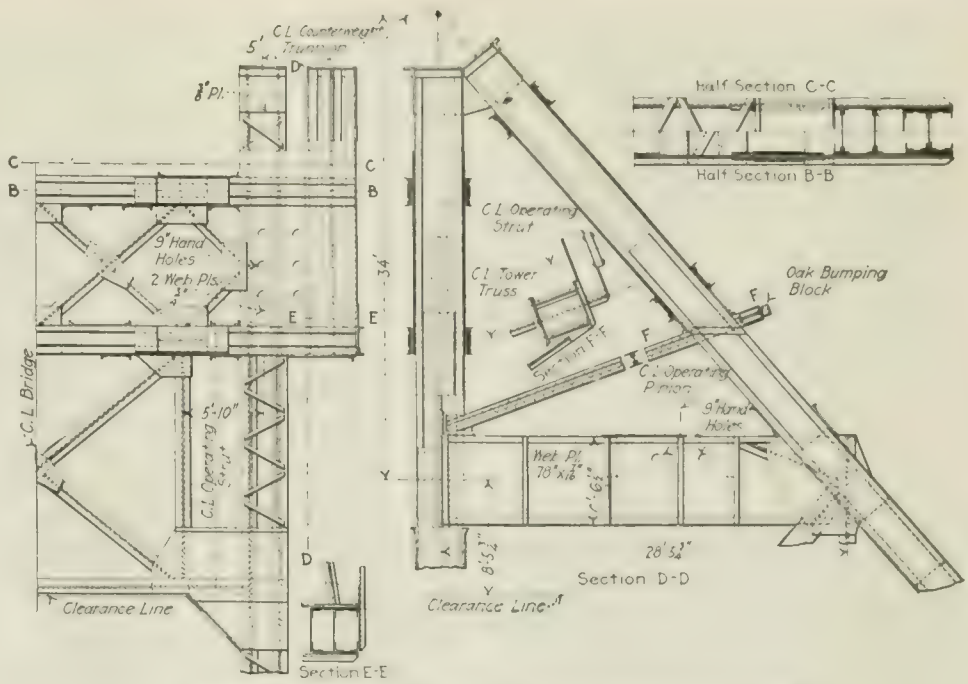
with connecting yokes as in many bridges of this type.

An emergency brake on each operating strut, controlled from the cabin, is a novel feature. This is operated by compressed-air cylinders in line with the strut and secured to flanges on the bottom of the strut guide. The pistons are connected by means of connecting levers and eccentrics to eight brake shoes—four each for the top and bottom flanges of the strut. The upper shoes show in approximately correct position in the last illustration on p. 1058, but the lower shoes are hanging with their contact surfaces downward; in position on the bridge they are reversed so as to bear on the bottom flanges of the strut.

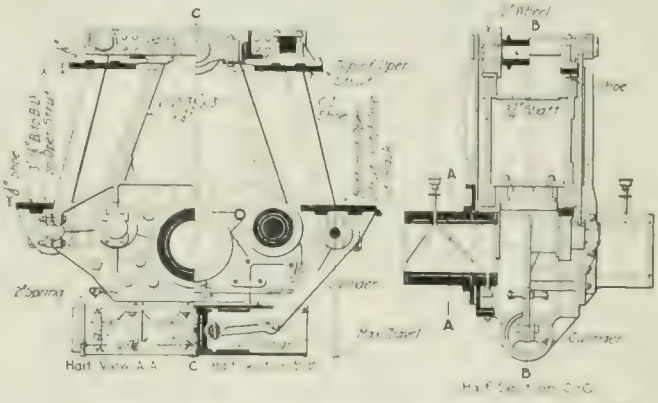
These emergency brakes are for use when the ordinary motor brakes are insufficient in case of accident to the operating machinery or other emergency. They serve also as a positive lock for the bridge in any position, irrespective of the bridge operating machinery. They relieve this machinery from the stress due to the shock of applying emergency braking force on an intermediate shaft, which method was employed before this air brake was developed. Thus the operation is not dependent upon the gears and shafts between them and the operating pinion and rack. Nor are they dependent upon the rack and pinion teeth, being applied directly to the structural flanges of the operating struts.

Timber falsework was used in the erection, constituting a new departure for bridges of this kind. As the bridge is on a new location near the old swing bridge, the work involved no interference with railway traffic, but the almost universal practice of erecting the leaf in the open position was followed to avoid interference with river traffic.

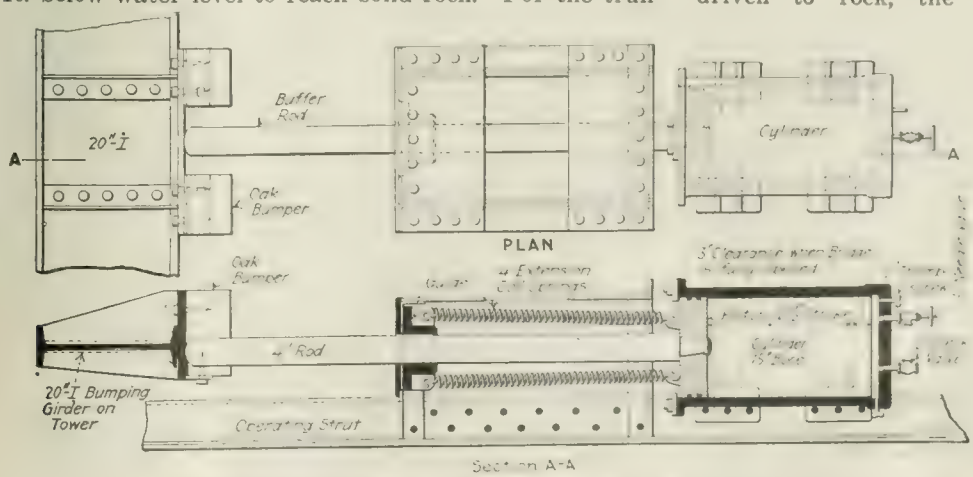
Concrete cylinder piers form the main part of the substructure as in many of the Chicago River bridges, but the cylinders had to be carried down only about 30 ft. below water level to reach solid rock. For the trunnion end of the bridge there are two pairs of 11½-ft. cylinders connected by traverse and longitudinal concrete girders. Here the rock was covered with only about 5 ft. of soft clay and a double wall timber crib was floated and sunk in place, being then pumped out to about 15 ft. Inside of this steel sheet piling was driven to rock, the piles being driven around a circular form and concrete being deposited directly against them. After the concrete had set the piles were withdrawn, but the timber crib remains in place as a fender protection for the piers. The rest pier, at the free end of the span, consists of two 8-ft. cylinders and a concrete cross-girder. At each end of the bridge is a short concrete trestle approach consisting of pile bents and caps about 14 ft. between centers, supporting a floor built up of precast concrete slabs.



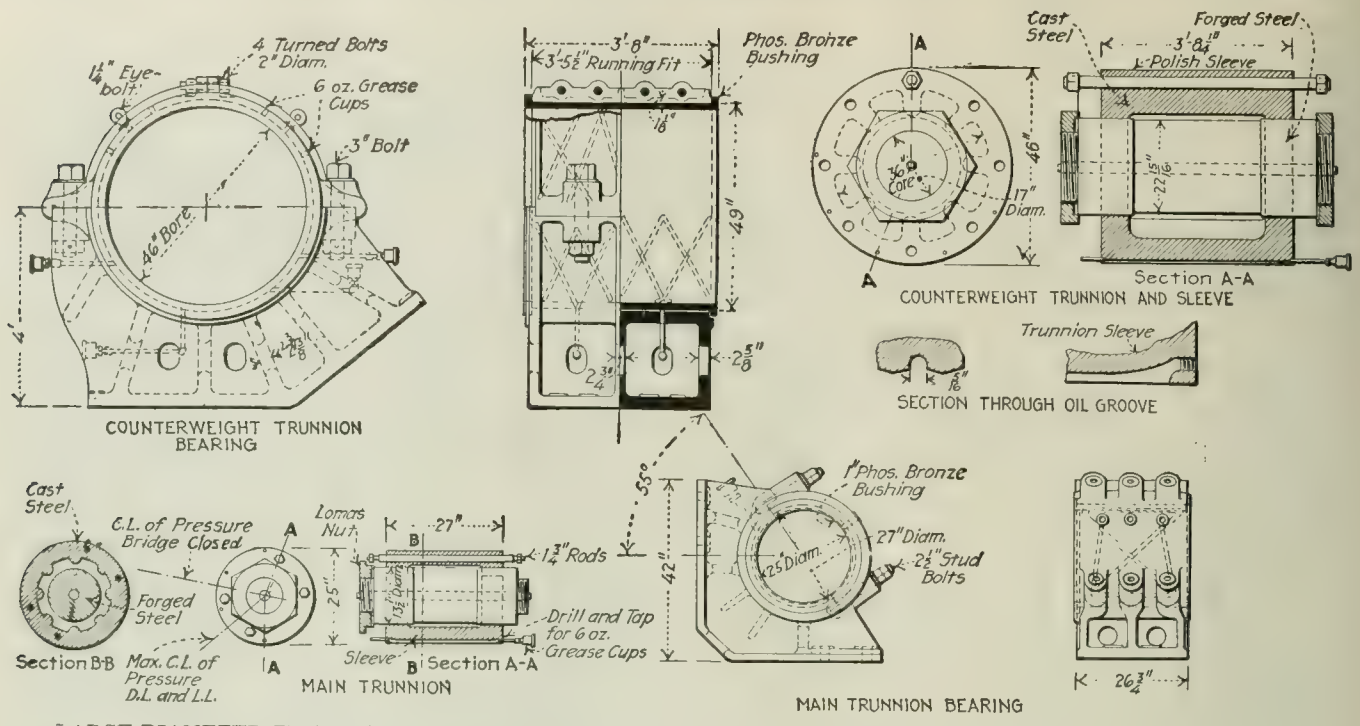
TOWER HAS CANTILEVER SUPPORT FOR COUNTERWEIGHT TRUNNION BEARINGS



PNEUMATIC BRAKE (SEE VIEW ON P. 1058)

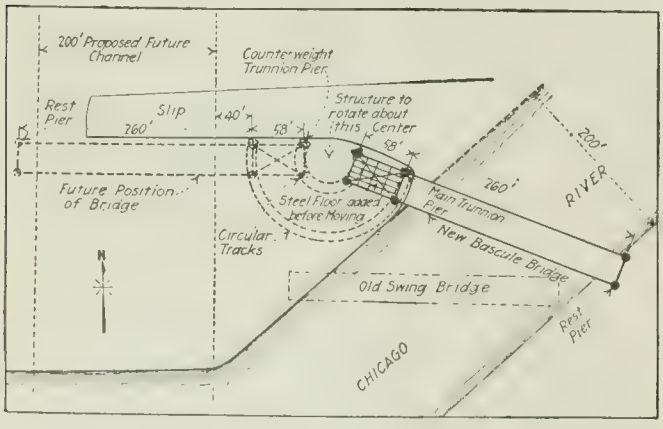


PNEUMATIC BUFFER CHECKS TRAVEL OF BASCULE



LARGE-DIAMETER TRUNNIONS AND BEARINGS OF BRIDGE AND COUNTERWEIGHT TRUSSES; HOLLOW CAST TRUNNIONS SEATED IN PHOSPHOR-BRONZE BUSHINGS REVOLVABLE IN THE BEARINGS

Removal of the bridge to a new site is a possible problem, as the proposed straightening of the river would put the channel about 400 ft. west of the present trunnion pier. A plan suggested by the bridge company is to shift the structure on conical rollers placed on segmental tracks, thus swinging it through an angle of



PROPOSED METHOD OF SHIFTING BASCULE BRIDGE TO NEW SITE

about 160° and transferring it to a trunnion pier on the east side of the new channel, as shown on one of the drawings. Hoisting engines and tackle would supply the necessary power.

This bridge was designed and built under the direction of A. S. Baldwin, former chief engineer (and now vice-president) of the Illinois Central R. R., and F. L. Thompson, the present chief engineer. They acted for the four railways which have joint ownership of the St. Charles Air Line R. R. Maro Johnson, assistant engineer, Illinois Central R. R., was in direct charge of construction. The design and plans for the superstructure were made by the Strauss Bascule Bridge Co. Substructure work was commenced in October, 1917, by the Foundation Co. and was completed in August, 1918. Fabrication of the steelwork and machinery was let to the American Bridge Co. and erection to the Ferro Construction Co. Erection was commenced in October, 1918, but in November it was interrupted by delays in receipt of material, work being resumed in February and completed in August, 1919.

Annual Report of Bureau of Standards

A review of the work of the national Bureau of Standards for the year which ended June 30, 1919, is given in the annual report of the Director of the Bureau of Standards at Washington. The report describes the functions of the bureau in connection with standards and standardization, and contains a chart and description of the several classes of standards dealt with. The director also gives a clear idea of the relation of the bureau's work to the general public, to the industries, and to the Government, and includes a special statement of the military work of the year. Brief statements are made upon practically all of the special researches and lines of testing completed or under way at the bureau. The list of these topics occupies 12 pages in the table of contents.

The bureau is organized in 64 scientific and technical sections and 20 clerical, construction and operative sections. During the year the bureau has issued 51 publications, not including reprintings, 36 of which were new and 15 revisions of previous publications. In the several laboratories of the bureau more than 131,000 tests were made during the year. The appropriations for the year, including special funds for war investigations, were approximately $3,000,000. A noteworthy event of the year included the completion of the industrial laboratory, in which will be housed the divisions having to do with researches and tests of structural materials. The building also includes a commodious kiln house for use, among other purposes, of the ceramics division in the experimental production of new clay products and for general experimental purposes.

The report comprises 293 pages, and may be obtained as long as free copies are available, by addressing the Bureau of Standards, Washington, D. C.

Machines for Handling Heavy Track Material

Small Gangs With Power- and Hand-Operated Devices Shift Rails, Ties and Frogs Rapidly, Cheaply and Safely

HEAVY weight of unit parts of modern railway track, and short supply and high cost of labor needed to handle such units, form conditions favorable to the increased use of machinery. This was pointed out in a paper on labor-saving devices presented at the annual meeting of the Roadmasters and Maintenance-of-Way Association, in Chicago. This paper was written by J. B. Baker, supervisor, Pennsylvania R.R., and an abstract of that part relative to the handling of heavy materials is given herewith.

Rail Unloading

For unloading heavy rails from cars a power device is practically imperative. One of these in common use consists of an air-operated derrick and boom, with rail hook. The air is obtained from the train line. A crew of six men is customarily employed. An attempt was made recently to eliminate two men by the use of a pair of hooks, one at each end of the rail, the hooks being so designed as to catch the rail whether lying on side, base or head. This did not prove to be a success, as a given length of lead to the two hooks would allow a variation in length of rail of only 2 ft., in order to obtain clearance to unload from a gondola car. Rails of shorter lengths would not lift over the side of the car unless a special short lead was used. Furthermore, when a rail was jammed against the end of the car it was necessary to move it endwise before applying the hook.

A hook that will release in midair is not desirable, on account of the likelihood of damaging the rail and injuring the workmen. Small steam derricks are being used, and operate faster than air unloaders, but Mr. Baker believes that they are more expensive to operate and maintain. Where rail is unloaded in reclamation yards, the magnet crane is most economical.

Rail-Laying Cranes

Where it is possible to obtain the use of track for the major portion of the day, the use of a power-operated rail-laying machine is economical. A machine of this sort will lift the new rail into track and travel over the newly laid rail at slow speed. The splices are placed on the rail and bolted up by an air motor, using air from the locomotive operating the rail derrick. Under heavy traffic it may be possible to obtain the use of track only for periods aggregating not more than two to three hours per day. Then the gang must be organized with a view to starting at once after the passing of the train, and making every minute count.

In this operation a small, hand-operated rail layer, consisting of a carriage and boom traveling on the opposite rail from that being installed, and lifting the rail by means of hand winches, is a real labor-saving device. On rail weighing as high as 125 lb. per yard, this machine with five men replaced 20 men handling the ordinary rail tongs. The old rail is thrown out several rail lengths ahead of the operation, and the new rail is set in by the machine at the rate of a little better than one rail per minute. This operation is usually no faster than that done by a competent gang of tong-men, but a speed can be maintained equal to that of the tong-men by using fewer men, while the operation by machine is undoubtedly easier on the men. Rails 60 ft. long and weighing 125 lb. per yard have been laid successfully with this device.

It is with a small gang that this machine appears most favorable. It has been found economical to apply a pair of splices to the far end of each rail, these being held together by means of only one bolt, loosely applied. Each succeeding rail is then laid by allowing the end to be inserted in the open end of the splice of the preceding rail. For insulated joints, there is a saving in time and labor if the joint is applied to two adjoining rails before the rails are placed, the two being lifted into track as one unit. This applies particularly to insulated joints having both side plates and a base plate.

Handling Ties, Frogs and Switches

Where ties are distributed by a work train equipped with a rail loader, the equipment should include a hook which will unload from an open car and release in midair. Unloading ties in yards, to be stacked for storage, can be done to advantage by power-operated davits set in the stake pockets of the cars and fitted with hooks and chains for handling one or more ties. For unloading from box cars, Mr. Baker suggests the use of a trolley hoist on a light I-beam; one end of this beam is clamped to the roof, the other end extending through the door and being supported on an A-frame outside.

The handling of frogs and switches in and out of cars should be done by an overhead lifting device of the type which best suits the nature and volume of the work. A small hand derrick, or a differential hoist on an I-beam supported on A-frames, is useful where such material is handled only occasionally. The latter arrangement can be made to handle material in and out of box-cars. In reclamation yards or storage yards, a hand derrick on a four-wheel truck traveling on a standard-gage track has been found a labor saver, as with it frogs can be unloaded from cars and trucked to storage piles or the shop by two men. An overhead trolley in a shop where such material is repaired is almost essential, as the real economy in the reclamation of frogs and switches depends largely on the labor charge incident to such reclamation. Where the use of locomotive cranes or cranes of the gantry type is justified by the volume of the material handled, such cranes should be used.

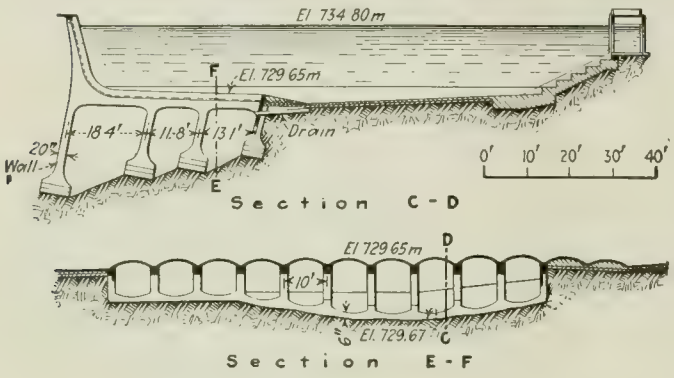
American Cement Exports Not Excessive in 1919

Although the amount of portland cement exported from the United States in 1919 will probably reach a value in dollars greater than ever before, the amount of cement exported is not greatly different from that exported at any time during the war, and is not as high as in the first year of the war. In the first three-quarters of 1919 the exports totaled 1,780,612 bbl., valued at $5,525,351, which is just about the average amount exported in the past five years. The imports of portland cement have practically ceased, with the exception of a small amount from Canada. The exports are largely to South America. During the first three-quarters of the current year the greatest amount has been shipped to Brazil, the second to Cuba, the third to Argentine, and the remaining countries are in the following order: Mexico, Panama, Peru, Colombia, Chili, Dominican Republic and Madagascar.

Reservoir Floor Partly Supported on Concrete Arches

Built on Side Hill for Simplon Tunnel Power Plant—Walls on Two of Three Sides Are Also Concrete Arches

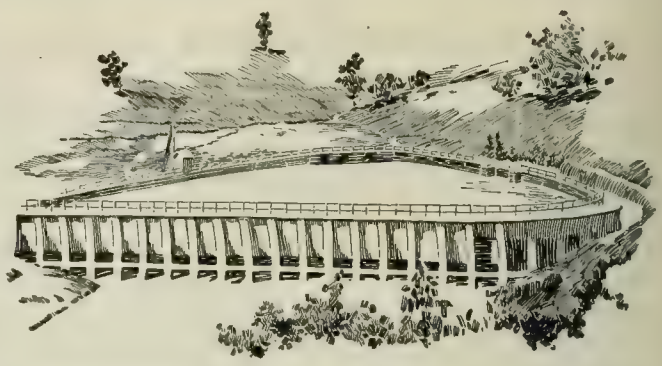
POWER for part of the Simplon canal train operation is generated by a hydro-electric plant on the Rhône River at Massaboden, Switzerland, which was built for the construction machinery for the tunnel and revised for permanent train operation. In the revision there



DETAILS OF RESERVOIR FOR SIMPLON TUNNEL POWER PLANT

was built a reservoir of very peculiar shape and design, drawings of which, taken from *Le Génie Civil*, of Oct. 11, 1919, are reproduced herewith.

The outstanding feature of the reservoir is the fact that, as it is built on a side hill, nearly half is an elevated structure of reinforced-concrete arches, in which the bottom and sides form an integral structure supported on rows of columns. As shown in the plan, the reservoir is triangular, with sides of about 220, 195 and 200 ft. Along the upper side runs the feed canal from the Rhône, with a reinforced-concrete L-shaped retaining wall separating it from the reservoir. The other two sides of the reservoir are formed of continuous arches of about 10-ft. span, backing on buttresses which extend around to the bottom of the reservoir to form there the stringers on which the arches of the elevated floor also rest. This whole arch system is carried through the stringers on sloping posts under the buttress beams, as shown in the cross-section. The



MASSABODEN RESERVOIR; INTAKE CANAL ALONG RIGHT REAR SIDE

outlet tunnel is through one of the arch walls, as shown in the plan. The incoming water is controlled by a gate in the canal at the head of a paved step section on the side slope on which the canal runs, as shown in the cross-section. Drains are placed upon the concrete floor of the solid part of the reservoir.

A Discussion on Superelevation of Highway Curves

THE question of how much superelevation should be given paved roadways was discussed at a recent meeting of engineers in the West, and the following was contributed by one of those present:

"Since the tendency to tip in rounding a curve varies as the speed, the height of center of gravity and width of tread, no one superelevation, of course, will meet all requirements as to different speeds, type of vehicle and loading. Moreover, no two individuals under same conditions of load and vehicle appear to desire the same speed. In the case of a railroad, with fixed width of tread, practically fixed center of gravity and with a comparatively narrow variation in speed limit, the problem is quite simple, while on highways it is very complex. No railroad company would for one minute consider operating trains without superelevation of the rails. Why, then, should highways with greater variation in all factors of safety be permitted to be built without superelevation?

"On a certain section of highway, before the concrete pavement was placed, traffic had built up a superelevation of 36 in. in 18 ft. on a curve of 80-ft. radius. This resulted from the erosion of the inside edge by the traffic and the forcing or throwing of materials to the outer edge. The concrete pavement laid on this curve has a superelevation of 24 in. in 18 ft. and at a speed of 15 miles per hour rides very easily and seems in nowise excessive. Three other curves, each of 1000-ft. radius, in another locality have a superelevation of 15 in. on a 20-ft. pavement and are regarded by the traveling public as particularly safe and comfortable.

"Experience would indicate that where a tangent meets a curve the run-off should be entirely on the tangent. The grade on the inside edge should be kept constant and symmetrical and the center and outside grade changed to meet the required superelevation. Except in cases where the entire superelevation is less than 6 in. the center line profile should not be depressed. Although the instances cited above may be more than ordinarily required, it is nevertheless suggested that in general the amount of superelevation should be increased."

Milwaukee Sewage-Testing Station: Experimental Data

Activated-Sludge Treatment Rate Doubled by Prescreening—Dorr Thickeners Reduce Sludge Moisture to 98.5 Per Cent.

RESULTS of sewage experiments with fine screens, activation tanks and Dorr thickeners at the testing station of the Sewerage Commission of Milwaukee are recorded in the annual report for 1918. Experiments with fine screens indicated that whereas the volume of liquor treated per square foot of fine screen wet area increased with increasing losses of head, the pounds of screenings removed per million gallons treated decreased. The screen used resembled the Hamburg type but the screenings are swept off by a system of revolving brushes. It is made of 38 bronze plates, 32 x 18 in., each plate having 28% of open space in the form of slots ⅛ in. wide. The screens were made by the Chain Belt Co. and installed for two purposes: To protect the aeration tanks from the coarse débris, which has proved to be a serious detriment in previous experiments, and to get data on the relative volumes passed, quantity of suspended matter removed and losses of head developed by slots of several sizes.

SEWAGE SCREEN RESULTS WITH VARYING LOSSES OF HEAD

Loss of Head	2 In.	4 In.	5.7 In.	6.7 In.
Sq. ft. wetted area	22.7	26.2	27.5	28.1
Million gallons treated daily	3.7	7.0	8.0	12.8
Gallons per sq.ft. wetted area	115,200	161,100	202,300	318,700
Pounds of screenings collected daily	3,498	4,500	5,181	5,548
Average per sq.ft. wetted screen area	1,079	1,032	1,320	1,382
Average per million gallons	953	655	650	441
Per cent. moisture in drained screenings	88.1	89.0	88.5	88.5
Per cent. rough suspended matter removed	6	9	6	5
Total suspended matter in sewage, p.p.m.	239	219	249	250
Coarse suspended matter in sewage, p.p.m.	193	157	143	127
Coarse suspended matter in screened liquor, p.p.m.	181	149	134	119

The screened effluent passes into aeration or activation tanks having liquiid areas of 284 sq.ft. and containing filtros plates guaranteed by the maker to pass, when dry, 10 cu.ft. of air per minute under a pressure equal to 2 in. of water. One of the 15-ft. tanks had 64 plates and the other 48. The two 10-ft. tanks were similarly equipped. From experiments in 1916 and 1917, standards of 90% removal of bacteria, 95% of suspended matter and 72 hours of stability of effluent were adopted. The activated-sludge tanks were found to be able to meet these standards, at rates of 7,000,000 gal. per acre daily. The 1918 experiments were for the purpose of doubling the rate. Both 15 and 10-ft. tanks, running at the high rate, met the standard with a margin to spare, 99% plus of the suspended matter being removed, 95% plus of the bacteria and the stability was 120 plus and 105 plus in the 15-ft. tanks and 100 plus and 95 plus in the 10-ft. tanks. The screens enabled the rate to be increased to 16,500,000 gallons.

Settling tanks equipped with Dorr thickeners received the mixed liquors discharged by the aeration tanks. Important features in these tanks are as follows: (1) Power-driven mechanical scrapers which travel over the surfaces of the slightly cone-shaped tank bottoms and force the heavy, settled sludge out through a central drain; (2) air lifts which raise the heavy discharged sludge to measuring devices or "tipping trays;" (3) weir troughs by which the purified sewage is drained off from the surfaces of the tanks and discharged into measuring boxes.

The thickeners were installed to serve as settling basins for separating purified sewage from sludge, and to condense the sludge. As the effluent contained less than 5 p.p.m. of suspended matter and the sludge, at times, contained less than 98.5% of moisture the thickeners were considered to have given good service.

The aeration tank effluents entering the thickeners were applied at an approximate rate of 1000 gal. per square foot of surface area daily. At this rate, the tanks contained a layer of heavy sludge at the bottom of from 2 ft. to 3 ft. thick, and the top of the sludge blanket was about 8 ft. above the bottom. The scrapers made one revolution in four minutes and moved the sludge from the outer edge to the center in ten minutes.

Analyses of the sludge discharged show that it varied in moisture from 97 to 99.5%. The moisture content is affected to a large degree by the quantity and character of the sludge in the mixed liquors which enter the tanks and by the manner in which the sludge is drawn off.

When the aeration tanks contain much sludge, as, for instance, 25 to 30% (on one-half hour settling), the moisture in the sludge escaping from the thickeners will range between 97 and 98%; when the aeration tanks contain 15% or less of sludge, the thickeners will discharge sludges with 99 to 99.5% of water. If the sludge is drawn off rapidly, top water breaks through and raises the moisture by dilution. If the sludge is drawn off slowly and continuously, a layer of thick sludge 2 to 3 ft. deep remains on the bottom all of the time and prevents top water from breaking through.

When sludge is drawn off continuously at a rate of 13% of the sewage flow, the sludge will carry 98% (or less) of moisture. When the sludge is drawn off continuously at a rate of from 18 to 20% of the sewage flow, the sludge will carry 98.5% of moisture. When the sludge is drawn off continuously at a rate of from 30 to 35% of the sewage flow, the sludge will carry 99% (or more) of moisture, but when the sludge is drawn off at a rate of 50% of the sewage flow, the sludge will carry 99.5% or more of water.

Sooty air on Jones Island clogged the filtros plates. Most of it was removed by filtering through a layer of 12-oz. duck then through a layer of canton flannel and finally by passing through a Nash hydro-turbo blower.

Aeration by perforated black iron pipes was not a success, the holes in the pipes of the grids filling with rust within two days. Filtros plates set in iron containers and fed by black iron pipe lines were covered with sufficient rust in a few months to shut off the air. It is concluded that galvanized iron or some noncorrosive metal should be used to deliver air to the filtros plates.

T. Chalkley Hatton is chief engineer of the commission and W. R. Copeland chief chemist.

Toconce Pipe Line of Steel, Not Wrought Iron

The Toconce pipe line, 98 km. in length, built by the Chile Exploration Co. to supply a copper mine and camp, as described in *Engineering News-Record* of Sept. 25, 1919, p. 593, was of steel instead of wrought iron, the latter description having been inserted through misunderstanding in the subcaption and opening lines of the article when it was being edited for publication.

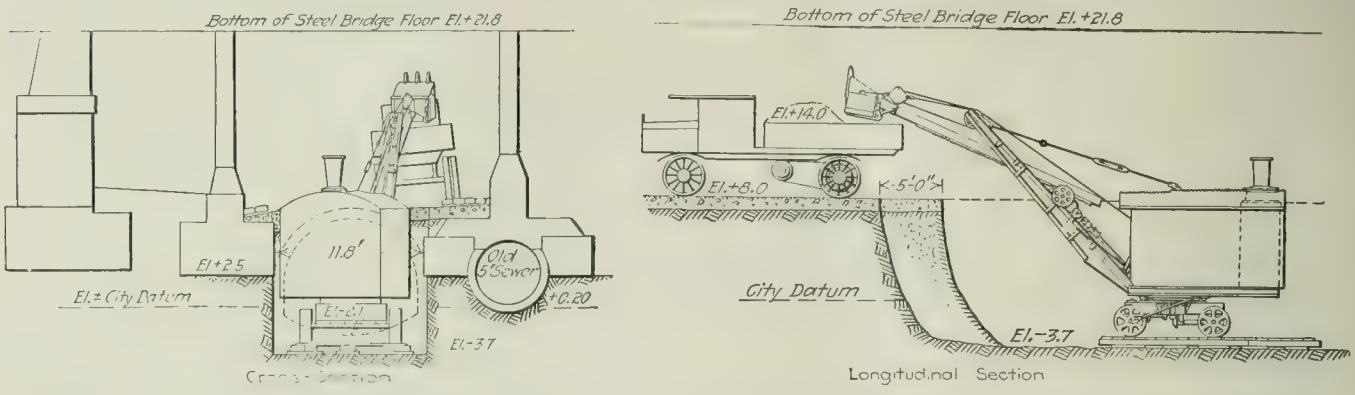
Steam Shovel Digs Sewer Trench in Narrow Space

Clear Space Between and Head Room Under Existing Structures in Chicago Limited to Inches

By George C. D. Lenth
Assistant Chief Sewer Engineer, Chicago, Ill.

By operating a steam shovel on the bottom, trench for a large sewer was excavated in an unusually narrow space, and labor and time were saved, compared with hand excavation, in recent sewer construction in Chicago. In particular, the shovel was used to carry the trench under an overhead railway crossing where the head room was scant and whose column foundations had to be guarded with great care. These foundations were not disturbed nor were adjacent a self-propelled shovel provided with an 18-ft. dipper stick, so that the motor trucks on the street adjacent to the ditch could be loaded directly by means of the shovel. As shown by the accompanying sketch, the shovel dug itself down to the bottom of the excavation, which was 14 ft. wide at the bottom and 17 ft. wide at the top. Of the total excavation of 280 cu.yd. per day of eight hours 55% or 154 cu.yd. had to be entirely removed from the street and wasted. As the ditch was excavated it was thoroughly sheeted and braced so that there was practically no settlement of the adjacent ground.

The sewer was constructed of 1:2½:5 reinforced concrete, and was poured in three operations. The invert was built first, and allowed to set one day. Then the forms for the side walls were set, reinforcement placed, and the side walls poured, and after setting a few hours the arch forms were moved into position,



METHOD OF EXCAVATING TRENCH BETWEEN FOOTINGS AND UNDER FLOOR OF BRIDGE OVER STREET

surface structures and close-by sewers and gas mains paralleling other parts of the work.

The sewer to be built was of concrete having a horseshoe section 11 x 9 ft. On Elston Ave. it was located on a line 8 ft. west of the east street line. On the east side of the street is a large lumber yard with a high board fence, which it was necessary to keep in place. In the center of the street there are two street car tracks and between the car tracks and the sewer there is a 24-in. high-pressure gas main. The contractor had to maintain traffic on the west track, but the east track could be used temporarily for construction purposes. The total width of the street was 33 ft. and the location of the sewer and the necessity of maintaining traffic required the immediate removal of the excavated material. This was accomplished by motor trucks.

In Augusta St. the center of the sewer was along a line 13 ft. south of the center of a 66-ft. street. In the center of the street there is a 5-ft. brick sewer built 50 years ago, the flow line of which is approximately 0.2 ft. above Chicago city datum.

General Methods

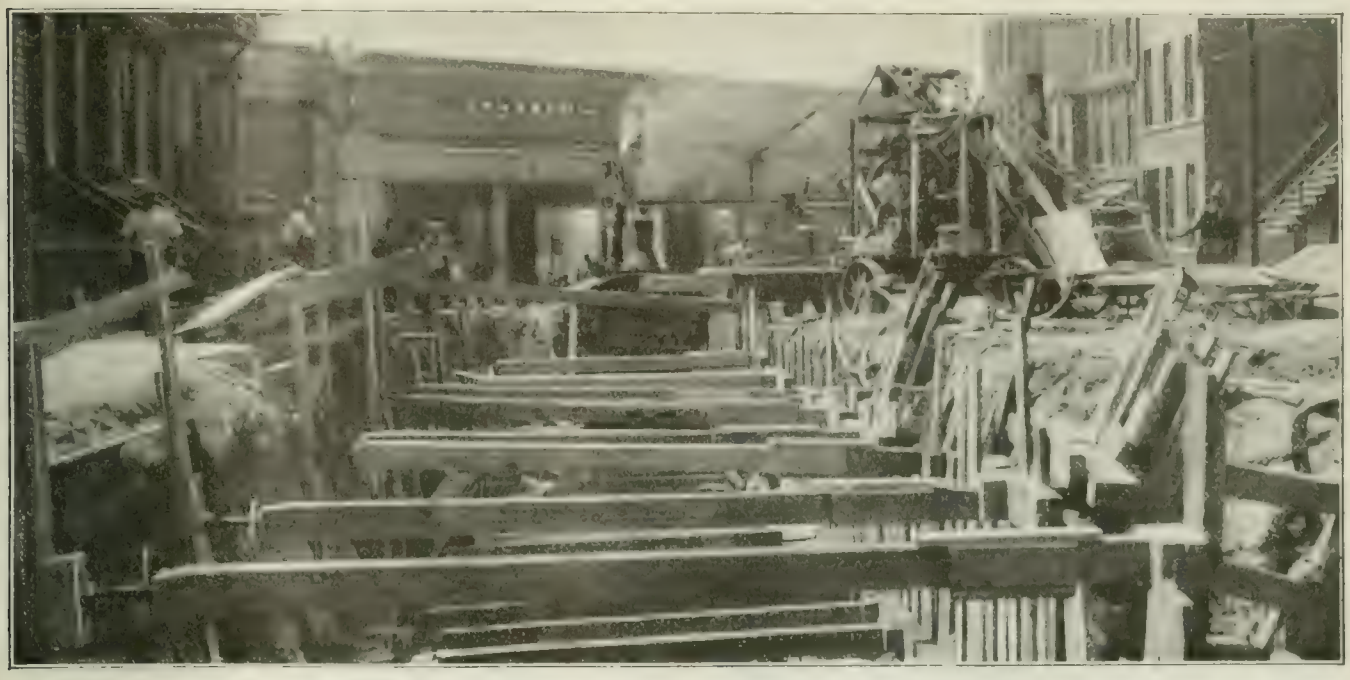
Originally, the surface of the ground in the vicinity of this sewer work was between 6 and 7 ft. above datum. The soil below this plane is a fairly stiff blue glacial clay. Above the plane there is filling of various kinds. The average elevation of the streets, except through the subway under the Chicago & Northwestern R.R., is 11 ft. above datum.

The contractor placed the steam shovel in the excavated ditch instead of on top of the ditch and used the reinforcement was placed and the concrete poured. The reinforcement was steel wire fabric. The forms were collapsible, of 4-in. dressed and bevelled yellow pine bolted to structural steel ribs. The forms were 25 ft. long and were moved on a carriage running on tracks laid on the invert.

It was necessary to change the shape of the cross-section of the sewer where it crossed Elston Ave., so that sufficient space over the top of the sewer could be obtained for utilities. Here the form was made a box section, having a horizontal diameter of 11 ft., with a vertical height of 8 ft. Also, because the street car tracks could not be removed at the intersection of Elston Ave. and Augusta St., the steam shovel dug to the street car tracks and was removed while the crossing was dug by hand. In Augusta St. the shovel dug itself down along the south side of the street between the sidewalk and the existing 5-ft. brick sewer. In this way, very little hand excavation was necessary.

Subway Complicates Problem

Approximately 400 ft. west of Elston Ave. is a subway under the main line tracks of the Chicago & North Western R.R. This subway is 175 ft. long and consists of two roadways with a line of columns separating them and lines of columns along the curbs between the sidewalks and the roadways. The columns and retaining wall along the street line are supported on spread footings made of natural cement concrete, the bottom of which is 2.5 ft. above datum. Inasmuch as the bottom of the excavation for the sewer is 3.7 ft. below datum and the clearance between the footings is 12 ft., the work of constructing this section of sewer was



HEAVY SHEETING AND BRACING RETAINED BANKS AND ADJACENT STRUCTURES

hazardous as well as complicated on account of the limited space.

The elevation of the lowest part of the steel work of the subway is 21.8 ft. above datum and the elevation of the pavement in the subway is 8.5 ft. above, making a net clearance of 13.3 ft. The height of the motor trucks carrying away the excavated material was approximately 6 ft. above the street level.

The first operation of the contractor was to remove the granite-block pavement in the subway. This increased the clearance over the trucks approximately 6 in. Next he broke and removed the south half of the concrete foundation of the granite-block pavement. The steam shovel was further lowered in the ditch so that the wheels of the shovel were approximately 1 ft. above the outside of the bottom of the sewer or 10 ft. below the street level. This gave the contractor a clearance of 18 in. between the top of the boom of the shovel and the bottom of the steel of the subway. In excavating, extreme care had to be taken to prevent the settlement of the foundations of the subway, so that the work was closely sheeted and braced. Three tiers of 10 x 10-in. braces spaced 6 ft. apart were installed behind the shovel and one brace in front of the shovel on the lower tier so that at no time was there a greater distance than 12 ft. between the braces and then only when the shovel was operating.

The method of loading the trucks by means of the shovel, under the subway, was unique. The sewer was being constructed so that the digging face was to the west. Instead of digging the face, as is ordinarily done for the entire width of the trench, the contractor dug the south half 6 ft. in advance of the north half, the north half acting as a roadway for the truck. The length of the dipper stick and the clearance above the truck when partially loaded made it difficult to open the bucket and discharge the load. The operator was also unable to reach the forward end of the truck, so he would load the rear end of the truck and then place the dipper on the bed of the truck and with the crowder engine shove the dipper stick forward, pushing the material previously dumped into the front end of the truck. This operation was repeated until the truck carried its load of 3 to 4 cu.yd., place measurement.

The railway company and the city had engineers on the premises who took elevations on the foundations and columns, and during the construction and afterwards there was practically no indication of settlement.

The invert of the sewer through the subway was

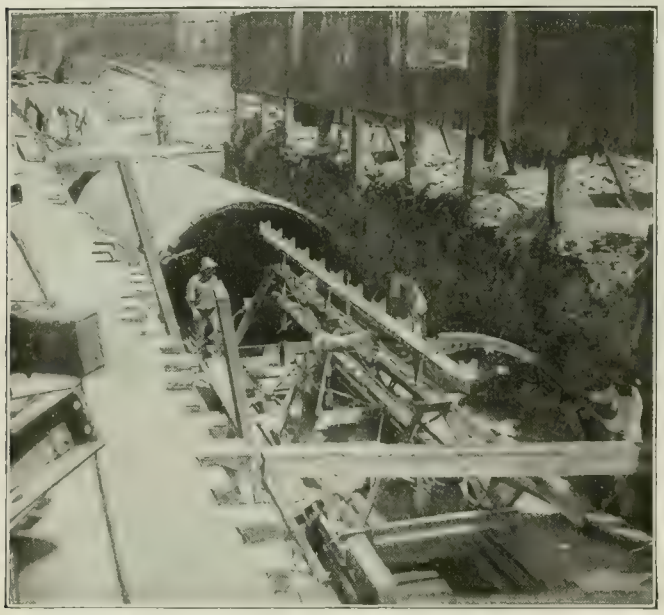


STEAM SHOVEL WITH BOOM CLEARANCE OF 18-IN. LOADING MOTOR TRUCK

heavily reinforced by means of steel bars, additional concrete was placed in the haunch walls, and the arch of this section was reinforced with rods instead of with wire fabric.

There was considerable discussion before the subway was reached as to the advisability of using the steam shovel. The engineers for the railroad company were inclined to the belief that the operations could not be carried on with safety. The engineers for the city were doubtful, and the contractor was of the opinion that,

on account of the labor conditions, this was the only economical method of construction. As an alternative to using the shovel, an estimate was made of the cost of excavating this trench by hand, which was $20 per foot, but the delay was such that it was considered inadvisable to expend this additional sum of money. The method used was entirely successful and only slightly slowed up the progress of the sewer construction. When the shovel reached the west end of the subway the sewer



ARCH RING FORMED ON TRAVELING CENTERS

was constructed along the center line of Augusta Street.

The small shovel was taken out of the ditch just west of the portal of the subway by means of cribbing and jacks. The balance of the excavation for the sewer is being done with a 70-ton shovel supported over the ditch.

The execution of this work was under the direction of Joseph Ryan, superintendent for the contractor, The Ryan Co., of Chicago. The construction is under the supervision of C. D. Hill, engineer, Board of Local Improvements, and the writer, with T. S. Ford, as engineer in local charge.

Wisconsin's New Drainage Laws

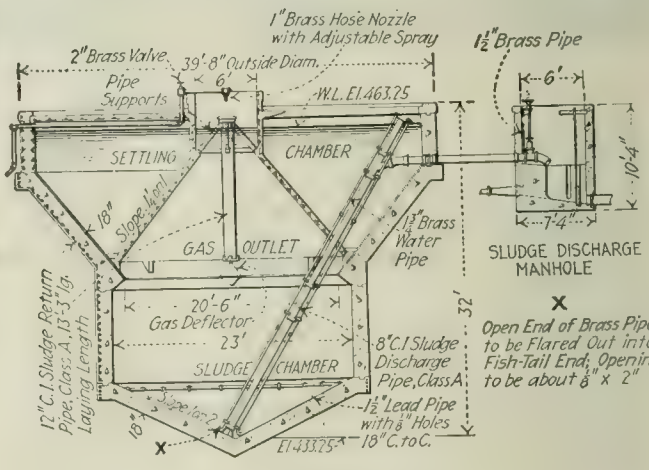
Two land-drainage laws were passed by the Wisconsin legislature during 1919, including the drainage district law, which is an improved form of the old law and covers the larger projects under the jurisdiction of the circuit judges. The second law repeals the old town, county and mine drain laws and gives the county judges jurisdiction over all the small drainage systems of their counties. Both laws give the state chief engineer, J. G. D. Mack, supervision over all drainage districts and all farm-drainage systems of more than 200 acres.

Mr. Mack has appointed E. R. Jones as state drainage engineer, and circulars are being sent out to engineers, attorneys and land owners to explain the steps necessary in the organization of drainage districts under the new law.

New Sewage-Works for Austin, Texas

SCUM or foam control device is a feature of the sewage-works put in operation at Austin, Tex., early in November, 1919. The plant consists of one 1,000,000 and two 2,500,000-gal. automatic float-switch, motor-driven centrifugal pumps on horizontal shafts; four circular reinforced-concrete Imhoff tanks with sludge beds formed by reinforced-concrete boards; a liquid chlorine dosing apparatus controlled by a connection with the venturi meter on the tank effluent outlet; and a brick-faced, tile-roofed pump house. Provision is made for trickling filters, which were omitted after the voters had twice defeated a bond issue designed to pay for both tanks and filters.

The scum-control device consists of a 12-in. cast-iron pipe, centered in the gas outlet, with its top about 12 in. above the sewage line and its bottom at about the level of the slots in the settling chamber. Both the top and bottom of the pipe are open, but at the bottom a gas deflector is hung to prevent gases from ascending



SCUM OR FOAM CONTROL DEVICE FOR IMHOFF TANK AT AUSTIN, TEXAS

through the pipe. Water under pressure will be sprayed into the top of the cast-iron pipe, should foaming occur, to break up and carry down the scum and floating sludge. So far as we know, the Imhoff tanks at Austin are the first to be equipped with this foam-control device.

The effluent will be discharged into the Colorado River. The sludge will be dumped on land.

The plant was designed by Prof. John H. Gregory, Baltimore, Md., who is serving the city as consulting engineer on sewage-disposal matters.

It was built on the cost-plus plan (5% on machinery and 10% on balance) by A. J. Potts, C. E. Moore and W. H. Prentice, Waco, Tex., with T. J. Palm as superintendent of construction. C. E. Leonard is city engineer.

The contract cost, including contractor's fee, was about $97,500. Additional outlay by the city for engineering, keeper's house and various accessories will bring the total cost up to about $110,000, not including land or outfall sewer, the latter having been built some time ago. The excavation for the tanks, and pump house required no sheeting and scarcely any concrete was wasted because of irregularities encountered in the excavation.

Municipal Garbage-Reduction Results at Columbus, Ohio, in 1918

GROSS profit from the municipal garbage-reduction plant of Columbus, Ohio, for the year 1918 was $26,667, with no allowance for capital charges. The amount of garbage received in 1918, according to the annual report of Thomas D. Banks, superintendent, was 15,629 tons, besides 60 dead horses and seven other large animals. Assuming a population of 220,000 the average amount of garbage per capita for the year was 138.44 lb. Average daily collections ranged from 39.19 tons in January to 62.77 tons in August, and averaged 49.93 tons.

OPERATION COST OF COLUMBUS GARBAGE-WORKS

		Per Ton Garbage
Supervision	$ 4,123.50	.26381
Clerk hire	1,213.50	.07763
Labor for operation	31,601.13	2.02184
Office supplies	89.87	.00574
Fuel	21,291.81	1.36261
Clothing	27.62	.00176
Mechanical and motor vehicle supplies	2,314.62	.14168
Other supplies	171.74	.00109
Chemical supplies	6,558.78	.41962
Transportation of employees	9.50	.00061
Telephone and telegraph	67.64	.00432
Insurance	19.25	.00123
Light and power	2,498.46	.15984
Other contractual services	171.00	.01094
Maintenance of buildings	23.59	.00151
Maintenance of railway tracks	3,362.77	.21515
Maintenance of equipment	12,040.64	.77746
Other maintenance	35.18	.00225
Total	$85,620.90	$5.47

The total yield of grease for the year was 676,407 lb., which was at the rate of 2.164% of the weight of garbage, or 43.28 lb. per ton, and brought $79,492.45 revenue. The tankage amounted to 1603.3 tons, or 10.258%, or 205.16 lb. per ton, and was worth $31,708. There was a revenue of $878 from 105 hides and of $211 from miscellaneous sources. The operating and maintenance costs are shown in the accompanying table.

The analysis of the tankage showed: Moisture, 3.39%; ammonia, 3.77; potash, 1.08; B.P.S., 7.94%. The grease showed: Moisture, 1.96%; impurities, 0.55; unsaponifiable, 4.57 per cent.

The Ohio Health-District Act

FOR purposes of local health administration, the State of Ohio has been divided by a 1919 statute into "general health districts" which, excluding cities of 25,000, having a sanitary administration satisfactory to the Department of Health, are as a rule coëxtensive with counties. The exceptions noted are known as municipal health districts. Two general health districts may unite, or one of such districts uniting may be a municipal health district located within the boundaries of a general health district. In each general health district, except those that have united with a municipal district, the law provides for a health board of five members, serving without pay but reimbursed for their expenses. The boards include one farmer, one attorney and two physicians. The members of these boards are selected by district advisory councils consisting of the mayor of each municipality not a municipal health district and the chairman of each township board of trustees within the district.

Each general health district has a full-time health commissioner, selected by the district health board from an eligible list certified by the state Civil Service Commission. Each general health district must appoint, on recommendation of the district health commissioner, a full-time public health nurse and a clerk. The district board must provide a health service in each city within the district and appoint a deputy health officer therefor. Provision is made by the statute for laboratory and necessary services and employees in each district and for each municipality within the district. In general, all employees of health districts are under the state Civil Service Commission. General health districts complying with the law to the satisfaction of the state Commission of Health are entitled to reimbursement by the state of half their expenses, up to state payments of not over $2000 a year.

The new plan insures Ohio about a hundred health districts, with as many full-time health officers, in place of the previous 2141 health districts, with only five full-time health officers. Dr. Allen W. Freeman, Columbus, Ohio, is state health commissioner.

Supervision of Water-Treatment Plants in Michigan

ALL water-treatment plants supplying water for domestic use in Michigan are required to submit by the tenth of each month a report on the daily operation of the plant for the previous month. This is done in accordance with a resolution of the board, effective Jan. 1, 1916. As soon as practicable after the reports are received, Edward D. Rich, state sanitary engineer, states, they are carefully examined by an assistant, who also writes a letter to the person or laboratory sending the report, offering such suggestions as may seem advisable. Furthermore, this assistant "aims to visit each plant at least once a year and much oftener, of course, if serious troubles arise."

The results of this method of supervision, Mr. Rich states, are gratifying, "particularly in insuring fairly good attention to the chlorination plants which at first were expected by the local authorities to work without much, if any, attention." Mr. Rich adds, "I am firmly convinced that any attempt to operate a chlorination plant without laboratory control cannot possibly result in getting even a fair degree of efficiency out of the apparatus."

The State Board of Health supplies water-works plants with two forms for making monthly reports on operations; one for combined filtration and chlorination plants, and one where chlorination alone is practiced. The form for complete treatment plants is 11 in. high by 17 in. wide, and it is folded to a size of 8½ x 11 in. It gives for each day the total gallons filtered and other operating data, including rate of application of chemicals, and results of physical, chemical and bacterial examinations. At the foot of the blank, space is provided for reporting the average results of analysis of the chemicals used during the month. Space is provided for additional information, and there is a blank form for swearing to the report before a notary public.

The form for reporting operation of water-disinfection plants is 8½ x 11 in. The daily report covers pumpage in gallons, the amount of liquid chlorine or hypochlorite, as the case may be, used in pounds per day, and the available chlorine in parts per million; turbidity of the raw water, and oxygen consumed in raw water; together with bacterial analyses substantially as already outlined as regards the other form. A note at the foot of the blank gives the following instructions: "In case the flow of the sterilizing agent

is discontinued for more than 24 hours, it is obligatory that this department be notified immediately, stating the reasons therefor, and giving an estimate of the time that the apparatus will be out of use."

The report form for water-treatment plants recently adopted and put in use by the State Board of Health of Wisconsin was reproduced in *Engineering News-Record* of July 24, 1919, p. 189.

Light, Portable Asphalt Plant for City Street Patching

Pug Mill Attached to Tandem Roller for Mixing—Portable Sand, Stone and Bituminous—Material Heaters

ASPHALT pavements are patched by means of a light portable asphalt plant by the street department of Reading, Penn. Having all the stages of manipulation which are ordinarily used in stationary plants, only on a smaller scale, it is claimed that the patches made by this plant are practically as good as those made from material hauled from permanent plants.







GENERAL ARRANGEMENT OF PORTABLE ASPHALT PLANT, WITH SIDE AND TOP VIEWS OF PUG-MILL ATTACHMENT

It is believed that the apparatus will be very useful in small cities where, on account of the small yardage of asphalt pavement, large stationary plants are not practicable.

Most of the plant which is used is ordinarily owned by city street departments. It consists of a tandem roller with mixing attachment, a small sheet-iron oven for heating sand and stone, and an ordinary asphalt- or tar-heating kettle. The arrangement of the plant at a conveniently located street intersection is shown in the general view.

The small sand heater shown in the general view is arranged with two compartments, with a grate beneath for a fire. Each compartment holds about 1 yd. of sand or stone. It is found possible to dry the materials with this device and heat them to a sufficiently high temperature. To arrange the tandem roller for this work, a small pug-mill is attached to the rear by lengthening out the frame. The side and top views of this are shown in the illustration. The small power sprocket is connected to the shaft of the engine in its free position, and when the roller is moved from one location to another the chain is removed from the sprockets.

To operate the plant, it is located at a convenient place adjacent to considerable patching, and the necessary sand and stone are dropped at the side. The heaters are then started and the materials brought up to the proper temperature for mixing. Just before mixing is started, a fire with kerosene oil is built in the pug mill which raises it to a temperature which will not cool the materials too much. When everything is in readiness the small stone for the binder course is put in and the bituminous material is added. About six pails of stone to one of asphaltic cement are used in the binder. When the mixing is properly done, a trap door at the bottom of the pug mill is opened and the mixture falls ready for placing in the patches.

Patching the street follows the usual method, the binder being placed in position and tamped, after which the sheet-asphalt covering is placed and rolled with the tandem roller.

Splitting and Relaying Granite Blocks

Old granite paving blocks at Nashville, Tenn., are being taken up, split and set in cinder concrete, and the joints are being filled with pitch, at a total cost of $2 to $2.10 per square yard. The original blocks were 8 to 13 in. long, 3½ to 4 in. wide and 6 in. deep. By the splitting crosswise, blocks with a new face, generally 4 x 6 in., and with a depth of 5 in., are obtained. The cinder concrete is mixed 1 : 2½ : 5 and placed dry to a depth of 2 to 3 in. on an old concrete or macadam base, the thickness varying according to inequalities in base surface. After the resplit blocks have been set, a garden hose is used to wet down the concrete. A mastic filler is used instead of cement grout, because the blocks were originally jointed with pitch. This cinder concrete, says W. W. Southgate, city engineer of Nashville, gives a resilient cushion, at the same time affording a matrix for the blocks. The city supplies all the material, and the labor is performed by contract. The contract price for splitting and redressing the blocks is 90c. per square yard and for resetting the blocks, mixing and placing cinder concrete, and pouring the joints, 45c. per square yard. The material for the cinder concrete cost 45c. per square yard, and for the joints cost the city 30c. per square yard.

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

Energy and Accomplishment in Philadelphia

The Philadelphia Association of Members of the American Society of Civil Engineers held a special meeting at the Engineers' Club, Philadelphia, Nov. 22, for the purpose of reviewing and discussing the final report of the Committee on Development to the Board of Direction of the parent society and to prepare for action in support of the measure when presented to the society by the board at the annual meeting to be held in New York next January.

The Philadelphia Association early this year created a local committee on development for the purpose of determining the attitude of the membership toward development projects, and of formulating its own policy in certain and definite recommendations. The subject was divided into five parts and subcommittees were formed to consider each part and report their findings and recommendations to the development committee for incorporation in that committee's report to the association. The committee meetings were held weekly and meetings of the association were held each month from January to November, except the months of July and August.

The report of the committee on development of the society includes, with few exceptions, the recommendations outlined in the report of the committee on development of the association. The association, therefore, voted unanimously to adopt the former and took definite steps to place the whole weight of the association's membership in its support at the annual meeting next January and thereafter until final action had been taken by the society.

By unanimous vote an executive committee of seven members was created to conduct a campaign in behalf of the proposed development. It is the intention of the committee to form teams of five or ten members headed by a captain, the members of each team to make a personal canvass of the members of the American Society of Civil Engineers in their vicinity and secure from each member, if possible, his support of the measure at the annual meeting and thereafter until a final vote is taken.

The tendency in some quarters to subordinate engineering to art and architecture as evidenced by the appointment of architects to design and supervise the construction of a number of important bridges was brought before the meeting and elicited a very spirited discussion which resulted in the association adopting the following resolution, which was voted to be sent to the Governor of the state, the mayors of all cities in the state and to the county commissioners of all the counties of the state:

"Whereas, in the design and erection of bridges and other similar public structures, involving fundamentally strictly engineering questions, there is a widespread tendency to subordinate engineering to art and architecture, and,

Whereas, the formation of commissions and the selection of the personnel to have the direction of the execution of these works is now under consideration by state, county and municipal authorities,

"Therefore, be it resolved, that the Philadelphia Association of Members of the American Society of Civil Engineers earnestly directs the attention of the Governor of the state, the county commissioners and the mayors of cities in the state to the fact that safety to human life and the proper expenditure of public funds requires that the design and erection of such structures be under the responsible charge of competent and experienced civil engineers, especially skilled and trained for that class of work."

A request from the Engineers, Architects and Constructors' Conference for the support of the bill to create a national Department of Public Works was presented to the association for its consideration. As very few members had any knowledge of the bill it was voted to postpone consideration until the January meeting.

The meeting was well attended, and while not the most notable in the number of members present was by far the most enthusiastic held for some time. The Philadelphia Association seems determined on a progressive development of the society and announces that no effort will be spared to carry that determination to accomplishment. The broad scheme of development is first to be secured, the details of expansion to be considered after the larger object is accomplished.

On What Shall Committees Work?

Now that the season for engineering society activity has arrived, attention to very definite, constructive lines of work by capable committees is decidedly in order. The Duluth Engineers' Club has acted on this principle in its assignments, as is indicated by the following subjects for special committees: Employment; engineering unity; promotion of the Babcock good roads amendment of the state constitution; civic relations; study and recommendation of action on proposed legislation, with subcommittees on patent office, mining on the public domain, national budget for the United States Government, national scientific research and national water-power legislation; dye legislation; forest-fire menace. Perhaps of the most significance, in that it is specific concerning an individual engineer, is a committee to obtain the appointment of W. H. Hoyt to membership on the Board of Regents of the University of Minnesota.

Canadians Active in Professional Welfare

The British Columbia Technical Association at its general monthly meeting, Nov. 17, in Vancouver, received satisfactory reports on various phases of its activities, and took up new plans for future action. The association has taken an active part in endeavoring to improve the status and salary grading of technical men in the Dominion civil service, and for several months past has been in constant correspondence with the authorities at Ottawa regarding the matter. It has taken similar action with regard to the regrading work of the provincial Civil Service Commission. Committee reports presented to the meeting indicated that a committee of the provincial Civil Service Commission then in conference with the regrading authorities did not contain a representative of the technical men in the service. It was made evident to the members present that all classes of employees in the provincial serv-

ice, except the technical, were in position to be assured of proper grading. Consequently, a delegation was appointed in the meeting, and left for Victoria on the following day to interview the Civil Service Commissioner on the matter.

The proceedings included a discussion on the minor parts which engineers and other technical men have taken in the public matters of the locality—a laxity resulting in the general expenditure of public money on engineering and other technical work by nontechnical men. Following the discussion a public service committee was created and given instructions to promote and encourage a greater interest in municipal, provincial, and Dominion Government affairs among technical men.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Mr. Baker's Railroad Plan

Sir—I have been much interested in Mr. Baker's article on the railway situation. He of course is by no means alone, nor the first to recognize that the efficiency of our railroads in the past is due to the executive officers and men of the railroad organization; even the Plumb plan does that.

However, he and all the other proposers of various plans attempt to set up new machinery for control and regulation. We all of us admit the need of more intelligent control, and the modification in some respects of the laws, but is there any use of setting up a lot of new machinery to administer the laws? Isn't the whole or nearly the whole trouble with our railroads the fault of the human element which administers the laws and supervises the regulation, rather than with the laws themselves? If we cannot find men to regulate the railroads under the name of the Interstate Commerce Commission, are we likely to have them under the name of a national Board of Transportation or national Board for the Administration of Altruism?

I agree with Mr. Baker that there should be some regulation of issues of securities, but that is not new, and does not need a new board or commission. It seems to me that Mr. Baker's plan, while differing in details, is built on pretty much the same principles as the Plumb plan and while theoretically calculated to produce good results will only do so if the human element in its administration is honest and competent.

It is not difficult to imagine, with a Government guarantee, that the directors representing the stockholders would be quite indifferent to the manner in which the property is managed; the employees would desire to make the greatest profit at the expense of the public or, on those roads where no surplus is earned for distribution as a bonus, increasing their pay as compensation.

I have yet to see any hope for deliverance from Government operation or ownership in any of these compromises. The railway organization as it existed before the war, in spite of charges of gouging, robbery and so forth on the part of a small minority of the bankers, officers and employees, produced the best results in the world—with few exceptions, as good and comfortable passenger service and better and cheaper freight service.

Why, then, not leave it alone and try to improve the regulation? Make the latter national. Pass the few laws necessary based on sound economic principles if this is possible, and strengthen the Interstate Commerce Commission. Then, if the latter is composed of fearless, courageous, intelligent men, let's go to it. If we can't achieve this, there is little hope for anything but straight Government operation as well as ownership.

F. LAVIS,
New York City. Consulting Engineer.

What Will Engineers Pay To Improve Their Status?

Sir—In reading over the letters you have received on "What Will Engineers Pay To Improve Their Status?" I am somewhat disappointed at the attitude expressed. In the present state of the world's unrest there seems to be a premium placed on manual labor, and education is discounted. This is a condition which I believe was created by the great scarcity of labor during the great war and is a condition which sound reason argues will not last. The nation is held in the grip of a vast wave of discontent. What is the cause of this discontent? Is it not because everyone is trying to get for himself a little more than his fellowmen—in other words, selfishness, pure and simple? The laboring man is being paid far more now than he ever was before, yet he is spending all he makes, and not entirely on the necessaries of life, and is clamoring for more—yet more. If the laboring man is worth what he is getting now, then surely the scale of the professions should be greatly increased. But will this tend to remedy conditions? It is an endless chain. As wages go up, cost of manufacture, cost of construction, cost of living goes up.

It is time for the educated men, the men with broad vision and sound common sense, to come to the front. Let us still be patriots, forget "self" for a little while and bend our endeavors to the common good. Let us show that sound public opinion is against the radicalism of the unions. One finds the greatest discontent among the uneducated—the untrained. We have not heard much from the "captains of industry"; they have been content to raise the wages of the working man because they have been able to raise the price of commodities and realize the same, if not an even greater profit. Is not this where the fault lies? Shall we let ourselves be stampeded by the selfishness of others who know no better, or shall we try to strike at the root of the evil?

EUGENE T. CRANCH,
Port Arthur, Tex. Sanitary Engineer.

Nature Confirms Engineers' Arguments

Sir:—With reference to the American Falls dam noted in *Engineering News-Record* in the editorial on p. 718, Oct. 16, 1919: The dam will not be a record breaker so far as the structure itself is concerned, but a dam 90 ft. in height will create a storage capacity of 3,000,000 acre-ft., which will, I believe, make it the largest reservoir in existence. The great expense is due to right-of-way complications, it being necessary to move the town of American Falls and to flood about 70,000 acres of land. Although the land is not in a high state of cultivation, it will doubtless cost a considerable amount. In addition, the proposed structure will destroy the usefulness of power devel-

opment of the Idaho Power Co. However, on account of the enormous capacity created, and the very large acreage that will be brought into cultivation by the use of the water for irrigation, there can be no doubt that the construction is fully justified.

In reference to the progress of this project: A meeting was held Nov. 24 in Idaho Falls at which A. P. Davis, director, and F. E. Weymouth, of the United States Reclamation Service, met with Gov. D. W. Davis and W. G. Swendsen, state commissioner of reclamation, and representatives of all the irrigation interests that would be affected by the construction of the reservoir. Recommendations, in a report of a committee of the interested parties, were unanimously adopted, and the committee was instructed to proceed in accordance with them. The report recommended that that United States Reclamation Service submit a form of contract covering the work, that each organization make a careful determination of its needs for storage based upon a possible cost of $10 per acre-foot, and take immediate steps to secure the necessary funds; that contracts be closed quickly so as to expedite right-of-way and other negotiations and preparation of places for construction; that the state commissioner of reclamation be requested to secure, if possible, an assignment of filings made last May by I. B. Perrine, acting for the Twin Falls-Bruneau Co., to the Secretary of the Interior. There is great hope that the contract with the Government will be signed in the near future and the work can be in full swing next season. While there is only about 1,000,000 acre-ft. required by the companies which have filed applications with the storage committee, it is hoped that, once the work is begun, the immediate demand for storage will be sufficient to warrant construction to the full 3,000,000 acre-ft. capacity.

BARRY DIBBLE,
Project Manager, United States Reclamation Service,
Burley, Idaho. Minidoka Project.

Blames "Engineering Aristocracy" for Present Status of Technical Men

Sir—I have read with considerable interest the statement of the American Association of Engineers as to the feeling of the officers of that body in regard to the principles which should control organizations of engineers. The last paragraph of this statement, which reads as follows, "The American Association of Engineers through its board of directors who have signed this statement, recognizing the many fundamental differences between the principles and objectives of the trade union and of an organization of professional men, express the opinion that an engineer cannot subscribe to the tenets of the above," is particularly interesting. These questions are

1. Why is an engineer an engineer?
2. What is a union and what are the purposes of union organization?
3. What is an engineering association or an engineering society as we know know these institutions?

Answering the first of these questions as briefly as possible, it may be said without fear of intelligent contradiction that the primary object which a human being has in entering the engineering profession is the earning of an honest living. There is a great deal said about professional ethics and about the proper relation of the engineer to other groups in society, all of which is worthy of consideration. Fundamentally, however, engineers are like other individuals in this world in that they must receive a reasonable compensation for their efforts and that they make these efforts with the compensation which they are to receive very largely in mind.

The question as to what is a union can perhaps be best stated by paraphrasing Mr. Lincoln's famous statement and saying that a union is an organization of the men of any trade or profession, by the members of this trade or profession and conducted for and in the interest of the members of this trade or profession. Briefly, a union is a democracy. It implies the organization of the men of any group along democratic lines and the conduct of the organization by men selected from the rank and file of the organization and, finally, its conduct in the interest of the group. Naturally, organizations so formed will, at times, use methods which do not appeal to those who are exponents of politeness and believers in suave persuasion. A man must always use the tools with which he is familiar. The essence of such an organization is, however, democracy, and while it will proceed, as a democracy always proceeds, somewhat lamely at times and perhaps somewhat crudely, it nevertheless proceeds directly toward the goal of its ambition. Moreover, its principles are a direct reflection of the principles of its membership. Unions sometimes do resort to force, but those who decry such action overlook the fact that force is only used where needed to overcome opposing forces.

An engineering society is an organization in charge of an aristocracy. The subordinate engineer, like the vassal of old, pays his dues and proceeds to do as he is told by the aristocrats of the profession, who dictate the policies of the organization, lay down systems of professional ethics, which work very nicely for the control of the subordinate membership, and otherwise conduct the affairs of these societies in the interest of the aristocracy of the profession. I do not wish to be understood as objecting to the engineering societies. There are a great many men in this world who would rather be abused by an aristocrat than assisted by a pauper. Moreover, I agree with the gentlemen who signed the American Association statement that an engineer cannot subscribe to both the tenets of the ordinary engineering association and the tenets of a well regulated union. If he subscribes to the former, he admits his preference for aristocratic domination, whereas if he subscribes to the latter, he admits his preference for democracy. Neither am I surprised that the aristocratic leadership of the association should make it entirely clear that it does not favor unions. Aristocracy has never been aligned in favor of democracy, and it is not to be expected that it will so align itself in the engineering profession any more than it does anywhere else in the world's activities.

Nevertheless, I am of the opinion that the subordinate engineer will continue to hold that there is increasing demand for a really democratic organization of American engineers. The reason for this is plain enough. Though outwardly subscribing to such doctrines as that "reward should be according to ability, initiative and constructive effort," there are today very few engineering organizations where the salaries paid to the subordinate engineers bear evidence that the aristocracy

of the engineering profession pays more than a lip service to this pronouncement. Indeed, there probably is today no group of men more absurdly underpaid than the engineers of this country. At least a considerable percentage of these men are employed by engineers who take high rank in their profession and, indeed, who deserve this high rank. The reason for this condition is not hard to find. Engineers are constantly seeking ways of reducing cost. The method of securing this end which appeals most strongly to men generally is that of keeping salaries and wages down.

This is not the place to analyze the actual effect of such a procedure, but the fact remains that there are large numbers of men, among whom are found numerous engineers, whose ideas as to securing low unit costs of production do not extend further than a general and rather hazy impression that if salaries and wages are kept down, unit costs will thereby be reduced. It would naturally be expected that in dealing with such men one would find no real effort to make remuneration commensurate with "ability, initiative and constructive effort," and, indeed, there is no real effort to that end, as the salaries paid to engineers *by* engineers in this country amply demonstrate. Moreover, this statement will, I very strongly surmise, apply to the heads of organizations which assume to lead engineering thought and to issue pronouncements on engineering ethics just as completely as it does to engineers not so conspicuously in the public view.

It would seem, therefore, that the engineer must, not because he particularly desires so to do, but because he has no other recourse, develop an organization composed of men from the rank and file of the profession and that this organization must be manned by and operated in the interest of the rank and file of the profession. Such an organization may not have silk-hat manners. It may not conduct itself along established lines of professional ethics, but it will get what the engineer now most needs and what he went into his profession for—a reasonable salary.

Finally, let me submit for the consideration of engineers generally, that the coal miners would not be receiving their present wages if they had elected the president of the Lackawanna Coal Company as the president of the coal miners' union, nor would the railroad brotherhoods be receiving their present wages if their board of directors consisted of the presidents of the Northwestern, the Burlington, the Pennsylvania, the New York Central and the Union Pacific Railroads. These gentlemen are most estimable and extremely valuable members of society. Any one of them would make a more diplomatic leader than the brotherhoods have ever had, but would his diplomacy have increased the wages of the railroad firemen? The answer is too simple to require that it be stated.

Until engineers are able to get this point of view and are able to develop their own organization along their own lines and to operate this organization independent of the assistance of the aristocracy of the engineering professions, their salaries will continue to be as poor as they are now. Moreover, there will be no one but themselves to thank.

The engineering profession is in grave danger. Very few of the members of this profesion, speaking relatively, could today give their children the education which they have themselves received. Very few of them enjoy the social position which they held even five years ago. Indeed, many of them lack the ordinary comforts of life. The plumber, the bricklayer and the carpenter all receive larger compensation than even a pretty fair engineer. And, for all of this, the leaders of the profession are, to a large extent, responsible, because of their failure to act as real leaders. The claim, then, that a man cannot be an engineer and also a member of a union resolves itself into nothing more than this:

> Engineers are poorly paid because
> Engineers are poorly led
> but
> You can't be an engineer if you try to find better leadership and better pay!! That would be improper, undignified and contrary to established professional ethics!!!

And, the real question is, Will engineers continue to subscribe to this doctrine?

J. L. HARRISON,
Washington, D. C. Bureau of Public Roads.

Uniform Practice in Farm Surveys

Sir—It has been my duty to look over many surveys of farm lands from the standpoint of the owner, and I find considerable lack of uniformity in describing the courses. Many engineers begin their description at some obscure corner of the property and run it around counter clockwise.

I believe if there were uniformity of practice in starting a farm survey from the principal corner of the farm—which would naturally be the corner on the main highway—and in running around in a clockwise direction, it would be to the benefit of surveyors and a great convenience to those who have to do with land titles.

R. T. CHILDS.
New York, N. Y.

Paint Service and Paint Technology

Sir—Several paragraphs of your summary (issue of Oct. 30-Nov. 6, 1919, p. 827), of the report of the American Railway Bridge and Building Association on railway bridge painting practice attracted the writer's attention, as they bring out again the rather remarkable disregard, on the part of so many extensive paint users, of some very simple and basic principles in paint technology that would promote economy and efficiency if more generally observed.

It is noted that in "coast regions where the atmosphere is damp, warm and impregnated with salt . . . . painting must be done every year." This is, most certainly, not necessarily true. It is true if it is attempted to use the same sort of paint in coast districts as inland, however successful they may have been there. There are both pigments and vehicles that show up very well inland which are destroyed by the salt in the sea atmosphere, but on the other hand there is no reason but habit for using these materials, and there are others much less susceptible. Lead pigments, for instance, are chemically effected and discolored by salt atmosphere, to a serious extent; zinc not so much; lithopone, asbestine, carbon and graphite (and iron oxide) not at all. In the vehicles, the linseed oil is the element attacked, but the addition of other ingredients decreases this action.

The reason for the failure of the bituminous paint on the bridge span is very simple. It is a fact that as a protective agent against almost any form of steel corrosion, there is no material superior to a bituminous

paint, but it has one fatal weakness which was overlooked in this case: It is destroyed by direct sunlight. Therefore, for interior painting, where black is permissible, it is most valuable, and much economy would result from a more general recognition of this fact, but for outside work it is absolutely inadmissible.

As to the painting of the galvanized iron, the zinc coating has absolutely nothing to do with the nonadherence of the paint. The latter effect is due to the film of palm oil which adheres to the sheet in the galvanizing process. The surface of the molten zinc is covered with palm oil to prevent oxidation, and, naturally, as the sheet of iron is withdrawn from the pot the oil clings to the surface of the sheet. This palm-oil skin can be removed with Sapolio and water and, after it is removed and the surface is dry, paint will adhere as well as to any other surface.

A. H. RHETT,
New York City. Engineer, Toch Brothers.

Triangular Bridges and Horace E. Horton

Sir—Referring to the "Inglis Light" footbridge, mentioned on page 692 of your issue of Oct. 9, 1919, and the originator of the triangular cross-section for bridges: I recall that about 35 years ago Horace E. Horton, a noted bridge designer in those days, designed and advocated the construction of long-span bridges having a triangular cross-section, formed by a single upper chord and two lower chords. The complicated details, for shops of that time, probably prevented the trial of this type for long spans, but in light moderate spans there is an example of triangular cross-section truss work in a train canopy at the Englewood union railroad station in Chicago, built by Mr. Horton, or the Chicago Bridge & Iron Co., many years ago and still in service.

J. W. PEARL.
Chicago, Ill.

Do Meters Prevent Water Famine?

Sir—The article in *Engineering News-Record* of Sept. 25, 1919, p. 611, entitled "Meters Prevented Water Famine at Pocatello," appears to be a reprehensible example of newspaper propaganda, especially objectionable in a journal of such standing. The title indicates the responsibility of the editor for a fixed policy of meter propaganda of many years standing, as frequently shown in other articles of the same trend. A careful reading of the item shows very clearly that the strict enforcement of the one-hour limit on sprinkling, necessary in spite of the meters, was the real preventive of the water famine at Pocatello.

Furthermore, a little arithmetic will show that the statement that consumption has been cut from 350 gal. per capita to 110, with a present population of 18,000, requires that the population three years ago was less than 6000, for the 2,000,000 gal. daily minimum flow—showing a remarkable growth, if true.

This policy of advocating universal metering may be defensible where good water is only obtainable at considerable expense for pumping, filtering and chemical treatment, but where a decrease in consumption effects no corresponding decrease in cost of water furnished, the condition is altered. Where water is naturally pure and the yearly flow is ample for many times the population, as is the case at Portland, Ore., the cost of full metering, with its annual charges for reading, billing and depreciation, intelligently applied to the purpose of boosting the low water flow during the two months of dry weather, would secure ample minimum supply for more years than the life of the meters. As it is, even with a fully metered city, Pocatello's example in restricting sprinkling will necessarily have to be followed and the flow supplemented by storage. Thus, in this case the meters (except for large consumers) are a total loss as an investment. The point is, as I pointed out in letters to *Engineering News*, published June 3 and July 8, 1915, that circumstances vary, and one metering plan is not best for every case. This is a reasonable proposition in almost any line, but one which the editor appears unwilling to admit as applicable to meters.

In Portland's case, the proposed universal metering is in fact only a costly expedient to remedy a total lack of foresight regarding water-supply, an example of what another article in the same issue points out under the heading, "Lack of Foresight in City Water-Supplies."

Portland, Ore. GEORGE RAE.

[Mr. Rae misses the point in that 1919 was the dryest year of record in Pocatello, and the 2,000,000-gal. minimum refers to 1919 conditions, although there has been a decided increase in population and in large water users. Doubtless there have also been seasons in the past when for brief periods the average of 350 gal. daily was not obtainable. Pocatello is 52% metered, not "fully" as Mr. Rae says. Had it been 100% metered sprinkling restrictions may or may not have been required, but in our opinion they would not have been.

Circumstances do vary, but by and large we believe in selling calico by the yard, sugar by the pound, gas by the cubic foot and water by the gallon, regardless of whether or not somebody lacks foresight in providing a superabundance so that future generations may continue to be wasters. The sooner the people of this country come to their senses in the way of paying for what they get and not for what someone else gets, the sooner shall we be on a sound economical and sociological basis. —EDITOR.]

Board of Consulting Engineers for Columbus

Acting upon a proposal made by the Engineers' Club of Columbus, Ohio, the council of that city passed an ordinance this year providing for the creation of a board of consulting engineers. The duties of the board are "to give to the mayor and the city council expert advice and information on any matter that may be referred to such board for consideration, and, in its discretion, to make recommendations to the mayor and city council on any subject connected with the administrative work of the city Government." The board consists of five members, two of whom are the director and the chief engineer of the public service department. Five other members are appointed by the mayor. The ordinance requires that these members be either architects or civil, mechanical, or electrical engineers of recognized standing and five years' active experience in their profession. The members of the board serve without compensation. The five appointive members now serving, all of whom are members of the Engineers' Club of Columbus, are: C. E. Sherman, professor of cival engineering, Ohio State University; E. G. Bradbury, sanitary engineer; N. D. Levin, mechanical engineer; J. J. Morgan, structural engineer, and F. W. Jennings, civil and highway engineer.

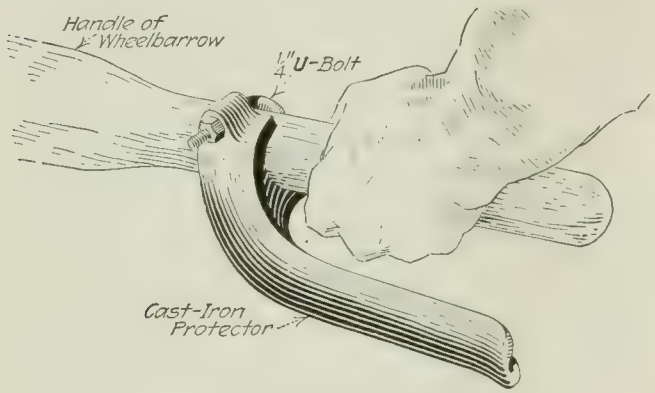
HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Knuckle Guard for Wheelbarrow Handles

By JOHN H. SAWKINS
Schenectady, N. Y.

FIRST aid to "skinned" knuckles, which are a considerable cause of time lost where many men are operating wheelbarrows, is practically eliminated by the simple knuckle guard illustrated by the accompanying sketch. The guard can be attached to and removed

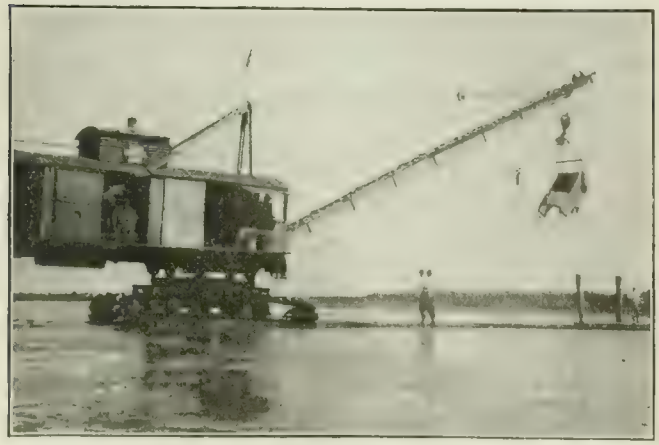


GUARD PROTECTS WHEELBARROW USER'S HAND

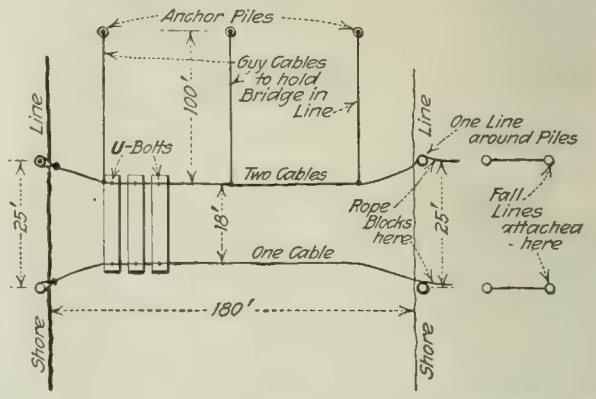
quickly from the handle, and when men are working in close quarters and about staging it will prevent many a bruised hand.

Dragline Crosses Rio Grande on Cable Pontoon Bridge

PARALLEL steel cables which were attached to shore piling and on which floor timbers were threaded formed a floating suspension bridge on which a 70-ton dragline excavator successfully crossed the Rio Grande, in conducting work on the Rio Grande project of the United States Reclamation Service. The river at the point of crossing is about 800 ft. wide and consists of two channels with a shoal between. The channel on the west side carried most of the water, which varied in depth from 18 in. at the edges to 40 in. at the center. It was across this deeper channel that the suspension pontoon bridge was constructed as shown by the diagram, the piles being driven as indicated. Two ¾-in. cables were stretched, fastened and made taut by a set of double blocks fastened to the piles, the cables being given one turn around the shore pile at the right.



DRAGLINE EXCAVATOR CROSSING PONTOON SUSPENSION BRIDGE



SKETCH PLAN OF SUSPENSION PONTOON CROSSING FOR DRAGLINE

Downstream 25 ft., corresponding piles were driven and spanned between by a single cable fastened and tightened as were the upstream cables. Across these "parallel" cables was laid a floor of 6 x 16 in. x 20 ft. timbers spaced 6 in. apart. The timbers were fastened to the cables by ⅝-in. U-bolts. About 67 timbers were required.

The dragline machine, mounted on caterpillars, propelled itself across this bridge without trouble. Beyond the bridge in shallow water it moved on self-laid track after the manner described in *Engineering News-Record* of Sept. 18, 1919, p. 582. The crossing operation from shore to shore required 6½ hours and the cost, including materials and haulage, was $355. N. E. Fordham, master mechanic of the Rio Grande project, devised the method of making the crossing and directed all operations.

Light Arch Supports for Canvas Sun Shields

CANVAS sun shields cost 75% less to shift, on concrete-road work near Smithfield, Penn., when the canvas was supported as illustrated, than when it was spread over the concrete without support. It required 1500 ft. b.m. of lumber, nails and wire costing $3, and the labor of four men for two days, or a total expenditure of $102, to construct eight 25-ft. sections of frame. The method of construction was to set up a horse along the middle of a completed slab and lay across it the boards long enough to bend down and touch the side forms. Then the longitudinal center and side strips were nailed to the ribs, and the ribs bent down and held to curve by placing wire ties fastened to cleats.

A crowbar pulled the ties taut. When the canvas was spread on the concrete it took eight men and a foreman



EASILY SHIFTED SUN SHIELD FOR CONCRETE ROAD

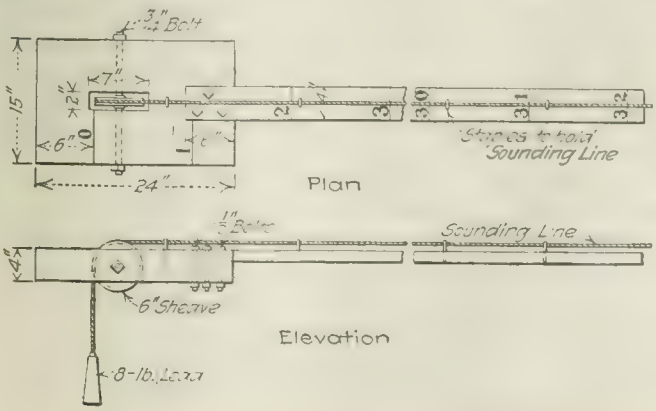
one hour to shift 200 ft. of covering. With the frames, the same crew makes the shift in 15 min., at a cost of about ½c. per square yard of slab covered. Reagan & Lynch, Uniontown, Penn., the contractors for the road, devised this sun shield, which is described in the *Concrete Highway Magazine* for November, 1919.

Rig Used for Sounding Under Piers

By R. W. Beuttenmuller
Great Lakes Dredge and Dock Company

On a war construction operation at the Philadelphia Quartermaster Terminal it was necessary to carry on piledriving and dredging at the same time, in order to keep up with the progress outlined. This did not give the necessary time to permit of dredging the slopes in the slips before piledriving and concrete work began. In order to remove the pressure from the piles, due to the material retained by them, it was necessary to jet the material from under the piers. By the time the jetting had been done, the piers had been decked, and the concrete retaining wall was in place and backfilled, which eliminated the ordinary methods of sounding under the piers. The writer devised a rig as shown in the sketch.

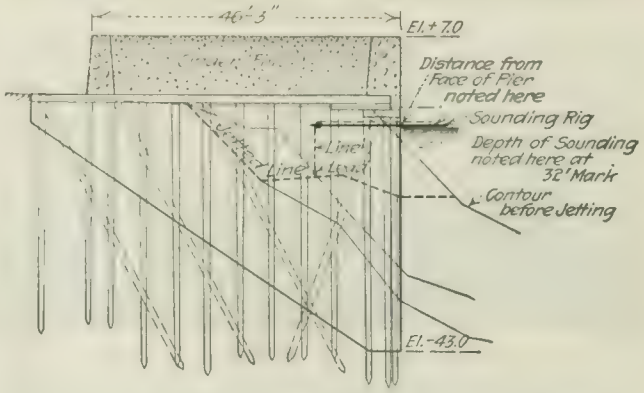
The method used was as follows: First the rig was floated and the flotation line noted; then the lead was pulled up until it struck the bottom of the 4-in. plank, and the distance from the flotation line to the bottom of the lead was then measured. The 32-ft. mark was assumed as the zero for the sounding line but, due to the construction, it was necessary to move the zero of the sounding line toward the 31-ft. mark the distance above



FLOATING RIG USED TO SOUND UNDER PIERS

noted—that is, the distance from the flotation line to the bottom of the lead when pulled up tight. The sounding line was marked off in foot intervals from the zero tag located as told above.

The sounding board was then pushed underneath the



TYPICAL DREDGING SECTION AND TYPE OF PIER

piers at 5-ft. intervals, and the sounding taken at each point; at the same time the distance in from the face of the pier was noted as shown by the figures on the sounding board, and the depth of sounding as shown by the tag on the sounding line. These points were plotted and connected up with the cross-section taken by the ordinary methods, in the slip. The block of wood at the end of the rig must be large enough to float its own weight plus the weight of the lead. A typical cross-section, with the rig in place, is shown.

Dredge Scows To Be Emptied Let Down Niagara River on Lines

Dredged excavation from the bed of the Welland River, which forms the first stretch of the new Queenston-Chippawa power canal around Niagara Falls being built by the Ontario Hydro-electric Power Commission, is being dumped from scows in the Niagara River about a mile or a mile and a half above the brink of the Canadian falls. As the current is very swift here, and the danger of a scow getting away is great, the scows are let down the river from a fixed crib in the Niagara River just off the mouth of the Welland River. The views herewith show the progress of the dumping operation.

At the time when these pictures were taken the dredge was working just at the mouth of the Welland River to the left of the view. It is now well up the river and the scows are loaded by the dredge and are taken by tugs to the crib, which shows at the extreme right of all the views. This consists of a pile crib, and attached to it is a scow carrying hauling machinery; that is, an ordinary hoisting engine with about 2500 ft. of line.

The scows are brought by the tugs to the crib and attached there to the hoisting line. They are then let down the river with an attending tug, or, as is shown in the view, sometimes two, which, for the first thousand feet, act merely as guides. After that length of line is paid out, it commences to drag on the bottom and the tug has to exert some slight pull on the filled scow. At the end of the 2500 ft. of line the scow is dumped, and is then hauled back by the line to the fixed hoist, where the tug picks it up and takes it back up the river to the dredge.

About a year ago a scow on the other side of the river, with five men aboard, got loose and washed down to the brink of the Canadian falls. Three of the men jumped overboard and were lost. Two of them, however, remained aboard and when the scow caught on a projecting rock almost at the brink of the falls were



Scow being fastened by line to hauling crib



Letting scow down river from hauling crib



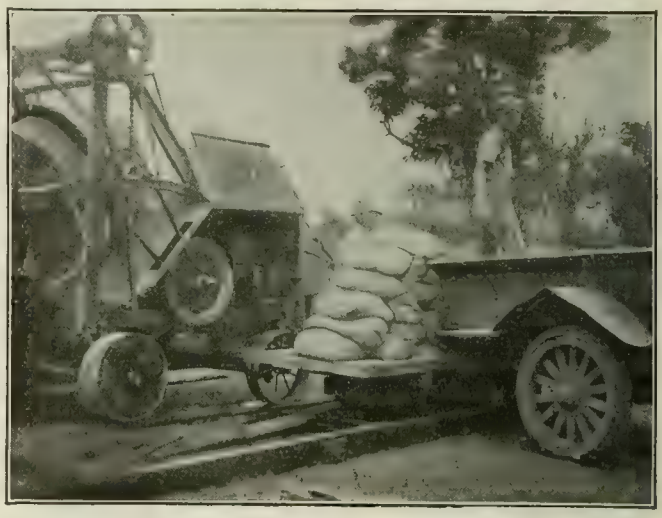
Hauling emptied scow back to crib

DUMPING SCOWS IN NIAGARA RIVER

rescued by a lifeline shot out from the adjoining Ontario power development power house. This accident, however, led the engineers of the Ontario Hydro-electric Power Commission to consider some safe method of controlling the unloaded scows.

Flat-Car Cement Stock Pile for Paving Mixer

SACKED cement delivered by motor trucks, on road work in Mason County, West Virginia, is unloaded onto a platform on wheels, traveling with the mixer, instead of onto the ground, and considerable labor is thereby saved in handling cement. The platform is 4 x 8 ft., of 2-in. oak planks, and is mounted on four mine-car wheels on $1\frac{5}{16}$-in. axles, with roller bearings. A track way of 10-ft. lengths of 3-in. joists, armored with $\frac{1}{4}$-in. steel straps, carries the platform car. It is proposed to substitute track sections of light steel rails. The platform holds 80 sacks of cement. With this traveling platform the cement can be lifted directly to the charging skip; it does not touch the ground, and can be easily protected from rain by tarpaulins. Samuel Lutton, superintendent of concrete-road construction,



CEMENT STOCK PILE ON FLAT-CAR

Mason County, devised this arrangement, which is described by L. E. Musgrave in the *Concrete Highway Magazine*, for November, 1919.

Convenient Table for Locating Short-Radius Curves

By C. M. Pritchett
Resident Engineer, North Carolina State Highway Commission

TIME is saved in laying out sharp curves by using the accompanying table employed by the writer for mountain road location in North Carolina. On this work a minimum radius of 50 ft. is allowed, and as these curves are quite numerous in some sections, involving often a *delta* of 180° and more, the time of figuring them and laying them out with 10-ft. chords in the usual manner is considerable. Often the contour of the ground does not require cross-sections closer than 50 ft., so the work of figuring and laying out the curves is unnecessary except to determine the true length of line. This can be accomplished by taking the true length of the chord from the table and using the corresponding deflection for all curves over 20°, when the length of chord comes within the limit of error. In most cases the degree of curvature can be selected from the table, but when an intermediate curve is desired the interpolation is simple.

SHORT-RADIUS CURVES TABLE

Radius	D	Def. for 50-Ft. Arc	Def. per Ft. of Arc	Chord for 50-Ft. Arc	Chord per Ft. of Arc
50.0	114°—36′	28°—39′	34.38	47.9	0.959
52.1—	110°	27°—30′	33.0	48.1	0.963
54.6—	105°	26°—15′	31.5	48.3	0.966
57.3	100°	25°—0′	30.0	48.4	0.969
60.3+	95°	23°—45′	98.5	48.6	0.972
63.7—	90°	22°—30′	27.0	48.8	0.975
67.4+	85°	21°—15′	25.5	48.9	0.978
71.6+	80°	20°—0′	24.0	49.0	0.980
76.4	75°	18°—45′	22.5	49.1	0.982
81.9—	70°	17°—30′	21.0	49.3	0.984
88.1+	65°	16°—15′	19.5	49.3	0.986
95.5	60°	15°—0′	18.0	49.4	0.989
104.2—	55°	13°—45′	16.5	49.5	0.991
114.6	50°	12°—30′	15.0	49.6	0.992
127.3+	45°	11°—15′	13.5	49.7	0.993
143.2+	40°	10°—0′	12.0	49.7	0.995
163.7+	35°	8°—45′	10.5	49.8	0.996
191.0	30°	7°—30′	9.0	49.9	0.997
229.2	25°	6°—15′	7.5	49.9	0.998
286.5	20°	5°—0′	6.0	50.0	0.999

NEWS OF THE WEEK

New York, December 25, 1919

Cummins Rail Bill Passed by Senate

Nonpartisan Vote of 46 to 30—Measure Will Go to Conference with the Esch Bill

The Cummins railroad bill was passed in the Senate Dec. 20 by a nonpartisan vote of 46 to 30, just before adjournment for the holiday recess. Immediately after the first of the year it will go to conference, together with the Esch bill. It is believed that neither bill will ultimately be adopted, but rather a compromise measure, which will not, however, embody new features, as this is prevented by the rules. An outline of the bill was published in *Engineering News-Record* of Sept. 4, 1919, p. 485. The Esch bill was described by Representative E. E. Denison of Illinois in a specially prepared article in *Engineering News-Record* of Nov. 13-20, 1919.

The Cummins bill differs from the House measure principally in providing for a Federal Transportation Board and a definite plan for fixing rates to produce fixed percentage return on value of properties. The bill also provides for consolidating the railroads of the country into from 20 to 35 competing systems. For the first seven years the consolidations would be voluntary, and thereafter would be compulsory. The bill also embodies drastic anti-strike provisions which are not contained in the House measure.

It is expected that the President will present his railroad message to Congress soon after the holiday recess and before the Senate and House conferees have reported a final measure.

Just before the passage of the Cummins bill the Senate rejected, by a vote of 65 to 11, the La Follette measure for extending Federal control two years.

Urge Examination for Chicago City Engineer

Engineers of the Chicago Chapter of the American Association of Engineers are requested in the *Monthly Bulletin* to write letters to their aldermen and the Civil Service Commissioner requesting that an examination be held for the position of city engineer of Chicago. The reason given is that a civil-service vacancy exists, and that there should be no question of the capabilities of the incumbent. Furthermore, a letter, which it is suggested be used, requests that an examining board of consulting engineers be appointed to prepare an examination, their names to be published prior to the examination and the appointee to be selected from the three applicants obtaining the highest rating.

To Abolish United States Housing Corporation

On Dec. 17 the House of Representatives passed without a dissenting vote a bill ordering the sale of the housing facilities erected by the Government during the war and abolishing the United States Housing Corporation. The bill transfers the property to the United States Treasury for sale to private persons, either for cash or part payment. It now goes to the Senate.

Would Enlarge Roads Bureau

Enlargement of the Bureau of Public Roads is asked in a resolution adopted unanimously at the convention of the Mississippi Valley Association held recently in Washington. The resolution also asked that the present Federal aid system be undisturbed.

Engineers on the Pan-American Trade Conference Committee

Several engineers are included in the membership of the committee of the second Pan-American financial conference, which will be held in Washington, D. C., Jan. 12-17, 1920. The following engineers are noted on the committee: Col. F. A. Molitor, consulting engineer, New York City; Calvin W. Rice, secretary, Am. Soc. M. E.; Verne Leroy Havens, editor, *Ingenieria Internacional*, McGraw-Hill Co., Inc.; S. T. Henry, vice-president, Allied Machinery Corporation; W. L. Saunders, chairman of the board of directors, Ingersoll-Rand Co., New York City; Pope Yeatman, consulting mining engineer, New York City; Philip W. Henry, vice-president, American International Corporation; J. G. White, of the J. G. White Corporation; Lindon W. Bates, contracting and consulting engineer, New York City.

Cincinnati Contractors Join National Body

Following a recent visit to Cincinnati by F. O. Southbrook, field secretary of the Associated General Contractors of America, the Cincinnati Contractors' Association of Public Works has affiliated with the former body. Announcement of the decision of the Cincinnati organization was made at the regular monthly meeting Dec. 4. The decision was unanimous.

Levee and Drainage Contractors To Meet in St. Louis

The Levee and Drainage Contractors' Association of America will hold its third annual meeting in St. Louis, Dec. 30, with headquarters at the Planters Hotel.

Campaign Begun To Support Development Report

Philadelphia Members, Am. Soc. C. E., Start Drive to Secure Backing for Project to Secure a United Profession

With the object of securing a favorable vote on the fundamental recommendations of the Committee on Development of the American Society of Civil Engineers and of securing a large attendance at the annual meeting in New York City, Jan. 21, 1920, the executive committee of the Philadelphia Association of Members, headed by Richard L. Humphrey, has begun an intensive educational campaign among the society's membership resident in the fourth district. Teams captained by engineers well known locally are now making a canvass of the members in Philadelphia, Altoona, Wilkes-Barre, Harrisburg, Allentown, Camden, Trenton and throughout the States of Maryland and Delaware. The objects of the campaign have been explained in detail in a report just issued by the executive committee, which includes, in addition to Mr. Humphrey, H. T. Shelley, Benjamin Franklin, Jonathan Jones, F. Herbert Snow, S. M. Swaab and Samuel T. Wagner. The recommendations contained in the report, it is explained, have been made with a view to making the united engineers of this country a recognized power and stimulating technical activities. The principal portions of the report follow:

The report of the Committee on Development covers two distinct fields:

1. External relations,
   (a) in technical matters with other societies and
   (b) in nontechnical matters or welfare work for the improvement of the status of the engineer in his relation to the public and to other engineers.
2. Internal relations,
   (a) increased technical activities and changes in present methods, involving only society matters.

While the formation of the single comprehensive organization recommended provides for affiliation in welfare work, it does not contemplate the amalgamation of the society with other national and local engineering societies nor does it contemplate any interference with the present technical and professional activities of the society.

The fundamental recommendations are:

1. External relations,
   (a) That the American Society of Civil Engineers "adopt the principle of becoming an active na-

tional force in economic, industrial and civic affairs, and with that purpose in view become an active factor in coöperation with other engineering and allied technical associations of the country." (Division C*).†

(b) "That a comprehensive organization be created as outlined in the Joint Conference Report" (Division C).†

2. Internal relations,

(a) that the technical activities of the society be increased (Division A, Sect. 1-5).†

(b) That local sections be created to embrace the entire membership of the society (Division B, Sect. 1, Par. a, b, c, d and h).‡

(c) That the director in each geographical district be nominated and elected by vote of the corporate members resident therein (Division B, Sect. 1, Par. e, f, g and l).‡

(d) That a portion of the society dues be allotted to local sections (Division B, Sect. 2, Par. i).†

(e) "That there be held during the annual convention a conference of the representatives from local sections to consider the welfare of the society and its members and report thereon to the Board of Direction" (Division B, Sect. 1, Par. j).†

(f) "That the present nominating committee be abolished and that a candidate for each of the offices of president, two vice-presidents and treasurer be nominated by the annual conference of representatives of the local sections" (Division B, Sect. 1, Par. k).‡

(g) That the present grades and requirements for membership be revised (Division B, Sect. 2).‡

(h) "That the dues of all members above the grade of Junior be adjusted to provide for the greater activities of the society and to the extent that the recommendations" of the Committee on Development "are adopted" (Division B, Sect. 3).‡

The above are the vital points in these recommendations. The details are relatively unimportant and must be worked out by properly constituted authority and will change from time to time as the necessity arises. Why not give this plan for a united engineering profession a trial and trust the wisdom of those charged with carrying it out to care properly for the details? The engineer has passed beyond the narrow limitations of yesterday and must take his place in the world's affairs. This is not a time for prolonged debate, but for action.

Do you know that there is a general tendency among states to enact laws for licensing the engineer?

Do you know that steps are being taken by the British Institution of Civil Engineers to obtain from Parliament statutory powers to regulate and establish registration for the civil engineering profession?

Do you know that a draftsman in order to obtain employment in some shipyards in Seattle, Wash., must be a member of a local of the American Federation of Labor?

Do you know that architects are being employed to design and build bridges in this state?

Do you know that an organization of draftsmen in Portland, Oregon, is seeking affiliation with labor in order to force the use of a union label on engineering plans?

Do you know that the Chairman of the National Service Committee of Engineering Council states that in his efforts to secure support for a national Department of Public Works "a great man—an acknowledged statesman, a high-minded politician, and a keen observer of people and events"—said:

"Your task is appalling. You have been elected to lead engineers into a political reform. They are the most unresponsive citizens that we have. Your organization has a praiseworthy purpose, but if it were sponsored by almost any other group of reputable men than engineers there would be more promise of success. If your organization succeeds I believe you will find that it will not be the engineers who have carried it through. Their aloofness and indifference to all matters outside of their own professional sphere are among the unexplained things in our political life?"

In view of the above facts, do you not think that the engineer should do something, to secure united action by the engineering and allied technical associations on matters of common interest to them?

Believing that you must be in favor of improving the status of the engineer, this committee is asking you to take an active part in making effective the basic recommendations of the Committee on Development.

Remember, this affects you. The gravity of the situation demands that each engineer shall do his duty. Go to the annual meeting of the society. Vote to place the engineering profession where it belongs.

*Report of the Committee on Development to the Board of Direction of the American Society of Civil Engineers.

‡Requires no amendment to the constitution.

†Requires an amendment to the constitution.

Apportionment of Highway Costs in Maryland

Reapportionment of division of road funds between Baltimore and the counties of Maryland will be made an issue in the highway-construction plans to be brought before the Maryland legislature at its session in January next. The burden of raising more than 75 per cent of the highway funds rests upon Baltimore, through its larger taxable basis, and a more just share of the funds than the 20% the city now receives will be asked. It is probable a 50% apportionment will be sought.

Public Officers Talk Road Finance

State, city, and county officials, and representatives of prominent state and municipal civic organizations of New York, met in Albany Dec. 17, to consider a twofold question: Was the present road construction scheme as being prosecuted in New York to be continued, and, if so, what financial means would be supplied to carry on that program? The meeting was called at the request of Governor Smith, and efforts were made to have at the meeting representatives from every board of county commissioners in the state, as well as numerous state and city officials and representatives of automobile and civic organizations. The discussions were extemporaneous, and inasmuch as the meeting was unofficial, no action was taken by the two hundred-odd interested men present. It was the general opinion of the meeting that no let-up should be given the general road-building program adopted by the state, but when there came further discussion as to how New York should finance its road construction after the remaining $10,000,000 of the second $50,000,000 bond issue are expended, three possibilities for raising needed revenues were considered—long-term bonds, serial bonds, and the "pay-as-you-go" plan. General dissatisfaction was expressed with the method of authorizing the issuance of long-term bonds, it being pointed out that the two $50,000,000 issues now practically expended would, when all bonds are retired, have cost the state approximately $300,000,000.

The greater part of the three-hour session was devoted to a discussion of the relative merits of the pay-as-you-go plan and short-term serial bonds. A report from Commissioner of Highways Greene indicated that the last of the $10,000,000 would be consumed during the 1920 construction season, and, figuring upon $40,000 a mile as a safe figure for future construction, a bond issue of $100,000,000 had been suggested. Figures compiled by the State Comptroller indicated that the average yearly cost of carrying the bond issue, including the average annual interest and the average annual sinking fund, would be $6,351,926. This would amount on a 30-year issue to $190,557,780. Under a pay-as-you-go plan, Mr. Greene showed, were the state and county each to provide 25% of the money needed to match Federal aid, and were they each to appropriate in addition $4,500,000 from a general fund, there would be available for road construction in New York State more than $18,000,000. During 1919, he said, 174 contracts, aggregating $18,107,000, had been let, and that it was impracticable to spend more, both because of the inability to secure men and materials and also because state highway departments in general did not seem to have hit upon the way of properly attracting big contractors with adequate plants to carry on large pieces of construction. Under this pay-as-you-go plan, therefore, the state's total share of this approximate

$18,000,000 would be $6,864,000, to be raised by direct tax. As there are, according to the present schedule, 882 miles of state roads and 2424 of state-aid roads, this total mileage could be built, said Commissioner Greene, under the pay-as-you-go plan in from 8 to 10 years, at the most.

Considerable objection was raised to the "pay-as-you-go" plan because of the possibilities present of any state legislature cutting road appropriations when the budgets were made up. Although a few men were present with authority to state that the organizations they represented favored the $100,000,000 bond issue, the general opinion expressed was to the effect that the question should receive the fullest and most serious discussion by financiers and legislators of the state, and that a plan, perhaps proposing the issuance of short-term serial bonds, be presented to the next legislative assembly.

Although the discussion of types of roads was not scheduled and, as a matter of fact, speakers were asked to confine their remarks to discussions of the twofold question above mentioned, former Commissioner of Highways Carlisle asserted that he could not consider any financial program without taking into account the type of pavement. To his mind, "$40,000-a-mile highways" were "preposterous." He urged against the adoption of any scheme admitting wholesale construction of such types, regardless of location, and asserted that construction of concrete roads on such a scale meant that New York State must to a great extent lose what macadam and bituminous roads it had already laid.

Valuation Features of Commission Report to Congress

In its annual report to Congress, presented this month, the Interstate Commerce Commission states that 53 tentative valuations have been served to date, although there has not been "fixed a single sum as the final value" of the Texas Midland R.R., the Kansas City Southern System, and the Winston-Salem Co., since legal actions upon protest have been taken.

The field work of the engineering section has been substantially finished, road and track parties having been disbanded in the Southern, Western and Pacific districts, with the expectation of disbanding those in the Central district about the first of the year. It is stated that progress in the land section has not been so great, due to the inability of the carriers to supply the necessary pre-inventory information.

The greatest difficulty is being experienced in the accounting section, as men capable of compiling statistics in narrative form are hard to find.

Arguments will be heard, early in January, of parties desiring the fixing of actual values in tentative valuations, in which no definite values have as yet been assigned, to aid in a study of the question.

Col. Henry W. Hodge Dead

Had Been New York Public Service Commissioner and Served For Over Two Years with the Engineers in France

Henry W. Hodge, consulting engineer, former colonel, Engineers, U. S. A., and former public service commissioner for the First District, New York State, died suddenly at his home, New York City, Dec. 21.

Prior to his work as an Engineer officer with the A. E. F. in France, Colonel Hodge, as a member of the firm



COL. HENRY W. HODGE

of Boller & Hodge (later Boller, Hodge & Baird) aided in the design and construction of some of the largest buildings and bridges in the country, many of them in New York City. His firm was engineer for numerous foreign enterprises, having designed over 1700 bridges for Mexico, all of the bridges for the Bolivian Central Railway, for the Madeira-Mamore and for the Cerro de Pasco.

The appointment of Colonel Hodge to the Public Service Commission in January, 1916 (the commission having charge of all subway construction work in the city), came after a great deal of public pressure had been applied demanding the appointment of an engineer to fill a vacancy created by the resignation of Robert C. Wood. Colonel Hodge continued as a commissioner until his resignation in June, 1917, when he entered the military service as a major of Engineers. His appointment as a member of the Public Service Commission received universal indorsement from the engineering profession, as his was the first appointment of an engineer to a New York State commission having control of so large a program of construction as that of building the New York subway system. He was accorded by his engineer friends a complimentary dinner after his appointment had been announced, and during his incumbency he proved a fearless public official. His independence frequently impressed the other commissioners. At hearings of property holders, when man after man would appear and repeat the same thing Colonel Hodge would suggest the immediate adjournment of the hearing, against the ardent protest of the citizens present. He believed in saving time for the commission, and fought for that end. Moreover, the petty play of politics had no consideration at his hands. When property holders pleaded the need for better transportation in their district, disregarding entirely whether the company was financially able to furnish it, Colonel Hodge would come back to the economics of the situation and inquire into the justice of the case from the utilities standpoint.

After his resignation from the commission and his commission as a reserve officer, he went to France with the American Expeditionary Forces. He was first manager of roads under the Director General of Transportation and held the same title under the Director of Light Railways and Roads. He was then transferred to G. H. Q., where he became the chief of the bridge section of the Office of the Chief Engineer at General Headquarters.

Boller, Hodge & Baird, of which firm Mr. Hodge had been senior member since the death of Mr. Boller in 1912, designed many of the largest bridges and buildings in the country, among them being the Duluth and Superior bridge, the cantilevers across the Monongahela and Ohio rivers at Pittsburgh and Steubenville, Ohio, for the Wabash Railroad, the Singer and the Metropolitan towers in New York City, the municipal bridge across the Mississippi River for the City of St. Louis, the bridges across the Connecticut River at Hartford, Saybrook and East Haddam, for the State of Connecticut. Other engineering structures designed by Colonel Hodge's firm are the Central Bridge, the Melrose Avenue viaduct, and the Riverside Drive viaduct at 96th St., all in New York City.

Colonel Hodge was born in Washington, D. C., Apr. 14, 1865. After studying several years in a private school he joined the field forces of the Chesapeake & Ohio R.R. in West Virginia. In 1882 he entered Rensselaer Polytechnic Institute, from which he was graduated in 1885. He then became one of the assistant engineers of the Phoenix Bridge Co., of Phoenixville, Penn., where he remained until 1891, when he became chief engineer of the Union Iron Works, New York City, engaged in steel-building construction. In 1893 he resigned from that office to enter private practice, becoming, in 1895, assistant to Alfred P. Boller, in charge of bridge design and construction, and a partner in the firm of Boller & Hodge in 1899.

His most recent engineering work, before he entered the military service,

was as consultant to the New York and New Jersey Interstate Bridge and Tunnel Commission, and as consultant with the Canadian Government as consulting engineer on the new design for the Quebec bridge.

Colonel Hodge was a member of the council of the American institute of Consulting Engineers, a former director of the American Society of Civil Engineers, a member of the Institute of Civil Engineers of Great Britain, the Engineering Institute of Canada and the Railroad Club.

Court Decides Chicago Creosote Oil Specifications "Closed"

By decision of the Appellate Court of the first district of Illinois Dec. 2 the City of Chicago is enjoined from proceeding with paving where creosoted wood blocks are specified that are treated by a creosote oil which infringes the Reilly patent (1,220,001, held by the Republic Creosoting Co.). This decision reverses a decree of the Circuit Court of Cook County, Illinois, and directs that court to issue the injunction prayed for.

The Circuit Court entered a decree Feb. 27, 1918, dismissing for want of equity a bill brought by property owners to restrain the performance of a contract for paving Sherman St. from West Jackson St. to West Van Buren Street.

On the question whether the specifications tend to foster a monopoly in the manufacture of creosote oil and creosoted wooden paving blocks the court reached the conclusion that they do so tend. Section 74 of the local improvement act of 1897 prohibiting the use of patented articles is the one on which the second question hangs. The first is as to infringement of patent the validity of which was not questioned.

Bids Asked on Entire County Road System

According to an item recently appearing in the *Southwest Contractor*, bids have been called for by the Highway Commission of Arizona for the construction of 278 miles of paved highways in Maricopa County, the entire authorized road program under a $4,000,000 bond issue. Bids are to be opened Jan. 12, 1920. Specifications call for roads of cement concrete, asphaltic concrete, and crushed rock with asphaltic concrete. The materials necessary for the construction of this mileage include 600,000 bbl. of cement, 200,000 cu.yd. of sand, and 400,000 cu.yd. of crushed rock. The problem of supplying the materials has given the highway commission much concern. A supreme court ruling prevents the commission from carrying out a plan to have the county supervisor establish a rock-crushing plant and operate a cement mill and furnish materials to the commission at cost, which, the commission claimed, would have saved many thousands of dollars.

Industrial Conference Completes Preliminary Report

The National Industrial Conference, appointed recently by the President to formulate methods and machinery for handling and preventing labor difficulties, has completed a preliminary report which will be made public within 10 days. The conference adjourned Dec. 19 and will reconvene in Washington Jan. 12.

The preliminary statement will not be in the nature of a report to the President, Dr. F. W. Taussig, one of the conferees explained, but will be given out in order to indicate tentatively what the members of the conference think of proposing, so that they may be benefited by the criticism of interested parties.

"This statement will not say much about general principles," said Dr. Taussig, "but it will be chiefly given to the presentation of a constructive plan of mediation, conciliation and adjustment. Discussion and criticism will be particularly invited from labor and employer organizations.

"We have not considered any specific labor problems. We are merely trying to lay down methods of dealing with labor problems."

It is expected that upon the reconvening of the conference in January, hearings will be held, at which time representatives of labor and employers will be heard. These hearings will partly be in executive session and partly open to the public.

Union Depot at Los Angeles Built for Long-Haul Buses

The rapid increase in the number of passenger stages radiating from Los Angeles, Calif., has required the city council to pass an ordinance requiring all stages to load and unload their passengers under cover. To comply with this ordinance, several passenger depots have been built by the various stage companies, the largest being the union bus depot at the southeast corner of Fifth and Los Angeles Streets.

This depot is controlled by the Eldorado Stage Line, Pickwick Northern Division, Pickwick Inc., United States, White Bus Co., Mount Wilson Stage Co., and Murietta Stage Line. Approximately 200 stages are operating out of this depot daily, making an average of 500 trips each day. The average number of passengers carried is approximately 5000. Stage lines radiating from this depot touch all of the important cities in California, from San Francisco to San Diego and the Imperial Valley.

This depot is up to date in every respect, and compares favorably with modern railway terminals. The building is equipped with adequate rest rooms with maids in attendance, ladies' parlor, restaurant, barber shop, depot master, cigar stand, Western Union branch office, drug store, checking room, news-stand, information bureau, waiting room, drivers' club room equipped with lockers, ticket office and offices for the use of the company.

The depot is a one-story building with a mezzanine floor. The interior is finished in light gray with tile floors. All stages enter from Maple Ave. and discharge their passengers under cover. After unloading, cars proceed to a loading platform, where runways are provided for loading the various stages. It is estimated that 30 stages can be loaded at one time.

The union bus depot was put in operation in the latter part of September, 1919. This depot is owned by a holding company which is made up of the various stage companies. The stage companies are very careful in the selection of drivers. Drivers are allowed three days to break in, and then are subjected to a rigid examination. This method has reduced the number of accidents to a minimum.

New Staff Planning Sacramento Water-Treatment Works

A complete engineering staff has just been organized and detailed designs are being made for the $1,800,000 water-purification works at Sacramento, Calif., voted last June. The initial construction will be for 30,000,000 gal. daily taken from the Sacramento River just below the mouth of the American River.

There will be an intake tower, a low-lift pumping station, a grit basin, a coagulation basin and rapid sand filters and high-lift pumps operating under a head of about 200 ft., or about double the pressure now on the city mains. Special attention is being given to the preparatory treatment of the water because of its wide seasonal variation—from 0 to about 1000 p.p.m. of turbidity.

Comparative studies are being made to determine whether steam or electric drive would be the more economical in the two pumping plants. It is probable that filter alum will be made at the plant.

A tract of 48.6 acres is to be acquired by the city for the filtration and pumping plants. This will afford space for doubling the present capacity should such increase later become desirable. This tract is about 400 ft. back from the bank of the Sacramento River and will have an independent dike system for flood protection. Laying about two miles of 36- to 42-in. steel force main is included in the present program. It is not expected that actual construction work on the project will begin before August, 1920. The bonds bearing interest at 4½% have not yet been sold.

The engineering staff is as follows: Charles Gilman Hyde, professor of sanitary engineering, University of California, recently returned from service in the Sanitary Corps, is consulting engineer; C. G. Gillespie, formerly with G. W. Fuller of New York and more recently chief engineer, California State Board of Health, is resident engineer. There are three principal assistants: H.

B. Foster, formerly chief engineer of the Board of Regents, University of California, will have charge of hydraulic and filtration design and construction; George J. Calder, of Hudnut & Calder, structural engineers, Sacramento, will have charge of structural design and construction; B. F. Raber, professor of mechanical engineering, University of California, has been granted a leave of absence of one year to serve as principal assistant engineer in charge of mechanical and electrical design. H. N. Jenks is special engineering assistant, and Carl L. Knight is field engineer. S. N. Whitman, formerly in charge of utilities at Camp Meade, is office engineer. W. F. Langelier, formerly assistant professor of sanitary engineering at the University of California, will have charge of the chemical and bacterial work.

Unanimously Indorse Comprehensive Engineering Organization

Unanimous indorsement of the general principles expressed in the report of the American Society of Civil Engineers' Development Committee, which proposed a comprehensive national organization of all engineering bodies, has been voted by the District of Columbia association of members of the society.

At a meeting of the association held Dec. 19 in Washington, the Development Committee's report was discussed and the following resolutions were unanimously adopted and ordered transmitted to the Board of Direction of the parent society:

"Resolved, that the District of Columbia Association of Members of the American Society of Civil Engineers indorses the general idea proposed in a report of the Committee on Development, and recommends that the Board of Direction of the society report favorably on the adoption of the general principles of the report, subject to such modifications in details as may be found necessary in order to put the general principles into operation.

"Resolved, that in further advancement and adoption of the report of the Development Committee, the Board of Directors of the District of Columbia Association appoint a committee to make a systematic personal canvass of the local members, that they may be informed in regard to the report."

Public Service Commission To Contract for Bethlehem Bridge

According to a decision reached by the Pennsylvania Public Service Commission in the matter of the Lehigh River bridge at Bethlehem, the commission will be party to the construction contract, in place of the Bethlehem Bridge Commission. The latter, however, will be the agent of the former in directing and supervising the execution of the contract. C. W. Hudson, engineer to the bridge commission, states that the contract will probably be let about Feb. 25, 1920.

Technical Employees in Chicago Hear Union Leaders

At a mass meeting of technical employees held in Chicago Dec. 11 under the auspices of Chicago Local 14 of the International Federation of Technical Engineers, 700 were present and A. A. Cother, international organizer, who sent to *Engineering News-Record* a report of the meeting abstracted below, estimated that 66% of those in attendance were not members but "were anxious to learn of its aims and accomplishments."

The principal address was made by Anthony J. Oliver, president of the international federation, which is now composed of some 40 local unions representing a membership of over 6000. He contemplates full affiliation of the technical men's international with the railway employees' department of the American Federation of Labor at its biennial convention next April. The following extracts are taken from his address:

"I want to challenge these societies which propagate the doctrine 'that you must not fight for your rights as it is not ethical,' and that you should only beg, plead and coax for what you are entitled to and then, if it is finally denied, you should just supinely submit. I want to challenge these organizations to announce what remedy is left them after going through this formula of begging, pleading and coaxing, and I feel sure, my friends, that their answer would be that they have no further remedy except the remedy that is written in the constitution of the American Federation of Labor.

"The engineer and architect in high position and of confidence and trust were responsible for keeping down the salaries of the younger men entering into employment, in order that they might ingratiate themselves further into the good-will of the management. This selfish spirit, though conscientious as it may appear to be, has been the cause of our whole calling being the poorest paid calling, education and training considered, of any in the industrial world. . . .

"Some experts in economics, as well as leaders in various engineering societies, tell us that we are between capital and labor. This is a rank fallacy—a sort of sophistry propagated by those connected with the capitalistic class who would cajole you into believing you are one of them so that they may hold you in a distinct and separate class and then do with you what they will. This policy has been followed by employees for the past forty years. Every scheme possible has been tried to keep the technicians out of the labor movement. The strongest abstract reason advanced, and perhaps the most foolish, is that *it is against professional ethics*. I ask, my friends, if underbidding your fellow engineer, architect or draftsman for his job is professional ethics? Ethics, my friends, are like some rules of etiquette. The standards established by custom or ethics are strange, vague and varied. Engineers, architects and draftsmen have no ethical standard, no gentleman's agreement, or any other compact. They work for whatever they get, or in most cases what is given them, and at all times they were willing to underbid their fellow worker for the position he held."

Road Machinery Companies Cited for Unfair Competition

The Federal Trade Commission has cited the Universal Road Machinery Co., Kingston, N. Y., and the New England Road Machinery Co., Boston, Mass., in formal complaints alleging unfair methods of competition. The complaints allege that, in the case of the latter respondent, "gratuities, entertainments and money," had been given and offered to certain public officials with an idea to induce them to recommend the purchase of its machinery and to refrain from dealing with competitors. The allegation is also made that similar gratuities were given and offered to employees of the company's customers and prospective customers, and that the company had paid the expenses of public officials to their place of business to inspect their products. Practically the same allegations are made with respect to the Universal Road Machinery Co. Both respondents have 40 days in which to file answers, after which the case will be tried upon its merits before a final settlement.

Swamp-Drainage Constitutional Amendment Vote Announced

An official announcement of the vote on the swamp-drainage amendment in New York State at the November election shows that it was adopted by a vote of 718,150 to 590,134. This amendment enlarges the scope of Section 7 of Article 1 of the Constitution, which originally permitted the drainage of swamp lands by means of districts when the object was to conserve public health or safety. The amendment adds public welfare to the objects to be attained. Proceedings for the formation of drainage districts may be initiated either by the State Conservation Commission or by petition to the commission. Petitions may be filed by any public corporation in which lands to be drained are located or by any owner or owners of such lands. After due process, as set forth in Chapter 493 of the Laws of New York, for 1919, which is a substitute for Article 8 of the conservation law of 1911, the cost of drainage works may be assessed, either wholly or in part, upon the property benefited.

Highway Engineer Will Be Highest Paid State Official

R. J. Windrow, state highway engineer of Texas, will be the highest paid state officer of that state after Jan 1, when his salary will be increased to $10,000 a year, as granted by the State Highway Commission Dec. 16.

Sanitary Engineer for Newark Health Service Advised

Creation of separate bureaus of (1) health and hospitals and (2) public welfare at Newark, N. J., each under a head responsible to the mayor as director of the Department of Public Affairs (Newark has commission government) is advised in a report made by the Bureau of Municipal Research of New York as a part of a general survey of the city government. The bureau recommends the employment of a sanitary engineer to advise the health officer on all sanitary-engineering matters, including water-supply, sewage and garbage disposal, amendments to the building code, and housing.

Dedicates Perforating Patent to Public

The patent covering the process of perforating cross-ties and timber for the purpose of equalizing the penetration of wood preservatives has been dedicated to the public by O. P. M. Goss, the inventor, and six companies on the Pacific Coast which had obtained an interest from Mr. Goss in his ownership of the patent.

The process is used in perforating—or, rather, indenting—Douglas fir timbers which resist penetration. The perforation machine by which the depth of penetration is regulated was described in *Engineering News* of Jan. 27, 1916, p. 200, and *Engineering Record* of Sept. 9, 1916, p. 332.

Dates Are Set for Registration of Engineers in Iowa

The Iowa State Board of Engineering Examiners has issued an announcement calling upon engineers and surveyors to register with the board in compliance with the new Iowa registration law.

Under the provisions of the new law any engineer or surveyor may register for practice in Iowa up to Jan. 4, 1920, by merely showing his professional qualifications and without taking the state examination. After Jan. 4, all engineers and surveyors outside the State of Iowa must take the state examination before being allowed to practice.

Engineers now practising in Iowa are allowed until July 4, 1920, in order to register with the state board, but those within the State who have not registered on that date will not be allowed to practice. K. C. Kastberg, of Des Moines, is secretary of the new Iowa State Board of Engineering Examiners.

Civil Service Examinations

Canada. Instructor in mathematics, Royal Military College, Kingston, Ont., $1800 per year. File application with Civil Service Commission of Canada at Ottawa, Ont., before Dec. 26.

New York State. Assistant sanitary engineer, State Department of Health—$2000 per year, $2400 after July 1, 1920—Jan. 24. File applications with State Civil Service Commission at Albany by Jan. 20.

New York State. Engineering assistant, Office of State Engineer and Highway Department, $1080 to $1560 per year, Jan. 24. File application before Jan. 20.

New York State. Engineering draftsman, $1500 to $1800 per year, Jan. 24. File application before January 20.

New York State. Junior assistant engineer, grade 1, Office of State Engineer and Highway Department, $1620 to $1860 per year, Jan. 24. File application before Jan. 20.

New York State. Junior assistant engineer, grade 2, Office of State Engineer and Highway Department, $1980 to $2280 per year, Jan. 25. File application before Jan. 20.

United States

For United States civil service examinations, listed below, apply to the United States Civil Service Commission, Washington, D. C., or to any local office of the commission, for form 1312.

Architectural and structural steel draftsman, Lighthouse Service, Key West, Fla., $1560 per year, Jan. 6. File application before Jan. 6.

Fire-prevention engineer, office of Director of Purchase and Storage, War Department, duty throughout United States, $2500 to $4000 per year, Jan. 13. Application should be filed before that date.

ENGINEERING SOCIETIES

The San Francisco Association of Members of the American Society of Civil Engineers held the 1919 annual meeting Dec. 16. Ninety-eight members and guests were present. Resolutions were addressed to the parent society urging that the 1920 annual convention be held in Los Angeles. A special meeting was called for Jan. 20 to discuss with O. E. Meinzer, chief of groundwater division, United States Geological Survey, a proposed glossary of terms pertaining to groundwater. G. G. Anderson of Los Angeles spoke briefly on the Development Committee report. The election of officers for 1920 resulted as follows: President, M. M. O'Shaughnessy; first vice-president, F. R. Muhs; second vice-president, W. L. Huber. The paper of the evening was presented by Francis B. Smith, on the subject of "Building the Pearl Harbor Dry Dock."

The Grand Rapids Engineering Society, at its meeting Dec. 10 listened to an address by Virgil C. Marani, consulting engineer of the Gypsum Industries Association of Chicago, on the use of gypsum as a fire retardant. Mr. Marani said that only 2% of construction in the United States is of fire-resisting material, and that the fire loss of last year was $250,000,000. He added that there is really no such thing as fireproof construction and that the proper adjective is "fire-resisting." The society voted to offer its aid to the city commission in its problem of grade separation.

The Marion County, Ohio, Association of Engineers was organized Dec. 11. The object of the organization is to promote county improvement work in the engineering line. Following the adoption of a constitution, the following officers were elected: President, Thomas Cathers; vice-president, William E. Weston; secretary, Loring K. Warner; treasurer, Harry Stock. The membership includes civil, electrical, mechanical, architectural and chemical engineers.

The Engineers and Architects' Association, Los Angeles Chapter, American Association of Engineers, held open meetings on every evening during the week which ended Dec. 20, for purposes of discussing various matters, including the welfare of engineers. On each evening a member representing a different classification of engineers was in charge, and the discussion included the status of flood-control engineers, corporation engineers, railroad engineers, county engineers, and students of engineering.

The Union of Municipalities of the Province of Quebec was organized at Montreal Dec. 15. A long paper entitled "Why the Quebec Municipalities Should Have a Centralizing Bureau and Clearing House of Information" was presented by Charles A. Mullen, director of paving, Milton Hersey Co., Ltd., Montreal and Winnipeg. The paper was largely a plea for municipal coöperation in legislation and possibly in purchasing, insurance and in obtaining engineering services.

Calendar

Annual Meetings

BRIDGE BUILDERS' & STRUCTURAL SOCIETY, 50 Church St., New York City; Jan. 16, New York City.

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 W. 39th St., New York City; Jan. 21-22, New York City.

ENGINEERING INSTITUTE OF CANADA; General Secretary, Fraser S. Keith, 176 Mansfield St., Montreal; Jan. 27-29, Montreal.

AMERICAN ROAD BUILDERS' ASSOCIATION, 150 Nassau St., New York City; Feb. 9-13, Louisville, Ky.

AMERICAN WOOD-PRESERVERS' ASSOCIATION; Secretary-Treasurer, F. J. Angier, Mt. Royal Station, Baltimore; Feb. 10-12, Chicago.

AMERICAN CONCRETE PIPE ASSOCIATION; 210 South La Salle St., Chicago; Feb. 20-21, Chicago.

AMERICAN RAILWAY ENGINEERING ASSOCIATION; 1426 Manhattan Bldg., Chicago; March 16-18, Chicago.

The Rochester Engineering Society witnessed an exposition of the various processes in the manufacture of steel pipe, at its meeting Dec. 12, by F. C. Nicol of the National Tube Co. Mr. Nicol's address was illustrated by about 2500 ft. of film, and showed the successive steps from the mining of the ore to the finished product. The weekly luncheon, Dec. 23, was addressed by Winthrop K. Howe, chief engineer, General Railway Signal Co., who spoke on "Modern Railway Signals and Safety Appliances."

The Engineers' Club of Minneapolis, at its meeting Nov. 24, voted an appropriation in support of the educational work for the Department of Public Works bill now before Congress. A committee was appointed to assist the Joint Engineering Board of Minnesota in pressing upon that state's representatives in Washington the necessity for passing legislation which will permit the immediate utilization of the power now being wasted at the high dam at Fort Snelling.

The Engineers' Society of Milwaukee held its regular monthly meeting Dec. 18. S. E. Doane, chief engineer, National Lamp Works, General Electric Co., Nela Park, Cleveland, spoke on "The Beginning of a New Lighting Era, or, How Fast Can You See?"

The Detroit Engineering Society on Dec. 19 was addressed by E. L. Crosby, president and general manager, Detroit Electric Furnace Co., on "Electric Furnaces for Melting Brass."

The Baltimore Chapter of the American Association of Engineers at a recent meeting was addressed by Dr. J. B. Whitehead, dean of the engineering school, Johns Hopkins University, and John H. Gregory, professor of civil engineering. Other speakers on the program were Maj. Ezra B. Whitman, F. P. Paternall, and Otto G. Simonson. The chapter is planning the erection of a club house.

The Engineers' Club of Trenton, N. J., elected the following officers at its recent annual meeting: President, Alfred P. S. Bellis; vice-presidents, Harry F. Harris and C. R. Waller; secretary, Joseph E. English, and treasurer, James J. Johnson.

The Cleveland Engineering Society was addressed Dec. 23 by R. E. Carpenter, manager, Lynite Laboratories, Aluminum Castings Co., Cleveland, who spoke on "The Meaning of Industrial Research." The next regular meeting of the society will be held Jan. 6. W. L. Decker, construction engineer, American Shipbuilding Co., Cleveland, will then speak on "The Sterilization of Water by Means of Ultra-Violet Rays." The noon-day meeting Dec. 19 was addressed by M. B. Daly, president, East Ohio Gas Co., Cleveland, on "Cleveland's Natural-Gas Problems."

The Engineers' Society of Pennsylvania held Dec. 22 its monthly meeting, at which Joseph H. O'Brien, vice-president and chief engineer, Central Construction Corporation, spoke of experiences in railroad terminal construction in the United States and Canada.

The General Contractors' Section of the Builders' Exchange of Montreal, at a recent meeting elected as chairman for the ensuing year K. D. Church, president, Church Ross Co., Ltd., engineers and contractors. Other members of the executive committee are John Allan, H. Fussing, Maj. E. G. M. Cape and E. B. Evans.

The District of Columbia Association of Members of the American Society of Civil Engineers, at its meeting, Dec. 19, in Washington, elected the following officers: President, David S. Carll; vice-president, John C. Hoyt; secretary-treasurer, James H. Van Wagenen.

PERSONAL NOTES

EARLE L. WATERMAN, who received his discharge as captain, Sanitary Corps, U. S. A., last August, has become associate professor of public health with the extension division, State University of Iowa, at Iowa City. He was previously stationed at Camp Meade, Maryland, as camp sanitary engineer.

W. D. NEVES, recently elected city engineer of Greenville, S. C., has assumed his duties, succeeding W. F. B. HAYNESWORTH, who resigned to become city commissioner of public works, Winston-Salem, N. C., as previously noted.

W. E. HOWE, for several years assistant city engineer of Topeka, Kan., has been appointed county engineer of Neosho County, Kansas, with headquarters at Erie.

L. G. WATTERS has been elected controller of roads in Floyd County, Georgia.

EDWARD NOLAND, Memphis, Tenn., has been appointed superintendent of the Mississippi River division of the Mississippi-Warrior Waterways Association, succeeding R. B. DOWNS, St. Louis.

Dr. S. W. WELCH has resigned as sanitary engineer, Alabama State Board of Health.

GEORGE H. BROWN, principal assistant engineer, Pennsylvania R.R., at Altoona, Penn., has become engineer maintenance of way, bridges and structures.

HERBERT S. CROCKER and FRANCIS S. CROWELL announce an association as consulting engineers with offices at 101 Park Ave., New York City. CROCKER & CROWELL will engage in the design and supervision of industrial and engineering features of proposed investments, and will act as owners' representative in the administration of contract work let on a percentage basis.

THOMAS FLEMING, JR., has withdrawn from the firm of CHESTER & FLEMING, engineers, Pittsburgh, to become associated with the Oil Well Supply Company.

JOHN C. WINSTON has been appointed director of the Department of Public Works of Philadelphia by Mayor-elect Moore, to take office Jan. 1. Mr. Winston has been president of the John C. Winston Co., publishers, Philadelphia, for many years. He was one of the originators of the Philadelphia reform movement and served as chairman of the Committee of Seventy.

DANIEL E. DAVIS, previously captain, Construction Division, U. S. A., who has been on the staff of CHESTER & FLEMING, engineers, Pittsburgh, for several years, has become a member of the firm following the withdrawal of Thomas Fleming, Jr., as noted elsewhere. JOHN T. CAMPBELL, for several years in charge of designs, has also become a member of the firm, and the partnership will continue to operate under the firm name of Chester & Fleming, with J. N. Chester, J. T. Campbell, D. E. Davis, and J. F. Laboon as the partners.

THOMAS H. KEHOE has resigned from membership in the Board of Water Commissioners of Hartford, Conn.

MARVIN L. CHASE has resigned as state hydraulic engineer and chairman of the state reclamation board of Washington.

NORMAN P. GERHARD, previously resident engineer for JAMES H. FUERTES, consulting engineer, New York City, on municipal work for the City of Cumberland, Md., has engaged in private practice with headquarters at Scarsdale, N. Y., and is associated with WILLIAM PAUL GERHARD, consulting engineer, 311 Audubon Ave., New York City. He was assistant engineer, Board of Water Supply, New York City, on the construction of the Catskill water-supply, from 1906 to 1918.

BENJAMIN O. JOHNSON has received an appointment as colonel in the United States Army, according to word received recently by Mrs. Johnson, Worcester, Mass. Colonel Johnson has been in Siberia two years, having been sent there as a major to aid in the reorganization of the Transsiberian Ry. He is stationed at present at Irkutsk.

W. C. WEST, of Buckhannon, W. Va., has been named road engineer for Houghton County, Michigan. THOMAS COON, acting engineer for the past two years, will be his assistant.

F. R. JONES, formerly master mechanic of the Victory Plant, Bethlehem Shipbuilding Corporation, has been appointed plant engineer at the Quincy works of the same corporation.

NORMAN McL. R. WILSON has been appointed chief engineer of the water-works department, Brantford, Ont. For the past 10 years he has

been inspector and water-works engineer for the Canadian Fire Underwriters' Association, Toronto, Ont.

WILLIAM A. WORTHINGTON, head of the sewer branch, works department, Toronto, Ont., has resigned and will enter private practice as a consulting engineer on water-works and sewage.

O. A. FARIS, for the past five years chief engineer of the Twin Falls Canal Co., Idaho, has opened an office in Boise, Idaho, and is associated with R. W. FARIS, consulting engineer. Special attention will be given by the new firm to the design and construction of concrete structures, though it will engage also in general engineering practice.

H. S. PERRY has been named assistant to A. H. HINKLE, head of the maintenance department of the Indiana State Highway Commission.

PROF. ALLAN R. CULLIMORE, dean of engineering, Delaware College, has resigned to become director of the Newark, N. J., Technical College. He will assume his new duties Feb. 1, 1920.

T. J. SKILLMAN, division engineer, Pennsylvania R.R., at Jersey City, N. J., has been appointed principal assistant engineer at Altoona, Penn., succeeding GEORGE H. BROWN, appointed engineer, maintenance of way, as noted elsewhere.

GANNETT, SEELYE & FLEMING, of Harrisburg, Penn., have opened a branch office in Memphis, Tenn., under the direction of T. E. SEELYE.

Dr. E. B. JOHNSON has been appointed sanitary engineer, Alabama State Board of Health, succeeding Dr. S. W. WELCH, resigned, as noted.

JAMES R. BROWN, formerly first lieutenant of engineers, A. E. F., has been appointed superintendent of streets of Binghamton, N. Y., succeeding FRANK D. LON.

HAROLD F. BLANCHARD, formerly of the *Motor World*, has become chief engineer of the automotive department. Detroit office, of MANN & MACNEILLE, architects and construction engineers, New York City, who have added this department to render building service to automobile dealers and garage men.

OBITUARY

ANDREW MUIR, pioneer railroad tunnel contractor of California, died in St. Paul, Minn., Dec. 15, at the age of 82. Early in life he engaged in work in South America and later in gold mining in California and Nevada. He built the Bozeman and Muir tunnels of the Northern Pacific in Montana. In 1900 he constructed the Franklin tunnel for the Santa Fé, and he was one of the builders of the old Santa Cruz narrow-gage line, known as the Dumbarton system. He had resided in St. Paul for the past 35 years.

ROBERT VAN BUREN, for almost half a century in the employ of the Brooklyn, N. Y., water-works prior to his voluntary retirement in 1914, died recently at Norwalk, Conn., at the age of 77. Mr. Van Buren was graduated from Rensselaer Polytechnic Institute, Troy, N. Y., in 1864. In the latter part of the next year he became an employee of the old Brooklyn Water Board, and two years later was made chief engineer of the Brooklyn Department of City Works. At the time of his retirement from public service he was the borough engineer of the Department of Water Supply, Gas and Electricity, Brooklyn, and during his term of service had much to do with the laying out of the original water-main systems.

HERBERT BUTLER, formerly resident engineer with the Illinois State Highway Commission, and more recently connected with the Division of Valuation, Interstate Commerce Commission, died recently in Toronto, Can. He was 49 years of age.

Combined Water Meter and Curb Cock Box

A combined water meter and curb or corporation cock box known as the No. 11 Oval Southland Clark Meter Box has been put on the market by the H. W. Clark Co., Mattoon, Ill. Ready access to the corporation cock is afforded, but the meter can be got at only by the use of a special key which serves also to lift the cover to the box. Removal of the key locks the box. Provision is made for the removal of the entire box without injury to the walk or pavement in which it is set.

BUSINESS NOTES

THE MECHANICAL MEMORY SYSTEMS CO. has been incorporated, with offices at Aurora, Ill., and will manufacture visible control systems.

THE SINCLAIR REFINING CO., Chicago, announces the establishment of an asphalt sales department to handle the output of the Meraux, La., refinery. The plant will be used to refine asphalt from specially selected maltha from the Panuco field, Mexico.

E. F. FITZPATRICK has been appointed manager of the asphalt sales department recently created by the Sinclair Refining Co., Chicago. J. M. WOODRUFF, formerly manager of the publicity and paving departments of the Standard Asphalt and Refining Co., has been selected as assistant to Mr. Fitzpatrick.

TRADE PUBLICATIONS

The following companies have issued trade publications:

THE MCALEAR MANUFACTURING CO., Chicago, Ill.; catalog No. 25; covers steam, water and air specialties for high- and low-pressure heating, power plant and devices for plumbing installations; also a special catalog, "Twenty-five Years of Know How," covering vacuum, vapor and air light heating specialties.

THE BAILEY METER CO., Cleveland, Ohio; bulletin No. 30, 8 x 10½ in., illustrated, 15 pages; explains uses and operative principles of fluid meters for low-pressure gas and air.

THE SIMPLEX EJECTOR CO., Chicago; catalog, 6 x 9 in., 32 pages, illustrated, of the "Simplex" automatic pneumatic sewage ejector.

THE LINK-BELT CO., Chicago; catalogs Nos. 375 and 380, each 6 x 9 in., 100 pages, illustrated; No. 375 describes "Link-Belt Labor-Saving Elevators and Conveyors," and No. 380 tells of "Link-Belt Electric Hoists and Overhead Cranes."

THE WALTER A. ZELNICKER SUPPLY CO., St. Louis, Mo.; bulletin No. 270; 3½ x 8½ in., illustrated, 56 pages; catalog of plant and equipment and accessories for sale.

THE MERCURY AVIATION CO., Los Angeles, Calif.; booklet, 9 x 12 in., illustrated; descriptive of commercial possibilities for the airplane, containing information on uses of airplanes and instruction given.

THE AMERICAN TRUCK BODY CO., Martinsville, Va.; bulletin No. 26, 4 x 8½ in., on "The Fontaine Demountable Truck Body."

THE NELSON VALVE CO., Philadelphia, Penn.; book, 5 x 8 in., illustrated; price quotations on bronze, iron and steel, gate, globe and check valves.

THE WHITING FOUNDRY EQUIPMENT CO., Harvey, Ill.; catalog No. 150 (superseding No. 129), 6 x 9 in., illustrated; on construction and uses of side-blow converter.

THE GRANITEX COMPANY, INC., New York City; pamphlet, 5 x 9 in.; describes new waterproofing mixture for cement, "Adamantex."

THE STOW MANUFACTURING CO., Binghamton, N. Y.; bulletins Nos. 103 and 104, 6 x 9 in., 30 and 60 pages, respectively, illustrated; specifications on motor-driven portable tools, and uses of the flexible Stow shaft.

THE WESTERN WHEELED SCRAPER CO., Aurora, Ill.; catalogs Nos. 44 and 45, 8½ x 11 in., 15 pages each, illustrated; descriptions of earth- and stone-handling machinery, including portable crushers, screening plants and industrial railways especially adapted to highway construction uses.



PROPOSALS

"For Proposals Advertised see the pages immediately following the Construction News Section."

WATERWORKS

Bids Close			See Eng. News-Record
Jan.	5	Galesburg, Ill. Adv. Dec. 11.	Dec. 11
Jan.	5	Whittier, Cal	Dec. 16
Jan.	5	East Grand Rapids, Mich.	Dec 26
Jan.	5	Rio, Wis.	Dec. 26
Jan.	5	Collinsville, Okla.	Dec. 26
Jan.	5	San Jose, Cal.	Dec. 26
Jan.	7	Alpaugh, Cal.	Dec. 26
Jan.	7	Heppner, Ore.	Dec 16
Jan	9	Akron, O.	Dec 26
Jan.	14	Phoenix, Ariz.	Dec. 26

SEWERS

Dec.	30	Toledo, O.	Dec. 26
Dec.	31	Cincinnati, O.	Dec. 26
Jan.	5	Rio, Wis.	Dec. 26
Jan.	14	Little Falls, Minn.	Dec. 20
Jan.	15	Duluth, Minn.	Dec. 11
Feb.	2	Kokomo, Ind.	Dec. 16

BRIDGES

Dec.	29	Reading, Pa.	Dec. 16
Dec.	30	Quitman, Ga.	Dec. 20
Dec.	30	Minco, Okla.	Dec. 16
Dec.	31	Michigan	Dec. 26
Jan.	5	Leavenworth, Kan.	Dec. 26
Jan.	5	Annapolis, N. S.	Dec. 26
Jan.	6	Seneca, Kan.	Dec. 26
Jan.	6	Owatonna, Minn.	Dec. 11
Jan.	6	Duluth, Minn.	Dec. 20
Feb.	7	Bethlehem, Pa.	Dec. 11

STREETS AND ROADS

Dec.	29	Indiana	Dec. 26
Dec.	30	Wilkes Barre, Pa.	Dec. 26
Dec.	30	Michigan	Dec. 20
Dec.	30	Texas	Dec. 20
Dec.	30	Denton, Tex.	Dec. 16
Dec.	30	Cincinnati, O.	Dec. 26
Dec.	31	Cincinnati, O.	Dec. 26
Dec.	31	Indiana	Dec. 26
Jan.	2	Waco, Tex.	Dec. 16
Jan.	2	Texas	Dec. 20
Jan.	3	Limestone, Ariz.	Dec. 20
Jan.	5	St. Louis, Mo.	Dec. 11
Jan.	5	Fayetteville, W. Va.	Dec. 20
Jan.	5	Indiana	Dec 26
Jan.	5	Michigan	Dec. 26
Jan.	5	Leavenworth, Kan.	Dec. 26
Jan.	5	Washington	Dec. 26
Jan.	5	San Bernardine, Cal.	Dec. 26
Jan.	6	Thomasville, Ga.	Dec. 26
Jan.	6	Randolph, W. Va.	Dec. 26
Jan.	6	Fresno, Cal.	Dec. 26
Jan.	6	Williamson, W. Va.	Dec. 26
Jan.	6	Hamlin, W. Va.	Dec. 16
Jan.	6	Indiana	Dec. 26
Jan.	7	New Jersey	Dec 26
Jan.	7	Palestine, Ill.	Dec. 20
Jan.	9	Fresno, Cal.	Dec. 20
Jan.	12	Texas	Dec 20
Jan.	12	Bunnell, Fla.	Dec. 26
Jan.	13	Coalinga, Cal.	Dec. 26
Jan.	14	Charleston, W. Va.	Dec. 20
Jan.	15	St. Louis, Mo.	Dec. 11
Jan.	16	La Grange, Tex.	Dec. 20
Jan.	16	Valdosta, Ga.	Dec 26
Jan.	16	Liberty, Tex.	Dec 20
Jan.	17	St. Louis, Mo.	Dec 11
Jan.	19	Finch, Ont.	Dec. 4
Jan.	28	St. Louis, Mo.	Dec. 11

RAILWAYS

Jan.	3	Ontario	Dec 26

EXCAVATION AND DREDGING.

Dec.	30	Charles City, Ia	Dec 26
Jan.	5	Des Moines, Ia.	Dec 26
Jan.	6	Shawneetown, Ill.	Dec 26
Jan.	7	Elbow Lake, Minn.	Dec. 20
Jan.	15	Sidney, Ia.	Dec. 26

INDUSTRIAL WORKS

Dec.	30	Newark, N. J.	Dec. 26
Jan.	1	Hamilton, Ont	Dec. 20
Jan.	2	Brooklyn, N. Y.	Dec. 26
Jan.	4	Iowa Falls, Ia.	Dec. 20
Jan.	7	Freehold, N. J.	Dec. 16
Jan.	7	Pullman, Wash	Dec 26
Jan	10	Salt Lake City, Utah	Dec 26
Jan.	12	Wakefield, Mass.	Dec. 16
Jan	15	Montreal, Que	Dec 20

BUILDINGS

Dec	30	Lynn, Mass	Dec 16
Dec	31	Detroit, Mich	Dec 20
Dec	31	Grand Rapids, Mich.	Dec 20
Jan.	1	Memphis, Tenn.	Dec. 26
Jan.	1	Waterloo, Ia	Dec. 20
Jan	1	Bloomer, Wis.	Dec 11
Jan.	1.	Windsor, Ont.	Dec. 20
Jan	1	Vancouver, B. C.	Dec 11
Jan.	2	Duluth, Minn.	Dec. 11
Jan.	3	McKeesport, Pa.	Dec. 11
Jan.	3	Woodbine, Ia.	Dec. 11
Jan	5	Gaza, Ia.	Dec 11
Jan	5	Hartford, Conn.	Dec 20
Jan.	5	Middletown, O.	Dec 26
Jan.	5	Madera, Cal.	Dec. 26
Jan.	6	Upper Sandusky, O	Dec. 26
Jan.	8	Fresno, Cal.	Dec. 20
Jan.	8	Laurel, Ia.	Dec. 20
Jan.	10	Kenosha, Wis.	Dec 11
Jan.	10	Westby, Wis.	Dec. 26
Jan	13	Ord, Neb.	Dec 20
Jan.	13	Storm Lake, Ia.	Dec. 4
Jan.	15	Waterloo, Que	Dec 16
Jan	15	Jacksonville, Ill.	Dec 11
Jan	15	Charleston, W. Va.	Dec 26
Jan	15	East Grand Forks, Minn.	Dec. 26
Jan	19	Lowell, Mass.	Dec 11
Jan.	20	Three River, Que.	Dec. 26
Feb.	1	Mitchell, S. D. Adv. Dec. 28.	Dec 20
Feb.	1	Duluth, Minn.	Dec 26
May	15	Syracuse, N. Y.	Dec 11

FEDERAL GOVERNMENT WORK

Dec.	30	Electric Elevators—Stapleton, N. Y.	Dec. 11
Dec.	30	Electric Traveling Cranes — Spec. 4094 — Washington, D. C.	Dec. 16
Dec.	30	Buoys—Spec. 4068—Yorktown, Va.	Dec 20
Dec.	31	Buildings — Washington, D. C.	Dec 16
Jan	2	Lock and Esplanade—Florence, Ala.	Dec 16
Jan.	5	Remodeling Post Office — Fitchburg, Mass.	Dec 16
Jan.	5	Sewers—Washington, D. C.	Dec 20
Jan	5	Stone — Humboldt Bay, Cal.	Dec. 20
Jan.	6	Alterations to Post Office—Ashland, Ky.	Dec 16
Jan.	7	Dirigible Hangar — Spec. 4080—Cape May, N. J.	Dec 16
Jan.	7	Dredging — Los Angeles, Cal	Dec 20
Jan	7	Water Tanks and Towers Spec 4103—Annapolis, Md	Dec 20
Jan.	7	Pattern Shop—Spec. 4041 — Norfolk, Va.	Dec. 26
Jan	7	Quay Wall Spec 4044 — Norfolk, Va	Dec 26
Jan.	8	Bridge—Santa Clara, Utah	Dec. 20
Jan.	8	Remodeling Post Office — Springfield, O	Dec. 20
Jan.	8	Remodeling Post Office — McKeesport, Pa.	Dec 26
Jan.	10	Barracks and Quarters, etc —New Dorp, S. I., N. Y	Dec 26
Jan.	13	Additional Buildings — Dawson Spring, Ky	Dec. 16
Jan.	14	Sewers—Washington, D. C	Dec 26
Jan.	20	Bridge—Montana	Dec 26
Feb.	2	Tower and Dwelling—Rincon, P. R. Adv. Dec. 11.	Dec. 11

MISCELLANEOUS

Dec.	29	Cranes—Detroit, Mich	Dec 26
Dec.	30	Water Gate Boxes and Covers, Sewer Manhole Frames and Cover—Jersey City, N. J.	Dec 26
Jan	6	Engines—Stockton, Cal	Dec 26
Jan	6	Asphalt, Etc. — Jackson Miss	Dec. 26
Jan	6	Sewer Pipe — Brownstown, Ind	Dec 20
Jan.	7	Dam — New Westminster, B. C.	Dec. 16
Jan.	12	Gravel Screening and Loading Plant — Minneapolis, Minn.	Dec. 20
Jan.	15	Survey Monuments—Toronto, Ont	Dec. 26
Jan.	17	Pipes, etc —York, Ont.	Dec. 26
Jan	22	Pipes, Valves, etc. — St. Louis, Mo.	Dec. 11

Where name of official is not given inquiries should be addressed to City Clerk, County Clerk or corresponding official.

Waterworks

PROPOSED WORK

N. Y., Mt. Vernon—City plans to build new waterworks system, involving 10,266 tons c.i. pipe, at $60 per ton, 1607 valves, 6-24 in., $71,938, 1582 valve boxes, $6.20 each, 2500 cu yd. rock excav., $7 per yd., laying 270,000 ft. 6 in pipe, $.50 per ft., 68,900 ft. 8 in., $.60, 37,700 ft. 10 in., $.70, 4550 ft. 12 in., $.80, 5680 ft., 16 in., $1.05, 2150 ft. 20 in., $1.20, 3720 ft. 24 in., $1.45, hauling 10,266 tons pipe, $2 per ton, 450,000 lb. lead, $.0675 per lb., etc., total cost, $1,951,399 C. Hick, city engr.

Md., Baltimore—P. O. Keilholtz, 1602 Continental Bldg., consult. engr. to W. A. McGraw, city water engr., presented report covering plans for increasing water supply by obtaining water from the Susquehanna River. Project involves 11 ft 6 in. unlined tunnel through rock from point above dam at McCall's Ferry (Susquehanna River) to Lock Raven Reservoir, Baltimore Co., a distance of 30 mi., with necessary shafts, 146,000,000 gal. daily capacity, cost $7,664,424; rights of way, pumping machinery, pumping water and the acquiring of additional land at Lock Haven, $3,224,000. Report also suggests an arrangement with Pennsylvania Water & Power Co. to run proposed tunnel underneath the company's power transmission line right-of-way from McCall's Ferry to Baltimore.

O., Rocky River—City receives bids in spring building 4000 ft. 6 in. water mains in Telbir and Shoreland Aves. About $11,000. E. H. Arnold, Rocky River, engr.

Mich., Redford—City plans election in January to vote on $25,000 bonds to lay 6-in c.i. watermain extensions in various streets. H. J. Wilmarth, Redford, engr.

Minn., Clearwater—City having plans prepared building waterworks system, including tank and pumps. About $60,000. Bradley Eng. Serv., Weber Bldg., St. Cloud, engrs.

Minn., Lake Benton—City having plans prepared extending waterworks system. About $20,000. Bradley Eng. Serv., Weber Bldg., St. Cloud, engrs.

Mont., Butte—City plans to lay 17,580 lin ft. 2, 4 and 6 in water pipe, in Thompson Park About $19,000. Loftus & McDonald, Great Falls, engr.

Okla., Bristow—City voted $20,000 bonds to extend waterworks system Engineer not selected

Okla., Madill—City election Jan. 15, to vote on $250,000 bonds to extend waterworks and build new water supply from Mill Creek Johnson & Benham, Firestone Bldg., Kansas City, Mo., engrs.

Idaho, Rathdrum—City plans to improve waterworks system including laying of 2640 ft. 8 in. pipe building pumping plant, and well. About $12,500. Engineer not selected

Ore., Enterprise—City plans election to vote on $120,000 additional bonds to enlarge waterworks system. O. J. Roe, city recdr.

Waterworks (Continued)

Ore., Knappa—City having preliminary plans prepared for gravity water system involving 3.5 mi. c.i. water mains and branches. About $8000. A. Lechner, agt.

Cal., Calexico—City voted $60,000 bonds to extend waterworks system, to include oil burning engine, pumps, motor, cement main canal, fire hydrants, mains, etc. P. B. Steintorf, city clk.

Cal., Los Banos—City purchased West San Joaquin Valley Water Co.'s plant, and plans to move same, install tank, tower and filter and build mains and fire hydrants.

Cal., San Diego—City voted $1,000,000 bonds to build Barret dam, probably single arch cyclopean masonry type. Work will probably be done by day labor under supervision of H. N. Savage, city hydraulic engr.

Ont., Napanee — Town retained E. A. James Co., Ltd., engrs., 36 Toronto St., Toronto, to valuate property of Napanee Water Co. and advise what additions should be made to system, should town decide to purchase same. Election Jan. 1 to vote on bonds for project. Present system worth about $100,000, extensions will probably include 4 mi. 6 in. c.i. pipe, $50,000 and fillers and pumps, $30,000.

Ont., Newmarket—Comrs. York Co., 57 Adelaide St., E., Toronto, having plans prepared by E. A. James Co., Ltd., engrs., 36 Toronto St., Toronto, and will soon receive bids building water supply system, including steel standpipe, in Industrial Home on Eagle St. About $15,000.

BIDS DESIRED

N. C., Lexington—Until Jan. 20, by Town Comrs. improving waterworks system, including brick and concrete pumping station, filter house and filter tubes, concrete and brick auxiliary station, concrete coagulating basin, 500,000 gal. concrete storage reservoir, 3½ mi. c.i. pipe, 3½ mi. 2200-volt transmission line, motordriven centrifugal pumps, accessories and filter plant equipment. J. V. Moffitt, clk.; advertised in this issue.

O., Akron—Until Jan. 9, by H. S. Morse, dir. pub. serv., Delaware Bldg., constructing 4.1 mi. pipe line, together with appurtenances, between Cuyahoga River Pumping Sta. and crossing of Cuyahoga River south of Kent, Contr. No. 164. Alternative bids will be received on "A" furnishing pipe and special castings for 48 in. c.i. line, "B" laying 48 in c.i. line, "C" furnishing and laying 48 in. lock bar steel pipe, "D" furnishing and laying 50 in. riveted steel pipe. G. G. Dixon, engr.; advertised in this issue.

Mich., East Grand Rapids (Grand Rapids P. O.)—Until Jan. 5, by H. P. Hugenholtz, 2224 Ewalthy St., furnishing labor and material for laying 6 and 8 in. watermains, valves and valve boxes in various streets for city. About $20,000.

Wis., Rio—Until Jan. 5, by W. Collins, village clk., furnishing and laying 8289 ft. 6 in. and 1267 ft. 8 in. c.i. pipe, 18 hydrants, three 8 in. and eight 6 in. valves, one 15 h.p. engine, one 150 gal. deep well pump, one 10 in. well, 200-300 ft. deep, 1 elevated tank, 40,000 gal. on 80 ft. tower, one 12 x 18 ft. power house, brick, cement block, concrete or tile; advertised in this issue.

Okla., Collinsville—Until Jan. 5, by city, building water filtration plant, including rein.-con. mixing chamber and settling basins, rein.-con. and brick filter house with machinery, pumps, two 250,000 G.P.D. rapid sand mechanical filters, electrical equipment, sewers, drains, piping, also building roof over present concrete storage reservoir. Noted Aug. 28.

Ariz., Phoenix—Until Jan. 14, by V. A. Thompson, city mgr., furnishing materials, tools and labor for Verde River gravity water supply, involving 32 mi. 36-38 in. concrete, steel or wood pipe line and 25,000,000 gal. rein.-con. covered circular reservoir. V. A. Thompson, city mgr.; advertised in this issue.

Cal., Alpaugh—Until Jan. 7, by Bd. Supervs., Tulare Co., (Visalia), building waterworks system, here. About $25,000.

Cal., San Jose—Until Jan. 5, by Bd. Supervs., Santa Clara Co., digging well and installing pump and motor at county almshouse, here. About $7000. H. A. Pfister, co. clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mich., Detroit**—Water Comm. will lay 6860 ft. 6 in. c.i. water pipe, with necessary valves, etc., in Graigwood, Erie, Muirland, Spaulding and Hazelwood Aves., also 15,915 ft. 8 in. c.i. pipe in Six Mile Rd., Lenox, Hanna, Parkside, Muirland, Bartram and Elmdale Aves.; 7205 lin.ft. 6 in. c.i. pipe in Lakewood Blvd., Gratiot, Iroquois, Hazelwood, Concord, Kearing, and Marion Aves., also 905 ft. 8 in. pipe in Pollard, Tennessee and Goitre Aves. Work will be done by day labor.

Sewers

PROPOSED WORK

O., Toledo—H. McClure, city engr., rejected bids received Dec. 9, building 8000 ft. 8-24 in. pipe sewers in Detroit and Sylvania Aves. About $23,000. Work will be readvertised.

Ill., West Frankfort—See "Streets and Roads."

Ill., Wheaton—City plans to build sewage disposal plant, including filter beds, cost, $57,573, also pipe sewer and outlet drain, $20,000. L. T. Ruddock, city engr.

Wis., Wauwatosa—Milwaukee Co. Bd. Administration plans to build extension to sewage disposal tank, involving 200 cu.yd. rein.-con. and 750 ft. 15 in. vitr. pipe. About $30,000. W. S. Shields, 1201 Hartford Bldg., Chicago, Ill., engr.

Minn., Benson—City having plans prepared building combined sewerage system. About $80,000. Bradley Eng. Serv., Weber Bldg., St. Cloud, engrs.

Minn., Lake Benton—City having plans prepared building 12-42 in. storm sewers in various streets. About $75,000. Bradley Eng. Serv., Weber Bldg., St. Cloud, engrs.

Minn., Madelia—City having plans prepared building storm sewers in various streets. About $60,000. Bids will be received on all materials. Bradley Eng. Serv., Weber Bldg., St. Cloud, engrs.

Minn., Paynesville—City having plans prepared building combined sewerage system. About $65,000. Bradley Eng. Serv., Weber Bldg., St. Cloud, engrs.

Okla., Bristow—City voted $20,000 bonds to extend sewerage system. Engineer not selected.

Cal., Calexico—City voted $20,000 bonds to extend sewerage system. P. B. Steintorf, city clk.

Ont., Toronto—City soon receives bids building 6000 ft., 30 in. concrete pipe in Worthington and Sherbrooke Sts. About $25,640. H. J. McAuslan, North Bay, engr.

Ont., Woodstock—Bd. Health having plans prepared by F. J. Wire & Son, engrs., Woodstock, furnishing and laying 2½ mi. 30 in. rein.-con. pipe and building concrete sewage disposal plant. About $93,000.

BIDS DESIRED

O., Cincinnati—Until Dec. 31, by F. Krug, city engr., building 11,830 ft. pipe sewer and 1555 ft. trunk sewer, Madisonville Contr. No. 4.

O., Toledo—Until Dec. 30, by D. H. Goodwillie, Dir. Pub. Serv., building Contr. No. 1 of Ten Mile Creek Intercepting Sewer, involving 18,000 ft. rein.-con., brick or segmental block sewer from junction of Manhattan Rd. and Blvd. following road to river. About $700,000. H. C. McClure, city engr.

Wis., Rio—Until Jan. 5, by city clk., excavating and laying 9289 ft. 6 in. and 1627 ft. 8 in. c.i. pipe sewer, 18 hydrants, etc. About $40,000. W. G. Kirchpffer, 31 Vroman Blk., Madison, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Chicopee**—City will build 7950 ft. segmental block and vitr. pipe sewers in Driving Park. About $173,000. Work will be done by day labor.

N. Y., Long Island City—M. E. Connolly, pres. Queens Boro., received bids Dec. 15, building sewer in (a) Greenpoint Ave. from Queens Blvd. to Hancock St., 2nd Ward, (b) 20th St. from Woodside Ave. to Bway., (c) Buell Pl. from Banks Ave. to crown about 250 ft. south, (d) Merrit St. from 51st St. to Way Ave., (e) Beeckman St. from State St. to Mitchell Ave., (f) Casco St. from Forest Parkway to Yarmouth Ave., (g) Oxford Ave. from Jamaica to Brandon Sts., from J. H. Johnson Constr. Co., (a) $7304, (b) $3311, (c) $7178, (d) $6280, (g) $2652; F. L. Paine, Woodhaven, L. I., (a) $7410; N. Lascalzo, (a) $7587; T. Welsh, (a) $7752, (b) $2993, (c) $7728, (d) $5810, (e) $3853, (f) $2709, (g) $2531; C. Petracca, 175 Spencer St., Brooklyn, (a) $8620, (c) $7803, (d) $5765; Peace Bros., 20 Main St., Flushing, (b) $3692, (e) $6619, (f) $3076, (g) $3052; E. W. Fitzpatrick, 128 3rd Ave., Astoria, (b) $3789, (d) $7141, (e) $5694, (f) $3934; Green Contg. Co., 734 Vernon Ave., Astoria, (c) $7816; H. J. Mullen Contg. Co., Inc., Fulton St., Jamaica, (f) $2500, (g) $2767.

O., Cleveland—City received bids Dec. 19, constructing twelve 8 x 50 ft., concrete grit chambers, laboratory, and 1 story, 140 x 142 ft., concrete, steel and brick screen grit chamber building, involving 3680 cu.yd. rein.-con. and 17,877 tons reinforcing and miscellaneous steel, at easterly sewage disposal plant, from Amer. Constr. Co., Marion Bldg., $258,957; McHugh Bros., West 37th St., $338,730; Masters-Mullen Constr. Co., Electric Bldg., $400,486.

★**O., Hamilton**—City let contract building storm sewers in Hooven, Clinton, Van Hook and Putman Sts., to W. M. Davis, Hamilton, $12,150.

★**Mich., Detroit**—City let contract building pumping station with electrically operated pumps and Seven Mile Rd. sewer, involving 11 ft. 3 in. cylinder sewer with special manhole, to C. A. Handyside, 833 Lothrop Ave. About $26,600.

Ore., Portland—City received bids building sewers in 61st Ave. S. E., and Martins Ave., cement pipe, from Elliott & Scoggin, McKay Bldg., $11,096; Jacobsen-Jensen Co., 407 Stanton St., $11,085; Azar & Co., $10,398; contractors all of Portland.

Bridges

PROPOSED WORK

N. Y., Lockport—Bd. Supervs. Niagara Co. passed resolution appropriating $12,000 for reconstructing present bridge carrying River Rd. over Lewiston Branch of New York Central R. R. Cost $43,250. State will appropriate $19,250 toward cost.

O., Cleveland—Comrs. Cuyahoga Co. plan to build Huron-Lorain high level bridge, 3750 ft. long, 80 ft. wide, concrete and steel superstructure and concrete abutments. About $7,000,000. W. A. Stinchcomb, co. engr.

Wisconsin—State Highway Comn., Madison, plans to rebuild concrete bridges in following counties:

Adams Co., bridge on Trunk Highway No. 13, $1300.

Ashland Co., Trunk Highway No. 13, $3300.

Barron Co., bridge across Pokegama Creek, Trunk Highway No. 14, $3300; across Yellow River Flowage, in Barron, $12,000.

Buffalo Co., Trunk Highway No. 25, Belvidere Twp., $1400.

Burnett Co., Yellow River Bridge, $10,300.

Calumet Co., Trunk Highway No. 47, Chilton Twp., $10,500.

Crawford Co., Tom Price Bridge, Marietta Twp., $6300; 5 bridges on Trunk Highway No. 30, 2 in Scott Twp., $800 each, 3 in Clayton Twp., $1500, $1100 and $1650, respectively; Trunk Highway No. 60, Marietta Twp., $3500.

Douglas Co., Middle River Bridge, Trunk Highway No. 11, $5700.

Eau Claire Co., Clear Creek Twp., $1500; Washington Twp., $2500; Fall Creek Village, $7000.

Juneau Co., Trunk Highway No. 12, $5000; 2 bridges on Trunk Highway No. 21, $3750 each; Trunk Highway No. 71, $3750.

La Crosse Co., 2 bridges on Trunk Highway No. 21, Campbell Twp., $15,000, Campbell and Barre Twps., $4000.

Lincoln Co., 3 bridges on Trunk Highway No. 10, Mile No. 242, $1400, Mile No. 252, $2900, Mile No. 262, $1600.

Manitowoc Co., 4 bridges on Trunk Highway No. 16, one $1050, two $1800 each, and one $1000.

Marathon Co., Jordan Bridge, Stevens Point-Rosholt Rd., $8000.

Monroe Co., 2 bridges on Trunk Highway No. 12, both La Grange Twp., $3000 each.

Oconto Co., bridge on Trunk Highway No. 33, with 10 ft. and 12 ft. spans, $1500.

Oneida Co., 2 bridges on Trunk Highway No. 14, Mile No. 116, $1500, Mile No. 118, $4200, culvert on Trunk Highway No. 14, Mile No. 118, $200.

Outagamie Co., Trunk Highway No. 18, Greenville Twp., $3800.

Pepin Co., bridge in Lima Twp., $1600.

Sawyer Co., bridge across Namekagon River, $7300.

Trempealeau Co., culverts on Trunk Highway No. 11, Gale Twp., $900.

Vernon Co., approach to bridge over Kickapoo River, Trunk Highway No. 11, Readstown Village, $18,000, No. 11, Kickapoo Twp., $1400, No. 11, Franklin Twp., $6000.

Washburn Co., bridge across Shell Creek, Trunk Highway No. 11, $2500; across Yellow River, $6200.

Waushara Co., Trunk Highway No. 21, $1300; Trunk Highway No. 49, $4200.

Bridges (Continued)

Wis., Appleton—Outagamie Co. voted bonds to build following bridges:
Baker Bridge, Cicero Twp., $1056.
Capman Bridge, Liberty Twp., $505.
Else Bridge, Liberty Twp., $567.
Evans No. 1 Bridge, Seymour Twp., $899.
Evans No. 2 Bridge, Seymour Twp., $877.
Knoke Bridge, Liberty Twp., $920.
Kuhn Bridge, Cicero Twp., $817.
Pfeiffer Bridge, Buchanan Twp., $788.
Reimer Bridge, Ellington Twp., $772.
Zebel Bridge, Seymour Twp., 883.
W. Hebbe Bridge, Maple Creek Twp., $558.
Finger Bridge, Maple Creek Twp., $1138.
Sickle Bridge, Oneida Twp., $1551. A. G. Brusewitz, comr.

Wis., Luxemburg—Town and Kewaunee Co. (Kewaunee) having plans prepared by Wisconsin Highway Comn., Madison, building Brandle Bridge, to include three 40 ft. concrete girder spans, baluster railing and 24 ft. roadway. About $15,000. M. Shaw, Algoma, co. highway comr.

Wis., Tomahawk—State Highway Comn., Madison, plans to rebuild Tomahawk Bridge, to have six 70 ft. plate girders. About $57,000.

Wis., Wausau—Marathon Co. plans to build bridge in Maine, Emmet, Wein, Frankfort, Hamburg, Wausau, Texas, Cassel, Weston, Kronenwetter and Knowlton Twps., 2 bridges in Bern, Reitbrick, Norrie, Eau Pleine, Kronenwetter, Harrison, Day and Cleveland Twps., 3 in Day Twp. and 4 in Halsey Twp. Total cost, $39,986. Cost will be borne equally by county and townships.

Tex., Ballinger—Runnels Co. having plans prepared building 518 ft. rein.-con. and steel girder bridge, 19 ft. wide, over Colorado River, including removing present structure and addition to present sub-structure. Work involves 805 cu.yd. Class "A" and 355 Class "B" concrete, 139,720 lb. structural and 99,330 lb. reinforcing steel, 1 approach with seven 28½ ft. girder spans, 1 with four 28½ ft. girder spans and two 99 ft. 2 in. steel spans, etc. About $61,432. Hess & Skinner, Southwestern Life Bldg., Dallas, engrs.

Wash., Tacoma—Comrs. Pierce Co. soon let contract building steel bridge over Puyallup River, at Helman-Bowman Crossing. About $35,000. E. A. White, co. engr.

Oregon—State Highway Comn., Portland, soon lets contract building 80 ft. steel span with 280 lin.ft. rein.-con. viaduct over North Yamhill River on McMinnville-West Dayton Rd., Yamhill Co., involving 750 cu.yd. class "A" and 350 cu.yd. class "B" concrete, 60,000 lb. structural steel, 125,000 lb. reinforcing steel, 3100 lin.ft. wooden piling, 724 lin.ft. concrete handrail, etc., cost $10,000; also 1 pile trestle over Chehalem Creek on West Side Highway near Newberg, involving 323 lin.ft. wood deck and 3300 lin.ft. timber piles. C. B. McCullough, Salem, engr.

Cal., San Miguel—San Luis Obispo Co. (San Luis Obispo) plans to build concrete bridge over Salinas River, east of here. About $115,000. W. Burch, co. engr.

Cal., Shandon—San Luis Obispo Co., (San Luis Obispo) plans to build concrete bridge over Estrella Creek, on Shandon-Paso Robles Rd., near here. About $44,000. J. H. Bradhoff, superv.

N. S., Annapolis—Provincial Government, Halifax, plans to build highway bridge over Allen's Creek, to have two 100 ft. spans, rein.-con. flooring and sidewalks. Work involves 67 tons steel. About $12,600. J. M. Rowland, Halifax, engr.

Ont., Simcoe—City election Jan. 5 to vote on $70,000 by-law for 5 steel and concrete bridges. A. Bancroft, alderman.

BIDS DESIRED

Michigan—Until Dec 31, by F. F. Rogers, state highway engr., Lansing, building State Trunk Line Bridge No. 258 over Dead River Mill Pond, 6 mi. north east of Negaunee, 265 ft. long, 20 ft. wide, involving 123 cu.yd. rein.-con., etc.

Kan., Leavenworth—Until Jan. 5, by Leavenworth Co., building one 35 ft. rein.-con. "T" girder bridge and 1 through girder bridge, with three 40 ft. spans. About $25,000. L. C. Clarke, Leavenworth, engr.

Kan., Secenca—Until Jan. 6, by Comrs. Nemaha Co., building bridges and culverts on 8 mi. Woodlawn Rd., Sects. A, B and C. About $96,000. L. P. Price, Seneca, engr.

N. S., Annapolis—Until Jan. 5, by Provincial Highway Bd., Halifax, building superstructure, for following bridges, 6 fixed spans of 102 ft., 1 of 109 ft., 1 of 157 ft., 1 of 294 ft., and 1 swing span of 157 ft. Work involves 849 ton steel, etc. About $116,000. J. M. Rowland, Halifax, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Pennsylvania—State Highway Dept., Harrisburg, received bids building bridges (a) Armstrong Co., Parks and Gilpin Twps.; (b) Berks Co., Union Twp., (c) Bucks Co., Falls Twp. (1) Sta. No. 704. (2) No. 768, from Farris Eng. Co., Empire Bldg., Pittsburgh, (a) $9877; F. S. Wilson, Kittanning, (a) $10,833; G. W. Ensign, Inc., Kirchey Bldg., Harrisburg, (a) $12,493, (b) $39,270, (c) $33,666, (c-2) $43,167; O. B. S. Co. Phila., (b) $31,157, (c-1) $24,377, (c-2) 28,541; U. G. I. Contg Co., Phila., (b) $31,197.

★**W. Va., Wayne**—Comrs. Wayne Co. let contract building stone masonry for 3 sets of bridge abutments on Project G-1 known as Upper Workman, Lower Workman and Sidney Booth bridge sites, to Lambert & Co., Huntington, $36,635.

★**O., Columbus**—Norfolk & Western R. R., Roanoke, Va., let contract building 600 ft. bridge, 50 ft. wide, steel superstructure, concrete abutments, here to C. R. Cummins Co., Leader-News Bldg., Cleveland. About $200,000. Incorrectly noted in our issue of Dec. 11.

★**Mich., Okemos**—Ingham Co. let steel contract for 90 ft. span low truss steel bridge, with two 20 ft. rein.-con. abutments, 18 ft. wide, over Red Cedar River, near here, involving 37 tons steel, to Brookville Bridge Co., Brookville, O., $4884; concrete work, involving 233 cu.yd. rein.-con., to E. C. Nolan & Son, Detroit, $8030.

★**Ill., Dixon**—Lee Co. let contract repairing Galena Ave. Bridge, here, to Freeport Bridge Co., Freeport, $34,869.

★**Ill., Findlay**—Town let contract building bridge between Sullivan Twp., Moultrie Co. and Okaw and Windsor Twps., Shelby Co., consisting of two 120 ft. spans on center line, 18 ft. roadway, 32 ft. abutments and 34 ft. pier, involving 843 cu.yd. concrete, 46,140 lb. reinforcing steel, to Rochester Bridge Co., Rochester, Ind. About $41,000.

★**Minn., Duluth**—W. H. Borgen, aud. St. Louis Co., let contract building bridges on State Rd. No. 1 as follows: One over St. Louis River, involving 175,000 lbs. structural steel and 324 cu.yd. rein.-con., to M. A. Adams Co., Andrus Bldg., Minneapolis, cost $35,643; 1 over Whitefact River, 75,000 lbs. structural steel and 212 cp.yd. concrete, to Iowa Bridge Co., 717 McKnight Bldg., Minneapolis, $17,700; 4 over Hellwigs Creeks, 659 cu.yd. rein.-con., to J. J. Fredin, Jr., Duluth, $5229, $5886, $5034 and $5684 respectively; 3 bridges involving 410 cu.yd. concrete and 1 bridge involving 20,000 lbs. structural steel and 140 cu.yd. concrete to E. J. Fennelly, Atkins, $3290, $4980, $5950 and $8150 respectively.

★**Ariz., Clifton**—See "Streets and Roads."

★**Wash., Walla Walla**—Walla Walla Co. let contract building 1 concrete bridge at Lowden, 1 at Waitsburg and 3 over Coppel Creek at Dixie, to Union Bridge Co., foot of Fenwick and Kenton Sts., Portland, Ore., $62,267.

Streets and Roads

PROPOSED WORK

Pennsylvania—State Highway Dept., Harrisburg, received no bids Dec. 16, building roads in counties as follows:

Crawford Co., 18,514 ft. 1 course rein.-con. and Hillside vitr. brick, East Mead Twp.

Fayette Co., 9432 ft. 1 course rein.-con. Bullskin and Upper Tyrone Twps.; 20,966 ft. 1 course rein.-con. and Hillside vitr. brick, Dunbar Twp.

Greene Co., 10,620 ft. 1 course rein.-con, Center Twp.

McKean Co., 14,800 ft. 1 course rein.-con. Eldred Twp.

Warren Co., 40,485 ft. 1 course rein.-con. Farmington and Sugar Grove Twps.; 12,012 ft. 1 course rein.-con, Tidioute Boro.; 22,287 ft. 1 course rein.-con. and Hillside vitr. brick, Farmington and Pine Grove Twps.

Pa., Monroe—City plans to grade and pave 20 mi. road on Pocono Mountain, 16 ft. wide, waterbonded macadam on concrete base. About $500,000.

W. Va., Parsons—Tucker Co. having plans prepared by F. A. Parsons, co. engr., grading and draining 9 mi. Haddix Rd. About $60,000.

North Carolina—State Highway Comn., Raleigh, plans to gravel 12 mi. road from Orange Co. line to Pittsboro, Chatham Co.; 22 mi. Pittsboro to Silver City and 16 mi. Lenoir to Catawba, Caldwell Co.; 18 mi. Hamlet to Drowning Creek, Watauga Co.; 16 mi. Lenoir to Wilkesboro, Halifax Co.; hard surface 5.5 mi. Roanoke to Weldon, Richmond Co.; gravel or sandclay 13 mi. Boone to Caldwell Co. line, Watauga Co. 10 mi. Mocksville to Yadkin River Bridge, Davie Co., also build concrete bridge over Yadkin River at Fulton Ferry. W. S. Fallis, state highway engr.

N. C., Greensboro—Comrs. Guilford Co. plan to hard surface 20 mi. Greensboro-Winston-Salem Rd. About $200,000. W. C. Boren, chn.

N. C., Winston-Salem—Forsyth Co. plans to hard surface 20 mi. Winston-Salem-Greensboro Rd. About $200,000. D. W. Harmon, co. engr.

O., East Liverpool—City Council plans to pave 4140 ft. West 6th St. from Diamond to Jefferson Sts., 36 ft. wide, brick block on concrete base. About $28,806. J. W. George, city engr.

O., Lisbon—Columbiana Co. plans to widen and resurface East Liverpool-Wellsville Rd., pave 2.73 mi. Unity-Springfield Rd.; grade 4½ mi. Lisbon-Salineville Rd., 7.2 mi. Hanover-Salem Rd., and 7½ mi. Columbiana-Lisbon Rd. About $362,000. G. Armstrong, co. engr.

Mich., Springwells—City having plans and estimates prepared by G. Jerome, engr., 1331 Majestic Bldg., Detroit, for grading, shaping and surfacing with concrete 3½ mi. Michigan Ave. from Detroit city limits to western corporation line, double roadway each 16 ft. wide. About $100,000.

Ill., Benton—City plans to pave 100,000 sq.yd. streets. About $500,000. C. B. Mantz, city engr.

Ill., Sesser—City receives bids about February building sidewalks. Cost $40,000. C. B. Mantz, Benton, engr.

Ill., West Frankfort—City will pave 60,000 sq.yd. and build storm sewers. About $400,000. C. B. Mantz, Benton, engr.

Wis., Crandon—Forest Co. plans to grade Elvoy Dam Rd., cost $1080, Alvin-Florence Rd., $2161, Alvin Twp.; Crandon-North Crandon Rd., Crandon Twp., $2334; Hiles-Gagen Rd., Hiles Twp., $2161; Loana-Cavour Rd., Laona Twp., $1037; Nashville-Crandon Rd., Nashville Twp., $2593; Armstrong Creek-North Crandon Rd., Caswell Twp., $3602; Newald-Long Lake Rd., Newald Twp., $3085; North Crandon-Alvin Rd., $4321; Bartline-Choate Rd., Wabeno Village, $648; surfacing Main St., $324; Soperton-Otter Lake, east, $2376, Wabeno Village; building concrete bridge west of Laona, Lanoa Twp., $778; concrete bridges and culverts, Wabeno Village, $972. F. J. Rogers, comr.

Wis., East End—Douglas Co. plans to concrete and gravel surface Trunk Highway No. 11, commencing at easterly limits near Bear Creek, in Itasca and extending along Itasca Rd. and Grand Ave. to Spalding Rd., cost $475,000; pave Trunk Highway No. 35, concrete, $220,000; gravel Lakeside Rd., $100,000; Brule-Highland Rd., $50,000; Borea Rd., $60,000; Union St., $20,000; Trunk Highway No 10, $70,000 and grading Moose River Rd., $25,000.

Wis., Janesville—Rock Co. plans to build Beloit-Monroe Rd., Avon Twp., $6250; Milton-Whitewater Rd., Lima Twp., $7500; Evansville-Albany Rd., Magnolia Twp., $5359, Beloit-Monroe Rd., Newark, Twp.; $7500; Footville-Magnolia Rd., Center Twp., $3000; Edgerton-Stoughton Rd., Fulton Twp., $3000; Middle Rd., Harmony Twp., $3000; Milwaukee Rd., Johnstown Twp., $6000; Evansville-Brodhead Rd., Magnolia Twp., $3000; Madison Rd., Plymouth Twp., $3000; Edgerton-Stoughton Rd., Porter Twp., $3000; Shopiere-Clinton Rd., Turtle Twp., $3000; Haufman Rd., Spring Valley Twp., $1931, and Magnolia-Evansville Rd., Union Twp., $3000. C. E. Moore, comr.

Wis., Kenosha—Kenosha Co. plans to concrete surface Geneva Rd., Bristol Twp., cost, $6300; Milwaukee Rd., $41,000, Sheridan Rd., $4000, Wilmot Rd., $2000, all in Pleasant Prairie Twp.; Burlington Rd., Somers Twp., $67,500; gravel surface Burlington-Kenosha Rd., Brighton Twp., $3150; Wilmot Rd., Randall Twp., $4780; Wilmot Rd., Salem Twp., $5250; Powers Lake Rd., Wheatland Twp., $2400; gravel macadam all county roads except Trunk Highways, Paris Twp., $7240, and all county roads except Trunk Highways, Bristol Twp., $5120. J. F. Herzog, comr.

Wis., Portage—Columbia Co. plans to gravel Surface Trunk Highway No. 65, Caledonia Twp., $3000; clay surface Trunk Highway No. 65, Ft. Winnebago Twp., $3000; grade, drain and gravel surface Trunk Highway No. 44, Scott Twp., $3000, Trunk Highway No. 29, Portage, $4562; grade, drain and surface Portage-Merrimac Rd., Columbus Twp., $3000, Portage-Merrimac Rd., Caledonia Twp., $3000, Rio-Randolph Rd., Courtland Twp., $2700, Co-

Streets and Roads (Continued)

lumbus-Randolph Rd., Fountain Prairie Twp., $1283. Wyocena-Madison Rd., Lowville Twp., $3000. West Town Line Rd., Otsego Twp., $3000. Main St., Fall River Village, $750. J. T. Henton, comr.

Minn., Madelia—City having plans prepared paving various streets. About $100,000. Bids will be received on all types of pavement. Bradley Eng. Serv., Weber Bldg., St. Cloud, engrs.

Minn., Thief River Falls—City having plans prepared for 97,852 yd. paving. Bids will be received on all types of pavement. Bradley Eng. Serv., Weber Bldg., St. Cloud, engrs.

Neb., Cozad—City soon lets contract improving 19 blocks Main and G Sts., 30, 50 and 60 ft. wide, involving 4750 lin.ft., 6 x 20 in. concrete curbing, 6700 lin.ft. concrete curbing and guttering, 6000 cu.yd. earth excav., 29,500 sq.yd. vitr, brick or asphalt. About $125,000. J. R. Marreauly, Grand Island, engr.

Mo., St. Joseph—Buchanan Co. having plans prepared building 20.7 mi. St. Joseph-Atchison Rd., concrete on 5 in. concrete base, cost $818,616; 10.7 mi. road from St. Joseph to Faucett, asphaltic concrete, $400,000; both 18 ft. wide. J. D. Mohler, 1522 South 25th St., engr.

Texas—R. J. Windrow, state highway engr., Austin, soon lets contract surfacing 5.9 mi. Highway No. 3, Federal Aid Project No. 15, about 20 ft. wide, gravel and bituminous. Cost to exceed $25,000.

Tex., Edna—Jackson Co. voted $60,000 bonds to build Highway No. 12. W. W. McCrory, co. judge, W. C. Youngs, Edna, engr.

Tex., Kaufman—Kaufman Co. plans to improve and drain 18.1 mi. Highway No. 15, from Van Zandt Co. line to Big Bushy Creek, 15 ft. wide, 14.32 mi. to be surfaced with bituminous topping, involving 28,240 cu.yd. gravel, 141,500 sq.yd. bituminous macadam, 1160 lin.ft. piling, 90 cu.yd. class A concrete, including steel, etc. About $172,000. T. Bartlett, Kaufman, engr.

Tex., Madisonville—Madison Co. had plans prepared building 25 mi. Highway No. 32 and laterals. Bonds for $50,000 voted for project. J. M. Roberts, co. judge. P. A. McCarthy, Lufkin, engr. Noted July 3.

Colorado—State Highway Dept., Denver, plans to pave roads in following counties:

Adams and Arapahoe Counties, 1.17 mi. Federal Aid Project No. 31, between Denver and U. S. A. General Hospital No. 21, 18 ft. wide, involving 162 lin.ft. 24 in. corrugated metal culverts, 2400 cu.yd. combined earth excav., 12,200 sq.yd. 1 course plain concrete and 19 cu.yd. concrete culvert headwalls, cost $43,957.

Boulder Co., .799 mi. Federal Aid Project No. 37, east from Boulder, 18 ft. wide, 726 cu.yd. earth excav., 8440 sq.yd. concrete, 208 cu.yd. gravel surfacing, 30 lin.ft. 15 in. corrugated iron pipe, 1 bridge, with two 30 ft. I-beam spans, concrete piers and abutments, etc., $44,810; (state to furnish all cement); 1.523 mi. Federal Aid Project No. 36, between Longmont and Denver, 18 ft. wide, 100 lin.ft. 18 in. corrugated metal culverts, 3409 cu.yd. combined earth excav., 16,054 sq.yd. concrete, 397 cu.yd. gravel shoulders, etc., $44,855.

Eagle Co., 2.759 mi. Federal Aid Project No. 78, between Cliff and Minturn, 18 ft. wide, 818 lin.ft. 24 in. corrugated metal culverts, 34,496 cu.yd. combined earth and 14,263 cu.yd. solid rock excav., 14,505 cu.yd. earth borrow, 9 acres clearing, 262 cu.yd. concrete culvert headwalls, etc., $114,503.

Elbert Co., 16.88 mi. Federal Aid Projecta No. 50, between River Bend and Kuhn's Crossing, 24 ft. wide, 80,000 cu.yd. combined earth excav., 58 cu.yd. concrete headwalls for culverts, 770 lin.ft. 15 in. and 180 lin.ft. 24 in. corrugated metal culverts, 9 bridges with 20 ft. spans, etc., $48,447.

Larimer Co., 1.962 mi. Federal Aid Project No. 33, south from Ft. Collins, 18 ft. wide, 2939 cu.yd. combined earth excav., 20,780 sq.yd. concrete, 518 cu.yd. gravel shoulders, 36 lin.ft. 18 in. corrugated metal culverts, etc., $74,682; (state to furnish cement).

Ouray Co., 1.155 mi. Federal Aid Project No. 65, between Ouray and Silverton, 18 ft. wide, 5991 cu.yd. combined earth and 15,292 cu.yd. solid rock excav., 1875 cu. yd. earth surfacing, 160 lin.ft. 15 in. and 20 lin.ft. 24 in. corrugated metal culverts, 1 bridge with 21 ft. span, etc., $68,433.

Summit Co., 2.093 mi. Federal Aid Project No. 28, between Dillon and Kremmling, 24 ft. wide, 7734 cu.yd. combined earth and 7730 cu.yd. solid rock excav., 511 lin.ft. 15-36 in. corrugated metal culverts, 52 cu.yd. concrete headwalls for culverts, $34,377, also 2 bridges with over 20 ft. spans, $4900 and $6160 respectively. J. E. Maloney, state highway engr.

Idaho, Waha—Comrs. Waha Tammany Highway Dist. plan to pave 7 mi. Waha-Tammany Highway to Lake Waha, gravel or waterbound macadam. Cost to exceed $75,000. G. W. Wallace, Lewiston, comr.

Wash., Pullman—City plans election soon to vote on $15,000 bonds to grade and pave roads within city limits. C. M. Hooper, city engr.

Ore., Enterprise—City Council plans election to vote on $50,000 addition bonds to pave with concrete, asphaltic concrete or bitulithic 35 blocks of side streets and alleys. L. C. Kelsey, 410 Selling Bldg., Portland, engr.

Ore., Klamath Falls—City sold $97,031 bonds to drain and pave side streets, concrete and cinder macadam. J. Cleghorn, city engr.

Ore., Medford—Jackson Co. plans to expend $180,000 for road work to be borne as follows: 1 mill market road levy, $55,000; general road tax, $82,500; road district tax, $42,000; sundry sums, $500. Work will include grading and paving with gravel or macadam unpaved portions of county and market roads.

Ore., Milton—City voted $16,000 bonds to pave and drain streets. S. D. Peterson, city atty.

Ore., Pendleton—Umatilla Co. having preliminary plans prepared for location and survey of highway from Pilot Rock through Albee and Ukiah to north fork of John Day River, connecting with Grant Co. road leading to John Day and Canyon City. Cost to exceed $50,000. M. O. Bennett, Pendleton, dist. highway engr.

Ore., Pendleton — Umatilla Co. having plans prepared by A. E. Perry, co. surveyor, for grading and graveling 3 mi. road from Helis to Cold Springs-Pendleton Highway. About $12,000. Farmers along route agree to pay $6000 for grading, county to pay for graveling.

Ore., Portland—City plans to grade and pave East 72nd St. from point 100 ft. east along west line of Katherine, Kensington and Brainard Additions to East Glisan St., concrete or asphaltic concrete, cost $7033; Boise St. from East 39th St. to west line of 42nd St., S. E., $4719. O. Laurgaard, city engr.

Ore., Portland—Multnomah Co. plans to improve Columbia River Highway, cost $37,500; Bertha-Beaverton project, $62,500; 16th St.-Patton Rd. Dr., $55,000; Foster Rd., $42,000; St. Johns River Rd., $43,700; Fairmount Blvd., $140,000; Columbia Blvd., $55,900. Work includes grading, draining and paving with concrete, asphaltic concrete or waterbound macadam. W. A. Eatchel, co. roadmaster.

Ore., Tillamook—Bayocean Rd. Dist. plans to grade and gravel 3 mi. Bayocean Rd. About $30,000. F. B. Stranahan, city recdr.

Ore., Vale—Malheur Co. plans to grade, gravel and build roads. About $100,000. C. C. Meuller, co. treas.

California—State Highway Comn., 515 Forum Bldg., Sacramento, soon receives bids building 7.25 mi. Division Creek Sect. of Inyo Co. Highway, from Independence to end of Indian allotment, to include grading and macadamizing. First unit of road, 2.73 mi., will be built by day labor. Cost to exceed $50,000. A. B. Fletcher, highway engr.

Cal., Los Angeles—Bd. Supervs. Los Angeles receives bids in January or February grading, draining and paving 12,680 ft. Francisquito Ave., oiled macadam. County furnished 9400 ton crushed rock. F. H. Joyner, co. engr.

Cal., Los Angeles—Bd. Pub. Wks. receives bids about January or February, paving 14 blocks San Pedro St., between Jefferson St. and Vernon Ave., 5 in. bituminous base and 2 in. asphalt surface. H. B. Ferris, secy. A. C. Hansen, city engr.

Cal., San Diego—City voted $80,000 bonds to pave 1.9 mi. Tide St., concrete base. F. Rhodes, city engr.

Cal., San Diego—San Diego Co. voted $2,300,000 bonds to pave 135 mi. roads. J. B. McLees, clk.

Cal., San Leandro—City plans election to vote on $10,000 bonds to widen East 4th St.

Cal., San Luis Obispo—Bd. Supvs. San Luis Obispo Co. having preliminary plans prepared building Arroyo Grande-Corbit Canyon Rd., 18 ft. wide, Arroyo Grande, $12,600, 2 mi. road from Ontario House to County Wharf, 18 ft., Avila, $16,400, 13.25 mi. road from Bank and Branch Sts. to old site Huasna Post Office, Huasna, $112,750, 3.75 mi. road from point opposite Southern Pacific Depot on County Rd. to Bridge St. at Grammar School corner, 20 ft. wide, $30,750, all crushed rock with oil macadam; highway from 1st to 9th Sts. and from 20th St. to north limits of city, 20 ft. wide, El Paso de Robles, $50,000 (surplus funds to be expended on 13th St.), Morro, Cayucos-Cambria Rd., 18-20 ft. wide, Cayucos, $545,000, concrete; grading and graveling 14 mi. road from State Highway to west line Superv. Dist. No. 5, 18-20 ft. wide, Templeton, $24,000; grading graveling, improving and building Morro Rd. from State Highway intersection to Atascadero Lake, Atascadero, west as far as funds permit, $25,000, rock macadam, 14 mi. road from Templeton east on Templeton-Creston Rd. No. 67 to east branch Templeton-Vasa Rd., etc., 16-18 ft. wide, Creston, $16,000; grading and building highway and concrete culverts from Pozo over Pozo-San Juan Grades, 20 ft. wide, $85,000; improving 4800 ft. traffic way at intersection with State Highway, north, 24 ft. wide, Atascadero, rock macadam, $12,000. W. Burch, co. engr.

Ont., Hamilton—City plans to pave 2500 ft. road in cemetary, 18-24 ft. wide. Work involves 1700 sq.yd. waterbound macadam, 40,000 cu.yd. earth fill and a small concrete bridge. About $46,000.

Ont., Toronto—City Council plans to pave Swanwick Ave. from Main to Pichering Sts., asphalt, 24 ft. wide on 5 in. base, cost, $36,720; also curb, gutter and pave with asphalt, 28 ft. wide, on concrete base, from Main St. to city limits, $182,441; pave Edna Ave. from Indian Rd. to Indian Grove, bitulithic, $7520; Crown Park Rd., asphalt, $6609. R. C. Harris, City Hall, engr.

BIDS DESIRED

New Jersey—Until Jan. 7, by State Highway Comn., Broad St. Bank Bldg., Trenton, building 9702 sq.yd. State Highway Route No. 4, Sect. 3, Bway. to Scott Ave., South Amboy, Middlesex Co., concrete surface. W. G. Thompson, state highway engr.

Pa., Wilkes-Barre—Until Dec. 30, by F. H. Gates, city clk., repaving with sheet asphalt or asphalt paving blocks, also setting or resetting curbs in various streets.

W. Va., Franklin — Until Dec. 29, by Comrs. Pendleton Co., grading 4.17 mi. Franklin-Petersburg Rd., 26 ft. wide, involving 22,000 yd. excav. About $26,000. G. Boggs, co. clk.

W. Va., Williamson—Until Jan. 6, by E. Boggs, clk. Mingo Co., building portion Pigeon Creek, beginning at intersection of Rd. No. 4 (Williamson-Burch Rd.) with Rd. No. 10, at mouth of Little Buffalo Creek on Pigeon Creek, thence up Pigeon Creek to station 264, total length, 8 mi.; advertised in this issue.

Ga., Thomasville—Until Jan. 6, by Comrs. Thomas Co., building 2¾ mi. Dixie Highway, involving 26,400 yd. paving and grading, 28.12 cu.yd. concrete, etc. About $85,000. F. Mitchell, Thomasville, engr. Noted May 15.

Ga., Valdosta—Until Jan. 16, by Comrs. Lowndes Co. building 4.86 mi. Natl. Highway from Valdosta to Mineola, 16 ft. wide, involving 45,940 sq.yd. paving, 8548 yd. excav., etc. About $150,000. Glyce & Hackley, 4th and 1st Bldg., Nashville, Tenn., engrs. Noted June 12.

Fla., Bunnell—Until Jan. 12, by Comrs. Flagler Co., hard surfacing with ojus rock, coquina rock or periwinkle shell, 26 mi. road in Shell Bluff Special Road Dist. About $150,000. S. C. Stattings, Bunnell, engr.

O., Cincinnati—Until Dec. 30, by city, grading, paving with bituminous macadam and building concrete curbs and gutters on 1630 ft. Rulison Ave., 30 ft. wide. About $21,231. F. Krug, city engr.

O., Cincinnati—Until Dec. 31, by city, paving with rein.-con. and building curbs and gutters on 690 ft. Gage St., 24 ft. wide. About $12,000. F. Krug, city engr.

Indiana—By Bd. Co. Comrs. building roads in following counties:

Dec. 29, Madison Co., Anderson, 2483 ft. concrete road, Anderson Twp., known as S. M. Mc Vay Rd., 6272 ft. road, Pipecreek and Duckcreek Twps., known as J. G. Lewis Rd.; 15,800 ft. in Anderson Twp., known as T. J. Nichol Rd. T. Flahavin, aud.

Dec. 31, Bartholomew Co., Columbus, 13,930 ft. crushed stone road, Hancock Twp., known as Fitzpatrick Rd. R. Henderson, aud.

Jan. 5, Ripley Co., Versailles, 10 mi. macadam road, Brown Twp., known as F. Moody et al Rd. J. F. Lockard, aud.

Newton Co., Kentland, macadam road, Beaver Twp., known as E. H. Kessler Rd. S. R. Sizelove, aud.

Blackford Co., Hartford City, crushed stone road, Jackson Twp., known as W. H. Brown Rd. W. C. Hughes, aud.

Streets and Roads (Continued)

Benton Co., Fowler, 15,830 ft. gravel road, Gilboa Twp., known as J. Burling Rd. W. Mankey, aud.

Warren Co., Williamsport, 4065 ft gravel road, Steuben Twp., known as Lester Ping Rd. W. H. Stephens, aud

Jaspar Co., Rensselaer, stone road, Walker Twp., known as J. Hine et al Rd. J. P. Hammond, aud.

Jan. 6, Harrison Co., Corydon, stone or gravel road between Posey and Taylor Twps., known as B. Russell et al Rd., 15,520 ft. stone road in Franklin Twp., known as J. Zabel Rd., road in Jackson Twp., known as J. Alitot Rd. S. C. Mauck, aud.

Noble Co., Albion, road in Washington Twp., known as N. S. Stump et al Rd. H. C. Erwin, aud.

Marshall Co., Plymouth, gravel road, Tippecanoe Twp., known as C. M. Urschel Rd., 3 roads in Bourbon Twp., known as A. C. Perry Rd., K. M. Bessinger et al Rd. and O. J. Senour et al Rd., road in Center Twp., known as J. R. Jacoby et al Rd.; road in Polk and West Twps., known as F. B. Haag et al Rd. O. H. Weber, aud.

Parke Co., Rockville, 6290 ft. gravel road, Penn Twp., known as Pierson et al Rd. R. E. Porter, aud.

Jan. 10, Floyd Co., New Albany, 30,180 ft. gravel road, known as Scottsville Rd. J. D. Mitchell, aud.

Jan. 20, Benton Co., Fowler, 15,830 ft. gravel road, Center Twp., known as M. Duffy Rd. W. Mankey, aud.

Allen Co., Ft. Wayne, 15,050 ft. stone road, Perry Twp., known as Hillegass Rd., 15,538 ft. road, Pleasant Twp., known as Smith Rd. A. C. McCoy, aud.

Michigan—Until Jan. 5, by F. F. Rogers, state highway engr., Lansing, grading, draining and surfacing 5.984 mi. State Trunk Line Rd., Assessment Dist. No. 127, 16 ft. wide, Ionia Co., involving 56,000 sq. yd. class B gravel. About $60,000.

Ia., Woodbine—City receiving bids for 51,500 yd. concrete pavement, 9000 yd. grading and 26,346 lin.ft. curb and gutters. About $150,000. Huff, Schmidt & Logan, Woodbine, engrs.

Kan., Leavenworth—Until Jan. 5, by Comrs. Leavenworth Co., grading 4.416 mi. Sect. C, Fort to Fort Highway, Federal Aid Project No. 13, 18 ft. wide, concrete, also necessary bridges and culverts on same. About $202,000.

Washington—Until Jan. 5, by J. Allen, state highway engr., Olympia, grading and draining 28 mi. Central Washington Highway from Connell to Lind, Adams and Frankin Counties; 8.6 mi. Inland Empire Highway, from Delaney to Dodge, Columbia and Garfield Counties.

Cal., Fresno—Until Jan. 13, by Bd. Supervs. Fresno Co., paving 10½ mi. road near Coalinga, concrete and asphalt or patented surface. D. M. Barnwell, co. clk.

Cal., San Bernardino—Until Jan. 5, by J. H. Osborne, city clk., paving 2 blocks 9th St., 4 in. concrete base and ⅝ in. oil and screenings surface. About $10,000. W. D. Brown, city engr.

Cal., Visalia—Until Jan. 6, by Bd. Supervs. Tulare Co., paving 6 mi. road from Poplar to Woodville, concrete. G. R. Prestidge, co. clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—M. F. Loughman, pres. Manhattan Boro., received bids Dec. 15, (a) paving with wood block in and between tracks roadway of Lexington Ave. from 53rd to 79th Sts., (b) with asphalt, Lexington Ave. to 97th St., from Asphalt Constr. Co., 2197 Madison Ave., (a) $83,178, (b) $74,652; J. L. Brustar, Harlem River and 150th St., (b) $76,697; Uvalde Asphalt Paving Co., 1 Bway., (b) $86,950.

★**N. Y., Rochester**—E. S. Walsh, supt. pub. wks., Capitol, Albany, let contract placing and compacting gravel surfacing and building frame freighthouse on terminal site here, Contr. 228, involving 150 cu.yd. excav., 45 cu.yd. 2nd class concrete, 4400 lb. iron castings, etc., to W. F. Martens, 245 Cutler Bldg., $13,493.

★**N. Y., Rochester**—Bd. Constr. & Supply let contract paving, building walks and sewers in Norton St. from Portland Ave. to Waring Rd., to J. Friedrichs Co., Livingston Bldg., $108,729.

★**N. Y., Rochester**—Bd. Contr. & Supply let contract resurfacing Driving Park Ave. and Tryon Park, asphalt, to Ribstein-Holter Co., 16 State St., $11,575 and $21,942 respectively.

Pennsylvania—State Highway Dept., Harrisburg, received bids building roads in counties as follows:

Allegheny Co., 10,453 ft. 1 course rein.-con., Forward Twp., from Foster-Waring Constr. Co., Pittsburgh, $136,081.

Armstrong Co., 1 course rein.-con., Kiskiminetas Twp., Summit Constr. Co., Akron, O., $119,883.

Beaver Co., 5413 ft. 1 course rein.-con., North Sewickley Twp., W. S. Morrison, New Brighton, $55,949; 13,062 ft. 1 course rein.-con. and Hillside vitr. brick, Daugherty and New Sewickley Twps., S. B. Markley, Rochester, $150,771, Foster-Waring Constr. Co., Pittsburgh, $155,550; 12,062 ft. 1 course rein.-con. and Hillside vitr. brick, Rochester and Daugherty Twps., S. Gamble Co., Carnegie, $180,921, J. C. Devine Co., Alliance O., $188,403, P. F. Connelly Co., Koppel, $196,562, 5311 ft. 1 course rein.-con., Center Twp., M. J. Scanlon, New Castle, $96,179, Jones Constr. Co., Lisbon Rd., Salem, O., $97,806.

Berks Co., 29,100 ft. 1 course rein.-con., Exeter and Amity, Colebrookdale and Oley Twps., Weller Constr. Co., Inc., 816 14th St., Washington, D. C., $221,128, O'Rourke-Horton & Co., Reading, $223,723. Sutton & Corson Co., 9th and Simpson Sts., Ocean City, N. J., $244,895, 14,850 ft. 1 course rein.-con., Tilden and Upper Bern Twps., Bennett & Randall, Lebanon, $105,852, Sutton & Corson Co., 9th and Simpson Sts., Ocean City, N. J., $132,922.

Butler Co., 18,778 ft. 1 course rein.-con., Fairview Twp., M. J. Scanlon, Newcastle, $221,016, 31,663 ft. 1 course rein.-con., Conoquessing and Butler Twps., C. F. Walter, Butler, $316,042

Carbon Co., 23,420 ft. 1 course rein.-con., Lehigh Twp., Morgan, Wilkes Barre, $232,-607.

Centre Co., 1720 ft. 1 course rein.-con., Bellefonte Boro., F. Murphy, Altoona, $38,-784, Spruks Co., Scranton, $45,248; 5326 ft. vitr. brick, State College Boro., L. E. Kelly, Brooklyn, N. Y., $154,878.

Chester Co., 11,524 ft. 1 course rein.-con., London Britain Twp., Winston & Co., Pottstown, $94,892, H. E. Baton, Front and Norris Sts., Phila., $99,282, M. Staub, Hammonton, N. J., $113,192.

Clearfield Co., 39,911 ft. 1 course rein.-con., Wallaceton Boro., Boggs and Bradford Twps., Warren Bros. Co., 142 Berkeley St., Boston, Mass., $415,451, Dowler & Anderson, Clearfield, $452,580, A. L. Anderson & Bros., Inc., Altoona Trust Bldg., Altoona, $501,776.

Delaware Co., 10,434 ft. 1 course rein.-con., Thronbury Twp., Sutton & Corson, 9th and Simpson Sts., Ocean City, N. J., $92,-829, Continental Contg. Co., 66 Knickerbocker Bldg., Baltimore, $95,759, M. Staub, Hammondton, N. J., $104,855

Elk Co., 7543 ft. 1 course rein.-con., Ridgway Boro., Miller Constr. Co., Weber Bldg., Punxsutawney, $95,964; 3169 ft. 1 course rein.-con., St. Mary's Boro., C. A. McDonald, 26 South Franklin St., DuBois, $42,621, Fish, Young & Parks, Phila., $47,-262; 25,563 ft. 1 course rein.-con., Horton and Ridgway Twps., Warren Bros. Co., 142 Berkeley St., Boston, Mass., $285,721.

Erie Co., 10,600 ft. 1 course rein.-con., Mill Creek Twp., C. H. Fry Constr. Co., Erie, $70,527, H. Shenk Co., 12th and Sassafras Sts., Erie, $93,561; 21,268 ft. 1 course rein.-con., Girard Twp. and Platea, C. H. Fry Constr. Co., $164,270, H. Shenk Co., $183,780; 21,109 ft. 1 course rein.-con., Green Twp., Summit Constr. Co., Akron, O., $193,399.

Fayette Co., 1125 ft. 1 course rein.-con., Fayette City Boro., L. S. Schultz & Son, Fredonia, N. Y., $14,752, T. Arrigo, Charleroi, $14,755.

Petriello Bros. & Co., South Brownsville, $15,065; 5467 ft. 1 course rein.-con., Henry Clay Twp., Petriello Bros. & Co., $66,072; 3732 ft. 1 course rein.-con. and Hillside vitr. brick, German Twp., Petriello Bros. & Co., $54,106; 15,323 ft. 1 course rein.-con. and Hillside vitr. brick, Perry Twp., T. Arrigo, $161,608.

Greene Co., 12,581 ft. 1 course rein.-con., Center Twp., E. E. Morris and T. R. Huffman, Waynesburg, $201,604.

Lawrence Co., 14,784 ft. 1 course rein.-con., Scott Twp., Aronberg & McDonald, New Castle, $135,000, Burns Bros., New Castle, $136,677, M. J. Scanlon, New Castle, $154,209; 11,625 ft. 1 course rein.-con., North Beaver Twp., M. J. Scanlon, $124,-957, P. F. Connelly Co., Koppel, $127,691, Burns Bros., $134,484.

Montgomery Co., 8596 ft. bituminous surface on concrete foundation or 1 course rein.-con., Hatfield and Towamencin Twps., Fish-Rutherford, Inc., Phila., $73,008, Hill Constr. Co., Phila., $74,767, Warren Bros. Co., 142 Berkeley St., Boston, Mass., $78,-800.

Northampton Co., 18,860 ft. 1 course rein.-con., Palmer Twp., Smith-McCormick & McInerney & McNeal, Inc., Easton, $165,526, Inerney & McNeal, Inc., Easton, $165,526, A. McMullen Co., Phila., $180,425, H. B. Snroul Constr. Co., Inc., Scranton, $212,750; 28,768 ft. 1 course rein.-con., Allen and East Allen Twps., A. McMullen Co., Phila., $231,883, Weller Constr. Co., 816 14th St., Wash., D. C., $234,812, Smith-McCormick & McInerney & McNeal, Inc., $248,777.

Northumberland Co., 17,569 ft. 1 course rein.-con., Ralpho Twp., Fiss & Christano, Shamokin Dam, $171,631, Sutton & Corson Co., 9th and Simpson Sts., Ocean City, N. J., $172,284, Mason & Hanger Co., Inc., Paxinos, $173,709.

Potter Co., 8358 ft. bituminous surface course on concrete foundation, or 1 course rein.-con., Shinglehouse Boro., Chenango Constr. Co., Syracuse, N. Y., $89,894, Horn & Devling, Main St., Galeton, $90,766, G. Metzger, Jr., 12 East 4th St. Emporium, $99,021.

Somerset Co., 5900 ft. 1 course rein.-con., Jenner Twp., F. H. Ziegler, Somerset, $48,448, J. F. Norris, Somerset, $53,398, B. J. Lynch Co., Inc., Meyersdale, $54,077.

Susquehanna Co., 3844 ft. 1 course rein.-con. and Hillside vitr. brick, Oakland Boro., M. Barber, Binghamton, N. Y., $38,352, W. E. Bennett, Lanesboro, $45,788, O. B. S. Co., Phila., $59,619.

Tioga Co., 6382 ft. 1 course rein.-con., Westfield Boro., R. J. Delong, 764 West Edwin St., Williamsport, $78,017, J. C. Bradley & Co., Wellsboro, $80,037.

Warren Co., 2080 ft. 1 course rein.-con., Warren Boro., J. P. Morrissey, 309 Central Ave., Dunkirk, N. Y., $39,656.

Westmoreland Co., 9184 ft. 1 course rein.-con. and Hillside vitr. brick, Salem and Unity Twps., McCrady Bros. Co., Braddock, $138,195; 32,017 ft. 1 course rein.-con. and Hillside vitr. brick, Derry Twp., McCrady Bros. Co., $413,866, Langthorn Co., Inc., 2 West 45th St., New York City, $478,205; 57,519 ft. 1 course rein.-con. and Hillside vitr. brick, Delmont Boro., Hempfield, Salem and Washington Twps., Warren Bros. Co., 142 Berkeley St., Boston, Mass., $668,-986.

★**W. Va., Woodsdale** (Wheeling P. O.)—City let contract improving 14,295 ft. road, asphaltic concrete, 20 ft. wide, to Ball Eng. Co., Woodsdale, $92,000.

★**Fla., Jacksonville**—Comrs. Duval Co. let contract paving 6¼ mi. Atlantic Blvd., to J. Y. Wilson Constr. Co., Clark Bldg. About $50,000.

★**O., Cleveland**—City let contract paving Adelbert Rd., to G. B. Herring, 10839 Drexel Ave., cost $7650; East 19th St., to Rieley Bros., The Arcade, $3875. Work involves 540 sq.yd. brick block, 2000 cu.yd. grading and 36,600 sq.yd. to be taken up and replaced with tar filler.

★**O., Hamilton**—City let contract grading and paving streets, building sidewalks, laying storm and sanitary pipe sewers, gas and water mains, in new addition, to Welling & Franz, Cincinnatti. About $60,000

★**O., Hamilton**—City let contract paving Webster and Sherman Ave. extensions, to Andrews Asphalt Paving Co., Rentschler Bldg., $69,224.

★**O., South Euclid**—Village let contracts for 13,000 cu.yd. grading on (1) Bayard Rd. and 4400 cu.yd. on (2) Wilmington Rd., to C. Wilms, Warrensville, $10,242 and $4477 respectively; 46,000 sq.ft. sidewalk on (1) and 25,000 sq.ft. on (2), both 2½ in. sandstone, to Cleveland Stone Co., 1836 Euclid Ave., Cleveland, $11,590 and $6420 respectively.

★**Mich., Marquette**—Rover Marquette Co. let contract clearing and grading 4.425 mi. Rd. No. 35-D, Marquette and Negaunee Twps., to Hall & Labby, Ironwood, $117,-500; clearing, grading and draining 9.007 mi. Rd. No. 35-E, to Garven-Wavenberg, Appelton, Wis., $160,000.

★**Minn., Duluth**—W. H. Borgen, aud. St. Louis Co., let contracts to S. J. Groves & Sons Co., 105 Kasota Bldg., Minneapolis, for subgrade construction on State Rd. No. 1 as follows: 10 mi. Div. No. 1 and 15 mi. Div. No. 2, State Job No. 1903, cost $124,130 and $221,085 respectively; 9.3 mi. State Job No. 1904, $162,192, all without special excavation and rock piled in grubbing.

★**Mo., Lancaster**—Town let contract paving Main St., involving 14,000 sq.yd. vitr. brick, 7500 ft. concrete curb and 3500 cu.yd. earth excav., to Cameron, Joyce & Co., Keokuk, Ia. About $55,000.

★**Okla., Okmulgee**—City let contract for 175,000 yd. concrete pavement, to Park-Moran Co., Okmulgee. Dist. No. 31, $97,183; Dist. No. 32, $12,729; Dist. No. 38, $25,693; Dist. No. 39, $54,720, and Dist. No. 40, $161,882. About $350,000.

★**Ariz., Clifton**—Comrs. Greenlee Co. let contract building Sects. 1 and 2 Clifton-Franklin Highway, Federal Aid Project No. 13, involving 32,000 cu.yd. road, 5000 cu.yd. borrow and 25,000 cu.yd. unclassified excav., 2630 cu.yd. class A concrete in bridges, 634 cu.yd. class B concrete, 2426 cu.yd. excav. for bridges and 84,707 lb. reinforcing steel, etc., to Webster. Webster & Kerby, Clifton, $111,213

Streets and Roads (Continued)

Ore., Seaside—City Council received only bid grading, draining and paving with concrete, building concrete curbs and sidewalks on 11 streets, from J. H. Tillman, Hammond. About $200,000.

★**Cal., Los Angeles**—Los Angles Co. let contract to Rogers Bros. Co., 350 Merrick St., $65,582, improving 2.4 mi. Harbor Truck Blvd., near Compton, 24 ft. wide and shoulders, involving 500 cu.yd. excav., 12,802 lin.ft. shaping roadbed. 7820 tons placing disintegrated granite, 34,136 sq.yd. 8 in. concrete paving, 22 cu.yd. concrete culverts and 4610 lb. reinforcing steel. County furnishes 7820 tons disintegrated granite, 11,481 bbl. cement and 316,266 sq. ft. weld wire mesh.

Cal., San Francisco—City received bids improving London St. between France and Amazon Aves., involving 2270 lin. ft. concrete curbing, 17,450 sq ft. artificial sidewalks, 5428 cu.yd. earth excav., 1000 sq. yd. vertical fibre, 3162 sq.yd. asphalt, etc., from Flinn & Treacy, 1 Montgomery St., $35,540; Reisch Impvt. Co., 46 Kearny St., $36,818. Former bids rejected.

★**Ont., London**—City will pave 24 mi. various streets. About $640,000. Work will be done by day labor under supervision of H. A. Brazier, city engr.

★**Ont., Toronto**—Bd. Control let contracts to Toronto Comr. of Wks., City Hall, Building asphalt pavements on Bristol Ave., $9908, Herman Ave. $3379, Hiawatha Rd. $13,926, Sackville St. $11,257; granite block pavement on Eastern Ave. from St. Lawrence St. to Broadview Ave. $37,440.

★**Ont., Toronto**—Bd. Control let contract to Godson Contg. Co., Manning Chambers, building asphalt pavements on Kennelworth Ave., $3157, Alven Ave. from Heath St., E., to Glen Elm Ave., $4959, Don Crest Rd. from 3rd St. to Ozark Crescent $7661, Weston Rd. $3481; Ramsey Contg. Co., 39 Indian Rd., concrete sidewalk, Erie Terrace from Queen to Gerard Sts., $2.23 per lin. ft., total $4000; Warren Bituminous Paving Co., McKinnon Bldg., bitulithic pavement on Exeter Ave. from Laughton to East End, $5871.

★**Ont., Toronto**—City Council let contract to Godson Constg. Co., Manning Chambers, building asphalt pavements on Greenwood Ave., $4296, Furness Ave., $6200, concrete curbing on Strathmore Blvd., $.80 lin.ft., to Comr. of Wks., City Hall, concrete sidewalks on Bay St. $.34 sq.ft., asphalt pavements on Bathgate Ave., $8488, Baltic Ave., $5604, Linsmore Crescent, $10,385 and Strathmore Blvd., $8351. Noted July 10.

Railways

PROPOSED WORK

Ont., Hanover—See "Industrial Works."

BIDS DESIRED

Ontario—Until Jan. 3, by City of Toronto, building 3 mi. double track railway from Toronto to Mount Pleasant, involving earth excav., fill, ballast and 6 mi. transmission line. About $750,000. R. C. Harris, City Hall, Toronto, engr. Noted Aug. 21.

Excavation and Dredging

PROPOSED WORK

Miss., Cleveland—Excavation—Drainage Comrs. Lead Bayou D.D Bolivar Co. soon lets contract for excavating following ditches: Horseshoe Bayou, 16,000 ft. long, involving 105,380 cu.yd. excav. and 51.40 acres clearing of right of way; East Main, 17,800 ft. long, 77,892 cu.yd. excav., and 62 acres clearing; East Main, 13,000 ft. long, 62,908 cu.yd. excav.; Lateral No. 9, 1700 ft. long, 5290 cu.yd. excav. and 3.5 acres clearing; Lateral No. 3, 4000 ft. long, 9190 cu.yd. excav. and 3 acres clearing; Lateral No. 5, 5500 ft. long, 3700 cu.yd. excav.; West Main, 36,100 ft. long, 151,000 cu.yd. excav. and 101.1 acres clearing; West Main, 13,700 ft. long, 101,900 cu.yd. excav.; Lateral No. 1, 9800 ft. long, 49,728 cu.yd. excav. and 20 acres clearing; Lateral No. 2, 3700 ft. long, 21,074 cu.yd. excav. and 8 acres clearing; Lateral No. 7, 5500 ft. long, 15,860 cu.yd. excav and 11 acres clearing; Lateral No. 8, 3000 ft. long, 9330 cu.yd. excav. and 6 acres clearing; South Main, 12,600 ft. long, 63,200 cu.yd. excav. and 45 acres clearing; South Main, 9200 ft. long, 43,480 cu.yd. excav.; Lateral No. 6, 14,500 ft. long, 81,000 cu.yd. excav. and 30 acres clearing. W. W. Boone, engr.

Tenn., Memphis — Irrigation — Big Creek D. D having surveys made of 12,000 acres north of Memphis preparatory to reclamation. About $150,00. Gaines & Carlisle, Memphis, engrs.

Minn., Elk River—Ditch—Comrs. Sherbourne Co. receive bids about February, building D. D. No. 27, involving 13,229 cu. yd. dirt excav., laying 3944 ft. 8-18 in. sewer pipe, head walls, culverts, etc. About $27,000. Former bids withdrawn. F. W. Nickerson, Elk River, engr.

Mont., Laurel — Ditch — Cove Ditch Co. plans to enlarge ditch, to irrigate 65,000 acres. About $200,000. B. C. Lillis, engr.

Mo., Bigelow—Drainage—Bd. Supervs. Squaw Creek D. D., Holt Co., have asked engineers to submit on or before Jan. 15, complete and comprehensive plans for reclamation of said district, comprising 29,000 acres of land. F. Walker ,Bigelow, secy. bd. supervs.

Washington—Special commission appointed by State of Washington with I. E. Goodner, state office engr., Salem, making preliminary surveys and plans for diverting water from Pend Oreille River for irrigation of 2,000,000 acres in big bend of Snake and Columbia Rivers.

Ore., Grants Pass—Ditch, etc.—H. J. Sisty and J. N. Britten filed application with P. A. Cupper, state engr., Salem, for appropriating 50 second ft. of water from Soldier Creek for placing mining and building ditch, headgate and dam. About $12,000.

Cal., Grass Valley—Irrigation—State will make preliminary investigatoins to determine possibilities for irrigation from Yuba River watershed, of large area in Nevada and Yuba Counties. W. F. McClure, Forum Bldg., Sacramento, state engr.

Cal., Westpoint—Canal—See "Industrial Works."

BIDS DESIRED

N. J., Jersey City—Excavating—Until Dec. 30, by F. A. Dolan, city clk., for rock excavation and removal of same in water pipe trench, Webster Ave. from North St. to Paterson Plankroad.

Ill., Shawneetown—Drainage—Until Jan. 6, by Comrs. Rocky Branch D. D., Gallatin Co., cutting ditches, laying tile drains, and building concrete spillway or retaining bottom, involving 105,239 cu.yd. excav. and 498 rods 12-18 in. tile. R. J. Mills, comr.

Ia., Charles City—Irrigation—Until Dec. 30, by Comrs. Floyd Co., furnishing labor and materials for building D.D. No. 9. Work involves 1500 ft. open ditch, 1 concrete bulkhead, 26 intakes and laying 112,623 ft. 6-36 in. tile. C. R. Jones, aud.

Ia., Charles City—Irrigation—Until Dec. 30, by Comrs. Floyd Co., furnishing labor and material for building D. D. No. 10. Work involves 19 manholes, 32 intakes, 1 bulkhead and laying 20,424 ft. 8-36 in. No. 2 vitr. pipe sewer. C. R. Jones, aud.

Ia., Des Moines—Drainage—Until Jan. 5, by F. J. Alber, aud. Polk Co., building D.D. No. 25. Project consists of widening, straightening and deepening 14 mi. Skunk River across northeastern part of county involving 1,151,360 cu.yd. earth excav. for channel, building levees, etc.

Ia., Sidney—Ditch—Until Jan. 15, by H. C. Swanson, aud. Fremont Co., building East Nishnabotna Ditch No. 4, with Laterals A and B, main ditch, 10.64 mi. long, 24 ft. wide, involving 836,000 cu.yd. earth excav., Lateral A, 3900 ft. long, 4 ft. wide, 6000 cu.yd. earth excav., Lateral B, 6500 ft. long, 4 ft. wide, 7000 cu.yd. earth excav.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**O., Ashtabula**—Excavation—City Council let contract excavating new spray pond in connection with municipal lighting plant, to E. J. Inman, $18,806.

Industrial Works

Mass., Springfield—See "Buildings."

Mass., Woburn—Crescent Leather Co. having plans prepared by Vaughn & Meyer, archts. and engrs., Security Bldg., Milwaukee, Wis., for two 3 story, 50 x 240 ft. brick and mill construction, tanneries, brick foundation. About $175,000.

Mass., Worcester—See "Buildings."

Mass., Worcester—Olson Mfg. Co., 54 Commercial St., plans to build factory on Barber and Wiley Aves. Architect not selected.

Mass., Worcester—J. Rice, archt., 306 Main St., receives bids about Jan. 10, building 1 story, 160 x 186 ft., concrete service station and salesroom, concrete flooring and foundation, for Franklin Motor Car Co., 3 King St. About $70,000.

Mass., Worcester—Sanford Riley Stoker Co., 25 Foster St., plans to build 1 story, 30,000 sq. ft., brick and concrete plant, concrete flooring and foundation, on West Boylston St. About $60,000. Private plans.

Conn., Hartford—See "Buildings."

Conn., Naugatuck—Lockwood-Green Co., archts. and engrs., 101 Park Ave., New York City, receive bids about Jan. 7, building 4 story, 60 x 80 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, for Naugatuck Chem. Co., c/o architects. About $70,000.

Conn., New Haven—Lockwood-Green Co., archts. and engrs., 101 Park Ave., New York City, receive bids about Jan. 10, building 3 story, 80 x 100 ft., brick, rein.-con. and steel factory, rein.-con. flooring, concrete foundation, for A. C. Gilbert, c/o architects. About $80,000.

Conn., Thomaston—Seth Thomas Clock Co., c/o Lockwood-Green Co., archts. and engrs., 101 Park Ave., New York City, soon receives bids building 2 story, 60 x 120 ft. and 4 story, 60 x 120 ft., rein.-con. and steel factories, rein.-con. flooring, concrete foundation.

N. Y., Brooklyn—F. Huber, 314 Park Ave., having plans prepared by W. B. Wills, Inc., archts. and engrs., 1101 Myrtle Ave., for 2½ story, 100 x 100 ft., brick and steel storage plant, rein.-con. flooring, concrete foundation, on Grand Ave. About $50,000.

N. Y., Brooklyn—Hudson Bag Co., 77 Washington St., receives bids about Dec. 29, building 2 story, 200 x 265 ft., brick and steel factory and warehouse, rein.-con. flooring, concrete foundation, on Bogert, Scholes and Meserole Sts. About $130,000. L. Allmendinger, 20 Palmetto St., archt. and engr.

N. Y., Brooklyn—L. Allmendinger, archt. and engr., 20 Palmetto St., receives bids about Jan. 2, building 1 and 2 story, 50 x 217 ft., brick and steel plant, rein.-con. flooring, concrete foundation, on Flushing Ave., for Kirsch & Hersel, 214 Scholes St. About $30,000.

N. Y., Brooklyn (Bay Ridge)—Knickerbocker Ice Co., 1480 Bway., New York City, soon lets contract building 1 story, 70 x 100 ft., rein.-con. and steel plant, rein.-con. flooring, concrete foundation. About $80,000.

N. Y., Lockport—Bd. Supervs. Niagara Co. plans to establish stone crushing plant at old poor house farm. About $25,000. Address J. W. Turner, Jr., 80 East Ave.

N. Y., Long Island City—J. Clark, c/o B. R. Swartburg, archt. and engr., 103 Park Ave., New York City, having plans prepared for 8 story, 100 x 150 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation. About $380,000.

N. Y., Long Island City—B. J. Johnson Soap Co., c/o Lockwood-Green Co., archts. and engrs., 101 Park Ave., New York City, having plans prepared for 4 story, rein.-con. and steel warehouse, rein.-con flooring, concrete foundation. About $250,000.

N. Y., Massena—J. Dunlop Sons Co., 19 Madison Ave., New York City, plans to alter and build additions to 2 plants on East Orms St., here. Cost, including machinery, $100,000. A. L. Brockway, 3rd Natl. Bank Bldg., Syracuse, archt.

N. Y., Mount Morris—Perry Knitting Co. purchased Seymour Opera House and plans to alter, build additions and install machinery in same for its own use. About $100,000. F. C. Miller, mgr.

N. Y., New York—L. Schurmacher, 1128 Bway., having plans prepared by L. A. Sheinart, archt. and engr., 192 Bowery, for 2 story, 75 x 130 ft., brick and steel garage, rein.-con. flooring, concrete foundation, at 1124 1st Ave. About $25,000.

N. Y., Rochester—Natl. Fire Escape Corp. recently incorporated with $250,000 capital stock plans to build modern assembly plant. About $150,000. Address G. Y. Webster, Wilder Bldg.

N. Y., Syracuse—Battery Serv. Co., Inc., 562 East Genesee St., receives bids about Mar. 1, building 1 story, concrete and steel factory. About $50,000. M. E. Granger, Gurney Bldg., archt. and engr.

N. Y., Syracuse—C. G. Hanna Co., South Clinton St., plans to build 4 story, 132 x 133 ft., concrete and steel factory, rein.-con. flooring, concrete foundation, on East Genesee St. About $165,000. Architect not selected.

N. J., Harrison—Lockwood, Green & Co., archts., 101 Park Ave., New York City, receive bids about Jan. 7, building 3 story, 50 x 100 ft., rein.-con. and steel extension to shipping and factory buildings, for Driver-Harris, Middlesex St.

N. J., Harrison—Lockwood, Green & Co., archts., 101 Park Ave., New York City, receive bids about Jan. 5, building 6 story, 80 x 200 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, for Driver-Harris, Middlesex St.

Industrial Works (Continued)

Pa., Scranton—Klots Throwing Co., c/o Lockwood, Green & Co., archts., 101 Park Ave., New York City, receives bids about Jan. 5, building 2 story, 116 x 200 ft., rein.-con. and steel factory, rein.-con. flooring, concrete foundation, here.

Md., Baltimore—L. Miller, 5 Lloyd St., receives bids about Jan. 15, building 2 story, 45 x 50 ft., dairy and cold storage plant, concrete and brick, concrete foundation, at 5-7-9 Lloyd St. About $50,000. G. R. Callis, Melvin Ave., Catonsville, archt.

Va., Petersburg—Steward Trunk & Bag Co. and F. A. Bishop, archt., Petersburg, soon receive bids building 2 story, 30 x 85 ft., concrete and brick factory, rein.-con. flooring, concrete foundation, on High St. About $25,000.

N. C., Greensboro—J. E. Sirrine, engr., Greenville, S. C., soon lets contract building 1 story, 60 x 110 ft., brick and timber addition to mill, for Pomona Mills, Greensboro.

S. C., Bamberg—J. E. Sirrine, engr., Greenville, soon lets contract building 2 story, 52 x 375 ft., brick and timber addition to cotton mill, for Bamberg Cotton Mills.

S. C., Orangeburg—J. E. Sirrine, engr., Greenville, soon lets contract building 1 story, 65 x 90 ft. mill construction warehouse, cement concrete flooring for Santee Mills.

O., Bucyrus—Halliday Motors Co. purchased site and plans to build factory covering 40,000 sq.ft. floor space. T. E. Huth, pres.

O., Cincinnati—E. H. Bardes Range Co., Colerain and Alfred Sts., plans to build 2 story, 85 x 102 ft., rein.-con. pattern shop. Kruckemeyer & Strong, St. Paul Bldg., archts.

O., Cleveland—Bender Auto Co. soon lets contract building 1 story, 100 x 250 ft., concrete, steel and brick factory, rein.-con. flooring, concrete and brick foundation, on West 65th St. and Denison Ave. About $150,000. Address H. Bender, c/o Northern Blower Co., Barberton Ave. R. M. Hulett, Fire Bldg., archt.

O., Cleveland—M. Hinkel, pres. Hinkel Motor Truck Corp., 6521 Euclid Ave., plans to build 2 story, 180 x 200 ft., concrete, steel and brick garage and salesroom, rein.-con. flooring, concrete foundation, on East 71st St. and Carnegie Ave. About $100,000. Whitworth & Johnson, Engineer's Bldg., archts.

O., Dayton—Allsteel Ridewell Tire & Rubber Co., Dayton Savings & Trust Bldg., plans to build 3 story, rein.-con. factory, rein.-con. flooring, concrete foundation. About $100,000. Architect not selected.

O., Dayton—Dayton Pneumatic Tool Co., Chapel Rd., plans to build 2 story, 100 x 100 ft., rein.-con. and brick addition to factory, rein.-con. flooring, concrete foundation. About $75,000. Architect not selected.

O., West Barberton—Portage Rubber Co. having plans prepared and soon receives bids constructing power plant and office building. About $200,000.

Ind., Indianapolis—Van Briggle Chemical Co., 429 North Capitol Ave., plans to build 3 story, 160 x 200 ft., rein.-con. and terra cotta factory, concrete foundation, on 16th St. and Capitol Ave. About $125,000. C. E. Bacon, Merchants' Bank Bldg., archt.

Mich., Detroit—Clayton & Lambert Mfg. Co., Beaubien St., plans to build power plant, also 1 and 2 story, rein.-con., brick and steel factory, rein.-con. flooring, concrete foundation, along tracks of Detroit Terminal Ry. About $500,000.

Mich., Detroit—Columbia Motors Corp., 1256 East Jefferson Ave., having plans prepared by H. H. Lane, engr. and archt., Dime Bank Bldg., for 2 and 3 story, 300 x 720 ft., rein.-con. and brick, rein.-con. flooring, concrete foundation, on Fort and Boyd Sts. About $600,000. Noted June 19.

Mich., Grand Rapids—Sonneveld Bros., 815 Leonard St., N. W., having plans prepared by P. Lindhout, archt., 817 Lake Drive, for 2 story, rein.-con., brick and steel addition to bakery and storage building, rein.-con. flooring, brick foundation. About $40,000.

Mich., Muskegon—See "Miscellaneous."

Ill., Chicago—Illinois Glass Co., Alton, acquired 157,462 sq.ft. of land on North Crawford and Wrightwood Aves. and plans to build plant. About $250,000.

Ill., Jacksonville—City plans to build additions to steam power plant. About $40,000. C. M. Borchers, mayor.

Wis., Marinette—Amer. Toy Horse Co. plans to build two 1 or 2 story, 100 x 200 ft., rein.-con. and brick factories, rein.-con. flooring, on Water St. About $150,000. H. Greene, 125 East Water St., Milwaukee, pres. Architect not selected.

Wis., Milwaukee—M. Tullgren & Sons, archts., 425 East Water St., soon let contract building 2 story, 60 x 100 ft., rein.-con. and brick factory, rein.-con. flooring, concrete foundation, for Gen. Mfg. Corp., 1520 Buffum St. About $50,000.

Wis., Racine — Racine Confectioners' Mchy. Co., 1630 Racine St., having plans prepared by D. R. Davis, archt. and engr., 526 Wisconsin St., for 1 story, 38 x 120 ft. machine shop and 2 story, 50 x 165 ft. factory, brick and concrete, rein.-con. flooring. About $60,000.

Wis., Waukesha — Bethesda Mineral Spring Co., 301 Dunbar Ave., plans to build 1 or 2 story, 40 x 60 ft., rein.-con. and brick plant, rein.-con. flooring, concrete foundation. About $25,000. Van Ryn & De Gelleke, Caswell Blk., Milwaukee, archts. and engrs.

Minn., Duluth—Minnesota Steel Co., Wolvin Bldg., having plans prepared and receives bids about spring extending blast furnace plant, here. Work involves building 175 concrete block houses at Morgan Park, (company's model town for housing employes), cost $2,000,000; rod and wire mills, cost $3,000,000, including conversion of rail mill into billet mill, now under construction by day labor. Project also includes 3 additional blast furnaces, 14 open-hearth furnaces and a unit of 16 soaking pit furnaces, cost $10,000,000

Minn., Minneapolis—Berger Mfg. Co., 300 10th Ave., S., having plans prepared by W. C. Westbey, archt., c/o owner, for 1 story, 80 x 112 ft., timber addition to factory, on Ulysses St. and Bway., N. E. About $60,000.

Minn., Minneapolis — Harris Realty Co., New England Bldg., having revised plans prepared by C. L. Kinport, archt., Andrus Bldg., for 2 story, 100 x 120 ft., rein.-con. and brick garage, on Lincoln and Aldrich Aves., S. About $52,000. Former bids rejected.

Wash., Olympia—Olympia Door Co. plans to build 2 story frame factory, concrete foundation, 150,000 ft. daily capacity, adjoining present plant. About $25,000. Private plans.

Wash., Sedro Wooley—T. Jungmeyer plans to build 1 story, 40 x 90 ft., brick garage, concrete foundation. About $50,000. Private plans.

Wash., Spokane—Centennial Mills, Ltd., 817 Howard St., plans to build 8 story mill with 27 rein.-con. tanks, 1,000,000 bu. capacity, and 7 story warehouse, 250,000 bu. capacity; both rein.-con., rein.-con. flooring. About $1,000,000. A. E. Witherspoon, Spokane, engr.

Ore., Doris (Ranier P. O.)—Associated Lumber & Box Co., Klamath Falls, plans to build 1 story frame factory, concrete foundation, here (25,000,000 ft. yearly capacity). About $25,000. Private plans.

Ore., Portland—Montgomery Ward & Co., 581 Upshur St., plans to build 8 story, 280 x 600 ft., mail order house, 1st unit, 280 x 300 ft., at Guilds Lake Dist. About $1,500,000. W. Q. Bateman, local mgr. W. H. McCaully, 2701 Mildred Ave., Chicago, engr.

Ore., Salem—Puyallup & Sumner Co. plans to build 2 story frame and concrete cannery, concrete foundation, in suburbs. About $50,000. Architect not selected.

Cal., Emeryville—W. J. Miller, archt., 417 Market St., San Francisco, soon receives bids building 2 story, brick factory, concrete foundation, for Amer. Rubber Co., Emeryville. About $100,000.

Cal., Westpoint—Mokelumne River Power & Water Co., San Mateo, plans to build one 6000 h.p. and 12,750 h.p. hydro-electric plants, 2 diversion canals, 4½ and 5½ mi. long, loose rock and concrete dam and reservoirs in south, middle and north forks of Mokelumne River. About $1,288,000.

Que., St. Hyacinthe—E. H. Richer plans to build 4 story, 175 x 225 ft., steel and brick factory, concrete foundation, on Ioli St. About $200,000. Architect not selected.

Que., St. Jerome—Regent Knitting Co., Ltd., Duluth and St. Lawrence Sts., Montreal, soon lets contract building 2 story, 50 x 75 ft., concrete and brick factory, rein.-con. flooring, on Notre Dame St. About $85,000.

Ont., Hanover—Hanover Portland Cement Co. plans to build quarry plant and 7 mi. light railway from present plant to quarry. About $200,000.

Ont., St. Thomas — Watt & Blackwell, archts., Bank of Toronto, London, preparing plans and receive bids about Jan. 5, building 3 story, 40 x 125 ft., rein.-con. plant, here, for Aylmer Laundry Co., Aylmer. About $75,000

Ont., Toronto—Auto Serv. Co., 139 Pears Ave., having plans prepared by Banigan & Thompson, archts. and engrs., 7 King St., E., for 6 story, brick and concrete garage, rein.-con. flooring, concrete foundation, on Richmond St. About $600,000.

Ont., Woodstock—Brunswick Canadian Products Co. plans to build concrete, steel and brick factory, rein.-con. flooring, concrete foundation. About $200,000. Architect not appointed.

BIDS DESIRED

N. Y., Brooklyn—Until Jan. 2, by Zipkes, Wolff & Kudroff, archts. and engrs. 25 West 42nd St., New York City, building 2 story, 100 x 125 ft., brick and steel warehouse, rein.-con. flooring, concrete foundation, on North Portland Ave., for H. De Angelis, 4-6 Park Ave. About $75,000. Noted July 10.

N. J., Newark—Until Dec. 30, by W. Steele & Sons Co., archts., 16th and Arch Sts., Phila., building 1½ story, 121 x 250 ft., rein.-con. factory, for Morris Twine Co.

O., Cleveland—Until Dec. 29, by W. J. Carter, engr., Illuminating Bldg., constructing 60 x 120 ft. factory, concrete foundation, at 1787 40th St., cost $60,000, 55 x 160 ft., factory, brick foundation, at 4115 Perkins Ave., $75,000, 60 x 160 ft. warehouse, concrete foundation, at 4100 Hough Ave., $60,000, all 3 story, steel and brick, for Amer. Stove Co.

O., Cleveland—Until Dec. 29, by W. S. Lougee, archt., Marshall Bldg., constructing 4 story, 100 x 110 ft., steel and brick factory, brick foundation, on Barberton Ave., for Colonial Woolen Mills Co., 6409 Barberton Ave. About $80,000. J. N. Hahn, pres.

O., Sidney—Sidney Mfg. Co., East Ave., receiving bids building 3 story, 30 x 82 ft., steel and brick factory, rein.-con. flooring, brick foundation, on Clinton St. About $50,000. United States Structural Co., City Natl. Bank Bldg., Dayton, archts.

Ill., Chicago—W. G. Uffendel, archt., 39 South State St., receiving bids constructing plant, including 2 story, 125 x 190 ft. main building, 2 story, 47 x 95 ft. office building, and 1 story, 47 x 66 ft. boiler house and garage with 1 story wing, all rein.-con. and brick, rein.-con. flooring, concrete foundation, at 2701 Greenview Ave., for Economy Fuse & Mfg. Co., 328 West Kinzie St. About $150,000.

Ill., Chicago—Mutual Broom Co., 1505 South Halstead St., receiving bids building 2 story, 100 x 125 ft., brick and timber factory, concrete foundation, on Ogden Ave. and Polk St. About $60,000. A. L. Himelblau, 179 West Washington St., archt.

Utah, Salt Lake City—Until Jan. 10, by Salt Lake Stamp Co., 65 West Bway., building 2 story, 35 x 110 ft., rein.-con. factory, on 3rd S. and 1st W. Sts. About $50,000. Gunther & Cannon, Deseret Bank Bldg., archts.

Wash., Pullman—Until Jan. 7, by T. C. Martin, building 2 story, 120 x 120 ft., brick and terra cotta garage and shop, on Grand and Oleson Sts. About $40,000. W. Swain, Pullman, archt.

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★**Mass., Brookline** (Boston P. O.)—See "Buildings."

★**Mass., Cambridge**—Cambridge Terminal Co. let contract building 3 story, concrete warehouse, to F.T. Ley Co., 185 Devonshire St., Boston. About $5,000,000.

★**Mass., Everett** (Boston P. O.)—Everett Factories Corp., 210 Bway., let contract building 4 story, brick and steel plant, concrete foundation, on Charleton St., to Clark & Lee Co., 201 Devonshire St., Boston. About $60,000.

★**Mass., New Bedford**—W. Whitman Co., 78 Chauncey St., Boston, let contract building brick and rein.-con. mill, picker house, storehouse and office, rein.-con. flooring, to L. E. Locke Constr. Co., Bay State Bldg., Lawrence. About $1,500,000.

★**Mass., Norfolk Downs** (Boston P. O.)—Pneumatic Scales Co. let contract building 3 story, 150 x 160 ft., brick and concrete addition to plant, to Aberthaw Constr. Co., School St., Boston.

★**Mass., Roxbury** (Boston P. O.)—Miller Candy Co., 116 North St., Boston, let contract altering 4 story, brick building, on Heath and Parker Sts., here, to C. A. Dodge Co., Erie St., Cambridge. About $100,000.

★**R. I., Woonsocket**—Woonsocket Wagon Mfg. Co., 15 Worrall St., will build a 2 story, 75 x 200 ft., concrete and steel factory, rock foundation, at 12 Worrall St. About $100,000. Work will be done by day labor.

Industrial Works (Continued)

★**Conn., Hartford**—Hartford Fairmont Co., 41 Arch St., let contract building 1 and 2 story, 93 x 194 ft., brick and concrete addition to plant, concrete flooring and foundation, to Bent-Bartlett Co., 43 Ann St.

★**Conn., Waterville** (Waterbury P. O.)—Amer. Pin Co. let contract building 4 story, 50 x 204 ft., brick and mill construction addition to factory, concrete foundation, to Torrington Bldg. Co., 197 Water St., Torrington. About $200,000.

★**N. Y., Attica**—Merrill-Soule Co., North Franklin and Plum Sts., Syracuse, let contract building 3 story, 45 x 74 ft factory, here, to Turner Constr. Co., 244 Madison Ave., New York City.

★**N. Y., Brooklyn**—J. Crawford, 753 Flatbush Ave., will build 1 story, 100 x 190 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Church Ave. and Johnson Pl. About $30,000. Work will be done by day labor.

★**N. Y., Brooklyn**—M. Friedland, c/o P. Caplan, archt., 16 Court St., will build 1 story, 100 x 150 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on 36th St. About $35,000. Work will be done by day labor.

★**N. Y., Brooklyn**—Sarkus Bros., Inc., 287 Thatford Ave., will build 1 story, 70 x 80 ft., brick and steel factory, rein.-con. flooring, concrete foundation, at 534 Junius St. About $25,000. Work will be done by day labor.

★**N. Y., Brooklyn**—J. Sclecowitz, 503 Myrtle Ave., will build 1 story, 100 x 100 ft., brick and steel garage, rein.-con. flooring, concrete foundation, on Fulton St. and Hopkinson Ave. About $30,000. Work will be done by day labor.

N. Y., Brooklyn—State Hospital Comn., Capitol, Albany, received bids building 2 story, 50 x 71 ft., brick and steel addition to laundry, concrete foundation, for Brooklyn State Hospital, here, general contract, from E. D. Broderick, 110 West 40th St., New York City, $40,800 (200 working days), McCann Bldg. Co., Dove St. and Sheridan Ave., Albany, $47,653 (200 working days), Fox, Reynolds Co., Inc., 81 East 125th St., New York City, $59,600 (200 working days); plumbing, from W. B. Armstrong Co., 3 Fulton St., Albany, $6288, C. H. Darmstadt, Inc., 852 West 43rd St., New York City, $6995; equipment, from Amer. Laundry Mchy. Co., 134 West 37th St., New York City, Proposal No. 1, $11,441, Proposal No. 2, $31,283, Henrici Laundry Mchy. Co., 46 Dey St., New York City, Proposal No. 1, $12,145, Troy Laundry Mchy. Co., 133 Centre St., New York City, Proposal No. 1, $14,400, Proposal No. 2, $32,455.

★**N. Y., Delevan** — Merrell-Soule Co., North Franklin and Plum Sts., Syracuse, let contract building 2 story, 60 x 100 ft., factory with 31 x 60 ft. boiler room extension, here, to Turner Constr. Co., 244 Madison Ave., New York City.

★**N. Y., Jamaica**—Agro Constr. Co., Hillside Ave., will build 1 story, 50 x 100 ft., brick and steel factory, rein.-con. flooring, concrete foundation, on Fulton St. About $80,000. Work will be done by day labor.

★**N. Y., Long Island City**—Transport Service Co., 125 Harris Ave., let contract, building 5 story, 75 x 100 ft., brick and steel garage and service station, rein.-con. flooring, concrete foundation, to L. Gold, 44 Court St., Brooklyn. About $200,000.

★**N. Y., North Tonawanda**—Buffalo Sled Co., 107 Woodward Ave., Buffalo, let contract building 2 story, 80 x 360 ft. and 1½ story, 80 x 140 ft., rein.-con. factory, here, to W. Steele & Sons Co., 16th and Arch Sts., Phila., Pa.

★**N. Y., Port Jervis**—S. J. Sonnenburg, 220 Straight St., Paterson, N. J., let contract building 1 story, 50 x 200 ft., brick and steel mill, rein.-con. flooring, concrete foundation here, to O. W. Shelly, 1 West 34th St., New York City. About $30,000.

★**N. J., Asbury Park**—Rydon Tire & Rubber Co., c/o E. A. Arend, archt., 105 West 40th St., New York City, let contract building brick and steel factory, rein.-con. flooring, concrete foundation, here, to Amer. Concrete Steel Co., 27 Clinton St., Newark. About $100,000.

★**Ala., Gadsden**—Gulf States Steel Co. will build large steel and concrete addition to wire mill. Work will be done by day labor.

★**O., Akron**—Goodyear Tire & Rubber Co., East Market St., let contract building 3 story, 120 x 340 ft., concrete, steel and brick machine shop, rein.-con. flooring, concrete foundation, to Hunkin-Conkey Constr. Co., Century Bldg., Cleveland. About $250,000.

★**O., Cincinnati**—Berghausen Chemical Co., 307 East 2nd St., let brick contract for 1 and 2 story, 50 x 150 ft. warehouse and office building, on Richmond and Carr Sts., to A. Hitzman, 2614 Spring Grove Ave.; excavation and cement work, to F. B. Geier; carpentry, to O. Schroeder, 15 East Rochelle Corv.; iron work, W. Lang & Sons Co., 2128 Patterson St.

★**O., Cincinnati**—Gibson Art Co., Elm St. between 4th and 5th Sts., let contract constructing 6 story, 146 x 168 ft., brick and terra cotta factory and office building, on 4th and Plum Sts., to Frank Hill Smith Co., Inc., 1035 Reibold Bldg., Dayton.

★**O., Cleveland**—Amer. Borvisk Co., West 98th St. and Walford Ave., let contract constructing 1 story, 58 x 156 ft., steel and brick mechanic's building, brick foundation, to W. Dunbar Co., 8201 Cedar Ave. About $50,000.

★**O., Cleveland**—Briggs Mfg. Co., East 131st St. and Taft Ave., let contract building 2 story, 98 x 176 ft., steel and brick factory, concrete foundation, on Taft Ave., to E. Paulsen, Erie Bldg. About $100,000.

★**O., Cleveland**—Christian-Schwarzenberg & Gaede Co., archts., Euclid Bldg., let contract to Ruple Constr. Co., Avenue Bldg. constructing 2 story, 83 x 95 ft. brick factory, brick foundation, on West 25th St. and Meyer Ave., for Lion Knitting Mills Co., 1051 Power Ave. About $60,000.

★**O., Cleveland**—Harshaw-Fuller-Goodwin Co., Newburg Ave., let contract building 1 story, 85 x 160 ft., steel and brick factory and warehouse, brick foundation, to Hunkin-Conkey Constr. Co., Century Bldg. About $30,000.

★**O., Dayton**—Stanley Mfg. Co., Cannon St., let contract building 3 story, 40 x 80 ft., rein.-con. factory, rein.-con. flooring, concrete foundation, to Frank Hill Smith Co., Inc., 1035 Reibold Bldg. About $25,000.

★**O., Newark**—Pharis Tire & Rubber Co. let contract building 3 story, 100 x 120 ft. addition to plant, mill construction, to State Constr. Co., 11 West State St., Columbus. About $100,000.

★**Ind., Indianapolis**—Cole Motor Car Co., 750 East Washington St., let contract building 4 story, 179 x 225 ft. rein.-con. auto assembly building, concrete foundation and flooring, on Market and Davidson Sts., to Bedford Stone & Constr. Co., 810-15 Fletcher Savings & Trust Bldg. About $250,000.

★**Mich., Detroit**—Feigenson Bros., 118 Benton St., let contract building 3 story, 82 x 90 ft., rein.-con. bottling works, rein.-con. flooring, concrete foundation, on Erskine and Beaubien Sts., to Fidler & Gales, 218 Harmon Ave. About $30,000.

★**Mich., Detroit**—Genl. Motors Corp., 435 Woodward Ave., let contract building 1 story garage, also 1 story, 26 x 26 ft., rein.-con. and brick pumping station, rein.-con. flooring, concrete foundation, on Holbrook Ave., to W. E. Wood Co., 1805 Ford Bldg.

★**Mich., Detroit**—Hupp Motor Car Co., Milwaukee and Mt. Elliott Aves., let contract building 4 story, 73 x 396 ft. and 4 story, 73 x 248 ft. factories, rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Milwaukee and Moran Aves., to E. Winter, Chamber Commerce Bldg.

★**Ill., Chicago**—Channel Chemical Co., 58 East Washington St., let contract building 4 story, 150 x 300 ft. factory, heavy mill construction, concrete foundation, on Western Ave. and West 45th St., to Davidson & Weiss, 53 West Jackson Blvd. About $450,000.

★**Ill., Chicago**—Guyton & Cumfer Mfg. Co., 4451 Fillmore St., let contract building 2 story, 60 x 130 ft. machine shop, mill construction and pressed brick, concrete foundation, at 4430 Fillmore St., to R. L. Brokob, 5448 Flournoy St. About $60,000.

★**Ill., Chicago**—T. R. Bishop, archt., 35 South Dearborn St., let contract to J. C. Stellwagen, 1583 Clybourne Ave., building 3 story, 110 x 160 ft., heavy mill construction factory, concrete foundation, on Lake St. and Kildare Ave., for Playerphone Talking Machine Co., 338 North Kedzie Ave. About $110,000.

★**Ill., Chicago**—W. Teuch & Co. and Brockman & Co., 740 North Franklin St., let contract building 1 story, 125 x 130 ft. printing plant, mill construction, at 2220 Racine Ave., to B. J. Regnell Co., 19 South La Salle St. About $50,000.

★**Wis., Milwaukee**—Kirchhoff & Rose, archts. and engrs., Majestic Bldg., let contract to Raulf Co., Patton Bldg., constructing 2 story, 102 x 255 ft. service station, rein.-con. and brick, rein.-con. flooring, concrete foundation, on North Ave., here, for Cadillac Motor Car Co., 1343 Cass St., Detroit, Mich. About $200,000.

★**Wis., Milwaukee**—W. S. Seaman Co., 480 Virginia St., let contract building 5 story, 100 x 420 ft., steel and brick factory, concrete foundation, on Richards and Lake Sts., to Klug & Smith Co., 40 Mack Blk. About $400,000.

★**Wis., Milwaukee**—Walsh Harness Co., 330 1st Wisconsin Natl. Bank Bldg., let contract building 1 story, 50 x 200 ft., brick and mill construction factory, concrete foundation, on Hubbard and Keefe Sts., to Wilke Bros., 1011 Island Ave. About $60,000.

★**Wis., Racine**—Harvey Spring & Forging Co., 17th and Murray Sts., let general contract building 2 story, 100 x 200 ft., brick and steel factory, concrete foundation, to Wisconsin Bridge & Iron Wks., North Milwaukee; masonry, to Nelson & Co., Robinson Bldg. Total cost, $60,000.

★**Minn., Duluth**—Klearflax Rug Co., 63rd Ave. W. and Grand Ave., let contract constructing 1 story, 66 x 98 ft. and 35 x 50 ft. addition to present 4 story factory and 2 story, 65 x 98 ft. building west of present factory, rein.-con. and brick, rein:-con. flooring, concrete foundation, to McLeod & Smith, Sellwood Bldg. About $65,000.

★**Minn., Grand Rapids**—J. C. Jacobson, engr., Metropolitan Band Bldg., Minneapolis, let contract to Siems, Helmers & Schaffner, 514 Guardian Life Bldg., St. Paul, building electric power plant, including 1000 ft. dam and 1500 h.p. developer and equipment, for Prairie River Power Co. About $150,000; cost plus percentage basis.

Minn., Hastings—State Bd. Control, Capitol, St. Paul, received bids Dec. 1, building 1 story, 45 x 140 ft., rein.-con. and brick power house, including tunnel, at State Hospital for Insane, here, from W. O'Neil & Son, Faribault, $56,458; C. Ash & Son, 202 Maria Ave., St. Paul, $56,672; N. P. Fransen, 628 Endicott Bldg., St. Paul, $68,940.

★**Kan., Topeka**—R. Knowles let contract building 1 story, 50 x 130 ft., brick, rein.-con. and steel garage and sales room, rein.-con. flooring, concrete foundation, to Lundgren & Carlson, 213 Jackson St. About $75,000; cost plus percentage basis.

★**Ore., Portland**—Aladdin Co., 607 Yeon Bldg., purchased plant of Stay-Round Silo Co., Peninsular Mfg. Dist., and will double present capacity and construct 2 story, 125 x 400 ft. frame addition. Work will be done by day labor under supervision of construction department of company. About $50,000.

★**Ont., Braeside**—Gillies Bros., Arnprior, let contract building 2 story, 73 x 190 ft., concrete, steel and brick sawmill and box factory, rein.-con. flooring, concrete foundation, here, to A. F. Byers & Co., 340 University St., Montreal. About $100,000.

★**Ont., Thorold**—Beaver Board Co. let contract building 3 story, 60 x 80 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, to Carswell Constr. Co., 58 Wellington St., Toronto. About $75,000.

★**Ont., Toronto**—Baldwins, Ltd., Ashbridge Bay St., let contract building 1 story, 70 x 800 ft., concrete, steel and brick mill, rein.-con. flooring, concrete foundation, to Canadian Allis-Chalmers, Ltd., 212 King St., W. About $200,000. Noted July 10.

★**Ont., Toronto**—Dunlap Tire & Rubber Goods Co., 224 Booth Ave., let concrete contract for 6 story, rein.-con. factory, to V. Gray Constr. Co., Confederation Life Bldg.; cost plus percentage basis.

★**Ont., Toronto**—Prest-O-Lite Co., Inc., 120 Elm St., let contract building 3 story, concrete and brick factory, rein.-con. flooring, concrete foundation, on Hillcrest Race Course, to Wells & Gray, Confederation Life Bldg. About $400,000; cost plus percentage basis.

★**Ont., Toronto**—Willard Chocolates, Ltd., 443 Wellington St., W., let contract building 5 story, 80 x 150 ft., concrete, steel and brick factory, rein.-con. flooring, concrete foundation, on Dupont St. and Manning Ave., to Wells & Gray, Confederation Life Bldg. About $150,000; cost plus 10 per cent.

Buildings

PROPOSED WORK

Me., Biddeford—Bank—First Natl. Bank having plans prepared by T. M. James, archt., 3 Park St., Boston, for 1 story, 40 x 100 ft., brick and stone, concrete and tile flooring, concrete foundation. About $50,000.

Mass., Boston—Armory—Commonwealth of Massachusetts having plans prepared by J. E. McLaughlin, archt., 88 Tremont St., for 1 story, brick and steel addition, on Commonwealth Ave. About $50,000.

Mass., Chicopee—Bank—Chicopee Savings Bank, Market Sq., plans to build bank on Center and School Sts. About $100,000. Architect not selected.

Mass., Framingham—Theatre—G. Sumner having plans prepared by Blackall, Clapp & Whittemore, archts., 30 Beacon St., Boston, for 2 story, brick and concrete, on Concord St. About $200,000.

Mass., Hopedale—Housing—Peabody & Stearnes, archts., 53 State St., Boston, soon receive bids building sixteen 2 story brick houses for workmen, stone or concrete foundation, for Draper Corp. About $150,000.

Mass., Springfield—Sales-Cadillac Auto Co. of Boston, 664 Commonwealth Ave., Boston, soon receives bids building 1 or 2 story sales and service station, brick, concrete and steel, concrete flooring and foundation, on Worthington St., here. About $50,000. H. L. Sprague, 310 Main St., archt.

Mass., West Roxbury (Boston P. O.)—High School—Bd. Educ. Boston, having plans prepared by Andrews, Rantoul & Jones, archts., 50 Congress St., Boston, for 3 story, brick and steel, here.

Mass., Worcester—Sales, etc.—H. J. Murch, 731 Main St., plans to build brick and rein.-con. sales and service station, on Park Ave. About $150,000. Cutting, Carlton & Cutting, 44 Front St., archts.

Conn., Ansonia—School—Trade School Comn. plans to build trade school on Clifton and Howard Aves. About $100,000. Architect not selected.

Conn., Bridgeport—School—Bd. Educ. plans to build 3 story, (24 room) grammar school, on Grand St. and Hurd Ave. About $442,000.

Conn., Bridgeport—Theatre—F. G. Reif, c/o H. E. Koerner, archt., 164 State St., plans to build 1 story, 66 x 110 ft., brick, concrete and stone, concrete foundation, on Boston Ave. About $50,000.

Conn., Hartford—Office, etc.—Goodyear Tire & Rubber Co., High St., plans to build 4 story, 70 x 160 ft., rein.-con. and steel office and storage plant, rein.-con. flooring, concrete foundation, on Winthrop St. About $300,000. Berenson & Moses, Pilgard Bldg., archts.

Conn., Hartford—Store—Bliss, Hill & Steiger having plans prepared by Buchman & Kahn, archts. and engrs., 56 West 45th St., New York City, for 6 story, brick and steel, brick foundation, here.

Conn., Milford—Dormitory—Rosenbaum School, New Haven Ave., having plans prepared by Brown & Von Beren, archts., 185 Church St., New Haven, for 2 story, 70 x 70 ft., brick and steel, on Gulf St. Noted Sept. 11.

Conn., New Britain—Synagogue—Congregation Beth El, 398 Main St., plans to build synagogue on Summer St. About $100,000. Architect not selected.

Conn., New Haven—Church—St. Josephs Roman Catholic Church, 118 Fountain St., having plans prepared by J. A. Jackson, archt. and engr., 1123 Bway., New York City, for 1 story, brick and terra cotta, brick foundation, on Fountain St. About $150,000. **J. J. McGivney, pastor.**

Conn., West Haven (New Haven P. O.)—Grade School—School Bd. soon lets contract building 2 story, 45 x 137 ft., steel, brick and stone, some rein.-con. flooring, brick and concrete foundation, on Noble St. and Washington Ave. About $75,000. R. W. Foote, 185 Church St., New Haven, archt.

N. Y., Alexandria Bay—Hotel—F. L. Raymond, mgr. Marsden House, Market St., plans to build 7 story, (200 room) frame addition. Cost between $100,000 and $125,000.

N. Y., Brooklyn (Bay Ridge)—Hospital—W. B. Wills, Inc., archts. and engrs., 1101 Myrtle Ave., preparing plans for 5 story, brick and steel, brick foundation. Owner's name withheld.

N. Y., Brooklyn—Office—W. B. Wills, Inc., archts. and engrs., 1101 Myrtle Ave., preparing plans for 12 story, brick and steel, brick foundation. Owner's name withheld.

N. Y., Gabriels—Hospital—Gabriels Hospital having plans prepared by J. R. Pope, archt. and engr., 527 5th Ave., New York City, for group of hospital buildings, brick, steel and stone, brick foundation. About $3,000,000.

N. Y., Malone—Bank—Peoples Bank, East Main St., plans to build bank on Main and Catharine Sts. Cost between $150,000 and $200,000. B. R. Clark vice pres.

N. Y., Massena—Club—Citizens Club plans to convert Allen House Hotel into club building. About $150,000. Architect not selected.

N. Y., Millbrook—Sanitarium—H. Ross, 47 West 34th St., New York City, having plans prepared by A. Bodker, archt. and engr., 62 West 45th St., New York City, for group of 1 and 2 story, brick and steel buildings, brick foundation, here. About $300,000.

N. Y., New York—Bank—Harriman Natl. Bank, 527 5th Ave., having plans prepared by J. R. Pope, archt. and engr., 527 5th Ave., for altering brick, steel and stone. About $500,000.

N. Y., New York—Church—J. G. Rogers, archt. and engr., 367 Lexington Ave., soon lets contract building 1 story, 40 x 65 ft., brick and steel, on University Ave., for Featherbed Lane Presbyterian Church, c/o architect. About $50,000.

N. Y., New York—Office—McReynolds Realty Corp., 26 West 31st St., having plans prepared by J. B. Snooks, archt. and engr., 261 Bway., for 12 story, 60 x 100 ft., brick, steel and stone, brick foundation, at 52-54 New St.

N. Y., New York—Office—One Hundred Ninety-Five Bway. Corp. having plans prepared by W. W. Bosworth, archt. and engr., 527 5th Ave., for altering 27 story, brick, steel and stone, at 195 Bway. About $5,000,000.

N. Y., New York—Office—Starrett & Van Vleck, archts. and engrs., 8 West 40th St., receive bids about Jan. 8, altering brick and steel office building, brick foundation, at 48-50 West 47th St., for W. H. Wise & Sons, 56 West 45th St. About $50,000.

N. Y., New York—School—Bd. Educ., 500 Park Ave., having plans prepared by C. B. J. Snyder, archt. and engr., Municipal Bldg., for 5 story, 120 x 195 ft., brick and steel, brick foundation, on St. Anns Ave. and Hagney Pl. About $500,000.

N. Y., New York—Stores, Offices, etc.—M. J. Harrison, archt. and engr., 63 Park Row, preparing plans for 11 story, brick, steel and stone, brick foundation, on 5th Ave., and 30th St. About $250,000. Owners name withheld.

N. Y., New York—Theatre—Consolidated Amusement Enterprises, c/o Arena Theatre, 8th Ave. and 40th St., having plans prepared by S. B. Eisendrath, archt. and engr., 18 East 41st St., for brick, steel and stone, brick foundation, on West 50th St. and 8th Ave. About $130,000.

N. Y., New York—Theatre—Loews Enterprises, 1492 Bway., plans to build 1 story, 102 x 189 ft., brick and steel, brick foundation, on Bway. and 83rd St. T. W. Lamb, 644 8th Ave., archt., and engr.

N. Y., Syracuse — Exchange — Superior-Dreadnaught Film Exch. plans to build 3 story, 60 x 120 ft. About $100,000. Architect and engineer not selected.

N. Y., Utica—Church—Central Methodist Episcopal Church plans to build church. About $200,000. A. E. Legg, pastor. Architect not selected.

N. Y., Utica—Theatre and Store—Wilmer & Vincent, Inc., 1451 Bway., New York City, plan to construct modern theatre and store building on Columbia and Washington Sts., here. Cost between $400,000 and $450,000.

N. Y., Watertown—Business—H. Ellis, 302 Court St., plans to build 4 story, brick and concrete, on lower Court St. Cost between $50,000 and $65,000.

N. J., Boonton—School—Bd. Educ. having plans prepared by W. Potter, archt., 22 East 17th St., New York City, for 2 story, brick, steel and stone, brick foundation, here. About $90,000.

N. J., Jersey City—Bank and Office—A. C. Bosson, archt., 366 5th Ave., New York City, receives bids about Jan. 5, building 10 story, brick, steel and stone, brick foundation, on Exch. Pl., for 1st Natl. Bank. About $1,000,000.

N. J., Jersey City—Schools—Bd. Educ. plans to spend over $5,000,000 during 1920 for building new schools.

N. J., Newark—Hotel—Robert Treat Hotel plans to construct 300 room addition to present building. About $75,000.

N. J., Westfield—School—City plans to build 14 room school on Westfield Ave. About $160,000.

Pa., Wilkes-Barre — Bank — Slavonic Banking Institution, 42 East Market St., plans to build 40 x 60 ft., steel, stone and marble, on East Market St. About $75,000. Architect not selected.

Pa., Wilkes-Barre—Store—L. Cohen and S. Heller plan to build 4 story, 50 x 100 ft., concrete, brick and steel, maple flooring, rock foundation, on South Main and Northampton Sts. About $80,000. Architect not selected.

Md., Baltimore Community—Hampden Woodberry Neighborhood Assn. having plans prepared by W. H. Emory, Jr., archt., 827 Munsey Bldg., for 2 story, brick and stucco, concrete foundation, on West Park St. About $50,000. C. T. Hewitt, 852 West 37th St., chn. bldg. com.

Md., Baltimore — Temple — Maryland Grand Lodge of A. F. & A. M., Charles and Saratoga Sts., plans to extend temple in rear to new frontage on St. Paul St. About $500,000.

Md., Crisfield—Hospital—McCready Memorial Hospital having plans prepared by H. G. Jory, archt., 1409 Munsey Bldg., Baltimore, for 1 and 2 story, brick and stone, on Main St. About $100,000.

Md., Highlandtown (Baltimore P. O.)—Temple—Loyal Order of Moose, 410 West Fayette St., plans to build 3 story, 75 x 125 ft., here. About $150,000.

Va., Norfolk—Church—Third Christian Church having plans prepared by W. H. Nicklas, archt., 1900 Euclid Bldg., Cleveland, O., for 1 story, 86 x 127 ft. brick, steel and stone, concrete foundation, on Llewellyn Ave. About $100,000.

Va., Roanoke—Hotel—Viscose Co., Marcus Hook, Pa., plans to build concrete and brick hotel for girls, to include gymnasium, rest rooms, dormitory, etc., here. About $300,000. Ballinger & Perrot, 17th and Arch Sts., Phila., archts. and engrs.

N. C., Asheville—Office—Liberty Realty Co. plans to build 3 story, brick addition. About $200,000. **Architect not selected.**

N. C., Fayetteville—Memorial—Comrs. Cumberland Co. plan to construct Soldiers' Memorial building here. About $150,000. E. V. Edeus, ch. com.

N. C., Greensboro—Hotel—General Green Hotel Co., Greensboro having plans prepared by H. Barton, archt., building 10 story, 125 x 133 ft. brick. About $500,000.

N. C., Smithfield—Court House—Comrs. Johnston Co. plan to build court house. Cost between $300,000 and $400,000. H. Barton, Greensboro, archt.

Miss., Ruleville—Hotel—P. W. Custer plans to build fireproof hotel on Main St. About $75,000. Architect not selected.

Tenn., Oakville—Hospital—Jones & Furbinger, archts., Porter Bldg., Memphis, receive bids about Jan. 1, constructing hospital, including several buildings of various sizes, power and heating plants, etc., for city of Memphis and Shelby Co. About $500,000.

Ky., Frankfort—Hotel—Capitol Hotel Co. soon lets contract building 6 story, rein.-con. and stone. About $200,000. C. C. Weber, 3rd and Walnut Sts., Cincinnati, O., archt.

O., Bedford—School—Bd. Educ. receives bids about Feb. 1, building 2 story, 80 x 164 ft., concrete, steel and brick, concrete foundation. About $200,000. Hamilton & Watterson, Guardian Bldg., Cleveland, archts.

O., Berley (Columbus P. O.) — High School—Bd. Educ. having plans prepared by O. D. Howard, archt., 8 East Broad St., Columbus, for 2 story, 100 x 150 ft., concrete and brick, here. Bonds for $200,000 voted for project.

O., Cincinnati—Church—Christ Scientist Church plans to build on Clifton and Probasco Sts. About $175,000. A. Robinson, Candler Bldg., Atlanta, Ga., archt.

O., Cincinnati—Office—Gibson Art Co., 4th, 5th and Elm Sts., plans to build 146 x 168 ft., rein.-con., on 4th and Plum Sts. About $500,000. Architect not selected.

O., Cleveland—Bank and Office—Citizens Savings & Trust Co. and Union Commerce Bank, Citizens Bldg., receive bids about Feb. 1, building 20 story, 145 x 258 x385 ft., brick, concrete, steel, stone and terra cotta, rein.-con. flooring, concrete foundation, on East 9th St. and Euclid Ave. About $8,000,000. Graham, Anderson, Probst & White, Ry. Exch. Bldg., Chicago, archts.

O., Cleveland—Commercial—A. B. Friedl, 3328 Vega Ave., plans to build 3 story, steel and brick, brick foundation, on East 93rd St. and Kinsman Rd. About $100,000. W. S. Lougee, Marshall Bldg., archt.

Buildings (Continued)

O., Cleveland—Loft—A. Sogg, archt., 319 Hippodrome Bldg., receives bids about Feb. 15, remodeling 5 story, brick and timber, on West 6th St. and St. Clair Ave. About $50,000. Owner's name withheld.

O., Cleveland—Mercantile and Office—A. E. Brown and E. J. Sapp, c/o Carey Roofing Co., to build 4 story, 66 x 190 ft. concrete, steel and brick, rein.-con. flooring, concrete foundation, at 1717 Prospect Ave. About $250,000. Architect and engineer not selected.

O., Cleveland—Office and Temple—Euclid-Malta Co., c/o Colcher & Smith, archts., Lennox Bldg., having plans prepared for 8 story, 64 x 114 ft., concrete, steel, brick and terra cotta, rein.-con. flooring, concrete foundation, on Euclid Ave. and East 105th St. About $200,000.

O., Columbus—Office—A. Crotti, 151 East Broad St., having preliminary sketches prepared for 6 story, 62 x 93 ft., on Town St. and Grant Ave.

O., Dayton—Hotel—Miami Hotel Co., 403 West 1st St., plans to build 6 story, 50 x 160 ft., rein.-con. and brick addition, rein.-con. flooring, concrete foundation, on 2nd and Ludlow Sts. About $100,000. F. H. Pike, pres. Architect not selected.

O., Lakewood (Cleveland P. O.)—Theatre and commercial—Detroit-Lake Ave. Co., 1212 Donald Ave., plans to build 6 story, 190 x 232 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, on Detroit and Lake Aves. About $600,000. G. W. Armstrong, pres. Architect's name withheld.

O., Marion—School—Bd. Educ. having plans prepared by O. D. Howard, archt., 8 East Broad St., Columbus, for 3 story, 80 x 90 ft., concrete and brick. About $110,000.

O., Put in Bay—Church—St. Mary's Catholic Church, c/o E. J. Scheider, archt., Cuyahoga Bldg., Cleveland, receives bids about May 1, building 1 story, 30 x 84 ft., brick, steel and stone, here About $50,000.

Ind., Ft. Wayne—Sales—Kopf & Woolling, archts., Pythian Bldg., Indianapolis, receive bids about Jan. 10, building 3 story, 80 x 150 ft., rein.-con., brick and terra cotta sales room, concrete foundation, on Washington and Garfield Sts., for E. W. Steinhart Co., St. Wayne and Indianapolis Sts. About $125,000.

Ind., Greensburg—Hospital—Decatur Co. Memorial Hospital Bd. having plans prepared by D. A. Bohlen & Son, archts., Majestic Bldg., Indianapolis, for hospital, here. About $75,000.

Ind., Portland—School—Bd. Educ. having plans prepared by W. Scholer, archt., State Life Bldg., Indianapolis, for 2 story, 62 x 83 ft., brick, steel and stone. About $75,000.

Ind., Shelbyville—Bank—Kopf & Woolling, archts., Pythian Bldg., Indianapolis, receive bids about Jan. 10, building 1 story, 65 x 190 ft., rein.-con., stone and brick, on Pub. Sq., for 1st Natl. Bank, here. About $100,000

Mich., Battle Creek—Dormitory—Kellog Toasted Corn Flake Co. plans to build 3 story, 100 x 218 ft., rein.-con., brick and steel, concrete foundation, to include 40 x 75 ft. concrete swimming pool. About $100,000.

Mich., Detroit—Commercial—A., L. and J. Kahn, Marquette Bldg., preparing plans for 4 story, 140 x 185 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Cass Ave. and Peterboro St. About $400,000. Private plans.

Mich., Detroit—Market—Dept. Pub. Welfare, Municipal Courts Bldg., having plans prepared by J. Scott & Co., archts., Dime Bank Bldg., for 1 and 2 story, steel, rein.-con. flooring, concrete foundation, also scale house and incinerator, on Russell and Market Sts. About $120,000.

Mich., Detroit — Theatre — Associated Amusements Co., c/o C. W. Brandt, archt., Kresge Bldg., having plans prepared for 2 story, 120 x 135 ft., rein.-con., brick, steel and stone, rein.-con. flooring, concrete foundation, on Hamilton Blvd. About $250,000.

Mich., Detroit—Theatre—E. Baron, Hastings St., having plans prepared by I. M. Lewis, archt., Congress Bldg., for 2 story, rein.-con. brick and steel, rein.-con. flooring, concrete foundation, on Livingston and Hastings Sts. About $60,000

Mich., Eaton Rapids—High School—Bd. Educ. having preliminary plans prepared by S. D. Butterworth, archt., 432 Tussing Blk., Lansing, for 2 story, rein.-con. brick, steel and wood, concrete foundation. About $200,000.

Mich., Flint—Home—St. Michael's Parish, c/o R. P. Dunnigan, plans to build 2 story, 40 x 82 ft., brick, steel and stone, tile flooring, brick foundation. About $50,000. VanLeyen, Schilling & Keough, Union Trust Bldg., Detroit, engrs. and archts.

Mich., Grand Rapids—Sanitarium—W. M. Burleson, 148 Fulton St. East, having plans prepared by Osgood & Osgood, archts., Herald Bldg., for 11 story, 105 x 146 ft., rein.-con. brick and steel, rein.-con. flooring, concrete foundation, on Island and and Michell Sts., to Murch Bros., Ry Exch. Jefferson Ave.

Mich., Ironwood—Municipal—City election in January, to vote on $400,000 bonds to construct municipal building.

Mich., Northville—Hospital—Detroit Bd. Health, 233 Antoine St., Detroit, plans to build Municipal Tuberculosis Sanitarium, here, to include 3 story, 41 x 144 ft. administration building, 3 story, 50 x 165 ft. infirmary with two 38 x 182 ft. wings, 2 story, 93 x 127 ft. service building and 2 story, 40 x 120 ft. laundry, all brick and rein.-con., rein.-con. flooring, concrete foundation; 2 story, 38 x 183 ft. ambulant building, with 38 x 84 ft. wing, brick and rein.-con., rein.-con. and wood flooring, concrete foundation; 2 story, 38 x 128 ft. nurses home with 30 x 32 ft. wing, 2 story, 28 x 36 ft. laboratory and 2 story, 34 x 143 ft. buildings for employees with 33 x 21 ft. wings, brick and timber, wood flooring, concrete foundation and 1 story, 48 x 87 ft. power plant, brick and steel. About $1,000,000. Stratton & Snyder, 1103 Union Trust Bldg., Detroit, archts.

Wis., Grand Rapids—Bank—First Natl. Bank having plans prepared by Childs-Smith, archts., Grand Ave., Chicago, Ill., for 2 story, 60 x 125 ft. brick, rein.-con. and steel, brick foundation, on Main St. About $60,000.

Wis., Lancaster—Community—City plans to construct community building, to contain rest rooms, offices, council rooms, gathering room, with kitchen and theatre with 1000 seating capacity. About $100,000. C. Calvery, chn.

Wis., Manitowoc — Theatre — George Bros., 913 South 8th St., having plans prepared by W. J. Raueber, archt., Manitowoc, for 3 story, 100 x 125 ft. brick, rein.-con. and steel, brick foundation. About $150,000.

Wis., Manitowoc—Training School—City plans to convert court house, on 8th St., into training school, also build large brick addition to same. About $60,000. A. Schuetze, cl. Architect not selected.

Wis., Merrill—High Schools—Bd. Educ. having plans prepared by Parkinson & Bockendorff, archts. and engrs., Linker Bldg., La Crosse, for 2 story central school and 3 story, 65 x 150 ft. high school, brick and concrete, rein.-con. flooring, concrete foundation. About $200,000.

Wis., Milwaukee—Gymnasium and Stadium—Marquette University, 1115 Grand Ave., plans to build 2 story, 139 x 147 ft., brick and concrete gymnasium, rein.-con. flooring, and rein.-con. stadium, on 15th and Clybourn Sts. About $200,000. E. Brielmeier & Sons Co., University Bldg., archts. and engrs.

Wis., Milwaukee — Nurses' Home—Mt. Sinai Hospital, 246 12th St., plans to build 3 story, rein.-con and brick, rein.-con. flooring, concrete foundation. About $50,000. E. Brielmeier & Sons Co., University Bldg., archts. and engrs.

Wis., Milwaukee — School—Bd. Educ. plans to build 2nd unit of continuation school, 6 story, rein.con. and brick, rein.-con. flooring, concrete foundation, on 7th and Prairie Sts. About $250,000. Van Ryn & De Gelleke, Caswell Blk., archts. and engrs.

Wis., Oshkosh — Hospital — Mercy Hospital, 185 Hazel St., plans to build 4 story, rein.-con. and brick addition to hospital, rein.-con. flooring, concrete foundation. About $300,000. E. Brielmeier & Sons Co., University Bldg., Milwaukee, archts. and engrs.

Wis., Owen—Hospital—Clark Co. plans to build 3 story, brick and rein.-con. hospital for insane, brick foundation. Bonds for $200,000 voted for project. Architect not selected.

Wis., Racine—High Schools—Bd. Educ. will receive competitive sketches about Feb. 1, for junior high school, cost $200,000, also high school, on 12th St., $500,000, both brick, rein.-con. flooring. J. J. Moritz, secy. Architect not selected.

Ia., Atlantic—Church—First Methodist Episcopal Church having plans prepared by W. C. Jones, archt., 907 North La Salle St., Chicago, Ill., for 2 story, 80 x 100 ft. brick, concrete and steel, concrete foundation. About $75,000.

Ia., Dayton—School—Bd. Educ., Consolidated Dist., receives bids about Jan. 15, building 2 story, 55 x 75 ft. brick, rein.-con. and steel, rein.-con. flooring, brick foundation. About $75,000. W. E. Hulse & Co., 210 Masonic Temple, Des Moines, archts.

Ia., Randall—School—Bd. Educ. voted $80,000 bonds to build 2 story school. Architect and engineer not selected.

Minn., Hibbing—School—C. E. Everett, chn. Bd. Educ., receives bids about Jan 15, building 2 story, 385 x 400 ft., rein.-con. and brick, rein.-con. flooring, in Central Div. About $330,250. W. T. Bray, Torrey Bldg., Duluth, archt. and engr.

Minn., Robbinsdale—School—Bd. Educ. plans to build 2 story, fireproof. About $125,000. H. H. Livingston, Robbinsdale, archt.

Minn., St. Paul—Home—Bd. Trustees of Jewish Home for Aged having plans prepared by C. H. Johnson, archt., 715 Capital Bank Bldg., for 2 story, at 75 Wilkin St About $100,000. J. Levy, c/o St. Paul House Furnishing Co., 41 East 7th St., pres.

Kan., Wellington—Auditorium—City receives bids about Jan. 2, building 2 story, 90 x 120 ft., brick, rein.-con. and steel, rein.-con. flooring, concrete foundation. About $125,000. C. Boller & Bro., Kansas City, Mo., archts.

Kan., Wichita—Business—Western Lithographic Co., 125 North Emporia Ave., having plans prepared by L. Schmidt, archt., 121 North Market St., for 3 story, 140 x 150 ft. brick, rein.-con. and steel, rein.-con. flooring, concrete foundation, on 1st and Lawrence Sts. About $150,000.

Neb., Fremont—Bank—Nebraska State Bldg. & Loan Assn. and Fremont State Bank plan to remodel bank, steel, concrete and brick, rein.-con. flooring. About $100,000. Architect not selected.

Wyo., Sheridan—School—School Dist. No. 7 soon lets contract building 3 story grade school. About $100,000. Randal & Jordon, Sheridan, archts.

Mont., Butte—Lodge—Odd Fellows Fidelity Lodge No. 8 plans to build 3 story, 58 x 110 ft., on Main and Galena Sts. About $250,000. Architect not selected.

Mo., St. Louis—Hotel—Letmar Club Assn., 3648 West Pine Blvd., plans to build brick hotel, rock foundation, at 3648 West Pine Blvd. About $50,000. Architect not selected.

Okla., Cushing—Hospital—City plans to build hospital. About $50,000. Architect and engineer not selected.

Okla., Henryetta—Depot—Missouri, Oklahoma & Gulf R.R. plans to build passenger and freight depot, here. About $50,000. C. N. Van Natta, Muskogee, ch. engr. Architect and engineer not selected.

Okla., Okmulgee—Schools—Bd. Educ. voted $238,000 bonds to build schools. Architect and engineer not selected. R. W. Adkinson, clk.

Colo. Denver—City plans election soon to vote on $85,000 bonds to build new school in Berthoud Dist.

Colo., Mineral Hot Springs—Bath House and Pavilion-Mineral Hot Springs Resort Co. plans to build 1 story, 40 x 100 ft. rein.-con. bath house, tile flooring, rein.-con. foundation, 1 story, 80 x 15 ft. frame dancing pavilion, wooden flooring, concrete foundation and 1 story, 55 x 150 ft. rein.-con. garage. Total cost $100,000. W. N. Bowman, Central Bank Bldg., Denver, archt.

Ariz., Fort Defiance—Administration and Dormitories—Home Missionary Bd. of Presbyterian Church of United States having plans prepared by H. M. Patterson, archt., 325 O. T. Johnson Bld., Los Angeles, for 2 story, sandstone administration building, 2 dormitories (each to accommodate 50 pupils) and 4 cottages. Cost to exceed $50,000.

Ariz., Yuma—School—Trustees School Dist. No. 1 soon receive bids building brick, concrete foundation. Former bids rejected. F. R. Ingle, Bd. Trade Bldg., clk. N. F. Marsh, 211 Bway. Central Bldg., Los Angeles and V. O. Wallingford, Goodrick Bldg., Phoenix, archts. Noted Aug. 21.

Wash., Seattle—Hospital—J. T. Mason, et al, Alaska Bldg., plan to build 6 story, 44 x 100 ft., rein.-con., brick and tile, on Terry and Spring Sts. About $130,000. Bebb & Gould, Securities Bldg., archts.

Wash., Seattle—Hotel—O. Dickinson, archt., Seaboard Bldg., preparing plans for 4 story, 50 x 120 ft., brick, on Westlake and Pine Sts. About $80,000. Owner's name withheld.

Buildings (Continued)

Wash., Seattle—Office—Medical Bldg. Co., Cobb Bldg., having plans prepared by Bebb & Gould, archts., Securities Bldg., for 10 story, 54 x 120 ft., on Madison and Minor Aves. About $400,000.

Wash., Seattle—Sales—Cascade Motor Sales Co., 8th and Pine Sts., plans to build 2 story, 100 x 100 ft., concrete and brick, on 12th and Madison Sts. About $78,000. V. W. Voorhees, Eitel Bldg., archt.

Wash., Yakima—Schools—City plans to build 1 or 2 story, brick or concrete high school, also addition to McKinley School. Bonds for $225,000 voted for project. Architect not selected.

Ore., Gearhart — Hotel — Citizens of Seattle, Wash., and Portland and Astoria having preliminary plans prepared for 2 or 3 story, modern hotel, on 450 x 650 ft. site adjoining golf links, here. About $200,000. Architect not selected. Address J. L. Meier, c/o Meier & Frank, 5th and Morrison Sts., Portland.

Cal., Elk Grove—High School—School Trustees having plans prepared by G. C. Sellon, archt., 1005 8th St., Sacramento, for high school, here. About $175,000.

Cal., Piedmont—(Oakland P. O.)—School Trustees Piedmont High School Dist. plan election to vote on $250,000 bonds to build school.

Cal., San Francisco — Sales — Pioneer Motor Co., 307 Golden Gate Ave., plans to build 5 story, 120 x 220 ft., rein.-con., on Van Ness Ave. and McAllister St. G. Peak, mgr. Architect not selected.

Cal., San Francisco—School—Bd. Educ. having plans prepared for Grant School, on Baker St. and Bway. About $200,000.

Cal., San Leandro—City Hall—City plans election to vote on $50,000 bonds to build city hall.

Ont., Belleville—School—Bd. Educ. plans to build 2 story school. About $125,000. A. McGie, chn. Architect not selected.

Ont., Brantford—Hospital—City election in January to vote on $87,000 by-law to build new isolation hospital and $78,000 to remodel present one. T. H. Jones, City Hall, engr.

Ont., Chatham—Hospital—Pub. Gen. Hospital Bd., 106 Emma St., having plans prepared by Watt & Blackwell, archts., 64 Bank of Toronto Chambers, London, for 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, here. About $140,000.

Ont., Hamilton—Store—Arcade, Ltd., 43 James St., N., plans to build 6 story, 80 x 120 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $300,000. McPhie & Kelly, 701 Bank of Hamilton Bldg., archts.

Ont., London—Exchange—Bell Telephone Co., 118 Notre Dame St., W., Montreal, plans to build 1 story, 60 x 80 ft., concrete and steel addition, concrete flooring, here. About $100,000. W. J. Carmichael, 29 Hospital St., Montreal, archt.

Ont., London—Seminary—Diocese of London having plans prepared by McGinnis & Walsh, archts., Boston, for 3 story, 85 x 400 ft., stone. Tenders will be called about end of March. About $500,000. Address A. Fallon, 90 Maple St., Bishop.

Ont., Mallorytown—School—Consolidated School Bd. having plans prepared by B. Dillon, archt., King St., Brockville, for 2 story, concrete, steel and brick, concrete foundation. About $160,000.

Ont., Oshawa — Church — Methodist Church Bd. plans to build 1 story, steel and brick, concrete foundation, on Simcoe St. About $75,000. Architect not selected.

Ont., Ottawa—City Hall—City plans to build 3 story, 100 x 200 ft., city hall, fire station and memorial hall, concrete, steel, brick and stone, rein.-con. flooring, concrete foundation. About $2,500,000. W. E. Noffke, Central Chambers Bldg., archt.

Ont., St. Thomas—School—Bd. Educ. plans to build 2 story, concrete, brick and steel, rein.-con. flooring, concrete foundation, on Elm St. and Wilson Ave. About $75,000. J. Darrach, St. Thomas, archt.

Ont., Sudbury—School—High School Bd. plans to build 3 story, 20 roomed, concrete, steel and brick, concrete foundation. About $200,000. Architect not selected.

Ont., Toronto—Lavatories—Bd. Control soon receiving bids building stucco and terra cotta, tile flooring. About $65,000. W. H. Pearse, city archt.

Ont., Trenton—Exchange—Bell Telephone Co., 118 Notre Dame St., W., Montreal, plans to build 3 story, 40 x 60 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation. About $60,000. W. J. Carmichael, 29 Hospital St., Montreal, archt.

TUNNEL—PITTSBURGH, PA.

Bids were received by Commissioners of Allegheny County, Dec. 2nd, for constructing Liberty Tunnel through South Hills, from (A) Booth & Flinn, Ltd., 1942 Forbes St., (awarded contract), (B) John F. Casey Co., Union Arcade, (C) Mellon-Stuart Co., Oliver Bldg., Rinehart-Dennis Co., Roanoke, Va., (D) James H. McQuade & Sons Co., Bakewell Bldg., $5,658,386, (E) Smith, Hauser & McInnes, 18 East 41st St., New York City, $5,146,008. The unit bids of the lowest 3 bidders were as follows:

	A	B	C
5,690 lin ft. of completed tunnel (lump sum)	$722 04	$702 00	$736 00
169,000 sq ft. of waterproofing over tunnel arches	25	66	35
116,000 cu yd. of excavation in two approaches (North Side)	1 80	2 66	2 00
11,000 cu yd. of excavation in two approaches (South Side)	3 00	2 52	2 00
4,030 cu yd. concrete masonry in portals and retaining walls (North Side)	10 00	14 93	14 80
2,800 cu yd. concrete masonry in portals and retaining walls (South Side)	14 00	14 93	14 80
2,000 cu yd. facing walls in two approaches (North Side)	10 00	14 93	14 80
500 cu yd. facing walls in two approaches (South Side)	14 00	17 33	14 80
200,000 lb. of reinforcing steel bars in approaches	.02	05	08
15,000 lb. of reinforcing steel, fabric, mesh or expanded metal	01	11	.10
10,000 lb. of structural steel shapes in concrete	01	10	08
400 lin ft. of 2½ inch iron pipe railing in two approaches	2 00	3 00	1 00
6,600 sq.yd. of brick paving in two approaches	4 00	4 00	5 75
1,575 sq yd. of stone block paving in approaches	4 00	6 50	8 00
1,510 lin ft. of concrete curb in approaches	1 35	2 05	1 40
12,340 sq ft. of concrete sidewalks in approaches	25	36	45
750 lin ft. of street railway tracks	9 00	9 70	8 50
1,000 lin ft. of terra cotta drain pipe in approaches	25	36	60
1,000 lin ft. of porous drain tile in approaches	15	30	26
1,020 lin ft. of 15-in. terra cotta pipe sewers in approaches	5 00	1 35	83
300 lin ft. of terra cotta pipe sewers, 9-in. and less	1 00	75	70
6 sewer manholes in approaches	90 00	180 00	88 00
6 sewer inlets in approaches	50 00	180 00	37 50
400 lin ft. of 6-in. cast iron water pipe in approaches	2 00	1 80	2 13
3 6-in. hub gate valves with large iron boxes	50 00	20 00	26 00
560 cu yd. of concrete in saw mill run bridge 1-2-4 mix	30 00	16 00	15 60
970 cu yd. of concrete in saw mill run bridge 1-2½-5 mix	22 00	12 00	15 00
8000 sq ft. of waterproofing over arch in saw mill run bridge	20	60	35
750 cu yd. of gravel fill over arch in saw mill run bridge	3 50	3 00	3 00
Extended totals	$4,593,259	$4,671,161	$4,746,207

BIDS DESIRED

Conn., New Haven—Loft, Offices, etc.—Brown & Von Beren, archts., Chamber Commerce Bldg., receiving bids building 8 story, 80 x 80 ft., brick and stone, concrete foundation, for J. Kilfeather, Meadow St. About $125,000.

W. Va., Charleston—Office—Until Jan. 15, by C. H. Higgins, archt., 19 West 44th St., New York City, building 7 story, 100 x 150 ft., brick, stone and steel, on Virginia and McFarland Sts., for Abney Barnes & Co., 812-18 Virginia St.

Tenn., Memphis—School—Until Jan. 1, by Mahan & Broadwell, archts., Amer. Bank Bldg., constructing 2 story, brick and hollow tile, for city. About $55,000.

O., Middletown—Business—Until Jan. 5, by C. E. Oeden, archt., Knights of Pythias Bldg., constructing 2 story, 60 x 110 ft., brick, steel and stone, tile and concrete flooring, brick foundation, on 3rd and Clinton Sts., for Lewis Bros., Main St. About $50,000.

O., Upper Sandusky—School—Until Jan. 5, by Bd. Educ., building 2 story, 65 x 70 ft. centralized school in Salem Twp., Wyandotte Co. About $85,000. O. Gotlieb, R. F. D., clk. O. D. Howard, 8 East Broad St., Columbus, archt.

Ill., Kewanee—Church—R. G. Pierce, archt., 10 South La Salle St., Chicago, receiving bids remodeling 2 story, 70 x 100 ft., brick, for Kewanee Methodist Episcopal Church. About $75,000. N. Ronneberg, 10 South La Salle St., Chicago, engr.

Wis., Westby—Church—Until Jan. 10, by C. Volkman, archt., 106½ Grand Ave., Eau Claire, building 60 x 70 ft., brick and tile, brick and concrete foundation, for Our Saviour's Evangelical Lutheran Church. About $50,000. S. Rondestvedt, pastor.

Ia., Laurel—School—Until Jan. 8 by Bd. Educ., Consolidated Dist., building 2 story, 80 x 120 ft. brick, rein.-con. and steel. About $90,000. H. E. Reimer, Marshalltown, archt.

Minn., Duluth—Bank and Office—Until Feb. 1, by F. G. Beamsly, cashier Duluth State Bank, West Superior St., building 2 story, 50 x 140 ft., brick and stone, rein.-con. foundation, on Superior St. and 20th Ave., W. About $75,000. Holstead & Sullivan, Palladio Bldg., engrs. and archts.

Minn., East Grand Forks—School—Until Jan. 15, by J. A. Noonan, secy. Independent School Dist. No. 3, Polk Co., building 3 story, 130 x 170 ft., rein.-con., brick and stone, rein.-con. flooring, concrete foundation, on Kittson Ave. and 6th St. B. D. Beck, Grand Forks, N. D., engr. and archt.

Mo., Joplin—Office and Salesroom—Joplin Supply Co., 3rd and Walls Sts., receiving bids building 3 story, 75 x 120 ft., rein.-con., steel and brick, rein.-con. flooring, concrete foundation. About $125,000. Smith, Rea & Lovitt, Finance Bldg., Kansas City, archts.

Okla., Oklahoma—Sales—Deignan Motor Co. receiving bids constructing 2 story, 100 x 190 ft. brick, rein.-con. and steel, sales and service building, rein.-con. flooring, concrete foundation. About $100,000. F. C. Gunn, 1606 West 39th St., Kansas City, Mo., archt.

Cal., Madera—School—Until Jan. 5, by Trustees Union High School Dist., constructing 2 story, brick and concrete auditorium and class room building. About $100,000. Swartz & Ryland, Rowell Bldg., Fresno, archts.

Que., Three Rivers—Hippodrome—Until Jan. 20, by J. B. Richer, building 100 x 200 ft., rein.-con., rein.-con. flooring, rock foundation, on Forges, Royal and St. George Sts. About $250,000. J. Irudel, Vianville St., Montreal, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Amherst**—Memorial—Massachusetts Agricultural College let contract building 2 story, 60 x 120 ft., brick and stone, rein.-con. flooring, concrete foundation, on campus, to E. F. Carlson Co., 395 Main St., Springfield. About $150,000.

★**Mass., Boston**—Office—F. D. Holdsworth & Co., 30 State St., let contract building 7 story, rein.-con. and steel, on Doane St., to Evatt Constr. Co., Devonshire St.

★**Mass., Brockton**—Business—F. S. Howard, Inc., Main St., let contract building 3 story, 50 x 135 ft., brick and frame construction, concrete foundation, on White Ave., to W. Hanson, 567 Pleasant St. About $50,000.

★**Mass., Brookline** (Boston P. O.)—Sales, etc.—L. Shapiro, 27 School St., will build 2 story, 85 x 270 ft., concrete and stone sales and service station, concrete flooring and foundation, on Commonwealth Ave. About $250,000. Work will be done by day labor.

★**Mass., Southbridge**—Church—St. Hedwigs Polish Church let contract building 1 story, 46 x 93 ft. with 50 ft. steeple, brick and timber concrete foundation, on Everett St., to J. G. Ray & Sons Co., 21 Silver St., Springfield. About $50,000.

★**Mass., Springfield**—Business—Forbes & Wallace, 392 Main St., let contract building 8 story, 80 x 100 ft., brick, concrete and steel addition, rein.-con. flooring, concrete foundation, on Main and Vernon Sts., to E. J. Pinney, 374 Main St.

★**R. I., Arctic**—Theatre—A. A. Spitz, C. Misch, Bldg., Providence, let contract building 2 story, brick, concrete and steel, concrete flooring and foundation, to C. J. Blaney Constr. Co., 898 Westminster St., Providence. About $100,000.

Buildings (Continued)

★**Conn., Bridgeport**—School—Bd. Educ. let general contract building 2½ story, 118 x 130 ft., brick and steel addition to McKinley School, concrete foundation, on Kelsey St., to M. Noonan, Tracey St., $153,753; plumbing and heating, to H. D. Fitzgerald, Bassick Ave., $22,000.

★**N. Y., Brooklyn** (Bensonhurst) — Bank—West End Bank, c/o Holmes & Winslow, archts. and engrs., 110 West 40th St., New York City, let contract building 1 story, 30 x 90 ft., brick, steel and stone, brick foundation, on 20th Ave. and 86th St., to F. G. Fearon, 280 Madison Ave., New York City. About $50,000.

★**N. Y., Brooklyn** (Bensonhurst)—Bank—Studebaker Corp. of Amer., 1751 Bway., New York City, let contract building 5 story, 60 x 100 ft., steel, at 1469-1471 Bedford Ave., to G. A. Fuller Co., 175 5th Ave., New York City.

★**N. Y., Brooklyn**—Theatre—J. Hilder, 271 75th St., will build 2 story, 157 x 175 ft., brick and steel, brick foundation, on Bway. and Chauncey St. About $175,000. Work will be done by day labor under supervision of Carlson & Wiseman, archts. and engrs., 226 Henry St.

★**N. Y., Brooklyn** — Theatre — Kingway Realty Co., c/o Carlson & Wiseman, archts. and engrs., 226 Henry St., will build brick and steel brick foundation, on Kings Highway and East 12th St. About $300,000. Work will be done by day labor, under supervision of archts.

★**N. Y., New York**—Hotel—Warren & Wetmore, archts. and engrs., 16 East 47th St., let contract to Thompson-Starrett, 49 Wall St., building 16 story, brick, steel and stone, brick foundation, on Park Ave. between 49th and 50th Sts. Owners name withheld.

★**N. Y., New York**—Loft—Hamilton Press, Inc., 40 Stone St., let contract altering 6 story, 80 x 100 ft., brick and steel, on Trinity Pl. and Thames St., to F. J. McWalters, 225 5th Ave. About $75,000.

★**N. Y., New York**—Office—International Tailoring Co., 97 East Houston St., will build 12 story, 116 x 142 ft., brick, steel and stone, brick foundation, on 4th Ave. and 12th St. About $750,000. Work will be done by day labor under supervision of Starrett & Van Vleck, archts., 8 West 40th St. Noted Aug. 14.

★**N. Y., New York**—Office—Lawyers Title & Trust Co., 160 Bway., let contract building 11 story, 50 x 106 ft., brick and steel, brick foundation, to G. B. Beaumont, 286 5th Ave.

N. Y., New York—Office—F. T. Ley, 19 West 44th St., will build 20 story, brick, steel and stone, brick foundation, on 42nd St. and Madison Ave. About $2,000,000. Work will be done by day labor.

★**N. Y., New York**—Offices, Stores, Theatre—G. Backer, 20 East 32nd St., will build 30 story, 100 x 162 ft., brick, steel, and stone, brick foundation, on 57th St. and 5th Ave. About $6,000,000. Work will be done by day labor.

★**N. Y., New York**—Theatre—W. Fox Amusement Co., 126 West 46th St., will build brick and steel, brick foundation, on Tremont and Washington Aves., (3500 seating capacity). About $400,000. Work will be done by day labor under supervision of Carlson & Wiseman, archts. and engrs., 226 Henry St., Brooklyn.

N. Y., Wards Island—Hospital—State Hospital Comn., Capitol, Albany, received bids Dec. 17, building 2 story, 58 x 98 ft., brick and rein.-con., concrete foundation, for Manhattan State Hospital, here, general contract, from M. Kantrowitz, 20½ Market St., Albany, $137,800 (180 working days); heating, from Leslie & Tracy, Inc., 5 Columbus Circle, New York City, $6300, Gillis & Geoghegan, 537 West Bway., New York City, $7180, Ryan Plumbing & Heating Co., Inc., Light and Power Bldg., Watertown, $7700; plumbing, from Ryan Plumbing & Heating Co., Inc., Light and Power Bldg., Watertown, $10,600, C. H. Darmstadt, Inc., 352 West 43rd St., New York City, $10,795.

★**N. Y., Woodhaven** (Jamaica P. O.)—Theatre—J. Hartman, 857 111th St., Richmond Hill, will build 1 story, 80 x 130 ft., brick and steel, brick foundation, on Boyd Ave., here. About $80,000. Work will be done by day labor under supervision of Carlson & Wiseman, archts. and engrs., 226 Henry St., Brooklyn.

★**Va., Richmond**—Hospital—Stuart Circle Hospital, Lumbardy and Franklin Sts., let contract building 6 story, 40 x 60 ft., rein.-con. and brick addition, on West Franklin St., to J. C. Beazley, 209 Real Estate Exch. Bldg. About $50,000.

★**Ga., Macon**—School—Bd. Educ. let contract building 2 story, 100 x 200 ft., brick and terra cotta, to W. D. Griffin, Macon. About $80,000.

O., Cincinnati—Office—See "Industrial Works."

★**O. Cleveland**—Hotel—J. W. Wilson, 450 Leader-News Bldg., let contract building 4 story, 76 x 270 ft., concrete, brick and steel, rein.-con. flooring, concrete foundation, on East 96th St. and Euclid Ave., to Paul Bros., 528 Citizens Bldg. About $400,000.

Mich., Detroit—Engine House—Fire Comn., Larned St., received bids for masonry work in connection with 2 story, 40 x 80 ft., rein.-con., brick and stone, rein.-con. and wood flooring, concrete foundation, on 12th and LaBelle Sts., from M. Bartholomaei Son & Co., 466 Warren Ave., $49,-200; Corrick Bros., Owen Bldg., $55,730; Lennane Bros., Union Trust Bldg., $59,020; carpentry work, from C. Keller Co., 210 Moran St., $21,920; Yatzek & Wunderlick, 400 Penobscot Bldg., $25,758; heating, plumbing and ventilating, from O'Connor Bros., 34 Roland Bldg., $9209; Irvine & Meier, 2289 Woodward Ave., $10,270; W. J. Rewoldt, Owen Bldg., $10,553.

★**Mich., Detroit**—School—Bd. Educ., 50 Bway., let masonry contract building 2 story, 150 x 211 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Maplewood and Spokane Sts., to F. H. Goddard, 516 Frankin St., $187,373; carpentry, to Harcus & Co., 774 Russell St., $47,257; heating, ventilating and plumbing to Irvine & Meier, 2289 Woodward Ave., $81,682; electrical work, to J. Miller & Co., Penobscot Bldg., $12,545.

★**Mich., Detroit**—Theatre—H. C. Keywell, 501 Old Whitney Bldg., let contract building 2 story, 38 x 115 x 190 ft., brick, steel and terra cotta, on Grand River Ave., to D. Fidler, 242 Melbourne Ave. About $90,000.

★**Mich., Detroit**—Theatre—LaSalle Gardens Theatre Co., c/o C. W. Brandt, archt., 1114 Kresge Bldg., let contract building 2 story, 100 x 160 ft., rein.-con., brick and steel, rein.-con. flooring, concrete foundation, to F. Farrington Co., Scherer Bldg. About $200,000.

★**Mich., Flint**—School—St. Mathew's Parish let contract building 2 story, (12 room) rein.-con., brick and steel, rein.-con. flooring, concrete foundation, on Beach St., to Duboise Constr. Co., 1519 North Saginaw St. About $150,000.

★**Ill., Rock Island**—Theatre—Rosenfield & Hopp let contract building concrete, steel and brick, rock foundation, or 19th St. and 3rd Ave., to Brissman & Co., 1412 10th St., Moline. About $250,000.

★**Mo., St. Louis**—School—Bd. Educ. let contract building Roe School, 2 story, 70 x 114 ft., brick, rock foundation, on Prather and Mitchell Sts., to Murch Bros., Ry. Exch. Bldg., $217,520.

★**Tex., Ft. Worth**—Office—N. P. Anderson & Co., Grand and Cotton Exch. Bldg., let contract building 11 story, 60 x 200 ft., concrete, brick and terra cotta, on 7th and Lamar Sts., to W. Hedrick Constr. Co., Ft. Worth Natl. Bank Bldg. About $500,000.

★**Cal., Monterey**—School—Trustees let contract building 14 room, rein.-con. school, here, to T. H. Dean, Monterey, $69,200.

★**Ont., Kingston**—School—Bd. Educ. let general contract building 3 story, (10 room), brick and steel, concrete flooring and foundation, to R. Wallace & Sons, 116 Patrick St., $100,000; electric work, to H. W. Newman Electric Co., Princess St., $5500; plumbing and heating, to Elliot Bros., Princess St., $12,000. Noted June 5.

★**Ont., Orillia**—Bank—Dominion Bank, Dominion Bank Bldg., Toronto, let contract building 3 story, brick, concrete flooring, to E. Webb & Sons, Orllia. About $60,000. Noted Apr. 17.

★**Ont., Toronto**—Hotel—King Edward Hotel, King St., E., let contract altering north wing, to Dickie Constr. Co., Ryrie Bldg. About $50,000.

★**Ont., Toronto**—Store and Office—W. Davies Co., 29 Queen St., W., let contract building 4 story, 36 x 103 ft., concrete, steel and brick, rein.-con. flooring, concrete foundation, to Carswell Constr. Co., 58 Wellington St., Toronto. About $100,-000. Noted Sept. 4.

★**Ont., Windsor**—Bank—Imperial Bank of Canada, 32 Wellington St., E., let contract building 3 story, concrete, steel and brick, rein.-con. flooring, concrete foundation, to Dickie Constr. Co., Ryrie Bldg., Toronto. About $110,000. Noted Sept. 11.

Federal Government Work

PROPOSED WORK

Pa., Phila.—Dredging—U. S. Eng. Office 815 Witherspoon Bldg., soon receives bids dredging Philadelphia Harbor to depth 35 ft., to begin at foot of Ritner St. and extend up along city front. About $400,000.

Va., Alexandria—Torpedo Storage Racks—Spec. 4111—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to build here. About $14,105.

Va., Hampton Roads—Removing and Rebuilding—Spec. 4109—Bureau of Yards & Docks, Navy Dept., Wash., D. C., plans to remove Bldg. "D" from Detroit and reerect same here.

S. C., Paris Island—Marine Aviation Field—Spec. 4079—Bureau Yards & Docks, Navy Dept., Wash., D. C., soon receives bids developing marine aviation field, here, to include 4 steel frame and 5 wood frame buildings, concrete flooring and foundation. About $100,000; $10 deposit required for plans and spec.

Wyom[illegible]—Road Work—J. S. Bright, dist. engr., Bureau Pub. Rds., 301 Custom House, Denver, Colo., receives bids in March improving 8 mi. Encampment Slater Rd., 20 ft. wide, Carlson Co., involving common and rock excav., corrugated metal pipe culverts and short span bridges; 38 mi. Sects. 1-5 and 9-14 Buffalo-Tensleep Rd. Project, 20 ft. wide, Johnson and Washakie Counties, involving 1300 sq.yd. dry rubble, 120 sq.yd. concrete, 120,000 cu. yd. common and 9000 cu.yd. rock excav., 500 lin.ft. piling, 135 lin.ft. log bridges, 4900 sq.ft. log cribs and incidental items. Cost to exceed, $10,000.

Montana—Road Work—Bureau Pub. Rds. U. S. Dept. of Agriculture, Missoula, plans to build 20 mi. Cedar Creek Rd. from near Superior to Cedar Creek Ranger Sta., 8 ft. wide, Mineral Co. About $52,000. C. H. Purcell, Post Office Bldg., Portland, Ore., dist. engr.

Mo., St. Louis—Earth and Levee Work—Mississippi River Comn., 1311 International Life Bldg., soon lets contract building 450,-000 cu.yd. earthwork (327,000 cu.yd. hydraulic fill in old barrow pits and 123,000 cu.yd. levee enlargement) Sny Island D. D., Ill., 260,000 cu.yd. earthwork (172,000 cu. yd. hydraulic fill in old barrow pits and 88,000 cu.yd. on application) for levee enlargement, Hunt D. D., Ill.

Wash., Puget Sound—Dredging—Spec. 4110—Bureau Yards & Docks, Navy Dept., Wash., D. C., plans to dredge at Receiving Ship Pier, here. About $8000. Bids to be opened at Navy Yard, here.

Wash., Seattle—Emergency Dam—U. S. Govt. has commissioned C. D. Young, electrical and mechanical engr., Lumber Exch. Bldg., to prepare plans for emergency dam at Ballard Locks in Lake Washington Canal, swing bridge type with movable wickets and steel construction, operated by electricity. About $400,000.

BIDS DESIRED

N. Y., S. I., New Dorp—Barracks and Quarters, etc.—Until Jan. 10, at Office of U. S. Constr. Quartermaster, 39 Whitehall St., New York City, furnishing labor and material for constructing barracks, quarters, mess hall, post exchange, administration building, etc., here.

Pa., McKeesport—Remodeling Post Office—Until Jan. 8, by Treas. Dept., Wash., D. C., remodeling, here. J. A. Wetmore, superv. archt.

Va., Norfolk—Pattern Shop—Spec. 4041—Until Jan. 7, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building 4 story pattern shop, 233 ft. long, 126 ft. wide and 78 ft. 3 in. high to top of parapet at Navy Yard, here. About $300,000; $20 deposit required for plans and spec.

Va., Norfolk—Quay Wall—Spec. 4044—Until Jan. 7, by Bureau Yards & Docks, Navy Dept., Wash., D. C., building, here, uncreosoted timber bearings, batter piles and creosoted fender piles and chocks, etc. Former bids rejected.

Mont., Belton—Bridge—Until Jan. 20, by Dept. of Interior, at office of W. W. Payne, supt., Glacier Natl. Park, Belton, furnishing labor and material for building steel or rein.-con. bridge over middle fork of Flathead River, near Belton.

Federal Government Work (Continued)

Cal., Humboldt Bay—Stone—Until Jan. 5, by U. S. Eng. Office, 401 Custom House, San Francisco, furnishing stone for jetty construction, here.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Watertown**—Storehouse—Constr. Eng., U. S. Army, c/o Arsenal, let contract building 2 story, 50 x 85 ft., brick and steel storehouse, concrete foundation, on Arsenal Grounds, to F. G. Coburn, 295 Washington St., Boston, $52,844.

★**N. Y., New York**—Dredge—U. E. Eng. Office, 39 Whitehall St., let contract building one dipper dredge for East River, to V. R. Browning & Co., 17701 Lake Shore Blk., Cleveland, O. Cost $605,000. Originally awarded for 2 but 1 was revoked.

★**W. Va., Wheeling**—Gate Operating Machinery—U. S. Eng. Office, Wheeling, let contract furnishing and delivering gate operating machinery for Dams. Nos. 23, 25 and 27, Ohio River, to J. B. Milholland Co., New York City, $17,650 each.

★**S. C., Charleston**—Repairing Wharf and Boat House—Treas. Dept., Wash., D. C., let contract repairing, wharf and boat house at Quarantine Sta., here, to Waterfront & Foundation Constr. Co., 51 Broad St., $4107.

S. C., Paris Island—Concrete Walls—Spec. 4096—Bureau Yards & Docks, Navy Dept., Wash., D. C., received bids Dec. 17, building at Main Sta. Marine Barracks, here, (1) work complete, from W. T. Hadlow, 15 Baldwin Bldg., Jacksonville, Fla., (1) $4800 (90 days), alternate $4600; Waterfront & Foundation Constr. Co., 51 Broad St., Charleston, (1) $6497 (75 days), (2) add $200; Newport Contg. & Eng. Co., Silsby Bldg., Newport News, Va., (1) $8200 (75 days).

Ky., Dawson Springs—Additional Buildings—Treas. Dept., Wash., D. C., received bids Dec. 10, constructing 3 additional buildings, here, (1) work complete, from King Lumber Co., Charlotteville, (1) $594,000 alt. 1, $2000, alt. 2, $1500, alt. 3, $7000, (2) $319,800 alt. 1, $1000, (3) 109,000 alt. 1, $500, (4) $164,000 alt. 1 $150; Dawson Springs Constr. Co., Dawson Springs, (1) $605,764 alt. 1 $2000, alt. 2 $12,000, alt. 3, $10,332, (2) $334,820 alt. 1 $2000, (3) $93,292 (4) $177,652; Forbes Mfg. Co., Hopkinsville, (1) $648,616 alt. 1 $2850, alt 2, $11,500, alt. 3 $9500, (2) $375,364, alt. 1 $260, (3) $97,325 alt. 1 $100, (4) $175,927 alt 1 $150.

Miscellaneous

PROPOSED WORK

Athletic Field—Hanover, N. H.—Dartmouth College receives bids about Mar. 15, building 3 gridirons (football fields), 3 baseball diamonds, 3 hockey rinks, 11 tennis courts, concrete stand on west side of football grounds, 10,000 seating capacity, bleachers on diamond, 1500 seating capacity, drainage system, etc. About $360,000. H. E. Keyes, business dir.

Amusement Park—Hartford, Conn.—S. A. De Waltoff, 67 California St., West Haven, having plans prepared by Berenson & Moses, engrs., 1026 Main St., for amusement park to include swimming pool, roller coaster, restaurant, flying horse, movie houses, etc., at Capitol Park, here. About 300,000.

Disposal Plant—Rochester, N. Y.—City plans to build large garbage and sewage disposal plant.

Monument, Nanticoke, Pa.—City plans to build memorial monument 40 ft. high, 25 x 25 ft., marble and granite, concrete base, on Main St. About $15,000. Architect not selected.

Park Shelter and Pavilion—Lansing Mich.—City plans to build 1 story, 60 x 100 ft. park shelter and pavilion, rein.-con., steel and frame, rein.-con. flooring, steel roof trusses. About $20,000. J. N. Churchill, 514 Oakland Bldg., archt.

Dock—Muskegon, Mich.—Standard Oil Co., Park and Laketon Aves., plans to build piling, timber and concrete dock on Muskegon Lake, with warehouse and pipe lines to railways. About $100,000.

Machinery—Racine, Wis.—Racine Co. appropriated $1000 to purchase road machinery. W. O. Thomas, co. highway comr.

Machinery—Rhinelander, Wis.—Oneida Co. appropriated $15,000 to purchase additional road machinery. F. E. Parker, comr.

Conduit—Sheb[illegible], Wis.—Citizens Telephone Co., 8th St. [illegible] build additional conduit and seria[illegible]les. About $85,000. Private plans.

Road Machinery—[illegible]boygan, Wis.—Sheboygan Co approp[illegible]0 to purchase road machinery, to [illegible]e patrol graders and tools for 15 pa[illegible]en, machinery for county repair shop [illegible]el screening machinery. G. W. [illegible]dge, comr.

Cement, etc.—Pho[illegible]z.—City rejected bids furnishin[illegible]nd and, gravel and crushed rock for [illegible]ss to be paved under $4,000,000 bond[illegible].

Stadium — Seattle, Wash. — Association Student Body of University of Washington plans to build 1st unit of concrete stadium. Cost, $60,000. Ultimate cost $400,000.

Tanks—Seattle, Wash.—Gen. Petroleum Co., White Bldg., plans to build 3 steel tanks, 30 ft. high, 113 ft. diameter, concrete foundations. About $90,000.

Dock—Marshfield, Ore.—Port of Coos Bay Comn. having preliminary plans prepared for building water and rail terminal dock and purchase of suction dredge for dredging inlet and main channels. About $250,000. Election soon to vote on bonds for project. J. Polhemus, Marshfield, engr.

Rock Crusher—Portland, Ore.—Comrs. Multnomah Co. plan to install 1 gyratory rock crusher, 150 yd. crusher run rock capacity in 8 hours, to vary evenly in size from screenings to 3 in. largest diameter, at Kelly Butte. Cost to exceed $1000. R. W. Hoyt, chn.

Developing Mining Property — Rogue River, Ore.—Bolan Creek Mining Co. plans to develop mining property on upper Sucker Creek, consisting of 2 mi. creek bed, also install giants and build 3 mi. flume taking water from Sucker Creek near mouth of Boloh Creek, furnishing 400 ft. head flume involving 1,000,000 ft. lumber. About $5000. S. J. Summy, operator.

Trucks, etc.—Salem, Ore.—Marion Co. soon lets contract furnishing 1 or more 3½ ton capacity trucks equipped for hauling gravel, to be delivered by Apr. 1, also 1 factory made paving plant and 1 assembled paving plant, capacity not less than 1250 sq.yd. of 2 in. asphaltic top per day. U. G. Boyer, clk.

Police and Fire Alarm Systems—Calexico, Cal.—City voted $11,000 bonds to install police and fire alarm systems. P. B. Steintorf, city clk.

Canal and Dam — Mendota, Cal. — Mendota Irrigation Dist. plans to build 22 mi. canal and wooden diversion dam to irrigate 87,000 acres. About $500,000. Address E. P. Mitchell, Mendota.

Dams and Tunnel—San Andreas, Cal.—R. W. Olmstead, Manteca, plans to build 2 dams in Littlejohn's and Black creeks, 120 and 130 ft. high, loose rock faced with concrete, ¾ mi. tunnel and power plant, here. About $2,000,000.

Bulkhead and Pier—San Diego, Cal.—City voted $250,000 bonds to build concrete bulkhead and filled-in-pier. F. Rhodes, city engr.

Fire Alarm System—San Leandro, Cal.—City plans election to vote on $14,000 bonds to install fire alarm system.

Hydro Electric System—Chatham, Ont.—Pub. Utilities Comn. plans to build extensions to system. About $90,000. J. S. Jackson, Chatham, engr.

Gasholder-Guelph, Ont.—City election in January to vote on $75,000 bonds to build steel gasholder, concrete foundation. F. McArthur, city engr.

Hydro System—Havelock, Ont.—Town Council having plans prepared by Ontario Hydro Comm., Toronto, for Hydro system. Election Jan. 5 to vote on $29,000 bonds for project. J. W. Bryans, clk.

Rink and Stadium—Kingston, Ont.—Queens University plans to build wood, steel, concrete and brick, concrete foundation. About $70,000. Engineer not selected.

Hydro Power System—Uxbridge, Ont.—Town election Jan. 5, to vote on $30,000 bonds to build hydro power system. About $30,000. A. Sler, Ontario Hydro Bldg., Toronto, engr.

BIDS DESIRED

Water Gate Boxes and Covers, Sewer Manhole Frames and Covers—Jersey City, N. J.—Until Dec. 30, by F. A. Dolan, city clk., furnishing and delivering 20 tons water gate boxes and covers and sewer manhole frames and covers.

Asphalt, etc.—Jackson, Miss.—Until Jan. 6, by city, for 300 tons asphalt and asphalt plant. M. L. Culley, engr.

Cranes, etc.—Detroit, Mich.—Until Dec. 29, by J. A. Martin, c/o Dept. Purchases & Supplies. Municipal Courts Bldg., furnishing two 20-ton locomotive cranes. Separate proposals on 3446 lin.ft. 80-lb. rail, 4 switches, 7 frogs, track spikes, etc.

Stone Crusher—New Ulm, Minn.—City Council receiving bids furnishing stone crusher. W. Backer, city clk.

Engines—Stockton, Cal.—Until Jan. 6, by Bd. Supervs. San Joaquin Co. furnishing one 75 h.p. and one 25 h.p. vertical or horizontal oil engine at county farm. E. D. Graham, clk.

Survey Monuments—Toronto, Ont.—Until Jan. 15, by Dept. Lands, Forests & Mines, Surveys Branch, Toronto, furnishing 2500 survey posts, of 1 in. w.i. pipe, 30 in. long, welded foot plate and cement filled. L. V. Rorke, Parliament Bldgs., Toronto, engr.

Pipe, etc.—York, Ont.—Until Jan. 17 by F. Barber, twp. engr., 40 Jarvis St., Toronto, furnishing 5000 lengths 6 in., 1000 lengths 12 in., and 1000 lengths 16 in., c.i. pipe; 500 tons, 6, 12 and 16 in. c.i. specials; 200 6 in., 30 12 in. and 20 16 in. gate valves; 250 hydrants and 250 round c.i. valve covers and frames. About $225,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pier—Curtis Bay, Md.** (Baltimore, P. O.)—Standard Guano Wks., 1214 Continental Bldg. Baltimore, let contract building 40 x 200 ft., wood pile and timber pier, at plant, here, to Whiting-Turner Co., Stewart Bldg., Baltimore. About $50,000.

★**Condensing Apparatus and Turbine Generator—Ashtabula, O.**—City Council let contract furnishing condensing apparatus for electric lighting plant, to Wheeler Condensing & Eng. Co., Oliver Bldg., Pittsburgh, cost $13,940; turbine generator, to Kerr Turbine Co., Wellsville, N. Y., $23,800.

★**Retaining Wall, Fence and Flag Pole—Cleveland, O.**—Bd. Educ. let contract building concrete retaining wall, 1200 ft. long, 4 ft. high and 12 in. thick, also iron fence, 200 ft. long, and flag pole, involving 3000 cu.yd. excav., at Gladstone Public School grounds, to C. N. Griffen, 5709 Euclid Ave., $23,591.

★**Water Pipe—Dayton, O.**—City let contract furnishing 1250 tons c. i. water mains, various sizes, to United States Cast Iron Pipe & Fdry. Co., 122 South Michigan Ave., Chicago, $80,322.

★**Structural Steel—Lansing, Mich.**—Atlas Drop Forge Co., 209 West Mt. Hope Ave., let contract furnishing structural steel for 150 ft. extension to steel plant and steel storage yard, also for equipment, to include 3 heavy trip hammers, 300 h.p. boiler, and traveling crane, to Wisconsin Bridge & Iron Co., Penobscot Bldg., Detroit

★**Water and Electric Equipment—Aitkin, Minn.**—City let contract furnishing water and electric equipment, to J. G. Robertson, Wabash and Eustis Sts., St. Paul, $9489.

★**Foundation—Hibbing, Minn.**—Bd. Educ. let contract excavating and building concrete foundation for 2 story, 385 x 400 ft., rein.-con. and brick school, in Central Division, to Swanson Contg. Co., Hibbing, $89,750.

★**Grain Elevator—Kansas City, Mo.**—Chicago, Burlington & Quincy R. R., 547 West Jackson Blvd., Chicago, let contract rebuilding rein.-con. elevator, here, to Burrell Eng. & Constr. Co., 327 La Salle St., Chicago. About $400,000.

★**Water Mains—Bellingham, Wash.**—City let contract furnishing c.i. water mains to be used along West Diagonal Rd., to Oregon Iron & Steel Co., Concord Bldg., Portland, cost $78.50 per ton. Total cost exceeds $5000.

Retaining Wall—San Francisco, Cal.—Bd. Pub. Serv. received bids building 1736 ft. retaining wall on Army St. from Evans Ave. to Iowa St., involving 1500 cu.yd. earth excav., 25,200 sq.yd. mass concrete and 52 tons reinforcing bars, from Healy & Tibbetts, 9 Main St., $40,257, A. H. Vogt, 185 Stevenson St., $43,837, Anderson & Ringrose, 320 Market St., $44,904.

OFFICIAL PROPOSALS

Bids: Jan. 6.

Road Construction

Williamson, W. Va.

Sealed proposals will be received by the Clerk of the County Court of Mingo County, West Virginia, until 2 o'clock p. m. on the 6th day of January, 1920, for the construction of the following section of road, to-wit:

A section of road on Pigeon Creek in said County, beginning at the intersection of road No. 4 (Williamson-Burch Road) with road No. 10, at the mouth of Little Buffalo Creek on said Pigeon Creek, thence up Pigeon Creek according to location of road made by L. C. Linkous, County Road Engineer, to station 264, about one mile above the residence of E. E. Musick on said Creek, making a total distance of about 8 miles.

Plans, specifications and estimates of quantities may be examined at the County Road Engineer's Office, Williamson, W. Va., at the Division Road Engineer's Office, Huntington, W. Va., and at the office of the State Road Commission, Charleston, W. Va.

Proposals will be received only on the standard State forms prepared by the State Road Commission, which may be obtained from the Division Engineer's Office, Huntington, W. Va.

A certified check of not less than Fifteen Hundred Dollars ($1500.00), payable to G. T. Blankenship, Sheriff, must accompany each proposal.

The right is reserved to reject any and all bids.

THE COUNTY COURT OF MINGO COUNTY,
By ALEX BISHOP, President
Attest: ELIHU BOGGS, Clerk.
Dated this 5th day of December, 1919.

Note by Engineer:

The undersigned hereby designates January 2nd and 3rd as the days upon which he will accompany the contractors or their representatives over the proposed section of road.

L. C. LINKOUS,
County Road Engineer.

Bids: Jan. 27.

Construction of Steel Water Towers and Tanks

Avoca, Iowa.

Sealed proposals will be received by the Town of Avoca, Iowa, until 8:00 o'clock P.M. on the 27th day of January, 1920, for furnishing all materials, labor and tools required in the construction of (1) a steel water tower and wood tank complete, (2) a steel water tower and steel tank complete and (3) a concrete water tower and tank complete, each tower and tank to be about 105 feet high and 100,000 gallons capacity and in accordance with plans and specifications now on file in the office of the Clerk of said Town. Copies of "Instructions, Bidding Blank, Specifications, Plans and Contract" may be obtained from the Town Clerk.

FRANK WISE,
Clerk.

Bids: Feb. 1.

Drawings for City Auditorium

City of Mitchell, S. D.

The City Council of the City of Mitchell are desirous of receiving Drawings for a City Auditorium, to cost approximately $150,000. Three prizes are offered for the best designs submitted, ($450, $300, and $150).

The program governing competition, together with Plat of site and full instructions, will be sent on request by the undersigned.

All drawings, to receive judgment and consideration, must be at the Office of the undersigned by February 1st, 1920.

THOMAS EASTCOTT,
City Auditor.

Bids: Jan. 9.

Constructing 48-Inch Force Main

CITY OF AKRON, OHIO,
DEPARTMENT OF PUBLIC SERVICE
WATERWORKS IMPROVEMENT
Contract No. 164.

Akron, Ohio.

Sealed proposals for constructing a 48-inch pipe line will be received at the Office of the Director of Public Service, Delaware Building, Akron, Ohio, until twelve o'clock noon, Central Standard time, of Friday, the ninth day of January, 1920, at which time and place they will be publicly opened and read.

The contract includes the furnishing and laying of approximately 4.1 miles of pipe line, together with appurtenances, between the Cuyahoga River Pumping Station and the crossing of the Cuyahoga River south of Kent.

Alternative bids will be received as follows:

Bid "A": Furnishing pipe and special castings for a 48-inch cast iron line.

Bid "B": Laying 48-inch cast iron line.

Bid "C": Furnishing and laying 48-inch lock bar steel pipe.

Bid "D": Furnishing and laying 50-inch riveted steel pipe.

All proposals must be made on the forms furnished by the City.

Each bidder must accompany his proposal with a satisfactory bond or certified check in the sum of Fifteen Thousand Dollars ($15,000.00).

A surety bond in the amount of fifty (50) per cent of the amount of the contract will be required of the successful bidder.

Plans and specifications may be seen at the office of the Director, or copies may be obtained from the Bureau of Water Works Improvement, 102 E. Mill St., Akron, Ohio, upon deposit of Ten Dollars ($10.00), which sum will be refunded on return of the plans and specifications in good condition within ten days after the award of the contract.

The right is reserved to reject any or all bids.

H. S. MORSE,
Director, of Public Service.
G. G. DIXON, Engineer.
H. H. FROST, Supt. Water Works.

Bids: Jan. 20.

Waterworks Improvements

Lexington, N. C.

Sealed proposals will be received by the Mayor and Board of Town Commissioners of the Town of Lexington, N. C., at the Town Hall in Lexington, N. C., until 4 p.m., Jan. 20, 1920, for waterworks improvements.

The work will consist of the following:

Brick and concrete pumping station, filter house and filter tubs.

Brick and concrete auxiliary station.

Concrete coagulating basin.

Concrete storage reservoir, 500,000 gal.

Three and one-half miles of cast-iron pipe line.

Three and one-half miles of 2200-volt transmission line.

Motor-driven centrifugal pumps and accessories.

Filter plant equipment.

Proposals must be marked, "Proposal for Waterworks Improvements."

All bids must be upon the blank forms provided in, "Proposal, Specifications and Contracts."

Each bid must be accompanied by a certified check for not less than 5% of the amount of the bid, as evidence of good faith.

Plans and specifications will be on file at the Clerk's Office in Lexington, and at the Office of the Engineer, in Durham, N. C., and copies of the specifications, form of proposal, etc., will be mailed upon application to the Engineer at Durham, N. C.

The right is reserved to reject any or all bids.

J. T. HEDRICK, Mayor.
J. V. MOFFIT, Clerk.
Engineer: GILBERT C. WHITE,
Durham, N. C.

Bids: Jan. 5.

Paving

Fayetteville, W. Va.

Sealed proposals will be received at the office of the Clerk of the County Court, Fayetteville, W. Va., until January 5th, 1920, for paving one section of the Midland Trail, through Nuttall District, of approximately 8.0 miles. Grading and drainage complete. Bids will be received on Port-and Cement Concrete, Bituminous Macadam (Penetration) and other improved types of paving.

Bids must be submitted on the blank form contained in the book of specifications, which with other information may be obtained upon application to J. K. McGrath, Road Engineer, Fayetteville, West Virginia.

A certified check for five per cent. of the proposal, made payable to the Sheriff of Fayette County, shall be filed with the bid. The County Court reserves the right to reject any and all bids.

J. K. McGRATH, Road Engineer.
By order of the County Court of Fayette County, West Virginia.
H. O. BOLEY President.
Dec. 10, 1919. C. E. MAHAN, Clerk.

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